

New Product

Communication Unit for Open Network

SC-GU3 SERIES

The digital sensor can be connected directly to the 3 types of open network!

Other types of analog input sensors can also be connected!

CC-Link
SC-GU3-01



DeviceNet
SC-GU3-02



EtherCAT
SC-GU3-03



On sale soon

Scattered digital sensors can be centrally managed and set through an open network.

Applicable Digital Sensor	Digital Fiber Sensor FX-501 FX-502	Digital Laser Sensor LS-403	Digital Pressure Sensor DPS-401 DPS-402
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Fiber Sensor Guide Book

Fiber Sensor Guide Book



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GENERAL TERMS AND CONDITIONS

Please read this document carefully with respect to our product warranty policy before using our Panasonic Electric Works SUNX products ("Products"). If you have any questions or comments regarding do's and don'ts of the Products, please consult your local Panasonic Electric Works SUNX authorized dealer for the correct use and application of the Products.

1. PRODUCT MODIFICATION & DISCONTINUANCE:

Panasonic Electric Works SUNX expressly reserves the right to modify, including the right to discontinue, any of the Products, prior to their order, from time to time without notice.

2. WARRANTIES:

- (1) Subject to the exclusions stated in 3 (EXCLUSIONS) herein below, Panasonic Electric Works SUNX warrants the Products to be free of defects in material and workmanship for a period of one (1) year from the date of shipment under normal usage in environments commonly found in manufacturing industry.
- (2) Any Products found to be defective must be shipped to Panasonic Electric Works SUNX with all shipping costs paid by Purchaser or offered to Panasonic Electric Works SUNX for inspection and examination. Upon examination by Panasonic Electric Works SUNX, Panasonic Electric Works SUNX will, at its sole discretion, repair or replace at no charge, or refund the purchase price of, any Products found to be defective.

3. EXCLUSIONS

- (1) This warranty does not apply to defects resulting from any cause:
 - (i) which was due to abuse, misuse, mishandling, improper installation, improper interfacing, or improper repair by Purchaser;
 - (ii) which was due to unauthorized modification by Purchaser, in part or in whole, whether in structure, performance or specification;
 - (iii) which was not discoverable by a person with the state-of-the-art scientific and technical knowledge at the time of manufacture;
 - (iv) which was due to an operation or use by Purchaser outside of the limits of operation or environment specified by Panasonic Electric Works SUNX;
 - (v) which was due to Force Majeure; and
 - (vi) which was due to any use or application expressly discouraged by Panasonic Electric Works SUNX in 5 (CAUTIONS FOR SAFE USE) hereunder.
- (2) This warranty extends only to the first purchaser for application, and is not transferable to any person or entity which purchased from such purchaser for application.
- (3) The performance data presented in this catalogue is only for guidance and shall not constitute any performance warranty by Panasonic Electric Works SUNX.

4. DISCLAIMERS

- (1) Panasonic Electric Works SUNX's sole obligation and liability under this warranty is limited to the repair or replacement, or refund of the purchase price, of a defective Product, at Panasonic Electric Works SUNX's option.
- (2) THE REPAIR, REPLACEMENT, OR REFUND IS THE EXCLUSIVE REMEDY OF THE PURCHASER. AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF PROPRIETARY RIGHTS, ARE HEREBY EXPRESSLY DISCLAIMED. IN NO EVENT SHALL PANASONIC ELECTRIC WORKS SUNX AND ITS AFFILIATED ENTITIES BE LIABLE FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCTS, OR FOR ANY INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND, OR ANY DAMAGES RESULTING FROM LOSS OF USE, BUSINESS INTERRUPTION, LOSS OF INFORMATION, LOSS OR INACCURACY OF DATA, LOSS OF PROFITS, LOSS OF SAVINGS, THE COST OF PROCUREMENT OF SUBSTITUTED GOODS, SERVICES OR TECHNOLOGIES, OR FOR ANY MATTER ARISING OUT OF OR IN CONNECTION WITH THE USE OR INABILITY TO USE THE PRODUCTS.

5. CAUTIONS FOR SAFE USE

- (1) The applications shown in this catalogue are only suggestions, and it is Purchaser's sole responsibility to ascertain the fitness and suitability of the Products for any particular application, as well as to abide by Purchaser's applicable local laws and regulations, if any.
- (2) Never use the Products NOT rated or designated as "SAFETY SENSOR" in any application involving risk to life or property. When such a use is made by Purchaser, such Purchaser shall indemnify and hold harmless Panasonic Electric Works SUNX from any liability or damage whatsoever arising out of or in relation to such use.
- (3) In incorporating the Products to any equipment, facilities or systems, it is highly recommended to employ fail-safe designs, including but not limited to a redundant design, flame propagation prevention design, and malfunction prevention design so as not to cause any risk of bodily injury, fire accident, or social damage due to any failure of such equipment, facilities or systems.
- (4) The Products are each intended for use only in environments commonly found in manufacturing industry, and, unless expressly allowed in this catalogue, specification or otherwise, shall not be used in, or incorporated into, any equipment, facilities or systems, such as those:
 - (a) which are used for the protection of human life or body parts;
 - (b) which are used outdoors or in environments subject to any likelihood of chemical contamination or electromagnetic influence;
 - (c) which are likely to be used beyond the limits of operations or environments specified by Panasonic Electric Works SUNX in this catalogue or otherwise;
 - (d) which may cause risk to life or property, such as nuclear energy control equipment, transportation equipment (whether on rail or land, or in air or at sea), and medical equipment;
 - (e) which are operated continuously each day for 24 hours; and
 - (f) which otherwise require a high level of safety performance similar to that required in those equipment, facilities or systems as listed in (a) through (e) above.

6. EXPORT CONTROL LAWS

In some jurisdictions, the Products may be subject to local export laws and regulations. If any diversion or re-export is to be made, Purchaser is advised to abide by such local export laws and regulations, if any, at its own responsibility.

7. PURCHASER'S TRASFER OBLIGATIONS

If Purchaser resell or deliver the Products to a third party, Purchaser must provide such third party with a copy of this document, all specifications, manuals, catalogs, leaflets and written information of any kind provided to Purchaser by Panasonic Electric Works SUNX or its authorized local representative from time to time regarding the Products.

Fiber Selection Guide

Choose by model

◆ Thru-beam type

Model No.	Page		
	Sensing range Specifications	Dimensions	
FT-140	P.10	P.34	
FT-30	P.9		
FT-31	P.10		
FT-31S	P.15		
FT-31W	P.10		
FT-40	P.9		
FT-42	P.10		
FT-42S	P.15		
FT-42W	P.10		
FT-43			
FT-45X			
FT-A11			
FT-A11W			
FT-A32	P.20	P.35	
FT-A32W			
FT-AL05			
FT-E13	P.12/P.15		
FT-E23			
FT-F93	P.28		
FT-H13-FM2	P.24		P.36
FT-H20-J20-S			
FT-H20-J30-S			
FT-H20-J50-S			
FT-H20-M1			
FT-H20-VJ50-S			
FT-H20-VJ80-S			
FT-H20W-M1			
FT-H30-M1V-S		P.26	
FT-H35-M2		P.24	
FT-H35-M2S6	P.23	P.37	
FT-HL80Y			
FT-KS40	P.19		
FT-KV26			
FT-KV40			
FT-KV40W	P.23		
FT-L80Y	P.10		
FT-R40	P.12		
FT-R41W	P.9		
FT-R42W	P.12		
FT-S11	P.9		
FT-S20	P.12		
FT-S21	P.9		
FT-S21W	P.12		
FT-S30	P.12		
FT-S31W	P.15	P.38	
FT-S32			
FT-V23	P.12		
FT-V24W			
FT-V25			
FT-V30	P.23		
FT-V40	P.16		P.39
FT-V80Y			
FT-WZ4			
FT-WZ7			
FT-Z20HBW			
FT-Z30			
FT-Z30E			

◆ Retroreflective type

Model No.	Page	
	Sensing range Specifications	Dimensions
FR-KZ22E	P.19/P.22	P.41
FR-KZ50E		
FR-KZ50H		
FR-Z50HW		

◆ Reflective type

Model No.	Page		
	Sensing range Specifications	Dimensions	
FD-30	P.9	P.42	
FD-31	P.11		
FD-31W			
FD-32G	P.11/P.18		
FD-32GX			
FD-40	P.9		
FD-41	P.11		
FD-41S	P.15		
FD-41SW			
FD-41W	P.11		
FD-42G	P.11/P.18	P.43	
FD-42GW			
FD-60	P.9		
FD-61	P.11		
FD-61G			
FD-61S	P.15		
FD-61W	P.11		
FD-62			
FD-64X	P.20		
FD-A16			
FD-AL11	P.13/P.15	P.44	
FD-E13			
FD-E23	P.11/P.18		
FD-EG30			
FD-EG30S	P.15		
FD-EG31	P.11/P.18		
FD-F4			
FD-F41	P.28		P.45
FD-F41Y			
FD-F71			
FD-F8Y			
FD-FA93	P.25	P.46	
FD-H13-FM2			
FD-H18-L31			
FD-H20-21			
FD-H20-M1			

Model No.	Page		
	Sensing range Specifications	Dimensions	
FD-H25-L43	P.25	P.46	
FD-H25-L45			
FD-H30-KZ1V-S	P.26	P.47	
FD-H30-L32	P.25		
FD-H30-L32V-S	P.26		
FD-H35-20S	P.25		
FD-H35-M2			
FD-H35-M2S6	P.28		
FD-HF40Y	P.21		P.48
FD-L10			
FD-L11			
FD-L12W			
FD-L20H			
FD-L21			
FD-L21W			
FD-L22A			
FD-L23			
FD-L30A			
FD-L31A	P.11	P.49	
FD-L32H			
FD-R60	P.13		
FD-S21	P.9		
FD-S30	P.13		
FD-S31			
FD-S32	P.15		
FD-S32W			
FD-S33GW			
FD-V30	P.17		P.50
FD-V30W			
FD-V50			
FD-WZ4			
FD-WZ7			
FD-Z20HBW			
FD-Z40HBW			
FD-Z50HW	P.19		

New product introduction

Tough Fiber

Fiber Selection Guide

Choose by model

Choose by shape/application
Viewing new models

Fibers

Super Quality

Threaded Type

Cylindrical Type

Sleeve

Flat Type

Small Spot

Narrow Beam

Wide Beam

Convergent Reflective Type

Retroreflective Type

Chemical-resistant

Heat-resistant

Vacuum-resistant

Liquid Leak/Liquid Detection

Fiber Options

Fiber Dimensions

Thru-beam Type

Retroreflective Type

Reflective Type

Others

Amplifiers

FX-500 series

FX-100 series

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Earlier models comparison table

Fiber Selection Guide

Choose by quality

Super Quality

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



P.8

Choose by shape

Threaded Type

- Standard type which is mounted using nuts.



P.10

Cylindrical Type

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



P.12

Sleeve

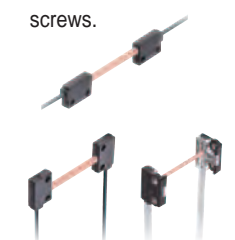
- Suitable for sensing in narrow locations and sensing minute objects.



P.14

Flat Type

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



P.16

Choose by beam shape

Small Spot

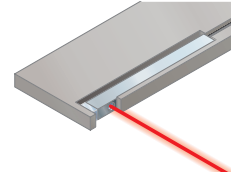
- Senses minute objects using a spot lens.



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Narrow Beam

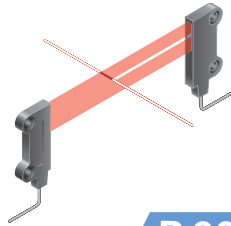
- Not easily affected by surrounding obstacles.



P.19

Wide Beam

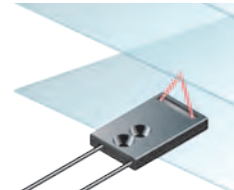
- Senses in the beam band without missing a work.



P.20

Convergent Reflective Type

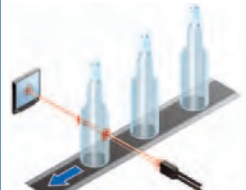
- Senses in the limited range only.



P.21

Retroreflective Type

- Ideal for sensing transparent objects



P.22

Choose by environment/performance

Chemical-resistant

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



P.23

Heat-resistant

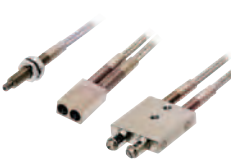
- Withstands at -60 °C -76 °F to 350 °C 662 °F



P.24

Vacuum-resistant

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



P.26

Liquid Leak / Liquid Detection

- Corresponds to various liquid events.



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Fiber amplifiers guidance

Digital fiber sensor FX-500 series

- At the industry's leading edge



P.56

Digital fiber sensor FX-100 series

- Super functionality, yet, economical price



P.66

New product introduction

Tough Fiber

Fiber Selection Guide

Choose by model

Choose by shape/application

Viewing new models

Fibers

Super Quality

Threaded Type

Cylindrical Type

Sleeve

Flat Type

Small Spot

Narrow Beam

Wide Beam

Convergent Reflective Type

Retroreflective Type

Chemical-resistant

Heat-resistant

Vacuum-resistant

Liquid Leak / Liquid Detection

Fiber Options

Fiber Dimensions

Thru-beam Type

Retroreflective Type

Reflective Type

Others

Amplifiers

FX-500 series

FX-100 series

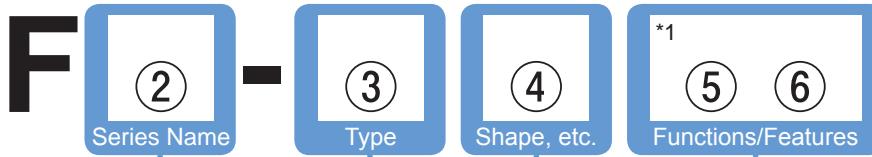
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Earlier models comparison table

Fiber Selection Guide

Viewing new models

Applies to the fiber marked **NEW** in the model name field (P.8~P.29)



*1: Excluding liquid leak / liquid detection fiber

②

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

⑤

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

*③ is for Flat type (Z and KZ) only

⑥

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

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

New product introduction

Tough Fiber

Fiber Selection Guide

Choose by model

Choose by shape/application

Viewing new models

Fibers

Super Quality

Threaded Type

Cylindrical Type

Sleeve

Flat Type

Small Spot

Narrow Beam

Wide Beam

Convergent Reflective Type

Retroreflective Type

Chemical-resistant

Heat-resistant

Vacuum-resistant

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Thru-beam Type

Retroreflective Type

Reflective Type

Others

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FX-500 series

FX-100 series

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Earlier models comparison table

Tough Fiber

Conventional 3 types rolled into 1 !!
New standard fiber

Flexible fiber
Flexible durability

1 million
times

Sharp bending fiber
Bending radius

R2~R1
mm

General purpose fiber
Bending radius

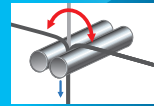
R25
mm

in

Tough Fiber

Break-free

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

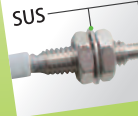


More flexible
Bending radius R2~R4
mm



ECO

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



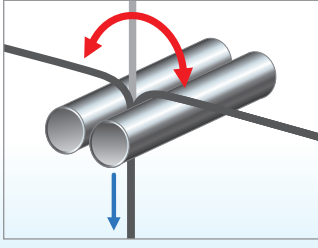
- Clearly conforms to RoHS
- Can be used for secondary battery
- Improved mounting strength

Introducing a tough fiber that transcends common knowledge!

It has toughness that can be used in moving parts, toughness that can be bent with precision, and high-quality for all purposes. It changes common knowledge about fibers.



Break-free



Flexible durability

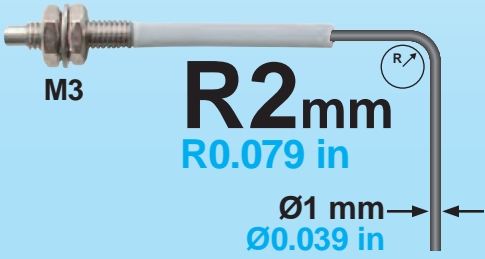
10 million times (Typical)

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

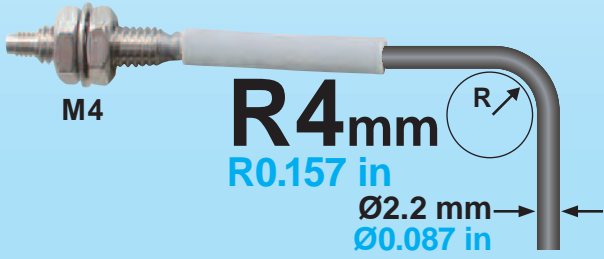
More flexible

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

Ex) FT-31



Ex) FT-42



Reduced the time for selecting fiber and registration numbers

For Designers *High-quality*

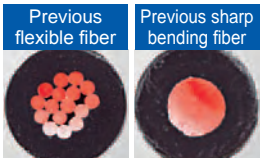
- High-quality in whichever tough fiber you choose!
- Easy selection!
- Reduced risk of breaking and bending during installation!

For Buyers *Low Price*

- Cost savings!
- Reduced registration numbers!
- Reduced frequency of maintenance stockpiling and replacement!

Reduced variation in sensing

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



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



The new standard fiber is composed of a single fiber core, achieving uniform light intensity.
•Uniform and highly accurate sensing
•Stable sensing even if the fiber is bent

New product introduction

Tough Fiber

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FX-100 series

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Earlier models comparison table

Super Quality

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

Digital management is simple due to small differences in body.

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

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

"Stabilized incident light intensities"
even in multiple units



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

Stable emission intensity within $\pm 10\%$

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

- Beam axis deviation: Thru-beam type within $\pm 2^\circ$, Reflective type within $\pm 3^\circ$
- Beam axis centering precision: within $\pm 150 \mu\text{m}$

Expanded temperature range

Ambient temperature [-40 to $+70^\circ\text{C}$ -40 to $+158^\circ\text{F}$ in previous]

-55 to $+80^\circ\text{C}$

1.2 times
more than
previous

-67 to $+176^\circ\text{F}$

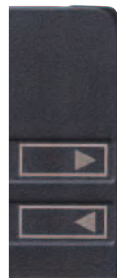
Integrated high-precision plug

The centering precision of the fiber core attached to the inserting plug is doubled.

As the insertion precision is increased, the variation among units can be greatly suppressed.



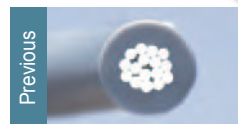
- Centering precision: within $\pm 40 \mu\text{m}$



$\varnothing 2.2 \text{ mm } \varnothing 0.087 \text{ in}$ 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

*Bending conditions

Bending radius: R10 mm R0.39 in,
Reciprocating bending 180°

Thru-beam type (one pair set)

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length : Free-cut	Sensing range (mm in)			Beam axis dia. (mm)	Beam axis position/Inclination of beam axis	Optical transmission loss	Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)					
Threaded	M3	Tough NEW FT-30	R2 Bending durability	2 m	STD 400 15.748	810 31.890 650 25.591 210 8.268	135 5.315 400 15.748	ø0.5	150 µm /±2°	±10 %	IP67	-55 to +80 °C
			HYPR 1,350 53.150		75 2.953							
	M4	Tough NEW FT-40	R4 Bending durability		STD 1,200 47.244	2,200 86.614 1,700 66.929 530 20.866	320 12.598 870 34.252	ø1				
			HYPR (Note) 3,600 141.732		190 7.480							
Cylindrical	ø1.5	Tough NEW FT-S20	R2 Bending durability		STD 400 15.748	810 31.890 650 25.591 210 8.268	135 5.315 400 15.748	ø0.5				
			HYPR 1,350 53.150		75 2.953							
	ø3	Tough NEW FT-S30	R4 Bending durability		STD 1,200 47.244	2,200 86.614 1,700 66.929 530 20.866	320 12.598 870 34.252	ø1				
			HYPR (Note) 3,600 141.732		190 7.480							

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

Reflective type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length : Free-cut	Sensing range (mm in) (Note)			Beam axis position/Inclination of beam axis	Optical transmission loss	Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)				
Threaded	M3	Tough NEW FD-30	R2 Bending durability	2 m	STD 160 6.299	330 12.992 250 9.843	45 1.772 155 6.102	150 µm /±3°	±10 %	IP67	-55 to +80 °C
			HYPR 600 23.622		80 3.150 25 0.984						
		M4	Tough NEW FD-40			STD 520 20.472	900 35.433 740 29.134 260 10.236				
			HYPR (Note) 1,550 61.024		90 3.543						
Cylindrical	ø3	Tough NEW FD-S30	R4 Bending durability		STD 160 6.299	330 12.992 250 9.843 80 3.150	45 1.772 155 6.102				
			HYPR 600 23.622		25 0.984						

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

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

New product introduction
Tough Fiber

Fiber Selection Guide
Choose by model
Choose by shape/application
Viewing new models

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

Fiber Options

Fiber Dimensions
Thru-beam Type
Retroreflective Type
Reflective Type
Others

Amplifiers
FX-500 series
FX-100 series

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Earlier models comparison table

Threaded Type

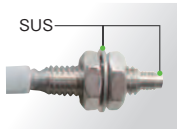
- It is a standard fiber which is mounted using nuts. It has reasonable pricing while drastically improving flexing performance.
- With the lens installable type, long distance sensing and microscopic object sensing is possible by installing a lens.
- A protective tube and a sturdy stainless jacket type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



<Thru-beam type> FT-31/31W/43/42/42W
FT-45X/R40
<Reflective type> FD-31/41/62/61/R60
More user-friendly, high quality fiber

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

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



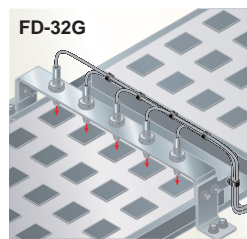
* Some models not included (FT-R41W, FT-R42W, FT-140)

Application

Metal-free fiber FT-41, FD-G60, FD-G40

- Made of resin
- Metallic particulate production ratio: ZERO
- Effect on magnetic fields: ZERO

*For details, please see our website.



Sensing the presence of workpiece



Improved centering accuracy

The beam axis deviation of each unit is kept within $\pm 3^\circ$ and the beam axis centering accuracy is kept within $\pm 150 \mu\text{m}$.
(Within $\pm 5^\circ$ and $\pm 90 \mu\text{m}$ for ultra small diameter fibers)

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

Improved specularity

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

- Light intensity is increased, enabling stable sensing.

Thru-beam type (one pair set)

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length (m)	Sensing range (mm in) (Note 1)			Beam axis dia. (mm)	Beam axis position/Inclination of beam axis	Protection	Ambient temp.		
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)						
Threaded	M3	Tough NEW FT-31	R2	Free-cut	STD 770 30.315 315 12.402 HYPR 210 8.268 1,350 53.150	550 21.654 70 2.756	130 5.118 340 13.386	ø0.5	150 μm / $\pm 2^\circ$	IP67	-55 to +80 °C		
		NEW FT-31W	R1		STD 590 23.228 260 10.236 HYPR 150 5.906 990 38.976	440 17.323 53 2.087	80 3.150 240 9.449						
	M4	Lens mountable	NEW FT-43	R4	2 m	STD 2,800 110.236 1,400 55.118 HYPR (Note 2) 3,600 141.732	2,100 82.677 770 30.315 240 9.449	350 13.780 970 38.189	ø1.5	150 μm / $\pm 2^\circ$	IP67	-55 to +80 °C	
			Tough NEW FT-42	R4		STD 2,050 80.709 1,130 44.488 HYPR (Note 2) 3,600 141.732	1,600 62.992 530 20.866 190 7.480	300 11.811 800 31.496					
		Lens mountable	NEW FT-42W	R1	1 m	STD 1,900 74.803 800 31.496 HYPR 1,400 55.118 490 19.291 160 6.299	1,400 55.118 160 6.299	260 10.236 720 28.346	ø1	150 μm / $\pm 3^\circ$	IP67	-40 to +60 °C	
			Lens mountable, Stainless-jacketed	NEW FT-45X		R4	STD 1,200 47.244 HYPR (Note 2) 1,600 62.992	1,600 62.992 (Note 2) 630 24.803 200 7.874					340 13.386 920 36.220
		Elbow	Lens mountable	Tough NEW FT-R40	R4	2 m	STD 930 36.614 HYPR (Note 2) 3,600 141.732	1,750 68.898 1,500 59.055 500 19.685 160 6.299	270 10.630 740 29.134	ø1	150 μm / $\pm 2^\circ$	IP67	-55 to +80 °C
			Square head	NEW FT-R41W	R1		STD 800 31.496 HYPR 3,200 125.984	1,800 70.866 1,400 55.118 460 18.110 150 5.906	250 9.843 710 27.953				
	Square head	With expansion lens	NEW FT-R42W	R1	2 m	STD 2,200 86.614 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,500 137.795 1,300 51.181 460 18.110	510 20.079 2,000 78.740	ø2.2	—	IP40	-40 to +60 °C	
		With expansion lens	Tough NEW FT-140	R4		STD (Note 2) 19,600 771.654 HYPR (Note 2) 19,600 771.654	19,600 771.654 (Note 2) 16,000 629.921 6,300 248.031	14,000 551.181 19,600 771.654 (Note 2)					

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

2) The fiber cable length practically limits the sensing range.

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

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

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



Supports spot lenses and zoom lenses!

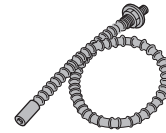
Fiber options

Lens (For thru-beam type fiber)
▶ P.30~

Lens (For reflective type fiber)
▶ P.32

Protective tube ▶ P.33

- FTP-□
- FDP-□



Reflective type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in) (Note 1, 2)			Beam axis position/ Inclination of beam axis	Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)			
M3	M3 12	Tough NEW FD-31	R2 Bending durability	2 m	STD 125 4.921 HYPR 515 20.276	290 11.417 220 8.661 80 3.150 25 0.984	35 1.378 140 5.512	150 μm /±3°	IP67	-55 to +80 °C
		NEW FD-31W	R1		STD 80 3.150 HYPR 330 12.992	180 7.087 140 5.512 45 1.772 12 0.472	15 0.591 60 2.362	—		-40 to +60 °C
	Coaxial, Lens mountable M3 17	Tough NEW FD-32G	R2 Bending durability	1 m (Note 3)	STD 200 7.874 HYPR 650 25.591	380 14.961 270 10.630 95 3.740 27 1.063	70 2.756 190 7.480	—	IP40	-55 to +80 °C
		NEW FD-32GX	R2		STD 200 7.874 HYPR 630 24.803	410 16.142 360 14.173 100 3.937 30 1.181	75 2.953 210 8.268	—		-40 to +70 °C
	Ultra-small diameter M3 16	NEW FD-EG30	R4	500 mm	STD 48 1.890 HYPR 170 6.693	130 5.118 110 4.331 30 1.181 9 0.354	20 0.787 70 2.756	—	—	-40 to +70 °C
		NEW FD-EG31			STD 20 0.787 HYPR 85 3.346	45 1.772 35 1.378 12 0.472 3.5 0.138	7 0.276 25 0.984	—		-20 to +60 °C
Threaded M4	M4 14	Tough NEW FD-41	R2 Bending durability	2 m	STD 125 4.921 HYPR 515 20.276	290 11.417 220 8.661 80 3.150 25 0.984	35 1.378 140 5.512	150 μm /±3°	IP67	-55 to +80 °C
		NEW FD-41W	R1		STD 270 10.630 HYPR 900 35.433	630 24.803 430 16.929 150 5.906 45 1.772	80 3.150 230 9.055	—		-40 to +60 °C
	Coaxial, Lens mountable M4 25	Tough NEW FD-42G	R2 Bending durability	2 m	STD 200 7.874 HYPR 650 25.591	380 14.961 270 10.630 95 3.740 27 1.063	70 2.756 190 7.480	—	IP40	-55 to +80 °C
		NEW FD-42GW	R1		STD 150 5.906 HYPR 670 26.378	340 13.386 280 11.024 90 3.543 25 0.984	45 1.772 140 5.512	—		-40 to +60 °C
M6	M6 17	NEW FD-62	R4 Bending durability	2 m	STD 520 20.472 HYPR 1,500 59.055	1,000 39.370 940 37.008 340 13.386 110 4.331	170 6.693 450 17.717	150 μm /±3°	IP67	-55 to +80 °C
		Tough NEW FD-61	R4		STD 450 17.717 HYPR 1,400 55.118	840 33.071 670 26.378 200 7.874 70 2.756	120 4.724 410 16.142	—		-40 to +60 °C
	Coaxial M6 17	NEW FD-61W	R1	2 m	STD 270 10.630 HYPR 900 35.433	630 24.803 430 16.929 150 5.906 45 1.772	80 3.150 230 9.055	—	IP40	-40 to +60 °C
		Tough NEW FD-61G	R4 Bending durability		STD 420 16.535 HYPR 1,100 43.307	800 31.496 650 25.591 200 7.874 60 2.362	120 4.724 350 13.780	—		-55 to +80 °C
	Stainless-jacketed M6 22	NEW FD-64X	R4	1 m	STD 280 11.024 HYPR 670 26.378	500 19.685 410 16.142 160 6.299 50 1.969	75 2.953 220 8.661	—	IP40	-55 to +80 °C
Elbow M6 15	Tough NEW FD-R60	R4 Bending durability	2 m	STD 290 11.417 HYPR 1,100 43.307	600 23.622 550 21.654 190 7.480 65 2.559	110 4.331 240 9.449	150 μm /±3°	IP67	-55 to +80 °C	

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
2) The sensing range is specified for white non-glossy paper.
3) The allowable cutting range is 700 mm 27.559 in from the end that the amplifier inserted.

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

New product introduction
Tough Fiber
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Choose by shape/application
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Super Quality
Threaded Type
Cylindrical Type
Sleeve
Flat Type
Small Spot
Narrow Beam
Wide Beam
Convergent Reflective Type
Retroreflective Type
Chemical-resistant
Heat-resistant
Vacuum-resistant
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Fiber Dimensions
Thru-beam Type
Retroreflective Type
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Others

Amplifiers
FX-500 series
FX-100 series

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Earlier models comparison table

Cylindrical Type

- Has a slender shape which can be mounted in narrow locations using set screws.
- Line up that includes ultra-thin fibers with $\phi 0.25$ mm tips.



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

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

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

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

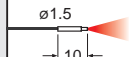
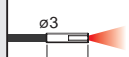


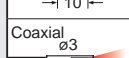
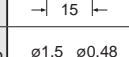
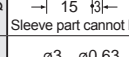
Thru-beam type (one pair set)

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in) (Note 1)			Beam axis dia. (mm)	Beam axis position/Inclination of beam axis	Protection	Ambient temp.	
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)					
Cylindrical	$\phi 1$	Tough NEW FT-S11	R2	500 mm	STD 190 3.543 HYPR 350 13.780	210 8.268 160 6.299 60 2.362 19 0.748	40 1.575 90 3.543	$\phi 0.25$	—	IP67	-55 to +80 °C	
	$\phi 1.5$	Tough NEW FT-S21	R1	2 m	STD 315 12.402 HYPR 1,350 53.150	770 30.315 550 21.654 210 8.268 70 2.756	130 5.118 340 13.386	$150 \mu\text{m} / \pm 2^\circ$				
	$\phi 1.5$	Tough NEW FT-S21W			STD 260 10.236 HYPR 990 38.976	590 23.228 440 17.323 150 5.906 53 2.087	80 3.150 240 9.449	$150 \mu\text{m} / \pm 3^\circ$				
	$\phi 2.5$	Tough NEW FT-S32	R10	2 m	STD 3,100 122.047 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 1,800 70.866 600 23.622	1,100 43.307 3,000 118.110	$\phi 2$	—	IP40	-40 to +70 °C	
	$\phi 3$	Tough NEW FT-S31W	R1		STD 800 31.496 HYPR 3,300 129.921	1,900 74.803 1,400 55.118 490 19.291 160 6.299	260 10.236 720 28.346	$\phi 1$	$150 \mu\text{m} / \pm 3^\circ$	IP67	-40 to +60 °C	
	Ultra-small diameter	Narrow beam $\phi 0.125$ mm Sleeve part cannot be bent.	Tough NEW FT-E13	R2	1 m	STD 15 0.591 HYPR 152 2.047	30 1.181 24 0.945 8 0.315 2 0.079	6 0.236 19 0.748	$\phi 0.125$			—
		Narrow beam $\phi 0.25$ mm Sleeve part cannot be bent.	Tough NEW FT-E23	R2	1 m	STD 75 2.953 HYPR 270 10.630	160 6.299 125 4.921 42 1.654 13 0.512	22 0.866 80 3.150	$\phi 0.25$	—		
	$\phi 4$	Tough NEW FT-V40	R4	2 m	STD 3,500 137.795 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 2,400 94.488 850 33.465	1,000 39.370 3,100 122.047	$\phi 2.5$	—	IP50	-40 to +60 °C	

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
2) The fiber cable length practically limits the sensing range.

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

Reflective type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in) (Note 1, 2)			Beam axis position/ Inclination of beam axis	Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)			
Cylindrical		Tough NEW FD-S21	R2 Bending durability	1 m	STD 80 3.150 HYPR 190 7.480	130 5.118 110 4.331 37 1.457 11 0.433	25 0.984 70 2.756	—	IP40	-55 to +80 °C
		Tough NEW FD-S32	R4 Bending durability	2 m	STD 420 16.535 HYPR 1,200 47.244	790 31.102 660 25.984 220 8.661 75 2.953	120 4.724 345 13.583	150 μm /±3°	IP67	
		NEW FD-S32W	R1		STD 270 10.630 HYPR 900 35.433	630 24.803 430 16.929 150 5.906 45 1.772	80 3.150 230 9.055	—		
		Tough NEW FD-S31	R2 Bending durability	STD 125 4.921 HYPR 515 20.276	290 11.417 220 8.661 80 3.150 25 0.984	35 1.378 140 5.512	150 μm /±3°			
		NEW FD-S33GW	R1	STD 150 5.906 HYPR 670 26.378	340 13.386 280 11.024 90 3.543 25 0.984	45 1.772 140 5.512	—			
		NEW FD-E13	R4	STD 12 0.472 HYPR 50 1.969	29 1.142 25 0.984 7 0.276 2 0.079	5 0.197 15 0.591	—			
	NEW FD-E23	STD 55 2.165 HYPR 170 6.693		120 4.724 80 3.150 30 1.181 9 0.354	20 0.787 70 2.756	—				

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
2) The sensing range is specified for white non-glossy paper.

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

Sleeve

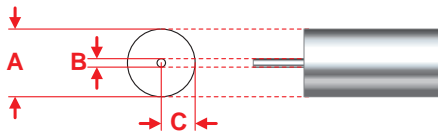
- It is suitable for sensing in narrow locations and sensing minute objects because the fiber tip is a thin sleeve.
- The 40 mm sleeve type can be bent in any direction.



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

Centering of 1/10 mm or less

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



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

Dimensions UNCLEAR

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

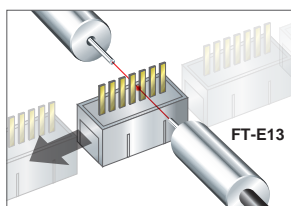
Dimensions CLEAR

Ex.) FT-E13

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

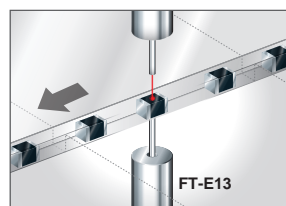
Minute sensing only possible with ultra small fiber

- Detection of fine-pitch connector pins



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

- Detection of tiny chips

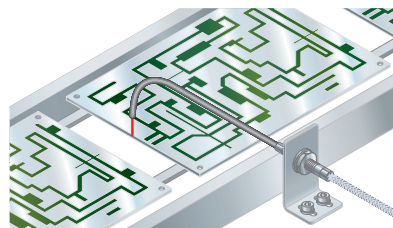


Fiber can be installed with only the $\varnothing 0.25 \text{ mm } \varnothing 0.010 \text{ in}$ sleeve close to the minute section.

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

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

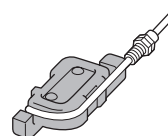
Application



Fiber options

Fiber bender

- FB-1



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

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

Thru-beam type (one pair set)

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in) (Note 1, 2)			Beam axis dia. (mm)	Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)			
Threaded	M3 	Tough NEW FT-31S	R2 Bending durability (Note 3)	2 m	STD 315 12.402 HYPR 1,220 48.031	740 29.134 550 21.654 195 7.677 63 2.480	130 5.118 340 13.386	ø0.5	IP67	-55 to +80 °C
	M4 	Tough NEW FT-42S	R4 Bending durability (Note 3)		STD 1,130 44.488 HYPR (Note 2) 3,600 141.732	2,050 80.709 1,600 62.992 530 20.866 190 7.480	300 11.811 800 31.496	ø1		
Cylindrical	Ultra-small diameter ø3 	Tough NEW FT-E13	R2 Bending durability	1 m	STD 15 0.591 HYPR 52 2.047	30 1.181 24 0.945 8 0.315 2 0.079	6 0.236 19 0.748	ø0.125	IP67	-40 to +70 °C
		Tough NEW FT-E23	R4 Bending durability		STD 175 2.953 HYPR 270 10.630	160 6.299 125 4.921 42 1.654 13 0.512	22 0.866 80 3.150	ø0.25		
	Side-view ø2 	Tough NEW FT-V23	R4 Bending durability	2 m	STD 450 17.717 HYPR 1,800 70.866	1,000 39.370 880 34.646 280 11.024 90 3.543	160 6.299 400 15.748	ø0.75	IP30	-55 to +80 °C
		Tough NEW FT-V25	R2 Bending durability		STD 240 9.449 HYPR 900 35.433	550 21.654 480 18.898 140 5.512 45 1.772	95 3.740 260 10.236	ø0.5		
		Tough NEW FT-V24W	R1		STD 110 4.331 HYPR 380 14.961	230 9.055 200 7.874 60 2.362 20 0.787	35 1.378 90 3.543			
		Tough NEW FT-V30	R4 Bending durability		STD 680 26.772 HYPR 2,200 86.614	1,200 47.244 1,000 39.370 340 13.386 100 3.937	180 7.087 480 18.898			

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

Reflective type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in) (Note 1, 2)			Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)		
Threaded	Ultra-small diameter M3 	NEW FD-EG30S	R4	1 m	STD 50 1.969 HYPR 170 6.693	110 4.331 80 3.150 30 1.181 9 0.354	20 0.787 70 2.756	IP40	-40 to +70 °C
	M4 	Tough NEW FD-41S	R2 Bending durability (Note 3)		STD 125 4.921 HYPR 515 20.276	290 11.417 220 8.661 80 3.150 25 0.984	35 1.378 140 5.512	IP67	-55 to +80 °C
	M4 	NEW FD-41SW	R1 (Note 3)		STD 80 3.150 HYPR 330 12.992	180 7.087 140 5.512 45 1.772 12 0.472	15 0.591 60 2.362		
	M6 	Tough NEW FD-61S	R4 Bending durability (Note 3)		STD 420 16.535 HYPR 1,200 47.244	790 31.102 660 25.984 220 8.661 75 2.953	130 5.118 360 14.173	IP67	-55 to +80 °C
Cylindrical	Ultra-small diameter ø1.5 	NEW FD-E13	R4	1 m	STD 12 0.472 HYPR 50 1.969	29 1.142 25 0.984 7 0.276 2 0.079	5 0.197 15 0.591	IP40	-40 to +60 °C
		NEW FD-E23			STD 55 2.165 HYPR 170 6.693	120 4.724 80 3.150 30 1.181 9 0.354	20 0.787 70 2.756		
	Side-view ø3 	Tough NEW FD-V30	R2 Bending durability	2 m	STD 65 2.559 HYPR 240 9.449	130 5.118 120 4.724 35 1.378 14 0.551	25 0.984 75 2.953	IP30	-55 to +80 °C
		NEW FD-V30W	R1		STD 20 0.787 HYPR 80 3.150	40 1.575 30 1.181 10 0.394 2 0.079	6 0.236 20 0.787		
		Tough NEW FD-V50	R4 Bending durability		STD 120 4.724 HYPR 370 14.567	220 8.661 210 8.268 75 2.953 25 0.984	40 1.575 100 3.937		

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

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

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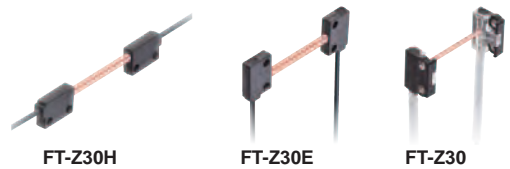
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Flat Type

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

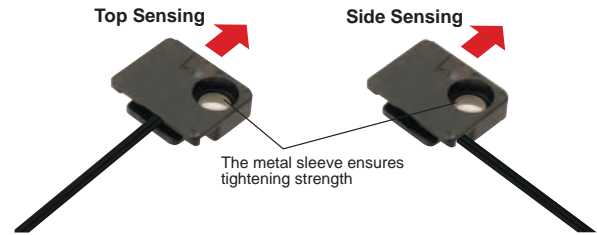
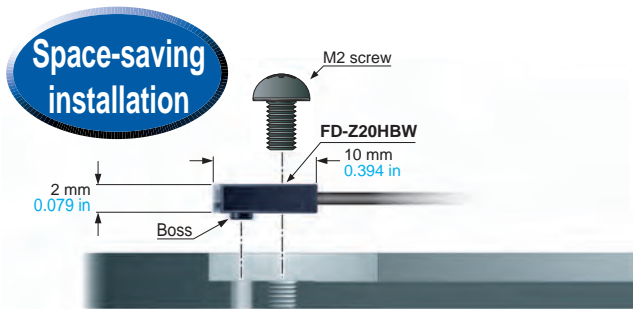


Mounting with M2 or M3 screw

We offer; FT-WZ4/Z20HBW, FD-WZ4/Z20HBW, 1 point mounting with M2 screw and FT-WZ7/Z40HBW, FD-WZ7/Z40HBW, 1 point mounting with M3 screw.

The built-in fiber guide allows for multiple installation angles.

FT/FD-WZ□HBW is equipped with a fiber guide feature. Front sensing and side sensing can be selected with one head.



Thru-beam type (one pair set)

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in) (Note 1)			Beam axis dia. (mm)	Protection	Ambient temp.		
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)					
Flat	Top sensing W3 x H8 x D12	Tough NEW FT-Z30H	R2 Bending durability	2 m	STD 3,500 137.795	3,600 141.732 (Note 2)	1,400 55.118	2 x 3	IP40	-40 to +60 °C		
	Top sensing W3 x H8 x D12	NEW FT-Z30HW	R1		HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	2,600 102.362				3,200 125.984	
	Side sensing W3 x H12 x D8	Tough NEW FT-Z30E	R2 Bending durability		STD 3,500 137.795	3,600 141.732 (Note 2)	2,400 94.488				1,200 47.244	
	Side sensing W3 x H12 x D8	NEW FT-Z30EW	R1		HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	740 29.134				3,200 125.984	
	Front sensing W8.5 x H12 x D3	Tough NEW FT-Z30	R2 Bending durability		STD 2,100 82.677	3,600 141.732 (Note 2)	2,000 78.740				710 27.953	
	Front sensing W8.5 x H12 x D3	NEW FT-Z30W			HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	630 24.803				2,600 102.362	
	With boss	Front sensing W10 x H7 x D2	FT-WZ4		1 m	STD 530 20.866	1,100 43.307	230 9.055	ø1.5		—	
		Fiber bending type W2 x H10 x D10	NEW FT-Z20HBW	R1		HYPR (Note 2) 1,600 62.992	900 35.433	330 12.992				670 26.378
		Front sensing W14 x H7 x D3.5	FT-WZ7			STD 260 10.236	670 26.378	100 3.937				570 22.441
		Fiber bending type W3.5 x H14 x D11	NEW FT-Z40HBW		HYPR 1,100 43.307	3,200 125.984	1,800 70.866	320 12.598	180 7.087		55 2.165	
						2 m	STD 1,400 55.118	3,300 129.921	330 12.992		ø1.5	—
					HYPR 3,500 137.795		2,300 90.551	1,000 39.370	890 35.039			
					STD 800 31.496	1,900 74.803	260 10.236	ø1	IP67			
				HYPR 3,300 129.921	1,400 55.118	720 28.346	490 19.291			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) The fiber cable length practically limits the sensing range.

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

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Retroreflective Type
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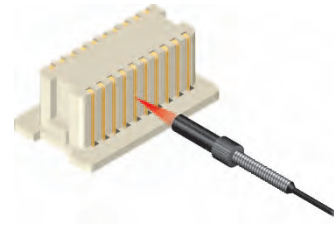
Reflective type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂️ : Free-cut	Sensing range (mm in) (Note 1, 2)			Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)		
Flat With boss	Front sensing  W10 x H7 x D2	FD-WZ4	R1	✂️ 1 m	STD 2 to 65 0.079 to 2.559 HYPR 1 to 230 0.039 to 9.055	1 to 110 0.039 to 4.331 1 to 85 0.039 to 3.346 3 to 35 0.118 to 1.378 5 to 13 0.197 to 0.512	2 to 20 0.079 to 0.787 1 to 70 0.039 to 2.756	—	-40 to +60 °C
	Fiber bending type  W2 x H10 x D10	FD-Z20HBW NEW			STD 2 to 85 0.079 to 3.346 HYPR 1 to 340 0.039 to 13.386	1 to 210 0.039 to 8.268 1 to 180 0.039 to 7.087 2 to 55 0.079 to 2.165 3 to 15 0.118 to 0.591	2 to 30 0.079 to 1.181 1 to 90 0.039 to 3.543	IP67	
	Front sensing  W14 x H7 x D3.5	FD-WZ7		✂️ 2 m	STD 110 4.331 HYPR 430 16.929	230 9.055 180 7.087 1.5 to 65 0.059 to 2.559 3 to 25 0.118 to 0.984	1 to 55 0.039 to 2.165 160 6.299	—	
	Fiber bending type  W3.5 x H14 x D11	FD-Z40HBW NEW			STD 260 10.236 HYPR 760 29.921	540 21.260 470 18.504 1 to 160 0.039 to 6.299 2 to 50 0.079 to 1.969	1 to 90 0.039 to 3.543 0.5 to 240 0.020 to 9.449	IP67	

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
2) The sensing range is specified for white non-glossy paper.

Small Spot

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



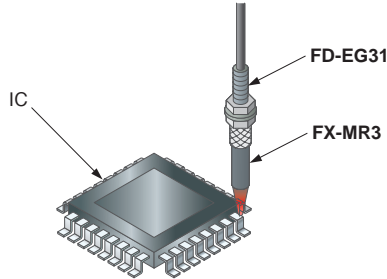
Applications

Packing detection

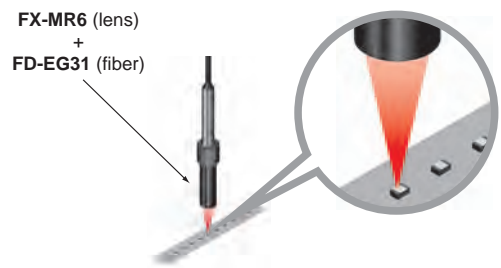


Because it's a side-view type, it can be mounted even in narrow spaces.

Number of IC pins checking



Discrimination of 0603 chip direction



Small spot fiber lineup (High precision fiber & Spot lens)

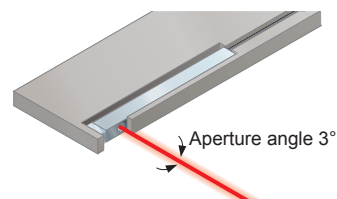
Designation	Shape of head (mm)	Spot diameter (mm in) (Note)	Distance to focal point (mm in) (Note)	Lens		Applicable fibers									
				Model No.	Ambient temp.	Model No.	Fiber cable length ✂: Free-cut	Bending radius (mm)	Protection	Ambient temp.					
Finest spot lens		ø0.1 ø0.004	7±0.5 0.276±0.020	FX-MR6	-20 to +60 °C	NEW FD-EG31	500 mm	R4	IP40	-20 to +60 °C					
		ø0.2 ø0.008				NEW FD-EG30					-40 to +70 °C				
		ø0.4 ø0.016	7±0.5 0.276±0.020	FX-MR6	-20 to +60 °C	Tough NEW FD-42G	2 m	R2 Bending durability		-55 to +80 °C					
						NEW FD-42GW		R1		-40 to +60 °C					
						Tough NEW FD-32G		R2 Bending durability		-55 to +80 °C					
		ø0.4 ø0.016	7±0.5 0.276±0.020	FX-MR6	-20 to +60 °C	NEW FD-32GX	✂ 1 m	R2		-55 to +80 °C					
						ø0.15 ø0.006	7.5±0.5 0.295±0.020	FX-MR3		-40 to +70 °C		NEW FD-EG31	500 mm	R4	-20 to +60 °C
												NEW FD-EG30		R4	-40 to +70 °C
		ø0.3 ø0.012	7.5±0.5 0.295±0.020	FX-MR3	-40 to +70 °C	Tough NEW FD-42G	2 m	R2 Bending durability		-55 to +80 °C					
						NEW FD-42GW		R1		-40 to +60 °C					
Tough NEW FD-32G						R2 Bending durability		-55 to +80 °C							
NEW FD-32GX						✂ 1 m		R2	-55 to +80 °C						
Pinpoint spot lens		ø0.5 ø0.020	6±1 0.236±0.039	FX-MR1	-40 to +70 °C	Tough NEW FD-42G	2 m	R2	-55 to +80 °C						
						NEW FD-42GW		R1	-40 to +60 °C						
Zoom lens		ø0.7 to ø2.0 ø0.028 to ø0.079	Approx. 18.5 to 43 Approx. 0.728 to 1.693	FX-MR2	-40 to +70 °C	Tough NEW FD-42G	2 m	R2	-55 to +80 °C						
						NEW FD-42GW		R1	-40 to +60 °C						
Zoom lens (Side-view type)		ø0.5 to ø3.0 ø0.020 to ø0.118	Approx. 13 to 30 Approx. 0.512 to 1.181	FX-MR5	-40 to +70 °C	Tough NEW FD-42G	2 m	R2	-55 to +80 °C						
						NEW FD-42GW		R1	-40 to +60 °C						

Note: Spot diameter and distance to focal point are specified for FX-500/FX-100 series.

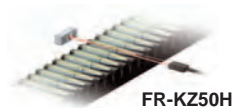
Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

Narrow Beam

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



Applications



Thru-beam type (one pair set)

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1)			Beam axis dia. (mm)	Beam axis position/Inclination of beam axis	Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)				
Narrow beam		Tough NEW FT-KS40	R2 Bending durability	2 m	STD (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	2,200 86.614	ø2.2	—	IP40	-40 to +60 °C
					HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)				
		Tough NEW FT-KV40			STD (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	2,200 86.614	ø2.5 ±0.8°	IP30		
					HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)				
	NEW FT-KV40W	R1	STD (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	2,200 86.614 (Note 2)						
			HYPR (Note 2) 3,600 141.732	3,100 122.047	940 37.008						
	Tough NEW FT-KV26	R2 Bending durability		STD (Note 2) 710 27.953	1,600 62.992	135 5.315	ø1	X±1° Z±0.5°	IP30	-40 to +60 °C	
			HYPR (Note 2) 2,500 98.425	1,200 47.244	440 17.323	560 22.047					

Retroreflective type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 3)			Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)		
With polarizing filters		NEW FR-Z50HW	R1	2 m	STD 100 to 990 3.937 to 38.976	100 to 1,400 3.937 to 55.118	100 to 550	IP40	-25 to +55 °C
			HYPR 100 to 1,900 3.937 to 74.803		100 to 1,200 3.937 to 47.244	100 to 780 3.937 to 30.709	3.937 to 21.654		
Wafer mapping		Tough NEW FR-KZ22E	R2 Bending durability		STD 15 to 310 0.591 to 12.205	15 to 460 0.591 to 18.110	15 to 200	IP30	-40 to +60 °C
					HYPR 15 to 570 0.591 to 22.441	15 to 410 0.591 to 16.142	15 to 220 0.591 to 8.661		
Narrow beam Side sensing		Tough NEW FR-KZ50H	R2 Bending durability	STD 20 to 300 0.787 to 11.811	20 to 800 0.787 to 31.496	20 to 200	IP30	-40 to +60 °C	
				HYPR 20 to 1,000 0.787 to 39.370	20 to 400 0.787 to 15.748	20 to 200 0.787 to 7.874			0.787 to 7.874
		Tough NEW FR-KZ50E		STD 20 to 1,000 0.787 to 39.370	20 to 800 0.787 to 31.496	20 to 200			
				HYPR 20 to 1,000 0.787 to 39.370	20 to 400 0.787 to 15.748	20 to 200 0.787 to 7.874	0.787 to 13.780		

Reflective type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1)			Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)		
Long range		NEW FD-Z50HW	R1	2 m	STD 10 to 650 0.394 to 25.991	10 to 1,100 0.394 to 43.307	10 to 200	IP40	-40 to +60 °C
			HYPR 10 to 2,500 0.394 to 98.425	10 to 1,000 0.394 to 39.370	10 to 410 0.394 to 16.142	0.394 to 7.874			
					HYPR 10 to 2,500 0.394 to 98.425	15 to 130 0.591 to 5.118	0.394 to 20.866		

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
 2) The fiber cable length practically limits the sensing range.
 3) The sensing range is the possible setting range for the attached reflector. The fiber can detect an object less than setting range for the reflector. Refer to P.22 for the sensing range when **FR-Z50HW** is used in combination with a reflector (optional).

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

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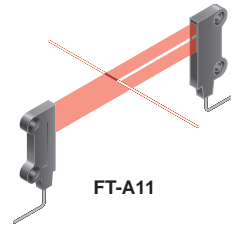
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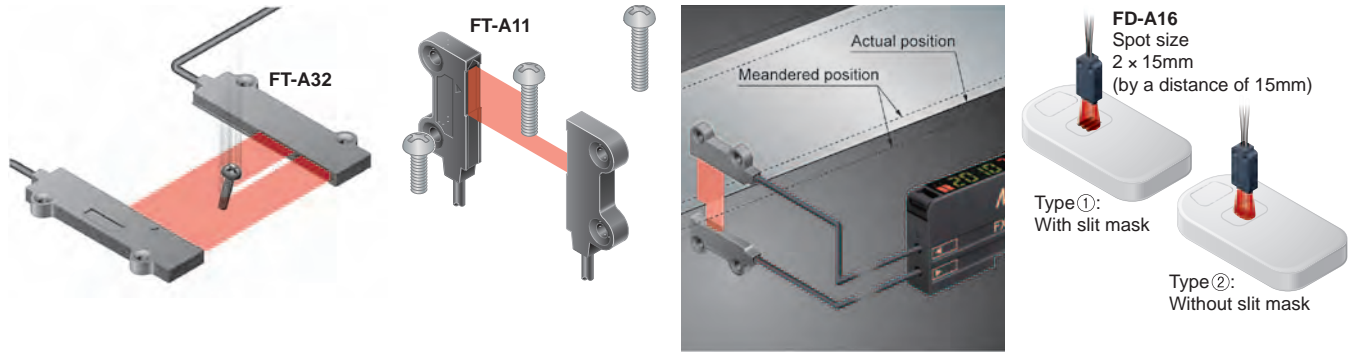
Wide Beam

■ Senses work with indefinite shape or position in the beam band without missing. It can also be used to determine shape.



Applications

Sensing tiny moving objects Inspecting screw height Control the amount of meandering Confirming presence of slit mask



Thru-beam type (one pair set)

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in) (Note 1)			Beam axis dia. (mm)	Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)			
Wide beam	 Sensing width 32mm W5 x H69 x D20 Allows flexible wiring	Tough NEW FT-A32	R2 Bending durability	 2 m	STD (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3.2 x 32	IP40	-40 to +60 °C
					HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2)				
	STD (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)							
	HYPR (Note 2) 3,600 141.732	3,000 118.110								
Wide beam	 Sensing width 32mm W5 x H69 x D20 Allows flexible wiring	Tough NEW FT-A32W	R1	STD (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	2.2 x 11	IP40	-40 to +55 °C	
				HYPR (Note 2) 3,600 141.732	3,000 118.110					
Wide beam	 Sensing width 11mm W4.2 x H31 x D13.5 Allows flexible wiring	Tough NEW FT-A11	R2 Bending durability	STD (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	1,900 74.803 (Note 2)	2.2 x 11	IP40	-40 to +70 °C	
				HYPR (Note 2) 3,600 141.732	1,100 43.307					
	STD (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	3,400 133.858 (Note 2)							
	HYPR (Note 2) 3,600 141.732	1,300 51.181								
Array	 Sensing width 5.5mm W5 x H15 x D15	Tough NEW FT-AL05	R2 Bending durability	STD 860 33.858	1,550 61.024	250 9.843	0.25 x 5.5	IP40	-55 to +80 °C	
				HYPR 12,300 90.551	1,500 59.055					500 19.685

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 141.72 in long.

Reflective type

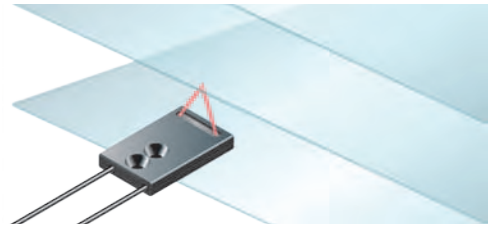
Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in) (Note 1, 2)			Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)		
Wide beam	 W7 x H15 x D30	Tough NEW FD-A16	R4 Bending durability	 2 m	STD 200 7.874	200 7.874	120 4.724	IP40	-40 to +60 °C
					HYPR Cannot use	140 5.512			
Array	 W5 x H20 x D20	Tough NEW FD-AL11	R2 Bending durability	STD 320 12.598	530 20.866	100 3.937	IP40	-55 to +80 °C	
				HYPR 670 26.378	510 20.079				285 11.220

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
2) The sensing range is specified for white non-glossy paper.

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

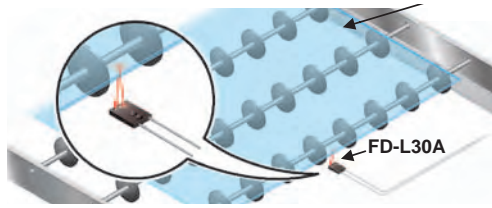
Convergent Reflective Type

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

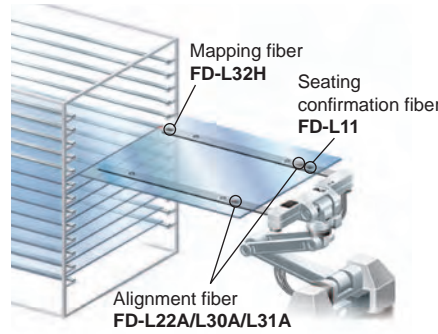


Applications

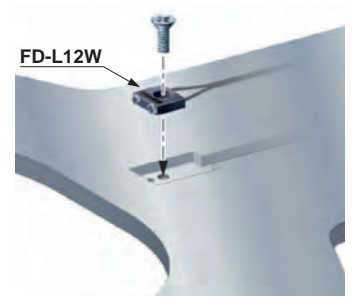
Detecting glass substrate



Substrate conveyors



Mounting in handling arms



Reflective type

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

Notes: 1) The sensing range is specified for transparent glass 100 × 100 × 10.7 mm 3.937 × 3.937 × 0.421 in (FD-L32H: R edge, FD-L21 and FD-L21W: t2 mm 0.709 in) (FD-L20H: white non-glossy paper, FD-L10: silicon wafers 100 × 100 mm 3.937 × 3.937 in).
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.

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

New product introduction

Tough Fiber

Fiber Selection Guide

Choose by model

Choose by shape/application

Viewing new models

Fibers

Super Quality

Threaded Type

Cylindrical Type

Sleeve

Flat Type

Small Spot

Narrow Beam

Wide Beam

Convergent Reflective Type

Retr reflective Type

Chemical-resistant

Heat-resistant

Vacuum-resistant

Liquid Leak / Liquid Detection

Fiber Options

Fiber Dimensions

Thru-beam Type

Retr reflective Type

Reflective Type

Others

Amplifiers

FX-500 series

FX-100 series

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Earlier models comparison table

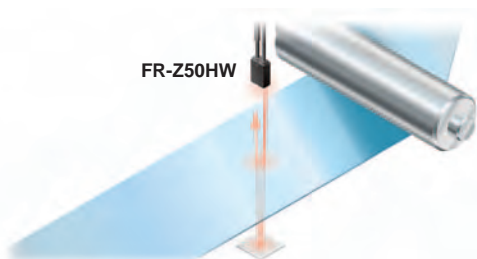
Retroreflective Type

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



Applications

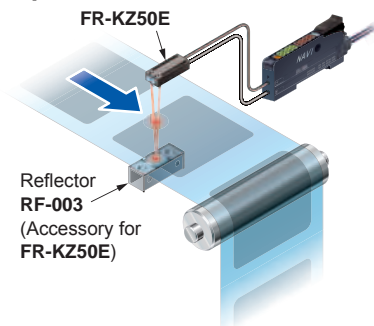
Detecting transparent film



Detecting wafer



Detection of transparent seals on transparent sheet



Retroreflective type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 2)			Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)		
With polarizing filters	W5.2 x H9.5 x D16 W30 x H30 x D0.5	FR-Z50HW NEW	R1	✂	STD 100 to 990 3.937 to 38.976	100 to 1,400 3.937 to 55.118	100 to 550	IP40	-25 to +55 °C
					HYPR 100 to 1,900 3.937 to 74.803	100 to 1,200 3.937 to 47.244 100 to 780 3.937 to 30.709 100 to 490 3.937 to 19.291	3.937 to 21.654 100 to 830 3.937 to 32.677		
Wafer mapping	W7.5 x H2.2 x D11.2 W4 x H2 x D21.5	Tough NEW FR-KZ22E	R2	✂ 2 m	STD 15 to 310 0.591 to 12.205	15 to 460 0.591 to 18.110 15 to 410 0.591 to 16.142 15 to 220 0.591 to 8.661 15 to 100 0.591 to 3.937	15 to 200 0.591 to 7.874 15 to 360 0.591 to 14.173	IP30	-40 to +60 °C
					HYPR 15 to 570 0.591 to 22.441				
Narrow beam Top sensing	W5.2 x H9.5 x D21 W10.6 x H28 x D10.1	Tough NEW FR-KZ50H	R2	✂	STD 20 to 300 0.787 to 11.811	20 to 800 0.787 to 31.496 20 to 400 0.787 to 15.748 20 to 200 0.787 to 7.874 20 to 200 0.787 to 7.874	20 to 200 0.787 to 7.874 20 to 350 0.787 to 13.780	IP30	-40 to +60 °C
					HYPR 20 to 1,000 0.787 to 39.370				
Narrow beam Side sensing	W9.5 x H25 x D5.2 W28 x H10.6 x D10.1	Tough NEW FR-KZ50E	R2	✂	STD 20 to 300 0.787 to 11.811	20 to 800 0.787 to 31.496 20 to 400 0.787 to 15.748 20 to 200 0.787 to 7.874 20 to 200 0.787 to 7.874	20 to 200 0.787 to 7.874 20 to 350 0.787 to 13.780	IP30	-40 to +60 °C
					HYPR 20 to 1,000 0.787 to 39.370				

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
2) The sensing range is the possible setting range for the attached reflector. The fiber can detect an object less than setting range for the reflector.

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

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

Note: The sensing range of retroreflective type is the possible setting range for the attached reflector. The fiber can detect an object less than 100 mm. However, note that if there are any white or highly-reflective surfaces near the fiber head, reflected incident light may affect the fiber head. If this occurs, adjust the threshold value of the amplifier unit before use.

Fiber option

Reflector (for FR-Z50HW) ▶ P.33



Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

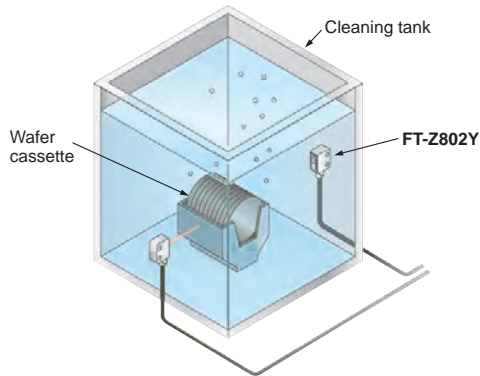
Chemical-resistant

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

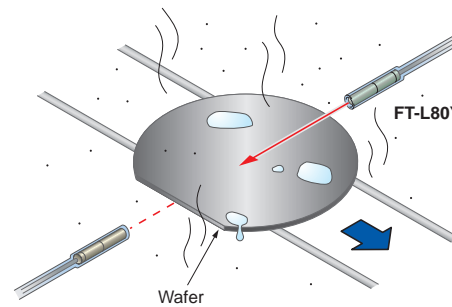


Applications

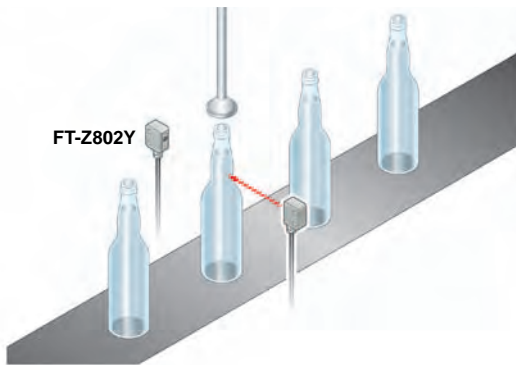
Detecting wafer cassette in cleaning tank



Sensing wafer in corrosive environment



Chemical filler



Thru-beam type (one pair set)

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in) (Note 1)			Beam axis dia. (mm)	Protection	Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)			
Chemical-resistant	Easy mounting • Rectangular head SEMI S2 compliant W7 × H15 × D13	FT-Z802Y	R25	2 m	STD 3,100 122.047	3,600 141.732 (Note 2)	520 20.472	IP67	0 to +60 °C	
	HYPR (Note 2) 3,600 141.732				1,900 74.803	3,100 122.047				
	Heat-resistant 115 °C	FT-HL80Y	R30	2 m (Note 3)	STD (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	990 38.976	IP67g	-40 to +115 °C	
	HYPR (Note 2) 3,600 141.732				2,300 90.551	2,340 92.126				
		FT-L80Y	R30	2 m (Note 3)	STD (Note 2) 3,600 141.732	3,600 141.732 (Note 2)	1,100 43.307	IP67g	-40 to +70 °C	
					HYPR (Note 2) 3,600 141.732	2,800 110.236	2,600 102.362			
	Side-view	FT-V80Y	R30	2 m (Note 3)	STD 1,300 51.181	2,800 110.236	340 13.386	IP67g	-40 to +70 °C	
					HYPR (Note 2) 3,600 141.732	2,200 86.614	800 31.496			

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
 2) The fiber cable length practically limits the sensing range.
 3) The allowable cutting range is 500 mm 19.685 in from the end that the amplifier inserted.

New product introduction
Tough Fiber

Fiber Selection Guide
Choose by model
Choose by shape/application
Viewing new models

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

Fiber Options

Fiber Dimensions
Thru-beam Type
Retroreflective Type
Reflective Type
Others

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FX-500 series
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New product introduction
Tough Fiber

Heat-resistant

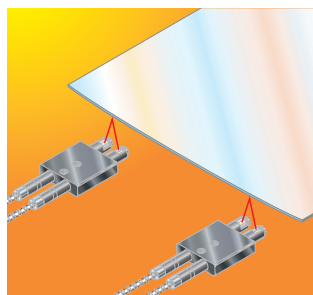
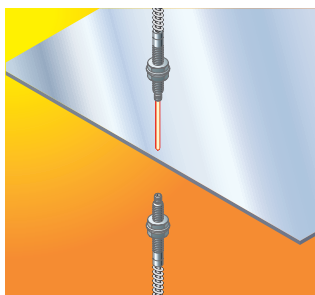
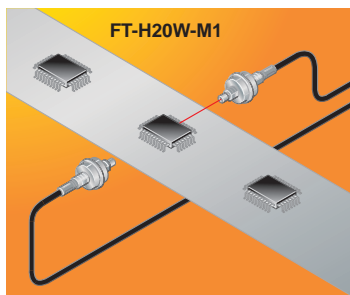
- It can be used under environments of -60 to +350 °C
-76 to +662 °F.
- A wide joint type for workability is also prepared.



Fiber Selection Guide
Choose by model
Choose by shape/application
Viewing new models

Applications

- IC detection within a high temperature handler
- Detecting glass substrates



Fibers
Super Quality
Threaded Type
Cylindrical Type
Sleeve
Flat Type
Small Spot
Narrow Beam
Wide Beam

Thru-beam type (one pair set)

Type	Heat-resistant temp.	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1)			Beam axis dia. (mm)	Ambient temp.
						FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)		
Heat-resistant	350 °C	Lens mountable (FX-LE1/LE2/SV1) 	FT-H35-M2	R25	2 m	STD 430 16.929	880 34.646 670 26.378	170 6.693 490 19.291	ø1.2	-60 to +350 °C
		Sleeve 60 mm 	FT-H35-M2S6	Fiber R25 Sleeve R10		HYPR 1,200 47.244	250 9.843 80 3.150			
	200 °C	Lens mountable (FX-LE1/LE2/SV1) 	FT-H20W-M1	R10	1 m	STD 470 18.504	1,000 39.370 840 33.071	100 3.937 300 11.811	ø0.8	-60 to +200 °C
		Lens mountable (FX-LE1/LE2/SV1) 	FT-H20-M1	R25		HYPR (Note 2) 1,600 62.992	300 12.992 90 3.543			
Heat-resistant (joint)	130 °C	Lens mountable (FX-LE2 only) 	FT-H13-FM2	R25	2 m	STD 700 27.559	1,900 74.803 1,300 51.181	250 9.843 700 27.559	ø1.5	-60 to +130 °C
		Lens mountable (FX-LE1/LE2/SV1) 	FT-H20-J20-S (Note 5)	Heat-resistant side R18 (Note 4)		✂	200 mm (Note 3)	HYPR 1,600 62.992		
	Lens mountable (FX-LE1/LE2/SV1) 	FT-H20-J30-S (Note 5)	✂		300 mm (Note 3)					
	Lens mountable (FX-LE1/LE2/SV1) 	FT-H20-J50-S (Note 5)	✂		500 mm (Note 3)					
	Side-view 	FT-H20-VJ50-S (Note 5)	✂		500 mm (Note 3)	STD 600 23.622	1,300 51.181 980 38.583		150 5.906 500 19.685	
Lens mountable (FX-LE1/LE2/SV1) 	FT-H20-VJ80-S (Note 5)	✂	800 mm (Note 3)		HYPR 2,100 82.677	390 15.354 120 4.724				

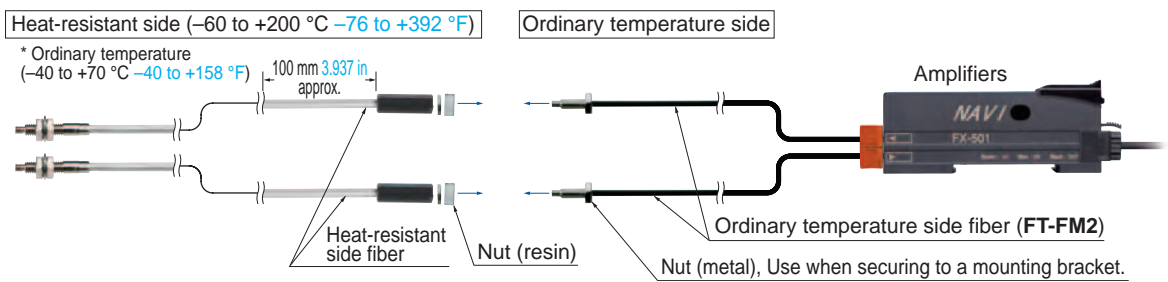
- Notes:
- Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
 - The fiber cable length practically limits the sensing range.
 - Fiber length (fixed-length) for heat-resistant fiber side. Fiber length for ordinary temperature side is 2 m 6.562 ft (free-cut).
 - R25 mm R0.984 in or more for ordinary temperature side.
 - Heat-resistant side fiber + ordinary temperature fiber (FT-FM2) are sold together as a set.

Fiber Dimensions
Thru-beam Type
Retroreflective Type
Reflective Type
Others

Amplifiers
FX-500 series
FX-100 series

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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
- Ordinary temperature side fiber **one pair set**
 FT-FM2

Reflective type

Type	Heat-resistant temp.	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂ : Free-cut	Sensing range (mm in) (Note 1, 2)			Ambient temp.		
						FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)			
Heat-resistant	350 °C	Coaxial M6 25	FD-H35-M2	R25	2 m	STD 260 10.236	540 21.260	75 2.953	-60 to +350 °C		
		Sleeve 60 mm M6 22	FD-H35-M2S6	Fiber Sleeve R25		HYPR 720 28.346	460 18.110			150 5.906	45 1.772
		Sleeve 90 mm M4 27	FD-H35-20S	R10		HYPR 840 33.071	440 17.323			140 5.512	45 1.772
	200 °C	Coaxial M6 28	FD-H20-M1	R25	1 m	STD 330 12.992	550 21.654	120 4.724			
		Coaxial M4 27	FD-H20-21			HYPR 840 33.071	500 19.685			200 7.874	55 2.165
	130 °C	Coaxial M6 21	FD-H13-FM2	R25	✂ 2 m	STD 350 13.780	640 25.197	100 3.937		-60 to +130 °C	
	Glass substrate detection convergent reflective	300 °C	W19 x H27 x D5	FD-H30-L32	R25	2 m	STD 17 0.669	30 1.181		2 to 9	-60 to +300 °C
		250 °C	W21 x H33.2 x D5	FD-H25-L43	3 m	HYPR 140 1.575	1 to 28 0.039 to 1.102	1.5 to 24 0.059 to 0.945		0.079 to 0.354	-20 to +250 °C
			W21 x H34.5 x D5	FD-H25-L45		STD 1 to 31 0.039 to 1.220	1.5 to 24 0.059 to 0.945	2 to 18 0.079 to 0.709		0 to 0.669	
		180 °C	W19 x H27 x D5	FD-H18-L31	✂ 2 m	STD 16 0.630	32 1.260	0 to 10		-20 to +70 °C (Ordinary temp. side)	
HYPR 60 2.362	24 0.945	0 to 394	13 0.512	0 to 25	0 to 0.984						

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

Fiber options

Lens (For thru-beam fiber) ▶ P.30~



New product introduction
 Tough Fiber
 Fiber Selection Guide
 Choose by model
 Choose by shape/application
 Viewing new models

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

Fiber Options

Fiber Dimensions

Thru-beam Type
 Retroreflective Type
 Reflective Type
 Others

Amplifiers

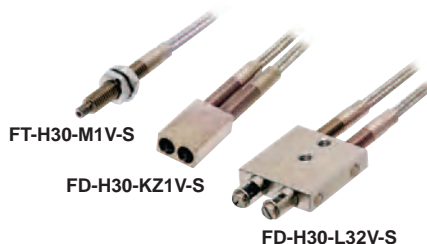
FX-500 series
 FX-100 series

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Earlier models comparison table

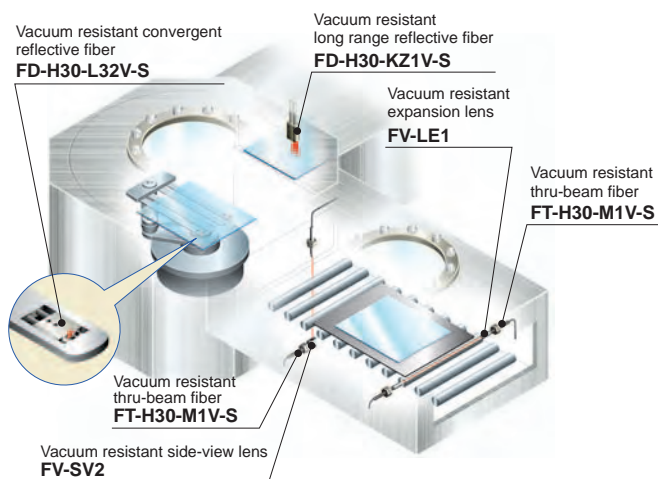
Vacuum-resistant

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



Applications

Detection of glass substrate in vacuum chamber



Highly resistant to repeated bending

Because it has a bending durability of over 100,000 times (R20 mm R0.79 in), it is highly resistant to repeated bending and is optimal for mounting on moving robot hand.



Thru-beam type (one pair set)

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

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

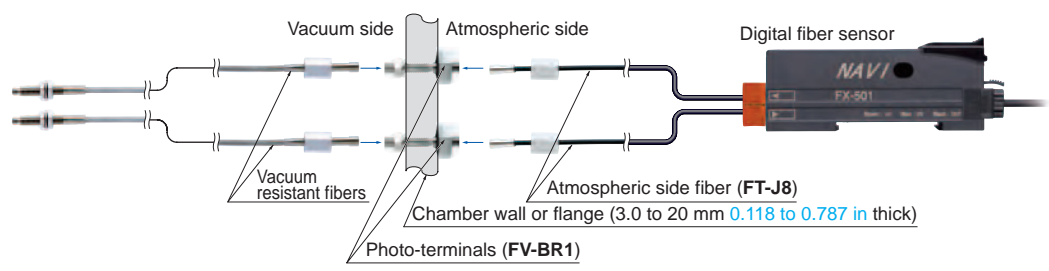
Reflective type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in)(Note 2)			Ambient temp.
					FX-500 series	U-LG LONG FAST H-SP	FX-101 (Upper value) FX-102 (Lower value)	
Vacuum-resistant Reflective	300 °C, Rectangular head W9.5 × H5.2 × D15	FD-H30-KZ1V-S (Note 1)	R18	1 m	STD 20 to 200 0.787 to 7.874 HYPR 5 to 500 0.197 to 19.685	10 to 340 0.394 to 13.386 15 to 270 0.591 to 10.630 20 to 120 0.787 to 4.724 20 to 45 0.787 to 1.772	25 to 80 0.984 to 3.150 10 to 220 0.394 to 8.661	-30 to +300 °C
Vacuum-resistant Convergent reflective	300 °C, Glass substrate detection W19 × H5 × D27	FD-H30-L32V-S (Note 1)			3 m	STD 8 0.315 HYPR 18 0.709	12 0.472 10 0.394 5.5 0.217 1.5 to 3 0.059 to 0.118	

Notes: 1) Sold as a set comprising vacuum type fiber + photo-terminal (FV-BR1) + fiber at atmospheric side (FT-J8).

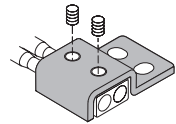
2) The sensing range of reflective type is the value for transparent glass 100 × 100 × t0.7 mm 3.937 × 3.937 × t0.028 in.

Set contents


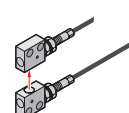


Model No. when ordering individual parts from repair parts

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



Fiber options Lens (For thru-beam fiber)

Designation	Model No.	Description																														
For thru-beam type fiber	Vacuum resistant expansion lens (Note 1)	<p>FV-LE1</p>  <p>Increases the sensing range 4 times or more. • Ambient temperature: -60 to +350 °C -76 to +662 °F (Note 3) • Beam axis dia: \varnothing3.6 mm \varnothing0.142 in Sensing range (mm in) [Lens on both sides] (Note 4)</p> <table border="1"> <thead> <tr> <th colspan="2">Amplifier</th> <th colspan="6">FX-500 series</th> <th>FX-101□</th> <th>FX-102□</th> </tr> <tr> <th>Fiber</th> <th>Mode</th> <th>HYPR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>FT-H30-M1V-S</td> <td></td> <td>3,600 141.732 (Note 2)</td> <td>3,600 141.732 (Note 2)</td> <td>3,400 133.858</td> <td>1,500 59.055</td> <td>900 35.433</td> <td>370 14.567</td> <td>450 17.717</td> <td>1,600 62.992</td> </tr> </tbody> </table>	Amplifier		FX-500 series						FX-101□	FX-102□	Fiber	Mode	HYPR	U-LG	LONG	STD	FAST	H-SP			FT-H30-M1V-S		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,400 133.858	1,500 59.055	900 35.433	370 14.567	450 17.717	1,600 62.992
	Amplifier		FX-500 series						FX-101□	FX-102□																						
Fiber	Mode	HYPR	U-LG	LONG	STD	FAST	H-SP																									
FT-H30-M1V-S		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,400 133.858	1,500 59.055	900 35.433	370 14.567	450 17.717	1,600 62.992																							
Vacuum resistant side-view lens (Note 1)	FV-SV2	 <p>Beam axis is bent by 90°. • Ambient temperature: -60 to +300 °C -76 to +572 °F (Note 3) • Beam axis dia: \varnothing3.7 mm \varnothing0.146 in Sensing range (mm in) [Lens on both sides] (Note 4)</p> <table border="1"> <thead> <tr> <th colspan="2">Amplifier</th> <th colspan="6">FX-500 series</th> <th>FX-101□</th> <th>FX-102□</th> </tr> <tr> <th>Fiber</th> <th>Mode</th> <th>HYPR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>FT-H30-M1V-S</td> <td></td> <td>3,600 141.732 (Note 2)</td> <td>3,600 141.732 (Note 2)</td> <td>3,400 133.858</td> <td>1,500 59.055</td> <td>900 35.433</td> <td>370 14.567</td> <td>450 17.717</td> <td>1,600 62.992</td> </tr> </tbody> </table>	Amplifier		FX-500 series						FX-101□	FX-102□	Fiber	Mode	HYPR	U-LG	LONG	STD	FAST	H-SP			FT-H30-M1V-S		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,400 133.858	1,500 59.055	900 35.433	370 14.567	450 17.717	1,600 62.992
Amplifier		FX-500 series						FX-101□	FX-102□																							
Fiber	Mode	HYPR	U-LG	LONG	STD	FAST	H-SP																									
FT-H30-M1V-S		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,400 133.858	1,500 59.055	900 35.433	370 14.567	450 17.717	1,600 62.992																							

- Notes: 1) Be careful when installing the thru-beam type fiber equipped with the lens, as the beam envelope becomes narrow and alignment is difficult.
 2) The fiber cable length practically limits the sensing range.
 3) Refer to P.26 for the ambient temperature of fibers to be used in combination.
 4) The fiber cable length for the **FT-H30-M1V-S** is 1 m **3.281 ft**. The sensing ranges in HYPR, U-LG and LONG of **FX-500** series, in **FX-102□** take into account the length of the **FT-J8** atmospheric side fiber.

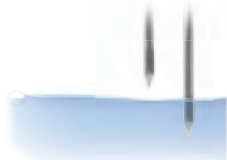
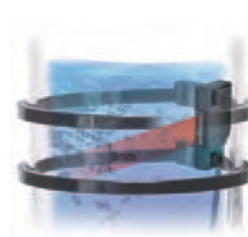
Liquid Leak / Liquid Detection

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

Applications

Detecting liquid level in a tank

Leak detection for use in semiconductor device manufacturing



For liquid surface level upper limit sensing, a "without fluid" incident light sensor is recommended.

The sensor will turn OFF during abnormal conditions (excess fluid, fiber disconnection, etc.)!

Liquid absent: Beam received (Output ON)

Liquid present / fiber is cutoff: Beam not received (Output OFF)

FD-FA93

Strong against air bubbles

Applicable pipe: Transparent pipe, Outer diameter $\phi 8$ mm

$\phi 0.315$ in or more

(When used with the tying bands: $\phi 8$ to $\phi 80$ mm $\phi 0.315$ to $\phi 3.150$ in)

FD-F41

Standard type

FD-F4

For 1 mm 0.039 in thick pipes manufactured by PFA



We recommend using the sensor so that the output is ON when liquid is present at lower limit detection level.

The sensor will turn OFF during abnormal conditions (insufficient liquid, fiber disconnection, etc.)!

Liquid present: Beam received (Output ON)

Liquid absent / fiber is cutoff: Beam not received (Output OFF)

FT-F93

Thru-beam



Reflective type / Thru-beam type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Description		Protection	Ambient temp.	
					FX-500 series (STD mode)	FX-101 FX-102			
Contact type	Liquid level sensing	Heat resistant 125 °C Fluorine resin coating $\phi 6$	FD-F8Y	Protective tube R40 Fiber R15	2 m (Note 1)	$\phi 6$ mm $\phi 0.236$ in Protective tube: Fluorine resin, length 1,000 mm 39.370 in (not cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam not received	IP68	-40 to +125 °C	
		Heat resistant 105 °C Fluorine resin coating $\phi 4$	FD-HF40Y (Note 2)	Protective tube R20 Fiber	2 m	$\phi 4$ mm $\phi 0.157$ in Protective tube: Fluorine resin, length 500 mm 19.685 in (cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam not received	IP67	-40 to +105 °C	
		Heat resistant 70 °C Fluorine resin coating throughout the fiber $\phi 4$	FD-F41Y (Note 2)	R10	2 m	$\phi 4$ mm $\phi 0.157$ in Protective tube: Fluorine resin, length 500 mm 19.685 in (cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam not received			
Pipe-mountable type	Liquid leak detection	SEMI S2 compliant W20 x H30 x D10	Tough NEW FD-F71	Protective tube R20 Fiber R4	5 m	Liquid leak detection Leak absent: Beam received, Leak present: Beam interrupted		-20 to +60 °C	
		Standard W25 x H13 x D20	FD-F41	R10	2 m	Applicable pipe diameter: Outer dia. $\phi 6$ to $\phi 26$ mm $\phi 0.236$ to $\phi 1.024$ in transparent pipe [PVC (vinyl chloride), fluorine resin, polycarbonate, acrylic, glass, wall thickness 1 to 3 mm 0.039 to 0.118 in] Liquid absent: Beam received, Liquid present: Beam not received	-	-40 to +100 °C	
	For 1 mm thick PFA pipe W25 x H13 x D20	FD-F4	Applicable pipe diameter: Outer dia. $\phi 6$ to $\phi 26$ mm $\phi 0.236$ to $\phi 1.024$ in transparent pipe [PFA (fluorine resin) or equivalently transparent pipe, wall thickness 1 mm 0.039 in] Liquid absent: Beam received, Liquid present: Beam not received						
	Liquid sensing	Mountable on pipe-array fiber W6.5 x H28.3 x D17	Tough NEW FD-FA93	R4	Bending durability	2 m	Applicable pipe diameter: Outer dia. $\phi 8$ mm $\phi 0.315$ in or more transparent pipe (When used with the tying bands: $\phi 8$ to $\phi 80$ mm $\phi 0.315$ to $\phi 3.150$ in) [PFA (fluorine resin), including translucent] Liquid absent: Beam received, Liquid present: Beam not received	IP40	-40 to +70 °C
		SEMI S2 compliant W23 x H20 x D17	Tough NEW FT-F93	Protective tube R20 Fiber R2	Bending durability	2 m	Applicable pipe diameter: Outer dia. $\phi 3$ to $\phi 10$ mm $\phi 0.118$ to $\phi 0.394$ in transparent pipe [PFA (fluorine resin) or equivalently transparent pipe, wall thickness 0.3 to 1 mm 0.012 to 0.039 in] Liquid absent: Beam not received, Liquid present: Beam received		-40 to +60 °C

Notes: 1) The allowable cutting range is 1,000 mm 39.370 in from the end that the amplifier inserted.

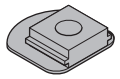
2) Liquid inflow prevention joint, protective tube extension joint, fiber mounting joint is available. Please refer to next page for details.

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

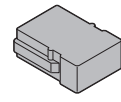
New product introduction
 Tough Fiber
 Fiber Selection Guide
 Choose by model
 Choose by shape/application
 Viewing new models

Accessories

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



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



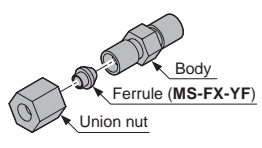
Fiber options

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

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

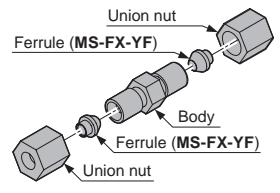
Liquid inflow prevention joint

• **MS-FX-01Y**



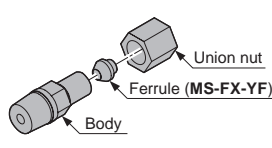
Protective tube extension joint

• **MS-FX-02Y**



Fiber mounting joint

• **MS-FX-03Y**



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

Fiber Options

Fiber Dimensions
 Thru-beam Type
 Retroreflective Type
 Reflective Type
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Wide Beam
Convergent Reflective Type
Retroreflective Type
Chemical-resistant
Heat-resistant
Vacuum-resistant
Liquid Leak/Liquid Detection


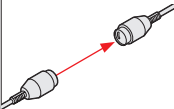
Fiber Options

Fiber Dimensions
Thru-beam Type
Retroreflective Type
Reflective Type
Others

Amplifiers
FX-500 series
FX-100 series

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Earlier models comparison table

Designation	Model No.	Description										
For thru-beam type fiber	Expansion lens (Note 1)		Increases the sensing range by 5 times or more. • Ambient temperature: -60 to +350 °C -76 to +662 °F (Note 3) • Beam dia: ø3.6 mm ø0.142 in Sensing range (mm in) [Lens on both sides]									
			Amplifier		FX-500 series						FX-101□	FX-102□
			Fiber	Mode	HYPR	U-LG	LONG	STD	FAST	H-SP		
			FT-43		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	1,600 62.992	2,400 94.488	3,600 141.732 (Note 2)
			FT-42 FT-42W		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	2,200 86.614	3,400 133.858	3,600 141.732 (Note 2)
			FT-45X		1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,500 59.055	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)
			FT-R40		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	1,900 74.803	3,100 122.047	3,600 141.732 (Note 2)
			FT-H35-M2		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,300 129.921	1,400 55.118	2,000 78.740	3,500 137.795 (Note 2)
			FT-H20W-M1		1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	850 33.465	1,300 51.181	1,600 62.992 (Note 2)
			FT-H20-M1		1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,200 47.244	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)
FT-H20-J50-S FT-H20-J30-S FT-H20-J20-S		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,500 137.795	2,000 78.740	1,600 62.992	500 19.685	1,000 39.370	3,500 137.795 (Note 2)			
For thru-beam type fiber	Super-expansion lens (Note 1)		Tremendously increases the sensing range with large diameter lenses. • Ambient temperature: -60 to +350 °C -76 to +662 °F (Note 3) • Beam dia: ø9.8 mm ø0.386 in Sensing range (mm in) [Lens on both sides]									
			Amplifier		FX-500 series						FX-101□	FX-102□
			Fiber	Mode	HYPR	U-LG	LONG	STD	FAST	H-SP		
			FT-43 FT-42 FT-42W		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)
			FT-45X		1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)
			FT-R40		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)
			FT-H35-M2		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,500 137.795 (Note 2)	3,500 137.795 (Note 2)
			FT-H20W-M1 FT-H20-M1		1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)
			FT-H13-FM2		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,500 137.795 (Note 2)	3,500 137.795 (Note 2)
			FT-H20-J50-S FT-H20-J30-S FT-H20-J20-S		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,500 137.795 (Note 2)	3,500 137.795 (Note 2)

Notes: 1) Be careful sure to use it only after you have adjusted it sufficiently when installing the thru-beam type fiber equipped with the expansion lens, as the beam envelope becomes narrow and alignment is difficult.
 2) The fiber cable length practically limits the sensing range.
 3) Refer to P.10~ for the ambient temperature of fibers to be used in combination.

Fiber options

Lens (For thru-beam type fiber)

Designation	Model No.	Description																																																																																																																					
For thru-beam type fiber	Side-view lens FX-SV1	<p>Beam axis is bent by 90°.</p> <ul style="list-style-type: none"> Ambient temperature: -60 to +300 °C -76 to +572 °F (Note 4) Beam dia: \varnothing2.8 mm \varnothing0.110 in <p>Sensing range (mm in) [Lens on both sides]</p> <table border="1"> <thead> <tr> <th rowspan="2">Fiber</th> <th colspan="7">Amplifier</th> <th rowspan="2">FX-101□</th> <th rowspan="2">FX-102□</th> </tr> <tr> <th>Mode</th> <th colspan="6">FX-500 series</th> </tr> <tr> <td></td> <td></td> <th>HYPR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> <td></td> <td></td> </tr> </thead> <tbody> <tr> <td>FT-43</td> <td>3,600 141.732 (Note 2)</td> <td>3,400 133.858</td> <td>2,600 102.362</td> <td>1,700 66.929</td> <td>970 38.189</td> <td>310 12.205</td> <td>510 20.079</td> <td>1,400 55.118</td> </tr> <tr> <td>FT-42</td> <td>3,600 141.732 (Note 2)</td> <td>3,600 141.732 (Note 2)</td> <td>3,600 141.732 (Note 2)</td> <td>2,100 82.677</td> <td>1,150 45.276</td> <td>370 14.567</td> <td>500 19.685</td> <td>1,700 66.929</td> </tr> <tr> <td>FT-42W</td> <td>3,600 141.732 (Note 2)</td> <td>3,500 137.795</td> <td>2,700 106.299</td> <td>1,800 70.866</td> <td>990 38.976</td> <td>320 12.598</td> <td>480 18.898</td> <td>1,300 51.181</td> </tr> <tr> <td>FT-45X</td> <td>1,600 62.992 (Note 2)</td> <td>1,600 62.992 (Note 2)</td> <td>1,600 62.992 (Note 2)</td> <td>1,400 55.118</td> <td>800 31.496</td> <td>210 8.268</td> <td>540 21.260</td> <td>1,600 62.992 (Note 2)</td> </tr> <tr> <td>FT-H35-M2</td> <td>3,500 137.795</td> <td>1,600 62.992</td> <td>1,200 47.244</td> <td>780 30.709</td> <td>500 19.685</td> <td>150 5.906</td> <td>280 11.024</td> <td>800 31.496</td> </tr> <tr> <td>FT-H20W-M1</td> <td>1,600 62.992 (Note 2)</td> <td>1,600 62.992 (Note 2)</td> <td>1,500 59.055</td> <td>950 37.402</td> <td>560 22.047</td> <td>190 7.480</td> <td>140 5.512</td> <td>400 15.748</td> </tr> <tr> <td>FT-H20-M1</td> <td>1,600 62.992 (Note 2)</td> <td>1,600 62.992 (Note 2)</td> <td>1,300 51.181</td> <td>780 30.709</td> <td>500 19.685</td> <td>150 5.906</td> <td>280 11.024</td> <td>840 33.071</td> </tr> <tr> <td>FT-H20-J50-S</td> <td>1,600 62.992 (Note 2)</td> <td>960 37.795</td> <td>740 29.134</td> <td>450 17.717</td> <td>290 11.417</td> <td>80 3.150</td> <td>150 5.906</td> <td>410 16.142</td> </tr> <tr> <td>FT-H20-J30-S</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>FT-H20-J20-S</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Fiber	Amplifier							FX-101□	FX-102□	Mode	FX-500 series								HYPR	U-LG	LONG	STD	FAST	H-SP			FT-43	3,600 141.732 (Note 2)	3,400 133.858	2,600 102.362	1,700 66.929	970 38.189	310 12.205	510 20.079	1,400 55.118	FT-42	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	2,100 82.677	1,150 45.276	370 14.567	500 19.685	1,700 66.929	FT-42W	3,600 141.732 (Note 2)	3,500 137.795	2,700 106.299	1,800 70.866	990 38.976	320 12.598	480 18.898	1,300 51.181	FT-45X	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,400 55.118	800 31.496	210 8.268	540 21.260	1,600 62.992 (Note 2)	FT-H35-M2	3,500 137.795	1,600 62.992	1,200 47.244	780 30.709	500 19.685	150 5.906	280 11.024	800 31.496	FT-H20W-M1	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,500 59.055	950 37.402	560 22.047	190 7.480	140 5.512	400 15.748	FT-H20-M1	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,300 51.181	780 30.709	500 19.685	150 5.906	280 11.024	840 33.071	FT-H20-J50-S	1,600 62.992 (Note 2)	960 37.795	740 29.134	450 17.717	290 11.417	80 3.150	150 5.906	410 16.142	FT-H20-J30-S									FT-H20-J20-S								
		Fiber		Amplifier									FX-101□	FX-102□																																																																																																									
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		FT-42	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	2,100 82.677	1,150 45.276	370 14.567	500 19.685	1,700 66.929																																																																																																													
		FT-42W	3,600 141.732 (Note 2)	3,500 137.795	2,700 106.299	1,800 70.866	990 38.976	320 12.598	480 18.898	1,300 51.181																																																																																																													
		FT-45X	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,400 55.118	800 31.496	210 8.268	540 21.260	1,600 62.992 (Note 2)																																																																																																													
		FT-H35-M2	3,500 137.795	1,600 62.992	1,200 47.244	780 30.709	500 19.685	150 5.906	280 11.024	800 31.496																																																																																																													
		FT-H20W-M1	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,500 59.055	950 37.402	560 22.047	190 7.480	140 5.512	400 15.748																																																																																																													
FT-H20-M1	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	1,300 51.181	780 30.709	500 19.685	150 5.906	280 11.024	840 33.071																																																																																																															
FT-H20-J50-S	1,600 62.992 (Note 2)	960 37.795	740 29.134	450 17.717	290 11.417	80 3.150	150 5.906	410 16.142																																																																																																															
FT-H20-J30-S																																																																																																																							
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Expansion lens for vacuum fiber (Note 1)	FV-LE1	<p>Sensing range increases by 4 times or more.</p> <ul style="list-style-type: none"> Ambient temperature: -60 to +350 °C -76 to +662 °F (Note 4) Beam dia: \varnothing3.6 mm \varnothing0.142 in <p>Sensing range (mm in) [Lens on both sides] (Note 3)</p> <table border="1"> <thead> <tr> <th rowspan="2">Fiber</th> <th colspan="7">Amplifier</th> <th rowspan="2">FX-101□</th> <th rowspan="2">FX-102□</th> </tr> <tr> <th>Mode</th> <th colspan="6">FX-500 series</th> </tr> <tr> <td></td> <td></td> <th>HYPR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> <td></td> <td></td> </tr> </thead> <tbody> <tr> <td>FT-H30-M1V-S</td> <td>3,600 141.732 (Note 2)</td> <td>3,600 141.732 (Note 2)</td> <td>3,400 133.858</td> <td>1,500 59.055</td> <td>900 35.433</td> <td>370 14.567</td> <td>450 17.717</td> <td>1,600 62.992</td> </tr> </tbody> </table>	Fiber	Amplifier							FX-101□	FX-102□	Mode	FX-500 series								HYPR	U-LG	LONG	STD	FAST	H-SP			FT-H30-M1V-S	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,400 133.858	1,500 59.055	900 35.433	370 14.567	450 17.717	1,600 62.992																																																																																	
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Vacuum-resistant side-view lens (Note 1)	FV-SV2	<p>Beam axis is bent by 90°.</p> <ul style="list-style-type: none"> Ambient temperature: -60 to +300 °C -76 to +572 °F (Note 4) Beam dia: \varnothing3.7 mm \varnothing0.146 in <p>Sensing range (mm in) [Lens on both sides] (Note 3)</p> <table border="1"> <thead> <tr> <th rowspan="2">Fiber</th> <th colspan="7">Amplifier</th> <th rowspan="2">FX-101□</th> <th rowspan="2">FX-102□</th> </tr> <tr> <th>Mode</th> <th colspan="6">FX-500 series</th> </tr> <tr> <td></td> <td></td> <th>HYPR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> <td></td> <td></td> </tr> </thead> <tbody> <tr> <td>FT-H30-M1V-S</td> <td>3,600 141.732 (Note 2)</td> <td>3,600 141.732 (Note 2)</td> <td>3,400 133.858</td> <td>1,500 59.055</td> <td>900 35.433</td> <td>370 14.567</td> <td>450 17.717</td> <td>1,600 62.992</td> </tr> </tbody> </table>	Fiber	Amplifier							FX-101□	FX-102□	Mode	FX-500 series								HYPR	U-LG	LONG	STD	FAST	H-SP			FT-H30-M1V-S	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,400 133.858	1,500 59.055	900 35.433	370 14.567	450 17.717	1,600 62.992																																																																																	
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- Notes: 1) Be careful sure to use it only after you have adjusted it sufficiently when installing the thru-beam type fiber equipped with the expansion lens, as the beam envelope becomes narrow and alignment is difficult.
 2) The fiber cable length practically limits the sensing range.
 3) The fiber cable length for the **FT-H30-M1V-S** is 1 m **3.28 ft**. The sensing ranges in HYPR, U-LG and LONG of **FX-500** series, in **FX-102□** take into account the length of the **FT-J8** atmospheric side fiber.
 4) Refer to P.10~ for the ambient temperature of fibers to be used in combination.

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Tough Fiber

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Choose by shape/application

Viewing new models

Fibers

Super Quality

Threaded Type

Cylindrical Type

Sleeve

Flat Type

Small Spot

Narrow Beam

Wide Beam

Convergent Reflective Type

Retroreflective Type

Chemical-resistant

Heat-resistant

Vacuum-resistant

Liquid Leak / Liquid Detection

Fiber Options

Fiber Dimensions

Thru-beam Type

Retroreflective Type

Reflective Type

Others

Amplifiers

FX-500 series


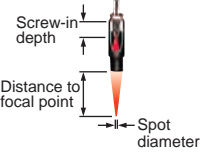
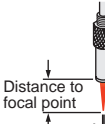
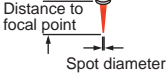
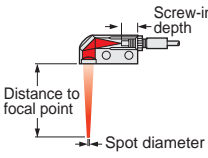
FX-100 series

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Fiber options

Lens (For reflective type fiber)

Designation	Model No.	Description													
For reflective type fiber	Pinpoint spot lens	FX-MR1	 <p>Pinpoint spot of $\varnothing 0.5$ mm $\varnothing 0.020$ in. Enables detection of minute objects or small marks.</p> <ul style="list-style-type: none"> Distance to focal point: 6 ± 1 mm 0.236 ± 0.039 in Applicable fibers: FD-42G, FD-42GW Ambient temperature: -40 to $+70$ °C -40 to $+158$ °F (Note) 												
	Zoom lens	FX-MR2	 <p>The spot diameter is adjustable from $\varnothing 0.7$ to $\varnothing 2$ mm $\varnothing 0.028$ to $\varnothing 0.079$ in according to how much the fiber is screwed in.</p> <ul style="list-style-type: none"> Applicable fibers: FD-42G, FD-42GW Ambient temperature: -40 to $+70$ °C -40 to $+158$ °F (Note) Accessory: MS-EX3 (mounting bracket) <table border="1"> <caption>Sensing range</caption> <thead> <tr> <th>Screw-in depth</th> <th>Distance to focal point</th> <th>Spot diameter</th> </tr> </thead> <tbody> <tr> <td>7 mm</td> <td>18.5 mm approx.</td> <td>$\varnothing 0.7$ mm</td> </tr> <tr> <td>12 mm</td> <td>27 mm approx.</td> <td>$\varnothing 1.2$ mm</td> </tr> <tr> <td>14 mm</td> <td>43 mm approx.</td> <td>$\varnothing 2.0$ mm</td> </tr> </tbody> </table>	Screw-in depth	Distance to focal point	Spot diameter	7 mm	18.5 mm approx.	$\varnothing 0.7$ mm	12 mm	27 mm approx.	$\varnothing 1.2$ mm	14 mm	43 mm approx.	$\varnothing 2.0$ mm
	Screw-in depth	Distance to focal point	Spot diameter												
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	12 mm	27 mm approx.	$\varnothing 1.2$ mm												
14 mm	43 mm approx.	$\varnothing 2.0$ mm													
Finest spot lens	FX-MR3	 <p>Extremely fine spot of $\varnothing 0.15$ mm $\varnothing 0.006$ in approx. achieved.</p> <ul style="list-style-type: none"> Applicable fibers: FD-EG31, FD-EG30, FD-42G, FD-42GW, FD-32G, FD-32GX Ambient temperature: -40 to $+70$ °C -40 to $+158$ °F (Note) <table border="1"> <caption>Sensing range</caption> <thead> <tr> <th>Fiber model No.</th> <th>Distance to focal point</th> <th>Spot diameter</th> </tr> </thead> <tbody> <tr> <td>FD-EG31</td> <td>7.5 ± 0.5 mm</td> <td>$\varnothing 0.15$ mm approx.</td> </tr> <tr> <td>FD-EG30</td> <td>7.5 ± 0.5 mm</td> <td>$\varnothing 0.3$ mm approx.</td> </tr> <tr> <td>FD-42G/42GW FD-32G/32GX</td> <td>7.5 ± 0.5 mm</td> <td>$\varnothing 0.5$ mm approx.</td> </tr> </tbody> </table>	Fiber model No.	Distance to focal point	Spot diameter	FD-EG31	7.5 ± 0.5 mm	$\varnothing 0.15$ mm approx.	FD-EG30	7.5 ± 0.5 mm	$\varnothing 0.3$ mm approx.	FD-42G/42GW FD-32G/32GX	7.5 ± 0.5 mm	$\varnothing 0.5$ mm approx.	
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FD-EG30	7.5 ± 0.5 mm	$\varnothing 0.3$ mm approx.													
FD-42G/42GW FD-32G/32GX	7.5 ± 0.5 mm	$\varnothing 0.5$ mm approx.													
Finest spot lens	FX-MR6	 <p>Extremely fine spot of $\varnothing 0.1$ mm $\varnothing 0.004$ in approx. achieved.</p> <ul style="list-style-type: none"> Applicable fibers: FD-EG31, FD-EG30, FD-42G, FD-42GW, FD-32G, FD-32GX Ambient temperature: -20 to $+60$ °C -4 to $+140$ °F (Note) <table border="1"> <caption>Sensing range</caption> <thead> <tr> <th>Fiber model No.</th> <th>Distance to focal point</th> <th>Spot diameter</th> </tr> </thead> <tbody> <tr> <td>FD-EG31</td> <td>7 ± 0.5 mm</td> <td>$\varnothing 0.1$ mm approx.</td> </tr> <tr> <td>FD-EG30</td> <td>7 ± 0.5 mm</td> <td>$\varnothing 0.2$ mm approx.</td> </tr> <tr> <td>FD-42G/42GW FD-32G/32GX</td> <td>7 ± 0.5 mm</td> <td>$\varnothing 0.4$ mm approx.</td> </tr> </tbody> </table>	Fiber model No.	Distance to focal point	Spot diameter	FD-EG31	7 ± 0.5 mm	$\varnothing 0.1$ mm approx.	FD-EG30	7 ± 0.5 mm	$\varnothing 0.2$ mm approx.	FD-42G/42GW FD-32G/32GX	7 ± 0.5 mm	$\varnothing 0.4$ mm approx.	
Fiber model No.	Distance to focal point	Spot diameter													
FD-EG31	7 ± 0.5 mm	$\varnothing 0.1$ mm approx.													
FD-EG30	7 ± 0.5 mm	$\varnothing 0.2$ mm approx.													
FD-42G/42GW FD-32G/32GX	7 ± 0.5 mm	$\varnothing 0.4$ mm approx.													
Zoom lens (side-view type)	FX-MR5	 <p>FX-MR2 is converted into a side-view type and can be mounted in a very small space.</p> <ul style="list-style-type: none"> Applicable fibers: FD-42G, FD-42GW Ambient temperature: -40 to $+70$ °C -40 to $+158$ °F (Note) <table border="1"> <caption>Sensing range</caption> <thead> <tr> <th>Screw-in depth</th> <th>Distance to focal point</th> <th>Spot diameter</th> </tr> </thead> <tbody> <tr> <td>8 mm</td> <td>13 mm approx.</td> <td>$\varnothing 0.5$ mm</td> </tr> <tr> <td>10 mm</td> <td>15 mm approx.</td> <td>$\varnothing 0.8$ mm</td> </tr> <tr> <td>14 mm</td> <td>30 mm approx.</td> <td>$\varnothing 3.0$ mm</td> </tr> </tbody> </table>	Screw-in depth	Distance to focal point	Spot diameter	8 mm	13 mm approx.	$\varnothing 0.5$ mm	10 mm	15 mm approx.	$\varnothing 0.8$ mm	14 mm	30 mm approx.	$\varnothing 3.0$ mm	
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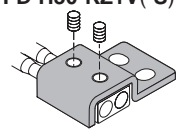
Note: Refer to P.11~ for the ambient temperature of fibers to be used in combination.

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

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

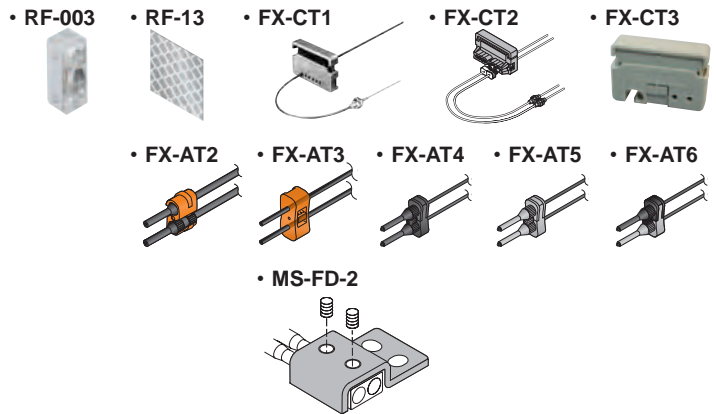
Model No. when ordering vacuum-resistant fibers individually as replacement parts

- Vacuum-resistant fiber **FD-H30W-M1V** (one pair set)
- Fiber at atmospheric side **FT-J8** (one pair set)
- Photo-terminal **FV-BR1** (one pair set)
- Mouting bracket for **FD-H30-KZ1V(-S)** **MS-FD-2**



Accessories (attached with fibers)

- RF-003** (FR-KZ50E/KZ50H 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 $\varnothing 2.2$ mm $\varnothing 0.087$ in fiber, Clear orange)
- FX-AT4** (Attachment for $\varnothing 1$ mm $\varnothing 0.039$ in fiber, Black)
- FX-AT5** (Attachment for $\varnothing 1.3$ mm $\varnothing 0.051$ in fiber, Gray)
- FX-AT6** (Attachment for $\varnothing 1$ mm $\varnothing 0.039$ in / $\varnothing 1.3$ mm $\varnothing 0.051$ in mixed fiber, Black / Gray)
- MS-FD-2** (Fiber mouting bracket)



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Cylindrical Type
Sleeve
Flat Type
Small Spot
Narrow Beam
Wide Beam
Convergent Reflective Type
Retroreflective Type
Chemical-resistant
Heat-resistant
Vacuum-resistant
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Fiber Dimensions
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Reflective Type
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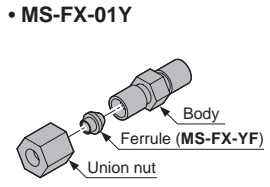
Fiber options

Others

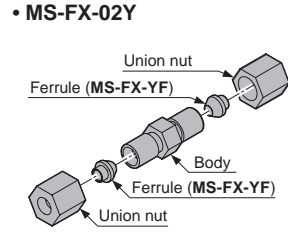
Designation	Model No.	Description				
Protective tube (For thru-beam type fiber)	FTP-500 (0.5 m 1.640 ft)	For M4 thread	Applicable fibers	FT-42	FT-43	The protective tube, made of non-corrosive stainless steel, protects the inner fiber cable from any external forces.
	FTP-1000 (1 m 3.281 ft)			FT-42S	FT-H13-FM2	
	FTP-1500 (1.5 m 4.921 ft)			FT-42W		
	For M3 thread	FTP-N500 (0.5 m 1.640 ft)		FT-31	FD-31	
		FTP-N1000 (1 m 3.281 ft)		FT-31S	FD-31W	
		FTP-N1500 (1.5 m 4.921 ft)		FT-31W		
Protective tube (For reflective type fiber)	FDP-500 (0.5 m 1.640 ft)	For M6 thread	FD-61	FD-62		
	FDP-1000 (1 m 3.281 ft)		FD-61G	FD-H13-FM2		
	FDP-1500 (1.5 m 4.921 ft)		FD-61S			
	For M4 thread	FDP-N500 (0.5 m 1.640 ft)	FD-41	FD-41S		
		FDP-N1000 (1 m 3.281 ft)	FD-41W	FD-41SW		
		FDP-N1500 (1.5 m 4.921 ft)				
Fiber bender	FB-1	The fiber bender bends the sleeve part of the fiber head at the proper radius. (Note 1)				
Universal sensor mounting stand (Note 2)	MS-AJ1-F	Horizontal mounting type	Mounting stand assembly for fiber (For M3, M4 or M6 threaded head fiber)			
	MS-AJ2-F	Vertical mounting type				
Liquid inflow prevention joint (Note 2)	MS-FX-01Y	Applicable fibers	FD-HF40Y FD-F41Y	This joint suppresses false operations due to liquid slip-in from the top of the protective tube.		
Protective tube extension joint (Note 2)	MS-FX-02Y			The protective tube can be extended.		
Fiber mounting joint (Note 2)	MS-FX-03Y			The joint is used for mounting fibers on a tank.		
Single core holder	FX-AT15A			The incident light intensity may vary when using a multi-core fiber or a thin type sharp bending fiber. This holder suppresses the variation in the incident light intensity. (Brown)		
Reflector	RF-210	It is available for FR-Z50HW.				
	RF-220	Refer to P.22 for the sensing range of FR-Z50HW to be used in combination.				
	RF-230					

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

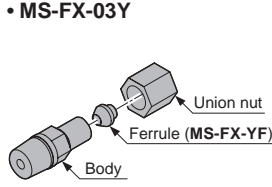
Liquid inflow prevention joint



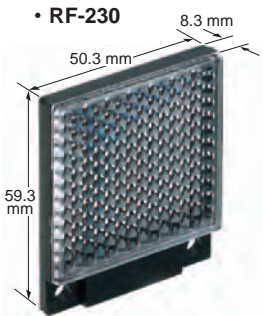
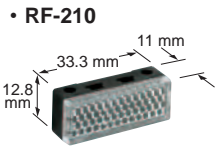
Protective tube extension joint



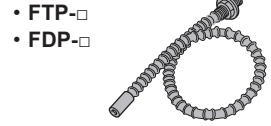
Fiber mounting joint



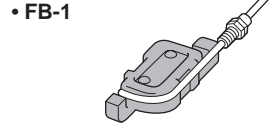
Reflector



Protective tube

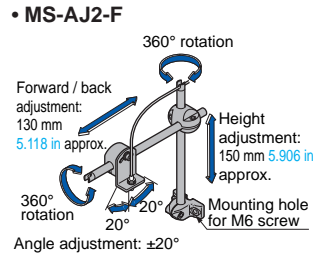
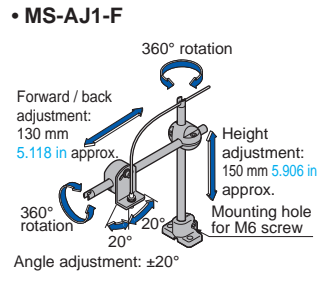


Fiber bender



Universal sensor mounting stand

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



Single core holder



New product introduction

Tough Fiber

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