



NEW DIGITAL FIBER SENSOR

FX-500SERIES



**At the industry's
leading edge**

FX-SERIES HIGH END MODEL



40th
Anniversary
MODEL

Stability

Industry leading stability

Decrease the variation among fiber sensors

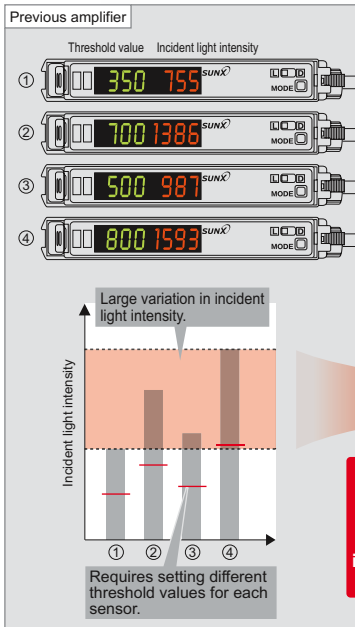
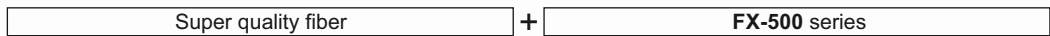
High stability!

“Why are the values different even for the same detection?” “If we try to forcibly unify all the display values of incident light intensity, we will not be able to read the actual changes.”

SUNX focuses on the variation among fiber sensors and aims for absolute digitalization.

When the **FX-500** series is used together with our super quality fiber, the incident light intensity variation among units is decreased to only 1/4 of that of conventional models.

By being close to absolute values instead of modified digital values, changes in detection that could not be found in the past can now be monitored.

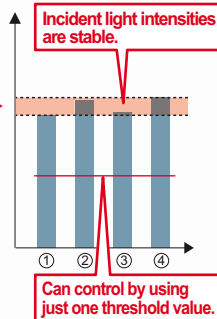


Digital control is essentially achieved

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

* Using a small diameter fiber (fiber core $\phi 0.5 \text{ mm } \phi 0.020 \text{ in.}$)
If using a standard fiber (fiber core $\phi 1.0 \text{ mm } \phi 0.039 \text{ in.}$), the variation will be double of that of conventional models.

1/4
incident light intensity variation [from previous]



Specifying just one value in an operation manual is possible

In the case where multiple fiber sensors are installed under the same operating conditions, the incident light intensities are nearly identical to each other, allowing for the specification of one threshold across all sensors.

Maintenance is easy on stabilized fiber sensors

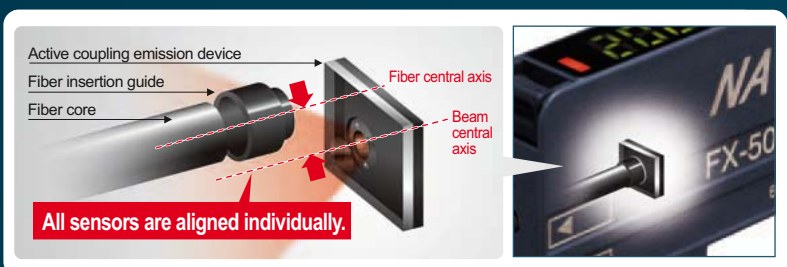
Because the incident light intensity is stable, the same threshold value can be used even when an amplifier is replaced. Also, copying of settings is easy when used together with optical communication.

Stability in incident light intensity and confidence in beam adjustment

When setting up fiber sensors in a row in the same layout, all incident light intensities will display nearly identical values once beams are aligned. This helps to raise installation precision and prevent trouble from occurring before equipment is turned on.

Improved fiber coupling efficiency and suppressed variation among units

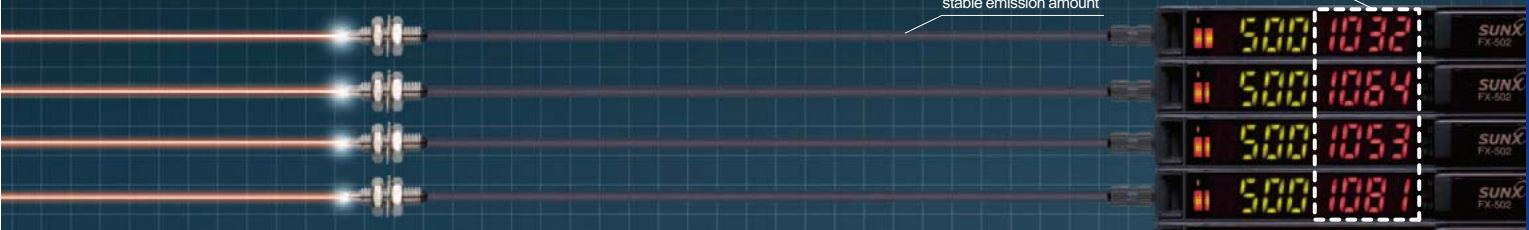
In each unit we have accurately aligned the central axis of the fiber with the central axis of the emitted light, which creates a high coupling efficiency that helps to reduce variation among units.



* Illustration is an image.

"Super quality fiber" with stable emission amount

"Stabilized incident light intensities" even in multiple units



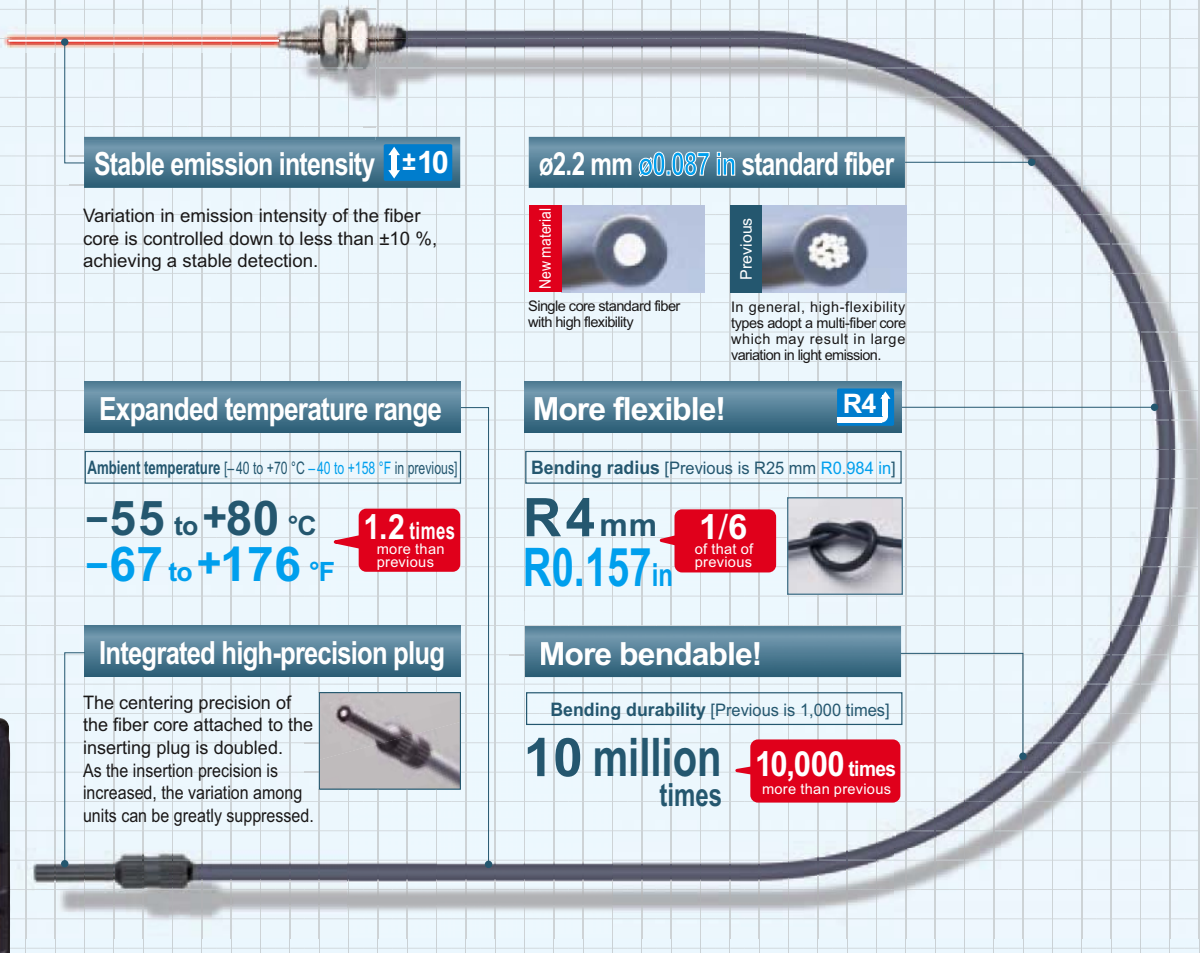
A quality that surpassed standard fiber

Introducing super quality fiber



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

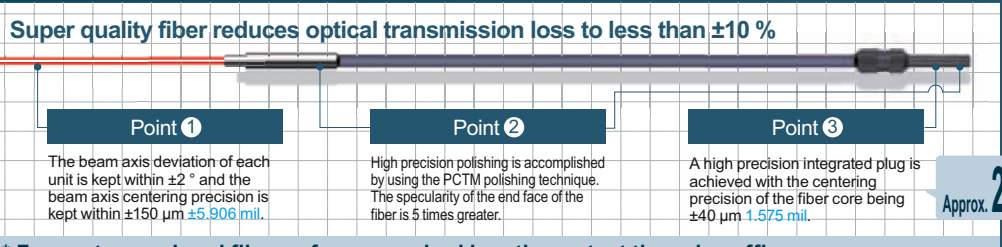
The basic performance of a standard fiber is greatly enhanced!



$\updownarrow \pm 10$

Variation in emission intensity is down to less than $\pm 10\%$

Under our new manufacturing method and quality control system, we have developed fiber heads that have a stabilized light emission. When used with the FX-500 amplifier, a complete digital control is essentially achieved.



* For custom-ordered fibers of your required length, contact the sales office near you.

Speed & Distance

Industry leading sensing performance

Ultra high-speed & Ultra long range detection

The exclusive detection IC combined with the high intensity beam emitted from the active coupling emission device provides the capability of offering high-speed response time over a longer sensing range, opening up new possibilities for fiber sensor detection.

Max. 25 μ s response time

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



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

Hyper HYPR mode incorporated

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

Max. **5.6** times! (Note)
longer than the previous model



Note: When using FD-NFM2.

Long sensing range with small diameter fibers

Small diameter fibers with a compact head can perform long range and stable detection for minute objects.

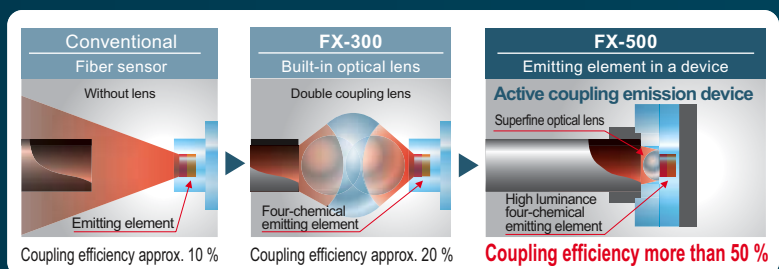
Long sensing range even in high speed mode

A high speed response time of 25 μ s, which is 2.6 times more than previous, and a long sensing range are now possible in high speed mode.

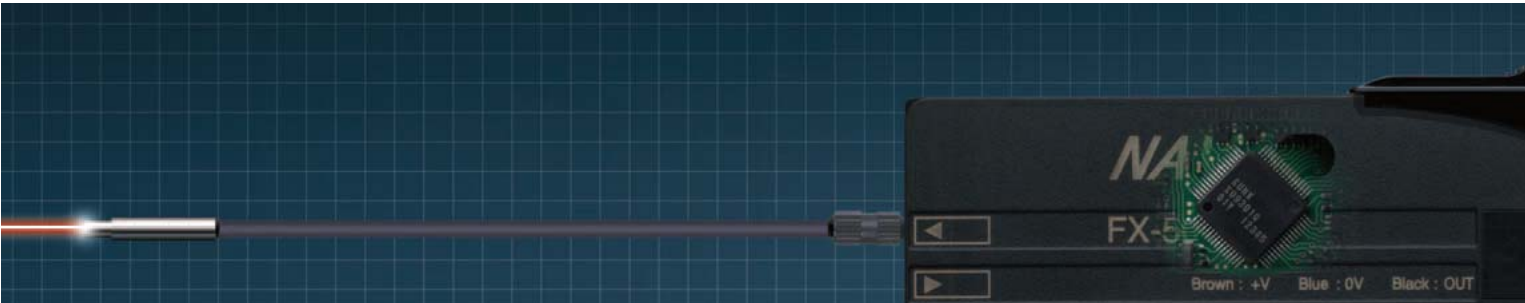
Satisfying both high speed and long range

The active coupling emission device efficiently focuses the beam through small diameter fibers

A super fine optical lens and emitting element are combined into one device enabling the beam emitted from the emitting element to be focused directly into the fiber. Coupling efficiency is therefore increased by 50 % of that of standard fiber (core ϕ 1 mm ϕ 0.039 in). In particular, the small diameter fibers (core ϕ 0.5 mm ϕ 0.020 in) see a dramatic increase in light intensity, making challenging detections possible.



Coupling efficiency = (light intensity directed into the fiber / emission intensity of active coupling emission device) \times 100 * Illustration is an image.



Sharp detection with suppressed hysteresis

A different accuracy!

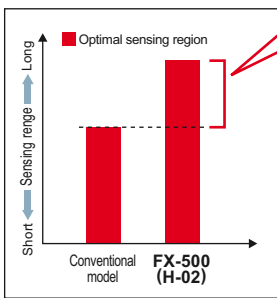
FX-500 with its accurate detection catches fractional difference in light intensity, fulfilling high precision and low-hysteresis applications.

H-02 mode

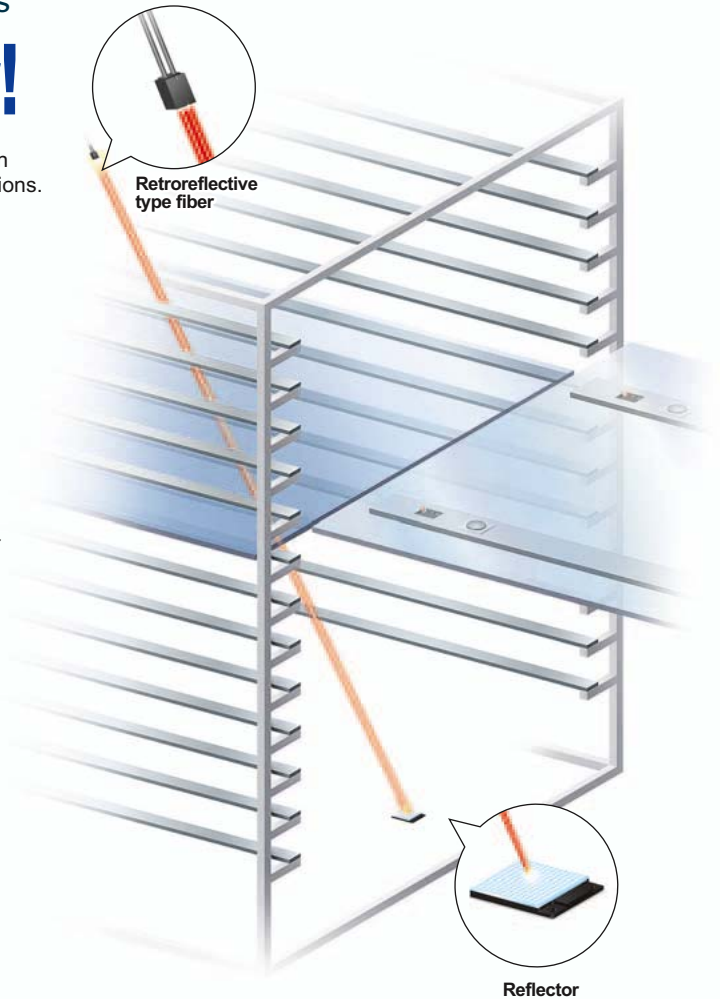
Long range detection of small objects with small difference in light intensity

FX-500 series achieves a long sensing range by its suppressed hysteresis and high intensity beam. Detection of minute objects over a long range is now more accurate compared to the past.

Comparison image of optimal sensing region



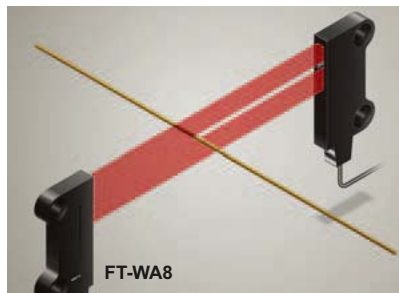
Long range detection of a glass target is now possible due to the ability of the sensor to detect small changes in light intensity.



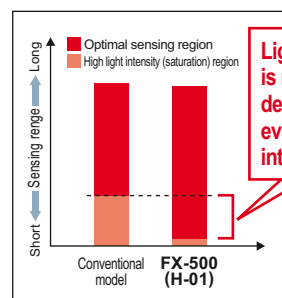
H-01 mode

Highly accurate detection while avoiding saturation

Even when the received light becomes saturated, the FX-500 series cuts down hysteresis to the utmost limit in order to produce the optimal margin for detection.



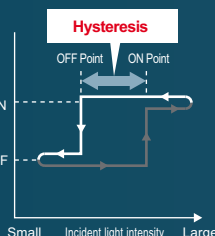
Comparison image of optimal sensing region



Light saturated region is reduced, and detection is possible even under high light intensity.

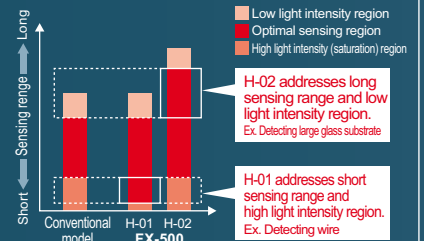
Three hysteresis modes

Hysteresis is the difference in incident light intensity at the points when the output turns ON and when the output turns OFF. Hysteresis was originally intended to be used as a measure against vibrations, but SUNX provides three hysteresis modes to suit the need of fiber sensors.



Mode table

Mode	Hysteresis amount	Light intensity	Description
H-01	Minimal	Small	Sharp detection with high accuracy is possible in this mode. Optimal for minute object detection where light saturates easily.
H-02	Small	Large	Initial setting mode. Accurate detection such as long range detection of a large glass substrate is possible.
H-03	Large	Large	A mode used for chattering prevention. Works in adverse environments such as vibration or dirt.



Class leading form and operability

New form!

Flat display with wide viewing angle

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

Clearly visible even from sideways

Compact cover does not get in the way
Reduced to **1/3** of that of previous

R23 mm
R0.906 in



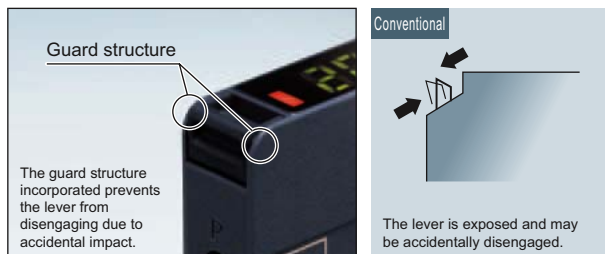
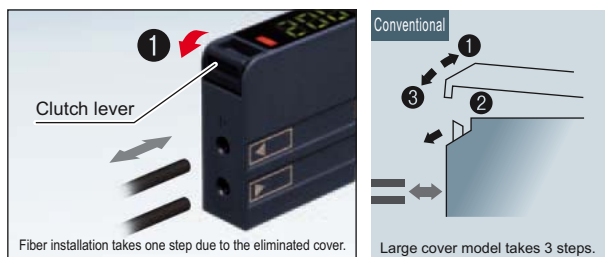
Streamlined fiber clutch

While the conventional fiber installation is done after opening up the cover, the FX-500 series adopts a guard structure, eliminating the cover so that the fiber installation can be done in one step.

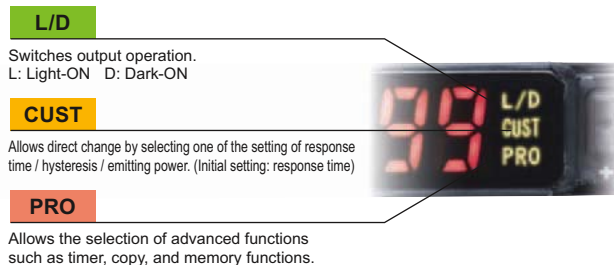
MODE NAVI + Direct setting

MODE NAVI uses three indicators and a dual display to show the amplifier's basic operations. The current operation mode can be confirmed at a glance, so even a first time user can easily operate the amplifier.

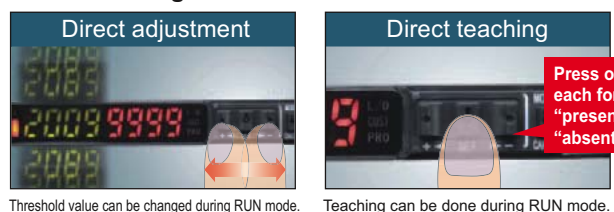
Streamlined fiber clutch



NAVI display (lights out during RUN mode)



Direct setting

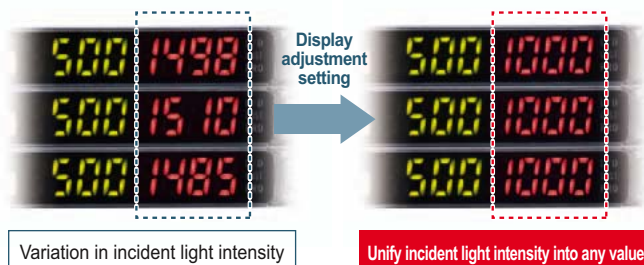


A variety of functions at the industry's leading edge

Resolves variation in incident light intensity display

Display adjustment setting

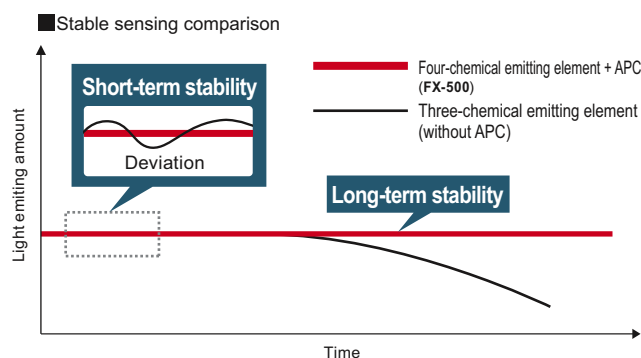
Even if there is no problem in detection, the variation in display may make it difficult for an operator to verify proper operation. By using the display adjustment setting, random values can be adjusted, and the visual variation can be resolved to help define proper operation in an operation manual.



Stable detection over long and short periods

Stabilized emission intensity

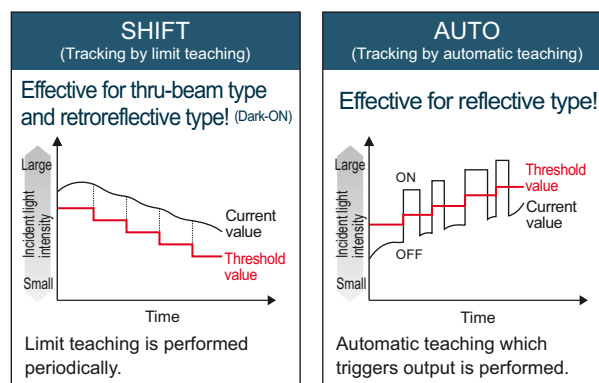
The "four-chemical emitting element" was first incorporated in the conventional model FX-300 to maintain a stable level of light emission and has now become an industry standard. FX-500 series continues to adopt the same emitting element as well as the "APC (Auto Power Control) circuit" which improves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



Saves maintenance time

Threshold tracking function

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



Suitable for preventative maintenance

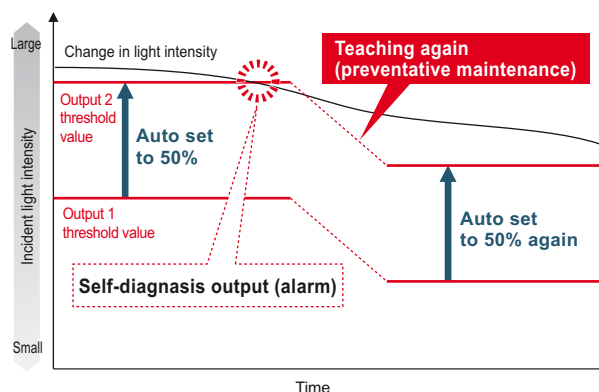
Self-diagnosis output

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

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



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



A variety of functions at the industry's leading edge

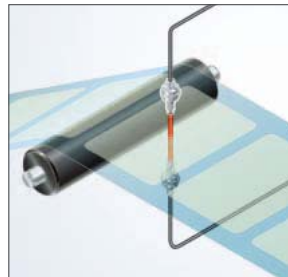
Stable detection while being eco-friendly

Emission power & gain setting



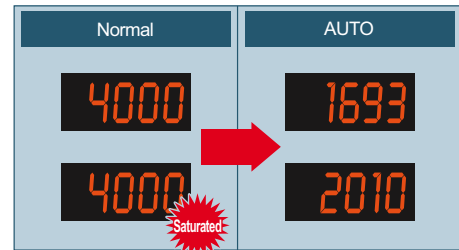
For cases when the incident light intensity saturates the receiver, the light intensity can be attenuated to the optimal level by AUTO without changing the response time. This allows for stable detection while maintaining an optimal S/N ratio and saves energy by controlling the emitting electric current.

Detecting a transparent sheet



Object present

Object absent



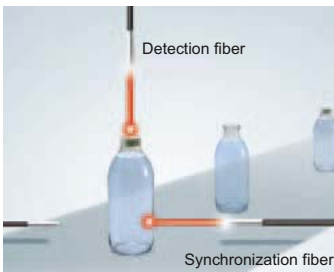
Auto mode (AUTO) and 3-level manual mode (3 levels: H / M / L [adjustable]) are incorporated.

Built-in logic functions

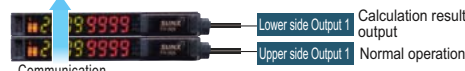
No PLC necessary saving material and programming costs

Logical calculation functions

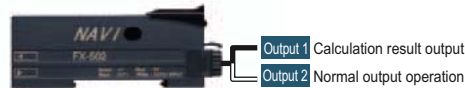
Three logical calculations (AND, OR, XOR), are selectable using Output 1 of multiple FX-500 series amplifiers. A PLC is not required which helps to reduce material and programming and costs.



Calculation of two neighboring amplifiers



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

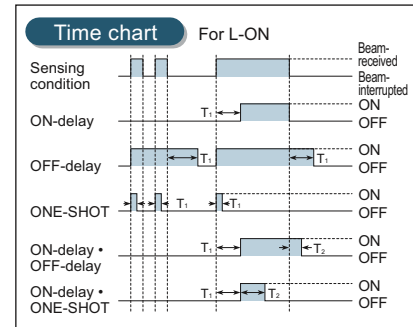


Calculation of one amplifier and external input FX-502(P) / 505(P)-C2



Equipped with 5 types timers

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

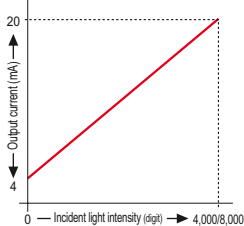


Timer period: 0.05 ms to 32 s
Output 1 has ON-delay • OFF-delay and ON-delay • ONE-SHOT timers.

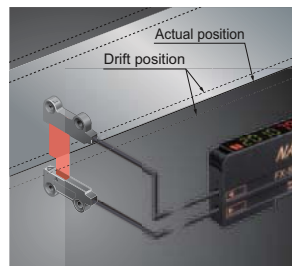
Analog control is possible

Analog output cable type FX-505(P)-C2

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



Edge tracking of film or sheet



Drifting path can be tracked as the light intensity changes.

8 data banks

Smooth setup changes

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

External input

Remote control improves work efficiency FX-502(P) / 505(P)-C2

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

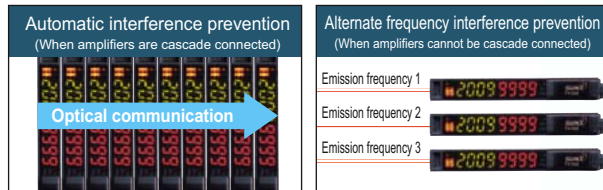
Functions operable by external input

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



Selectable interference prevention

In addition to the automatic interference prevention function which is enabled through the optical communication of cascade connected amplifiers, an alternate frequency interference prevention function is also incorporated. So even for layouts where optical communication cannot be carried out, switching of emission frequencies allows interference prevention.



* Refer to specifications for details of number of sensors allowed in interference prevention.

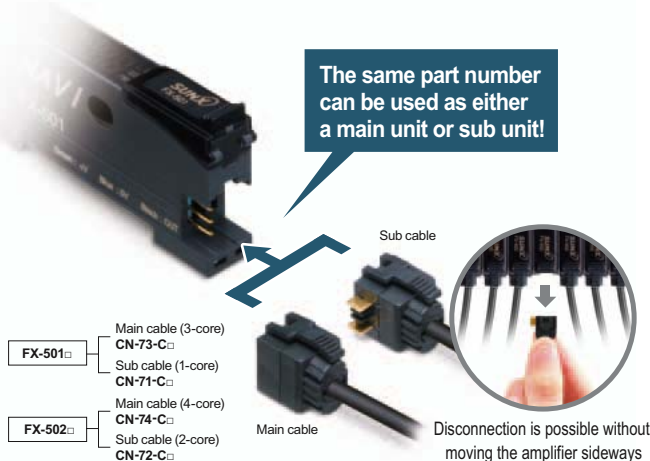
An optical communication function allows sensors to be adjusted simultaneously

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



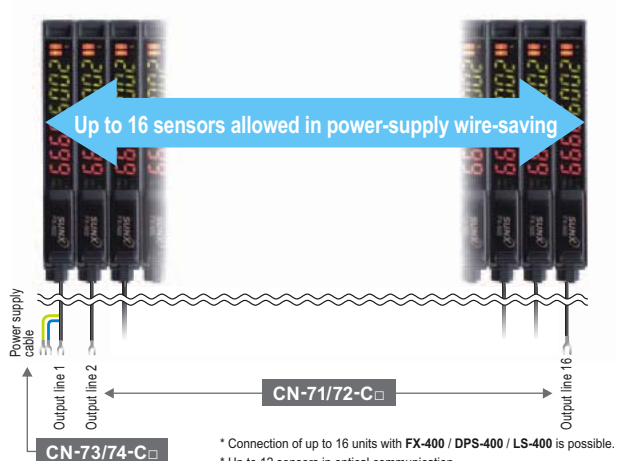
No need to specify a main unit or sub unit

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



Wire-saving, space-saving

The quick-connection cables enable reduction in wiring. The connections and man-hours required for the relay terminal block setup can be reduced and valuable space is saved.



PRO mode functions



PRO1	Response time setting
	Timer setting
	Hysteresis setting
	Shift amount setting
	Emission power setting
PRO2	Timer range setting
	Teaching lock setting
	Digital display item setting
	Digital display turning on setting
	ECO setting
PRO3	Period hold setting
	Data bank loading setting
	Data bank saving setting
	Back up setting
PRO4	Input / output setting ¹
	Copy setting
	Copy action setting
	Copy lock setting
	Communication protocol setting
	External input setting ²

PRO5	Code setting	
	Display adjustment setting	
	Reset setting	
	CUSTOM setting	
	Interference prevention setting	
PRO6	Sensing output mode	Normal mode
		Window comparator mode ³
		Rising differential mode
		Trailing differential mode
		Hysteresis mode
		Forced ON output mode
		Forced OFF output mode
		Self-diagnosis output mode ⁴
Answer back output mode ⁵		
PRO7	Setting of threshold value tracking	Logical operation setting ⁶
		Setting of threshold tracking
		Sensing output setting
		Storage cycle setting
		Algorithm setting

¹: FX-502(P) only ²: FX-502(P) and FX-505(P)-C2 only ³: Output 1 only
⁴: Output 2 only of FX-502(P) and FX-505(P)-C2 ⁵: Output 2 only of FX-505(P)-C2
⁶: FX-501(P) can do a part of operations.

ORDER GUIDE

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

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

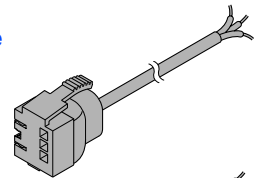
Quick-connection cables

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

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

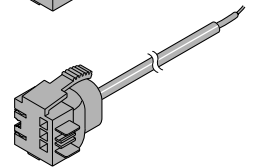
Main cable

- **CN-73-C□**



Sub cable

- **CN-71-C□**

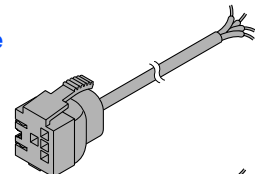


For FX-502(P) Quick-connection cable is not supplied with the amplifier. Please order it separately.

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

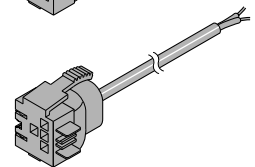
Main cable

- **CN-74-C□**

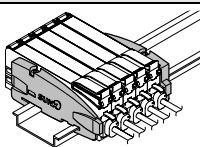


Sub cable

- **CN-72-C□**



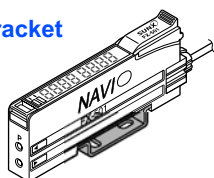
End plates End plates are not supplied with the amplifier. Please order them separately when the amplifiers are mounted in cascade.

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

OPTIONS

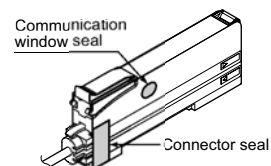
Amplifier mounting bracket

- **MS-DIN-2**



Amplifier protection seal

- **FX-MB1**
10 sets of 2 communication window seals and 1 connector seal



SPECIFICATIONS

Item	Model No.	Type	Standard type	2-output type	Cable type	
		NPN output	FX-501	FX-502	FX-505-C2	
		PNP output	FX-501P	FX-502P	FX-505P-C2	
Supply voltage		12 to 24 V DC \pm 10 % Ripple P-P 10 % or less				
Power consumption		Normal operation: 960 mW or less (current consumption 40 mA or less at 24 V supply voltage, excluding analog output of cable type) ECO mode: 680 mW or less (current consumption 28 mA or less at 24 V supply voltage, excluding analog output of cable type)				
Output (2-output type and cable type: Output 1, Output 2)		<NPN output type> NPN open-collector transistor • Maximum sink current: 100 mA (2-output type and cable type are 50 mA) (Note 2) • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 2 V or less (Note 3) (at maximum sink current)		<PNP output type> PNP open-collector transistor • Maximum source current: 100 mA (2-output type and cable type are 50 mA) (Note 2) • Applied voltage: 30 V DC or less (between output and +V) • Residual voltage: 2 V or less (Note 3) (at maximum source current)		
		Output points	1 point	2 points		
		Output operation	Switchable either Light-ON or Dark-ON by L/D mode			
		Short-circuit protection	Incorporated			
Response time		H-SP: 25 μ s or less, FAST: 60 μ s or less, STD: 250 μ s or less, LONG: 2 ms or less, U-LG: 4 ms or less, HYPR: 24 ms or less, selectable				
Analog output (Cable type only)		Output current: 4 to 20 mA approx. [H-SP, FAST STD: At 0 to 4,000 digits, LONG: At 0 to 8,000 digits (Note 4)], Response time: 2 ms or less, Zero point: Within 4 mA \pm 1 % F.S., Span: Within 16 mA \pm 5 % F.S., Linearity: Within \pm 3 % F.S., Load resistance: 0 to 250 Ω				
External input (2-output type only, switchable with Output 2)		—————	<NPN output type> NPN non-contact input • Signal condition High: +8 V to +V DC or Open Low: 0 to +1.2 V DC (at 0.5 mA source current) • Input impedance: 10 k Ω approx.	<PNP output type> PNP non-contact input • Signal condition High: +4 V to +V DC (at 3 mA sink current) Low: 0 to +0.6 V DC or Open • Input impedance: 10 k Ω approx.		
Possible external input function		—————	Emission halt / Teaching (Full-auto, Limit, 2-point) / Logic operation setting / Copy lock / Display adjustment / Data bank load / Data bank save, selectable			
Sensitivity setting		2-point teaching / Limit teaching / Full-auto teaching / Manual adjustment				
Incident light intensity display range		H-SP / FAST / STD: 0 to 4,000, LONG: 0 to 8,000, U-LG / HYPR: 0 to 9,999				
Timer function		Incorporated with variable OFF-delay / ON-delay / ONE SHOT / ON-delay • OFF-delay / ON-delay • ONE SHOT timer, switchable either effective or ineffective		<Output 1> Incorporated with variable OFF-delay / ON-delay / ONE SHOT / ON-delay • OFF-delay / ON-delay • ONE SHOT timer, switchable either effective or ineffective		
		Timer period		<Output 2> Incorporated with variable OFF-delay / ON-delay / ONE SHOT timer, switchable either effective or ineffective		
Light emitting amount selection function		Incorporated, 3 levels (each level 25 to 100 %) + Auto setting [1 level (25 to 100 %) when using H-SP mode]				
Interference prevention function		Incorporated (Note 5), selectable either automatic interference prevention or different frequency				
Various settings		Hysteresis setting / Shift amount setting / Emission power setting / Display turning setting / ECO setting / Data bank loading saving setting / Copying setting / Code setting / Reset setting / Logical calculation setting / Threshold tracking setting, etc.				
Protection		IP40 (IEC)				
Ambient temperature		-10 to +55 °C +14 to +131 °F [If 4 to 7 units are mounted in cascade: -10 to +50 °C +14 to +122 °F or if 8 to 16 units (cable type: 8 to 12 units) are mounted in cascade: -10 to +45 °C +14 to +113 °F] (No dew condensation or icing allowed), Storage: -20 to +70 °C -4 to +158 °F				
Emitting element (modulated)		Red LED (Peak emission wavelength: 650 nm 0.026 mil)				
Material		Enclosure: Heat-resistant ABS (Cable type: Polycarbonate), Case cover: Polycarbonate, Switch: TPEE				
Cable		—————	0.2 mm ² 6-core cabtyre cable, 2 m 6.562 ft long			
Cable extension		—————	Extension up to total 100 m 328.084 ft is possible with 0.3 mm ² , or more, cable. (however, supply voltage 12 V DC)			
Weight		Net weight: 15 g approx., Gross weight: 70 g approx.		Net weight: 60 g approx., Gross weight: 100 g approx.		
Accessory		FX-MB1 (Amplifier protection seal): 1 set				

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C **+73.4 °F**.
 2) 50 mA max. if 5 or more standard types are connected together. (25 mA in case of 2-output type)
 3) In case of using the quick-connection cable (cable length 5 m **16.404 ft**) (optional).
 4) If display adjustment was conducted, it is not in this range.
 5) Number of sensor heads which is possible to be mounted closely in auto interference prevention function depends on response time as shown in table below.
 Number of sensor heads which is possible to be mounted closely in different frequency Interference prevention function is up to 3 units.

• Number of sensor heads mountable closely (Unit: set)

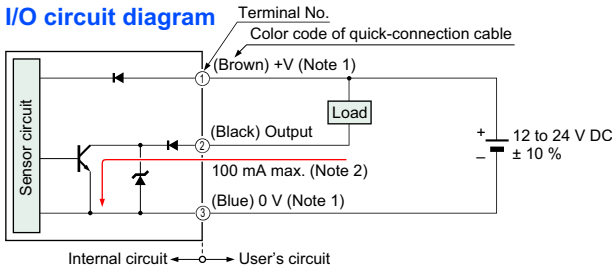
Response time	H-SP	FAST	STD	LONG	U-LG	HYPR
IP-1	0	2	4	8	8	12

I/O CIRCUIT AND WIRING DIAGRAMS

FX-501

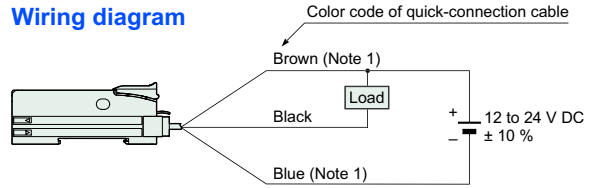
NPN output type

I/O circuit diagram



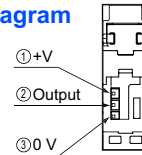
Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.
2) 50 mA max., if five amplifiers, or more, are connected together.

Wiring diagram



Note: The quick-connection sub cable does not have brown lead wire and blue lead wire.

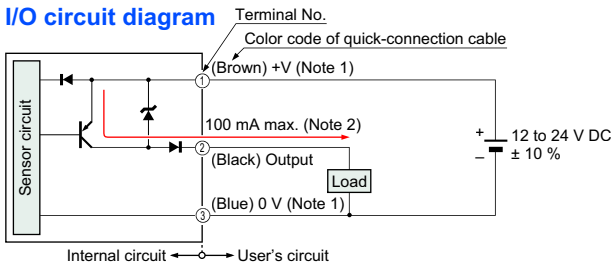
Terminal arrangement diagram



FX-501P

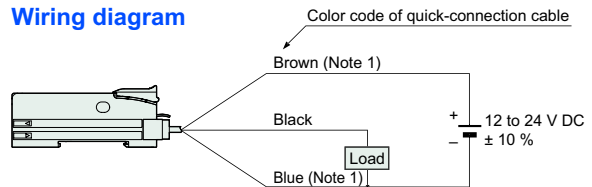
PNP output type

I/O circuit diagram



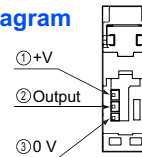
Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.
2) 50 mA max., if five amplifiers, or more, are connected together.

Wiring diagram



Note: The quick-connection sub cable does not have brown lead wire and blue lead wire.

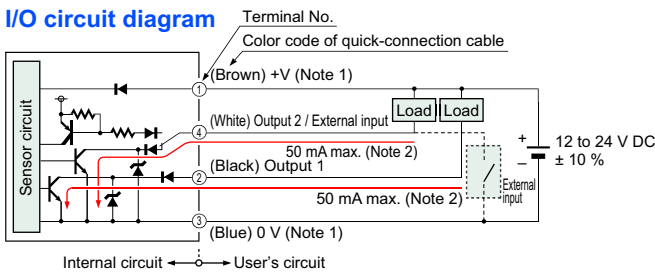
Terminal arrangement diagram



FX-502

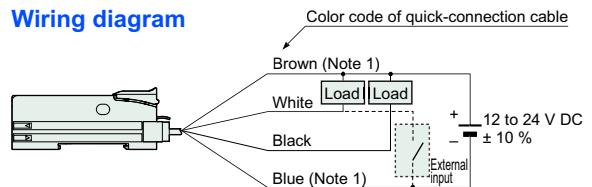
NPN output type

I/O circuit diagram



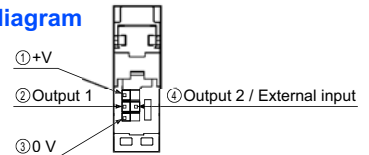
Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.
2) 25 mA max., if five amplifiers, or more, are connected together.

Wiring diagram



Note: The quick-connection sub cable does not have brown lead wire and blue lead wire.

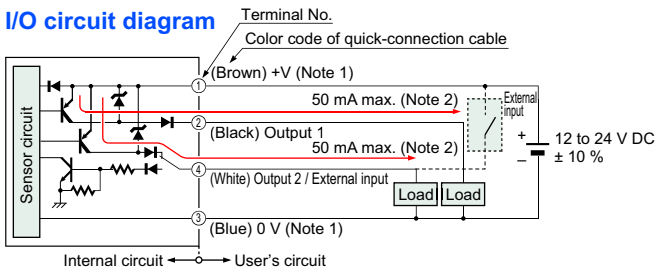
Terminal arrangement diagram



FX-502P

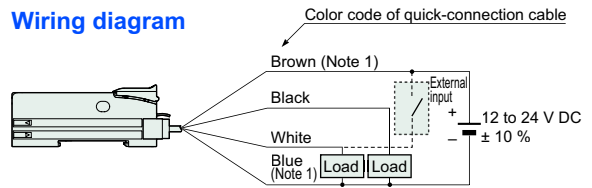
PNP output type

I/O circuit diagram



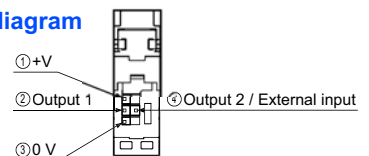
Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.
2) 25 mA max., if five amplifiers, or more, are connected together.

Wiring diagram



Note: The quick-connection sub cable does not have brown lead wire and blue lead wire.

Terminal arrangement diagram

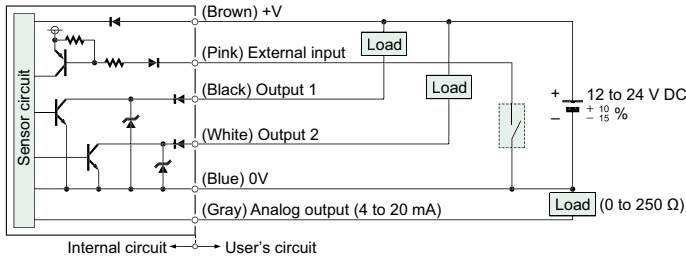


I/O CIRCUIT AND WIRING DIAGRAMS

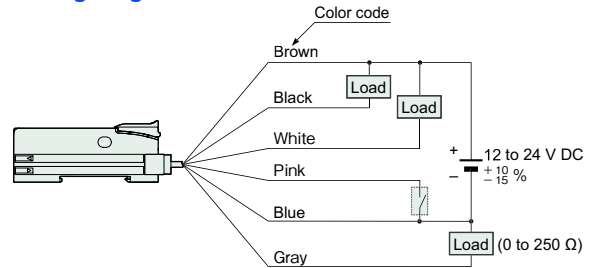
FX-505-C2

NPN output type

I/O circuit diagram



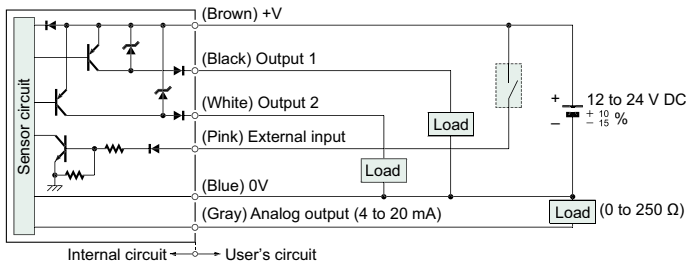
Wiring diagram



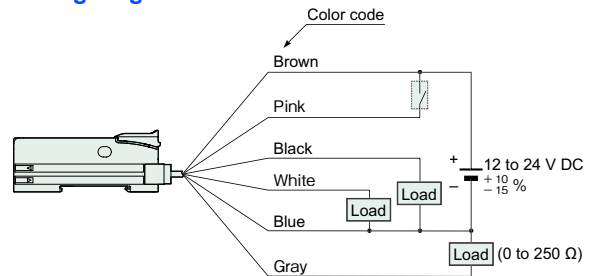
FX-505P-C2

PNP output type

I/O circuit diagram



Wiring diagram



Super Quality Fibers

A quality that surpasses standard fiber

LIST OF SUPER QUALITY FIBERS

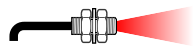
Thru-beam type (one pair set)



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

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

Reflective type

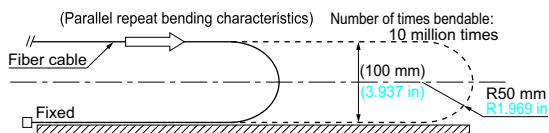


Type	Shape of fiber head (mm in)	Sensing range (mm in)			U-LG LONG FAST	Fiber cable length	Bending radius	Ambient temperature	Model No.
		■ : HYPR	■ : STD	■ : H-SP					
Threaded	M6	1,550 61.024	520 20.472	90 3.543	U-LG: 900 35.433 LONG: 740 29.134 FAST: 260 10.236	2 m 6.562 ft	R4 mm R0.157 in Allowable bending radius	-55 to +80 °C -67 to +176 °F	FD-60
	M4	600 23.622	160 6.299	25 0.984	U-LG: 330 12.992 LONG: 250 9.843 FAST: 80 3.150				FD-40
	M3	600 23.622	160 6.299	25 0.984	U-LG: 330 12.992 LONG: 250 9.843 FAST: 80 3.150				FD-30
Cylindrical	ø3 ø0.118	600 23.622	160 6.299	25 0.984	U-LG: 330 12.992 LONG: 250 9.843 FAST: 80 3.150				FD-S30

SUPER QUALITY FIBER SPECIFICATIONS

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

- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
- 2) The value is in standard condition [+23 °C +73.4 °F / 50 % RH, no bending fiber (R50 mm R1.969 in or more)].
- 3) The value is based on outer shape of fiber head.
- 4) It has a repeat flexibility as below.



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

LIST OF FIBERS

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

Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1)		Beam axis dia. (mm in)	Fiber cable length ✂: Free-cut	Bending radius	Ambient temperature	Model No.	
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST						
Threaded type	Lens mountable (FX-LE1/LE2/SV1)		3,600 (Note 2) 141.732 1,250 49.213 180 7.087	U-LG : 2,400 LONG : 2,100 FAST : 570	ø1.5 ø0.059	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FT-B8	
	Metal-free								FT-41
	Lens mountable (FX-LE1/LE2/SV1)		3,300 129.921 1,100 43.307	U-LG : 2,000 LONG : 1,550 FAST : 445	ø1 ø0.039			Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	
	Sleeve 90 mm 3.543 in		150 5.906	17.520		FT-FM2S			
	Sleeve 40 mm 1.575 in					FT-FM2S4			
	Lens mountable (FX-LE1/LE2/SV1)		3,300 129.921 790 31.102 140 5.512	U-LG : 1,800 LONG : 1,400 FAST : 420			R1 mm R0.039 in		
	Lens mountable (FX-LE1/LE2/SV1)		3,300 129.921 810 31.890 160 6.299	U-LG : 2,000 LONG : 1,500 FAST : 470	ø1.4 ø0.055	R4 mm R0.157 in Flexible	-40 to +70 °C -40 to +158 °F	FT-P80	
	Lens mountable (FX-LE1/LE2/SV1) Tough flexible		1,600 (Note 3) 62.992 880 34.646 160 6.299	U-LG : 1,600 LONG : 1,600 FAST : 530		1 m 3.281 ft	R10 mm R0.394 in		FT-P81X
	Lens mountable (FX-LE1/LE2/SV1)		1,200 47.244 350 13.780 60 2.362	U-LG : 640 LONG : 560 FAST : 210	ø0.7 ø0.028	2 m 6.562 ft	R4 mm R0.157 in Flexible	-40 to +60 °C -40 to +140 °F	FT-P60
	Square head type		2,600 102.362 660 25.984 130 5.118	U-LG : 1,300 LONG : 1,100 FAST : 410	ø1 ø0.039	2 m 6.562 ft	R1 mm R0.039 in		FT-WR80
With lens			3,600 (Note 2) 141.732 2,200 86.614 470 18.504	U-LG : 3,600 LONG : 3,300 FAST : 1,300	ø2 ø0.079			FT-WR80L	
Elbow	Lens mountable (FX-LE1/LE2)		3,500 137.795 780 30.709 140 5.512	U-LG : 1,750 LONG : 1,100 FAST : 450	ø1 ø0.039	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FT-R80
M3	Lens mountable (FX-LE1/SV1)		3,300 129.921 1,100 43.307 150 5.906	U-LG : 2,000 LONG : 1,550 FAST : 445	ø1 ø0.039	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FT-T80
	Lens mountable (FX-LE1/SV1)		1,220 48.031 310 12.205 63 2.480	U-LG : 740 LONG : 545 FAST : 192	ø0.5 ø0.020				FT-NFM2

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
 2) The fiber cable length practically limits the sensing range to 3,600 mm 141.732 in long.
 3) The fiber cable length practically limits the sensing range to 1,600 mm 62.992 in long.

LIST OF FIBERS

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

Thru-beam type (one pair set)




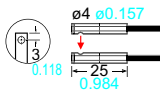

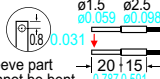
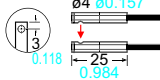
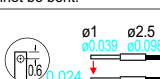

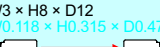


Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1)		Beam axis dia. (mm in)	Fiber cable length (Free-cut)	Bending radius	Ambient temperature	Model No.					
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST										
Threaded type	Sleeve 90 mm 3.543 in 	■ 1,220 48.031	U-LG : 740 LONG : 29.134 FAST : 545	ø0.5 ø0.020	2 m 6.562 ft	R25 mm R0.984 in Sleeve R10 mm R0.394 in	-40 to +70 °C -40 to +158 °F	FT-NFM2S					
		■ 310 12.205 ■ 63 2.480	LONG : 545 FAST : 192 7.559					FT-NFM2S4					
	M3		■ 960 37.795	U-LG : 590 LONG : 23.228 FAST : 150	ø0.6 ø0.024	2 m 6.562 ft	R1 mm R0.039 in R4 mm R0.157 in Flexible	-40 to +60 °C -40 to +140 °F	FT-W4				
			■ 250 9.843 ■ 53 2.087 ■ 650 25.591	LONG : 440 FAST : 150 5.906					FT-P40				
	Long sensing range	With lens 	■ 19,600 (Note 2) 771.652	U-LG : 19,600 LONG : 19,600 FAST : 13,000	ø10 ø0.394	10 m 32.808 ft	R25 mm R0.984 in	-40 to +158 °F	FT-FM10L				
Cylindrical type	With lens • Long sensing range ø3 ø0.118 	■ 3,600 (Note 3) 141.732	U-LG : 3,600 LONG : 3,500 FAST : 1,700	ø2 ø0.079	2 m 6.562 ft	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FT-WS8L					
		■ 3,300 129.921 ■ 640 25.197	LONG : 3,500 FAST : 1,700 66.929					FT-WS3					
	ø2.5 ø0.098	With lens • Long sensing range ø2.5 ø0.098 	■ 3,600 (Note 3) 141.732	U-LG : 3,600 LONG : 3,500 FAST : 1,400	ø2 ø0.079	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FT-SFM2L				
			■ 3,300 129.921 ■ 1,100 43.307	LONG : 3,500 FAST : 1,400 55.118					FT-SFM2				
			■ 3,300 129.921 ■ 790 31.102 ■ 150 5.906	U-LG : 2,000 LONG : 1,550 FAST : 445					ø1 ø0.039	R1 mm R0.039 in	FT-WS8		
	ø1.5 ø0.059		■ 1,220 48.031	U-LG : 740 LONG : 29.134 FAST : 192	ø0.5 ø0.020	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FT-SNFM2				
			■ 310 12.205 ■ 63 2.480	LONG : 545 FAST : 192 7.559					FT-WS4				
			■ 960 37.795	U-LG : 590 LONG : 23.228 FAST : 150					ø0.6 ø0.024	1 m 3.281 ft	R4 mm R0.157 in Flexible	-40 to +70 °C -40 to +158 °F	FT-P2
			■ 250 9.843 ■ 53 2.087	LONG : 440 FAST : 150 5.906									FT-PS1
	ø1 ø0.039		■ 1,200 47.244	U-LG : 770 LONG : 30.315 FAST : 200	ø0.25 ø0.010	500 mm 19.685 in	R4 mm R0.157 in Flexible	-40 to +60 °C -40 to +140 °F	FT-PS1				

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
 2) The fiber cable length practically limits the sensing range to 19,600 mm 771.652 in long.
 3) The fiber cable length practically limits the sensing range to 3,600 mm 141.732 in long.

LIST OF FIBERS

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

Thru-beam type (one pair set) 

Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1)			U-LG LONG FAST	Beam axis dia. (mm in)	Fiber cable length  : Free-cut	Bending radius	Ambient temperature	Model No.									
		■ : HYPR	■ : STD	■ : H-SP															
Cylindrical type	Side-view		3,600 (Note 2)	141.732	3,500	U-LG : 3,600 LONG : 3,600 FAST : 2,400	2.5 ø0.098	R25 mm R0.984 in	-40 to +60 °C -40 to +140 °F	FT-V10									
			2,200	86.614	570	U-LG : 1,300 LONG : 1,000 FAST : 360	1.1 ø0.043				2 m 6.562 ft	-20 to +70 °C -4 to +158 °F	FT-SFM2SV2						
			1,200	47.244	300	U-LG : 600 LONG : 490 FAST : 200	0.8 ø0.031							1 m 3.281 ft	-20 to +60 °C -4 to +140 °F	FT-V22			
			790	31.102	200	U-LG : 450 LONG : 360 FAST : 130	0.55 ø0.022										2 m 6.562 ft	-40 to +60 °C -40 to +140 °F	FT-V41
			380	14.961	100	U-LG : 220 LONG : 170 FAST : 60	0.5 ø0.020												
	100	3.937	20	U-LG : 86.61 LONG : 6.93 FAST : 2.36															
Rectangular type	Compact	Easy mounting • Top sensing W3 × H8 × D12 W0.118 × H0.315 × D0.472	3,600 (Note 2)	141.732	3,300	U-LG : 3,600 LONG : 3,500 FAST : 1,800	2.2 × 3 0.087 × 0.118	2 m 6.562 ft	-40 to +60 °C -40 to +140 °F	FT-WZ8H									
			3,600 (Note 2)	141.732	2,100	U-LG : 3,600 LONG : 3,300 FAST : 1,300				R4 mm R0.157 in	Flexible	FT-Z8H							
		Easy mounting • Side sensing W3 × H12 × D8 W0.118 × H0.472 × D0.315	3,600 (Note 2)	141.732	3,400	U-LG : 3,600 LONG : 3,600 FAST : 1,850				R1 mm R0.039 in		FT-WZ8E							
			3,600 (Note 2)	141.732	2,000	U-LG : 3,600 LONG : 3,300 FAST : 1,300				R4 mm R0.157 in	Flexible	FT-Z8E							
		Easy mounting • Front sensing W8.5 × H12 × D3 W0.335 × H0.472 × D0.118	3,600 (Note 2)	141.732	1,300	U-LG : 3,100 LONG : 2,300 FAST : 830				R1 mm R0.039 in		FT-WZ8							
			3,600 (Note 2)	141.732	1,200	U-LG : 2,700 LONG : 2,100 FAST : 750				R4 mm R0.157 in	Flexible	FT-Z8							
		Front sensing W10 × H7 × D2 W0.394 × H0.278 × D0.079	1,600 (Note 3)	62.992	100	U-LG : 1,100 LONG : 900 FAST : 330				1.5 ø0.059	1 m 3.281 ft		FT-WZ4						
		Fiber bending type W2 × H10 × D10 W0.079 × H0.394 × D0.394	800	31.496	40	U-LG : 460 LONG : 370 FAST : 130				0.5 ø0.020		R1 mm R0.039 in	FT-WZ4HB						
		Front sensing W14 × H7 × D3.5 W0.551 × H0.278 × D0.138	3,500	137.795	1,400	U-LG : 3,300 LONG : 2,300 FAST : 890				1.5 ø0.059	2 m 6.562 ft		FT-WZ7						
		Fiber bending type W3.5 × H14 × D11 W0.138 × H0.551 × D0.433	3,500	137.795	790	U-LG : 1,700 LONG : 1,300 FAST : 490				1 ø0.039				FT-WZ7HB					

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
 2) The fiber cable length practically limits the sensing range to 3,600 mm 141.732 in long.
 3) The fiber cable length practically limits the sensing range to 1,600 mm 62.992 in long.

LIST OF FIBERS

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

Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1)			Beam axis dia. (mm in)	Fiber cable length	Bending radius	Ambient temperature	Model No.	
		■ : HYPR ■ : STD ■ : H-SP	U-LG	LONG						FAST
Special	Narrow beam 	3,600 (Note 2)	U-LG : 3,600	141.732	141.732	2.2 0.087	R25 mm R0.984 in		FT-K8	
		750	LONG : 3,600	141.732	141.732					
		29.528	FAST : 2,700	106.299	106.299					
	Narrow beam 	3,600 (Note 2)	U-LG : 3,600	141.732	141.732	2.5 0.098	2 m 6.562 ft	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FT-WKV8
		760	LONG : 3,600	141.732	141.732					
		29.921	FAST : 2,400	94.488	94.488					
	Narrow beam 	2,400	U-LG : 1,100	43.307	43.307	1 0.039		R10 mm R0.394 in		FT-KV1
		540	LONG : 850	33.465	33.465					
		160	FAST : 430	16.929	16.929					
	Wide beam	Wide area sensing 	3,600 (Note 2)	U-LG : 3,600	141.732	141.732	3.2 x 32 0.126	R1 mm R0.039 in	-40 to +55 °C -40 to +131 °F	FT-WA30
			3,300	LONG : 3,600	141.732	141.732				
			129.921	FAST : 3,600	141.732	141.732				
Wide area sensing 		3,600 (Note 2)	U-LG : 3,600	141.732	141.732	2.2 x 11 0.087	R1 mm R0.039 in	-40 to +55 °C -40 to +131 °F	FT-WA8	
		980	LONG : 3,600	141.732	141.732					
		38.583	FAST : 3,300	129.921	129.921					
Wide area sensing 	3,600 (Note 2)	U-LG : 3,600	141.732	141.732	0.433	R10 mm R0.394 in	-40 to +70 °C -40 to +158 °F	FT-A8		
	3,500	LONG : 3,600	141.732	141.732						
	1,200	FAST : 3,300	129.921	129.921						
Array	Top sensing 	3,500	U-LG : 2,000	78.740	78.740	0.265 x 5.5 0.010 x 0.217	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FT-AFM2	
	860	LONG : 1,500	59.055	59.055						
Array	Side sensing 	160	FAST : 490	19.291	19.291				FT-AFM2E	
	6.299									
Heat-resistant	350 °C 662 °F Lens mountable (FX-LE1/LE2/SV1) 	1,200	U-LG : 880	34.646	34.646	1.2 0.047	R25 mm R0.984 in	-60 to +350 °C -76 to +662 °F	FT-H35-M2	
	430	LONG : 670	26.378	26.378						
	350 °C 662 °F Sleeve 60 mm 2.362 in 	80	FAST : 250	9.843	9.843	2 m 6.562 ft	Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in		FT-H35-M2S6	
	3.150									
	Allows flexible wiring 200 °C 392 °F Lens mountable (FX-LE1/LE2/SV1) 	1,600 (Note 3)	U-LG : 1,000	39.370	39.370	0.8 0.031	R10 mm R0.394 in	-60 to +200 °C	FT-H20W-M1	
	470	LONG : 840	33.071	33.071						
200 °C 392 °F Lens mountable (FX-LE1/LE2/SV1) 	1,600 (Note 3)	U-LG : 1,300	51.181	51.181	1.2 0.047		-76 to +392 °F	FT-H20-M1		
540	LONG : 960	37.795	37.795							
130 °C 266 °F Lens mountable (FX-LE2 only) 	3,300	U-LG : 1,900	74.803	74.803	1.5 0.059	R25 mm R0.984 in	-60 to +130 °C -76 to +266 °F	FT-H13-FM2		
700	LONG : 1,300	51.181	51.181							
		140	FAST : 410	16.142	16.142					

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
 2) The fiber cable length practically limits the sensing range to 3,600 mm 141.732 in long.
 3) The fiber cable length practically limits the sensing range to 1,600 mm 62.992 in long.

LIST OF FIBERS

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

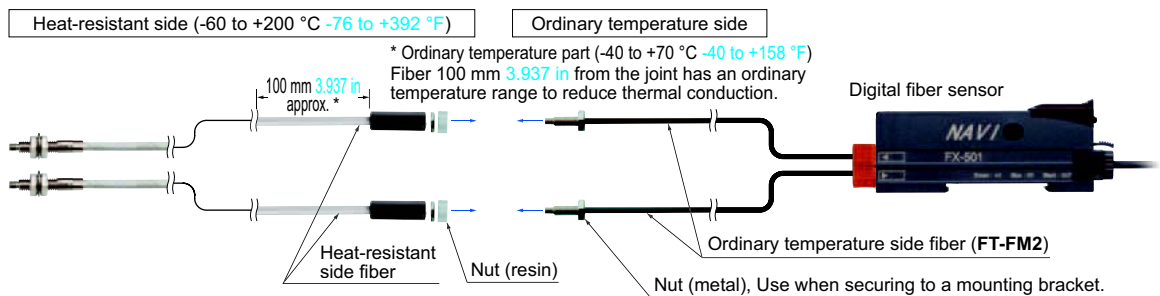
Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1)		Beam axis dia. (mm in)	Fiber cable length (Free-cut)	Bending radius	Ambient temperature	Model No.						
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST											
Heat-resistant • Joint	Lens mountable (FX-LE1/LE2/SV1)			U-LG : 1,000 LONG : 790 FAST : 300	200 mm 7.874 in (Note 2) 300 mm 11.811 in (Note 2) 500 mm 19.685 in (Note 2) 500 mm 19.685 in (Note 2) 800 mm 31.496 in (Note 2)	Heat-resistant fiber R18 mm R0.709 in (Note 3)	-60 to +200 °C -76 to +392 °F	FT-H20-J20-S (Note 4)						
				U-LG : 1,300 LONG : 980 FAST : 390				FT-H20-J30-S (Note 4)						
	Side-view			U-LG : 1,300 LONG : 980 FAST : 390				FT-H20-J50-S (Note 4)						
				U-LG : 1,300 LONG : 980 FAST : 390				FT-H20-VJ50-S (Note 4)						
				U-LG : 1,300 LONG : 980 FAST : 390				FT-H20-VJ80-S (Note 4)						
Special	Easy mounting • Rectangular head SEMI S2 compliant W7 × H15 × D13 W0.276 × H0.591 × D0.512			U-LG : 3,600 LONG : 3,600 FAST : 1,900	2 m 6.562 ft 2 m 6.562 ft (Note 6)	R25 mm R0.984 in	0 to +60 °C 32 to +140 °F	FT-Z802Y						
		Chemical-resistant						U-LG : 3,600 LONG : 3,600 FAST : 2,300	2 m 6.562 ft (Note 6)	R30 mm R1.181 in	-40 to +115 °C -40 to +239 °F	FT-HL80Y		
			U-LG : 3,600 LONG : 3,600 FAST : 2,800	2 m 6.562 ft (Note 6)				R30 mm R1.181 in				-40 to +70 °C -40 to +158 °F	FT-L80Y	
			U-LG : 2,800 LONG : 2,200 FAST : 800										2 m 6.562 ft (Note 6)	R30 mm R1.181 in
	Side-view			U-LG : 2,800 LONG : 2,200 FAST : 800				2 m 6.562 ft (Note 6)	R30 mm R1.181 in	-40 to +70 °C -40 to +158 °F	FT-V80Y			
Vacuum-resistant				U-LG : 590 LONG : 470 FAST : 160	1 m 3.281 ft	R18 mm R0.709 in	-30 to +300 °C -22 to +572 °F	FT-H30-M1V-S (Note 7)						

- Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
 2) This is the fiber length (fixed length) for heat-resistant fibers. The ordinary-temperature fibers are free-cut to 2 m 6.562 ft.
 3) The bending radius for the ordinary-temperature fiber is R25 mm R0.984 in or more.
 4) Heat-resistant joint fibers and ordinary-temperature fibers (FT-FM2) are sold as a set.
 5) The fiber cable length practically limits the sensing range to 3,600 mm 141.732 in long.
 6) The allowable cutting range is 500 mm 19.685 in from the end that the amplifier inserted.
 7) Sold as a set comprising vacuum type fiber + photo-terminal (FV-BR1) + fiber at atmospheric side (FT-J8).

Heat-resistant joint fiber set contents



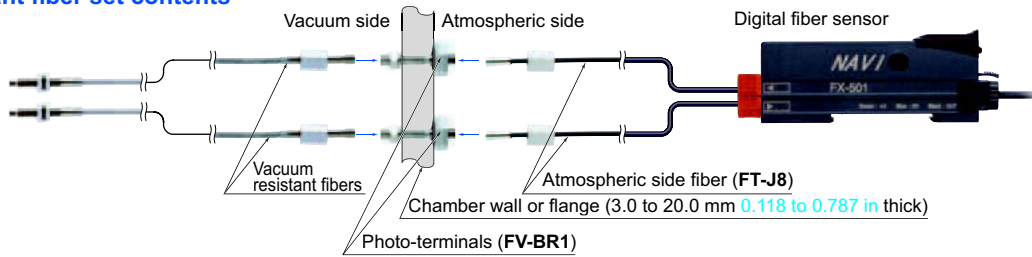
Model No. when ordering individual parts from spare parts

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

LIST OF FIBERS

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

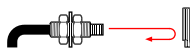
Vacuum-resistant fiber set contents



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

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

Retroreflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length 2 m 6.562 ft	Bending radius R1 mm R0.039 in	Ambient temperature -25 to +55 °C -13 to +131 °F	Model No.
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST				
Sharp bending With polarizing filters	W9.5 × H5.2 × D15 W0.374 × H0.205 × D0.591 W30 × H30 × D0.5 W1.181 × H1.181 × D0.020	100 to 1,900 3.937 to 74.803 100 to 990 3.937 to 38.976 100 to 490 3.937 to 19.291	U-LG : 100 to 1,400 3.937 to 55.118 LONG : 100 to 1,200 3.937 to 47.244 FAST : 100 to 780 3.937 to 30.709	Free-cut	R1 mm R0.039 in	-25 to +55 °C -13 to +131 °F	FR-WKZ11
	Narrow beam Top sensing Side sensing	W9.5 × H5.2 × D21 W0.374 × H0.205 × D0.827 W10.6 × H28 × D10.1 W0.417 × H1.102 × D0.398 W9.5 × H25 × D5.2 W0.374 × H0.984 × D0.205 W10.6 × H28 × D10.1 W0.417 × H1.102 × D0.398	200 7.874 200 7.874 200 7.874	U-LG : 200 7.874 LONG : 200 7.874 FAST : 200 7.874	Free-cut	R10 mm R0.394 in	-40 to +60 °C -40 to +140 °F
Wafer mapping		W7.5 × H22 × D11.2 W0.295 × H0.867 × D0.441 W4 × H2 × D21.5 W0.157 × H0.079 × D0.846	20 to 530 0.787 to 20.866 20 to 310 0.787 to 12.205 20 to 100 0.787 to 3.937	U-LG : 20 to 460 0.787 to 18.110 LONG : 20 to 410 0.787 to 16.142 FAST : 20 to 220 0.787 to 8.661	Free-cut	R10 mm R0.394 in	-40 to +60 °C -40 to +140 °F

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut. The sensing range of **FR-WKZ11** is specified for the **RF-13**. The sensing range of **FR-KZ21**, **FR-KZ21E** is specified for the attached reflector **RF-003**. The sensing range of **FR-KV1** is specified for the attached reflector. Refer to the table below for sensing range when **FR-WKZ11** is used in combination with a reflector (optional).

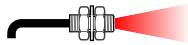
Reflector Amplifier	RF-230	RF-220	RF-210
FX-501(P)	100 to 3,600 3.937 to 141.732 (HYPR)	100 to 3,600 3.937 to 141.732 (HYPR)	100 to 2,500 3.937 to 98.425 (HYPR)
FX-502(P)	100 to 3,600 3.937 to 141.732 (U-LG)	100 to 3,000 3.937 to 118.110 (U-LG)	100 to 1,800 3.937 to 70.866 (U-LG)
	100 to 3,600 3.937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

- 2) The sensing range of **FR-WKZ11** is the possible setting range for the reflective tape. The fiber can detect an object less than 100 mm 3.937 in away. However, note that if there are any white or highly-reflective surfaces near the fiber head, reflected incident light may affect the fiber head. If this occurs, adjust the threshold value of the amplifier unit before use. The sensing range of **FR-KZ21** and **FR-KZ21E** is the possible setting range for the reflector. However, if setting the fiber to detect objects passing within 0 to 20 mm 0 to 0.787 in from the fiber head, unstable detection may result. The sensing range of **FR-KV1** is the possible setting range for the reflector. The fiber can detect an object less than 20 mm 0.787 in away.

LIST OF FIBERS

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

Reflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length ✂ : Free-cut	Bending radius	Ambient temperature	Model No.		
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST						
Threaded type	M6		1,450 57.087	U-LG : 960 LONG : 860 FAST : 330	✂ 2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-B8	
			1,000 39.370	U-LG : 680 LONG : 600 FAST : 200				FD-G60	
			1,400 55.118	U-LG : 800 LONG : 650 FAST : 200				FD-FM2	
			1,100 43.307	U-LG : 700 LONG : 540 FAST : 220				FD-FM2S	
			380 14.961	FAST : 8.661				FD-FM2S4	
		870 34.252	U-LG : 560 LONG : 420 FAST : 140	✂ 1 m 3.281 ft		R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FD-W8	
		820 32.283	U-LG : 610 LONG : 480 FAST : 160			R4 mm R0.157 in	Flexible	FD-P80	
		450 17.717	U-LG : 370 LONG : 330 FAST : 160			R10 mm R0.394 in	-40 to +70 °C -40 to +158 °F	FD-P81X	
	Elbow		890 35.039	U-LG : 500 LONG : 370 FAST : 130		✂ 2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-R80
			890 35.039	U-LG : 500 LONG : 370 FAST : 130		✂ 2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-R80
M4		1,100 43.307	U-LG : 700 LONG : 540 FAST : 220	✂ 2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-T80		
		380 14.961	FAST : 8.661				FD-NFM2		
		510 20.079	U-LG : 280 LONG : 215 FAST : 70				FD-NFM2S		
		120 4.724	FAST : 2.756		FD-NFM2S4				
		330 12.992	U-LG : 180 LONG : 140 FAST : 45		✂ 2 m 6.562 ft	Fiber R1 mm R0.039 in Sleeve R10 mm R0.394 in	-40 to +60 °C -40 to +140 °F	FD-W44	
		80 3.150	FAST : 1.772			R1 mm R0.039 in	FD-WT8		

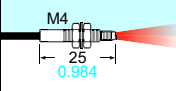
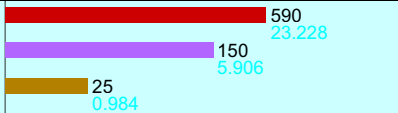
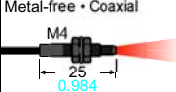
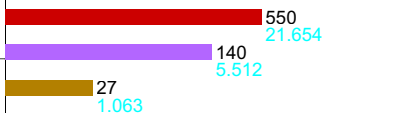
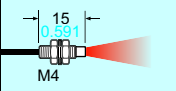
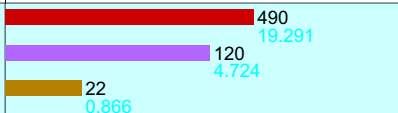
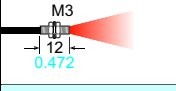
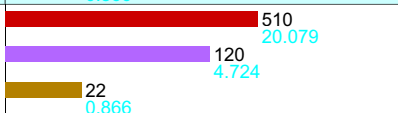
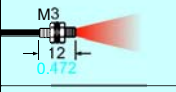
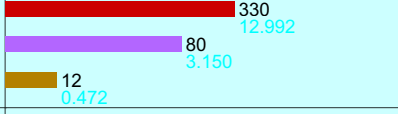
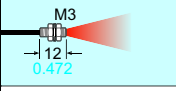
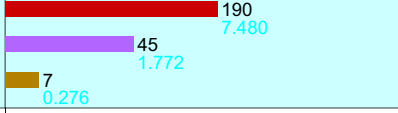
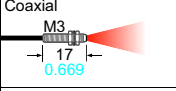
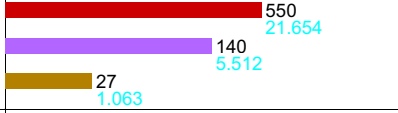
Notes: 1) The sensing range is specified for white non-glossy paper.
2) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

LIST OF FIBERS

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

Reflective type



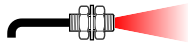
Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length ✂: Free-cut	Bending radius	Ambient temperature	Model No.	
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST					
Threaded type	M4 Minute objects can be detected due to the small spot beam. Coaxial • Lens mountable (FX-MR1/MR2/MR3/MR5/MR6) 	590 23.228	U-LG : 340 13.386	✂	R2 mm R0.079 in	-40 to +60 °C -40 to +140 °F	FD-WG4	
		150 5.906	LONG : 280 11.024					
		25 0.984	FAST : 90 3.543					
	M4 Metal-free • Coaxial 	550 21.654	U-LG : 330 12.992	✂	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-G4	
		140 5.512	LONG : 270 10.630					
	M4 	490 19.291	U-LG : 250 9.843	✂	R4 mm R0.157 in Flexible	-40 to +60 °C -40 to +140 °F	FD-P60	
		120 4.724	LONG : 190 7.480					
		22 0.866	FAST : 75 2.953					
	M3	M3 Small diameter 	510 20.079	U-LG : 280 11.024	✂	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-T40
			120 4.724	LONG : 215 8.465				
22 0.866			FAST : 70 2.756					
M3 		330 12.992	U-LG : 180 7.087	✂	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FD-WT4	
		80 3.150	LONG : 140 5.512					
		12 0.472	FAST : 45 1.772					
M3 		190 7.480	U-LG : 100 3.937	✂	R4 mm R0.157 in Flexible	-40 to +70 °C -40 to +158 °F	FD-P40	
		45 1.772	LONG : 85 3.346					
		7 0.276	FAST : 20 0.787					
M3		M3 Lens mountable (FX-MR3, FX-MR6) Coaxial 	550 21.654	U-LG : 330 12.992	✂	R25 mm R0.984 in	-40 to +60 °C -40 to +140 °F	FD-G6
	140 5.512		LONG : 270 10.630					
	27 1.063		FAST : 80 3.150					
	M3 Tough flexible Lens mountable (FX-MR3, FX-MR6) Coaxial 	630 24.803	U-LG : 370 14.567	✂	R10 mm R0.394 in	-40 to +60 °C -40 to +140 °F	FD-G6X	
		170 6.693	LONG : 310 12.205					
		27 1.063	FAST : 95 3.740					
	M3 High precision Lens mountable (FX-MR3, FX-MR6) Coaxial 	170 6.693	U-LG : 100 3.937	✂	R25 mm R0.984 in	-40 to +60 °C -40 to +140 °F	FD-EG1	
		40 1.575	LONG : 80 3.150					
		7.5 0.295	FAST : 24 0.945					
	M3 High precision Lens mountable (FX-MR3, FX-MR6) Coaxial 	130 5.118	U-LG : 100 3.937	✂	R10 mm R0.394 in	-20 to +60 °C -4 to +140 °F	FD-EG2	
24 0.945		LONG : 80 3.150						
3 0.118		FAST : 19 0.748						
M3 High precision Lens mountable (FX-MR3, FX-MR6) Coaxial 	85 3.346	U-LG : 45 1.772	✂	R10 mm R0.394 in	-20 to +60 °C -4 to +140 °F	FD-EG3		
	20 0.787	LONG : 35 1.378						
	3.5 0.138	FAST : 12 0.472						
M3 Coaxial 	190 7.480	U-LG : 110 4.331	✂	R25 mm R0.984 in	-40 to +60 °C -40 to +140 °F	FD-ENM1S1		
	50 1.969	LONG : 90 3.543						
	9 0.354	FAST : 28 1.102						
Cylindrical type	ø3 ø0.118 	1,100 43.307	U-LG : 700 27.559	✂	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-S80	
		380 14.961	LONG : 540 21.260					
ø3 ø0.118 	960 37.795	U-LG : 550 21.654	✂	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FD-WS8		
	250 9.843	LONG : 410 16.142						

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

LIST OF FIBERS

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

Reflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length ✂: Free-cut	Bending radius	Ambient temperature	Model No.
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST				
Cylindrical type	Coaxial ø3 ø0.118 	■ : 590 ■ : 23.228 ■ : 150 ■ : 5.906 ■ : 25 ■ : 0.984	U-LG : 340 LONG : 13.386 FAST : 280 FAST : 11.024 FAST : 90 FAST : 3.543	 2 m 6.562 ft	R2 mm R0.079 in	-40 to +60 °C -40 to +140 °F	FD-WSG4
		■ : 490 ■ : 19.291 ■ : 120 ■ : 4.724 ■ : 22 ■ : 0.866	U-LG : 250 LONG : 9.843 FAST : 190 FAST : 7.480 FAST : 75 FAST : 2.953				
	Coaxial ø2.5 ø0.098 	■ : 510 ■ : 20.079 ■ : 120 ■ : 4.724 ■ : 22 ■ : 0.866	U-LG : 280 LONG : 11.024 FAST : 215 FAST : 8.465 FAST : 70 FAST : 2.756	 2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-SNFM2
	Coaxial ø1.5 ø0.059 	■ : 260 ■ : 10.236 ■ : 80 ■ : 3.150 ■ : 20 ■ : 0.787	U-LG : 170 LONG : 6.693 FAST : 140 FAST : 5.512 FAST : 55 FAST : 2.165				
	Ultra-small diameter ø1.5 ø0.5 ø0.059 ø0.020 Sleeve part cannot be bent.	■ : 45 ■ : 1.772 ■ : 12 ■ : 0.472 ■ : 2 ■ : 0.079	U-LG : 25 LONG : 0.984 FAST : 22 FAST : 0.866 FAST : 7 FAST : 0.276	1 m 3.281 ft	R10 mm R0.394 in	-40 to +60 °C -40 to +140 °F	FD-E12
	Ultra-small diameter Coaxial ø3 ø0.65 ø0.118 ø0.026 Sleeve part cannot be bent.	■ : 210 ■ : 8.268 ■ : 55 ■ : 2.165 ■ : 11 ■ : 0.433	U-LG : 130 LONG : 5.118 FAST : 110 FAST : 4.331 FAST : 32 FAST : 1.260				
	Small diameter Sleeve part cannot be bent.	■ : 260 ■ : 10.236 ■ : 65 ■ : 2.559 ■ : 14 ■ : 0.551	U-LG : 140 LONG : 5.512 FAST : 110 FAST : 4.331 FAST : 35 FAST : 1.378	R25 mm R0.984 in	-40 to +60 °C -40 to +140 °F	FD-V41	
	Side-view Sleeve part cannot be bent.	■ : 60 ■ : 2.362 ■ : 16 ■ : 0.630 ■ : 2 ■ : 0.079	U-LG : 35 LONG : 1.378 FAST : 25 FAST : 0.984 FAST : 8 FAST : 0.315				 2 m 6.562 ft
	Side-view Sleeve part cannot be bent.	■ : 370 ■ : 14.567 ■ : 120 ■ : 4.724 ■ : 25 ■ : 0.984	U-LG : 250 LONG : 9.843 FAST : 210 FAST : 8.268 FAST : 75 FAST : 2.953	R25 mm R0.984 in	-20 to +60 °C -4 to +140 °F	FD-SFM2SV2	
	Rectangular	Glass substrate detection • Mapping W25 × H7.3 × D30 W0.984 × H0.287 × D1.181	■ : 1 to 110 ■ : 0.039 to 4.331				U-LG : 1 to 87 LONG : 0.039 to 3.425 FAST : 1 to 74 FAST : 0.039 to 2.913 FAST : 1 to 38 FAST : 0.039 to 1.496
Cannot use ■ : 1 to 56 ■ : 0.039 to 2.205			U-LG : 43 LONG : 1.693 FAST : 43 FAST : 1.693 FAST : 40 FAST : 1.575	 3 m 9.843 ft	R4 mm R0.157 in	FD-L45	
Glass substrate detection • Alignment W20 × H29 × D3.8 W0.787 × H1.142 × D0.150		■ : 3 to 51 ■ : 0.118 to 2.008 ■ : 4 to 44 ■ : 0.157 to 1.732 ■ : 5 to 38 ■ : 0.197 to 1.496	U-LG : 4 to 47 LONG : 0.157 to 1.850 FAST : 4 to 46 FAST : 0.157 to 1.811 FAST : 4 to 42 FAST : 0.157 to 1.654				R25 mm R0.984 in
Glass substrate detection • Alignment W17 × H29 × D3.8 W0.665 × H1.142 × D0.150		■ : 31 ■ : 1.220 ■ : 24 ■ : 0.945 ■ : 18 ■ : 0.709	U-LG : 25 LONG : 0.984 FAST : 24 FAST : 0.945 FAST : 24 FAST : 0.945	 2 m 6.562 ft	R4 mm R0.157 in	FD-L43	
Glass substrate detection • Seating confirmation W18 × H29 × D3.8 W0.709 × H1.142 × D0.150		■ : 30 ■ : 1.181 ■ : 29 ■ : 1.142 ■ : 1.5 to 24 ■ : 0.059 to 0.945	U-LG : 30 LONG : 1.181 FAST : 30 FAST : 1.181 FAST : 28 FAST : 1.102				 3 m 9.843 ft

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

LIST OF FIBERS

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

Reflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length ✂: Free-cut	Bending radius	Ambient temperature	Model No.		
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST						
Rectangular	Glass substrate detection • Seating confirmation W12 × H19 × D3 W0.472 × H0.748 × D0.118	■ 11.5 ■ 0.453 ■ 9.5 ■ 0.374 ■ 8 ■ 0.315	U-LG : 10.5 0.413 LONG : 10 0.394 FAST : 9 0.354	✂	R10 mm R0.394 in	-40 to +60 °C -40 to +140 °F	FD-L44		
		■ 6 ■ 0.236 ■ 5 ■ 0.197 ■ 4 ■ 0.157	U-LG : 5.5 0.217 LONG : 5.5 0.217 FAST : 4.5 0.177				FD-L44S		
	Convergent reflective type W24 × H21 × D4 W0.945 × H0.827 × D0.157	■ 1.5 to 15 ■ 0.059 to 0.591 ■ 2.5 to 14 ■ 0.098 to 0.551 ■ 6.5 to 10 ■ 0.256 to 0.394	U-LG : 2 to 14.5 0.079 to 0.571 LONG : 2 to 14.5 0.079 to 0.571 FAST : 5.5 to 13.5 0.217 to 0.531	✂	2 m 6.562 ft	R1 mm R0.039 in		FD-WL41	
		■ 1 to 19 ■ 0.039 to 0.748 ■ 1.5 to 16 ■ 0.059 to 0.630 ■ 8 to 11 ■ 0.315 to 0.433	U-LG : 1 to 18 0.039 to 0.709 LONG : 1.5 to 16 0.059 to 0.630 FAST : 3 to 15 0.118 to 0.591	✂		R10 mm R0.394 in		FD-L41	
		■ 21.5 ■ 0.846 ■ 15.5 ■ 0.610 ■ 5 to 7.5 ■ 0.197 to 0.295	U-LG : 19.5 0.768 LONG : 18.5 0.728 FAST : 3 to 13 0.118 to 0.512	✂		R10 mm R0.394 in	-40 to +70 °C -40 to +158 °F	FD-L4	
		■ 16 ■ 0.630 ■ 7.5 ■ 0.295 ■ 0.5 to 4 ■ 0.020 to 0.157	U-LG : 12.5 0.492 LONG : 11.5 0.453 FAST : 0.5 to 6 0.020 to 0.236	✂	1 m 3.281 ft	R1 mm R0.039 in	-20 to +60 °C -4 to +140 °F	FD-WL48	
	Small	Front sensing W10 × H7 × D2 W0.394 × H0.276 × D0.079	■ 1 to 230 ■ 0.039 to 9.055 ■ 2 to 65 ■ 0.079 to 2.559 ■ 5 to 13 ■ 0.197 to 0.512	U-LG : 1 to 110 0.039 to 4.331 LONG : 1 to 85 0.039 to 3.346 FAST : 3 to 35 0.118 to 1.378	✂	1 m 3.281 ft		FD-WZ4	
		Fiber bending type W2 × H10 × D10 W0.079 × H0.394 × D0.394	■ 1 to 190 ■ 0.039 to 7.480 ■ 2.5 to 65 ■ 0.098 to 2.559 ■ 3 to 11 ■ 0.118 to 0.433	U-LG : 1 to 130 0.039 to 5.118 LONG : 1 to 90 0.039 to 3.543 FAST : 2.5 to 40 0.098 to 1.575	✂		R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FD-WZ4HB
		Front sensing W14 × H7 × D3.5 W0.551 × H0.276 × D0.138	■ 430 ■ 16.929 ■ 110 ■ 4.331 ■ 3 to 25 ■ 0.118 to 0.984	U-LG : 230 9.055 LONG : 180 7.087 FAST : 1.5 to 65 0.059 to 2.559	✂	2 m 6.562 ft		FD-WZ7	
		Fiber bending type W3.5 × H14 × D11 W0.138 × H0.551 × D0.433	■ 0.5 to 560 ■ 0.020 to 22.047 ■ 1 to 150 ■ 0.039 to 5.906 ■ 2.5 to 30 ■ 0.098 to 1.181	U-LG : 0.5 to 320 0.020 to 12.598 LONG : 0.5 to 270 0.020 to 10.630 FAST : 1 to 90 0.039 to 3.543	✂			FD-WZ7HB	
Special	Long sensing range • Rectangular head W52 × H9.5 × D15 W0.205 × H0.374 × D0.591	■ 20 to 1,700 ■ 0.787 to 66.929 ■ 20 to 490 ■ 0.787 to 19.291 ■ 20 to 100 ■ 0.787 to 3.937	U-LG : 20 to 1,000 0.787 to 39.370 LONG : 20 to 820 0.787 to 32.283 FAST : 20 to 310 0.787 to 12.205	✂	2 m 6.562 ft	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FD-WKZ1	
	Wide beam W7 × H15 × D30 W0.276 × H0.591 × D1.181	■ 200 ■ 7.874 ■ 200 ■ 7.874 ■ 75 ■ 2.953	U-LG : 200 7.874 LONG : 200 7.874 FAST : 140 5.512	✂	2 m 6.562 ft	R25 mm R0.984 in		FD-A15	
	Array Top sensing W5 × H20 × D20 W0.197 × H0.787 × D0.787	■ 660 ■ 25.984 ■ 280 ■ 11.024	U-LG : 510 20.079 LONG : 430 16.929 FAST : 160 6.299	✂	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-AFM2	
Side sensing W5 × H20 × D20 W0.197 × H0.787 × D0.787	■ 50 ■ 1.969		✂				FD-AFM2E		

Notes: 1) The sensing range is specified for white non-glossy paper (FD-L44, FD-WL41 and FD-L41: 100 × 100 × t 0.7 mm 3.937 × 3.937 × t 0.028 in transparent glass, FD-L44S: silicon wafers polished surface) as the object.
 2) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

LIST OF FIBERS

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

Reflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length ✂ : Free-cut	Bending radius	Ambient temperature	Model No.	
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST					
Special	Liquid level sensing	Heat resistant 125 °C 257 °F Fluorine resin coating ø6 0.236	ø6 mm 0.236 in Protective tube: Fluorine resin, length 1,000 mm 39.370 in (not cuttable) Liquid surface contacted: Beam received, Liquid surface not contacted: Beam interrupted	2 m 6.562 ft (Note 3)	Protective tube R40 mm R1.575 in Fiber R15 mm R0.591 in	-40 to +125 °C -40 to +257 °F	FD-F8Y	
		Heat resistant 105 °C 221 °F Fluorine resin coating ø4 0.157	ø4 mm 0.157 in Protective tube: Fluorine resin, length 500 mm 19.685 in (cuttable) Liquid surface contacted: Beam received, Liquid surface not contacted: Beam interrupted	2 m 6.562 ft	Protective tube R20 mm R0.787 in Fiber R10 mm R0.394 in	-40 to +105 °C -40 to +221 °F	FD-HF40Y	
		Heat resistant 70 °C 158 °F Fluorine resin coating throughout the fiber ø4 0.157	ø4 mm 0.157 in Protective tube: Fluorine resin, length 500 mm 19.685 in (cuttable) Liquid surface contacted: Beam received, Liquid surface not contacted: Beam interrupted		-40 to +70 °C -40 to +158 °F	FD-F41Y		
		Mountable on pipe • Standard W25 × H13 × D20 W0.984 × H0.512 × D0.787	Applicable pipe diameter: Outer dia. ø6 to ø26 mm 0.236 to 1.024 in transparent pipe [PVC (vinyl chloride), fluorine resin, polycarbonate, acrylic, glass, wall thickness 1 to 3 mm 0.039 to 0.118 in] Liquid absent: Beam received, Liquid present: Beam interrupted	2 m 6.562 ft	R10 mm R0.394 in	-40 to +100 °C -40 to +212 °F	FD-F41	
		Mountable on pipe • For PFA, wall thickness 1 mm 0.039 in pipe W25 × H13 × D20 W0.984 × H0.512 × D0.787	Applicable pipe diameter: Outer dia. ø6 to ø26 mm 0.236 to 1.024 in transparent pipe [PFA (fluorine resin) or equivalently transparent pipe, wall thickness 1 mm 0.039 in] Liquid absent: Beam received, Liquid present: Beam interrupted		FD-F4			
Special	Liquid sensing	Mountable on pipe • Array fiber W6.5 × H28.3 × D17 W0.256 × H1.114 × D0.669	Applicable pipe diameter: Outer dia. ø8 mm 0.315 in or more transparent pipe (When used with the tying bands: ø8 to ø80 mm 0.315 to 3.150 in) [PFA (fluorine resin), including translucent] Liquid absent: Beam received, Liquid present: Beam interrupted	2 m 6.562 ft	R10 mm R0.394 in	-40 to +70 °C -40 to +158 °F	FD-FA90	
		Mountable on pipe SEMI S2 compliant W23 × H20 × D17 W0.906 × H0.787 × D0.669	Applicable pipe diameter: Outer dia. ø3 to ø10 mm 0.118 to 0.394 in transparent pipe [PFA (fluorine resin) or equivalently transparent pipe, wall thickness 0.3 to 1 mm 0.012 to 0.039 in] Liquid absent: Beam received, Liquid present: Beam interrupted	2 m 6.562 ft	Protective tube R20 mm R0.787 in Fiber R4 mm R0.157 in	-20 to +60 °C -4 to +140 °F	FT-F902	
		SEMI S2 compliant W20 × H30 × D10 W0.787 × H1.181 × D0.394	Liquid leak detection Leak absent: Beam received, Leak present: Beam interrupted	5 m 16.404 ft (Protective tube:) 3 m 9.843 ft	Protective tube R20 mm R0.787 in Fiber R4 mm R0.157 in	-20 to +50 °C -4 to +122 °F	FD-F705	
Special	Heat-resistant	350 °C 662 °F • Coaxial M6 25 0.984	 720 28.346 260 10.236 45 1.772	U-LG : 540 21.260 LONG : 460 18.110 FAST : 150 5.906	2 m 6.562 ft	R25 mm R0.984 in	-60 to +350 °C -76 to +662 °F	FD-H35-M2
		350 °C 662 °F • Sleeve 60 mm 2.362 in M6 22 0.866	 45 1.772		Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in		FD-H35-M2S6	
		200 °C 392 °F • Coaxial M6 28 1.102	 840 33.071 330 12.992 55 2.165	U-LG : 550 21.654 LONG : 500 19.685 FAST : 200 7.874	R25 mm R0.984 in	-60 to +200 °C -76 to +392 °F	FD-H20-M1	
		350 °C 662 °F • Sleeve 90 mm 3.543 in M4 27 1.063 ø2.1 0.083	 840 33.071 260 10.236 45 1.772	U-LG : 550 21.654 LONG : 440 17.323 FAST : 140 5.512	Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	-60 to +350 °C -76 to +662 °F	FD-H35-20S	
		200 °C 392 °F • Coaxial M4 27 1.063	 770 30.315 230 9.055 45 1.772	U-LG : 500 19.685 LONG : 380 14.961 FAST : 130 5.118	R25 mm R0.984 in	-60 to +200 °C -76 to +392 °F	FD-H20-21	
		300 °C 572 °F • Glass substrate detection Convergent reflective type W19 × H27 × D5 W0.748 × H1.063 × D0.197	 40 1.575 17 0.669 1.5 to 6 0.059 to 0.236	U-LG : 30 1.181 LONG : 25 0.984 FAST : 12 0.472	2 m 6.562 ft	-60 to +300 °C -76 to +572 °F	FD-H30-L32	

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

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

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

LIST OF FIBERS

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

Reflective type

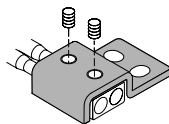


Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length ✂️: Free-cut	Bending radius	Ambient temperature	Model No.
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST				
Special	250 °C 482 °F • Glass substrate detection Convergent reflective type W21 × H33.2 × D5 W0.827 × H1.307 × D0.197	■ 1 to 31 ■ 0.039 to 1.220 ■ 1.5 to 26 ■ 0.059 to 1.024 ■ 2 to 18 ■ 0.079 to 0.709	U-LG : 1 to 30 0.039 to 1.181 LONG : 1 to 28 0.039 to 1.102 FAST : 1.5 to 24 0.059 to 0.945	3 m 9.843 ft	R25 mm R0.984 in	-20 to +250 °C -4 to +482 °F (Ordinary temperature side: -20 to +70 °C -4 to +158 °F)	FD-H25-L43
		■ 4 to 43.5 ■ 0.157 to 1.713 ■ 5 to 42 ■ 0.197 to 1.654 ■ 6.5 to 34 ■ 0.256 to 1.339	U-LG : 4 to 43 0.157 to 1.693 LONG : 4.5 to 43 0.177 to 1.693 FAST : 5 to 40 0.197 to 1.575				
	180 °C 356 °F • Glass substrate detection Convergent reflective type W19 × H27 × D5 W0.748 × H1.063 × D0.197	■ 60 ■ 2.362 ■ 16 ■ 0.630 ■ 2 to 6.5 ■ 0.079 to 0.256	U-LG : 32 1.260 LONG : 24 0.945 FAST : 13 0.512	2 m 6.562 ft	R18 mm R0.709 in	-60 to +180 °C -76 to +356 °F	FD-H18-L31
		■ 880 ■ 34.646 ■ 350 ■ 13.780 ■ 65 ■ 2.559	U-LG : 640 25.197 LONG : 600 23.622 FAST : 200 7.874				
	Vacuum-resistant 300 °C 572 °F • Rectangular head W9.5 × H5.2 × D15 W0.374 × H0.205 × D0.591	■ 1 to 500 ■ 0.039 to 19.685 ■ 2 to 200 ■ 0.079 to 7.874 ■ 10 to 25 ■ 0.394 to 0.984	U-LG : 1 to 340 0.039 to 13.386 LONG : 1 to 270 0.039 to 10.630 FAST : 3 to 120 0.118 to 4.724	1 m 3.281 ft	R18 mm R0.709 in	-30 to +300 °C -22 to +572 °F	FD-H30-KZ1V-S (Note 3)
		300 °C 572 °F • Glass substrate detection Convergent reflective type W19 × H5 × D27 W0.748 × H0.197 × D1.063	■ 18 ■ 0.709 ■ 8 ■ 0.315 ■ 1.5 to 3 ■ 0.059 to 0.118				

- Notes: 1) The sensing range is specified for white non-glossy paper (FD-H25-L43, FD-H25-L45, FD-H18-L31, FD-H30-KZ1V-S, FD-H30-L32V-S: 100 × 100 × t 0.7 mm 3.937 × 3.937 × t 0.028 in transparent glass) as the object.
 2) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
 3) Sold as a set comprising vacuum type fiber + photo-terminal (FV-BR1) + fiber at atmospheric side (FT-J8). Refer to P.6 for vacuum-resistant fiber set contents.

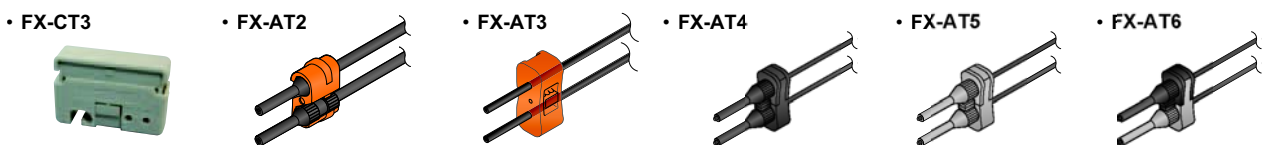
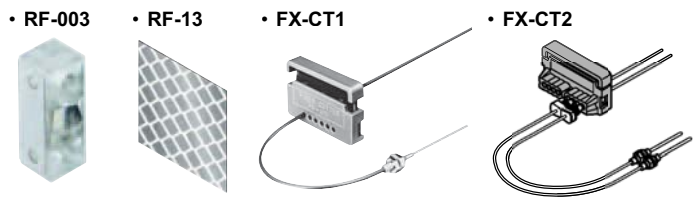
Model No. when ordering vacuum-resistant fibers individually as replacement parts

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



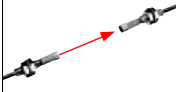
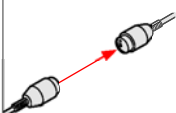
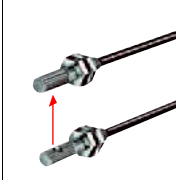
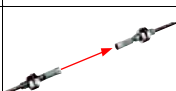
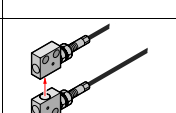
Accessories (attached with fibers)

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



FIBER OPTIONS


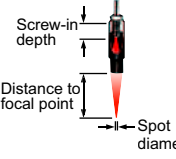
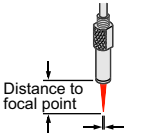
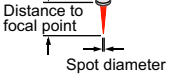
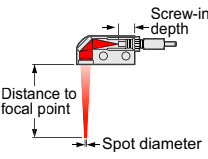
Lens (For thru-beam type fiber)

Designation	Model No.	Description																																																																																																										
For thru-beam type fiber	Expansion lens (Note 1)	<p>FX-LE1</p>  <p>Increases the sensing range by 5 times or more.</p> <ul style="list-style-type: none"> Ambient temperature: -60 to +350 °C -76 to +662 °F <p>Beam dia: ø3.6 mm ø0.142 in</p>	<p>Sensing range (mm) [Lens on both sides]</p> <table border="1"> <thead> <tr> <th>Fiber \ Mode</th> <th>HYPR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> </tr> </thead> <tbody> <tr> <td>FT-B8</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>2,000</td> </tr> <tr> <td>FT-FM2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>FT-T80</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>FT-R80</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>1,400</td> </tr> <tr> <td>FT-W8</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>2,100</td> </tr> <tr> <td>FT-P80</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>2,500</td> </tr> <tr> <td>FT-P60</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,500</td> <td>1,200</td> </tr> <tr> <td>FT-P81X</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,500</td> </tr> <tr> <td>FT-H35-M2</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,300</td> <td>1,400</td> </tr> <tr> <td>FT-H20W-M1</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>850</td> </tr> <tr> <td>FT-H20-M1</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,200</td> </tr> <tr> <td>FT-H20-J50-S</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,500</td> <td>2,000</td> <td>1,600</td> <td>500</td> </tr> <tr> <td>FT-H20-J30-S</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> </tr> </tbody> </table>	Fiber \ Mode	HYPR	U-LG	LONG	STD	FAST	H-SP	FT-B8	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	2,000	FT-FM2							FT-T80							FT-R80	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	1,400	FT-W8	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	2,100	FT-P80	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	2,500	FT-P60	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,500	1,200	FT-P81X	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,500	FT-H35-M2	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,300	1,400	FT-H20W-M1	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	850	FT-H20-M1	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,200	FT-H20-J50-S	3,600 (Note 2)	3,600 (Note 2)	3,500	2,000	1,600	500	FT-H20-J30-S							FT-H20-J20-S						
	Fiber \ Mode	HYPR	U-LG	LONG	STD	FAST	H-SP																																																																																																					
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FT-P60	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,500	1,200																																																																																																						
FT-P81X	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,500																																																																																																						
FT-H35-M2	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,300	1,400																																																																																																						
FT-H20W-M1	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	850																																																																																																						
FT-H20-M1	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,200																																																																																																						
FT-H20-J50-S	3,600 (Note 2)	3,600 (Note 2)	3,500	2,000	1,600	500																																																																																																						
FT-H20-J30-S																																																																																																												
FT-H20-J20-S																																																																																																												
Super-expansion lens (Note 1)	<p>FX-LE2</p>  <p>Tremendously increases the sensing range with large diameter lenses.</p> <ul style="list-style-type: none"> Ambient temperature: -60 to +350 °C -76 to +662 °F <p>Beam dia: ø9.8 mm ø0.386 in</p>	<p>Sensing range (mm) [Lens on both sides]</p> <table border="1"> <thead> <tr> <th>Fiber \ Mode</th> <th>HYPR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> </tr> </thead> <tbody> <tr> <td>FT-B8</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> </tr> <tr> <td>FT-FM2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>FT-R80</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>FT-W8</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>FT-P80</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>FT-P60</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>FT-P81X</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> </tr> <tr> <td>FT-H35-M2</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> </tr> <tr> <td>FT-H20W-M1</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> </tr> <tr> <td>FT-H20-M1</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> </tr> <tr> <td>FT-H13-FM2</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> </tr> <tr> <td>FT-H20-J50-S</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> </tr> <tr> <td>FT-H20-J30-S</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> </tr> </tbody> </table>	Fiber \ Mode	HYPR	U-LG	LONG	STD	FAST	H-SP	FT-B8	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	FT-FM2							FT-R80							FT-W8							FT-P80							FT-P60							FT-P81X	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	FT-H35-M2	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	FT-H20W-M1	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	FT-H20-M1	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	FT-H13-FM2	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	FT-H20-J50-S	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	FT-H20-J30-S							FT-H20-J20-S							
Fiber \ Mode	HYPR	U-LG	LONG	STD	FAST	H-SP																																																																																																						
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FT-H20W-M1	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)																																																																																																						
FT-H20-M1	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)																																																																																																						
FT-H13-FM2	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)																																																																																																						
FT-H20-J50-S	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)	3,600 (Note 2)																																																																																																						
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Side-view lens	<p>FX-SV1</p>  <p>Beam axis is bent by 90°.</p> <ul style="list-style-type: none"> Ambient temperature: -60 to +300 °C -76 to +572 °F <p>Beam dia: ø2.8 mm ø0.110 in</p>	<p>Sensing range (mm) [Lens on both sides]</p> <table border="1"> <thead> <tr> <th>Fiber \ Mode</th> <th>HYPR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> </tr> </thead> <tbody> <tr> <td>FT-B8</td> <td>3,600 (Note 2)</td> <td>3,300</td> <td>2,800</td> <td>1,600</td> <td>970</td> <td>310</td> </tr> <tr> <td>FT-FM2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>FT-T80</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>FT-W8</td> <td>3,600 (Note 2)</td> <td>3,500</td> <td>2,000</td> <td>1,000</td> <td>600</td> <td>250</td> </tr> <tr> <td>FT-P80</td> <td>3,600 (Note 2)</td> <td>3,500</td> <td>2,200</td> <td>1,300</td> <td>790</td> <td>290</td> </tr> <tr> <td>FT-P60</td> <td>3,500</td> <td>1,700</td> <td>1,400</td> <td>800</td> <td>500</td> <td>150</td> </tr> <tr> <td>FT-P81X</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,400</td> <td>880</td> <td>280</td> </tr> <tr> <td>FT-H35-M2</td> <td>3,500</td> <td>1,600</td> <td>1,200</td> <td>780</td> <td>500</td> <td>150</td> </tr> <tr> <td>FT-H20W-M1</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,500</td> <td>950</td> <td>560</td> <td>190</td> </tr> <tr> <td>FT-H20-M1</td> <td>1,600 (Note 2)</td> <td>1,600 (Note 2)</td> <td>1,300</td> <td>780</td> <td>500</td> <td>150</td> </tr> <tr> <td>FT-H20-J50-S</td> <td>1,600 (Note 2)</td> <td>960</td> <td>740</td> <td>450</td> <td>290</td> <td>80</td> </tr> <tr> <td>FT-H20-J30-S</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> </tr> </tbody> </table>	Fiber \ Mode	HYPR	U-LG	LONG	STD	FAST	H-SP	FT-B8	3,600 (Note 2)	3,300	2,800	1,600	970	310	FT-FM2							FT-T80							FT-W8	3,600 (Note 2)	3,500	2,000	1,000	600	250	FT-P80	3,600 (Note 2)	3,500	2,200	1,300	790	290	FT-P60	3,500	1,700	1,400	800	500	150	FT-P81X	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,400	880	280	FT-H35-M2	3,500	1,600	1,200	780	500	150	FT-H20W-M1	1,600 (Note 2)	1,600 (Note 2)	1,500	950	560	190	FT-H20-M1	1,600 (Note 2)	1,600 (Note 2)	1,300	780	500	150	FT-H20-J50-S	1,600 (Note 2)	960	740	450	290	80	FT-H20-J30-S							FT-H20-J20-S														
Fiber \ Mode	HYPR	U-LG	LONG	STD	FAST	H-SP																																																																																																						
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Expansion lens for vacuum fiber (Note 1)	<p>FV-LE1</p>  <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 <p>Beam dia: ø3.6 mm ø0.142 in</p>	<p>Sensing range (mm) [Lens on both sides] (Note 3)</p> <table border="1"> <thead> <tr> <th>Fiber \ Mode</th> <th>HYPR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> </tr> </thead> <tbody> <tr> <td>FT-H30-M1V</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,400</td> <td>1,500</td> <td>900</td> <td>370</td> </tr> </tbody> </table>	Fiber \ Mode	HYPR	U-LG	LONG	STD	FAST	H-SP	FT-H30-M1V	3,600 (Note 2)	3,600 (Note 2)	3,400	1,500	900	370																																																																																												
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Vacuum-resistant side-view lens (Note 1)	<p>FV-SV2</p>  <p>Beam axis is bent by 90°.</p> <ul style="list-style-type: none"> Ambient temperature: -60 to +300 °C -76 to +572 °F <p>Beam dia: ø3.7 mm ø0.146 in</p>	<p>Sensing range (mm) [Lens on both sides] (Note 3)</p> <table border="1"> <thead> <tr> <th>Fiber \ Mode</th> <th>HYPR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> </tr> </thead> <tbody> <tr> <td>FT-H30-M1V</td> <td>3,600 (Note 2)</td> <td>3,600 (Note 2)</td> <td>3,400</td> <td>1,500</td> <td>900</td> <td>370</td> </tr> </tbody> </table>	Fiber \ Mode	HYPR	U-LG	LONG	STD	FAST	H-SP	FT-H30-M1V	3,600 (Note 2)	3,600 (Note 2)	3,400	1,500	900	370																																																																																												
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Notes: 1) Be careful when installing the thru-beam type fiber equipped with the expansion lens, as the beam envelope becomes narrow and alignment is difficult. Especially when installing a fiber with many cores (sharp bending fibers and heat-resistant glass fiber), please be sure to use it only after you have adjusted it sufficiently.
 2) The fiber cable length practically limits the sensing range to 3,600 mm 141.732 in long (FT-P81X, FT-H20W-M1 and FT-H20-M1: 1,600 mm 62.992 in).
 3) The fiber cable length for the FT-H30-M1V is 1 m 3.281 ft. The sensing ranges in HYPR, U-LG and LONG modes take into account the length of the FT-J8 atmospheric side fiber.

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-WG4, FD-G4 Ambient temperature: -40 to $+70$ °C -40 to $+158$ °F 														
	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-WG4, FD-G4 Ambient temperature: -40 to $+70$ °C -40 to $+158$ °F Accessory: MS-EX-3 (mounting bracket) <p>Sensing range</p> <table border="1"> <thead> <tr> <th>Screw-in depth</th> <th>Distance to focal point</th> <th>Spot diameter</th> </tr> </thead> <tbody> <tr> <td>7mm</td> <td>18.5 mm approx.</td> <td>$\varnothing 0.7$ mm</td> </tr> <tr> <td>12mm</td> <td>27 mm approx.</td> <td>$\varnothing 1.2$ mm</td> </tr> <tr> <td>14mm</td> <td>43 mm approx.</td> <td>$\varnothing 2.0$ mm</td> </tr> </tbody> </table>	Screw-in depth	Distance to focal point	Spot diameter	7mm	18.5 mm approx.	$\varnothing 0.7$ mm	12mm	27 mm approx.	$\varnothing 1.2$ mm	14mm	43 mm approx.	$\varnothing 2.0$ mm		
	Screw-in depth	Distance to focal point	Spot diameter														
	7mm	18.5 mm approx.	$\varnothing 0.7$ mm														
	12mm	27 mm approx.	$\varnothing 1.2$ mm														
14mm	43 mm approx.	$\varnothing 2.0$ mm															
Finest spot lens	FX-MR3	 <p>Extremely fine spot of $\varnothing 0.3$ mm $\varnothing 0.012$ in approx. achieved.</p> <ul style="list-style-type: none"> Applicable fibers: FD-WG4, FD-G4, FD-EG1, FD-EG2, FD-EG3, FD-G6X, FD-G6 Ambient temperature: -40 to $+70$ °C -40 to $+158$ °F <p>Sensing range</p> <table border="1"> <thead> <tr> <th>Fiber model No.</th> <th>Distance to focal point</th> <th>Spot diameter</th> </tr> </thead> <tbody> <tr> <td>FD-EG3</td> <td>7.5 ± 0.5 mm</td> <td>$\varnothing 0.15$ mm approx.</td> </tr> <tr> <td>FD-EG2</td> <td>7.5 ± 0.5 mm</td> <td>$\varnothing 0.2$ mm approx.</td> </tr> <tr> <td>FD-EG1</td> <td>7.5 ± 0.5 mm</td> <td>$\varnothing 0.3$ mm approx.</td> </tr> <tr> <td>FD-WG4/G4/G6X/G6</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-EG3	7.5 ± 0.5 mm	$\varnothing 0.15$ mm approx.	FD-EG2	7.5 ± 0.5 mm	$\varnothing 0.2$ mm approx.	FD-EG1	7.5 ± 0.5 mm	$\varnothing 0.3$ mm approx.	FD-WG4/G4/G6X/G6	7.5 ± 0.5 mm	$\varnothing 0.5$ mm approx.
Fiber model No.	Distance to focal point	Spot diameter															
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FD-EG1	7.5 ± 0.5 mm	$\varnothing 0.3$ mm approx.															
FD-WG4/G4/G6X/G6	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-WG4, FD-G4, FD-EG1, FD-EG2, FD-EG3, FD-G6X, FD-G6 Ambient temperature: -20 to $+60$ °C -4 to $+140$ °F <p>Sensing range</p> <table border="1"> <thead> <tr> <th>Fiber model No.</th> <th>Distance to focal point</th> <th>Spot diameter</th> </tr> </thead> <tbody> <tr> <td>FD-EG3</td> <td>7 ± 0.5 mm</td> <td>$\varnothing 0.1$ mm approx.</td> </tr> <tr> <td>FD-EG2</td> <td>7 ± 0.5 mm</td> <td>$\varnothing 0.15$ mm approx.</td> </tr> <tr> <td>FD-EG1</td> <td>7 ± 0.5 mm</td> <td>$\varnothing 0.2$ mm approx.</td> </tr> <tr> <td>FD-WG4/G4/G6X/G6</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-EG3	7 ± 0.5 mm	$\varnothing 0.1$ mm approx.	FD-EG2	7 ± 0.5 mm	$\varnothing 0.15$ mm approx.	FD-EG1	7 ± 0.5 mm	$\varnothing 0.2$ mm approx.	FD-WG4/G4/G6X/G6	7 ± 0.5 mm	$\varnothing 0.4$ mm approx.
Fiber model No.	Distance to focal point	Spot diameter															
FD-EG3	7 ± 0.5 mm	$\varnothing 0.1$ mm approx.															
FD-EG2	7 ± 0.5 mm	$\varnothing 0.15$ mm approx.															
FD-EG1	7 ± 0.5 mm	$\varnothing 0.2$ mm approx.															
FD-WG4/G4/G6X/G6	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-WG4, FD-G4 Ambient temperature: -40 to $+70$ °C -40 to $+158$ °F <p>Sensing range</p> <table border="1"> <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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14 mm	30 mm approx.	$\varnothing 3.0$ mm															

FIBER OPTIONS

Designation	Model No.	Description		
Protective tube (For thru-beam type fiber)	FTP-500 (0.5 m 1.640 ft)	For M4 thread	FT-B8 FT-P80 FT-FM2 FT-P60 FT-FM2S FT-FM2S4	
	FTP-1000 (1 m 3.281 ft)		Applicable fibers	
	FTP-1500 (1.5 m 4.921 ft)			FT-T80 FT-P40 FT-NFM2 FD-T40 FT-NFM2S FD-P40 FT-NFM2S4
	FTP-N500 (0.5 m 1.640 ft)	For M3 thread		The protective tube, made of non-corrosive stainless steel, protects the inner fiber cable from any external forces.
	FTP-N1000 (1 m 3.281 ft)			
	FTP-N1500 (1.5 m 4.921 ft)			
Protective tube (For reflective type fiber)	FDP-500 (0.5 m 1.640 ft)	For M6 thread	FD-B8 FD-P80 FD-FM2 FD-H13-FM2 FD-FM2S FD-FM2S4	
	FDP-1000 (1 m 3.281 ft)		Applicable fibers	
	FDP-1500 (1.5 m 4.921 ft)			FD-T80 FD-NFM2 FD-NFM2S FD-NFM2S4
	FDP-N500 (0.5 m 1.640 ft)	For M4 thread		
	FDP-N1000 (1 m 3.281 ft)			
	FDP-N1500 (1.5 m 4.921 ft)			
Fiber bender	FB-1	The fiber bender bends the sleeve part of the fiber head at the proper radius. (Note 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		
Resin nut set	FX-M6N	Applicable fibers	FD-G60	For 10 set of resin M6 nuts and flat washers
	FX-M4N		FT-F41 FD-G40	For 10 set of resin M4 nuts and flat washers
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.

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.

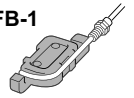
Protective tube

- FTP-□
- FDP-□



Fiber bender

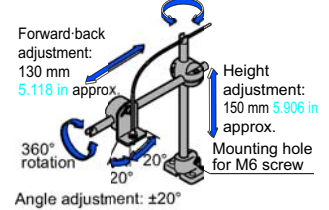
- FB-1



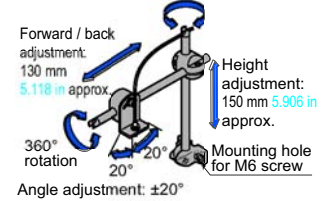
Universal sensor mounting stand

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

- MS-AJ1-F

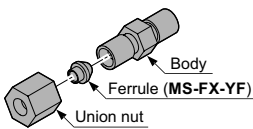


- MS-AJ2-F



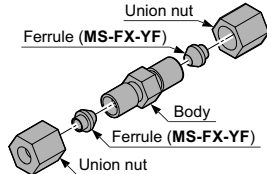
Liquid inflow prevention joint

- MS-FX-01Y



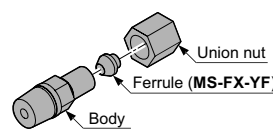
Protective tube extension joint

- MS-FX-02Y



Fiber mounting joint

- MS-FX-03Y



Single-core holder

- FX-AT15A



PRECAUTIONS FOR PROPER USE



- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

Wiring

- Make sure that the power supply is OFF while adding or removing the amplifiers.
- Note that if a voltage exceeding the rated range is applied, or if an AC power supply is directly connected, the product may get burnt or damaged.
- Note that short-circuit of the load or wrong wiring may burn or damage the product.
- Do not run the wires together with high-voltage lines or power lines, or put them in the same raceway. This can cause malfunction due to induction.
- Verify that the supply voltage variation is within the rating.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this product, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- Make sure to use the quick-connection cable (optional) for the connection of the controller.
Extension up to total 100 m **328.084 ft** is possible with 0.3 mm² or more, cable.
However, in order to reduce noise, make the wiring as short as possible.
- Make sure that stress by forcible bending or pulling is not applied to the sensor cable joint and fiber cable.

Others

- This product has been developed / produced for industrial use only.
- The specification may not be satisfied in a strong magnetic field.
- The ultra long distance (U-LG, HYPR) mode is more likely to be affected by extraneous noise since the sensitivity of that is higher than the other modes. Make sure to check the environment before use.
- Do not use during the initial transient time (H-SP, FAST, STD: 0.5 sec., LONG, U-LG, HYPR: 1 sec.) after the power supply is switched ON.
- This product is suitable for indoor use only.
- Avoid dust, dirt, and steam.
- Make sure that the product does not come in contact with oil, grease, organic solvents such as thinner, etc., strong acid or alkaline.
- This product cannot be used in an environment containing inflammable or explosive gases.
- Never disassemble or modify this product.
- This product adopts EEPROM. Settings cannot be done 100 thousand times or more because of the EEPROM's lifetime.

Disclaimer

The applications described in the catalog are all intended for examples only. The purchase of our products described in the catalog shall not be regarded as granting of a license to use our products in the described applications. We do NOT warrant that we have obtained some intellectual properties, such as patent rights, with respect to such applications, or that the described applications may not infringe any intellectual property rights, such as patent rights, of a third party.

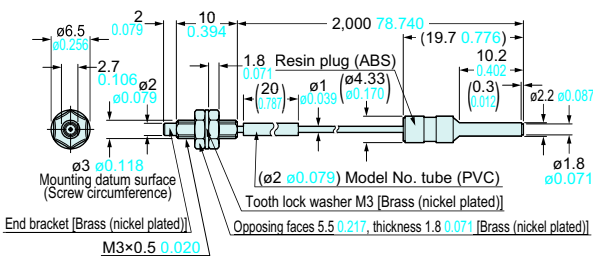
DIMENSIONS (Unit: mm in)

Super quality fibers • Thru-beam type



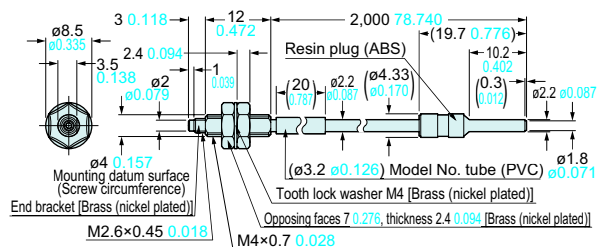
FT-30

<with FX-AT2>



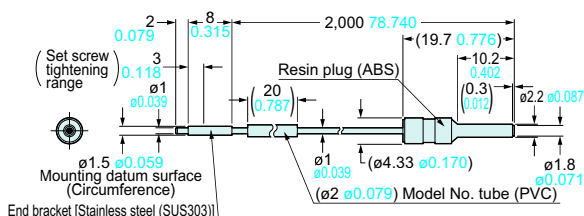
FT-40

<with FX-AT2>



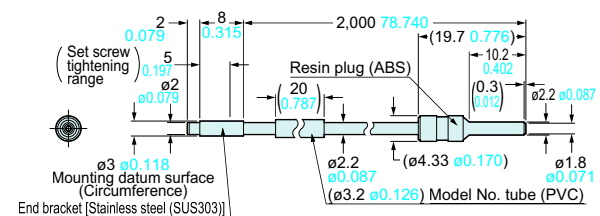
FT-S20

<with FX-AT2>



FT-S30

<with FX-AT2>

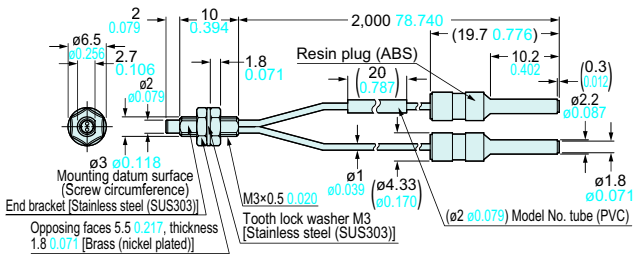


DIMENSIONS (Unit: mm in)

Super quality fibers • Reflective type 

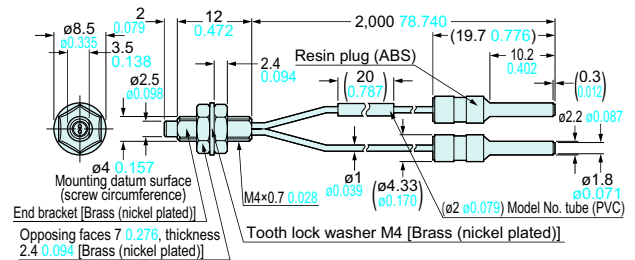
FD-30

<with FX-AT2>



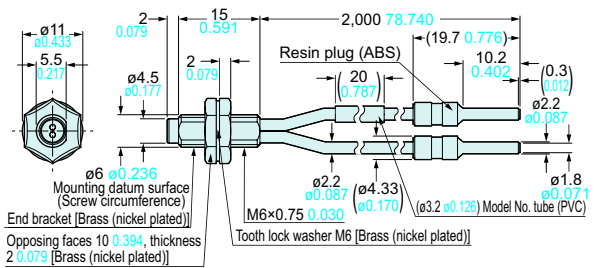
FD-40

<with FX-AT2>



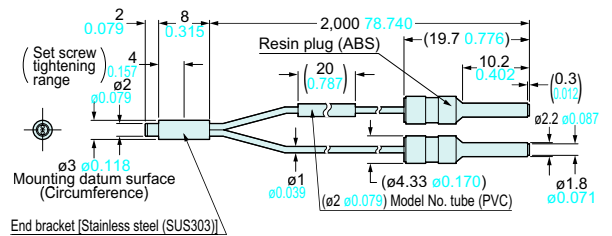
FD-60

<with FX-AT2>



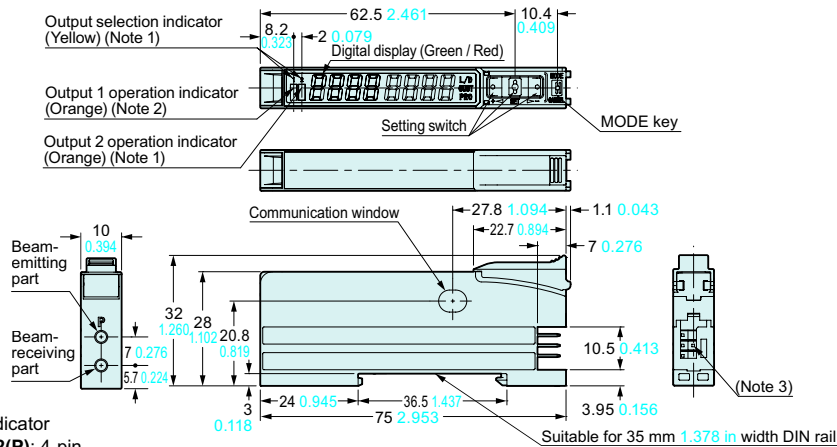
FD-S30

<with FX-AT2>



FX-501(P) FX-502(P)

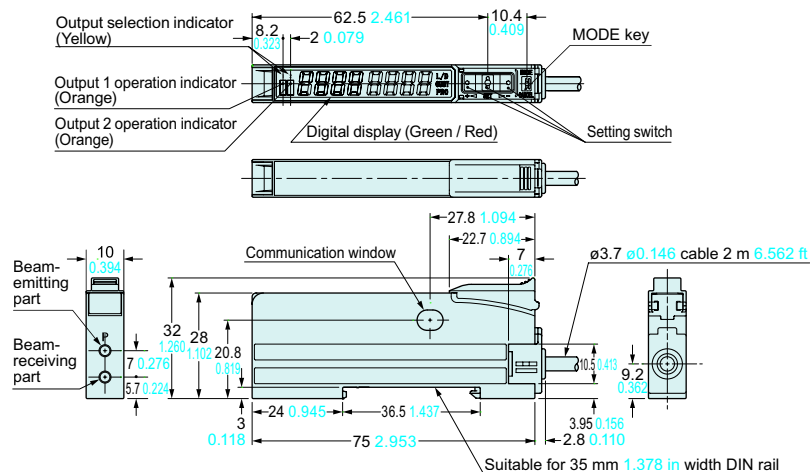
Amplifier



- Notes: 1) FX-502(P) only
- 2) FX-501(P): Operation indicator
- 3) FX-501(P): 3-pin, FX-502(P): 4-pin

FX-505(P)-C2

Amplifier

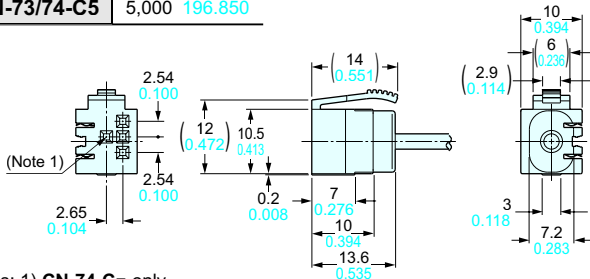
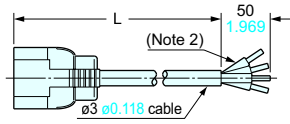


DIMENSIONS (Unit: mm in)

CN-73-C □ CN-74-C □ Main cable (Optional)

• Length L

Model No.	Length L
CN-73/74-C1	1,000 39.370
CN-73/74-C2	2,000 78.740
CN-73/74-C5	5,000 196.850

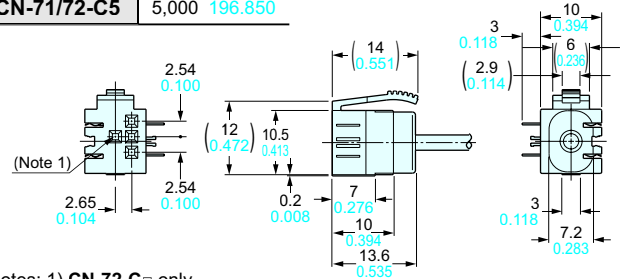
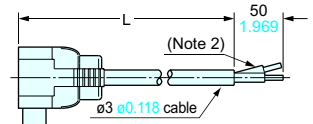


Notes: 1) CN-74-C □ only
2) CN-73-C □: 3-core

CN-71-C □ CN-72-C □ Sub cable (Optional)

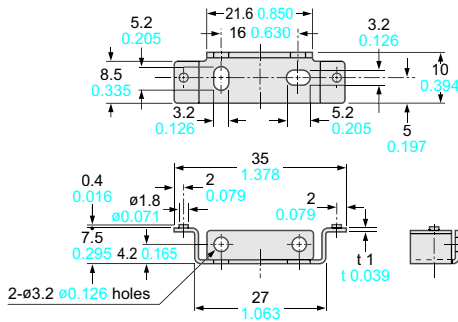
• Length L

Model No.	Length L
CN-71/72-C1	1,000 39.370
CN-71/72-C2	2,000 78.740
CN-71/72-C5	5,000 196.850



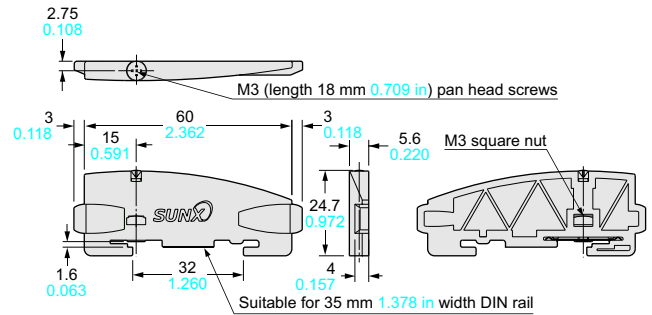
Notes: 1) CN-72-C □ only
2) CN-71-C □: 1-core

MS-DIN-2 Amplifier mounting bracket (Optional)



Material: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)

MS-DIN-E End plate (Optional)



Material: Polycarbonate

<Fiber Sensor Lineup>

Digital fiber sensor FX-100 series

- The digital dual-display is greatly visible in the workplace!
- Commercially-available connectors are used so that lead time and spare part numbers can both be reduced.



Digital fiber sensor (Manually set) FX-410 series

- Simple operation that does not require users to read instruction manuals.
- The beam power has been greatly increased.



All information is subject to change without prior notice.



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