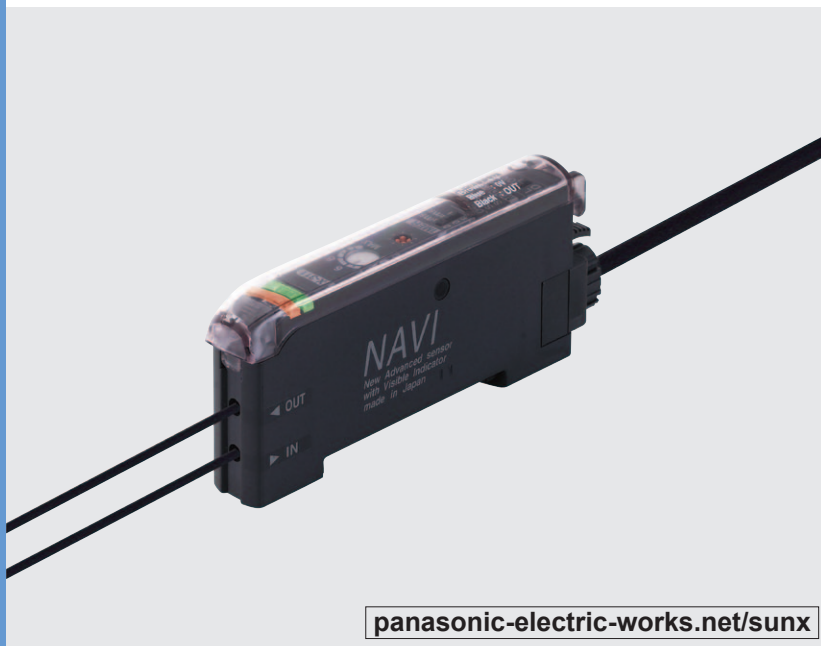


# Manually Set Fiber Sensor FX-311 SERIES

Related Information

- General terms and conditions..... F-17
- Sensor selection guide..... P.3~
- Fiber selection ..... P.5~
- Glossary of terms / General precautions... P.1359~ / P.1405



[panasonic-electric-works.net/sunx](http://panasonic-electric-works.net/sunx)



**\* Passed the UL 991 Environment Test**

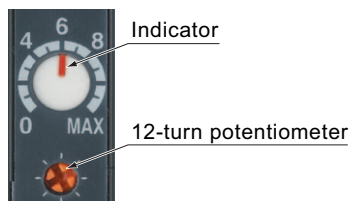
\* UL 61010C-1 compatible, Passed the UL 991 Environment Test based on SEMI S2-0200. [Category applicable for semiconductor manufacturing: TWW2, Process Equipment] [Applicable standards: UL 61010C-1] [Additional test / evaluation standards as per intended use: UL 991, SEMI S2-0200]



## Highly sensitive manual tuning made easy

### 12-turn potentiometer with visible indicator

12-turn potentiometer has been incorporated for fine adjustments. It enables detection of very fine differences. Moreover, since the pointer of indicator has a red backlight, you can confirm the position at a glance, even in a dark area.



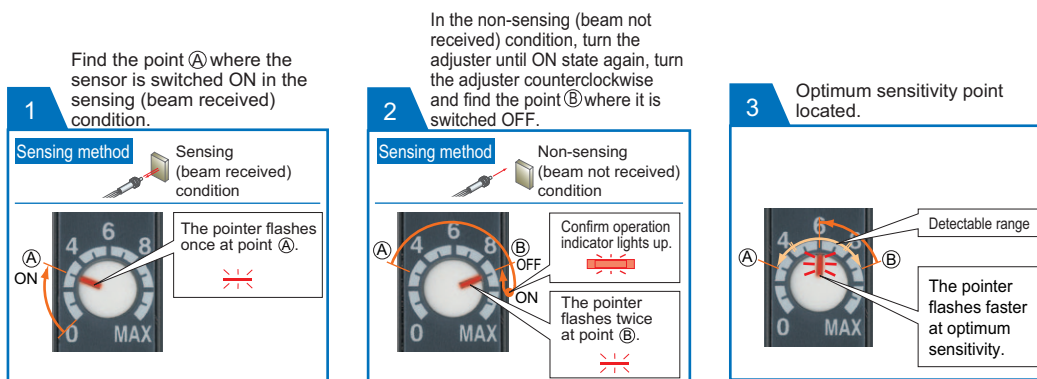
### Long life and reduced maintenance work-hours

The light-emitting elements of conventional fiber sensors are affected by temperature and long-term use, changing their emission over time and requiring sensitivity readjustment. **FX-311** (red LED type) employs the new "four-chemical LED", first used in the **FX-301** (red LED type). This emitter greatly reduces adverse influences on emission performance, resulting in stable operation that almost never needs adjustment.

### Rapid flashing "assist function" eases adjustment for optimum sensitivity

The **FX-311** series has a convenient built-in "assist function" which indicates the optimum sensitivity position by flashing rapidly when optimum sensitivity is reached. This enables easy and reliable sensitivity adjustment, which is convenient for a narrow sensing range requiring fine tuning.

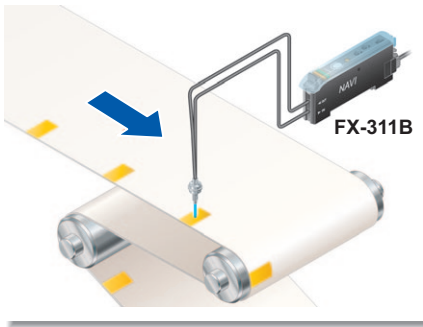
\* In order enable the "assist function", switch the operation selection switch from **L-ON**→**D-ON**→**L-ON** .



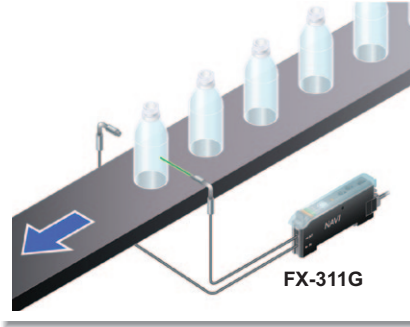
- FIBER SENSORS
- LASER SENSORS
- PHOTOELECTRIC SENSORS
- MICRO PHOTOELECTRIC SENSORS
- AREA SENSORS
- LIGHT CURTAINS
- PRESSURE / FLOW SENSORS
- INDUCTIVE PROXIMITY SENSORS
- PARTICULAR USE SENSORS
- SENSOR OPTIONS
- SIMPLE WIRE- SAVING UNITS
- WIRE- SAVING SYSTEMS
- MEASUREMENT SENSORS
- STATIC CONTROL DEVICES
- ENDOSCOPE
- LASER MARKERS
- PLC / TERMINALS
- HUMAN MACHINE INTERFACES
- ENERGY CONSUMPTION VISUALIZATION COMPONENTS
- FA COMPONENTS
- MACHINE VISION SYSTEMS
- UV CURING SYSTEMS
- Selection Guide
- Fibers
- Amplifiers
- FX-500
- FX-100
- FX-300
- FX-410
- FX-311
- FX-301-F7/ FX-301-F

**APPLICATIONS**

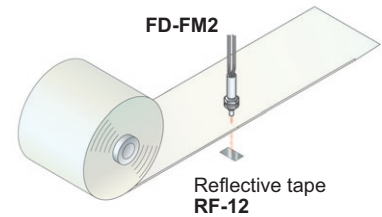
**Detecting register marks**



**Detecting transparent bottles**



**Sensing the presence of a translucent sheet**



**ORDER GUIDE**

**Amplifiers** Quick-connection cable is not supplied with the amplifier. Please order it separately.

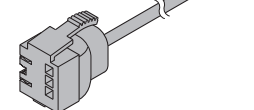
Type	Appearance	Model No.	Emitting element	Output	
Manually set		<b>FX-311</b>	Red LED	NPN open-collector transistor	
		<b>FX-311B</b>	Blue LED		
		<b>FX-311G</b>	Green LED		
		PNP output	<b>FX-311P</b>	Red LED	PNP open-collector transistor
			<b>FX-311BP</b>	Blue LED	
			<b>FX-311GP</b>	Green LED	

**Quick-connection cables** Quick-connection cable is not supplied with the amplifier. Please order it separately.

Type	Model No.	Description
Main cable (3-core)	<b>CN-73-C1</b>	Length: 1 m <b>3.281 ft</b>
	<b>CN-73-C2</b>	Length: 2 m <b>6.562 ft</b>
	<b>CN-73-C5</b>	Length: 5 m <b>16.404 ft</b>
Sub cable (1-core)	<b>CN-71-C1</b>	Length: 1 m <b>3.281 ft</b>
	<b>CN-71-C2</b>	Length: 2 m <b>6.562 ft</b>
	<b>CN-71-C5</b>	Length: 5 m <b>16.404 ft</b>

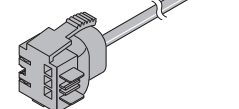
**Main cable**

- **CN-73-C□**



**Sub cable**

- **CN-71-C□**



FIBER SENSORS

LASER SENSORS

PHOTO-ELECTRIC SENSORS

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**FX-500**

**FX-100**

**FX-300**

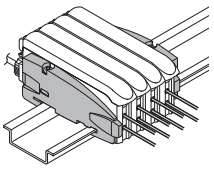
**FX-410**

**FX-311**

FX-301-F7/  
FX-301-F

## ORDER GUIDE

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

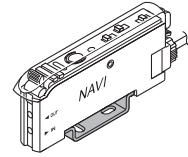
Appearance	Model No.	Description
	<b>MS-DIN-E</b>	When cascading multiple amplifiers, or when it moves depending on the way it is installed on a DIN rail, these end plates clamp amplifiers into place on both sides. Make sure to use end plates when cascading multiple amplifiers together. <b>Two pcs. per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

## OPTIONS

Designation	Model No.	Description
Amplifier mounting bracket	<b>MS-DIN-2</b>	Mounting bracket for amplifier
Hand-turned knob attached cover	<b>FX-AJ1</b>	Hand-turned knob allows easy adjustment of sensor sensitivity.
Fiber amplifier protection seal	<b>FX-MB1</b>	10 sets of 2 communication window seals and 1 connector seal Communication window seal: It prevents malfunction due to transmission signal from another amplifier, as well as, prevents effect on another amplifier. Connector seal: It prevents contact of any metal, etc., with the pins of the quick-connection cable.

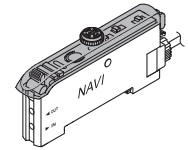
### Amplifier mounting bracket

- **MS-DIN-2**



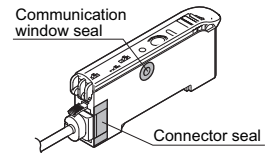
### Hand-turned knob attached cover

- **FX-AJ1**



### Fiber amplifier protection seal

- **FX-MB1**



Communication window seal

Connector seal

**LIST OF FIBERS**

**Thru-beam type (one pair set)**



Fibers are listed in alphabetic order. Refer to p.5~ "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 1)									Dimensions
	Red LED			Blue LED			Green LED			
	LONG	STD	S-D	LONG	STD	FAST	LONG	STD	FAST	
<b>FT-30</b>	310 <a href="#">12.205</a>	150 <a href="#">5.906</a>	60 <a href="#">2.362</a>	55 <a href="#">2.165</a>	28 <a href="#">1.102</a>	18 <a href="#">0.709</a>	28 <a href="#">1.102</a>	13 <a href="#">0.512</a>	9 <a href="#">0.354</a>	P.90
<b>FT-31</b>	290 <a href="#">11.417</a>	142 <a href="#">5.591</a>	49 <a href="#">1.929</a>	50 <a href="#">1.969</a>	25 <a href="#">0.984</a>	16 <a href="#">0.630</a>	24 <a href="#">0.945</a>	12 <a href="#">0.472</a>	8 <a href="#">0.315</a>	P.90
<b>FT-40</b>	900 <a href="#">35.433</a>	450 <a href="#">17.717</a>	180 <a href="#">7.087</a>	155 <a href="#">6.102</a>	76 <a href="#">2.992</a>	45 <a href="#">1.772</a>	90 <a href="#">3.543</a>	40 <a href="#">1.575</a>	26 <a href="#">1.024</a>	P.90
<b>FT-41</b>	780 <a href="#">30.709</a>	400 <a href="#">15.748</a>	130 <a href="#">5.118</a>	150 <a href="#">5.906</a>	75 <a href="#">2.953</a>	40 <a href="#">1.575</a>	70 <a href="#">2.756</a>	35 <a href="#">1.378</a>	24 <a href="#">0.945</a>	P.90
<b>FT-42</b>	800 <a href="#">31.496</a>	400 <a href="#">15.748</a>	150 <a href="#">5.906</a>	150 <a href="#">5.906</a>	75 <a href="#">2.953</a>	40 <a href="#">1.575</a>	80 <a href="#">3.150</a>	35 <a href="#">1.378</a>	24 <a href="#">0.945</a>	P.90
<b>FT-A8</b>	3,500 <a href="#">137.795</a> (Note 2)	1,500 <a href="#">59.055</a>	750 <a href="#">29.528</a>	600 <a href="#">23.622</a>	300 <a href="#">11.811</a>	220 <a href="#">8.661</a>	300 <a href="#">11.811</a>	150 <a href="#">5.906</a>	110 <a href="#">4.331</a>	P.90
<b>FT-A30</b>	3,500 <a href="#">137.795</a> (Note 2)	3,500 <a href="#">137.795</a> (Note 2)	3,500 <a href="#">137.795</a> (Note 2)	2,400 <a href="#">94.488</a>	1,200 <a href="#">47.244</a>	700 <a href="#">27.559</a>	1,200 <a href="#">47.244</a>	600 <a href="#">23.622</a>	350 <a href="#">13.780</a>	P.90
<b>FT-AFM2</b>	650 <a href="#">25.591</a>	330 <a href="#">12.992</a>	115 <a href="#">4.528</a>	120 <a href="#">4.724</a>	60 <a href="#">2.362</a>	40 <a href="#">1.575</a>	60 <a href="#">2.362</a>	30 <a href="#">1.181</a>	20 <a href="#">0.787</a>	P.90
<b>FT-AFM2E</b>	590 <a href="#">23.228</a>	290 <a href="#">11.417</a>	100 <a href="#">3.937</a>	120 <a href="#">4.724</a>	60 <a href="#">2.362</a>	40 <a href="#">1.575</a>	60 <a href="#">2.362</a>	30 <a href="#">1.181</a>	20 <a href="#">0.787</a>	P.90
<b>FT-B8</b>	1,100 <a href="#">43.307</a>	530 <a href="#">20.866</a>	180 <a href="#">7.087</a>	220 <a href="#">8.661</a>	110 <a href="#">4.331</a>	75 <a href="#">2.953</a>	110 <a href="#">4.331</a>	55 <a href="#">2.165</a>	40 <a href="#">1.575</a>	P.90
<b>FT-E12</b>	18 <a href="#">0.709</a>	10 <a href="#">0.394</a>	3 <a href="#">0.118</a>	3 <a href="#">0.118</a>	2 <a href="#">0.079</a>	1 <a href="#">0.039</a>	1 <a href="#">0.039</a>	—	—	P.91
<b>FT-E13</b>	13 <a href="#">0.512</a>	6 <a href="#">0.236</a>	2 <a href="#">0.079</a>	2 <a href="#">0.079</a>	1 <a href="#">0.039</a>	—	1 <a href="#">0.039</a>	—	—	P.91
<b>FT-E22</b>	80 <a href="#">3.150</a>	50 <a href="#">1.969</a>	15 <a href="#">0.591</a>	14 <a href="#">0.551</a>	7 <a href="#">0.276</a>	4 <a href="#">0.157</a>	6 <a href="#">0.236</a>	3 <a href="#">0.118</a>	2 <a href="#">0.079</a>	P.91
<b>FT-E23</b>	65 <a href="#">2.559</a>	31 <a href="#">1.220</a>	12 <a href="#">0.472</a>	8 <a href="#">0.315</a>	4 <a href="#">0.157</a>	3 <a href="#">0.118</a>	4 <a href="#">0.157</a>	2 <a href="#">0.079</a>	1 <a href="#">0.039</a>	P.91
<b>FT-FM2</b>	780 <a href="#">30.709</a>	400 <a href="#">15.748</a>	130 <a href="#">5.118</a>	150 <a href="#">5.906</a>	75 <a href="#">2.953</a>	40 <a href="#">1.575</a>	70 <a href="#">2.756</a>	35 <a href="#">1.378</a>	24 <a href="#">0.945</a>	P.91
<b>FT-FM2S</b>	780 <a href="#">30.709</a>	400 <a href="#">15.748</a>	130 <a href="#">5.118</a>	150 <a href="#">5.906</a>	75 <a href="#">2.953</a>	40 <a href="#">1.575</a>	70 <a href="#">2.756</a>	35 <a href="#">1.378</a>	24 <a href="#">0.945</a>	P.91
<b>FT-FM2S4</b>	780 <a href="#">30.709</a>	400 <a href="#">15.748</a>	130 <a href="#">5.118</a>	150 <a href="#">5.906</a>	75 <a href="#">2.953</a>	40 <a href="#">1.575</a>	70 <a href="#">2.756</a>	35 <a href="#">1.378</a>	24 <a href="#">0.945</a>	P.91
<b>FT-FM10L</b>	19,500 <a href="#">767.715</a> (Note 3)	14,000 <a href="#">551.180</a>	3,800 <a href="#">149.606</a>	5,400 <a href="#">212.598</a>	2,700 <a href="#">106.299</a>	1,900 <a href="#">74.803</a>	2,800 <a href="#">110.236</a>	1,400 <a href="#">55.118</a>	1,000 <a href="#">39.370</a>	P.91
<b>FT-H13-FM2</b>	880 <a href="#">34.646</a>	440 <a href="#">17.323</a>	155 <a href="#">6.102</a>	72 <a href="#">2.835</a>	36 <a href="#">1.417</a>	26 <a href="#">1.024</a>	32 <a href="#">1.260</a>	16 <a href="#">0.630</a>	10 <a href="#">0.394</a>	P.91
<b>FT-H20-J20-S</b> (Note 4)	390 <a href="#">15.354</a>	200 <a href="#">7.874</a>	60 <a href="#">2.362</a>	60 <a href="#">2.362</a>	20 <a href="#">0.787</a>	—	35 <a href="#">1.378</a>	—	—	P.92
<b>FT-H20-J30-S</b> (Note 4)	390 <a href="#">15.354</a>	200 <a href="#">7.874</a>	60 <a href="#">2.362</a>	60 <a href="#">2.362</a>	20 <a href="#">0.787</a>	—	35 <a href="#">1.378</a>	—	—	P.92
<b>FT-H20-J50-S</b> (Note 4)	390 <a href="#">15.354</a>	200 <a href="#">7.874</a>	60 <a href="#">2.362</a>	60 <a href="#">2.362</a>	20 <a href="#">0.787</a>	—	35 <a href="#">1.378</a>	—	—	P.92
<b>FT-H20-M1</b>	550 <a href="#">21.654</a>	280 <a href="#">11.024</a>	90 <a href="#">3.543</a>	100 <a href="#">3.937</a>	50 <a href="#">1.969</a>	35 <a href="#">1.378</a>	50 <a href="#">1.969</a>	25 <a href="#">0.984</a>	18 <a href="#">0.709</a>	P.92
<b>FT-H20-VJ50-S</b> (Note 4)	550 <a href="#">21.654</a>	280 <a href="#">11.024</a>	90 <a href="#">3.543</a>	85 <a href="#">3.346</a>	30 <a href="#">1.181</a>	—	50 <a href="#">1.969</a>	—	—	P.92
<b>FT-H20-VJ80-S</b> (Note 4)	550 <a href="#">21.654</a>	280 <a href="#">11.024</a>	90 <a href="#">3.543</a>	85 <a href="#">3.346</a>	30 <a href="#">1.181</a>	—	50 <a href="#">1.969</a>	—	—	P.92
<b>FT-H20W-M1</b>	310 <a href="#">12.205</a>	140 <a href="#">5.512</a>	50 <a href="#">1.969</a>	44 <a href="#">1.732</a>	22 <a href="#">0.866</a>	14 <a href="#">0.551</a>	22 <a href="#">0.866</a>	11 <a href="#">0.433</a>	7 <a href="#">0.276</a>	P.92
<b>FT-H30-M1V-S</b> (Note 5)	250 <a href="#">9.843</a>	125 <a href="#">4.922</a>	50 <a href="#">1.969</a>	—	—	—	—	—	—	P.92
<b>FT-H35-M2</b>	550 <a href="#">21.654</a>	280 <a href="#">11.024</a>	90 <a href="#">3.543</a>	100 <a href="#">3.937</a>	50 <a href="#">1.969</a>	35 <a href="#">1.378</a>	50 <a href="#">1.969</a>	25 <a href="#">0.984</a>	18 <a href="#">0.709</a>	P.92
<b>FT-H35-M2S6</b>	550 <a href="#">21.654</a>	280 <a href="#">11.024</a>	90 <a href="#">3.543</a>	100 <a href="#">3.937</a>	50 <a href="#">1.969</a>	35 <a href="#">1.378</a>	50 <a href="#">1.969</a>	25 <a href="#">0.984</a>	18 <a href="#">0.709</a>	P.92
<b>FT-HL80Y</b>	3,500 <a href="#">137.795</a>	1,350 <a href="#">53.150</a>	480 <a href="#">18.898</a>	80 <a href="#">3.150</a>	40 <a href="#">1.575</a>	25 <a href="#">0.984</a>	110 <a href="#">4.331</a>	55 <a href="#">2.165</a>	40 <a href="#">1.575</a>	P.92
<b>FT-K8</b>	2,000 <a href="#">78.740</a>	1,000 <a href="#">39.370</a>	350 <a href="#">13.780</a>	400 <a href="#">15.748</a>	200 <a href="#">7.874</a>	130 <a href="#">5.118</a>	200 <a href="#">7.874</a>	100 <a href="#">3.937</a>	65 <a href="#">2.559</a>	P.93
<b>FT-KV1</b>	500 <a href="#">19.685</a>	250 <a href="#">9.843</a>	100 <a href="#">3.937</a>	—	—	—	—	—	—	P.93
<b>FT-KV8</b>	2,000 <a href="#">78.740</a>	1,000 <a href="#">39.370</a>	350 <a href="#">13.780</a>	400 <a href="#">15.748</a>	200 <a href="#">7.874</a>	130 <a href="#">5.118</a>	200 <a href="#">7.874</a>	100 <a href="#">3.937</a>	65 <a href="#">2.559</a>	P.93
<b>FT-L80Y</b>	3,500 <a href="#">137.795</a>	1,500 <a href="#">59.055</a>	530 <a href="#">20.866</a>	160 <a href="#">6.299</a>	80 <a href="#">3.150</a>	50 <a href="#">1.969</a>	160 <a href="#">6.299</a>	80 <a href="#">3.150</a>	50 <a href="#">1.969</a>	P.93
<b>FT-NFM2</b>	270 <a href="#">10.630</a>	140 <a href="#">5.512</a>	49 <a href="#">1.929</a>	50 <a href="#">1.969</a>	25 <a href="#">0.984</a>	16 <a href="#">0.630</a>	24 <a href="#">0.945</a>	12 <a href="#">0.472</a>	8 <a href="#">0.315</a>	P.93
<b>FT-NFM2S</b>	270 <a href="#">10.630</a>	140 <a href="#">5.512</a>	49 <a href="#">1.929</a>	50 <a href="#">1.969</a>	25 <a href="#">0.984</a>	16 <a href="#">0.630</a>	24 <a href="#">0.945</a>	12 <a href="#">0.472</a>	8 <a href="#">0.315</a>	P.93
<b>FT-NFM2S4</b>	270 <a href="#">10.630</a>	140 <a href="#">5.512</a>	49 <a href="#">1.929</a>	50 <a href="#">1.969</a>	25 <a href="#">0.984</a>	16 <a href="#">0.630</a>	24 <a href="#">0.945</a>	12 <a href="#">0.472</a>	8 <a href="#">0.315</a>	P.93
<b>FT-P2</b>	280 <a href="#">11.024</a>	120 <a href="#">4.724</a>	42 <a href="#">1.654</a>	36 <a href="#">1.417</a>	18 <a href="#">0.709</a>	14 <a href="#">0.551</a>	20 <a href="#">0.787</a>	10 <a href="#">0.394</a>	8 <a href="#">0.315</a>	P.93
<b>FT-P40</b>	250 <a href="#">9.843</a>	100 <a href="#">3.937</a>	35 <a href="#">1.378</a>	32 <a href="#">1.260</a>	16 <a href="#">0.630</a>	12 <a href="#">0.472</a>	18 <a href="#">0.709</a>	9 <a href="#">0.354</a>	7 <a href="#">0.276</a>	P.93
<b>FT-P60</b>	400 <a href="#">15.748</a>	190 <a href="#">7.48</a>	80 <a href="#">3.150</a>	50 <a href="#">1.969</a>	25 <a href="#">0.984</a>	18 <a href="#">0.709</a>	26 <a href="#">1.024</a>	13 <a href="#">0.512</a>	8 <a href="#">0.315</a>	P.93
<b>FT-P80</b>	650 <a href="#">25.591</a>	320 <a href="#">12.598</a>	110 <a href="#">4.331</a>	130 <a href="#">5.118</a>	65 <a href="#">2.559</a>	45 <a href="#">1.772</a>	70 <a href="#">2.756</a>	35 <a href="#">1.378</a>	25 <a href="#">0.984</a>	P.93

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 3,500 mm [137.795 in](#) long.  
 3) The fiber cable length practically limits the sensing range to 19,500 mm [767.715 in](#) long.  
 4) Heat-resistant joint fibers and ordinary-temperature fibers (**FT-FM2**) are sold as a set.  
 5) Sold as a set comprising vacuum type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**).

FIBER SENSORS

LASER SENSORS

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MICRO PHOTO-ELECTRIC SENSORS

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PARTICULAR USE SENSORS

SENSOR OPTIONS

SIMPLE WIRE-SAVING UNITS

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Fibers

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**FX-100**

**FX-300**

**FX-410**

**FX-311**

FX-301-F7/  
FX-301-F

**LIST OF FIBERS**

**Thru-beam type (one pair set)**



Fibers are listed in alphabetic order. Refer to p.5~ "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 1)									Dimensions
	Red LED			Blue LED			Green LED			
	LONG	STD	S-D	LONG	STD	FAST	LONG	STD	FAST	
<b>FT-P81X</b>	650 <a href="#">25.591</a>	320 <a href="#">12.598</a>	110 <a href="#">4.331</a>	130 <a href="#">5.118</a>	64 <a href="#">2.520</a>	45 <a href="#">1.772</a>	64 <a href="#">2.520</a>	32 <a href="#">1.260</a>	22 <a href="#">0.866</a>	P.94
<b>FT-PS1</b>	80 <a href="#">3.150</a>	40 <a href="#">1.575</a>	17 <a href="#">0.669</a>	14 <a href="#">0.551</a>	7 <a href="#">0.276</a>	4 <a href="#">0.157</a>	6 <a href="#">0.236</a>	3 <a href="#">0.118</a>	2 <a href="#">0.079</a>	P.93
<b>FT-R80</b>	530 <a href="#">20.866</a>	230 <a href="#">9.055</a>	80 <a href="#">3.150</a>	85 <a href="#">3.346</a>	42 <a href="#">1.654</a>	28 <a href="#">1.102</a>	44 <a href="#">1.732</a>	22 <a href="#">0.866</a>	16 <a href="#">0.630</a>	P.94
<b>FT-S20</b>	310 <a href="#">12.205</a>	150 <a href="#">5.906</a>	60 <a href="#">2.362</a>	55 <a href="#">2.165</a>	28 <a href="#">1.102</a>	18 <a href="#">0.709</a>	28 <a href="#">1.102</a>	13 <a href="#">0.512</a>	9 <a href="#">0.354</a>	P.94
<b>FT-S21</b>	290 <a href="#">11.417</a>	142 <a href="#">5.591</a>	49 <a href="#">1.929</a>	50 <a href="#">1.969</a>	25 <a href="#">0.984</a>	16 <a href="#">0.630</a>	24 <a href="#">0.945</a>	12 <a href="#">0.472</a>	8 <a href="#">0.315</a>	P.94
<b>FT-S30</b>	900 <a href="#">35.433</a>	450 <a href="#">17.717</a>	180 <a href="#">7.087</a>	155 <a href="#">6.102</a>	76 <a href="#">2.992</a>	45 <a href="#">1.772</a>	90 <a href="#">3.543</a>	40 <a href="#">1.575</a>	26 <a href="#">1.024</a>	P.94
<b>FT-SFM2</b>	780 <a href="#">30.709</a>	400 <a href="#">15.748</a>	130 <a href="#">5.118</a>	150 <a href="#">5.906</a>	75 <a href="#">2.953</a>	40 <a href="#">1.575</a>	70 <a href="#">2.756</a>	35 <a href="#">1.378</a>	24 <a href="#">0.945</a>	P.94
<b>FT-SFM2L</b>	1,600 <a href="#">62.992</a>	800 <a href="#">31.496</a>	280 <a href="#">11.024</a>	400 <a href="#">15.748</a>	200 <a href="#">7.874</a>	130 <a href="#">5.118</a>	200 <a href="#">7.874</a>	100 <a href="#">3.937</a>	65 <a href="#">2.559</a>	P.94
<b>FT-SFM2SV2</b>	400 <a href="#">15.748</a>	200 <a href="#">7.874</a>	70 <a href="#">2.756</a>	80 <a href="#">3.150</a>	40 <a href="#">1.575</a>	28 <a href="#">1.102</a>	40 <a href="#">1.575</a>	20 <a href="#">0.787</a>	14 <a href="#">0.551</a>	P.94
<b>FT-SNFM2</b>	270 <a href="#">10.630</a>	140 <a href="#">5.512</a>	49 <a href="#">1.929</a>	50 <a href="#">1.969</a>	25 <a href="#">0.984</a>	16 <a href="#">0.630</a>	24 <a href="#">0.945</a>	12 <a href="#">0.472</a>	8 <a href="#">0.315</a>	P.95
<b>FT-T80</b>	780 <a href="#">30.709</a>	400 <a href="#">15.748</a>	130 <a href="#">5.118</a>	150 <a href="#">5.906</a>	75 <a href="#">2.953</a>	40 <a href="#">1.575</a>	70 <a href="#">2.756</a>	35 <a href="#">1.378</a>	24 <a href="#">0.945</a>	P.95
<b>FT-V10</b>	2,000 <a href="#">78.740</a>	1,000 <a href="#">39.370</a>	350 <a href="#">13.780</a>	400 <a href="#">15.748</a>	200 <a href="#">7.874</a>	130 <a href="#">5.118</a>	200 <a href="#">7.874</a>	100 <a href="#">3.937</a>	65 <a href="#">2.559</a>	P.95
<b>FT-V22</b>	390 <a href="#">15.354</a>	180 <a href="#">7.087</a>	63 <a href="#">2.480</a>	50 <a href="#">1.969</a>	25 <a href="#">0.984</a>	16 <a href="#">0.630</a>	26 <a href="#">1.024</a>	13 <a href="#">0.512</a>	8 <a href="#">0.315</a>	P.95
<b>FT-V41</b>	175 <a href="#">6.890</a>	80 <a href="#">3.150</a>	27 <a href="#">1.063</a>	28 <a href="#">1.102</a>	14 <a href="#">0.551</a>	10 <a href="#">0.394</a>	14 <a href="#">0.551</a>	7 <a href="#">0.276</a>	5 <a href="#">0.197</a>	P.95
<b>FT-V80Y</b>	800 <a href="#">31.496</a>	400 <a href="#">15.748</a>	140 <a href="#">5.512</a>	120 <a href="#">4.724</a>	60 <a href="#">2.362</a>	35 <a href="#">1.378</a>	80 <a href="#">3.150</a>	40 <a href="#">1.575</a>	25 <a href="#">0.984</a>	P.95
<b>FT-W4</b>	160 <a href="#">6.299</a>	80 <a href="#">3.150</a>	28 <a href="#">1.102</a>	16 <a href="#">0.630</a>	8 <a href="#">0.315</a>	5 <a href="#">0.197</a>	10 <a href="#">0.394</a>	5 <a href="#">0.197</a>	3 <a href="#">0.118</a>	P.95
<b>FT-W8</b>	570 <a href="#">22.441</a>	290 <a href="#">11.417</a>	100 <a href="#">3.937</a>	90 <a href="#">3.543</a>	45 <a href="#">1.772</a>	30 <a href="#">1.181</a>	56 <a href="#">2.205</a>	28 <a href="#">1.102</a>	20 <a href="#">0.787</a>	P.95
<b>FT-WA8</b>	3,500 <a href="#">137.795</a> (Note 2)	1,500 <a href="#">59.055</a>	750 <a href="#">29.528</a>	600 <a href="#">23.622</a>	300 <a href="#">11.811</a>	220 <a href="#">8.661</a>	300 <a href="#">11.811</a>	150 <a href="#">5.906</a>	110 <a href="#">4.331</a>	P.95
<b>FT-WA30</b>	3,500 <a href="#">137.795</a> (Note 2)	3,500 <a href="#">137.795</a> (Note 2)	3,500 <a href="#">137.795</a> (Note 2)	2,400 <a href="#">94.488</a>	1,200 <a href="#">47.244</a>	700 <a href="#">27.559</a>	1,200 <a href="#">47.244</a>	600 <a href="#">23.622</a>	350 <a href="#">13.780</a>	P.95
<b>FT-WKV8</b>	1,700 <a href="#">66.929</a>	700 <a href="#">27.559</a>	300 <a href="#">11.811</a>	300 <a href="#">11.811</a>	150 <a href="#">5.906</a>	100 <a href="#">3.937</a>	160 <a href="#">6.299</a>	80 <a href="#">3.150</a>	60 <a href="#">2.362</a>	P.96
<b>FT-WR80</b>	570 <a href="#">22.441</a>	290 <a href="#">11.417</a>	100 <a href="#">3.937</a>	90 <a href="#">3.543</a>	45 <a href="#">1.772</a>	30 <a href="#">1.181</a>	56 <a href="#">2.205</a>	28 <a href="#">1.102</a>	20 <a href="#">0.787</a>	P.96
<b>FT-WR80L</b>	1,200 <a href="#">47.244</a>	600 <a href="#">23.622</a>	210 <a href="#">8.268</a>	240 <a href="#">9.449</a>	120 <a href="#">4.724</a>	90 <a href="#">3.543</a>	120 <a href="#">4.724</a>	60 <a href="#">2.362</a>	40 <a href="#">1.575</a>	P.96
<b>FT-WS3</b>	570 <a href="#">22.441</a>	290 <a href="#">11.417</a>	100 <a href="#">3.937</a>	90 <a href="#">3.543</a>	45 <a href="#">1.772</a>	30 <a href="#">1.181</a>	56 <a href="#">2.205</a>	28 <a href="#">1.102</a>	20 <a href="#">0.787</a>	P.96
<b>FT-WS4</b>	160 <a href="#">6.299</a>	80 <a href="#">3.150</a>	28 <a href="#">1.102</a>	16 <a href="#">0.630</a>	8 <a href="#">0.315</a>	5 <a href="#">0.197</a>	10 <a href="#">0.394</a>	5 <a href="#">0.197</a>	3 <a href="#">0.118</a>	P.96
<b>FT-WS8</b>	570 <a href="#">22.441</a>	290 <a href="#">11.417</a>	100 <a href="#">3.937</a>	90 <a href="#">3.543</a>	45 <a href="#">1.772</a>	30 <a href="#">1.181</a>	56 <a href="#">2.205</a>	28 <a href="#">1.102</a>	20 <a href="#">0.787</a>	P.96
<b>FT-WS8L</b>	1,200 <a href="#">47.244</a>	600 <a href="#">23.622</a>	210 <a href="#">8.268</a>	240 <a href="#">9.449</a>	120 <a href="#">4.724</a>	90 <a href="#">3.543</a>	120 <a href="#">4.724</a>	60 <a href="#">2.362</a>	40 <a href="#">1.575</a>	P.96
<b>FT-WV42</b>	90 <a href="#">3.543</a>	40 <a href="#">1.575</a>	15 <a href="#">0.591</a>	————	————	————	————	————	————	P.96
<b>FT-WZ4</b>	200 <a href="#">7.874</a>	100 <a href="#">3.937</a>	40 <a href="#">1.575</a>	35 <a href="#">1.378</a>	15 <a href="#">0.591</a>	9 <a href="#">0.354</a>	18 <a href="#">0.709</a>	8 <a href="#">0.315</a>	4.8 <a href="#">0.189</a>	P.96
<b>FT-WZ4HB</b>	150 <a href="#">5.906</a>	75 <a href="#">2.953</a>	30 <a href="#">1.181</a>	32 <a href="#">1.260</a>	15 <a href="#">0.591</a>	9.6 <a href="#">0.378</a>	16 <a href="#">0.630</a>	9 <a href="#">0.354</a>	5.4 <a href="#">0.213</a>	P.97
<b>FT-WZ7</b>	440 <a href="#">17.323</a>	220 <a href="#">8.661</a>	80 <a href="#">3.150</a>	80 <a href="#">3.150</a>	40 <a href="#">1.575</a>	24 <a href="#">0.945</a>	54 <a href="#">2.126</a>	27 <a href="#">1.063</a>	16.2 <a href="#">0.638</a>	P.97
<b>FT-WZ7HB</b>	580 <a href="#">22.835</a>	290 <a href="#">11.417</a>	110 <a href="#">4.331</a>	100 <a href="#">3.937</a>	50 <a href="#">1.969</a>	30 <a href="#">1.181</a>	56 <a href="#">2.205</a>	28 <a href="#">1.102</a>	16.8 <a href="#">0.662</a>	P.97
<b>FT-WZ8</b>	700 <a href="#">27.559</a>	330 <a href="#">12.992</a>	120 <a href="#">4.724</a>	80 <a href="#">3.150</a>	40 <a href="#">1.575</a>	25 <a href="#">0.984</a>	40 <a href="#">1.575</a>	20 <a href="#">0.787</a>	13 <a href="#">0.512</a>	P.97
<b>FT-WZ8E</b>	1,500 <a href="#">59.055</a>	700 <a href="#">27.559</a>	210 <a href="#">8.268</a>	240 <a href="#">9.449</a>	120 <a href="#">4.724</a>	80 <a href="#">3.150</a>	120 <a href="#">4.724</a>	60 <a href="#">2.362</a>	40 <a href="#">1.575</a>	P.97
<b>FT-WZ8H</b>	2,500 <a href="#">98.425</a>	1,200 <a href="#">47.244</a>	410 <a href="#">16.142</a>	400 <a href="#">15.748</a>	200 <a href="#">7.874</a>	140 <a href="#">5.512</a>	200 <a href="#">7.874</a>	100 <a href="#">3.937</a>	70 <a href="#">2.756</a>	P.97
<b>FT-Z8</b>	800 <a href="#">31.496</a>	400 <a href="#">15.748</a>	140 <a href="#">5.512</a>	120 <a href="#">4.724</a>	60 <a href="#">2.362</a>	40 <a href="#">1.575</a>	60 <a href="#">2.362</a>	30 <a href="#">1.181</a>	22 <a href="#">0.866</a>	P.97
<b>FT-Z8E</b>	1,600 <a href="#">62.992</a>	800 <a href="#">31.496</a>	280 <a href="#">11.024</a>	400 <a href="#">15.748</a>	200 <a href="#">7.874</a>	140 <a href="#">5.512</a>	200 <a href="#">7.874</a>	100 <a href="#">3.937</a>	65 <a href="#">2.559</a>	P.97
<b>FT-Z8H</b>	2,700 <a href="#">106.299</a>	1,400 <a href="#">55.118</a>	490 <a href="#">19.291</a>	560 <a href="#">22.047</a>	280 <a href="#">11.024</a>	200 <a href="#">7.874</a>	200 <a href="#">7.874</a>	100 <a href="#">3.937</a>	65 <a href="#">2.559</a>	P.97
<b>FT-Z802Y</b>	3,500 <a href="#">137.795</a>	1,500 <a href="#">59.055</a>	530 <a href="#">20.866</a>	320 <a href="#">12.598</a>	160 <a href="#">6.299</a>	120 <a href="#">4.724</a>	160 <a href="#">6.299</a>	80 <a href="#">3.150</a>	60 <a href="#">2.362</a>	P.97

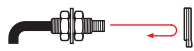
Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.  
 2) The fiber cable length practically limits the sensing range to 3,500 mm [137.795](#) in long.

- FIBER SENSORS
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**LIST OF FIBERS**

**Retroreflective type**



Fibers are listed in alphabetic order. Refer to p.5~ "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 1, 2)									Dimensions
	Red LED			Blue LED			Green LED			
	LONG	STD	S-D	LONG	STD	FAST	LONG	STD	FAST	
<b>FR-KV1</b>	15 to 330 <b>0.591 to 12.992</b>	15 to 210 <b>0.591 to 8.268</b>	15 to 90 <b>0.591 to 3.543</b>	—	—	—	—	—	—	P.98
<b>FR-KZ21</b>	20 to 200 <b>0.787 to 7.874</b>	20 to 200 <b>0.787 to 7.874</b>	20 to 200 <b>0.787 to 7.874</b>	20 to 200 <b>0.787 to 7.874</b>	20 to 120 <b>0.787 to 4.724</b>	20 to 90 <b>0.787 to 3.543</b>	20 to 130 <b>0.787 to 5.118</b>	20 to 80 <b>0.787 to 3.150</b>	20 to 50 <b>0.787 to 1.969</b>	P.98
<b>FR-KZ21E</b>	20 to 200 <b>0.787 to 7.874</b>	20 to 200 <b>0.787 to 7.874</b>	20 to 200 <b>0.787 to 7.874</b>	20 to 160 <b>0.787 to 6.299</b>	20 to 100 <b>0.787 to 3.937</b>	20 to 60 <b>0.787 to 2.362</b>	20 to 110 <b>0.787 to 4.331</b>	—	—	P.98
<b>FR-WKZ11</b>	100 to 730 <b>3.937 to 28.740</b>	100 to 520 <b>3.937 to 20.472</b>	—	—	—	—	—	—	—	P.98

- Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.  
 The sensing range of **FR-WKZ11** is specified for the **RF-13**. The sensing range of **FR-KZ21** and **FR-KZ21E** is specified for the attached reflector **RF-003**.  
 The sensing range of **FR-KV1** is specified for the attached reflector.  
 2) The sensing range of retroreflective type is the possible setting range for the attached reflector. The fiber can detect an object less than setting range for the reflector. However, note that if there are any white or highly-reflective surfaces near the fiber head, reflected incident light may affect the fiber head. If this occurs, adjust the threshold value of the amplifier unit before use.

**Reflective type**



Fibers are listed in alphabetic order. Refer to p.5~ "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 1, 2)									Dimensions
	Red LED			Blue LED			Green LED			
	LONG	STD	S-D	LONG	STD	FAST	LONG	STD	FAST	
<b>FD-30</b>	110 <b>4.331</b>	50 <b>1.969</b>	18 <b>0.709</b>	19 <b>0.748</b>	9 <b>0.354</b>	6 <b>0.236</b>	9 <b>0.354</b>	4.5 <b>0.177</b>	2.5 <b>0.098</b>	P.99
<b>FD-31</b>	95 <b>3.740</b>	45 <b>1.772</b>	16 <b>0.630</b>	18 <b>0.709</b>	8 <b>0.315</b>	5 <b>0.197</b>	8 <b>0.315</b>	4 <b>0.157</b>	2 <b>0.079</b>	P.99
<b>FD-40</b>	110 <b>4.331</b>	50 <b>1.969</b>	18 <b>0.709</b>	19 <b>0.748</b>	9 <b>0.354</b>	6 <b>0.236</b>	9 <b>0.354</b>	4.5 <b>0.177</b>	2.5 <b>0.098</b>	P.99
<b>FD-41</b>	95 <b>3.740</b>	45 <b>1.772</b>	16 <b>0.630</b>	18 <b>0.709</b>	8 <b>0.315</b>	5 <b>0.197</b>	8 <b>0.315</b>	4 <b>0.157</b>	2 <b>0.079</b>	P.99
<b>FD-60</b>	350 <b>13.780</b>	160 <b>6.299</b>	70 <b>2.756</b>	55 <b>2.165</b>	28 <b>1.102</b>	18 <b>0.709</b>	30 <b>1.181</b>	15 <b>0.591</b>	10 <b>0.394</b>	P.99
<b>FD-61</b>	320 <b>12.598</b>	145 <b>5.709</b>	60 <b>2.362</b>	48 <b>1.890</b>	24 <b>0.945</b>	16 <b>0.630</b>	26 <b>1.024</b>	13 <b>0.512</b>	8 <b>0.315</b>	P.99
<b>FD-A15</b>	200 <b>7.874</b>	150 <b>5.906</b>	50 <b>1.969</b>	25 <b>0.984</b>	15 <b>0.591</b>	—	—	—	—	P.99
<b>FD-AFM2</b>	220 <b>8.661</b>	110 <b>4.331</b>	39 <b>1.535</b>	40 <b>1.575</b>	20 <b>0.787</b>	13 <b>0.512</b>	18 <b>0.709</b>	9 <b>0.354</b>	5 <b>0.197</b>	P.99
<b>FD-AFM2E</b>	220 <b>8.661</b>	110 <b>4.331</b>	39 <b>1.535</b>	40 <b>1.575</b>	20 <b>0.787</b>	13 <b>0.512</b>	18 <b>0.709</b>	9 <b>0.354</b>	5 <b>0.197</b>	P.99
<b>FD-B8</b>	480 <b>18.898</b>	220 <b>8.661</b>	75 <b>2.953</b>	80 <b>3.150</b>	40 <b>1.575</b>	26 <b>1.024</b>	42 <b>1.654</b>	21 <b>0.827</b>	14 <b>0.551</b>	P.99
<b>FD-E12</b>	11 <b>0.433</b>	6 <b>0.236</b>	1 <b>0.039</b>	2 <b>0.079</b>	1 <b>0.039</b>	—	1 <b>0.039</b>	—	—	P.100
<b>FD-E22</b>	45 <b>1.772</b>	23 <b>0.906</b>	7 <b>0.276</b>	6 <b>0.236</b>	3 <b>0.118</b>	2 <b>0.079</b>	3 <b>0.118</b>	1.5 <b>0.059</b>	1 <b>0.039</b>	P.100
<b>FD-EG1</b>	38 <b>1.496</b>	18 <b>0.709</b>	6 <b>0.236</b>	6 <b>0.236</b>	3 <b>0.118</b>	2 <b>0.079</b>	3 <b>0.118</b>	1.5 <b>0.059</b>	1 <b>0.039</b>	P.100
<b>FD-EG2</b>	25 <b>0.984</b>	12 <b>0.472</b>	5 <b>0.197</b>	5 <b>0.197</b>	2 <b>0.079</b>	1 <b>0.039</b>	2 <b>0.079</b>	1 <b>0.039</b>	—	P.100
<b>FD-EG3</b>	15 <b>0.591</b>	8 <b>0.315</b>	3 <b>0.118</b>	2 <b>0.079</b>	1 <b>0.039</b>	—	1 <b>0.039</b>	—	—	P.100
<b>FD-EN500S1</b>	5 <b>0.197</b>	3 <b>0.118</b>	—	—	—	—	—	—	—	P.100
<b>FD-ENM1S1</b>	38 <b>1.496</b>	18 <b>0.709</b>	6 <b>0.236</b>	6 <b>0.236</b>	3 <b>0.118</b>	2 <b>0.079</b>	3 <b>0.118</b>	1.5 <b>0.059</b>	1 <b>0.039</b>	P.100
<b>FD-F4</b>	Applicable pipe diameter: Outer dia. ø6 to ø26 mm <b>ø0.236 to ø1.024 in</b> transparent pipe [PFA (fluorine resin) or equivalently transparent pipe, wall thickness 1 mm <b>0.039 in</b> ]									P.100
<b>FD-F41</b>	Applicable pipe diameter: Outer dia. ø6 to ø26 mm <b>ø0.236 to ø1.024 in</b> transparent pipe [PVC, fluorine resin, polycarbonate, acrylic, glass, wall thickness 1 to 3 mm <b>0.039 to 0.118 in</b> ]									P.100
<b>FD-F41Y</b>	ø4 mm <b>ø0.157 in</b> Protective tube: Fluorine resin, length 500 mm <b>19.685 in</b> (cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam interrupted									P.101
<b>FD-F8Y</b>	—									P.101
<b>FD-FA90</b>	Applicable pipe diameter: Outer dia. ø8 mm <b>ø0.315 in</b> or more transparent pipe (When used with the tying bands: ø8 to ø80 mm <b>ø0.315 to ø3.150 in</b> ) [PFA (fluorine resin), including translucent] Liquid absent: Beam received, Liquid present: Beam interrupted									P.101
<b>FD-FM2</b>	310 <b>12.205</b>	140 <b>5.512</b>	47 <b>1.850</b>	46 <b>1.811</b>	23 <b>0.906</b>	15 <b>0.591</b>	24 <b>0.945</b>	12 <b>0.472</b>	8 <b>0.315</b>	P.101
<b>FD-FM2S</b>	270 <b>10.630</b>	110 <b>4.331</b>	39 <b>1.535</b>	46 <b>1.811</b>	23 <b>0.906</b>	15 <b>0.591</b>	24 <b>0.945</b>	12 <b>0.472</b>	8 <b>0.315</b>	P.101
<b>FD-FM2S4</b>	270 <b>10.630</b>	110 <b>4.331</b>	39 <b>1.535</b>	46 <b>1.811</b>	23 <b>0.906</b>	15 <b>0.591</b>	24 <b>0.945</b>	12 <b>0.472</b>	8 <b>0.315</b>	P.101

- Notes: 1) The standard sensing objects of the sensing ranges vary depending on the fibers.  
 2) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

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**FX-500**

**FX-100**

**FX-300**

**FX-410**

**FX-311**

**FX-301-F7/ FX-301-F**

**LIST OF FIBERS**

**Reflective type**



Fibers are listed in alphabetic order. Refer to p.5~ "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 1, 2)									Dimensions	
	Red LED			Blue LED			Green LED				
	LONG	STD	S-D	LONG	STD	FAST	LONG	STD	FAST		
<b>FD-G4</b>	110 4.331	55 2.165	19 0.748	22 0.866	11 0.433	8 0.315	12 0.472	6 0.236	4 0.157	P.101	
<b>FD-G6</b>	110 4.331	55 2.165	19 0.748	22 0.866	11 0.433	8 0.315	12 0.472	6 0.236	4 0.157	P.102	
<b>FD-G6X</b>	90 3.543	45 1.772	20 0.787	22 0.866	11 0.433	6 0.236	12 0.472	6 0.236	4 0.157	P.102	
<b>FD-G40</b>	110 4.331	55 2.165	19 0.748	22 0.866	11 0.433	8 0.315	12 0.472	6 0.236	4 0.157	P.101	
<b>FD-G60</b>	310 12.205	140 5.512	47 1.850	46 1.811	23 0.906	15 0.591	24 0.945	12 0.472	8 0.315	P.102	
<b>FD-H13-FM2</b>	310 12.205	140 5.512	47 1.850	20 0.787	11 0.433	7 0.276	20 0.787	11 0.433	7 0.276	P.102	
<b>FD-H18-L31</b>	0 to 15 0 to 0.591	0 to 10 0 to 0.394	2 to 6 0.079 to 0.236	—	—	—	—	—	—	P.102	
<b>FD-H20-21</b>	270 10.630	140 5.512	47 1.850	36 1.417	18 0.709	12 0.472	20 0.787	10 0.394	7 0.276	P.102	
<b>FD-H20-M1</b>	270 10.630	140 5.512	47 1.850	36 1.417	18 0.709	12 0.472	20 0.787	10 0.394	7 0.276	P.102	
<b>FD-H25-L43</b>	3 to 25 0.118 to 0.984	4 to 20 0.157 to 0.787	4 to 16 0.157 to 0.630	—	—	—	—	—	—	P.103	
<b>FD-H25-L45</b>	6 to 41 0.236 to 1.614	7 to 38 0.276 to 1.496	—	—	—	—	—	—	—	P.103	
<b>FD-H30-KZ1V-S (Note 3)</b>	20 to 200 0.787 to 7.874	25 to 130 0.984 to 5.118	—	—	—	—	—	—	—	P.103	
<b>FD-H30-L32</b>	0 to 15 0 to 0.591	0 to 10 0 to 0.394	2 to 6 0.079 to 0.236	—	—	—	—	—	—	P.103	
<b>FD-H30-L32V-S (Note 3)</b>	0 to 8 0 to 0.315	1.5 to 5 0.059 to 0.197	—	—	—	—	—	—	—	P.103	
<b>FD-H35-20S</b>	160 6.299	80 3.150	26 1.024	22 0.866	11 0.433	7 0.276	12 0.472	6 0.236	4 0.157	P.104	
<b>FD-H35-M2</b>	270 10.630	140 5.512	47 1.850	36 1.417	18 0.709	12 0.472	20 0.787	10 0.394	7 0.276	P.104	
<b>FD-H35-M2S6</b>	270 10.630	140 5.512	47 1.850	36 1.417	18 0.709	12 0.472	20 0.787	10 0.394	7 0.276	P.104	
<b>FD-HF40Y</b>	ø4 mm ø0.157 in Protective tube: Fluorine resin, length 500 mm 19.685 in (cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam interrupted									P.104	
<b>FD-L4</b>	2.5 to 18 0.098 to 0.709 (Convergent point 6 0.236)	4 to 12 0.157 to 0.472 (Convergent point 6 0.236)	4.8 to 9.5 0.189 to 0.374 (Convergent point 6 0.236)	4.5 to 9.5 0.177 to 0.374 (Convergent point 6 0.236)	5 to 9 0.197 to 0.354 (Convergent point 6 0.236)	5.5 to 8 0.217 to 0.315 (Convergent point 6 0.236)	5 to 9 0.197 to 0.354 (Convergent point 6 0.236)	5.5 to 8 0.217 to 0.315 (Convergent point 6 0.236)	—	P.104	
<b>FD-L41</b>	2.5 to 18 0.098 to 0.709 (Convergent point 8 0.315)	3 to 16 0.118 to 0.630 (Convergent point 8 0.315)	—	—	—	—	—	—	—	P.104	
<b>FD-L43</b>	—	0 to 23 0 to 0.906	—	—	—	—	—	—	—	P.104	
<b>FD-L44</b>	0 to 7 0 to 0.276	0 to 6 0 to 0.236	0 to 5.2 0 to 0.205	—	—	—	—	—	—	P.104	
<b>FD-L44S</b>	0 to 4.5 0 to 0.177	0 to 4 0 to 0.157	0 to 3.5 0 to 0.138	—	—	—	—	—	—	P.104	
<b>FD-L45</b>	0 to 36 0 to 1.417	0 to 30 0 to 1.181	0 to 21 0 to 0.827	—	—	—	—	—	—	P.104	
<b>FD-L45A</b>	10 to 33 0.394 to 1.299 (Note 4)	10 to 32 0.394 to 1.260 (Note 4)	13 to 18 0.512 to 0.709 (Note 4)	—	—	—	—	—	—	P.105	
<b>FD-L46</b>	12.5 to 37.5 0.492 to 1.476	15 to 35 0.591 to 1.378	—	—	—	—	—	—	—	P.105	
<b>FD-L47</b>	30 1.181	30 1.181	2 to 27 0.079 to 1.063	—	—	—	—	—	—	P.105	
<b>FD-NFM2</b>	90 3.543	45 1.772	16 0.630	16 0.630	8 0.315	5 0.197	8 0.315	4 0.157	2 0.079	P.105	
<b>FD-NFM2S</b>	90 3.543	45 1.772	16 0.630	16 0.630	8 0.315	5 0.197	8 0.315	4 0.157	2 0.079	P.105	
<b>FD-NFM2S4</b>	90 3.543	45 1.772	16 0.630	16 0.630	8 0.315	5 0.197	8 0.315	4 0.157	2 0.079	P.105	
<b>FX-500</b>	<b>FD-P2</b>	50 1.969	25 0.984	9 0.354	8 0.315	4 0.157	2.5 0.098	4 0.157	2 0.079	1.5 0.059	P.105
<b>FX-100</b>	<b>FD-P40</b>	36 1.417	18 0.709	6 0.236	5 0.197	2.5 0.098	1.5 0.059	3 0.118	1.5 0.059	1 0.039	P.105
<b>FX-300</b>	<b>FD-P50</b>	90 3.543	45 1.772	16 0.630	20 0.787	10 0.394	6 0.236	10 0.394	5 0.197	3 0.118	P.105
<b>FX-410</b>	<b>FD-P60</b>	90 3.543	45 1.772	16 0.630	20 0.787	10 0.394	6 0.236	10 0.394	5 0.197	3 0.118	P.105
<b>FX-311</b>	<b>FD-P80</b>	220 8.661	100 3.937	35 1.378	40 1.575	20 0.787	13 0.512	20 0.787	10 0.394	7 0.276	P.105
<b>FX-301-F7/ FX-301-F</b>	<b>FD-P81X</b>	185 7.283	80 3.150	35 1.378	32 1.260	16 0.630	10 0.394	16 0.630	8 0.315	5 0.197	P.106
	<b>FD-R80</b>	185 7.283	85 3.346	30 1.181	32 1.260	16 0.630	10 0.394	16 0.630	8 0.315	5 0.197	P.106
	<b>FD-S30</b>	110 4.331	50 1.969	18 0.709	19 0.748	9 0.354	6 0.236	9 0.354	4.5 0.177	2.5 0.098	P.106
	<b>FD-S31</b>	95 3.740	45 1.772	16 0.630	18 0.709	8 0.315	5 0.197	8 0.315	4 0.157	2 0.079	P.106
	<b>FD-S80</b>	270 10.630	110 4.331	39 1.535	46 1.811	23 0.906	15 0.591	24 0.945	12 0.472	8 0.315	P.106

Notes: 1) The standard sensing objects of the sensing ranges vary depending on the fibers.  
 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).  
 4) Sensing distance varies depending on the sensing object's inclination.

**LIST OF FIBERS**

**Reflective type**



Fibers are listed in alphabetic order. Refer to p.5~ "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 1, 2)									Dimensions
	Red LED			Blue LED			Green LED			
	LONG	STD	S-D	LONG	STD	FAST	LONG	STD	FAST	
<b>FD-SFM2SV2</b>	100 3.937	45 1.772	16 0.630	14 0.551	7 0.276	4 0.157	7 0.276	3.5 0.138	—	P.106
<b>FD-SNFM2</b>	90 3.543	45 1.772	16 0.630	16 0.630	8 0.315	5 0.197	8 0.315	4 0.157	2 0.079	P.106
<b>FD-T40</b>	90 3.543	45 1.772	16 0.630	16 0.630	8 0.315	5 0.197	8 0.315	4 0.157	2 0.079	P.106
<b>FD-T80</b>	270 10.630	110 4.331	39 1.535	46 1.811	23 0.906	15 0.591	24 0.945	12 0.472	8 0.315	P.106
<b>FD-V41</b>	55 2.165	25 0.984	9 0.354	6 0.236	3 0.118	—	3 0.118	—	—	P.106
<b>FD-W8</b>	190 7.480	90 3.543	32 1.260	23 0.906	11 0.433	8 0.315	14 0.551	7 0.276	4 0.157	P.107
<b>FD-W44</b>	30 1.181	15 0.591	5 0.197	5 0.197	2.5 0.098	1.5 0.059	3 0.118	1.5 0.059	1 0.039	P.107
<b>FD-WG4</b>	65 2.559	32 1.260	11 0.433	11 0.433	5 0.197	3 0.118	6 0.236	3 0.118	2 0.079	P.107
<b>FD-WKZ1</b>	20 to 480 0.787 to 18.898	20 to 230 0.787 to 9.055	25 to 100 0.984 to 3.937	—	—	—	—	—	—	P.107
<b>FD-WL41</b>	6.5 to 14 0.256 to 0.551 (Convergent point 8 0.315)	7 to 12 0.276 to 0.472 (Convergent point 8 0.315)	—	—	—	—	—	—	—	P.107
<b>FD-WL48</b>	0.5 to 7.5 0.020 to 0.295	1 to 5.5 0.039 to 0.217	—	—	—	—	—	—	—	P.107
<b>FD-WS8</b>	190 7.480	90 3.543	32 1.260	23 0.906	11 0.433	8 0.315	14 0.551	7 0.276	4 0.157	P.107
<b>FD-WSG4</b>	65 2.559	32 1.260	11 0.433	11 0.433	5 0.197	3 0.118	6 0.236	3 0.118	2 0.079	P.107
<b>FD-WT4</b>	30 1.181	15 0.591	5 0.197	5 0.197	2.5 0.098	1.5 0.059	3 0.118	1.5 0.059	1 0.039	P.107
<b>FD-WT8</b>	190 7.480	90 3.543	32 1.260	23 0.906	11 0.433	8 0.315	14 0.551	7 0.276	4 0.157	P.107
<b>FD-WV42</b>	15 0.591	7 0.276	—	—	—	—	—	—	—	P.108
<b>FD-WZ4</b>	1.5 to 3.4 0.059 to 0.134	3 to 17 0.118 to 0.669	—	—	—	—	—	—	—	P.108
<b>FD-WZ4HB</b>	1 to 46 0.039 to 1.811	2.5 to 23 0.098 to 0.906	3 to 7 0.118 to 0.276	4 to 9 0.157 to 0.354	—	—	—	—	—	P.108
<b>FD-WZ7</b>	120 4.724	1 to 60 0.039 to 2.362	2.5 to 18 0.098 to 0.709	4 to 15 0.157 to 0.591	—	—	—	—	—	P.108
<b>FD-WZ7HB</b>	0.5 to 180 0.020 to 7.087	1 to 90 0.039 to 3.543	1 to 35 0.039 to 1.378	3 to 28 0.118 to 1.102	3 to 14 0.118 to 0.551	4 to 8.4 0.157 to 0.331	3 to 16 0.118 to 0.630	4 to 8 0.157 to 0.315	4.8 0.189	P.108

Notes: 1) The standard sensing objects of the sensing ranges vary depending on the fibers.

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

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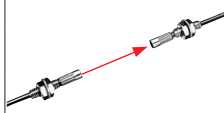
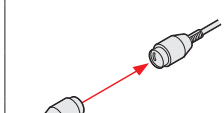

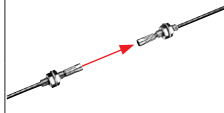
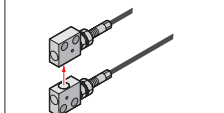
FX-301-F7/

FX-301-F



**FIBER OPTIONS**

**Lens (for thru-beam type fiber)**

Designation	Model No.	Description
For thru-beam type fiber	Expansion lens (Note 1) <b>FX-LE1</b>	 <p>Increases the sensing range by 5 times or more.</p> <ul style="list-style-type: none"> <li>Ambient temperature: -60 to +350 °C -76 to +662 °F (Note 5)</li> </ul>
	Super-expansion lens (Note 1) <b>FX-LE2</b>	 <p>Tremendously increases the sensing range with large diameter lenses.</p> <ul style="list-style-type: none"> <li>Ambient temperature: -60 to +350 °C -76 to +662 °F (Note 5)</li> </ul>
	Side-view lens <b>FX-SV1</b>	 <p>Beam axis is bent by 90°.</p> <ul style="list-style-type: none"> <li>Ambient temperature: -60 to +300 °C -76 to +572 °F (Note 5)</li> </ul>
	Expansion lens for vacuum fiber (Note 1) <b>FV-LE1</b>	 <p>Sensing range increases by 4 times or more.</p> <ul style="list-style-type: none"> <li>Ambient temperature: -60 to +350 °C (Note 5) -76 to +662 °F</li> </ul>
Vacuum resistant side-view lens (Note 1) <b>FV-SV2</b>	 <p>Beam axis is bent by 90°.</p> <ul style="list-style-type: none"> <li>Ambient temperature: -60 to +300 °C -76 to +572 °F (Note 5)</li> </ul>	

Sensing range for red LED type (mm in) [Lens on both sides] (Note 3)

Fiber	Mode	LONG	STD	S-D
FT-B8	3,500	137.759 (Note 2)	2,500 98.425	1,000 39.370
FT-FM2	3,500	137.759 (Note 2)	3,500 137.759 (Note 2)	1,300 51.181
FT-T80	3,500	137.759 (Note 2)	3,500 137.759 (Note 2)	1,300 51.181
FT-R80	3,500	137.759 (Note 2)	2,300 90.551	800 31.496
FT-W8	3,500	137.759 (Note 2)	2,900 114.173	1,000 39.370
FT-P80	3,500	137.759 (Note 2)	3,500 137.759 (Note 2)	1,100 43.307
FT-P60	3,500	137.759 (Note 2)	3,500 137.759 (Note 2)	900 35.433
FT-P81X	1,600	62.992 (Note 2)	1,600 62.992 (Note 2)	1,100 43.307
FT-H35-M2	3,500	137.759 (Note 2)	2,000 78.740	750 29.528
FT-H20W-M1	1,600	62.992 (Note 2)	1,300 51.181	500 19.685
FT-H20-M1	1,600	62.992 (Note 2)	1,600 62.992 (Note 2)	900 35.433

Sensing range for red LED type (mm in) [Lens on both sides] (Note 3)

Fiber	Mode	LONG	STD	S-D
FT-B8	3,500	137.759 (Note 2)	3,500 137.759 (Note 2)	3,500 137.759 (Note 2)
FT-FM2	3,500	137.759 (Note 2)	3,500 137.759 (Note 2)	3,500 137.759 (Note 2)
FT-R80	3,500	137.759 (Note 2)	3,500 137.759 (Note 2)	3,500 137.759 (Note 2)
FT-W8	3,500	137.759 (Note 2)	3,500 137.759 (Note 2)	3,500 137.759 (Note 2)
FT-P80	3,500	137.759 (Note 2)	3,500 137.759 (Note 2)	3,500 137.759 (Note 2)
FT-P60	3,500	137.759 (Note 2)	3,500 137.759 (Note 2)	3,500 137.759 (Note 2)
FT-P81X	1,600	62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)
FT-H35-M2	3,500	137.759 (Note 2)	3,500 137.759 (Note 2)	3,500 137.759 (Note 2)
FT-H20W-M1	1,600	62.992 (Note 2)	1,600 62.992 (Note 2)	1,500 59.055
FT-H20-M1	1,600	62.992 (Note 2)	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)
FT-H13-FM2	3,500	137.759 (Note 2)	3,500 137.759 (Note 2)	3,500 137.759 (Note 2)

Sensing range for red LED type (mm in) [Lens on both sides] (Note 3)

Fiber	Mode	LONG	STD	S-D
FT-B8	1,100	43.307	530 20.866	186 7.323
FT-FM2	1,200	47.244	600 23.622	210 8.268
FT-T80	1,200	47.244	600 23.622	210 8.268
FT-W8	900	35.433	450 17.717	160 6.299
FT-P80	1,200	47.244	600 23.622	210 8.268
FT-P60	650	25.591	300 11.811	130 5.118
FT-P81X	1,200	47.244	600 23.622	200 7.874
FT-H35-M2	550	21.654	280 11.024	90 3.543
FT-H20W-M1	310	12.205	140 5.512	50 1.969
FT-H20-M1	550	21.654	280 11.024	90 3.543

Sensing range for red LED type (mm in) [Lens on both sides] (Note 3, 4)

Fiber	Mode	LONG	STD	S-D
FT-H30-M1V-S	1,200	47.244	450 17.717	150 5.906


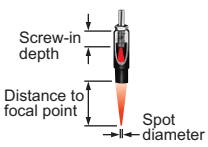
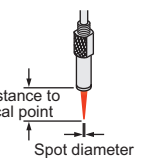
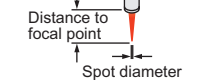
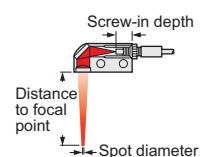
Sensing range for red LED type (mm in) [Lens on both sides] (Note 3, 4)

Fiber	Mode	LONG	STD	S-D
FT-H30-M1V-S	1,200	47.244	450 17.717	150 5.906

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 3,500 mm 137.795 in long (FT-P81X, FT-H20W-M1 and FT-H20-M1: 1,600 mm 62.992 in).  
 3) The sensing ranges are the values for red LED type amplifier. Please contact our office for details on sensing ranges for other types of amplifiers.  
 4) The fiber cable length for the FT-H30-M1V-S is 1 m 3.281 ft. The sensing ranges in LONG mode take into account the length of the FT-J8 atmospheric side fiber.  
 5) Refer to p.76~ for the ambient temperatures of fibers to be used in combination.

**FIBER OPTIONS**

**Lens (for reflective type fiber)**

Designation	Model No.	Description																
For reflective type fiber	Pinpoint spot lens <b>FX-MR1</b>		Pinpoint spot of $\varnothing 0.5$ mm $\varnothing 0.020$ in. Enables detection of minute objects or small marks. • Distance to focal point: $6 \pm 1$ mm $0.236 \pm 0.039$ in • Applicable fibers: <b>FD-WG4, FD-G4</b> • Ambient temperature: $-40$ to $+70$ °C $-40$ to $+158$ °F (Note 2)															
	Zoom lens <b>FX-MR2</b>		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. • Applicable fibers: <b>FD-WG4, FD-G4</b> • Ambient temperature: $-40$ to $+70$ °C $-40$ to $+158$ °F (Note 2) • Accessory: <b>MS-EX3</b> (Mounting bracket) <b>Sensing range for red LED type (Note 1)</b>															
	Finest spot lens <b>FX-MR3</b>		Extremely fine spot of $\varnothing 0.3$ mm $\varnothing 0.012$ in approx. achieved. • Applicable fibers: <b>FD-WG4, FD-G4, FD-EG1, FD-EG2, FD-EG3, FD-G6X, FD-G6</b> • Ambient temperature: $-40$ to $+70$ °C $-40$ to $+158$ °F (Note 2) <b>Sensing range for red LED type (Note 1)</b>															
	Finest spot lens <b>FX-MR6</b>		Extremely fine spot of $\varnothing 0.1$ mm $\varnothing 0.004$ in approx. achieved. • Applicable fibers: <b>FD-WG4, FD-G4, FD-EG1, FD-EG2, FD-EG3, FD-G6X, FD-G6</b> • Ambient temperature: $-20$ to $+60$ °C $-4$ to $+140$ °F (Note 2) <b>Sensing range for red LED type (Note 1)</b>															
	Zoom lens (Side-view type) <b>FX-MR5</b>		<b>FX-MR2</b> is converted into a side-view type and can be mounted in a very small space. • Applicable fibers: <b>FD-WG4, FD-G4</b> • Ambient temperature: $-40$ to $+70$ °C $-40$ to $+158$ °F (Note 2) <b>Sensing range for red LED type (Note 1)</b>															
			<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>7 mm <b>0.276</b> in</td> <td><math>\varnothing 18.5</math> mm <math>\varnothing 0.728</math> in approx.</td> <td><math>\varnothing 0.7</math> mm <math>\varnothing 0.028</math> in</td> </tr> <tr> <td>12 mm <b>0.472</b> in</td> <td><math>\varnothing 27</math> mm <math>\varnothing 1.063</math> in approx.</td> <td><math>\varnothing 1.2</math> mm <math>\varnothing 0.047</math> in</td> </tr> <tr> <td>14 mm <b>0.551</b> in</td> <td><math>\varnothing 43</math> mm <math>\varnothing 1.693</math> in approx.</td> <td><math>\varnothing 2.0</math> mm <math>\varnothing 0.079</math> in</td> </tr> </tbody> </table>	Screw-in depth	Distance to focal point	Spot diameter	7 mm <b>0.276</b> in	$\varnothing 18.5$ mm $\varnothing 0.728$ in approx.	$\varnothing 0.7$ mm $\varnothing 0.028$ in	12 mm <b>0.472</b> in	$\varnothing 27$ mm $\varnothing 1.063$ in approx.	$\varnothing 1.2$ mm $\varnothing 0.047$ in	14 mm <b>0.551</b> in	$\varnothing 43$ mm $\varnothing 1.693$ in approx.	$\varnothing 2.0$ mm $\varnothing 0.079$ in			
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Notes: 1) The sensing ranges are the values when used in combination with red LED type amplifier. Please contact our office for details on sensing ranges for other types of amplifier.  
 2) Refer to p.76~ for the ambient temperatures of fibers to be used in combination.

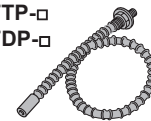
**Others**

Designation	Model No.	Description	
Protective tube (For thru-beam type fiber)	<b>FTP-500</b> (0.5m <b>1.641</b> ft)	For M4 thread	Applicable fibers
	<b>FTP-1000</b> (1m <b>3.281</b> ft)		
	<b>FTP-1500</b> (1.5m <b>4.922</b> ft)		
	<b>FTP-N500</b> (0.5m <b>1.641</b> ft)	For M3 thread	
	<b>FTP-N1000</b> (1m <b>3.281</b> ft)		
	<b>FTP-N1500</b> (1.5m <b>4.922</b> ft)		
Protective tube (For reflective type fiber)	<b>FDP-500</b> (0.5m <b>1.641</b> ft)	For M6 thread	Applicable fibers
	<b>FDP-1000</b> (1m <b>3.281</b> ft)		
	<b>FDP-1500</b> (1.5m <b>4.922</b> ft)		
	<b>FDP-N500</b> (0.5m <b>1.641</b> ft)	For M4 thread	
	<b>FDP-N1000</b> (1m <b>3.281</b> ft)		
	<b>FDP-N1500</b> (1.5m <b>4.922</b> ft)		
Fiber bender	<b>FB-1</b>	The fiber bender bends the sleeve part of the fiber head at the proper radius. (Note 2)	
Universal sensor mounting stand (Note 2)	<b>MS-AJ1-F</b>	Horizontal mounting type	Mounting stand assembly for fiber (For M3, M4 or M6 threaded head fiber)
	<b>MS-AJ2-F</b>	Vertical mounting type	
Single core holder	<b>FX-AT15A</b>	The incident light intensity may vary when using a multi-core fiber or a thin type sharp bending fiber. This holder suppresses the variation in the incident light intensity. Brown.	

Notes: 1) Do not bend the sleeve part of any side-view type fiber or ultra-small diameter head type fiber.  
 2) Refer to the universal sensor mounting stand **MS-AJ** series pages for details.

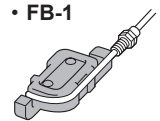
**Protective tube**

- **FTP-□**
- **FDP-□**



**Fiber bender**

- **FB-1**

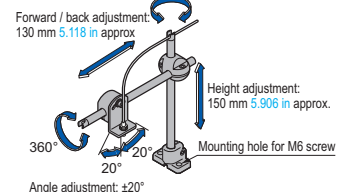


**Universal sensor mounting stand**

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

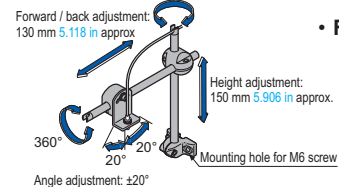
- **MS-AJ1-F**

Swivel: 360° rotation



- **MS-AJ2-F**

Swivel: 360° rotation



**Single core holder**

- **FX-AT15A**



FIBER SENSORS

LASER SENSORS

PHOTO-ELECTRIC SENSORS

MICRO PHOTO-ELECTRIC SENSORS

AREA SENSORS

LIGHT CURTAINS

PRESSURE / FLOW SENSORS

INDUCTIVE PROXIMITY SENSORS

PARTICULAR USE SENSORS

SENSOR OPTIONS

SIMPLE WIRE-SAVING UNITS

WIRE-SAVING SYSTEMS

MEASUREMENT SENSORS

STATIC CONTROL DEVICES

ENDOSCOPE

LASER MARKERS

PLC / TERMINALS

HUMAN MACHINE INTERFACES

ENERGY CONSUMPTION VISUALIZATION COMPONENTS

FA COMPONENTS

MACHINE VISION SYSTEMS

UV CURING SYSTEMS

Selection Guide

Fibers

Amplifiers

**FX-500**

**FX-100**

**FX-300**

**FX-410**

**FX-311**

**FX-301-F7/**

**FX-301-F**

## SPECIFICATIONS

### Amplifiers

Item	Type Model No.	NPN output			PNP output		
		Red LED <b>FX-311</b>	Blue LED <b>FX-311B</b>	Green LED <b>FX-311G</b>	Red LED <b>FX-311P</b>	Blue LED <b>FX-311BP</b>	Green LED <b>FX-311GP</b>
Supply voltage		12 to 24 V DC $\pm 10\%$ Ripple P-P 10% or less					
Power consumption		840 mW or less (Current consumption 35 mA or less at 24 V supply voltage)					
Output		NPN open-collector transistor • Maximum sink current: 100 mA (50 mA, if five, or more, amplifiers are connected in cascade) • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 1.5 V or less [at 100 mA sink current (50 mA, if five, or more, amplifiers are connected in cascade)]			PNP open-collector transistor • Maximum source current: 100 mA (50 mA, if five, or more, amplifiers are connected in cascade) • Applied voltage: 30 V DC or less (between output and +V) • Residual voltage: 1.5 V or less [at 100 mA sink current (50 mA, if five, or more, amplifiers are connected in cascade)]		
Utilization category		DC-12 or DC-13					
Output operation		Selectable either Light-ON or Dark-ON, with selection switch					
Short-circuit protection		Incorporated					
Response time		<Red LED type> 250 $\mu$ s or less (STD / S-D), 2 ms or less (LONG) selectable with selection switch			<Blue LED type / Green LED type> 150 $\mu$ s or less (FAST), 250 $\mu$ s or less (STD), 2 ms or less (LONG) selectable with selection switch		
Operation indicator		Orange LED (lights up when the output is ON)					
Stability indicator		Green LED (lights up under stable light received condition or stable dark condition)					
Sensitivity adjuster		12-turn potentiometer with indicator (Pointer part: red backlight) (Note 2)					
Timer function		Incorporated with OFF-delay timer, selectable either effective (approx. 10 ms or 40 ms) or ineffective					
Automatic interference prevention function		Incorporated (Up to 4 sets of fiber heads can be mounted close together.) (Note 3)					
Environmental resistance	Pollution degree	3 (Industrial environment)					
	Ambient temperature	-10 to +55 °C <b>-14 to +131 °F</b> (If 4 to 7 units are connected in cascade: -10 to +50 °C <b>+14 to +122 °F,</b> ) (if 8 to 16 units are connected in cascade: -10 to +45 °C <b>+14 to +113 °F</b> ) (No dew condensation or icing allowed), Storage: -20 to +70 °C <b>-4 to +158 °F</b>					
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH					
	Ambient illuminance	Incandescent light: 3,000 lx at the light-receiving face					
	EMC	EN 60947-5-2					
	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure (Note 4)					
	Insulation resistance	20 M $\Omega$ , or more, with 250 V DC megger between all supply terminals connected together and enclosure (Note 4)					
	Vibration resistance	10 to 150 Hz frequency, 0.75 mm <b>0.03 in</b> amplitude in X, Y and Z directions for two hours each					
Shock resistance	98 m/s <sup>2</sup> acceleration (10 G approx.) in X, Y and Z directions for five times each						
Emitting element (modulated)	Red LED	Blue LED	Green LED	Red LED	Blue LED	Green LED	
	Peak emission wavelength	650 nm <b>0.026 mil</b>	470 nm <b>0.019 mil</b>	525 nm <b>0.021 mil</b>	650 nm <b>0.026 mil</b>	470 nm <b>0.019 mil</b>	525 nm <b>0.021 mil</b>
Material	Enclosure: Heat-resistant ABS, Case cover: Polycarbonate						
Connecting method	Connector (Note 5)						
Cable length	Total length up to 100 m <b>328.084 ft</b> is possible with 0.3 mm <sup>2</sup> , or more, cable.						
Weight	Net weight: 15 g approx., Gross weight: 20 g approx.						

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 red backlight of the pointer part lights up more brightly when the power is turned ON and when the sensitivity is adjusted.

3) When the power supply is switched on, the emission timing are automatically set for interference prevention.

4) The voltage withstandability and the insulation resistance values given in the above table are for the amplifier only.

5) The cable for amplifier connection is not supplied as an accessory. Make sure to use the optional quick-connection cable given below.

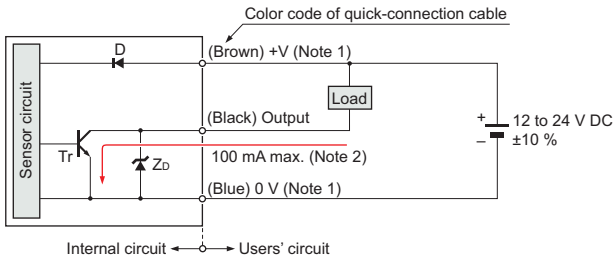
Main cable (3-core): **CN-73-C1** (cable length 1 m **3.281 ft**), **CN-73-C2** (cable length 2 m **6.562 ft**), **CN-73-C5** (cable length 5 m **16.404 ft**)

Sub cable (1-core): **CN-71-C1** (cable length 1 m **3.281 ft**), **CN-71-C2** (cable length 2 m **6.562 ft**), **CN-71-C5** (cable length 5 m **16.404 ft**)

**I/O CIRCUIT AND WIRING DIAGRAMS**

**FX-311□ NPN output type**

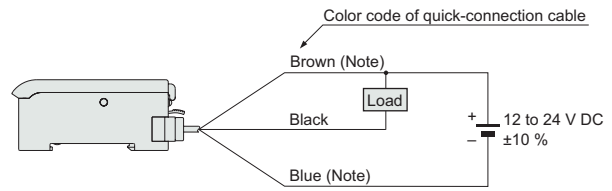
**I/O circuit diagram**



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.

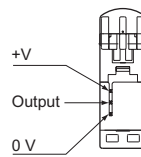
Symbols ... D : Reverse supply polarity protection diode  
 Zd: Surge absorption zener diode  
 Tr : NPN output transistor

**Wiring diagram**



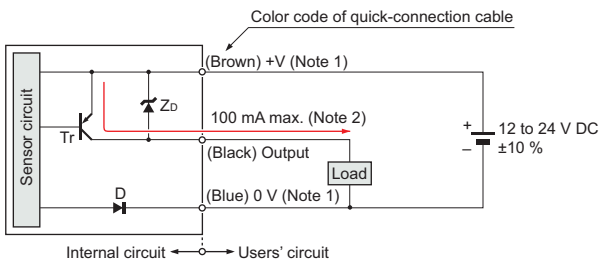
Note: The quick-connection sub cable does not have brown lead wire and blue lead wire. The power is supplied from the connector of the main cable.

**Terminal arrangement diagram**



**FX-311□P PNP output type**

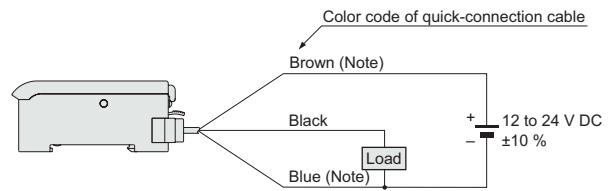
**I/O circuit diagram**



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.

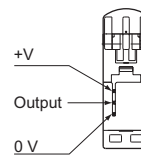
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 Tr : PNP output transistor

**Wiring diagram**



Note: The quick-connection sub cable does not have brown lead wire and blue lead wire. The power is supplied from the connector of the main cable.

**Terminal arrangement diagram**



**SENSING CHARACTERISTICS (TYPICAL)**

Refer to p.195 for sensing characteristics. (STD mode only. Contact our office for information on other modes.)

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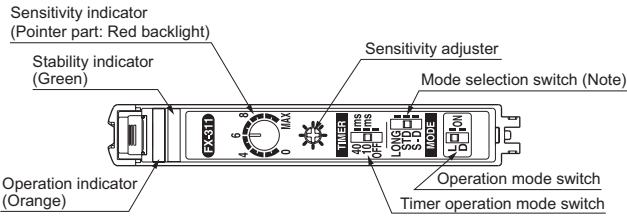
**PRECAUTIONS FOR PROPER USE**

Refer to General precautions and p.80~ for fiber precautions.



- 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.

**Part description**



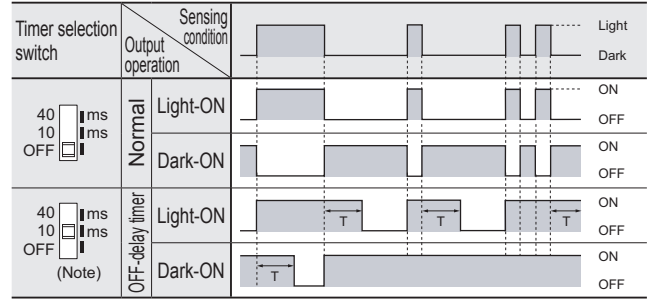
Note: The mode selected by the mode selection switch for **FX-311B(P)** and **FX-311G(P)** is 'LONG', 'STD' or 'FAST'.

**Amplifier of cascading**

- Make sure that the power supply is off while adding or removing the amplifiers.
  - Make sure to check the allowable ambient temperature, as it depends on the number of amplifiers connected in cascade.
  - In case two, or more, amplifiers are connected in cascade, make sure to mount them on a DIN rail.
  - When the amplifiers move on the DIN rail depending on the attaching condition, fitting them between the optional end plates (**MS-DIN-E**) mounted at the two ends.
  - When connecting in cascade, mount the amplifiers close to each other, fitting them between the optional end plates (**MS-DIN-E**) mounted at the two ends.
  - Up to maximum 15 amplifiers can be added (total 16 amplifiers connected in cascade.)
  - When connecting more than two amplifiers in cascade, use the sub cable (**CN-71-C□**) as the quick-connection cable for the second amplifier onwards.
  - The settings other than the interference prevention function cannot be transmitted between this product and other digital fiber amplifiers. Therefore, in case both models of amplifiers are mounted in cascade, be sure to mount identical models together.
- For more details, refer to **“Cautions on sensor connection in cascade”** (p.197).

**Timer function**

- This product incorporates an OFF-delay timer function. The delay time can be selected as either 10 ms. approx. or 40 ms. approx. with the timer selection switch. Since the output is extended by a fixed period, it is useful when the connected device has a slow response time or when small objects are being sensed and the output signal width is small.



Delay time T: 10 ms approx. (when set to 10 ms),  
40 ms approx. (when set to 40 ms)

Note: The diagram shows the case when 10 ms delay time is selected.

**Automatic interference prevention function**

- This product incorporates an automatic interference prevention function. If the amplifiers are mounted in cascade, since a different emission timing is automatically set for up to 4 amplifiers, up to 4 sets of fibers can be mounted closely. Further, even if the amplifiers are mounted closely along with the digital fiber sensor **FX-300** series, the interference prevention function works. However, in case both models of amplifiers are mounted in cascade, mount identical models together.

**Wiring**

- Make sure that the power supply is off while wiring.
- Verify that the supply voltage variation is within the rating.
- Take care 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.
- 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.
- Take care that short circuit of the load 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.
- Make sure to use an isolation transformer for the DC power supply. If an autotransformer (single winding transformer) is used, this product or the power supply may get damaged.
- Make sure to use the optional quick-connection cable for the connection of the amplifier. Extension up to total 100 m **328.084 ft** is possible with 0.3 mm<sup>2</sup>, or more, cable. However, in order to reduce noise, make the wiring as short as possible.

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**PRECAUTIONS FOR PROPER USE**

Refer to General precautions and p.80~ for fiber precautions.

**Operation procedure**

- For **FX-311(P)**, the most suitable sensing mode can be selected according to the application from LONG (long range distance), STD (standard) or S-D (reduced intensity). Furthermore, for **FX-311B(P)** and **FX-311G(P)**, the sensing mode can be selected from LONG (long range distance), STD (standard) or FAST (high speed sensing).

Mode selection switch		Applications	Response time
<b>FX-311(P)</b>	<b>FX-311B(P)/311G(P)</b>		
LONG STD S-D	LONG STD FAST	Used in case long distance sensing is required. (However, the response time is longer than in STD mode.)	2 ms
LONG STD S-D	LONG STD FAST	Used for general sensing application.	250 μs
—	LONG STD FAST	Used in case high speed sensing is required.	150 μs
LONG STD S-D	—	Since the emitted light amount is restricted in this mode, it is suitable for delicate sensing, such as when the received light is saturated due to too short a sensing distance or when detecting translucent objects, etc.	250 μs

Note: Make sure to carry out sensitivity adjustment after mode setting.

**Sensitivity adjustment**

- Adjust the sensitivity, observing the operation indicator (orange). However, since the condition for lighting up of the indicator depends on the combination of the sensing condition and the selected operation of L/D-ON, verify it from the table below.

☉ : Lights up ● : Turns off

Sensing condition	Operation	Operation indicator
Light	L-ON (Light-ON)	☉
	D-ON (Dark-ON)	●
Dark	L-ON (Light-ON)	●
	D-ON (Dark-ON)	☉

- The sensitivity adjuster is a 12-turn potentiometer. The maximum sensitivity is obtained by turning it fully clockwise.
- The pointer shows the present sensitivity level.



**Assist function**

- This product incorporates an “assist function”, which helps to easily search the optimum sensitivity position by flashing of the pointer. In order to make “assist function” effective, switch the operation selection switch in the order L-ON (Light ON) → D-ON (Dark ON) → L-ON (Light ON).

- Notes: 1) “Assist function” cannot be used when adjusting sensitivity for moving objects.  
 2) “Assist function” turns off automatically once the sensitivity adjustment has been completed.  
 3) In case “assist function” is not to be used, set the operation selection switch to D-ON (Dark ON) and wait for 2 sec., or more, to make “assist function” ineffective.

Step	Sensing method		Operation	Sensitivity indicator
	Reflective type	Thru-beam type		
①	Make sure that the operation selection switch is set to L-ON (Light ON). In case “assist function” is to be used, switch the operation selection switch in the order of L-ON (Light ON) → D-ON (Dark ON) → L-ON (Light ON).		Turn the sensitivity adjuster fully counterclockwise. (Minimum sensitivity)	
②	Beam received	Beam received	In the beam received condition, slowly turn the adjuster clockwise and find the point (A) where the sensor is switched ON. The pointer flashes once at the point (A). (Note 1)	
③	Beam not received	Beam not received	In the beam not received condition, slowly turn the adjuster further clockwise until the sensor goes into the ON state again. Once it is switched on, turn the adjuster counterclockwise a little and find the point (B) where it is switched OFF. The pointer flashes twice at the point (B). (Note 2) (If the sensor does not go into the ON state, MAX is the point (B).)	
④	—	—	Turn the adjuster towards the point (A) from the point (B) slowly. The pointer starts flashing when it approaches the optimum sensitivity point and flashes faster at the optimum sensitivity point for 3 sec. This point is the optimum sensitivity point. (Note 2)	
⑤	Select either L-ON (Light ON) or D-ON (Dark ON) according to your application.			

- Notes: 1) When “assist function” is not used, the pointer does not flash.  
 2) When “assist function” is not used, the middle point of (A) and (B) is regarded as the optimum sensitivity point.  
 3) In order to protect the mechanism, the sensitivity adjuster idles when over turned, which may result in a backlash of 1 to 2 divisions.  
 4) Depending upon the sensing conditions, stable sensing may be possible at a position which is slightly shifted from the optimum sensitivity point.  
 5) Do not move or bend the fiber cable after the sensitivity adjustment. Detection may become unstable.

**Others**

- Do not use during the initial transient time (0.5 sec. approx.) after the power supply is switched on.
- Take care that the sensor is not directly exposed to fluorescent lamp from a rapid-starter lamp, a high frequency lighting device or sunlight etc., as it may affect the sensing performance.
- This sensor is suitable for indoor use only.
- Do not use this sensor in places having excessive vapor, dust, etc., or where it may come in contact with corrosive gas.
- Take care that the sensor does not come in contact with water, oil, grease, organic solvents, such as, thinner etc., or strong acid, and alkaline.
- This sensor cannot be used in an environment containing inflammable or explosive gases.
- Never disassemble or modify the sensor.

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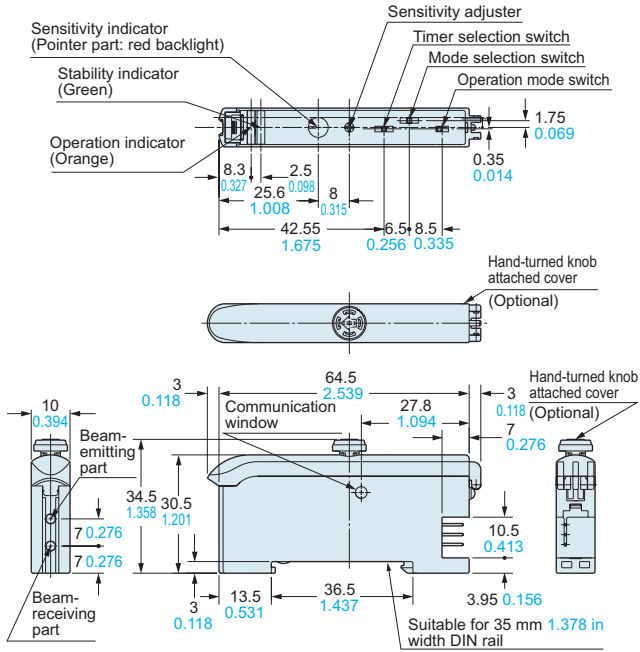
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**DIMENSIONS (Unit: mm in)**

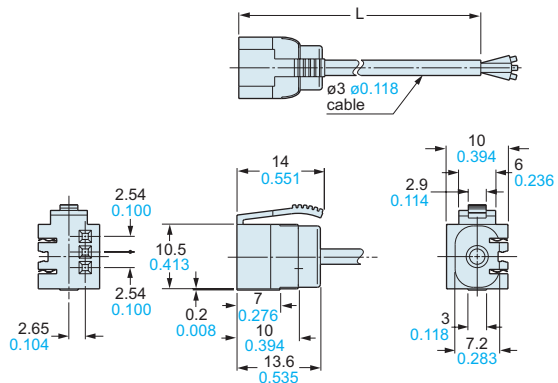
The CAD data in the dimensions can be downloaded from our website.

**FX-311□ FX-311□P** Amplifier

**Mounting drawing with a hand-turned knob attached cover FX-AJ1 (Optional)**



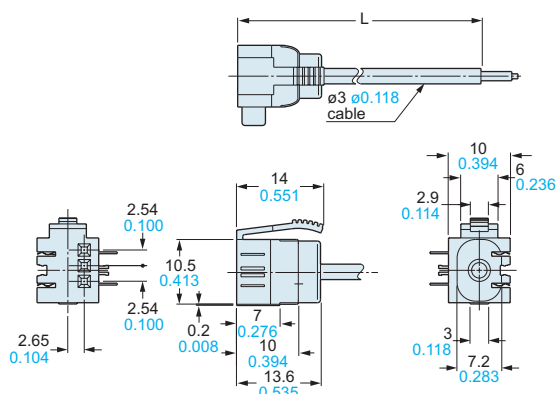
**CN-73-C1 CN-73-C2 CN-73-C5** Main cable (Optional)



• Length L

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

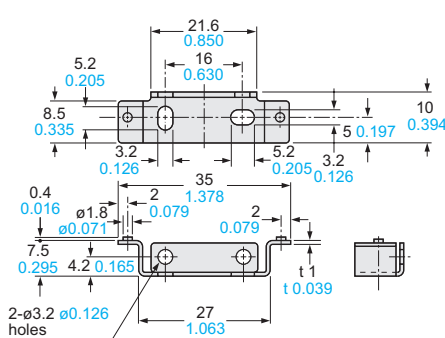
**CN-71-C1 CN-71-C2 CN-71-C5** Sub cable (Optional)



• Length L

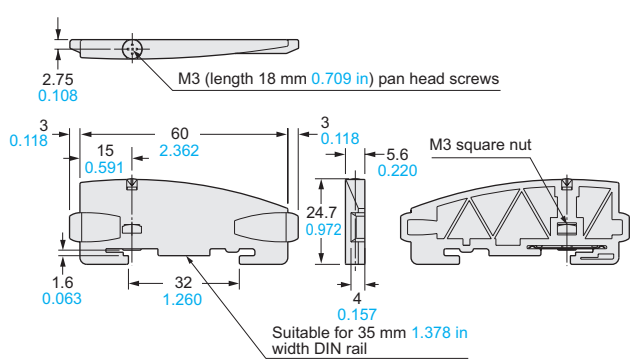
Model No.	Length L
<b>CN-71-C1</b>	1,000 39.370
<b>CN-71-C2</b>	2,000 78.740
<b>CN-71-C5</b>	5,000 196.850

**MS-DIN-2** Amplifier mounting bracket (Optional)



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

**MS-DIN-E** End plate (Optional)



Material: Polycarbonate

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