

FX-300 SERIES

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Related Information

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SUNX website <http://www.sunx.com>



The digital fiber sensor FX-301(P) has been modified since its production in June 2004. Refer to p.154~ for details.



PNP output type available



Timer



Interference prevention



Light intensity monitor



Automatic sensitivity setting

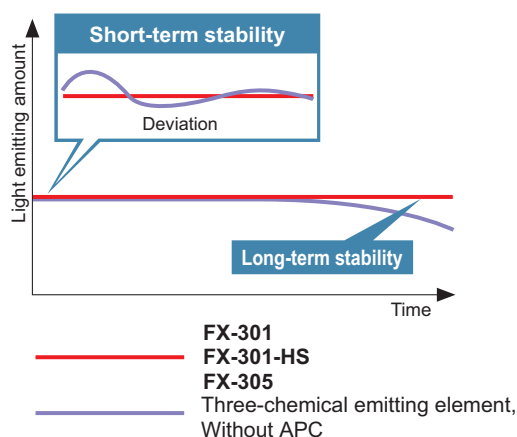
Constant advances achieving significant improvement of sensing performance

Stable sensing over long and short periods

FX-301 FX-301-HS FX-305

In addition to a "four-chemical emitting element" which suppresses changes in the light emitting element over time so that a stable level of light emission can be maintained over long periods, a "APC (Auto Power Control) circuit" has also been adopted afreshly. The light emitting amount can be controlled in minute degrees so that even changes occurring over very short periods can be handled, allowing stable sensing performance by suppressing deviations in light emitting amounts caused by changes in the ambient environment that could not previously be suppressed.

• Stable sensing comparison

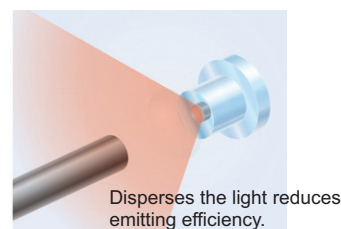


Even greater sensing range

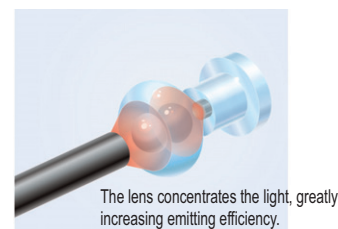
All models

Adoption of a "double coupling lens" that increases emission efficiency to its maximum limits and greatly increases sensing range. Sensing ranges with small diameter fibers and ultra-small diameter fibers, which have become very popular due to the miniaturization of chip components, have been increased by 50 % over previous values achieved with other amplifiers.

• Conventional fiber sensors (Without lens)



• Double coupling lens



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FX-100

FX-300

FX-410

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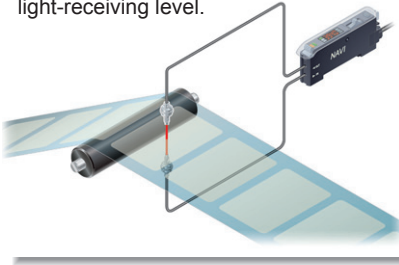
FX-11A

FX-301-F

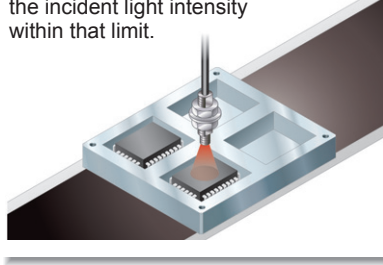
Other
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P.145~SPECIFICATIONS
P.151I/O CIRCUIT DIAGRAMS
P.152SENSING CHARACTERISTICS
P.153~PRECAUTIONS FOR PROPER USE
P.153~DIMENSIONS
P.156**APPLICATIONS****Detecting the presence or absence of labels**

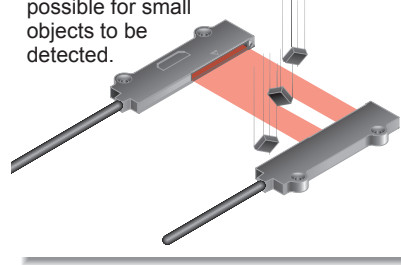
The light-emitting amount selection function can even stabilize detection of transparent labels that saturate the light-receiving level.

**Detecting the presence or absence of ICs on a tray**

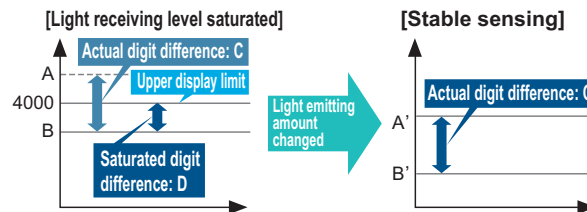
You can set upper and lower limits for the threshold values using the window comparator mode and turn ON / OFF the incident light intensity within that limit.

**Detecting the passage of small objects**

The differential sensing mode will only detect rapid changes in the amount of light, which makes it possible for small objects to be detected.

**Light-emitting amount selection****FX-301** **FX-301-HS** **FX-305**

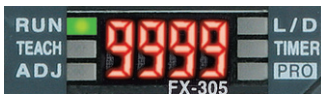
If the light receiving level becomes saturated during close-range sensing or when sensing transparent or minute objects, you can adjust the light emitting amount of the sensor to stabilize sensing **without needing to change the response time**. Sensing that previously required the response time or fibers to be changed can now be set much more easily using this function.



Light emitting amount can be changed without changing response time

Large display 9999**FX-305**

Large display with 4 digits (9999). With a greater difference in digit value than previous models, threshold values can be set in units of 1 digit up to maximum 9999. Threshold setting can now be done more easily and accurately.

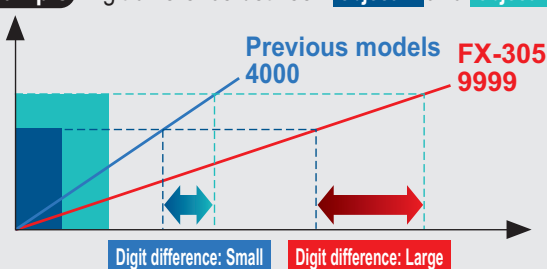


(During STDF, LONG and U-LG modes)

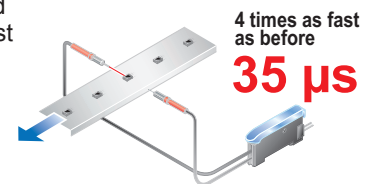
**2.5 times
previous
models**

Digit difference comparison

Example Digit difference between **object A** and **object B**

**Ultra high-speed 35 μ s response****FX-301-HS**

Ultra high-speed 35 μ s response. Even small objects moving at high speeds can be sensed. In addition, at 65 μ s the **FX-301** standard type is also twice as fast as previous models.



4 times as fast
as before
35 μ s

Ultra high-speed type FX-301-HS

(H-SP mode)

35 μ s**Standard type FX-301, High-function type FX-305**

(H-SP mode)

65 μ s**Previous model****150 μ s****FIBER SENSORS****LASER SENSORS**

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FX-100**FX-300****FX-410****FX-311****FX-11A****FX-301-F**

Other Products

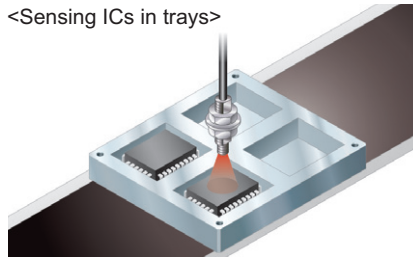
Simplified systems using new operating modes

A window comparator mode and differential sensing mode have been added. These modes make it easy to carry out sensing tasks that previously required multiple sensors or involved complex threshold settings.

- **Window comparator mode**



<Sensing ICs in trays>



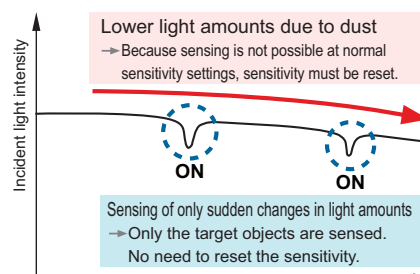
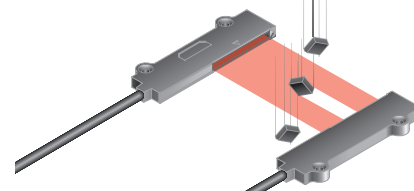
Tray absent	IC present	Tray present
OFF	ON	OFF

Upper and lower limits for threshold values can be set so that the incident light intensity can turn on and off within those ranges. Single output is used, so that only one cable is required, and no PLC processing is required either.

- **Differential sensing mode**



<Sensing of tiny moving objects>



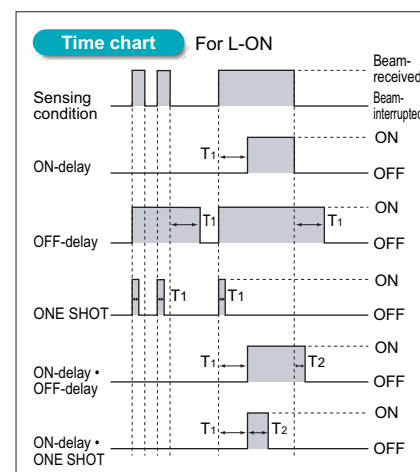
Equipped with 5 types timers

The **FX-305** includes the same ON-delay / OFF-delay / ONE SHOT timer as the **FX-301(-HS)**, as well as an ON-delay • OFF-delay timer and an ON-delay • ONE SHOT timer. A wide variety of timer control operations can be carried out by these fiber sensors alone.

Timer period










Output 1: 0.5 to 9,999 ms (variable)
Output 2: 0.5 to 500 ms (variable)

FX-305












Even beginners can quickly learn how to use the MODE NAVI

MODE NAVI uses six indicators to display the amplifier's basic operations. The current operating mode can be confirmed at a glance, so even a first time user can easily operate the amplifier without becoming confused.

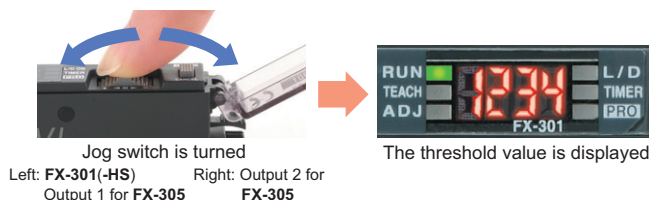
RUN 	RUN → This is the sensing mode. Incident light level is displayed in the digital display.
TEACH 	
ADJ 	
RUN 	
TEACH 	TEACH → This mode is for setting the threshold value.
ADJ 	
RUN 	
TEACH 	
ADJ 	ADJ → In this mode, the threshold value, once set, may be fine-tuned.



-  **L / D** **ON**→
 **TIMER**
 **PRO**
 This mode allows the selection of output operation as either Light-ON or Dark-ON.
-  **L / D** **TIMER**→
 **TIMER**
 **PRO**
 This mode permits the choice of using or not using the timer.
-  **L / D** **PRO**→
 **TIMER**
 **PRO**
 This mode allows the selection of further advanced functions, such as the copying of individual settings and the memory functions.

Easy confirming of threshold value settings

The threshold value can be confirmed by turning the jog switch even during RUN mode.

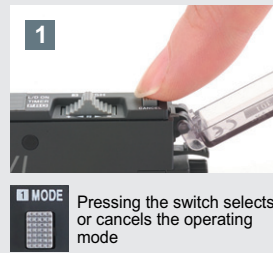


The use of only two switches makes for very simple operations

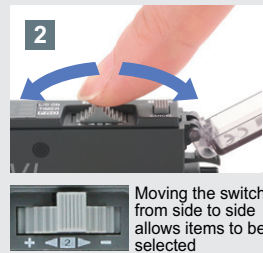
All models

Only two switches, the large jog switch and the large MODE key, are required for operation. You can operate it simply by the 3 steps shown on the right.

• Large MODE key



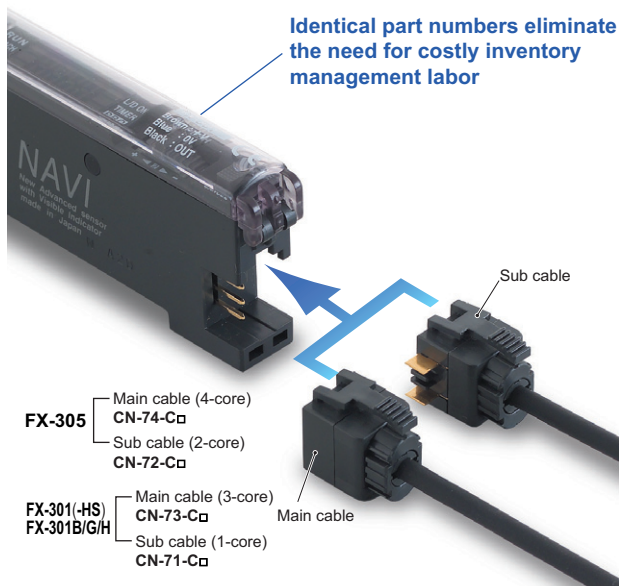
• Large jog switch



A quick-connection cable saves wiring and work-hours **FX-301/B/G/H** **FX-301-HS** **FX-305**

One unit can be used as either a main unit or sub unit

The amplifier unit can be used as either a main unit or a sub unit. This feature allows for easy mounting in the side-by-side configuration. The main and sub unit functions are distinguished only by the proper use of the main cable and the sub cable. Moreover, inventory management and maintenance is simplified.



An optical communication function allows up to *16 sensors to be adjusted simultaneously **FX-301** **FX-305**

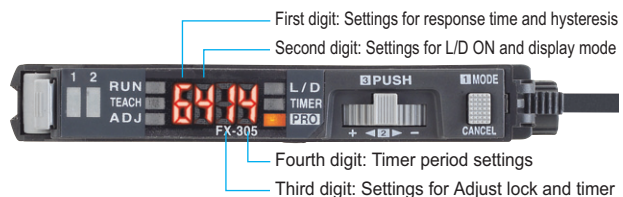
The optical communication function allows the data that is currently set to be copied and saved all at once for all amplifiers connected together from the right side. This greatly reduces troublesome setup tasks and makes setup much smoother. In addition, troublesome adjustment operations at times such as when replacing sensors can also be carried out easily and data can also be copied and stored using the optical communication function.



* Use the optical communication function for only the same types of sensors. Furthermore, the FX-301-HS is not equipped with optical communication function capability.

Settings can be entered directly using numerical input **All models**

Every function can be directly set merely by the input of a four digit code (numbers) from the code table. This convenient feature is easy to set up. In the event that settings are accidentally changed at the operating site, merely entering the correct code can restore the original settings. This results in easy and quick maintenance.



Communication unit improves equipment starting up and maintenance **FX-301** **FX-305**

External input unit for digital sensor **FX-CH2**

Teaching and changing settings can be performed by using the PLC and touch panel.

Various settings and switching of up to 16 units of digital fiber sensors can be accomplished at once without operating the actual sensors themselves, but via external signals, such as the PLC, touch panel, and push buttons.

<Main functions>

- Batch teaching.
- Key lock setting
- Batch loading / saving of the data bank.



Refer to p.199 for details

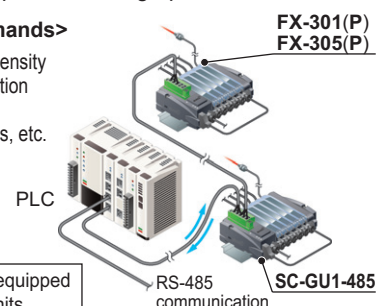
Upstream communication unit for digital sensor **SC-GU1-485**

We now offer remote maintenance for digital sensors!

The communication unit enables inputs to the digital fiber sensors (such as teaching and data bank switching) to be carried out via a PLC or a personal computer, and also allows confirming of the incident light intensity an output status for the fiber sensors. This greatly improves workability during equipment starting up and maintenance.

<Communicable commands>

- Sensor incident light intensity
- Sensor settings verification
- Sensor output status
- Threshold value settings, etc.



Compatible with all PLCs equipped with RS-485 compatible units

Refer to p.201~ for details

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FX-301-F

Other Products

ORDER GUIDE**Amplifiers**

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

Type	Appearance	Model No.	Emitting element	Output	Quick-connection cables			
					Type	Model No.	Length	
Standard type		FX-301	Red LED	NPN open-collector transistor	Main cable (3-core)	CN-73-C1	1 m 3.281 ft	
		FX-301P		PNP open-collector transistor				
		FX-301B	Blue LED	NPN open-collector transistor		CN-73-C2	2 m 6.562 ft	
		FX-301BP		PNP open-collector transistor				
		FX-301G	Green LED	NPN open-collector transistor		CN-73-C5	5 m 16.404 ft	
		FX-301GP		PNP open-collector transistor				
		FX-301H	Infrared LED	NPN open-collector transistor	CN-71-C1	1 m 3.281 ft		
		FX-301HP		PNP open-collector transistor	CN-71-C2	2 m 6.562 ft		
		High-speed type	FX-301-HS	Red LED	NPN open-collector transistor	Sub cable (1-core)	CN-71-C5	5 m 16.404 ft
			FX-301P-HS		PNP open-collector transistor			
High-function type		FX-305	Red LED	NPN open-collector transistor	Main cable (4-core)	CN-74-C1	1 m 3.281 ft	
						CN-74-C2	2 m 6.562 ft	
						CN-74-C5	5 m 16.404 ft	
		FX-305P	PNP open-collector transistor	Sub cable (2-core)	CN-72-C1	1 m 3.281 ft		
					CN-72-C2	2 m 6.562 ft		
					CN-72-C5	5 m 16.404 ft		

ORDER GUIDE

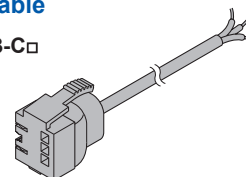
Quick-connection cables

For FX-301(-HS)/B/G/H 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	

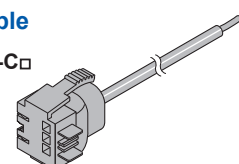
Main cable

- **CN-73-C□**



Sub cable

- **CN-71-C□**

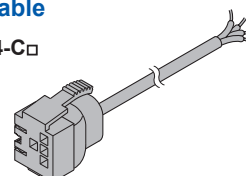


For FX-305 Quick-connection cable is not supplied with the amplifier. Please order it separately.

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	

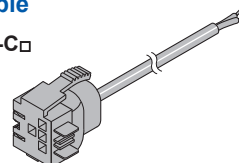
Main cable

- **CN-74-C□**

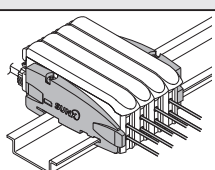


Sub cable

- **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

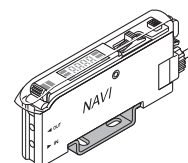
OPTIONS

Designation	Model No.	Description
Amplifier mounting bracket	MS-DIN-2	Mounting bracket for amplifier
Fiber amplifier protection seal	FX-MB1	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.

Note: Fiber amplifier protection seals are supplied with the **FX-301(P)** and **FX-305(P)**.

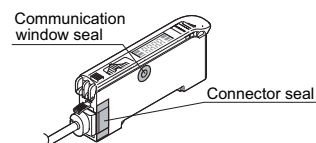
Amplifier mounting bracket

- **MS-DIN-2**



Fiber amplifier protection seal

- **FX-MB1**



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LIST OF FIBERS

FX-305 / FX-301 (Red LED type) sensing range (Note 1)

Thru-beam type (one pair set)



The **FX-305** and **FX-301(-HS)** have different sensing modes.

FX-305: H-SP, FAST, STD, STDF, LONG, U-LG (no S-D mode)

FX-301(-HS): S-D, H-SP, FAST, STD, LONG (no STDF or U-LG mode)

Fibers are listed in alphabetic order. Refer to p.63~ "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 2)							Dimensions
	Red LED							
	U-LG	LONG	STDF	STD	FAST	H-SP	S-D	
FT-A8	3,500 137.795 (Note 3)	3,500 137.795 (Note 3)	3,300 129.921	1,500 59.055	1,100 43.307	1,080 42.520	750 29.528	P.106
FT-A30	3,500 137.795 (Note 3)	3,500 137.795 (Note 3)	3,500 137.795 (Note 3)	3,500 137.795 (Note 3)	3,500 137.795 (Note 3)	3,000 118.110	3,500 137.795 (Note 3)	P.106
FT-AFM2	850 33.465	650 25.591	380 14.961	330 12.992	220 8.661	100 3.937	115 4.528	P.106
FT-AFM2E	800 31.496	590 23.228	350 13.780	290 11.417	200 7.874	90 3.543	100 3.937	P.106
FT-B8	1,600 62.992	1,100 43.307	700 27.559	530 20.866	400 15.748	200 7.874	180 7.087	P.106
FT-E12	20 0.787	18 0.709	13 0.512	10 0.394	8 0.315	3 0.118	3 0.118	P.106
FT-E22	130 5.118	80 3.150	60 2.362	50 1.969	36 1.417	18 0.709	15 0.591	P.106
FT-FM2	1,000 39.370	780 30.709	500 19.685	400 15.748	280 11.024	150 5.906	130 5.118	P.106
FT-FM2S	1,000 39.370	780 30.709	500 19.685	400 15.748	280 11.024	150 5.906	130 5.118	P.106
FT-FM2S4	1,000 39.370	780 30.709	500 19.685	400 15.748	280 11.024	150 5.906	130 5.118	P.106
FT-FM10L	19,500 767.715	19,500 767.715	19,500 767.715	14,000 551.180	10,000 393.700	3,500 137.795	3,800 149.606	P.106
FT-H13-FM2	1,200 47.244	880 34.646	550 21.654	440 17.323	300 11.811	150 5.906	155 6.102	P.106
FT-H20-J20-S (Note 4)	530 20.866	390 15.354	225 8.858	200 7.874	140 5.512	60 2.362	60 2.362	P.107
FT-H20-J30-S (Note 4)	530 20.866	390 15.354	225 8.858	200 7.874	140 5.512	60 2.362	60 2.362	P.107
FT-H20-J50-S (Note 4)	530 20.866	390 15.354	225 8.858	200 7.874	140 5.512	60 2.362	60 2.362	P.107
FT-H20-M1	750 29.528	550 21.654	320 12.598	280 11.024	200 7.874	85 3.346	90 3.543	P.107
FT-H20-VJ50-S (Note 4)	840 33.071	550 21.654	370 14.567	280 11.024	200 7.874	90 3.543	90 3.543	P.107
FT-H20-VJ80-S (Note 4)	840 33.071	550 21.654	370 14.567	280 11.024	200 7.874	90 3.543	90 3.543	P.107
FT-H20W-M1	420 16.535	310 12.205	180 7.087	140 5.512	100 3.937	40 1.575	50 1.969	P.107
FT-H30-M1V-S (Note 5)	350 13.780	250 9.843	150 5.906	125 4.921	90 3.543	50 1.969	40 1.575	P.107
FT-H35-M2	750 29.528	550 21.654	330 12.992	280 11.024	200 7.874	85 3.346	90 3.543	P.107
FT-H35-M2S6	750 29.528	550 21.654	330 12.992	280 11.024	200 7.874	85 3.346	90 3.543	P.107
FT-HL80Y	3,500 137.795	3,500 137.795	1,800 70.866	1,350 53.150	900 35.433	450 17.717	480 18.898	P.107
FT-K8	3,000 118.110	2,000 78.740	1,500 59.055	1,000 39.370	800 31.496	300 11.811	350 13.780	P.108
FT-KV1	600 23.622	500 19.685	300 11.811	250 9.843	180 7.087	90 3.543	100 3.937	P.108
FT-KV8	3,000 118.110	2,000 78.740	1,500 59.055	1,000 39.370	800 31.496	300 11.811	350 13.780	P.108
FT-L80Y	3,500 137.795	3,500 137.795	2,000 78.740	1,500 59.055	1,000 39.370	500 19.685	530 20.866	P.108
FT-NFM2	400 15.748	270 10.630	200 7.874	140 5.512	100 3.937	55 2.165	49 1.929	P.108
FT-NFM2S	400 15.748	270 10.630	200 7.874	140 5.512	100 3.937	55 2.165	49 1.929	P.108
FT-NFM2S4	400 15.748	270 10.630	200 7.874	140 5.512	100 3.937	55 2.165	49 1.929	P.108
FT-P2	350 13.780	280 11.024	160 6.299	120 4.724	90 3.543	40 1.575	42 1.654	P.108
FT-P40	350 13.780	250 9.843	150 5.906	100 3.937	75 2.953	30 1.181	35 1.378	P.108
FT-P60	550 21.654	400 15.748	250 9.843	190 7.480	140 5.512	70 2.756	80 3.150	P.108
FT-P80	900 35.433	650 25.591	400 15.748	320 12.598	230 9.055	100 3.937	110 4.331	P.108
FT-P81X	900 35.433	650 25.591	380 14.961	320 12.598	230 9.055	100 3.937	110 4.331	P.108
FT-PS1	100 3.937	80 3.150	50 1.969	40 1.575	30 1.181	13 0.512	17 0.669	P.109

Notes: 1) Refer to p.76 for the sensing ranges for the **FX-301-HS** in H-SP mode and for the **FX-301B/G/H**.

2) Please take care 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 fiber cable length practically limits the sensing range to 3,500 mm 137.795 in long.

4) Heat-resistant joint fibers and ordinary-temperature fibers (**FT-FM2**) are sold as a set. Please refer to p.93~ for details.

5) Sold as a set comprising vacuum type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**). Please refer to p.91~ for details.

LIST OF FIBERS**FX-305 / FX-301 (Red LED type) sensing range (Note 1)****Thru-beam type (one pair set)**The **FX-305** and **FX-301(-HS)** have different sensing modes.**FX-305:** H-SP, FAST, STD, STDF, LONG, U-LG (no S-D mode)**FX-301(-HS):** S-D, H-SP, FAST, STD, LONG (no STDF or U-LG mode)

Fibers are listed in alphabetic order. Refer to p.63~ "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 2)							Dimensions
	Red LED							
	U-LG	LONG	STDF	STD	FAST	H-SP	S-D	
FT-R80	740 29.134	530 20.866	320 12.598	230 9.055	150 5.906	75 2.953	80 3.150	P.109
FT-SFM2	1,000 39.370	780 30.709	500 19.685	400 15.748	280 11.024	150 5.906	130 5.118	P.109
FT-SFM2L	2,000 78.740	1,600 62.992	820 32.283	800 31.496	580 22.835	170 6.693	280 11.024	P.109
FT-SFM2SV2	550 21.654	400 15.748	240 9.449	200 7.874	140 5.512	65 2.559	70 2.756	P.109
FT-SNFM2	400 15.748	270 10.630	200 7.874	140 5.512	100 3.937	55 2.165	49 1.929	P.109
FT-T80	1,000 39.370	780 30.709	500 19.685	400 15.748	280 11.024	150 5.906	130 5.118	P.109
FT-V10	2,350 92.520	2,000 78.740	1,400 55.118	1,000 39.370	800 31.496	340 13.386	350 13.780	P.109
FT-V22	410 16.142	390 15.354	220 8.661	180 7.087	125 4.921	60 2.362	63 2.480	P.109
FT-V41	220 8.661	175 6.890	100 3.937	80 3.150	60 2.362	25 0.984	27 1.063	P.109
FT-V80Y	1,000 39.370	800 31.496	500 19.685	400 15.748	280 11.024	120 4.724	140 5.512	P.109
FT-W4	220 8.661	160 6.299	100 3.937	80 3.150	55 2.165	25 0.984	28 1.102	P.109
FT-W8	750 29.528	570 22.441	350 13.780	290 11.417	200 7.874	90 3.543	100 3.937	P.110
FT-WA8	3,500 137.795 (Note 3)	3,500 137.795 (Note 3)	3,300 129.921	1,500 59.055	1,100 43.307	1,080 42.520	750 29.528	P.110
FT-WA30	3,500 137.795 (Note 3)	3,500 137.795 (Note 3)	3,500 137.795 (Note 3)	3,500 137.795 (Note 3)	3,500 137.795 (Note 3)	3,000 118.110	3,500 137.795 (Note 3)	P.110
FT-WKV8	2,200 86.614	1,700 66.929	1,000 39.370	700 27.559	600 23.622	280 11.024	300 11.811	P.110
FT-WR80	750 29.528	570 22.441	350 13.780	290 11.417	200 7.874	90 3.543	100 3.937	P.110
FT-WR80L	1,500 59.055	1,200 47.244	750 29.528	600 23.622	420 16.535	200 7.874	210 8.268	P.110
FT-WS3	780 30.709	570 22.441	340 13.386	290 11.417	200 7.874	90 3.543	100 3.937	P.110
FT-WS4	220 8.661	160 6.299	100 3.937	80 3.150	55 2.165	25 0.984	28 1.102	P.110
FT-WS8	750 29.528	570 22.441	350 13.780	290 11.417	200 7.874	90 3.543	100 3.937	P.110
FT-WS8L	1,500 59.055	1,200 47.244	750 29.528	600 23.622	420 16.535	200 7.874	210 8.268	P.110
FT-WV42	120 4.724	90 3.543	55 2.165	40 1.575	30 1.181	13 0.512	15 0.591	P.110
FT-WZ4	300 11.811	200 7.874	140 5.512	100 3.937	70 2.756	40 1.575	40 1.575	P.110
FT-WZ4HB	220 8.661	150 5.906	105 4.134	75 2.953	50 1.969	30 1.181	30 1.181	P.111
FT-WZ7	660 25.984	440 17.323	308 12.126	220 8.661	150 5.906	80 3.150	80 3.150	P.111
FT-WZ7HB	870 34.252	580 22.835	406 15.984	290 11.417	210 8.268	110 4.331	110 4.331	P.111
FT-WZ8	950 37.402	700 27.559	420 16.535	330 12.992	240 9.449	100 3.937	120 4.724	P.111
FT-WZ8E	2,100 82.677	1,500 59.055	950 37.402	700 27.559	500 19.685	200 7.874	210 8.268	P.111
FT-WZ8H	3,500 137.795	2,500 98.425	1,600 62.992	1,200 47.244	850 33.465	400 15.748	410 16.142	P.111
FT-Z8	1,100 43.307	800 31.496	500 19.685	400 15.748	300 11.811	120 4.724	140 5.512	P.111
FT-Z8E	1,850 72.835	1,600 62.992	950 37.402	800 31.496	600 23.622	250 9.843	280 11.024	P.111
FT-Z8H	3,100 122.047	2,700 106.299	1,550 61.024	1,400 55.118	1,000 39.370	420 16.535	490 19.291	P.111
FT-Z802Y	3,500 137.795	3,500 137.795	3,000 118.110	1,500 59.055	1,000 39.370	500 19.685	530 20.866	P.111

Notes: 1) Refer to p.76 for the sensing ranges for the **FX-301-HS** in H-SP mode and for the **FX-301B/G/H**.

2) Please take care 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 fiber cable length practically limits the sensing range to 3,500 mm 137.795 in long.

FIBER
SENSORSLASER
SENSORSPHOTO-
ELECTRIC
SENSORSMICRO
PHOTO-
ELECTRIC
SENSORSAREA
SENSORSSAFETY
COMPONENTSPRESSURE
SENSORSINDUCTIVE
PROXIMITY
SENSORSPARTICULAR
USE
SENSORSSENSOR
OPTIONSWIRE-
SAVING
SYSTEMSMEASURE-
MENT
SENSORSSTATIC
CONTROL
DEVICESLASER
MARKERSSelection
Guide

Fibers

FT / FD / FR

Fiber Sensor
Amplifiers**FX-100****FX-300****FX-410****FX-311****FX-11A****FX-301-F**Other
Products

LIST OF FIBERS

FX-305 / FX-301 (Red LED type) sensing range (Note 1)

Retroreflective type



The **FX-305** and **FX-301(-HS)** have different sensing modes.

FX-305: H-SP, FAST, STD, STDF, LONG, U-LG (no S-D mode)

FX-301(-HS): S-D, H-SP, FAST, STD, LONG (no STDF or U-LG mode)

Fibers are listed in alphabetic order. Refer to p.63~ "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 2, 3)							Dimensions
	Red LED							
	U-LG	LONG	STDF	STD	FAST	H-SP	S-D	
FR-KV1	15 to 370 0.591 to 14.567	15 to 330 0.591 to 12.992	15 to 240 0.591 to 9.449	15 to 210 0.591 to 8.268	15 to 170 0.591 to 6.693	15 to 80 0.591 to 3.150	15 to 90 0.591 to 3.543	P.112
FR-KZ21	200 7.874	200 7.874	200 7.874	200 7.874	200 7.874	200 7.874	200 7.874	P.112
FR-KZ21E	200 7.874	200 7.874	200 7.874	200 7.874	200 7.874	200 7.874	200 7.874	P.112
FR-WKZ11	100 to 910 3.937 to 35.827	100 to 730 3.937 to 28.740	100 to 600 3.937 to 23.622	100 to 520 3.937 to 20.472	100 to 460 3.937 to 18.110	————	————	P.112

Notes: 1) Refer to p.76 for the sensing ranges for the **FX-301-HS** in H-SP mode and for the **FX-301B/G/H**.

2) Please take care 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.

3) The sensing range of **FR-KV1** is the possible setting range for the reflector. The fiber can detect an object less than 15 mm **0.591 in** away.

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-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.

FX-305 / FX-301 (Red LED type) sensing range (Note 1)

Reflective type



The **FX-305** and **FX-301(-HS)** have different sensing modes.

FX-305: H-SP, FAST, STD, STDF, LONG, U-LG (no S-D mode)

FX-301(-HS): S-D, H-SP, FAST, STD, LONG (no STDF or U-LG mode)

Fibers are listed in alphabetic order. Refer to p.63~ "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 2, 3)							Dimensions
	Red LED							
	U-LG	LONG	STDF	STD	FAST	H-SP	S-D	
FD-A15	230 9.055	200 7.874	150 5.906	150 5.906	100 3.937	45 1.772	50 1.969	P.113
FD-AFM2	290 11.417	220 8.661	135 5.315	110 4.331	78 3.071	35 1.378	39 1.535	P.113
FD-AFM2E	290 11.417	220 8.661	135 5.315	110 4.331	78 3.071	35 1.378	39 1.535	P.113
FD-B8	600 23.622	480 18.898	280 11.024	220 8.661	160 6.299	85 3.346	75 2.953	P.113
FD-E12	15 0.591	11 0.433	8 0.315	6 0.236	4 0.157	2 0.079	1 0.039	P.113
FD-E22	65 2.559	45 1.772	28 1.102	23 0.906	17 0.669	8 0.315	7 0.276	P.113
FD-EG1	50 1.969	38 1.496	25 0.984	18 0.709	14 0.551	5 0.197	6 0.236	P.113
FD-EG2	40 1.575	25 0.984	14 0.551	12 0.472	9 0.354	3 0.118	5 0.197	P.113
FD-EG3	20 0.787	15 0.591	9 0.354	8 0.315	5 0.197	2.5 0.098	3 0.118	P.113
FD-EN500S1	6.5 0.256	5 0.197	3 0.118	3 0.118	2 0.079	Cannot use	Cannot use	P.113
FD-ENM1S1	50 1.969	38 1.496	20 0.787	18 0.709	14 0.551	5 0.197	6 0.236	P.114
FD-F4	Applicable pipe diameter: Outer dia. ø6 to ø26 mm ø0.236 to ø1.024 in transparent pipe [PFA (fluorine resin) or equivalently transparent pipe, wall thickness 1 mm 0.039 in]							P.114
FD-F41	Applicable pipe diameter: Outer dia. ø6 to ø26 mm ø0.236 to ø1.024 in transparent pipe [PVC (vinyl chloride), fluorine resin, polycarbonate, acrylic, glass, wall thickness 1 to 3 mm 0.039 to 0.118 in]							P.114
FD-F8Y	————	————	————	————	————	————	————	P.114
FD-FM2	410 16.142	310 12.205	200 7.874	140 5.512	100 3.937	55 2.165	47 1.850	P.114
FD-FM2S	370 14.567	270 10.630	170 6.693	110 4.331	85 3.346	45 1.772	39 1.535	P.114
FD-FM2S4	370 14.567	270 10.630	170 6.693	110 4.331	85 3.346	45 1.772	39 1.535	P.114
FD-G4	150 5.906	110 4.331	65 2.559	55 2.165	42 1.654	15 0.591	19 0.748	P.114
FD-G6	150 5.906	110 4.331	65 2.559	55 2.165	42 1.654	15 0.591	19 0.748	P.114
FD-G6X	150 5.906	90 3.543	48 1.890	45 1.772	35 1.378	12 0.472	20 0.787	P.114
FD-H13-FM2	410 16.142	310 12.205	200 7.874	140 5.512	100 3.937	55 2.165	47 1.850	P.114
FD-H18-L31	0 to 20 0 to 0.787	0 to 15 0 to 0.591	0 to 10 0 to 0.394	0 to 10 0 to 0.394	1 to 8 0.039 to 0.315	Cannot use	2 to 6 0.079 to 0.236	P.115
FD-H20-21	300 11.811	270 10.630	150 5.906	140 5.512	100 3.937	35 1.378	47 1.850	P.115

Notes: 1) Refer to p.76 for the sensing ranges for the **FX-301-HS** in H-SP mode and for the **FX-301B/G/H**.

2) The standard sensing objects of the sensing ranges vary depending on the fibers. Refer to p.71~ for details.

3) Please take care 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**FX-305 / FX-301 (Red LED type) sensing range (Note 1)****Reflective type**The **FX-305** and **FX-301(-HS)** have different sensing modes.**FX-305:** H-SP, FAST, STD, STDF, LONG, U-LG (no S-D mode)**FX-301(-HS):** S-D, H-SP, FAST, STD, LONG (no STDF or U-LG mode)

Fibers are listed in alphabetic order. Refer to p.63~ "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 2, 3)							Dimensions
	Red LED							
	U-LG	LONG	STDF	STD	FAST	H-SP	S-D	
FD-H20-M1	300 11.811	270 10.630	150 5.906	140 5.512	100 3.937	35 1.378	47 1.850	P.115
FD-H30-KZ1V-S (Note 4)	20 to 300 0.787 to 11.811	20 to 200 0.787 to 7.874	20 to 150 0.787 to 5.906	25 to 130 0.984 to 5.118	30 to 100 1.181 to 3.937	Cannot use	Cannot use	P.115
FD-H30-L32	0 to 20 0 to 0.787	0 to 15 0 to 0.591	0 to 10 0 to 0.394	0 to 10 0 to 0.394	1 to 8 0.039 to 0.315	Cannot use	2 to 6 0.079 to 0.236	P.115
FD-H30-L32V-S (Note 4)	0 to 11 0 to 0.433	0 to 8 0 to 0.315	1.5 to 6 0.059 to 0.236	1.5 to 5 0.059 to 0.197	2 to 4 0.079 to 0.157	Cannot use	Cannot use	P.115
FD-H35-20S	190 7.480	160 6.299	80 3.150	80 3.150	57 2.244	20 0.787	26 1.024	P.116
FD-H35-M2	300 11.811	270 10.630	150 5.906	140 5.512	100 3.937	35 1.378	47 1.850	P.116
FD-H35-M2S6	300 11.811	270 10.630	150 5.906	140 5.512	100 3.937	35 1.378	47 1.850	P.116
FD-L4	2 to 20 0.079 to 0.787 (Convergent point 6 0.236)	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 to 12 0.157 to 0.472 (Convergent point 6 0.236)	4.5 to 11 0.177 to 0.433 (Convergent point 6 0.236)	5 to 8.5 0.197 to 0.335 (Convergent point 6 0.236)	4.8 to 9.5 0.189 to 0.374 (Convergent point 6 0.236)	P.116
FD-L41	2 to 19 0.079 to 0.748 (Convergent point 8 0.315)	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)	3 to 16 0.118 to 0.630 (Convergent point 8 0.315)	3.5 to 15 0.138 to 0.591 (Convergent point 8 0.315)	Cannot use	Cannot use	P.116
FD-L43	—	—	—	0 to 23 0 to 0.906	—	—	—	P.116
FD-L44	0 to 8.2 0 to 0.323	0 to 7 0 to 0.276	0 to 6.5 0 to 0.256	0 to 6 0 to 0.236	0 to 5.7 0 to 0.224	0 to 5 0 to 0.197	0 to 5.2 0 to 0.205	P.116
FD-L44S	0 to 4.7 0 to 0.185	0 to 4.5 0 to 0.177	0 to 4 0 to 0.157	0 to 4 0 to 0.157	0 to 3.8 0 to 0.150	0 to 3 0 to 0.118	0 to 3.5 0 to 0.138	P.116
FD-L45	0 to 50 0 to 1.969	0 to 36 0 to 1.417	0 to 33 0 to 1.299	0 to 30 0 to 1.181	0 to 30 0 to 1.181	0 to 15 0 to 0.591	0 to 21 0 to 0.827	P.116
FD-L46	12 to 50 0.472 to 1.969	12.5 to 37.5 0.492 to 1.476	15 to 36 0.591 to 1.417	15 to 35 0.591 to 1.378	16 to 29 0.630 to 1.142	Cannot use	Cannot use	P.116
FD-NFM2	140 5.512	90 3.543	60 2.362	45 1.772	35 1.378	16 0.630	16 0.630	P.117
FD-NFM2S	140 5.512	90 3.543	60 2.362	45 1.772	35 1.378	16 0.630	16 0.630	P.117
FD-NFM2S4	140 5.512	90 3.543	60 2.362	45 1.772	35 1.378	16 0.630	16 0.630	P.117
FD-P2	80 3.150	50 1.969	30 1.181	25 0.984	19 0.748	7.5 0.295	9 0.354	P.117
FD-P40	50 1.969	36 1.417	20 0.787	18 0.709	14 0.551	5.5 0.217	6 0.236	P.117
FD-P50	130 5.118	90 3.543	55 2.165	45 1.772	30 1.181	13 0.512	16 0.630	P.117
FD-P60	130 5.118	90 3.543	55 2.165	45 1.772	30 1.181	13 0.512	16 0.630	P.117
FD-P80	300 11.811	220 8.661	130 5.118	100 3.937	70 2.756	30 1.181	35 1.378	P.117
FD-P81X	270 10.630	185 7.283	100 3.937	80 3.150	60 2.362	30 1.181	35 1.378	P.117
FD-R80	240 9.449	185 7.283	110 4.331	85 3.346	60 2.362	25 0.984	30 1.181	P.117
FD-S80	370 14.567	270 10.630	170 6.693	110 4.331	85 3.346	45 1.772	39 1.535	P.117
FD-SFM2SV2	170 6.693	100 3.937	55 2.165	45 1.772	32 1.260	15 0.591	16 0.630	P.117
FD-SNFM2	140 5.512	90 3.543	60 2.362	45 1.772	35 1.378	16 0.630	16 0.630	P.118
FD-T40	140 5.512	90 3.543	60 2.362	45 1.772	35 1.378	16 0.630	16 0.630	P.118
FD-T80	370 14.567	270 10.630	170 6.693	110 4.331	85 3.346	45 1.772	39 1.535	P.118
FD-V41	80 3.150	55 2.165	30 1.181	25 0.984	17 0.669	8 0.315	9 0.354	P.118
FD-W8	250 9.843	190 7.480	110 4.331	90 3.543	60 2.362	25 0.984	32 1.260	P.118
FD-W44	40 1.575	30 1.181	18 0.709	15 0.591	12 0.472	4.5 0.177	5 0.197	P.118
FD-WG4	85 3.346	65 2.559	37 1.457	32 1.260	25 0.984	10 0.394	11 0.433	P.118
FD-WKZ1	20 to 660 0.787 to 25.984	20 to 480 0.787 to 18.898	20 to 300 0.787 to 11.811	20 to 230 0.787 to 9.055	20 to 170 0.787 to 6.693	25 to 90 0.984 to 3.543	25 to 100 0.984 to 3.937	P.118
FD-WL41	6.5 to 14.5 0.256 to 0.571 (Convergent point 8 0.315)	6.5 to 14 0.256 to 0.551 (Convergent point 8 0.315)	7 to 14 0.276 to 0.551 (Convergent point 8 0.315)	7 to 12 0.276 to 0.472 (Convergent point 8 0.315)	7.5 to 12 0.295 to 0.472 (Convergent point 8 0.315)	Cannot use	Cannot use	P.118
FD-WL48	0.5 to 8.5 0.020 to 0.335	0.5 to 7.5 0.020 to 0.295	1 to 6.5 0.039 to 0.256	1 to 5.5 0.039 to 0.217	1 to 5 0.039 to 0.197	Cannot use	Cannot use	P.119
FD-WS8	250 9.843	190 7.480	110 4.331	90 3.543	60 2.362	25 0.984	32 1.260	P.119
FD-WSG4	85 3.346	65 2.559	37 1.457	32 1.260	25 0.984	10 0.394	11 0.433	P.119
FD-WT4	40 1.575	30 1.181	18 0.709	15 0.591	12 0.472	4.5 0.177	5 0.197	P.119
FD-WT8	250 9.843	190 7.480	110 4.331	90 3.543	60 2.362	25 0.984	32 1.260	P.119
FD-WV42	20 0.787	15 0.591	8.5 0.335	7 0.276	5 0.197	Cannot use	Cannot use	P.119
FD-WZ4	1 to 50 0.039 to 1.969	1.5 to 34 0.059 to 1.339	2 to 24 0.079 to 0.945	3 to 17 0.118 to 0.669	3 to 10 0.118 to 0.394	—	—	P.119
FD-WZ4HB	1 to 70 0.039 to 2.756	1 to 46 0.039 to 1.811	1 to 32.2 0.039 to 1.268	2.5 to 23 0.098 to 0.906	2.5 to 15 0.098 to 0.591	3 to 7 0.118 to 0.276	3 to 7 0.118 to 0.276	P.119
FD-WZ7	200 7.874	120 4.724	1 to 84 0.039 to 3.307	1 to 60 0.039 to 2.362	1.5 to 35 0.059 to 1.378	2.5 to 18 0.098 to 0.709	2.5 to 18 0.098 to 0.709	P.119
FD-WZ7HB	0.5 to 270 0.020 to 10.630	0.5 to 180 0.020 to 7.087	1 to 126 0.039 to 4.961	1 to 90 0.039 to 3.543	1 to 70 0.039 to 2.756	1 to 35 0.039 to 1.378	1 to 35 0.039 to 1.378	P.119

Notes: 1) Refer to p.76 for the sensing ranges for the **FX-301-HS** in H-SP mode and for the **FX-301B/G/H**.

2) The standard sensing objects of the sensing ranges vary depending on the fibers. Refer to p.71~ for details.

3) Please take care that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

4) Sold as a set comprising vacuum type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**). Please refer to p.91~ for details.

FIBER SENSORS

LASER SENSORS

PHOTO-ELECTRIC SENSORS

MICRO PHOTO-ELECTRIC SENSORS

AREA SENSORS

SAFETY COMPONENTS

PRESSURE SENSORS

INDUCTIVE PROXIMITY SENSORS

PARTICULAR USE SENSORS

SENSOR OPTIONS

WIRE- SAVING SYSTEMS

MEASURE- MENT SENSORS

STATIC CONTROL DEVICES

LASER MARKERS

Selection Guide

Fibers

FT / FD / FR

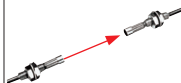
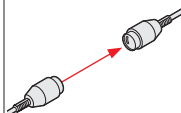

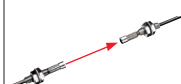
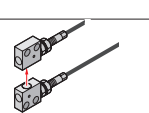
Fiber Sensor Amplifiers

FX-100**FX-300****FX-410****FX-311****FX-11A****FX-301-F**

Other Products

LENS FOR FIBERS (OPTIONAL)**Lens (for thru-beam type fiber)**


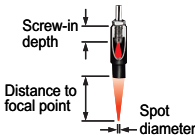
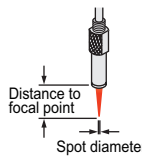
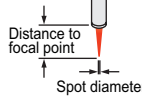
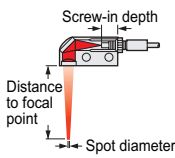
The dimensions are on p.120~.

Designation		Model No.	Description																																																																																																									
For thru-beam type fiber	Expansion lens (Note 1)	FX-LE1		Increases the sensing range by 5 times or more. • Ambient temperature: -60 to +350 °C -76 to +662 °F (Note 5)	Sensing range for red LED type (mm) [Lens on both sides] (Note 3) <table><tr><th>Fiber \ Mode</th><th>U-LG</th><th>LONG</th><th>STDF</th><th>STD</th><th>FAST</th><th>S-D</th><th>H-SP</th></tr><tr><td>FT-B8</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,000</td><td>2,500</td><td>2,000</td><td>1,000</td><td>1,000</td></tr><tr><td>FT-FM2</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>2,500</td><td>1,300</td><td>1,000</td></tr><tr><td>FT-T80</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>2,500</td><td>1,300</td><td>1,000</td></tr><tr><td>FT-R80</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>2,300</td><td>1,600</td><td>800</td><td>750</td></tr><tr><td>FT-W8</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>2,900</td><td>2,000</td><td>1,000</td><td>900</td></tr><tr><td>FT-P80</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>2,500</td><td>1,100</td><td>1,000</td></tr><tr><td>FT-P60</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>1,500</td><td>900</td><td>800</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>1,100</td><td>950</td></tr><tr><td>FT-H35-M2</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>2,500</td><td>2,000</td><td>1,500</td><td>750</td><td>700</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>1,300</td><td>900</td><td>500</td><td>400</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>1,100</td><td>900</td><td>600</td></tr></table>								Fiber \ Mode	U-LG	LONG	STDF	STD	FAST	S-D	H-SP	FT-B8	3,500 (Note 2)	3,500 (Note 2)	3,000	2,500	2,000	1,000	1,000	FT-FM2	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	2,500	1,300	1,000	FT-T80	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	2,500	1,300	1,000	FT-R80	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	2,300	1,600	800	750	FT-W8	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	2,900	2,000	1,000	900	FT-P80	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	2,500	1,100	1,000	FT-P60	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	1,500	900	800	FT-P81X	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,100	950	FT-H35-M2	3,500 (Note 2)	3,500 (Note 2)	2,500	2,000	1,500	750	700	FT-H20W-M1	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,300	900	500	400	FT-H20-M1	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,100	900	600
	Fiber \ Mode	U-LG	LONG	STDF	STD	FAST	S-D	H-SP																																																																																																				
	FT-B8	3,500 (Note 2)	3,500 (Note 2)	3,000	2,500	2,000	1,000	1,000																																																																																																				
	FT-FM2	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	2,500	1,300	1,000																																																																																																				
	FT-T80	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	2,500	1,300	1,000																																																																																																				
FT-R80	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	2,300	1,600	800	750																																																																																																					
FT-W8	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	2,900	2,000	1,000	900																																																																																																					
FT-P80	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	2,500	1,100	1,000																																																																																																					
FT-P60	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	1,500	900	800																																																																																																					
FT-P81X	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,100	950																																																																																																					
FT-H35-M2	3,500 (Note 2)	3,500 (Note 2)	2,500	2,000	1,500	750	700																																																																																																					
FT-H20W-M1	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,300	900	500	400																																																																																																					
FT-H20-M1	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,600 (Note 2)	1,100	900	600																																																																																																					
Super-expansion lens (Note 1)	FX-LE2		Tremendously increases the sensing range with large diameter lenses. • Ambient temperature: -60 to +350 °C -76 to +662 °F (Note 5)	Sensing range for red LED type (mm) [Lens on both sides] (Note 3) <table><tr><th>Fiber \ Mode</th><th>U-LG</th><th>LONG</th><th>STDF</th><th>STD</th><th>FAST</th><th>S-D</th><th>H-SP</th></tr><tr><td>FT-B8</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td></tr><tr><td>FT-FM2</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td></tr><tr><td>FT-R80</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td></tr><tr><td>FT-W8</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td></tr><tr><td>FT-P80</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td></tr><tr><td>FT-P60</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</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><td>1,600 (Note 2)</td></tr><tr><td>FT-H35-M2</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (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>1,500</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><td>1,600 (Note 2)</td></tr><tr><td>FT-H13-FM2</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td></tr></table>								Fiber \ Mode	U-LG	LONG	STDF	STD	FAST	S-D	H-SP	FT-B8	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	FT-FM2	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	FT-R80	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	FT-W8	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	FT-P80	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	FT-P60	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	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)	1,600 (Note 2)	FT-H35-M2	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (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)	1,500	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)	1,600 (Note 2)	FT-H13-FM2	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	
Fiber \ Mode	U-LG	LONG	STDF	STD	FAST	S-D	H-SP																																																																																																					
FT-B8	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)																																																																																																					
FT-FM2	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)																																																																																																					
FT-R80	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)																																																																																																					
FT-W8	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)																																																																																																					
FT-P80	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)																																																																																																					
FT-P60	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)																																																																																																					
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)	1,600 (Note 2)																																																																																																					
FT-H35-M2	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (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)	1,500	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)	1,600 (Note 2)																																																																																																					
FT-H13-FM2	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)	3,500 (Note 2)																																																																																																					
Side-view lens	FX-SV1		Beam axis is bent by 90°. • Ambient temperature: -60 to +300 °C -76 to +572 °F (Note 5)	Sensing range for red LED type (mm) [Lens on both sides] (Note 3) <table><tr><th>Fiber \ Mode</th><th>U-LG</th><th>LONG</th><th>STDF</th><th>STD</th><th>FAST</th><th>S-D</th><th>H-SP</th></tr><tr><td>FT-B8</td><td>1,450</td><td>1,100</td><td>660</td><td>530</td><td>400</td><td>186</td><td>180</td></tr><tr><td>FT-FM2</td><td>1,800</td><td>1,200</td><td>810</td><td>600</td><td>440</td><td>210</td><td>210</td></tr><tr><td>FT-T80</td><td>1,800</td><td>1,200</td><td>810</td><td>600</td><td>440</td><td>210</td><td>210</td></tr><tr><td>FT-W8</td><td>1,300</td><td>900</td><td>600</td><td>450</td><td>330</td><td>160</td><td>160</td></tr><tr><td>FT-P80</td><td>1,800</td><td>1,200</td><td>810</td><td>600</td><td>440</td><td>210</td><td>210</td></tr><tr><td>FT-P60</td><td>850</td><td>650</td><td>400</td><td>300</td><td>200</td><td>130</td><td>120</td></tr><tr><td>FT-P81X</td><td>1,800</td><td>1,200</td><td>810</td><td>600</td><td>440</td><td>200</td><td>200</td></tr><tr><td>FT-H35-M2</td><td>840</td><td>550</td><td>370</td><td>280</td><td>200</td><td>90</td><td>90</td></tr><tr><td>FT-H20W-M1</td><td>400</td><td>310</td><td>180</td><td>140</td><td>100</td><td>50</td><td>50</td></tr><tr><td>FT-H20-M1</td><td>840</td><td>550</td><td>370</td><td>280</td><td>200</td><td>90</td><td>90</td></tr></table>								Fiber \ Mode	U-LG	LONG	STDF	STD	FAST	S-D	H-SP	FT-B8	1,450	1,100	660	530	400	186	180	FT-FM2	1,800	1,200	810	600	440	210	210	FT-T80	1,800	1,200	810	600	440	210	210	FT-W8	1,300	900	600	450	330	160	160	FT-P80	1,800	1,200	810	600	440	210	210	FT-P60	850	650	400	300	200	130	120	FT-P81X	1,800	1,200	810	600	440	200	200	FT-H35-M2	840	550	370	280	200	90	90	FT-H20W-M1	400	310	180	140	100	50	50	FT-H20-M1	840	550	370	280	200	90	90									
Fiber \ Mode	U-LG	LONG	STDF	STD	FAST	S-D	H-SP																																																																																																					
FT-B8	1,450	1,100	660	530	400	186	180																																																																																																					
FT-FM2	1,800	1,200	810	600	440	210	210																																																																																																					
FT-T80	1,800	1,200	810	600	440	210	210																																																																																																					
FT-W8	1,300	900	600	450	330	160	160																																																																																																					
FT-P80	1,800	1,200	810	600	440	210	210																																																																																																					
FT-P60	850	650	400	300	200	130	120																																																																																																					
FT-P81X	1,800	1,200	810	600	440	200	200																																																																																																					
FT-H35-M2	840	550	370	280	200	90	90																																																																																																					
FT-H20W-M1	400	310	180	140	100	50	50																																																																																																					
FT-H20-M1	840	550	370	280	200	90	90																																																																																																					
Expansion lens for vacuum fiber (Note 1)	FV-LE1		Sensing range increases by 4 times or more. • Ambient temperature: -60 to +350 °C -76 to +662 °F (Note 5)	Sensing range for red LED type (mm) [Lens on both sides] (Note 3, 5) <table><tr><th>Fiber \ Mode</th><th>U-LG</th><th>LONG</th><th>STDF</th><th>STD</th><th>FAST</th><th>S-D</th><th>H-SP</th></tr><tr><td>FT-H30-M1V</td><td>1,600</td><td>1,200</td><td>650</td><td>450</td><td>300</td><td>150</td><td>200</td></tr></table>								Fiber \ Mode	U-LG	LONG	STDF	STD	FAST	S-D	H-SP	FT-H30-M1V	1,600	1,200	650	450	300	150	200																																																																																	
Fiber \ Mode	U-LG	LONG	STDF	STD	FAST	S-D	H-SP																																																																																																					
FT-H30-M1V	1,600	1,200	650	450	300	150	200																																																																																																					
Vacuum resistant side-view lens (Note 1)	FV-SV2		Beam axis is bent by 90°. • Ambient temperature: -60 to +300 °C -76 to +572 °F (Note 5)	Sensing range for red LED type (mm) [Lens on both sides] (Note 3, 4) <table><tr><th>Fiber \ Mode</th><th>U-LG</th><th>LONG</th><th>STDF</th><th>STD</th><th>FAST</th><th>S-D</th><th>H-SP</th></tr><tr><td>FT-H30-M1V</td><td>1,600</td><td>1,200</td><td>650</td><td>450</td><td>300</td><td>150</td><td>200</td></tr></table>								Fiber \ Mode	U-LG	LONG	STDF	STD	FAST	S-D	H-SP	FT-H30-M1V	1,600	1,200	650	450	300	150	200																																																																																	
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FT-H30-M1V	1,600	1,200	650	450	300	150	200																																																																																																					

- 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 is 1 m **3.281 ft**. The sensing ranges in U-LG and LONG modes take into account the length of the FT-J8 atmospheric side fiber.
- 5) Refer to p.101~ for the ambient temperatures of fibers to be used in combination.

LENS FOR FIBERS (OPTIONAL)**Lens (for reflective type fiber)**

The dimensions are on p.121.

Designation		Model No.	Description															
For reflective type fiber	Pinpoint spot lens	FX-MR1		<p>Pinpoint spot of $\phi 0.5$ mm $\phi 0.020$ 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 inApplicable fibers: FD-WG4, FD-G4Ambient temperature: -40 to $+70$ °C -40 to $+158$ °F (Note 2)														
	Zoom lens	FX-MR2		<p>The spot diameter is adjustable from $\phi 0.7$ to $\phi 2$ mm $\phi 0.028$ to $\phi 0.079$ in according to how much the fiber is screwed in.</p> <p>Sensing range for red LED type (Note 1)</p> <table><thead><tr><th>Screw-in depth</th><th>Distance to focal point</th><th>Spot diameter</th></tr></thead><tbody><tr><td>7 mm 0.276 in</td><td>$\phi 18.5$ mm $\phi 0.728$ in approx.</td><td>$\phi 0.7$ mm $\phi 0.028$ in</td></tr><tr><td>12 mm 0.472 in</td><td>$\phi 27$ mm $\phi 1.063$ in approx.</td><td>$\phi 1.2$ mm $\phi 0.047$ in</td></tr><tr><td>14 mm 0.551 in</td><td>$\phi 43$ mm $\phi 1.693$ in approx.</td><td>$\phi 2.0$ mm $\phi 0.079$ in</td></tr></tbody></table> <ul style="list-style-type: none">Applicable fibers: FD-WG4, FD-G4Ambient temperature: -40 to $+70$ °C -40 to $+158$ °F (Note 2)Accessory: MS-EX-3 (mounting bracket)	Screw-in depth	Distance to focal point	Spot diameter	7 mm 0.276 in	$\phi 18.5$ mm $\phi 0.728$ in approx.	$\phi 0.7$ mm $\phi 0.028$ in	12 mm 0.472 in	$\phi 27$ mm $\phi 1.063$ in approx.	$\phi 1.2$ mm $\phi 0.047$ in	14 mm 0.551 in	$\phi 43$ mm $\phi 1.693$ in approx.	$\phi 2.0$ mm $\phi 0.079$ in		
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14 mm 0.551 in	$\phi 43$ mm $\phi 1.693$ in approx.	$\phi 2.0$ mm $\phi 0.079$ in																
Finest spot lens	FX-MR3		<p>Extremely fine spot of $\phi 0.3$ mm $\phi 0.012$ 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-G6Ambient temperature: -40 to $+70$ °C -40 to $+158$ °F (Note 2) <p>Sensing range for red LED type (Note 1)</p> <table><thead><tr><th>Fiber</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 0.295 ± 0.020 in</td><td>$\phi 0.15$ mm $\phi 0.006$ in approx</td></tr><tr><td>FD-EG2</td><td>7.5 ± 0.5 mm 0.295 ± 0.020 in</td><td>$\phi 0.2$ mm $\phi 0.008$ in approx</td></tr><tr><td>FD-EG1</td><td>7.5 ± 0.5 mm 0.295 ± 0.020 in</td><td>$\phi 0.3$ mm $\phi 0.012$ in approx</td></tr><tr><td>FD-WG4/G4/G6X/G6</td><td>7.5 ± 0.5 mm 0.295 ± 0.020 in</td><td>$\phi 0.5$ mm $\phi 0.020$ in approx</td></tr></tbody></table>	Fiber	Distance to focal point	Spot diameter	FD-EG3	7.5 ± 0.5 mm 0.295 ± 0.020 in	$\phi 0.15$ mm $\phi 0.006$ in approx	FD-EG2	7.5 ± 0.5 mm 0.295 ± 0.020 in	$\phi 0.2$ mm $\phi 0.008$ in approx	FD-EG1	7.5 ± 0.5 mm 0.295 ± 0.020 in	$\phi 0.3$ mm $\phi 0.012$ in approx	FD-WG4/G4/G6X/G6	7.5 ± 0.5 mm 0.295 ± 0.020 in	$\phi 0.5$ mm $\phi 0.020$ in approx
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FD-WG4/G4/G6X/G6	7.5 ± 0.5 mm 0.295 ± 0.020 in	$\phi 0.5$ mm $\phi 0.020$ in approx																
Finest spot lens	FX-MR6		<p>Extremely fine spot of $\phi 0.1$ mm $\phi 0.004$ 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-G6Ambient temperature: -20 to $+60$ °C -4 to $+140$ °F (Note 2) <p>Sensing range for red LED type (Note 1)</p> <table><thead><tr><th>Fiber</th><th>Distance to focal point</th><th>Spot diameter</th></tr></thead><tbody><tr><td>FD-EG3</td><td>7 ± 0.5 mm 0.276 ± 0.020 in</td><td>$\phi 0.1$ mm $\phi 0.004$ in approx</td></tr><tr><td>FD-EG2</td><td>7 ± 0.5 mm 0.276 ± 0.020 in</td><td>$\phi 0.15$ mm $\phi 0.006$ in approx</td></tr><tr><td>FD-EG1</td><td>7 ± 0.5 mm 0.276 ± 0.020 in</td><td>$\phi 0.2$ mm $\phi 0.008$ in approx</td></tr><tr><td>FD-WG4/G4/G6X/G6</td><td>7 ± 0.5 mm 0.276 ± 0.020 in</td><td>$\phi 0.4$ mm $\phi 0.016$ in approx</td></tr></tbody></table>	Fiber	Distance to focal point	Spot diameter	FD-EG3	7 ± 0.5 mm 0.276 ± 0.020 in	$\phi 0.1$ mm $\phi 0.004$ in approx	FD-EG2	7 ± 0.5 mm 0.276 ± 0.020 in	$\phi 0.15$ mm $\phi 0.006$ in approx	FD-EG1	7 ± 0.5 mm 0.276 ± 0.020 in	$\phi 0.2$ mm $\phi 0.008$ in approx	FD-WG4/G4/G6X/G6	7 ± 0.5 mm 0.276 ± 0.020 in	$\phi 0.4$ mm $\phi 0.016$ in approx
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FD-WG4/G4/G6X/G6	7 ± 0.5 mm 0.276 ± 0.020 in	$\phi 0.4$ mm $\phi 0.016$ in 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-G4Ambient temperature: -40 to $+70$ °C -40 to $+158$ °F (Note 2) <p>Sensing range for red LED type (Note 1)</p> <table><thead><tr><th>Screw-in depth</th><th>Distance to focal point</th><th>Spot diameter</th></tr></thead><tbody><tr><td>8 mm 0.315 in</td><td>13 mm 0.512 in approx.</td><td>$\phi 0.5$ mm $\phi 0.020$ in</td></tr><tr><td>10 mm 0.394 in</td><td>15 mm 0.591 in approx.</td><td>$\phi 0.8$ mm $\phi 0.031$ in</td></tr><tr><td>14 mm 0.551 in</td><td>30 mm 1.181 in approx.</td><td>$\phi 3.0$ mm $\phi 0.118$ in</td></tr></tbody></table>	Screw-in depth	Distance to focal point	Spot diameter	8 mm 0.315 in	13 mm 0.512 in approx.	$\phi 0.5$ mm $\phi 0.020$ in	10 mm 0.394 in	15 mm 0.591 in approx.	$\phi 0.8$ mm $\phi 0.031$ in	14 mm 0.551 in	30 mm 1.181 in approx.	$\phi 3.0$ mm $\phi 0.118$ 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 p.101~ for the ambient temperatures of fibers to be used in combination.

Refer to p.100 for other fiber options.

FIBER SENSORS

LASER SENSORS

PHOTO-ELECTRIC SENSORS

MICRO PHOTO-ELECTRIC SENSORS

AREA SENSORS

SAFETY COMPONENTS

PRESSURE SENSORS

INDUCTIVE PROXIMITY SENSORS

PARTICULAR USE SENSORS

SENSOR OPTIONS

WIRE- SAVING SYSTEMS

MEASURE- MENT SENSORS

STATIC CONTROL DEVICES

LASER MARKERS

Selection Guide

Fibers

FT / FD / FR

Fiber Sensor Amplifiers

FX-100**FX-300****FX-410****FX-311****FX-11A****FX-301-F**

Other Products

SPECIFICATIONS

Refer to p.101~ for specifications of fibers.

Item	Mode No.	Type	Standard type				High-speed type	High-function type
			Red LED	Blue LED	Green LED	Infrared LED		
		NPN output	FX-301	FX-301B	FX-301G	FX-301H	FX-301-HS	FX-305
Supply voltage		PNP output	FX-301P	FX-301BP	FX-301GP	FX-301HP	FX-301P-HS	FX-305P
		12 to 24 V DC $\pm 10\%$					Ripple P-P 10% or less	
Power consumption		<Red LED / Infrared LED type> Normal operation: 960 mW or less (Current consumption 40 mA or less at 24 V supply voltage) ECO mode: 600 mW or less (Current consumption 25 mA or less at 24 V supply voltage)					<Blue LED / Green LED type> Normal operation: 720 mW or less (Current consumption 30 mA or less at 24 V supply voltage) ECO mode: 430 mW or less (Current consumption 18 mA or less at 24 V supply voltage)	
		<NPN output type> 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 (at 50 mA, if five, or more, amplifiers are connected in cascade) sink current.]					<NPN output type> NPN open-collector transistor 2 outputs • Maximum sink current: 50 mA each (Note 2) • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 1.5 V or less [at 50 mA (Note 2)]	
Output		<PNP output type> 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 (at 50 mA, if five, or more, amplifiers are connected in cascade) source current.]					<PNP output type> PNP open-collector transistor 2 outputs • Maximum source current: 50 mA each (Note 2) • Applied voltage: 30 V DC or less (between output and +V) • Residual voltage: 1.5 V or less [at 50 mA (Note 2)]	
		Output operation					Selectable either Light-ON or Dark-ON, with jog switch	
Short-circuit protection		Incorporated						
		65 μ s or less [H-SP (Red LED type only)], 150 μ s or less (FAST), 250 μ s or less [STD / S-D (Red LED type only)], 2 ms or less (LONG), selectable with jog switch					35 μ s or less (H-SP), 150 μ s or less (FAST), 250 μ s or less (STD / S-D), 2 ms or less (LONG), selectable with jog switch	65 μ s or less (H-SP), 150 μ s or less (FAST), 250 μ s or less (STD), 700 μ s or less (STDF), 2.5 ms or less (LONG), 4.5 ms or less (U-LG), selectable with jog switch
Sensitivity setting		2-level teaching / Limit teaching / Manual adjustment / Full-auto teaching / Max. sensitivity teaching					Normal mode: 2-level teaching / Limit teaching / Full-auto teaching / Max. sensitivity teaching / Manual adjustment Window comparator mode: Teaching (1-level / 2-level / 3-level) / Manual adjustment	
		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)					_____	
		MODE indicator					RUN: Green LED, TEACH • ADJ • L/D ON • TIMER • PRO: Yellow LED	
Digital display		4 digit red LED display						
		Fine sensitivity adjustment function					Incorporated	
Timer function		Incorporated with variable ON-delay / OFF-delay / ONE SHOT timer, switchable either effective or ineffective. [Timer period: Red LED type; 0.5 ms approx., 1 to 9999 ms (Blue LED, Green LED, Infrared LED type; approx. 0.5 to 500 ms)]					Incorporated with variable ON-delay / OFF-delay / ONE SHOT / ON-delay • OFF-delay / ON-delay • ONE SHOT timer, switchable either effective or ineffective. (Timer period: Output 1; 0.5 ms, 1 to 9999 ms, Output 2; 0.5 ms, 1 to 500 ms)	
		Light emitting amount selection function					Incorporated (Note 3) FAST, STD, LONG: 4 level H-SP, S-D: 2 level	Incorporated (Note 3) FAST, STD, STDF, LONG, U-LG: 4 level H-SP: 3 level
Automatic interference prevention function		Incorporated (Up to four sets of fiber heads can be mounted close together. However, H-SP mode is 2 fiber heads.) (Note 4)					_____	Incorporated [Up to four sets of fiber heads can be mounted close together. (However, U-LG mode is 8 fiber heads, H-SP mode is 2 fiber heads.)] (Note 5)
		Ambient temperature					-10 to +55 °C +14 to -131 °F (If 4 to 7 units are connected in cascade: -10 to +50 °C +14 to +122 °F, if 8 to 16 units are connected 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	
Ambient humidity		35 to 85 % RH, Storage: 35 to 85 % RH						
		Ambient illuminance					Incandescent light: 3,000 lx at the light-receiving face	
Voltage withstandability		1,000 V AC for one min. between all supply terminals connected together and enclosure (Note 6)						
		Insulation resistance					20 M Ω , or more, with 250 V DC megger between all supply terminals connected together and enclosure (Note 6)	
Vibration resistance		10 to 150 Hz frequency, 0.75 mm 0.030 in amplitude in X, Y and Z directions for two hours each						
		Shock resistance					98 m/s ² acceleration (10 G approx.) in X, Y and Z directions for five times each	
Emitting element (modulated)		Red LED	Blue LED	Green LED	Infrared LED	Red LED	Red LED	
		Peak emission wavelength	650 nm 0.026 mil	470 nm 0.019 mil	525 nm 0.021 mil	940 nm 0.037 mil	650 nm 0.026 mil	650 nm 0.026 mil
Material		Enclosure: Heat-resistant ABS, Case cover: Polycarbonate, MODE key: Acrylic, Jog switch: Heat-resistant ABS (FX-301B/G/H: Acrylic)						
		Connecting method					Connector (Note 7)	
Cable length		Total length up to 100 m 328.084 ft (50 m 164.042 ft for 5 to 8 units, 20 m 65.617 ft for 9 to 16 units) is possible with 0.3 mm ² , or more, cable.						
		Weight					Net weight: 20 g approx., Gross weight: 25 g approx.	
Accessory		FX-MB1 (amplifier protection seal): 1 set					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 per output. 25 mA if five, or more, amplifiers are connected in cascade.

3) The light emitting amount can be zero (emission halt) in all modes.

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

5) When the interference prevention function "P-2" is set, the number of mountable fiber heads becomes double.

Furthermore, take care that the response time also becomes double.

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

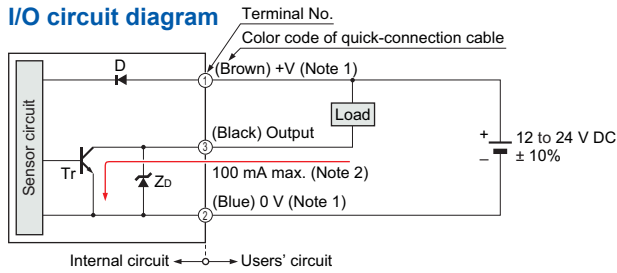
7) The cable for amplifier connection is not supplied as an accessory. Make sure to use the optional quick-connection cables given below.

Main cable (3-core) for FX-301(P)(-HS): 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) for FX-301(P)(-HS): 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)

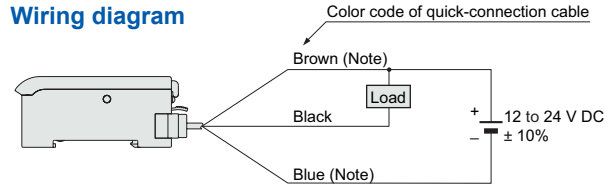
Main cable (4-core) for FX-305(P): CN-74-C1 (Cable length 1 m 3.281 ft), CN-74-C2 (Cable length 2 m 6.562 ft), CN-74-C5 (Cable length 5 m 16.404 ft)

Sub cable (2-core) for FX-305(P): CN-72-C1 (Cable length 1 m 3.281 ft), CN-72-C2 (Cable length 2 m 6.562 ft), CN-72-C5 (Cable length 5 m 16.404 ft)

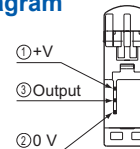
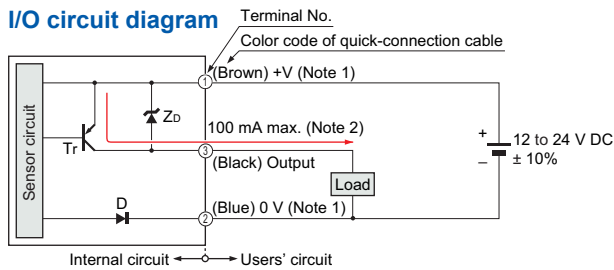
I/O CIRCUIT AND WIRING DIAGRAMS**FX-301(-HS)****NPN output type****I/O circuit diagram**

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

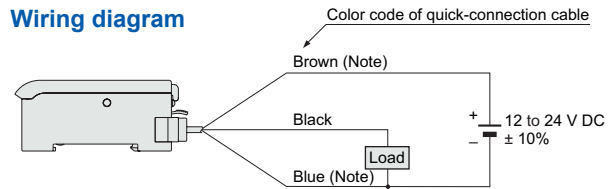
Wiring diagram

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

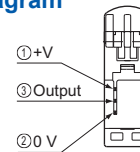
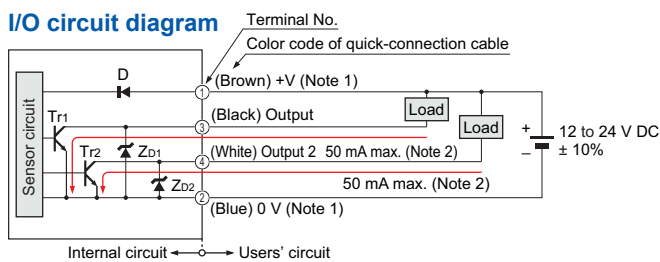
Terminal arrangement diagram**FX-301P(-HS)****PNP output type****I/O circuit diagram**

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.

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

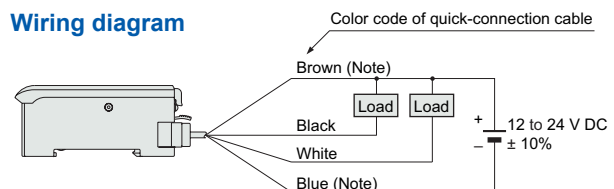
Wiring diagram

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

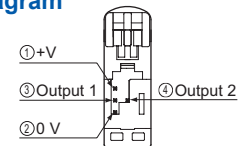
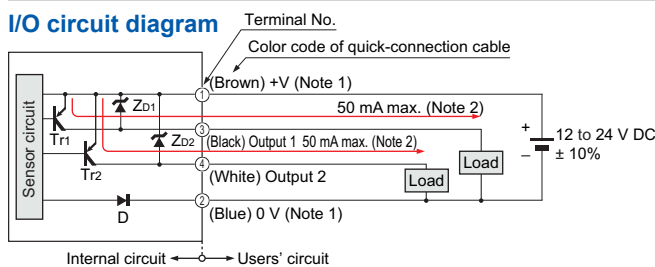
Terminal arrangement diagram**FX-305****NPN output type****I/O circuit diagram**

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.

Symbols ... D : Reverse supply polarity protection diode
Zd1, Zd2 : Surge absorption zener diode
Tr1, Tr2 : NPN output transistor

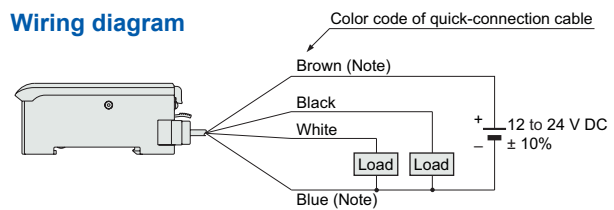
Wiring diagram

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

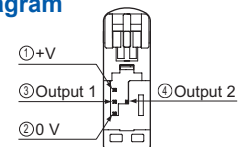
Terminal arrangement diagram**FX-305P****PNP output type****I/O circuit diagram**

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.

Symbols ... D : Reverse supply polarity protection diode
Zd1, Zd2 : Surge absorption zener diode
Tr1, Tr2 : PNP output transistor

Wiring diagram

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

Terminal arrangement diagramFIBER
SENSORSLASER
SENSORSPHOTO-
ELECTRIC
SENSORSMICRO
PHOTO-
ELECTRIC
SENSORSAREA
SENSORSSAFETY
COMPONENTSPRESSURE
SENSORSINDUCTIVE
PROXIMITY
SENSORSPARTICULAR
USE
SENSORSSENSOR
OPTIONSWIRE-
SAVING
SYSTEMSMEASURE-
MENT
SENSORSSTATIC
CONTROL
DEVICESLASER
MARKERSSelection
Guide

Fibers

FT / FD / FR

Fiber Sensor
Amplifiers**FX-100****FX-300****FX-410****FX-311****FX-11A****FX-301-F**Other
Products

SENSING CHARACTERISTICS (TYPICAL)

Refer to p.104 for sensing characteristics.

PRECAUTIONS FOR PROPER USE

Refer to p.986~ for general precautions, p.105 for fiber precautions, and to the "PRO mode operation guide" or "SUNX website" (<http://www.sunx.com>) for details pertaining to operating instructions for the amplifier.



- 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.

- The digital fiber sensor **FX-301(P)** has been modified since its production in June 2004. The explanations below are about the modified product.

For FX-305(P)

The **FX-305(P)** is equipped with two independent outputs, but the items that can be set in output 1 and output 2 respectively are only the following.

The items other than those are common.

- ① Threshold value ② Output operation
③ Timer operation and Timer period ④ Sensing mode

Others

- When the emission halt of the light emitting amount selection function is set from "OFF" to "ON", the output may be unstable. Do not use the output control for 0.5 sec. after starting emission.
- Do not use during the initial transient time (0.5 sec.) after the power supply is switched on.

Cascading

- The settings other than the interference prevention function cannot be transmitted between **FX-301(P)**, **FX-301B/G/H(P)**, **FX-305(P)**. Therefore, in case both models of amplifiers are mounted in cascade, be sure to mount identical models together. However, the interference prevention function is not incorporated in the **FX-301(P)**-HS. Take care when the sensors are mounted in cascade.
- If the **FX-301(P)** updated version unit or the **FX-305(P)** is mounted with the **FX-301(P)** previous version unit or the **FX-301B/G/H(P)** in cascade, place the **FX-301(P)** updated version units and the **FX-305(P)** units to the right side (seen from the connector side) of the previous version units. For details, refer to "**Cautions on sensor connection in cascade**" on p.154. For a difference between the updated version unit and the previous version unit, refer to "**A difference between the updated version unit and the previous version unit**" on p.154.
- The communication function of this product and that of the **FX-301(P)**-F is different. If these models are mounted in cascade, affix the accessory fiber amplifier protection seal (**FX-MB1**) included in the **FX-301(P)** and **FX-305(P)** to the communication windows of the amplifiers.

Function table for FX-300 series

	Previous models			New models		
	Standard type	High-function type	High-speed type	Standard type	High-speed type	High-function type
	FX-301(P) (Previous version unit)	FX-302(P)	FX-303(P)	FX-301(P) (Updated version unit)	FX-301(P) -HS	FX-305(P)
FX-100						
FX-300						
FX-410	Four-chemical emitting element + APC circuit	×	×	○	○	○
FX-311	Four-chemical emitting element only	○ (Note)	○	—	—	—
FX-11A	Light emitting amount selection function	×	×	○	○	○
FX-301-F	Reduced intensity mode (S-D)	○ (Note)	×	○	○	—
Other Products	9,999 digit display	×	×	×	×	○
	Response time (Max. speed)	150 μs	300 μs	65 μs	35 μs	65 μs
	Interference prevention function (Effective no. of units)	Incorporated (4)	Incorporated (8)	Incorporated (4)	Not incorporated (0)	Incorporated (16)
	Independent 2 outputs	×	×	×	×	○
	Alarm output function	×	×	×	×	○
	Error output function	×	×	×	×	○
	Differential sensing	×	×	×	×	○
	Window comparator mode	×	○	×	×	○

Peripheral units that can be combined

Bank selection unit FX-CH(-P)	○	○	×	×	×	×
External input unit FX-CH2(-P)	×	×	×	○	×	○
Upper communication unit SC-GU1-485	×	×	×	○	×	○

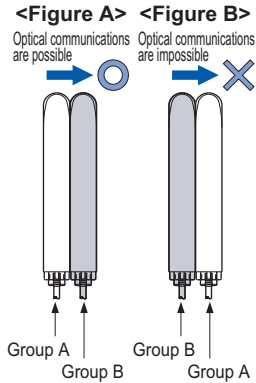
Note: Except **FX-301B/G/H**.

PRECAUTIONS FOR PROPER USE

Refer to p.986~ for general precautions, p.105 for fiber precautions, and to the "PRO mode operation guide" or "SUNX website" (<http://www.sunx.com>) for details pertaining to operating instructions for the amplifier.

Cautions on sensor connection in cascade

- When the units in the group A and the group B shown in the table below are connected in cascade, connect them in cascade as **<Figure A>** shown below.



Group A	FX-301(P): Previous version unit (Note 1), FX-301G(P)/B(P)/H(P), FX-410(P), LS-401(P) (Note 2)
Group B	FX-301(P): Updated version unit (Note 1), FX-305(P)

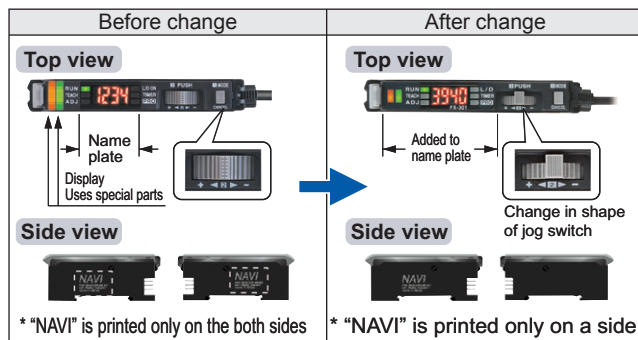
Notes: 1) For the difference between the updated version unit and the previous version unit, refer to "A difference between the updated version unit and the previous version unit" (p.154).
 2) When LS-401(P) is connected with the digital fiber amplifier in cascade, be sure to locate LS-401(P) at the left-most position (when viewed from the connector side).

- When the units of the group A and the group B are connected in cascade as **<Figure B>** shown above, optical communications cannot be done. When the optical communications function is used, connect them as **<Figure A>** shown above. If the units cannot be placed as **<Figure A>**, the following measure ① or ② should be taken.

- Affix the communication window seal of the accessory fiber amplifier protection seal (FX-MB1) to the communication window of the FX-301(P) updated version unit or FX-305(P).
- If the measure ① described above cannot be taken, change the optical communications spec. of the group B units.

A difference between the updated version unit and the previous version unit for FX-301(P) (Red LED type)

- The product has been modified as shown below since its production in June 2004.

Changes in appearance

- Checking minor changes between previous and updated models can be done by checking whether the printing is on both sides or only one side.

Upgraded functions**1. Response times added**

An ultra high-speed mode (H-SP) has been added to the existing 4 response time modes [high-speed (FAST), reduced intensity (S-D), standard (STD) and long range (LONG)].

This is changed using "Pro" in "SPED"

Before change	After change
4 steps	5 steps
RUN: FAST 150 μ s (FAST)	RUN: H-SP 65 μ s (added) (H-SP)
TEACH: S-D 250 μ s (S-D)	TEACH: FAST 150 μ s (FAST)
ADJ: STD 250 μ s (STD)	ADJ: S-D 250 μ s (S-D)
ADJ: LONG 2 ms (LONG)	ADJ: STD 250 μ s (STD)
	ADJ: LONG 2 ms (LONG)

2. Extension of timer period

The setting range for the timer period was previously 500 ms, but this has been extended to a new range of 9,999 ms.

3. Light emitting amount selection function

The light emitting amount can be changed to one of 4 levels (5 levels when emission halt is included).

4. Backup, copy lock and key lock functions added

Backup: This selects whether or not threshold values set by teaching are written to (stored in) an EEPROM.

Copy lock: This selects whether copy function and data bank function communication are possible or not.

Key lock: This disables input using switches to prevent accidental changing of settings.

Changes in operation**1. Timer selection method**

Previous version unit: Timer type was changed using PRO1 mode. The "TIMER" setting in NAVI mode could only be turned on or off.

After change: The type of timer can be changed using the "TIMER" function in NAVI mode.

2. Checking threshold value in RUN mode

The threshold values can be checked by turning the jog switch.

Display changes**1. Checking blinking of sensitivity surplus**

The stable surplus display method after teaching has been changed.

Previous version unit: Sensitivity surplus is indicated by the number of blinks of the stability indicator.

After change **Good** **Hard**
Digital display only

2. Initial direct code value changed

The factory default settings for the direct codes have been changed.

Previous version unit 0000 **➔** After change 0004

* The default setting for the timer period is 10 ms, and the direct code for 10 ms is "4", so this has been changed.

Internal circuit changes**1. Addition of an APC circuit**

A four-chemical emitting element which provides stable sensing over long periods has been added, as well as an APC (Auto Power Control) circuit that improves stability during short periods.

Cautions on sensor connection in cascade

When connecting the previous version unit (including FX-301B/G/H) and updated version unit to be used in a cascade, refer to "Cautions on sensor connection in cascade" (p.154).

FIBER SENSORS

LASER SENSORS

PHOTO-ELECTRIC SENSORS

MICRO PHOTO-ELECTRIC SENSORS

AREA SENSORS

SAFETY COMPONENTS

PRESSURE SENSORS

INDUCTIVE PROXIMITY SENSORS

PARTICULAR USE SENSORS

SENSOR OPTIONS

WIRE- SAVING SYSTEMS

MEASURE- MENT SENSORS

STATIC CONTROL DEVICES

LASER MARKERS

Selection Guide

Fibers

FT / FD / FR

Fiber Sensor Amplifiers

FX-100

FX-300

FX-410

FX-311

FX-11A

FX-301-F

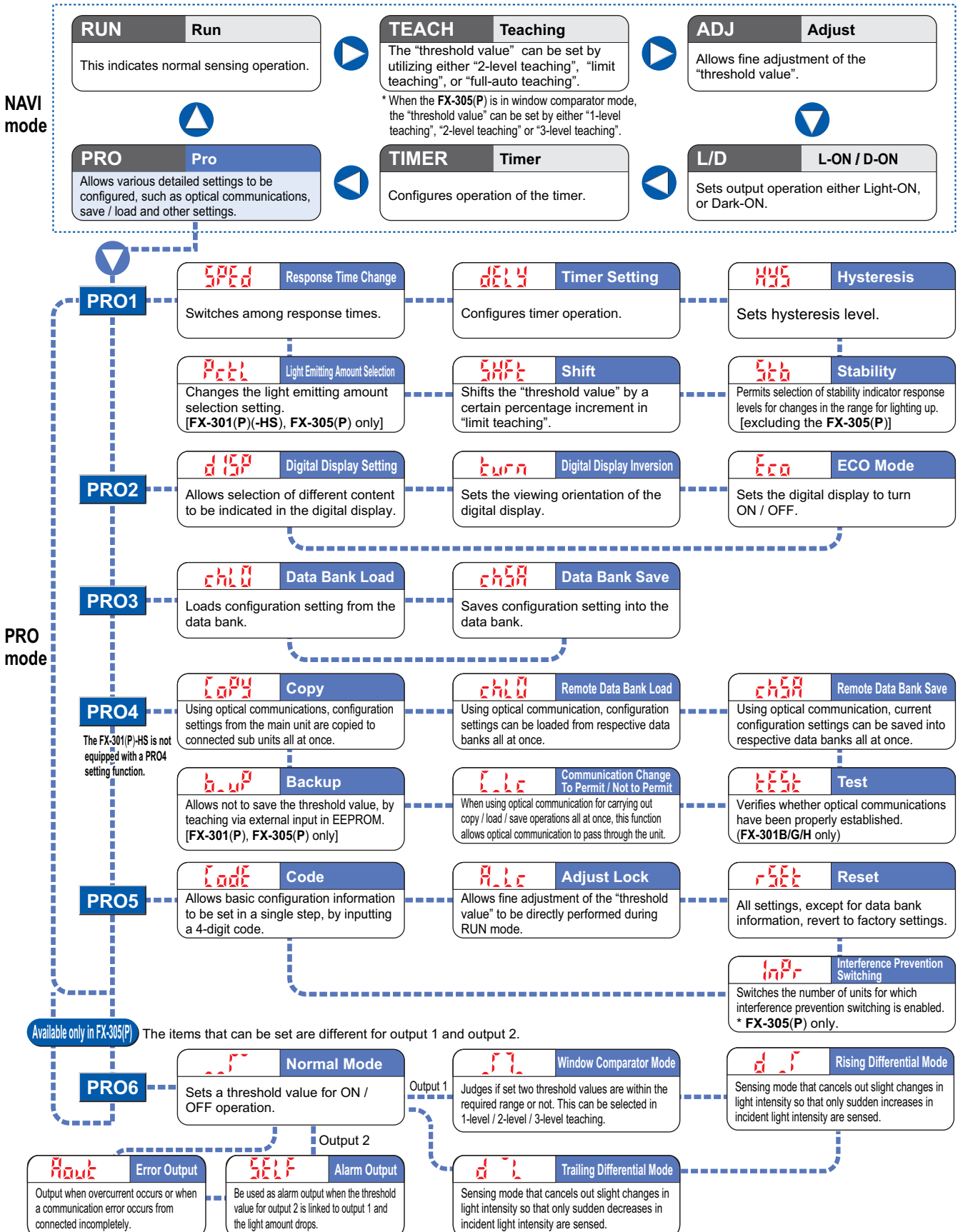
Other Products

PRECAUTIONS FOR PROPER USE

Refer to p.986~ for general precautions, p.105 for fiber precautions, and to the "PRO mode operation guide" or "SUNX website" (<http://www.sunx.com>) for details pertaining to operating instructions for the amplifier.

Diagram of functions and settings

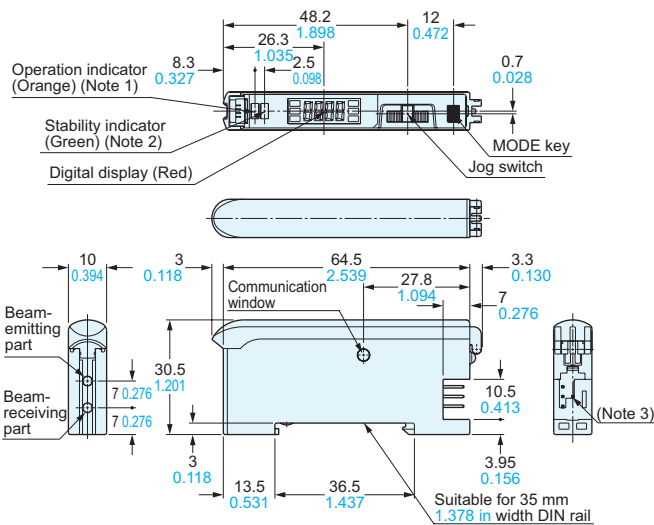
The amplifier features and settings are generally classified into two main modes; the "NAVI mode" for items and settings that are frequently reconfigured, and the "PRO mode" that contains more detailed settings.



* The 0-ADJ setting function equipped on the FX-301□ and FX-305(P) has been deleted since the production in May 2005.

DIMENSIONS (Unit: mm in)The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.com>

Refer to p.106~ for dimensions of fibers.

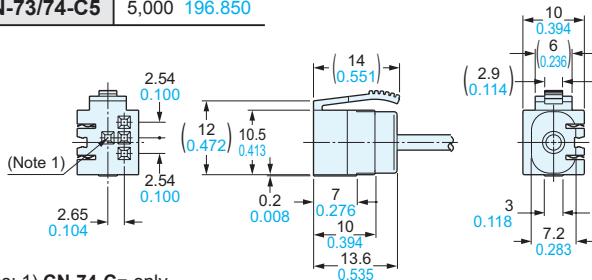
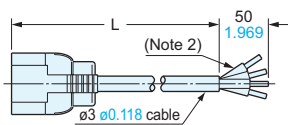
FX-301□ FX-305(P)**Amplifier**

- Notes: 1) **FX-305□**; Output 1 operation indicator (Orange)
 2) **FX-305□**; Output 2 operation indicator (Orange)
 3) **FX-301□**; 3-pin, **FX-305□**; 4-pin

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

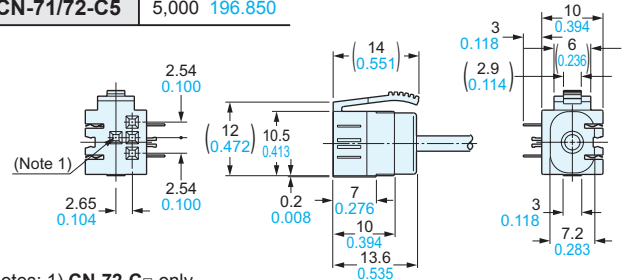
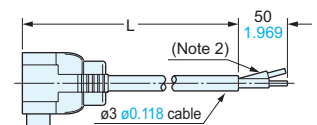


- Notes: 1) **CN-74-C□** only
 2) **CN-73-C□**; 3-core

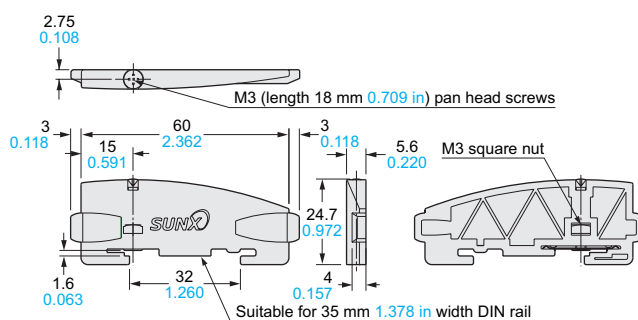
CN-71-C□ CN-72-C□**Sub cable (Optional)**

• Length L

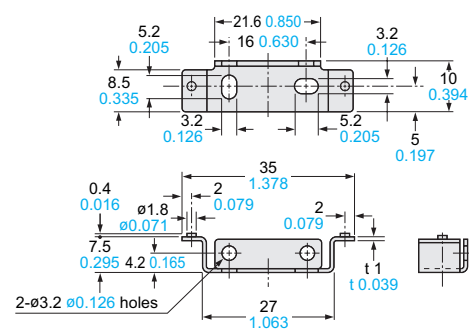
Model No.	Length L
CN-71/72-C1	1,000 39.370
CN-71/72-C2	2,000 78.740
CN-71/72-C5	5,000 196.850



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

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

Material: Polycarbonate

MS-DIN-2**Amplifier mounting bracket (Optional)**Material: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)**FIBER SENSORS****LASER SENSORS****PHOTO-ELECTRIC SENSORS****MICRO PHOTO-ELECTRIC SENSORS****AREA SENSORS****SAFETY COMPONENTS****PRESSURE SENSORS****INDUCTIVE PROXIMITY SENSORS****PARTICULAR USE SENSORS****SENSOR OPTIONS****WIRE- SAVING SYSTEMS****MEASURE- MENT SENSORS****STATIC CONTROL DEVICES****LASER MARKERS****Selection Guide****Fibers****FT / FD / FR****Fiber Sensor Amplifiers****FX-100****FX-300****FX-410****FX-311****FX-11A****FX-301-F****Other Products**