High Speed Digital Fiber Sensor











High-speed sensing of 90 μs

Passed the UL 991 Environment Test





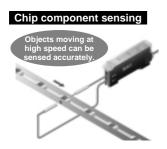
New

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: UL991, SEMI S2-0200]

90 μ s high-speed response

FX-303 is high-speed type with response time of 90 μ s.

This is ideal for applications which require high-speed sensing and sensing of minute



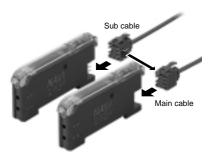
Solves saturation problems at close distances

The light amount can be set to one of three levels at a fixed response time (90 μ s).

H-SP MODE Normal (standard)	Used for general sensing.
S-D1 MODE Approx. 50 % of standard	Used when the received light amount
S-D2 MODE Approx. 80 % of standard	becomes saturated during H-SP mode.

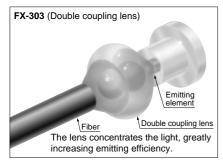
Easy maintenance, as main and sub units are identical

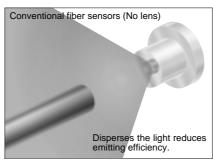
Both main and sub units utilize the same amplifier body. This feature allows for easy mounting in the sideby-side configuration. The main and sub unit functions are distinguished only by the proper use of the 3-core main cable and the 1-core sub cable. Moreover, by utilizing the same body for both main and sub units, inventory management and maintenance is simplified.



Long-range sensing made possible with built-in optical lens

For the first time in the industry, an optical 'double coupling lens' has been incorporated directly into the fiber sensor itself. This lens maximizes the light emission efficiency, resulting in a tremendous improvement in the sensing range. Sensing ranges with small diameter fibers and ultra-small diameter fibers, which have become very popular in recent years due to the miniaturization of chip components, have been increased by 50 % over previous values achieved with other amplifiers.





Easy operation with 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.

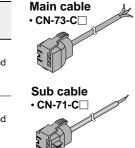


Amplifiers Quick-connection cable is not supplied with the amplifier. Please order it separately.

Туре	Appearance	Model No.	Emitting element	Output
peeds		FX-303	5 5	NPN open-collector transistor
High 8		FX-303P	Red LED	PNP open-collector transistor

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

Туре	Model No.	Description		
	CN-73-C1	Length: 1 m 3.281 ft		
Main cable	CN-73-C2	Length: 2 m 6.562 ft	0.15 mm ² 3-core cabtyre cable, with connector on one end Cable outer diameter: ϕ 3 mm ϕ 0.118 in	
	CN-73-C5	Length: 5 m 16.404 ft	, ,	
	CN-71-C1	Length: 1 m 3.281 ft		
Sub cable	CN-71-C2	Length: 2 m 6.562 ft	0.15 mm ² 1-core cabtyre cable, with connector on one end Cable outer diameter: ϕ 3 mm ϕ 0.118 in	
	CN-71-C5	Length: 5 m 16.404 ft		



End plates | End plates are not supplied with the amplifier. Please order it 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 ensure that all amplifiers are mounted together in a secure and fully connected manner. Two pcs. per set

OPTIONS

Designation	Model No.	Description		
Amplifier mounting bracket	MS-DIN-2	Mounting bracket for amplifier		
Universal sensor mounting stand	MS-AJ1-F	Horizontal mounting type	Mounting stand assembly for fiber	
(Note)	MS-AJ2-F	Vertical mounting type	(For M3, M4 or M6 threaded head fibers)	

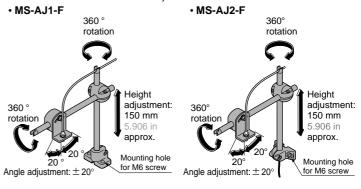
Amplifier mounting bracket • MS-DIN-2



Note: Refer to p.322~ for the universal sensor mounting stand.

Universal sensor mounting stand

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



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	Chang of file as beard	Sensing range (mm in) (Note 1)	Fiber cable	Allowable	
е	Shape of fiber head (mm in)	H-SP mode	length : Free-cut	bending radius	Model No.
	With lens M14	7,700 303.149	3∠ 10 m 32.808 ft		FT-FM10L
sensing range	With lens \$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	450 17.717	2 m 6.562 ft	R25 mm	FT-SFM2L
Long sens	Lens mountable M4	300 11.811	2 m 6.562 ft	R0.984 in	FT-B8
	—===())——→—())——————————————————————————	270 10.630	2 m 6.562 ft (Note 2)		FT-NB8
	Lens mountable M4			R25 mm R0.984 in	FT-FM2
	Sleeve 90 mm 3.543 in M4 \$\phi 1.48			Fiber R25 mm R0.984 in	FT-FM2S
	Sleeve 40 mm 1.575 in M4 # 1.48 # 0.058	220 8.661	3 ≤ 2 m 6.562 ft	Sleeve R10 mm R0.394 in R25 mm R0.984 in	FT-FM2S4
	Lens mountable M3				FT-T80
	φ2.5 φ0.098				FT-SFM2
	—————————————————————————————————————	200 7.874	2 m 6.562 ft (Note 2)	R25 mm R0.984 in	FT-N8
	M3 →□((())		2 m 6.562 ft	R25 mm R0.984 in	FT-NFM2
	Sleeve 90 mm 3.543 in M3	80 3,150		Fiber R25 mm R0.984 in	FT-NFM2S
	Sleeve 40 mm 1.575 in M3	00 3.130		R10 mm R0.394 in	FT-NFM2S4
	φ1.5 φ0.059			R25 mm R0.984 in	FT-SNFM2
Elbow	Lens mountable M4	130 5.118	2 m 6.562 ft	R25 mm R0.984 in	FT-R80
	6 4 6 0 . 1 5 7 1 1 1 1 1 1 1 1 1 1	570 22.441	*		FT-V10
view	φ1.5 φ0.059 ψ 425 φ0.098 Sleeve part cannot be bent.	110 4.331	2 m 6.562 ft	R25 mm R0.984 in	FT-SFM2S\
Side-view	$ \begin{array}{c c} & \phi & 1 & \phi & 0.039 \\ \hline & 0.6 & 0.024 & \hline & \phi & 2 & \phi & 0.079 \\ \hline & Sleeve part cannot be bent. \end{array} $	100 3.937	1 m 3.281 ft		FT-V22
	φ1 φ0.039 φ1 φ2.5 φ0.098	45 1.772	≫ 2 m		FT-V41

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

The sensing range for **FX-303** is for H-SP mode. Please contact our office for details on sensing ranges in the S-d1 and S-d2 modes.

2) The fiber cutter is not attached with **FT-NB8** and **FT-N8**. Please order it separately.

har	р	bending fibers / Fle	exible fibers [Thru-beam type (one	pair set)]		
Гуре	е	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) H-SP mode	Fiber cable length : Free-cut	Allowable bending radius	Model No.
	beam	Wide area sensing Sensing width 32 mm 1.250 In W5 X H69 X D20 W0.197 X H2.717 X D0.787	3,500 137.795 (Note 2)	2 m 6.562 ft	R1 mm R0.039 in	<u>"</u> јеи FT-WA30
Rectangular head Wide beam	Wide	Wide area sensing Sensing width 11 mm 0.433 in W4.2 X H31 X D13.5	850 33.465	2 m 6.562 ft	R1 mm R0.039 in	<i>Ne</i> v FT-WA8
		Easy mounting · Top sensing W3×H8×D12 W0.118×H0.315×D0.472	660 25.984			<i>Ne</i> ı FT-WZ8H
	angular he	Easy mounting · Side sensing W3×H12×D8 W0.118×H0.472×D0.315	390 15.354	≥ 2 m 6.562 ft	R1 mm R0.039 in	<i>Ne</i> s FT-WZ8E
	Recta	Easy mounting - Front sensing W8.5 X H12 X D3 W0.335 X H0.472 X D0.118	180 7.087			FT-WZ8
Narrow In	bean	Side-view type with small light dispersion $\phi 4 \phi 0.157$	385 15.157	≥ 2 m 6.562 ft	R1 mm R0.039 in	<i>Ņe</i> : FT-WKV8
ong sensing	~	Long sensing range · With lens ### ### ### ########################	330 12.992	2 m 6.562 ft	R1 mm R0.039 in	FT-WS8L
		Lens mountable M4				FT-W8
Small	Standaro	φ3 φ0.118	160 6.299	2 m 6.562 ft	R1 mm R0.039 in	FT-WS3
		φ2.5 φ0.098 → □				FT-WS8
	eter		45 1.772	> <	R1 mm	FT-W4
Sma	dian	φ1.5 φ 0.059	10 1.772	2 m 6.562 ft	R0.039 in	FT-WS4
	Side-view	$ \begin{array}{c} \phi & 1 & \phi & 0.039 \\ \hline \phi & 1 & \phi & 0.039 \\ \hline 0.039 & \hline 0.03$	22 0.866	2 m 6.562 ft	R1 mm R0.039 in	<i>Ne</i> FT-WV42
-		Easy mounting · Top sensing W3×H8×D12 W0.118×H0.315×D0.472	770 30.315			FT-Z8H
	tangular	Easy mounting · Side sensing W3×H12×D8 W0.118×H0.472×D0.315	440 17.323	2 m 6.562 ft	R4 mm R0.157 in	FT-Z8E
	Rec	Easy mounting · Front sensing W8.5 X H12 X D3 W0.335 X H0.472 X D0.118	220 8.661			FT-Z8
	dard	Lens mountable	180 7.087	×	R4 mm	FT-P80
Standard	Stan	Lens mountable	105 4.134	2 m 6.562 ft	R0.157 in	<i>Ne</i> FT-P60
	ter	——a([[]) → a([[]) iii	55 2.165	2 m 6.562 ft		FT-P40
	Small diameter	φ1.5 φ0.059	65 2.559	1 m 3.281 ft	R4 mm R0.157 in	FT-P2
Small	Sm	φ1 φ0.039	22 0.866	500 mm		Ne FT-PS1

Notes: 1) 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 for FX-303 is for H-SP mode. Please contact our office for details on sensing ranges in the S-d1 and S-d2

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

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Special use fibers [Thru-beam type (one pair set)]

т,	φe	Shape of fiber head	Sensing range (mm in) (Note 1)	Fiber cable length	Allowable bending	Model No.
- 13	pe	(mm in)	H-SP mode	Erigin E : Free-cut	radius	Model No.
	Wide beam	Wide area sensing Sensing width 32 mm 1,260 in Width H69 X D20 (Note 2)		2 m 6.562 ft	R10 mm R0.394 in	New FT-A30
	Wide	Wide area sensing Sensing width 11 mm W4.2 X H31 X D13.5	850 33.465	2 m 6.562 ft	R10 mm R0.394 in	FT-A8
	Array	Top sensing W5×H15×D15 W0.197×H0.591×D0.591	180 7.087	≫ 2 m	R25 mm	FT-AFM2
	Ari	Side sensing W5 X H15 X D15 W0.197 X H0.591 X D0.591	160 6.299	6.562 ft	R0.984 in	FT-AFM2E
Special use	٤	φ3.5 φ0.138 φ3.7 φ3.7 φ0.146	550 21.654	≫	R25 mm	FT-K8
Speci	Narrow beam	Side-view \$4 \(\phi \).118	330 21.004	6.562 ft	R0.984 in	FT-KV8
	Ž	Side-view W2 X H1.5 X D20 W0.079 X H0.059 X D0.787	100 3.937	2 m 6.562 ft	R10 mm R0.394 in	New FT-KV1
	I diameter	Beam diameter \$0.125 mm \$0.005 in \$3 mm \$0.118 in \$0.25 mm \$0.010 in \$3 mm \$0.118 in \$0.25 mm \$0.010 in \$0.118 in \$0	5 0.197	500 mm 19.685 in	R5 mm	FT-E12
	Ultra-small	Beam diameter \$0.25 mm \$\phi 0.010 in \$\phi 3 mm \$\phi 0.118 in \$\phi 0.4 mm \$\phi 0.016 in \$\$\$ Sleeve part cannot be bent.	27 1.063	1 m 3.281 ft	R0.197 in	FT-E22
	Tough flexible	Sleeve part cannot be bent. Lens mountable M4	180 7.087	1 m 3.281 ft	R10 mm R0.394 in	New FT-P81X

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

modes.
2) The fiber cable length practically limits the sensing range to 3,500 mm 137.795 in long.

The sensing range for **FX-303** is for H-SP mode. Please contact our office for details on sensing ranges in the S-d1 and S-d2

OPTIONS

	Shape of fiber head	Shape of fiber head Sensing range (mm in) (Note 1)		Allowable	
ype	(mm in)	H-SP mode	length ≥ : Free-cut	bending radius	Model No.
	350 °C 662 °F Lens mountable M4			R25 mm R0.984 in	FT-H35-M2
	350 °C 662 °F Sleeve 60 mm 2.362 in M4	155 6.102	2 m 6.562 ft	Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	FT-H35-M2S
Heat-resistant	Allows flexible wiring 200 °C 392 °F Lens mountable	00045	1 m 3.281 ft	R10 mm	FT-H20W-M ²
Heat-r		80 3.15	2 m 6.562 ft	R10 mm R0.394 in	FT-H20W-M
	200 °C 392 °F Lens mountable M4	155 6.102	1 m 3.281 ft	R25 mm	FT-H20-M1
	130 °C 266 °F Lens mountable	240 9.449	2 m 6.562 ft	R0.984 in	FT-H13-FM2
Chemical-resistant	Easy mounting · Rectangular head SEMI S2 compliant W7 × H15 × D13 W0.276 × H0.591 × D0.512	830 32.677	3∠ 2 m 6.562 ft	R25 mm R0.984 in	FT-Z802Y
Chemical	φ5.5 φ 0.217	830 32.677	% 2 m	R30 mm	FT-L8Y
	Side-view \$5.5 \$\phi 0.217\$	220 8.661	6.562 ft (Note 2)	R1.181 in	FT-V8Y
Ē	Lens mountable M4	125 4.921		R200 mm R7.874 in	FT-6V
Vacuum			1 m 3.281 ft	D20	

Notes: 1) 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 for FX-303 is for H-SP mode. Please contact our office for details on sensing ranges in the S-d1 and S-d2 modes. 2) The allowable cutting range is 500 mm 19.685 in from the end that the amplifier inserted.

The vacuum type fiber must be used with the following products as a set.

55 2.165

FT-J6: Fiber at atmospheric side (one pair set) FV-BR1: Photo-terminal (one pair set)

Semi-standard fibers (Custom made per order)

The fiber cable length or sleeve length of the standard fibers can be modified at your request. Select the fiber cable length (symbol 🔂) or the sleeve length (symbol \triangle) from the table below.

R30 mm

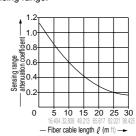
FT-60V

Туре		Basic model No.	⊠ Fiber cable length (Unit: m ft)	☑ Sleeve length (Unit: cm in)
	dard threaded (free-cut)	FT-FM ☆	3 9.843, 4 13.123, 5 16.404, 10 32.808, 15 49.213, 20 65.617, 25 82.021, 30 98.425	
	With sleeve	FT-FM ☆ -S △	2 6.562 (Note), 3 9.843, 4 13.123, 5 16.404, 10 32.808, 15 49.213, 20 65.617, 25 82.021, 30 98.425	1 0.394, 2 0.787, 3 1.181, 4 1.575, 5 1.969, 6 2.362, 7 2.756, 8 3.150, 9 3.543, 10 3.937, 11 4.331, 12 4.724
With la	rge diameter lens	FT-FM ☆ L	20 65.617, 30 98.425	
	iameter threaded ith sleeve (free-cut)	FT-NFM2-S		1 0.394, 2 0.787, 3 1.181, 4 1.575, 5 1.969, 6 2.362, 7 2.756, 8 3.150, 9 3.543, 10 3.937, 11 4.331, 12 4.724
Wide	e beam	FT-WA30- ☆ FT-WA8- ☆ FT-A30- ☆ FT-A8- ☆	5 16.404	
200°C 3	92°F heat-resistant	FT-H20-M ☆	2 6.562, 3 9.843	
350°C 6	62°F heat-resistant	FT-H35-M ☆	3 9.843	
Chem	nical-resistant	FT-Z80 ☆ Y	5 16.404, 7 22.966	

Note: The standard fiber has a 2 m 6.562 ft fiber cable length and a 4 cm 1.575 in or 9 cm 3.543 in sleeve length.

Correlation between sensing range attenuation coefficient and fiber cable length

The longer the fiber cable, the shorter the sensing range.



FX-303

Standard fibers (Reflective type)

Туре	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1, 2) H-SP mode	Fiber cable length	Allowable bending radius	Model No.
Long sensing range	M6	125 4.921	2 m 6.562 ft		FD-B8
	Coaxial M6	80 3.150	500 mm 19.685 ft	R25 mm R0.984 in	FD-5
		80 3.150	≥ 2 m 6.562 ft		FD-FM2
	Sleeve 90 mm 3.543 in M6	60 2.362	*	Fiber R25 mm R0.984 in	FD-FM2S
	Sleeve 40 mm 1.575 in M6	00 2.302	2 m 6.562 ft	Sleeve R10 mm R0.394 in	FD-FM2S4
	M4	60 2.362			FD-T80
	Small diameter M3	25 0.984	2 m 6.562 ft	R25 mm R0.984 in	FD-T40
	φ3 φ0.118	60 2.362			FD-S80
Standard	M6	66 2.598	≫ 2 m	R25 mm	FD-N8
	M4	20 0.787	6.562 ft (Note 3)	R0.984 in	FD-N4
	M4		2 m 6.562 ft	R25 mm R0.984 in	FD-NFM2
	Sleeve 90 mm 3.543 in M4 \$\displaystyle{\psi} 1.48 \displaystyle{\psi} 0.058	25 0.984		Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	FD-NFM2S
	Sleeve 40 mm 1.575 in M4 \$\displaystyle{\phi_1.48} \displaystyle{\phi_0.058}\$	20 0.304			FD-NFM2S4
	φ2.5 φ0.098			R25 mm R0.984 in	FD-SNFM2
Elbow	M6	46 1.811	2 m 6.562 ft	R25 mm R0.984 in	FD-R80
view	\$5 \\ \phi 0.197 \\ \phi 0.079 \\ \phi 0.031 \\ \phi 0.031 \\ \phi 0.031 \\ \phi 0.001	25 0.984	*	R25 mm R0.984 in	FD-SFM2SV2
Side-view	Small diameter \$\frac{\psi 3}{\phi 3} \cdot \frac{\psi 1.5}{\phi 0.059} \frac{\psi 0.028}{0.70,028} \text{Sleeve part cannot be bent.}	14 0.551	2 m 6.562 ft		FD-V41

Notes: 1) The sensing range is specified for white non-glossy paper (FD-B8, FD-5, FD-FM2, FD-FM2S, FD-FM2S4, FD-N8, FD-T80, FD S80 and FD-R80: 400 × 400 mm 15.748 × 15.748 in, FD-T40, FD-N4, FD-NFM2, FD-NFM2S, FD-NFM2S4, FD-SNFM2, FD-SFM2SV2 and FD-V41: 200 × 200 mm 7.874 × 7.874 in) as the object.

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 for FX-303 is for H-SP mode. Please contact our office for details on sensing ranges in the S-d1 and S-d2

³⁾ The fiber cutter is not attached with FD-N8 and FD-N4. Please order it separately.

Sharp bending fibers / Fl	exible fibers (Reflective type)	

Ту	ре	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1, 2) H-SP mode	Fiber cable length	Allowable bending	Model No.
		M6	50 1.969	≍ : Free-cut	R1 mm R0.039 in	FD-W8
	lard	Sleeve 40 mm 1.575 in M4 \$1.48 \$0.058	8 0.315		Fiber R1 mm R0.039 in Sleeve R10 mm R0.394 in	FD-W44
70	Standard	M4	50	≥ 2 m 6.562 ft		FD-WT8
Sharp bending		∮3 ∮ 0.118	1.969		R1 mm R0.039 in	FD-WS8
ShS		M3	8 0.315			FD-WT4
	ecision	Small spot for sensing minute objects Coaxial · Lens mountable	18 0.709	*	R2 mm	FD-WG4
	High precision	For sensing minute objects Coaxial	18 0.709	2 m 6.562 ft	R0.079 in	FD-WSG4
	Side-view	φ2 φ0.079 φ3 φ0.118 Sleeve part cannot be bent.	4 0.157	≥ 2 m 6.562 ft	R1 mm R0.039 in	New FD-WV42
		M6	55 2.165			FD-P80
	Standard	M4	25 0.984	*		FD-P60
Flexible		∳3 ∳0.118	25 0.904	2 m 6.562 ft	R4 mm R0.157 in	FD-P50
	ameter	МЗ	10 0.394			FD-P40
	Small diameter	♦1.5 ♦0.059	13 0.512	1 m 3.281 ft		FD-P2

Notes: 1) The sensing range is specified for white non-glossy paper [100×100 mm 3.937×3.937 in (FD-W8, FD-W78, FD-W88 and FD-P80: 400×400 mm 15.748×15.748 in, FD-WG4, FD-WSG4, FD-P60 and FD-P50: 200×200 mm 7.874×7.874 in)] as

the object.

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 for FX-303 is for H-SP mode. Please contact our office for details on sensing ranges in the S-D1 and S-D2

FX-303

Special use fibers (Reflective type)

_p\	_	ii use libers (Kellet	clive type)			
Ту	ре	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1, 2) H-SP mode	Fiber cable length	Allowable bending radius	Model No.
	Wide beam	W7 × H15 × D30 W0.276 × H0.591 × D1.181	80 3.150	%< 2 m 6.562 ft	R25 mm R0.984 in	New FD-A15
	Array	Top sensing		≫ 2 m	R25 mm	FD-AFM2
	Ā	Side sensing W5 × H20 × D20 W0.197 × H0.787 × D0.787	00 2.002	6.562 ft	R0.984 in	FD-AFM2E
		Coaxial · Lens mountable	30 1.181	% 2 m		FD-G4
	uo	Coaxial · Lens mountable M3	30 1.101	6.562 ft	R25 mm R0.984 in	FD-G6
	High precision	Coaxial · Lens mountable M3	10 0.394			FD-EG1
	王	Coaxial · Lens mountable M3	7 0.276	500 mm 19.685 in	R10 mm	New FD-EG2
		Coaxial · Lens mountable M3	4.5 0.177		R10 mm R0.394 in	New FD-EG3
		φ 0.5 φ 0.020 φ 1.5 φ 0.059 Sleeve part cannot be bent.	2 0.079	1 m	R10 mm R0.394 in	FD-E12
Special use	Ultra-small diameter	Coaxial \$\sqrt{0.65}\$ \$\phi 0.026\$ \$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		3.281 ft		FD-E22
้	Ultra-smal	M3 ϕ 0.5 ϕ 0.020	1 0.039	500 mm 19.685 in	R25 mm R0.984 in	FD-EN500S1
		Coaxial M3 \$\display 0.8 \display 0.031 Sleeve part cannot be bent.	10 0.394	1 m 3.281 ft		FD-ENM1S1
	Fixed-focus reflective	W6 × H18 × D14 W0.236 × H0.709 × D0.551	4.5 to 11 0.177 to 0.433 (Convergent point 6)	3< 2 m 6.562 ft	R10 mm R0.394 in	FD-L4
	0	Contact type φ6 φ 0.236		2 m 6.562 ft (Note 3)	Protective tube R40 mm R1.575 in Fiber R15 mm R0.591 in	FD-F8Y
	Liquid level sensing	Mountable on pipe ⋅ Standard W25 × H13 × D20	Applicable pipe diameter: Outer dia. φ6 to φ26 mm φ0.236 to φ1.024 in transparent pipe (PVC, fluorine resin, polycardnate, acrylic,)	2 m 6.562 ft		FD-F41
	d leve	W0.984 × H0.512 × D0.787	glass, wall thickness 1 to 3 mm 0.039 to 0.118 in	5 m 16.404 ft	R10 mm	FD-F91
	Liqui	Mountable on pipe For 1 mm 0.039 in thick PFA pipe W25 × H13 × D20	Applicable pipe diameter: Outer dia. ϕ 6 to ϕ 26 mm ϕ 0.236 to ϕ 1.024 in transparent pipe (PFA (fluorine resin) or equivalently)	2 m 6.562 ft	R10 mm R0.394 in	FD-F4
		W0.984 × H0.512 × D0.787	transparent pipe, wall thickness 1 mm 0.039 in	5 m 16.404 ft		FD-F9
	Tough flexible	M6	45 1.772	1 m 3.281 ft	R10 mm	<i>New</i> FD-P81X
	Tough	Small spot for sensing minute objects M3 Lens mountable Coaxial · High precision	25 0.984	1 m 3.281 ft (Note 3)	R0.394 in	<i>New</i> FD-G6X

Notes: 1) The sensing range is specified for white non-glossy paper [100 × 100 mm 3.937 × 3.937 in (FD-A15, FD-G4, FD-G6X: 200 × 200 mm 7.874 × 7.874 in, FD-AFM2, FD-AFM2E, FD-P81X: 400 × 400 mm 15.748 × 15.748 in,)] as the object.

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

The sensing range for FX-303 is for H-SP mode. Please contact our office for details on sensing ranges in the S-d1 and S-d2 modes.

³⁾ Following is the allowable cutting range from the end that the amplifier is inserted FD-F8Y: 1,000 mm 39.370 in, FD-G6X: 700 mm 27.559 in.

Environment resistant fibers (Reflective type)

Tv	ре	Shape of fiber head	(Allowable bending	Model No.
. ,	PC	(mm in)	H-SP mode	length : Free-cut	radius	Wodel No.
		350 °C 662 °F · Coaxial			R25 mm R0.984 in	FD-H35-M2
		350 °C 662 °F Sleeve 60 mm 2.362 in \$2.8 M6 \$0.110 in	75 2.953	2 m 6.562 ft	Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	FD-H35-M2S6
istant	sistant	200 °C 392 °F · Coaxial M6		1 m 3,281 ft	R25 mm R0.984 in	FD-H20-M1
Environment resistant	Heat-resistant	350 °C 662 °F Sleeve 90 mm 3.543 in M4	45 1.772	1 m 3,281 ft	Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	New FD-H35-20S
		200 °C 392 °F · Coaxial	75 2.953	1 m 3,281 ft	R25 mm R0.984 in	<i>New</i> FD-H20-21
		130 °C 266 °F M6	75 2.953	2 m 6.562 ft	R25 mm R0.984 in	FD-H13-FM2
	Vacuum	M6	40 1.575	1 m 3,281 ft	R200 mm R7.874 in	FD-6V

Notes: 1) The sensing range is specified for white non-glossy paper [400×400 mm 15.748×15.748 in] as the object.

The vacuum type fiber must be used with the following products as a set.

FT-J6: Fiber at atmospheric side (one pair set)

FV-BR1: Photo-terminal (one pair set)

Semi-standard fibers (Custom made per order)

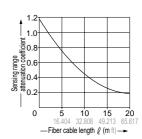
The fiber cable length or sleeve length of the standard fibers can be modified at your request. Select the fiber cable length (symbol 🛣) or the sleeve length (symbol \triangle) from the table below.

	Туре	Basic model No.	⊠ Fiber cable length (Unit: m ft)	☐ Sleeve length (Unit: cm in)
	dard threaded d (free-cut)	FD-FM ☆	3 9.843, 4 13.123, 5 16.404, 10 32.808, 15 49.213, 20 65.617	
	With sleeve	FD-FM ☆-S △	2 6.562 (Note), 3 9.843, 4 13.123, 5 16.404, 10 32.808, 15 49.213, 20 65.617	
threa	Il diameter aded head with ve (free-cut)	FD-NFM2-S		1 0.394, 2 0.787, 3 1.181, 4 1.575, 5 1.969, 6 2.362, 7 2.756, 8 3.150, 9 3.543, 10 3.937, 11 4.331, 12 4.724
200°C	392°F heat-resistant	FD-H20-M ☆	2 6.562, 3 9.843	
350°C	662°F heat-resistant	FD-H35-M ☆	3 9.843	

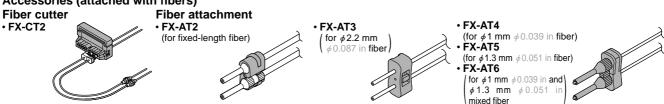
Note: The standard fiber has a 2 m 6.562 ft fiber cable length and a 4 cm 1.575 in or 9 cm 3.543 in sleeve length.

Correlation between sensing range attenuation coefficient and fiber cable length

The longer the fiber cable, the shorter the sensing range.



Accessories (attached with fibers)



Notes: 1) Fiber cutter is not supplied as accessory along with FT-NB8, FD-N8 and FD-N4. Please order it separately.

2) The fiber attachment is not attached with FT-N8/NB8, FT/FD-P80 and FD-N8, The previous FX-AT10 attachment is attached with FD-N4.

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 for **FX-303** is for H-SP mode. Please contact our office for details on sensing ranges in the S-d1 and S-d2 modes.

SPECIFICATIONS

Refer to p.78 \sim for fiber specifications.

	Туре	NPN output	PNP output				
Iten	Model No.	FX-303	FX-303P				
Sup	oly votage	12 to 24 V DC ± 10 % Ripple P-P 10 % or less					
Pow	er consumption	Normal operation: 960 mW or less (Current cor ECO mode: 600 mW or less (Current consump	nsumption 40 mA or less at 24 V supply voltage) tion 25 mA or less at 24 V supply voltage)				
Outp	out	NPN open-collector transistor • Maximum sink current: 100 mA (Note 1) • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 1.5 V or less [at 100 mA (Note 1) sink current]	PNP open-collector transistor				
	Utilization category	DC-12 c	or DC-13				
	Output operation	Light-ON or Dark-ON, s	electable with jog switch				
	Short-circuit protection	Incorp	porated				
Res	oonse time	90 μs	or less				
Оре	ration indicator	Orange LED (lights up	when the output is ON))				
Stab	ility indicator	Green LED (lights up under stable light re	eceived condition or stable dark condition)				
MOI	DE indicator	RUN: Green LED, TEACH · ADJ · I	L/D ON · TIMER · PRO: Yellow LED				
Digital display		4 digit red LED display					
Sen	sitivity setting	2-level teaching / Limit teaching / Manual adjustment					
Fine	sensitivity adjustment function	Incorp	orated				
Inter	ference prevension function	Not incorporated (The communication	n function is not incorporated) (Note 1)				
Time	er function	Incorporated with variable ON-delay / OFF-delay / ONE SHOT timer, switchable either effective or ineffective (Timer period: 0.5 to 500 ms approx.)					
	Pollution degree	3 (Industrial environment)					
Ambient temperature Ambient humidity Ambient illuminance EMC Voltage withstandability		$-$ 10 to $+55^{\circ}\mathrm{C}$ $+$ 14 to $+$ 131 $^{\circ}\mathrm{F}$ (If 4 to 7 units are connected in cascade: $-$ 10 to $+50^{\circ}\mathrm{C}$ $+$ 14 to $+$ 122 $^{\circ}\mathrm{F}$, if 8 to 16 units are connected in cascade: $-$ 10 to $+$ 45 $^{\circ}\mathrm{C}$ $+$ 14 to $+$ 113 $^{\circ}\mathrm{F}$) (No dew condensation or icing allowed), Storage: $-$ 20 to $+$ 70 $^{\circ}\mathrm{C}$ $-$ 4 to $+$ 158 $^{\circ}\mathrm{F}$					
resi	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH					
ental	Ambient illuminance	Sunlight: 10,000 ℓ x at the light-receiving face, Inca	andescent light: 3,000 ℓx at the light-receiving face				
onmo	EMC	EN 609	947-5-2				
invir	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure					
	Insulation resistance	20 M Ω , or more, with 250 V DC megger between all supply terminals connected together and enclosure					
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/s² acceleration (10 G approx.) in 2	X, Y and Z directions for five times each				
Emi	ting element	Red LED (modulated)					
Mate	erial	Enclosure: Heat-resistant ABS, Case	e cover: Polycabonate, Switch: Acrilic				
Con	necting method	Connector	connection				
Cab	le extension	Extension up to total 100 m 328.084 ft i	s possible with 0.3 mm ² , or more, cable.				
Weight		20 g approx.					

Notes: 1) 50 mA, if five, or more, amplifiers are connected in cascade.

When this sensor used by cascading along with the **FX-301/302/311** series, since the communication function is not incorporated, mount identical models together.

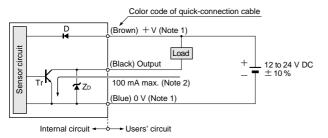
²⁾ The cable for amplifier connection is not supplied as an accessory. Make sure to use the optional quick-connection cable given below. Main cable (3-core): CN-73-C1 (cable length 1 m 3.281 in), CN-73-C2 (cable length 2 m 6.562 in), CN-73-C5 (cable length 5 m 16.404 in) Sub cable (1-core): CN-71-C1 (cable length 1 m 3.281 in), CN-71-C2 (cable length 2 m 6.562 in), CN-71-C5 (cable length 5 m 16.404 in)

I/O CIRCUIT AND WIRING DIAGRAMS

FX-303

NPN output type

I/O circuit diagram



Notes: 1) The quick-connection sub cable does not have $\,\pm\,$ V (brown) and 0 V (blue).

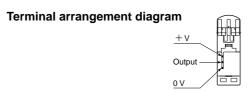
2) 50 mA max., if five, or more, amplifiers are connected together.

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

Wiring diagram Color code of quick-connection cable Brown (Note) Load 12 to 24 V DC ± 10 %

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

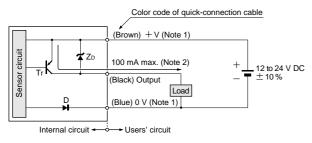
Blue (Note)



FX-303P

PNP output type

I/O circuit diagram



Notes: 1) The quick-connection sub cable does not have $\,+\,$ V (brown) and 0 V (blue).

2) 50 mA max., if five, or more, amplifiers are connected together.

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

Wiring diagram Color code of quick-connection cable Brown (Note) 12 to 24 V DC Load Blue (Note)

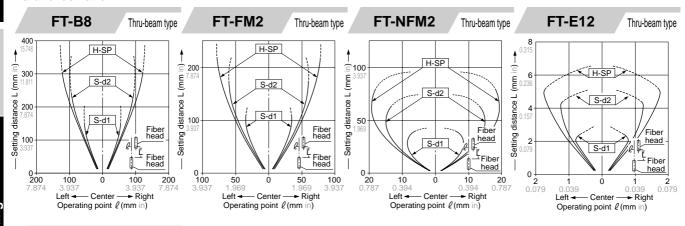
Note: The quick-connection sub cable does not have brown lead wire and blue lead wire.

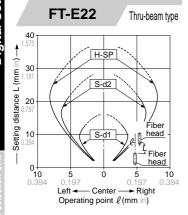


SENSING CHARACTERISTICS (TYPICAL)

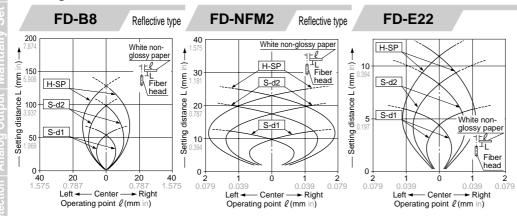
Please contact our office more details on models the not described below.

Parallel deviation





Sensing fields



PRECAUTIONS FOR PROPER USE

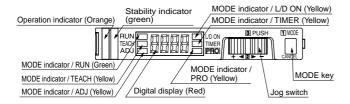
Refer to p.1135 ~ for general precautions, and to the 'PRO Mode Operation Guide' or 'SUNX fiber sensor home page' (http://www.fiber-sensor.com) for details pertaining to operating instructions for the amplifier.

Amplifier



This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body injury or property damage from dangerous parts of machinery. It is a normal object detection sensor.

Part description



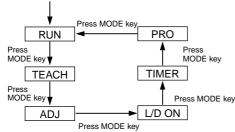
Cascading amplifiers

- Make sure that the power supply is off while cascading 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 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.
- · 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.
- · 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.
- · When this amplifier used by cascading along with the FX-301/302/311 series, since the communication function is not incorporated, mount indentical models together.
- · Since this product does not incorporate the interference prevention function, please install not to be influenced of disturbance light, such as other sensors.

Operation procedure

· When MODE key is pressed, the mode changes as per the diagram below.

Power supply switched on



Notes: 1) When jog switch is pressed, the setting is confirmed.

- 2) When MODE key is pressed for 2 sec., or more, the sensor returns to the RUN mode.
- 3) Cancellation is possible by pressing MODE key during setting.
- 4) When Jog switch is turned in the 'RUN' mode, the current threshold value is displayed. And then, the current light intensity display appears again automatically.
- · For details of operation procedure, refer to the 'SUNX fiber sensor home page' (http://www.fiber-sensor.com).

Teaching

• The threshold values can be set by 2-level teaching or limit teaching, when the MODE indicator / TEACH (yellow) lights up.

In case of 2-level teaching

• This is the method of setting the threshold value by teaching two levels, corresponding to the object present and object absent conditions. Normally, setting is done by this method.

Step	Description	Display
1	Set the fiber within the sensing range. Press MODE key to light up MODE indicator / TEACH (yellow).	1234
2	Press Jog switch in the object present condition. If the teaching is accepted, the read incident light intensity blinks in the digital display.	587
3	The MODE indicator / TEACH (yellow) blinks. Press Jog switch in the object absent condition.	1234
4	If the teaching is accepted, the read incident light intensity blinks in the digital display and the threshold value is set at the mid-value between the incident light intensities in the object present and the object absent conditions. After this, the judgment on the stability of sensing is displayed.	9000
	In case stable sensing is possible: ' g_{ood} ' is displayed. Stability indicator (green) blinks. In case stable sensing is not possible: ' HRrd ' is displayed. Stability indicator (green) is off.	XXr o
(5)	The threshold value is displayed.	300
6	' · · · · ' blinks in the digital display.	••••
7	The incident light intensity appears in the digital display and the setting is complete.	1234

In case of limit teaching

• This is the method of setting the threshold value by teaching only the object absent condition (stable incident light condition). This is used for detection in the presence of a background body or for detection of small objects.

	<i>'</i>	
Step	Description	Display
1	Set the fiber within the sensing range. Press MODE key to light up MODE indicator / TEACH (yellow).	1000
2	Press Jog switch in the object absent condition. If the teaching is accepted, the read incident light intensity blinks in the digital display.	1000
3	The MODE indicator / TEACH (yellow) blinks. Press Jog switch to the '+' side or the '-' side.	1000
4	If Jog switch is turned to the '+' side, ' \cdot ' scrolls (twice) the display from right to left, and the threshold level is shifted to a value approx. 15 % higher (lower sensitivity) than that set at $@.$ (Note) This is used in case of reflective type fibers. If Jog switch is turned to the ' $-$ ' side, ' \cdot ' scrolls (twice) the display from right to left, and the threshold level is shifted to a value approx. 15 % lower (higher sensitivity) than that set at $@.$ (Note) This is used in case of thru-beam type fibers.	
5	After this, the judgment on whether the set shift amount is possible or not will be displayed. When the shift is possible: ' $\frac{9}{2000}d$ ' is displayed. When the shift is not possible: ' $\frac{9}{2000}d$ ' is displayed.	Sood XXrd
6	The threshold value is displayed.	1158
7	' · · · · ' blinks in the digital display.	••••
8	The incident light intensity appears in the digital display and the setting is complete.	(000

Note: The approx. 15 % amount of shift is the initial value. The amount of shift can be changed in the PRO mode from approx. 5 to 80 % (5 % step). Refer to the 'SUNX fiber sensor home page' (http://www.fibersensor.com) for details of the setting method.

PRECAUTIONS FOR PROPER USE

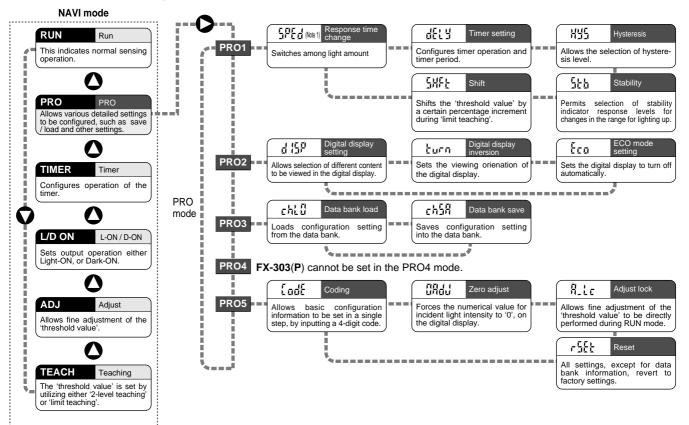
Refer to p.1135 ~ for general precautions, and to the 'PRO Mode Operation Guide' or 'SUNX fiber sensor home page' (http://www.fiber-sensor.com) for details pertaining to operating instructions for the amplifier.

Amplifiers

PRO mode

- · Refer to the 'SUNX fiber sensor home page' (http://www.fibersensor.com) for details pertaining to the PRO mode's setting instructions and procedures.
- PRO settings can be done when MODE indicator / PRO (yellow) lights up.

Table for PRO mode settings



Notes: 1) Although the response time is '90 μ s or less' in all settings, if the following item is set, the light amount can be changed.

	· · · · · · · · · · · · · · · · · · ·							
Display	X · 5 P	5.01	5.95					
Light amount	Usual (standard)	About 50 % of the standard	About 80 % of the standard					

- 2) There is no item to set since the communication function is not incorporated in this amplifier.
- 3) When the code setting function is used, refer to the code setting table given below.

PRO5 direct code setting table

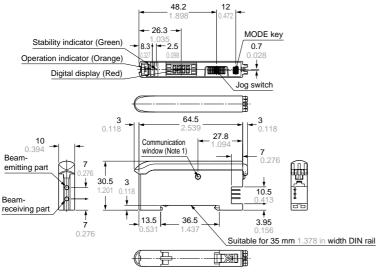
	RUN DIA DI LO ON TEACH DI TIMER ADJ PRO									
	1st fig	ure		2nd fig	ure		3rd fig	ure	4th	figure
Direct code	Light amunt	Hyste- resis	Direct code	L-ON/ D-ON	Display	Direct code	Adjust lock	Timer lock	Direct code	Timer
B	H-SP	H-02 (standard)	B	L-ON	digit	0	ON	NON	B.	OFF
1	H-SP	H-03 (large)	1	L-ON	Percent	1	ON	OFF-delay	1	1 ms
2	H-SP	H-01 (small)	2	L-ON	Peak hold	2	ON	ON-delay	2	3 ms
3	S-d1	H-02 (standard)	3	L-ON	Bottom hold	3	ON	ONE-SHOT	3	5 ms
ч	S-d1	H-03 (large)	ч	D-ON	digit	ч	OFF	NON	ч	10 ms
5	S-d1	H-01 (small)	5	D-ON	Percent	5	OFF	OFF-delay	5	30 ms
Б	S-d2	H-02 (standard)	Б	D-ON	Peak hold	Б	OFF	ON-delay	Б	50 ms
7	S-d2	H-03 (large)	7	D-ON	Bottom hold	7	OFF	ONE-SHOT	7	100 ms
8	S-d2	H-01 (small)	_	_	_		_	_	8	300 ms
_	_	_	_	-	-	_	_	_	9	500 ms

DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX 'fiber sensor home page': http://www.fiber-sensor.com/ Refer to p.103~ for fiber dimensions.

FX-303 FX-303P

Amplifier

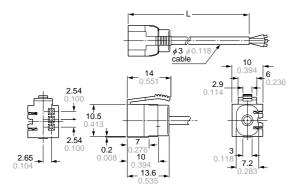


Notes: 1) Not used.

2) When cascading multiple amplifiers, or when it moves depending on the way it is installed on a DIN rail, these end plates ensure that all amplifiers are mounted together in a secure and fully connected manner. Two pcs. per set.

CN-73-C1 CN-73-C2 CN-73-C5

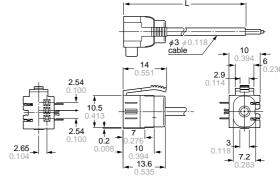
Main cable (Optional)



• Length (L)

Model No.	Length (mm in)
CN-73-C1	1,000 39.370
CN-73-C2	2,000 78.740
CN-73-C5	5,000 196.850

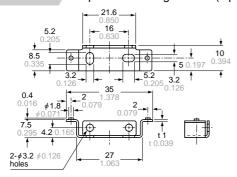
CN-71-C1 CN-71-C2 CN-71-C5 Sub cable (Optional)



• Length (L)

Model No.	Length (mm in)
CN-71-C1	1,000 39.370
CN-71-C2	2,000 78.740
CN-71-C5	5,000 196.850

MS-DIN-2 Amplifier mounting bracket (Optional)



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

MS-DIN-E End plates (Optional)

