Slim Body Analog Fiber Sensor FX_1



MARKERS





Analog output type for diverse applications

Analog voltage output

It incorporates an analog voltage output of 1 to 5 V.

Various uses

In combination with various types of fibers and the ultracompact digital panel controller, CA2 series, FX-11A can be used for various applications, such as, height evaluation, level detection by differential sensing, etc.



CA2 series (Refer to p.793~.) Digital panel controller

Interference prevention function

Two sets of fibers can be mounted close together or face to face.



Slim size

Being only 10 mm 0.394 in thick, it can be mounted in a narrow space.



Saturation indicator

The saturation indicator lights up when the output reaches 5 V. Hence, the sensitivity can be easily adjusted even without using a tester. Moreover, an incident beam indicator which brightens up in proportion to the amount of incident beam (output voltage) is also incorporated.



Selection Guide Fibers FT / FD / FR FX-100 FX-300 FX-410 FX-311 **FX-11A** FX-301-F Other Products

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Accessory

• MS-DIN-2 (Amplifier mounting bracket)



SENSORS
STATIC CONTROL DEVICES
LASER

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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

		-						MARKERS
T	Type		Shape of fiber head (mm in)	Sensing range (Note 1,2)	Features Fiber cabl		Model No.	
			Lens mountable	160 mm 6.299 in	 Twice the sensing range for the same diameter 	<mark>≫</mark> 2 m 6.562 ft	FT-B8	
		Long s range	With lens	125 mm 4.921 in	 Long sensing range with small fiber heads of ø2.5 mm ø0.098 in 	2 m 6.562 ft	FT-SFM2L	
			Lens mountable		Free-cut type		FT-FM2	Selection
			With sleeve	85 mm 3.346 in		<mark>≫</mark> 2 m 6.562 ft	FT-FM2S With sleeve 90 mm 3.543 in FT-FM2S4 With sleeve 40 mm 1.575 in	Guide Fibers FT/FD/FR
	7	-	ø2.5 ø0.098				FT-SFM2	Fiber Sensor Amplifiers
	20000+	ומווחמו	Lens mountable M3	85 mm 3.346 in	 Miniature head but having the same sensing range as the standard type fiber 	<mark>≫</mark> 2 m 6.562 ft	FT-T80	FX-100 FX-300
	U	0		23 mm	 Suitable for detection in a congested equipment 	×	FT-NFM2	FX-410
_			With sleeve				FT-NFM2S With sleeve 90 mm 3.543 in	FX-311
I-beam			ØU.88 Ø0.035		Free-cut type	2 m 6.562 m	With sleeve 40 mm 1.575 in	FX-301-F
Thr							FT-SNFM2	Other Products
		Long sensing range	With lens Ø3 Ø0.118	100 mm 3.937 in	 The fiber can be bent sharply, like an electric wire, to avoid space wastage in installation because of its small allowable bending radius of R1 mm R0.039 in or more. 	<mark>≫</mark> 2 m 6.562 ft	FT-WS8L	
	end	ndard	Lens mountable M4	35 mm			FT-W8	
	narp b	r Stai	Ø2.5 Ø0.098	1.378 IN			FT-WS8	
	SI	diamete		8 mm 0.315 in			FT-W4	
		Small					FT-WS4	
	al use	Wide beam	Sensing width 11 mm 0.433 in W4.2 × H31 × D13.5 W0.165 × H1.220 × D0.531	100 mm 3.937 in	The wide beam detects an object at any place within the range.	<mark>≫</mark> 2 m 6.562 ft	FT-A8	
Specie	Speci	ay	Top sensing	65 mm	The wide beam detects an object at	*	FT-AFM2	
		Arra	Side sensing	2.559 in	any place within the range.	2 m 6.562 ft	FT-AFM2E	

Notes: 1) The sensing range is defined as the range until the saturation indicator lights up.

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.

LASER SENSORS

ORDER GUIDE

FT/FD/FR Fiber Sensor Amplifiers FX-100 FX-300 FX-410 FX-311

FX-301-F

Other Products

Fib	ers	[Re	eflective type]				
	Туре		Shape of fiber head (mm in)	Sensing range (Note 1,2)	Features	Fiber cable length	Model No.
		M6 M6		31 mm 1.220 in	Long sensing range	<mark>≫</mark> 2 m 6.562 ft	FD-B8
			Coaxial M6		Free-cut type	<mark>≫</mark> 2 m 6.562 ft	FD-FM2
			With sleeve	22 mm 0.866 in			FD-FM2S With sleeve 90 mm 3.543 in
			ø2.5 ø0.098				FD-FM2S4 With sleeve 40 mm 1.575 in
				22 mm 0.866 in			FD-T80
		Idard	M3 Small diameter	7 mm 0.276 in	 Miniature head but having the same sensing range as the standard type fiber 	≥ 2 m 6.562 ft	FD-T40
	5	Star	ø3 ø0.118	22 mm 0.866 in			FD-S80
				- 7 mm	Suitable for detection in a congested	×	FD-NFM2
			With sleeve				FD-NFM2S With sleeve 90 mm 3.543 in
0			ø1.48 ø0.058	□ 0.276 in	equipment Free-cut type	2 m <u>6.56</u> 2 ft	FD-NFM2S4 With sleeve 40 mm 1.575 in
eflective			ø2.5 ø0.098				FD-SNFM2
Re		p		8 mm 0.315 in	 The fiber can be bent sharply, like an electric wire, to avoid space 	≥ 2 m 6.562 ft	FD-W8
	p	Standar		□ 8 mm			FD-WT8
	arp bei		ø3 ø0.118	¹ 0.315 in	wastage in installation because of its small allowable bending radius of R1 mm R0.039 in or more		FD-WS8
	Sh	ecision	Coaxial M4	3 mm	(FD-WG4, FD-WSG4: R2 mm R0.079 in or more).		FD-WG4
		High pr	Coaxial ø3 ø0.118	0.118 in			FD-WSG4
		~	Top sensing	- 10		<mark>}<</mark> 2 m 6.562 ft	FD-AFM2
	se	Array	Side sensing	13 mm 0.512 in	Its wide beam meets various needs.		ED-AEM2E
	ecial u			- 10 mm		9~	
	Sp	recisio	Lens mountable	0.394 in	coaxial fiber	2 m 6.562 ft	FD-G4
		High pi	Coaxial • Small head M3 Lens mountable	3 mm 0.118 in	• Combination with the FX-MR3 lens gives an extremely small spot diameter of Ø0.3 mm Ø0.012 in approx.	500 mm 19.685 in	FD-EG1

Notes: 1) The sensing range is defined as the range until the saturation indicator lights up.

Further, for the reflective type fibers, it is specified for white non-glossy paper [50 × 50 mm 1.969 × 1.969 in (**FD-B**: 100 × 100 mm 3.937 × 3.937 in)] as the object.
Please take care that the sensing range of free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

Accessories

- FX-CT2 (Fiber cutter)
- FX-AT10 (ø1 mm ø0.039 in fiber attachment) FX-AT13 (ø1.3 mm ø0.051 in fiber attachment)



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Designation		Madal Na	Description					Expansion lens		
								• FX-LE1		
e fiber	Expansion lens	FX-LE1	Increases the • Sensing ra 900 mm 3 FT-T80), 3	e sen: ange 5.433 350 m	atter and					
ru-beam type	Super- expansion lens	FX-LE2	ange with large aperture lenses. es) (Note 1): 500 mm 98.425 in (FT-FM2),	Side-view lens • FX-SV1						
For th	Side-view lens	FX-SV1	Beam axis is • Sensing ra 220 mm 8 25 mm 0.9	bent ange .661 984 in	by 90°. (Lenses in (FT-B (FT-W 8					
	Pinpoint spot lens	FX-MR1	Pinpoint spot • Applicable • Distance t	t of ø(e fiber o foca	0.5 mm s: FD-W al point:	Zaam lana				
reflective type fiber	Zoom lens FX-MR2 The spot diameter is adjustable from Ø0.7 to Ø2 mm Ø0.028 to Ø0.079 in according to how much the fiber is screwed in. • Applicable fibers: FD-WG4, FD-G4 • Distance to focal point: 18.5 to 43 mm 0.728 to 1.693 in approx (Screw-in depth: 7 to 14 mm Ø0.276 to 0.551 in) • Spot diameter: Ø0.7 to Ø2 mm Ø0.028 to Ø0.079 in (Screw-ir depth: 7 to 14 mm Ø0.276 to 0.551 in)						n ø0.7 to ø2 mm ø0.028 to te fiber is screwed in. 34 8 mm 0.728 to 1.693 in approx. 76 to 0.551 in) ø0.028 to ø0.079 in (Screw-in 551 in)	• FX-MR2 Screw-in depth $\frac{1}{1}$		
For	Finest spot lens	FX-MR3	Extremely fir • Applicable • Distance t • Spot diam ø0.5 mm	e spo fiber o foca eter: 0.02	ot of ø0.3 rs: FD-W al point: ø0.3 mn <mark>0 in (FD</mark>	focal point ⊥→i⊷ Spot di Digital panel contro • CA2 series				
Digital panel controller (Note 2)		CA2-T2	This is a very threshold lev Supply vo Output: NI No. of input Input rang Main func Threshold scale setti function, a function, e	/ sma el set ltage: PN op uts: 1 tions: level ng fu auto-re etc.	Protective tube • FTP-= • FDP-=					
Protective tube (For thru-beam (type fiber)) Protective tube (For reflective (type fiber)) Fiber bender		FTP-500 (0.5 m 1.640 ft) FTP-1000 (1 m 3.281 ft) FTP-1500 (1.5 m 4.921 ft)	For M4 thread		FT-B8 FT-FM FT-FM FT-FM	2 2S 2S4		Universal sensor m Using the arm which er the horizontal direction, done from above an as		
		FTP-N500 (0.5 m 1.640 ft) FTP-N1000 (1 m 3.281 ft) FTP-N1500 (1.5 m 4.921 ft)	For M3 thread	le fibers	FT-T80 FT-NFM2 FT-NFM2S FT-NFM2S4 FD-T40 FD-B8 FD-FM2 FD-FM2S FD-FM2S4 FD-T80 FD-NFM2S FD-NFM2S FD-NFM2S FD-NFM2S4		The protective tube, made of non-corrosive stainless steel, protects the inner fiber cable from any external forces.	• MS-AJ1-F Forward / back adjustment: 130 mm 5.118 in		
		FDP-500 (0.5 m 1.640 ft) FDP-1000 (1 m 3.281 ft) FDP-1500 (1.5 m 4.921 ft)	For M6 thread	Applicabl				approx. 360° contraction		
		FDP-N500 (0.5 m 1.640 ft) FDP-N1000 (1 m 3.281 ft) FDP-N1500 (1.5 m 4.921 ft)	For M4 thread					Angle adjustment: ± 20° MS-AJ2-F Forward / back adjustment:		
		FB-1	The fiber ber proper radius	nder b 3.	130 mm 5.118 in approx.					
Uni	versal	MS-AJ1-F	Horizontal mounting type Mounting stand asse				g stand assembly for fiber			
sensor mounting stand (Note 3)		MS-AJ2-F	Vertical mou	nting	type	(For M3 (head fi	, M4 or M6 threaded) bers	360° vitation 20° 20°		
								Angle aujustment: ± 20°		

Notes: 1) The sensing range is defined as the range until the saturation indicator lights up. 2) For further details, refer to p.793~ for the ultra-compact digital panel controller CA2 series.

3) Refer to p.799 for the universal sensor mounting stand.



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approx.

Mounting hole

for M6 screw

20°

SPECIFICATIONS

LASER SENSORS **Fibers**

PHOTO-ELECTRIC SENSORS MICRO PHOTO-ELECTRIC SENSORS

AREA SENSORS

SAFETY COMPONENTS

PRESSURE SENSORS

INDUCTIVE PROXIMITY SENSORS PARTICULAR USE SENSORS SENSOR OPTIONS

WIRE-SAVING SYSTEMS

Type	Standard, small fiber head, small diameter, sharp bend, long sensing range with lens, wide beam, array, high precision				
Allowable bending radius	R25 mm R0.984 in or more [Sharp bend: R1 mm R0.039 in or more (FD-WG4, FD-WSG4: R2 mm R0.079 in or more)]				
Ambient temperature	-40 to +70 °C -40 to +158 °F (Sharp bend: -40 to +60 °C -40 to +140 °F, FD-EG1 : -20 to +60 °C -4 to +140 °F) (No dew condensation or icing allowed), Storage: -40 to +70 °C -40 to +158 °F (Sharp bend: -40 to +60 °C -40 to +140 °F, FD-EG1 : -20 to +60 °C -4 to +140 °F)				
Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH				
Material	Fiber core: Acrylic Sheath: Polyethylene Fiber head: Brass (Nickel-plated) (Threaded part of standard, threaded part of small diameter, threaded type of sharp bend, high precision, array Stainless steel (SUS) (FT-SFM2, small fiber head, FT-SNFM2, FD-SNFM2, non-threaded type of sharp bend, FT-SFM2L, sleeve part of sleeve-attached fiber Polycarbonate (Lens of FT-WS8L), Norbornene resin (Lens of FT-A8)				
Accessories	All fibers: 1 fiber attachment set Free-cut type fibers: FX-CT2 1pc. (Fiber cutter) Threaded head fibers: nuts 2 pcs. (thru-beam type: 4 pcs.) and toothed lock washer 1 pc. (thru-beam type: 2 pcs.) FT-A8 : 0.5 × 12 mm 0.020 × 0.472 in seal type slit mask 2 pcs. and 1 × 12 mm 0.039 × 0.472 in seal type slit mask 2 pcs.				

Amplifier

MEASURE- MENT	Am	olifier	
SENSORS STATIC CONTROL DEVICES	Item	Model No.	FX-11A
LASER	Supply voltage		12 to 24 V DC ± 10 % Ripple P-P 10 % or less
MARKERS	Current consumption		35 mA or less
	Anal	og output	 Analog voltage Output voltage: 1 to 5 V (proportional to incident light intensity) Output current: 5 mA or less Output impedance: 47 Ω Load resistance: 2 kΩ or more Temperature characteristics: 0.3 % F.S./°C or less
	Res	oonse time	Switchable either 1 ms or less, or 10 ms or less
Selection	Incic	lent beam indicator	Red LED (brightens up in proportion to analog output voltage)
Fibers	Saturation indicator		Green LED (lights up when the analog output voltage reaches 5 V)
FT/FD/FR	Sensitivity adjuster		8-turn potentiometer with indicator
Fiber Sensor	Interference prevention function		Incorporated
FX-100	e	Ambient temperature	-10 to +55 °C +14 to +131 °F (No dew condensation or icing allowed), Storage: -20 to +70 °C -4 to +158 °F
FX-300	stanc	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH
FX-410	resis	Ambient illuminance	Incandescent light: 1,000 & at the light-receiving face
FX-311	ental	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure (Note 2)
FX-11A	onme	Insulation resistance	20 M Ω , or more, with 250 V DC megger between all supply terminals connected together and enclosure (Note 2)
FX-301-F	Envir	Vibration resistance	10 to 150 Hz frequency, 0.75 mm 0.030 in amplitude in X, Y and Z directions for two hours each
Other		Shock resistance	100 m/s ² acceleration (10 G approx.) in X, Y and Z directions for five times each
Products	Emitting element		Red LED (Peak emission wavelength: 660 nm 0.026 mil, modulated)
	Material		Enclosure: Heat-resistant ABS, Case cover: Polycarbonate, Fiber lock lever: PES
	Cable		0.2 mm ² 4-core cabtyre cable, 2 m 6.562 ft long
	Cable extension		Extension up to total 100 m 328.084 ft is possible with 0.3 mm ² , or more, cable. (Note 3)
	Weig	ght	Net weight: 60 g approx., Gross weight: 100 g approx.
	Acce	essories	MS-DIN-2 (Amplifier mounting bracket): 1 pc., Adjusting screwdriver: 1 pc.

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.

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

3) Take care that the output voltage drops when the cable is extended.

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I/O CIRCUIT AND WIRING DIAGRAMS

I/O circuit diagram



Symbols...D1: Reverse supply polarity protection diode D2, D3: Surge absorption diode

Note: The analog voltage output is not incorporated with a short-circuit protection circuit. Do not connect it directly to a power supply or a capacitive load.

SENSING CHARACTERISTICS (TYPICAL)



Wiring diagram

MICRO PHOTO-ELECTRIC SENSORS AREA SENSORS SAFETY COMPONENTS

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PHOTO-ELECTRIC

SENSORS

PRESSURE SENSORS

INDUCTIVE PROXIMITY SENSORS PARTICULAR

USE SENSORS SENSOR OPTIONS

The sensing characteristics for the thru-beam type and reflective type are listed in alphabetic order respectively.



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SENSING CHARACTERISTICS (TYPICAL)

LASER SENSORS Correlation between setting distance and output voltage



Correlation between setting distance and output voltage when using seal type slit masks

FT-A8

4

2

0

Half sensitivity

20

Selection Guide Fibers FT/FD/FR Fiber Senso Amplifier FX-100 FX-300 FX-410 FX-311 FX-301-F Other Products

CONTROL

DEVICES LASER MARKERS



Maximum sensitivity

60

2.

80

8

6

4

2

0

Half sensitivity

200 400

3.150

-

40 1.575

Setting distance L (mm in) -

With slit mask (0.5 × 12 mm 0.020 × 0.472 in) on both sides

Fiber head

Fiber head

800 1.000

¢

Maximum sensitivity

600

Setting distance L (mm in) -

Ļ

With slit mask (1 × 12 mm 0.020 × 0.472 in) on one side



With slit masks (1 × 12 mm 0.020 × 0.472 in) on both sides

Thru-beam type



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PRECAUTIONS FOR PROPER USE

• Never use this product as a sensing device for personnel protection.



 In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

Response time selection

- The response time of **FX-11A** can be selected either "1 ms" or "10 ms". If your detecting application does not need a quick response, "10 ms" is recommended as it makes the detection secure against inductive noise and ambient light. If you choose "1 ms", pay attention to electromagnetic noise and ambient light.
- The response time of FX-11A is the time required for the output voltage to rise from 1 V (dark state voltage) to [90 % of {light state voltage 1 V (dark state voltage)} + 1 V (dark state voltage)] or the time required for the output voltage to fall from the light state voltage to [10 % of {light state voltage 1 V (dark state voltage)} + 1 V (dark state voltage)]. The response time of FX-11A is constant regardless of the amplitude of the output voltage.



Refer to p.986~ for general precautions and p.105 for precautions of fibers.

Others

- Do not use during the initial transient time (50 ms) after the power supply is switched on.
- The analog output is not incorporated with a short-circuit protection circuit. Do not connect it directly to a power supply or a capacitive load.

ELECTRIC SENSORS
MICRO PHOTO- ELECTRIC SENSORS
AREA SENSORS
SAFETY COMPONENTS
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INDUCTIVE PROXIMITY SENSORS
PARTICULAR USE SENSORS
SENSOR OPTIONS
WIRE- SAVING SYSTEMS
MEASURE- MENT SENSORS
STATIC CONTROL DEVICES
LASER MARKERS

Selection Guide

Fibers

Fiber Se Amplifie

FT / FD / FR

FX-100

FX-300

FX-410

FX-311

FX-11A

FX-301-F

Other Products

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

Amplifier

FX-11A





Note: The top view is shown without the cover.