

FX-11A

Slim Body Analog Fiber Sensor



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 ultra-compact digital panel controller, **CA2** series or the digital panel controller **CA** series, **FX-11A** can be used for various applications, such as, height evaluation, level detection by differential sensing, etc.



CA2 series



CA series

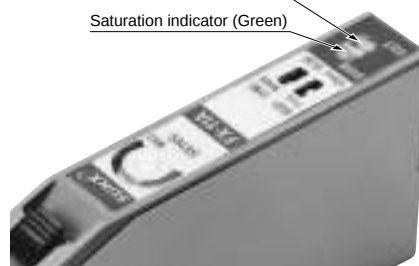
Digital panel controller

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.

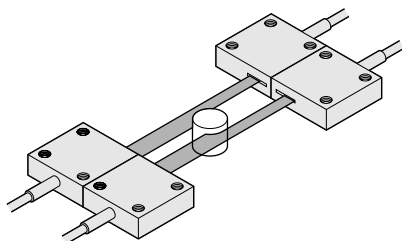
Moreover, an incident beam indicator which brightens up in proportion to the amount of incident beam (output voltage) is also incorporated.

Incident beam indicator (Red)
Saturation indicator (Green)



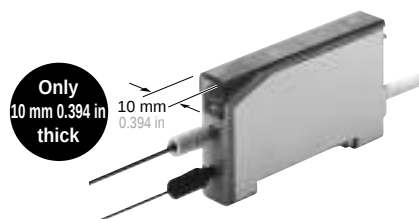
Interference prevention function

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



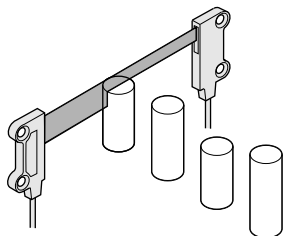
Slim size

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

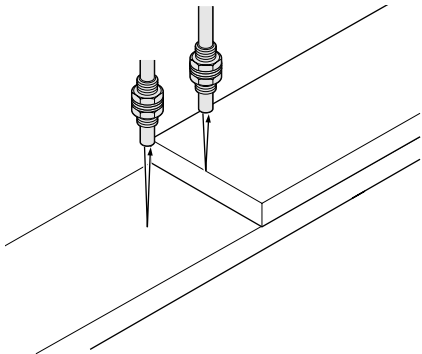


APPLICATIONS

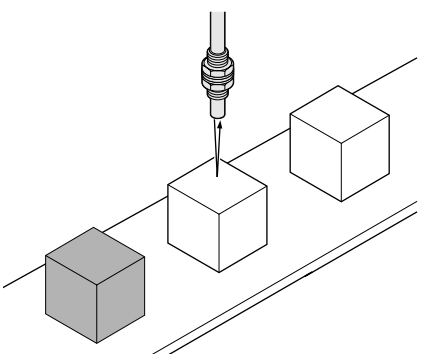
Evaluating height of traveling objects
Objects can be sorted according to their height.



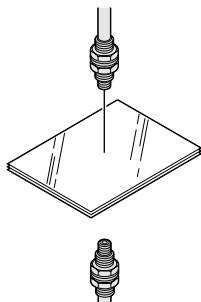
Detecting level difference
When differential sensing is used, no sensitivity readjustment is required even if the reflectivity of the objects changes.



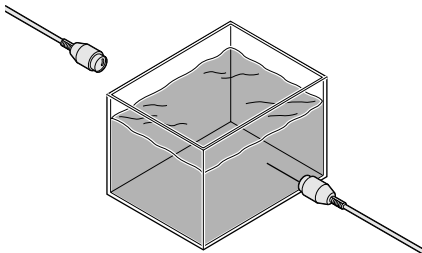
Detecting product mix-up
Mixed-up products that differ in color (reflectivity) can be sorted out from normal products.



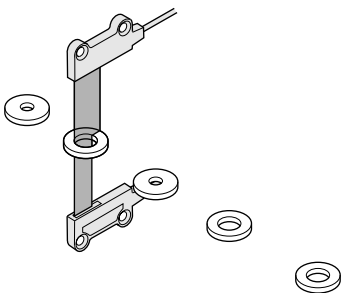
Ascertaining the number of translucent films
The number of overlapping translucent films can be ascertained.



Sensing turbidity of liquid
The turbidity of a liquid inside a clear-wall tank can be sensed in an analog manner.



Measuring inner diameter of rings
Rings can be sorted according to their inner diameter.



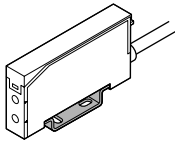
FX-11A

ORDER GUIDE

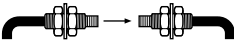
Amplifier

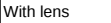
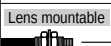
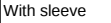
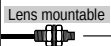
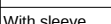
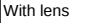
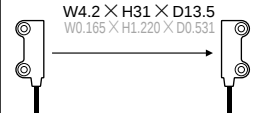
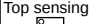
Appearance	Model No.	Supply voltage	Analog output
	FX-11A	12 to 24 V DC $\pm$ 10 %	Analog voltage • Output voltage: 1 to 5 V

Accessory
 • **MS-DIN-2** (Amplifier mounting bracket)



Fibers [Thru-beam type (one pair set)]



Type	Shape of fiber head (mm in)	Sensing range (Note 1)	Features	Fiber cable length  : free cut	Model No.	
Thru-beam	Long sensing range	 M4  160 mm 6.299 in	• Twice the sensing range for the same diameter	 2 m 6.562 ft	FT-B8	
		 With lens ϕ 2.5 ϕ 0.098  125 mm 4.921 in	• Long sensing range with small fiber heads of ϕ 2.5 mm ϕ 0.098 in		 2 m 6.562 ft	FT-SFM2L
	Standard	 M4	 85 mm 3.346 in	• Free-cut type	 2 m 6.562 ft	FT-FM2
		 With sleeve  ϕ 1.48 ϕ 0.058				FT-FM2S With sleeve 90 mm 3.543 in
		 ϕ 2.5 ϕ 0.098				FT-FM2S4 With sleeve 40 mm 1.575 in
						FT-SFM2
		 M3  85 mm 3.346 in	 23 mm 0.906 in	• Miniature head but having the same sensing range as the standard type fiber	 2 m 6.562 ft	FT-T80
		 M3				FT-NFM2
		 With sleeve  ϕ 0.88 ϕ 0.035				FT-NFM2S With sleeve 90 mm 3.543 in
		 ϕ 1.5 ϕ 0.059				FT-NFM2S4 With sleeve 40 mm 1.575 in
				FT-SNFM2		
	Sharp bend	Long sensing range	 With lens ϕ 3 ϕ 0.118  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.	 2 m 6.562 ft	FT-WS8L
		Standard	 M4  35 mm 1.378 in			FT-W8
			 ϕ 2.5 ϕ 0.098			FT-WS8
		Small diameter	 M3  8 mm 0.315 in			FT-W4
			 ϕ 1.5 ϕ 0.059			FT-WS4
Special use	Wide beam	 W4.2 $\times$ H31 $\times$ D13.5 W0.165 $\times$ H1.220 $\times$ D0.531  100 mm 3.937 in	• The wide beam detects an object at any place within the range.	 2 m 6.562 ft	FT-A8	
	Array	 Top sensing  15 mm 0.591 in	• The wide beam detects an object at any place within the range.	 2 m 6.562 ft	FT-AFM2	
		 Side sensing  15 mm 0.591 in			FT-AFM2E	

Note: The sensing range is defined as the range until the saturation indicator lights up.

ORDER GUIDE

Fibers [Reflective type]



Type	Shape of fiber head (mm in)	Sensing range (Note 1)	Features	Fiber cable length ✂ : free cut	Model No.
Reflective	Long sensing range	M6	• Long sensing range	2 m 6.562 ft	FD-B8
		Coaxial M6			FD-FM2
	Standard	With sleeve M6 φ 2.5 φ 0.098	• Free-cut type	2 m 6.562 ft	FD-FM2S With sleeve 90 mm 3.543 in FD-FM2S4 With sleeve 40 mm 1.575 in
		M4			FD-T80
		M3 Small diameter φ 3 φ 0.118	• Miniature head but having the same sensing range as the standard type fiber	2 m 6.562 ft	FD-T40 FD-S80
	Sharp bend	M4			FD-NFM2
		With sleeve M4 φ 1.48 φ 0.058	• Suitable for detection in a congested equipment • Free-cut type	2 m 6.562 ft	FD-NFM2S With sleeve 90 mm 3.543 in FD-NFM2S4 With sleeve 40 mm 1.575 in FD-SNFM2
		φ 2.5 φ 0.098			
		M6			FD-W8
	High precision	M4	• 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 (FD-WG4, FD-WSG4: R2 mm R0.079 in or more).	2 m 6.562 ft	FD-WT8 FD-WS8 FD-WG4 FD-WSG4
		Coaxial M4 Lens mountable Coaxial φ 3 φ 0.118			
	Special use	Top sensing φ 20 φ 0.787	• Its wide beam meets various needs.	2 m 6.562 ft	FD-AFM2 FD-AFM2E
		Side sensing φ 20 φ 0.787			
		Coaxial M4 Lens mountable	• Precise position sensing with coaxial fiber	2 m 6.562 ft	FD-G4
		Coaxial • Small head Lens mountable M3	• Combination with the FX-MR3 lens gives an extremely small spot diameter of φ 0.3 mm φ 0.012 in approx.	500 mm 19.685 in	FD-EG1

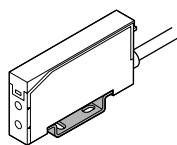
Notes: 1) The sensing range is defined as the range until the saturation indicator lights up.

Further, for the reflective type fibers, it is specified for white non-glossy paper [50 × 50 mm 1.969 × 1.969 in (FD-B8: 100 × 100 mm 3.937 × 3.937 in)] as the object.

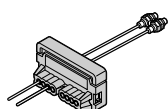
2) Please take care that the sensing range of free-cut type fiber may be reduced by 20 % max.

Accessories

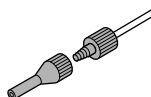
• MS-DIN-2
(Amplifier mounting bracket)



• FX-CT2
(Fiber cutter)



• FX-AT10
(φ 1 mm φ 0.039 in fiber attachment)
• FX-AT13
(φ 1.3 mm φ 0.051 in fiber attachment)



FX-11A

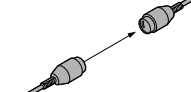
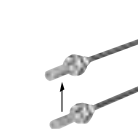
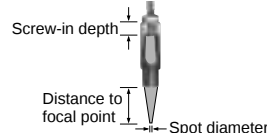
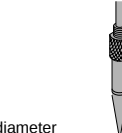
OPTIONS

Designation		Model No.	Description			
For thru-beam type fiber	Expansion lens	FX-LE1	Increases the sensing range by 6 times or more. • Sensing range (Lens on both sides) (Note 1): 900 mm 35.433 in (FT-B8), 750 mm 29.528 in (FT-FM2, FT-T80), 350 mm 13.780 in (FT-W8)			
	Super-expansion lens	FX-LE2	Tremendously increases the sensing range with large aperture lenses. • Sensing range (Lens on both sides) (Note 1): 3,000 mm 118.110 in (FT-B8), 2,500 mm 98.425 in (FT-FM2), 3,000 mm 118.110 in (FT-W8)			
	Side-view lens	FX-SV1	Beam axis is bent by 90°. • Sensing range (Lenses on both sides) (Note 1) : 220 mm 8.661 in (FT-B8), 200 mm 7.874 in (FT-FM2, FT-T80), 25 mm 0.984 in (FT-W8)			
For reflective type fiber	Pinpoint spot lens	FX-MR1	Pinpoint spot of $\phi 0.5$ mm $\phi 0.020$ in. • Applicable fiber: FD-WG4, FD-G4 • Distance to focal point: 6 ± 1 mm 0.236 ± 0.039 in			
	Zoom lens	FX-MR2	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. • Applicable fiber: 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 0.276 to 0.551 in) • Spot diameter: $\phi 0.7$ to $\phi 2$ mm $\phi 0.028$ to $\phi 0.079$ in (Screw-in depth: 7 to 14 mm $\phi 0.276$ to $\phi 0.551$ in)			
	Finest spot lens	FX-MR3	Extremely fine spot of $\phi 0.3$ mm $\phi 0.012$ in is achieved. • Applicable fiber: FD-WG4, FD-EG1, FD-G4 • Distance to focal point: 7.5 ± 0.5 mm 0.295 ± 0.020 in • Spot diameter: $\phi 0.3$ mm $\phi 0.012$ in (FD-EG1), $\phi 0.5$ mm $\phi 0.020$ in (FD-WG4, FD-G4)			
Digital panel controller (Note 2)		CA2-T2	NPN open-collector transistor	This is a very small controller which allows two independent threshold level settings. • Supply voltage: 24 V DC ± 10 % • No. of inputs: 1 No. (sensor input) • Input range: 1 to 5 V DC • Main functions: Threshold level setting function, zero-adjust function, scale setting function, hysteresis setting function, start / hold function, auto-reference function, power supply ON-delay function, etc.		
		CA-R2	Relay contact	This is a multi-functional controller having mathematical functions, hold function, etc. • Supply voltage: 100 to 240 V AC ± 10 % • No. of inputs: 2 Nos. (sensor inputs) • Input range: 1 to 5 V DC • Power supply for sensor: 12 V DC, 150 mA • Main functions: Mathematical functions, process number selection function, hold function, scaling function, auto-reference function, power supply ON-delay function, measurement start delay function, hysteresis setting function, etc.		
		CA-T2	NPN open-collector transistor			
		CA-B2	NPN open-collector transistor With BCD output			
Protective tube (For thru-beam type fiber)		FTP-500 (0.5 m 1.640 ft)	For M4 thread	Applicable fibers	FT-B8	The protective tube, made of non-corrosive stainless steel, protects the inner fiber cable from any external forces.
		FTP-1000 (1 m 3.281 ft)			FT-FM2	
		FTP-1500 (1.5 m 4.921 ft)			FT-FM2S	
		FTP-N500 (0.5 m 1.640 ft)	FT-T80		FD-T40	
		FTP-N1000 (1 m 3.281 ft)	FT-NFM2			
		FTP-N1500 (1.5 m 4.921 ft)	FT-NFM2S			
Protective tube (For reflective type fiber)		FDP-500 (0.5 m 1.640 ft)	For M6 thread	Applicable fibers	FD-B8	
		FDP-1000 (1 m 3.281 ft)			FD-FM2	
		FDP-1500 (1.5 m 4.921 ft)			FD-FM2S	
		FDP-N500 (0.5 m 1.640 ft)	FD-T80			
		FDP-N1000 (1 m 3.281 ft)	FD-NFM2			
		FDP-N1500 (1.5 m 4.921 ft)	FD-NFM2S			
Fiber bender		FB-1	The fiber bender bends the sleeve part of the fiber head at the proper radius.			
Universal sensor mounting stand (Note 3)		MS-AJ1-F	Horizontal mounting type		Mounting stand assembly for fiber (For M3, M4 or M6 threaded) head fibers	
		MS-AJ2-F	Vertical mounting type			

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

2) For further details, refer to [p.864](#)~ for the ultra-compact digital panel controller **CA2** series, and to [p.854](#)~ for the digital panel controller **CA** series.

3) Refer to [P.332](#)~ for the universal sensor mounting stand.

Expansion lens
• FX-LE1Super-expansion lens
• FX-LE2Side-view lens
• FX-SV1Pinpoint spot lens
• FX-MR1Zoom lens
• FX-MR2Finest spot lens
• FX-MR3

Digital panel controller

• CA2 series



• CA series

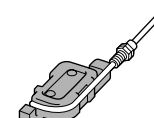


Protective tube

• FTP-□
• FDP-□

Fiber bender

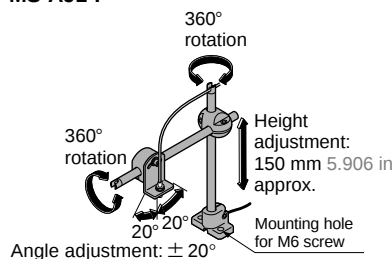
• FB-1



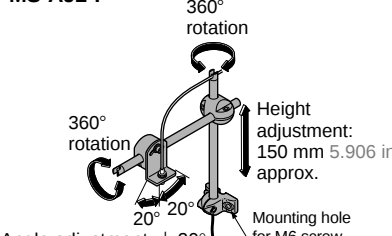
Universal sensor mounting stand

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

• MS-AJ1-F



• MS-AJ2-F



SPECIFICATIONS

Fibers

Item \ 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 (FT-A8 , Lens of FT-WS8L), Polyolefin (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

Item \ Model No.	FX-11A
Supply voltage	12 to 24 V DC ± 10 % Ripple P-P 10 % or less
Current consumption	35 mA or less
Analog 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
Response time	Switchable either 1 ms or less, or 10 ms or less
Incident beam indicator	Red LED (brightens up in proportion to analog output voltage)
Saturation indicator	Green LED (lights up when the analog output voltage reaches 5 V)
Sensitivity adjuster	8-turn potentiometer with indicator
Interference prevention function	Incorporated
Environmental resistance	Ambient temperature
	Ambient humidity
	Ambient illuminance
	Noise immunity
	Voltage withstandability
	Insulation resistance
	Vibration resistance
Shock resistance	100 m/s ² acceleration (10 G approx.) in X, Y and Z directions for five times each
Emitting element	Red LED (modulated)
Material	Enclosure: Heat-resistant ABS, 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 2)
Weight	60 g approx.
Accessories	MS-DIN-2 (Amplifier mounting bracket): 1 pc., Adjusting screwdriver: 1 pc.

Notes: 1) The voltage withstandability and the insulation resistance values given in the above table are for the amplifier only.
2) Take care that the output voltage drops when the cable is extended.

Fiber Selection

FX-301

Digital Setting

FX-302

FX-303

Bank Selection Unit

FX-CH

Manually Set

FX-311

Analog Output

FX-11A

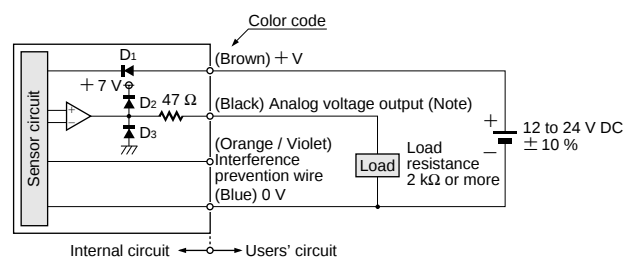
Color Detection

FZ-10

FX-11A

I/O CIRCUIT AND WIRING DIAGRAMS

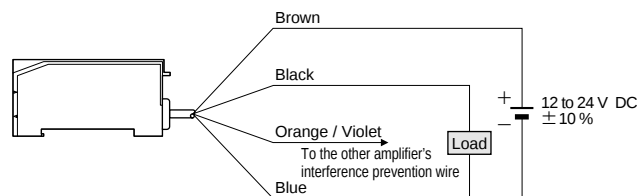
I/O circuit diagram



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.

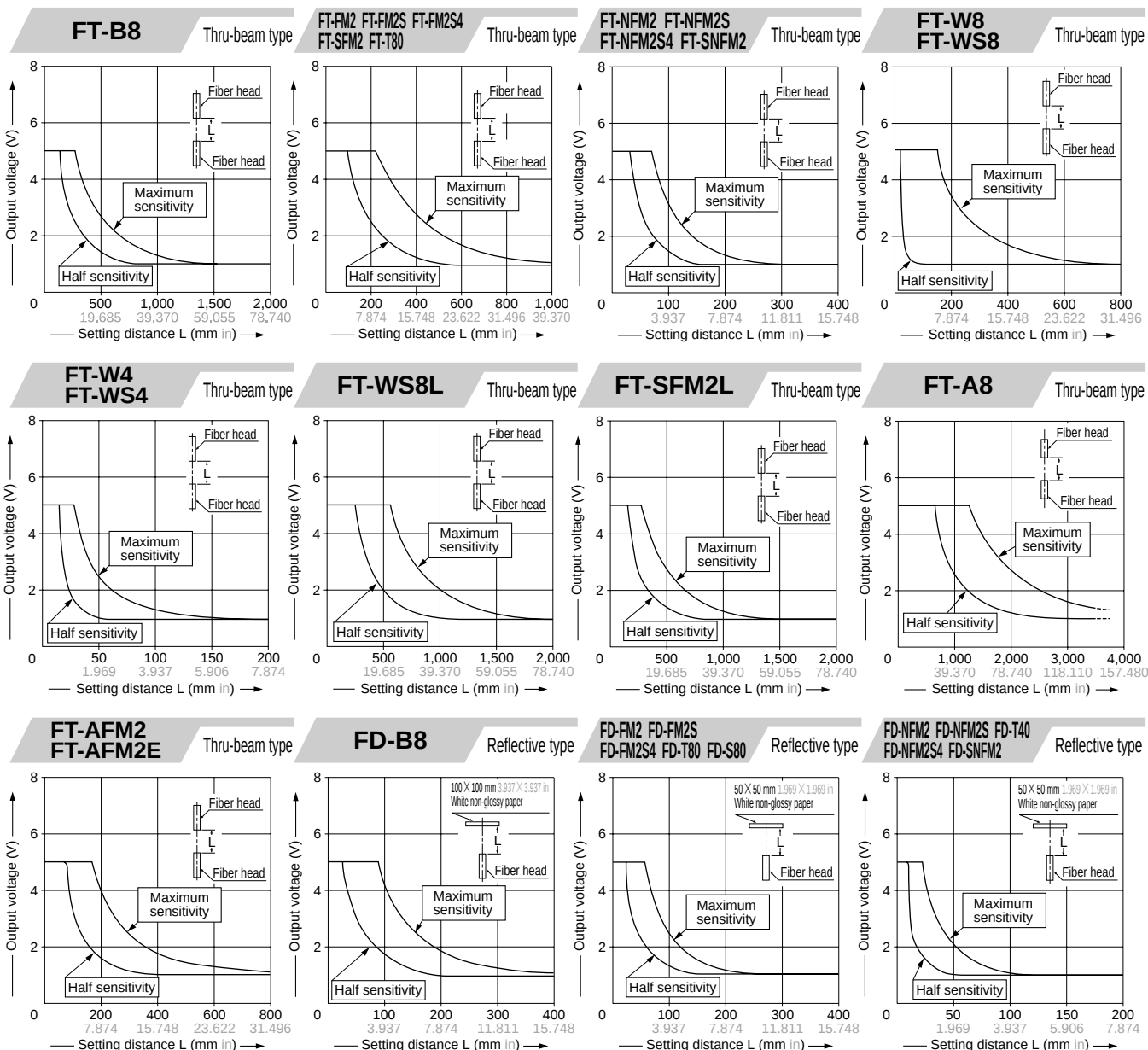
Symbols ... D1: Reverse supply polarity protection diode
D2, D3: Surge absorption diode

Wiring diagram



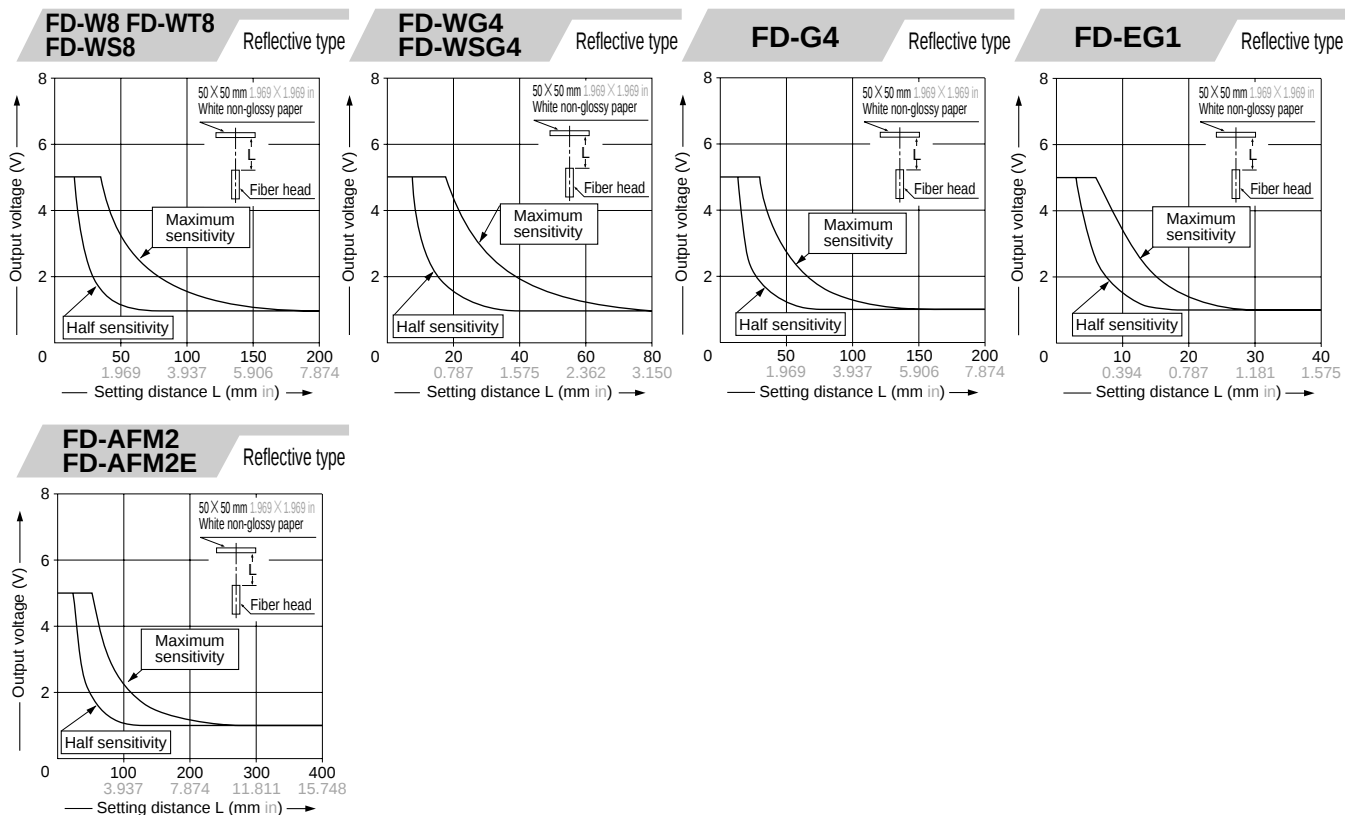
SENSING CHARACTERISTICS (TYPICAL)

Correlation between setting distance and output voltage

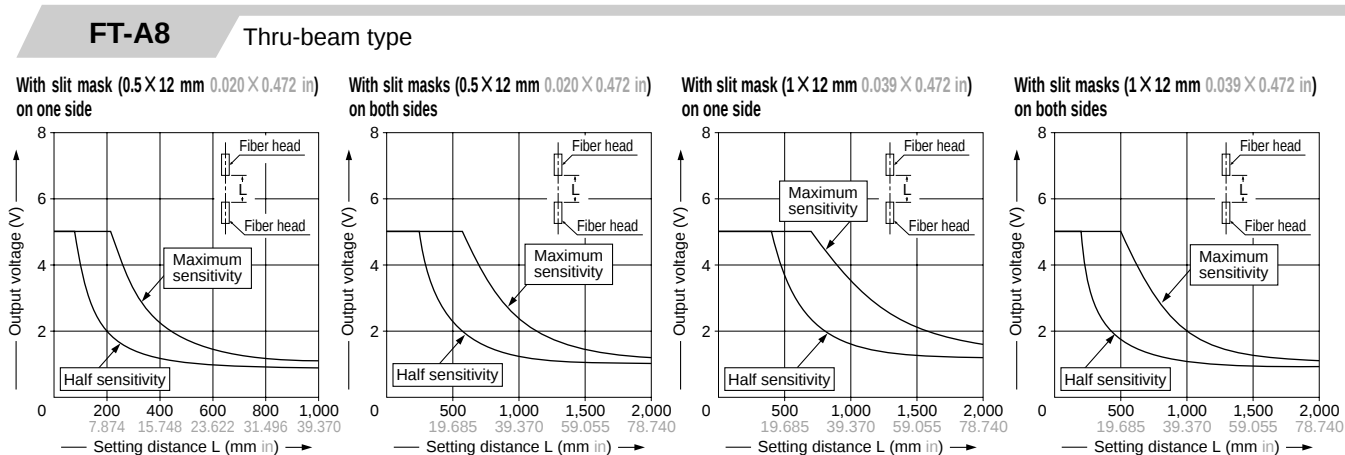


SENSING CHARACTERISTICS (TYPICAL)

Correlation between setting distance and output voltage



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



PRECAUTIONS FOR PROPER USE

Refer to p.1135~ for general precautions and p.94~ for fiber precautions.

Amplifier

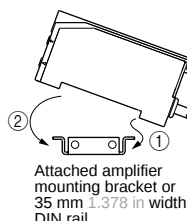


This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body injury or property damage from dangerous parts of machinery. It is a normal object detection sensor.

Mounting

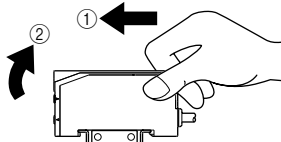
How to mount the amplifier

- ① Fit the rear part of the amplifier on the attached amplifier mounting bracket (**MS-DIN-2**) or a 35 mm 1.378 in width DIN rail.
- ② Press down the front part of the amplifier on the amplifier mounting bracket (**MS-DIN-2**) or DIN rail to fit it.



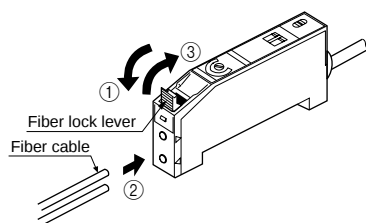
How to remove the amplifier

- ① Push the amplifier forward.
- ② Lift up the front part of the amplifier to remove it.



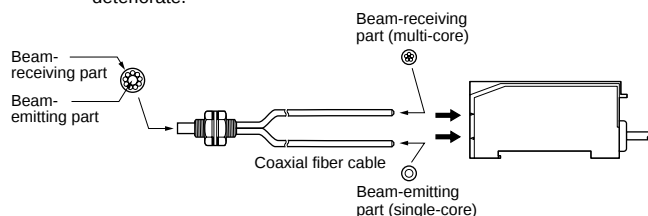
How to connect the fiber cables

- ① Unlock the fiber lock lever.
- ② Insert the fiber cables slowly into the inlets until they stop. (Note 1)
- ③ Lock the fiber lock lever in the original position.



Notes: 1) In case the fiber cables are not inserted to a position where they stop, the sensing range reduces.

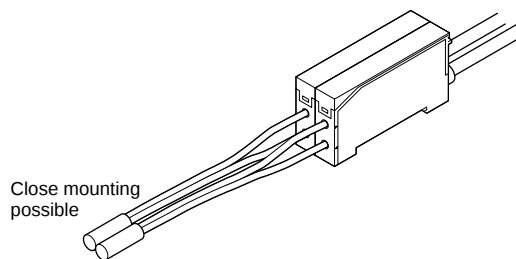
2) With the coaxial reflective type fiber, such as **FD-G4** or **FD-FM2**, insert the center fiber cable (single-core) into the beam-emitting inlet and the outer fiber cable (multi-core) into the beam-receiving inlet. If they are inserted in reverse, the sensing accuracy will deteriorate.



Interference prevention function

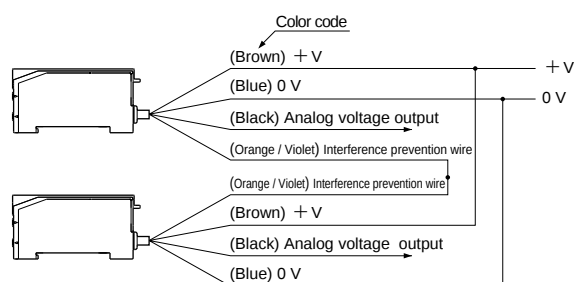
- Two sets of fibers can be mounted close together because an interference prevention function has been incorporated in **FX-11A**.

The wiring and the setting of the interference prevention selection switch should be done as follows.



① Wiring

- Connect together the interference prevention wires and the 0 V wires of the two **FX-11A** amplifiers, respectively.



② Interference prevention selection switch

- Set the interference prevention selection switch to 'MAIN' for one amplifier and to 'SUB' for the other amplifier.

※ In case interference function is not used

- Make sure to set the interference prevention selection switch to 'MAIN'. If it is set to 'SUB', the sensor will not work.
- Insulate the interference prevention wire.

