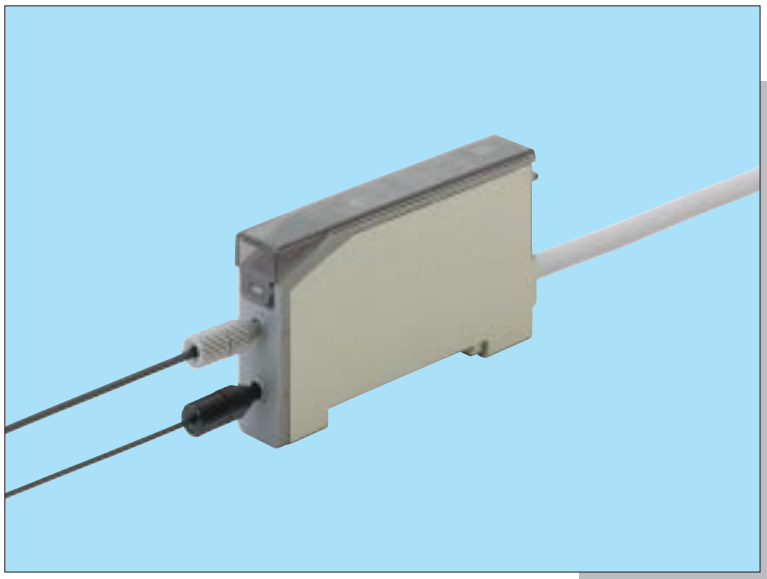
FX-13

Slim Body High Speed Fiber Sensor

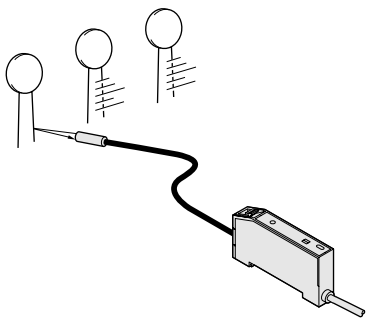


Slim, Fast and Reliable

CE Marked
Conforming to EMC Directive

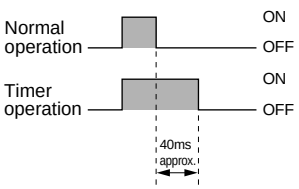
Ultra-high Speed Response Time: 30 μs

The high-speed sensing amplifier **FX-13** is quite immune to ambient light because of its modulated beam. Also, the response time is just 30 μs.
It can detect small and high-speed moving objects reliably.



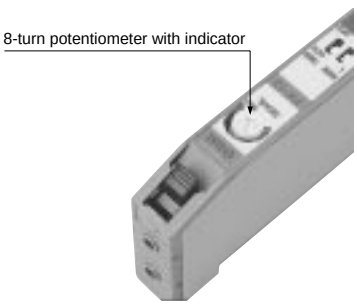
OFF-delay Timer Function

FX-13 is incorporated with an approx. 40ms fixed OFF-delay timer.
The delay timer extends the output signal and is useful to detect small objects which travel so fast that the device connected to the sensor cannot respond.



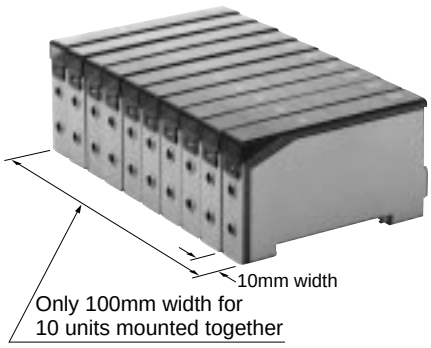
8-turn Adjuster with Indicator

The sensitivity is adjustable with an 8-turn potentiometer enabling delicate setting. Moreover, the potentiometer position can be confirmed at a glance on the indicator.



Compact Size! 10mm Width

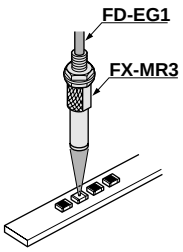
Since its width is merely 10mm, it can be installed in a narrow space.



APPLICATIONS

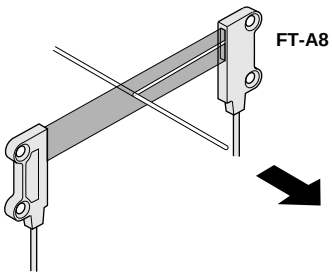
Distinguishing top/bottom surface of a chip component

Due to the small spot size (ϕ0.3mm), the top surface can be distinguished from the bottom surface for small components, such as the 1005 chip.



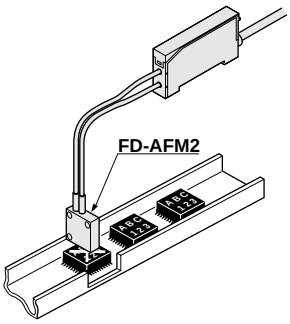
Detecting presence/absence of wire

Even if the wire vibrates, its end can be reliably detected.



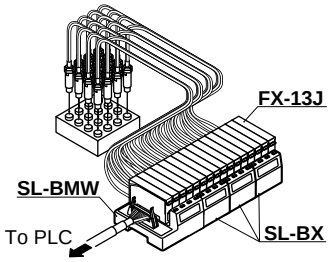
Detecting bad mark on IC

The wide sensing area reduces the effect of characters printed on the IC.



Sensor wire-saving

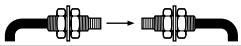
When checking 16 points at a time, 16 Nos. of sensors are needed and the wiring could be complicated. But, if the optional sensor block is used, the wiring can be done easily.



FX-13

ORDER GUIDE

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



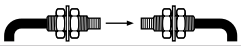
Type	Shape of fiber head (mm)	Sensing range (Note 1)	Min. sensing object [under the optimum condition (Note 2)]	Features	Fiber cable length	Model No.
Standard — Long sensing range	Lens mountable M4	150mm	ϕ0.15mm opaque object	• Twice the sensing range as before	Free Cut 2m	**FT-B8**
Standard	Lens mountable M4	80mm	ϕ0.08mm opaque object	• Free-cut type	Free Cut 2m	**FT-FM2**
Standard	With sleeve M4 ϕ1.48	80mm	ϕ0.08mm opaque object	• Free-cut type	Free Cut 2m	**FT-FM2S** With sleeve 90mm
Standard	With sleeve M4 ϕ1.48	80mm	ϕ0.08mm opaque object	• Free-cut type	Free Cut 2m	**FT-FM2S4** With sleeve 40mm
Standard	ϕ2.5	80mm	ϕ0.08mm opaque object	• Free-cut type	Free Cut 2m	**FT-SFM2**
Small fiber head	Lens mountable M3	80mm	ϕ0.08mm opaque object	• Miniature head but having the same sensing range as the standard type fiber	Free Cut 2m	**FT-T80**
Small diameter	M3	25mm	ϕ0.05mm opaque object	• Suitable for detection in a congested equipment • Free-cut type	Free Cut 2m	**FT-NFM2**
Small diameter	With sleeve M3 ϕ0.88	25mm	ϕ0.05mm opaque object	• Suitable for detection in a congested equipment • Free-cut type	Free Cut 2m	**FT-NFM2S** With sleeve 90mm
Small diameter	With sleeve M3 ϕ0.88	25mm	ϕ0.05mm opaque object	• Suitable for detection in a congested equipment • Free-cut type	Free Cut 2m	**FT-NFM2S4** With sleeve 40mm
Small diameter	ϕ1.5	25mm	ϕ0.05mm opaque object	• Suitable for detection in a congested equipment • Free-cut type	Free Cut 2m	**FT-SNFM2**
Sharp bend — Standard	Lens mountable M4 ϕ2.5	70mm	ϕ0.06mm opaque object	• The fiber can be bent sharply, like an electric wire, to avoid space wastage in installation because of its small allowable bending radius of R1mm or more.	Free Cut 2m	NEW **FT-W8**
Sharp bend — Standard	Lens mountable M4 ϕ2.5	70mm	ϕ0.06mm opaque object	• The fiber can be bent sharply, like an electric wire, to avoid space wastage in installation because of its small allowable bending radius of R1mm or more.	Free Cut 2m	NEW **FT-WS8**
Sharp bend — Small diameter	M3 ϕ1.5	12mm	ϕ0.06mm opaque object	• The fiber can be bent sharply, like an electric wire, to avoid space wastage in installation because of its small allowable bending radius of R1mm or more.	Free Cut 2m	NEW **FT-W4**
Sharp bend — Small diameter	M3 ϕ1.5	12mm	ϕ0.06mm opaque object	• The fiber can be bent sharply, like an electric wire, to avoid space wastage in installation because of its small allowable bending radius of R1mm or more.	Free Cut 2m	NEW **FT-WS4**
Sharp bend — With lens	ϕ3	210mm	ϕ0.016mm opaque object	• The fiber can be bent sharply, like an electric wire, to avoid space wastage in installation because of its small allowable bending radius of R1mm or more.	Free Cut 2m	NEW **FT-WS8L**
Flexible	Lens mountable M4	80mm	ϕ0.12mm opaque object	• Allowable bending radius: R4mm or more • Bending durability: 1,000,000 times or more	Free Cut 2m	**FT-P80**
Flexible	Small diameter M3	25mm	ϕ0.05mm opaque object	• Allowable bending radius: R4mm or more • Bending durability: 1,000,000 times or more	Free Cut 2m	**FT-P40**
Flexible	Small diameter ϕ1.5	30mm	ϕ0.05mm opaque object	• Allowable bending radius: R4mm or more • Bending durability: 1,000,000 times or more	1m	**FT-P2**

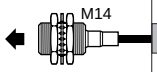
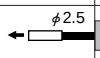
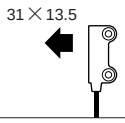
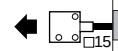
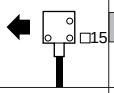
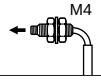
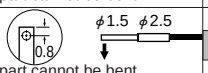
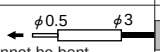
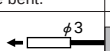
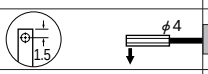
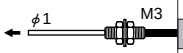
Notes: 1) Please take care that the sensing range of the free-cut type fiber may be reduced by 20% max. depending upon how the fiber is cut.

2) The optimum condition is the condition when the sensitivity is set so that the sensing output just changes to light incident operation in the object absent condition.

ORDER GUIDE

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



Type	Shape of fiber head (mm)	Sensing range (Note 1)	Min. sensing object [under the optimum condition (Note 2)]	Features	Fiber cable length	Model No.
Long sensing range with lens		3,500mm	ϕ1mm opaque object	• Large lenses on the fiber heads increase the sensing range significantly. • Fiber cable length 10m each	Free Cut 10m	FT-FM10L
		200mm	ϕ0.15mm opaque object	• Long sensing range with small fiber heads of ϕ2.5mm	Free Cut 2m	FT-SFM2L
Wide beam		300mm	(Note 3)	• The wide beam detects an object at any place within the range.	Free Cut 2m	NEW FT-A8
Array	Top sensing 	70mm	Horizontal ϕ0.04mm opaque object Vertical ϕ0.6mm opaque object	• The wide beam detects an object at any place within the range.	Free Cut 2m	FT-AFM2
	Side sensing 	60mm	Horizontal ϕ0.04mm opaque object Vertical ϕ0.6mm opaque object			FT-AFM2E
Elbow	Lens mountable 	60mm	ϕ0.12mm opaque object	• The fiber head is bent at a right angle with 5mm bending radius.	Free Cut 2m	FT-R80
Side-view	Small diameter  Sleeve part cannot be bent.	38mm	ϕ0.08mm opaque object	• The side-view sensing enables it to be used in a small space.	1m	FT-V22
		15mm	ϕ0.08mm opaque object		Free Cut 2m	FT-V41
	 Sleeve part cannot be bent.	50mm	ϕ0.08mm opaque object			FT-SFM2SV2
Ultra-small diameter	 Sleeve part cannot be bent.	6mm	ϕ0.03mm opaque object	• Ultra-small diameter heads, very narrow beam ϕ0.25mm	1m	FT-E20
Narrow beam		125mm	ϕ0.3mm opaque object	• Aperture angle 4° or less • Laser beam equivalent detection	1m	FT-K2
		80mm	ϕ0.3mm opaque object	• Aperture angle 4° or less • Side-view type		FT-KV2
	 Sleeve part cannot be bent.	38mm	ϕ0.05mm opaque object	• The narrow aperture angle, 1/6 of a conventional model, reduces interference.		FT-KM1S2

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.

2) The optimum condition is the condition when the sensitivity is set so that the sensing output just changes to light incident operation in the object absent condition.

3) The sensing width varies with the sensing object size and the sensing distance.
Please contact our office for details.

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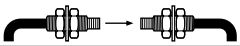
ORDER GUIDE

Environment resistant fibers [Thru-beam type (one pair set)]



Type	Shape of fiber head (mm)	Sensing range (Note 1)	Min. sensing object [under the optimum condition (Note 2)]	Features	Fiber cable length	Model No.
Heat-resistant	Lens mountable, M4	70mm	ϕ0.08mm opaque object	• Heat-resistant temp.: 350°C Cold-resistant temp.: −60°C	2m	**FT-H35-M2**
	With sleeve, M4, ϕ2.1					**FT-H35-M2S6** With sleeve 60mm
	Lens mountable, M4			• Flexible cable with silicone jacket • Heat-resistant temp.: 200°C Cold-resistant temp.: −60°C	1m	**FT-H20-M1**
	Lens mountable, M4	110mm	ϕ0.15mm opaque object	• Heat-resistant temp.: 130°C Cold-resistant temp.: −60°C • Free-cut type	Free Cut 2m	**FT-H13-FM2**
Chemical-resistant	ϕ5.5	340mm	ϕ0.5mm opaque object	• Usable in chemical solvents • Heat-resistant specification (115°C) • Long sensing range with lens	2m (Bending R: 30mm)	**FT-L8Y**
	ϕ5.5	100mm	ϕ0.5mm opaque object	• Usable in chemical solvents • Heat-resistant specification (115°C) • Side-view type		**FT-V8Y**
Vacuum	Lens mountable, M4	60mm	ϕ0.1mm opaque object	• Usable in vacuum chamber • Heat-resistant temp.: 120°C	1m (Bending R: 200mm)	**FT-6V**
		30mm	ϕ0.1mm opaque object		1m (Bending R: 30mm)	**FT-60V**

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.

2) The optimum condition is the condition when the sensitivity is set so that the sensing output just changes to light incident operation in the object absent condition.

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-order made)

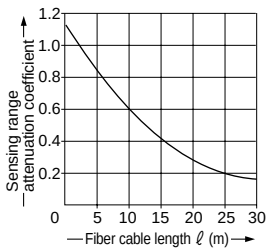
The fiber cable length or sleeve length of the standard fibers can be modified at your request. Select the fiber cable length (symbol ☆) or the sleeve length (symbol △) from the table below.

Type		Basic model No.	☆ Fiber cable length (Unit: m)	△ Sleeve length (Unit: cm)
Standard threaded head (free-cut)		**FT-FM** ☆	3, 4, 5, 10, 15, 20, 25, 30	———
	With sleeve	**FT-FM** ☆ **-S** △	2 (Note), 3, 4, 5, 10, 15, 20, 25, 30	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
With large diameter lens		**FT-FM** ☆ **L**	20, 30	———
Small diameter threaded head with sleeve (free-cut)		**FT-NFM2-S** △	———	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
200°C heat-resistant		**FT-H20-M** ☆	2, 3	———
350°C heat-resistant		**FT-H35-M** ☆	3	———

Note: The standard fiber has a 2m fiber cable length and a 4cm or 9cm sleeve length.

- **Correlation between sensing range attenuation coefficient and fiber cable length**

Longer the fiber cable, shorter is the sensing range.



ORDER GUIDE

General use fibers [Reflective type]

Type	Shape of fiber head (mm)	Sensing range (Note 1, 2)	Min. sensing object [at the maximum sensitivity (Note 3)]	Features	Fiber cable length	Model No.
Standard — Long sensing range	M6	60mm	ϕ0.03mm gold wire	• Long sensing range • Free-cut type	Free Cut 2m	**FD-B8**
Standard — Coaxial	M6	30mm	ϕ0.02mm gold wire	• Suitable for green LED type	500mm	**FD-5**
Standard — Coaxial	M6	30mm	ϕ0.02mm gold wire	• Free-cut type	Free Cut 2m	**FD-FM2**
Standard — With sleeve	M6, ϕ2.5	30mm	ϕ0.02mm gold wire	• Free-cut type	Free Cut 2m	**FD-FM2S** With sleeve 90mm
Standard — With sleeve	M6, ϕ2.5	30mm	ϕ0.02mm gold wire	• Free-cut type	Free Cut 2m	**FD-FM2S4** With sleeve 40mm
Small fiber head	M4	30mm	ϕ0.02mm gold wire	• Miniature head but having the same sensing range as the standard type fiber	Free Cut 2m	**FD-T80**
Small fiber head — Small diameter	M3	10mm	ϕ0.03mm gold wire	• Miniature head but having the same sensing range as the standard type fiber	Free Cut 2m	**FD-T40**
Small fiber head	ϕ3	30mm	ϕ0.02mm gold wire	• Miniature head but having the same sensing range as the standard type fiber	Free Cut 2m	**FD-S80**
Small diameter	M4	10mm	ϕ0.03mm gold wire	• Suitable for detection in a congested equipment • Free-cut type	Free Cut 2m	**FD-NFM2**
Small diameter — With sleeve	M4, ϕ1.48	10mm	ϕ0.03mm gold wire	• Suitable for detection in a congested equipment • Free-cut type	Free Cut 2m	**FD-NFM2S** With sleeve 90mm
Small diameter — With sleeve	M4, ϕ1.48	10mm	ϕ0.03mm gold wire	• Suitable for detection in a congested equipment • Free-cut type	Free Cut 2m	**FD-NFM2S4** With sleeve 40mm
Small diameter	ϕ2.5	10mm	ϕ0.03mm gold wire	• Suitable for detection in a congested equipment • Free-cut type	Free Cut 2m	**FD-SNFM2**
Sharp bend — Standard	M6	15mm	ϕ0.01mm gold wire	• The fiber can be bent sharply, like an electric wire, to avoid space wastage in installation because of its small allowable bending radius of R1mm or more (**FD-WG4**, **FD-WSG4**: R2mm or more).	Free Cut 2m	NEW **FD-W8**
Sharp bend — Small head	M4	15mm	ϕ0.01mm gold wire	• The fiber can be bent sharply, like an electric wire, to avoid space wastage in installation because of its small allowable bending radius of R1mm or more (**FD-WG4**, **FD-WSG4**: R2mm or more).	Free Cut 2m	NEW **FD-WT8**
Sharp bend — Small head	ϕ3	15mm	ϕ0.01mm gold wire	• The fiber can be bent sharply, like an electric wire, to avoid space wastage in installation because of its small allowable bending radius of R1mm or more (**FD-WG4**, **FD-WSG4**: R2mm or more).	Free Cut 2m	NEW **FD-WS8**
Sharp bend — High precision — Lens mountable Coaxial	M4	7mm	ϕ0.01mm gold wire	• The fiber can be bent sharply, like an electric wire, to avoid space wastage in installation because of its small allowable bending radius of R1mm or more (**FD-WG4**, **FD-WSG4**: R2mm or more).	Free Cut 2m	NEW **FD-WG4**
Sharp bend — High precision — Coaxial	ϕ3	7mm	ϕ0.01mm gold wire	• The fiber can be bent sharply, like an electric wire, to avoid space wastage in installation because of its small allowable bending radius of R1mm or more (**FD-WG4**, **FD-WSG4**: R2mm or more).	Free Cut 2m	NEW **FD-WSG4**
Flexible	M6	25mm	ϕ0.03mm gold wire	• Allowable bending radius: R4mm or more • Bending durability: 1,000,000 times or more	Free Cut 2m	**FD-P80**
Flexible — Small diameter	M3	4mm	ϕ0.02mm gold wire	• Allowable bending radius: R4mm or more • Bending durability: 1,000,000 times or more	Free Cut 2m	**FD-P40**
Flexible — Small diameter	ϕ1.5	5mm	ϕ0.02mm gold wire	• Allowable bending radius: R4mm or more • Bending durability: 1,000,000 times or more	1m	**FD-P2**

Notes: 1) The sensing range is specified for white non-glossy paper [100 × 100mm (**FD-B8**: 200 × 200mm)] 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.

3) The minimum sensing object is specified for maximum sensitivity. Also, note that the corresponding setting distance is different from the rated sensing distance.

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Special use fibers [Reflective type]

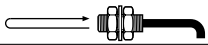
Type	Shape of fiber head (mm)	Sensing range (Note 1, 2)	Min. sensing object [at the maximum sensitivity (Note 3)]	Features	Fiber cable length	Model No.
Fixed-focus reflective	18×14	5 to 8mm (Convergent point: 6mm)	ϕ0.02mm gold wire	• Detection is not affected by object color.	Free Cut 2m	**FD-L4**
High precision	Lens mountable Coaxial M4	12mm	ϕ0.02mm gold wire	• Precise position sensing with coaxial fiber	Free Cut 2m	**FD-G4**
	Lens mountable M3 Coaxial•small diameter	4mm	ϕ0.02mm gold wire	• Combination with the **FX-MR3** lens gives an extremely small spot diameter of ϕ0.3mm approx.	500mm	**FD-EG1**
Array	Top sensing □20 / Side sensing □20	26mm	Horizontal ϕ0.01mm gold wire Vertical ϕ0.2mm copper wire	• Its wide beam meets various needs.	Free Cut 2m	**FD-AFM2** / **FD-AFM2E**
Elbow	M6	20mm	ϕ0.03mm gold wire	• The fiber head is bent at a right angle with 5mm bending radius at the neck.	Free Cut 2m	**FD-R80**
Side-view	Small diameter 0.7 ϕ1.5 ϕ3 Sleeve part cannot be bent.	6mm	ϕ0.2mm copper wire	• The side view sensing enables it to be used in a small space.	Free Cut 2m	**FD-V41**
	0.8 ϕ2 ϕ5 Sleeve part cannot be bent.	10mm	ϕ0.3mm copper wire			**FD-SFM2SV2**
Ultra-small diameter	Coaxial ϕ0.8 M3 Sleeve part cannot be bent.	4mm	ϕ0.02mm gold wire	• Precise position sensing with coaxial fiber	1m	**FD-ENM1S1**
Narrow-view	Coaxial ϕ2 M5 Sleeve part cannot be bent.	3mm	ϕ0.02mm gold wire	• The narrow aperture angle, 1/6 of a conventional model, produces a small detecting area.	1m	**FD-KM1S2**

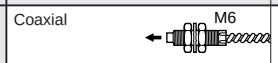
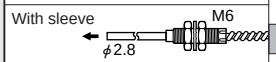
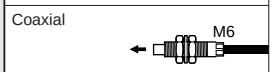
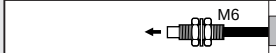
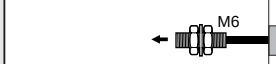
Notes: 1) The sensing range is specified for white non-glossy paper [100×100mm (**FD-V41**: 50×50mm, **FD-KM1S2**: 10×10mm)] as the object.
2) Please take care that the sensing range of the free-cut type fiber may be reduced by 20% max. depending upon how the fiber is cut.

3) The minimum sensing object is specified for maximum sensitivity. Also, note that the corresponding setting distance is different from the rated sensing distance.

ORDER GUIDE

Environment resistant fibers [Reflective type]



Type	Shape of fiber head (mm)	Sensing range (Note 1, 2)	Min. sensing object [at the maximum sensitivity (Note 2)]	Features	Fiber cable length	Model No.
Heat-resistant	Coaxial 	30mm	ϕ0.02mm gold wire	• Heat-resistant temp.: 350°C Cold-resistant temp.: −60°C	2m	**FD-H35-M2**
	With sleeve 					**FD-H35-M2S6** With sleeve 60mm
	Coaxial 			• Flexible cable with silicone jacket • Heat-resistant temp.: 200°C Cold-resistant temp.: −60°C	1m	**FD-H20-M1**
		36mm	ϕ0.08mm copper wire	• Heat-resistant temp.: 130°C Cold-resistant temp.: −60°C • Free-cut type	Free Cut 2m	**FD-H13-FM2**
Vacuum		18mm	ϕ0.02mm gold wire	• Usable in vacuum chamber • Heat-resistant temp.: 120°C	1m	**FD-6V**

Notes: 1) The sensing range is specified for white non-glossy paper (100 × 100mm) 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.

3) The minimum sensing object is specified for maximum sensitivity. Also, note that the corresponding setting distance is different from the rated sensing range.

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-order made)

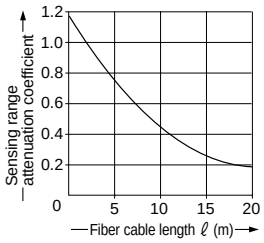
The fiber cable length or sleeve length of the standard fibers can be modified at your request. Select the fiber cable length (symbol ☆) or the sleeve length (symbol △) from the table below.

Type		Basic model No.	☆ Fiber cable length (Unit: m)	△ Sleeve length (Unit: cm)
Standard threaded head (free-cut)		**FD-FM**☆	3, 4, 5, 10, 15, 20	———
	With sleeve	**FD-FM**☆**-S**△	2 (Note), 3, 4, 5, 10, 15, 20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Small diameter threaded head with sleeve (free-cut)		**FD-NFM2-S**△	———	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
200°C heat-resistant		**FD-H20-M**☆	2, 3	———
350°C heat-resistant		**FD-H35-M**☆	3	———

Note: The standard fiber has a 2m fiber cable length and a 4cm or 9cm sleeve length.

- **Correlation between sensing range attenuation coefficient and fiber cable length**

Longer the fiber cable, shorter is the sensing range.



FX-13

ORDER GUIDE

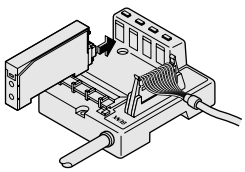
Amplifiers

Type	Appearance	Model No.	Output	Response time	Emitting element
High-speed		**FX-13**	NPN open-collector transistor	30 μs or less	Red LED
		FX-13P	PNP open-collector transistor		

Plug-in connector type

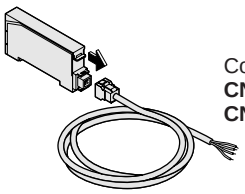
Plug-in connector type is available for the PNP output type.
When ordering the plug-in connector type, add suffix, '**J**' to the model No.
Model No.: **FX-13PJ** (Standard: cable type)
Usable with the sensor block for simple wiring **SL-BMW** or **SL-BW**, or with the connector attached cable **CN-54-C2** or **CN-54-C5**.

FX-13PJ



Sensor block for simple wiring **SL-BMW**, **SL-BW**

(Refer to P.54～ for details.)



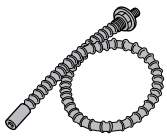
Connector attached cable
CN-54-C2 (2m long)
CN-54-C5 (5m long)

OPTIONS

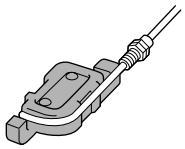
Designation	Model No.	Description				
Protective tube (For thru-beam type fiber)	**FTP-500** (0.5m)	For M4 thread	Applicable fibers	**FT-B8** **FT-P80** **FT-FM2** **FT-H13-FM2** **FT-FM2S** **FT-FM2S4**		The protective tube, made of non-corrosive stainless steel, protects the inner fiber cable from any external forces.
	FTP-1000 (1m)					
	FTP-1500 (1.5m)					
	FTP-N500 (0.5m)	For M3 thread		**FT-T80** **FT-P40** **FT-NFM2** **FD-T40** **FT-NFM2S** **FD-P40** **FT-NFM2S4**		
	FTP-N1000 (1m)					
	FTP-N1500 (1.5m)					
Protective tube (For reflective type fiber)	**FDP-500** (0.5m)	For M6 thread		**FD-B8** **FD-P80** **FD-FM2** **FD-H13-FM2** **FD-FM2S** **FD-FM2S4**		
	FDP-1000 (1m)					
	FDP-1500 (1.5m)					
	FDP-N500 (0.5m)	For M4 thread		**FD-T80** **FD-NFM2** **FD-NFM2S** **FD-NFM2S4**		
	FDP-N1000 (1m)					
	FDP-N1500 (1.5m)					
Fiber bender	**FB-1**	The fiber bender bends the sleeve part of the fiber head at the proper radius. (Note 1)				
Universal sensor mounting stand (Note 2)	**MS-AJ-F**	Mounting stand assembly for fiber (For M3, M4 or M6 threaded head fibers)				
Fiber cutter	**FX-CT1**	The free-cut type fiber can be easily cut.				

Notes: 1) Do not bend the sleeve part of any side-view type fiber, ultra-small diameter head type fiber, narrow beam type fiber, or narrow-view type fiber.
2) Refer to P.310～ for the universal sensor mounting stand.

Protective tube

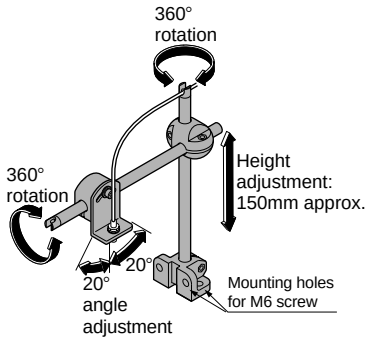


Fiber bender



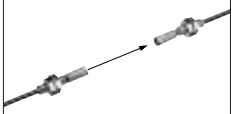
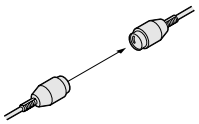
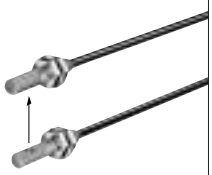
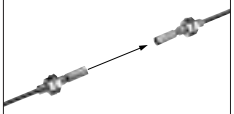
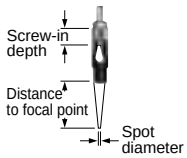
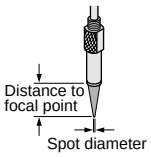
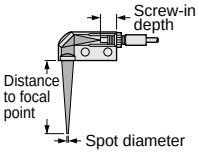
Universal sensor mounting stand

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



Fiber cutter

OPTIONS

Designation		Model No.	Description
For thru-beam type fiber	Expansion lens	**FX-LE1**	 Increases the sensing range by 5 times or more. • Ambient temperature: −60 to +350°C **Sensing range (mm) [Lens on both sides]** Fiber / Applicable amplifier: **FX-13□** **FT-B8** 770 **FT-FM2** 700 **FT-T80** 700 **FT-W8** 440 **FT-P80** 700 **FT-H35-M2** 560 **FT-H20-M1** 560 **FT-R80** 600
	Super-expansion lens	**FX-LE2**	 Tremendously increases the sensing range with large aperture lenses. • Ambient temperature: −60 to +350°C **Sensing range (mm) [Lens on both sides]** Fiber / Applicable amplifier: **FX-13□** **FT-B8** 3,500 (Note) **FT-FM2** 3,500 (Note) **FT-W8** 3,500 (Note) **FT-P80** 3,500 (Note) **FT-H35-M2** 3,500 (Note) **FT-H20-M1** 1,600 (Note) **FT-H13-FM2** 3,000 **FT-R80** 3,000
	Side-view lens	**FX-SV1**	 Beam axis is bent by 90°. • Ambient temperature: −60 to +300°C **Sensing range (mm) [Lens on both sides]** Fiber / Applicable amplifier: **FX-13□** **FT-B8** 180 **FT-FM2** 150 **FT-T80** 150 **FT-W8** 90 **FT-P80** 150 **FT-H35-M2** 120 **FT-H20-M1** 120
	Expansion lens for vacuum fiber	**FV-LE1**	 Sensing range increases by 7 times or more. • Ambient temperature: −40 to +120°C **Sensing range (mm) [Lens on both sides]** Fiber / Applicable amplifier: **FX-13□** **FT-6V** 500 **FT-60V** 250
For reflective type fiber	Pinpoint spot lens	**FX-MR1**	 Pinpoint spot of ϕ0.5mm. Enables detection of minute objects or small marks. • Distance to focal point: 6±1mm • Applicable fibers: **FD-WG4**, **FD-G4** • Ambient temperature: −10 to +300°C
	Zoom lens	**FX-MR2**	 The spot diameter is adjustable from ϕ0.7 to ϕ2mm according to how much the fiber is screwed in. • Applicable fiber: **FD-G4** • Ambient temperature: −40 to +70°C Screw-in depth / Distance to focal point / Spot diameter: 7mm / 18.5mm approx. / ϕ0.7mm 12mm / 27mm approx. / ϕ1.2mm 14mm / 43mm approx. / ϕ2.0mm
	Finest spot lens	**FX-MR3**	 Extremely fine spot of ϕ0.3mm achieved. • Applicable fibers: **FD-WG4**, **FD-EG1**, **FD-G4** • Ambient temperature: −40 to +70°C Screw-in depth / Distance to focal point / Spot diameter: **FD-WG4** 7.5±0.5mm ϕ0.5mm approx. **FD-EG1** 7.5±0.5mm ϕ0.3mm approx. **FD-G4** 7.5±0.5mm ϕ0.5mm approx.
	Zoom lens (Side-view type)	**FX-MR5**	 **FX-MR2** is converted into a side-view type and can be mounted in a very small space. • Applicable fiber: **FD-G4** • Ambient temperature: −40 to +70°C Screw-in depth / Distance to focal point / Spot diameter: 8mm / 13mm approx. / ϕ0.5mm 10mm / 15mm approx. / ϕ0.8mm 14mm / 30mm approx. / ϕ3.0mm

Note: The fiber cable length practically limits the sensing range to 3,500mm long (**FT-H20-M1**: 1,600mm).

FX-13

SPECIFICATIONS

Fibers

Item \ Type	Standard, small fiber head, small diameter, sharp bend, flexible, long sensing range with lens, wide beam, array, elbow, high precision, thru-beam type of ultra-small diameter	Fixed-focus reflective	Side-view, narrow beam, narrow-view, reflective type of ultra-small diameter
Allowable bending radius	R25mm or more (Sharp bend: R1mm or more (**FD-WG4**, **FD-WSG4**: R2mm or more) Flexible: R4mm or more, Thru-beam type of ultra-small diameter: R5mm or more	R10mm or more	R25mm or more (**FT-K2** and **FT-KV2**: R10mm or more)
Ambient temperature	−40 to +70°C (Sharp bend: −40 to +60°C, **FD-EG1**: −20 to +60°C)	−40 to +70°C	−20 to +60°C (**FT-V41**, **FD-V41**, **FT-K2** and **FT-KV2**: −40 to +60°C)
Ambient humidity	35 to 85% RH (No dew condensation or icing allowed)		
Material: Fiber core	Acrylic		
Material: Sheath	Polyethylene (Thru-beam type of ultra-small diameter and flexible, except for **FD-P2**: Vinyl chloride; Reflective type of narrow-view: Polyurethane)		
Material: Fiber head	Brass (Nickel plated): Threaded part of standard, threaded part of small diameter, threaded type of sharp bend, threaded part of thru-beam type ultra-small diameter, **FT-P80**, **FD-P80**, high precision, array, threaded part of **FT-R80** Polycarbonate: **FT-A8**, lens of **FT-WS8L** Stainless steel (SUS): **FT-SFM2**, small fiber head, non-threaded type of sharp bend, **FT-SNFM2**, **FD-SNFM2**, **FT-SFM2L**, **FT-P40**, **FT-P2**, **FD-P40**, **FD-P2**, sleeve part of sleeve-attached fiber Polyolefin: Lens of **FT-A8** ABS: **FT-FM10L** Acrylic: Lens of **FT-FM10L** Die-cast zinc alloy: Threaded part of **FD-R80**	ABS: **FD-L4** Acrylic: Lens of **FD-L4**	Stainless steel (SUS) (**FT-KV2**, threaded part of **FD-EN500S1**·**FD-ENM1S1**·**FT-KM1S2** and **FD-KM1S2**: Brass, Lens of **FT-K2**: Glass, Prism of **FT-KV2**: Acrylic)
Accessories	Threaded head fiber: 2 Nos. of nuts (thru-beam type: 4 Nos.) and 1 No. of toothed lock washer (thru-beam type: 2 Nos.) Free-cut type fiber: 1 No. of **FX-CT1** (Fiber cutter) Small diameter free-cut type fiber, high precision free-cut type fiber: **FX-AT10** (φ1mm fiber attachment) **FX-AT13** (φ1.3mm fiber attachment) **FT-WS4**, **FD-WT8**, **FD-WS8**, **FD-WG4** or **FD-WSG4**: **FX-AT10** (φ1mm fiber attachment) **FT-A8**: 2 Nos. of 0.5×12mm seal type slit mask and 2 Nos. of 1×12mm seal type slit mask **FD-L4**: **FX-AT10** (φ1mm fiber attachment), **FX-AT13** (φ1.3mm fiber attachment), 2 Nos. of M2.6 (length 12mm) screws with washers and 2 Nos. of nuts		

Fibers

Item \ Type	Vacuum	Heat-resistant			Chemical-resistant
		350°C type	200°C type	130°C type	
Allowable bending radius	R200mm or more (**FT-60V**: R30mm or more)	R25mm or more			R30mm or more
Ambient temperature	−40 to +120°C	−60 to +350°C (Note 1, 2)	−60 to +200°C (Note 2)	−60 to +130°C	−40 to +115°C
Ambient humidity	35 to 85% RH (No dew condensation or icing allowed)				
Material: Fiber core	Quartz glass (Note 3)	Multi-component glass (Note 4)		Acrylic	
Material: Sheath	Fluorine resin	Stainless steel (SUS)	Silicone (Inside stainless steel (SUS) spiral tube)	Fluorine resin	Protective tube: Fluorine resin Fiber sheath: Polypropylene
Material: Fiber head	Aluminum		Brass (Nickel plated)	Brass (Nickel plated)	
Accessories	Threaded head fiber: 2 Nos. of nuts (thru-beam type: 4 Nos.) and 1 No. of toothed lock washer (thru-beam type: 2 Nos.) Free-cut type fiber, chemical-resistant type fiber: 1 No. of **FX-CT1** (Fiber cutter)				

Notes: 1) If the fiber is used under −30°C, its resistible maximum temperature drops to +200°C. If the side-view lens **FX-SV1** is put on the fiber head, the allowable maximum temperature comes down to +300°C. (The ambient temperature range of the **FX-SV1** is from −60 to +300°C.)
2) The ambient temperature of heat-resistant 350°C type and 200°C type fibers is the valve in dry condition. In humid environment, the ambient temperature differs. (For a high humidity of 85% RH, the ambient temperature is 0 to 40°C.)
3) If the fiber material is quartz glass, keep it away from vibration or impact.
4) If the fiber material is multi-component glass, keep it away from vibration or impact.

SPECIFICATIONS

Amplifiers

Item \ Type / Model No.		NPN output **FX-13**	PNP output **FX-13P**
Supply voltage		12 to 24V DC ± 10% Ripple P-P 10% or less	
Current consumption		35mA or less	
Sensing output		NPN open-collector transistor • Maximum sink current: 100mA • Applied voltage: 30V DC or less (between sensing output and 0V) • Residual voltage: 1.5V or less (at 100mA sink current) 0.4V or less (at 16mA sink current)	PNP open-collector transistor • Maximum source current: 100mA • Applied voltage: 30V DC or less (between sensing output and + V) • Residual voltage: 1.5V or less (at 100mA source current) 0.4V or less (at 16mA source current)
	Utilization category	DC-12 or DC-13	
	Output operation	Switchable either Light-ON or Dark-ON	
	Short-circuit protection	Incorporated	
Self-diagnosis output		NPN open-collector transistor • Maximum sink current: 50mA • Applied voltage: 30V DC or less (between self-diagnosis output and 0V) • Residual voltage: 1V or less (at 50mA sink current) 0.4V or less (at 16mA sink current)	PNP open-collector transistor • Maximum source current: 50mA • Applied voltage: 30V DC or less (between self-diagnosis output and + V) • Residual voltage: 1V or less (at 50mA source current) 0.4V or less (at 16mA source current)
	Output operation	ON in unstable sensing condition	
	Short-circuit protection	———	
Response time		30 μs or less	
Operation indicator		Red LED (lights up when the sensing output is ON)	
Stability indicator		Green LED (lights up under stable light received condition or stable dark condition)	
Sensitivity adjuster		8-turn potentiometer with indicator	
Timer function		Incorporated with approx. 40ms fixed OFF-delay timer, switchable either effective or ineffective	
Environmental resistance	Pollution degree	3 (Industrial environment)	
	Ambient temperature	− 10 to + 55°C (No dew condensation or icing allowed), Storage: − 20 to + 70°C	
	Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH	
	Ambient illuminance	Sunlight: 10,000 ℓx at the light-receiving face, Incandescent light: 3,500 ℓx at the light-receiving face	
	EMC	Emission: EN50081-2, Immunity: EN50082-2	
	Voltage withstandability	1,000V AC for one min. between all supply terminals connected together and enclosure (Note)	
	Insulation resistance	20MΩ, or more, with 250V DC megger between all supply terminals connected together and enclosure (Note)	
	Vibration resistance	10 to 150Hz frequency, 0.75mm amplitude in X, Y and Z directions for two hours each	
	Shock resistance	100m/s² acceleration (10G approx.) in X, Y and Z directions for five times each	
Emitting element		Red LED (modulated)	
Material		Enclosure: Heat-resistant ABS, Case cover: Polycarbonate, Fiber lock lever: PES	
Cable		0.2mm² 4-core cabtyre cable, 2m long	
Cable extension		Extension up to total 100m is possible with 0.3mm², or more, cable.	
Weight		60g approx.	
Accessories		**MS-DIN-2** (Amplifier mounting bracket): 1 No., Adjusting screwdriver: 1 No.	

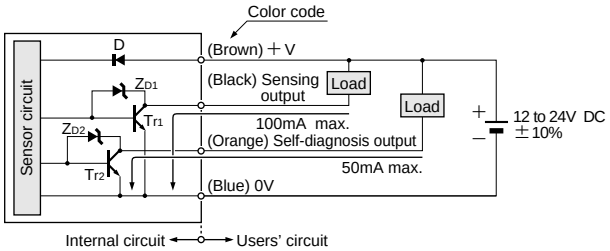
Note: The voltage withstandability and the insulation resistance values given in the above table are for the amplifier only.

FX-13

I/O CIRCUIT AND WIRING DIAGRAMS

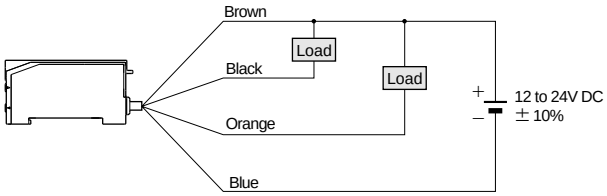
NPN output type

I/O circuit diagram



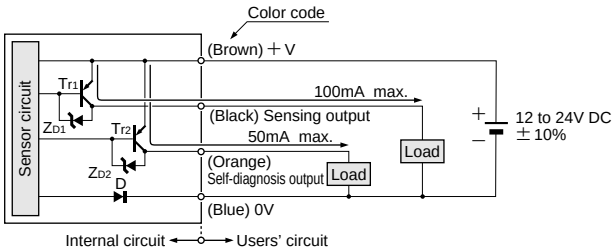
Symbols ... D: Reverse supply polarity protection diode
Z_{D1}, Z_{D2}: Surge absorption zener diode
Tr_1, Tr_2 : NPN output transistor

Wiring diagram



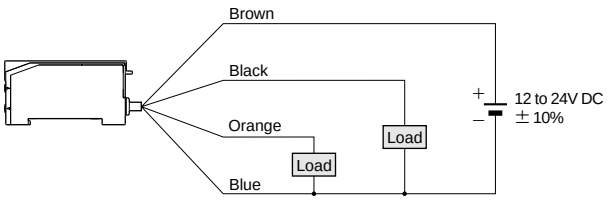
PNP output type

I/O circuit diagram



Symbols ... D: Reverse supply polarity protection diode
Z_{D1}, Z_{D2}: Surge absorption zener diode
Tr_1, Tr_2 : PNP output transistor

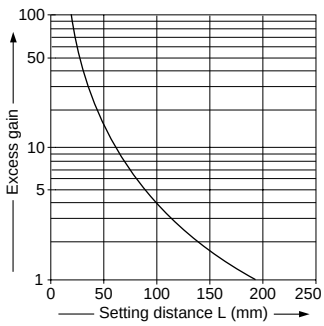
Wiring diagram



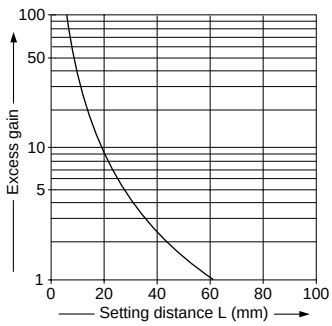
SENSING CHARACTERISTICS (TYPICAL)

Correlation between setting distance and excess gain

FT-FM2 Thru-beam type



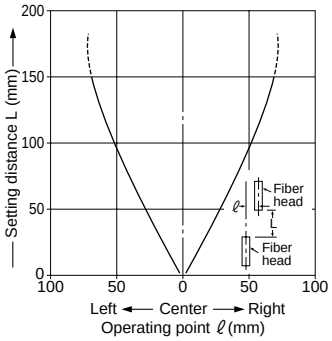
FD-FM2 Reflective type



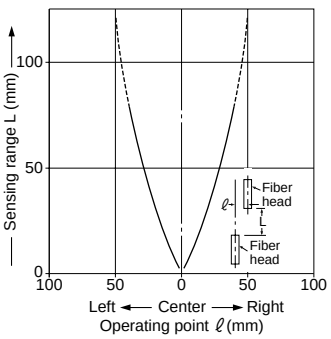
SENSING CHARACTERISTICS (TYPICAL)

Parallel deviation

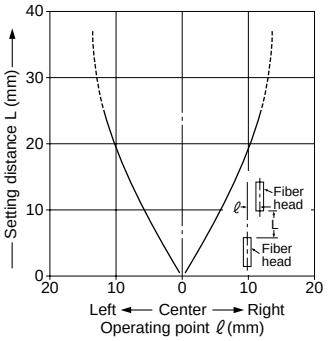
FT-B8 Thru-beam type



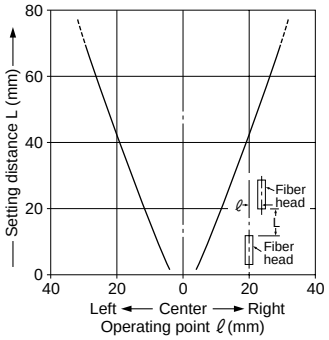
FT-FM2 FT-FM2S FT-FM2S4 FT-SFM2 FT-T80 Thru-beam type



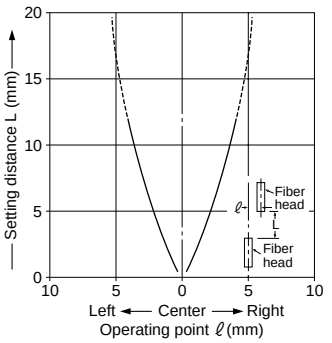
FT-NFM2 FT-NFM2S FT-NFM2S4 FT-SNFM2 Thru-beam type



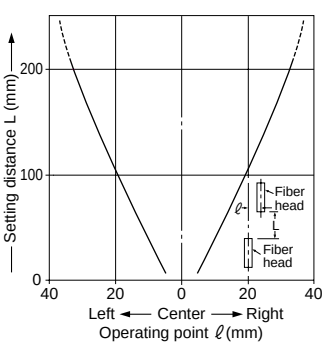
FT-W8 FT-WS8 Thru-beam type



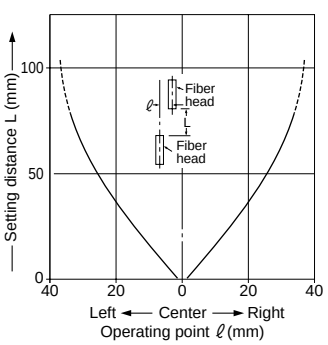
FT-W4 FT-WS4 Thru-beam type



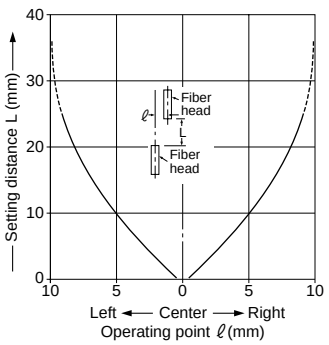
FT-WS8L Thru-beam type



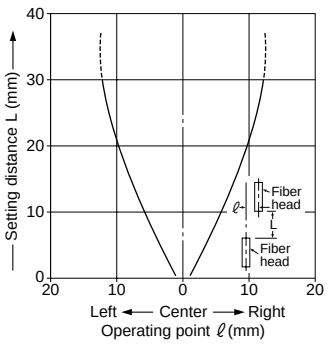
FT-P80 Thru-beam type



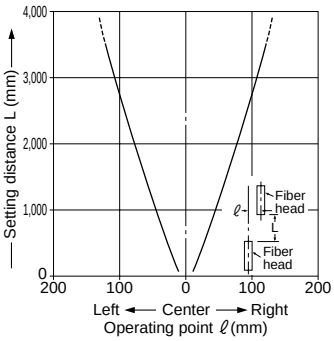
FT-P40 Thru-beam type



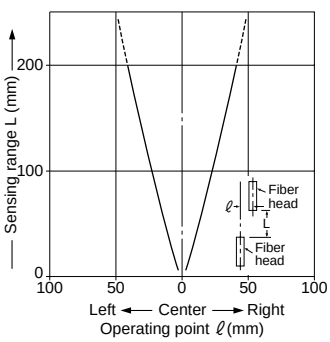
FT-P2 Thru-beam type



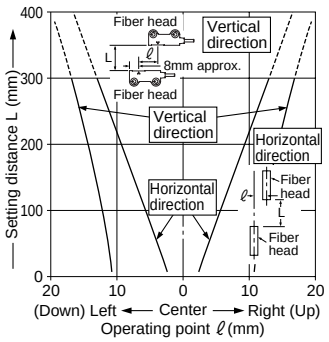
FT-FM10L Thru-beam type



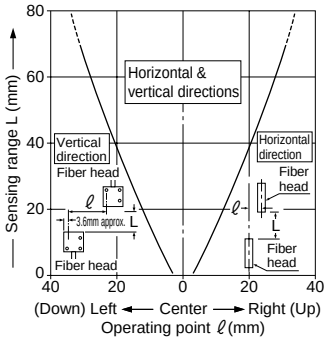
FT-SFM2L Thru-beam type



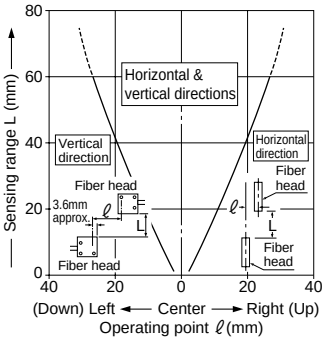
FT-A8 Thru-beam type



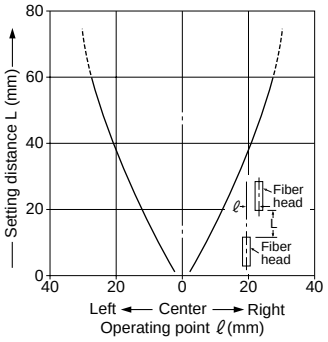
FT-AFM2 Thru-beam type



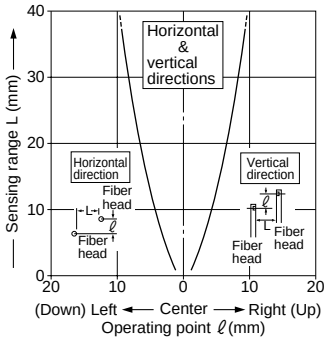
FT-AFM2E Thru-beam type



FT-R80 Thru-beam type



FT-V22 Thru-beam type

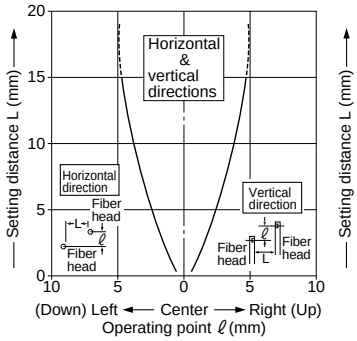


FX-13

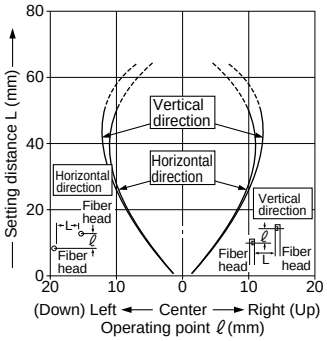
SENSING CHARACTERISTICS (TYPICAL)

Parallel deviation

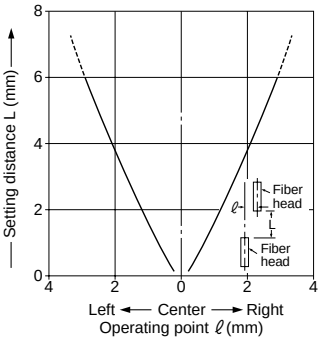
FT-V41 Thru-beam type



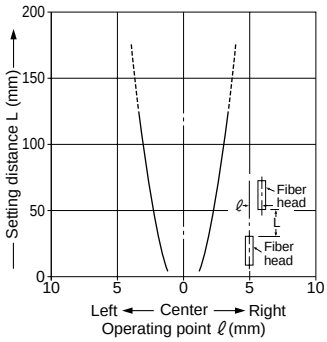
FT-SFM2SV2 Thru-beam type



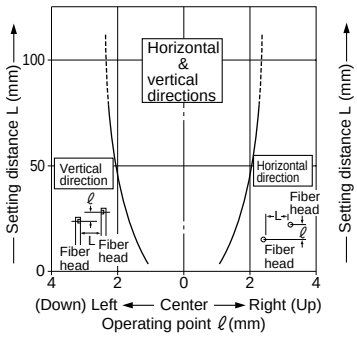
FT-E20 Thru-beam type



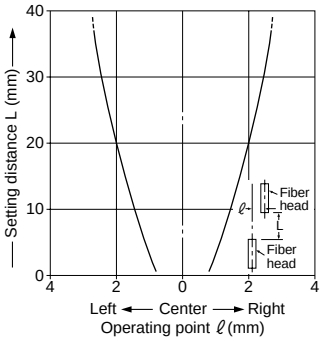
FT-K2 Thru-beam type



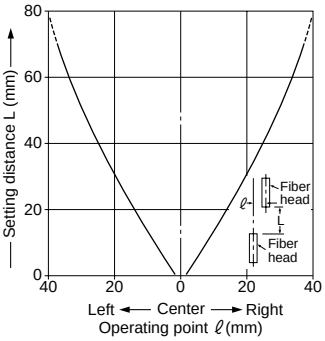
FT-KV2 Thru-beam type



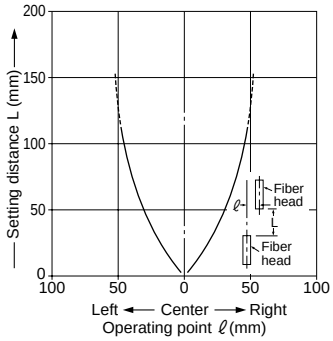
FT-KM1S2 Thru-beam type



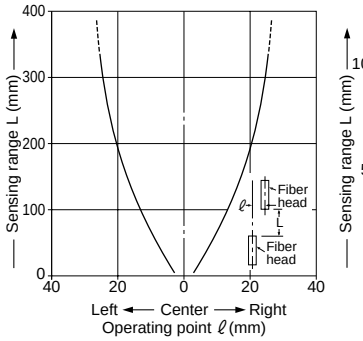
FT-H35-M2 FT-H35-M2S6 FT-H20-M1 Thru-beam type



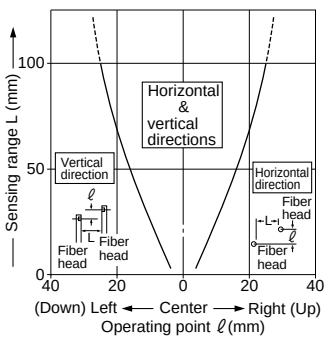
FT-H13-FM2 Thru-beam type



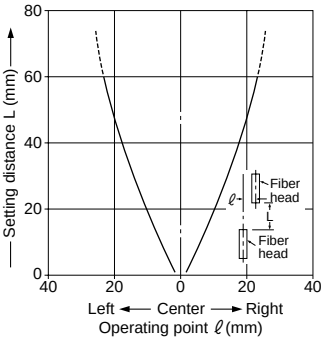
FT-L8Y Thru-beam type



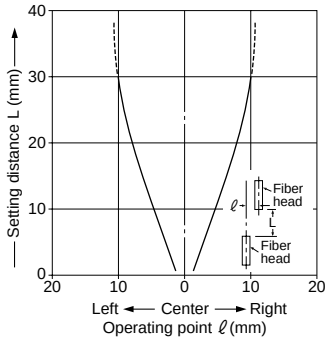
FT-V8Y Thru-beam type



FT-6V Thru-beam type



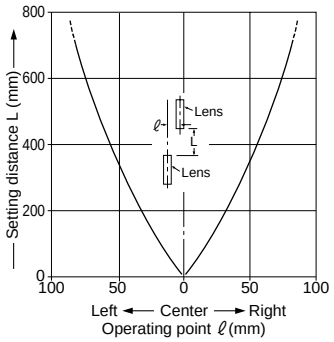
FT-60V Thru-beam type



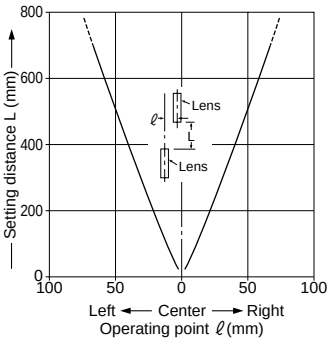
SENSING CHARACTERISTICS (TYPICAL)

Parallel deviation with FX-LE1 (expansion lens) applied on both sides

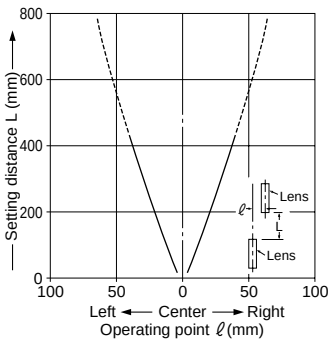
FT-B8 Thru-beam type



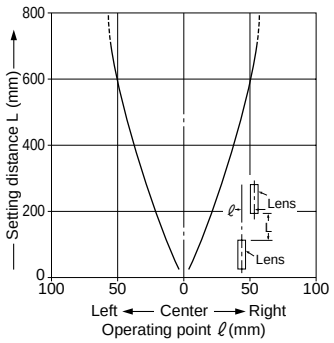
FT-FM2 FT-T80 Thru-beam type



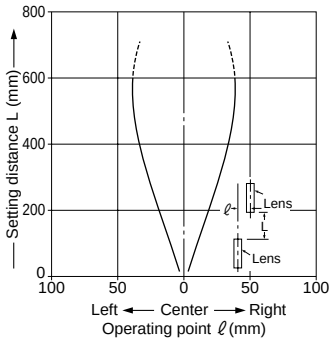
FT-W8 Thru-beam type



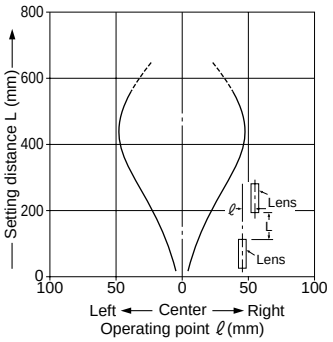
FT-P80 Thru-beam type



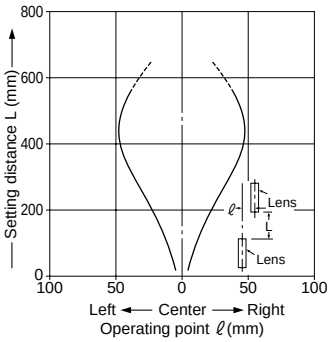
FT-R80 Thru-beam type



FT-H35-M2 Thru-beam type

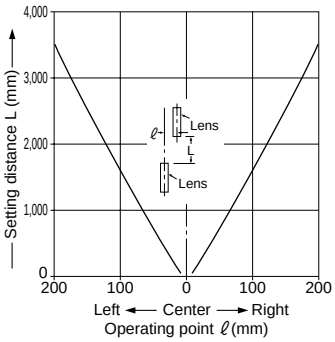


FT-H20-M1 Thru-beam type

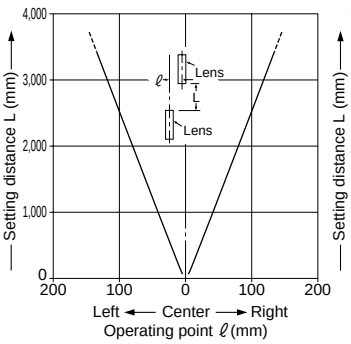


Parallel deviation with FX-LE2 (super-expansion lens) applied on both sides

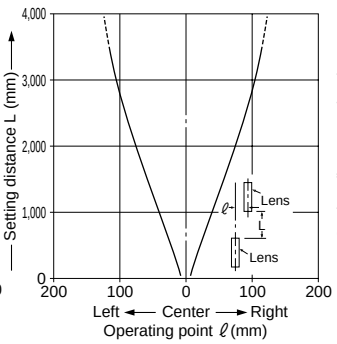
FT-B8 Thru-beam type



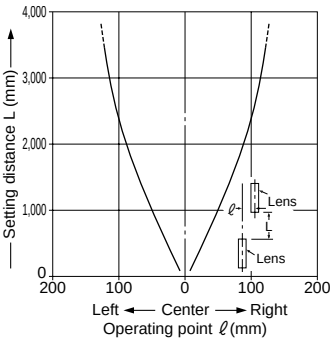
FT-FM2 Thru-beam type



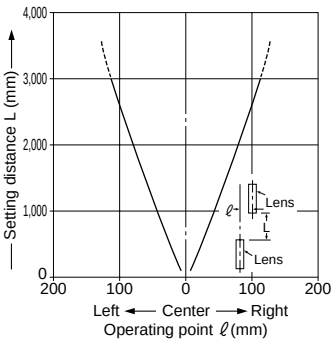
FT-W8 Thru-beam type



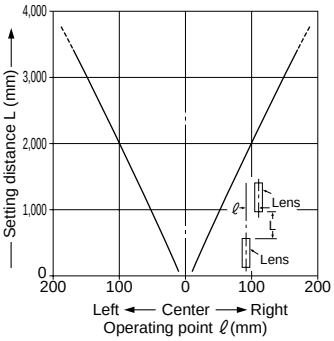
FT-P80 Thru-beam type



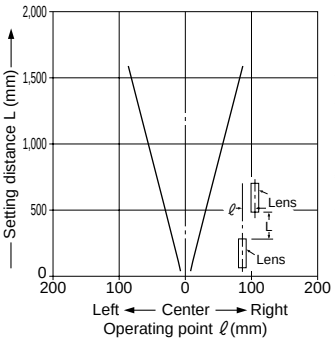
FT-R80 Thru-beam type



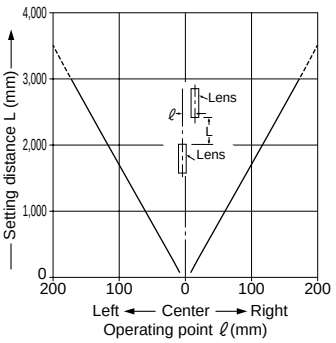
FT-H35-M2 Thru-beam type



FT-H20-M1 Thru-beam type



FT-H13-FM2 Thru-beam type

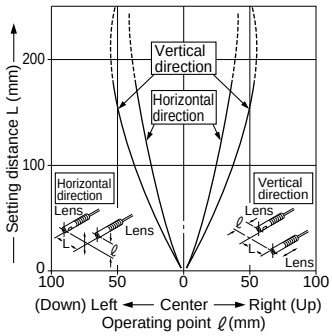


FX-13

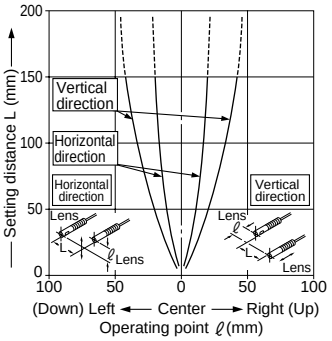
SENSING CHARACTERISTICS (TYPICAL)

Parallel deviation with FX-SV1 (side-view lens) applied on both sides

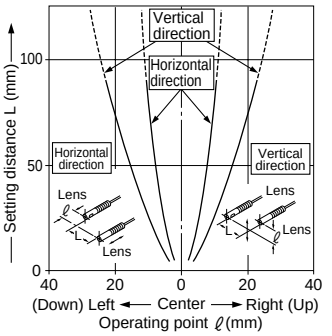
FT-B8 Thru-beam type



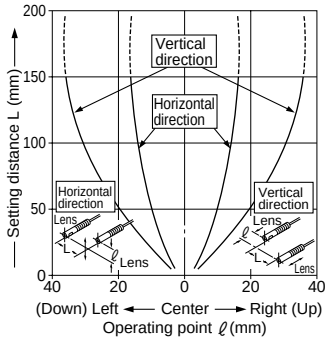
FT-FM2 FT-T80 Thru-beam type



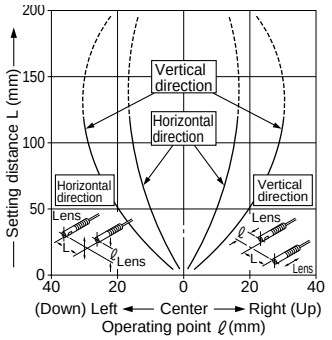
FT-W8 Thru-beam type



FT-P80 Thru-beam type

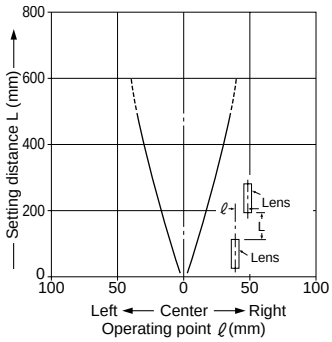


FT-H35-M2 FT-H20-M1 Thru-beam type

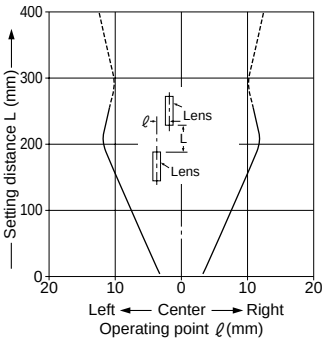


Parallel deviation with FV-LE1 (vacuum•expansion lens) applied on both sides

FT-6V Thru-beam type



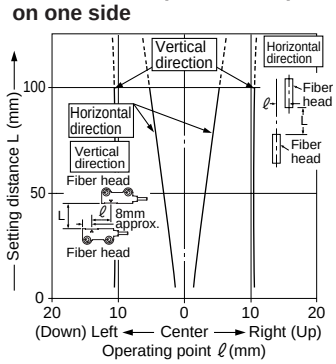
FT-60V Thru-beam type



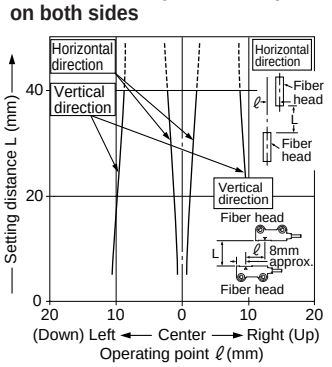
Parallel deviation with seal type slit masks

FT-A8 Thru-beam type

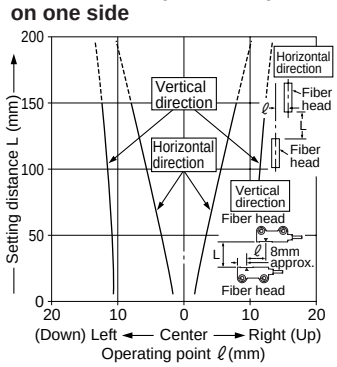
With slit mask (0.5 × 12mm) on one side



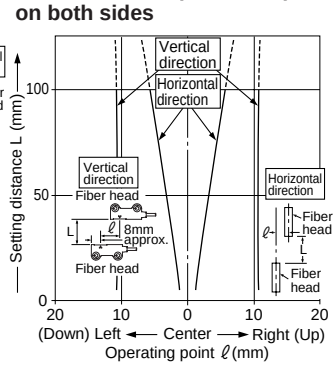
With slit masks (0.5 × 12mm) on both sides



With slit mask (1 × 12mm) on one side



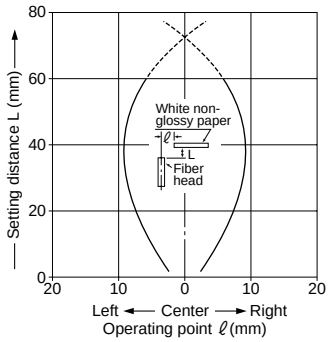
With slit masks (1 × 12mm) on both sides



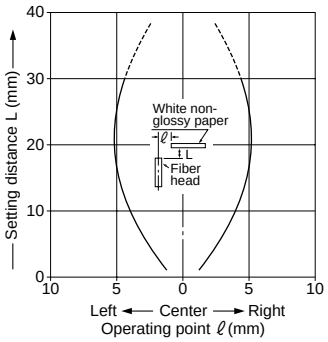
SENSING CHARACTERISTICS (TYPICAL)

Sensing fields

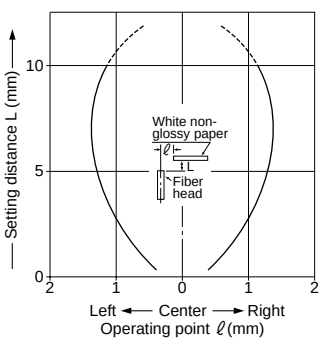
FD-B8 Reflective type



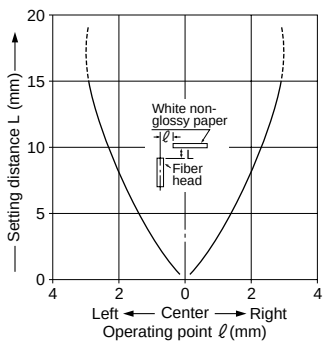
FD-FM2 FD-FM2S FD-FM2S4 FD-T80 FD-S80 Reflective type



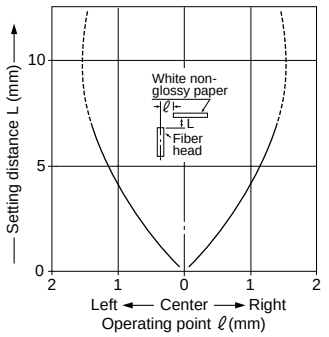
FD-T40 FD-NFM2 FD-NFM2S FD-NFM2S4 FD-SNFM2 Reflective type



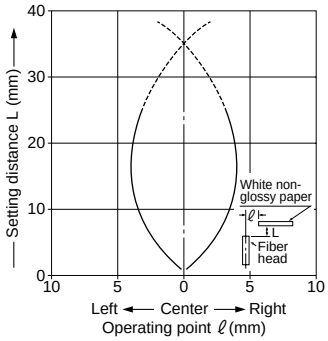
FD-W8 FD-WT8 FD-WS8 Reflective type



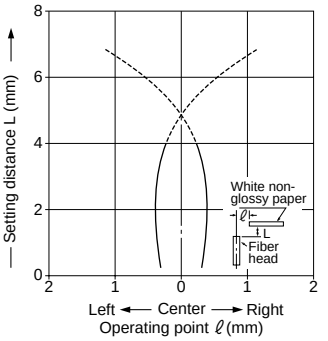
FD-WG4 FD-WSG4 Reflective type



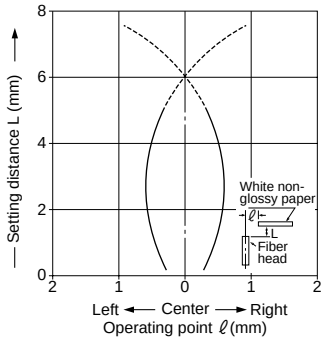
FD-P80 Reflective type



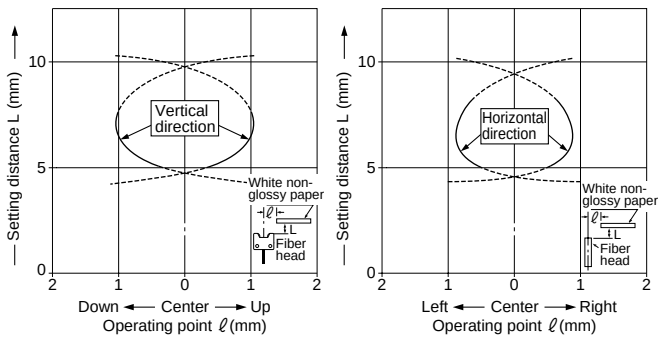
FD-P40 Reflective type



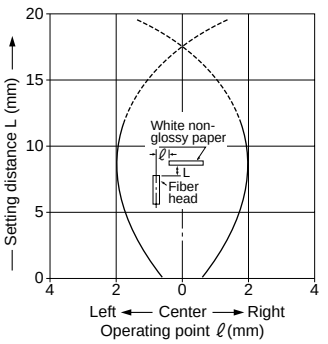
FD-P2 Reflective type



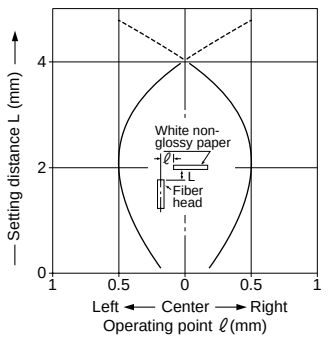
FD-L4 Reflective type



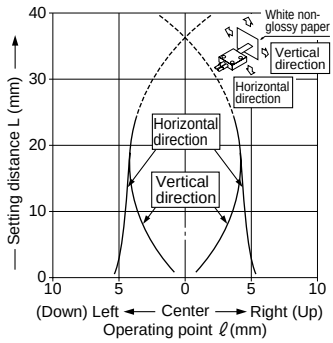
FD-G4 Reflective type



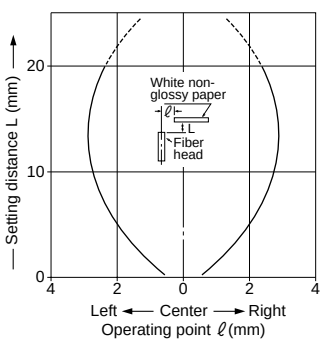
FD-EG1 Reflective type



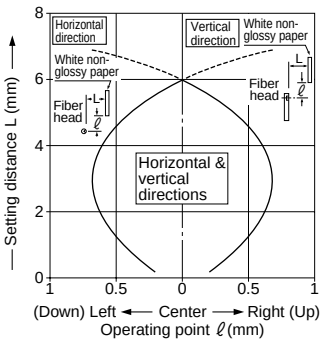
FD-AFM2 FD-AFM2E Reflective type



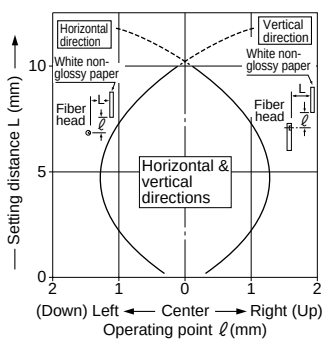
FD-R80 Reflective type



FD-V41 Reflective type



FD-SFM2SV2 Reflective type

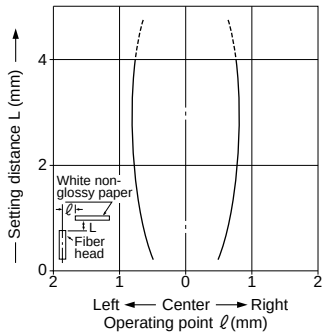


FX-13

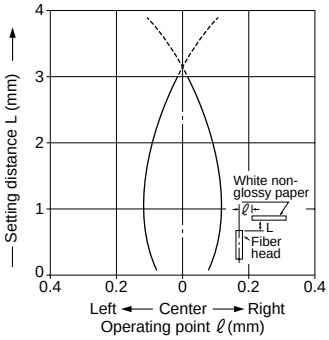
SENSING CHARACTERISTICS (TYPICAL)

Sensing fields

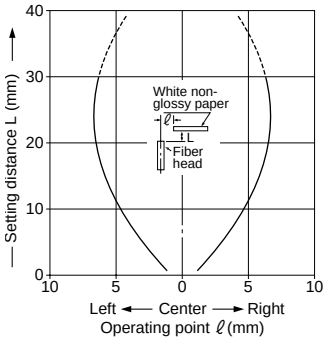
FD-ENM1S1 Reflective type



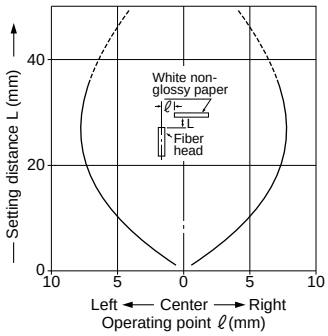
FD-KM1S2 Reflective type



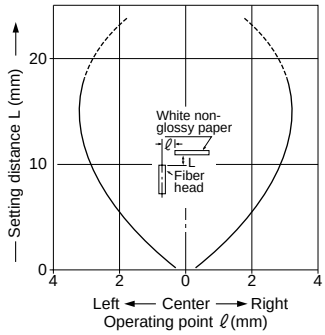
FD-H35-M2 FD-H35-M2S6 FD-H20-M1 Reflective type



FD-H13-FM2 Reflective type

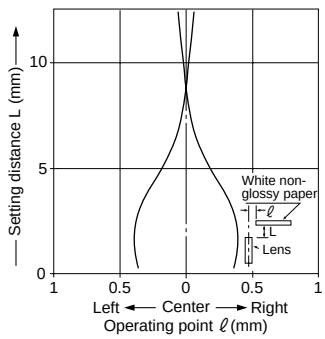


FD-6V Reflective type

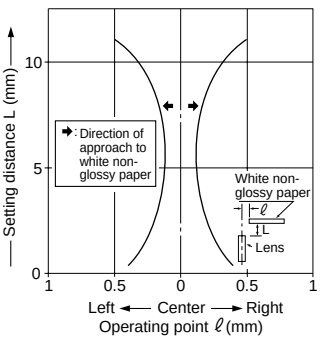


Sensing fields with FX-MR1 (pinpoint spot lens) applied

FD-WG4 Reflective type

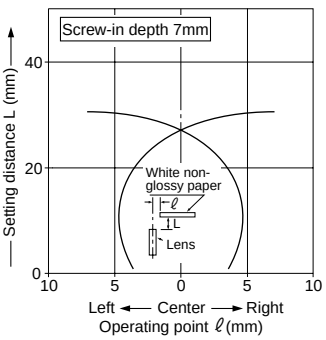


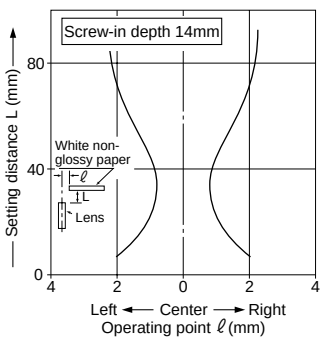
FD-G4 Reflective type



Sensing fields with FX-MR2 (zoom lens) applied

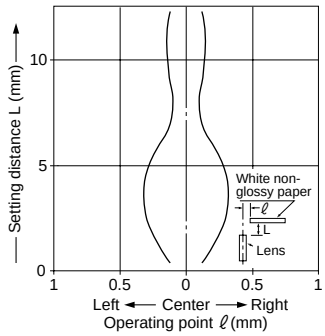
FD-G4 Reflective type



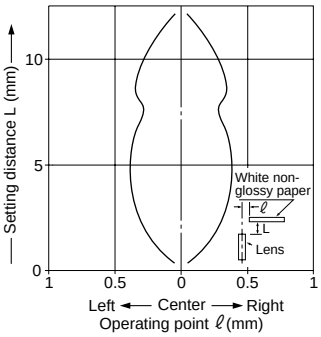


Sensing fields with FX-MR3 (finest spot lens) applied

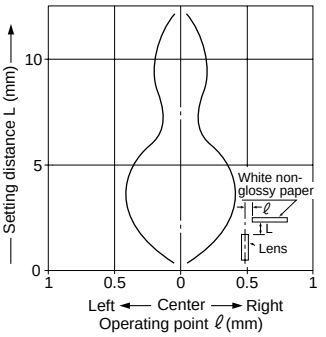
FD-WG4 Reflective type



FD-G4 Reflective type



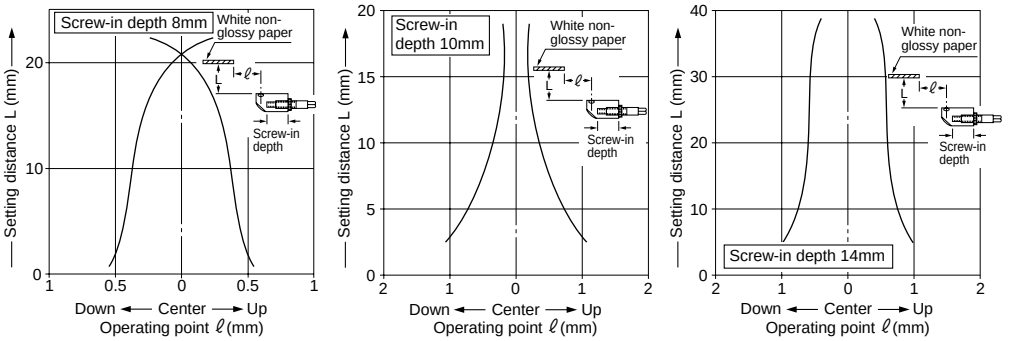
FD-EG1 Reflective type



SENSING CHARACTERISTICS (TYPICAL)

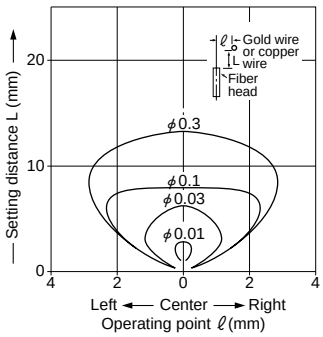
Sensing fields with FX-MR5 (side-view type zoom lens) applied

FD-G4 Reflective type

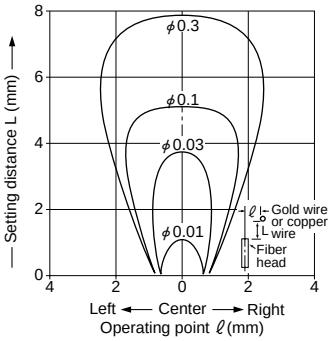


Correlation between sensing object diameter and sensing field

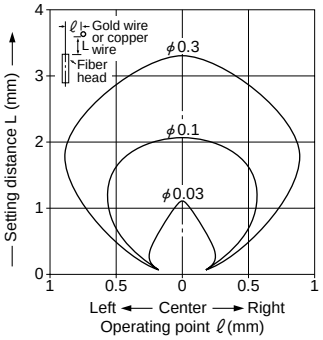
FD-B8 Reflective type



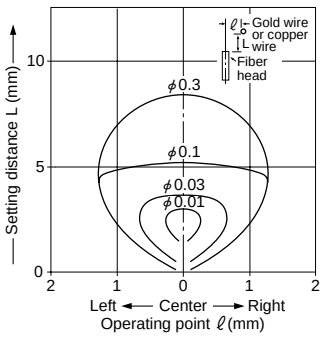
FD-FM2 FD-T80 FD-S80 Reflective type



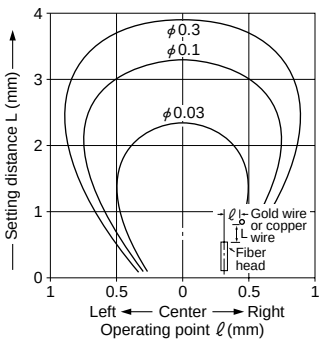
FD-T40 FD-NFM2 Reflective type



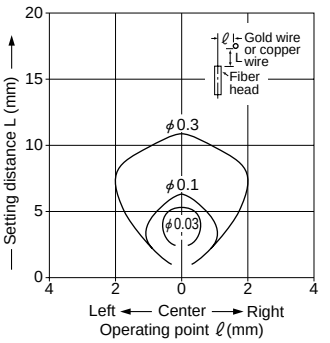
FD-W8 Reflective type



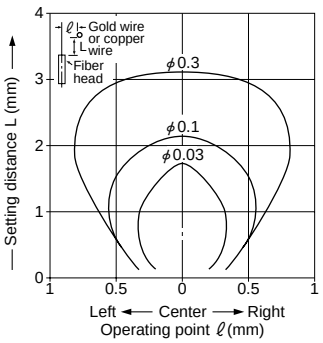
FD-WG4 Reflective type



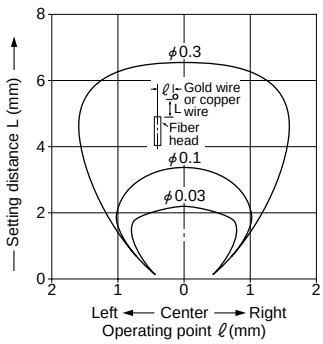
FD-P80 Reflective type



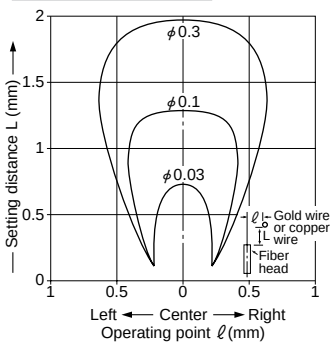
FD-P2 Reflective type



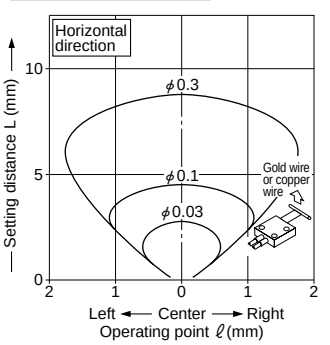
FD-G4 Reflective type

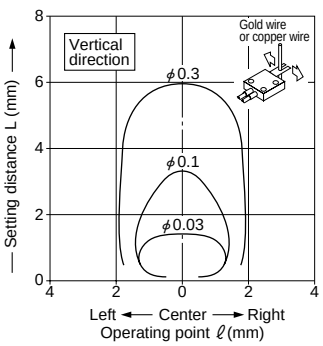


FD-EG1 Reflective type

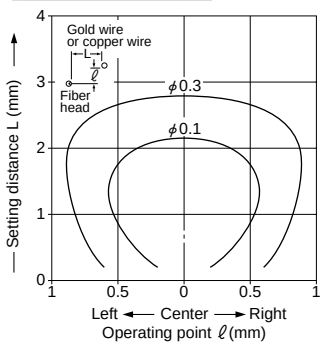


FD-AFM2 Reflective type





FD-SFM2SV2 Reflective type

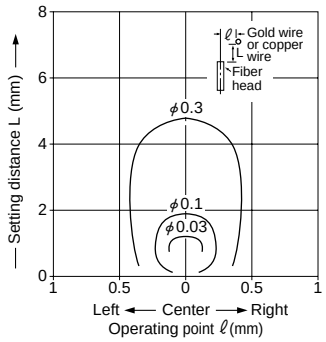


FX-13

SENSING CHARACTERISTICS (TYPICAL)

Correlation between sensing object diameter and sensing field

FD-KM1S2 Reflective type



PRECAUTIONS FOR PROPER USE

Refer to P.820～ for general precautions and P.99～ for fiber precautions.

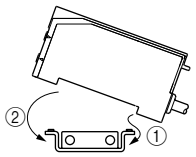
Amplifier

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

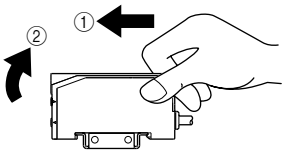
① Fit the rear part of the amplifier on the attached amplifier mounting bracket (**MS-DIN-2**) or a 35mm width DIN rail.
② Press down the front part of the amplifier on the amplifier mounting bracket (**MS-DIN-2**) or the DIN rail to fit it.



Attached amplifier mounting bracket or 35mm width DIN rail

How to remove the amplifier

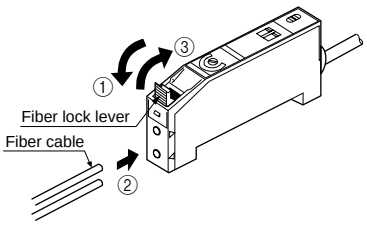
① Push the amplifier forward.
② Lift up the front part of the amplifier to remove it.



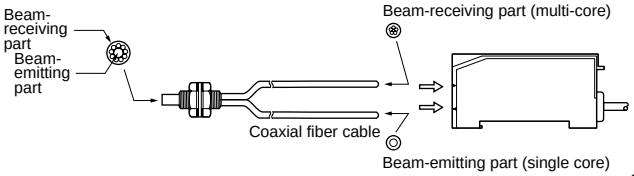
Note: Please take care that if the front part is lifted without pushing the amplifier forwards the hooks on the rear portion of the mounting section are likely to break.

How to connect the fiber cables

① Snap the fiber lock lever down.
② Insert fiber cables slowly into the inlets until they stop. (Note 1)
③ Lock the fiber lock lever in the original position, till you feel a click.



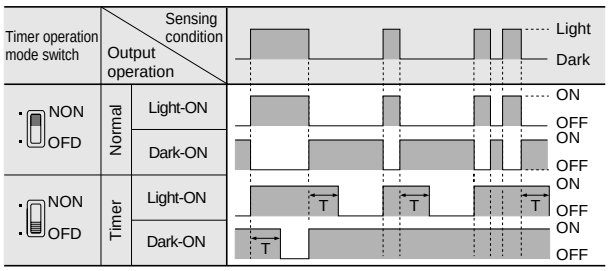
Notes: 1) In case the fiber cables are not inserted to a position where they stop, the sensing range reduces.
2) With the coaxial reflective type fiber, such as, **FD-G4** or **FD-FM2**, insert the center fiber cable (single-core) into the beam-emitting inlet and the outer fiber cable (multi-core) into the beam-receiving inlet. If they are inserted in reverse, the sensing accuracy will deteriorate.



OFF-delay timer function

• **FX-13** incorporates an approx. 40ms fixed OFF-delay timer. Timer operation is effective when the timer operation mode switch is set to the 'OFD' side.
Since the output is extended by a fixed period, it is useful when the connected device has a slow response time or when small objects are being sensed and the output signal width is small.

<Time chart>



Timer period: T = 40ms approx.

Wiring

• The self-diagnosis output is not incorporated with a short-circuit protection circuit. Do not connect it directly to a power supply or a capacitive load.

Others

• Do not use during the initial transient time (50ms) after the power supply is switched on.

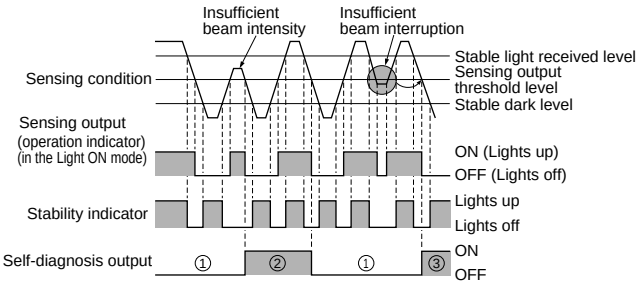
PRECAUTIONS FOR PROPER USE

Refer to P.820〜 for general precautions and P.99〜 for fiber precautions.

Amplifier

Self-diagnosis function

- This is a function which diagnoses a decrease in the incident light intensity due to dirt or dust, or optical misalignment, and gives an output.

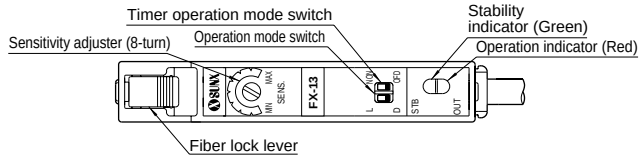


① The self-diagnosis output transistor stays in the 'OFF' state during stable sensing.

② When the sensing output changes, if the incident light intensity does not reach the stable light received level or the stable dark level, the self-diagnosis output becomes ON.
Further, the self-diagnosis output is generated at the time when the sensing output changes from Light to Dark state.
(The operation of the sensing output is not affected.)

③ In case of insufficient beam interruption, there will be a time lag before the self-diagnosis output turns ON.

Part description



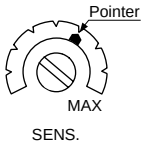
Sensitivity adjustment

- Adjust the sensitivity while observing the operation indicator.

☼: Light up ●: Light off

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

- The sensitivity adjuster is an 8-turn potentiometer.
  The maximum sensitivity is obtained by turning fully clockwise.
- The indicator shows the present sensitivity level.



Step	Sensing method		Operation	Sensitivity adjuster
	Reflective	Thru-beam		
①	Set the operation mode switch to Light-ON mode. (Initial setting)		Turn the sensitivity adjuster fully counter-clockwise. (Minimum sensitivity)	
②	Beam received	Beam received	In the beam received condition, slowly turn the adjuster clockwise and find the point Ⓐ where the sensor is switched ON.	
③	Beam not received	Beam not received	In the beam not received condition, turn the adjuster further clockwise until the sensor goes into the ON state again. Once it is switched on, turn the adjuster counterclockwise a little and find the point Ⓑ where it is switched OFF. (If the sensor does not go into the ON state, MAX is the point Ⓑ.)	
④	———	———	Set the adjuster at the center of points Ⓐ and Ⓑ. This is regarded as the optimum sensitivity point.	
⑤	Select the mode either Light-ON or Dark-ON according to your application. (L-ON: ON when the beam is received, D-ON: ON when the beam is not received)			

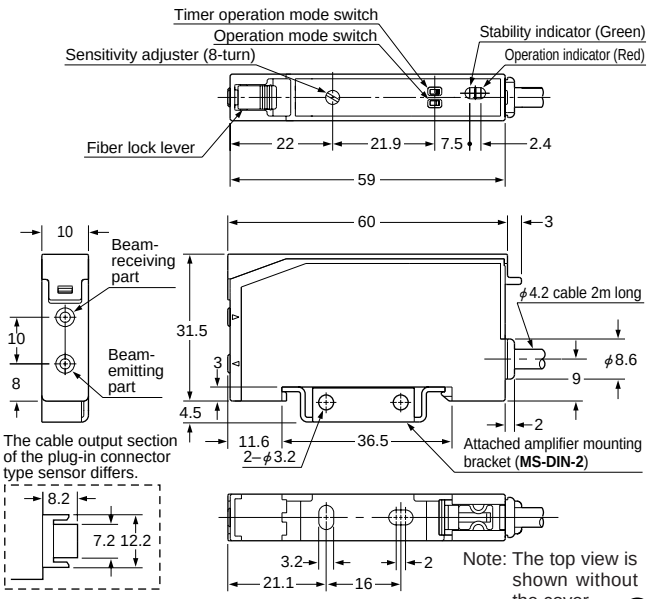
Notes: 1) In order to protect the mechanism, the sensitivity adjuster idles when over turned.
2) Do not move or bend the fiber cable after the sensitivity adjustment. Detection may become unstable.

DIMENSIONS (Unit: mm)

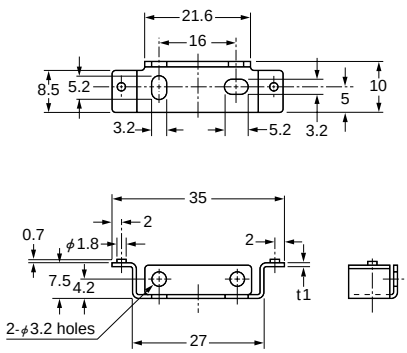
Refer to P.106〜 for dimensions other than those given below.

FX-13 FX-13P Amplifier

Assembly dimensions with attached amplifier mounting bracket



MS-DIN-2 Amplifier mounting bracket (Accessory for amplifier)



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