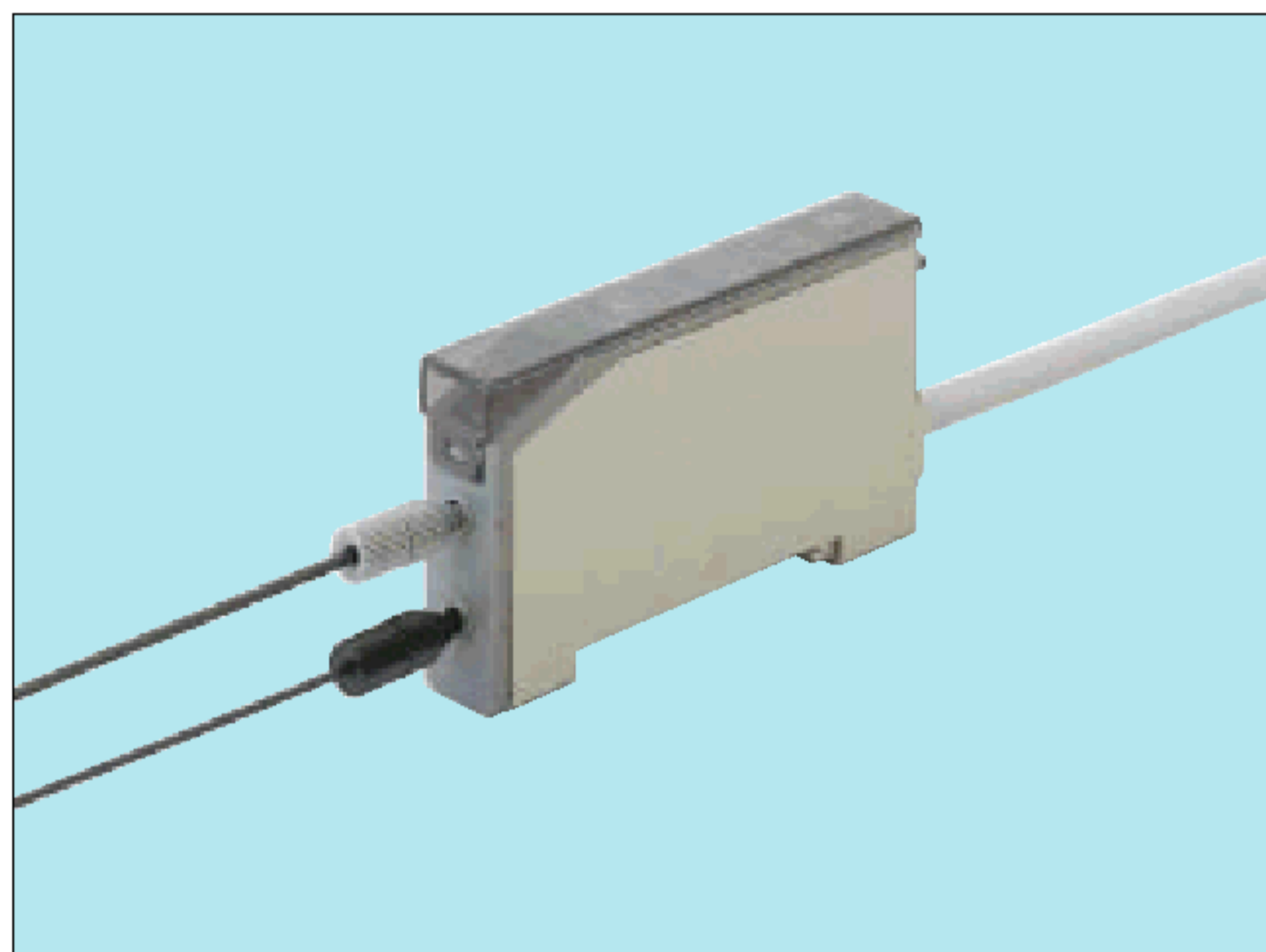


# FX-10 SERIES

**NEW**

## Slim Body with Manual Sensitivity Setting



The Best Sensing Performance in the Smallest Body

**CE Marked**  
Conforming to EMC directive

### 8-turn Adjuster with the Pointer

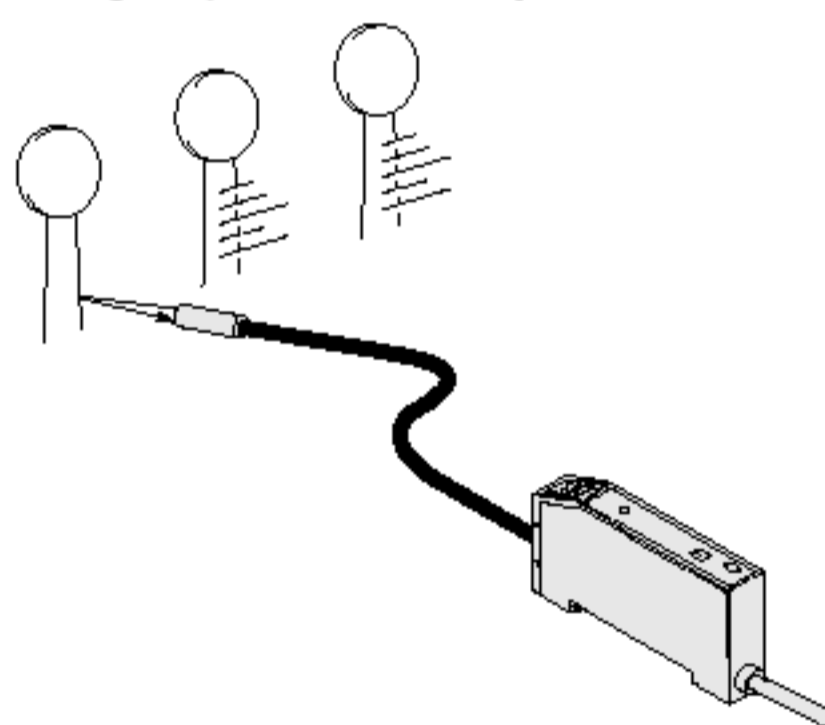
The wide adjustable range of 8 turns permits a delicate setting. The pointer shows the adjustment position.

8-turn adjuster with the pointer



### Ultra-high Speed Response Time : 30 $\mu$ s

The high-speed sensing amplifier **FX-13** is much immune against ambient lights because of the beam modulated. Also, the response time is just 30 $\mu$ s (standard type : 0.3ms). It detects small and high-speed moving objects securely.

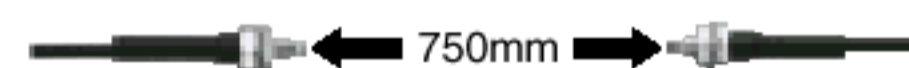


### High Sensing Performance

The long sensing range amplifier **FX-12** has attained 750mm sensing range with the M4 thru-beam fiber. The longer sensing range it gives even with the ultra-small diameter fiber. The green LED amplifier and the high-speed sensing amplifier can be also used with the pinpoint spot lenses.

#### Thru-beam mode

M4 standard • long sensing range fiber(**FT-B8**) + **FX-12**(Long sensing range type)



Ultra-small diameter fiber(**FT-E20**) + **FX-11G**(Green LED type)



#### Reflective mode

M6 standard • long sensing range fiber(**FD-B8**) + **FX-12**(Long sensing range type)

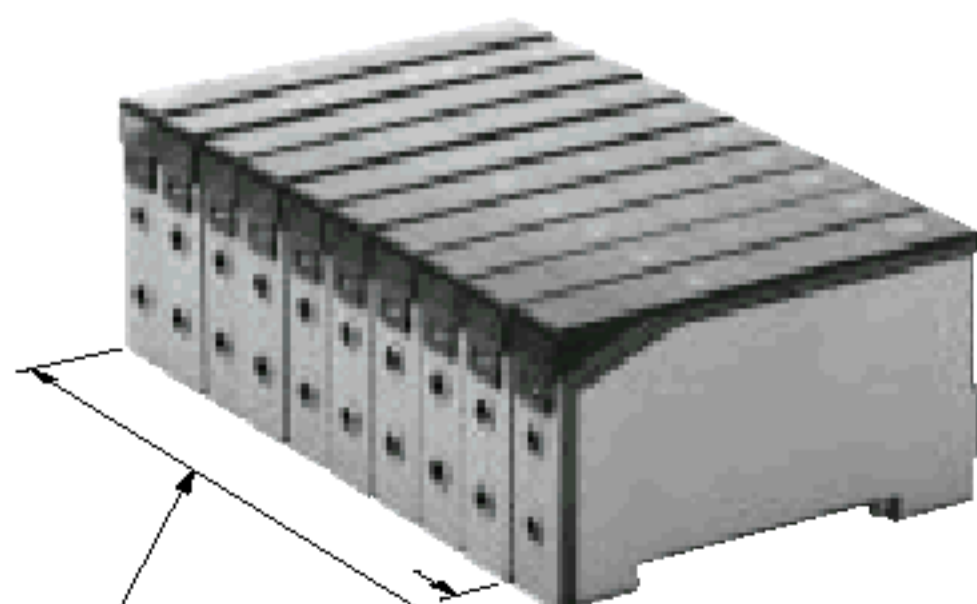


### New Fibers

The **FD-L41** for detecting glass boards, the **FD-L42** for detecting wafers or specular objects, the **FT-K2** for detecting wafers in a cassette by the sharp beam (opening angle 4°), and the **FT-KV2** as the side-view type of the **FT-K2**.

### Compact Size ! Width : 10mm

Effective in a narrow space.

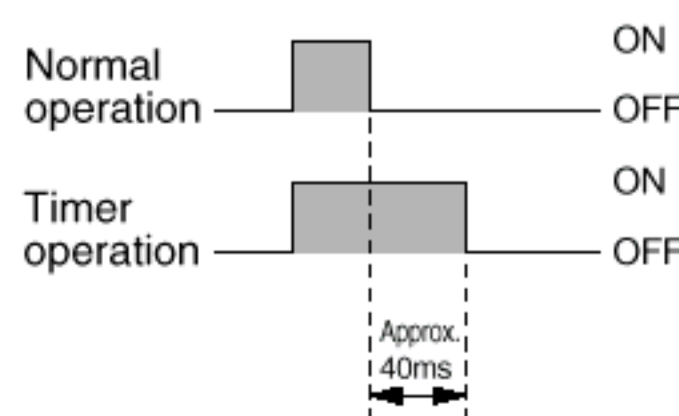


Only 100mm wide with 10 units mounted together

### OFF-delay Timer Function

The **FX-10** series is incorporated with the OFF-delay timer for approx. 40ms fixed.

The delay timer prolonging output signals is useful for the applications small objects travel so fast that the connected device can not catch up them.

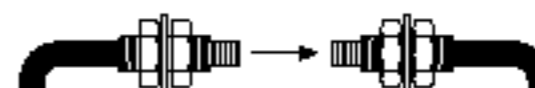




# FX-10

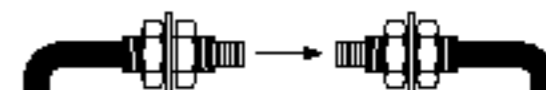
## ORDER GUIDE

For general use fibers [Thru-beam mode (One pair of two fibers a set)]



Type	Shape of fiber head (mm)	Sensing range (*3)	Min. sensing object [on optimum condition (*1)]	Features	Fiber cable length	Model No.
Standard	Lens applicable 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13	• Twice longer sensing range than before	Free Cut 2m	<b>FT-B8</b>
	Lens applicable 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13	• Free-cut type	Free Cut 2m	<b>FT-FM2</b> <b>FT-FM2S</b> With sleeve 90mm <b>FT-FM2S4</b> With sleeve 40mm <b>FT-SFM2</b>
	With sleeve 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13			
Small fiber head	Lens applicable 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13	• Miniature but the same sensing range as the standard type	Free Cut 2m	<b>FT-T80</b>
Small diameter	Lens applicable 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13			
	With sleeve 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13	• Mountable in a tight area or a narrow space • Free-cut type	Free Cut 2m	<b>FT-NFM2</b> <b>FT-NFM2S</b> With sleeve 90mm <b>FT-NFM2S4</b> With sleeve 40mm <b>FT-SNFM2</b>
Flexible	Lens applicable Small diameter 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13	• Small diameter fiber head with coiled cable	2m	<b>FT-C4</b>
	Lens applicable 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13		Free Cut 2m	<b>FT-P80</b>
	Small diameter 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13	• Allowable bending radius : R4mm or more • Bending durability : One million times or more	Free Cut 2m	<b>FT-P40</b>
	Small diameter 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13		1m	<b>FT-P2 (*2)</b>

Environmental-resistant fibers [Thru-beam mode (One pair of two fibers a set)]



Type	Shape of fiber head (mm)	Sensing range (*3)	Min. sensing object [on optimum condition (*1)]	Features	Fiber cable length	Model No.
Heat-resistant	Lens applicable 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13	• Heat-resistant : 350°C • Cold-resistant : -60°C	2m	<b>FT-H35-M2</b> <b>FT-H35-M2S6</b> With sleeve 60mm
	With sleeve 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13	• Flexible cable with silicone jacket • Heat-resistant : 200°C • Cold-resistant : -60°C	1m	<b>FT-H20-M1</b>
	Lens applicable 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13	• Heat-resistant : 130°C • Cold-resistant : -60°C • Free-cut type	Free Cut 2m	<b>FT-H13-FM2</b>
Chemical-resistant			① FX-11 ② FX-11G ③ FX-12 ④ FX-13	• Applicable in chemical solvent • Heat-resistant specification (115°C) • Long sensing range with lenses	2m (Bending R : 30mm)	<b>FT-L8Y</b>
			① FX-11 ② FX-11G ③ FX-12 ④ FX-13	• Applicable in chemical solvent • Heat-resistant specification (115°C) • Side-view type	2m (Bending R : 30mm)	<b>FT-V8Y</b>
Vacuum	Lens applicable 		① FX-11 ② FX-11G ③ FX-12 ④ FX-13	• Applicable in vacuum chamber • Heat-resistant : 120°C	1m (Bending R : 200mm)	<b>FT-6V</b>
			① FX-11 ② FX-11G ③ FX-12 ④ FX-13		1m (Bending R : 30mm)	<b>FT-60V</b>

The vacuum fiber must be used with both the followings.

FT-J6 : Outer fibers in the atmosphere (One pair of two fibers a set)

FV-BR1 : Terminal joints (One pair of two joints a set)

## ORDER GUIDE

For special use fibers [Thru-beam mode (One pair of two fibers a set)]



Type	Shape of fiber head (mm)	Sensing range (*3)	Min. sensing object [on optimum condition (*1)]	Features	Fiber cable length	Model No.
Long sensing range with lenses		 5,000mm 2,800mm 13,000mm 3,500mm	① $\phi$ 1mm opaque object ② $\phi$ 1mm opaque object ③ $\phi$ 1mm opaque object ④ $\phi$ 1mm opaque object	<ul style="list-style-type: none"> <li>Large lenses on the tops of the fiber heads expand the sensing range significantly.</li> <li>Fiber cable length 10m each</li> </ul>	Free Cut 10m	FT-FM10L
		 400mm 150mm 1,000mm 200mm	① $\phi$ 0.15mm opaque object ② $\phi$ 0.15mm opaque object ③ $\phi$ 0.15mm opaque object ④ $\phi$ 0.15mm opaque object	<ul style="list-style-type: none"> <li>Small fiber heads of <math>\phi</math> 2.5mm with lenses expand the sensing range.</li> </ul>	Free Cut 2m	FT-SFM2L
Array	Top sensing 	 140mm 50mm 350mm 70mm	① Vertical $\phi$ 0.6mm opaque object Horizontal $\phi$ 0.04mm opaque object ② Vertical $\phi$ 0.6mm opaque object Horizontal $\phi$ 0.04mm opaque object ③ Vertical $\phi$ 0.6mm opaque object Horizontal $\phi$ 0.04mm opaque object ④ Vertical $\phi$ 0.6mm opaque object Horizontal $\phi$ 0.04mm opaque object	<ul style="list-style-type: none"> <li>The wide beam stripe detects an object at any place within the area.</li> </ul>	Free Cut 2m	FT-AFM2
	Side sensing 	 110mm 40mm 275mm 60mm	① Vertical $\phi$ 0.6mm opaque object Horizontal $\phi$ 0.04mm opaque object ② Vertical $\phi$ 0.6mm opaque object Horizontal $\phi$ 0.04mm opaque object ③ Vertical $\phi$ 0.6mm opaque object Horizontal $\phi$ 0.04mm opaque object ④ Vertical $\phi$ 0.6mm opaque object Horizontal $\phi$ 0.04mm opaque object			FT-AFM2E
Elbow	Lens applicable 	 110mm 45mm 275mm 60mm	① $\phi$ 0.08mm opaque object ② $\phi$ 0.12mm opaque object ③ $\phi$ 0.08mm opaque object ④ $\phi$ 0.12mm opaque object	<ul style="list-style-type: none"> <li>The fiber head is bent at a right angle of 5mm radius at the neck.</li> </ul>	Free Cut 2m	FT-R80
Side-view	Small diameter 	 70mm 18mm 175mm 38mm	① $\phi$ 0.05mm opaque object ② $\phi$ 0.08mm opaque object ③ $\phi$ 0.05mm opaque object ④ $\phi$ 0.08mm opaque object	<ul style="list-style-type: none"> <li>The side-view sensing enables to use in a tight space.</li> </ul>	Free Cut 2m	FT-V22 (*2)
	Sleeve part can not be bent. 	 30mm 10mm 75mm 15mm	① $\phi$ 0.03mm opaque object ② $\phi$ 0.08mm opaque object ③ $\phi$ 0.03mm opaque object ④ $\phi$ 0.08mm opaque object			FT-V41
	Sleeve part can not be bent. 	 100mm 35mm 250mm 50mm	① $\phi$ 0.08mm opaque object ② $\phi$ 0.08mm opaque object ③ $\phi$ 0.08mm opaque object ④ $\phi$ 0.08mm opaque object			FT-SFM2SV2
Ultra-small diameter		 7mm	③ $\phi$ 0.01mm opaque object	<ul style="list-style-type: none"> <li>Ultra-small diameter heads produce the sharp beam envelope of <math>\phi</math> 0.125mm.</li> </ul>	500mm	FT-E10 (*2)
		 12mm 30mm 6mm	① $\phi$ 0.02mm opaque object ③ $\phi$ 0.02mm opaque object ④ $\phi$ 0.03mm opaque object	<ul style="list-style-type: none"> <li>Ultra-small diameter heads produce the sharp beam envelope of <math>\phi</math> 0.25mm.</li> </ul>	1m	FT-E20 (*2)
Narrow beam		 250mm 90mm 700mm 125mm	① $\phi$ 0.3mm opaque object ② $\phi$ 0.3mm opaque object ③ $\phi$ 0.3mm opaque object ④ $\phi$ 0.3mm opaque object	<ul style="list-style-type: none"> <li>Beam-opening angle 4°</li> <li>Equivalent quality as the laser ray</li> </ul>	1m	<b>NEW</b> FT-K2
		 120mm 400mm 80mm	① $\phi$ 0.3mm opaque object ③ $\phi$ 0.3mm opaque object ④ $\phi$ 0.3mm opaque object	<ul style="list-style-type: none"> <li>Beam-opening angle 4°</li> <li>Side-view type</li> </ul>	1m	<b>NEW</b> FT-KV2
	Sleeve part can not be bent. 	 70mm 18mm 175mm 38mm	① $\phi$ 0.05mm opaque object ② $\phi$ 0.05mm opaque object ③ $\phi$ 0.05mm opaque object ④ $\phi$ 0.05mm opaque object	<ul style="list-style-type: none"> <li>The narrow beam-opening angle, one-sixth of a conventional model, reduces crosstalking.</li> </ul>	1m	FT-KM1S2

(\*1) : The optimum condition is specified that the sensitivity is adjusted to have the operation indicator exactly light up at a certain distance in the Light-ON mode.

(\*2) : Its model No. has been changed because the shorter plug attachments are provided for the FX-10 connection. The specifications including the sensing range are identical as before.  
 (\*3) : The free-cut fibers may reduce the sensing ranges 20% lower than the above specified according to how they are cut off.

### Semi-standard fibers (Custom-order made)

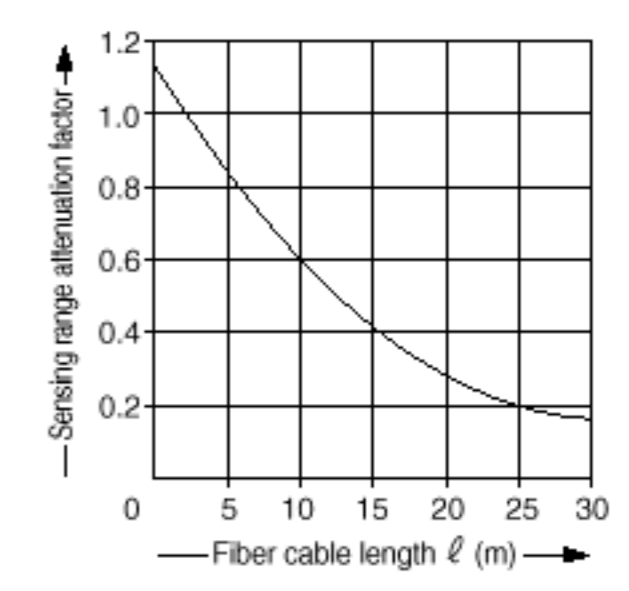
The standard fibers can be modified in fiber cable length or in sleeve length based on your request. Select the fiber cable length (symbolized with  $\square$ ) or the sleeve length (symbolized with  $\triangle$ ) you need from the below table.

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

(\*1) : The standard fiber features 2m in fiber cable length and 4cm or 9cm in sleeve length.

### Correlation between attenuation factor of sensing range and fiber cable length

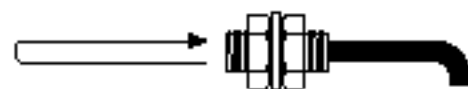
The longer the fiber cable is, the shorter the sensing range becomes.



# FX-10

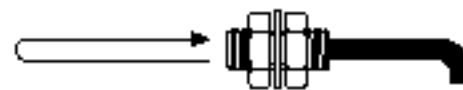
## ORDER GUIDE

For general use fibers [Reflective mode]



Type	Shape of fiber head (mm)	Sensing range (*1) (*4)	Min. sensing object at the maximum sensitivity(*2)	Features	Fiber cable length	Model No.
Long sensing range			① φ0.01mm gold wire ② φ0.05mm copper wire ③ φ0.01mm gold wire ④ φ0.03mm gold wire	• Long sensing range	Free Cut 2m	<b>FD-B8</b>
		Coaxial				
Standard			① φ0.01mm gold wire ② φ0.03mm gold wire ③ φ0.01mm gold wire ④ φ0.02mm gold wire	• Suitable for green LED type  • Free-cut type	Free Cut 2m	<b>FD-5 (*3)</b>  <b>FD-FM2</b> FD-FM2S With sleeve 90mm FD-FM2S4 With sleeve 40mm
		With sleeve				
Small fiber head			① φ0.01mm gold wire ② φ0.03mm gold wire ③ φ0.01mm gold wire ④ φ0.02mm gold wire	• Miniature but the same sensing range as the standard type	Free Cut 2m	<b>FD-T80</b>  <b>FD-T40</b>  <b>FD-S80</b>
		Small diameter				
Small diameter			① φ0.01mm gold wire ② φ0.05mm copper wire ③ φ0.01mm gold wire ④ φ0.03mm gold wire	• Mountable in a tight area or a narrow space • Free-cut type	Free Cut 2m	<b>FD-NFM2</b> FD-NFM2S With sleeve 90mm FD-NFM2S4 With sleeve 40mm  <b>FD-SNFM2</b>
		With sleeve				
Flexible			① φ0.01mm gold wire ② φ0.05mm copper wire ③ φ0.01mm gold wire ④ φ0.03mm gold wire	• Allowable bending radius : R4mm or more • Bending durability : One million times or more	Free Cut 2m	<b>FD-P80</b>  <b>FD-P40</b>  <b>FD-P2 (*3)</b>
		Small diameter				

Environmental-resistant fibers [Reflective mode]



Type	Shape of fiber head (mm)	Sensing range (*1) (*4)	Min. sensing object at the maximum sensitivity(*2)	Features	Fiber cable length	Model No.
Heat-resistant			① φ0.01mm gold wire ② φ0.03mm gold wire ③ φ0.01mm gold wire ④ φ0.02mm gold wire	• Heat-resistant : 350°C • Cold-resistant : -60°C  • Flexible cable with silicone jacket • Heat-resistant : 200°C • Cold-resistant : -60°C	2m	<b>FD-H35-M2</b>  <b>FD-H35-M2S6</b> With sleeve 60mm
		With sleeve				
Vacuum			① φ0.01mm gold wire ② φ0.12mm copper wire ③ φ0.01mm gold wire ④ φ0.08mm copper wire	• Heat-resistant : 130°C • Cold-resistant : -60°C • Free-cut type	Free Cut 2m	<b>FD-H20-M1</b>
		Coaxial				
Vacuum			① φ0.01mm gold wire ② φ0.01mm gold wire ④ φ0.02mm gold wire	• Applicable in vacuum chamber • Heat-resistant : 120°C	1m	<b>FD-H13-FM2</b>
		Coaxial				

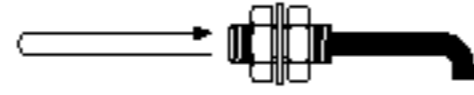
The vacuum fiber must be used with both the followings.

FT-J6 : Outer fibers in the atmosphere (One pair of two fibers a set)

FV-BR1 : Terminal joints (One pair of two joints a set)

## ORDER GUIDE

For special use fibers [Reflective mode]



Type	Shape of fiber head (mm)	Sensing range (*1) (*4)	Min. sensing object at the maximum sensitivity(*2)	Features	Fiber cable length	Model No.
Convergent reflective Glass board detection Wafer or specular object detection	18 × 14	5 to 10mm 4.5 to 12mm (Center : 6mm) 5 to 8mm	① φ0.01mm gold wire ③ φ0.01mm gold wire ④ φ0.02mm gold wire	• The optical system cancels affection by color or surface condition of an object.	Free Cut 2m	FD-L4
	24 × 21	3 to 14mm (Center : 8mm)	③ φ0.2mm copper wire	• Just 4mm thick • Glass board is securely detected.		<b>NEW</b> FD-L41
	15 × 19	Center : 2mm	③ φ0.2mm copper wire	• Just 3mm thick • Wafer is securely detected.		<b>NEW</b> FD-L42
High precision	Lens applicable Coaxial	22mm 9mm 55mm 12mm	① φ0.01mm gold wire ② φ0.03mm gold wire ③ φ0.01mm gold wire ④ φ0.02mm gold wire	• The coaxial fiber gives precise and symmetrical sensing.	Free Cut 2m	FD-G4
	Lens applicable Coaxial • Small diameter	8mm 20mm 4mm	① φ0.01mm gold wire ③ φ0.01mm gold wire ④ φ0.02mm gold wire	• The combination with the FX-MR3 lens gives the smallest spot diameter of approx. φ0.3mm.	500mm	FD-EG1
Array	Top sensing	46mm 17mm	① Vertical φ0.1mm copper wire Horizontal φ0.01mm gold wire ② Vertical φ0.3mm copper wire Horizontal φ0.01mm gold wire ③ Vertical φ0.1mm copper wire Horizontal φ0.01mm gold wire ④ Vertical φ0.2mm copper wire Horizontal φ0.01mm gold wire	• Its wide and flat detection area enables to detect objects traveling through in exactly.	Free Cut 2m	FD-AFM2
	Side sensing	115mm 26mm				FD-AFM2E
Elbow	M6	36mm 13mm 90mm 20mm	① φ0.01mm gold wire ② φ0.05mm copper wire ③ φ0.01mm gold wire ④ φ0.03mm gold wire	• The fiber head is bent at a right angle of 5mm radius at the neck.	Free Cut 2m	FD-R80
Side-view	Small diameter Sleeve part can not be bent.	φ1.5 φ3 11mm 27mm 6mm	① φ0.01mm gold wire ③ φ0.01mm gold wire ④ φ0.2mm copper wire	• The side view sensing enables to use in a tight space.	Free Cut 2m	FD-V41
	Sleeve part can not be bent.	φ2 φ5 18mm 6mm 45mm 10mm	① φ0.1mm copper wire ② φ0.5mm copper wire ③ φ0.1mm copper wire ④ φ0.3mm copper wire			FD-SFM2SV2
Ultra-small diameter	Sleeve part can not be bent.	φ0.5 M3 2.5mm	③ φ0.01mm gold wire	• Mountable in a complex area	500mm	FD-EN500S1
	Coaxial Sleeve part can not be bent.	φ0.8 M3 8mm 20mm 4mm	① φ0.01mm gold wire ③ φ0.01mm gold wire ④ φ0.02mm gold wire	• The coaxial fiber gives precise and symmetrical sensing.	1m	FD-ENM1S1
Narrow-view	Coaxial Sleeve part can not be bent.	φ2 M5 6mm 15mm 3mm	① φ0.02mm gold wire ③ φ0.02mm gold wire ④ φ0.02mm gold wire	• The narrow beam-opening angle, one-sixth of a conventional model, makes a small detecting area.	1m	FD-KM1S2
Liquid level detection Mountable on pipe	φ6 φ5	—	③ (Liquid)	• Liquid drop on the top never affects the sensing.	Free Cut 2m	<b>NEW</b> FD-F8Y
	25 × 20	Applicable pipe diameter : φ6 to φ26mm [ PFA(fluorine resin) or the equivalent bearing the same transparency thickness 1 mm ]	③ (Liquid)	• Liquid surface is securely detected from the outside of a pipe.	Free Cut 2m Free Cut 5m	<b>NEW</b> FD-F4 <b>NEW</b> FD-F9

(\*1) : The sensing range is specified with using white non-glossy paper (50 × 50mm). (FD-B8 : 100 × 100mm, FD-SFM2SV2 : 30 × 30mm, FD-KM1S2 : 10 × 10mm)

(\*2) : The minimum sensing object is obtainable with the maximum sensitivity, but at the ideal sensing distance within the rated sensing range.

(\*3) : Its model No. has been changed because the shorter plug attachments are provided for the FX-10 connection. The specifications including the sensing range are identical as before.

(\*4) : The free-cut fibers may reduce the sensing ranges 20% lower than the above specified according to how they are cut off.

### Semi-standard fibers (Custom-order made)

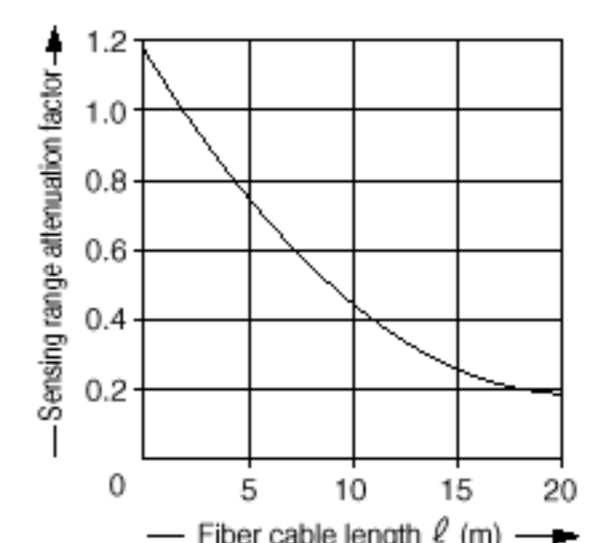
The standard fibers can be modified in fiber cable length or in sleeve length based on your request. Select the fiber cable length (symbolized with ☒) or the sleeve length (symbolized with ☐) you need from the below table.

Type	Basic model No.	☒ Fiber cable length (Unit : m)	☐ Sleeve length (Unit : cm)
Standard of threaded head (Free-cut)	FD-FM ☒	3, 4, 5, 10, 15, 20	—
With sleeve	FD-FM ☒-S ☐	2 (*1), 3, 4, 5, 10, 15, 20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Small diameter of 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	—

(\*1) : The standard fiber features 2m in fiber cable length and 4cm or 9cm in sleeve length.

### Correlation between attenuation factor of sensing range and fiber cable length


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



# FX-10

## ORDER GUIDE

### Amplifiers

Type	Appearance	Model No.	Output	Response time	Emitting element
Sensitive type		<b>FX-11</b>	NPN open-collector transistor	0.3ms or less	Red LED
		<b>FX-11P</b>	PNP open-collector transistor		
Green LED type		<b>FX-11G</b>	NPN open-collector transistor	0.8ms or less	Green LED
Long sensing range type		<b>FX-12</b>	NPN open-collector transistor	0.4ms or less	Red LED
		<b>FX-12P</b>	PNP open-collector transistor		
High-speed type		<b>FX-13</b>	NPN open-collector transistor	30μs or less	Red LED
	<b>FX-13P</b>	PNP open-collector transistor			

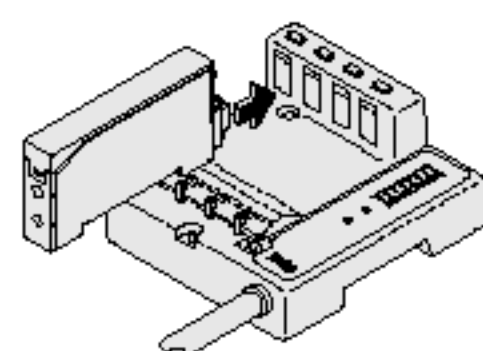
### Plug-in connector type

Integrated plug-in connector is available on the sensitive types, the long sensing range types, and the PNP-output high-speed type.

Model No. : **FX-11J, FX-11PJ, FX-12J, FX-12PJ** and **FX-13PJ** (Standard : Cable type)

Applicable with the **SL-BM** or the **SL-BX** of the sensor & wire-saving link system **S-LINK**; the **SL-BMW** or the **SL-BW** of the sensor block for simple wiring; or the **CN-54-C2** or the **CN-54-C5** mating cable.

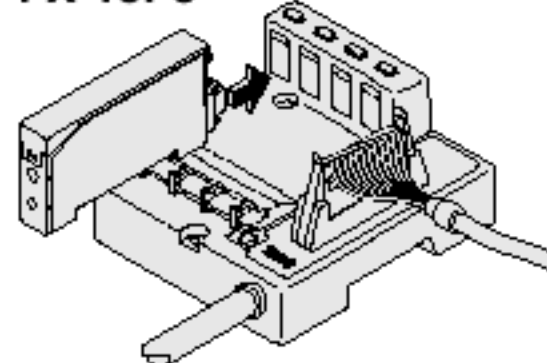
**FX-11J**  
**FX-12J**



Sensor & wire-saving link system, **S-LINK**

(Refer to P.582 for details.)

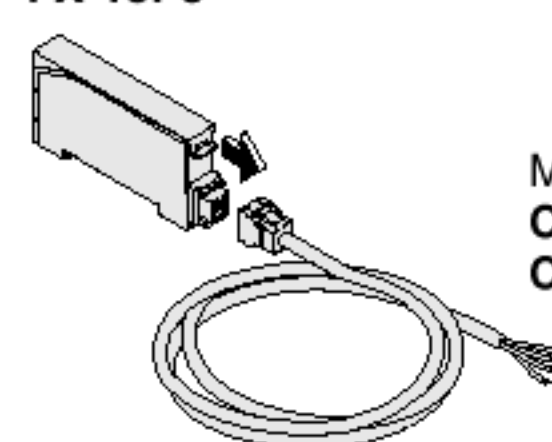
**FX-11J, FX-11PJ**  
**FX-12J, FX-12PJ**  
**FX-13PJ**



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

(Refer to P.626 for details.)

**FX-11J, FX-11PJ**  
**FX-12J, FX-12PJ**  
**FX-13PJ**



Mating cable  
**CN-54-C2** (2m long)  
**CN-54-C5** (5m long)

PNP output type amplifier can not be connected.

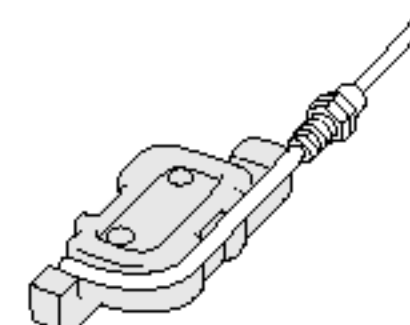
### OPTION

Designation	Model No.	Description	
Protective tube (For thru-beam fiber)	<b>FTP-500</b> (0.5m)	For M4 thread	Applicable fibers
	<b>FTP-1000</b> (1m)		
	<b>FTP-1500</b> (1.5m)		
	<b>FTP-N500</b> (0.5m)	For M3 thread	
	<b>FTP-N1000</b> (1m)		
	<b>FTP-N1500</b> (1.5m)		
Protective tube (For reflective fiber)	<b>FDP-500</b> (0.5m)	For M6 thread	
	<b>FDP-1000</b> (1m)		
	<b>FDP-1500</b> (1.5m)		
	<b>FDP-N500</b> (0.5m)	For M4 thread	
	<b>FDP-N1000</b> (1m)		
	<b>FDP-N1500</b> (1.5m)		
Fiber bender	<b>FB-1</b>	The fiber bender curves the sleeve part of the fiber head at the proper radius. (*1)	
Universal sensor mounting stand (*2)	<b>MS-AJ-F</b>	Fiber assemblies (For M3, M4 or M6 threaded head fiber)	

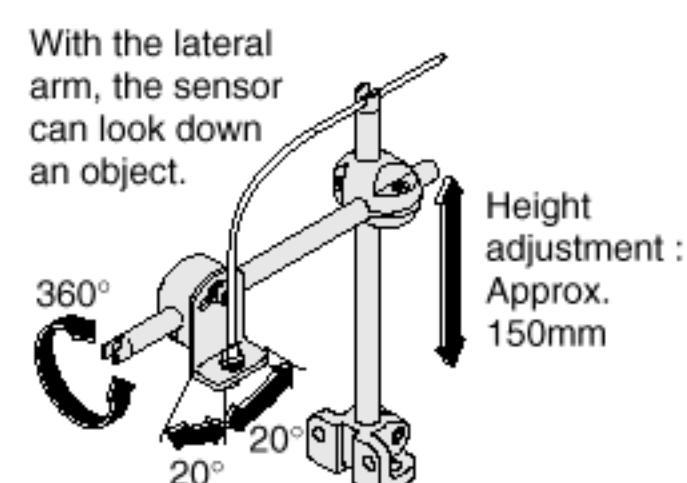
### Protective tube



### Fiber bender



### Universal sensor mounting stand



(\*1) : Do not bend the sleeve part of any side-view fiber, ultra-small diameter head fiber, or narrow-view fiber.

(\*2) : Refer to P.242~ for details of the universal sensor mounting stand.

## OPTION

Designation	Model No.	Description																																																								
For thru-beam fiber	Expansion lens <b>FX-LE1</b>		Five times longer or more • Ambient temperature : - 60 to + 350°C	<b>Sensing range (mm) [Two lenses on both sides]</b> <table border="1"> <thead> <tr> <th>Fiber</th> <th>Applicable amplifier</th> <th>FX-11□</th> <th>FX-11G</th> <th>FX-12□</th> <th>FX-13□</th> </tr> </thead> <tbody> <tr> <td>FT-B8</td> <td></td> <td>1,500</td> <td>650</td> <td>3,500 (*1)</td> <td>770</td> </tr> <tr> <td>FT-FM2</td> <td></td> <td>1,300</td> <td>600</td> <td>3,500 (*1)</td> <td>700</td> </tr> <tr> <td>FT-T80</td> <td></td> <td>1,300</td> <td>600</td> <td>3,500 (*1)</td> <td>700</td> </tr> <tr> <td>FT-C4</td> <td></td> <td>450</td> <td>220</td> <td>800</td> <td>330</td> </tr> <tr> <td>FT-P80</td> <td></td> <td>1,300</td> <td>600</td> <td>3,500 (*1)</td> <td>700</td> </tr> <tr> <td>FT-H35-M2</td> <td></td> <td>1,000</td> <td>350</td> <td>3,500 (*1)</td> <td>560</td> </tr> <tr> <td>FT-H20-M1</td> <td></td> <td>1,000</td> <td>350</td> <td>1,600 (*1)</td> <td>560</td> </tr> <tr> <td>FT-R80</td> <td></td> <td>1,100</td> <td>500</td> <td>3,500 (*1)</td> <td>600</td> </tr> </tbody> </table>	Fiber	Applicable amplifier	FX-11□	FX-11G	FX-12□	FX-13□	FT-B8		1,500	650	3,500 (*1)	770	FT-FM2		1,300	600	3,500 (*1)	700	FT-T80		1,300	600	3,500 (*1)	700	FT-C4		450	220	800	330	FT-P80		1,300	600	3,500 (*1)	700	FT-H35-M2		1,000	350	3,500 (*1)	560	FT-H20-M1		1,000	350	1,600 (*1)	560	FT-R80		1,100	500	3,500 (*1)	600
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Super-expansion lens <b>FX-LE2</b>		The farthest expansion with large aperture lenses • Ambient temperature : - 60 to + 350°C	<b>Sensing range (mm) [Two lenses on both sides]</b> <table border="1"> <thead> <tr> <th>Fiber</th> <th>Applicable amplifier</th> <th>FX-11□</th> <th>FX-11G</th> <th>FX-12□</th> <th>FX-13□</th> </tr> </thead> <tbody> <tr> <td>FT-B8</td> <td></td> <td>3,500 (*1)</td> <td>3,500 (*1)</td> <td>3,500 (*1)</td> <td>3,500 (*1)</td> </tr> <tr> <td>FT-FM2</td> <td></td> <td>3,500 (*1)</td> <td>3,000</td> <td>3,500 (*1)</td> <td>3,500 (*1)</td> </tr> <tr> <td>FT-P80</td> <td></td> <td>3,500 (*1)</td> <td>3,000</td> <td>3,500 (*1)</td> <td>3,500 (*1)</td> </tr> <tr> <td>FT-H35-M2</td> <td></td> <td>3,500 (*1)</td> <td>3,000</td> <td>3,500 (*1)</td> <td>3,500 (*1)</td> </tr> <tr> <td>FT-H20-M1</td> <td></td> <td>1,600 (*1)</td> <td>1,600 (*1)</td> <td>1,600 (*1)</td> <td>1,600 (*1)</td> </tr> <tr> <td>FT-H13-FM2</td> <td></td> <td>3,500 (*1)</td> <td>2,400</td> <td>3,500 (*1)</td> <td>3,000</td> </tr> <tr> <td>FT-R80</td> <td></td> <td>3,500 (*1)</td> <td>2,400</td> <td>3,500 (*1)</td> <td>3,000</td> </tr> </tbody> </table>	Fiber	Applicable amplifier	FX-11□	FX-11G	FX-12□	FX-13□	FT-B8		3,500 (*1)	3,500 (*1)	3,500 (*1)	3,500 (*1)	FT-FM2		3,500 (*1)	3,000	3,500 (*1)	3,500 (*1)	FT-P80		3,500 (*1)	3,000	3,500 (*1)	3,500 (*1)	FT-H35-M2		3,500 (*1)	3,000	3,500 (*1)	3,500 (*1)	FT-H20-M1		1,600 (*1)	1,600 (*1)	1,600 (*1)	1,600 (*1)	FT-H13-FM2		3,500 (*1)	2,400	3,500 (*1)	3,000	FT-R80		3,500 (*1)	2,400	3,500 (*1)	3,000							
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Expansion lens for vacuum fiber <b>FV-LE1</b>		Seven times longer or more • Ambient temperature : - 40 to + 120°C	<b>Sensing range (mm) [Two lenses on both sides]</b> <table border="1"> <thead> <tr> <th>Fiber</th> <th>Applicable amplifier</th> <th>FX-11□</th> <th>FX-11G</th> <th>FX-12□</th> <th>FX-13□</th> </tr> </thead> <tbody> <tr> <td>FT-6V</td> <td></td> <td>900</td> <td>—</td> <td>2,700</td> <td>500</td> </tr> <tr> <td>FT-60V</td> <td></td> <td>400</td> <td>—</td> <td>1,400</td> <td>250</td> </tr> </tbody> </table>	Fiber	Applicable amplifier	FX-11□	FX-11G	FX-12□	FX-13□	FT-6V		900	—	2,700	500	FT-60V		400	—	1,400	250																																					
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For reflective fiber	Pinpoint spot lens <b>FX-MR1</b>		Pinpoint spot of $\phi 0.5\text{mm}$ • Applicable amplifiers : All models • Applicable fiber : <b>FD-G4</b> • Distance to focal point : $6 \pm 1\text{mm}$ • Ambient temperature : - 10 to + 300°C																																																							
			Zoom lens <b>FX-MR2</b>		The spot diameter is adjustable from $\phi 0.7$ to $\phi 2\text{mm}$ according to how much it is screwed in. • Applicable amplifiers : <b>FX-11, FX-12 &amp; FX-13</b> • Applicable fiber : <b>FD-G4</b> • Ambient temperature : - 40 to + 70°C	<table border="1"> <thead> <tr> <th>Screw-in depth</th> <th>Distance to focal point</th> <th>Spot diameter</th> </tr> </thead> <tbody> <tr> <td>7mm</td> <td>Approx. 18.5mm</td> <td><math>\phi 0.7\text{mm}</math></td> </tr> <tr> <td>12mm</td> <td>Approx. 27mm</td> <td><math>\phi 1.2\text{mm}</math></td> </tr> <tr> <td>14mm</td> <td>Approx. 43mm</td> <td><math>\phi 2.0\text{mm}</math></td> </tr> </tbody> </table>	Screw-in depth	Distance to focal point	Spot diameter	7mm	Approx. 18.5mm	$\phi 0.7\text{mm}$	12mm	Approx. 27mm	$\phi 1.2\text{mm}$	14mm	Approx. 43mm	$\phi 2.0\text{mm}$																																								
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Finest spot lens <b>FX-MR3</b>		Finest spot of $\phi 0.3\text{mm}$ (with <b>FD-EG1</b> ) • Applicable amplifiers : <b>FX-11, FX-12 &amp; FX-13</b> • Applicable fibers : <b>FD-EG1 &amp; FD-G4</b> • Ambient temperature : - 40 to + 70°C	<table border="1"> <thead> <tr> <th>Screw-in depth</th> <th>Distance to focal point</th> <th>Spot diameter</th> </tr> </thead> <tbody> <tr> <td><b>FD-EG1</b></td> <td><math>7.5 \pm 0.5\text{mm}</math></td> <td>Approx. <math>\phi 0.3\text{mm}</math></td> </tr> <tr> <td><b>FD-G4</b></td> <td><math>7.5 \pm 0.5\text{mm}</math></td> <td>Approx. <math>\phi 0.5\text{mm}</math></td> </tr> </tbody> </table>	Screw-in depth	Distance to focal point	Spot diameter	<b>FD-EG1</b>	$7.5 \pm 0.5\text{mm}$	Approx. $\phi 0.3\text{mm}$	<b>FD-G4</b>	$7.5 \pm 0.5\text{mm}$	Approx. $\phi 0.5\text{mm}$																																														
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Zoom lens (Side-view type) <b>FX-MR5</b>		The side-view spot lens <b>FX-MR5</b> contributes space saving. • Applicable amplifiers : <b>FX-11, FX-12 &amp; FX-13</b> • Applicable fiber : <b>FD-G4</b> • Ambient temperature : - 40 to + 70°C	<table border="1"> <thead> <tr> <th>Screw-in depth</th> <th>Distance to focal point</th> <th>Spot diameter</th> </tr> </thead> <tbody> <tr> <td>8mm</td> <td>Approx. 13mm</td> <td><math>\phi 0.5\text{mm}</math></td> </tr> <tr> <td>10mm</td> <td>Approx. 15mm</td> <td><math>\phi 0.8\text{mm}</math></td> </tr> <tr> <td>14mm</td> <td>Approx. 30mm</td> <td><math>\phi 3.0\text{mm}</math></td> </tr> </tbody> </table>	Screw-in depth	Distance to focal point	Spot diameter	8mm	Approx. 13mm	$\phi 0.5\text{mm}$	10mm	Approx. 15mm	$\phi 0.8\text{mm}$	14mm	Approx. 30mm	$\phi 3.0\text{mm}$																																											
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(\*1) : The fiber cable length practically limits the sensing range at 3,500mm long (FT-H20-M1 : 1,600mm).



# FX-10

## SPECIFICATIONS

### Fibers

Item	Type	Heat-resistant			Chemical-resistant	Vacuum	Convergent reflective	Side-view, Narrow beam, Narrow-view, Reflective of ultra-small diameter	Liquid level detection		
		350°C type	200°C type	130°C type						Mountable on pipe	
Allowable bending radius	Standard, Small fiber head, Small diameter, Flexible, Long sensing range with lenses, Array, Elbow, High precision, Thru-beam of ultra-small diameter	R25mm or more (Flexible : R4mm or more, Thru-beam of ultra-small diameter : R5mm or more)			R30mm or more	R200mm or more (FT-60V : R30mm or more)	R10mm or more	R25mm or more (FT-K2 and FT-KV2 : R10mm or more)	Protective tube : R40mm or more Fiber cable : R15mm or more	R10mm or more	
Ambient temperature		-40 to +70°C (FD-EG1 : -20 to +60°C)	-60 to +350°C (*1)	-60 to +200°C	-60 to +130°C	-40 to +115°C	-40 to +120°C	-40 to +70°C (FD-L42 : -40 to +60°C)	-20 to +60°C (FT-V41, FD-V41, FT-K2, and FT-KV2 : -40 to +60°C)	-40 to +125°C (*2)	-40 to +100°C (*2)
Ambient humidity	35 to 85%RH (No dew condensation nor icing allowed)										
Material	Fiber core	Acrylic	Multi-component glass (*3)		Acrylic	Quartz glass (*3)	Acrylic				
	Sheath	Polyethylene (Thru-beam of ultra-small diameter and Flexible except for FT-C4 and FD-P2 : Vinyl chloride)		Silicone (SUS spiral tube inside)	Fluorine resin	Fluorine resin	Polyethylene Reflective of narrow-view type : Polyurethane, FT-K2 and FT-KV2 : Polyolefine			Polypropylene	
Material	Fiber head	Brass : Threaded part of standard, (Nickel plated) Threaded part of small diameter, High precision, FT-C4, Threaded part of thru-beam of ultra-small diameter, FT-P80, FD-P80, Array, Threaded part of FT-R80  SUS : FT-SFM2, Small fiber head, FT-SNFM2, FD-SNFM2, FT-SFM2L, FT-P40, FT-P2, FD-P40, FD-P2, Sleeve part of sleeve-attached fiber  ABS : FT-FM10L (Lens : Acrylic)  Zinc alloy die-casted : Threaded part of FD-R80	SUS	Brass (Nickel plated)	Brass (Nickel plated)	Protective tube : Fluorine resin (*4)  Fiber sheath : Polypropylene	Aluminum	ABS : FD-L4, FD-L41 (Lens : Acrylic) Aluminum : FD-L42 (Lens : Acrylic)	SUS FT-KV2 and Threaded part of FD-EN500S1, FD-ENM1S1, FT-KM1S2, and FD-KM1S2 : Brass Lens of FT-K2 : Glass Lens of FT-KV2 : Acrylic	Protective tube : Fluorine resin Sheath : Polypropylene	Polyetherimido
	Accessories	Threaded head fiber : 2 pcs. of nuts (thru-beam type : 4 pcs.) and 1 pc. of toothed lock washer (thru-beam type : 2pcs.) Free-cut type, flexible coiled fiber, chemical-resistant fiber and liquid level detection fiber : 1 pc. of FX-CT1 (Fiber cutter) Small diameter of free-cut fiber, convergent reflective fiber, high precision of free-cut fiber, FD-F4 and FD-F9 : 2 sets of plug attachments (FD-L41, FD-L42, FD-F4 and FD-F9 : 1 set of attachments) FD-F4 and FD-F9 : 4 pcs. of tying bands and 2 pcs. of anti-slip tubes FD-L4 : 2 pcs. of M2.6×12mm screws with washers and 2 pcs. of nuts									

(\*1) : If the fiber is used under -30°C, its resistable 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) : With the liquid level detection fiber, also make sure of the temperature of the liquid in which the fiber is immersed.

(\*3) : Keep the fiber composed of multi-component glass or quartz glass from vibration or impact.

## SPECIFICATIONS

### Amplifiers

Item	Type Model No.	NPN output				PNP output		
		Sensitive type	Green LED type	Long sensing range type	High-speed type	Sensitive type	Long sensing range type	High-speed type
		<b>FX-11</b>	<b>FX-11G</b>	<b>FX-12</b>	<b>FX-13</b>	<b>FX-11P</b>	<b>FX-12P</b>	<b>FX-13P</b>
Supply voltage		12 to 24V DC $\pm$ 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 • 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 • 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 • 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 • Residual voltage : 1V or less (at 50mA source current) 0.4V or less (at 16mA source current)		
	Output operation	ON under the unstable sensing condition						
	Short-circuit protection	Incorporated						
Response time		0.3ms or less	0.8ms or less	0.4ms or less	30 $\mu$ s or less	0.3ms or less	0.4ms or less	30 $\mu$ s or less
Operation indicator		Red LED (lights up when the sensing output is activated)						
Stability indicator		Green LED (lights up under the stable Light condition or the stable Dark condition)						
Sensitivity adjuster		8-turn adjuster with the pointer						
Automatic crosstalk prevention function		Incorporated						
Timer function		Fixed OFF-delay timer approx. 40ms (switchable either effective or ineffective)						
Environmental resistance	Pollution degree	3 (Industrial environment)						
	Ambient temperature	- 10 to + 55°C (No dew condensation nor icing allowed), Storage : - 20 to + 70°C						
	Ambient humidity	35 to 85%RH, Storage : 35 to 85%RH						
	Ambient illuminance (Extraneous light immunity)	Sun light : 10,000 $\ell$ x at the light-receiving face, Incandescent light : 3,500 $\ell$ x at the light-receiving face						
	EMC	Emission : EN50081-2, Immunity : EN50082-2						
	Voltage withstandability	1,000V AC for one min. between all terminals connected and enclosure (*1)						
	Insulation resistivity	20M $\Omega$ or more at 250V DC Megger between all terminals connected and enclosure (*1)						
	Vibration-proof	10 to 150Hz frequency, 0.75mm amplitude, and X, Y, and Z directions each for two hours (unenergized)						
Shock-proof	100m/s <sup>2</sup> acceleration (approx.10G), and X, Y, and Z directions each for five times (unenergized)							
Emitting element		Red LED (modulated)	Green LED (modulated)	Red LED (modulated)				
Material		Enclosure : Heat-resistant ABS, Case cover : Polycarbonate, Fiber lock lever : PPS						
Cable		Cabtyre cable 2m long with four 0.2mm <sup>2</sup> conductors						
Cable extension		Maximum extension is 100m overall with an equivalent cable with conductors 0.3mm <sup>2</sup> or more						
Weight		Approx. 60g						
Accessories		<b>MS-DIN-2</b> (Mounting bracket) : 1 pc., Adjusting screw-driver : 1 pc.						

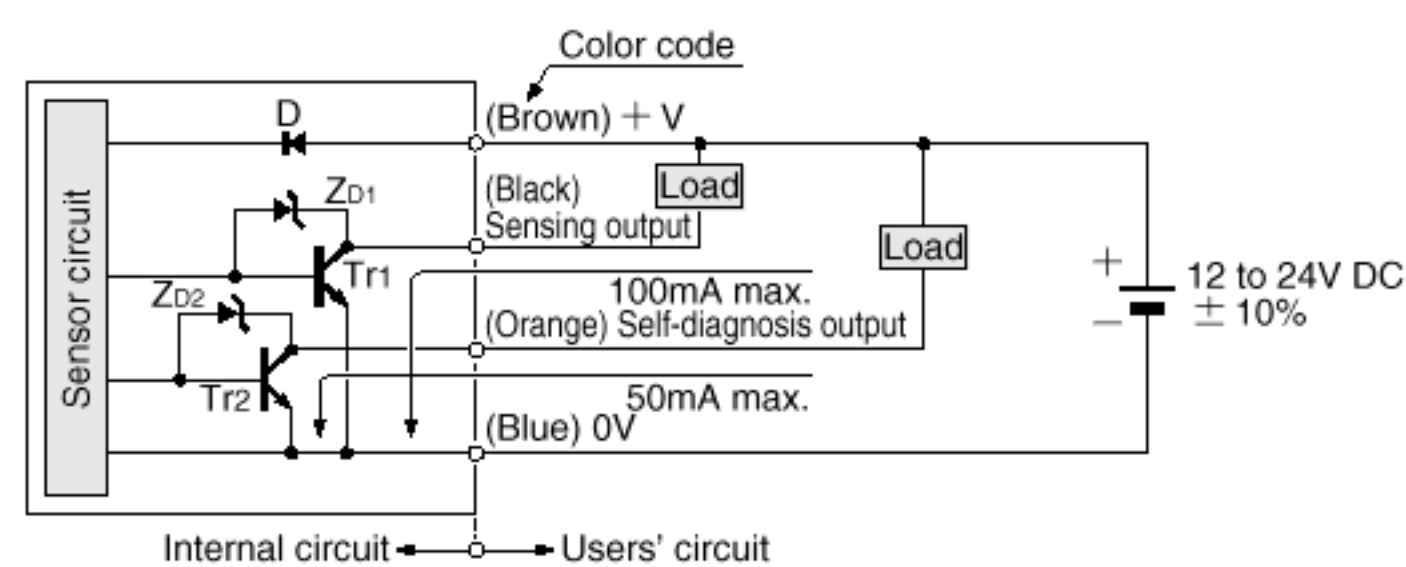
(\*1) : The voltage withstandability and the insulation resistivity described in the above table are inherent in the amplifier only.

# FX-10

## I/O CIRCUIT AND WIRING DIAGRAMS

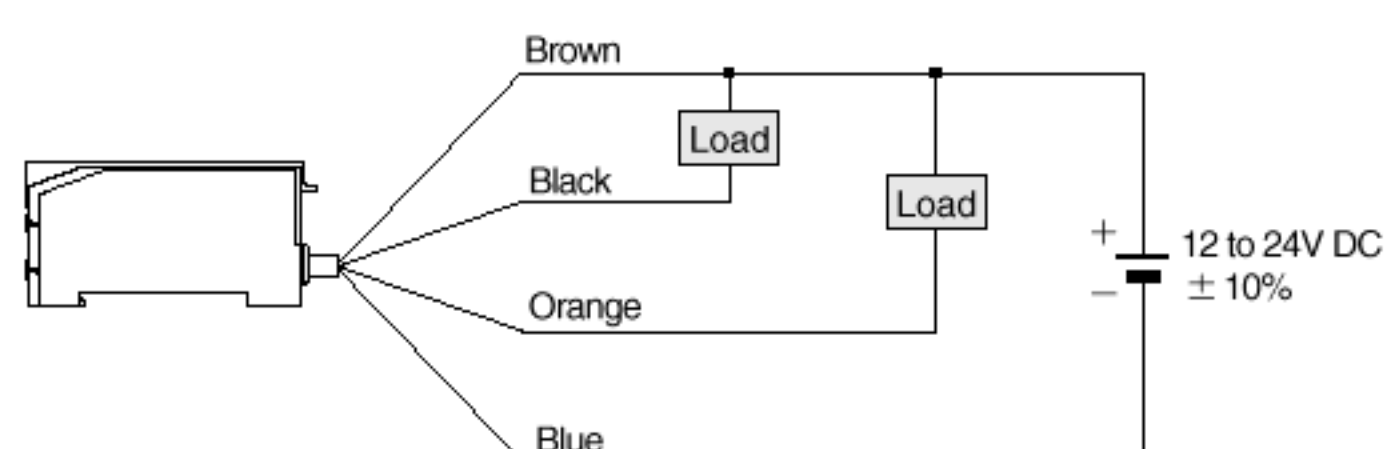
### NPN output type

#### I/O circuit diagram



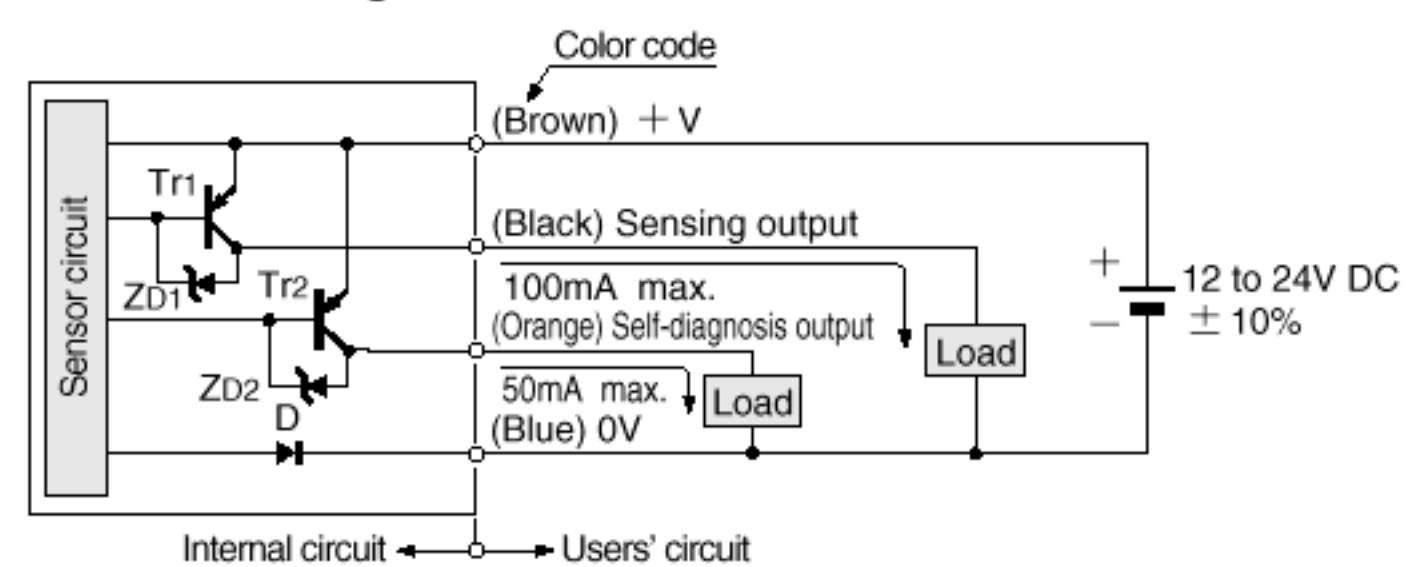
Symbol . . . D : Reverse polarity protection diode  
 Z<sub>D1</sub>, Z<sub>D2</sub> : Surge absorption zener diode  
 Tr<sub>1</sub>, Tr<sub>2</sub> : NPN output transistor

#### Wiring diagram



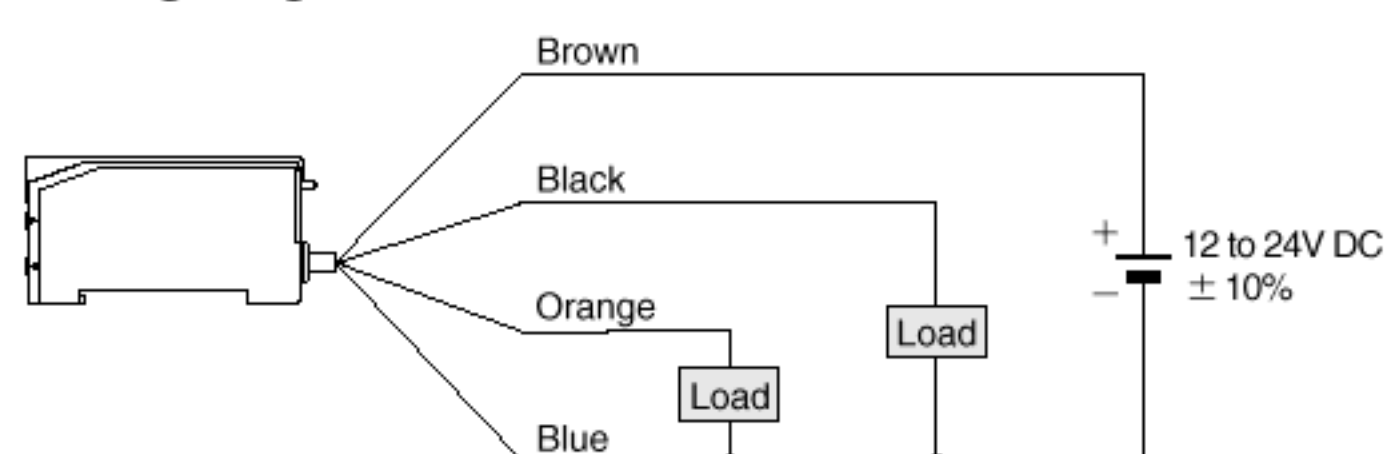
### PNP output type

#### I/O circuit diagram



Symbol . . . D : Reverse polarity protection diode  
 Z<sub>D1</sub>, Z<sub>D2</sub> : Surge absorption zener diode  
 Tr<sub>1</sub>, Tr<sub>2</sub> : PNP output transistor

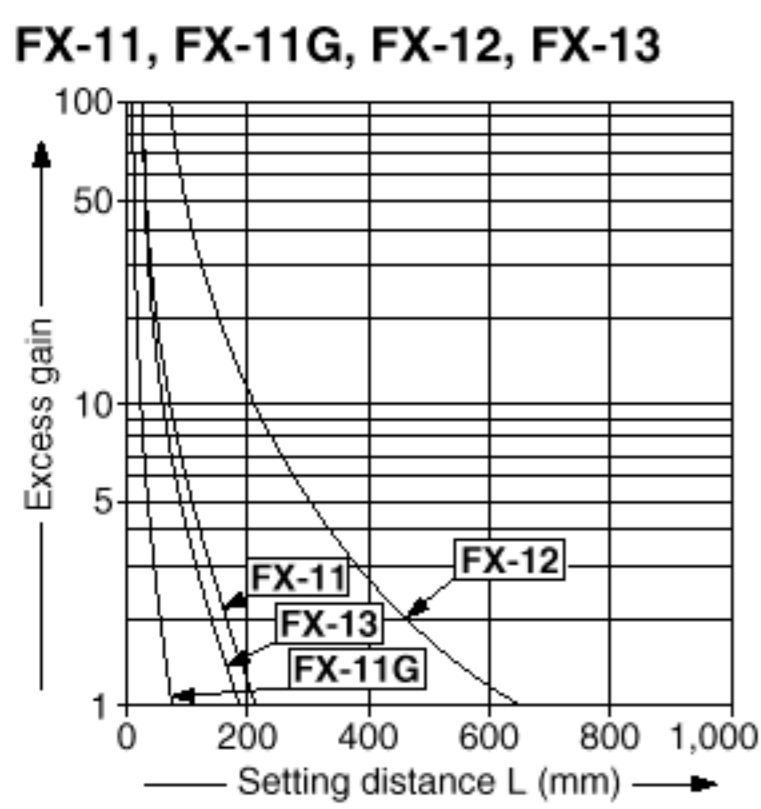
#### Wiring diagram



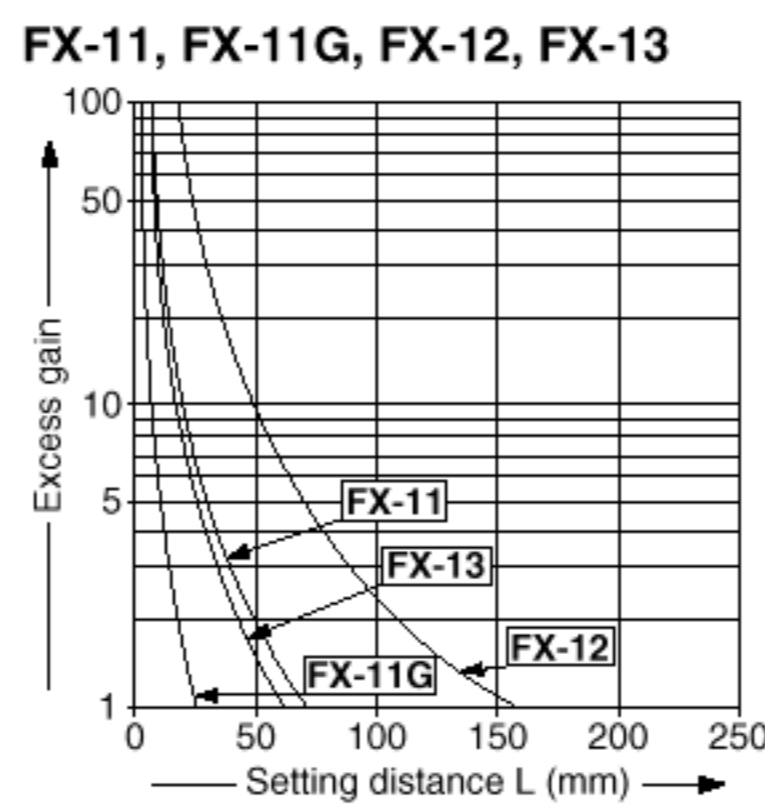
## SENSING FIELDS (TYPICAL)

### Correlation between setting distance and excess gain

#### FT-FM2 Thru-beam

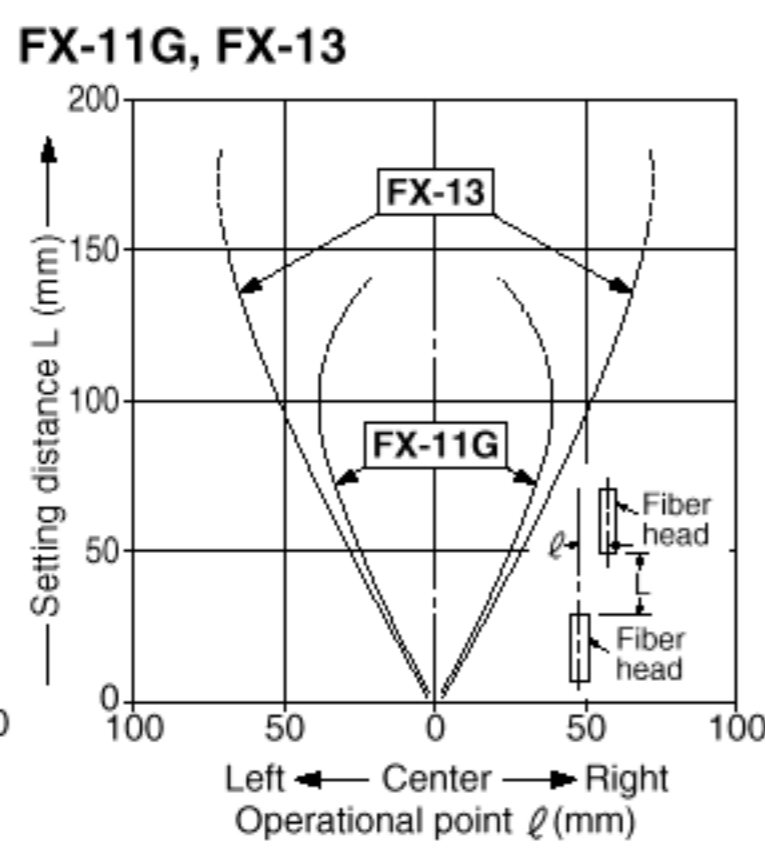
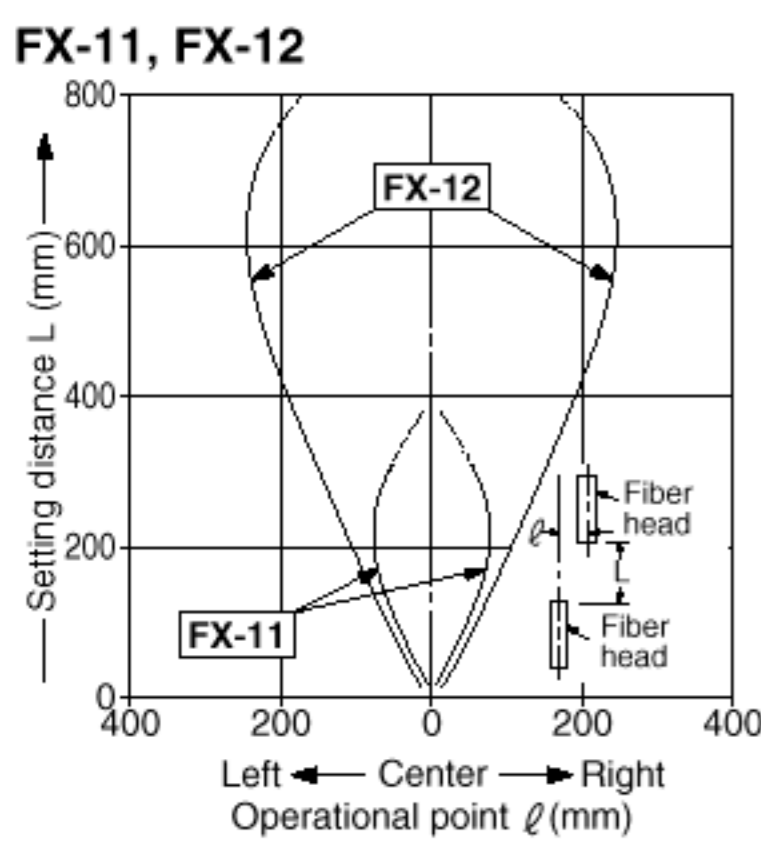


#### FD-FM2 Reflective

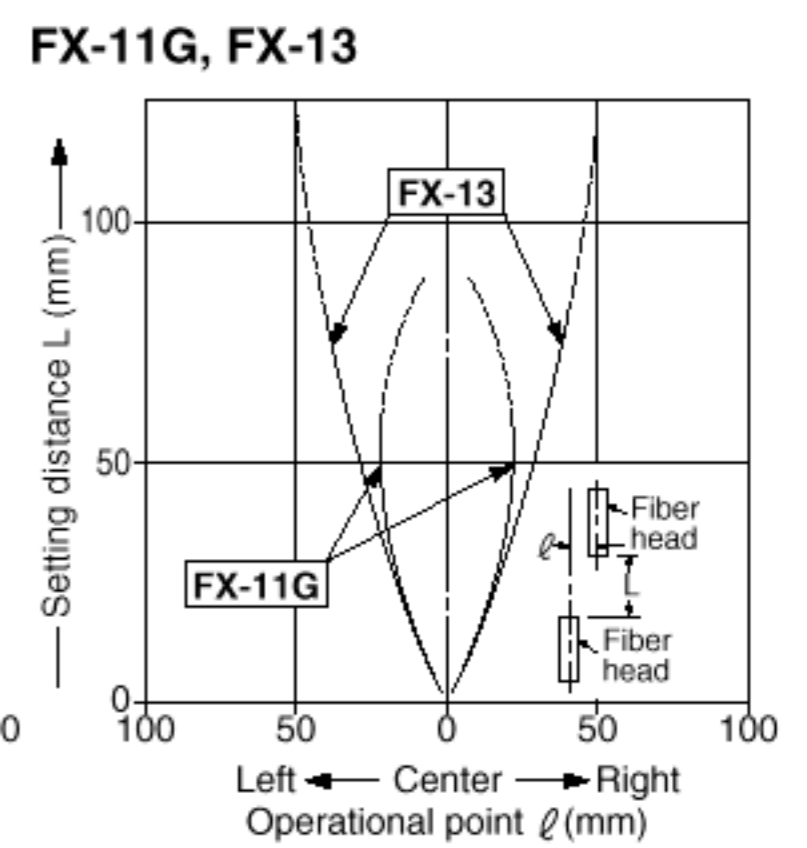
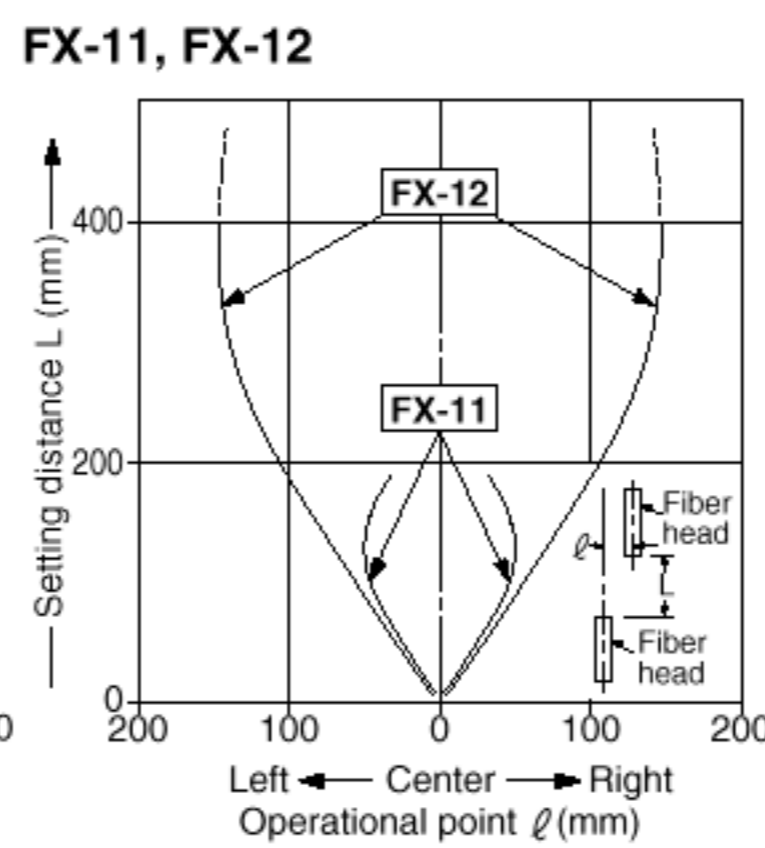


### Parallel deviations

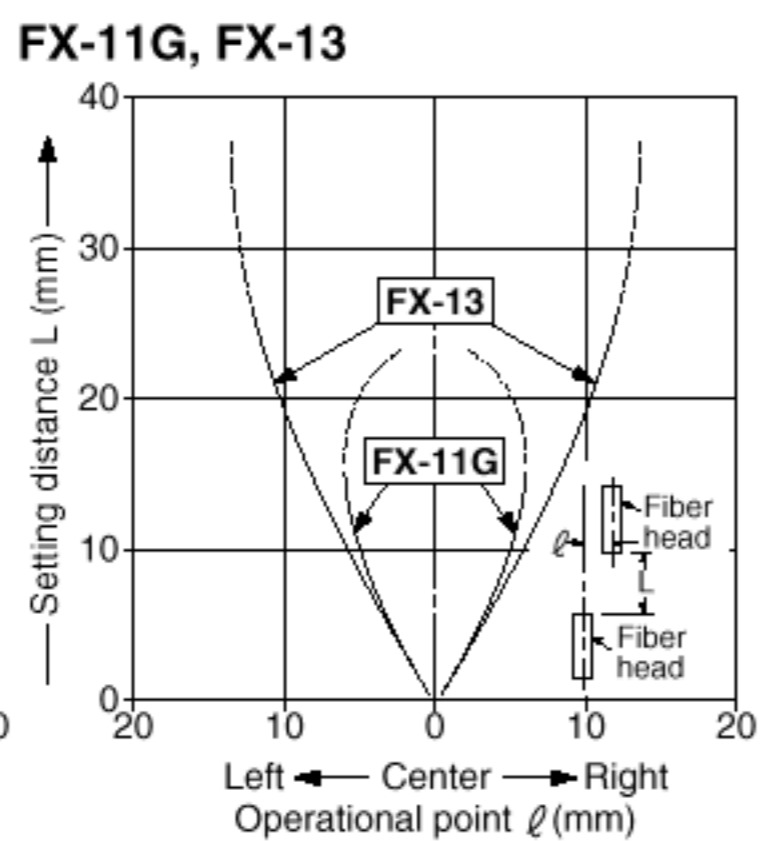
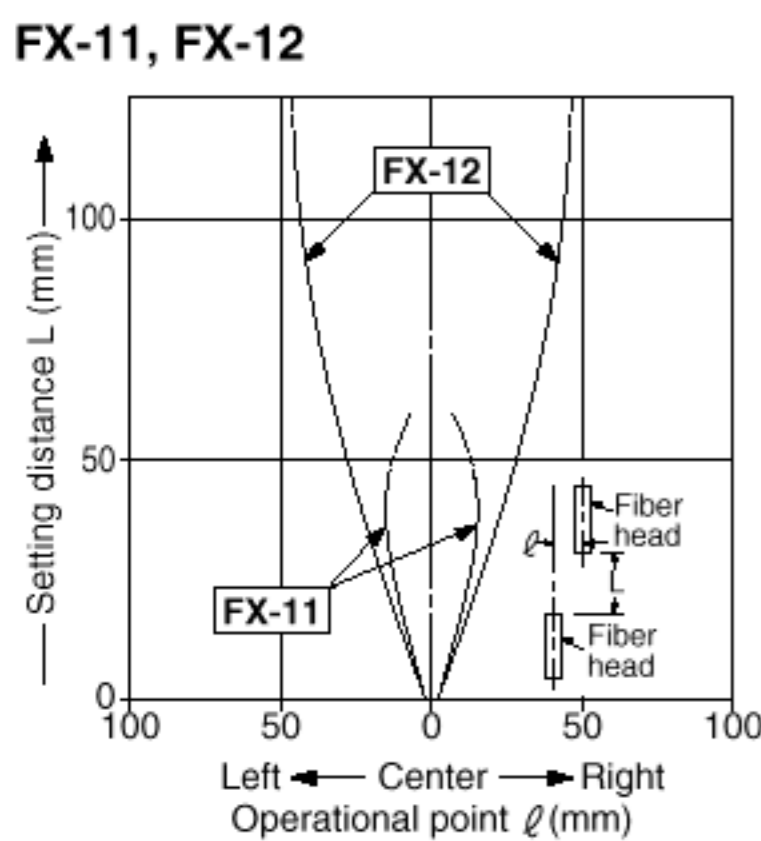
#### FT-B8 Thru-beam



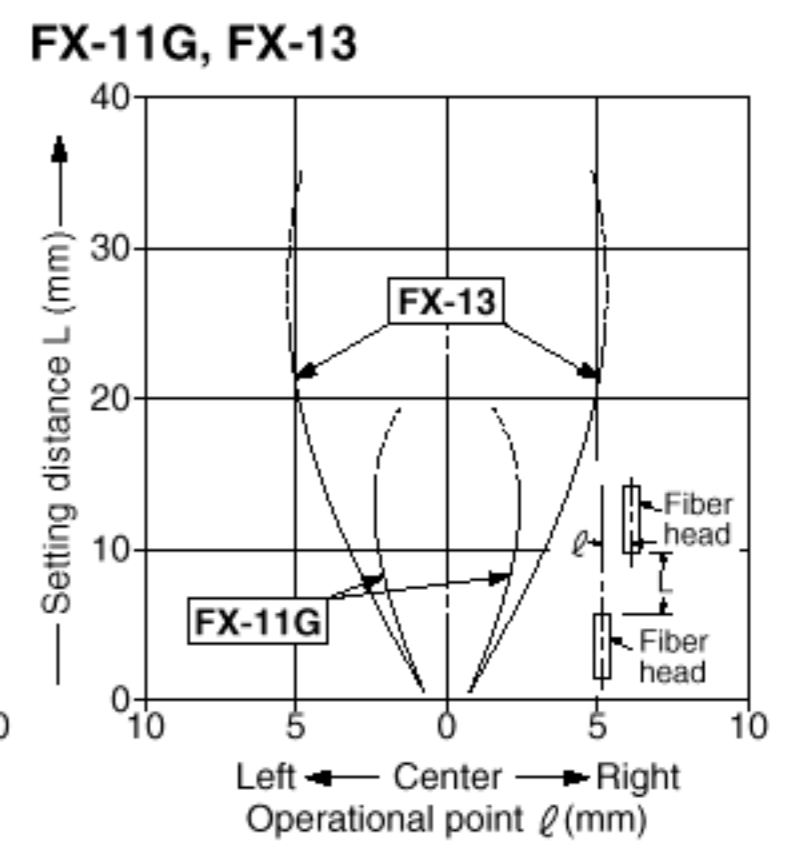
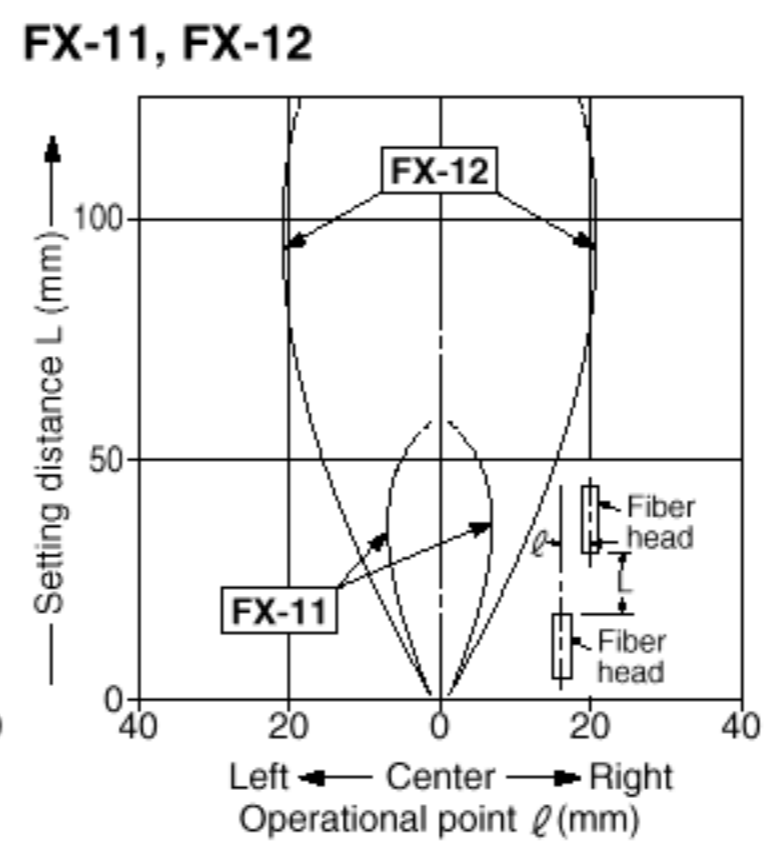
#### FT-FM2 FT-FM2S FT-FM2S4 FT-SFM2 FT-T80 Thru-beam



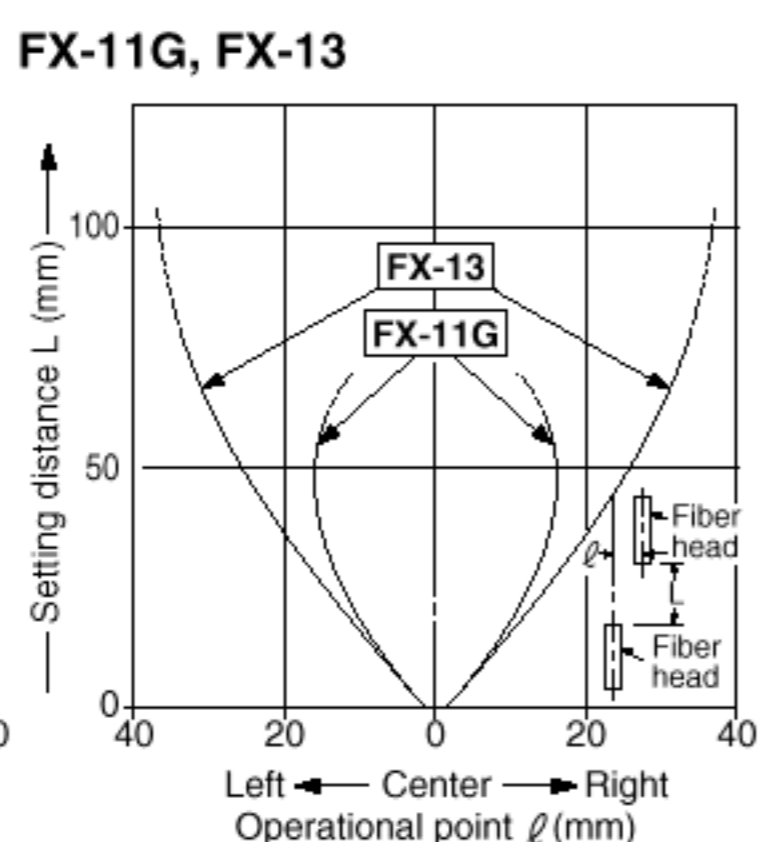
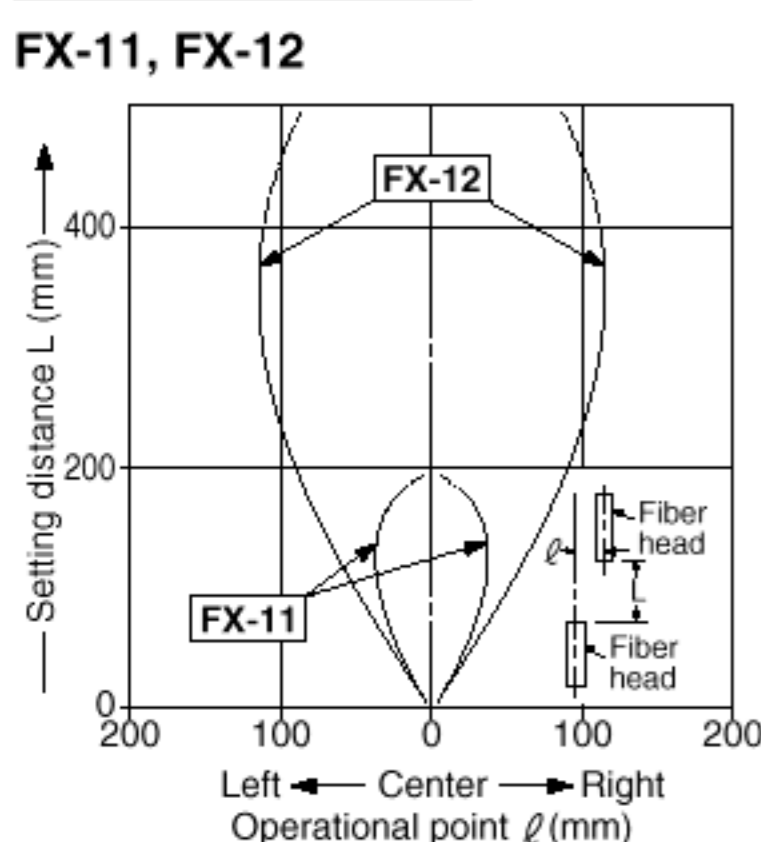
#### FT-NFM2 FT-NFM2S FT-NFM2S4 FT-SNFM2 Thru-beam



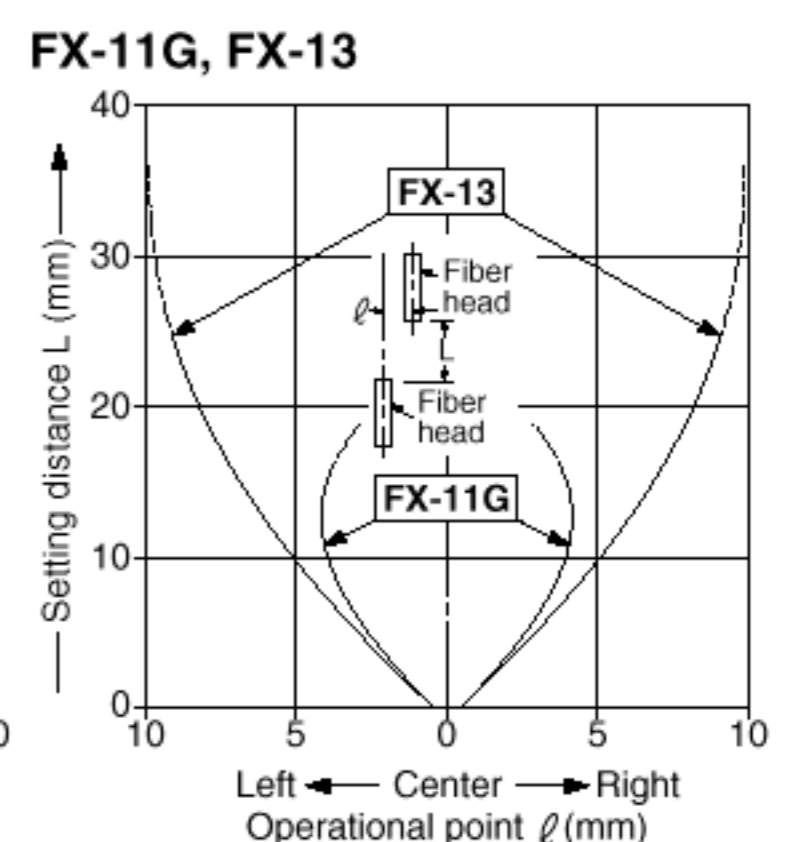
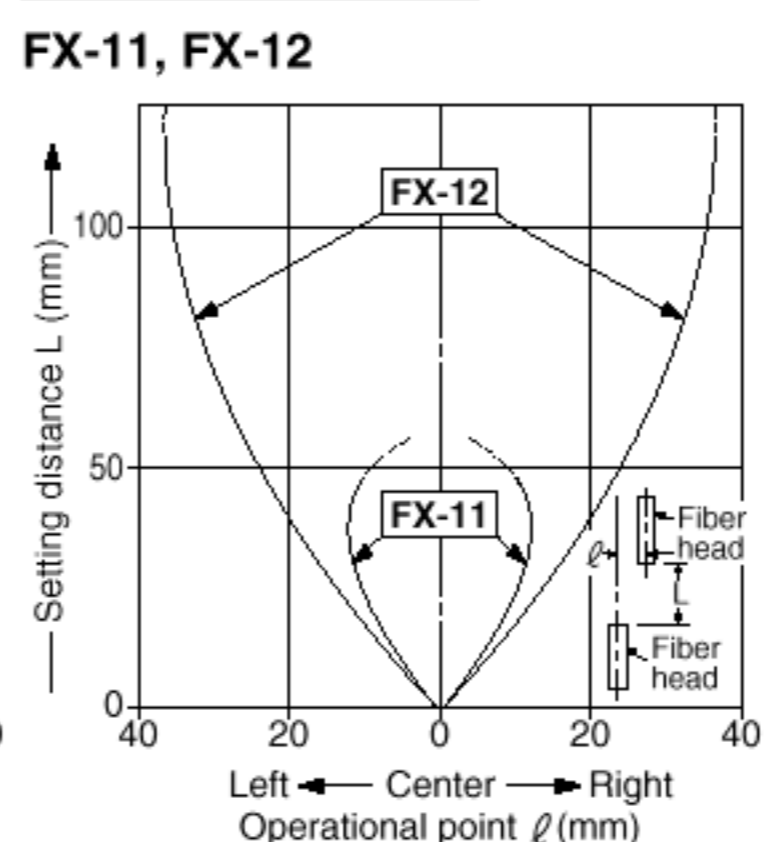
#### FT-C4 Thru-beam



#### FT-P80 Thru-beam



#### FT-P40 Thru-beam

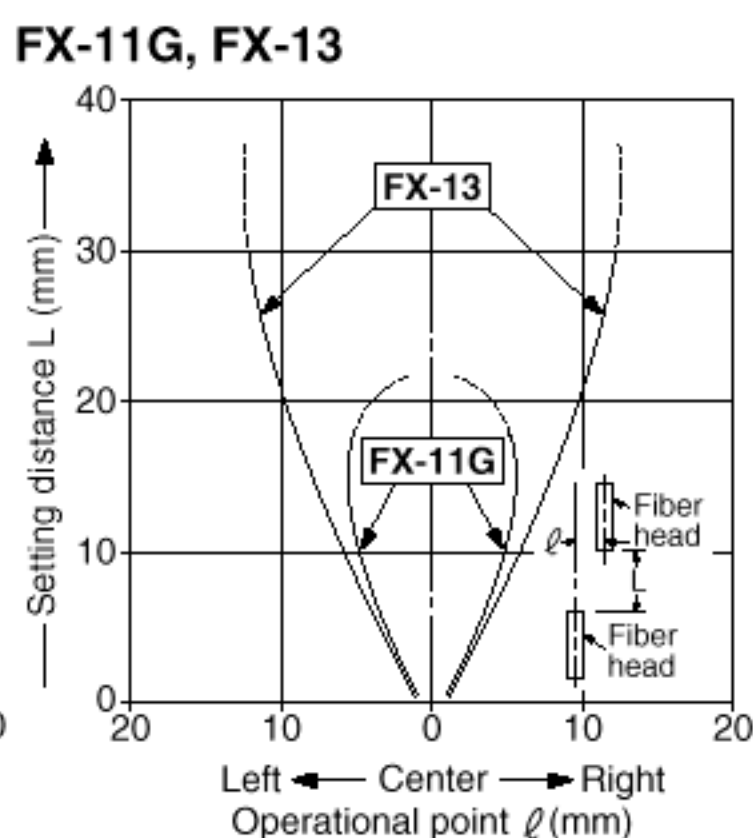
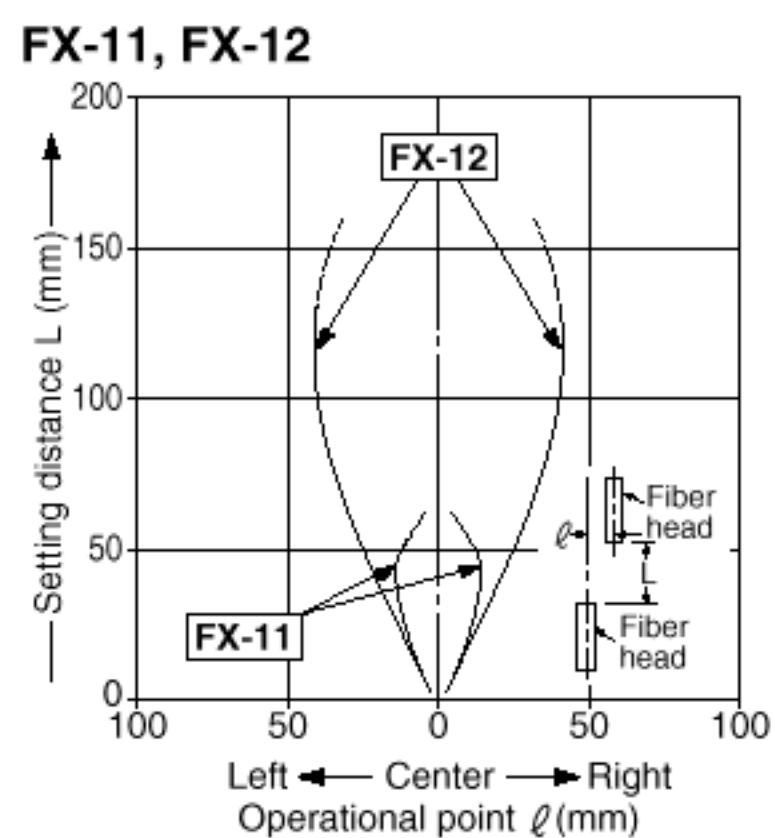


# FX-10

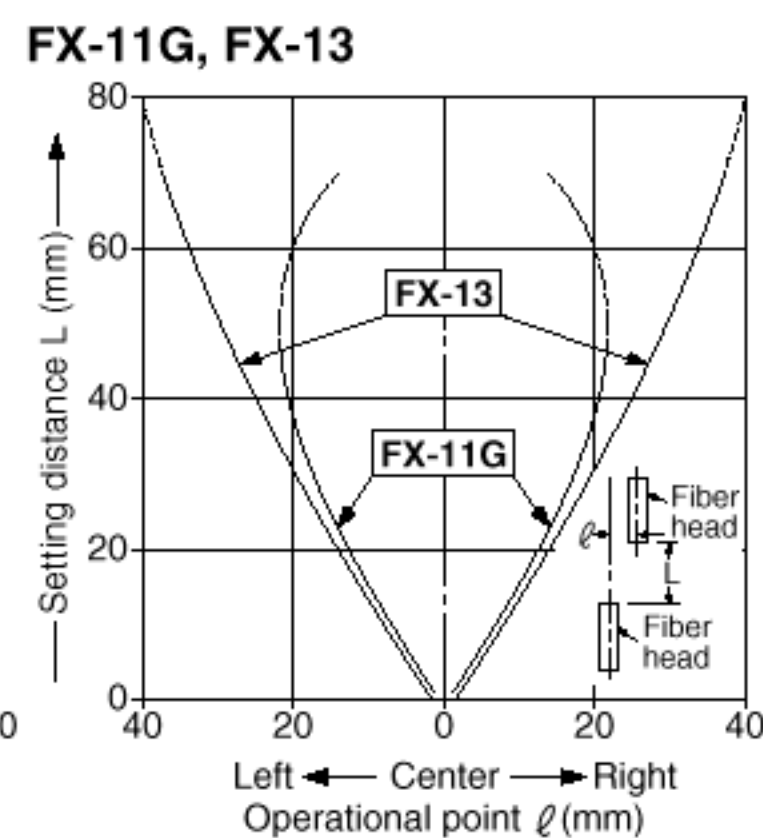
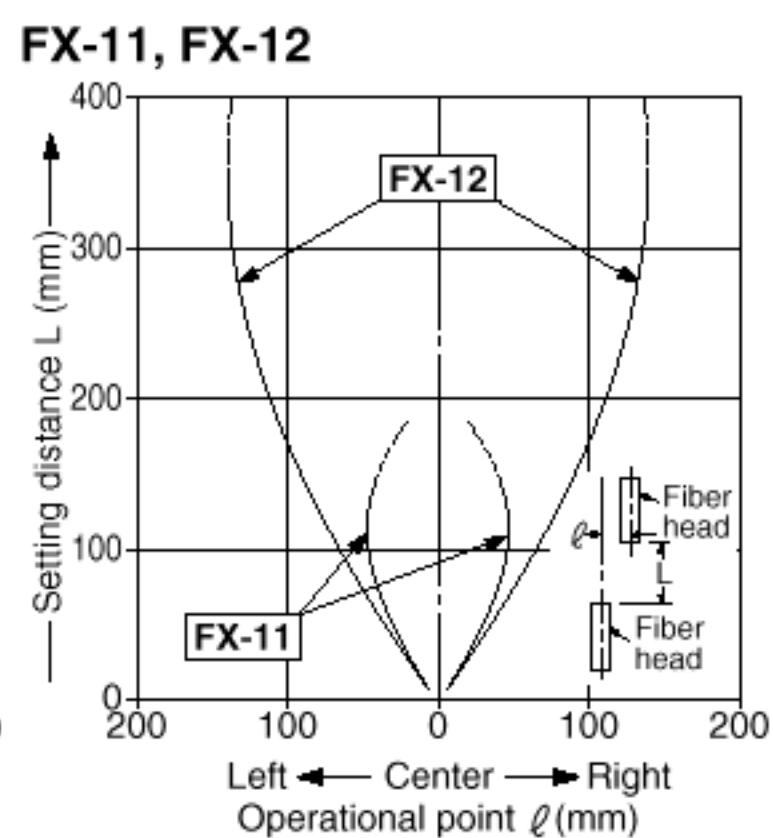
## SENSING FIELDS (TYPICAL)

### Parallel deviations

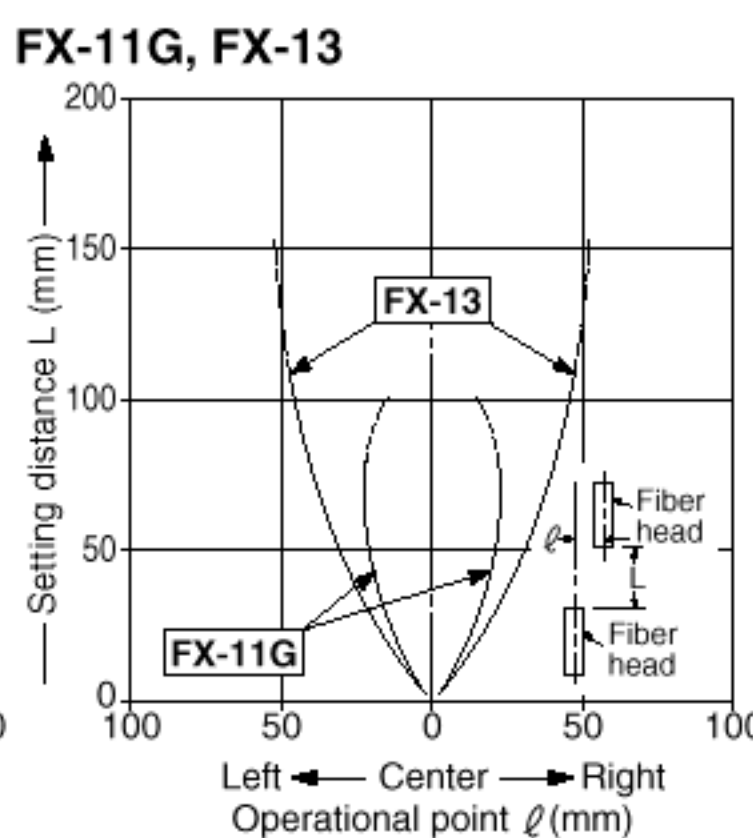
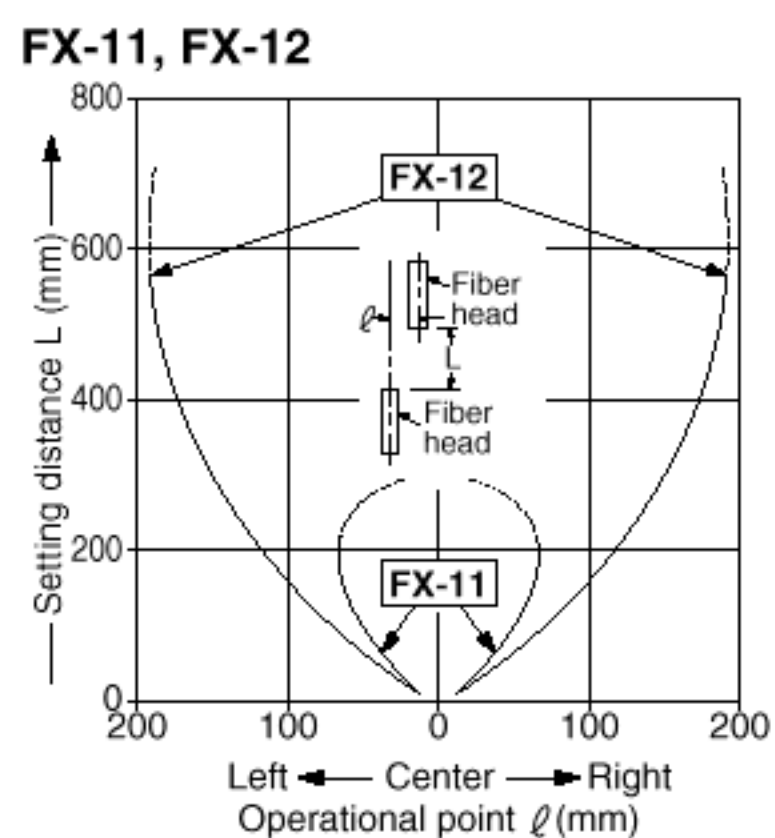
**FT-P2** Thru-beam



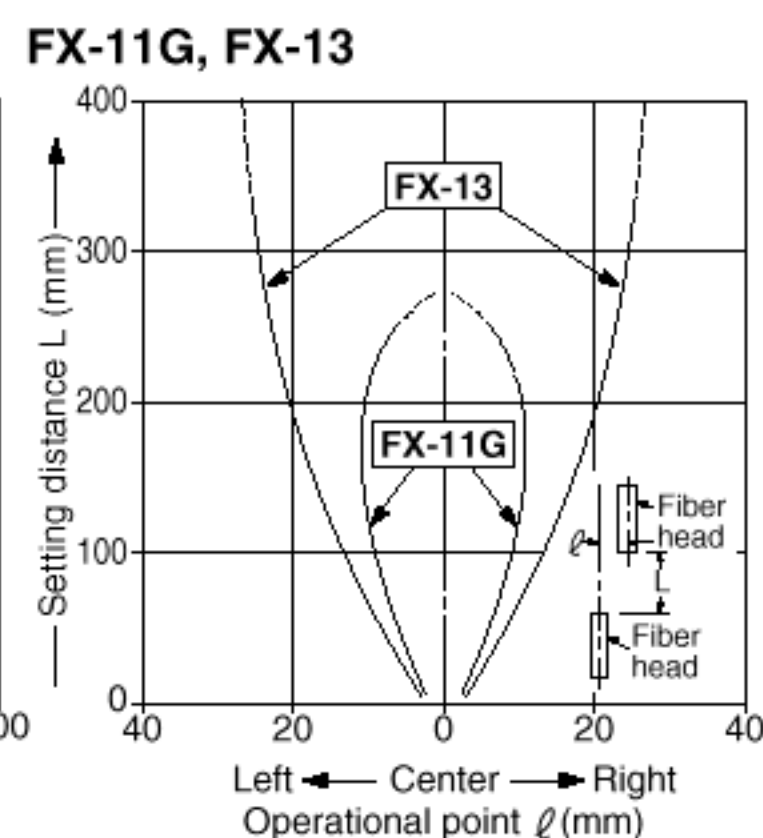
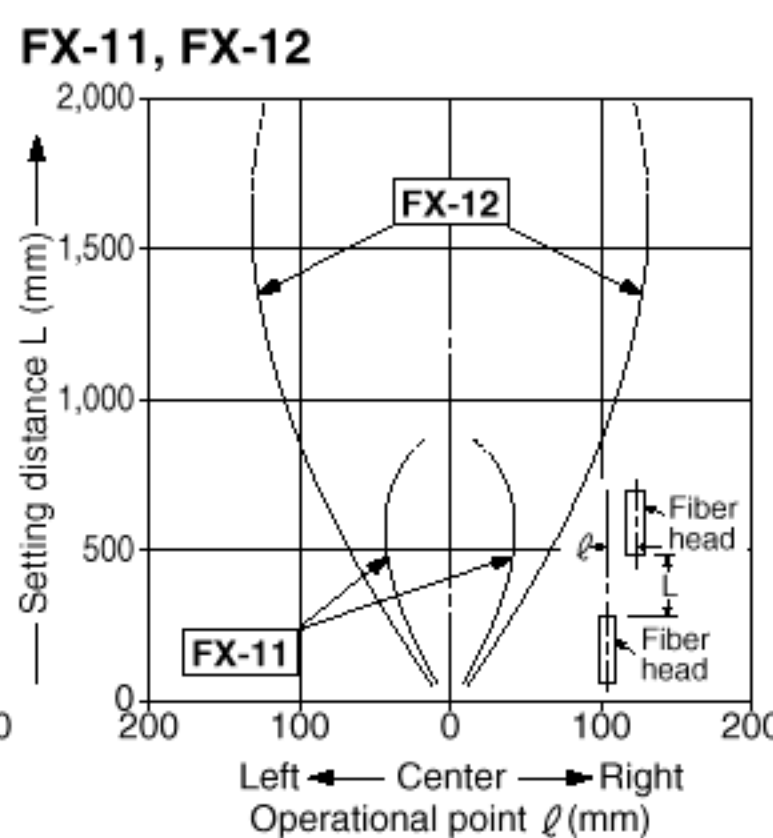
**FT-H35-M2 FT-H35-M2S6 FT-H20-M1** Thru-beam



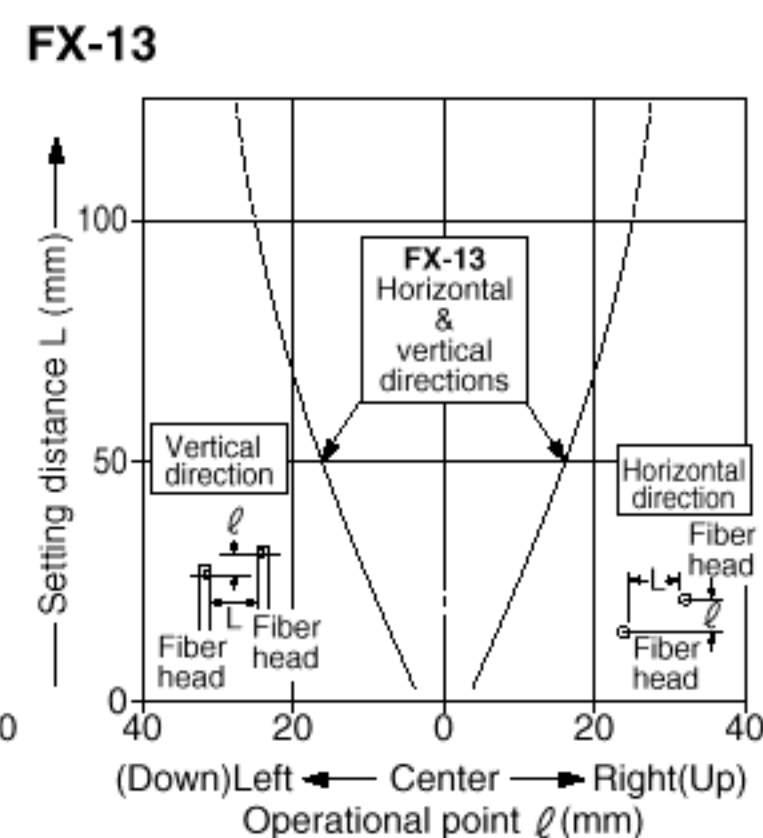
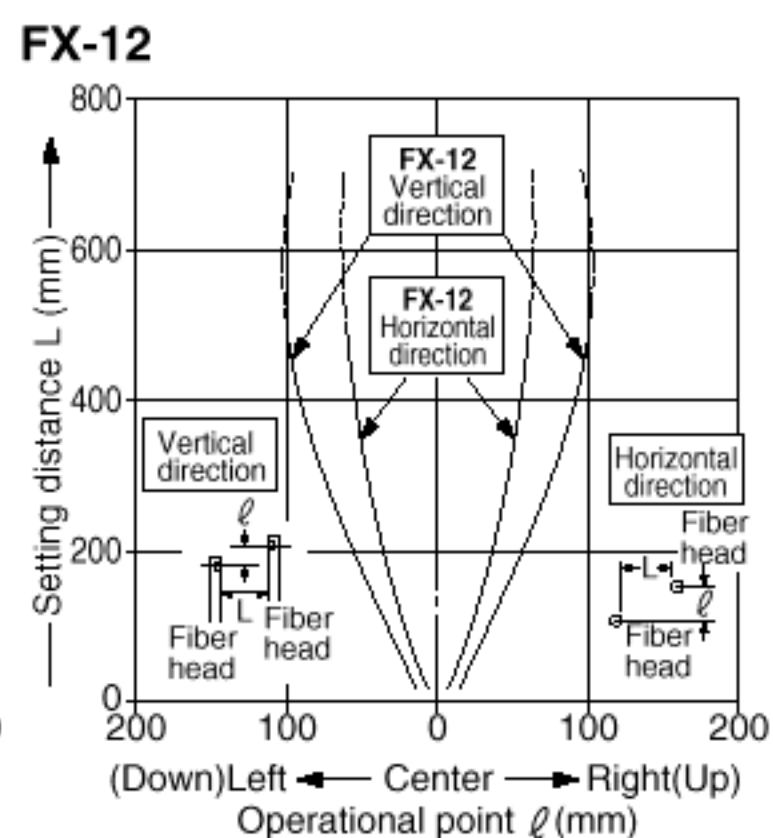
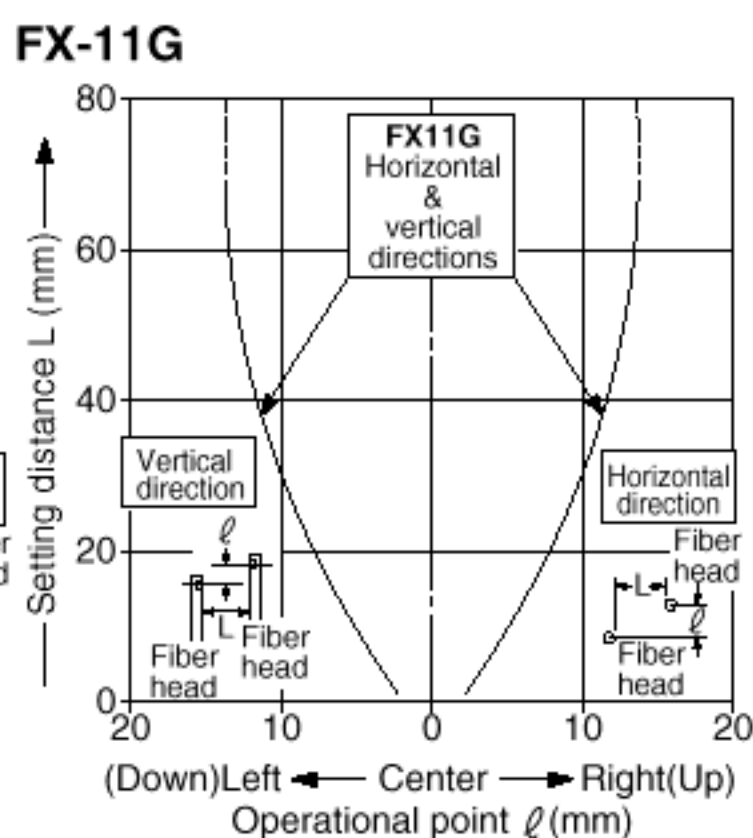
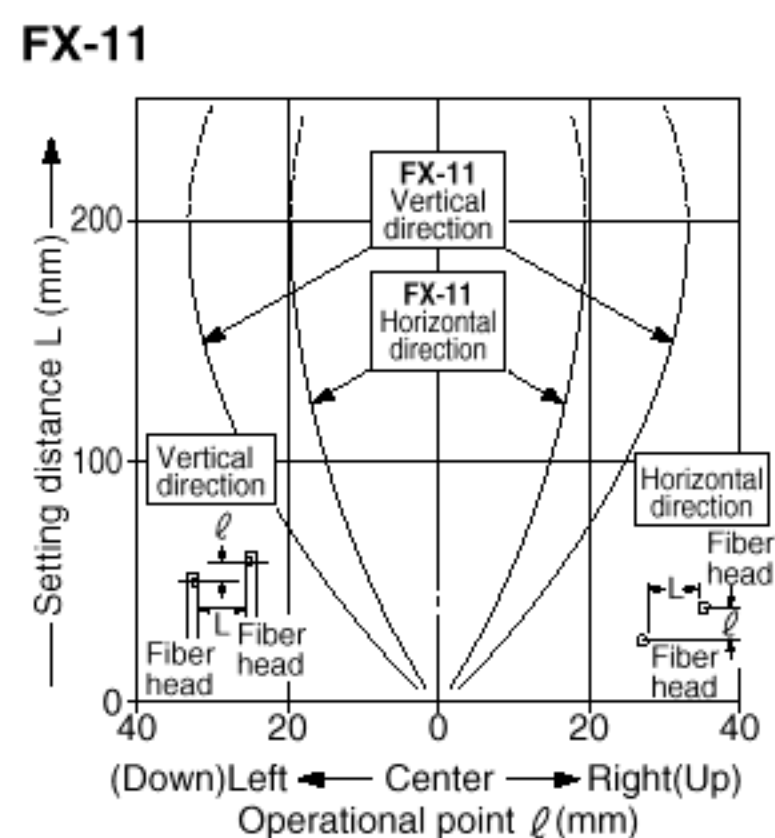
**FT-H13-FM2** Thru-beam



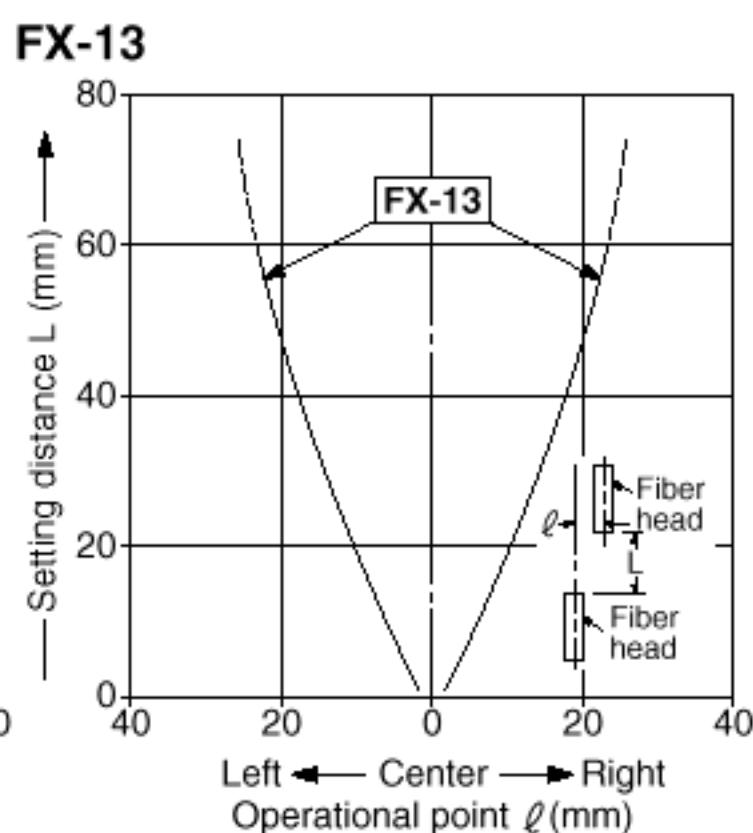
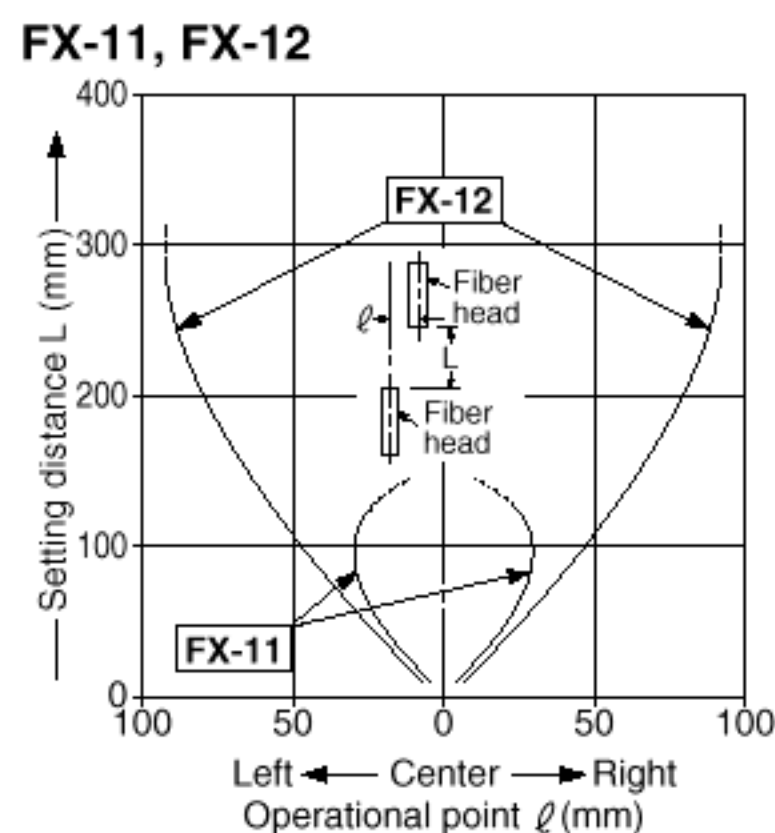
**FT-L8Y** Thru-beam



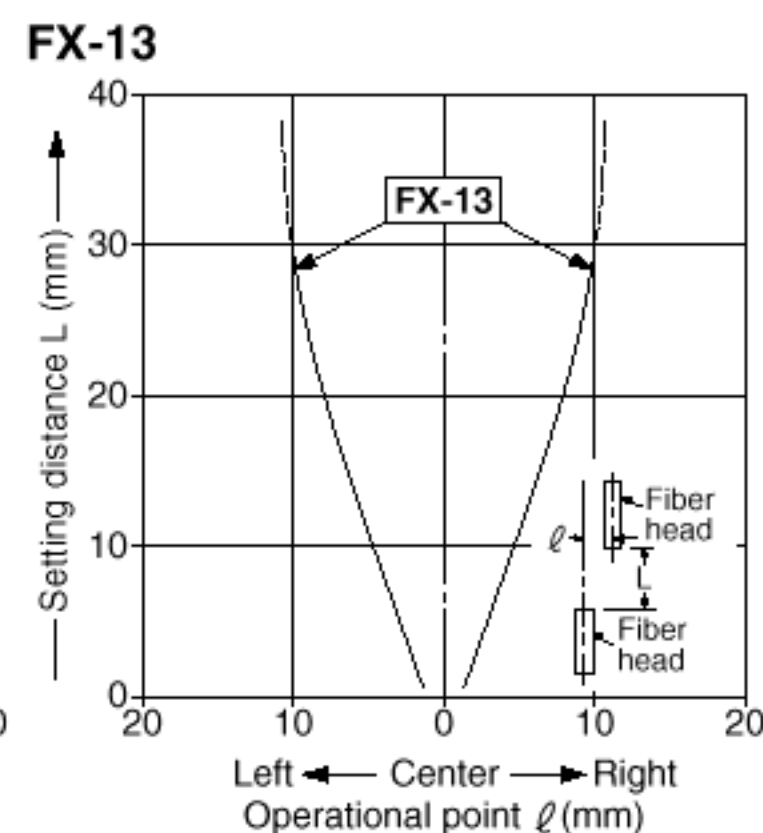
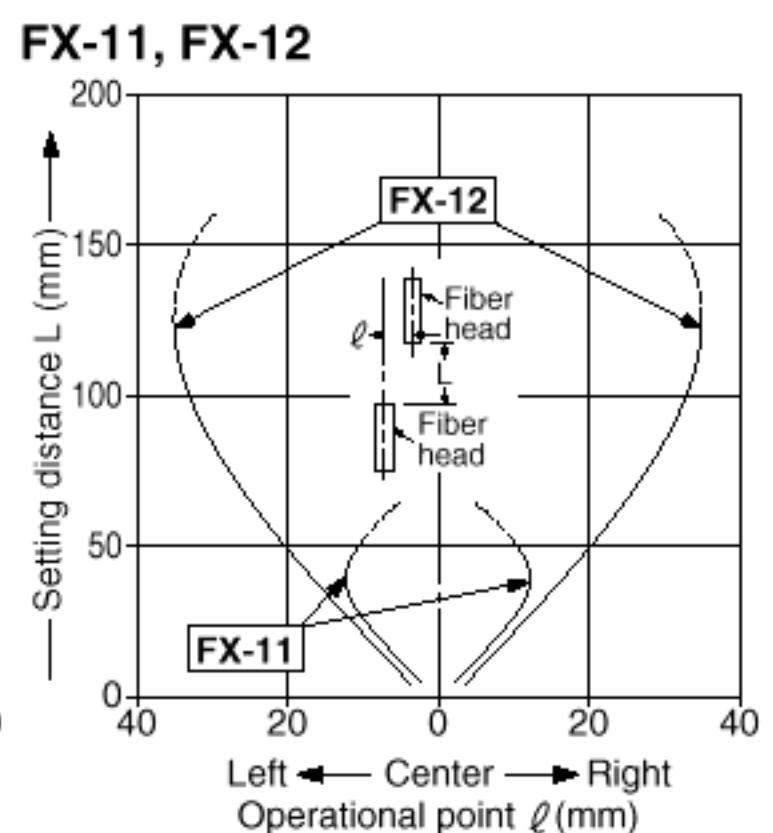
**FT-V8Y** Thru-beam



**FT-6V** Thru-beam



**FT-60V** Thru-beam

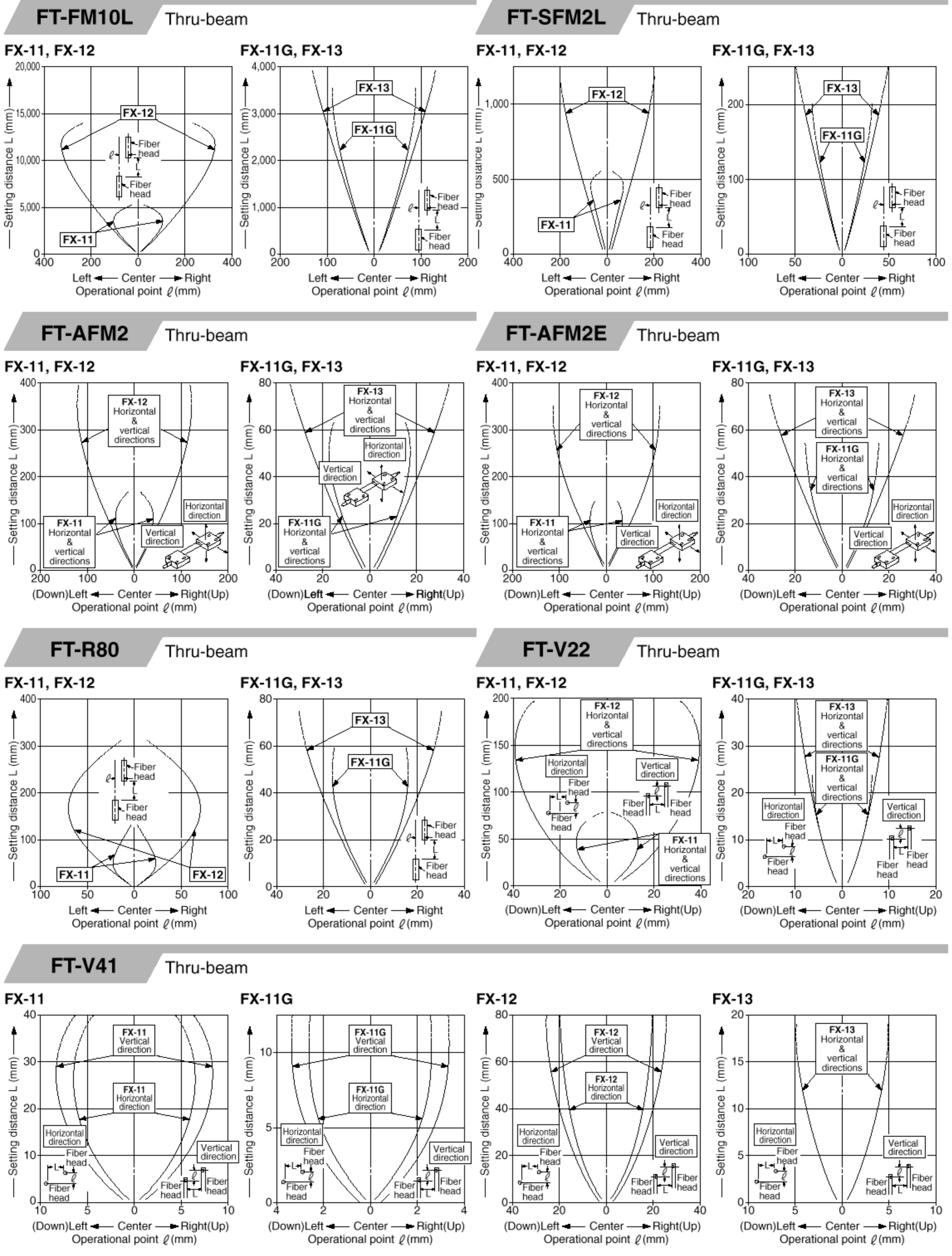


FZ-10  
 FX-7  
 FX-10  
 FX-11A  
 CX-20  
 CX-30  
 CX-ND300R  
 EX-10  
 EQ-20  
 EQ-30  
 EX-40  
 RX  
 RX-LS200

Amplifier Built-in Type

## SENSING FIELDS (TYPICAL)

### Parallel deviations



FZ-10

FX-7

FX-10

FX-11A

CX-20

CX-30

CX-ND300R

EX-10

EQ-20

EQ-30

EX-40

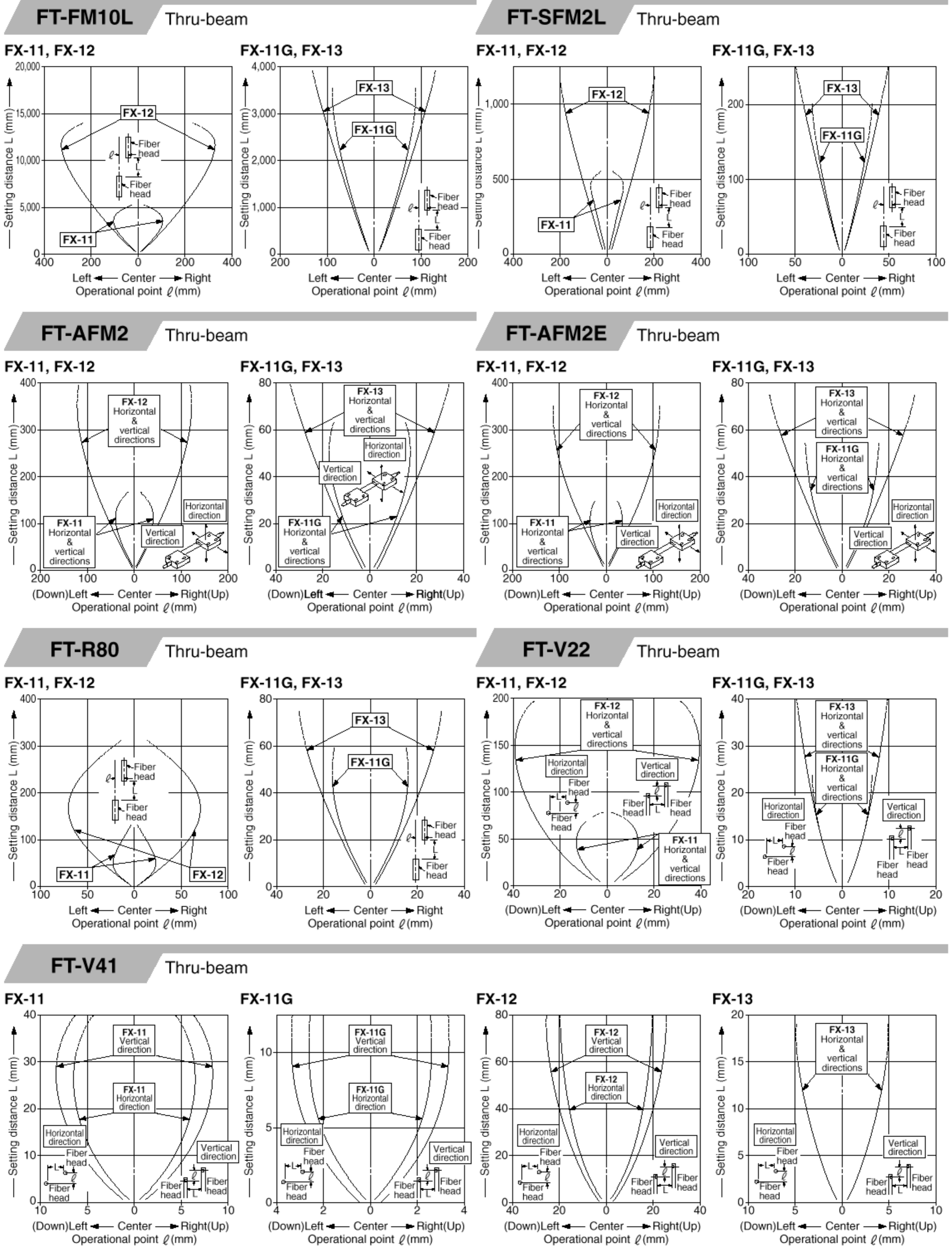
RX

RX-LS200

Amplifier Built-in Type

## SENSING FIELDS (TYPICAL)

### Parallel deviations



FZ-10

FX-7

FX-10

FX-11A

CX-20

CX-30

CX-ND300R

EX-10

EQ-20

EQ-30

EX-40

RX

RX-LS200

Amplifier Built-in Type

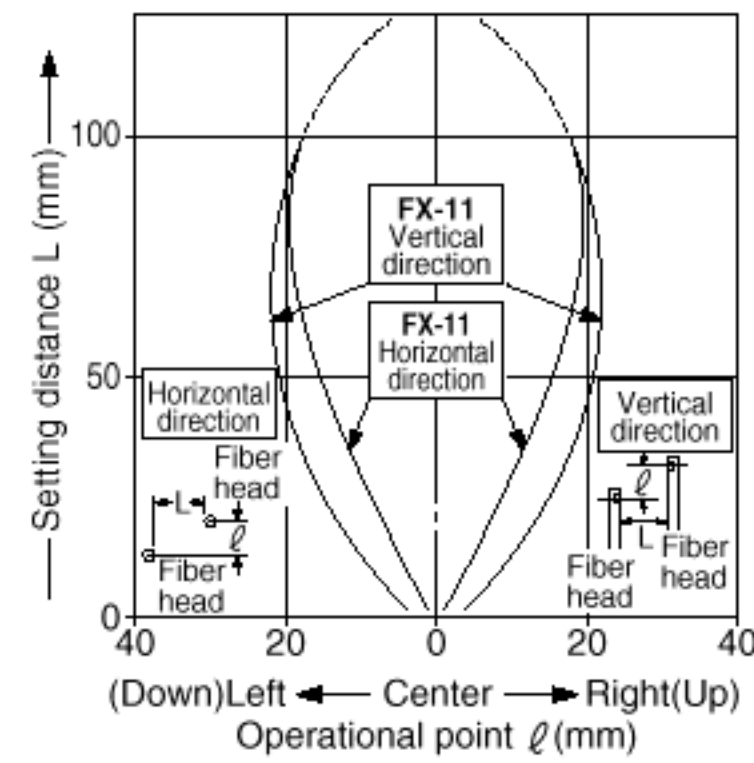
# FX-10

## SENSING FIELDS (TYPICAL)

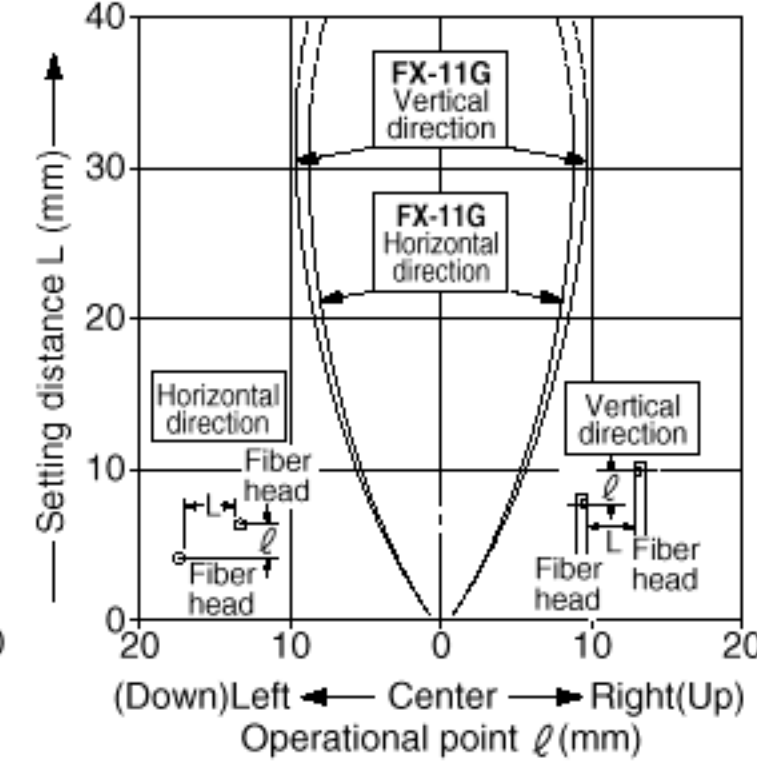
### Parallel deviations

#### FT-SFM2SV2 Thru-beam

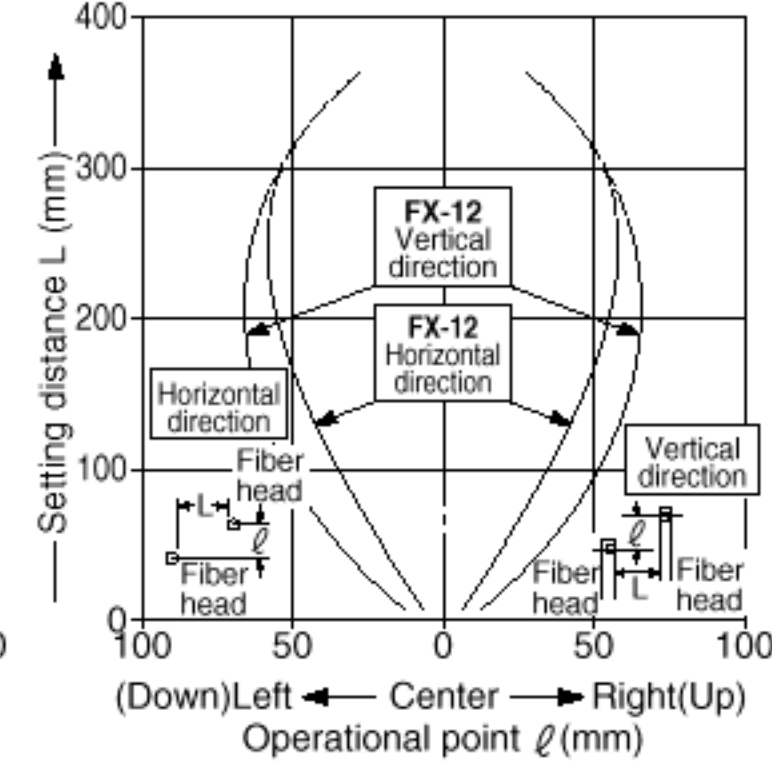
**FX-11**



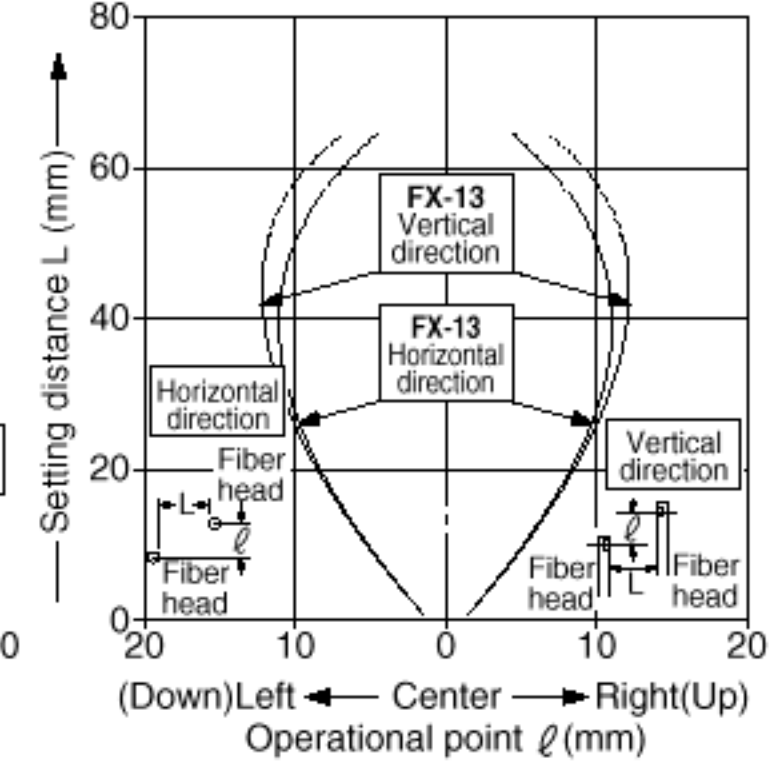
**FX-11G**



**FX-12**

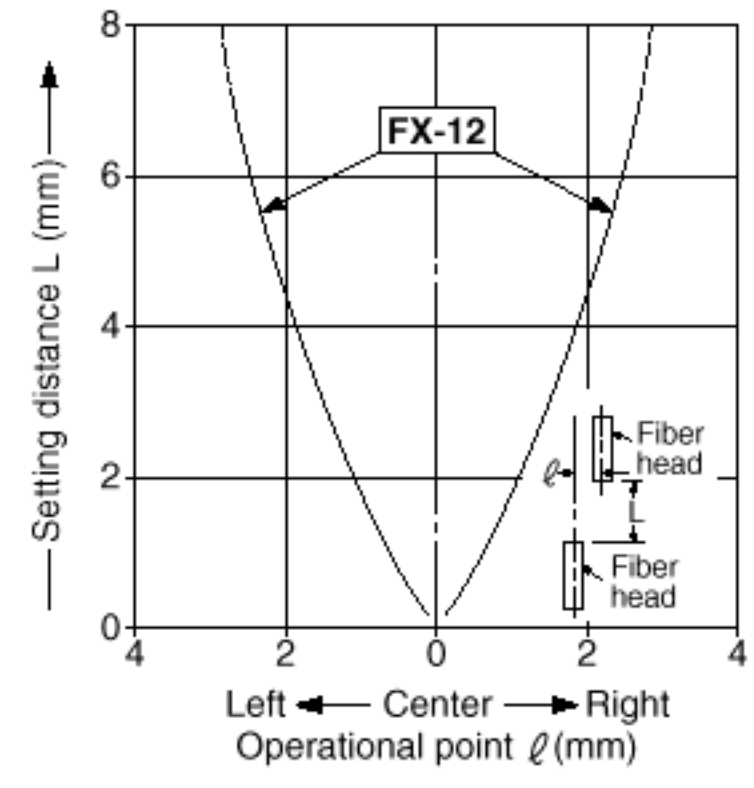


**FX-13**



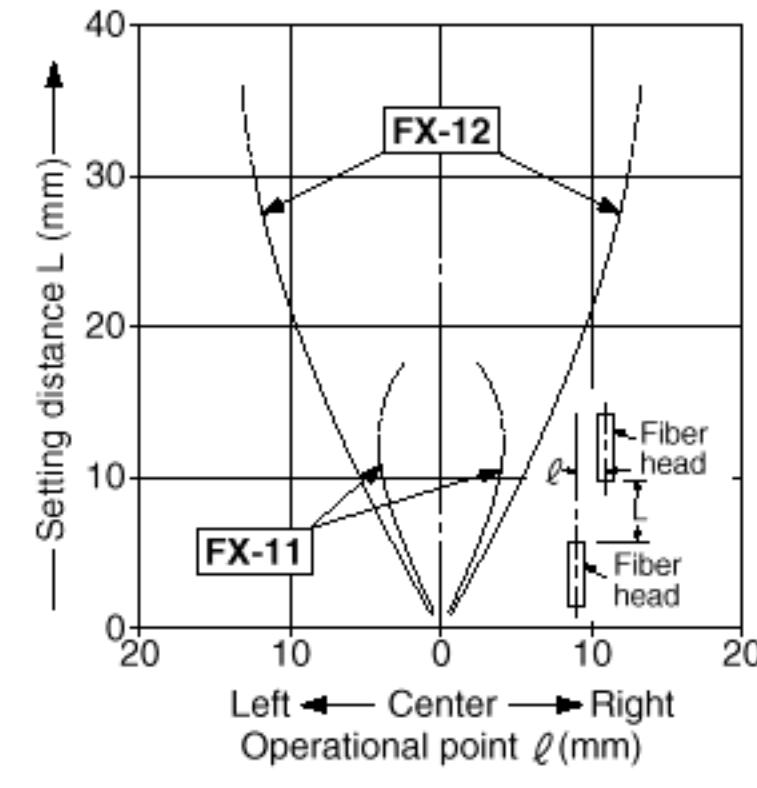
#### FT-E10 Thru-beam

**FX-12**

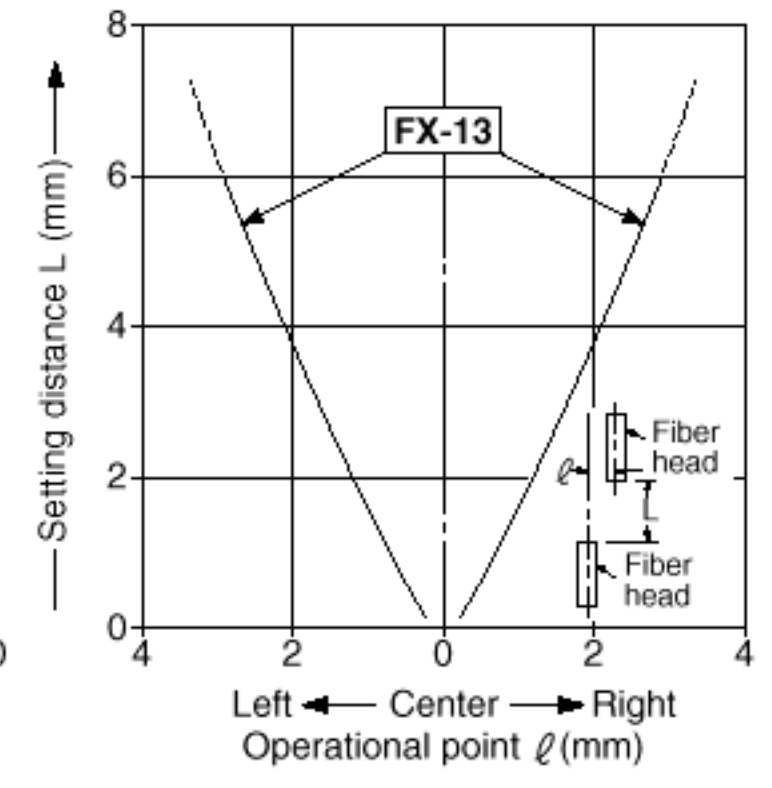


#### FT-E20 Thru-beam

**FX-11, FX-12**

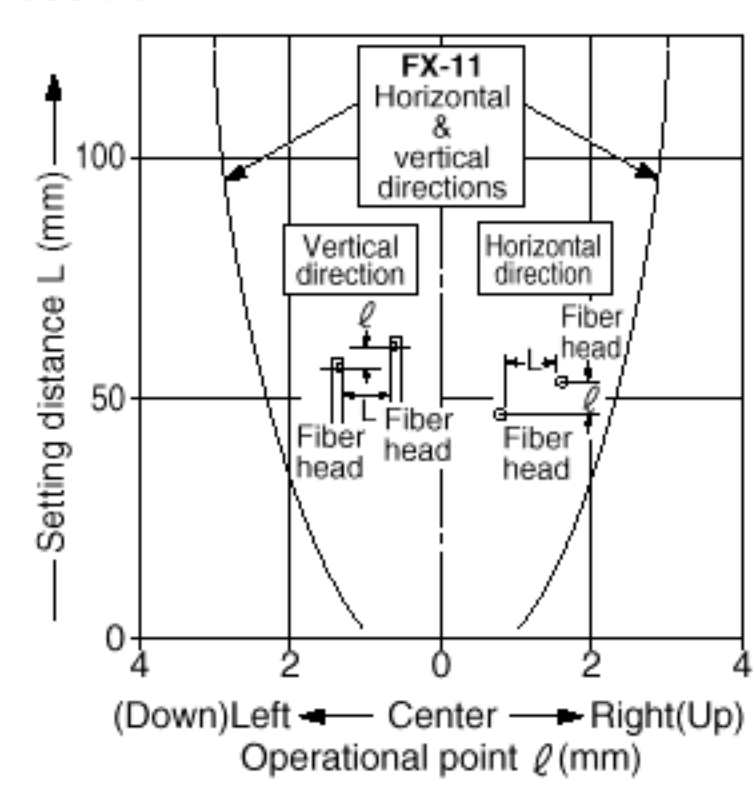


**FX-13**

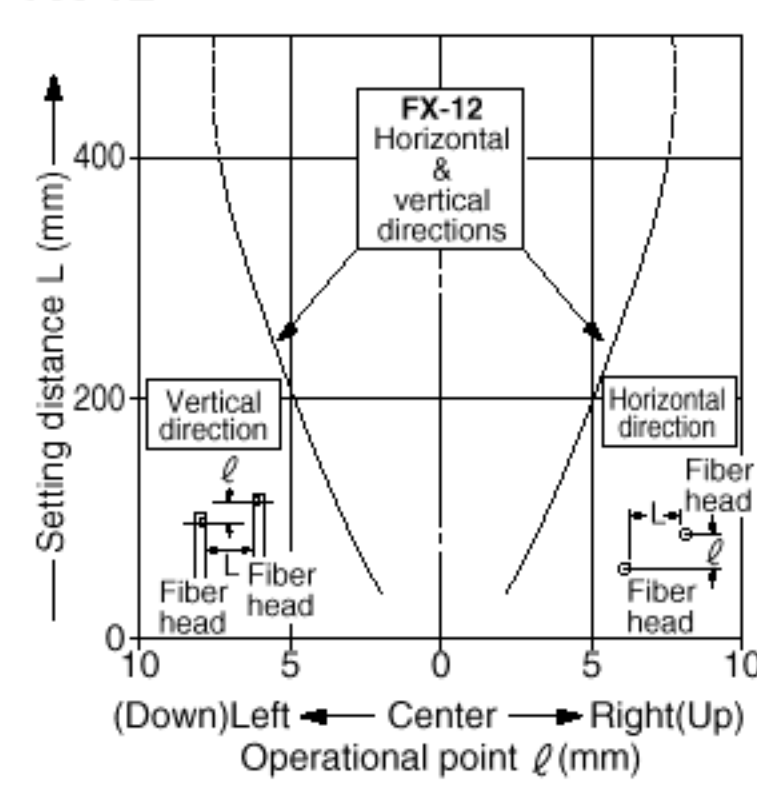


#### FT-KV2 Thru-beam

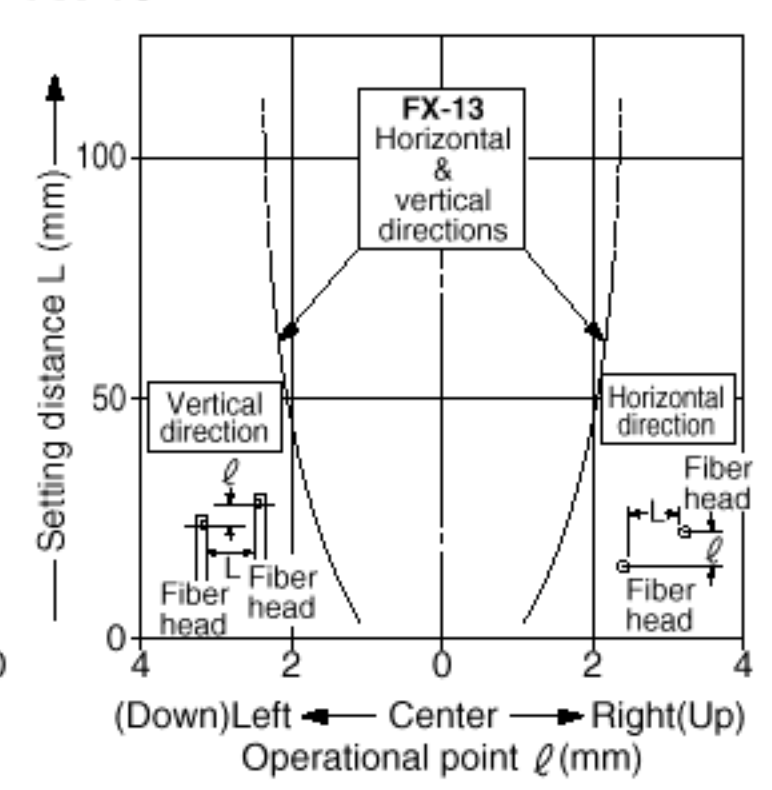
**FX-11**



**FX-12**

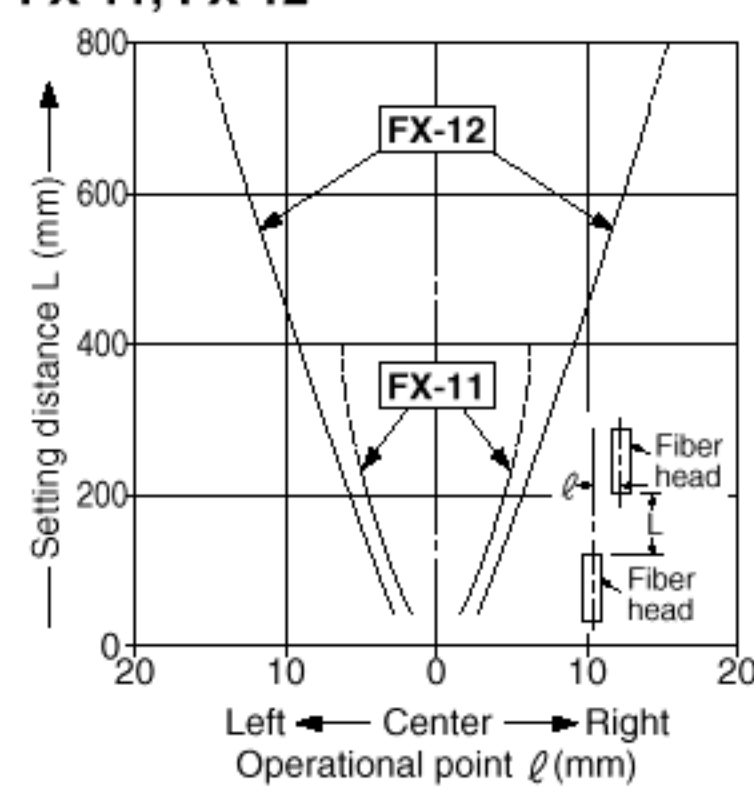


**FX-13**



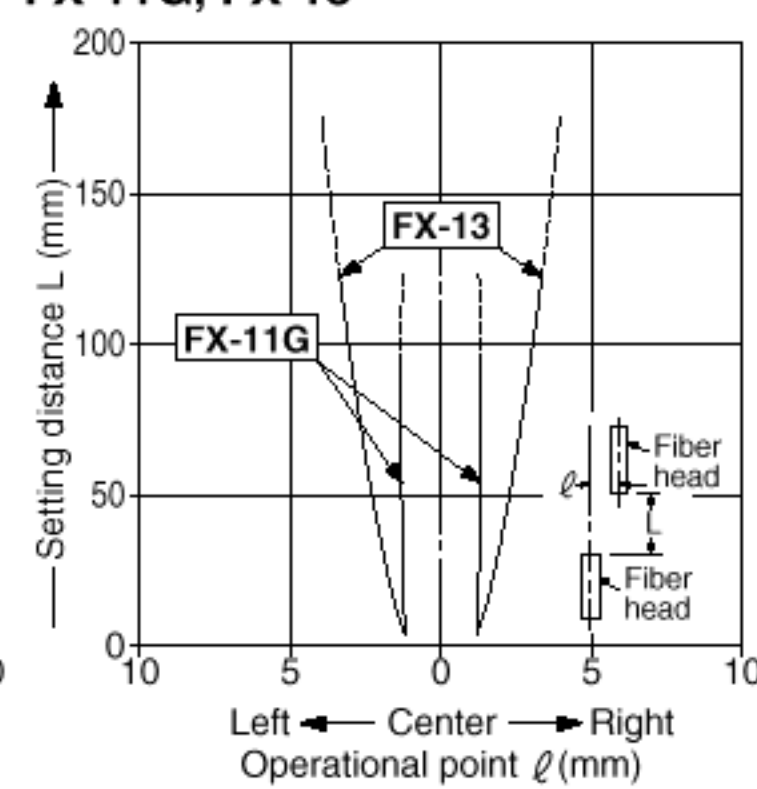
#### FT-K2 Thru-beam

**FX-11, FX-12**

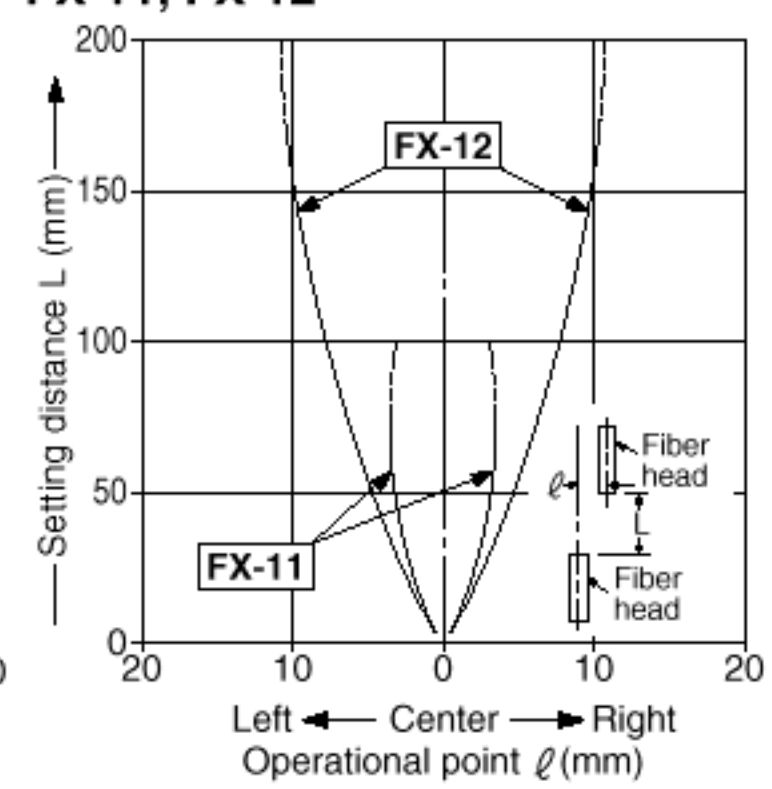


#### FT-KM1S2 Thru-beam

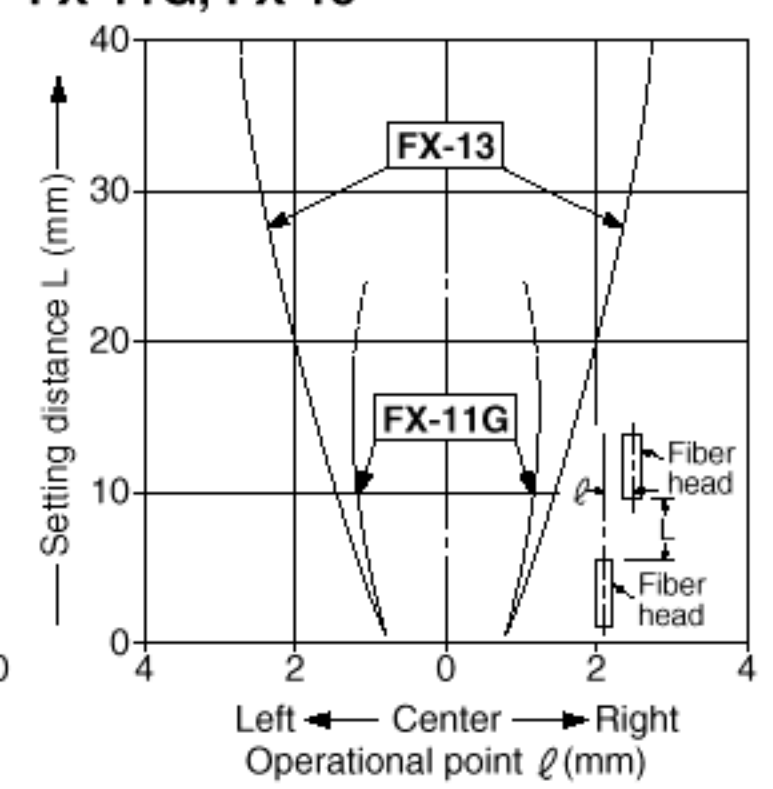
**FX-11G, FX-13**



**FX-11, FX-12**



**FX-11G, FX-13**

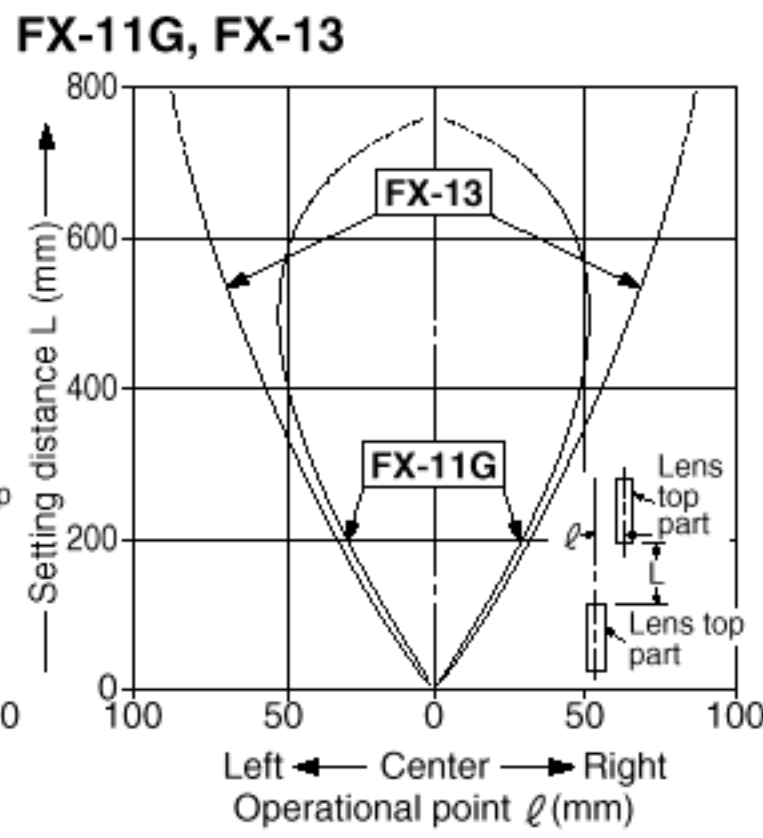
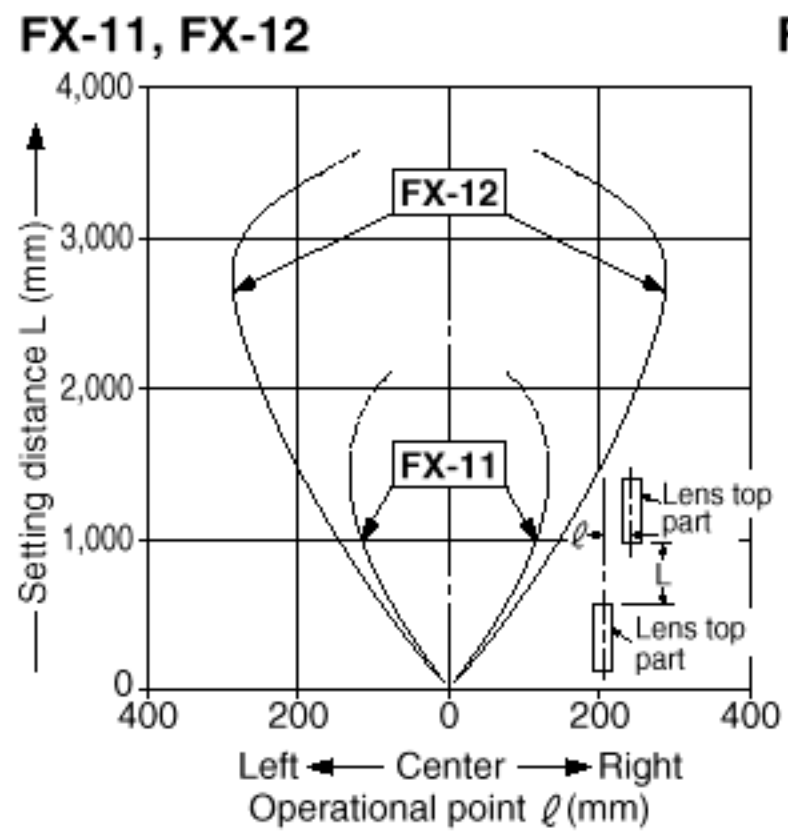




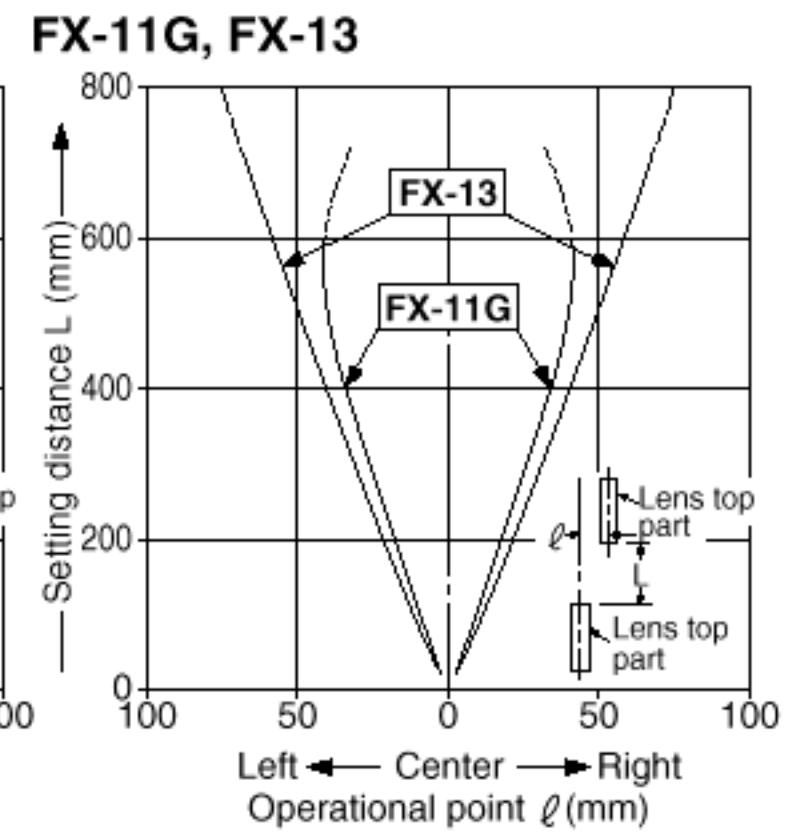
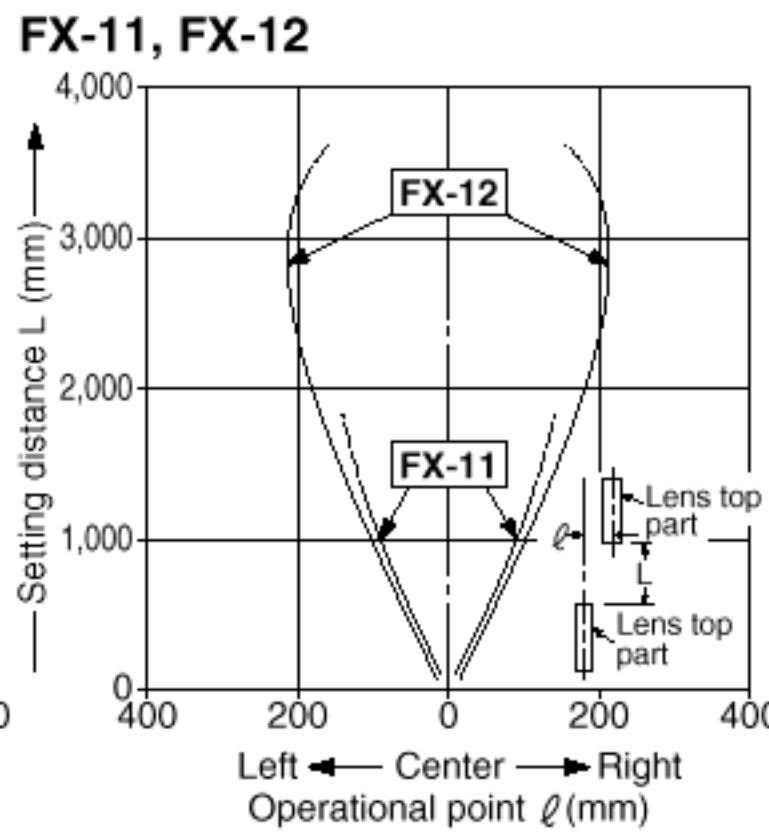
## SENSING FIELDS (TYPICAL)

Parallel deviations with FX-LE1 (Expansion lens) applied on both sides

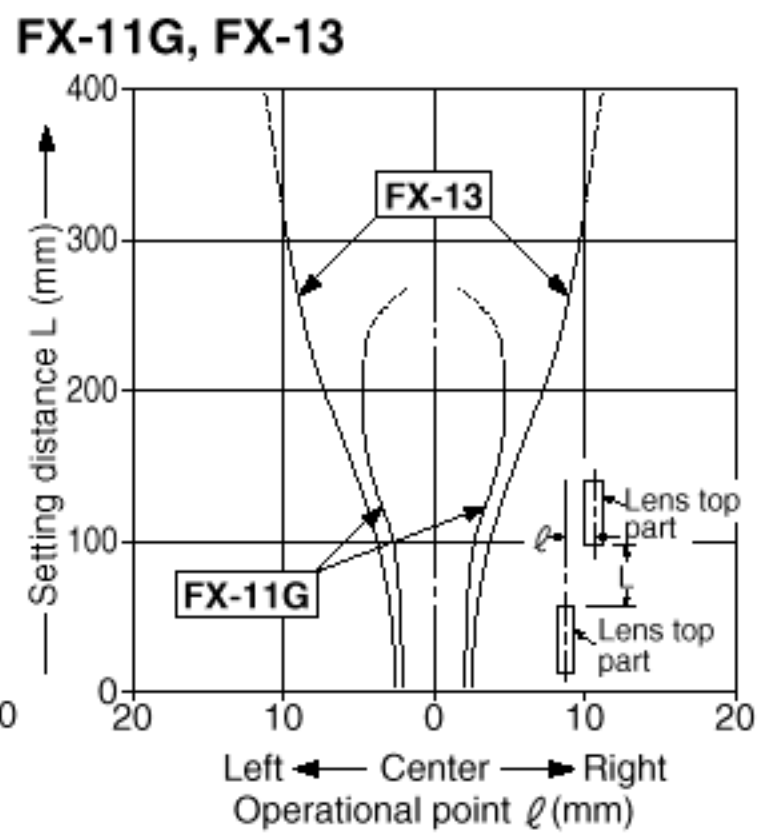
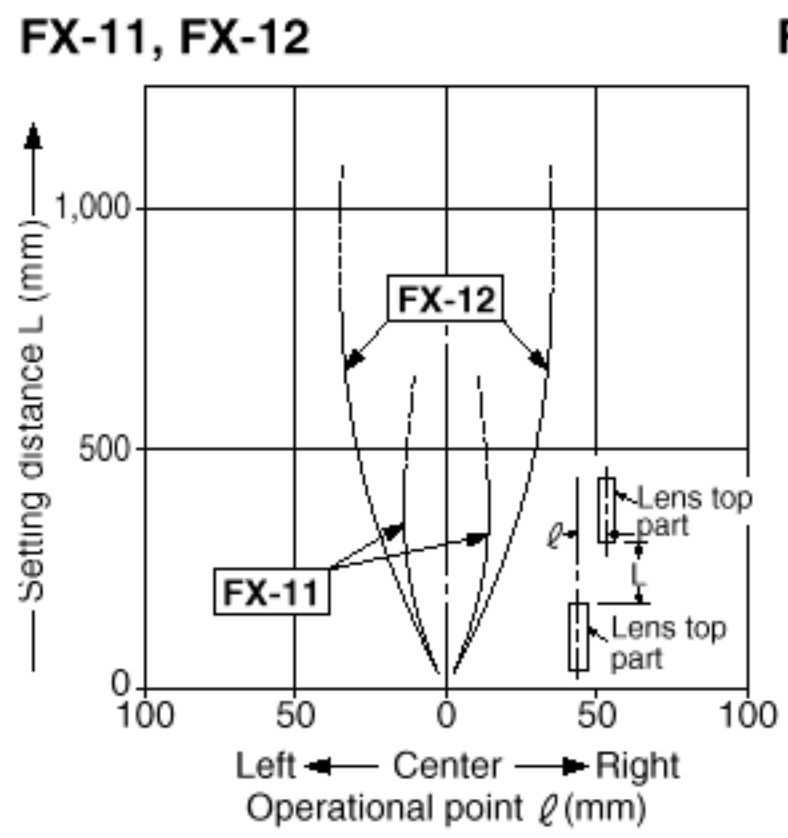
### FT-B8 Thru-beam



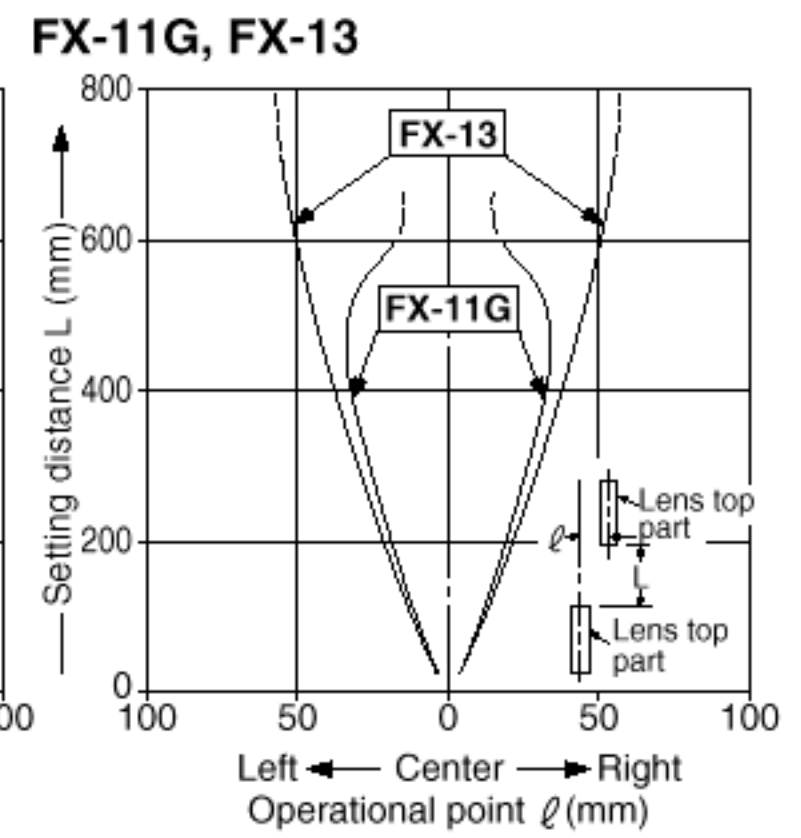
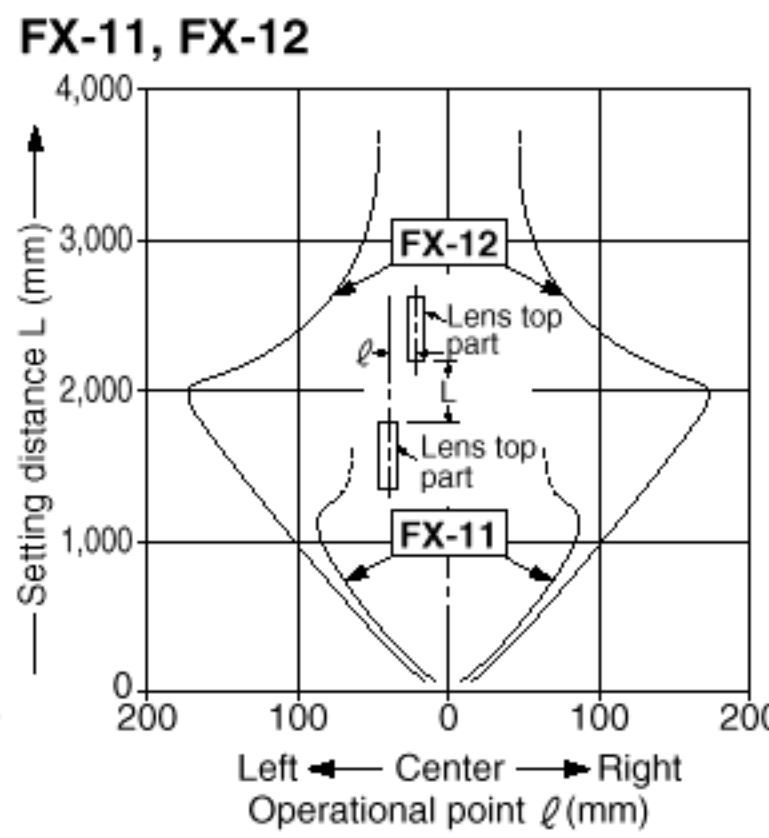
### FT-FM2 FT-T80 Thru-beam



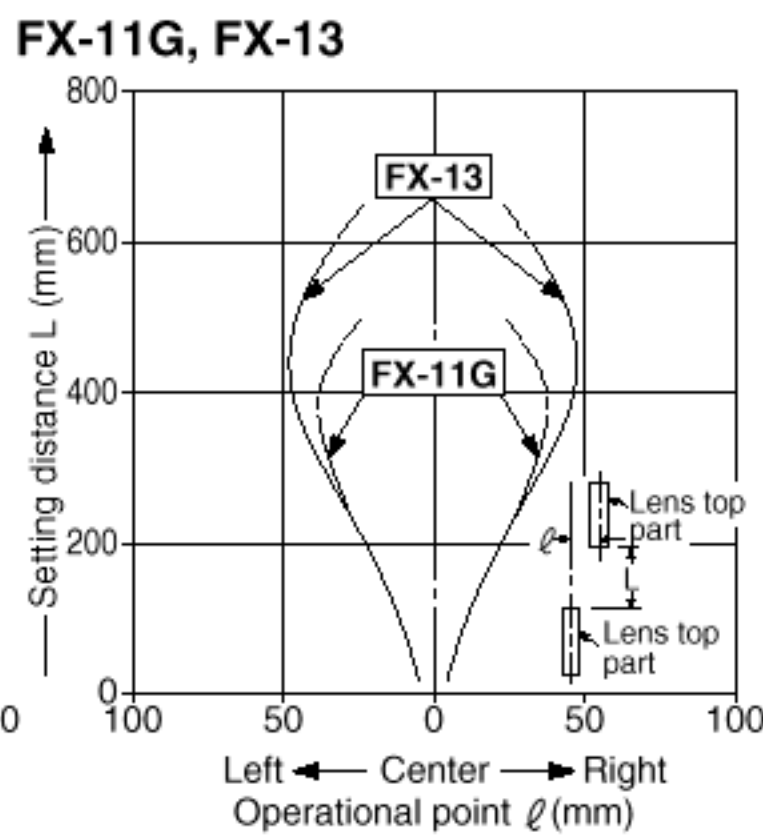
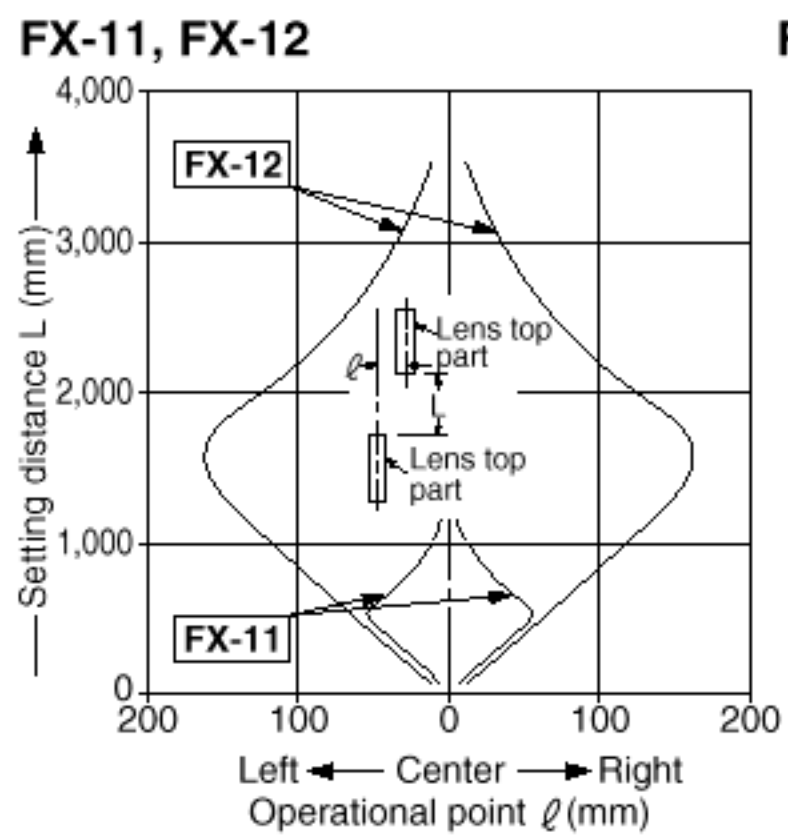
### FT-C4 Thru-beam



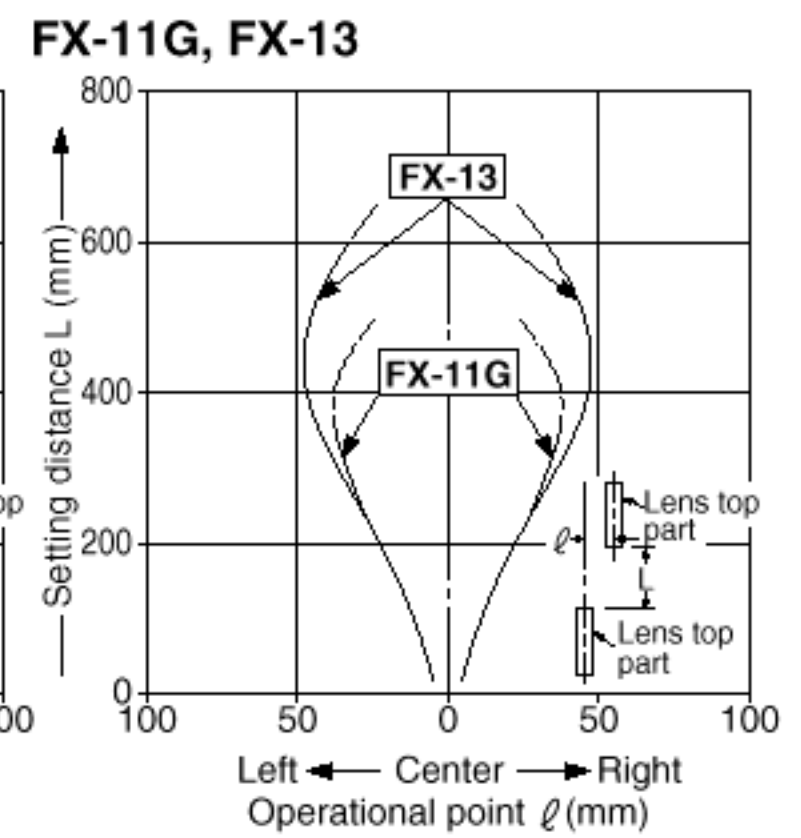
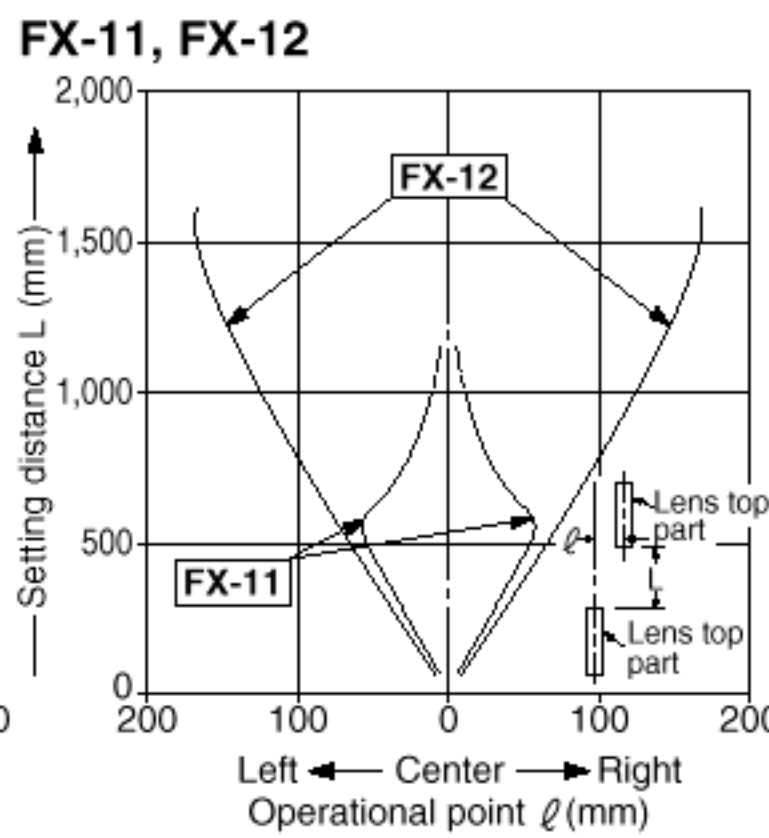
### FT-P80 Thru-beam



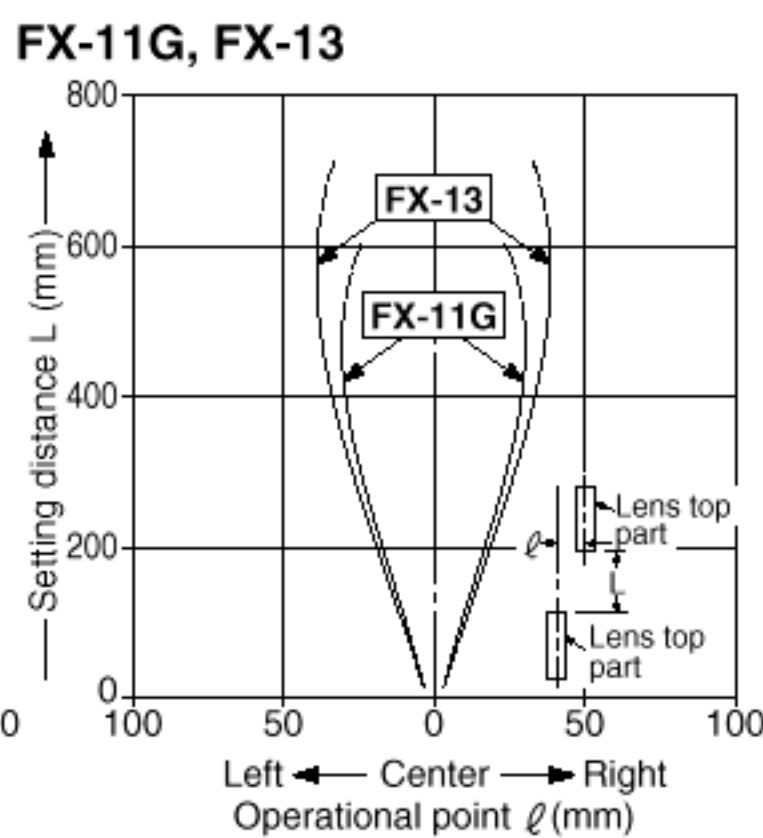
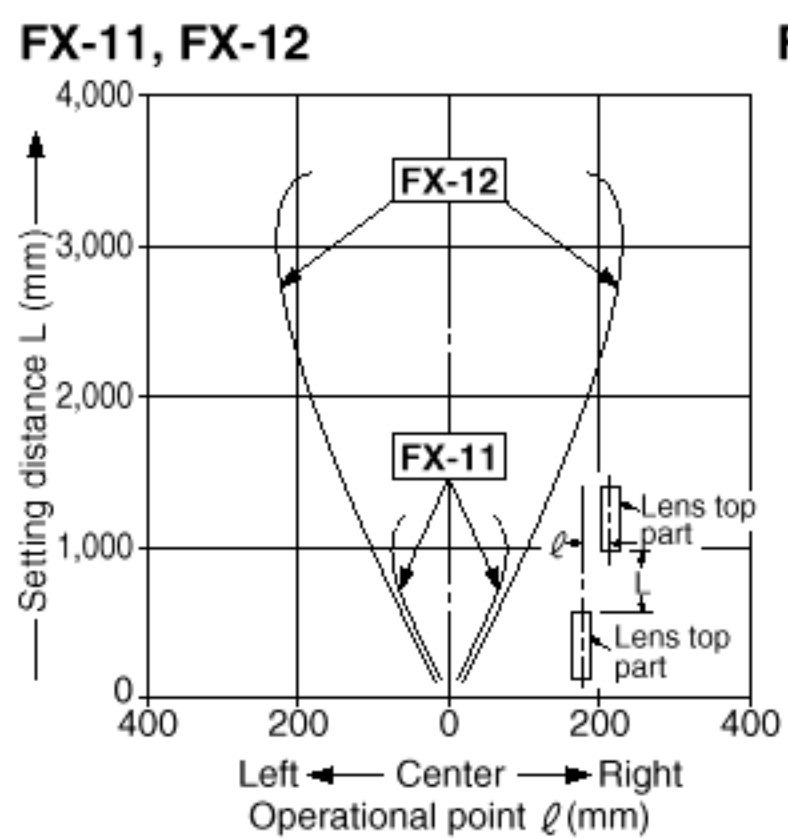
### FT-H35-M2 Thru-beam



### FT-H20-M1 Thru-beam



### FT-R80 Thru-beam

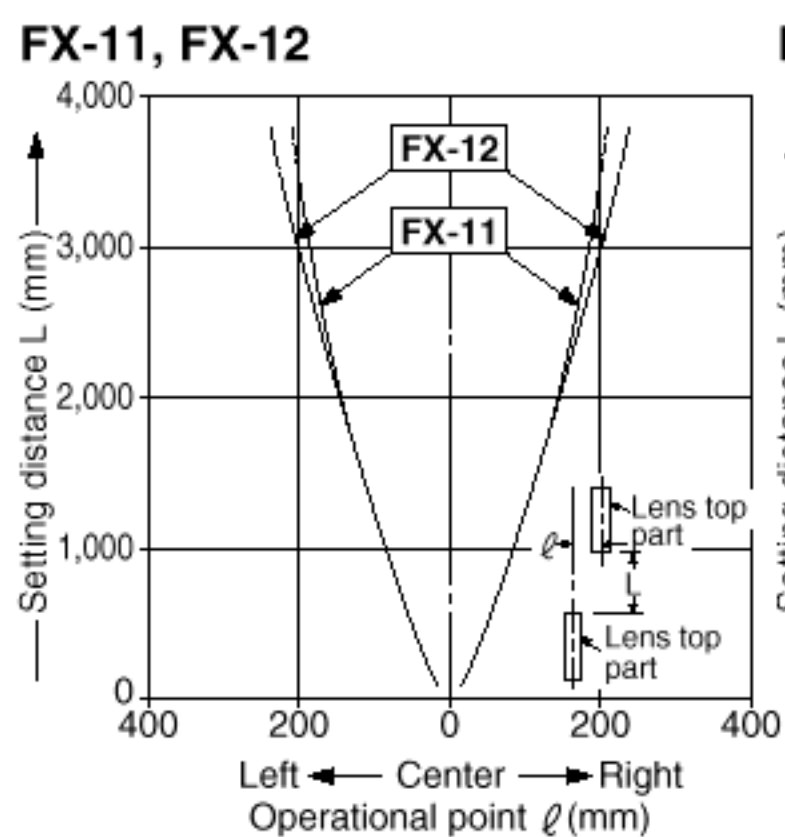


# FX-10

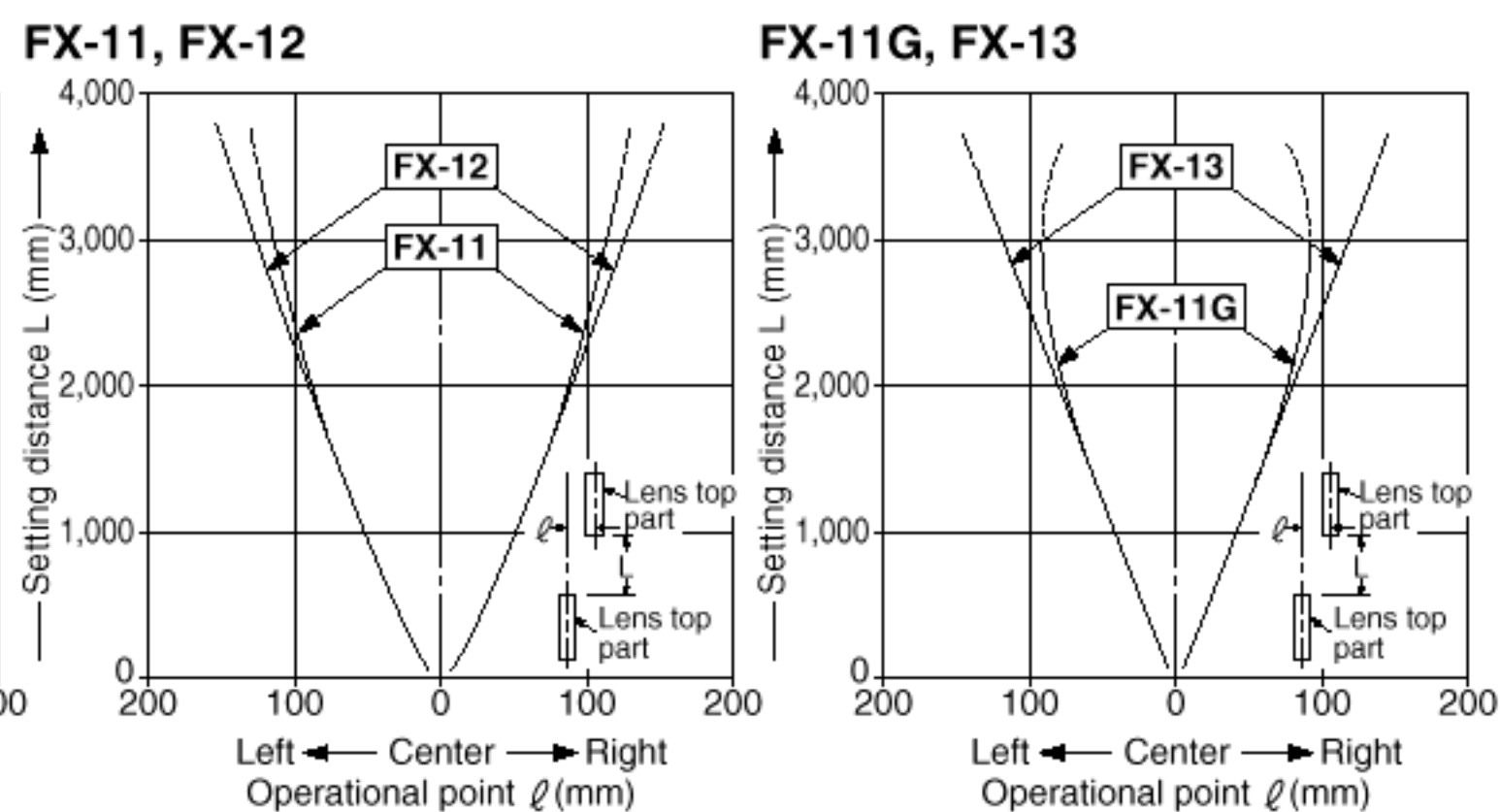
## SENSING FIELDS (TYPICAL)

Parallel deviations with FX-LE2 (Super-expansion lens) applied on both sides

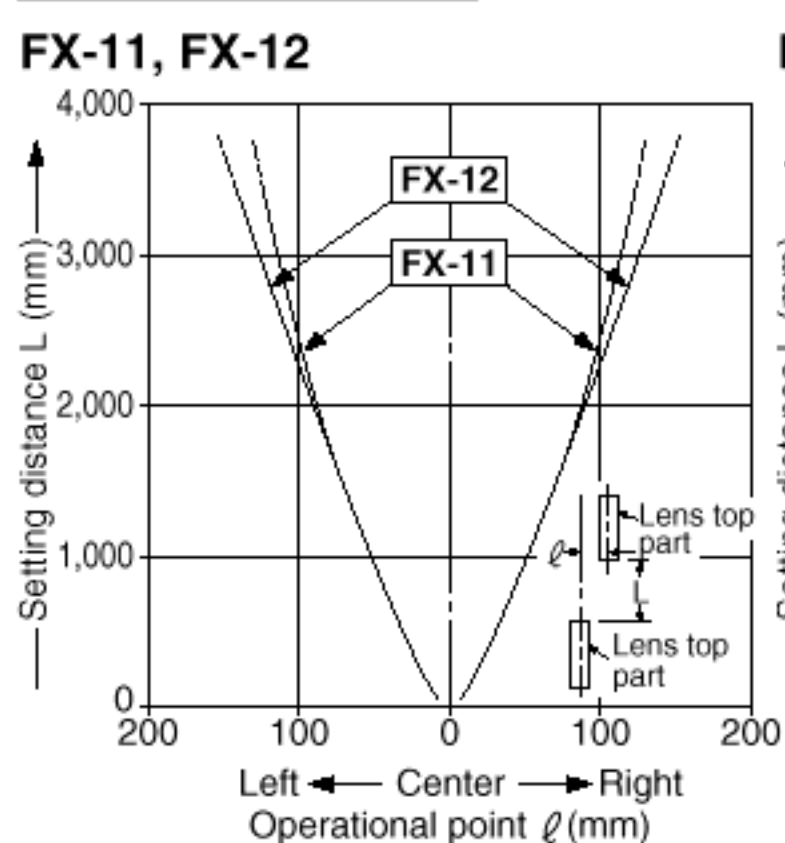
**FT-B8** Thru-beam



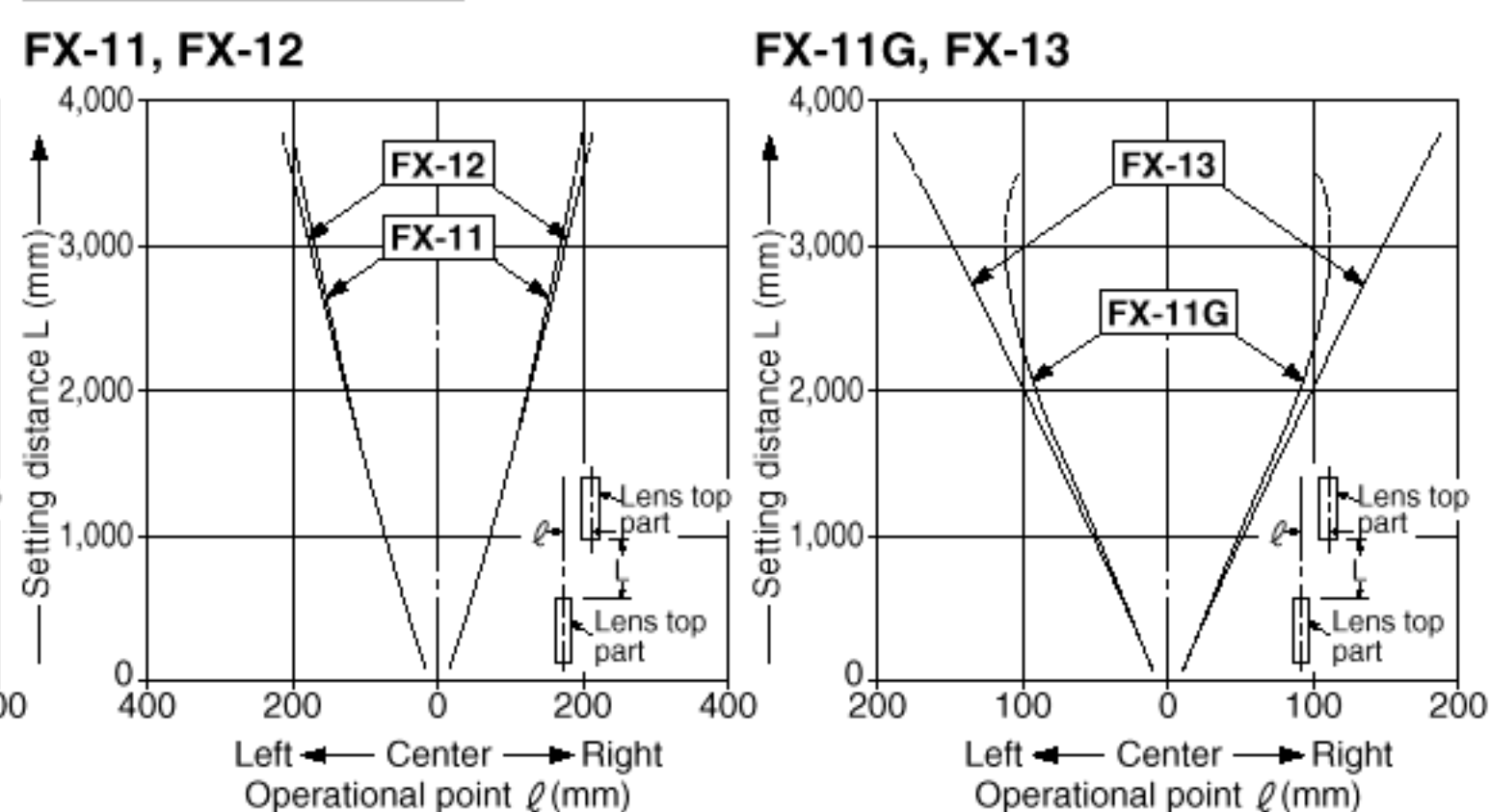
**FT-FM2** Thru-beam



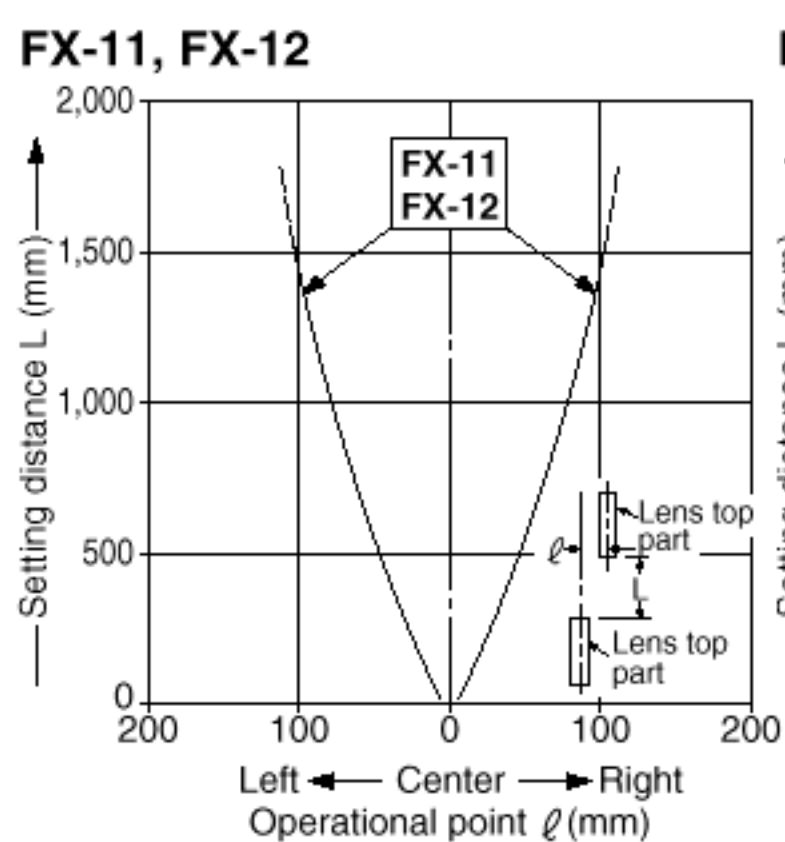
**FT-P80** Thru-beam



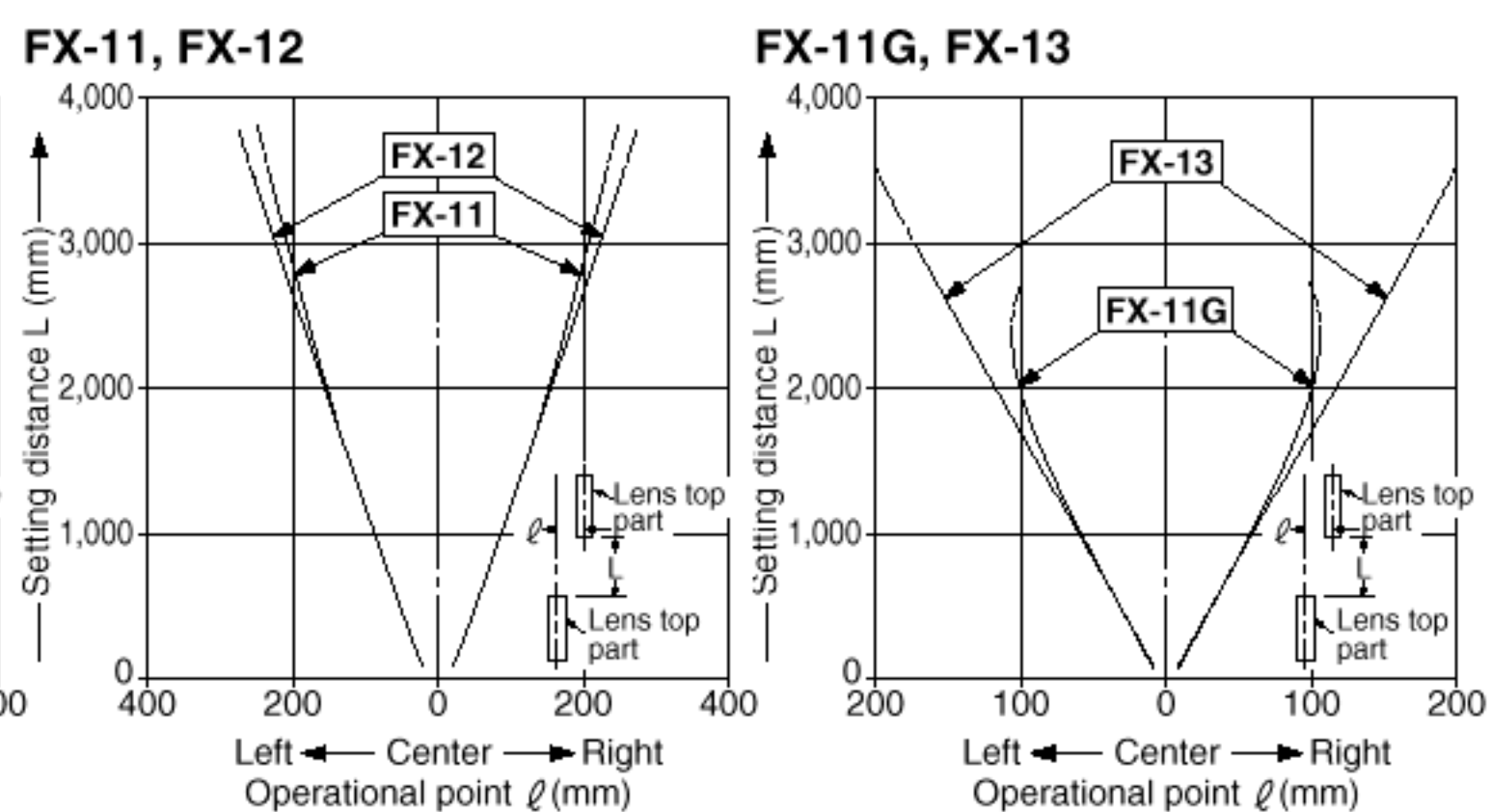
**FT-H35-M2** Thru-beam



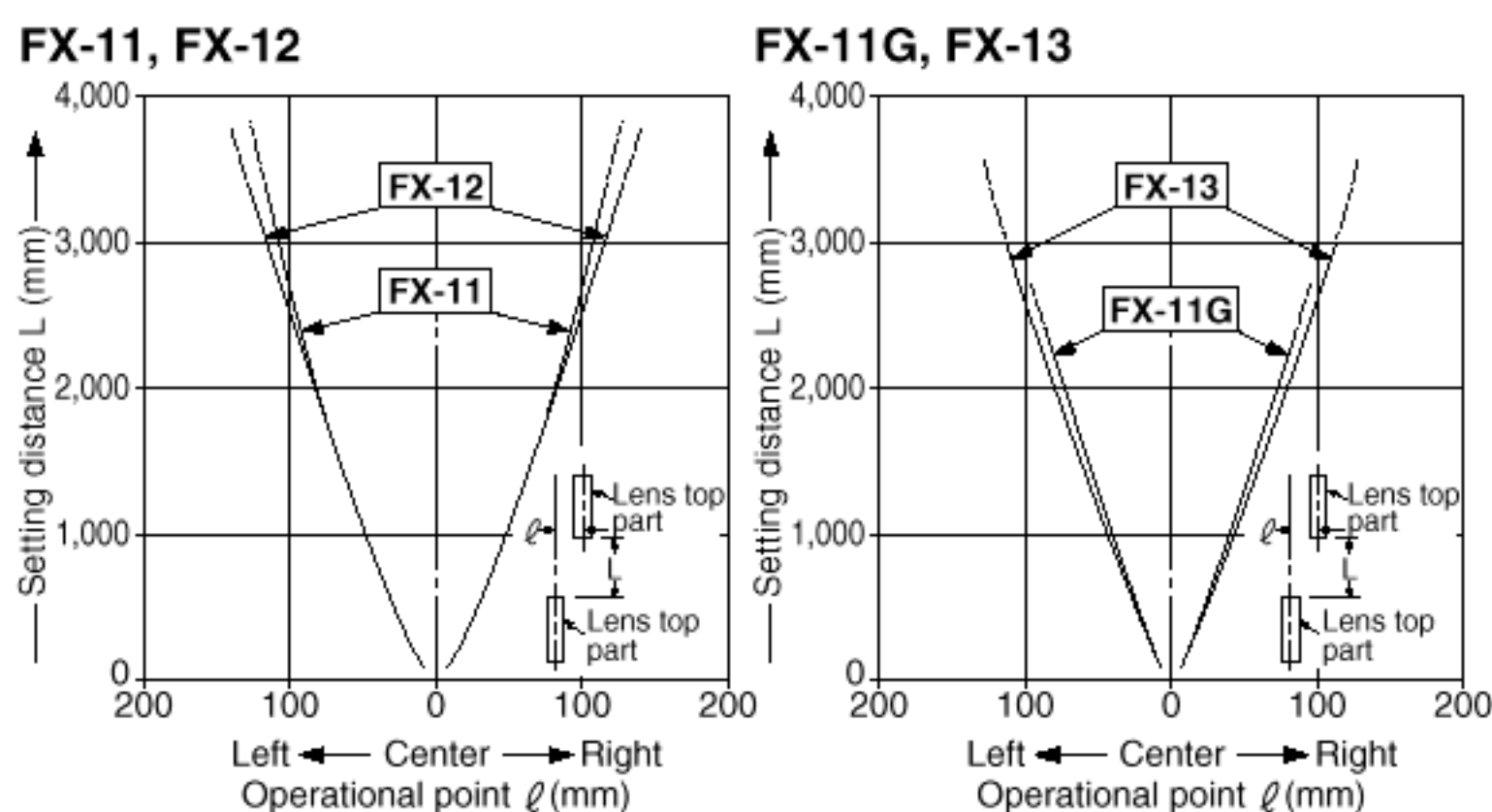
**FT-H20-M1** Thru-beam



**FT-H13-FM2** Thru-beam



**FT-R80** Thru-beam

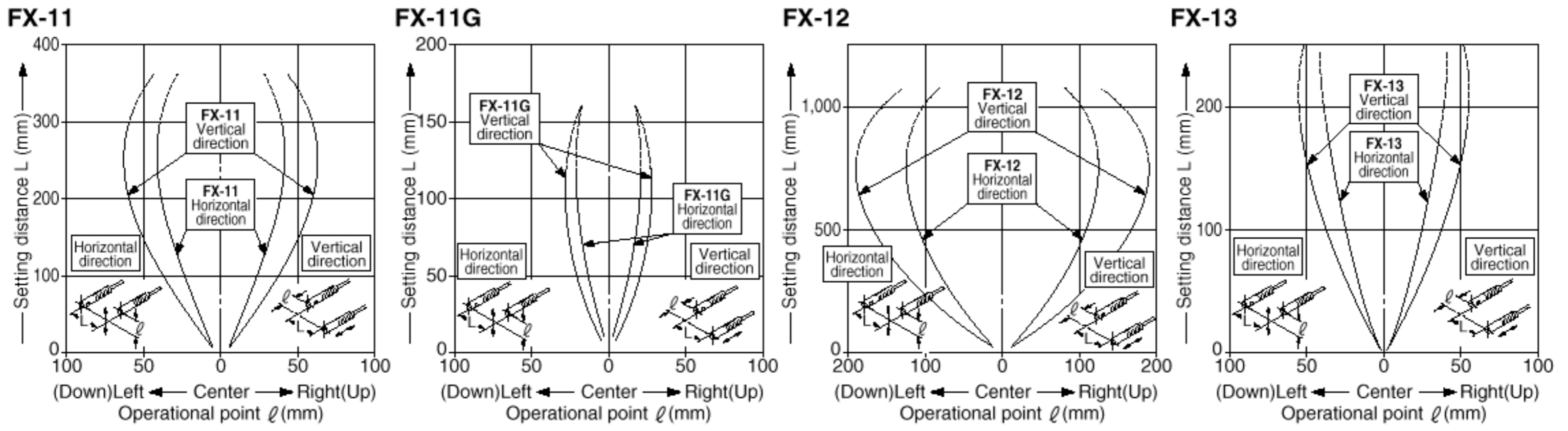


FZ-10  
 FX-7  
 Fiber Sensor  
 FX-10  
 FX-11A  
 CX-20  
 CX-30  
 CX-ND300R  
 EX-10  
 Amplifier Built-in Type  
 EQ-20  
 EQ-30  
 EX-40  
 RX

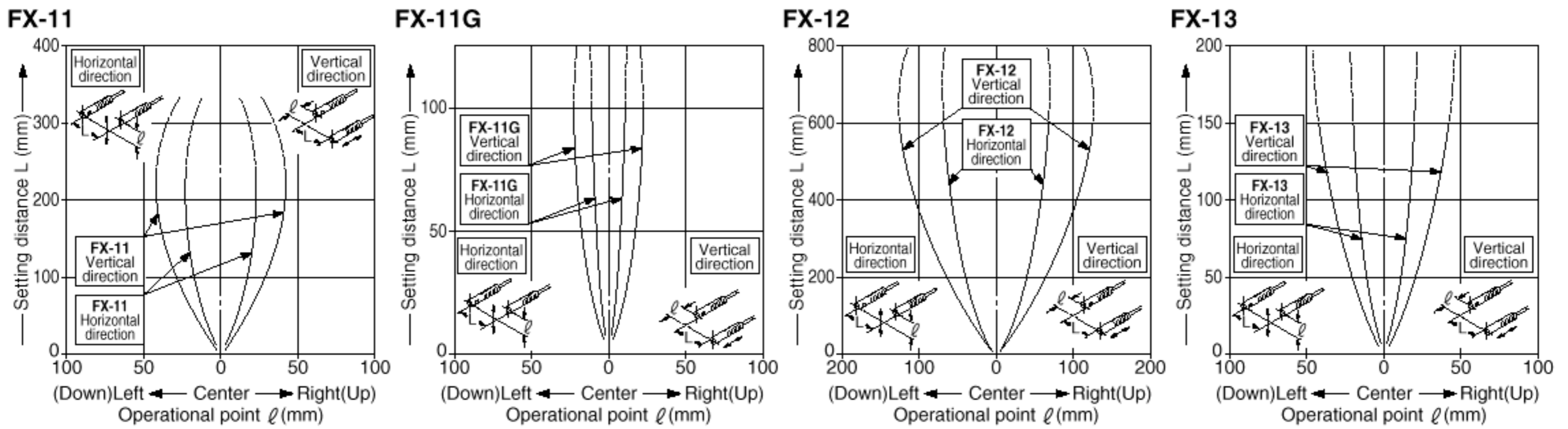
## SENSING FIELDS (TYPICAL)

Parallel deviations with FX-SV1 (Side-view lens) applied on both sides

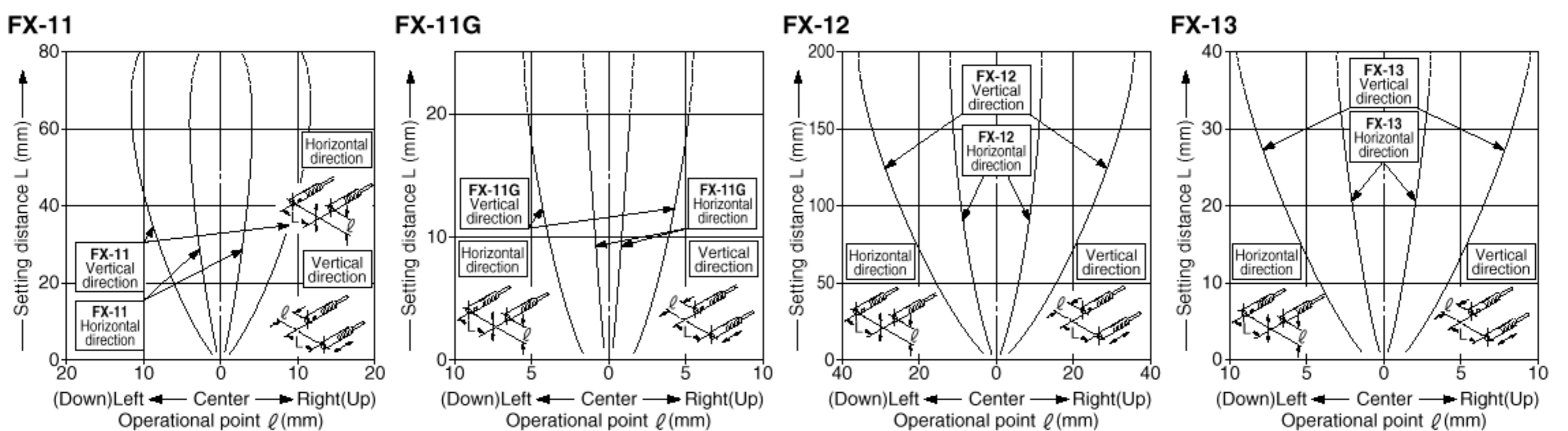
### FT-B8 Thru-beam



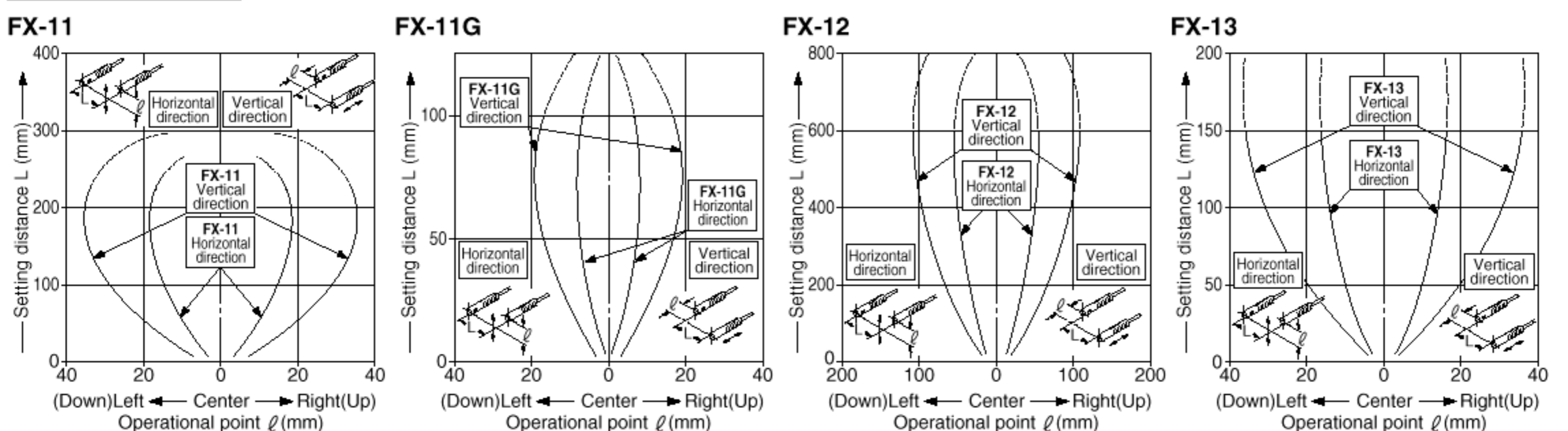
### FT-FM2 FT-T80 Thru-beam



### FT-C4 Thru-beam



### FT-P80 Thru-beam

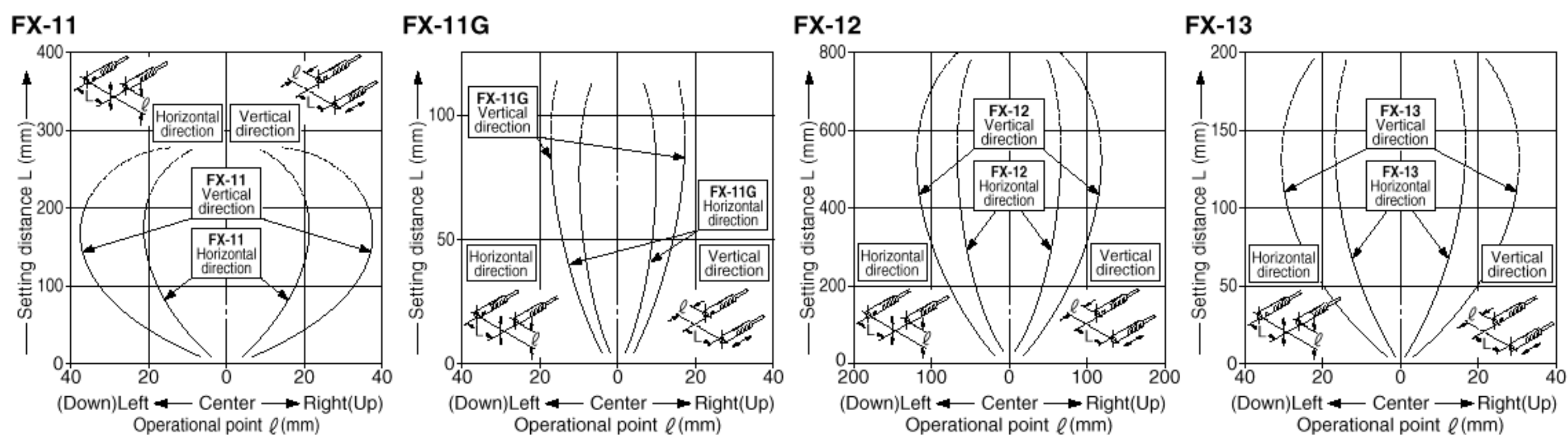


# FX-10

## SENSING FIELDS (TYPICAL)

Parallel deviations with FX-SV1 (Side-view lens) applied on both sides

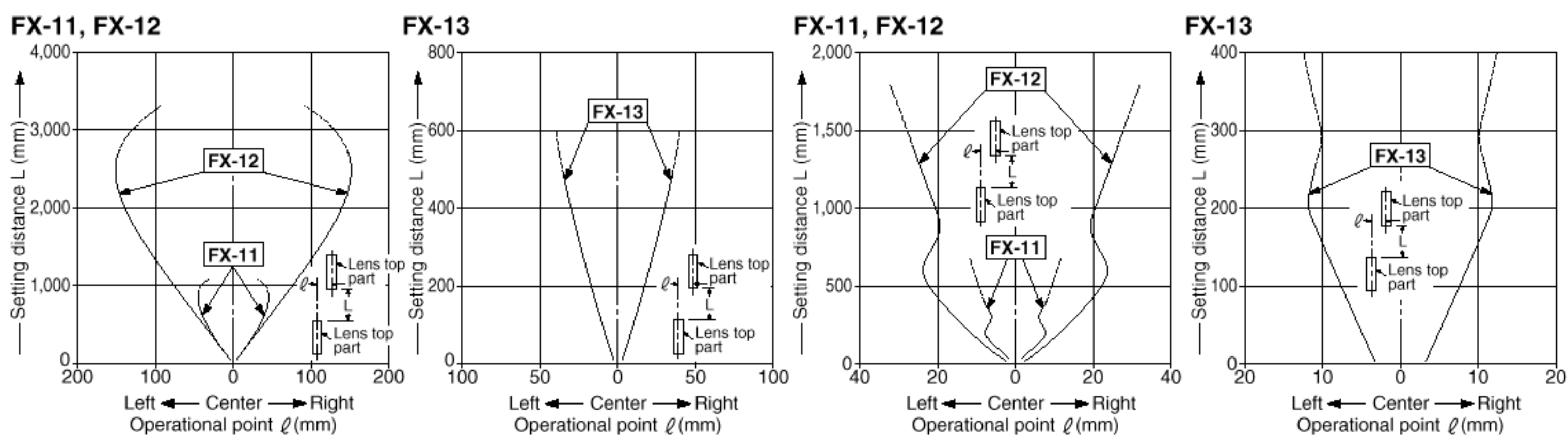
**FT-H35-M2**  
**FT-H20-M1** Thru-beam



Parallel deviations with FV-LE1 (Vacuum • expansion lens) applied on both sides

**FT-6V** Thru-beam

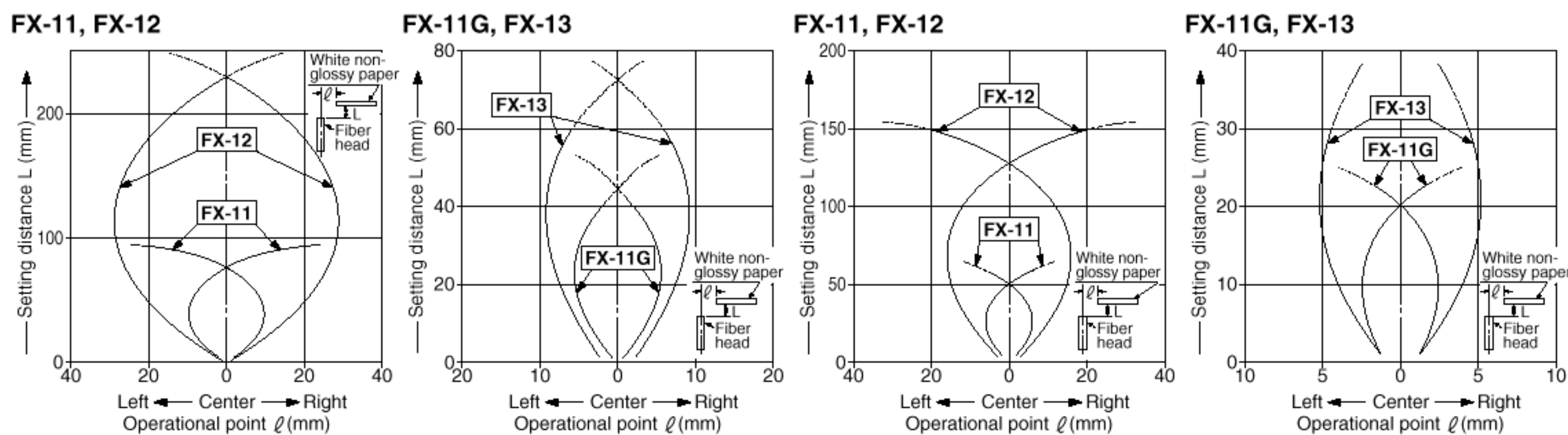
**FT-60V** Thru-beam



### Sensing fields

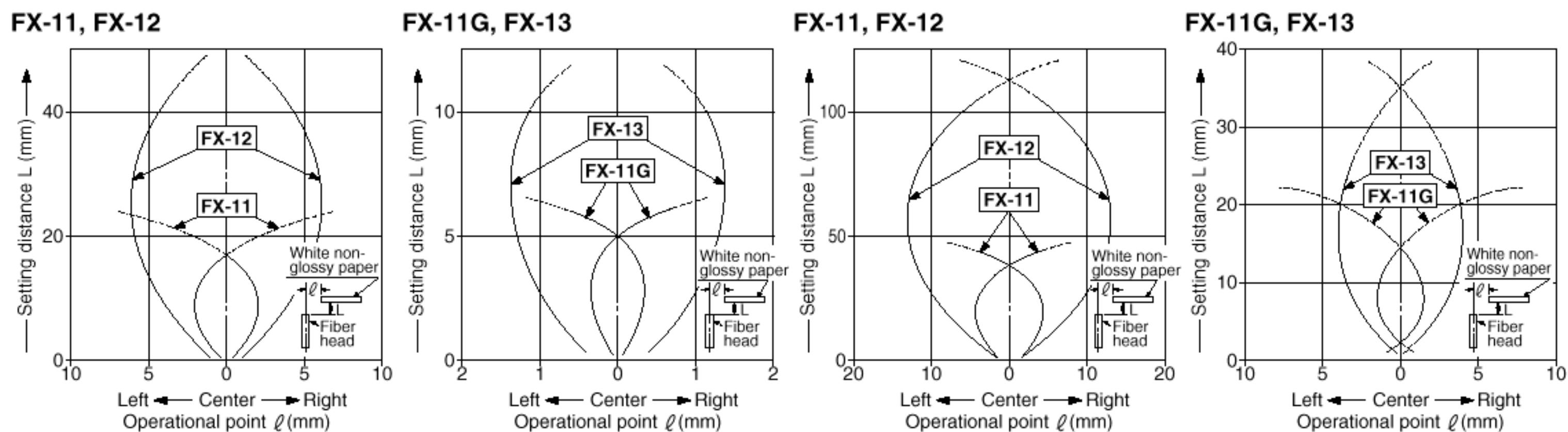
**FD-B8** Reflective

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



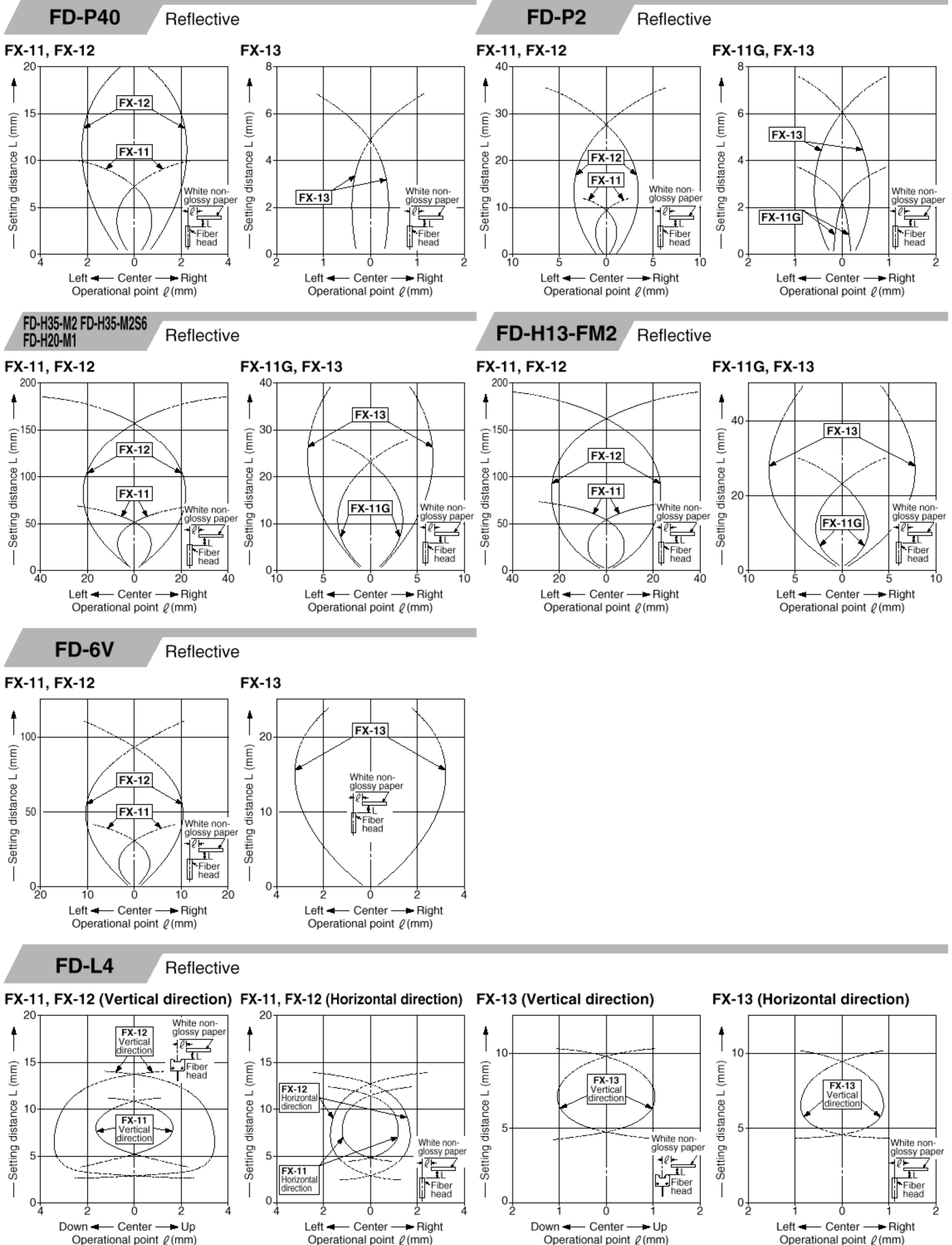
**FD-T40 FD-NFM2 FD-NFM2S**  
**FD-NFM2S4 FD-SNFM2** Reflective

**FD-P80**



## SENSING FIELDS (TYPICAL)

### Sensing fields



FZ-10

FX-7

FX-10

FX-11A

CX-20

CX-30

CX-ND300R

EX-10

EQ-20

EQ-30

EX-40

RX

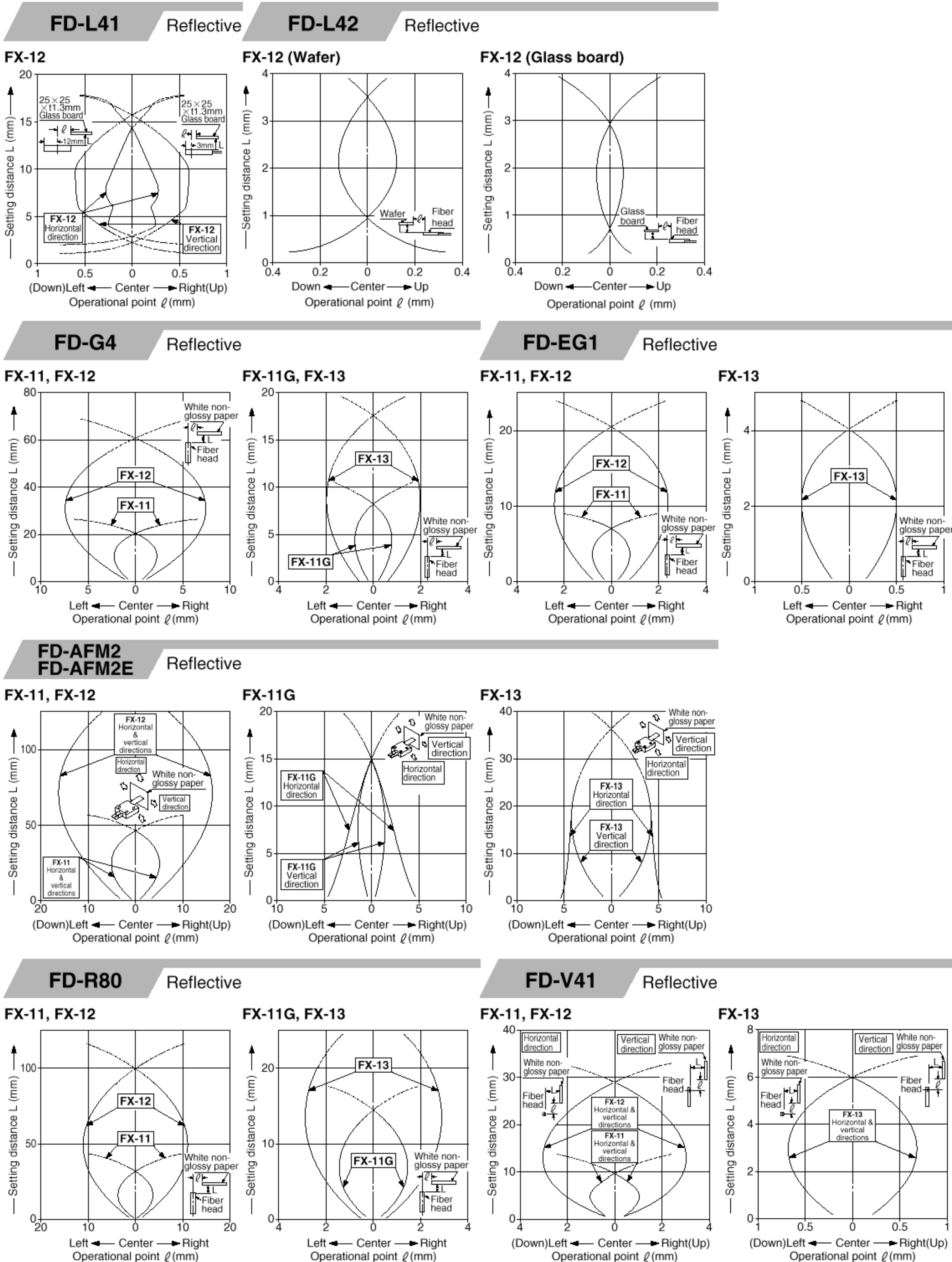
RX-LS200

Amplifier Built-in Type

# FX-10

## SENSING FIELDS (TYPICAL)

### Sensing fields

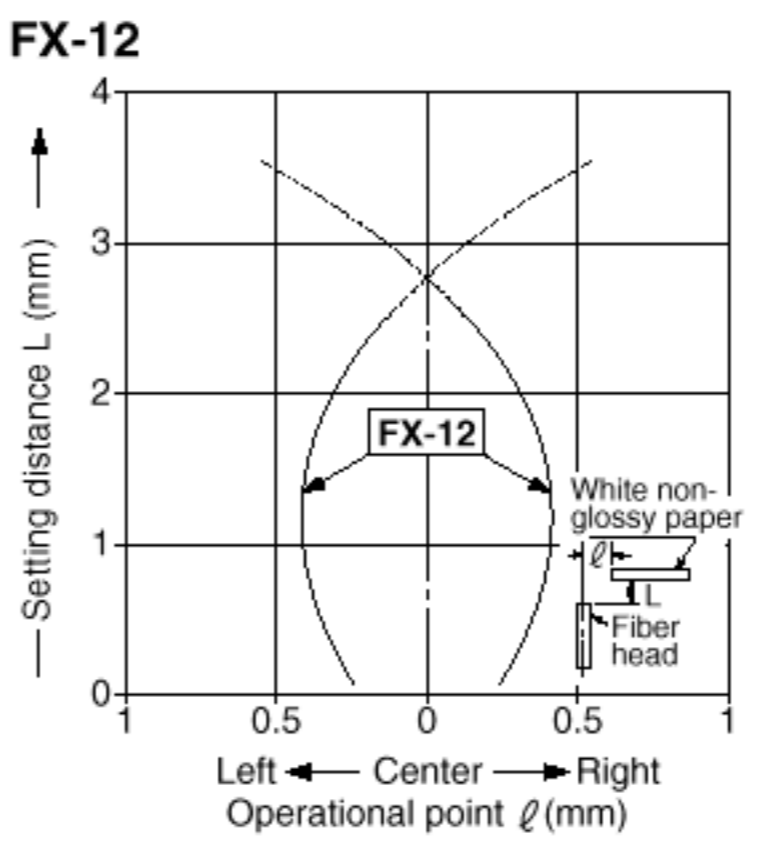
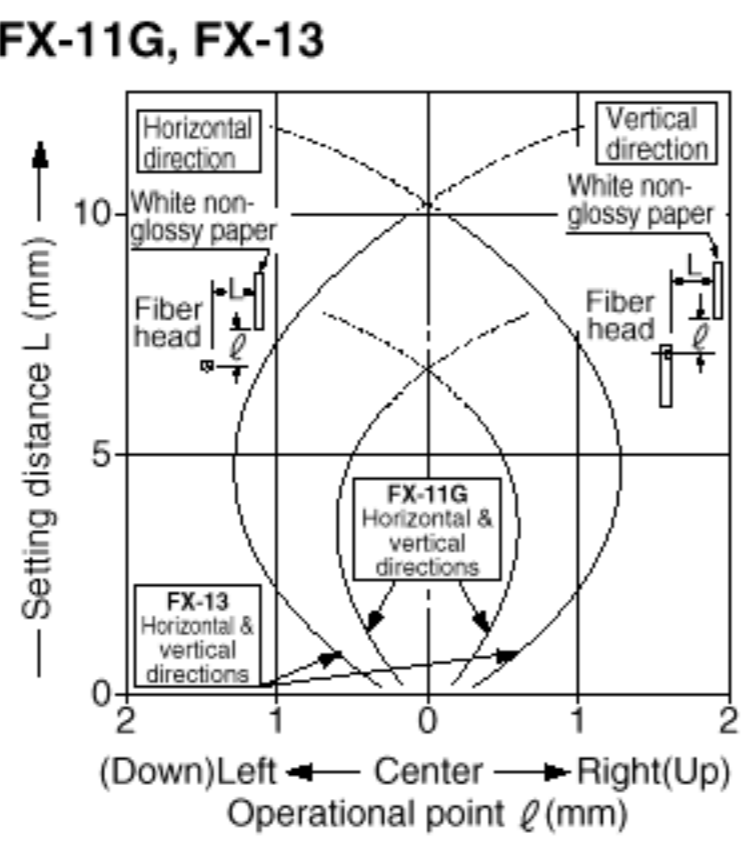
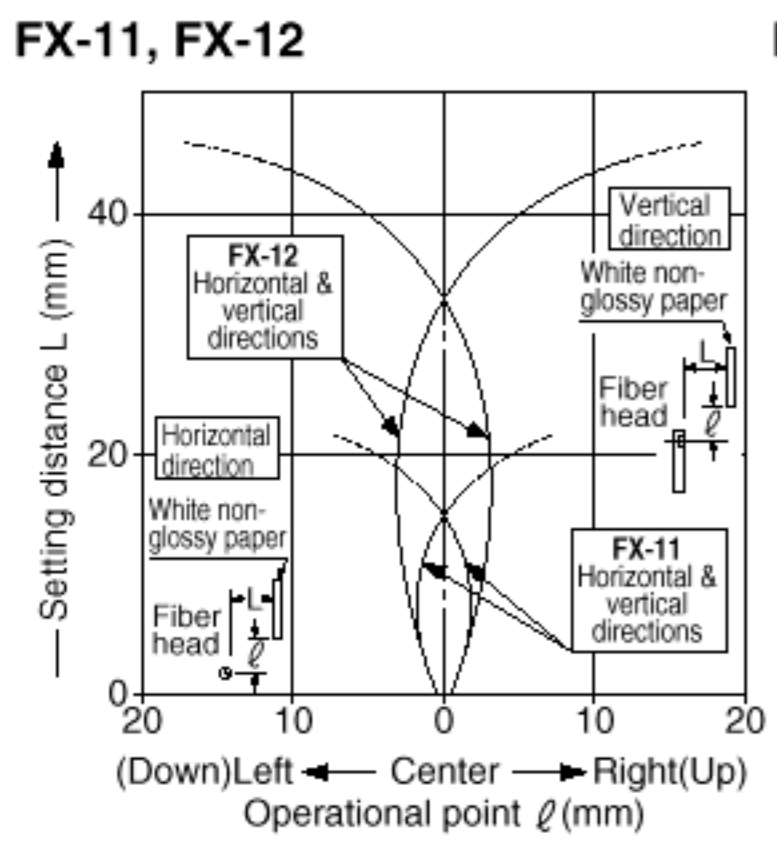


## SENSING FIELDS (TYPICAL)

### Sensing fields

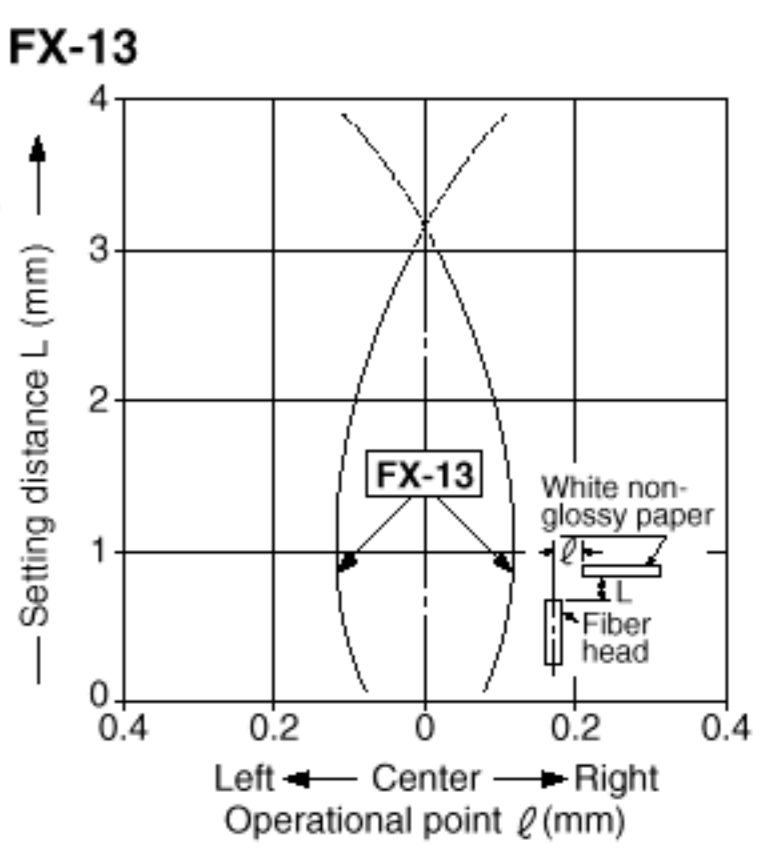
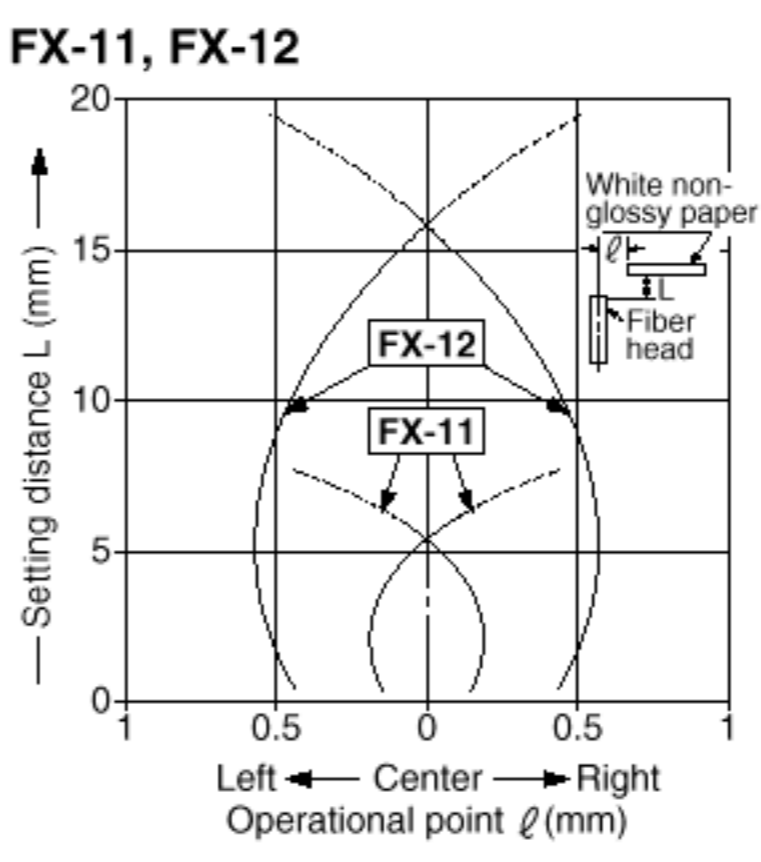
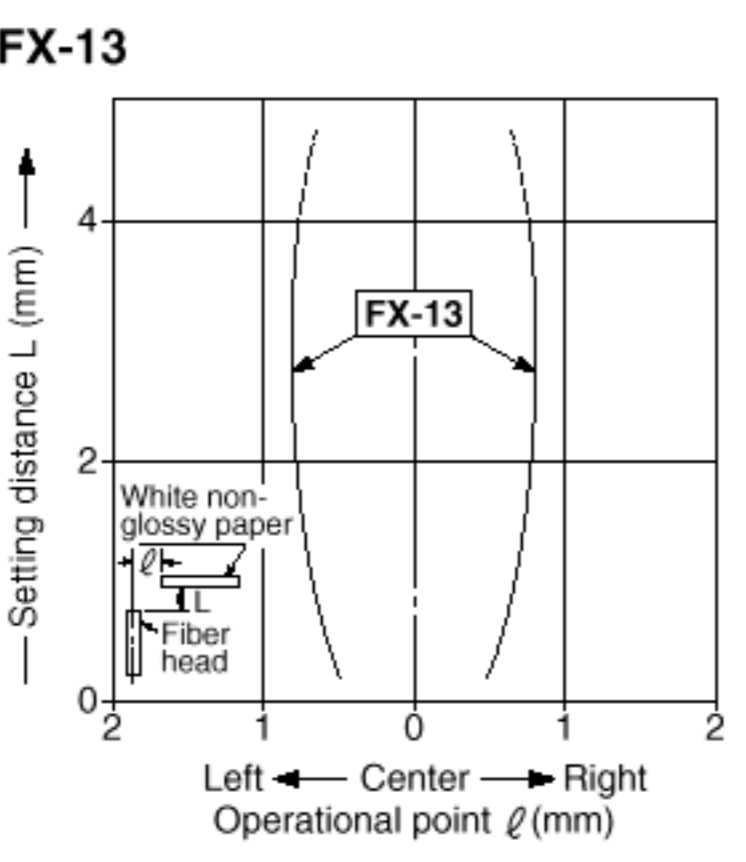
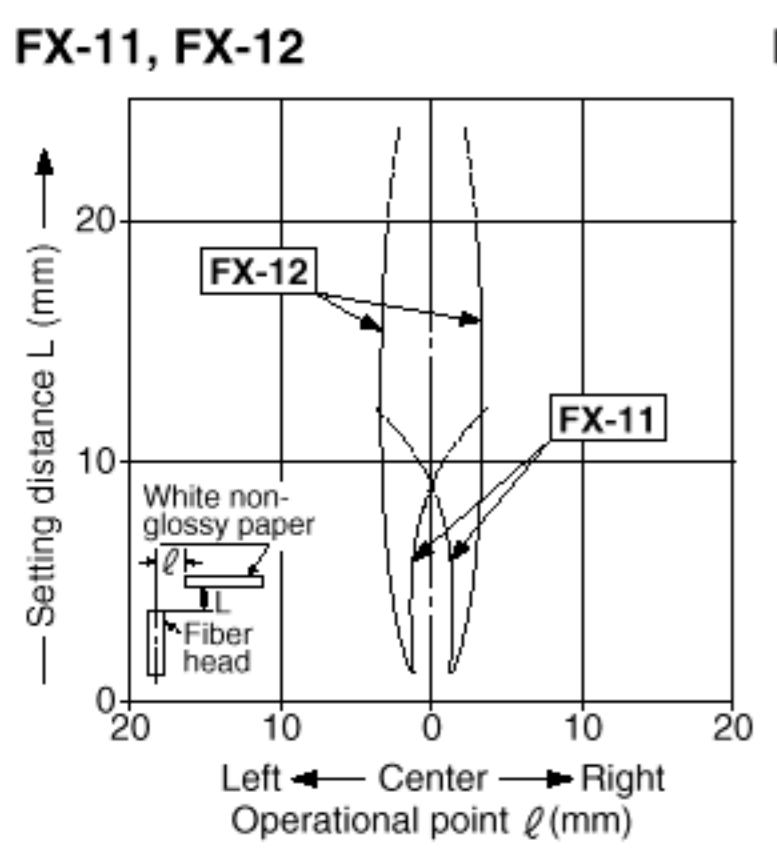
#### FD-SFM2SV2 Reflective

#### FD-EN500S1 Reflective



#### FD-ENM1S1 Reflective

#### FD-KM1S2 Reflective

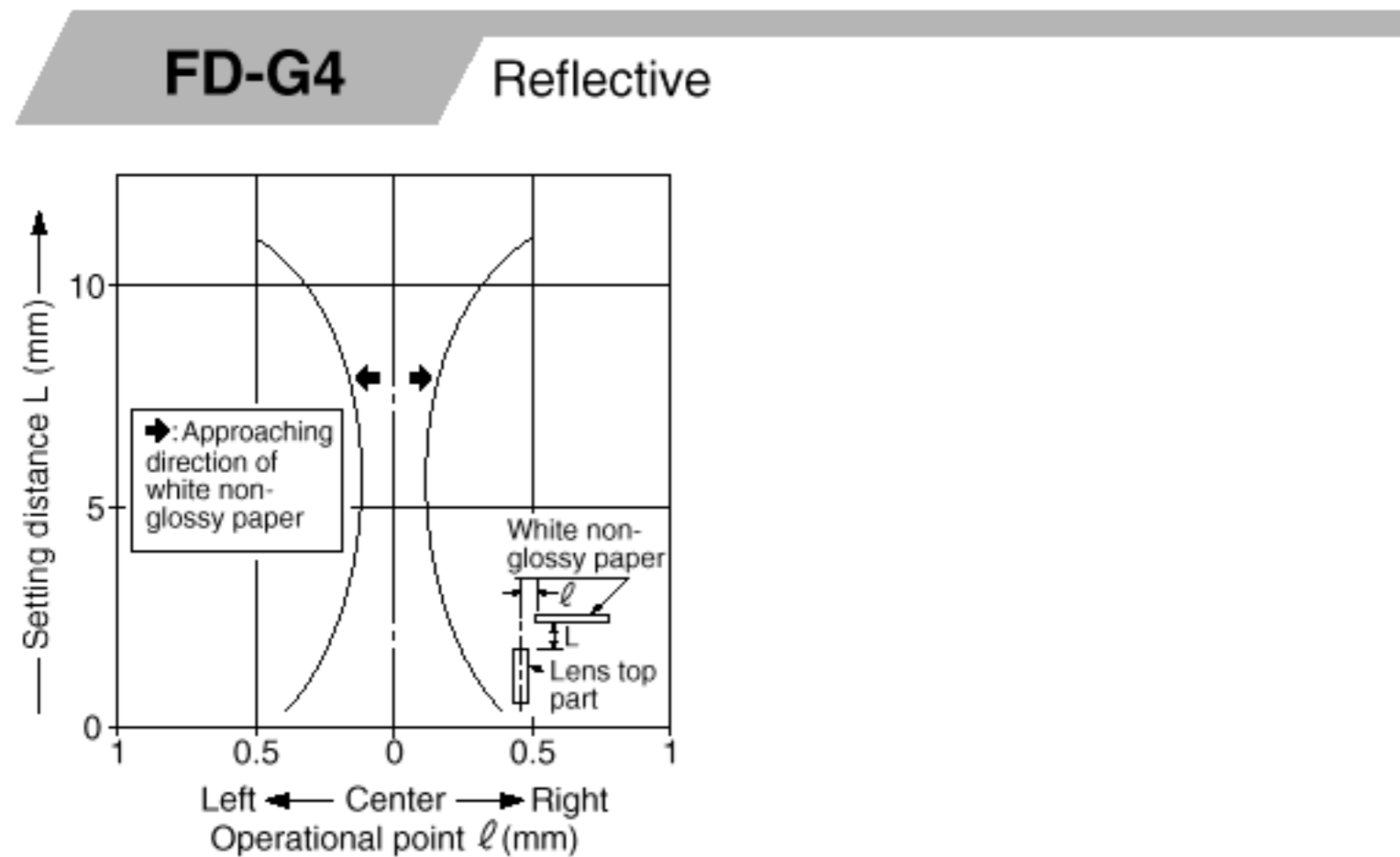


Fiber Sensor	FX-10	FZ-10
	FX-10	FX-7
	FX-11A	FX-10
Amplifier Built-in Type	CX-20	CX-30
	CX-ND300R	CX-30
	EX-10	EX-10
	EQ-20	EQ-20
	EQ-30	EQ-30
RX	EX-40	RX
RX-LS200		

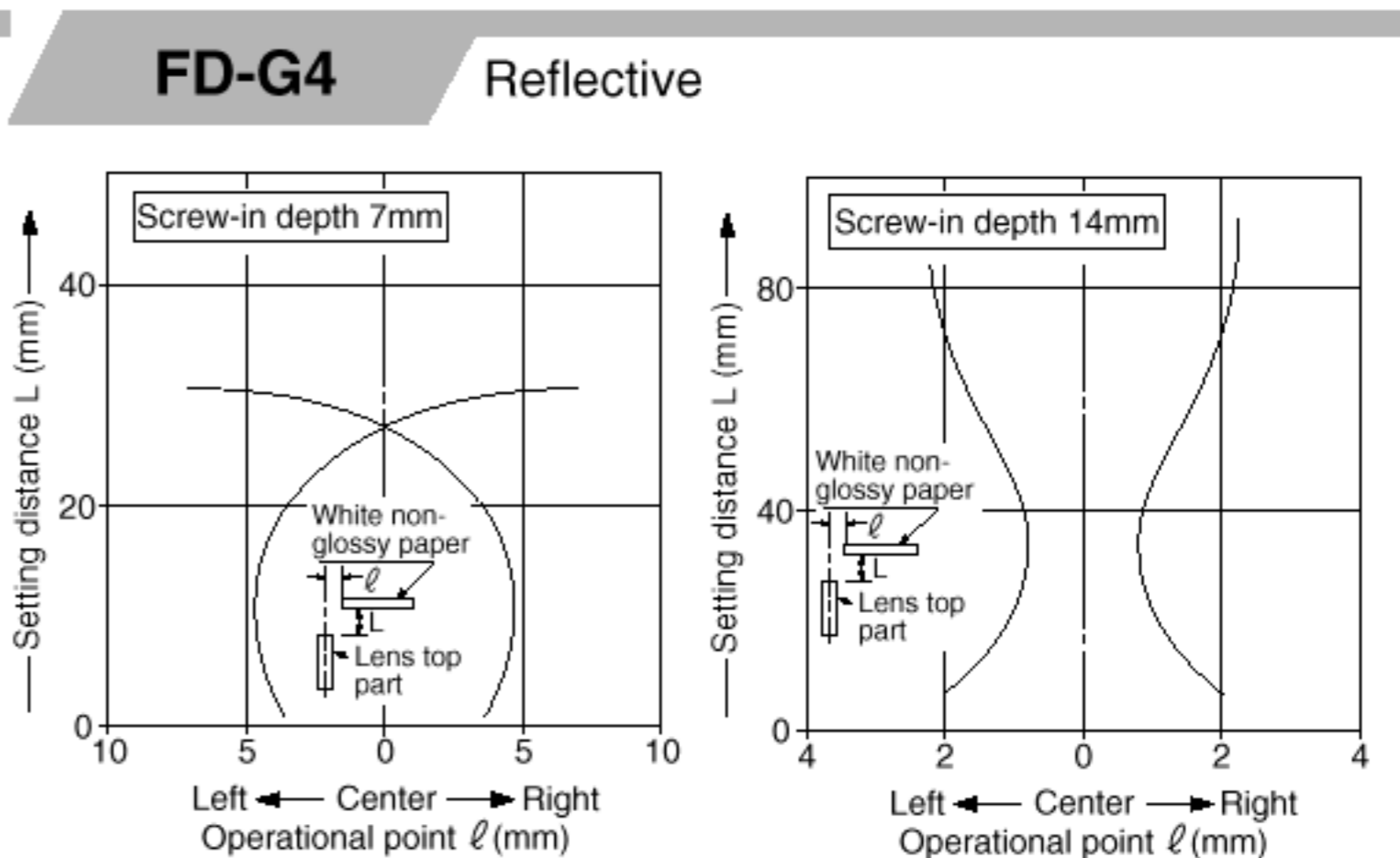
# FX-10

## SENSING FIELDS (TYPICAL)

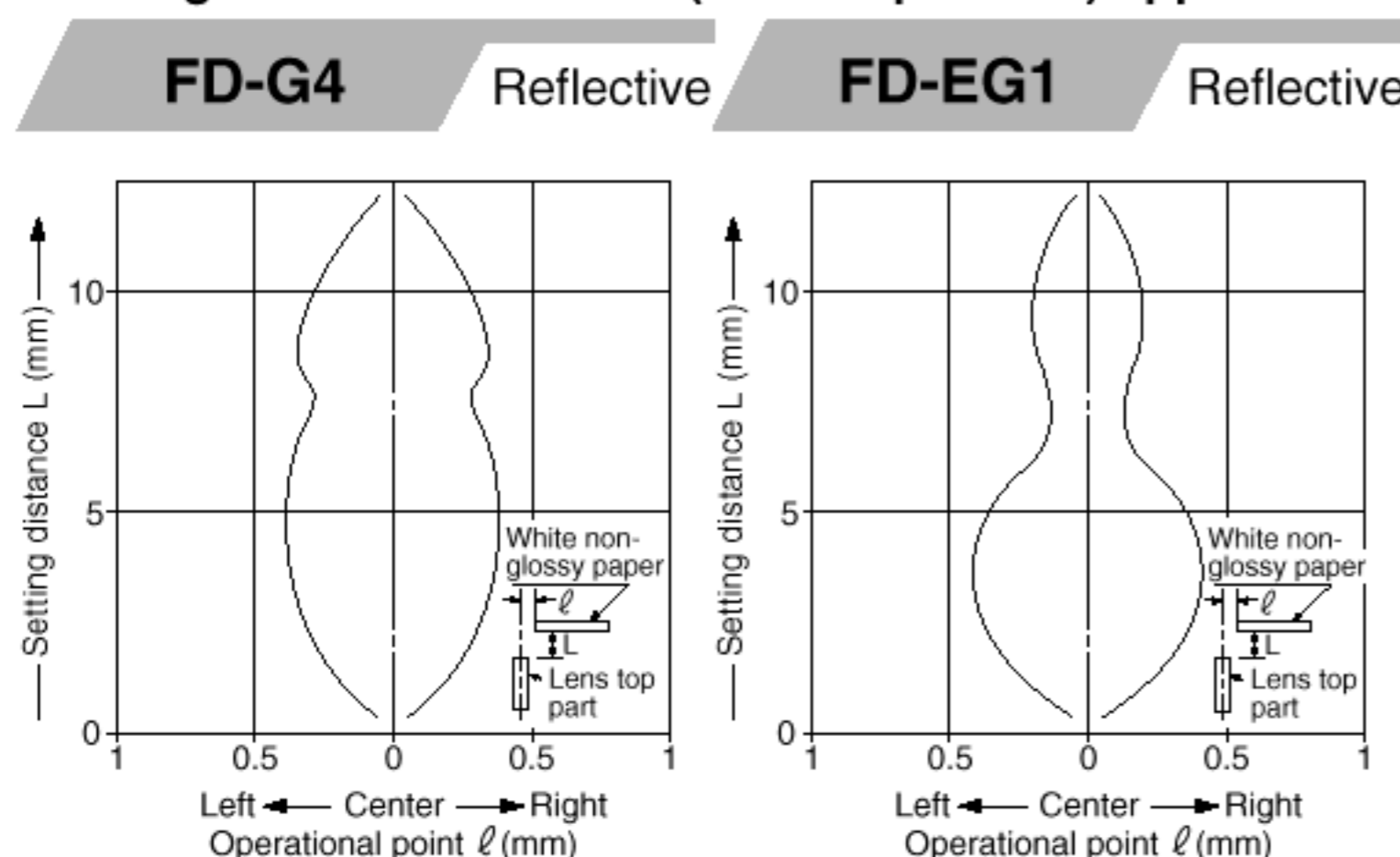
### Sensing field with FX-MR1 (Pinpoint spot lens) applied



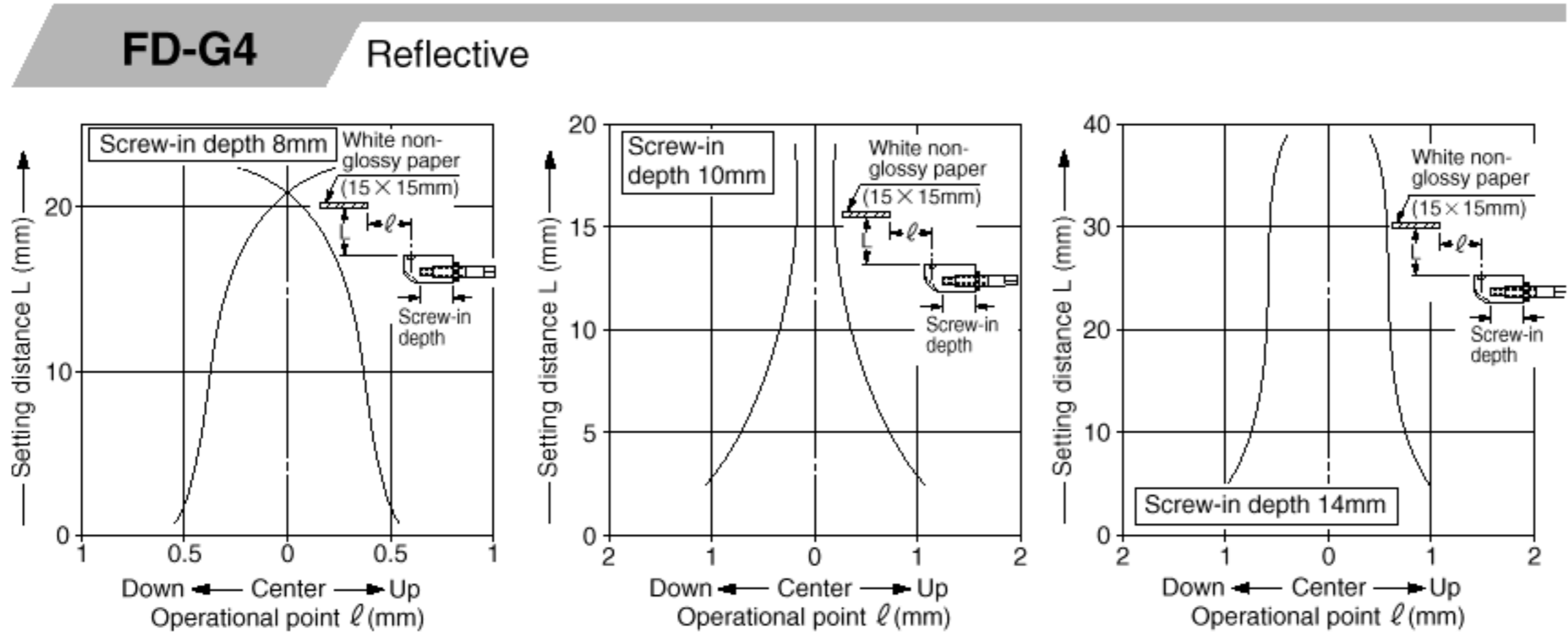
### Sensing fields with FX-MR2 (Zoom lens) applied



### Sensing fields with FX-MR3 (Finest spot lens) applied



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



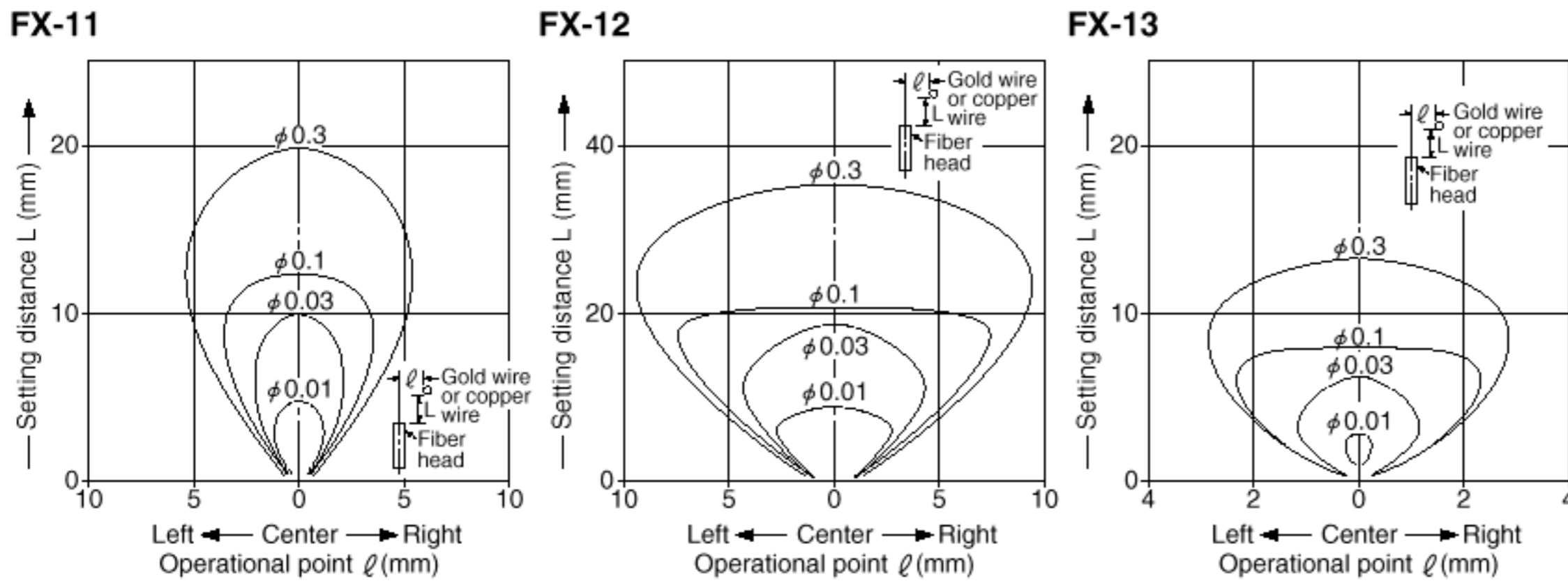
Amplifier Built-in Type



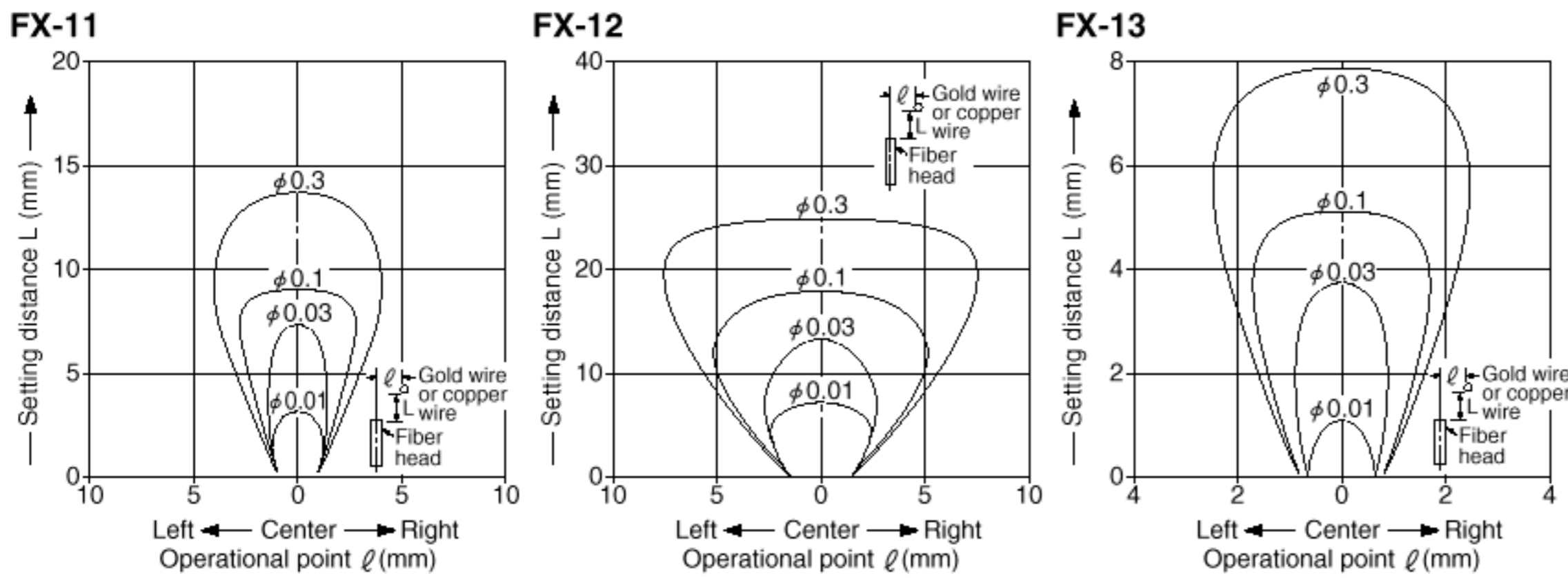
## SENSING FIELDS (TYPICAL)

Correlation between diameter of an object and sensing fields

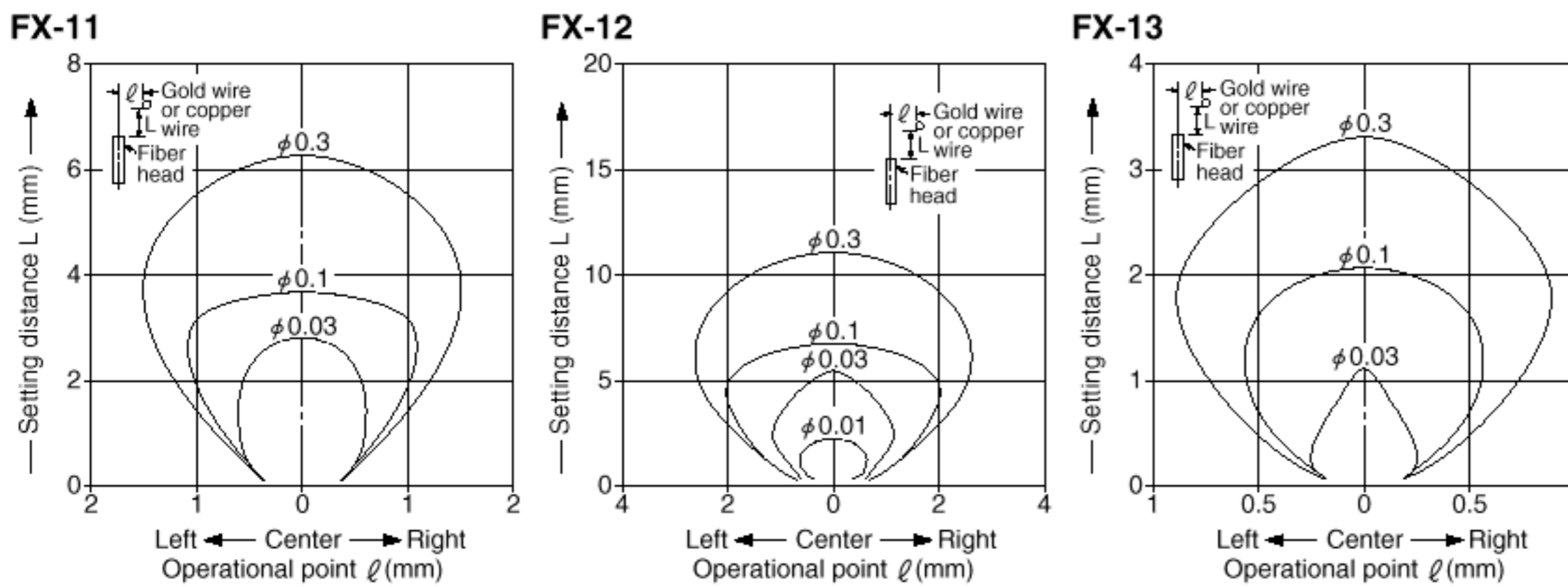
### FD-B8 Reflective



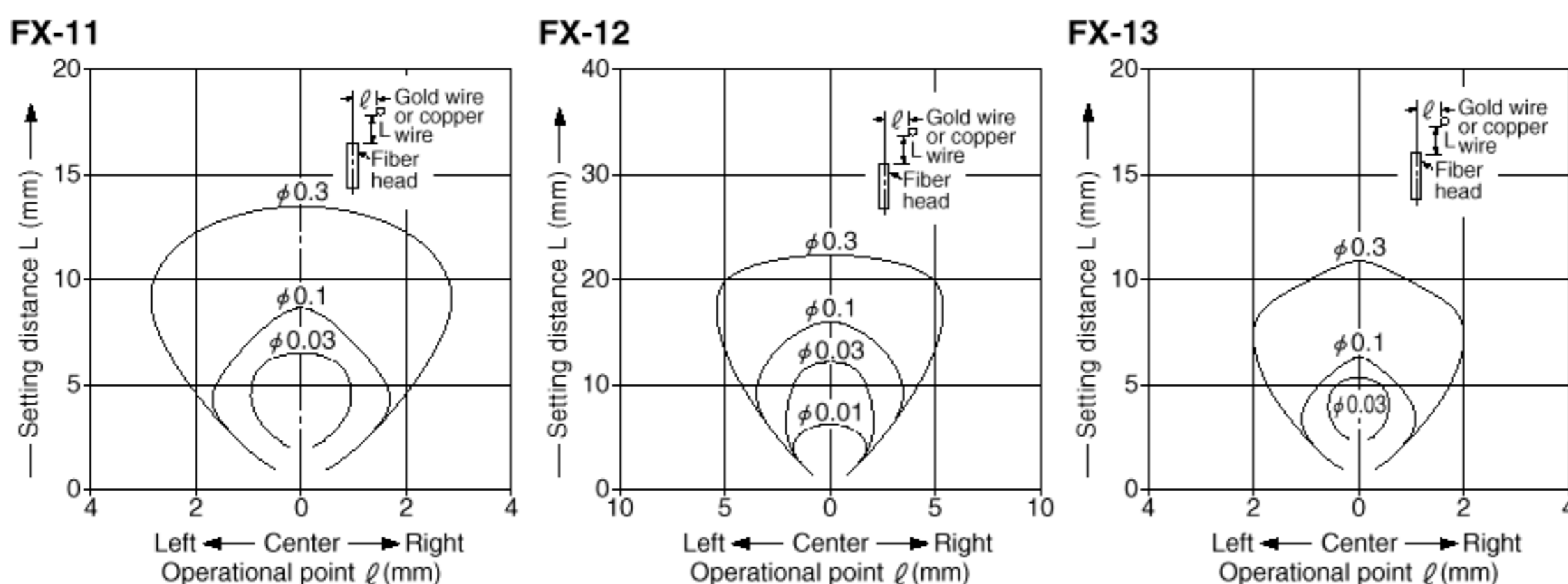
### FD-FM2 FD-T80 FD-S80 Reflective



### FD-T40 FD-NFM2 Reflective



### FD-P80 Reflective



FZ-10

FX-7

FX-10

FX-11A

CX-20

CX-30

CX-ND300R

EX-10

EQ-20

EQ-30

EX-40

RX

RX-LS200

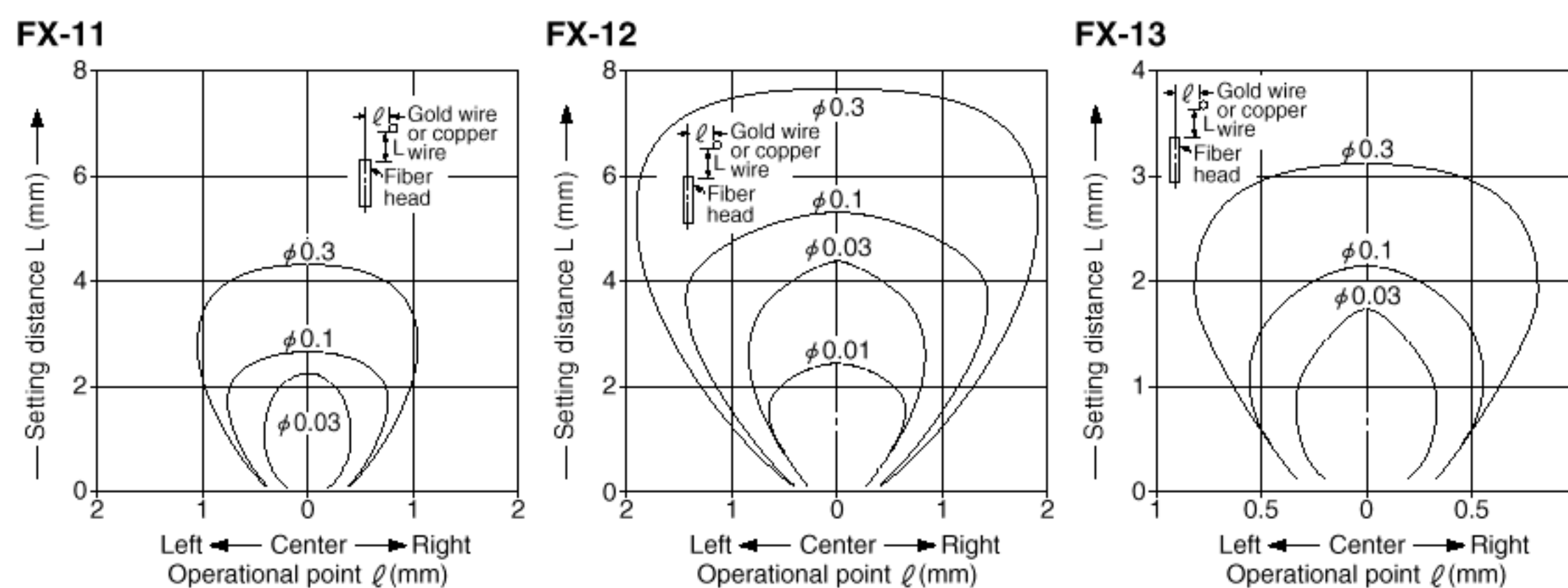
Amplifier Built-in Type

# FX-10

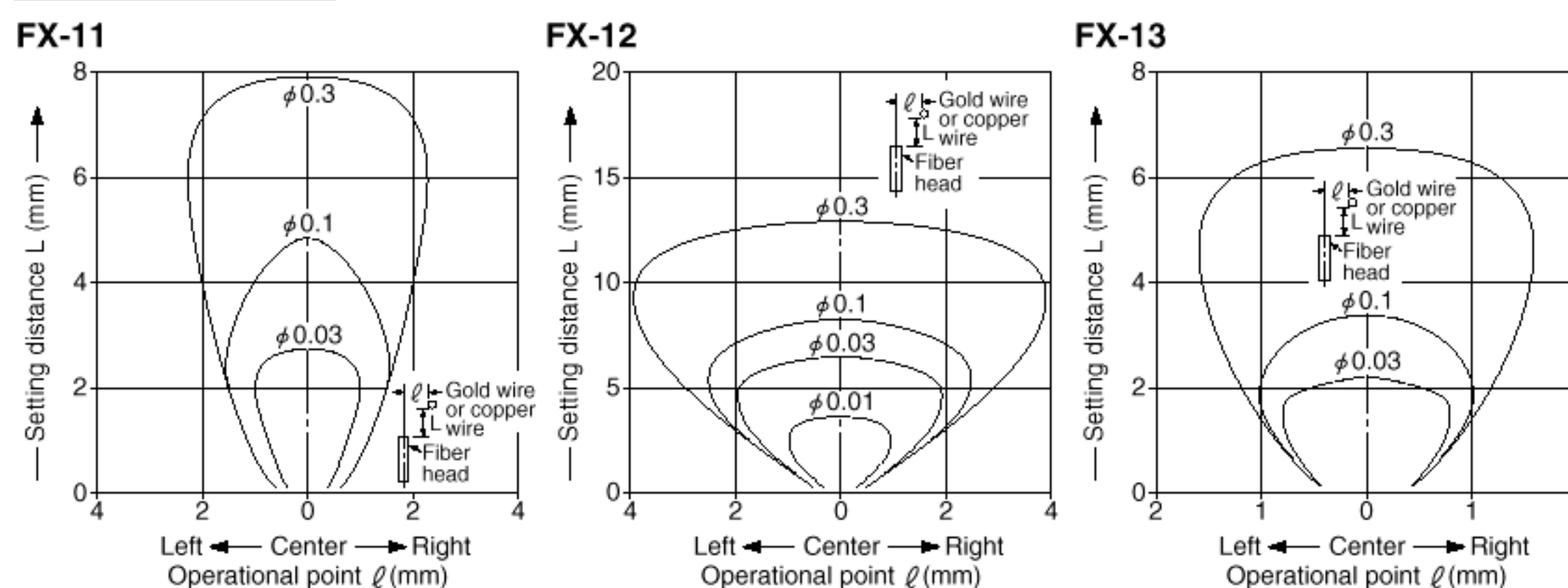
## SENSING FIELDS (TYPICAL)

Correlation between diameter of an object and sensing fields

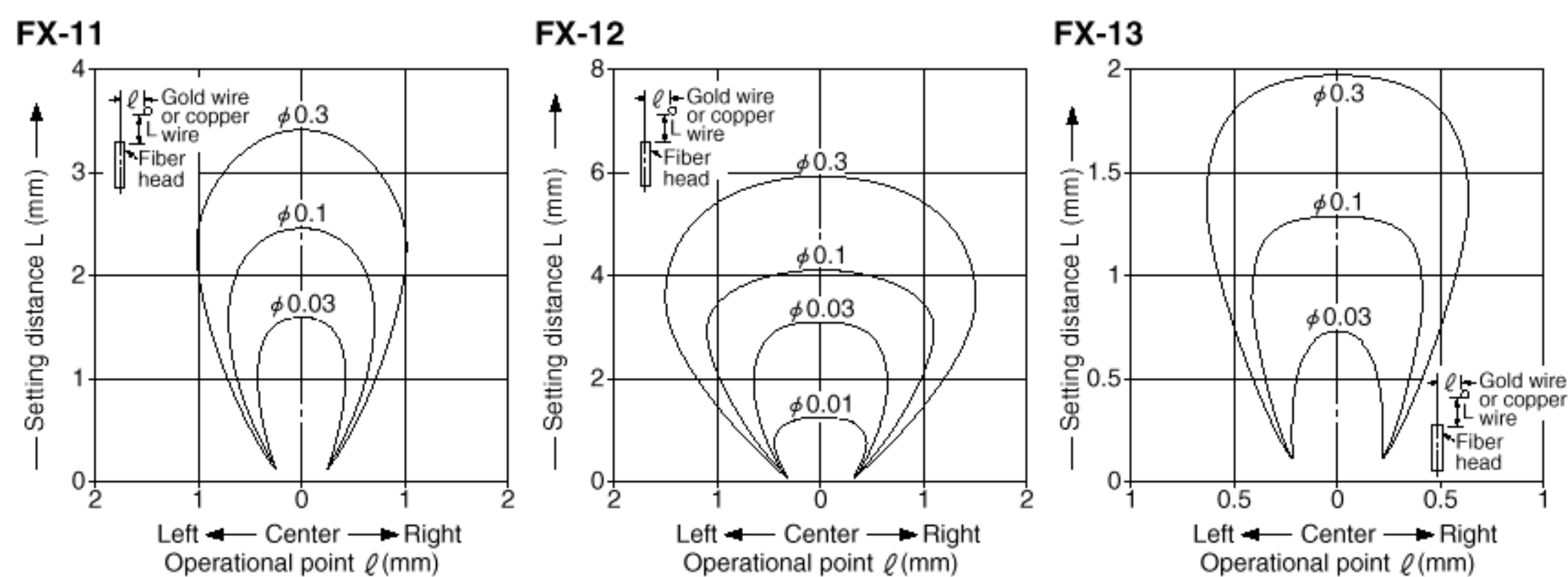
### FD-P2 Reflective



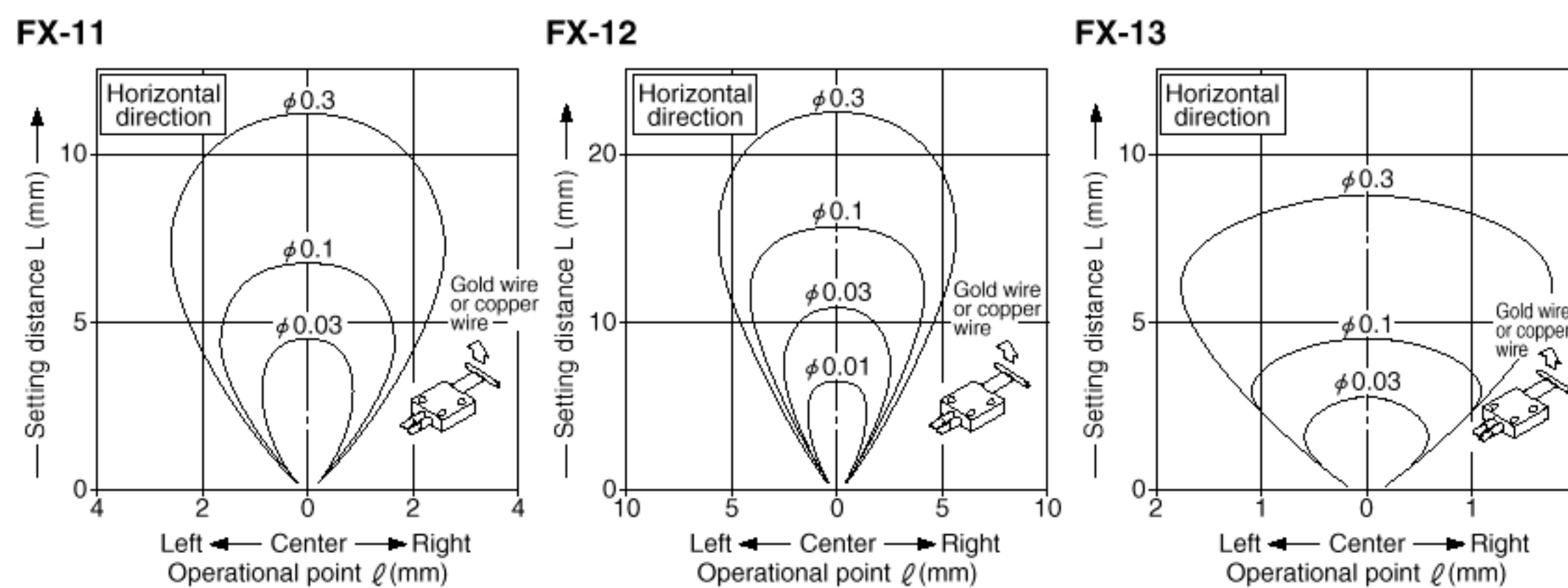
### FD-G4 Reflective



### FD-EG1 Reflective



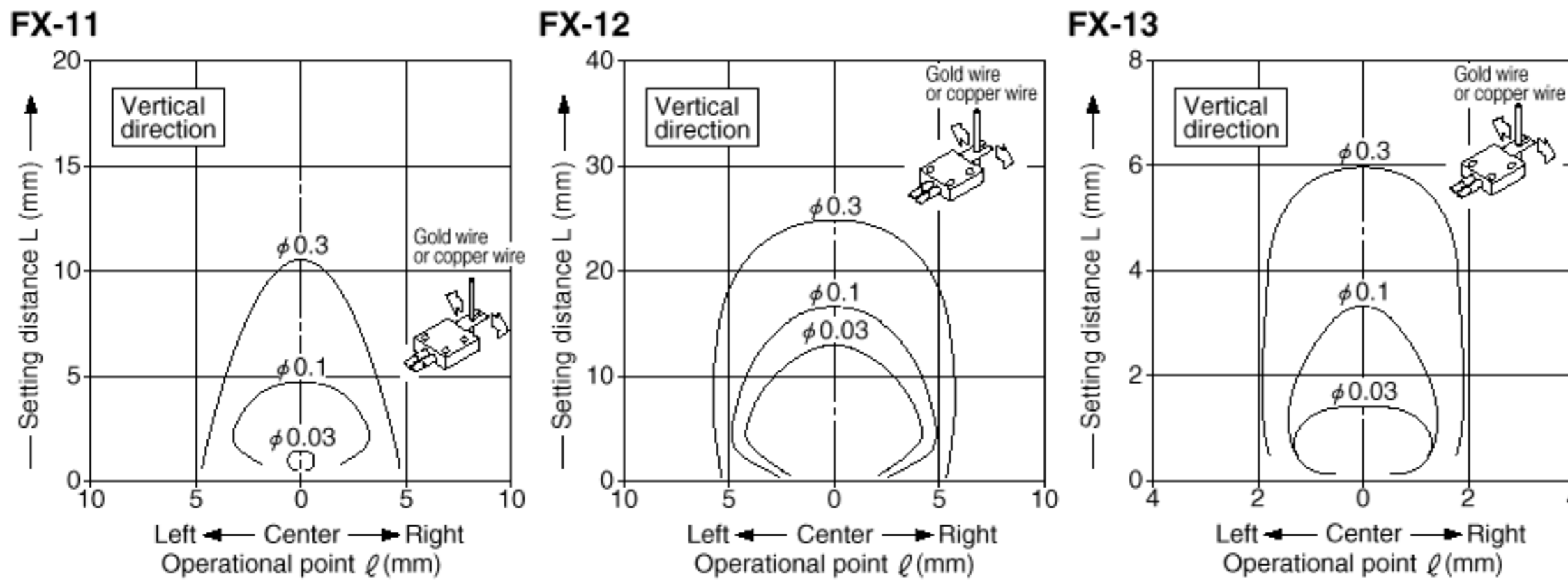
### FD-AFM2 Reflective



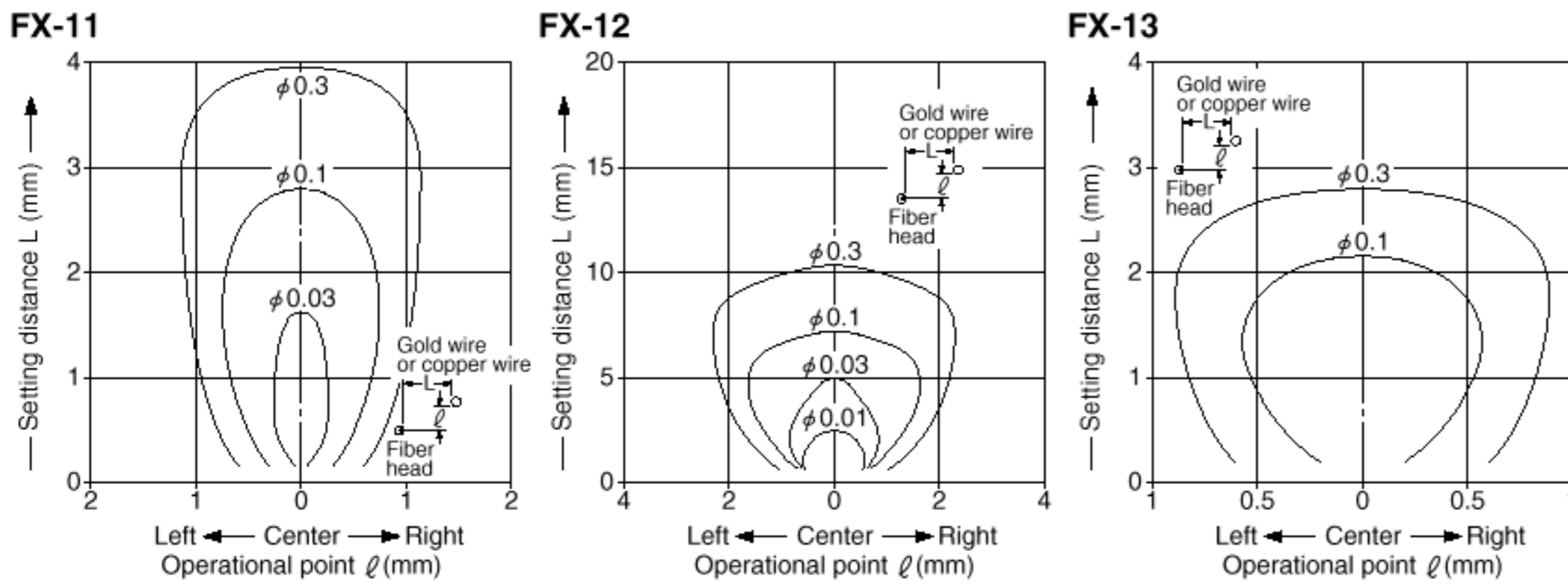
## SENSING FIELDS (TYPICAL)

Correlation between diameter of an object and sensing fields

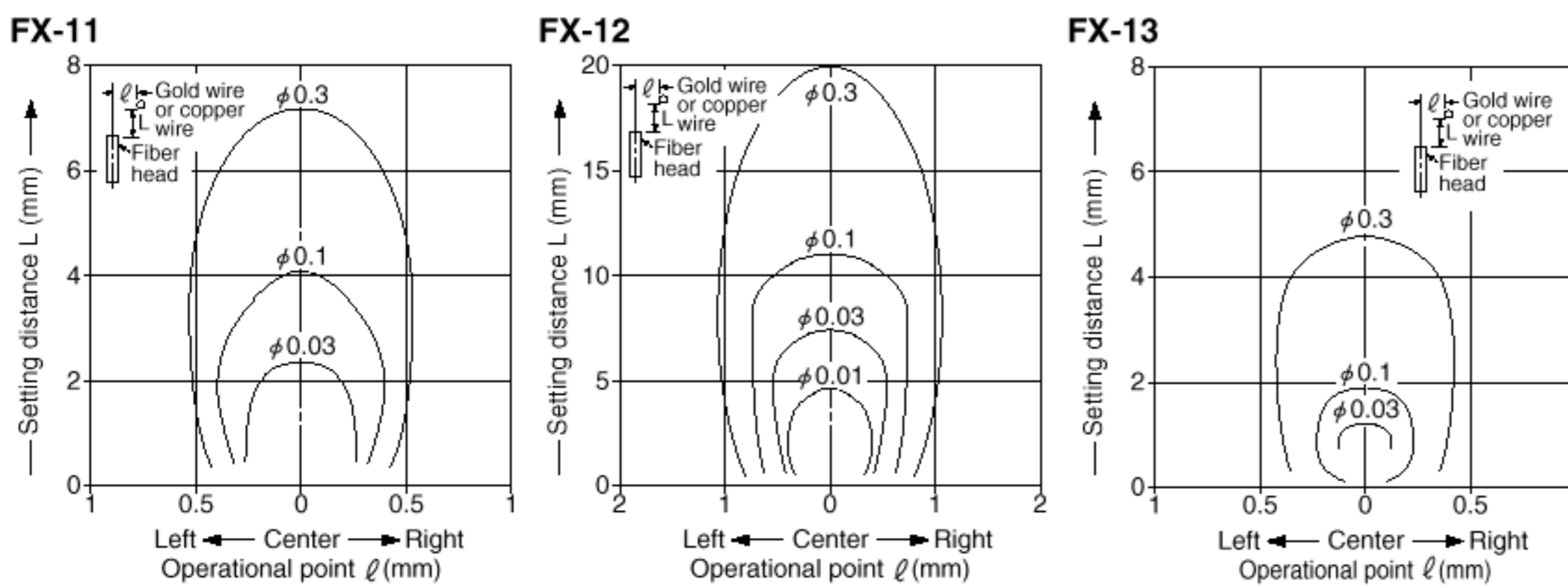
### FD-AFM2 Reflective



### FD-SFM2SV2 Reflective



### FD-KM1S2 Reflective



Refer to P. 57~ for crosstalk characteristics

FZ-10

FX-7

FX-10

FX-11A

CX-20

CX-30

CX-ND300R

EX-10

EQ-20

EQ-30

EX-40

RX

RX-LS200

Amplifier Built-in Type

## PRECAUTIONS FOR PROPER USE

Refer to P.682~ for general cautions and P.62~ for fiber cautions

## Amplifier

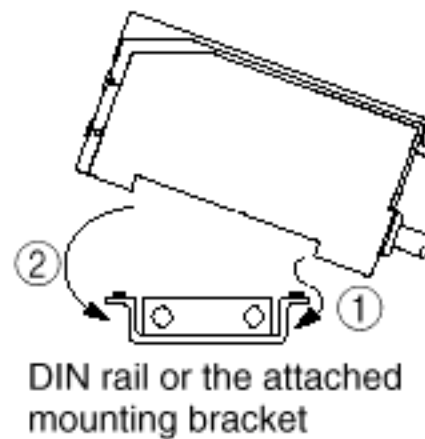


This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body injury or property damage from dangerous parts of machinery. It is a normal object detection sensor.

## Mounting

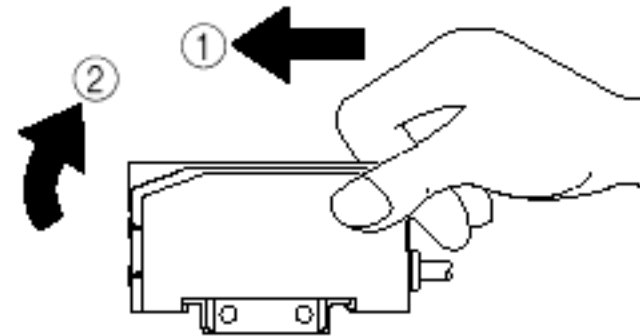
## How to mount the amplifier

- Hook the rear part to the attached mounting bracket (MS-DIN-2) or DIN rail.
- Press the amplifier down on the bracket or DIN rail.



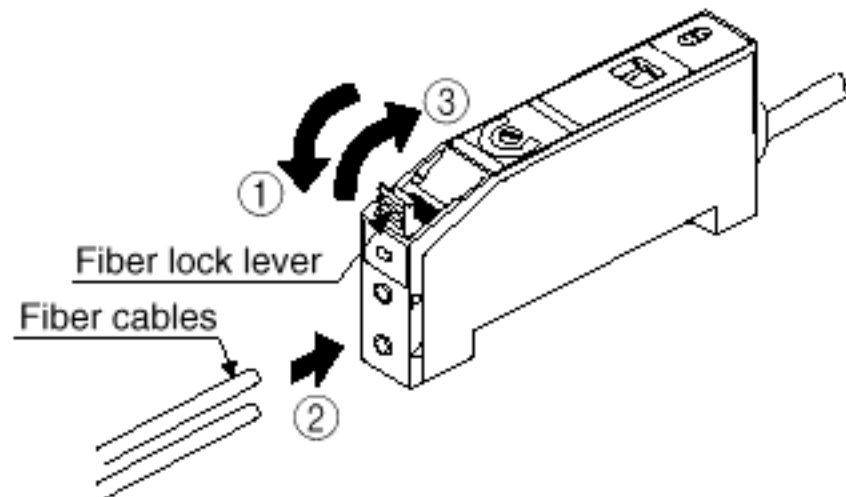
## How to remove the amplifier

- Push the amplifier forward.
- With keeping on it, lift up the front part of the amplifier.

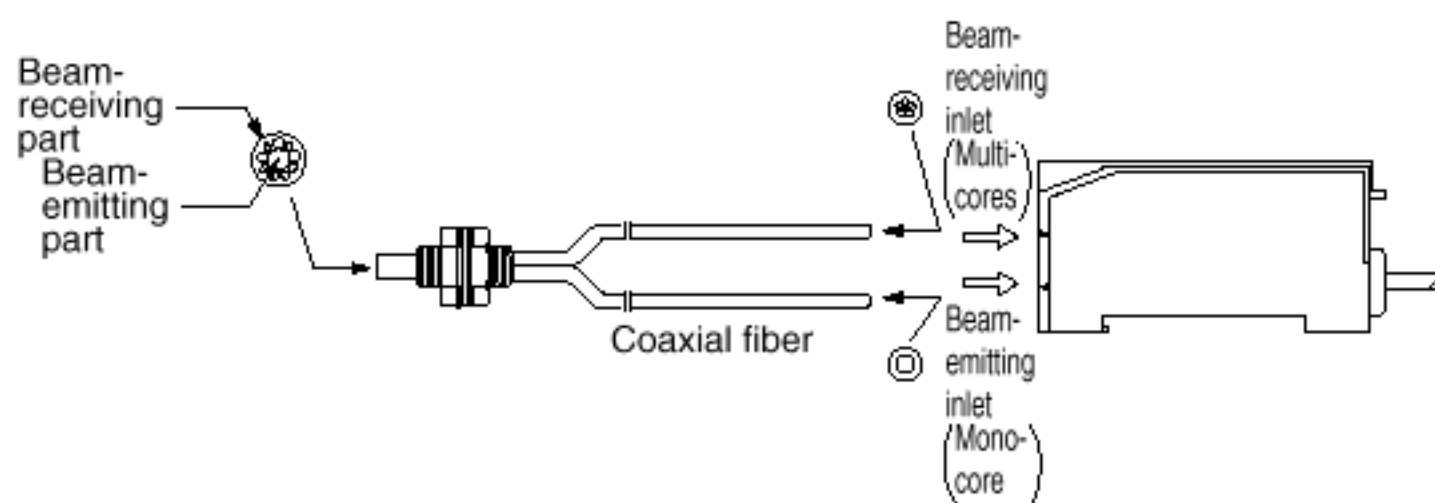


## How to connect fiber cables

- Unlock the fiber lock lever upright.
- Insert fiber cables into the inlets slowly until fully deepened.
- Lock the fiber lock lever on the original position.



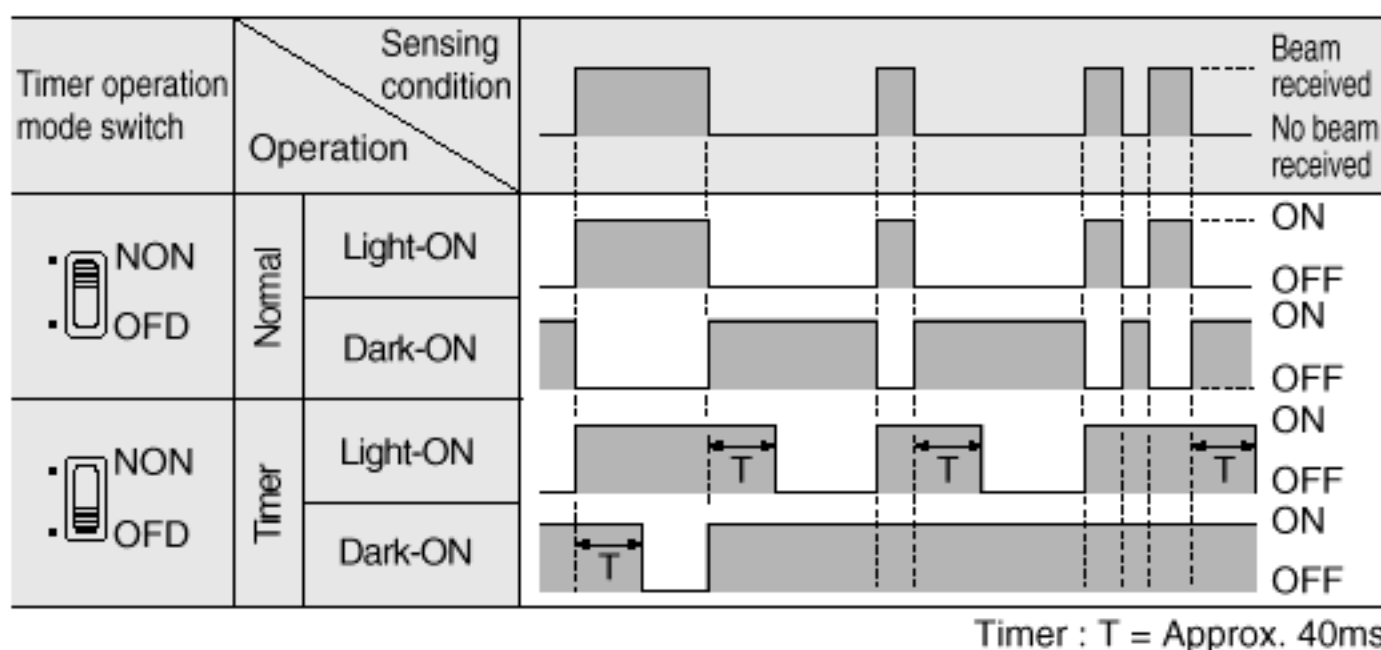
(\*1): With the coaxial diffuse fiber such as the FD-G4 or the FD-FM2, insert the mono-core fiber cable into the beam-emitting inlet and the multi-core fiber cable into the beam-receiving inlet. If they are inserted in opposition, the repeatability will deteriorate.



## OFF-delay timer function

- The FX-10 series is incorporated with the OFF-delay timer fixed for approx. 40ms. The timer function is useful if the output signal responds so quickly that a connected device can not take in. To bring the timer in effect condition set the timer operation mode switch to "OFD".

## &lt; Time chart &gt;



## Wiring

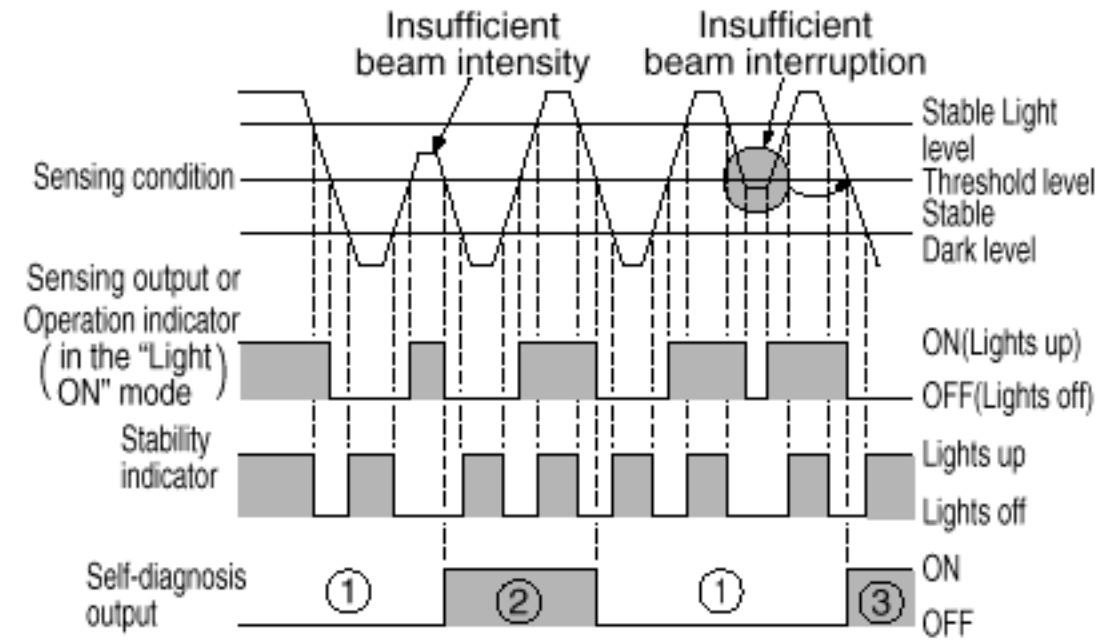
- The FX-10 series does not incorporate a short-circuit protection at the self-diagnosis output. Do not connect it directly to a power source or a capacitive load.

## Others

- The transient time duration is 50ms after power-up.

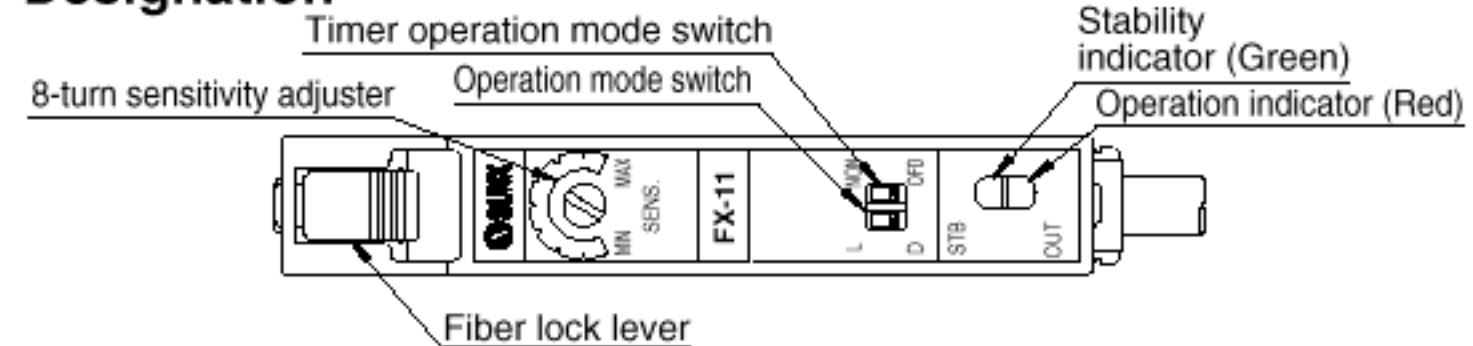
## Self-diagnosis function

The sensor diagnosis itself in the incident beam intensity. If the lens is foiled with dirt or dust, or the beam alignment is displaced, the output is generated.



- The self-diagnosis output transistor stays in the "OFF" state during the stable sensing.
- If the incident beam intensity does not reach the stable Light or Dark level, the self-diagnosis output is turned ON at the same time as the sensor goes from the Light state to the Dark state. It is automatically restored after approx. 40ms. (The sensing output does not relate to it.)
- The incomplete Light state introduces to generate the self-diagnosis output at the same time as the sensor changes the states. However, the incomplete Dark state introduces to generate the self-diagnosis output half-cycle behind.

## Designation



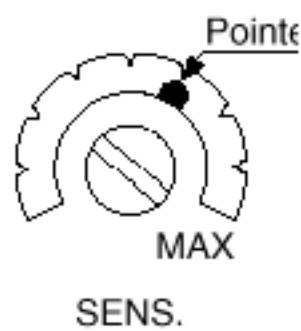
## Sensitivity adjustment

## Normal usage

- Adjust the sensitivity with observing the operation indicator. Which state it lights up depends on the mode set with the operation mode switch.

Mode	Sensing condition		Operation indicator
	Light state	Dark state	
D-ON (Dark-ON)	Light state	●	
	Dark state	☀	
L-ON (Light-ON)	Light state	☀	
	Dark state	●	

- The sensitivity adjuster is the 8-turn trimmer. The maximum sensitivity can be obtained by fully turned clockwise.
- The pointer shows where you set the sensitivity.



Pro- cedure	Sensing condition		Operation	Setting adjuster
	Reflective	Thru- beam		
①	Beam received	Beam received	Set the operation mode switch in Light-ON mode. (Initialization)	Turn the sensitivity adjuster counter-clockwise fully. (The minimum sensitivity)
②	Beam received	Beam received	On condition that beam is received, turn the adjuster clockwise and find the position ④ where the sensor is switched ON.	MAX SENS.
③	No beam received	No beam received	On condition that beam is not received, turn the adjuster further clockwise until the sensor goes into the ON state again. Once it is switched on, turn the adjuster backwards a little and find the position ⑤ where it is switched OFF. If the sensor does not go into the ON state (normally in the thru-beam mode), the position ⑤ is designated at the maximum point (MAX.).	OFF SENS.
④	---	---	Set the adjuster at the center between ④ and ⑤. It is regarded as the optimum sensitivity point.	MAX SENS.
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)			MAX SENS.

(\*1): In order to protect the mechanism, the sensitivity adjuster idles even over turned.

## PRECAUTIONS FOR PROPER USE

Refer to P.682~ for general cautions and P.62~ for fiber cautions

### Amplifier

#### Combination with FD-F8Y

- Adjust the sensitivity with observing the operation indicator. Which state it lights up depends on the mode set with the operation mode switch.

MODE	Sensing condition	Operation indicator	
		☀: Lights up	●: Lights off
D-ON (Wet-ON)	In-liquid	☀	●
	Off liquid	●	☀
L-ON (Dry-ON)	In-liquid	●	☀
	Off liquid	☀	●

Pro- cedure	Sensing condition	Operation	Sensitivity adjuster
①	Set the mode as D-ON (Wet-ON). (Initialization)	Turn the sensitivity adjuster counterclockwise fully. (The minimum sensitivity)	
②		In the In-liquid state, the fiber head is immersed in liquid, turn the adjuster clockwise until the output is turned into ON at the point ㉑.	
③		In the Off-liquid state, the fiber head is placed in the air, turn the adjuster further clockwise until the output is turned into ON again. Once it is turned ON, turn the adjuster gradually counterclockwise until the output is turned into OFF at the point ㉒. (If the output does not go into the ON state even the adjuster is fully turned, the point ㉒ can be regarded as the maximum point.)	
④		Set the adjuster at the center between the point ㉑ and ㉒. It is regarded as the optimum sensing position.	
⑤	Select the mode according to your need. (D-ON : Wet-ON, L-ON : Dry-ON)		

(\*1) : In order to protect the mechanism, the sensitivity adjuster idles even over turned.

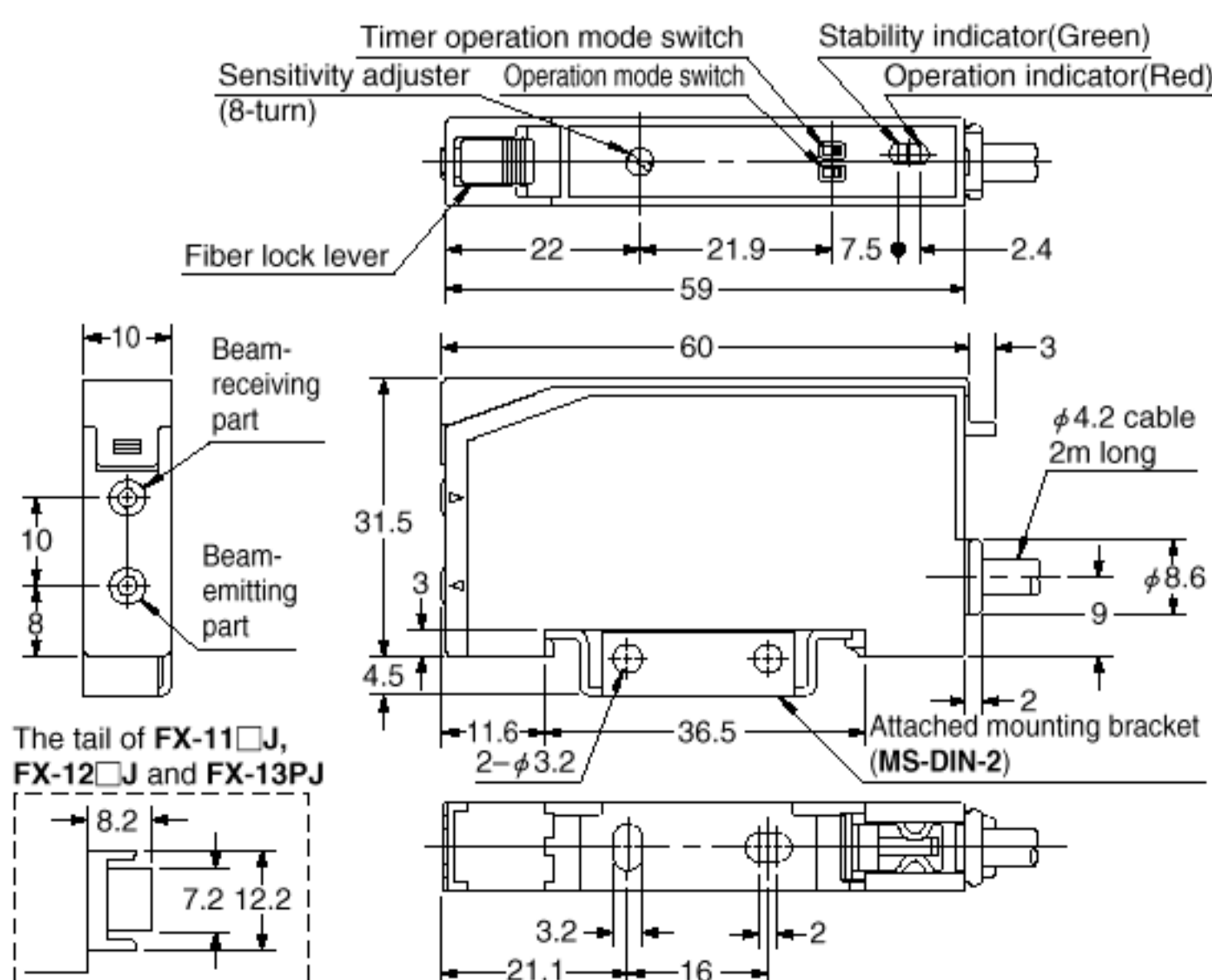
#### Trouble shooting

- Output chatter will be caused by a liquid drop on the fiber head. Turn the sensitivity adjuster further clockwise to rise the threshold level or use the timer function.
- Reflection on tank bottom will cause the sensor to generate the output. Readjust the sensitivity at the depth you want to detect the level.

#### DIMENSIONS (Unit : mm)

#### FX-11 FX-11G FX-12 FX-13 Amplifier

#### Assembled dimensions with attached mounting bracket



#### Combination with FD-F4 or FD-F9

- Adjust the sensitivity with observing the operation indicator. Which state it lights up depends on the mode set with the operation mode switch.

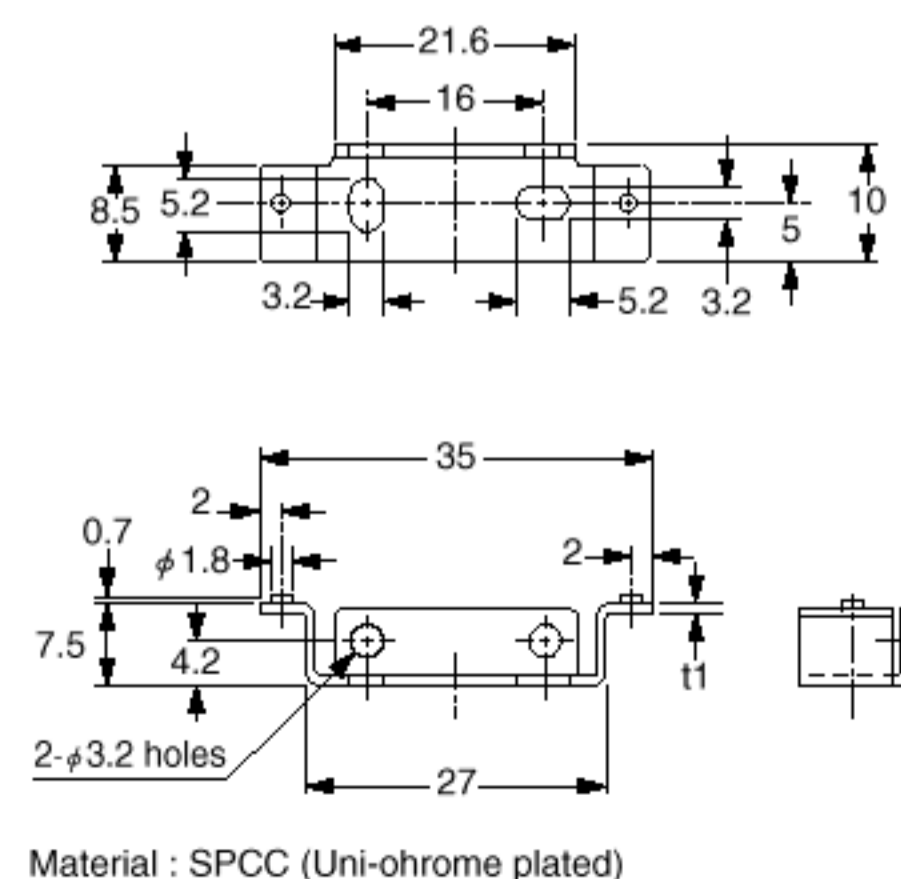
MODE	Sensing condition	Operation indicator	
		☀: Lights up	●: Lights off
D-ON (High-level-ON)	High-level	☀	●
	Low-level	●	☀
L-ON (Low-level-ON)	High-level	●	☀
	Low-level	☀	●

Pro- cedure	Sensing condition	Operation	Sensitivity adjuster
①	Set mode on D-ON (High-level-ON) (Initialization)	Turn the sensitivity adjuster counterclockwise fully. (The minimum sensitivity)	
②		In the Low-level state, the level is lower than the position the fiber head is mounted, turn the adjuster clockwise until the output is turned into OFF at the point ㉑.	
③		In the High-level state, turn the adjuster further clockwise until the output is turned into OFF again. Once it is turned OFF, turn the adjuster gradually counterclockwise until the output is turned into ON at the point ㉒. (If the output does not go into the OFF state, even the adjuster is fully turned, the point ㉒ can be regarded as the maximum point.)	
④		Set the adjuster at the center between the point ㉑ and ㉒. It is regarded as the optimum sensing position.	
⑤	Select the mode according to your need. (D-ON : High-level-ON, L-ON : Low-level-ON)		

(\*1) : In order to protect the mechanism, the sensitivity adjuster idles even over turned.

Refer to P.67~ for the dimensions other than the below illustration

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



FZ-10

FX-7

FX-10

FX-11A

CX-20

CX-30

CX-ND300R

EX-10

EQ-20

EQ-30

EX-40

RX

RX-LS200