

# Fiber Unit Selection Catalog

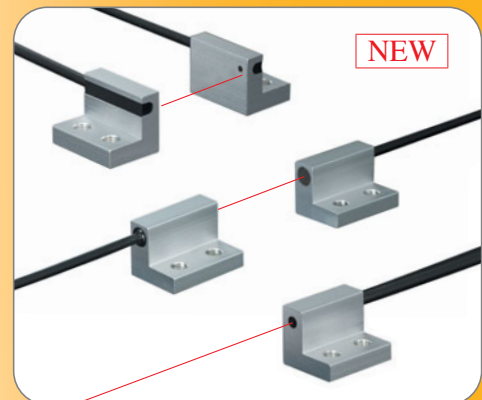


Choose from the largest selection of fiber optic sensors in the industry!

FU-E40 1.57" 40 mm AREA BEAM



FU-L INTEGRATED BRACKET FIBERS



Please contact us  
if you have any questions.



Tell the operator you want to  
find out more about our Fiber Units.  
Specialists are available  
to take your call.

CALL  
TOLL  
FREE

1-888-KEYENCE  
1-888-539-3623



## Easy step-by-step fiber search

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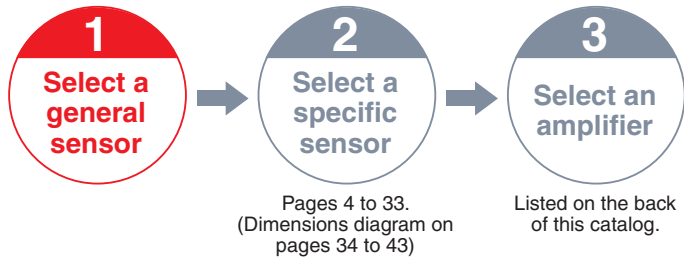
Model	Page
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Dimensions for each fiber unit can be found starting from **P.34** of this catalog.

# Selecting a Fiber Sensor

Follow the steps below to select the fiber sensor that suits your particular needs.



## STEP 1 Select a general sensor

### Mounting Configurations

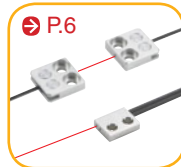
Select from a variety of fibers specifically designed for easy installation.

#### Integrated Bracket



Sensor is integrated into a metal bracket.

#### Flat



Flat pack fibers provide space saving.

#### Threaded and Hex-shaped Fibers



Screw shape allows for easy mounting onto a bracket.

#### Cylinder



Secured using a set screw. Allows for space-saving installation.

#### Sleeve



Tip is a thin sleeve.

### Beam Configurations

Select from a variety of beam styles and shapes.

#### Small Spot Reflective



Ideal for small object detection.

#### Area



Reliable detection of vibrating targets.

#### Retro-reflective



Excellent for transparent target detection.

#### Narrow Beam/High-Power



Built-in lensing tightens beam angles to provide for long distance detection.

#### Definite-reflective



Detection within a fixed distance.

### Application-specific

Select from a variety of fibers to suit your application needs.

#### High-flex



Ideal for use where fiber optic movement is required.

#### Oil/Chemical Resistant



Sensor is encased in a PTFE case.

#### Heat Resistant



Ideal for use under high temperatures. Withstands up to 662°F (350°C).

#### Liquid-level



Pipe attachment and direct contact liquid level sensors are available.

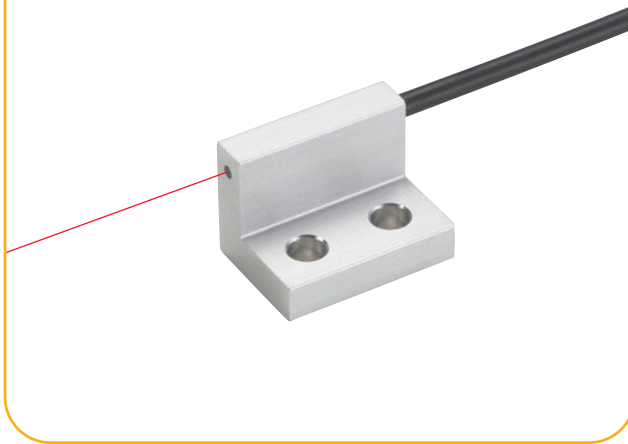
#### Liquid Crystals/Semiconductors



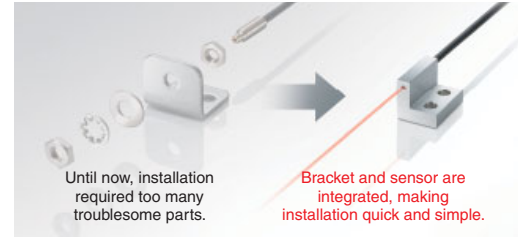
Sensors for alignment and mapping.

## STEP 2 Select a specific sensor

### Integrated Bracket **NEW**



The bracket and sensor are integrated, which eliminates the need for troublesome assembly.



Let us help you make your selection. Tell the operator you want to find out more about our Fiber Units.

**CALL TOLL FREE** 1-888-KEYENCE  
1-888-539-3623

**RED** indicates thrubeam fibers.

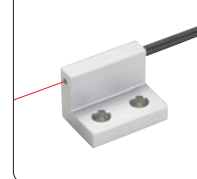
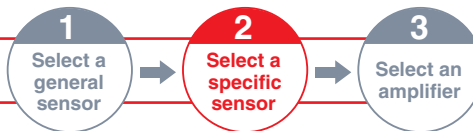
Unit: inch mm

Type	Detecting method	Beam emitting direction	Optical axis height	Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Optical axis diameter (Standard target to be detected)	Smallest detectable object <sup>*2</sup>	Model	Weight	Dimensions
							MEGA	Other power modes					
Thrubeam	Top		0.39" 10	6.6' 2 m Free-cut (ø0.09") (ø2.2) -40 to +122°F (-40 to +50°C)		R0.08" R2 ToughFlex		ULTRA : 141.73" (141.73') 3600 (3600) SUPER : 141.73" (141.73') 3600 (3600) TURBO : 141.73" (118.11') 3600 (3000) HSP : 55.12" (35.43') 1400 (900)	ø0.14" ø3.5	ø0.0002" ø0.005	<b>NEW</b> FU-L50Z Approx. 30 g	⇒P.41	
				6.6' 2 m Free-cut (ø0.09") (ø2.2) -40 to +122°F (-40 to +50°C)					<b>NEW</b> FU-L51Z Approx. 30 g				
				6.6' 2 m Free-cut (ø0.09") (ø2.2) -40 to +122°F (-40 to +50°C)					<b>NEW</b> FU-L52Z Approx. 30 g	⇒P.41			
				6.6' 2 m Free-cut (ø0.09") (ø2.2) -40 to +122°F (-40 to +50°C)					<b>NEW</b> FU-L53Z Approx. 30 g				
		Side		0.39" 10	6.6' 2 m Free-cut (ø0.09") (ø2.2) -40 to +122°F (-40 to +50°C)				ULTRA : 43.31" (25.20') 1100 (640) SUPER : 24.41" (16.93') 620 (430) TURBO : 19.69" (13.78') 500 (350) HSP : 6.30" (3.54') 160 (90)	ø0.04" ø1.13	ø0.0002" ø0.005	<b>NEW</b> FU-L54Z Approx. 30 g	⇒P.41

\*1 When using the FS-V30.

\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

Smaller types can be found on **P.6**.



**BLUE** indicates reflective fibers.

Unit: inch mm

Type			Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Smallest detectable object <sup>*2</sup>	Model Weight	Dimensions
Detecting method	Beam emitting direction	Optical axis height				MEGA	Other power modes			
Reflective	Top	0.39" 10	6.6' 2 m Free-cut (ø0.09") (ø2.2) -40 to +122°F (-40 to +50°C)		R0.08" R2 ToughFlex	MEGA: 19.69" (15.75') 500 (400) FINE: 3.35" (2.56') 85 (65)	ULTRA : 15.75" (12.60') 400 (320) SUPER: 8.66" (7.09') 220 (180) TURBO: 6.69" (5.12') 170 (130) HSP : 1.97" (1.42') 50 (36)	ø0.0002" ø0.005	<b>NEW</b> FU-L41Z Approx. 25 g	➔ P.41

\*1 When using the FS-V30. Standard target: White mat paper (Reflective type only.)  
\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

Smaller types can be found on **P.7**.

What our customers are saying. . .

- Installation used to take all day with a large number of sensors. This is much easier.
- Now I don't have to worry about losing nuts when I drop them. That really used to get to me.
- The optical axis height is easy to understand, which simplifies machine designing.
- With the built-in lens, there is no more worry that the lens might come off.
- Comparing the old and new sensor styles, it is easy to see that the new fibers are much smaller. This helps to make machine designs more compact.
- Why didn't we have something like this before?



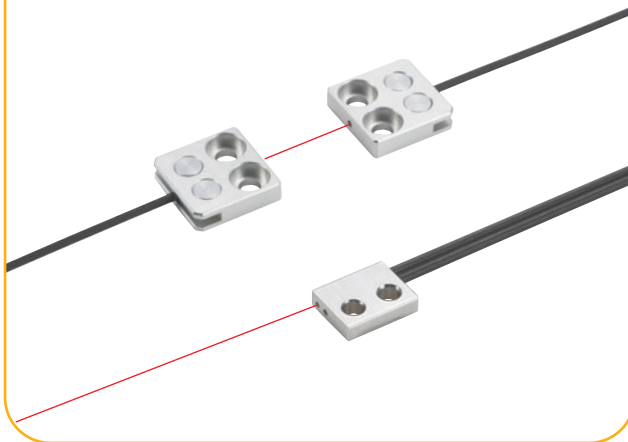
No more worries about bracket design, bracket and sensor assembly, or loose brackets. Integrated designs reduce space requirements.

- Integrated Bracket
- Flat
- Threaded/Hex-shaped
- Cylinder
- Sleeve
- Small Spot
- Area
- Retro-reflective
- Narrow Beam/High-Power
- Definite-reflective
- High-flex
- Oil/Chemical Resistant
- Heat Resistant
- Liquid-level
- Liquid Crystals/Semiconductors

# STEP 2

## Select a specific sensor

### Flat Bracket Fibers



Can be installed where little space is available.



Let us help you make your selection. Tell the operator you want to find out more about our Fiber Units.

**CALL TOLL FREE** 1-888-KEYENCE  
1-888-539-3623

**RED** indicates thru-beam fibers.

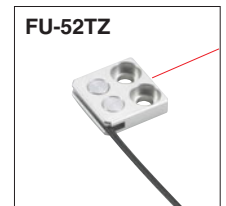
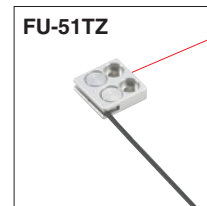
Unit: inch mm

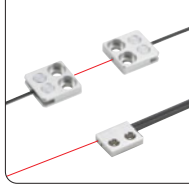
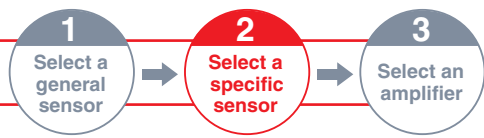
Type	Detecting method	Beam emitting direction	Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Optical axis diameter (Standard target to be detected)	Smallest detectable object <sup>*2</sup>	Model	Weight	Dimensions
						MEGA	Other power modes					
Thru-beam	Top	Top	3.3' 1 m Free-cut (ø0.04')(ø1.0)	<p>10 -40 to +122°F (-40 to +50°C) 0.39"</p> <p>2-ø0.08" ø2.1</p> <p>Thickness: 0.12" 3</p>	R0.08" R2 ToughFlex	<p>14.96" (11.02") 380 (280)</p> <p>2.95" (2.36") 75 (60)</p>	<p>ULTRA : 11.81" (9.06") 300 (230)</p> <p>SUPER : 7.09" (5.91") 180 (150)</p> <p>TURBO : 5.91" (4.72") 150 (120)</p> <p>HSP : 1.77" (0.98") 45 (25)</p>	ø0.02" ø0.5	ø0.0002" ø0.005	FU-51TZ	Approx. 5 g	Ⓢ P.37
			6.6' 2 m Free-cut (ø0.05')(ø1.3)	<p>14 -40 to +122°F (-40 to +50°C) 0.55"</p> <p>2-ø0.13" ø3.2</p> <p>Thickness: 0.14" 3.5</p>		<p>51.18" (39.37") 1300 (1000)</p> <p>9.84" (7.87") 250 (200)</p>	<p>ULTRA : 43.31" (33.46") 1100 (850)</p> <p>SUPER : 24.41" (19.64") 620 (500)</p> <p>TURBO : 19.69" (15.75") 500 (400)</p> <p>HSP : 0.30" (3.94") 160 (100)</p>					
		Side	3.3' 1 m Free-cut (ø0.04')(ø1.0)	<p>10.5 0.41"</p> <p>ø0.08"</p> <p>2-ø2.1</p> <p>Thickness: 0.10"</p>		<p>12.99" (9.84") 330 (250)</p> <p>2.17" (1.77") 55 (45)</p>	<p>ULTRA : 9.84" (7.87") 250 (200)</p> <p>SUPER : 5.91" (4.72") 150 (120)</p> <p>TURBO : 4.33" (3.54") 110 (90)</p> <p>HSP : 1.38" (0.98") 35 (25)</p>	ø0.02" ø0.5	FU-57TZ	Approx. 5 g	Ⓢ P.38	
			Flat	3.3' 1 m Free-cut (ø0.04')(ø1.0)		<p>7 0.28"</p> <p>130.51"</p> <p>ø0.08"</p> <p>2-ø2.1</p> <p>Thickness: 0.08" 2</p>	<p>9.84" (7.87") 250 (200)</p> <p>1.97" (1.57") 50 (40)</p>					<p>ULTRA : 7.87" (5.91") 200 (150)</p> <p>SUPER : 5.12" (3.94") 130 (100)</p> <p>TURBO : 3.94" (3.15") 100 (80)</p> <p>HSP : 1.57" (0.98") 40 (25)</p>
		Flat	2 m 6.6' Free-cut (ø0.09')(ø2.2)	<p>0.28" 7</p> <p>0.59" 15</p> <p>2-M3</p> <p>Thickness: 0.16" 4</p>		<p>51.18" (39.37") 1300 (1000)</p> <p>9.84" (7.87") 250 (200)</p>	<p>ULTRA : 43.31" (33.46") 1100 (850)</p> <p>SUPER : 24.41" (19.69") 620 (500)</p> <p>TURBO : 19.69" (15.75") 500 (400)</p> <p>HSP : 6.30" (3.94") 160 (100)</p>	FU-54TZ	Approx. 25 g			

\*1 When using the FS-V30.

\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

FU-51TZ/52TZ also can be used as side-view fibers.





**BLUE** indicates reflective fibers.

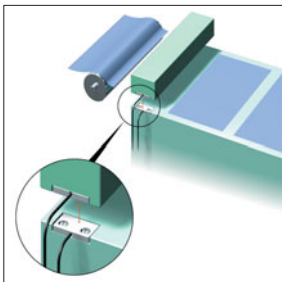
Unit: inch mm

Type	Detecting method	Beam emitting direction	Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Smallest detectable object <sup>*2</sup>	Model Weight	Dimensions
						MEGA	Other power modes			
Reflective		Top	3.3' 1 m Free-cut (ø0.04" ø1.0 x 2) -40 to +122°F (-40 to +50°C)		R0.08" R2 ToughFlex	0.04" to 3.54" (0.04" to 2.95") 1 to 90 (1 to 75)	ULTRA : 0.04" to 2.95" (0.04" to 2.36") 1 to 75 (1 to 60) SUPER : 0.04" to 1.77" (0.04" to 1.46") 1 to 45 (1 to 37) TURBO : 0.04" to 1.46" (0.04" to 1.18") 1 to 37 (1 to 30) HSP : 0.04" to 0.35" (0.04" to 0.24") 1 to 9 (1 to 6)	ø0.0002" ø0.005 gold wire	FU-44TZ Approx. 3 g	P.37
						0.04" to 3.54" (0.04" to 2.95") 1 to 90 (1 to 75)	ULTRA : 0.04" to 2.95" (0.04" to 2.36") 1 to 75 (1 to 60) SUPER : 0.04" to 1.77" (0.04" to 1.46") 1 to 45 (1 to 37) TURBO : 0.04" to 1.46" (0.04" to 1.18") 1 to 37 (1 to 30) HSP : 0.04" to 0.47" (0.04" to 0.31") 1 to 12 (1 to 8)			
						0.08" to 2.36" (0.08" to 1.97") 2 to 60 (2 to 50)	ULTRA : 0.08" to 1.97" (0.08" to 1.57") 2 to 50 (2 to 40) SUPER : 0.08" to 0.98" (0.08" to 0.79") 2 to 25 (2 to 20) TURBO : 0.08" to 0.79" (0.08" to 0.63") 2 to 20 (2 to 16) HSP : 0.08" to 0.24" (0.08" to 0.16") 2 to 6 (2 to 4)			
						0.04" to 0.98" (0.04" to 0.79") 1 to 25 (1 to 20)	ULTRA : 0.04" to 12.60" (0.04" to 9.84") 1 to 320 (1 to 250) SUPER : 0.04" to 4.72" (0.04" to 3.94") 1 to 120 (1 to 100) TURBO : 0.04" to 2.95" (0.04" to 2.36") 1 to 75 (1 to 60) HSP : 0.04" to 1.18" (0.04" to 0.98") 1 to 30 (1 to 25)			
		Side	3.3' 1 m Free-cut (ø0.04" ø1.0 x 2) -40 to +122°F (-40 to +50°C)		R0.08" R2 ToughFlex	0.04" to 3.54" (0.04" to 2.95") 1 to 90 (1 to 75)	ULTRA : 0.04" to 2.95" (0.04" to 2.36") 1 to 75 (1 to 60) SUPER : 0.04" to 1.77" (0.04" to 1.46") 1 to 45 (1 to 37) TURBO : 0.04" to 1.46" (0.04" to 1.18") 1 to 37 (1 to 30) HSP : 0.04" to 0.35" (0.04" to 0.24") 1 to 9 (1 to 6)	ø0.0002" ø0.005 gold wire	FU-47TZ Approx. 4 g	P.37
						0.04" to 3.54" (0.04" to 2.95") 1 to 90 (1 to 75)	ULTRA : 0.08" to 1.97" (0.08" to 1.57") 2 to 50 (2 to 40) SUPER : 0.08" to 0.98" (0.08" to 0.79") 2 to 25 (2 to 20) TURBO : 0.08" to 0.79" (0.08" to 0.63") 2 to 20 (2 to 16) HSP : 0.08" to 0.24" (0.08" to 0.16") 2 to 6 (2 to 4)			
						0.08" to 2.36" (0.08" to 1.97") 2 to 60 (2 to 50)	ULTRA : 0.08" to 1.97" (0.08" to 1.57") 2 to 50 (2 to 40) SUPER : 0.08" to 0.98" (0.08" to 0.79") 2 to 25 (2 to 20) TURBO : 0.08" to 0.79" (0.08" to 0.63") 2 to 20 (2 to 16) HSP : 0.08" to 0.24" (0.08" to 0.16") 2 to 6 (2 to 4)			
						0.04" to 0.98" (0.04" to 0.79") 1 to 25 (1 to 20)	ULTRA : 0.04" to 12.60" (0.04" to 9.84") 1 to 320 (1 to 250) SUPER : 0.04" to 4.72" (0.04" to 3.94") 1 to 120 (1 to 100) TURBO : 0.04" to 2.95" (0.04" to 2.36") 1 to 75 (1 to 60) HSP : 0.04" to 1.18" (0.04" to 0.98") 1 to 30 (1 to 25)			
		Flat	3.3' 1 m Free-cut (ø0.04" ø1.0 x 2) -40 to +122°F (-40 to +50°C)		R0.08" R2 ToughFlex	0.08" to 2.36" (0.08" to 1.97") 2 to 60 (2 to 50)	ULTRA : 0.08" to 1.97" (0.08" to 1.57") 2 to 50 (2 to 40) SUPER : 0.08" to 0.98" (0.08" to 0.79") 2 to 25 (2 to 20) TURBO : 0.08" to 0.79" (0.08" to 0.63") 2 to 20 (2 to 16) HSP : 0.08" to 0.24" (0.08" to 0.16") 2 to 6 (2 to 4)	ø0.0002" ø0.005 gold wire	FU-41TZ Approx. 5 g	P.36
						0.08" to 2.36" (0.08" to 1.97") 2 to 60 (2 to 50)	ULTRA : 0.04" to 9.84" (0.04" to 7.87") 1 to 250 (1 to 200) SUPER : 0.04" to 4.72" (0.04" to 3.94") 1 to 120 (1 to 100) TURBO : 0.04" to 2.95" (0.04" to 2.36") 1 to 75 (1 to 60) HSP : 0.04" to 1.18" (0.04" to 0.98") 1 to 30 (1 to 25)			
						0.04" to 0.98" (0.04" to 0.79") 1 to 25 (1 to 20)	ULTRA : 0.04" to 12.60" (0.04" to 9.84") 1 to 320 (1 to 250) SUPER : 0.04" to 4.72" (0.04" to 3.94") 1 to 120 (1 to 100) TURBO : 0.04" to 2.95" (0.04" to 2.36") 1 to 75 (1 to 60) HSP : 0.04" to 1.18" (0.04" to 0.98") 1 to 30 (1 to 25)			
						0.04" to 0.98" (0.04" to 0.79") 1 to 25 (1 to 20)	ULTRA : 0.04" to 12.60" (0.04" to 9.84") 1 to 320 (1 to 250) SUPER : 0.04" to 4.72" (0.04" to 3.94") 1 to 120 (1 to 100) TURBO : 0.04" to 2.95" (0.04" to 2.36") 1 to 75 (1 to 60) HSP : 0.04" to 1.18" (0.04" to 0.98") 1 to 30 (1 to 25)			
		Flat	6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +122°F (-40 to +50°C)		R0.08" R2 ToughFlex	0.04" to 12.60" (0.04" to 9.84") 1 to 320 (1 to 250)	ULTRA : 0.04" to 9.84" (0.04" to 7.87") 1 to 250 (1 to 200) SUPER : 0.04" to 4.72" (0.04" to 3.94") 1 to 120 (1 to 100) TURBO : 0.04" to 2.95" (0.04" to 2.36") 1 to 75 (1 to 60) HSP : 0.04" to 1.18" (0.04" to 0.98") 1 to 30 (1 to 25)	ø0.0002" ø0.005 gold wire	FU-42TZ Approx. 24 g	P.36
						0.04" to 12.60" (0.04" to 9.84") 1 to 320 (1 to 250)	ULTRA : 0.08" to 1.97" (0.08" to 1.57") 2 to 50 (2 to 40) SUPER : 0.08" to 0.98" (0.08" to 0.79") 2 to 25 (2 to 20) TURBO : 0.08" to 0.79" (0.08" to 0.63") 2 to 20 (2 to 16) HSP : 0.08" to 0.24" (0.08" to 0.16") 2 to 6 (2 to 4)			
						0.08" to 2.36" (0.08" to 1.97") 2 to 60 (2 to 50)	ULTRA : 0.08" to 1.97" (0.08" to 1.57") 2 to 50 (2 to 40) SUPER : 0.08" to 0.98" (0.08" to 0.79") 2 to 25 (2 to 20) TURBO : 0.08" to 0.79" (0.08" to 0.63") 2 to 20 (2 to 16) HSP : 0.08" to 0.24" (0.08" to 0.16") 2 to 6 (2 to 4)			
						0.04" to 0.98" (0.04" to 0.79") 1 to 25 (1 to 20)	ULTRA : 0.04" to 12.60" (0.04" to 9.84") 1 to 320 (1 to 250) SUPER : 0.04" to 4.72" (0.04" to 3.94") 1 to 120 (1 to 100) TURBO : 0.04" to 2.95" (0.04" to 2.36") 1 to 75 (1 to 60) HSP : 0.04" to 1.18" (0.04" to 0.98") 1 to 30 (1 to 25)			

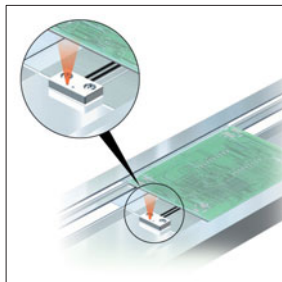
\*1 When using the FS-V30. Standard target: White mat paper (Reflective type only)  
\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

Thin, small spot fibers can be found on **P.25**

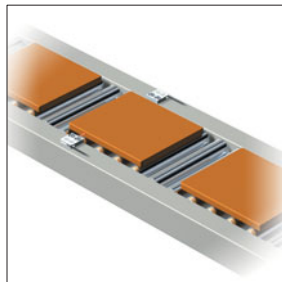
Example Installation Applications



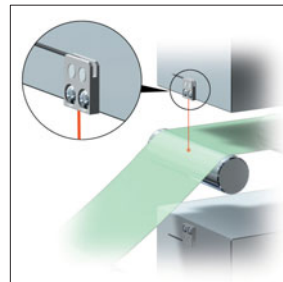
Cover page alignment



Circuit board detection



Thin work via hole detection



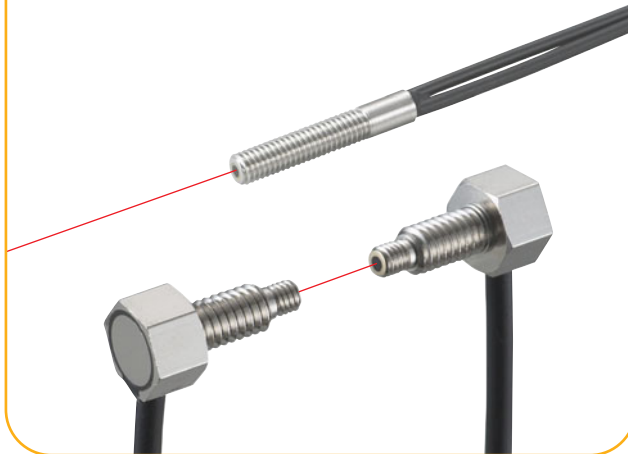
Detecting presence/absence of film

Metal casing eliminates concern about damaged sensors. The sensor and case form a flat surface, so there are no openings where dust and other foreign matter can form.

- Integrated Bracket
- Flat
- Threaded/Hex-shaped
- Cylinder
- Sleeve
- Small Spot
- Area
- Retro-reflective
- Narrow Beam/High-Power
- Definite-reflective
- High-flex
- Oil/Chemical Resistant
- Heat Resistant
- Liquid-level
- Liquid Crystals/Semiconductors

## STEP 2 Select a specific sensor

### Threaded and Hex-shaped Fibers



Conventional threaded fibers mount onto brackets like the one shown below.



Let us help you make your selection. Tell the operator you want to find out more about our Fiber Units.

**CALL TOLL FREE** 1-888-KEYENCE  
1-888-539-3623

**RED** indicates thru-beam fibers.

Unit: inch mm

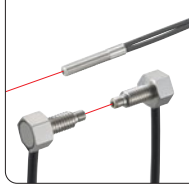
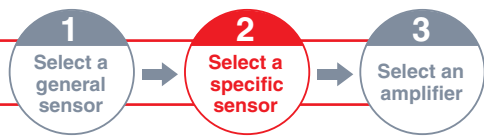
Type			Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Optical axis diameter (Standard target to be detected)	Smallest detectable object <sup>*2</sup>	Model Weight	Dimensions			
Shape	Detecting method	Size				MEGA	Other power modes							
Hex-shaped	Thru-beam	M4	6.6' 2 m Free-cut (ø0.09" ø2.2) -40 to +122°F (-40 to +50°C)		R0.08" R2 ToughFlex		<b>ULTRA</b> : 43.31" (34.65") 1100 (880) <b>SUPER</b> : 25.59" (19.69") 650 (500) <b>TURBO</b> : 19.69" (15.75") 500 (400) <b>HSP</b> : 6.69" (4.33") 170 (110)	ø0.04" ø1.13	ø0.0002" ø0.005	<b>FU-77TZ</b> Approx. 43 g				
			3.3' 1 m cut not allowed -40 to +122°F (-40 to +50°C)		R0.39" R10 Stainless Steel							55.12" (43.31") 1400 (1100)	<b>FU-77TG</b> Approx. 43 g	
			3.3' 1 m Free-cut (ø0.04" ø1.13) -40 to +122°F (-40 to +50°C)		R0.79" R20 Stainless Steel							9.84" (7.87") 250 (200)		

\*1 When using the FS-V30.

\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

See **P.12** for specifications when a thru-beam lens is attached.





**RED** indicates thrubeam fibers.

Unit: inch mm

Type			Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Optical axis diameter (Standard target to be detected)	Smallest detectable object <sup>*2</sup>	Model Weight	Dimensions			
Shape	Detecting method	Size				MEGA FINE	Other power modes							
Threaded	Thrubeam	M3	3.3' 1 m Free-cut (ø0.04" ø1.0) -40 to +158°F (-40 to +70°C)		R0.16" R4 High-flex	19.68" (14.96") 500 (380)	ULTRA : 16.54" (12.99") 420 (330) SUPER : 10.63" (7.87") 270 (200) TURBO : 8.66" (6.69") 220 (170) HSP : 2.76" (1.38") 70 (35)	ø0.028" ø0.7	ø0.0002" ø0.005	FU-79 Approx. 6 g	⇒ P.40			
			M4	6.6' 2 m Free-cut (ø0.09" ø2.2) -40 to +122°F (-40 to +50°C)		R0.02" R0.5 ToughFlex	66.93" (51.18") 1700 (1300)	ULTRA : 51.18" (43.31") 1300 (1100) SUPER : 29.53" (23.62") 750 (600) TURBO : 23.62" (18.11") 600 (460) HSP : 7.87" (5.51") 200 (140)		ø0.04" ø1.13	FU-77V Approx. 25 g	⇒ P.39		
				3.3' 1 m cut not allowed -40 to +122°F (-40 to +50°C)		R0.08" R2 ToughFlex					11.81" (0.06") 300 (230)	ULTRA : 62.99" (43.31") 1600 (1100) SUPER : 37.40" (31.50") 950 (800) TURBO : 31.50" (18.11") 800 (600) HSP : 8.66" (5.91") 220 (150)	ø0.04" ø1	FU-77 Approx. 21g
		M4	3.3' 1 m Free-cut (ø0.04" ø1.13) -40 to +122°F (-40 to +50°C)		R0.39" R10 Stainless Steel	43.31" (29.53") 1100 (750)	ULTRA : 31.50" (18.11") 800 (600) SUPER : 18.11" (14.57") 460 (370) TURBO : 14.57" (11.81") 370 (300) HSP : 5.12" (2.95") 130 (75)	ø0.04" ø1		FU-77G Approx. 39g				⇒ P.39
			6.6' 2 m Free-cut (ø0.09" ø2.2) -40 to +158°F (-40 to +70°C)		R0.79" R20 Stainless Steel					90.55" (55.12") 2300 (1400)	ULTRA : 74.80" (51.18") 1900 (1300) SUPER : 43.31" (35.43") 1100 (900) TURBO : 35.43" (27.56") 900 (700) HSP : 10.63" (6.30") 270 (160)	ø0.06" ø1.5	<b>NEW</b> FU-77MG Approx. 100 g	⇒ P.39
			6.6' 2 m Free-cut (ø0.05" ø1.3) -40 to +158°F (-40 to +70°C)		R0.98" R25								15.75" (12.60") 400 (320)	ULTRA : 78.74" (62.99") 2000 (1600) SUPER : 53.15" (39.39") 1350 (1000) TURBO : 39.37" (33.46") 1000 (850) HSP : 12.99" (7.87") 330 (200)
		M6	6.6' 2 m Free-cut (ø0.09" ø2.2) FU-71Z: -40 to +122°F (-40 to +50°C) FU-71: -40 to +158°F (-40 to +70°C)		R0.16" R4	94.49" (66.93") 2400 (1700)	ULTRA : 74.80" (51.18") 1900 (1300) SUPER : 43.31" (35.43") 1100 (900) TURBO : 35.43" (27.56") 900 (700) HSP : 10.63" (6.30") 270 (160)	ø0.04" ø1		FU-78 Approx. 9 g	⇒ P.39			
			6.6' 2 m Free-cut (ø0.09" ø2.2)		R0.08" R2 ToughFlex					17.72" (13.78") 450 (350)	ULTRA : 78.74" (62.99") 2000 (1600) SUPER : 53.15" (39.39") 1350 (1000) TURBO : 39.37" (33.46") 1000 (850) HSP : 12.99" (7.87") 330 (200)	ø0.06" ø1.5	FU-71Z Approx. 25 g	⇒ P.39
			6.6' 2 m Free-cut (ø0.05" ø1.3) -40 to +158°F (-40 to +70°C)		R0.98" R25								102.36" (74.80") 2600 (1900)	ULTRA : 78.74" (62.99") 2000 (1600) SUPER : 53.15" (39.39") 1350 (1000) TURBO : 39.37" (33.46") 1000 (850) HSP : 12.99" (7.87") 330 (200)

\*1 When using the FS-V30.

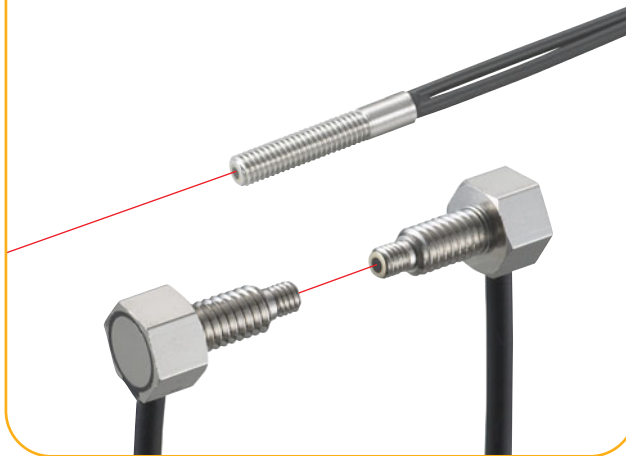
\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

See P.12 for specifications when a thrubeam lens is attached.

- Integrated Bracket
- Flat
- Threaded/Hex-shaped
- Cylinder
- Sleeve
- Small Spot
- Area
- Retro-reflective
- Narrow Beam/High-Power
- Definite-reflective
- High-flex
- Oil/Chemical Resistant
- Heat Resistant
- Liquid-level
- Liquid Crystals/Semiconductors

## STEP 2 Select a specific sensor

### Threaded and Hex-shaped Fibers



(Continued)

**BLUE** indicates reflective fibers.

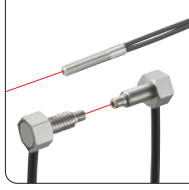
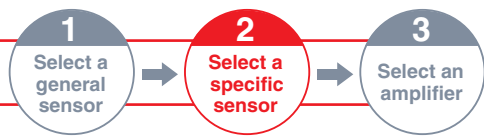
Unit: inch mm

Type				Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Smallest detectable object <sup>*2</sup>	Model Weight	Dimensions	
Shape	Detecting method	Size	Detecting Arrangement				MEGA	Other power modes				
Hex-shaped	Reflective	M3	Coaxial	3.3' 1 m Free-cut (ø0.05" ø1.3 x 2)		R0.08" R2 ToughFlex	7.09" (5.51") 180 (140)	ULTRA : 5.51" (4.33") 140 (110) SUPER : 2.95" (2.36") 75 (60) TURBO : 2.17" (1.65") 55 (42) HSP : 0.79" (0.63") 20 (16)	ø0.0002" ø0.005 gold wire	FU-35TZ	Approx. 7 g	P.35
				-40 to +122°F (-40 to +50°C)	M3	1.81" (0.91") 30 (23) Lens attachment P.18						
		M4	Parallel	6.6' 2 m Free-cut (ø0.05" ø1.3 x 2)		R0.08" R2 ToughFlex	13.78" (11.02") 350 (280)	ULTRA : 11.02" (9.06") 280 (230) SUPER : 5.91" (4.72") 150 (120) TURBO : 3.94" (3.15") 100 (80) HSP : 1.38" (1.10") 35 (28)		FU-66TZ	Approx. 10 g	P.38
				-40 to +122°F (-40 to +50°C)	M4	1.97" (1.57") 50 (40)						
		M6	Parallel	6.6' 2 m Free-cut (ø0.09" ø2.2 x 2)		R0.08" R2 ToughFlex	19.68" (15.75") 500 (400)	ULTRA : 15.75" (12.60") 400 (320) SUPER : 7.87" (6.30") 200 (160) TURBO : 5.91" (4.72") 150 (120) HSP : 1.77" (1.30") 45 (33)		FU-67TZ	Approx. 32 g	P.39
				-40 to +122°F (-40 to +50°C)	M6	2.95" (2.36") 75 (60)						
M6	Parallel	3.3' 1 m cut not allowed.		R0.39" R10 Stainless Steel	19.68" (15.75") 500 (400)	ULTRA : 15.75" (12.60") 400 (320) SUPER : 7.87" (6.30") 200 (160) TURBO : 5.91" (4.72") 150 (120) HSP : 1.77" (1.30") 45 (33)	FU-67TG	Approx. 32 g	P.39			
		-40 to +122°F (-40 to +50°C)	M6	2.95" (2.36") 75 (60)								
M6	Coaxial	3.3' 1 m Free-cut (ø0.04" ø1.13)		R0.98" R25 Stainless Steel	19.68" (15.75") 500 (400)	ULTRA : 15.75" (12.60") 400 (320) SUPER : 7.87" (6.30") 200 (160) TURBO : 5.91" (4.72") 150 (120) HSP : 1.77" (1.30") 45 (33)	FU-67MTG	Approx. 80 g	NEW P.38			
		-40 to +122°F (-40 to +50°C)	M6	2.95" (2.36") 75 (60)								
M6	Coaxial	3.3' 1 m cut not allowed.		R0.39" R10 Stainless Steel	7.09" (5.51") 180 (140)	ULTRA : 5.51" (4.33") 140 (110) SUPER : 2.95" (2.36") 75 (60) TURBO : 2.17" (1.65") 55 (42) HSP : 0.79" (0.63") 20 (16)	FU-35TG	Approx. 32 g	P.35			
		-40 to +122°F (-40 to +50°C)	M6	1.18" (0.91") 30 (23) Lens attachment P.18								

\*1 When using the FS-V30. Standard target: White mat paper (Reflective type only.)

\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

See P.18 to 20 for specifications when a reflective lens is attached.



**BLUE** indicates reflective fibers.

Unit: inch mm

Type				Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Smallest detectable object <sup>*2</sup>	Model	Weight	Dimensions
Shape	Detecting method	Size	Detecting Arrangement				MEGA	Other power modes				
Threaded	Reflective	M3	Coaxial	3.3' 1 m Free-cut (ø0.05" ø1.3 x 2) -40 to +122°F (-40 to +50°C)		R0.08" R2 ToughFlex	7.87" (6.30") 200 (160)	ULTRA : 6.30" (5.12") 160 (130) SUPER : 3.15" (2.56") 80 (65) TURBO : 2.36" (1.77") 60 (45) HSP : 0.87" (0.67") 22 (17)	ø0.0002" ø0.005 gold wire	FU-35FZ	Approx. 6 g	⇒ P.35
				3.3' 1 m Free-cut Spiral 11.81" 30 cm		R0.08" R2	1.26" (0.98") 32 (25)	Lens attachment ⇒ P.16		FU-2303	Approx. 15 g	⇒ P.35
				3.3' 1 m Free-cut (ø0.05" ø1.3 x 2) -40 to +158°F (-40 to +70°C)		R0.98" R25	13.39" (10.63") 340 (270)	ULTRA : 10.63" (8.66") 270 (220) SUPER : 5.51" (4.33") 140 (110) TURBO : 3.54" (2.76") 90 (70) HSP : 1.18" (0.98") 30 (25)		FU-35FA	Approx. 6 g	⇒ P.35
				19.69' 50 cm cut not allowed. FU-21X: -40 to +158°F (-40 to +70°C) FU-24X: -40 to +122°F (-40 to +50°C)		R0.39" R10	1.77" (1.38") 45 (35)	Lens attachment ⇒ P.16		FU-21X	Approx. 4 g	⇒ P.34
			6.6' 2 m Free-cut (ø0.05" ø1.3 x 2) FU-66Z: -40 to +122°F (-40 to +50°C) FU-66: -40 to +158°F (-40 to +70°C)		R0.08" R2 ToughFlex	15.75" (12.60") 400 (320)	ULTRA : 12.60" (10.24") 320 (260) SUPER : 6.30" (5.12") 160 (130) TURBO : 4.72" (3.54") 120 (90) HSP : 1.57" (1.18") 40 (30)	FU-66Z		Approx. 10 g	⇒ P.38	
			6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +122°F (-40 to +50°C)		R0.98" R25	27.56" (20.87") 700 (530)	ULTRA : 20.47" (16.93") 520 (430) SUPER : 13.78" (9.84") 350 (250) TURBO : 9.06" (7.09") 230 (180) HSP : 3.15" (2.17") 80 (55)	FU-66		Approx. 10 g	⇒ P.38	
			6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +158°F (-40 to +70°C)		R0.02" R0.5 ToughFlex	19.69" (15.75") 500 (400)	ULTRA : 15.75" (12.60") 400 (320) SUPER : 8.66" (7.09") 220 (180) TURBO : 6.69" (5.12") 170 (130) HSP : 1.97" (1.42") 50 (36)	FU-67V		Approx. 25 g	⇒ P.38	
			6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +122°F (-40 to +50°C)		R0.08" R2 ToughFlex	26.77" (21.65") 680 (550)	ULTRA : 21.65" (17.72") 550 (450) SUPER : 14.57" (11.02") 370 (280) TURBO : 9.84" (7.87") 250 (200) HSP : 3.15" (2.36") 80 (60)	FU-61Z		Approx. 22 g	⇒ P.38	
		6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +122°F (-40 to +50°C)		R0.98" R25	4.92" (3.94") 125 (100)	FU-67	Approx. 21 g	⇒ P.38				
		3.3' 1 m Free-cut (ø0.04" ø1.13) -40 to +122°F (-40 to +50°C)		R0.98" R25 Stainless Steel	19.69" (15.75") 500 (400)	ULTRA : 15.75" (12.60") 400 (320) SUPER : 8.66" (7.09") 220 (180) TURBO : 6.69" (5.12") 170 (130) HSP : 1.97" (1.42") 50 (36)	<b>NEW</b> FU-67MG	Approx. 70 g		⇒ P.38		
		3.3' 1 m cut not allowed. -40 to +122°F (-40 to +50°C)		R0.39" R10 Stainless Steel	3.35" (2.56") 85 (65)	FU-67G	Approx. 29 g	⇒ P.38				
		6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +158°F (-40 to +70°C)		R0.98" R25	37.40" (29.53") 950 (750)	ULTRA : 35.43" (23.62") 900 (600) SUPER : 19.69" (15.75") 500 (400) TURBO : 14.17" (11.02") 360 (280) HSP : 4.72" (3.15") 120 (80)	FU-61	Approx. 21 g		⇒ P.38		
		6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +158°F (-40 to +70°C)		R0.98" R25	7.87" (5.91") 200 (150)	FU-6F	Approx. 21 g	⇒ P.38				
		6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +158°F (-40 to +70°C)		R0.98" R25	27.56" (20.87") 700 (530)	ULTRA : 20.47" (16.93") 520 (430) SUPER : 13.78" (9.84") 350 (250) TURBO : 9.06" (7.09") 230 (180) HSP : 3.15" (2.17") 80 (55)	FU-6F	Approx. 21 g		⇒ P.38		
6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +158°F (-40 to +70°C)		R0.98" R25	4.92" (3.94") 125 (100)	FU-25	Approx. 18 g	⇒ P.35						
6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +158°F (-40 to +70°C)		R0.98" R25	22.05" (18.50") 560 (470)	ULTRA : 20.47" (16.93") 520 (430) SUPER : 11.81" (9.45") 300 (240) TURBO : 7.87" (6.30") 200 (160) HSP : 2.76" (1.97") 70 (50)	FU-25	Approx. 18 g	⇒ P.35					

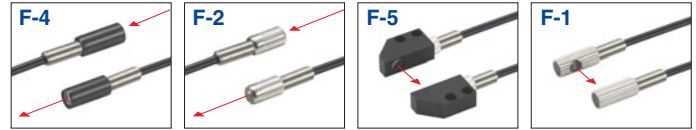
\*1 When using the FS-V30. Standard target: White mat paper (Reflective type only).  
\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

See P.18 to 20 for specifications when a reflective lens is attached.

- Integrated Bracket
- Flat
- Threaded/Hex-shaped
- Cylinder
- Sleeve
- Small Spot
- Area
- Retro-reflective
- Narrow Beam/High-Power
- Definite-reflective
- High-flex
- Oil/Chemical Resistant
- Heat Resistant
- Liquid-level
- Liquid Crystals/Semiconductors

## STEP 2 Select a specific sensor

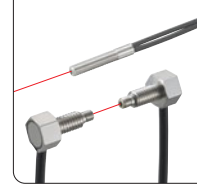
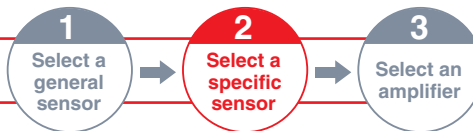
### Detecting Distance Using Thrubeam Lenses



Unit: inch mm

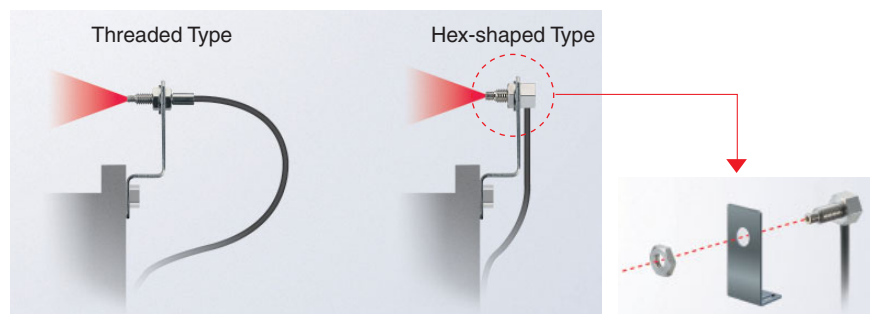
Type	Ambient temperature Appearance	Model Weight	Dimensions	Applicable fiber units	Detecting distance <sup>*1</sup>						
					Each detecting distance in parentheses shows the data when the S-APC function is ON.						
					MEGA	ULTRA	SUPER	TURBO	FINE	HSP	
Ultra-long detecting distance Aperture Angle: Approx. 8°	Heat Resistance: 158°F (70°C)  Tip: ø0.17" ø4.3 	F-4 Approx. 1 g	⇒ P.42	FU-77TZ/77V/77					125.98" (98.43") 3200 (2500)	74.80" (55.12") 1900 (1400)	
				FU-7F	141.73" (141.73") 3600 (3600)				141.73" (118.11") 3600 (3000)	82.68" (59.06") 2100 (1500)	
				FU-78					98.43" (78.74") 2500 (2000)	59.06" (43.31") 1500 (1100)	
				FU-77G/77MG/ 77TG/77MTG	70.87" (70.87") 1800 (1800)					70.87" (55.12") 1800 (1400)	
Long-detecting distance Aperture Angle: Approx. 15°	Heat Resistance: 572°F (300°C)  Tip: ø0.16" ø4 	F-2 Approx. 2 g	⇒ P.42	FU-77TZ/77V/77/ 84C/88K	141.73" (141.73") 3600 (3600)		141.73" (118.11") 3600 (3000)	74.80" (59.06") 1900 (1500)	55.12" (35.43") 1400 (900)		
				FU-7F/86A	141.73" (141.73") 3600 (3600)		90.55" (70.87") 2300 (1800)	59.06" (39.37") 1500 (1000)			
				FU-86Z	141.73" (141.73") 3600 (3600)		141.73" (118.11") 3600 (3000)	78.74" (62.99") 2000 (1600)	51.18" (25.59") 1300 (650)		
				FU-78	141.73" (141.73") 3600 (3600)	141.73" (118.11") 3600 (3000)	118.11" (94.49") 3000 (2400)	59.06" (47.24") 1500 (1200)	43.31" (31.50") 1100 (800)		
				FU-77G/77MG/ 77TG/77MTG	70.87" (70.87") 1800 (1800)		70.87" (59.06") 1800 (1500)	55.12" (35.43") 1400 (900)			
Side-view with mounting holes	Heat Resistance: 221°F (105°C)  	F-5 Approx. 10 g	⇒ P.42	FU-77V/77					90.55" (70.87") 2300 (1800)	59.06" (39.37") 1500 (1000)	
				FU-7F/86A	141.73" (141.73") 3600 (3600)				141.73" (94.49") 3600 (2400)	70.87" (47.24") 1800 (1200)	
				FU-86Z					98.43" (78.74") 2500 (2000)	62.99" (31.50") 1600 (800)	
				FU-78					90.55" (70.87") 2300 (1800)	51.18" (35.43") 1300 (900)	
				FU-77G	70.87" (70.87") 1800 (1800)					59.06" (39.37") 1500 (1000)	
Side-view	Heat Resistance: 158°F (70°C) <sup>*2</sup>  Tip: ø0.16" ø4 	F-1 Approx. 2 g	⇒ P.42	FU-77V/77/77G/ 77MG	70.87" (55.12") 1800 (1400)	55.12" (43.31") 1400 (1100)	33.46" (27.56") 850 (700)	27.56" (21.65") 700 (550)	15.75" (11.81") 400 (300)	11.81" (7.87") 300 (200)	
				FU-7F/86A	98.43" (78.74") 2500 (2000)	78.74" (62.99") 2000 (1600)	51.18" (39.37") 1300 (1000)	39.37" (31.50") 1000 (800)	19.69" (15.75") 500 (400)	12.60" (8.66") 320 (220)	
				FU-86Z	74.80" (59.06") 1900 (1500)	59.06" (47.24") 1500 (1200)	37.40" (29.53") 950 (750)	29.53" (23.62") 750 (600)	15.75" (11.81") 400 (300)	9.84" (5.12") 250 (130)	
				FU-78/84C/88K	55.12" (43.31") 1400 (1100)	43.31" (35.43") 1100 (900)	27.56" (21.65") 700 (550)	21.65" (17.72") 550 (450)	11.81" (9.84") 300 (250)	7.87" (5.51") 200 (140)	

\*1 When using the FS-V30 Series. The maximum sensing distance of 141.73" 3600 mm (70.87" 1800 mm) is possible because the fiber length on one side is 6.6' 2 m (3.3' 1 m).  
\*2 When using the F-1 at a temperature of 158°F (70°C) or more, specify the "Heat-resistant F-1".



## Hex-shaped and Conventional threaded fibers

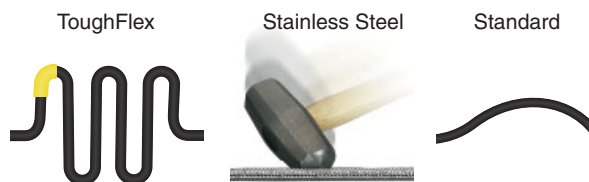
Using the hex-shaped fiber as shown below allows for a neater cable configuration. This avoids breakage problems caused by the cable being pulled.



With the hex-shaped fiber, one end is secured with a nut, so installation is simpler.

## Fiber Cable Type

The ToughFlex series are cables that reduce problems caused by bending. They are very versatile and are recommended for general-purpose applications.



Stainless steel braided cable is used in situations where the fiber could be subjected to impacts.

**Stainless steel braided cable is recommended in areas where human traffic passes nearby.**

Note: Use High-flex cable (P.26) in locations where there is the chance that a cable can move.

ToughFlex fibers use fine strands that are bundled into a cable. This provides a high level of bendability and strain relief.

Bend radius of 0.08" 2 mm	Bend radius of 0.02" 0.5 mm	Conventional fiber
217-core fiber	613-core fiber	Tight bending causes a break.
		ToughFlex fiber
		No breaking, even when subjected to a tight bend radius.

## Parallel (Standard) and Coaxial Fibers

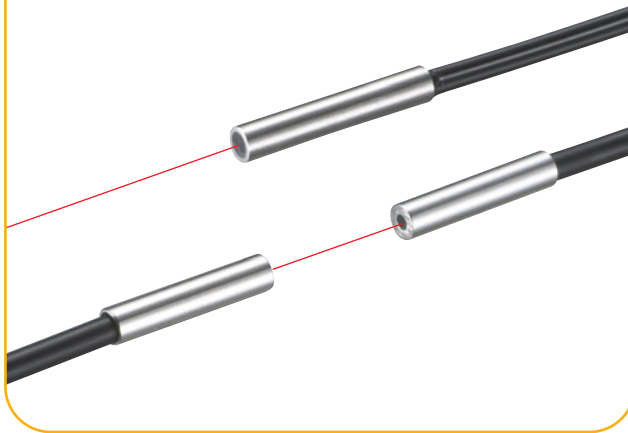
Type	Characteristics
Parallel (Standard)	Transmitter and receiver are routed side-by-side in parallel reflective fiber optic sensors.
Coaxial	Transmitter light is located in the center, while Receiver light is around the periphery. This cable has outstanding short-distance characteristics. Focusing lenses can be attached to coaxial fiber optics.

- Integrated Bracket
- Flat
- Threaded/ Hex-shaped**
- Cylinder
- Sleeve
- Small Spot
- Area
- Retro-reflective
- Narrow Beam/ High-Power
- Definite-reflective
- High-flex
- Oil/Chemical Resistant
- Heat Resistant
- Liquid-level
- Liquid Crystals/ Semiconductors

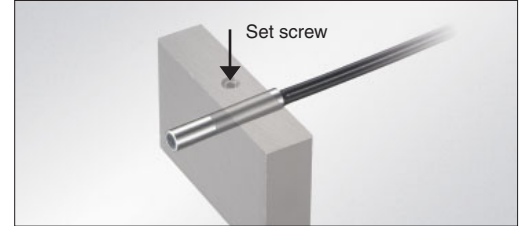
# STEP 2

## Select a specific sensor

### Cylinder (Set Screw Installation)



Suitable for installation in locations where space is limited. Installed by drilling a hole and using a set screw.



Let us help you make your selection. Tell the operator you want to find out more about our Fiber Units.

**CALL TOLL FREE** 1-888-KEYENCE  
1-888-539-3623

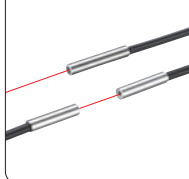
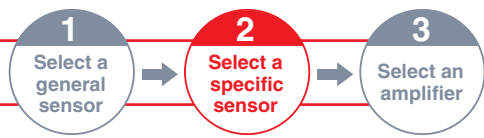
**RED** indicates thrubeam fibers.

Unit: inch mm

Type		Fiber unit length (Diameter)	Minimum bend radius	Detecting distance <sup>*1</sup>		Optical axis diameter (Standard target to be detected)	Smallest detectable object <sup>*2</sup>	Model	Weight	Dimensions
Detecting method	Size	Ambient temperature	Appearance	Each detecting distance in parentheses shows the data when the S-APC function is ON.						
				MEGA	Other power modes					
Thrubeam	ø0.04" ø1.0	19.69" 50 cm cut not allowed. -40 to +122°F (-40 to +50°C) ø0.04" ø1	R0.39" R10	5.91" (4.72") 150 (120)	ULTRA : 5.12" (3.94") 130 (100) SUPER : 2.56" (1.97") 65 (50) TURBO : 1.97" (1.57") 50 (40) HSP : 0.79" (0.47") 20 (12)	ø0.01" ø0.265	ø0.0002" ø0.005	FU-58	Approx. 8 g	⇒ P.38
	ø0.06" ø1.5	3.3' 1 m Free-cut (ø0.04" ø1.0) -40 to +158°F (-40 to +70°C) ø0.06" ø1.5	R0.16" R4 High-flex	16.69" (14.96") 500 (380) 4.92" (3.94") 125 (100)	ULTRA : 16.54" (12.99") 420 (330) SUPER : 10.63" (7.87") 270 (200) TURBO : 8.66" (6.69") 220 (170) HSP : 2.76" (1.38") 70 (35)	ø0.03" ø0.7	ø0.0002" ø0.005	FU-59	Approx. 3 g	⇒ P.38
	ø0.10" ø2.5	19.69" 50 cm cut not allowed. -40 to +158°F (-40 to +70°C) ø0.10" ø2.5	R0.39" R10	0.98" (0.79") 25 (20) 0.20" (0.16") 5 (4)	ULTRA : 0.79" (0.63") 20 (16) SUPER : 0.59" (0.39") 15 (10) TURBO : 0.39" (0.28") 10 (7) HSP : - (-)	ø0.005" ø0.125	ø0.0002" ø0.005	FU-55	Approx. 3 g	⇒ P.37
		19.69" 50 cm cut not allowed. -40 to +158°F (-40 to +70°C) ø0.10" ø2.5 ø0.01" ø0.3		0.98" (0.79") 25 (20) 0.20" (0.16") 5 (4)	ULTRA : 0.79" (0.63") 20 (16) SUPER : 0.59" (0.39") 15 (10) TURBO : 0.39" (0.28") 10 (7) HSP : - (-)					
	ø0.12" ø3	6.6' 2 m Free-cut (ø0.09" ø2.2) -40 to +122°F (-40 to +50°C) ø0.12" ø3	R0.08" R2 ToughFlex	66.93" (51.18") 1700 (1300) 11.81" (9.06") 300 (230)	ULTRA : 51.18" (43.31") 1300 (1100) SUPER : 29.53" (23.62") 750 (600) TURBO : 23.62" (18.11") 600 (460) HSP : 7.87" (5.51") 200 (140)	ø0.04" ø1.13	ø0.0002" ø0.005	FU-5FZ	Approx. 19 g	⇒ P.37
6.6' 2 m Free-cut (ø0.09" ø2.2) -40 to +158°F (-40 to +70°C) ø0.12" ø3		90.55" (55.12") 2300 (1400) 15.75" (12.60") 400 (320)		ULTRA : 62.99" (43.31") 1600 (1100) SUPER : 37.40" (31.50") 950 (800) TURBO : 31.50" (23.62") 800 (600) HSP : 8.66" (5.91") 220 (150)						

\*1 When using the FS-V30.

\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.



**BLUE** indicates reflective fibers.

Unit: inch mm

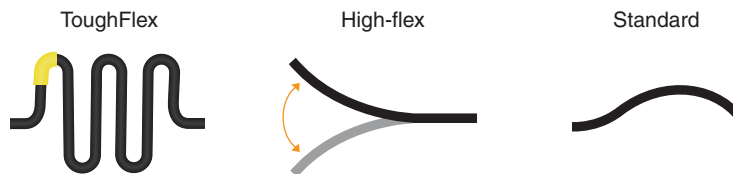
Type	Detecting method	Size	Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Smallest detectable object <sup>*2</sup>	Model Weight	Dimensions
						Ambient temperature	MEGA			
Reflective	Blue	ø0.06" ø1.5	3.3' 1 m cut not allowed. -40 to +158°F (-40 to +70°C)		R0.16" R4 High-flex	MEGA: 2.95" (2.36") 75 (60)	ULTRA: 2.36" (1.97") 60 (50) SUPER: 1.26" (0.98") 32 (25) TURBO: 0.98" (0.79") 25 (20) HSP: 0.51" (0.39") 13 (10)	ø0.0002" ø0.005 gold wire	FU-49X Approx. 3 g	➔P.37
						Other: 0.79" (0.63") 20 (16)	ULTRA: 0.47" (0.39") 12 (10) SUPER: 0.31" (0.28") 8 (7) TURBO: 0.24" (0.20") 6 (5) HSP: 0.06" (0.04") 1.6 (1.1)			
		ø0.10" ø2.5	3.3' 1 m cut not allowed. -40 to +158°F (-40 to +70°C)		R0.39" R10	MEGA: 0.59" (0.47") 15 (12)	ULTRA: 0.47" (0.39") 12 (10) SUPER: 0.31" (0.28") 8 (7) TURBO: 0.24" (0.20") 6 (5) HSP: 0.06" (0.04") 1.6 (1.1)	FU-46 Approx. 2 g	➔P.37	
						Other: 0.12" (0.08") 3 (2)	ULTRA: 1.65" (1.34") 42 (34) SUPER: 0.59" (0.47") 15 (12) TURBO: 0.51" (0.39") 13 (10) HSP: 0.24" (0.16") 6 (4)			
		ø0.12" ø3	19.69' 50 cm cut not allowed. -40 to +158°F (-40 to +70°C)		R0.98" R25	MEGA: 1.89" (1.57") 48 (40)	ULTRA: 1.65" (1.34") 42 (34) SUPER: 0.59" (0.47") 15 (12) TURBO: 0.51" (0.39") 13 (10) HSP: 0.24" (0.16") 6 (4)	FU-22X Approx. 4 g	➔P.35	
						Other: 1.39" (0.31") 10 (8)	ULTRA: 12.60" (10.24") 320 (260) SUPER: 6.30" (5.12") 160 (130) TURBO: 4.72" (3.54") 120 (90) HSP: 1.57" (1.18") 40 (30)			
	ø0.12" ø3	6.6' 2 m Free-cut (ø0.05" ø1.3 x 2) FU-4FZ: -40 to +122°F (-40 to +50°C) FU-4F: -40 to +158°F (-40 to +70°C)		R0.08" R2 ToughFlex	MEGA: 15.75" (12.60") 400 (320)	ULTRA: 20.47" (16.93") 520 (430) SUPER: 13.78" (9.84") 350 (250) TURBO: 9.06" (7.09") 230 (180) HSP: 3.15" (2.17") 80 (55)	FU-4FZ Approx. 8 g	➔P.36		
					Other: 2.36" (1.77") 60 (45)	ULTRA: 20.47" (16.93") 520 (430) SUPER: 13.78" (9.84") 350 (250) TURBO: 9.06" (7.09") 230 (180) HSP: 3.15" (2.17") 80 (55)				
	ø0.12" ø3	6.6' 2 m Free-cut (ø0.04" ø1.0 x 2) -40 to +158°F (-40 to +70°C)		R0.16" R4 High-flex	MEGA: 6.30" (5.12") 160 (130)	ULTRA: 5.12" (4.33") 130 (110) SUPER: 2.76" (2.17") 70 (55) TURBO: 1.97" (1.57") 50 (40) HSP: 0.87" (0.67") 22 (17)	FU-48 Approx. 7 g	➔P.37		
					Other: 1.38" (1.10") 35 (28)	ULTRA: 21.65" (17.32") 550 (440) SUPER: 14.57" (11.81") 370 (300) TURBO: 9.84" (7.87") 250 (200) HSP: 3.35" (2.36") 85 (60)				
	ø0.12" ø3	19.69' 50 cm cut not allowed. -40 to +158°F (-40 to +70°C)		R0.98" R25	MEGA: 26.77" (21.65") 680 (550)	ULTRA: 21.65" (17.32") 550 (440) SUPER: 14.57" (11.81") 370 (300) TURBO: 9.84" (7.87") 250 (200) HSP: 3.35" (2.36") 85 (60)	FU-23X Approx. 4 g	➔P.35		
					Other: 4.92" (3.94") 125 (100)	ULTRA: 1.38" (1.10") 35 (28) SUPER: 0.71" (0.55") 18 (14) TURBO: 0.51" (0.39") 13 (10) HSP: 0.20" (0.16") 5 (4)				
ø0.12" ø3	19.69' 50 cm cut not allowed. -40 to +158°F (-40 to +70°C)		R0.16" R4 High-flex	MEGA: 1.77" (1.38") 45 (35)	ULTRA: 1.38" (1.10") 35 (28) SUPER: 0.71" (0.55") 18 (14) TURBO: 0.51" (0.39") 13 (10) HSP: 0.20" (0.16") 5 (4)	FU-45X Approx. 4 g	➔P.37			
				Other: 0.31" (0.24") 8 (6)	ULTRA: 1.38" (1.10") 35 (28) SUPER: 0.71" (0.55") 18 (14) TURBO: 0.51" (0.39") 13 (10) HSP: 0.20" (0.16") 5 (4)					

\*1 When using the FS-V30. Standard target: White mat paper (Reflective type only).  
\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

- Integrated Bracket
- Flat
- Threaded/Hex-shaped
- Cylinder**
- Sleeve
- Small Spot
- Area
- Retro-reflective
- Narrow Beam/High-Power
- Definite-reflective
- High-flex
- Oil/Chemical Resistant
- Heat Resistant
- Liquid-level
- Liquid Crystals/Semiconductors

### Selection Tip 1 Fiber Cable Style

The ToughFlex cable style eliminates problems caused by bending of fibers. The High-Flex fibers are designed for repeated bending like what occurs in applications with frequent movement.

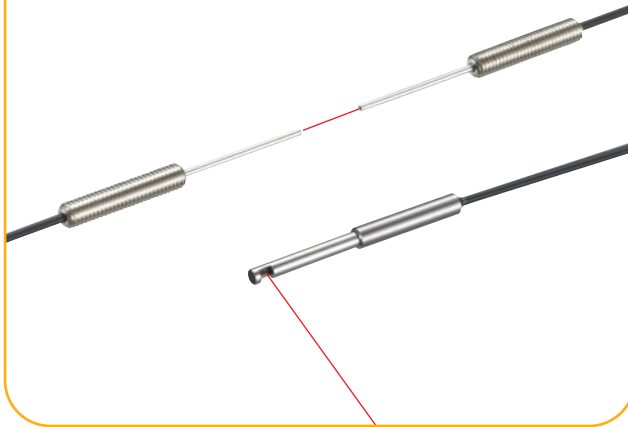


### Selection Tip 2 Cylinder Type Installation

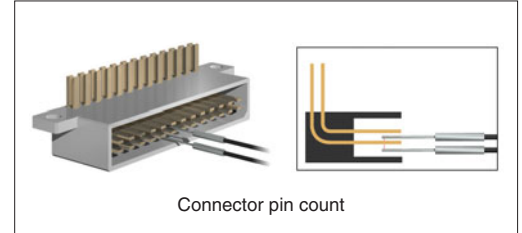
**Q** What size of hole needs to be drilled for installation? **A** The diameter tolerance of the sensor conforms to JIS intermediate. The tolerance is  $\pm 0.004" \pm 0.1$  mm up to an outside diameter of  $\phi 0.24" \phi 6$  mm. For the  $\phi 0.12" \phi 3$  type, for example, this translates to  $\phi 0.11"$  to  $\phi 0.12"$   $\phi 2.9$  to  $\phi 3.1$ , so a hole of  $\phi 0.13"$   $\phi 3.2$  should be drilled.

## STEP 2 Select a specific sensor

### Sleeve



No more space problems.  
Sensors can be located closer to the target.



Connector pin count

Let us help you make your selection.  
Tell the operator you want to find out more about our Fiber Units.

**CALL TOLL FREE** 1-888-KEYENCE  
1-888-539-3623

**RED** indicates thrubeam fibers.

Unit: inch mm

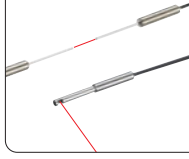
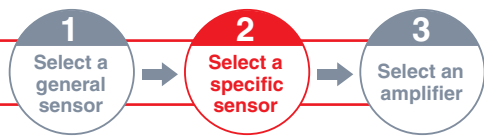
Type		Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Optical axis diameter (Standard target to be detected)	Smallest detectable object <sup>*2</sup>	Model	Weight	Dimensions
Detecting method	Beam emitting direction				Ambient temperature	MEGA					
Thrubeam	Side-view	3.3' 1 m Free-cut (ø0.05" ø1.3) -40 to +158°F (-40 to +70°C) ø0.03" ø0.82	ø0.10" ø2.5 0.59" 15 Do not bend sleeve.	R0.98" R25	11.81" (9.06") 300 (230)	ULTRA : 9.06" (7.09") 230 (180) SUPER : 3.94" (2.95") 100 (75) TURBO : 2.95" (2.36") 75 (60) HSP : 0.98" (0.59") 25 (15)	ø0.02" ø0.6	ø0.0002" ø0.005	FU-32	Approx. 5 g	⇒ P.35
		6.6' 2 m Free-cut (ø0.09" ø2.2) -40 to +158°F (-40 to +70°C) ø0.05" ø1.2	0.59" 15 2.56" 65 ø0.12" ø3 Min. bend radius of sleeve: R0.98" R25		25.20" (20.47") 640 (520)	ULTRA : 19.69" (15.75") 500 (400) SUPER : 12.60" (9.84") 320 (250) TURBO : 9.84" (7.87") 250 (200) HSP : 3.54" (1.97") 90 (50)	ø0.04" ø1		FU-34	Approx. 17 g	⇒ P.35
		6.6' 2 m Free-cut (ø0.09" ø2.2) -40 to +158°F (-40 to +70°C) ø0.06" ø1.65	M4 0.59" 15 2.64" 67 Min. bend radius of sleeve: R0.39" R10		90.55" (55.12") 2300 (1400)	ULTRA : 62.99" (43.31") 1600 (1100) SUPER : 37.40" (31.50") 950 (800) TURBO : 31.50" (23.62") 800 (600) HSP : 8.66" (5.91") 220 (150)	ø0.04" ø1		FU-73	Approx. 24 g	⇒ P.39
	Top-view	3.3' 1 m Free-cut (ø0.04" ø1.0) -40 to +158°F (-40 to +70°C) ø0.03" ø0.82	M3 0.59" 15 Do not bend sleeve.	R0.39" R10	15.75" (11.81") 400 (300)	ULTRA : 13.39" (10.24") 340 (260) SUPER : 7.09" (5.91") 180 (150) TURBO : 5.91" (4.72") 150 (120) HSP : 1.97" (1.18") 50 (30)	ø0.02" ø0.5	FU-75F	Approx. 10 g	⇒ P.39	
		3.3' 1 m Free-cut (ø0.04" ø1.0) ø0.12" ø3 -40 to +158°F (-40 to +70°C) ø0.02" ø0.4	0.59" 15 1.77" 45 Min. bend radius of sleeve: R0.39" R10		6.30" (5.12") 160 (130)	ULTRA : 5.12" (3.94") 130 (100) SUPER : 2.56" (1.97") 65 (50) TURBO : 1.97" (1.57") 50 (40) HSP : 0.71" (0.39") 18 (10)	ø0.01" ø0.265	FU-76F	Approx. 10 g	⇒ P.39	
		19.69' 50 cm cut not allowed. ø0.10" ø2.5 -40 to +158°F (-40 to +70°C) ø0.01" ø0.3	0.10" ø2.5 0.20" 5 0.39" 10 Do not bend sleeve.		0.98" (0.79") 25 (20) 0.20" (0.16") 5 (4)	ULTRA : 0.79" (0.63") 20 (16) SUPER : 0.59" (0.39") 15 (10) TURBO : 0.39" (0.28") 10 (7) HSP : - (-)	ø0.005" ø0.125	FU-56	Approx. 3 g	⇒ P.37	

\*1 When using the FS-V30.

\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

The long sleeve fibers allow for some bending. See the dimensions diagram for bend ranges.





**BLUE** indicates reflective fibers.

Unit: inch mm

Type	Detecting method	Beam emitting direction	Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Smallest detectable object <sup>*2</sup>	Model	Weight	Dimensions	
						Ambient temperature	MEGA					Other power modes
Reflective	Side		6.6' 2 m Free-cut (ø0.04" ø1.0 x 2) -40 to +158°F (-40 to +70°C) ø0.08" ø2		R0.39" R10	3.35' (2.68") 85 (68) 0.67" (0.51") 17 (13)	ULTRA : 2.68" (2.13") 68 (54) SUPER : 1.34" (1.06") 34 (27) TURBO : 0.98" (0.79") 25 (20) HSP : 0.43" (0.31") 11 (8)	ø0.0002" ø0.005 gold wire	FU-31 Approx. 5 g		➔P.35	
			3.3' 1 m Free-cut (ø0.09" ø2.2 x 2) -40 to +158°F (-40 to +70°C) ø0.08" ø2.1		R0.98" R25	7.09" (5.91") 180 (150) 0.98" (0.79") 25 (20)	ULTRA : 5.91" (4.72") 150 (120) SUPER : 2.95" (2.36") 75 (60) TURBO : 1.97" (1.57") 50 (40) HSP : 0.71" (0.55") 18 (14)		FU-33 Approx. 10 g		➔P.35	
	Top			19.69' 50 cm cut not allowed. -40 to +158°F (-40 to +70°C) ø0.82 ø0.03"		R0.16" R4	1.77" (1.38") 45 (35) 0.31" (0.24") 8 (6)	ULTRA : 1.38" (1.10") 35 (28) SUPER : 0.71" (0.55") 18 (14) TURBO : 0.51" (0.39") 13 (10) HSP : 0.20" (0.16") 5 (4)		FU-65X Approx. 5 g		➔P.38
				6.6' 2 m Free-cut (ø0.05" ø1.3 x 2) -40 to +122°F (-40 to +50°C) ø0.08" ø2		R0.08" R2 ToughFlex	5.12" (4.33") 130 (110) 0.98" (0.79") 25 (20)	ULTRA : 4.33" (3.54") 110 (90) SUPER : 2.17" (1.77") 55 (45) TURBO : 1.69" (1.38") 43 (35) HSP : 0.51" (0.31") 13 (8)		FU-63Z Approx. 10 g		➔P.38
				6.6' 2 m Free-cut (ø0.05" ø1.3 x 2) -40 to +158°F (-40 to +70°C) ø0.06" ø1.65		R0.98" R25	7.09" (5.91") 180 (150)	ULTRA : 5.91" (4.72") 150 (120) SUPER : 3.35" (2.76") 85 (70) TURBO : 2.36" (1.97") 60 (50) HSP : 0.94" (0.63") 24 (16)		FU-63 Approx. 10 g		➔P.38
				6.6' 2 m Free-cut (ø0.05" ø1.3 x 2) -40 to +158°F (-40 to +70°C) ø0.06" ø1.65		R0.98" R25	1.46" (1.18") 37 (30)	ULTRA : 5.91" (4.72") 150 (120) SUPER : 3.35" (2.76") 85 (70) TURBO : 2.36" (1.97") 60 (50) HSP : 0.94" (0.63") 24 (16)		FU-63T Approx. 10 g		➔P.38
				19.69' 50 cm cut not allowed. -40 to +158°F (-40 to +70°C) ø0.82 ø0.03"		R0.16" R4	1.77" (1.38") 45 (35) 0.31" (0.24") 8 (6)	ULTRA : 1.38" (1.10") 35 (28) SUPER : 0.71" (0.55") 18 (14) TURBO : 0.51" (0.39") 13 (10) HSP : 0.20" (0.16") 5 (4)		FU-45X Approx. 4 g		➔P.37
				6.6' 2 m Free-cut (ø0.05" ø1.3 x 2) -40 to +158°F (-40 to +70°C) ø0.06" ø1.65		R0.98" R25	7.09" (5.91") 180 (150) 1.46" (1.18") 37 (30)	ULTRA : 5.91" (4.72") 150 (120) SUPER : 3.35" (2.76") 85 (70) TURBO : 2.36" (1.97") 60 (50) HSP : 0.94" (0.63") 24 (16)		FU-43 Approx. 8 g		➔P.37
				3.3' 1 m cut not allowed. -40 to +158°F (-40 to +70°C) ø0.02" ø0.5		R0.39" R10	0.59" (0.47") 15 (12) 0.12" (0.08") 3 (2)	ULTRA : 0.47" (0.39") 12 (10) SUPER : 0.31" (0.28") 8 (7) TURBO : 0.24" (0.20") 6 (5) HSP : 0.06" (0.04") 1.6 (1.1)		FU-46 Approx. 2 g		➔P.37
				Coaxial, narrow beam 10°	19.69' 50 cm cut not allowed. -40 to +158°F (-40 to +70°C) ø0.07" ø1.77		R0.98" R25	1.89" (1.57") 48 (40) 0.39" (0.31") 10 (8)	ULTRA : 1.65" (1.34") 42 (34) SUPER : 0.59" (0.47") 15 (12) TURBO : 0.51" (0.39") 13 (10) HSP : 0.24" (0.16") 6 (4)		FU-22X Approx. 4 g	

\*1 When using the FS-V30. Standard target: White mat paper (Reflective type only.)  
\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

- Integrated Bracket
- Flat
- Threaded/Hex-shaped
- Cylinder
- Sleeve
- Small Spot
- Area
- Retro-reflective
- Narrow Beam/High-Power
- Definite-reflective
- High-flex
- Oil/Chemical Resistant
- Heat Resistant
- Liquid-level
- Liquid Crystals/Semiconductors

When determining the smallest detectable object, positioning the sensor too closely to the object caused the object to disappear making alignment difficult. With the sleeve type, the sensor itself does not become an obstruction and alignment is easier.

**Small Spot Reflective**



**Great for Small Object Detection**

Reflective type fiber sensors are great for small object detecting. Select the sensor according to the size of the object.



Let us help you make your selection. Tell the operator you want to find out more about our Fiber Units.

**CALL TOLL FREE** | 1-888-KEYENCE  
1-888-539-3623

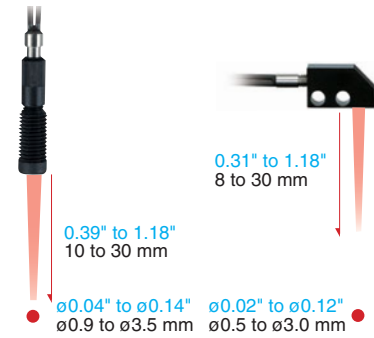
Small spot sensors come in the three types described below. Select the sensor you need according to application conditions.

The FU-23X + F-2HA (↪ P.20) and the FU-20 (↪ P.21) produce the smallest beam spot of  $\varnothing 0.004"$   $\varnothing 0.1$  mm.

**Adjustable Beam Spot** ↪ P.19

Spot size is freely selectable.

Focal distance is variable, so there is no need to adjust the distance between the sensor and the target.



**Parallel Beam Spot** ↪ P.19

The approximate  $\varnothing 0.16"$   $\varnothing 4$  mm diameter spot radius does not change from 0 to 0.79" 0 to 20 mm.

This is great for applications where distance varies due to vibration and other factors.

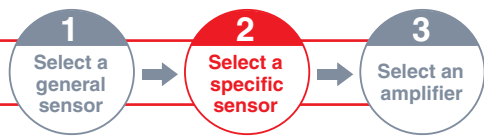


**Small Spot** ↪ P.20

This type is available as a  $\varnothing 0.004"$   $\varnothing 0.1$  mm small spot, long distance with integrated lens, or as a lens-and-fiber combination.

Select the type you need according to application conditions.





## Adjustable Beam Spot

### Built-in Lens Fiber Unit

Unit: inch mm

Type	Beam spot diameter	Focal distance	Fiber unit length (Diameter)	Appearance	Model	Minimum bend radius	Dimensions
			Ambient temperature				
Adjustable beam spot	ø0.04" to ø0.14" ø0.9 to 3.5	0.39" to 1.18" 10 to 30	6.6' 2 m Free-cut (ø0.05" ø1.3 x 2) -40 to +158°F (-40 to +70°C)		<b>FU-10</b> Approx. 5 g	R0.98" R25	➔ P.34
				<b>FU-2540</b>	R0.98" R25	➔ P.35	

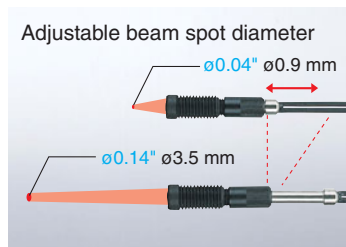


### Lens + Fiber Unit

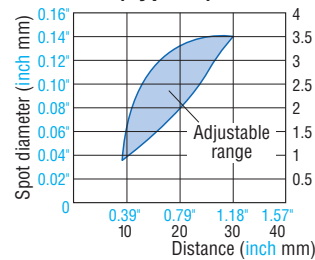
Unit: inch mm

Type	Beam spot diameter	Focal distance	Lens			Fiber units			Dimensions
			Model	Appearance	Weight	Minimum bend radius	Appearance	Model	
Side-view adjustable spot	ø0.02" to ø0.12" ø0.5 to 3	0.31" to 1.18" 8 to 30	<b>F-5HA</b>		Approx. 2 g	R0.08" R2 ToughFlex		<b>FU-35FZ</b>	➔ P.35
						R0.08" R2		<b>FU-2303</b>	
						R0.98" R25		<b>FU-35FA</b>	

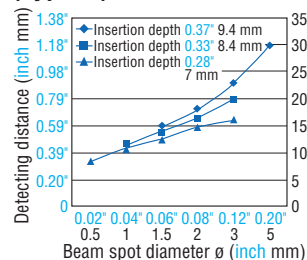
### FU-10 Adjustable beam spot



### FU-10 Adjustable range of spot diameter (Typical)



### F-5HA+FU-35FZ Target width vs. operating range (Typical)



## Focused Beam Spot

### Lens + Fiber Unit

Unit: inch mm

Type	Beam spot diameter	Lens			Fiber unit			Detecting distance <sup>*1</sup>		Dimensions
		Model	Appearance	Weight	Minimum bend radius	Appearance	Model	MEGA	Other power modes	
Parallel beam	Approx. ø0.16" ø4 beam spot diameter (within the detecting of 0" to 0.79" 0 to 20 mm)	<b>F-3HA</b>		Approx. 2 g	R0.08" R2 ToughFlex		<b>FU-35FZ</b>	1.50" (1.18") 38 (30)	ULTRA : 1.50" (1.18") 38 (30) SUPER : 1.50" (1.18") 38 (30) TURBO : 1.30" (1.10") 33 (28) HSP : 0.79" (0.63") 20 (16)	➔ P.35
					R0.08" R2		<b>FU-2303</b>	1.10" (0.87") 28 (22)		
					R0.98" R25		<b>FU-35FA</b>	2.56" (2.05") 65 (52) 1.77" (1.50") 45 (38)	ULTRA : 2.56" (2.05") 65 (52) SUPER : 2.56" (2.05") 65 (52) TURBO : 2.17" (1.77") 55 (45) HSP : 1.38" (0.98") 35 (25)	
					R0.08" R2 ToughFlex		<b>FU-35TZ</b>	1.38" (0.98") 35 (25)	ULTRA : 1.38" (0.98") 35 (25) SUPER : 1.38" (1.10") 35 (28) TURBO : 1.18" (0.98") 30 (25) HSP : 0.71" (0.55") 18 (14)	
					R0.39" R10 Stainless steel		<b>FU-35TG</b>	0.98" (0.79") 25 (20)		

\*1 When using the FS-V30. Standard target: White mat paper (Reflective type only.)

- Integrated Bracket
- Flat
- Threaded/Hex-shaped
- Cylinder
- Sleeve
- Small Spot**
- Area
- Retro-reflective
- Narrow Beam/High-Power
- Definite-reflective
- High-flex
- Oil/Chemical Resistant
- Heat Resistant
- Liquid-level
- Liquid Crystals/Semiconductors

# STEP 2

## Select a specific sensor

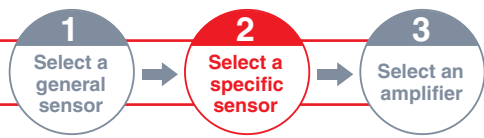
### Small Beam Spot



#### Lens + Fiber Unit

Unit: inch mm

Type	Beam spot diameter	Focal distance	Lens		Fiber units			Dimensions
			Model	Appearance Weight	Minimum bend radius	Appearance	Model	
Small spot	Approx. $\varnothing 0.004^*$ $\varnothing 0.1$	$0.28^{\circ} \pm 0.08^{\circ}$ 7 $\pm$ 2	F-2HA		R0.39^* R10		FU-24X	⇒ P.35
	R0.98^* R25					FU-21X	⇒ P.34	
	R0.08^* R2 ToughFlex					FU-35FZ	⇒ P.35	
	R0.08^* R2					FU-2303		
	R0.98^* R25					FU-35FA		
	R0.08^* R2 ToughFlex					FU-35TZ		
	R0.39^* R10 Stainless steel		FU-35TG					
	Approx. $\varnothing 0.01^*$ $\varnothing 0.2$	$0.59^{\circ} \pm 0.08^{\circ}$ 15 $\pm$ 2	F-4HA		R0.08^* R2 ToughFlex			FU-35FZ
	Approx. $\varnothing 0.02^*$ $\varnothing 0.4$				R0.08^* R2		FU-2303	
					R0.08^* R2 ToughFlex		FU-35TZ	
					R0.39^* R10 Stainless steel		FU-35TG	
					R0.98^* R25		FU-35FA	
R0.08^* R2 ToughFlex						FU-35TZ		
R0.39^* R10 Stainless steel			FU-35TG					
Approx. $\varnothing 0.04^*$ $\varnothing 1.0$	$1.38^{\circ} \pm 0.12^{\circ}$ 35 $\pm$ 3	F-6HA		R0.98^* R25		FU-21X	⇒ P.34	
Approx. $\varnothing 0.08^*$ $\varnothing 2.0$				R0.08^* R2 ToughFlex		FU-35FZ	⇒ P.35	
				R0.08^* R2		FU-2303		
				R0.08^* R2 ToughFlex		FU-35TZ		
				R0.98^* R25		FU-35FA		
				R0.08^* R2 ToughFlex		FU-35TZ		
	R0.98^* R25		FU-35FA					



## Small Beam Spot Built-in Lens Fiber Unit

Unit: inch mm

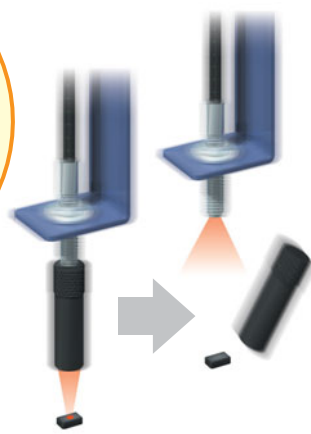
Type	Beam spot diameter	Focal distance	Fiber unit length (Diameter) Ambient temperature	Appearance	Model Weight	Minimum bend radius	Dimensions
Small spot	Approx. $\phi 0.004"$ $\phi 0.1$	$0.20"$ 5	19.69" 50 cm cut not allowed. -40 to +158°F (-40 to +70°C) Tip: $\phi 0.12"$ $\phi 3$		<b>FU-20</b> Approx. 2 g	$R0.98"$ R25	

\* Cannot be used with the FS-V30 Series HIGH SPEED mode.

- Integrated Bracket
- Flat
- Threaded/Hex-shaped
- Cylinder
- Sleeve
- Small Spot**
- Area
- Retro-reflective
- Narrow Beam/High-Power
- Definite-reflective
- High-flex
- Oil/Chemical Resistant
- Heat Resistant
- Liquid-level
- Liquid Crystals/Semiconductors

### Problem 1

**Vibration or other conditions causes the lens to come off!**  
The lens unexpectedly comes off making detecting impossible.



### Solution 1

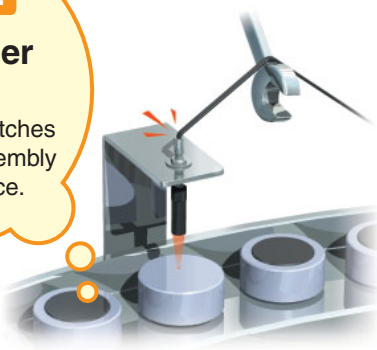
**FU-10 Adjustable Beam Spot Fiber**  
**Select a fiber with a fixed lens!**

Since the lens has threading to secure it to the sensor, there is no more need to worry about the lens coming off due to vibration.



### Problem 2

**Broken fiber cable!**  
The fiber cable catches during device assembly or maintenance.



### Problem 3

No room to install sensors!  
I want to use a side-view spot sensor.

### Solution 3

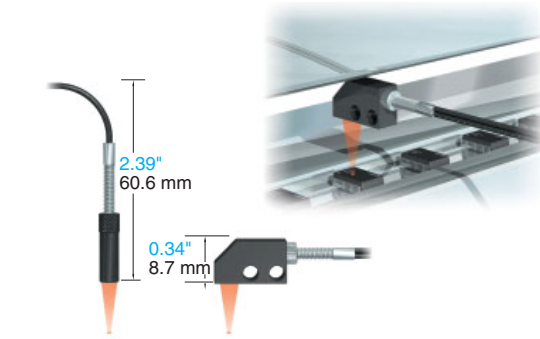
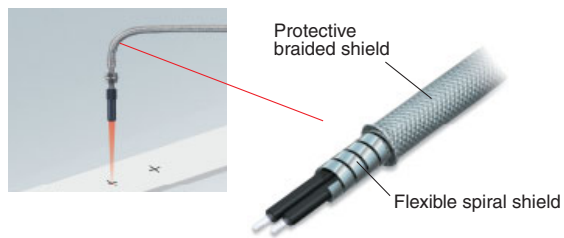
**F-5HA Space Saving Lens + Fiber**  
**Select a side-view lens!**

A side-view lens can be used for accurate detection of small parts in locations where other sensors were difficult to install. Also, since the size of the spot can be changed by varying the insertion depth of the fiber unit, there is no need to be concerned about the distance from the target.

### Solution 2

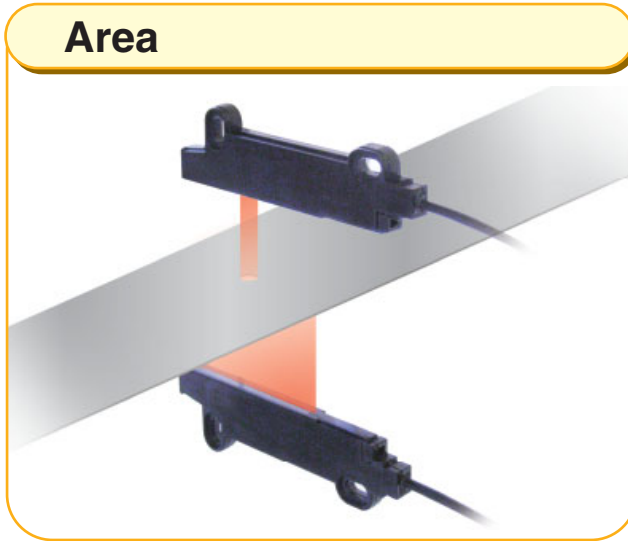
**FU-2303/35TG+ Lens Coaxial Fiber with Guarding**  
**Select a spiral protected fiber!**

FU-2303/35TG protects against fiber cable breakage. Protected by stainless steel, the fiber cable maintains a bend radius of  $R0.39"$  R10. Protective braided shielding increases strength against pulling, while a flexible spiral shield increases strength against side impact.

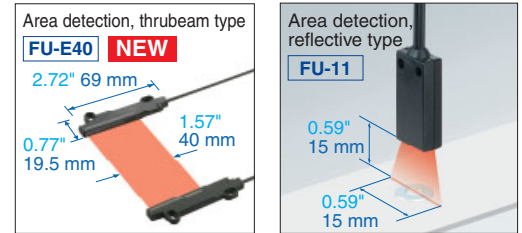


Requires approximately 1/7 the space of previous products.

## STEP 2 Select a specific sensor



Great for applications where there is variance in target position and for detecting multiple shapes.

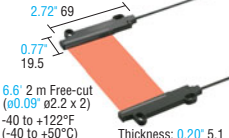



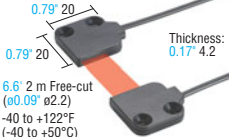




Let us help you make your selection. Tell the operator you want to find out more about our Fiber Units.

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1-888-539-3623




**RED** indicates thrubeam fibers.

Unit: inch mm

Type		Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Optical axis diameter (Standard target to be detected)	Smallest detectable object <sup>*2</sup>	Model	Weight	Dimensions
Detecting method	Optical axis width				Ambient temperature	MEGA					
Thrubeam	1.57" 40	 2.72" 69 0.77" 19.5 6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +122°F (-40 to +50°C) Thickness: 0.20" 5.1	R0.08" R2 ToughFlex	 11.8" (11.8") 3600 (3600)  11.8" (11.8") 3600 (3600)  9.8" (7.2") 3000 (2200)	ULTRA : 11.8" (11.8") 3600 (3600) SUPER : 11.8" (11.8") 3600 (3600) TURBO : 11.8" (11.8") 3600 (3600) HSP : 55.12" (31.50") 1400 (800)	1.57" x 0.12" 40 x 3	ø0.02" ø0.4	<b>NEW</b> FU-E40 Approx. 30 g	⊕ P.41		
	0.39" 10	 0.79" 20 0.79" 20 6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +122°F (-40 to +50°C) Thickness: 0.17" 4.2	R0.08" R2 ToughFlex	 66.93" (55.12") 1700 (1400)  27.56" (21.65") 700 (550)	ULTRA : 55.12" (43.31") 1400 (1100) SUPER : 47.24" (37.40") 1200 (950) TURBO : 37.40" (29.53") 950 (750) HSP : 12.60" (7.09") 320 (180)	0.39" x 0.12" 10 x 3	ø0.05" ø1.2 (TURBO) ø0.01" ø0.3 (FINE)	FU-12 Approx. 23 g	⊕ P.34		

**BLUE** indicates reflective fibers.

Unit: inch mm

Type		Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Smallest detectable object <sup>*2</sup>	Model	Weight	Dimensions
Detecting method	Spot width				Ambient temperature	MEGA				
Reflective	0.59" 15 (at distance 0.59" 15)	 6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +158°F (-40 to +70°C) 15 0.59" 15 1.10" 28	R0.98" R25	 0.20" to 6.30" (0.20" to 6.30") 5 to 160 (5 to 160)  0.20" to 4.72" (0.20" to 3.54") 5 to 120 (5 to 90)	ULTRA : 0.20" to 6.30" (0.20" to 6.30") 5 to 160 (5 to 160) SUPER : 0.20" to 5.91" (0.20" to 5.91") 5 to 150 (5 to 150) TURBO : 0.20" to 5.51" (0.20" to 5.12") 5 to 140 (5 to 130) HSP : 0.20" to 2.76" (0.20" to 2.17") 5 to 70 (5 to 55)	ø0.0002" ø0.005 gold wire (Parallel)	FU-11 Approx. 19 g	⊕ P.34		

\*1 When using the FS-V30. Standard target: White mat paper (Reflective type only)

\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

When detecting small light differences, such as that for small objects, using an amplifier with an external input function (such as the FS-V33) makes it possible to periodically reset sensitivity for stable sensing.

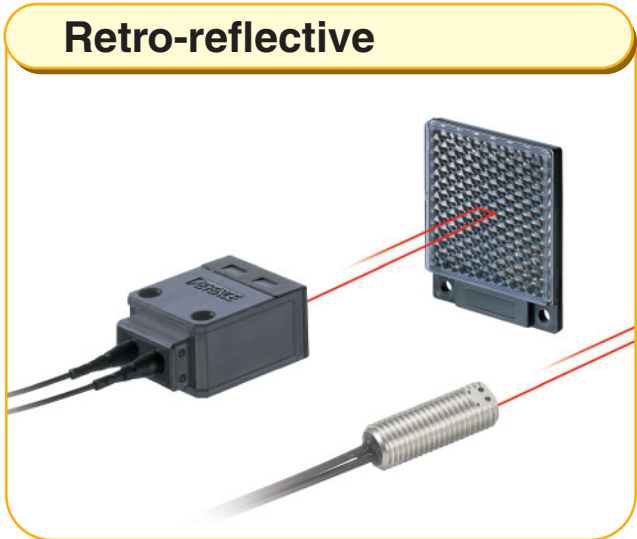
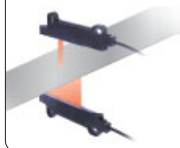
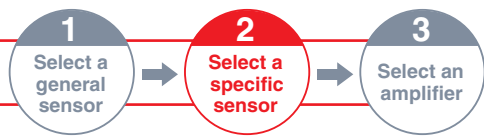
### Applications



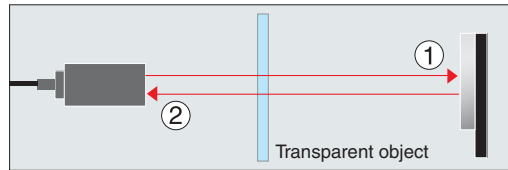
Chip movement detection



Lead frame detection



**Retro-reflective is effective for detecting transparent objects. The beam passes through the (transparent) item twice, so light attenuation is twice as great as a normal thru-beam would see.**



Let us help you make your selection. Tell the operator you want to find out more about our Fiber Units.  
**CALL TOLL FREE 1-888-KEYENCE 1-888-539-3623**

- Integrated Bracket
- Flat
- Threaded/Hex-shaped
- Cylinder
- Sleeve
- Small Spot

**GREEN** indicates retro-reflective fibers.

Type	Detecting method	Beam emitting direction	Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Model	Dimensions
						Ambient temperature	MEGA		
Retro-reflective		M6	6.6' 2 m Free-cut (ø0.04" ø1.0 x 2) -40 to +122°F (-40 to +50°C)		R0.08" R2 ToughFlex	MEGA: 0.39" to 18.90" (0.39" to 14.96") 10 to 480 (10 to 380)	ULTRA: 0.39" to 14.96" (0.39" to 11.81") 10 to 380 (10 to 300) SUPER: 0.39" to 7.48" (0.39" to 5.91") 10 to 190 (10 to 150) TURBO: 0.39" to 4.92" (0.39" to 3.94") 10 to 125 (10 to 100) HSP: - (-)	FU-13 Approx. 8 g	P.34
		Square type	6.6' 2 m Free-cut (ø0.04" ø1.0 x 2) -40 to +122°F (-40 to +50°C)		R0.39" R10	MEGA: 3.94" to 125.98" (3.94" to 98.43") 100 to 3200 (100 to 2500) 3.94" to 24.80" (3.94" to 19.69") 100 to 630 (100 to 500)	ULTRA: 3.94" to 98.43" (3.94" to 78.74") 100 to 2500 (100 to 2000) SUPER: 3.94" to 49.21" (3.94" to 39.37") 100 to 1250 (100 to 1000) TURBO: 3.94" to 37.01" (3.94" to 29.53") 100 to 940 (100 to 750) HSP: 3.94" to 19.69" (3.94" to 15.75") 100 to 500 (100 to 400)	FU-15 Approx. 12 g	P.34

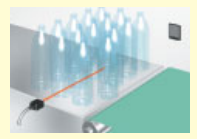
- Area
- Retro-reflective
- Narrow Beam/High-Power
- Definite-reflective
- High-flex
- Oil/Chemical Resistant
- Heat Resistant
- Liquid-level
- Liquid Crystals/Semiconductors

**Reflector / Reflective Tape Specifications (Optional Parts)**

Type	Power modes	R-2 (OP-95388)	R-3 (OP-96436)	R-5	Reflective tape (OP-96629)
FU-13	MEGA	2.02" x 2.40" 51.2 x 61	1.38" x 1.65" 35 x 42	0.55" x 1.42" 14 x 36	1.57" x 1.18" 40 x 30
	ULTRA	0.39" to 37.01" (0.39" to 29.53") 10 to 940 (10 to 750)	0.39" to 30.31" (0.39" to 24.41") 10 to 770 (10 to 620)	0.39" to 20.87" (0.39" to 16.93") 10 to 530 (10 to 430)	0.39" to 18.90" (0.39" to 14.96") 10 to 480 (10 to 380)
	SUPER	0.39" to 29.53" (0.39" to 23.62") 10 to 750 (10 to 600)	0.39" to 24.41" (0.39" to 19.69") 10 to 620 (10 to 500)	0.39" to 16.93" (0.39" to 13.78") 10 to 430 (10 to 350)	0.39" to 14.96" (0.39" to 11.81") 10 to 380 (10 to 300)
	TURBO	0.39" to 14.96" (0.39" to 11.81") 10 to 380 (10 to 300)	0.39" to 12.60" (0.39" to 9.84") 10 to 320 (10 to 250)	0.39" to 8.66" (0.39" to 6.69") 10 to 220 (10 to 170)	0.39" to 7.48" (0.39" to 5.91") 10 to 190 (10 to 150)
	FINE	0.39" to 9.84" (0.39" to 7.87") 10 to 250 (10 to 200)	0.39" to 7.87" (0.39" to 5.91") 10 to 200 (10 to 150)	0.39" to 4.92" (0.39" to 3.94") 10 to 125 (10 to 100)	0.39" to 4.92" (0.39" to 3.94") 10 to 125 (10 to 100)
	HSP	0.39" to 4.92" (0.39" to 3.94") 10 to 125 (10 to 100)	0.39" to 3.94" (0.39" to 2.95") 10 to 100 (10 to 75)	0.39" to 2.56" (0.39" to 1.97") 10 to 65 (10 to 50)	0.39" to 2.36" (0.39" to 1.97") 10 to 60 (10 to 50)
FU-15 <sup>*1</sup>	MEGA	3.94" to 125.98" (3.94" to 98.43") 100 to 3200 (100 to 2500)	3.94" to 86.61" (3.94" to 70.67") 100 to 2200 (100 to 1800)	3.94" to 51.18" (3.94" to 43.31") 100 to 1300 (100 to 1100)	-
	ULTRA	3.94" to 98.43" (3.94" to 78.74") 100 to 2500 (100 to 2000)	3.94" to 70.87" (3.94" to 59.06") 100 to 1800 (100 to 1500)	3.94" to 43.31" (3.94" to 35.43") 100 to 1100 (100 to 900)	-
	SUPER	3.94" to 49.21" (3.94" to 39.37") 100 to 1250 (100 to 1000)	3.94" to 39.37" (3.94" to 31.50") 100 to 1000 (100 to 800)	3.94" to 29.53" (3.94" to 23.62") 100 to 750 (100 to 600)	-
	TURBO	3.94" to 37.01" (3.94" to 29.53") 100 to 940 (100 to 750)	3.94" to 29.53" (3.94" to 23.62") 100 to 750 (100 to 600)	3.94" to 23.62" (3.94" to 19.69") 100 to 600 (100 to 500)	-
	FINE	3.94" to 24.80" (3.94" to 19.69") 100 to 630 (100 to 500)	3.94" to 19.69" (3.94" to 15.75") 100 to 500 (100 to 400)	3.94" to 19.69" (3.94" to 15.75") 100 to 500 (100 to 400)	-
	HSP	3.94" to 19.69" (3.94" to 15.75") 100 to 500 (100 to 400)	3.94" to 16.93" (3.94" to 13.78") 100 to 430 (100 to 350)	3.94" to 16.93" (3.94" to 13.78") 100 to 430 (100 to 350)	-

\* When using the FS-V30 [Red LED]. The values may vary slightly if APC is enabled.  
<sup>\*1</sup> Reflective tape cannot be used.

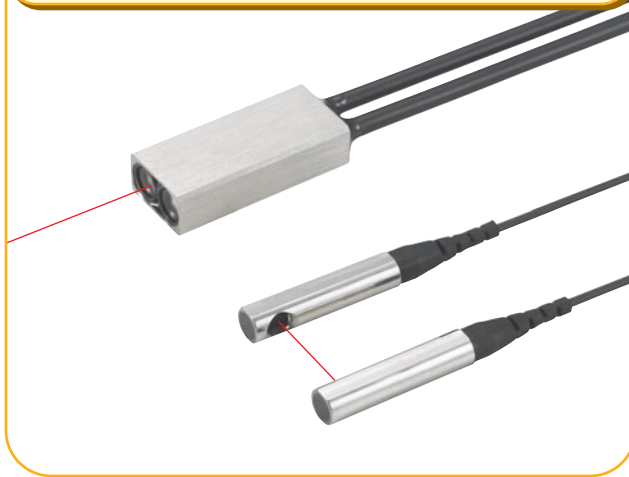
The optics of the FU-15 suppress the effects of refraction and deflection for stable and easy detection of liquid-filled PET bottles and other objects that tend to generate refraction. The enclosure rating of FU-15 also is IP67.



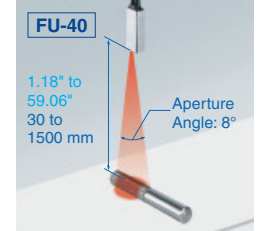
# STEP 2

## Select a specific sensor

### Narrow Beam / High-power



Use of a lens reduces beam width and helps avoid deflection.



Let us help you make your selection. Tell the operator you want to find out more about our Fiber Units.  
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 1-888-539-3623

**RED** indicates thru-beam fibers.

Unit: inch mm

Type			Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>1</sup>		Optical axis diameter (Standard target to be detected)	Smallest detectable object <sup>2</sup>	Model	Weight	Dimensions
Detecting method	Beam emitting direction	Aperture angle				MEGA	Other power modes					
Thru-beam	Side	Approx. 6°	6.6' 2 m Free-cut (ø0.04" ø1.0) FU-16Z: -40 to +122°F (-40 to +50°C) FU-16/18: -40 to +158°F (-40 to +70°C)	R0.08" R2 ToughFlex	125.98" (98.43") 3200 (2500)	ULTRA : 98.43" (78.74") 2500 (2000) SUPER : 51.18" (39.37") 1300 (1000) TURBO : 39.37" (31.50") 1000 (800) HSP : 14.96" (8.66") 380 (220)	ø0.10" ø2.5	ø0.004" ø0.1	FU-16Z Approx. 8 g	⊕ P.34		
		Approx. 2°	R0.39" R10	125.98" (98.43") 3200 (2500)	ULTRA : 98.43" (78.74") 2500 (2000) SUPER : 59.06" (47.24") 1500 (1200) TURBO : 47.24" (39.37") 1200 (1000) HSP : 18.90" (10.24") 480 (260)	ø0.04" ø1	ø0.0008" ø0.02	FU-16 Approx. 8 g	⊕ P.34			
				31.50" (25.59") 800 (650)	ULTRA : 27.56" (25.59") 700 (650) SUPER : 14.17" (12.99") 360 (330) TURBO : 11.81" (11.02") 300 (280) HSP : 5.12" (4.33") 130 (110)							
Approx. 3°	R0.08" R2 ToughFlex	33.46" (31.50") 850 (800)	ULTRA : 27.56" (25.59") 700 (650) SUPER : 14.17" (12.99") 360 (330) TURBO : 11.81" (11.02") 300 (280) HSP : 5.12" (4.33") 130 (110)	ø0.11" ø2.8	ø0.004" ø0.1	FU-18M Approx. 6 g	⊕ P.34					
9.45" (8.66") 240 (220)	ULTRA : 141.73" (141.73") 3600 (3600) SUPER : 141.73" (141.73") 3600 (3600) TURBO : 141.73" (125.98") 3600 (3200) HSP : 59.06" (33.46") 1500 (850)											
Top	Approx. 6°	R0.08" R2 ToughFlex	141.73" (141.73") 3600 (3600)	ULTRA : 141.73" (141.73") 3600 (3600) SUPER : 141.73" (141.73") 3600 (3600) TURBO : 141.73" (125.98") 3600 (3200) HSP : 59.06" (33.46") 1500 (850)	ø0.11" ø2.8	ø0.004" ø0.1	FU-50 Approx. 8 g	⊕ P.37				
90.55" (70.87") 2300 (1800)												

**BLUE** indicates reflective fibers.

Unit: inch mm

Type			Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>1</sup>		Smallest detectable object <sup>2</sup>	Model	Weight	Dimensions
Detecting method	Beam emitting direction	Aperture angle				MEGA	Other power modes				
Reflective	Top	Approx. 8°	6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +122°F (-40 to +50°C) Thickness: 0.20" 5.2	R0.08" R2 ToughFlex	1.18" to 59.06" (1.18" to 47.24") 30 to 1500 (30 to 1200)	ULTRA : 1.18" to 43.31" (1.18" to 33.46") 30 to 1100 (30 to 850) SUPER : 1.18" to 15.75" (1.18" to 12.60") 30 to 400 (30 to 320) TURBO : 1.18" to 10.24" (1.18" to 8.66") 30 to 260 (30 to 220) HSP : 1.18" to 3.94" (1.18" to 3.15") 30 to 100 (30 to 80)	ø0.01" ø0.3 copper wire (vertical)	FU-40 Approx. 23 g	⊕ P.36		

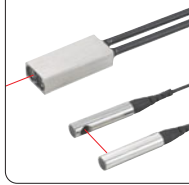
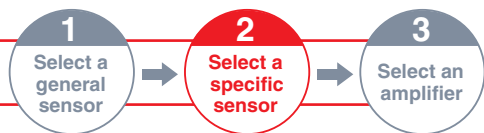
\*1 When using the FS-V30. Standard target: White mat paper (Reflective type only). "141.73" 3,600" is assumed as maximum because the fiber cable has a length of 6.6' 2 m.

\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

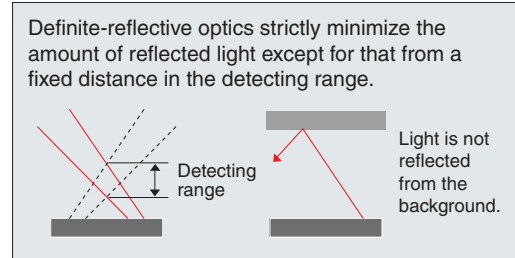
Thru-beam type lens attachment can be found on **P.12**.

Long-distance, retro-reflective type can be found on **P.17**.





**Definite-reflective reduces the effect of background, thin profile requires less space.**



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- Integrated Bracket
- Flat
- Threaded/Hex-shaped
- Cylinder
- Sleeve
- Small Spot
- Area
- Retro-reflective
- Narrow Beam/High-Power
- Definite-reflective
- High-flex
- Oil/Chemical Resistant
- Heat Resistant
- Liquid-level
- Liquid Crystals/Semiconductors

**BLUE** indicates reflective fibers.

Unit: inch mm

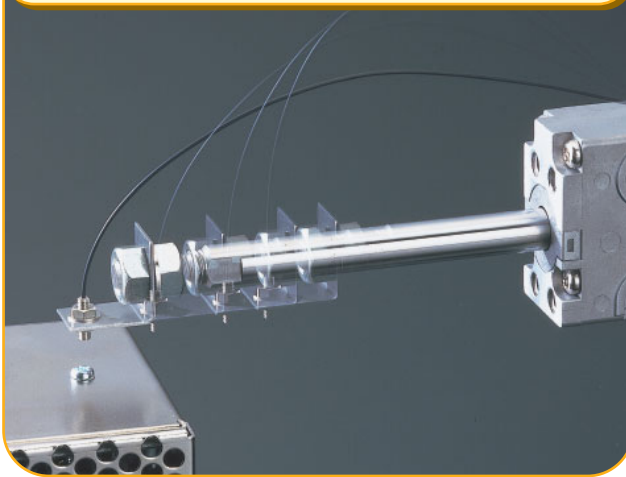
Type	Detecting method	Beam emitting direction	Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Beam spot diameter	Smallest detectable object <sup>*2</sup>	Model	Weight	Dimensions
						MEGA	Other power modes					
Reflective		Side	6.6' 2 m Free-cut (ø0.04" ø1.0 x 2)		R0.39" R10	0.12" (0.12") 3 (3) center of detecting distance	ULTRA : 0.12" (0.12") 3 (3) center of detecting distance		ø0.0002" ø0.005 gold wire	FU-37	Approx. 6 g	⇒ P.35
						0.12" (0.12") 3 (3) center of detecting distance	SUPER : 0.12" (0.12") 3 (3) center of detecting distance					
						0.12" (0.12") 3 (3) center of detecting distance	TURBO : 0.12" (0.12") 3 (3) center of detecting distance					
Reflective		Top	6.6' 2 m Free-cut (ø0.04" ø1.0 x 2)		R0.39" R10	0.24" (0.24") 6 (6) center of detecting distance	ULTRA : 0.24" (0.24") 6 (6) center of detecting distance		ø0.0002" ø0.005 gold wire	FU-38	Approx. 5 g	⇒ P.35
						0.24" (0.24") 6 (6) center of detecting distance	SUPER : 0.24" (0.24") 6 (6) center of detecting distance					
						0.24" (0.24") 6 (6) center of detecting distance	TURBO : 0.24" (0.24") 6 (6) center of detecting distance					
Reflective		Top	6.6' 2 m Free-cut (ø0.04" ø1.0 x 2)		R0.39" R10	0" to 0.16" (0" to 0.16") 0 to 4 (0 to 4)	ULTRA : 0" to 0.16" (0" to 0.16") 0 to 4 (0 to 4)	-	ø0.003" ø0.08 copper wire	FU-38V	Approx. 5 g	⇒ P.36
						0" to 0.16" (0" to 0.16") 0 to 4 (0 to 4)	SUPER : 0" to 0.16" (0" to 0.16") 0 to 4 (0 to 4)					
						0" to 0.16" (0" to 0.16") 0 to 4 (0 to 4)	TURBO : 0" to 0.16" (0" to 0.16") 0 to 4 (0 to 4)					

\*1 When using the FS-V30. Standard target: White mat paper (Reflective type only.)  
 \*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

Longer distance definite-reflective types can be found on **P.32**.

Both types are thin to aid installation where space is limited. Since the effects of the background are minimized, stable detection is possible in complex environments. The FU-38 is a small spot type, which is great for small object detection.

**High-flex**



Provides higher flexibility than an electric wire. **R0.16"** R4 models are resistant to repeated bends.

**Cable Flexibility Data**

Rough sketch 	Tested target	Number of bends before wire/fiber breaks
	ø0.04" ø1 mm metallic cord	131 times
	3-core cable	2200 times
	High-flex fiber	80000 times or more
[Measuring conditions]		Roller diameter: 0.31" 8 mm (R0.16" R4 mm) Load: 1 kg

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**RED** indicates thrubeam fibers.

Unit: inch mm

Type		Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Optical axis diameter (Standard target to be detected)	Smallest detectable object <sup>*2</sup>	Model	Weight	Dimensions
Detecting method	Size				Ambient temperature	MEGA					
Thrubeam	ø0.06" ø1.5	3.3' 1 m Free-cut (ø0.04" ø1.0) -40 to +158°F (-40 to +70°C)		R0.16" R4 High-flex	MEGA: 18.69" (14.96") 500 (380) FINE: 4.92" (3.94") 125 (100)	ULTRA : 16.54" (12.99") 420 (330) SUPER : 10.63" (7.87") 270 (200) TURBO : 8.66" (6.69") 220 (170) HSP : 2.76" (1.38") 70 (35)	ø0.03" ø0.7	ø0.0002" ø0.005	FU-59	Approx. 3 g	⊕P.38
	M3	3.3' 1 m Free-cut (ø0.04" ø1.0) -40 to +158°F (-40 to +70°C)			MEGA: 12.60" (9.84") 320 (250) FINE: 1.97" (1.57") 50 (40)	ULTRA : 9.84" (7.87") 250 (200) SUPER : 5.51" (4.33") 140 (110) TURBO : 3.94" (3.15") 100 (80) HSP : 1.18" (0.79") 30 (20)			FU-79	Approx. 6 g	⊕P.40
	0.24" x 0.41" x 0.10" 6 x 10.5 x 2.5	3.3' 1 m Free-cut (ø0.04" ø1.0) -40 to +158°F (-40 to +70°C)							FU-57TE	Approx. 5 g	⊕P.38

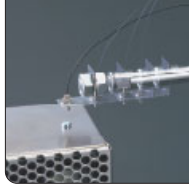
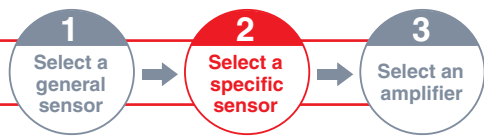
**BLUE** indicates reflective fibers.

Unit: inch mm

Type		Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Smallest detectable object <sup>*2</sup>	Model	Weight	Dimensions	
Detecting method	Size				Ambient temperature	MEGA					Other power modes
Reflective	ø0.06" ø1.5	3.3' 1 m cut not allowed. -40 to +158°F (-40 to +70°C)		R0.16" R4 High-flex	MEGA: 2.95" (2.36") 75 (60) FINE: 0.79" (0.63") 20 (16)	ULTRA : 2.36" (1.97") 60 (50) SUPER : 1.26" (0.98") 32 (25) TURBO : 0.98" (0.79") 25 (20) HSP : 0.51" (0.39") 13 (10)	ø0.0002" ø0.005 gold wire	FU-49X	Approx. 3 g	⊕P.37	
	M3	3.3' 1 m cut not allowed. -40 to +158°F (-40 to +70°C)						FU-69X	Approx. 3 g	⊕P.39	
	ø0.12" ø3	6.6' 2 m Free-cut (ø0.04" ø1.0 x 2) -40 to +158°F (-40 to +70°C)				MEGA: 6.30" (5.12") 160 (130) FINE: 1.38" (1.10") 35 (28)		ULTRA : 5.12" (4.33") 130 (110) SUPER : 2.76" (2.17") 70 (55) TURBO : 1.97" (1.57") 50 (40) HSP : 0.87" (0.67") 22 (17)	FU-48	Approx. 7 g	⊕P.37
	M4	6.6' 2 m Free-cut (ø0.04" ø1.0 x 2) -40 to +158°F (-40 to +70°C)						FU-68	Approx. 8 g	⊕P.39	

\*1 When using the FS-V30. Standard target: White mat paper (Reflective type only.)

\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.



For use in any environment thanks to its FEP-sheathed body.

FEP chemical resistance data (Reference)							
Chemical	Acetone	Methyl ethyl ketone	Benzene	Methyl alcohol	Toluene	Hydrochloric acid	Sulfuric acid (98%)
FEP	○	○	○	○	○	○	○
ABS	×	×	△	△	×	△	×
Polycarbonate	×	×	×	×	×	△	×

○ Resistant △ Resistant depending on the conditions × Not resistant

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- Integrated Bracket
- Flat
- Threaded/ Hex-shaped
- Cylinder
- Sleeve
- Small Spot
- Area
- Retro-reflective
- Narrow Beam/ High-Power
- Definite-reflective
- High-flex
- Oil/Chemical Resistant
- Heat Resistant
- Liquid-level
- Liquid Crystals/ Semiconductors

**RED** indicates thru-beam fibers.

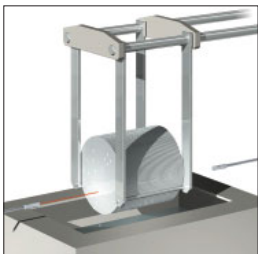
Type			Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Optical axis diameter (Standard target to be detected)	Smallest detectable object <sup>*2</sup>	Model Weight	Dimensions
Detecting method	Beam emitting direction	Size				MEGA	Other power modes				
Thru-beam	Top	ø0.20" ø5	6.6' 2 m Free-cut (ø0.09" ø2.2) -40 to +158°F (-40 to +70°C)		R1.57" R40	141.73" (141.73) 3600 (3600)	ULTRA : 141.73" (141.73) 3600 (3600)	ø0.15" ø3.7	ø0.01" ø0.2	FU-92 Approx. 71 g	P.41
						51.18" (39.37) 1300 (1000)	SUPER : 118.11" (94.49) 3000 (2400)				
	Side		6.6' 2 m Free-cut (ø0.09" ø2.2) -40 to +158°F (-40 to +70°C)			106.30" (86.61) 2700 (2200)	ULTRA : 86.61" (66.93) 2200 (1700)	ø0.11" ø2.8	ø0.004" ø0.1	FU-96 Approx. 71 g	P.41
					16.93" (13.78) 430 (350)	SUPER : 43.31" (34.65) 1100 (880)	TURBO : 34.65" (27.56) 880 (700)				

**BLUE** indicates reflective fibers.

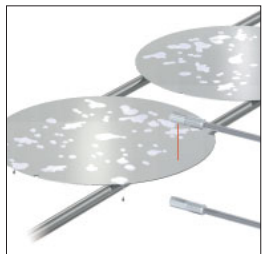
Type			Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Smallest detectable object <sup>*2</sup>	Model Weight	Dimensions
Detecting method	Beam emitting direction	Size				MEGA	Other power modes			
Reflective	Top	ø0.18" ø4.5	6.6' 2 m Free-cut (ø0.05" ø1.3 x 2) -40 to +158°F (-40 to +70°C)		R1.57" R40	8.66" (7.09) 220 (180)	ULTRA : 8.66" (7.09) 220 (180)	ø0.0002" ø0.005 gold wire	FU-91 Approx. 32 g	P.40
						2.95" (2.36) 75 (60)	SUPER : 5.31" (4.33) 135 (110)			
							TURBO : 4.33" (3.35) 110 (85)			
							HSP : 1.77" (1.38) 45 (35)			

\*1 When using the FS-V30. Standard target: White mat paper (Reflective type only.) "141.73" 3,600" is assumed as maximum because the fiber cable has a length of 6.6' 2 m.  
 \*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

**Applications**



Wafer detection (Wet)

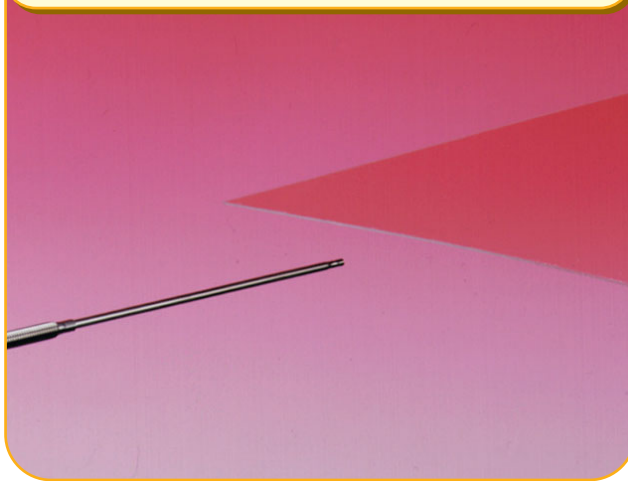


Wafer detection (Wash)

# STEP 2

## Select a specific sensor

### Heat Resistant



### Resists temperatures up to 662°F (350°C)

A wide variety of heat-resistant types, including the easy-to-install R5 type and the high-temperature fiber unit, resist temperatures up to 662°F (350°C).

Heat resistant temperatures	Fibers
Up to 356°F (180°C)	Plastic
From 392°F (200°C)	Multi-component glass

Let us help you make your selection. Tell the operator you want to find out more about our Fiber Units.

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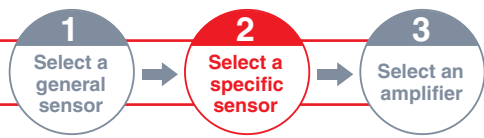
### RED indicates thrubeam fibers.

Unit: inch mm

Type	Detecting method	Heat resistant temperatures <sup>3</sup>	Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Optical axis diameter (Standard target to be detected)	Smallest detectable object <sup>*2</sup>	Model	Weight	Dimensions
						MEGA	Other power modes					
Thrubeam		212°F (100°C) <sup>*4</sup>	6.6' 2 m Free-cut (ø0.09" ø2.2) -40 to +212°F (-40 to +100°C)		R0.20° R5 ToughFlex	55.12" (43.31") 1400 (1100)	ULTRA : 43.31" (33.46") 1100 (850) SUPER : 31.50" (23.62") 800 (600) TURBO : 21.65" (17.32") 550 (440) HSP : 7.48" (4.33") 190 (110)	ø0.04" ø1	ø0.0002" ø0.005	FU-86Z Approx. 25 g		⊕P.40
		221°F (105°C) <sup>*4</sup>	6.6' 2 m Free-cut (ø0.09" ø2.2) -40 to +221°F (-40 to +105°C)		R0.98° R25	90.55" (55.12") 2300 (1400)	ULTRA : 62.99" (43.31") 1600 (1100) SUPER : 37.40" (31.50") 950 (800) TURBO : 31.50" (23.62") 800 (600) HSP : 8.66" (5.91") 220 (150)			FU-86A Approx. 22 g		⊕P.40
		302°F (150°C) <sup>*5</sup>	6.6' 2 m Free-cut (ø0.09" ø2.2) -40 to +302°F (-40 to +150°C)		R0.79° R20	55.12" (34.65") 1400 (880)	ULTRA : 39.37" (27.56") 1000 (700) SUPER : 23.62" (19.69") 600 (500) TURBO : 19.69" (14.96") 500 (380) HSP : 5.51" (3.74") 140 (95)			FU-86H Approx. 35 g		⊕P.40
		356°F (180°C) <sup>*6</sup>	6.6' 2 m Free-cut (ø0.09" ø2.2) -76 to +356°F (-60 to +180°C)		R1.38° R35	51.18" (39.37") 1300 (1000)	ULTRA : 39.37" (31.50") 1000 (800) SUPER : 24.41" (19.69") 620 (500) TURBO : 19.69" (15.75") 500 (400) HSP : 7.09" (4.33") 180 (110)			FU-88 Approx. 36 g		⊕P.40
		392°F (200°C)	6.6' 2 m cut not allowed. -40 to +392°F (-40 to +200°C)		R0.31° R8	37.40" (29.53") 950 (750)	ULTRA : 29.53" (23.62") 750 (600) SUPER : 18.11" (14.96") 460 (380) TURBO : 14.96" (11.81") 380 (300) HSP : 5.12" (2.95") 130 (75)			FU-88K Approx. 30 g		⊕P.40
		572°F (300°C)	6.6' 2 m cut not allowed. -40 to +572°F (-40 to +300°C)		R0.98° R25	7.09" (5.91") 180 (150)			ø0.04" ø1		FU-84C Approx. 66 g	

\*1 When using the FS-V30. \*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.  
\*3 Use the fiber sensor under dry conditions. Allow some margin for the temperature upper limit when selecting a heat-resistant fiber unit.  
\*4 The recommended maximum ambient temperature during operation is 194°F (90°C) when constantly using a fiber unit in a high-temperature environment.  
\*5 The recommended maximum ambient temperature during operation is 266°F (130°C) when constantly using a fiber unit in a high-temperature environment.  
\*6 The recommended maximum ambient temperature during operation is 302°F (150°C) when constantly using a fiber unit in a high-temperature environment.

Thrubeam type lens attachment can be found on **P.12**.



**BLUE** indicates reflective fibers.

Unit: inch mm

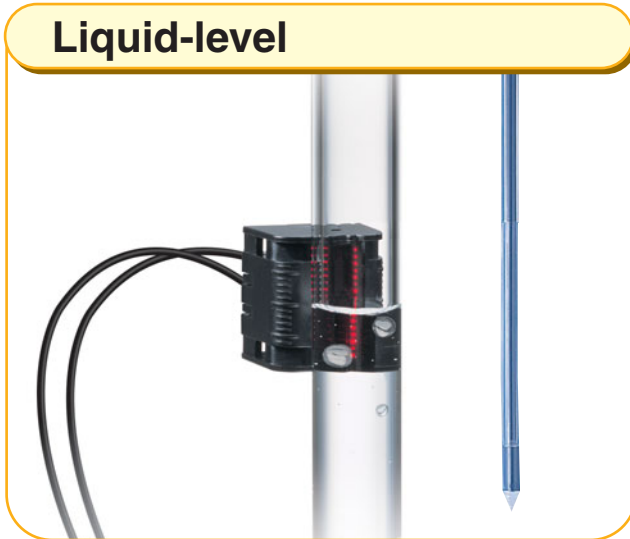
Type	Detecting method	Heat resistant temperatures <sup>-3</sup>	Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Smallest detectable object <sup>*2</sup>	Model	Weight	Dimensions	
						MEGA	Other power modes					
Reflective		212°F <sup>-4</sup> (100°C)	6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +212°F (-40 to +100°C) M6		R0.20" R5 ToughFlex	18.11" (14.96") 460 (380)	ULTRA : 14.96" (11.81") 380 (300) SUPER : 8.66" (7.09") 220 (180) TURBO : 6.30" (5.12") 160 (130) HSP : 1.97" (1.57") 50 (40)	ø0.0002" ø0.005 gold wire	FU-85Z	Approx. 25 g	⇒ P.40	
		221°F <sup>-4</sup> (105°C)	6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +221°F (-40 to +105°C) M6		R0.98" R25	26.77" (22.05") 680 (560)	ULTRA : 22.05" (17.72") 560 (450) SUPER : 14.57" (11.81") 370 (300) TURBO : 9.84" (7.87") 250 (200) HSP : 3.15" (2.36") 80 (60)		FU-85A	Approx. 21 g	⇒ P.40	
		302°F <sup>-5</sup> (150°C)	6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +302°F (-40 to +150°C) M6		R0.79" R20	16.93" (14.17") 430 (360)	ULTRA : 14.17" (11.42") 360 (290) SUPER : 9.45" (7.48") 240 (190) TURBO : 6.30" (5.12") 160 (130) HSP : 1.97" (1.57") 50 (40)		FU-85H	Approx. 35 g	⇒ P.40	
		356°F <sup>-6</sup> (180°C)	6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -76 to +356°F (-60 to +180°C) M6		R1.38" R35	22.44" (18.11") 570 (460)	ULTRA : 18.11" (14.17") 460 (360) SUPER : 10.24" (8.27") 260 (210) TURBO : 7.09" (5.51") 180 (140) HSP : 2.17" (1.77") 55 (45)		FU-87	Approx. 33 g	⇒ P.40	
		392°F (200°C)	3.3' 1 m cut not allowed. -40 to +392°F (-40 to +200°C) M4		R0.31" R8					FU-87K	Approx. 15 g	⇒ P.40
		572°F (300°C)	3.3' 1 m cut not allowed. -40 to +572°F (-40 to +300°C) Min. bend radius of sleeve R0.39" R10 ø0.08" ø2.1		R0.98" R25	16.54" (13.39") 420 (340)	ULTRA : 16.54" (13.39") 420 (340) SUPER : 10.24" (8.27") 260 (210) TURBO : 7.09" (5.51") 180 (140) HSP : 2.17" (1.77") 55 (45)		FU-82C	Approx. 29 g	⇒ P.40	
			3.3' 1 m cut not allowed. -40 to +572°F (-40 to +300°C) M4 ø0.10" ø2.6			3.54" (2.76") 90 (70)				FU-83C	Approx. 23 g	⇒ P.40
		662°F (350°C)	3.3' 1 m cut not allowed. -22 to +662°F (-30 to +350°C) Min. bend radius of sleeve R0.39" R10 ø0.08" ø2.1			15.75" (14.17") 400 (360)	ULTRA : 14.17" (11.02") 360 (280) SUPER : 8.27" (6.69") 210 (170) TURBO : 5.91" (4.72") 150 (120) HSP : 1.77" (1.38") 45 (35)		FU-81C	Approx. 24 g	⇒ P.40	
		482°F (250°C)	6.6' 2 m cut not allowed. -40 to +482°F (-40 to +250°C) 1.17" 29.7		R0.98" R25	0.31" to 1.46" (0.31" to 1.34") 8 to 37 (8 to 34)	ULTRA : 0.31" to 1.34" (0.31" to 1.22") 8 to 34 (8 to 31) SUPER : 0.31" to 1.26" (0.31" to 1.14") 8 to 32 (8 to 29) TURBO : 0.31" to 1.18" (0.31" to 1.06") 8 to 30 (8 to 27) HSP : 0.39" to 0.71" (0.39" to 0.59") 10 to 18 (10 to 15)		FU-38LK	Approx. 70 g	⇒ P.36	
			3.3' 1 m cut not allowed. -40 to +482°F (-40 to +250°C) 1.06" 27			0.10" to 2.56" (0.10" to 2.17") 2.5 to 65 (2.5 to 55)				FU-38K	Approx. 45 g	⇒ P.36
		356°F (180°C)	6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +356°F (-40 to +180°C) 27 1.06"		R1.38" R35	0.10" to 0.63" (0.10" to 0.47") 2.5 to 16 (2.5 to 12)	HSP : 0.10" to 0.39" (0.10" to 0.28") 2.5 to 10 (2.5 to 7)		FU-38H	Approx. 45 g	⇒ P.36	

\*1 When using the FS-V30. Standard target: white mat paper (Reflective type only). **FU-38LK** shows values for t=0.03" 0.7 mm glass substrate (horizontal direction).  
\*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.  
\*3 Use the fiber sensor under dry conditions. Allow some margin for the temperature upper limit when selecting a heat-resistant fiber unit.  
\*4 The recommended maximum ambient temperature during operation is 194°F (90°C) when constantly using a fiber unit in a high-temperature environment.  
\*5 The recommended maximum ambient temperature during operation is 266°F (130°C) when constantly using a fiber unit in a high-temperature environment.  
\*6 The recommended maximum ambient temperature during operation is 302°F (150°C) when constantly using a fiber unit in a high-temperature environment.

- Integrated Bracket
- Flat
- Threaded/Hex-shaped
- Cylinder
- Sleeve
- Small Spot
- Area
- Retro-reflective
- Narrow Beam/High-Power
- Definite-reflective
- High-flex
- Oil/Chemical Resistant
- Heat Resistant
- Liquid-level
- Liquid Crystals/Semiconductors

## STEP 2 Select a specific sensor

### Liquid-level



Liquid-level sensors come in tube-mountable and immersible types.



Let us help you make your selection. Tell the operator you want to find out more about our Fiber Units.

**CALL TOLL FREE** 1-888-KEYENCE  
1-888-539-3623

**BLUE** indicates reflective fibers.

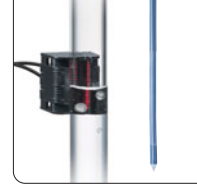
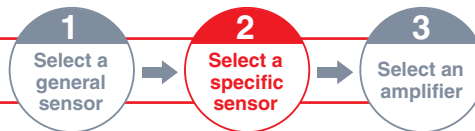
Unit: inch mm

Type			Fiber unit length (Diameter)	Appearance	Minimum bend radius	Accessory	Model Weight	Dimensions
Detecting method	Transparent tube diameter	Beam axis	Ambient temperature					
Tube-mountable	ø0.16" to ø1.02" ø4 to 26	16	6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +158°F (-40 to +70°C)		R0.20" R5	Binding band x 2 Nonslip rubber x 2	<b>FU-95S</b> Approx. 23 g	➔ P.41
		1	6.6' 2 m Free-cut (ø0.04" ø1.0 x 2) FU-95Z: -40 to +122°F (-40 to +50°C) FU-95HA: -40 to +221°F (-40 to +105°C)* FU-95: -40 to +158°F (-40 to +70°C)		R0.08" R2 ToughFlex	Binding band x 2 Nonslip rubber x 2 Spacer x 2 Screw x 2 Nut x 2	<b>FU-95Z</b> Approx. 7 g	➔ P.41
					R0.98" R25		<b>FU-95HA</b> Approx. 7 g	➔ P.41
		More than ø1.02" ø26 recommended	16	6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +158°F (-40 to +70°C)		R0.39" R10	— (Optionally available)	<b>FU-95</b> Approx. 7 g
			* The recommended maximum ambient temperature during operation is 194°F (90°C) when constantly using a fiber unit in a high-temperature environment.		R0.20" R5		<b>FU-95W</b> Approx. 20 g	➔ P.41

Unit: inch mm

Type	Fiber unit length (Diameter)	Appearance	Minimum bend radius		Model Weight	Dimensions
			PFA-sheathed section	Fiber		
Immersion	6.6' 2 m Free-cut (ø0.05" ø1.3 x 2) FU-93Z: -40 to +122°F (-40 to +50°C) FU-93: -40 to +158°F (-40 to +70°C)	 ø0.24" ø6 (PFA)	R1.57** R40	R0.20" R0.5 ToughFlex	<b>FU-93Z</b> Approx. 78 g	➔ P.41
				R0.98" R25	<b>FU-93</b> Approx. 78 g	➔ P.41

\* Not bendable up to 3.15' 80 mm from the tip.



## Selection Tip Beam axes of tube-mountable type

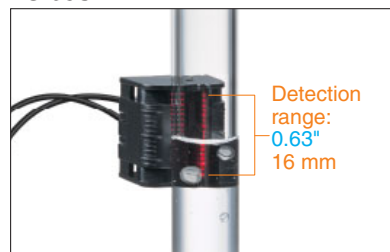
### Sixteen beam axes eliminate problems caused by air bubbles and water droplets.

Detection relies on a series of 16 beam axes, so even if an object such as an air bubble affects one or more axes, the remaining axes continue to operate normally and detect the liquid level.

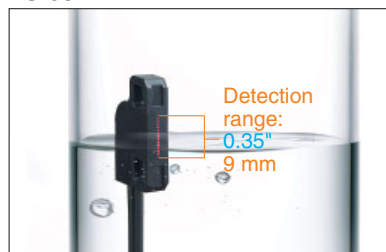


Though a single beam axis was the norm in the past, this resulted in mis-detection caused by air bubbles, droplets, and other problems. The 16 beam axis is a suitable countermeasure for these types of problems.

For  $\varnothing 0.16''$  to  $\varnothing 1.02''$   $\varnothing 4$  to  $\varnothing 26$  tubes  
**FU-95S**

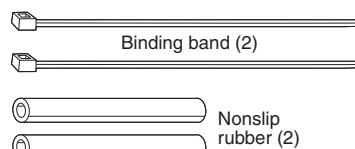


For tubes  $\varnothing 1.02''$   $\varnothing 26$  and greater  
**FU-95W**



**FU-95W Options**  
**OP-82177**

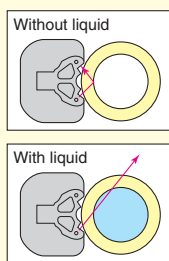
Binding band x 2, Nonslip rubber x 2  
Can be used on pipe diameters of  $\varnothing 1.02''$  to  $\varnothing 3.15''$   $\varnothing 26$  to  $\varnothing 80$  mm.



### Detection principle

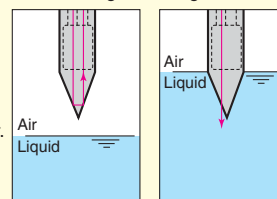
#### FU-95 Series

There is a big difference in the refractive index between a tube with no liquid inside and air. The light beam reflects inside a tube and goes back to the receiver. On the other hand, the difference in the refractive index between a tube filled with liquid and the liquid is small. Most of the light beam is absorbed by liquid and none returns to the receiver. The FU-95 Series fibers detect the presence of liquid using these characteristics.



#### FU-93 Series

There is a big difference in the refractive index between the fluorine resin and air when the tip of the sensor is in the air. Total reflection of the light beam occurs and the light beam goes back to the receiver. On the other hand, when the tip of the sensor is in the liquid, the difference in the refractive index between the fluorine resin and the liquid lessens. Most of the light beam is absorbed by liquid and no light beam goes back to the receiver. The FU-93 Series fibers detect the presence of liquid using these characteristics.



### Helpful Usage Tips

- Use an on-delay timer if chattering occurs due to dripping or bubbles in the liquid.
- Do not pull or push the fiber unit. 30N every three seconds maximum for the FU-93 Series, and 10N every three seconds maximum for the FU-95 Series.
- Stable detection may not be possible in the following cases (FU-93 Series):  
If a bubble adheres to the tip of the sensor;  
If a foreign material adheres to the tip of the sensor;  
Highly adhesive liquid;  
High temperature liquid such as strong acid or strong alkali (Liquid with PFA mixed or penetrated, or fluorinated acid.); and Opalescent liquid or liquid that colors PFA.
- A tube, whose wall thickness is  $0.12''$  3 mm, or greater, may make detection difficult. (FU-95 Series)
- FU-95 Series cannot be used for opaque tubes.
- Use the display scaling function of the FS-V30 Series to adjust the displayed light intensity.
- With the FU-93/93Z, the sensor and PFA case are inserted into a thermally fitted tube  $3.15''$  80 mm, up to the tip, in order to secure them in place. To prevent a loose fit, take care to avoid cutting this tube.

Integrated Bracket

Flat

Threaded/  
Hex-shaped

Cylinder

Sleeve

Small Spot

Area

Retro-reflective

Narrow Beam/  
High-Power

Definite-reflective

High-flex

Oil/Chemical  
Resistant

Heat  
Resistant

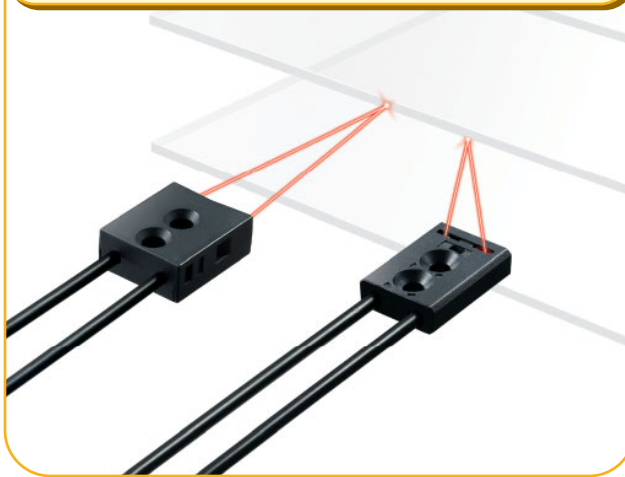
Liquid-level

Liquid Crystals/  
Semiconductors

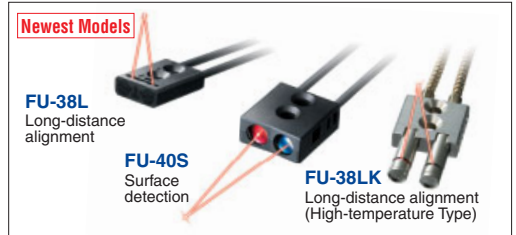
# STEP 2

## Select a specific sensor

### Liquid Crystals/Semiconductors



Perfect for glass substrate detection. A wide variety of types including distance alignment, heat-resistant type, and more.



Let us help you make your selection. Tell the operator you want to find out more about our Fiber Units.  
**CALL TOLL FREE** 1-888-KEYENCE  
 1-888-539-3623

**RED** indicates thru-beam fibers.

Unit: inch mm

Type			Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Optical axis diameter (Standard target to be detected)	Smallest detectable object <sup>*2</sup>	Model Weight	Dimensions
Detecting method	Beam emitting direction	Aperture Angle				MEGA	Other power modes				
Mapping	Side	Approx. 3°	6.6' 2 m Free-cut (ø0.04" ø1.0) -40 to +158°F (-40 to +70°C)		R0.39" R10	MEGA: 33.46" (31.50") 850 (800) FINE: 9.45" (8.66") 240 (220)	ULTRA : 27.56" (25.59") 700 (650) SUPER : 14.17" (12.99") 360 (330) TURBO : 11.81" (11.02") 300 (280) HSP : 5.12" (4.33") 130 (110)	ø0.04" ø1	ø0.0008" ø0.02	FU-18M Approx. 6 g	⇒ P.34

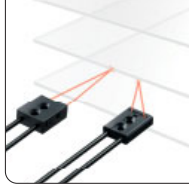
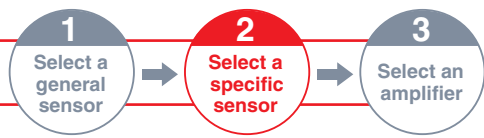
**BLUE** indicates reflective fibers.

Unit: inch mm

Type		Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>*1</sup>		Model Weight	Dimensions
Detecting method	Beam emitting direction				MEGA	Other power modes		
Glass substrate Mapping	Top	6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +158°F (-40 to +70°C)		R0.98" R25	MEGA: 0.59" to 2.76" (0.59" to 2.44") 15 to 70 (15 to 62) FINE: 0.71" to 1.18" (0.79" to 0.98") 18 to 30 (20 to 25)	ULTRA : 0.59" to 2.36" (0.59" to 2.13") 15 to 60 (15 to 54) SUPER : 0.59" to 1.81" (0.59" to 1.57") 15 to 46 (15 to 40) TURBO : 0.59" to 1.50" (0.71" to 1.30") 15 to 38 (18 to 33) HSP : -	FU-40S Approx. 25 g	⇒ P.36
		6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) 14 to 140°F (-10 to +60°C)		R0.98" R25	MEGA: 0.31" to 1.50" (0.31" to 1.38") 8 to 38 (8 to 35) FINE: 0.31" to 1.26" (0.31" to 1.14") 8 to 32 (8 to 29)	ULTRA : 0.31" to 1.42" (0.31" to 1.30") 8 to 36 (8 to 33) SUPER : 0.31" to 1.38" (0.31" to 1.26") 8 to 35 (8 to 32) TURBO : 0.31" to 1.34" (0.31" to 1.22") 8 to 34 (8 to 31) HSP : 0.39" to 1.02" (0.39" to 0.91") 10 to 26 (10 to 23)	FU-38L Approx. 20 g	⇒ P.36
Glass substrate Alignment	Flat	6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +158°F (-40 to +70°C)		R0.20" R5	MEGA: 0 to 0.98" (0 to 0.98") 0 to 25 (0 to 25) FINE: 0 to 0.98" (0 to 0.98") 0 to 25 (0 to 25)	ULTRA : 0 to 0.98" (0 to 0.98") 0 to 25 (0 to 25) SUPER : 0 to 0.98" (0 to 0.98") 0 to 25 (0 to 25) TURBO : 0 to 0.98" (0 to 0.98") 0 to 25 (0 to 25) HSP : -	FU-38S Approx. 20 g	⇒ P.36
		6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +158°F (-40 to +70°C)		R0.98" R25	MEGA: 0 to 0.55" (0 to 0.55") 0 to 14 (0 to 14) FINE: 0 to 0.55" (0 to 0.55") 0 to 14 (0 to 14)	ULTRA : 0 to 0.55" (0 to 0.55") 0 to 14 (0 to 14) SUPER : 0 to 0.55" (0 to 0.55") 0 to 14 (0 to 14) TURBO : 0 to 0.55" (0 to 0.55") 0 to 14 (0 to 14) HSP : 0 to 0.47" (0 to 0.35") 0 to 12 (0 to 9)	FU-38R Approx. 20 g	⇒ P.36
Seating check		6.6' 2 m Free-cut (ø0.04" ø1.0 x 2) -40 to +158°F (-40 to +70°C)		R0.39" R10	MEGA: 0 to 0.16" (0 to 0.16") 0 to 4 (0 to 4) FINE: 0 to 0.16" (0 to 0.16") 0 to 4 (0 to 4)	ULTRA : 0 to 0.16" (0 to 0.16") 0 to 4 (0 to 4) SUPER : 0 to 0.16" (0 to 0.16") 0 to 4 (0 to 4) TURBO : 0 to 0.16" (0 to 0.16") 0 to 4 (0 to 4) HSP : 0.08±0.06" (0.08±0.06") 2±1.4 (2±1.4)	FU-38V Approx. 5 g	⇒ P.36

\*1 When using the FS-V30. Standard target: White mat paper (Reflective type only.) (Excluding FU-40S, FU-38L)  
 FU-40S values for a t=0.03" 0.7 mm glass substrate R surface (end direction) FU-38L shows values for t=0.03" 0.7 mm glass substrate (horizontal direction).





**BLUE** indicates reflective fibers.

Unit: inch mm

Type	Detecting method	Heat Resistant Temperatures <sup>2</sup>	Beam emitting direction	Fiber unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance <sup>1</sup>		Model	Dimensions
							MEGA	Other power modes		
Heat-resistant Glass substrate Alignment		482°F (250°C)	Right Angle	6.6' 2 m cut not allowed. -40 to +482°F (-40 to +250°C)		R0.98' R25	0.31" to 1.46" (0.31" to 1.34") 8 to 37 (8 to 34)	ULTRA : 0.31" to 1.34" (0.31" to 1.22") 8 to 34 (8 to 31) SUPER : 0.31" to 1.26" (0.31" to 1.14") 8 to 32 (8 to 29) TURBO : 0.31" to 1.18" (0.31" to 1.06") 8 to 30 (8 to 27) HSP : 0.39" to 0.71" (0.39" to 0.59") 10 to 18 (10 to 15)	FU-38LK Approx. 70 g	⊗ P.36
				6.6' 1 m cut not allowed. -40 to +482°F (-40 to +250°C)			0.10" to 2.56" (0.10" to 2.17") 2.5 to 65 (2.5 to 55)	ULTRA : 0.10" to 2.17" (0.10" to 1.73") 2.5 to 55 (2.5 to 44) SUPER : 0.10" to 1.06" (0.10" to 0.87") 2.5 to 27 (2.5 to 22) TURBO : 0.10" to 0.87" (0.10" to 0.75") 2.5 to 22 (2.5 to 19) HSP : 0.10" to 0.39" (0.10" to 0.28") 2.5 to 10 (2.5 to 7)	FU-38K Approx. 45 g	⊗ P.36
				6.6' 2 m Free-cut (ø0.09" ø2.2 x 2) -40 to +356°F (-40 to +180°C)		R1.38' R35	0.10" to 0.63" (0.10" to 0.47") 2.5 to 16 (2.5 to 12)		FU-38H Approx. 45 g	⊗ P.36

<sup>1</sup> When using the FS-V30. Standard target: White mat paper (Reflective type only.) FU-38LK shows values for t=0.03" 0.7 mm glass substrate (horizontal direction).  
<sup>2</sup> Use the fiber sensor under dry conditions. Allow some margin for the temperature upper limit when selecting a heat-resistant fiber unit.

## Selection Tips

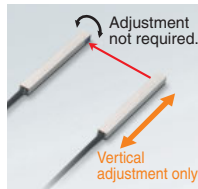
### FU-18M



#### Perfect for wafer mapping

##### Vertical adjustment only

Rotary direction adjustment not required, which reduces installation time.



##### Mouting brackets included

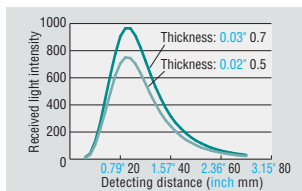
Special brackets are provided to make installation easier. Easy installation in existing devices.



### FU-40S

#### Stable target detection even if the detecting distance changes

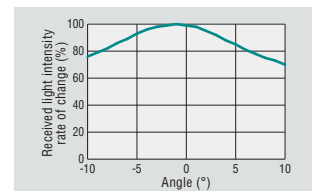
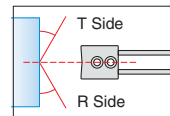
A high-power, large-aperture, aspherical lens provides coverage for a wide range of distances.



**Detecting distance vs. Received light intensity (Typical)**  
 R Surface of Class Substrate for Liquid Crystal (ULTRA APC OFF)

#### Stable target detection even at an angle

A high-power, large-aperture, aspherical lens performs exceptionally even at an angle.



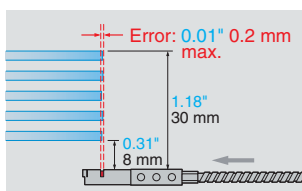
**Angle characteristics (Typical)**  
 Detecting distance: 1.18" 30 mm 0.03" 0.7 mm thick glass substrate for liquid crystal, R surface

### FU-38L/38LK/38S

#### High-accuracy detection at distances of 0.31" to 1.18" 8 to 30 mm

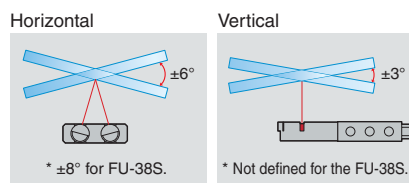
Positioning accuracy of 0.01" 0.2 mm or less is maintained even if the distance to the glass substrate changes within a range of 0.31" to 1.18" 8 mm to 30 mm.

\* the FS-V31 Series TURBO mode, APC OFF  
 \* FU-38S provides positioning accuracy of 0.01" 0.2 mm or less at distances from 0.20" to 0.67" 5 mm to 17 mm.



#### Stable detection of substrates at angles of: Horizontal: ±6°, Vertical: ±3°

Stable detection is possible even when the glass substrate is at an angle.



\* ±8° for FU-38S.

\* Not defined for the FU-38S.

Integrated Bracket

Flat

Threaded/Hex-shaped

Cylinder

Sleeve

Small Spot

Area

Retro-reflective

Narrow Beam/High-Power

Definite-reflective

High-flex

Oil/Chemical Resistant

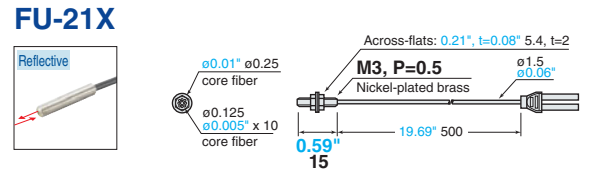
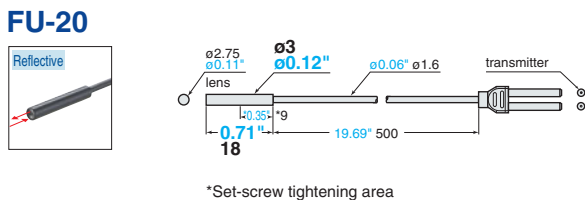
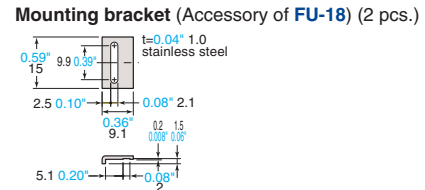
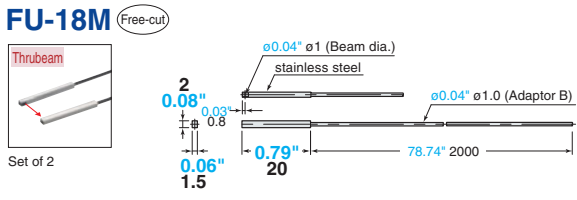
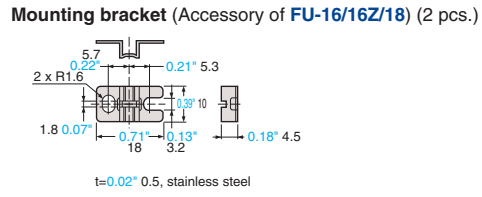
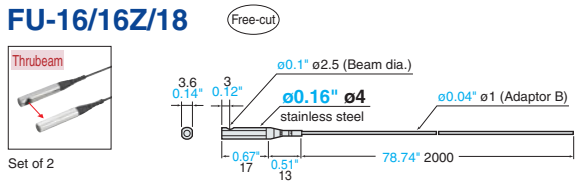
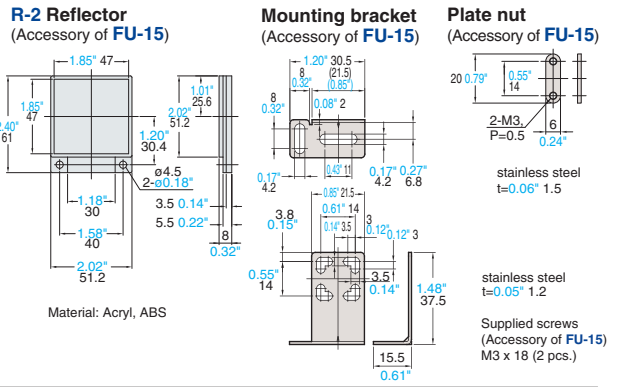
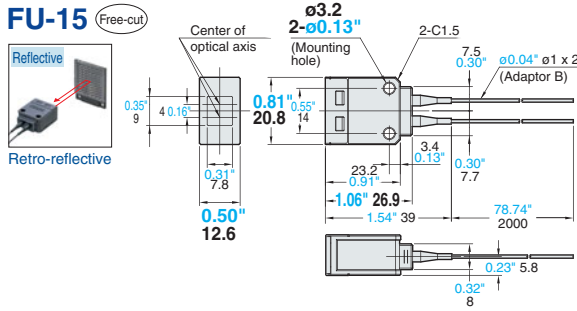
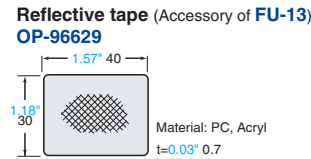
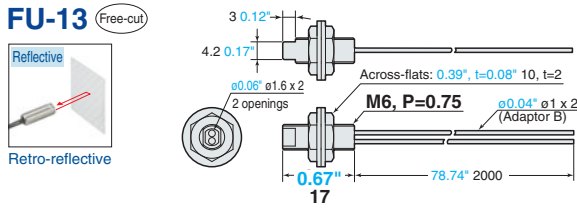
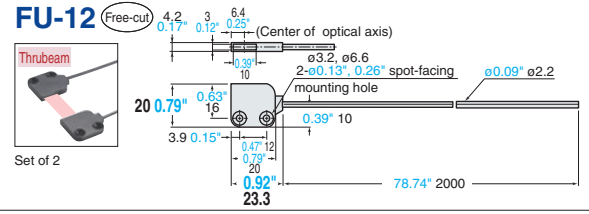
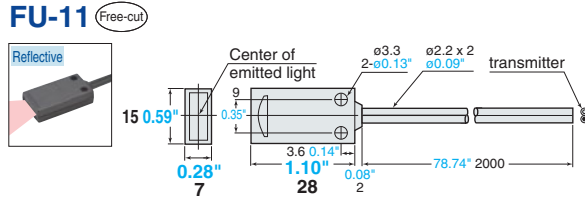
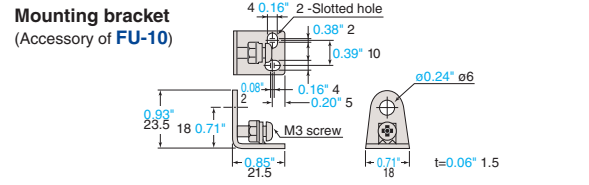
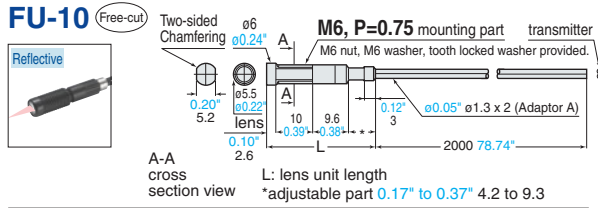
Heat Resistant

Liquid-level

Liquid Crystals/Semiconductors

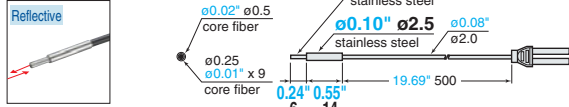
# Fiber Unit Dimensions

Unit: inch mm

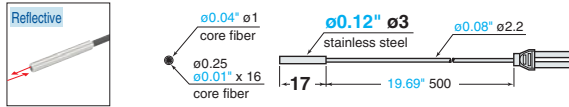


Unit: inch mm

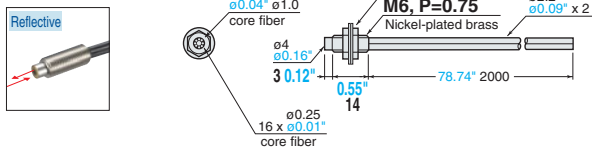
**FU-22X**



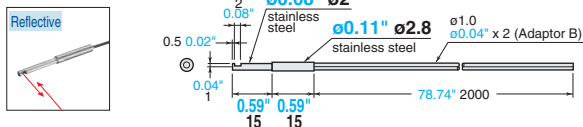
**FU-23X**



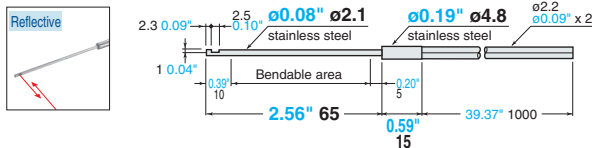
**FU-25**



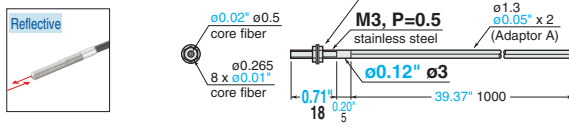
**FU-31** (Free-cut)



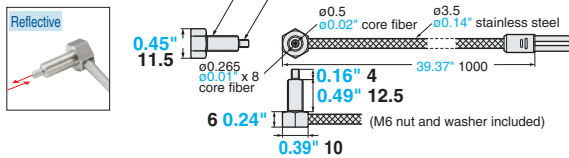
**FU-33** (Free-cut)



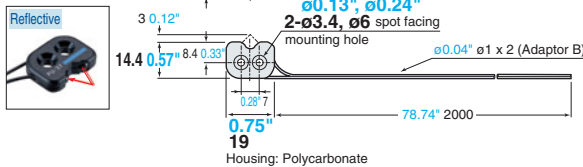
**FU-35FA** (Free-cut)



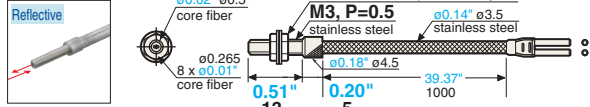
**FU-35TG**



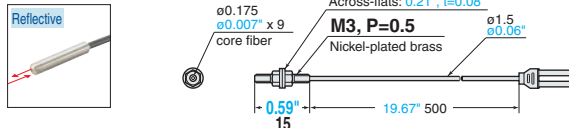
**FU-37** (Free-cut)



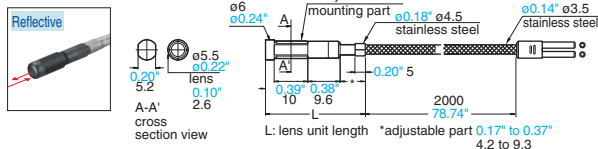
**FU-2303**



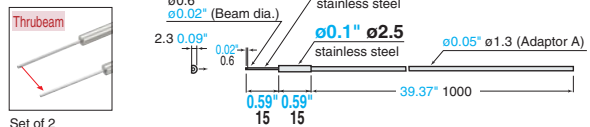
**FU-24X** (Free-cut)



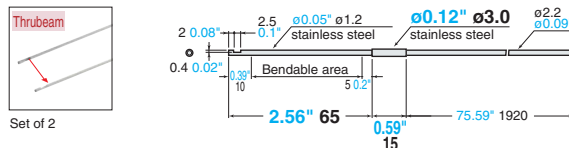
**FU-2540**



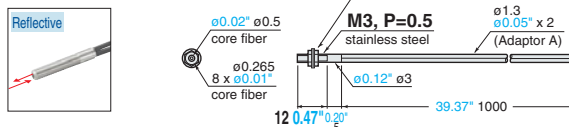
**FU-32** (Free-cut)



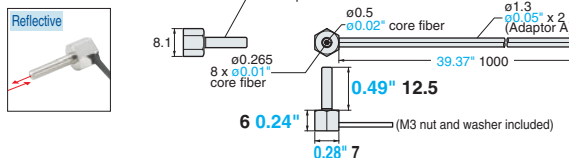
**FU-34** (Free-cut)



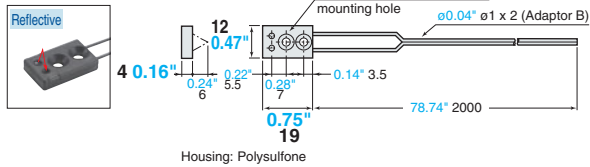
**FU-35FZ** (Free-cut)



**FU-35TZ** (Free-cut)



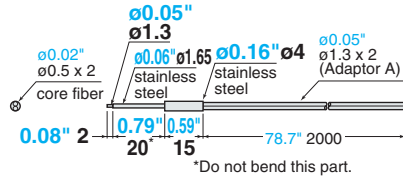
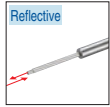
**FU-38** (Free-cut)



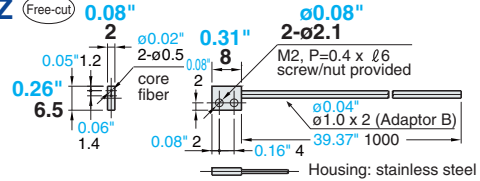


Unit: inch mm

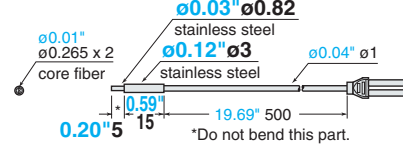
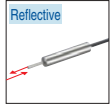
**FU-43** (Free-cut)



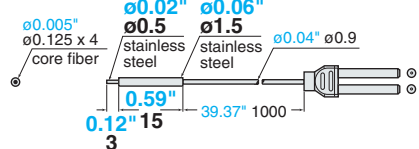
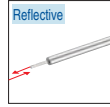
**FU-44TZ** (Free-cut)



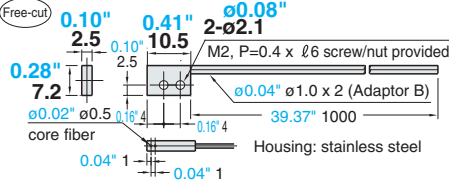
**FU-45X**



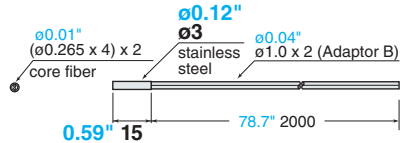
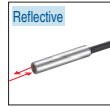
**FU-46**



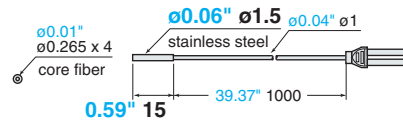
**FU-47TZ** (Free-cut)



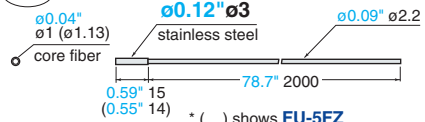
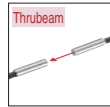
**FU-48** (Free-cut)



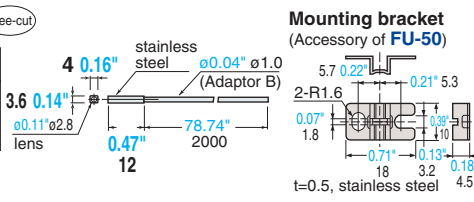
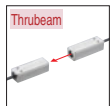
**FU-49X**



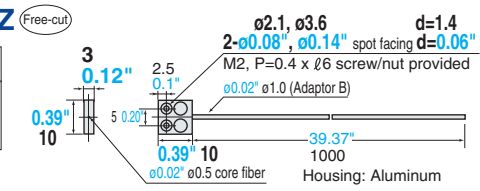
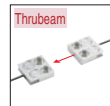
**FU-5F / 5FZ** (Free-cut)



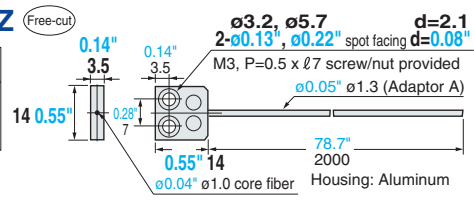
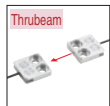
**FU-50** (Free-cut)



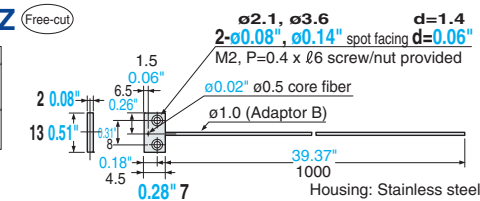
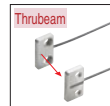
**FU-51TZ** (Free-cut)



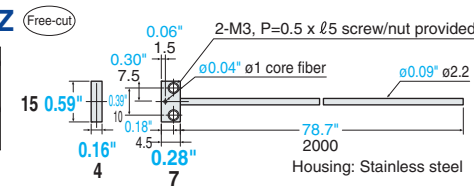
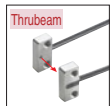
**FU-52TZ** (Free-cut)



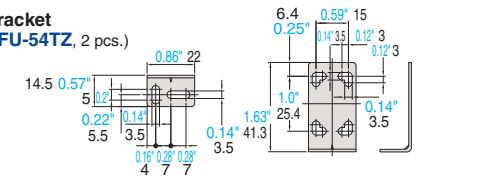
**FU-53TZ** (Free-cut)



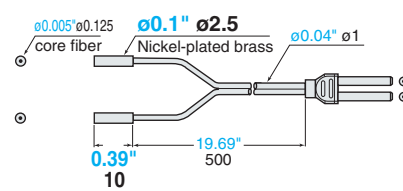
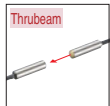
**FU-54TZ** (Free-cut)



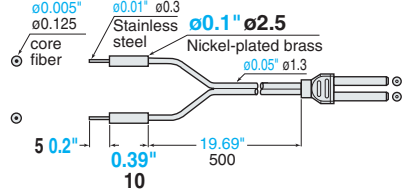
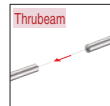
**Mounting bracket**  
(Accessory of FU-54TZ, 2 pcs.)



**FU-55**

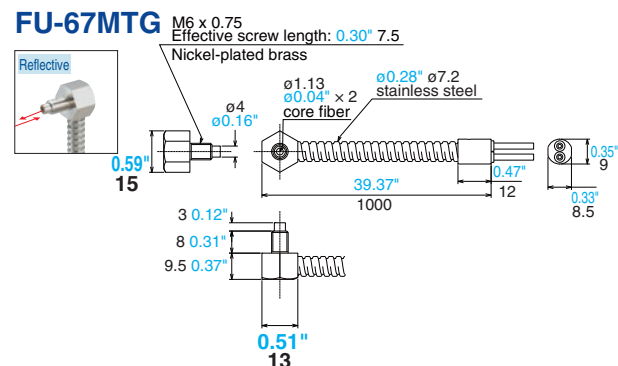
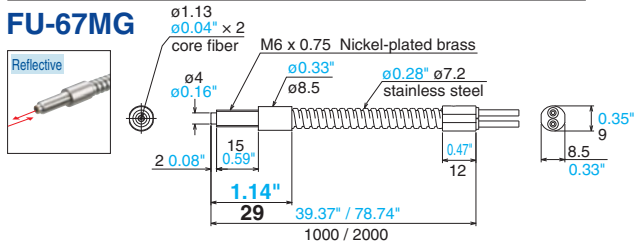
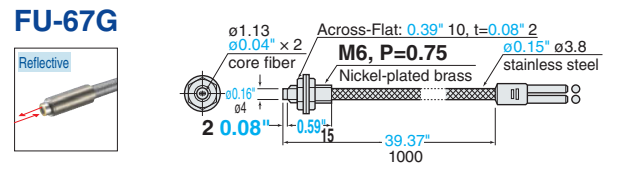
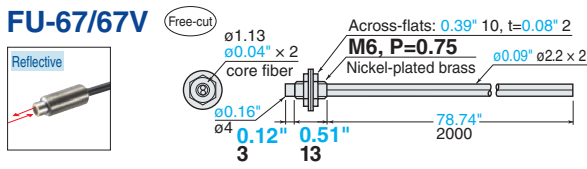
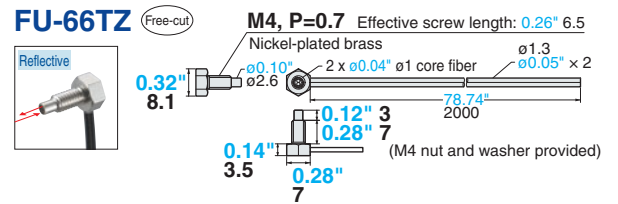
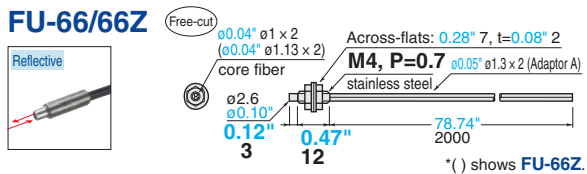
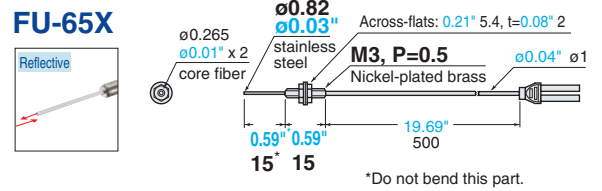
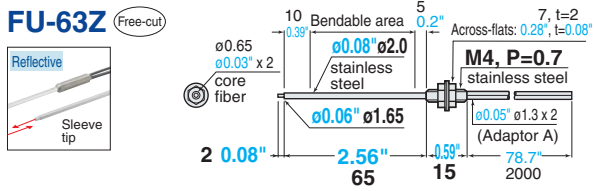
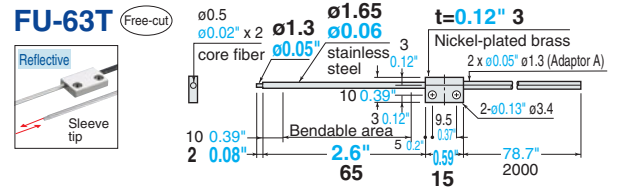
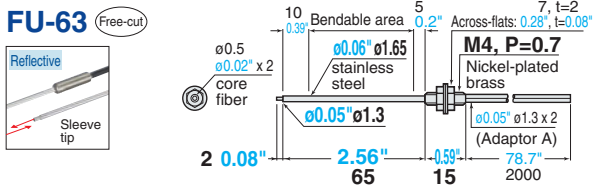
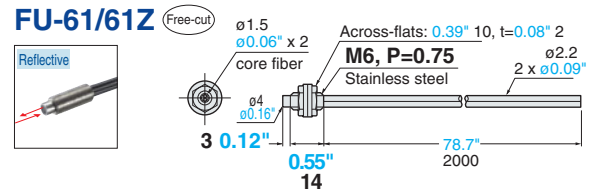
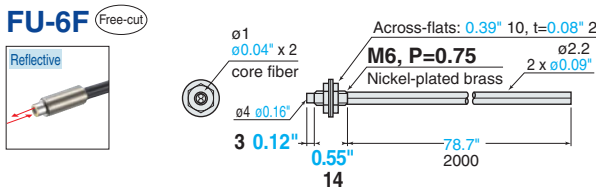
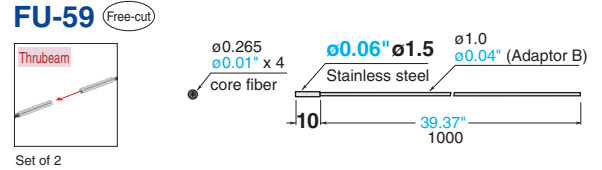
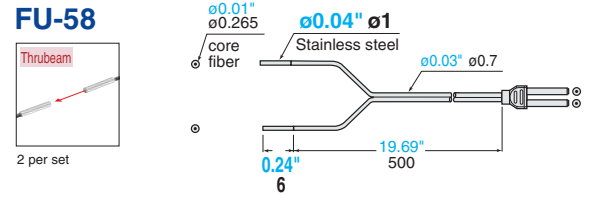
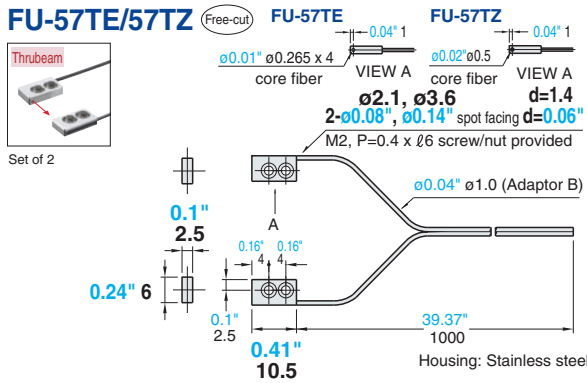


**FU-56**



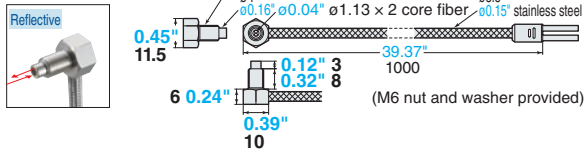
# Fiber Unit Dimensions

Unit: inch mm

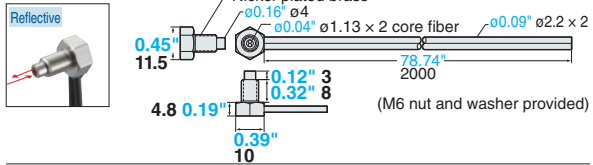


Unit: inch mm

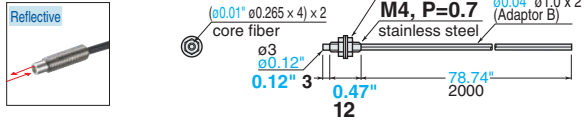
**FU-67TG**



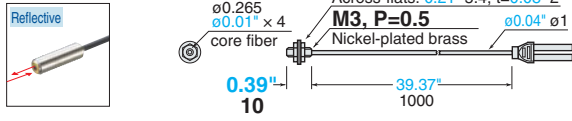
**FU-67TZ**



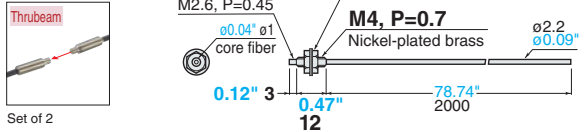
**FU-68**



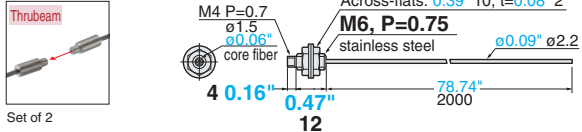
**FU-69X**



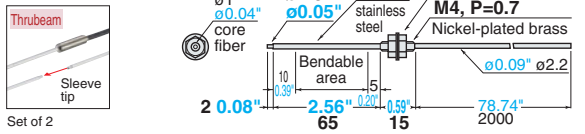
**FU-7F**



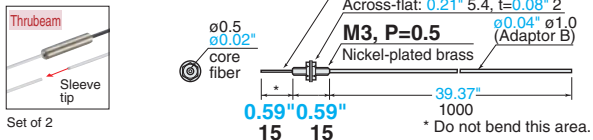
**FU-71/71Z**



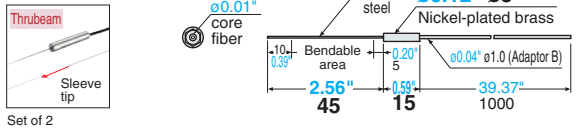
**FU-73**



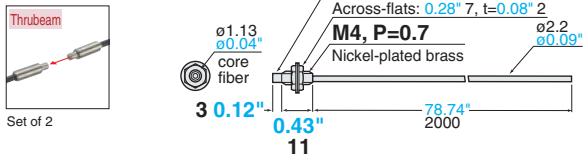
**FU-75F**



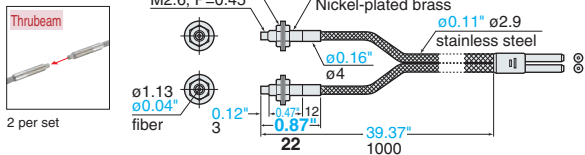
**FU-76F**



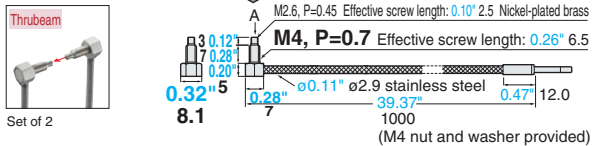
**FU-77/77V**



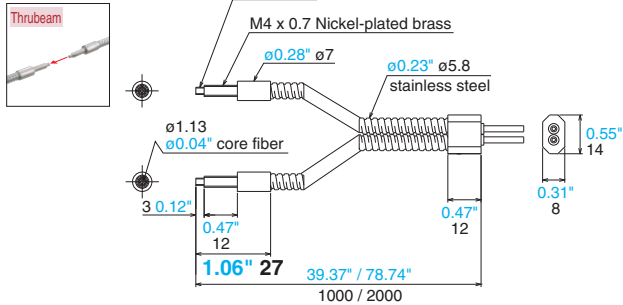
**FU-77G**



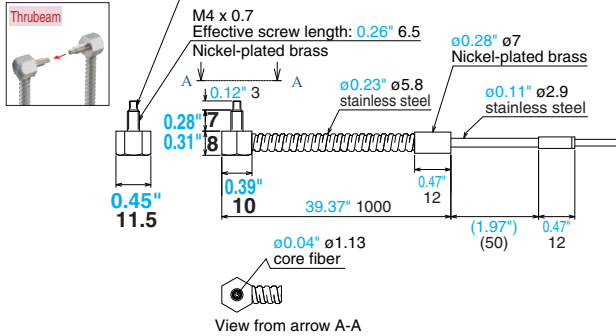
**FU-77TG**



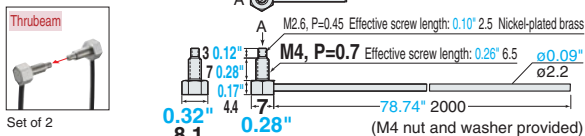
**FU-77MG**



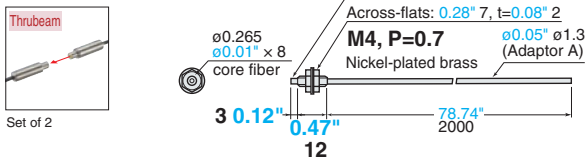
**FU-77MTG**



**FU-77TZ**

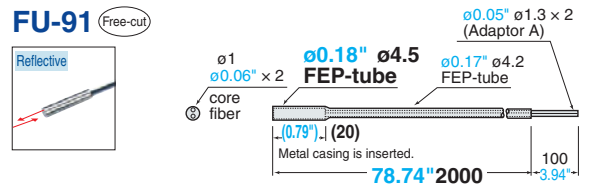
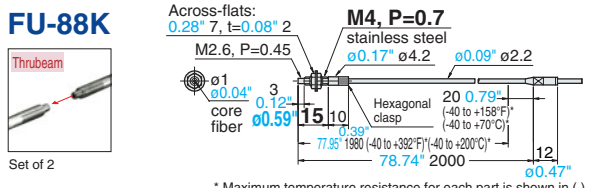
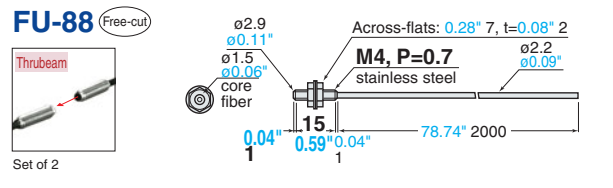
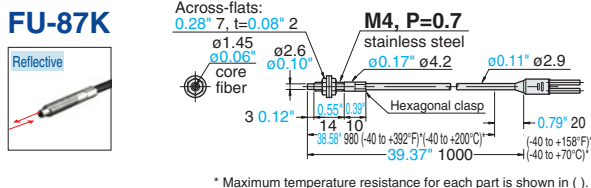
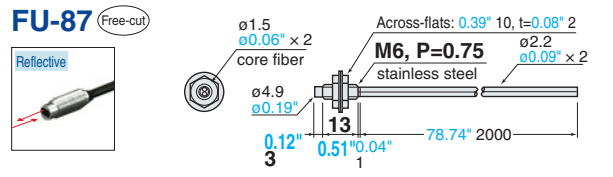
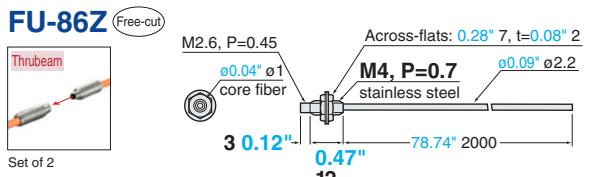
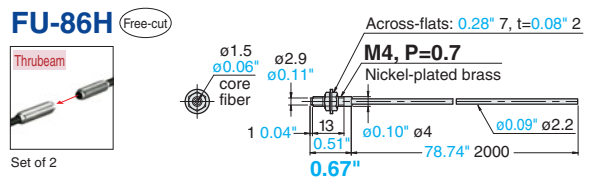
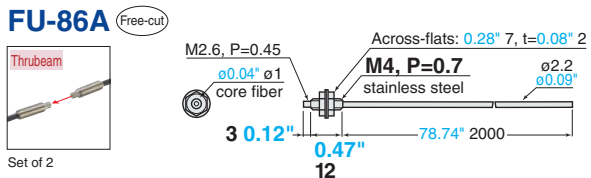
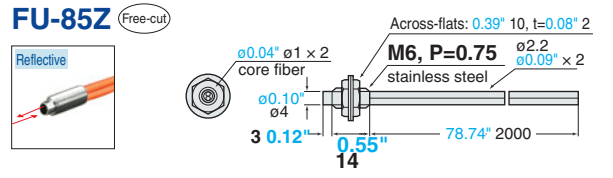
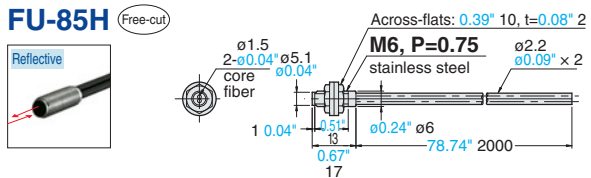
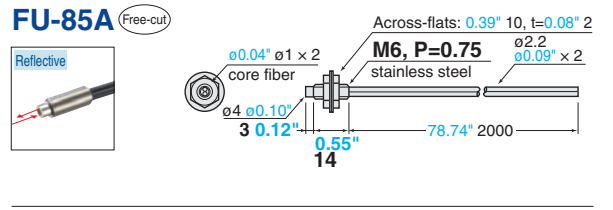
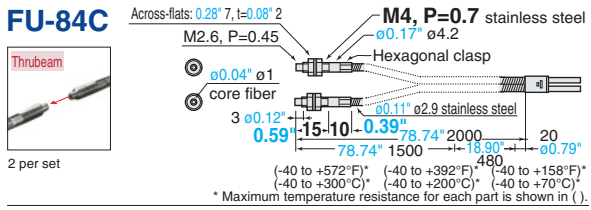
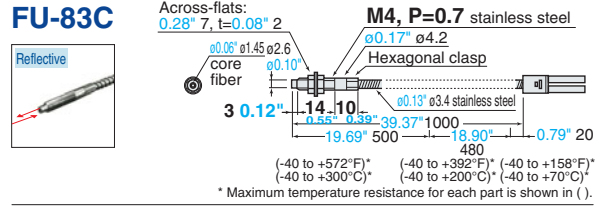
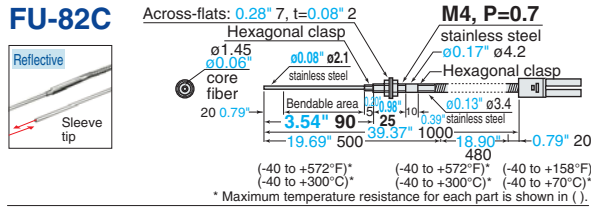
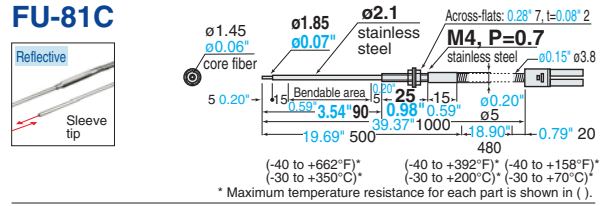
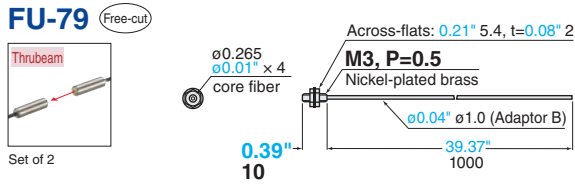


**FU-78**



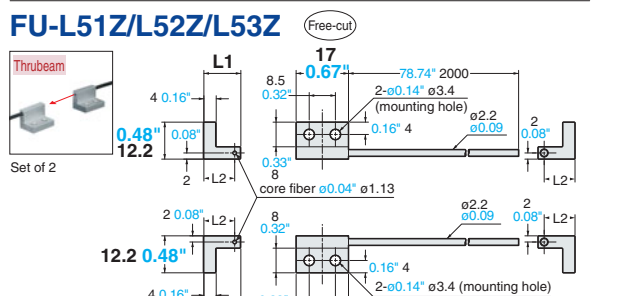
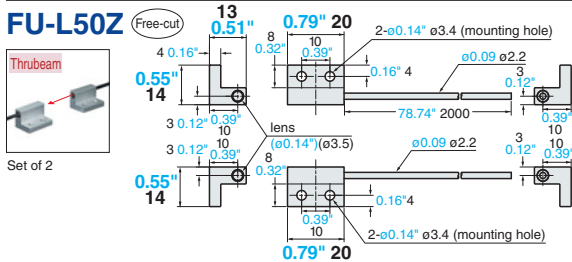
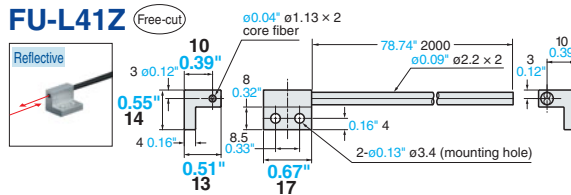
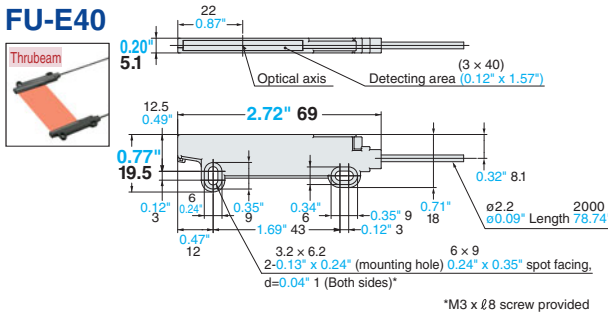
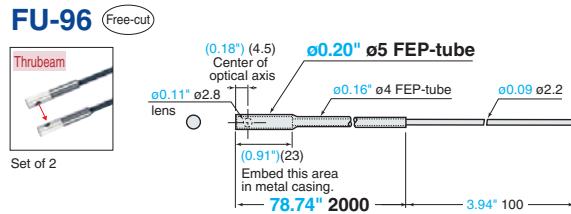
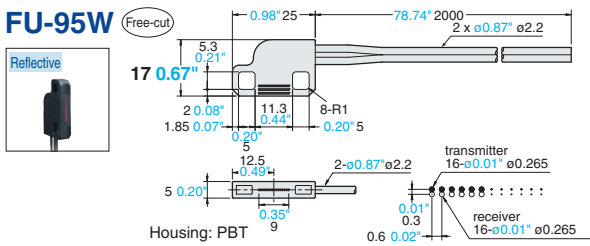
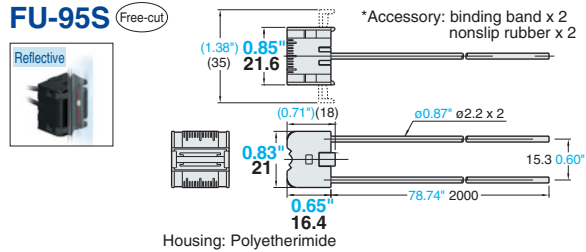
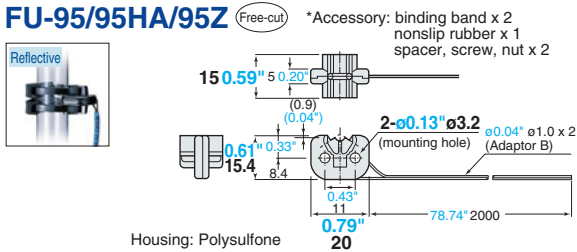
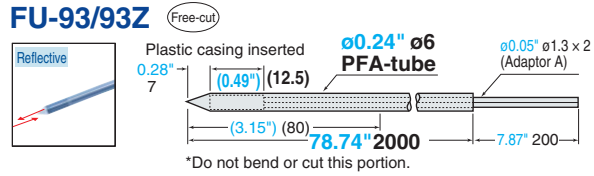
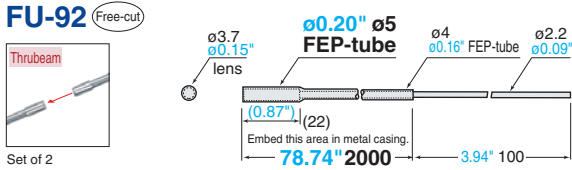
# Fiber Unit Dimensions

Unit: inch mm

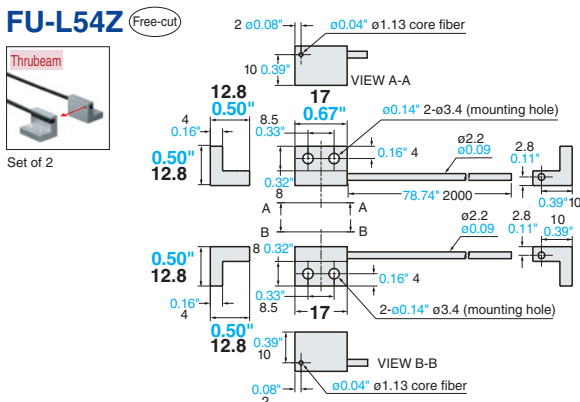




Unit: inch mm



Model	L1	L2
FU-L51Z	0.48" 12.2	0.39" 10
FU-L52Z	0.67" 17	0.59" 15
FU-L53Z	0.89" 22	0.79" 20



# Fiber Unit Dimensions

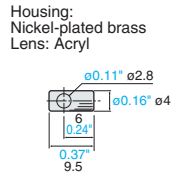
Unit: inch mm

## Lens (Option)

### F-1



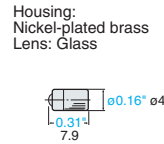
2 per set



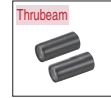
### F-2



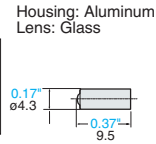
2 per set



### F-4



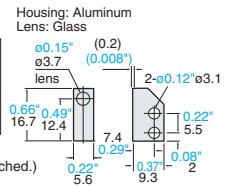
2 per set



### F-5



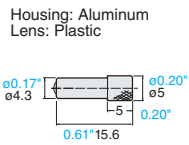
2 per set



### F-2HA



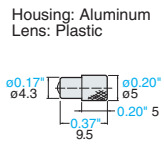
Reflective



### F-3HA



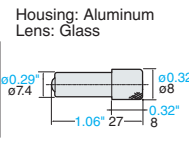
Reflective



### F-4HA



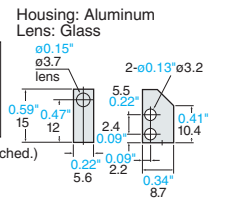
Reflective



### F-5HA



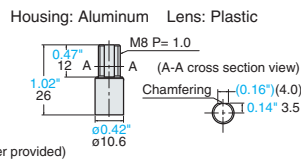
Reflective



### F-6HA



(M8 nut and washer provided)

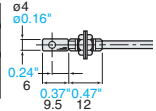


## With lenses

### F-1+FU-7F/86A/86Z



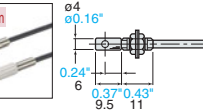
Thrubeam



### F-1+FU-77/77V



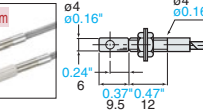
Thrubeam



### F-1+FU-77G/77MG



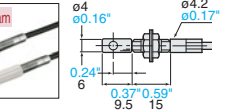
Thrubeam



### F-1+FU-84C/88K



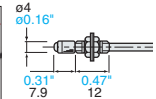
Thrubeam



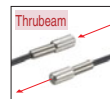
### F-2+FU-7F/86A/86Z



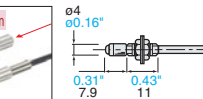
Thrubeam



### F-2+FU-77/77V



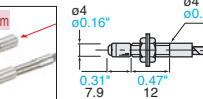
Thrubeam



### F-2+FU-77G/77MG



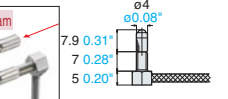
Thrubeam



### F-2+FU-77TG/77MTG



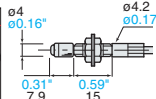
Thrubeam



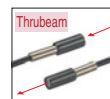
### F-2+FU-84C/88K



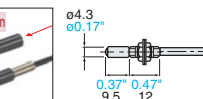
Thrubeam



### F-4+FU-7F



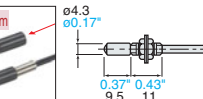
Thrubeam



### F-4+FU-77/77V



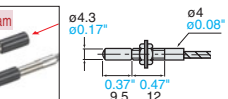
Thrubeam



### F-4+FU-77G/77MG



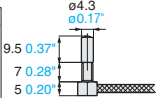
Thrubeam



### F-4+FU-77TG/77MTG



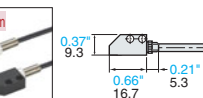
Thrubeam



### F-5+FU-7F/86A/86Z



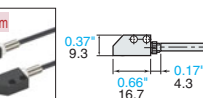
Thrubeam



### F-5+FU-77/77V



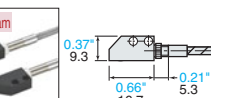
Thrubeam



### F-5+FU-77G/77MG

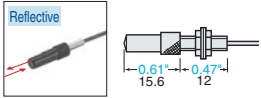


Thrubeam

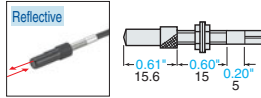


Unit: inch mm

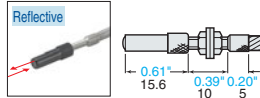
**F-2HA+FU-21X/FU-24X**



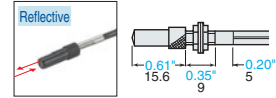
**F-2HA+FU-35FA**



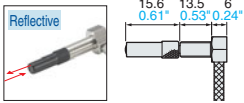
**F-2HA+FU-2303**



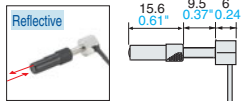
**F-2HA+FU-35FZ**



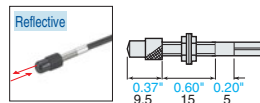
**F-2HA+FU-35TG**



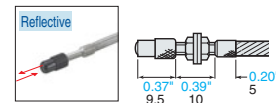
**F-2HA+FU-35TZ**



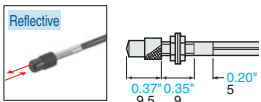
**F-3HA+FU-35FA**



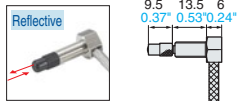
**F-3HA+FU-2303**



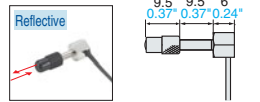
**F-3HA+FU-35FZ**



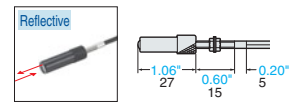
**F-3HA+FU-35TG**



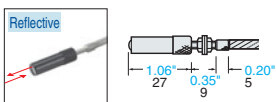
**F-3HA+FU-35TZ**



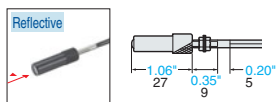
**F-4HA+FU-35FA**



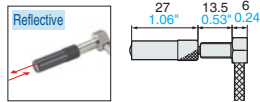
**F-4HA+FU-2303**



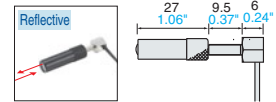
**F-4HA+FU-35FZ**



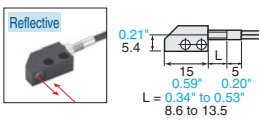
**F-4HA+FU-35TG**



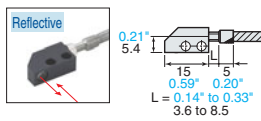
**F-4HA+FU-35TZ**



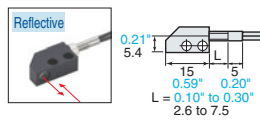
**F-5HA+FU-35FA**



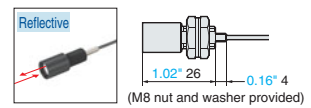
**F-5HA+FU-2303**



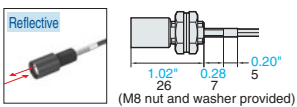
**F-5HA+FU-35FZ**



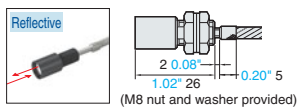
**F-6HA+FU-21X**



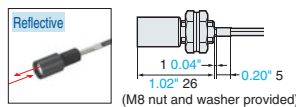
**F-6HA+FU-35FA**



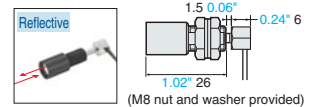
**F-6HA+FU-2303**



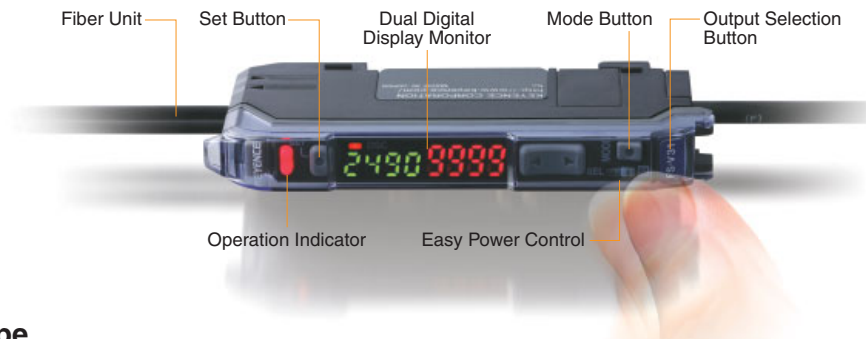
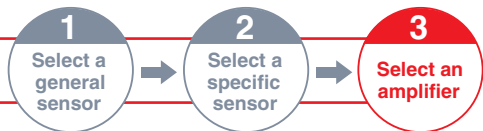
**F-6HA+FU-35FZ**



**F-6HA+FU-35TZ**



# STEP 3 Select an amplifier



## Cable Type

Appearance	Type	Model		ON/OFF outputs	External input	Analog output		
		NPN output	PNP output					
	Standard	Main unit	FS-V31	FS-V31P	1	0		
		Expansion unit	FS-V32	FS-V32P				
	2-output	Main unit	FS-V33	FS-V33P	2	1	0	
		Expansion unit	FS-V34	FS-V34P				
	Analog	Main unit	FS-V31M	—	1	0		1

\* The FS-V30 0-line expansion unit to support 0-line system is also available.

## Connector (M8) Type

Appearance	Type	Model		ON/OFF outputs	External input	Analog output	
		NPN output	PNP output				
	Standard	Main unit	FS-V31C	FS-V31CP	1	1	
		Expansion unit	FS-V32C	FS-V32CP			
	2-output	Main unit	FS-V33C	FS-V33CP	2	0	0
		Expansion unit	FS-V34C	FS-V34CP			

\* To use the connector styled amplifier, purchase the connector cable OP-73864 or OP-73865.

For the standard and analog output amplifiers, up to 16 expansion units can be added per main unit.  
 For the 2-output amplifiers, up to 7 expansion units can be added per main unit. (Current consumption of a 2-output amplifier is twice that of a standard amplifier.)

## Select amplifier options as required.

Type	Appearance	Description	Model
Amplifier securing bracket (for main unit)		Can be installed without DIN-rail. Also can be installed from above or from the side as shown in the illustration to the right.	OP-73880
End unit (when using expansion units)		Should be installed (as shown in the illustration to the right) when using both main and expansion units. (Two per set)	OP-26751
M8 connector cable (6.6' 2 m)		Fiber amplifiers with model numbers ending with a "C" are quick disconnect styled amplifiers. Mating connector cables are not included with the amplifier, so purchase them as needed.	OP-73864
M8 connector cable (32.8' 10 m)			OP-73865

Specifications are subject to change without notice.



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