

Fibre Unit Selection Guide

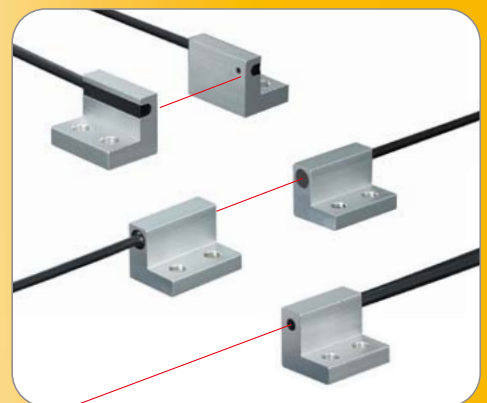


Choose from the largest selection of fibre optic sensors in the industry!

FU-E40 40 mm AREA BEAM



FU-L INTEGRATED BRACKET FIBRES



Please contact us
if you have any questions.



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



Easy step-by-step fibre search

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11	➔P.22
12	
13	➔P.23
15	
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16Z	➔P.24
18	
18M	➔P.24, 32
20	➔P.21
21X	➔P.11
22X	➔P.15,17
2303	➔P.11
23X	➔P.15
24X	➔P.11
25	
2540	➔P.19
31	➔P.17
32	➔P.16
33	➔P.17
34	➔P.16
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Model	Page
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40	
40G	➔P.24
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41TZ	
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44TZ	➔P.7
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57TZ	➔P.6
58	➔P.14
59	➔P.14, 26
6F	
61	➔P.11
61Z	

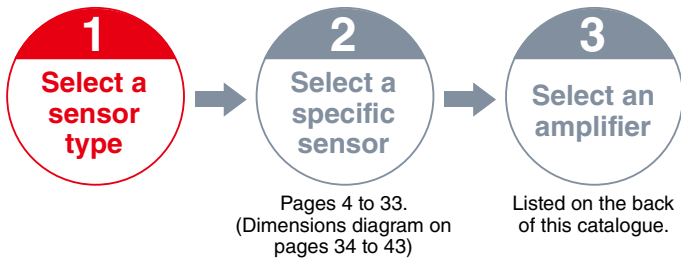
Model	Page
FU- 63	
63T	➔P.17
63Z	
65X	
66	➔P.11
66TZ	➔P.10
66Z	
67	➔P.11
67G	
67MG	
67MTG	
67TG	➔P.10
67TZ	
67V	➔P.11
68	➔P.26
69X	
7F	
71	➔P.9
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75F	➔P.16
76F	
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77TG	➔P.8
77TZ	
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Model	Page
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L52Z	➔P.4
L53Z	
L54Z	
L41Z	➔P.5

Dimensions for each fibre unit can be found starting from **P.34** of this catalogue.

Selecting a Fibre Sensor

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

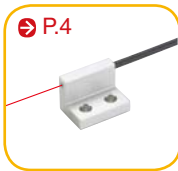


STEP 1 Select a sensor type

Mounting Configurations

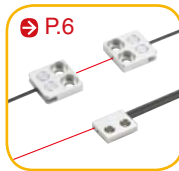
Select from a variety of fibres specifically designed for easy installation.

Integrated Bracket



Sensor is integrated into a metal bracket.

Flat Bracket Fibres



Flat pack fibres provide space saving.

Threaded and Hex-shaped Fibres



Hex shape allows easy mounting onto a bracket.

Cylinder



Secured using a set screw. Allows 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 Field/High-Power



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

Definite-reflective



Detection within a fixed distance.

Application-specific

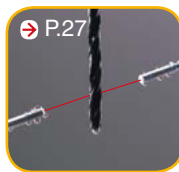
Select from a variety of fibres to suit your application needs.

High-flex



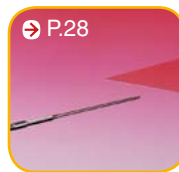
Ideal for use where fibre optic movement is required.

Oil/Chemical Resistant



Sensor is encased in a PTFE case.

Heat Resistant



Ideal for use under high temperatures. Withstands up to 350°C.

Liquid-level



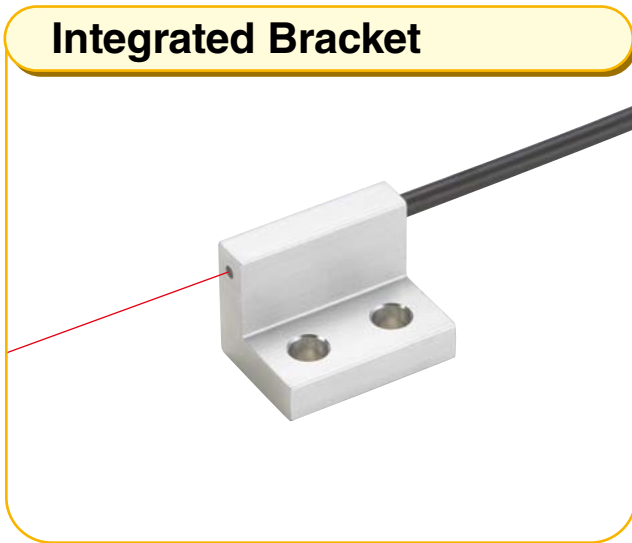
Pipe attachment and direct contact liquid level sensors are available.

Liquid Crystals/Semiconductors

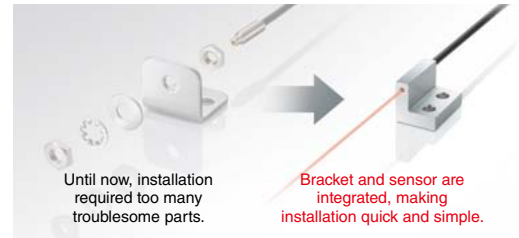


Sensors for alignment and mapping.

STEP 2 Select a specific sensor



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



Ask the Expert
Call us for Details on
the FU Series

RED indicates thrubeam fibres.

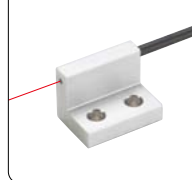
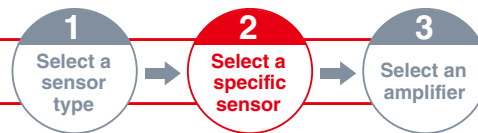
Unit: mm

Type			Fibre unit length (Diameter) Ambient temperature	Appearance	Minimum bend radius	Detecting distance*1		Optical axis diameter (Standard target to be detected)	Smallest detectable object*2	Model Weight	Dimensions
Detecting method	Beam emitting direction	Optical axis height				MEGA	Other power modes				
Thrubeam	Top	10	2 m Free-cut (ø2.2) -40 to +50°C 	R2 ToughFlex	3600 (3600) 1900 (1500)	ULTRA : 3600 (3600) SUPER : 3600 (3600) TURBO : 3600 (3000) HSP : 1400 (900)	ø3.5	ø0.005	FU-L50Z Approx. 30 g	⊕P.41	
			2 m Free-cut (ø2.2) -40 to +50°C 								
		15	2 m Free-cut (ø2.2) -40 to +50°C 								
			20								2 m Free-cut (ø2.2) -40 to +50°C
	Side	10	2 m Free-cut (ø2.2) -40 to +50°C 								1300 (1000) 250 (200)

*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 fibres.

Unit: mm

Type			Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Smallest detectable object ^{*2}	Model Weight	Dimensions
Detecting method	Beam emitting direction	Optical axis height				MEGA	Other power modes			
Reflective	Top	10	2 m Free-cut (ø2.2) -40 to +50°C		R2 ToughFlex	85 (65)	500 (400)	ø0.005	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 be so hard when there were a large number of sensors. This is much easier.
- The optical axis height is easy to understand, which simplifies design.
- With the built-in lens, there is no more worry that the lens might come off.

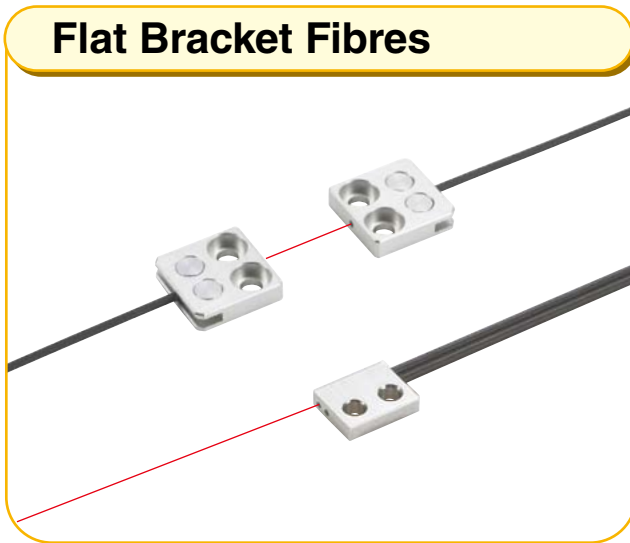
- Comparing the old and new sensor styles, it is easy to see that the new fibres are much smaller. This helps to make designs more compact.
- Why didn't we have something like this before?



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

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

STEP 2 Select a specific sensor



Can be installed where little space is available.



Ask the Expert
Call us for Details on
the FU Series

RED indicates thru-beam fibres.

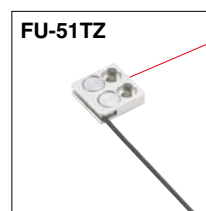
Unit: mm

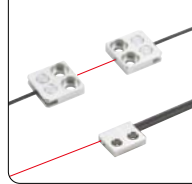
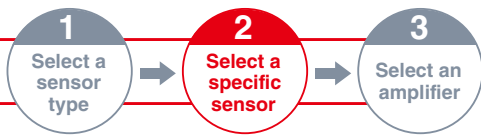
Type		Fibre unit length (Diameter) Ambient temperature	Appearance	Minimum bend radius	Detecting distance ^{*1}		Optical axis diameter (Standard target to be detected)	Smallest detectable object ^{*2}	Model Weight	Dimensions
Detecting method	Beam emitting direction				MEGA	Other power modes				
Thru-beam	Top	1 m Free-cut (ø1.0) -40 to +50°C 2-ø2.1 Thickness: 3		R2 ToughFlex	380 (280) 75 (60)	ULTRA : 300 (230) SUPER : 180 (150) TURBO : 150 (120) HSP : 45 (25)	ø0.5	ø0.005	FU-51TZ Approx. 5 g	⊗ P.37
		2 m Free-cut (ø1.3) -40 to +50°C 2-ø3.2 Thickness: 3.5			1300 (1000) 250 (200)	ULTRA : 1100 (850) SUPER : 620 (500) TURBO : 500 (400) HSP : 160 (100)			FU-52TZ Approx. 15 g	⊗ P.37
	Side	1 m Free-cut (ø1.0) -40 to +50°C 10.5 2-ø2.1 Thickness: 2.5			330 (250) 55 (45)	ULTRA : 250 (200) SUPER : 150 (120) TURBO : 110 (90) HSP : 35 (25)	ø0.5	ø0.005	FU-57TZ Approx. 5 g	⊗ P.38
		Flat	1 m Free-cut (ø1.0) -40 to +50°C 13 2-ø2.1 Thickness: 2			250 (200) 50 (40)			ULTRA : 200 (150) SUPER : 130 (100) TURBO : 100 (80) HSP : 40 (25)	ø0.5
	2 m Free-cut (ø2.2) -40 to +50°C 15 2-M3 Thickness: 4				1300 (1000) 250 (200)	ULTRA : 1100 (850) SUPER : 620 (500) TURBO : 500 (400) HSP : 160 (100)	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 fibres.





BLUE indicates reflective fibres.

Unit: mm

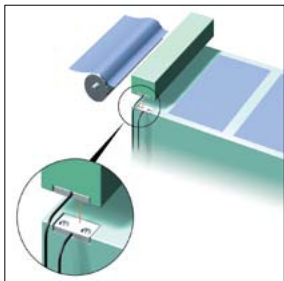
Type		Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Smallest detectable object ^{*2}	Model Weight	Dimensions
Detecting method	Beam emitting direction				Ambient temperature	MEGA			
Reflective	Top	1 m Free-cut (ø1.0 x 2) -40 to +50°C		R2 ToughFlex	1 to 90 (1 to 75)	ULTRA : 1 to 75 (1 to 60) SUPER : 1 to 45 (1 to 37) TURBO : 1 to 37 (1 to 30) HSP : 1 to 9 (1 to 6)	ø0.005 gold wire	FU-44TZ Approx. 3 g	P.37
		1 m Free-cut (ø1.0 x 2) -40 to +50°C			1 to 90 (1 to 75)	ULTRA : 1 to 75 (1 to 60) SUPER : 1 to 45 (1 to 37) TURBO : 1 to 37 (1 to 30) HSP : 1 to 12 (1 to 8)			
	Flat	1 m Free-cut (ø1.0) -40 to +50°C			2 to 60 (2 to 50) 2 to 10 (2 to 8)	ULTRA : 2 to 50 (2 to 40) SUPER : 2 to 25 (2 to 20) TURBO : 2 to 20 (2 to 16) HSP : 2 to 6 (2 to 4)		FU-41TZ Approx. 5 g	
		2 m Free-cut (ø2.2 x 2) -40 to +50°C			1 to 320 (1 to 250) 1 to 37 (1 to 30)	ULTRA : 1 to 250 (1 to 200) SUPER : 1 to 120 (1 to 100) TURBO : 1 to 75 (1 to 60) HSP : 1 to 30 (1 to 25)		FU-42TZ Approx. 24 g	

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

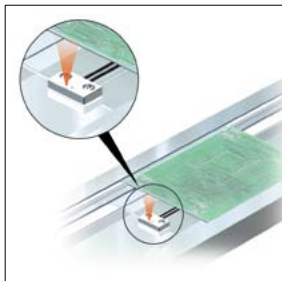
*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

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

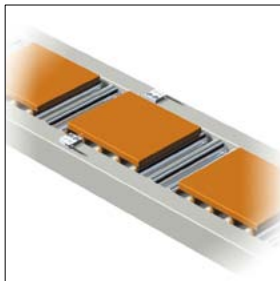
Example Installation Applications



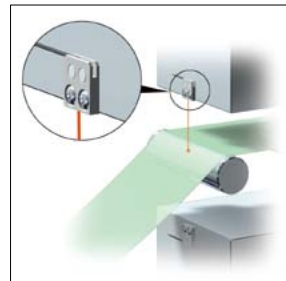
Cover page alignment



Circuit board detection



Thin work via hole detection

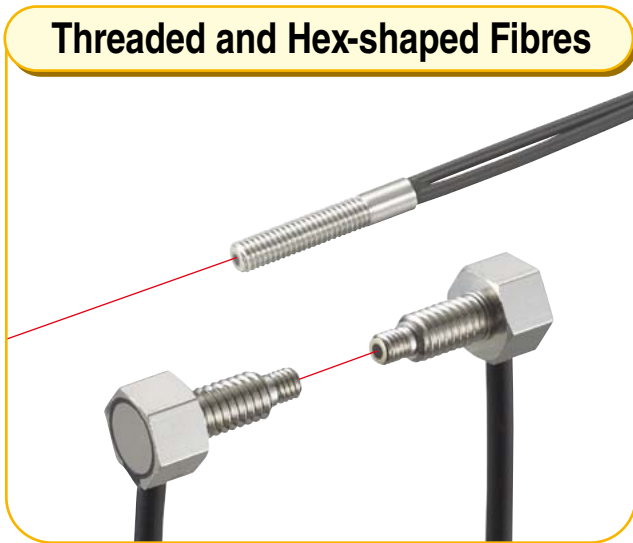


Detecting presence/absence of film

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

STEP 2 Select a specific sensor



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



Ask the Expert
Call us for Details on
the FU Series

RED indicates thrubeam fibres.

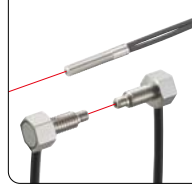
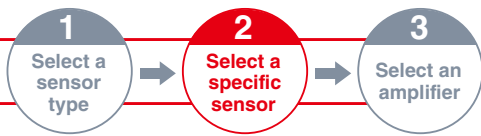
Unit: mm

Type			Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Optical axis diameter (Standard target to be detected)	Smallest detectable object ^{*2}	Model Weight	Dimensions	
Shape	Detecting method	Size				MEGA	Other power modes					
Hex- shaped	Thrubeam	M4	2 m Free-cut (ø2.2) -40 to +50°C		R2 ToughFlex			ø1.13	ø0.005	FU-77TZ Approx. 43 g		
			1 m cut not allowed. -40 to +50°C		R10 Stainless Steel		1400 (1100) 250 (200)			ULTRA : 1100 (880) SUPER : 650 (500) TURBO : 500 (400) HSP : 170 (110)	FU-77TG Approx. 43 g	
			1 m cut not allowed. -40 to +50°C		R20 Stainless Steel					Lens attachment	FU-77MTG Approx. 100 g	

*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.



RED indicates thrubeam fibres.

Unit: mm

Type			Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance*1		Optical axis diameter (Standard target to be detected)	Smallest detectable object*2	Model Weight	Dimensions
Shape	Detecting method	Size				MEGA	Other power modes				
Threaded	Thrubeam	M3	1 m Free-cut (ø1.0) -40 to +70°C		R4 High-flex	500 (380) 125 (100)	ULTRA : 420 (330) SUPER : 270 (200) TURBO : 220 (170) HSP : 70 (35)	ø0.7	ø0.005	FU-79 Approx. 6 g	⊕ P.40
			2 m Free-cut (ø2.2) -40 to +50°C		R0.5 ToughFlex	1700 (1300)	ULTRA : 1300 (1100) SUPER : 750 (600) TURBO : 600 (460) HSP : 200 (140)	ø1.13		FU-77V Approx. 25 g	⊕ P.39
		M4	1 m cut not allowed. -40 to +50°C		R10 Stainless Steel					300 (230)	Lens attachment ⊕ P.12
			1 m cut not allowed. -40 to +50°C		R20 Stainless Steel	2300 (1400) 400 (320)	FU-77MG Approx. 100 g	⊕ P.39			
			2 m Free-cut (ø2.2) -40 to +70°C		R25		1100 (750) 190 (150)	FU-7F Approx. 21 g		⊕ P.39	
			2 m Free-cut (ø1.3) -40 to +70°C		R4	ULTRA : 800 (600) SUPER : 460 (370) TURBO : 370 (300) HSP : 130 (75)		FU-78 Approx. 9 g		⊕ P.39	
		M6	2 m Free-cut (ø2.2) FU-71Z: -40 to +50°C FU-71: -40 to +70°C		R2 ToughFlex	2400 (1700) 450 (350)	ULTRA : 1900 (1300) SUPER : 1100 (900) TURBO : 900 (700) HSP : 270 (160)	ø1.5		FU-71Z Approx. 25 g	⊕ P.39
					R25	2600 (1900) 550 (450)	ULTRA : 2000 (1600) SUPER : 1350 (1000) TURBO : 1000 (850) HSP : 330 (200)			FU-71 Approx. 25 g	⊕ P.39

*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 Bracket

Threaded/
Hex-shaped

Cylinder

Sleeve

Small Spot

Area

Retro-reflective

Narrow Field/
High-Power

Definite-reflective

High-flex

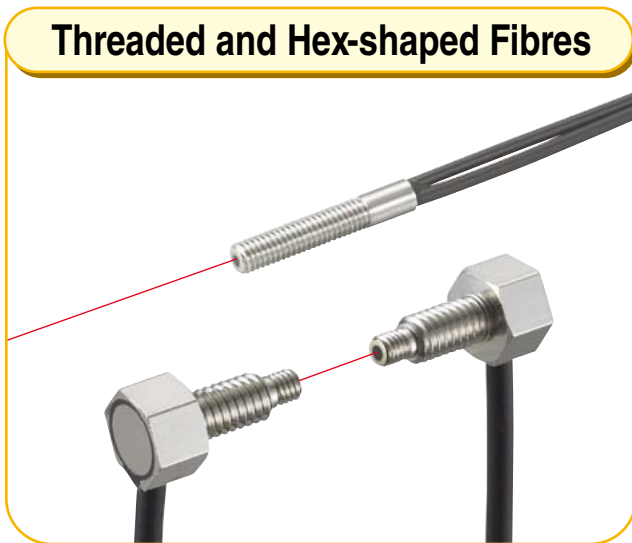
Oil/Chemical Resistant

Heat Resistant

Liquid-level

Liquid Crystals/
Semiconductors

STEP 2 Select a sensor type



BLUE indicates reflective fibres.

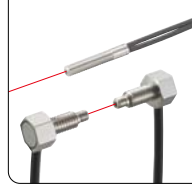
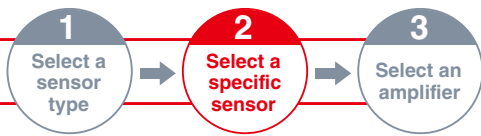
Unit: mm

Type				Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Smallest detectable object ^{*2}	Model Weight	Dimensions	
Shape	Detecting method	Size	Detecting Arrangement				Ambient temperature	MEGA FINE				Other power modes
Hex-shaped	Reflective	M3	Coaxial	1 m Free-cut (ø1.3 x 2)		R2 ToughFlex	180 (140) 30 (23)	ULTRA : 140 (110) SUPER : 75 (60) TURBO : 55 (42) HSP : 20 (16)	ø0.005 gold wire	FU-35TZ	Approx. 7 g	➔ P.35
				-40 to +50°C	M3	R2 ToughFlex	350 (280) 50 (40)	ULTRA : 280 (230) SUPER : 150 (120) TURBO : 100 (80) HSP : 35 (28)		FU-66TZ		
		M6	Parallel	2 m Free-cut (ø1.3 x 2)		R2 ToughFlex	500 (400) 75 (60)	ULTRA : 400 (320) SUPER : 200 (160) TURBO : 150 (120) HSP : 45 (33)		FU-67TZ	Approx. 32 g	➔ P.39
				2 m Free-cut (ø2.2 x 2)		R2 ToughFlex	500 (400) 75 (60)	ULTRA : 400 (320) SUPER : 200 (160) TURBO : 150 (120) HSP : 45 (33)		FU-67TG	Approx. 32 g	➔ P.39
				1 m cut not allowed.		R10 Stainless Steel	500 (400) 75 (60)	ULTRA : 400 (320) SUPER : 200 (160) TURBO : 150 (120) HSP : 45 (33)		FU-67MTG	Approx. 80 g	➔ P.38
				1 m cut not allowed.		R25 Stainless Steel	500 (400) 75 (60)	ULTRA : 400 (320) SUPER : 200 (160) TURBO : 150 (120) HSP : 45 (33)		FU-67MTG	Approx. 80 g	➔ P.38
Coaxial	1 m cut not allowed.		R10 Stainless Steel	180 (140) 30 (23)	ULTRA : 140 (110) SUPER : 75 (60) TURBO : 55 (42) HSP : 20 (16)	FU-35TG	Approx. 32 g	➔ P.35				
-40 to +50°C	M6	R10 Stainless Steel	180 (140) 30 (23)	ULTRA : 140 (110) SUPER : 75 (60) TURBO : 55 (42) HSP : 20 (16)	FU-35TG	Approx. 32 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.



BLUE indicates reflective fibres.

Unit: mm

Type				Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Smallest detectable object ^{*2}	Model	Weight	Dimensions		
Shape	Detecting method	Size	Detecting Arrangement				Ambient temperature	MEGA					Other power modes	
Threaded	Reflective	M3	Coaxial	1 m Free-cut (ø1.3 x 2)		R2 ToughFlex	200 (160)	ULTRA : 160 (130) SUPER : 80 (65) TURBO : 60 (45) HSP : 22 (17)	ø0.005 gold wire	FU-35FZ	Approx. 6 g	➔ P.35		
				1 m cut not allowed.		R10	32 (25)	Lens attachment ➔ P.16		FU-2303	Approx. 15 g	➔ P.35		
				1 m Free-cut (ø1.3 x 2)		R25	340 (270)	ULTRA : 270 (220) SUPER : 140 (110) TURBO : 90 (70) HSP : 30 (25)		FU-35FA	Approx. 6 g	➔ P.35		
				50 cm cut not allowed. FU-21X: -40 to +70°C FU-24X: -40 to +50°C			45 (35)	Lens attachment ➔ P.16		FU-21X	Approx. 4 g	➔ P.34		
						R10	55 (45)	ULTRA : 45 (36) SUPER : 22 (18) TURBO : 15 (12) HSP : 6 (4)		FU-24X	Approx. 4 g	➔ P.35		
						R2 ToughFlex	400 (320)	ULTRA : 320 (260) SUPER : 160 (130) TURBO : 120 (90) HSP : 40 (30)		FU-66Z	Approx. 10 g	➔ P.38		
				R25	700 (530)	ULTRA : 520 (430) SUPER : 350 (250) TURBO : 230 (180) HSP : 80 (55)	FU-66	Approx. 10 g		➔ P.38				
				R0.5 ToughFlex	500 (400)	ULTRA : 400 (320) SUPER : 220 (180) TURBO : 170 (130) HSP : 50 (36)	FU-67V	Approx. 25 g		➔ P.38				
					85 (65)		FU-61Z	Approx. 22 g		➔ P.38				
					125 (100)		FU-67	Approx. 21 g		➔ P.38				
				M6	Parallel	2 m Free-cut (ø2.2 x 2)		R25 Stainless Steel		500 (400)	ULTRA : 400 (320) SUPER : 220 (180) TURBO : 170 (130) HSP : 50 (36)	FU-67MG	Approx. 70 g	➔ P.38
						1 m cut not allowed.				85 (65)		FU-67G	Approx. 29 g	➔ P.38
						1 m cut not allowed.						FU-67	Approx. 29 g	➔ P.38
				M6	Parallel	2 m Free-cut (ø2.2 x 2)		R25		950 (750)	ULTRA : 900 (600) SUPER : 500 (400) TURBO : 360 (280) HSP : 120 (80)	FU-61	Approx. 21 g	➔ P.38
						2 m Free-cut (ø2.2 x 2)				200 (150)		FU-6F	Approx. 21 g	➔ P.38
		2 m Free-cut (ø2.2 x 2)				700 (530)								
			Coaxial	2 m Free-cut (ø2.2 x 2)			560 (470)	ULTRA : 520 (430) SUPER : 300 (240) TURBO : 200 (160) HSP : 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 Bracket

Threaded/
Hex-shaped

Cylinder

Sleeve

Small Spot

Area

Retros-reflective

Narrow Field/
High-Power

Definite-reflective

High-flex

Oil/Chemical
Resistant

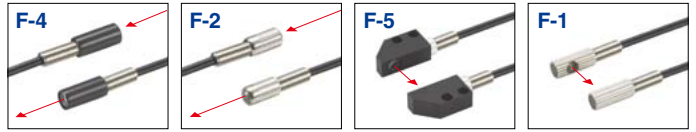
Heat
Resistant

Liquid-level

Liquid Crystals/
Semiconductors

STEP 2 Select a specific sensor

Detecting Distance Using Thrubeam Lenses

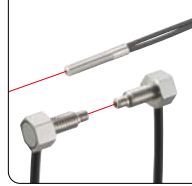
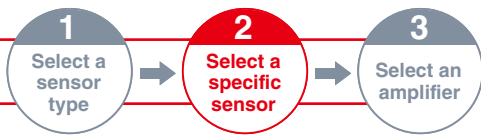


Unit: mm

Type	Ambient Temperature Shape	Model Weight	Dimensions	Applicable Fibre	Detecting distance ^{*1}					
					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: 70°C Tip: ø4.3 9.5	F-4 Approx. 1 g	⊕P.42	FU-77TZ/77V/77					3200 (2500)	1900 (1400)
				FU-7F	3600 (3600)				3600 (3000)	2100 (1500)
				FU-78					2500 (2000)	1500 (1100)
				FU-77G/77MG/ 77TG/77MTG	1800 (1800)					
Long Distance Aperture Angle: Approx. 15°	Heat Resistance: 300°C Tip: ø4 7.9	F-2 Approx. 2 g	⊕P.42	FU-77TZ/77V/77/ 84C/88K	3600 (3600)			3600 (3000)	1900 (1500)	1400 (900)
				FU-7F/86A	3600 (3600)				2300 (1800)	1500 (1000)
				FU-86Z	3600 (3600)			3600 (3000)	2000 (1600)	1300 (650)
				FU-78	3600 (3600)		3600 (3000)	3000 (2400)	1500 (1200)	1100 (800)
				FU-77G/77MG/ 77TG/77MTG	1800 (1800)				1800 (1500)	1400 (900)
Side-view with mounting hole	Heat Resistance: 105°C Fixing Nut 9.3 16.7 5.6	F-5 Approx. 10 g	⊕P.42	FU-77V/77					2300 (1800)	1500 (1000)
				FU-7F/86A	3600 (3600)				3600 (2400)	1800 (1200)
				FU-86Z					2500 (2000)	1600 (800)
				FU-78					2300 (1800)	1300 (900)
				FU-77G	1800 (1800)					
Side-view	Heat Resistance: 70°C ^{*2} Tip: ø4 9.5	F-1 Approx. 2 g	⊕P.42	FU-77V/77/ 77G/77MG	1800 (1400)	1400 (1100)	850 (700)	700 (550)	400 (300)	300 (200)
				FU-7F/86A	2500 (2000)	2000 (1600)	1300 (1000)	1000 (800)	500 (400)	320 (220)
				FU-86Z	1900 (1500)	1500 (1200)	950 (750)	750 (600)	400 (300)	250 (130)
				FU-78/84C/88K	1400 (1100)	1100 (900)	700 (550)	550 (450)	300 (250)	200 (140)

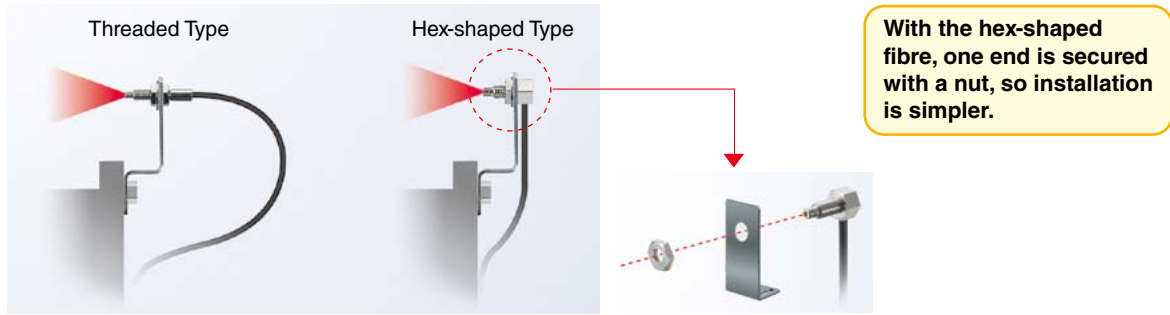
*1 When using the FS-V30 Series. The maximum sensing distance of 3600 mm is possible because the fibre length on one side is 2 m.

*2 When using the F-1 at a temperature of 70°C or more, specify the "Heat-resistant F-1".



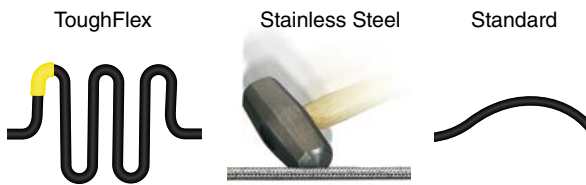
Hex-shaped and Conventional threaded fibres

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



Fibre Cable Type

Cables are divided broadly into three. The ToughFlex is a cable that reduces problems caused by cable bending. It is very versatile and is the choice for general-purpose applications.



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

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

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

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

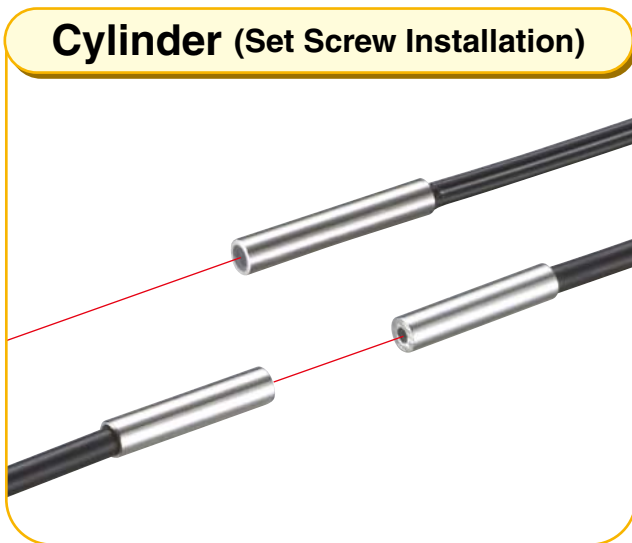
Bend radius of 2 mm	Bend radius of 0.5 mm	Conventional fibre
217-core fibre	613-core fibre	Tight bending causes a break.
		ToughFlex fibre
		No breaking, even when subjected to a tight bend radius.

Parallel (Standard) and Coaxial Fibres

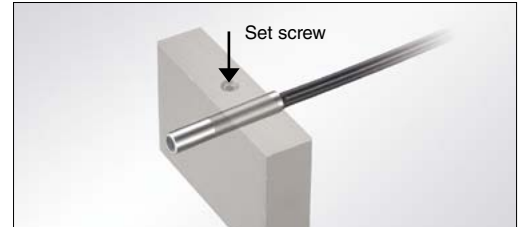
Type	Characteristics
Parallel (Standard)	Transmitter and receiver are routed side-by-side in parallel reflective fibre optic sensors.
Coaxial	Transmitter light is located in the centre, while Receiver light is around the periphery. This cable has outstanding short-distance characteristics. Focusing lenses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

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

STEP 2 Select a specific sensor



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



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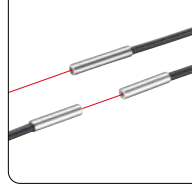
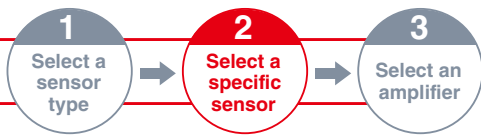
RED indicates thrubeam fibres.

Unit: mm

Type		Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Optical axis diameter (Standard target to be detected)	Smallest detectable object ^{*2}	Model Weight	Dimensions
Detecting method	Size				Ambient temperature	MEGA				
Thrubeam	ø1.0	50 cm cut not allowed. -40 to +50°C		R10	150 (120) 32 (25)	ULTRA : 130 (100) SUPER : 65 (50) TURBO : 50 (40) HSP : 20 (12)	ø0.265	ø0.005	FU-58 Approx. 8 g	⊗P.38
		1 m Free-cut (ø1.0) -40 to +70°C		R4 High-flex	500 (380) 125 (100)	ULTRA : 420 (330) SUPER : 270 (200) TURBO : 220 (170) HSP : 70 (35)	ø0.7		FU-59 Approx. 3 g	⊗P.38
	ø2.5	50 cm cut not allowed. -40 to +70°C		R10	25 (20) 5 (4)	ULTRA : 20 (16) SUPER : 15 (10) TURBO : 10 (7) HSP : - (-)	ø0.125		FU-55 Approx. 3 g	⊗P.37
		50 cm cut not allowed. -40 to +70°C			25 (20) 5 (4)	ULTRA : 20 (16) SUPER : 15 (10) TURBO : 10 (7) HSP : - (-)	ø0.125		FU-56 Approx. 3 g	⊗P.37
	ø3	2 m Free-cut (ø2.2) -40 to +50°C		R2 ToughFlex	1700 (1300) 300 (230)	ULTRA : 1300 (1100) SUPER : 750 (600) TURBO : 600 (460) HSP : 200 (140)	ø1.13		FU-5FZ Approx. 19 g	⊗P.37
		2 m Free-cut (ø2.2) -40 to +70°C		R25	2300 (1400) 400 (320)	ULTRA : 1600 (1100) SUPER : 950 (800) TURBO : 800 (600) HSP : 220 (150)	ø1		FU-5F Approx. 19 g	⊗P.37

*1 When using the FS-V30.

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



BLUE indicates reflective fibres.

Unit: mm

Type		Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Smallest detectable object ^{*2}	Model Weight	Dimensions	
Detecting method	Size				Ambient temperature	MEGA				Other power modes
Reflective	ø1.5	1 m cut not allowed. -40 to +70°C		R4 High-flex	75 (60) 20 (16)	ULTRA : 60 (50) SUPER : 32 (25) TURBO : 25 (20) HSP : 13 (10)	ø0.005 gold wire	FU-49X Approx. 3 g	⇒ P.37	
		1 m cut not allowed. -40 to +70°C		R10	15 (12) 3 (2)	ULTRA : 12 (10) SUPER : 8 (7) TURBO : 6 (5) HSP : 1.6 (1.1)		FU-46 Approx. 2 g	⇒ P.37	
		50 cm cut not allowed. -40 to +70°C		R25	48 (40) 10 (8)	ULTRA : 42 (34) SUPER : 15 (12) TURBO : 13 (10) HSP : 6 (4)		FU-22X Approx. 4 g	⇒ P.35	
		ø3	2 m Free-cut (ø1.3 x 2) FU-4FZ: -40 to +50°C FU-4F: -40 to +70°C		R2 ToughFlex	400 (320) 60 (45)		ULTRA : 320 (260) SUPER : 160 (130) TURBO : 120 (90) HSP : 40 (30)	FU-4FZ Approx. 8 g	⇒ P.36
			2 m Free-cut (ø1.0 x 2) -40 to +70°C		R4 High-flex	160 (130) 35 (28)		ULTRA : 520 (430) SUPER : 350 (250) TURBO : 230 (180) HSP : 80 (55)	FU-4F Approx. 8 g	⇒ P.36
			50 cm cut not allowed. -40 to +70°C		R25	680 (550) 125 (100)		ULTRA : 130 (110) SUPER : 70 (55) TURBO : 50 (40) HSP : 22 (17)	FU-48 Approx. 7 g	⇒ P.37
	ø3	50 cm cut not allowed. -40 to +70°C		R25	680 (550) 125 (100)	ULTRA : 550 (440) SUPER : 370 (300) TURBO : 250 (200) HSP : 85 (60)		FU-23X Approx. 4 g	⇒ P.35	
		50 cm cut not allowed. -40 to +70°C		R4	45 (35) 8 (6)	ULTRA : 35 (28) SUPER : 18 (14) TURBO : 13 (10) HSP : 5 (4)		FU-45X Approx. 4 g	⇒ P.37	

*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 Bracket

Threaded/Hex-shaped

Cylinder

Sleeve

Small Spot

Area

Retro-reflective

Narrow Field/High-Power

Definite-reflective

High-flex

Oil/Chemical Resistant

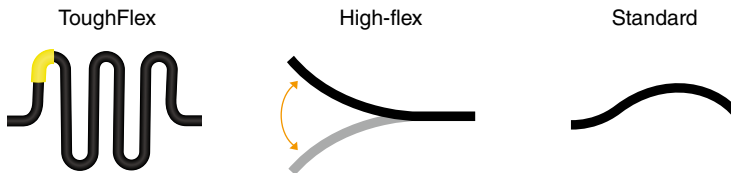
Heat Resistant

Liquid-level

Liquid Crystals/Semiconductors

Selection Tip 1 Fibre Cable Type

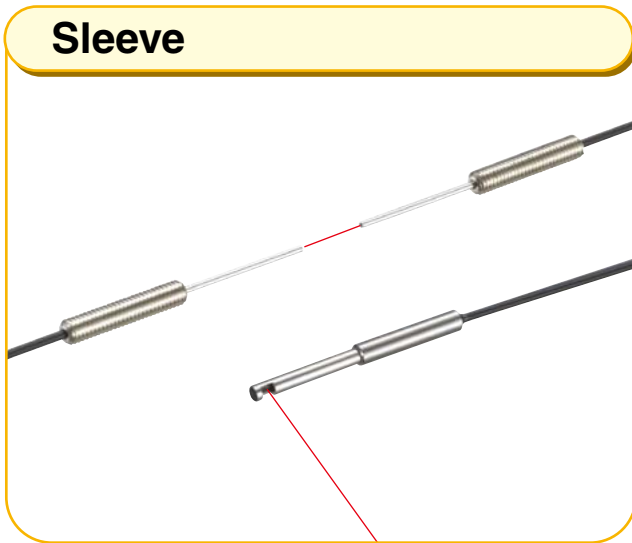
The ToughFlex type is a type that eliminates problems caused by the bending of fibres. The High-Flex fibres are designed for repeated bending like what occurs in applications with frequent movement.



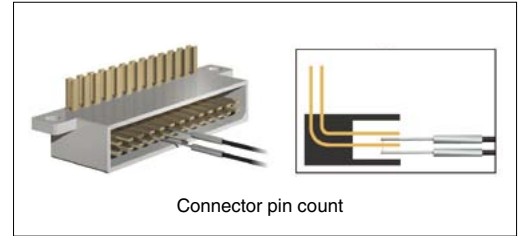
Selection Tip 2 Cylinder Type Installation

Q What size of hole needs to be drilled for installation? **A** The diameter tolerance of the sensor conforms to JIS [JIS - Japanese Industrial Standards] intermediate. The tolerance is ±0.1 mm up to an outside diameter of ø6 mm. For the ø3 type, for example, this translates to ø2.9 to ø3.1, so a hole of ø3.2 should be drilled.

STEP 2 Select a specific sensor



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



Connector pin count



Ask the Expert
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the FU Series

RED indicates thrubeam fibres.

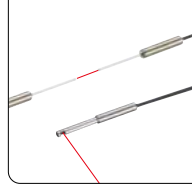
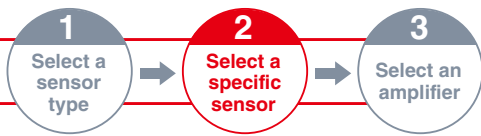
Unit: mm

Type	Detecting method	Beam emitting direction	Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Optical axis diameter (Standard target to be detected)	Smallest detectable object ^{*2}	Model	Weight	Dimensions
						MEGA	Other power modes					
Thrubeam		Side View	1 m Free-cut (ø1.3) -40 to +70°C		R25	300 (230)	ULTRA : 230 (180) SUPER : 100 (75) TURBO : 75 (60) HSP : 25 (15)	ø0.6	ø0.005	FU-32	Approx. 5 g	P.35
						38 (30)						
			2 m Free-cut (ø2.2) -40 to +70°C		R25	640 (520)	ULTRA : 500 (400) SUPER : 320 (250) TURBO : 250 (200) HSP : 90 (50)	ø1		FU-34	Approx. 17 g	P.35
						125 (100)						
			2 m Free-cut (ø2.2) -40 to +70°C		R10	2300 (1400)	ULTRA : 1600 (1100) SUPER : 950 (800) TURBO : 800 (600) HSP : 220 (150)	ø0.5		FU-73	Approx. 24 g	P.39
						400 (320)						
1 m Free-cut (ø1.0) -40 to +70°C		R10	400 (300)	ULTRA : 340 (260) SUPER : 180 (150) TURBO : 150 (120) HSP : 50 (30)	ø0.265	FU-75F	Approx. 10 g	P.39				
			95 (75)									
1 m Free-cut (ø1.0) -40 to +70°C		R10	160 (130)	ULTRA : 130 (100) SUPER : 65 (50) TURBO : 50 (40) HSP : 18 (10)	ø0.125	FU-76F	Approx. 10 g	P.39				
50 cm cut not allowed. -40 to +70°C		R10	25 (20)	ULTRA : 20 (16) SUPER : 15 (10) TURBO : 10 (7) HSP : - (-)					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 fibres allow for some bending. See the dimensions diagram for bend ranges.



BLUE indicates reflective fibres.

Unit: mm

Type		Fibre unit length (Diameter) Ambient temperature	Appearance	Minimum bend radius	Detecting distance ^{*1}		Smallest detectable object ^{*2}	Model Weight	Dimensions
Detecting method	Beam emitting direction				MEGA	Other power modes			
Reflective	Side	2 m Free-cut (ø1.0 x 2) -40 to +70°C		R10	85 (68) 17 (13)	ULTRA : 68 (54) SUPER : 34 (27) TURBO : 25 (20) HSP : 11 (8)	ø0.005 gold wire	FU-31 Approx. 5 g	⊕P.35
		1 m Free-cut (ø2.2 x 2) -40 to +70°C		R25	180 (150) 25 (20)	ULTRA : 150 (120) SUPER : 75 (60) TURBO : 50 (40) HSP : 18 (14)		FU-33 Approx. 10 g	⊕P.35
	Top	50 cm cut not allowed. -40 to +70°C		R4	45 (35) 8 (6)	ULTRA : 35 (28) SUPER : 18 (14) TURBO : 13 (10) HSP : 5 (4)		FU-65X Approx. 5 g	⊕P.38
		2 m Free-cut (ø1.3 x 2) -40 to +50°C		R2 ToughFlex	130 (110) 25 (20)	ULTRA : 110(90) SUPER : 55(45) TURBO : 43(35) HSP : 13(8)		FU-63Z Approx. 10 g	⊕P.38
		2 m Free-cut (ø1.3 x 2) -40 to +70°C		R25	180 (150) 37 (30)	ULTRA : 150 (120) SUPER : 85 (70) TURBO : 60 (50) HSP : 24 (16)		FU-63 Approx. 10 g	⊕P.38
		2 m Free-cut (ø1.3 x 2) -40 to +70°C						FU-63T Approx. 10 g	⊕P.38
		50 cm cut not allowed. -40 to +70°C		R4	45 (35) 8 (6)	ULTRA : 35 (28) SUPER : 18 (14) TURBO : 13 (10) HSP : 5 (4)		FU-45X Approx. 4 g	⊕P.37
		2 m Free-cut (ø1.3 x 2) -40 to +70°C		R25	180 (150) 37 (30)	ULTRA : 150 (120) SUPER : 85 (70) TURBO : 60 (50) HSP : 24 (16)		FU-43 Approx. 8 g	⊕P.37
		1 m cut not allowed. -40 to +70°C		R10	15 (12) 3 (2)	ULTRA : 12 (10) SUPER : 8 (7) TURBO : 6 (5) HSP : 1.6 (1.1)		FU-46 Approx. 2 g	⊕P.37
		Coaxial, narrow beam 10°	50 cm cut not allowed. -40 to +70°C		R25	48 (40) 10 (8)		ULTRA : 42 (34) SUPER : 15 (12) TURBO : 13 (10) HSP : 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 Bracket

Threaded/ Hex-shaped

Cylinder

Sleeve

Small Spot

Area

Retro-reflective

Narrow Field/ 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.



Great for Small Object Detection

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

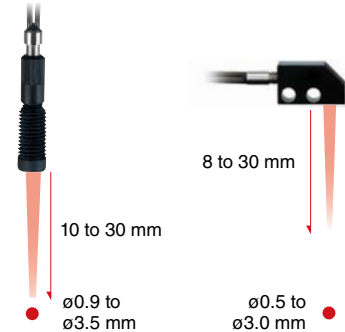


 **Ask the Expert**
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Small spot sensors come in the three types described below. Select the sensor you need according to application conditions.
The FU-23X + F-2HA (P.20) and the FU-20 (P.21) produce the smallest beam spot of $\varnothing 0.1$ mm.

Adjustable Beam Spot Fibres P.19

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



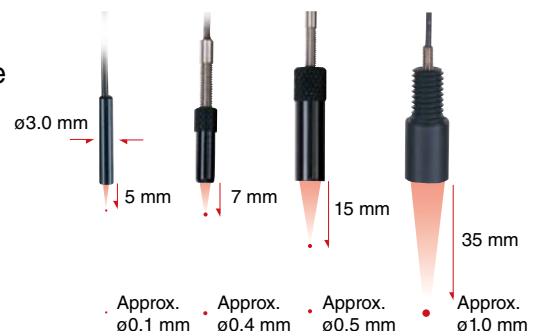
Parallel Beam Spot Fibres P.19

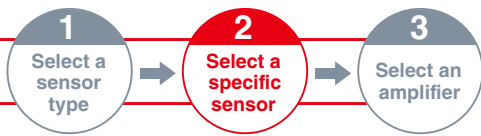
With a beam spot of approximately 4 mm the spot radius does not change from 0 to 20 mm.
This is great for applications where distance varies due to vibration and other factors.



Small Spot Fibres P.20

This type is available as a $\varnothing 0.1$ mm small spot, long distance type with integrated lens, or as lens-and-fibre combination type.
Select the type you need according to application conditions.

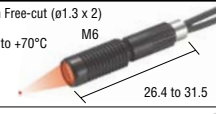





Adjustable Beam Spot Fibres

Built-in Lens Fibre Unit

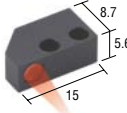



Unit: mm

Type	Beam spot diameter	Focal distance	Fibre unit length (Diameter) Ambient temperature	Appearance	Model Weight	Minimum bend radius	Dimensions
Adjustable beam spot	ø0.9 to 3.5	10 to 30	2 m Free-cut (ø1.3 x 2) -40 to +70°C		FU-10 Approx. 5 g	R25	➔ P.34
					FU-2540	R25	➔ P.35



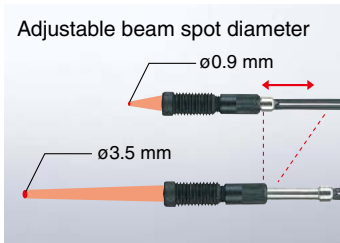
Lens + Fibre Unit

Unit: mm

Type	Beam spot diameter	Focal distance	Lens		Fibre units			Dimensions
			Model	Appearance Weight	Minimum bend radius	Appearance	Model	
Side-view adjustable spot	ø0.5 to 3	8 to 30	F-5HA	 Approx. 2 g	R2 ToughFlex		FU-35FZ	➔ P.35
					R10		FU-2303	
					R25		FU-35FA	

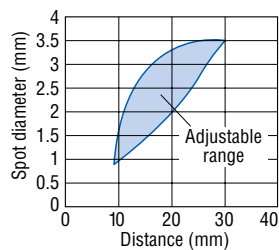
FU-10

Adjustable beam spot



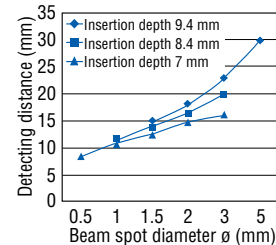
FU-10

Adjustable range of spot diameter (Typical)



F-5HA+FU-35FZ







Target width vs. operating range (Typical)



Parallel Beam Spot Fibres

Lens + Fibre Unit

Unit: mm

Type	Beam spot diameter	Lens		Fibre unit			Detecting distance ^{*1}		Dimensions	
		Model	Appearance Weight	Minimum bend radius	Appearance	Model	MEGA FINE	Other power modes		
Parallel beam	Approx. ø4 (within the detecting of 0 to 20 mm)	F-3HA	 Approx. 2 g	R2 ToughFlex		FU-35FZ	38 (30)	ULTRA : 38 (30) SUPER : 38 (30) TURBO : 33 (28) HSP : 20 (16)	➔ P.35	
				R10		FU-2303	28 (22)			
				R25		FU-35FA	65 (52) 45 (38)	ULTRA : 65 (52) SUPER : 65 (52) TURBO : 55 (45) HSP : 35 (25)		
				R2 ToughFlex		FU-35TZ	35 (25)			ULTRA : 35 (25) SUPER : 35 (28) TURBO : 30 (25) HSP : 18 (14)
				R10 Stainless steel		FU-35TG	25 (20)			



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

Integrated Bracket

Flat Bracket

Threaded/
Hex-shaped

Cylinder

Sleeve

Small Spot

Area

Retro-reflective

Narrow Field/
High-Power

Definite-reflective

High-flex

Oil/Chemical
Resistant

Heat
Resistant

Liquid-level

Liquid Crystals/
Semiconductors

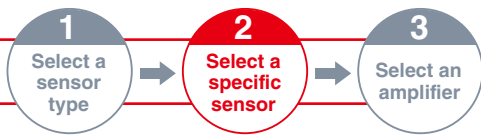


Small Spot Fibres

Lens + Fibre Unit



Unit: mm

Type	Beam spot diameter	Focal distance	Lens		Fibre unit			Dimensions
			Model	Appearance Weight	Minimum bend radius	Appearance	Model	
Small spot	Approx. $\varnothing 0.1$	7 ± 2	F-2HA	<p>Tip: $\varnothing 4.3$ 15.6 Approx. 1 g</p>	R10		FU-24X	\Rightarrow P.35
	Approx. $\varnothing 0.2$				R25		FU-21X	\Rightarrow P.34
	Approx. $\varnothing 0.4$				R2 ToughFlex		FU-35FZ	\Rightarrow P.35
					R10		FU-2303	
					R25		FU-35FA	
					R2 ToughFlex		FU-35TZ	
	Approx. $\varnothing 0.5$	15 ± 2	F-4HA	<p>Tip: $\varnothing 7.4$ 27 Approx. 2 g</p>	R2 ToughFlex		FU-35FZ	\Rightarrow P.35
					R10		FU-2303	
					R2 ToughFlex		FU-35TZ	
					R10 Stainless steel		FU-35TG	
					R25		FU-35FA	
					Approx. $\varnothing 1.0$	35 ± 3	F-6HA	
R2 ToughFlex		FU-35FZ	\Rightarrow P.35					
Approx. $\varnothing 2.0$					R10		FU-2303	
					R2 ToughFlex		FU-35TZ	
					R25		FU-35FA	



I Small Beam Spot Built-in Lens Fibre Unit

Unit: mm

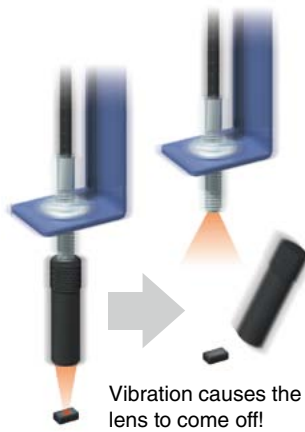
Type	Beam spot diameter	Focal distance	Fibre unit length (Diameter) Ambient temperature	Appearance	Model Weight	Minimum bend radius	Dimensions
Small spot	Approx. $\phi 0.1$	5	50 cm cut not allowed. -40 to +70°C Tip: $\phi 3$		FU-20 Approx. 2 g	R25	

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

Problem 1

Vibration or other conditions causes the lens to come off!

The lens unexpectedly comes off making detecting impossible.



Vibration causes the lens to come off!

Solution

Recommended Type:
FU-10 Adjustable Beam Spot Fibre

Select a type with a fixed lens!

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



Problem 2

Broken fibre cable!

The fibre cable catches in the work during device assembly or maintenance.

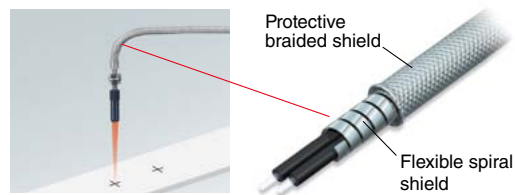


Solution

Recommended Type:
FU-2303/35TG+ Lens Coaxial Fibre with Spiral

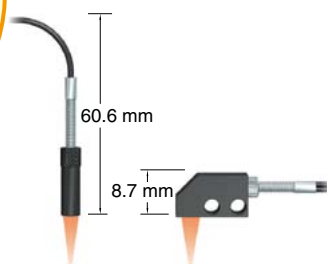
Select a spiral protected type!

FU-2303/35TG protects against fibre cable breakage. Protected by stainless steel, the fibre cable maintains a radius of R10 when bent. Protective braided shield increases strength against pulling, while a flexible spiral shield increases strength against side impact.



Problem 3

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



Requires approximately 1/7 the space of previous products.

Solution

Recommended Type:
F-5HA Space Saving Lens + Fibre

Select a side-view lens!

Now a side-view lens can be used for accurate detection of small work in locations where previous products were difficult to install.

Also, since the size of the spot can be changed by varying the insertion depth of the fibre unit, there is no need to be concerned about the distance from the work.



Integrated Bracket

Flat Bracket

Threaded/
Hex-shaped

Cylinder

Sleeve

Small Spot

Area

Retro-reflective

Narrow Field/
High-Power

Definite-reflective

High-flex

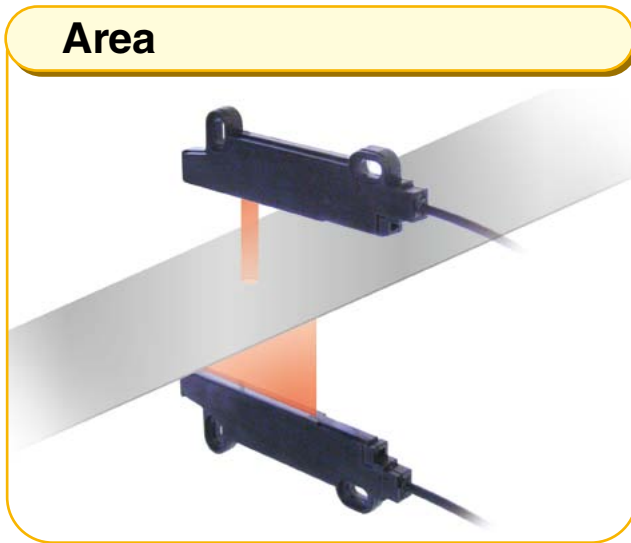
Oil/Chemical
Resistant

Heat
Resistant

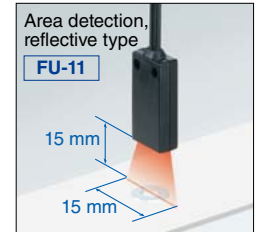
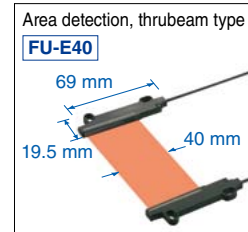
Liquid-level

Liquid Crystals/
Semiconductors

STEP 2 Select a specific sensor

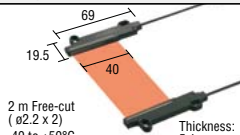
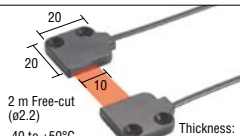


Great for applications where there is variance in work movement position and for detecting multiple work shapes.

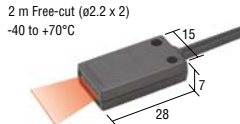


 Ask the Expert
Call us for Details on
the FU Series

RED indicates thrubeam fibres.

Type		Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Optical axis diameter (Standard target to be detected)	Smallest detectable object ^{*2}	Model Weight	Dimensions
Detecting method	Optical axis width				MEGA	Other power modes				
Thrubeam	40	2 m Free-cut (ø2.2 x 2) -40 to +50°C		R2 ToughFlex	3600 (3600) 3000 (2200)	ULTRA : 3600 (3600) SUPER : 3600 (3600) TURBO : 3600 (3600) HSP : 1400 (800)	40 x 3	ø0.4	FU-E40 Approx. 30 g	ⓈP.41
	10	2 m Free-cut (ø2.2) -40 to +50°C		R2 ToughFlex	1700 (1400) 700 (550)	ULTRA : 1400 (1100) SUPER : 1200 (950) TURBO : 950 (750) HSP : 320 (180)	10 x 3	ø1.2 (TURBO) ø0.3 (FINE)	FU-12 Approx. 23 g	ⓈP.34

BLUE indicates reflective fibres.

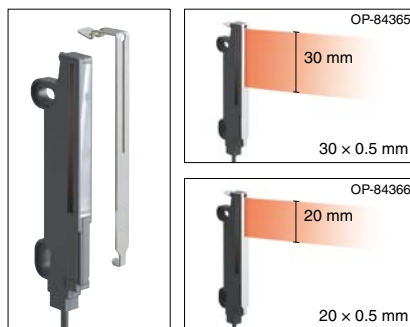
Type		Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Smallest detectable object ^{*2}	Model Weight	Dimensions
Detecting method	Spot width				MEGA	Other power modes			
Reflective	15 (at distance 15)	2 m Free-cut (ø2.2 x 2) -40 to +70°C		R25	5 to 160 (5 to 160) 5 to 120 (5 to 90)	ULTRA : 5 to 160 (5 to 160) SUPER : 5 to 150 (5 to 150) TURBO : 5 to 140 (5 to 130) HSP : 5 to 70 (5 to 55)	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.)

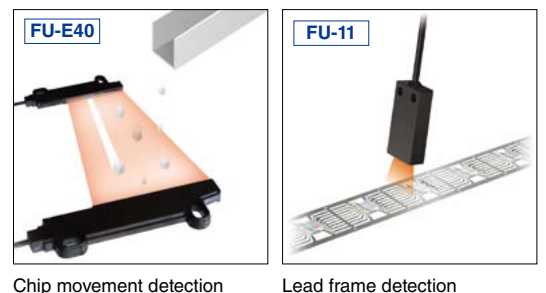
*2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

Optional metal slit attachment FU-E40

Small targets can also be detected by limiting the length and width of the detection area with the slit attachment.

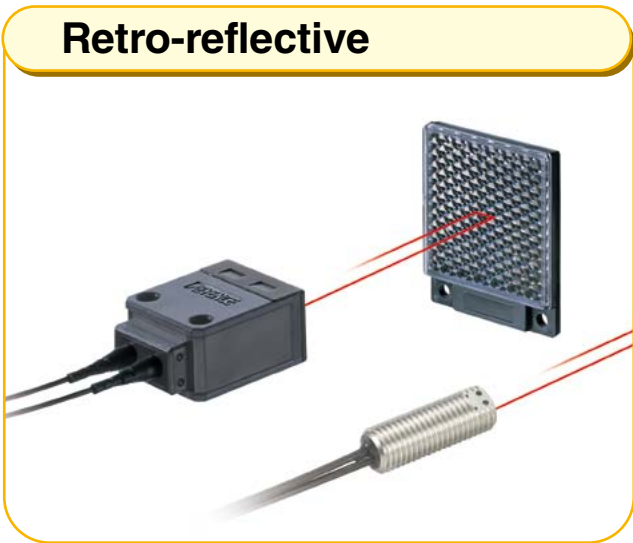
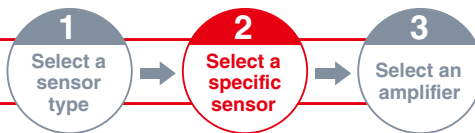


Applications

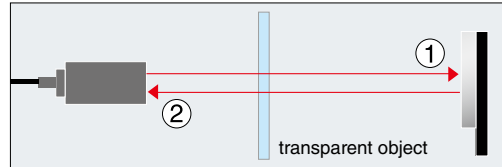


Chip movement detection

Lead frame detection



Retro-reflective is effective for detecting transparent objects. The beam passes through the (transparent) item twice, so light loss is relatively greater than with the thru-beam type.



Ask the Expert
Call us for Details on the FU Series

Integrated Bracket

Flat Bracket

Threaded/Hex-shaped

Cylinder

Sleeve

Small Spot

Area

Retro-reflective

Narrow Field/High-Power

Definite-reflective

High-flex

Oil/Chemical Resistant

Heat Resistant

Liquid-level

Liquid Crystals/Semiconductors

GREEN indicates retro-reflective fibres.

Unit: mm

Type	Detecting method	Beam emitting direction	Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ¹		Model	Dimensions
						MEGA	Other power modes		
Retro-reflective	M6	M6	2 m Free-cut (ø1.0 x 2) -40 to +50°C	Reflective tape (accessory) ²	R2 ToughFlex	10 to 480 (10 to 380)	ULTRA : 10 to 380 (10 to 300) SUPER : 10 to 190 (10 to 150) TURBO : 10 to 125 (10 to 100) HSP : - (-)	FU-13 Approx. 8 g	➔ P.34
						10 to 60 (10 to 50)	ULTRA : 100 to 2500 (100 to 2000) SUPER : 100 to 1250 (100 to 1000) TURBO : 100 to 940 (100 to 750) HSP : 100 to 500 (100 to 400)	FU-15 Approx. 12 g	➔ P.34
		Square type	2 m Free-cut (ø1.0 x 2) -40 to +50°C	Thickness: Reflector: R-2 12.6 (accessory)	R10	100 to 3200 (100 to 2500)			
						100 to 630 (100 to 500)			

Reflector / Reflective Tape Specifications (Optional Parts)

Unit: mm

Type	Power modes	R-2 (OP-95388)	R-3 (OP-96436)	R-5	Reflective tape (OP-96629)
		51.2 x 61	35 x 42	14 x 36	40 x 30
FU-13	MEGA	10 to 940 (10 to 750)	10 to 770 (10 to 620)	10 to 530 (10 to 430)	10 to 480 (10 to 380)
	ULTRA	10 to 750 (10 to 600)	10 to 620 (10 to 500)	10 to 430 (10 to 350)	10 to 380 (10 to 300)
	SUPER	10 to 380 (10 to 300)	10 to 320 (10 to 250)	10 to 220 (10 to 170)	10 to 190 (10 to 150)
	TURBO	10 to 250 (10 to 200)	10 to 200 (10 to 150)	10 to 125 (10 to 100)	10 to 125 (10 to 100)
	FINE	10 to 125 (10 to 100)	10 to 100 (10 to 75)	10 to 65 (10 to 50)	10 to 60 (10 to 50)
	HSP	-	-	-	-
FU-15 ¹	MEGA	100 to 3200 (100 to 2500)	100 to 2200 (100 to 1800)	100 to 1300 (100 to 1100)	-
	ULTRA	100 to 2500 (100 to 2000)	100 to 1800 (100 to 1500)	100 to 1100 (100 to 900)	-
	SUPER	100 to 1250 (100 to 1000)	100 to 1000 (100 to 800)	100 to 750 (100 to 600)	-
	TURBO	100 to 940 (100 to 750)	100 to 750 (100 to 600)	100 to 600 (100 to 500)	-
	FINE	100 to 630 (100 to 500)	100 to 500 (100 to 400)	100 to 500 (100 to 400)	-
	HSP	100 to 500 (100 to 400)	100 to 430 (100 to 350)	100 to 430 (100 to 350)	-

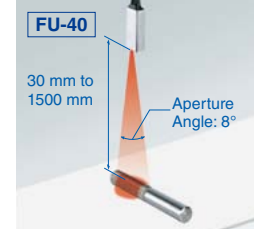
^{*} When using the FS-V30 [Red LED]. The values may vary slightly if APC is enabled.
¹ Reflective tape cannot be used.

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



Use of a lens suppresses beam width and reduces deflection.



Ask the Expert
Call us for Details on
the FU Series

RED indicates thru-beam fibres.

Unit: mm

Type			Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Optical axis diameter (Standard target to be detected)	Smallest detectable object ^{*2}	Model Weight	Dimensions
Detecting method	Beam emitting direction	Aperture angle				MEGA	Other power modes				
Thru-beam	Side	Approx. 6°	2 m Free-cut (ø1.0) FU-16Z: -40 to +50°C FU-16/18: -40 to +70°C		R2 ToughFlex	3200 (2500)	ULTRA : 2500 (2000) SUPER : 1300 (1000) TURBO : 1000 (800) HSP : 380 (220)	ø2.5	ø0.1	FU-16Z Approx. 8 g	⊕ P.34
						630 (500)				FU-16 Approx. 8 g	⊕ P.34
		Approx. 2°		R10	3600 (3600) 950 (750)	ULTRA : 3600 (3000) SUPER : 2000 (1500) TURBO : 1500 (1200) HSP : 500 (280)	FU-18 Approx. 8 g	⊕ P.34			
	Approx. 3°	2 m Free-cut (ø1.0) -40 to +70°C		R10	3200 (2500) 800 (650)	ULTRA : 2500 (2000) SUPER : 1500 (1200) TURBO : 1200 (1000) HSP : 480 (260)	FU-18M Approx. 6 g	⊕ P.34			
	Top	Approx. 6°	2 m Free-cut (ø1.0) -40 to +50°C		R2 ToughFlex	3600 (3600) 2300 (1800)	ULTRA : 3600 (3600) SUPER : 3600 (3600) TURBO : 3600 (3200) HSP : 1500 (850)	ø2.8	ø0.1	FU-50 Approx. 8 g	⊕ P.37

BLUE indicates reflective fibres.

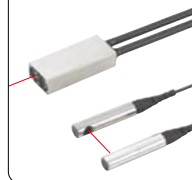
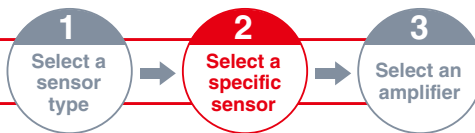
Unit: mm

Type			Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Smallest detectable object ^{*2}	Model Weight	Dimensions
Detecting method	Beam emitting direction	Aperture angle				MEGA	Other power modes			
Reflective	Top	Approx. 8°	2 m Free-cut (ø2.2 x 2) -40 to +50°C Thickness: 5.2		R2 ToughFlex	30 to 1500 (30 to 1200)	ULTRA : 30 to 1100 (30 to 850) SUPER : 30 to 400 (30 to 320) TURBO : 30 to 260 (30 to 220) HSP : 30 to 100 (30 to 80)	ø0.3 copper wire (Vertical)	FU-40 Approx. 23 g	⊕ P.36
						30 to 150 (30 to 120)			FU-40G Approx. 50 g	⊕ P.36

*1 When using the FS-V30. Standard target: White mat paper (Reflective type only). "3600" is assumed as maximum because the fibre cable has a length of 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.**

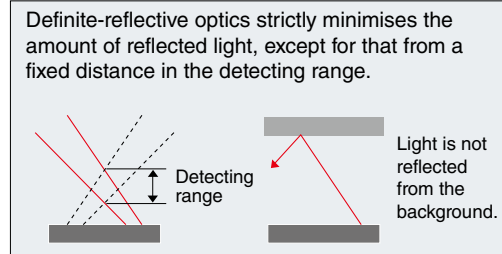
Long-distance, retro-reflective type can be found on **P.23.**



Definite-reflective (Thin, Small)



Definite-reflective reduces the effect of background, small and thin configuration requires less space.



Ask the Expert
Call us for Details on
the FU Series

BLUE indicates reflective fibres.

Unit: mm

Type	Detecting method	Beam emitting direction	Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance*1		Beam spot diameter	Smallest detectable object*2	Model	Weight	Dimensions
						MEGA	Other power modes					
Reflective		Side	2 m Free-cut (ø1.0 x 2)		R10	3 (3) centre of detecting distance	ULTRA : 3 (3) centre of detecting distance	Approx. ø4.5 Approx. ø3.5 (At distance of 3)	ø0.005 gold wire	FU-37	Approx. 6 g	➔ P.35
			-40 to +70°C	3 (3) centre of detecting distance		SUPER : 3 (3) centre of detecting distance						
			3 (3) centre of detecting distance	TURBO : 3 (3) centre of detecting distance								
Reflective		Top	2 m Free-cut (ø1.0 x 2)		R10	6 (6) centre of detecting distance	ULTRA : 6 (6) centre of detecting distance	Approx. ø1.5 (At distance of 6)	ø0.005 gold wire	FU-38	Approx. 5 g	➔ P.35
			-40 to +70°C	6 (6) centre of detecting distance		SUPER : 6 (6) centre of detecting distance						
			6 (6) centre of detecting distance	TURBO : 6 (6) centre of detecting distance								
Reflective		Top	2 m Free-cut (ø1.0 x 2)		R10	0 to 4 (0 to 4)	ULTRA : 0 to 4 (0 to 4)	-	ø0.08 copper wire	FU-38V	Approx. 5 g	➔ P.36
			-40 to +70°C	0 to 4 (0 to 4)		SUPER : 0 to 4 (0 to 4)						
			0 to 4 (0 to 4)	TURBO : 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 retro-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 minimised, stable detection is possible in complex environments. The FU-38 is a small spot type, which is great for small object detection.

Integrated Bracket

Flat Bracket

Threaded/
Hex-shaped

Cylinder

Sleeve

Small Spot

Area

Retro-reflective

Narrow Field/
High-Power

Definite-reflective

High-flex

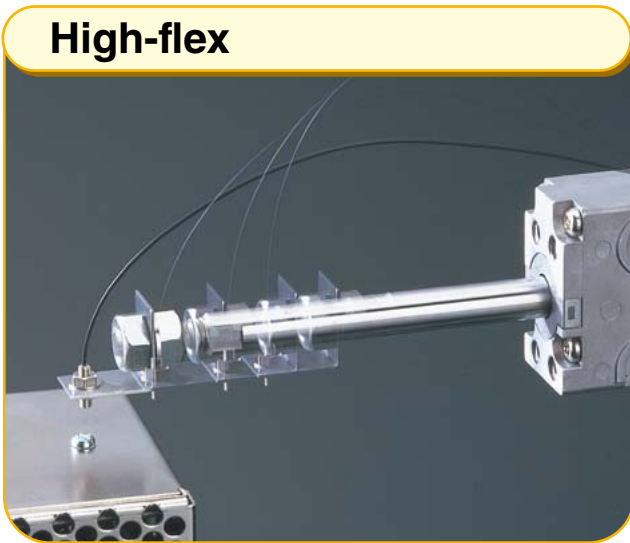
Oil/Chemical Resistant

Heat Resistant

Liquid-level

Liquid Crystals/
Semiconductors

STEP 2 Select a specific sensor



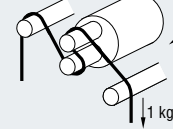
High-flex

Provides higher flexibility than an electric wire. R4 models are resistant to repeated bends.

Cable Flexibility Data

Comparison of bending frequency up to breakage with bending tester

Rough sketch



Tested target	Bending frequency up to core wire breakage
ø1 mm metallic cord	131 times
3-core cable	2200 times
High-flex fibre	80000 times or more

[Measuring conditions] Roller diameter: 8 mm (R4 mm) Load: 1 kg



Ask the Expert
Call us for Details on
the FU Series

RED indicates thrubeam fibres.

Unit: mm

Type		Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Optical axis diameter (Standard target to be detected)	Smallest detectable object ^{*2}	Model Weight	Dimensions
Detecting method	Size				MEGA	Other power modes				
Thrubeam	ø1.5	1 m Free-cut (ø1.0) -40 to +70°C		R4 High-flex	MEGA: 500 (380)	ULTRA : 420 (330) SUPER : 270 (200) TURBO : 220 (170) HSP : 70 (35)	ø0.7	ø0.005	FU-59 Approx. 3 g	⊕ P.38
	M3	1 m Free-cut (ø1.0) -40 to +70°C			MEGA: 125 (100)	FU-79 Approx. 6 g			⊕ P.40	
	6 x 10.5 x 2.5	1 m Free-cut (ø1.0) -40 to +70°C			MEGA: 320 (250) FINE: 50 (40)	ULTRA : 250 (200) SUPER : 140 (110) TURBO : 100 (80) HSP : 30 (20)			FU-57TE Approx. 5 g	⊕ P.38

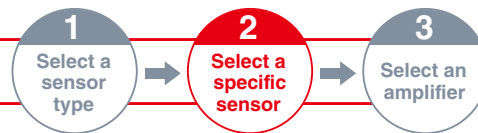
BLUE indicates reflective fibres.

Unit: mm

Type		Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Smallest detectable object ^{*2}	Model Weight	Dimensions
Detecting method	Size				MEGA	Other power modes			
Reflective	ø1.5	1 m cut not allowed. -40 to +70°C		R4 High-flex	MEGA: 75 (60)	ULTRA : 60 (50) SUPER : 32 (25) TURBO : 25 (20) HSP : 13 (10)	ø0.005 gold wire	FU-49X Approx. 3 g	⊕ P.37
	M3	1 m cut not allowed. -40 to +70°C			MEGA: 20 (16)	FU-69X Approx. 3 g		⊕ P.39	
	ø3	2 m Free-cut (ø1.0 x 2) -40 to +70°C			MEGA: 160 (130)	ULTRA : 130 (110) SUPER : 70 (55) TURBO : 50 (40) HSP : 22 (17)		FU-48 Approx. 7 g	⊕ P.37
	M4	2 m Free-cut (ø1.0 x 2) -40 to +70°C			MEGA: 35 (28)	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 any environment due to its FEP-sheathed body.

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

Ask the Expert
Call us for Details on the FU Series

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

RED indicates thru-beam fibres.

Unit: mm

Type			Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ¹		Optical axis diameter (Standard target to be detected)	Smallest detectable object ²	Model Weight	Dimensions
Detecting method	Beam emitting direction	Size				MEGA	Other power modes				
Thru-beam	Top	ø5	2 m Free-cut (ø2.2) -40 to +70°C 	R40	3600 (3600) 1300 (1000)	ULTRA : 3600 (3600) SUPER : 3000 (2400) TURBO : 2600 (2000) HSP : 750 (400)	ø3.7	ø0.2	FU-92 Approx. 71 g	➔ P.41	
	Side										2700 (2200) 430 (350)

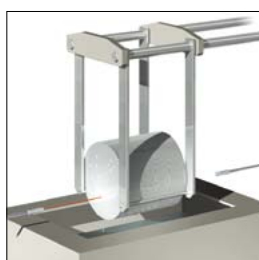
BLUE indicates reflective fibres.

Unit: mm

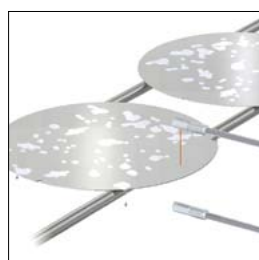
Type			Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ¹		Smallest detectable object ²	Model Weight	Dimensions
Detecting method	Beam emitting direction	Size				MEGA	Other power modes			
Reflective	Top	ø4.5	2 m Free-cut (ø1.3 x 2) -40 to +70°C 	R40	220 (180) 75 (60)	ULTRA : 220 (180) SUPER : 135 (110) TURBO : 110 (85) HSP : 45 (35)	ø0.005 gold wire	FU-91 Approx. 32 g	➔ P.40	

¹ When using the FS-V30. Standard target: White mat paper (Reflective type only.) "3600" is assumed as maximum because the fibre cable has a length of 2 m.
² The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

Applications

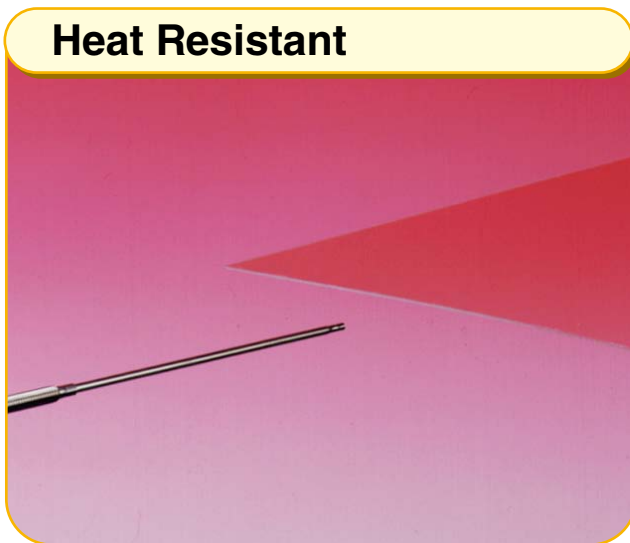


Wafer detection (Wet)



Wafer detection (Wash)

STEP 2 Select a specific sensor



Resists temperatures up to 350°C

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

Heat resistant temperatures	Fibres
Up to 180°C	Plastic
From 200°C	Multi-component glass



Ask the Expert
Call us for Details on
the FU Series

RED indicates thrubeam fibres.

Unit: mm

Type	Heat resistant temperatures ³	Fibre unit length (Diameter) Ambient temperature	Appearance	Minimum bend radius	Detecting distance ^{*1}		Optical axis diameter (Standard target to be detected)	Smallest detectable object ^{*2}	Model Weight	Dimensions
					MEGA	Other power modes				
Thrubeam	100°C ^{*4}	2 m Free-cut (ø2.2) -40 to +100°C		R5 ToughFlex	1400 (1100) 300 (250)	ULTRA : 1100 (850) SUPER : 800 (600) TURBO : 550 (440) HSP : 190 (110)	ø1	ø0.005	FU-86Z Approx. 25 g	➔ P.40
	105°C ^{*4}	2 m Free-cut (ø2.2) -40 to +105°C		R25	2300 (1400) 400 (320)	ULTRA : 1600 (1100) SUPER : 950 (800) TURBO : 800 (600) HSP : 220 (150)			FU-86A Approx. 22 g	➔ P.40
	150°C ^{*5}	2 m Free-cut (ø2.2) -40 to +150°C		R20	1400 (880) 250 (200)	ULTRA : 1000 (700) SUPER : 600 (500) TURBO : 500 (380) HSP : 140 (95)	ø1.5		FU-86H Approx. 35 g	➔ P.40
	180°C ^{*6}	2 m Free-cut (ø2.2) -60 to +180°C		R35	1300 (1000) 250 (200)	ULTRA : 1000 (800) SUPER : 620 (500) TURBO : 500 (400) HSP : 180 (110)	ø1.5		FU-88 Approx. 36 g	➔ P.40
	200°C	2 m cut not allowed. -40 to +200°C		R8	950 (750)	ULTRA : 750 (600) SUPER : 460 (380) TURBO : 380 (300) HSP : 130 (75)	ø1		FU-88K Approx. 30 g	➔ P.40
	300°C	2 m cut not allowed. -40 to +300°C		R25	180 (150)	Lens attachment ➔ P.12			FU-84C Approx. 66 g	➔ P.40

*1 When using the FS-V30. *2 The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

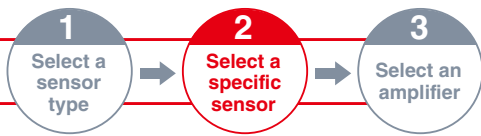
*3 Use the fibre sensor under dry conditions. Allow some margin for the temperature upper limit when selecting a heat-resistant fibre unit.

*4 The recommended maximum ambient temperature during operation is 90°C when constantly using a fibre unit in a high-temperature environment.

*5 The recommended maximum ambient temperature during operation is 130°C when constantly using a fibre unit in a high-temperature environment.

*6 The recommended maximum ambient temperature during operation is 150°C when constantly using a fibre unit in a high-temperature environment.

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



BLUE indicates reflective fibres.

Unit: mm

Type		Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Smallest detectable object ^{*2}	Model	Weight	Dimensions
Detecting method	Heat resistant temperatures ^{*3}				Ambient temperature	MEGA				
Reflective	100°C ^{*4}	2 m Free-cut (ø2.2 x 2) -40 to +100°C		R5 ToughFlex	460 (380) 80 (65)	ULTRA : 380 (300) SUPER : 220 (180) TURBO : 160 (130) HSP : 50 (40)	ø0.005 gold wire	FU-85Z	Approx. 25 g	⇒ P.40
		2 m Free-cut (ø2.2 x 2) -40 to +105°C		R25	680 (560) 120 (100)	ULTRA : 560 (450) SUPER : 370 (300) TURBO : 250 (200) HSP : 80 (60)		FU-85A	Approx. 21 g	⇒ P.40
		2 m Free-cut (ø2.2 x 2) -40 to +150°C		R20	430 (360) 80 (65)	ULTRA : 360 (290) SUPER : 240 (190) TURBO : 160 (130) HSP : 50 (40)		FU-85H	Approx. 35 g	⇒ P.40
		2 m Free-cut (ø2.2 x 2) -60 to +180°C		R35	570 (460) 90 (70)	ULTRA : 460 (360) SUPER : 260 (210) TURBO : 180 (140) HSP : 55 (45)		FU-87	Approx. 33 g	⇒ P.40
	200°C	1 m cut not allowed. -40 to +200°C		R8				FU-87K	Approx. 15 g	⇒ P.40
	300°C	1 m cut not allowed. -40 to +300°C		R25	420 (340) 90 (70)	ULTRA : 420 (340) SUPER : 260 (210) TURBO : 180 (140) HSP : 55 (45)		FU-82C	Approx. 29 g	⇒ P.40
		1 m cut not allowed. -40 to +300°C							FU-83C	Approx. 23 g
	350°C	1 m cut not allowed. -30 to +350°C			400 (360) 75 (60)	ULTRA : 360 (280) SUPER : 210 (170) TURBO : 150 (120) HSP : 45 (35)		FU-81C	Approx. 24 g	⇒ P.40
	250°C	2 m cut not allowed. -40 to +250°C		R25	8 to 37 (8 to 34) 8 to 30 (8 to 27)	ULTRA : 8 to 34 (8 to 31) SUPER : 8 to 32 (8 to 29) TURBO : 8 to 30 (8 to 27) HSP : 10 to 18 (10 to 15)		FU-38LK	Approx. 70 g	⇒ P.36
		1 m cut not allowed. -40 to +250°C				2.5 to 65 (2.5 to 55)		ULTRA : 2.5 to 55 (2.5 to 44) SUPER : 2.5 to 27 (2.5 to 22) TURBO : 2.5 to 22 (2.5 to 19) HSP : 2.5 to 10 (2.5 to 7)	FU-38K	Approx. 45 g
180°C	2 m Free-cut (ø2.2 x 2) -40 to +180°C		R35	2.5 to 16 (2.5 to 12)		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=0.7 mm glass substrate (horizontal direction).

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

*3 Use the fibre sensor under dry conditions. Allow some margin for the temperature upper limit when selecting a heat-resistant fibre unit.

*4 The recommended maximum ambient temperature during operation is 90°C when constantly using a fibre unit in a high-temperature environment.

*5 The recommended maximum ambient temperature during operation is 130°C when constantly using a fibre unit in a high-temperature environment.

*6 The recommended maximum ambient temperature during operation is 150°C when constantly using a fibre unit in a high-temperature environment.

Integrated Bracket

Flat Bracket

Threaded/ Hex-shaped

Cylinder

Sleeve

Small Spot

Area

Retro-reflective

Narrow Field/ High-Power

Definite-reflective

High-flex

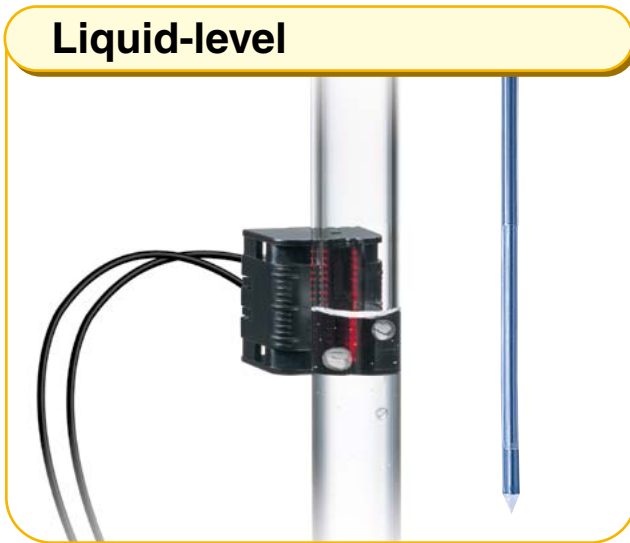
Oil/Chemical Resistant

Heat Resistant

Liquid-level

Liquid Crystals/ Semiconductors

STEP 2 Select a specific sensor










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



 Ask the Expert
Call us for Details on
the FU Series

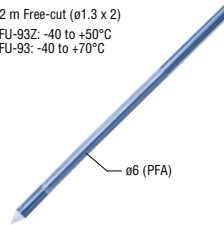


BLUE indicates reflective fibres.

Unit: mm

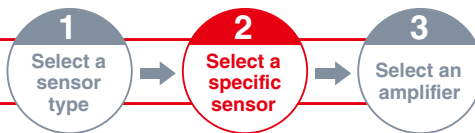
Type			Fibre unit length (Diameter)	Appearance	Minimum bend radius	Accessory	Model Weight	Dimensions
Detecting method	Transparent tube diameter	Beam axis						
Tube-mountable	ø4 to 26	16	2 m Free-cut (ø2.2 x 2) -40 to +70°C 	R5	Binding band x 2 Nonslip rubber x 2	FU-95S Approx. 23 g		
		1	2 m Free-cut (ø1.0 x 2) FU-95Z: -40 to +50°C FU-95HA: -40 to +105°C* FU-95: -40 to +70°C 	R2 ToughFlex	Binding band x 2 Nonslip rubber x 2 Spacer x 2 Screw x 2 Nut x 2	FU-95Z Approx. 7 g		
			R25	FU-95HA Approx. 7 g				
	More than ø26 recommended	16	2 m Free-cut (ø2.2 x 2) -40 to +70°C 	R10	— (Optionally available)	FU-95 Approx. 7 g		

*The recommended maximum ambient temperature during operation is 90°C when constantly using a fibre unit in a high-temperature environment.

Unit: mm

Type	Fibre unit length (Diameter)	Appearance	Minimum bend radius		Model Weight	Dimensions
			PFA-sheathed section	Fibre		
Immersion	2 m Free-cut (ø1.3 x 2) FU-93Z: -40 to +50°C FU-93: -40 to +70°C 	ø6 (PFA)	R40*	R0.5 ToughFlex	FU-93Z Approx. 78 g	
				R25	FU-93 Approx. 78 g	

* Not bendable up to 80 mm from the tip.



Selection Guide Beam axes of tube-mountable type

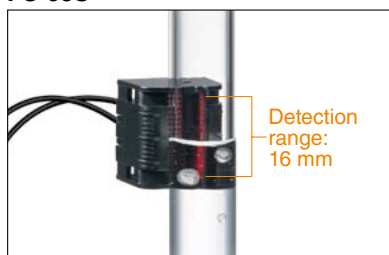
Sixteen beam axis eliminate problems caused by air bubbles and water droplets.

Detection relies on a series of 16 beam axis, 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.

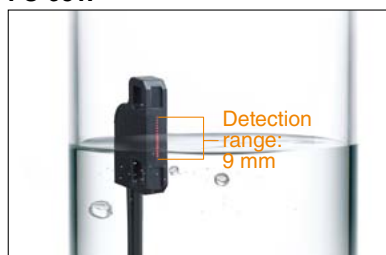


Using a single beam axis was normal in the past, this resulted in mis-operation caused by air bubbles, droplets, and other problems. The 16-axis type is a suitable countermeasure against these problems.

For $\varnothing 4$ to $\varnothing 26$ tubes
FU-95S

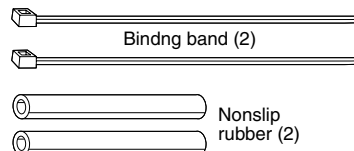


For tubes $\varnothing 26$ and greater
FU-95W



FU-95W Options
OP-82177

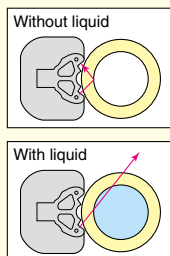
Binding band x 2, Nonslip rubber x 2
Can be used on pipe diameters of $\varnothing 26$ to $\varnothing 80$ mm.



Detection principle

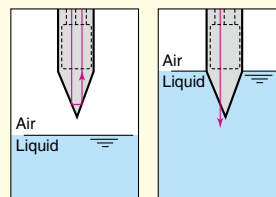
FU-95 Series

There is a wide 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 narrow. Most of the light beam is absorbed by liquid and no light beam goes back to the receiver. The FU-95 Series fibres detect the presence of liquid using these characteristics.



FU-93 Series

There is a wide difference in the refractive index between the fluorine resin and air when the tip of the sensor is in the air. The 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 narrows. Most of the light beam is absorbed by liquid and no light beam goes back to the receiver. The FU-93 Series fibres detect the presence of liquid using these characteristics.



Hints on correct use

- Use the timer if chattering occurs due to dripping or bubbles in the liquid.
- Do not pull or push the fibre 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 colours PFA.
- A tube, whose wall thickness is 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 thermo fitted tube 80 mm, up to the tip, in order to secure them in place. Take care to avoid cutting this tube, will result in looseness.

Integrated Bracket

Flat Bracket

Threaded/Hex-shaped

Cylinder

Sleeve

Small Spot

Area

Retro-reflective

Narrow Field/High-Power

Definite-reflective

High-flex

Oil/Chemical Resistant

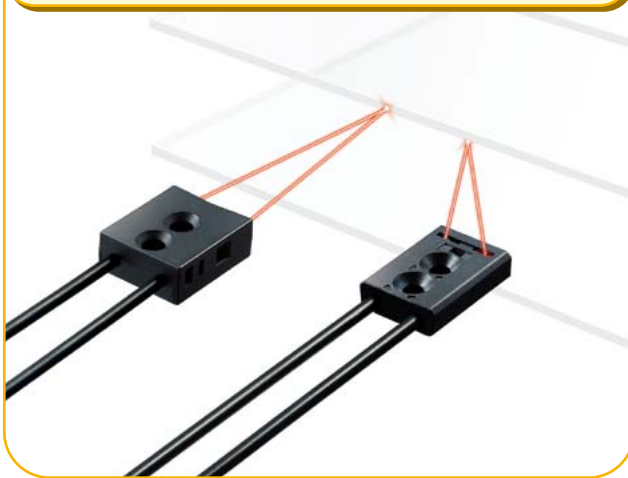
Heat Resistant

Liquid-level

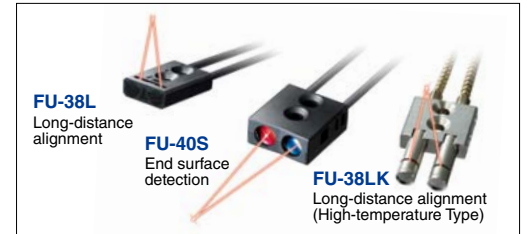
Liquid Crystals/Semiconductors

STEP 2 Select a specific sensor

Liquid Crystals/Semiconductors



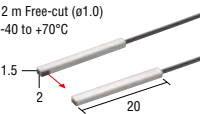


Perfect for glass substrate detection. A wide variety of types including distance alignment, heat-resistant type, and more.



Ask the Expert
Call us for Details on
the FU Series

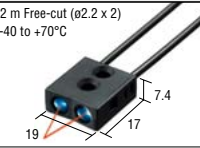


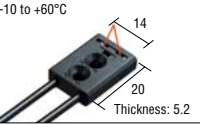


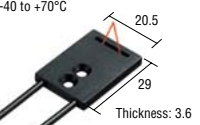








RED indicates thru-beam fibres.

Unit: mm

Type			Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Optical axis diameter (Standard target to be detected)	Smallest detectable object ^{*2}	Model Weight	Dimensions
Detecting method	Beam emitting direction	Aperture Angle				MEGA	Other power modes				
Mapping	Side	Approx. 3°	2 m Free-cut (ø1.0) -40 to +70°C 1.5 2 20		R10	 850 (800)  240 (220)	ULTRA : 700 (650) SUPER : 360 (330) TURBO : 300 (280) HSP : 130 (110)	ø1	ø0.02	FU-18M Approx. 6 g	⊕P.34

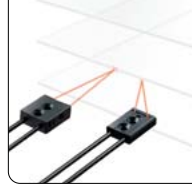
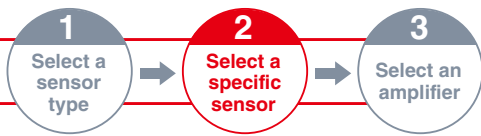
BLUE indicates reflective fibres.

Unit: mm

Type		Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Model Weight	Dimensions
Detecting method	Beam emitting direction				MEGA	Other power modes		
Glass substrate Mapping	Top	2 m Free-cut (ø2.2 x 2) -40 to +70°C 	R25	 15 to 70 (15 to 62)  18 to 30 (20 to 25)	ULTRA : 15 to 60 (15 to 54) SUPER : 15 to 46 (15 to 40) TURBO : 15 to 38 (18 to 33) HSP : -	FU-40S Approx. 25 g	⊕P.36	
		2 m Free-cut (ø2.2 x 2) -10 to +60°C 	R25	 8 to 38 (8 to 35)  8 to 32 (8 to 29)	ULTRA : 8 to 36 (8 to 33) SUPER : 8 to 35 (8 to 32) TURBO : 8 to 34 (8 to 31) HSP : 10 to 26 (10 to 23)	FU-38L Approx. 20 g	⊕P.36	
Glass substrate Alignment	Flat	2 m Free-cut (ø2.2 x 2) -40 to +70°C 	R5	 0 to 25 (0 to 25)  0 to 25 (0 to 25)	ULTRA : 0 to 25 (0 to 25) SUPER : 0 to 25 (0 to 25) TURBO : 0 to 25 (0 to 25) HSP : -	FU-38S Approx. 20 g	⊕P.36	
		2 m Free-cut (ø2.2 x 2) -40 to +70°C 	R25	 0 to 14 (0 to 14)  0 to 14 (0 to 14)	ULTRA : 0 to 14 (0 to 14) SUPER : 0 to 14 (0 to 14) TURBO : 0 to 14 (0 to 14) HSP : 0 to 12 (0 to 9)	FU-38R Approx. 20 g	⊕P.36	
Seating check		2 m Free-cut (ø1.0 x 2) -40 to +70°C 	R10	 0 to 4 (0 to 4)  0 to 4 (0 to 4)	ULTRA : 0 to 4 (0 to 4) SUPER : 0 to 4 (0 to 4) TURBO : 0 to 4 (0 to 4) HSP : 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=0.7 mm glass substrate R surface (end direction) FU-38L shows values for t=0.7 mm glass substrate (horizontal direction).



BLUE indicates reflective fibres.

Unit: mm

Type			Fibre unit length (Diameter)	Appearance	Minimum bend radius	Detecting distance ^{*1}		Model	Dimensions	
Detecting method	Heat Resistant Temperatures ^{*2}	Beam emitting direction				MEGA	Other power modes			Weight
Heat-resistant Glass substrate Alignment	250°C	Flat	2 m cut not allowed. -40 to +250°C		R25	8 to 37 (8 to 34)	ULTRA : 8 to 34 (8 to 31)	FU-38LK	Approx. 70 g	P.36
			1 m cut not allowed. -40 to +250°C			8 to 30 (8 to 27)	SUPER : 8 to 32 (8 to 29)			
	180°C		2 m Free-cut (ø2.2 x 2) -40 to +180°C		R35	2.5 to 65 (2.5 to 55)	ULTRA : 2.5 to 55 (2.5 to 44)	Approx. 45 g	P.36	
						2.5 to 16 (2.5 to 12)	TURBO : 2.5 to 22 (2.5 to 19)			
							HSP : 2.5 to 10 (2.5 to 7)			

*1 When using the FS-V30. Standard target: White mat paper (Reflective type only). FU-38LK shows values for t=0.7 mm glass substrate (horizontal direction).

*2 Use the fibre sensor under dry conditions. Allow some margin for the temperature upper limit when selecting a heat-resistant fibre unit.

Integrated Bracket

Flat Bracket

Threaded/Hex-shaped

Cylinder

Sleeve

Small Spot

Area

Retro-reflective

Narrow Field/High-Power

Definite-reflective

High-flex

Oil/Chemical Resistant

Heat Resistant

Liquid-level

Liquid Crystals/Semiconductors

Selection Guide

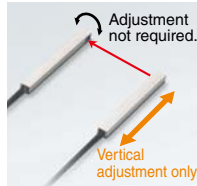
FU-18M



Perfect for wafer mapping

Vertical adjustment only

Rotary direction adjustment not required, which reduces installation time.



Mouting brackets included

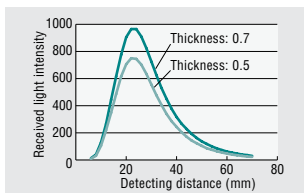
Special brackets are provided to make installation easier. Easy installation in existing devices.



FU-40S

No problem, even if the detecting distance changes

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

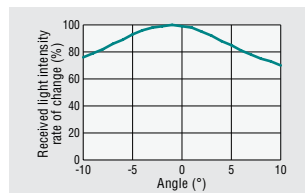
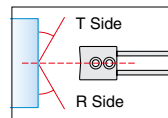


Detecting distance vs. Received light intensity (Typical)

R Surface of Class Substrate for Liquid Crystal (ULTRA APC OFF)

No problem, even at an angle

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



Angle characteristics (Typical)

Detecting distance: 30 mm 0.7 mm thick glass substrate for liquid crystal, R surface

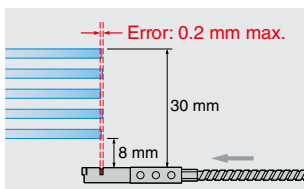
FU-38L/38LK/38S

High-accuracy detection at distances of 8 mm to 30 mm

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

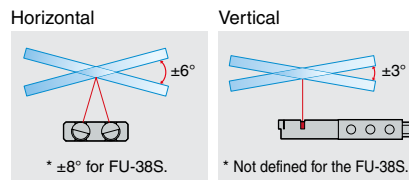
* the FS-V31 Series TURBO mode, APC OFF

* FU-38S provides positioning accuracy of 0.2 mm or less at distances from 5 mm to 17 mm.



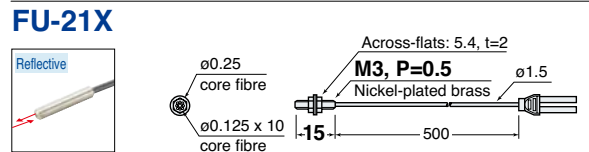
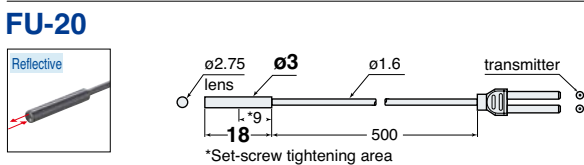
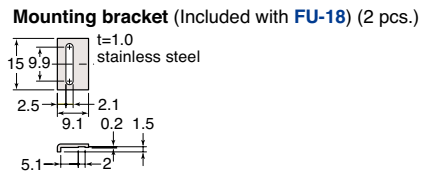
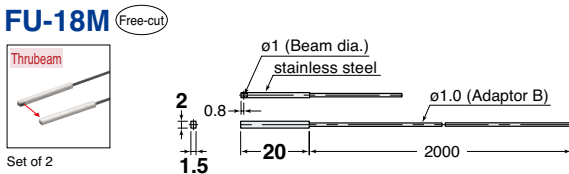
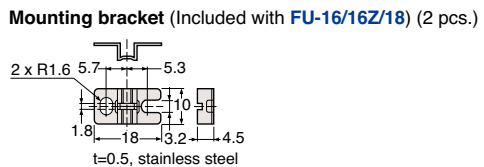
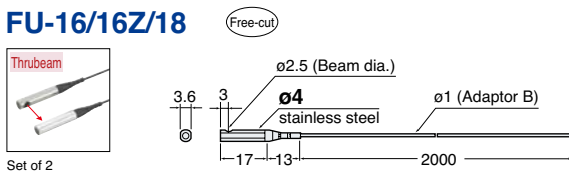
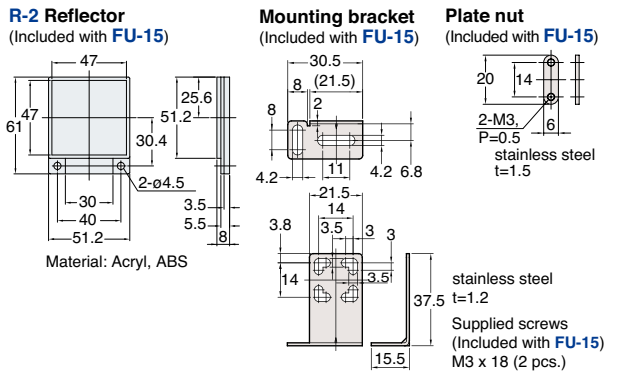
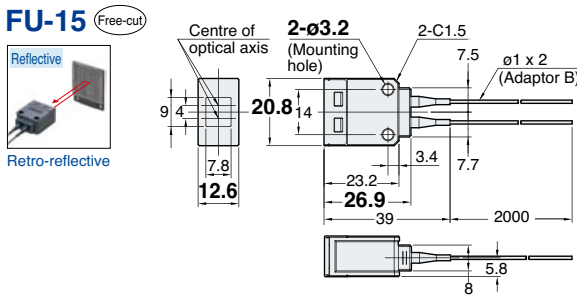
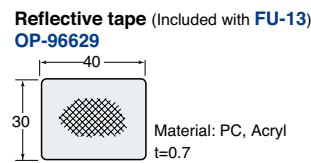
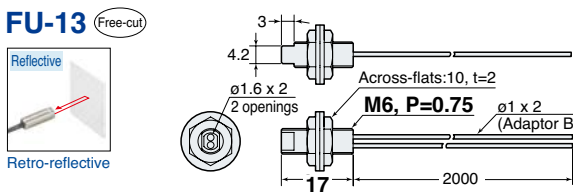
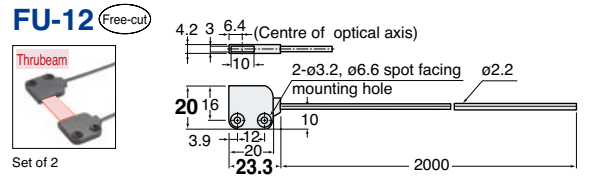
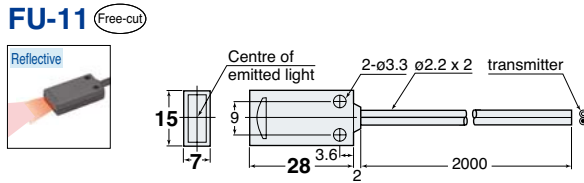
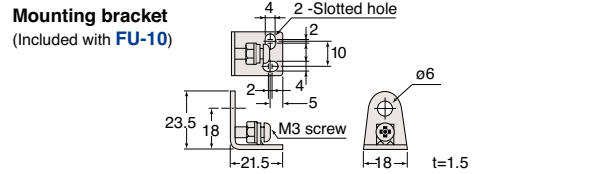
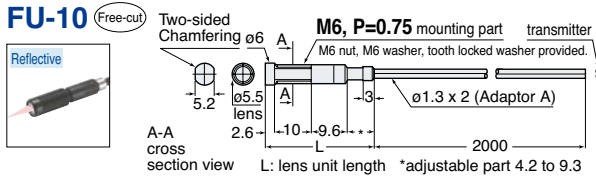
Stable detection of substrates at angles of: Horizontal: ±6°, Vertical: ±3°

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



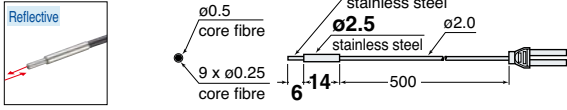
* ±8° for FU-38S.

* Not defined for the FU-38S.

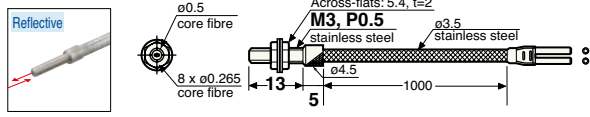


Unit: mm

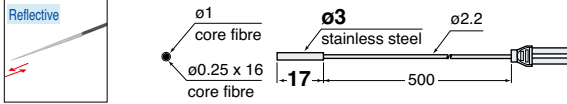
FU-22X



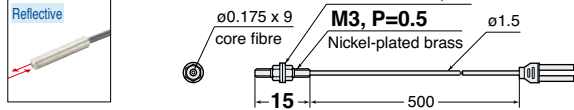
FU-2303



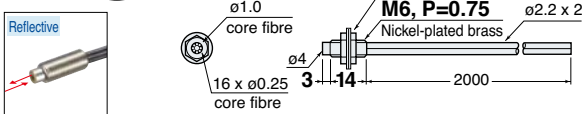
FU-23X



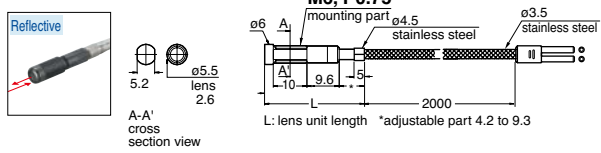
FU-24X



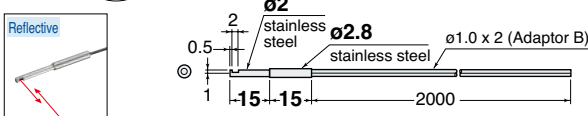
FU-25 (Free-cut)



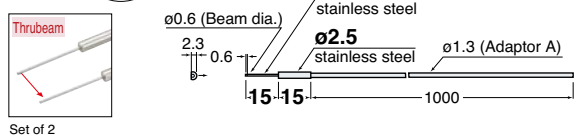
FU-2540



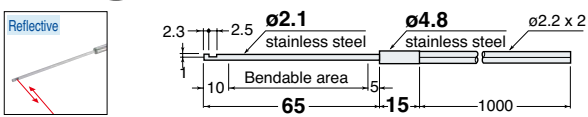
FU-31 (Free-cut)



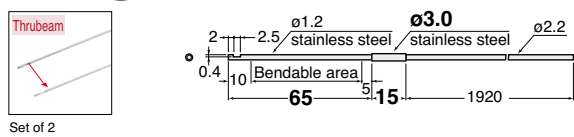
FU-32 (Free-cut)



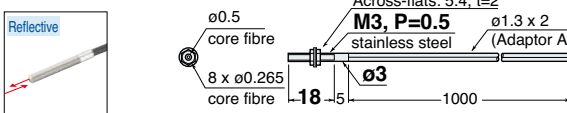
FU-33 (Free-cut)



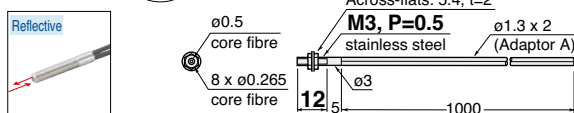
FU-34 (Free-cut)



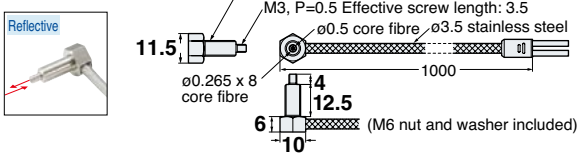
FU-35FA (Free-cut)



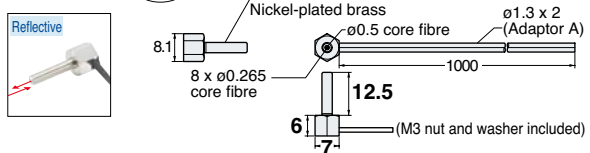
FU-35FZ (Free-cut)



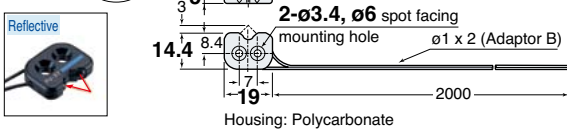
FU-35TG



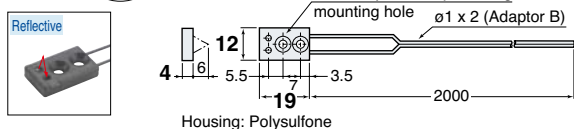
FU-35TZ (Free-cut)

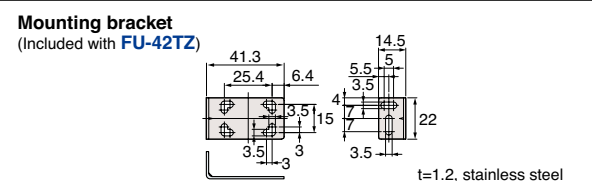
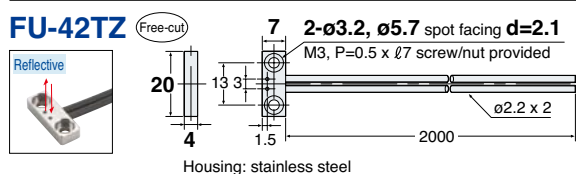
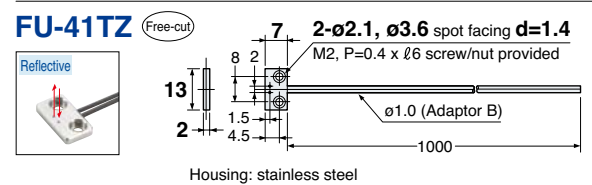
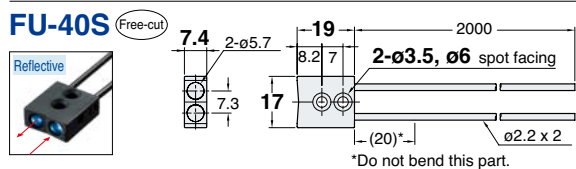
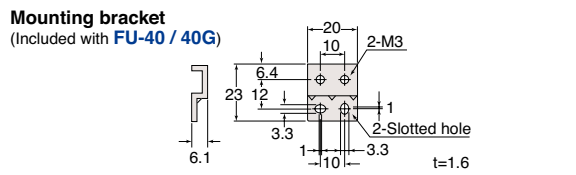
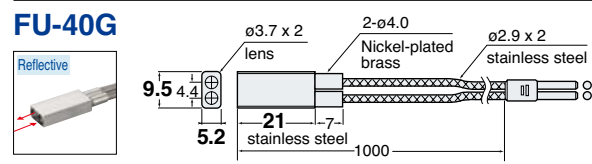
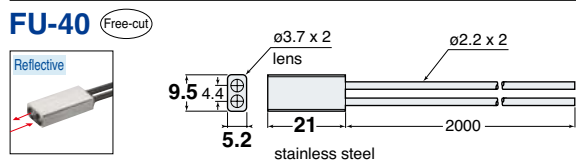
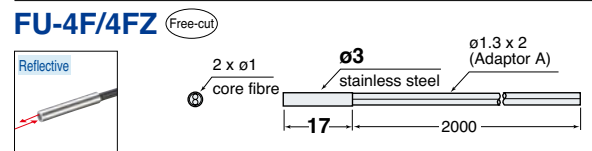
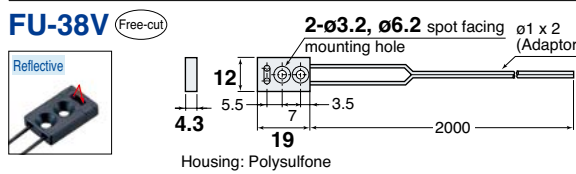
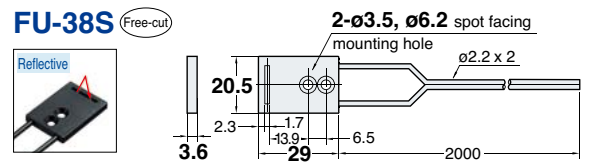
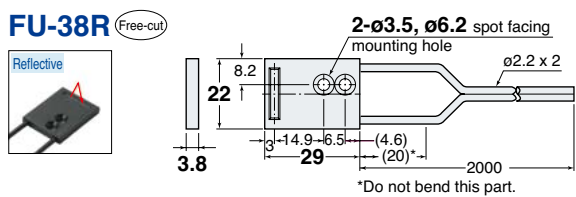
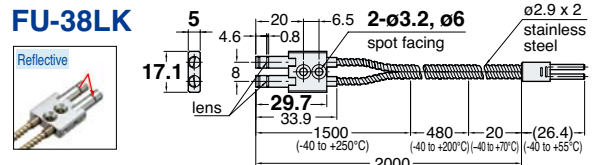
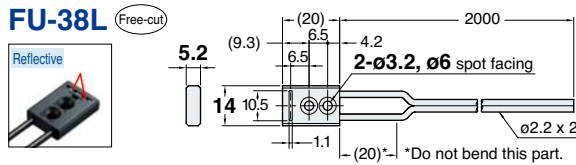
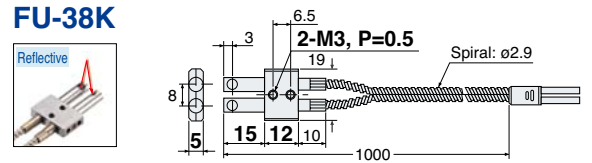
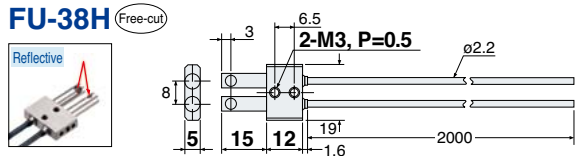


FU-37 (Free-cut)

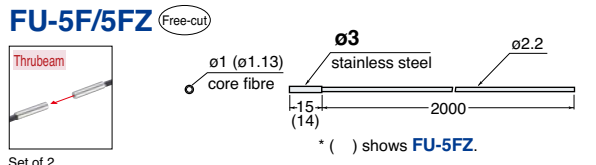
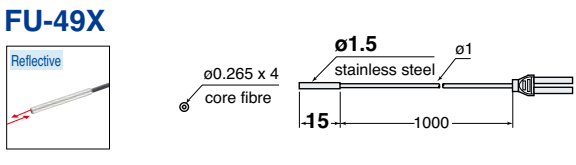
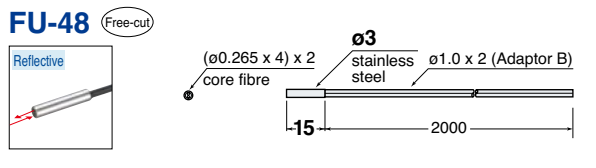
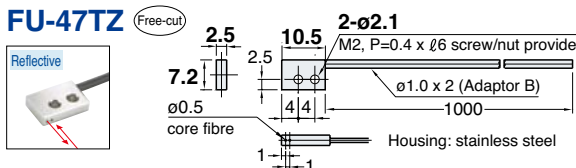
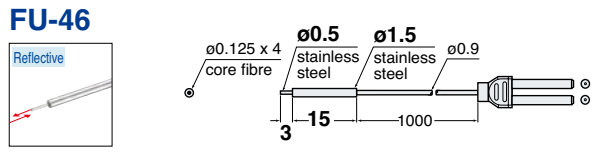
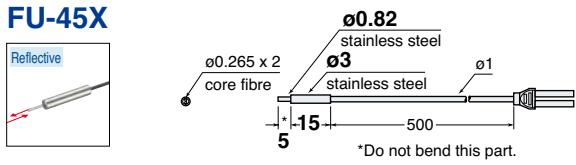
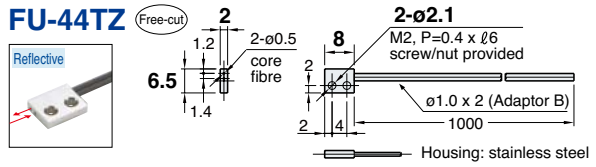
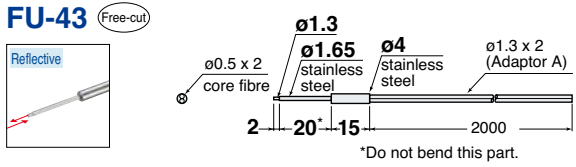


FU-38 (Free-cut)

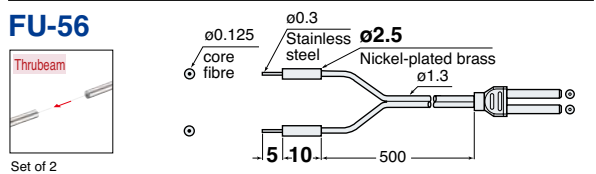
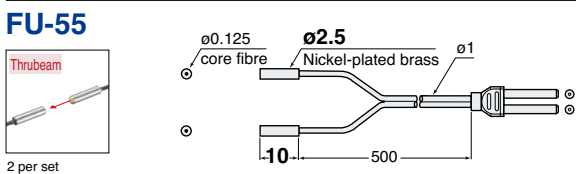
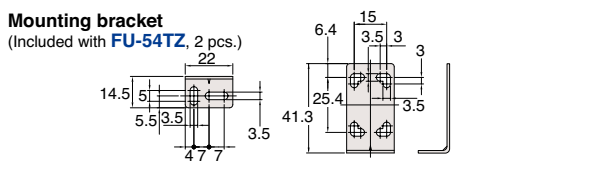
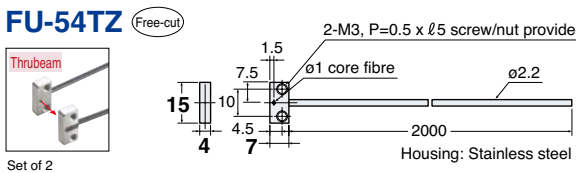
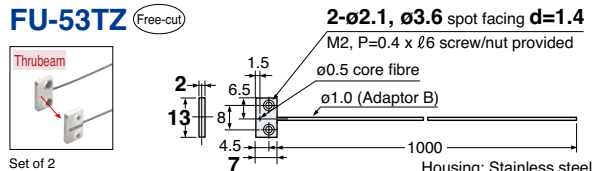
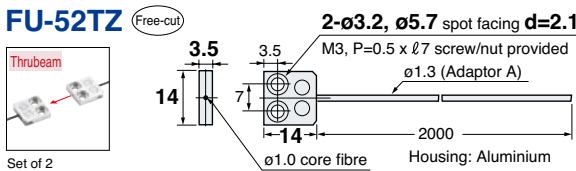
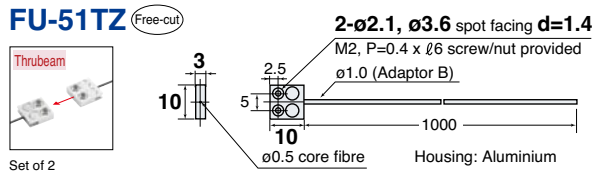
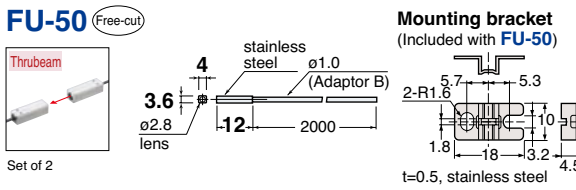


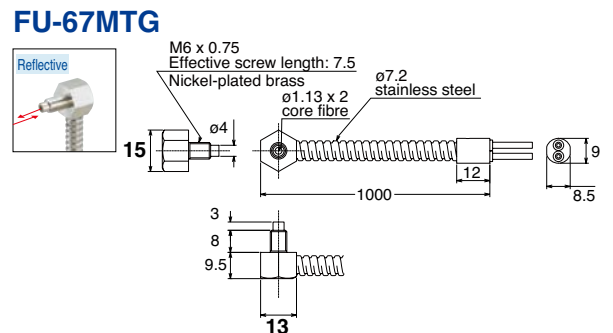
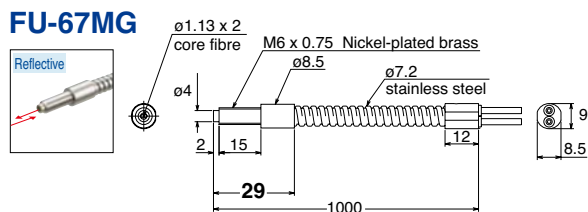
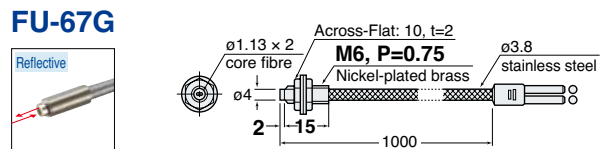
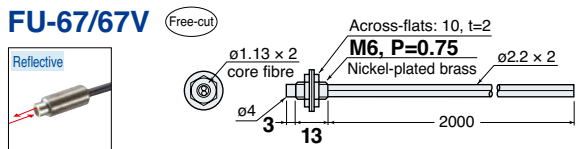
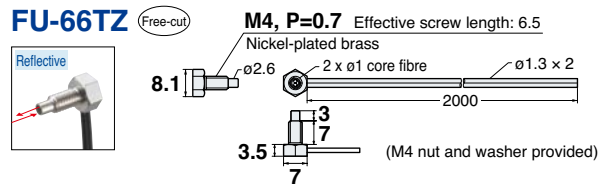
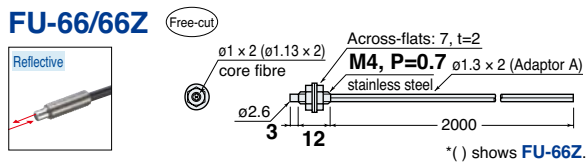
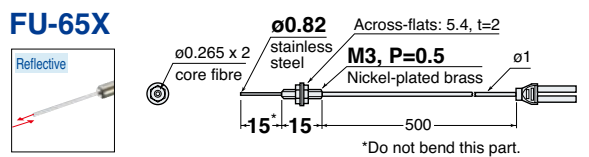
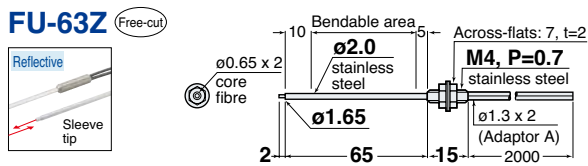
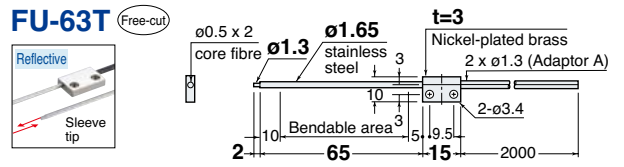
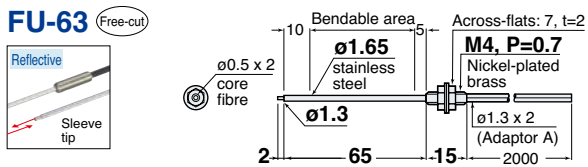
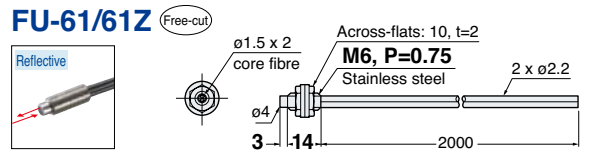
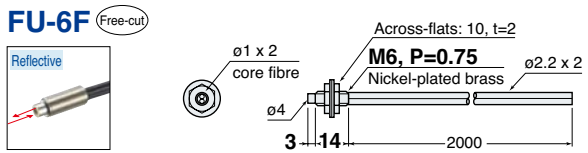
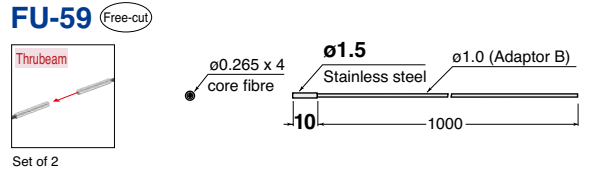
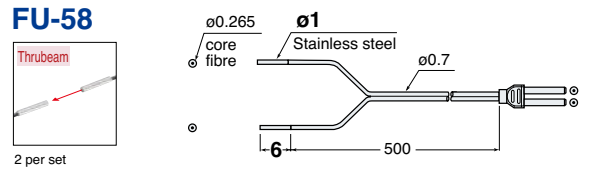
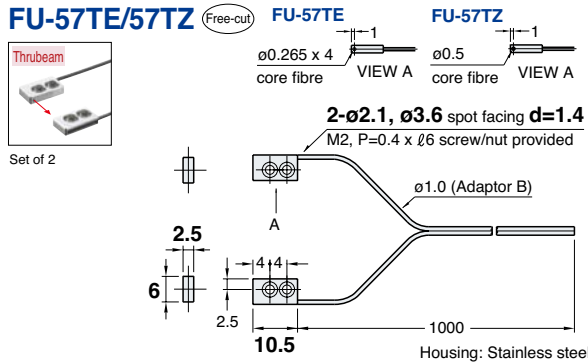


Unit: mm



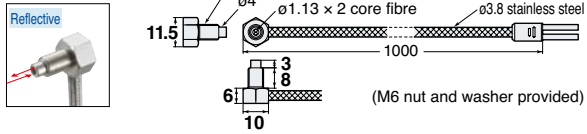
Set of 2



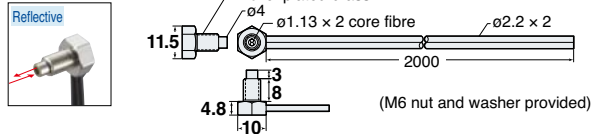


Unit: mm

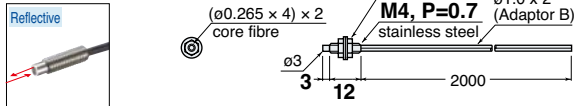
FU-67TG



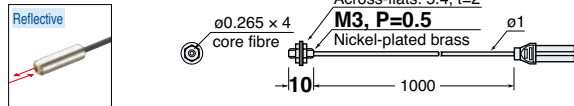
FU-67TZ (Free-cut)



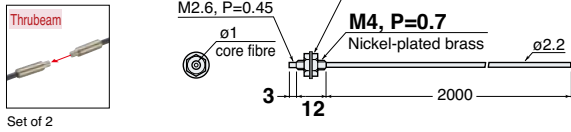
FU-68 (Free-cut)



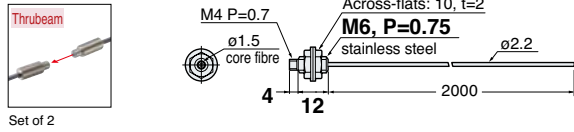
FU-69X



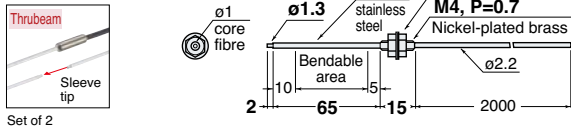
FU-7F (Free-cut)



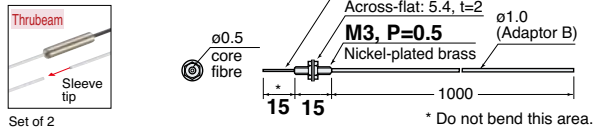
FU-71/71Z (Free-cut)



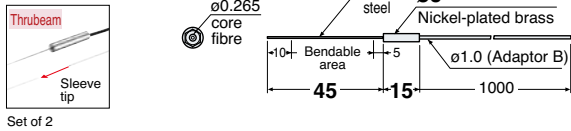
FU-73 (Free-cut)



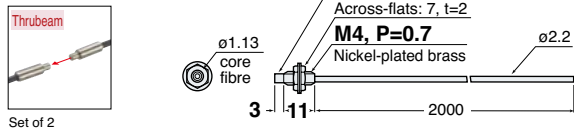
FU-75F (Free-cut)



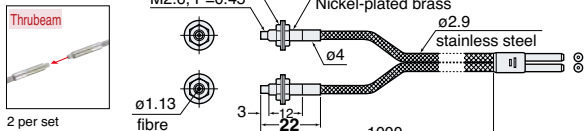
FU-76F (Free-cut)



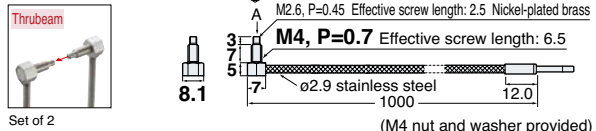
FU-77/77V (Free-cut)



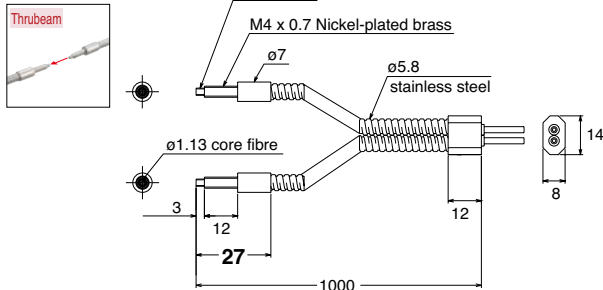
FU-77G



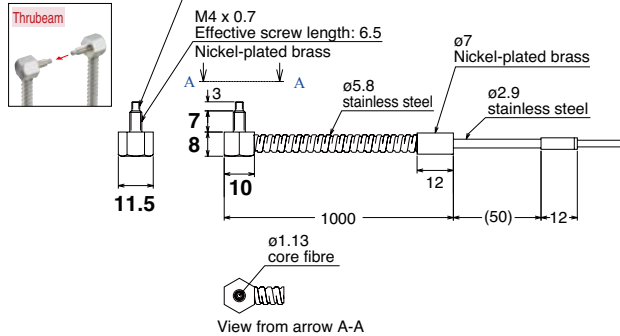
FU-77TG



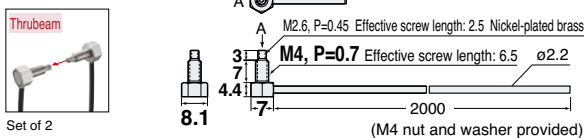
FU-77MG



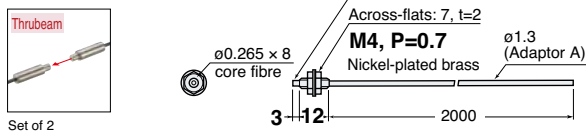
FU-77MTG



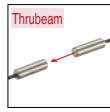
FU-77TZ (Free-cut)



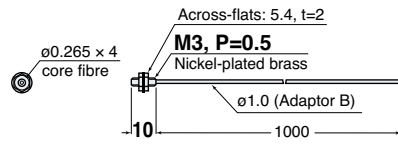
FU-78 (Free-cut)



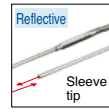
FU-79 (Free-cut)



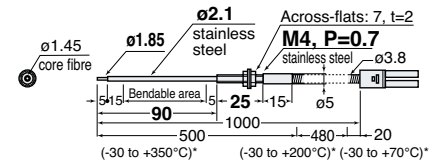
Set of 2



FU-81C

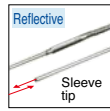


Sleeve tip

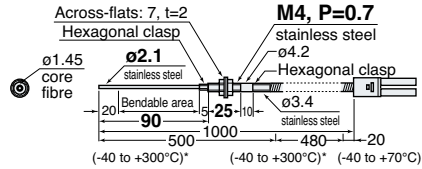


* Maximum temperature resistance for each part is shown in ().

FU-82C



Sleeve tip

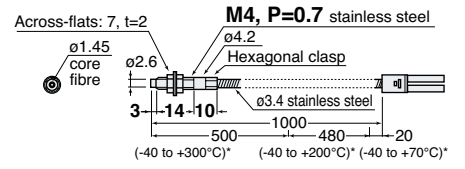


* Maximum temperature resistance for each part is shown in ().

FU-83C

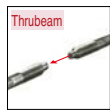


Sleeve tip

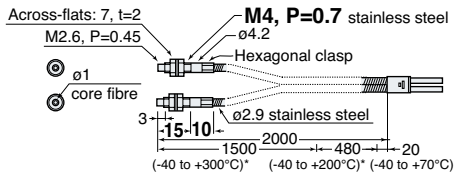


* Maximum temperature resistance for each part is shown in ().

FU-84C



2 per set

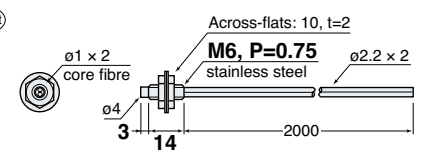


* Maximum temperature resistance for each part is shown in ().

FU-85A (Free-cut)



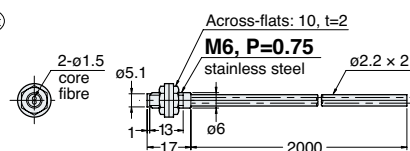
Sleeve tip



FU-85H (Free-cut)



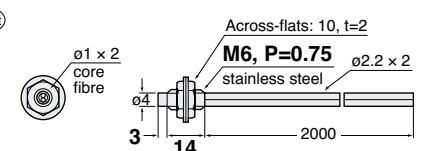
Sleeve tip



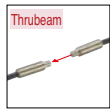
FU-85Z (Free-cut)



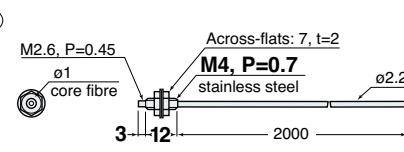
Sleeve tip



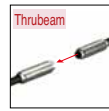
FU-86A (Free-cut)



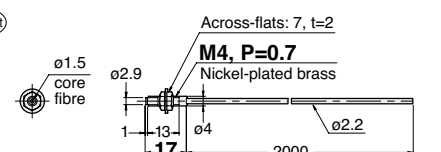
Set of 2



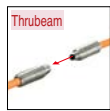
FU-86H (Free-cut)



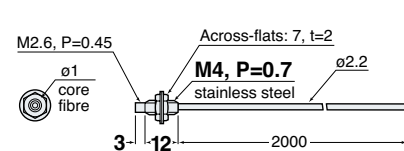
Set of 2



FU-86Z (Free-cut)



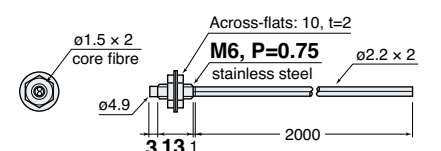
Set of 2



FU-87 (Free-cut)



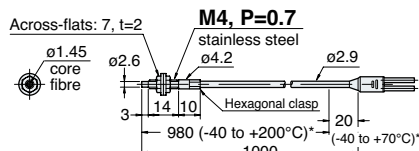
Sleeve tip



FU-87K

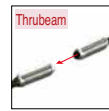


Sleeve tip

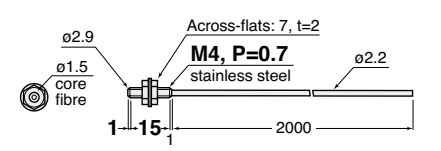


* Maximum temperature resistance for each part is shown in ().

FU-88 (Free-cut)



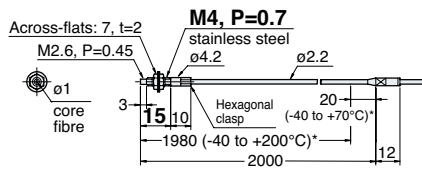
Set of 2



FU-88K

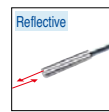


Set of 2

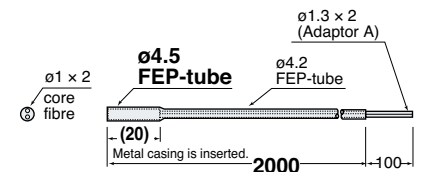


* Maximum temperature resistance for each part is shown in ().

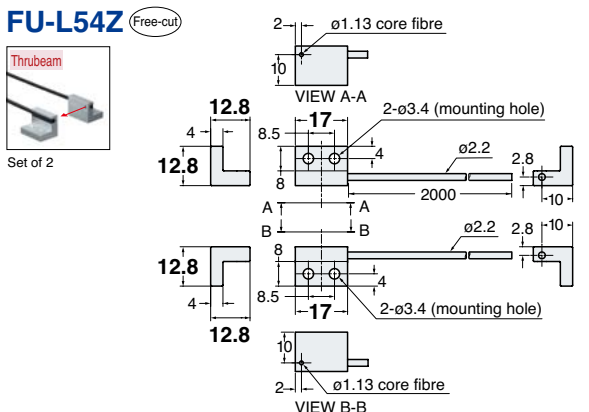
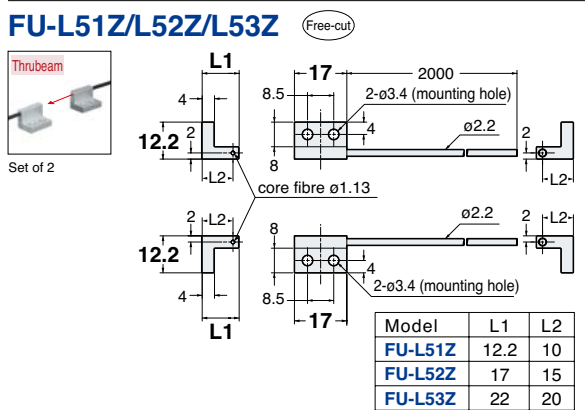
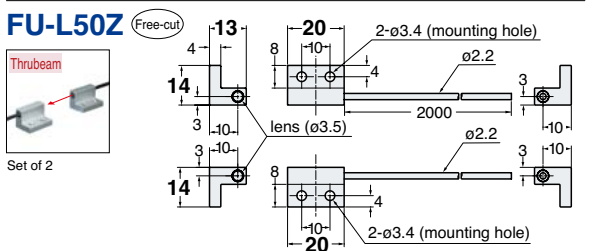
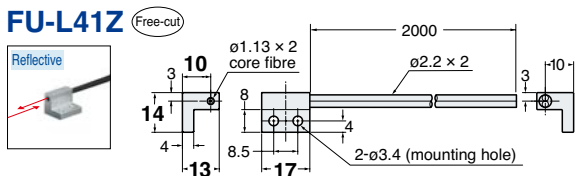
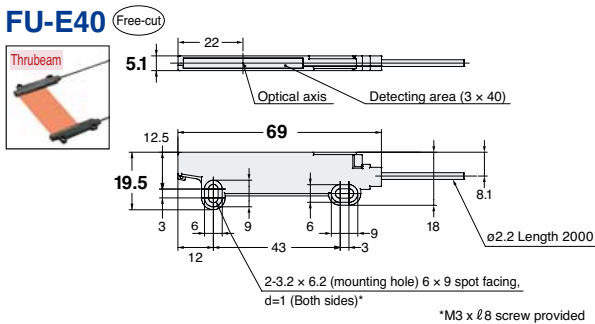
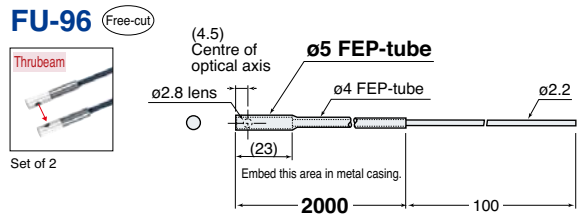
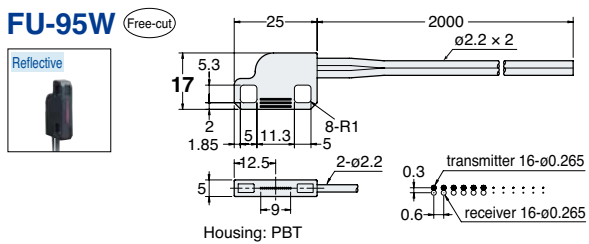
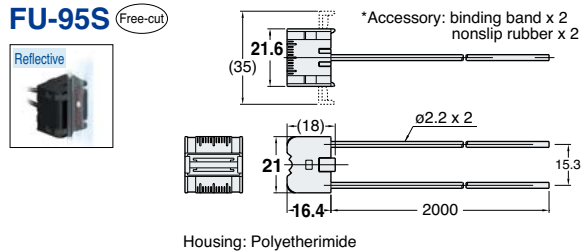
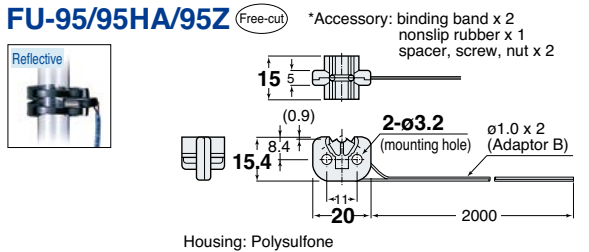
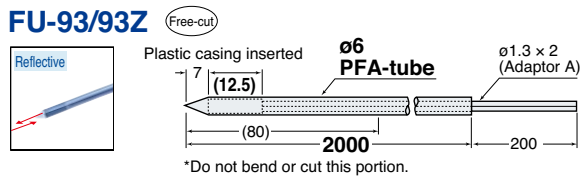
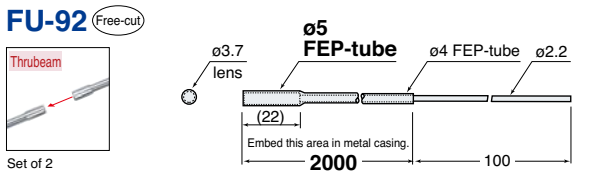
FU-91 (Free-cut)



Sleeve tip



Unit: mm



Lens (Option)

F-1

Housing: Nickel-plated brass
Lens: Acryl



2 per set

F-2

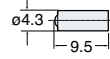
Housing: Nickel-plated brass
Lens: Glass



2 per set

F-4

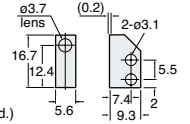
Housing: Aluminium
Lens: Glass



2 per set

F-5

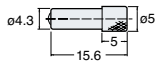
Housing: Aluminium
Lens: Glass



2 per set
(Knurled nut attached.)

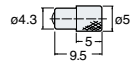
F-2HA

Housing: Aluminium
Lens: Plastic



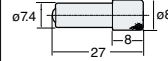
F-3HA

Housing: Aluminium
Lens: Plastic



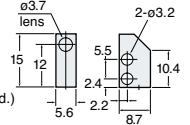
F-4HA

Housing: Aluminium
Lens: Glass



F-5HA

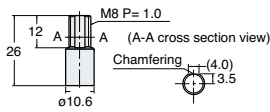
Housing: Aluminium
Lens: Glass



(Knurled nut attached.)

F-6HA

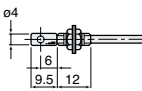
Housing: Aluminium Lens: Plastic



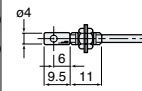
(M8 nut and washer provided)

With lenses

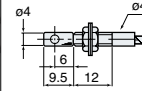
F-1+FU-7F/86A/86Z



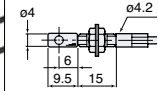
F-1+FU-77/77V



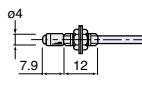
F-1+FU-77G/77MG



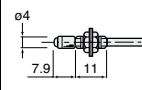
F-1+FU-84C/88K



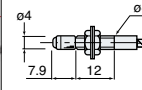
F-2+FU-7F/86A/86Z



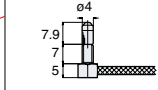
F-2+FU-77/77V



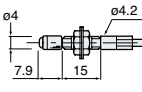
F-2+FU-77G/77MG



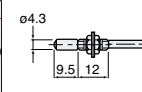
F-2+FU-77TG/77MTG



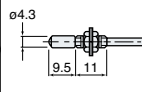
F-2+FU-84C/88K



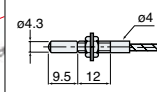
F-4+FU-7F



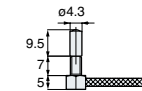
F-4+FU-77/77V



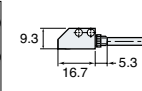
F-4+FU-77G/77MG



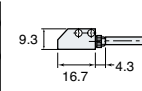
F-4+FU-77TG/77MTG



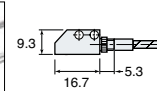
F-5+FU-7F/86A/86Z



F-5+FU-77/77V

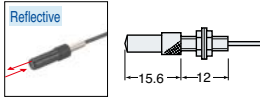


F-5+FU-77G/77MG

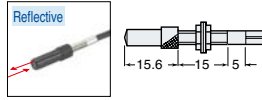


Unit: mm

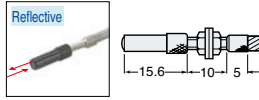
F-2HA+FU-21X/FU-24X



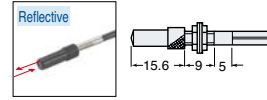
F-2HA+FU-35FA



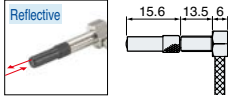
F-2HA+FU-2303



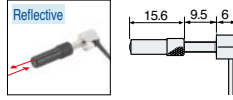
F-2HA+FU-35FZ



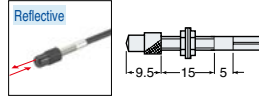
F-2HA+FU-35TG



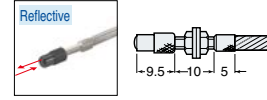
F-2HA+FU-35TZ



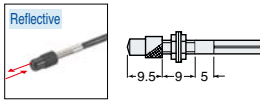
F-3HA+FU-35FA



F-3HA+FU-2303



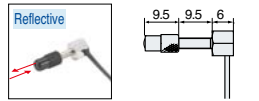
F-3HA+FU-35FZ



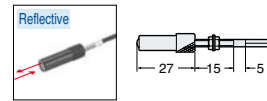
F-3HA+FU-35TG



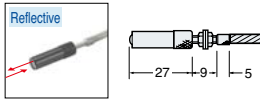
F-3HA+FU-35TZ



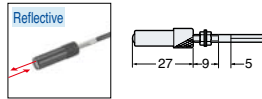
F-4HA+FU-35FA



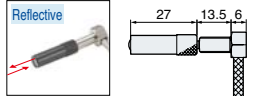
F-4HA+FU-2303



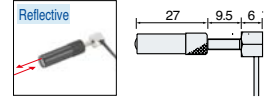
F-4HA+FU-35FZ



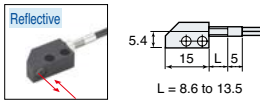
F-4HA+FU-35TG



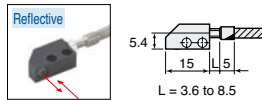
F-4HA+FU-35TZ



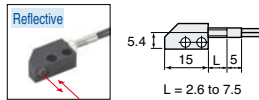
F-5HA+FU-35FA



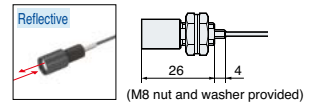
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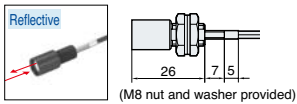
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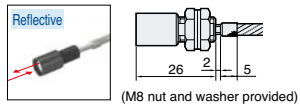
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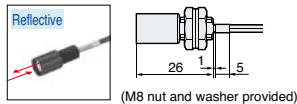
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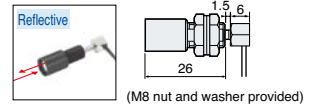
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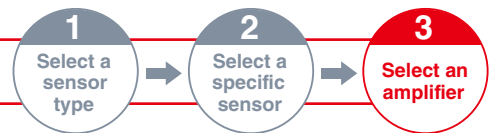
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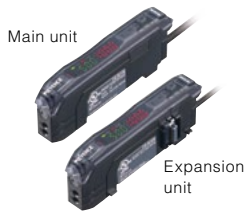
F-6HA+FU-35TZ



STEP 3 Select an amplifier



Cable Type



Type	Model	Model		Control outputs	External input	Analogue output
		NPN output	PNP output			
Standard	Main unit	FS-N11N	FS-N11P	1	0	0
	Expansion unit	FS-N12N	FS-N12P			
2-output	Main unit	FS-N13N	FS-N13P	2	1	
	Expansion unit	FS-N14N	FS-N14P			
Analogue	Main unit	FS-N11MN	—	1	0	1

Connector Type (M8)



Type	Model	Model		Control outputs	External input	Analogue output
		NPN output	PNP output			
Standard	Main unit	FS-N11CN	FS-N11CP	1	1	0
	Expansion unit	FS-N12CN	FS-N12CP			
2-output	Main unit	—	FS-N13CP	2	0	
	Expansion unit	—	FS-N14CP			

Optional (sold separately)

Amplifier securing bracket (for main unit)



Description	Model
Can be installed without a DIN-rail. Can be installed from above or from the side.	OP-73880

End unit (when using expansion units)



Used to secure the main and expansion units. (Two per set)	OP-26751 (Two per set)
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M8 connector cable (2 m/10 m)



Used to connect to the M8 connector type amplifier (model numbers end with a "CN" or "CP"). Connector cables are not included with the amplifier.	2 m type OP-73864
	10 m type OP-73865

Expansion converter unit



The FS-N Series has different amplifier connection connectors than the FS-V30, LV, and CZ Series. This is an adapter to connect these models. It supplies power from the main unit to the expansion unit and prevents interference. *Communication is not supported.	OP-87199
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Please visit: www.keyence.com



SAFETY INFORMATION

Please read the instruction manual carefully in order to safely operate any KEYENCE product.

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