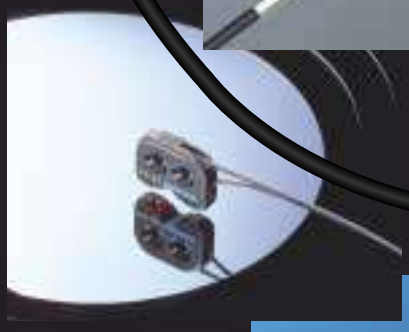
KEYENCE

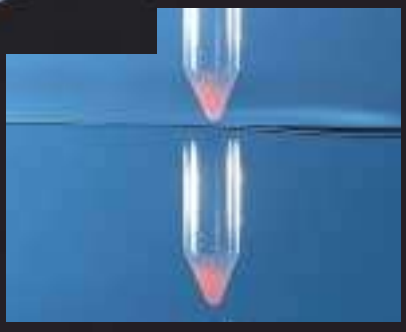
Cat. No. FSV10-EU-C

Hybrid Fibreoptic Sensor

FS-V10 Series

A Revolutionary High Power Digital Amplifier



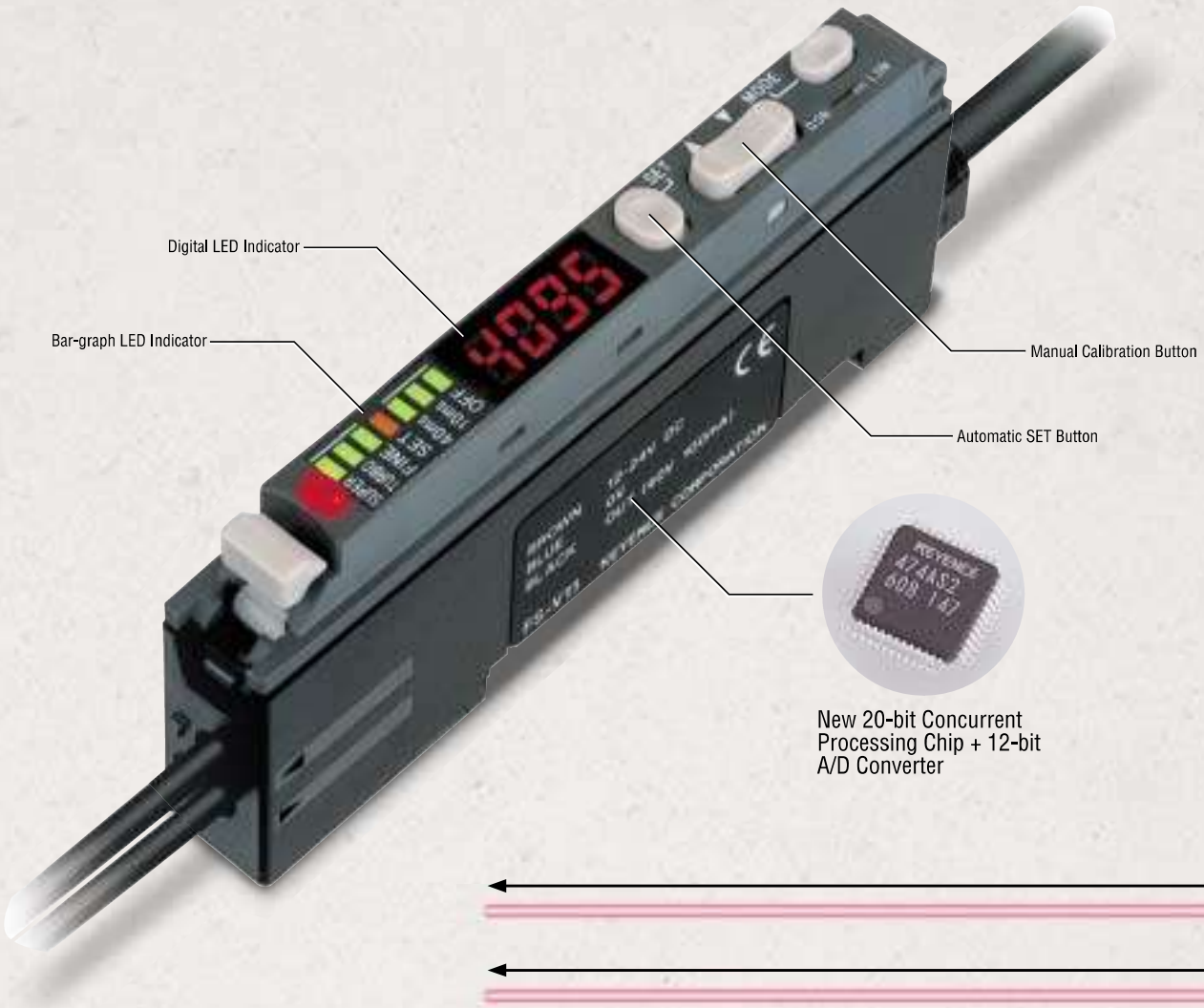


THE WORLD'S BEST SELLER

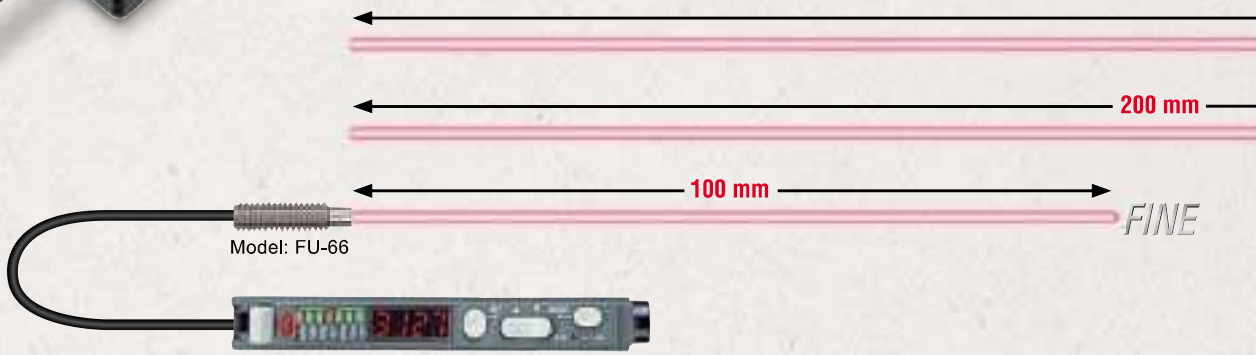
CE

Keyence's HYBRID Amplifier Delivers Both High Accuracy & High Power

The FS-V10 is packed with features and functions,
where other advanced fibreoptic sensors provide only one or two.



New 20-bit Concurrent Processing Chip + 12-bit A/D Converter



The FS-V10 series offers three levels of detection to suit every application.

Keyence fibreoptic sensors are used by over 80,000 users around the world.

THE WORLD'S BEST SELLER

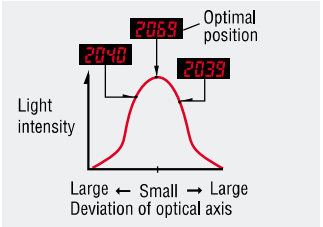
Hybrid Digital

Simplified status checking

Dual Monitoring System An Industry First !

The FS-V10 features both a digital LED indicator and a Bar LED indicator. The digital LED indicator numerically displays the received light intensity while the bar LED indicator shows the level of detection stablity (excess gain).

Optical axis alignment using digital LED indicator

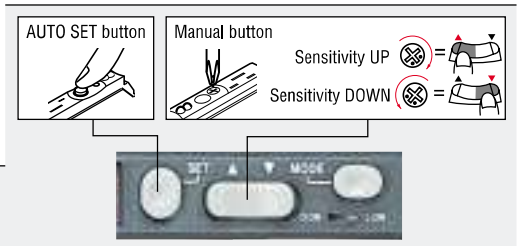


Increased detection stability

Auto & Manual Calibration An Industry First !

In addition to the conventional AUTO SET button, the FS-V10 features a manual adjustment button that permits fine adjustments. After initial calibration using the AUTO SET button, detection can begin and fine adjustments made using the manual button. By including manual adjustment, even the most inexperienced users can achieve a very precise detection.

Calibration Comparisons	Setting	Fine Adjustment
By Button	Good ○ Just press the button for the optimal setting	No good — Sensitivity is fixed. Fine adjustments are impossible.
By Trimmer	No good — Calibration requires experience.Settings vary depending upon the operator.	Good ○ Sensitivity can be set as desired.
By Hybrid Calibration	Good ○ Just press the button for a fully automatic calibration.	Good ○ Fine adjustments can be made to the sensitivity.



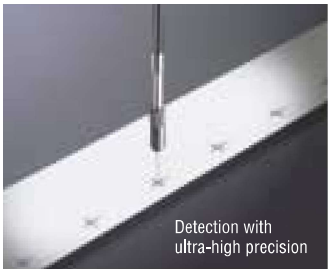
300 mm

SUPER TURBO

TURBO

High Power

The FS-V10 amplifier can be used for precise detection of wire as thin as 0.01mm in diameter using a thrubeam fibre unit.It is also ideal for detection in harsh environments where oil and dust exist.

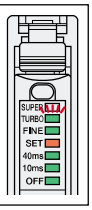


Bar LED Indicators Identify Unstable Operating Conditions at a Glance

The bar LED indicates detection stability using 7 Levels. Stable detection is achieved when all LEDs are lit during light beam reception and off when the light beam is interrupted. When only 5 LEDs are lit during light beam reception, the excess gain is +5%, in other words, the sensor received just enough light to turn on. At a glance the LED indicates when maintenance is required, a function that is difficult to notice with ordinary digital displays.

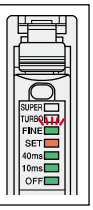
Low Excess Gain

When only one LED does not light during light beam reception, the excess gain is 10%.



Inspection Required

When two LEDs do not light during light beam reception, the excess gain is 5%, and an immediate inspection is required.



Automatic Interference Prevention

In TURBO/SUPER TURBO mode, up to 8 units can be mounted side-by-side without mutual interference. (In FINE mode, up to 4 units)

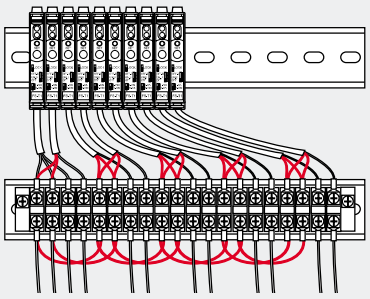
1-line Wire Connection System Significantly Reduces Wiring Time

The FS-V10 series uses the unique Keyence 1-line system. The power is supplied from the main unit (FS-V11) through the expansion connector so the expansion unit (FS-V12) does not require power cables.

The wiring costs are significantly reduced, even when a single expansion unit is connected. The more expansion units installed the greater the cost savings.

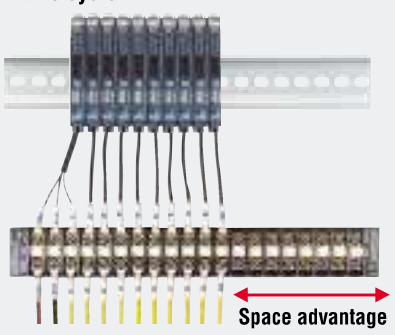
When 10 units are used

Conventional system



No. of terminal blocks	20 pairs
No. of wires	58
No. of crossover wires	80
Man-hours	120 minutes Approx.

1-line system



No. of terminal blocks	12 pairs
No. of wires	24
No. of crossover wires	0
Man-hours	50 minutes Approx.

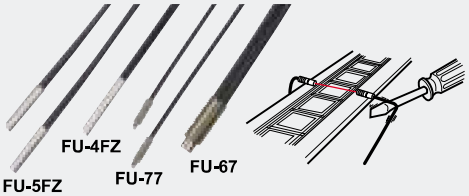
The red wires can be reduced with the 1-line system.

Fibre Unit Variations

Detailed support for various types of detection

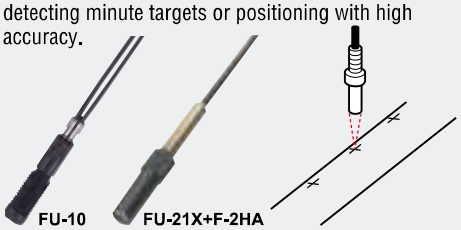
"Tough Flex" Fibre Unit Patent Pending
FU-67/77/35FZ/4FZ/5FZ/63Z/66Z/12

Even at a minimum bend radius of 2mm these fibre units retain light intensity, even when folded.



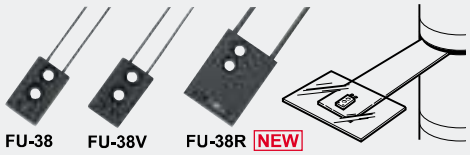
Focused Beam Lens Fibre Unit
FU-21X+F-2HA

This fibre unit and lens combination is useful for detecting minute targets or positioning with high accuracy.



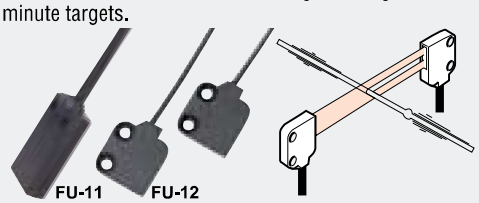
Compact Reflective Fibre Unit
FU-38/38V/38R

Ideal for detection in tight spaces, such as a suction arm of a robot or inside a conveyor. Detection is almost unaffected by the target's background.



Area Detection Fibre Unit
FU-12

FU-12 can detect a target within a 10mm detecting width. It is also suitable for detecting vibrating or minute targets.

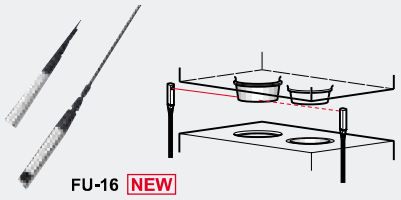


High-Flex Fibre Unit
FU-45X/48/49X/59/65X/68/69X/78/79

These fibres have superior flexibility like electric wire and offer excellent durability against repeated bending.

Long Detecting Distance, Side View Fibre Unit
FU-16

The FU-16 offers a long detecting distance of 1.7m and a narrow beam with an aperture angle of 6°.

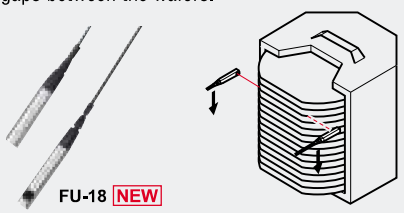


Liquid Level Detection Fibre Unit
FU-93

The FU-93 is completely encased in a Teflon® sheath. It repels liquid so it can be used to reliably detect a liquid surface.

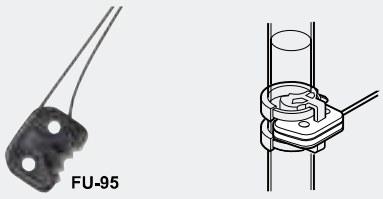
Wafer Mapping Fibre Unit
FU-18

The FU-18 ensures stable wafer mapping by detecting narrow gaps between the wafers.



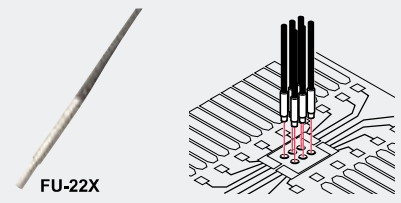
Pipe Mount Liquid Level Detection Fibre Unit
FU-95

The FU-95 is a liquid level detection fibre unit that can be easily mounted to a pipe, using a tie band.



Narrow Beam Fibre Unit
FU-22X

The narrow-beam fibre unit has a diffused angle of 10° (1/6 the width of conventinal models.)



FU-5FZ Tough Flex

FU-4FZ Tough Flex

FU-77 Tough Flex

FU-67 Tough Flex

FU-66Z Tough Flex

FU-63Z Tough Flex

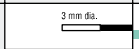
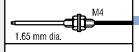
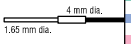
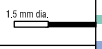
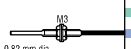
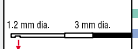
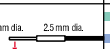
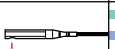
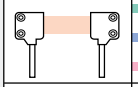
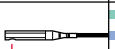
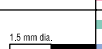
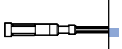
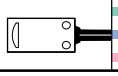
FU-35FZ Tough Flex

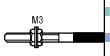
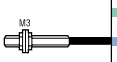
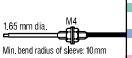
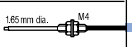
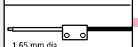
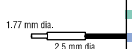
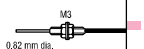
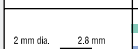
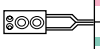
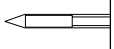
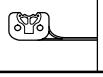
FU-10 NEW Tough Flex

FU-11 NEW Tough Flex

Selection Chart

Fibre unit

Type	Configuration	Detecting distance	Feature	Model
Thrubeam		760 mm	Long detecting distance (3 mm dia.) Free-cut	FU-5F
		640 mm	Long detecting distance type with sleeve Free-cut	FU-73
		320 mm	Long detecting distance (M4) Free-cut	FU-7F
		570 mm 460 mm 230 mm	Break-free fibre with a minimum bend radius of 2 mm Free-cut	FU-77
		370 mm 300 mm 150 mm	High-flex fibre with a minimum bend radius of 4 mm Free-cut	FU-78
		570 mm 460 mm (0.03 dia.) 230 mm (0.03 dia.)	Break-free fibre with a minimum bend radius of 2 mm Free-cut	FU-5FZ
		500 mm 400 mm 250 mm	Narrow beam type with built-in micro lens	FU-36X
		220 mm 200 mm	High-flex fibre with a minimum bend radius of 4 mm Free-cut	FU-59
		100 mm		FU-79
		150 mm 120 mm 75 mm	Thin sleeve Free-cut	FU-75F
		250 mm 200 mm 100 mm	Space-saving, side-view type Free-cut	FU-34
		80 mm 60 mm 30 mm	Side-view type with thin sleeve Free-cut	FU-32
		1700 mm 1300 mm 800 mm	Long detecting distance Side-view type Free-cut	FU-16
		1000 mm 800 mm 600 mm	Area detection fibre with a detecting width of 10 mm Free-cut	FU-12
		1300 mm 1000 mm 650 mm	Wafer mapping type Free-cut	FU-18
Reflective		300 mm 200 mm 100 mm	Long detecting distance Free-cut	FU-4F
			Coaxial fibre suitable for positioning	FU-23X
		55 mm 40 mm 25 mm	High-flex fibre with a minimum bend radius of 4 mm Free-cut	FU-48
		25 mm 20 mm 15 mm	High-flex fibre with a minimum bend radius of 4 mm	FU-49X
		300 mm 200 mm 100 mm	Long detecting distance (M6) Free-cut	FU-6F
		180 mm 130 mm 65 mm	Break-free fibre with a minimum bend radius of 2 mm Free-cut	FU-67
		240 mm 160 mm 80 mm	Coaxial fibre suitable for positioning Free-cut	FU-25
		28 mm 20 mm	Coaxial fibre with 0.2 mm spot diameter when used with F-2HA	FU-21X
		10 to 30 mm (ø0.9 to 3.5 mm)	Adjustable spot size fibre 10 to 30 mm Free-cut	NEW FU-10
		(5 to 160 mm) (5 to 130 mm) (5 to 90 mm)	Area detection fibre with a detecting width of 15 mm (when detecting distance is 15mm) Free-cut	NEW FU-11

Type	Configuration	Detecting distance	Feature	Model
Reflective		300 mm 200 mm 100 mm	Long detecting distance (M4) Free-cut	FU-66
		55 mm 40 mm 25 mm	High-flex fibre with a minimum bend radius of 4 mm Free-cut	FU-68
		25 mm 20 mm 15 mm	High-flex fibre with a minimum bend radius of 4 mm	FU-69X
		110 mm 70 mm 35 mm	Coaxial fibre with 0.4 mm spot diameter when used with F-2HA Free-cut	FU-35FA
		130 mm 80 mm (0.01 dia. gold wire)	Break-free fibre with a minimum bend radius of 2 mm Free-cut	FU-4FZ
		45 mm (0.01 dia. gold wire)		FU-66Z
		65 mm 45 mm (0.01 dia. gold wire) 25 mm (0.01 dia. gold wire)	Coaxial fibre with 0.4 mm spot diameter when used with F-2HA Free-cut	FU-35FZ
		45 mm 35 mm (0.01 dia. gold wire) 20 mm (0.01 dia. gold wire)	Thin sleeve Free-cut	FU-63Z
		70 mm	Flush-mounting type with sleeve Free-cut	FU-43
		50 mm	Screw-mounting type with sleeve Free-cut	FU-63
		30 mm	Flat type with sleeve Free-cut	FU-63T
		12 mm 10 mm 8 mm	Narrow-beam type for small beam spot	FU-22X
		14 mm 10 mm	High-flex fibre with a minimum bend radius of 4 mm, flush-mounting type with thin sleeve	FU-45X
		6 mm	High-flex fibre with a minimum bend radius of 4 mm, screw-mounting type with thin sleeve	FU-65X
		60 mm 40 mm 20 mm	Space-saving, side-view type Free-cut	FU-33
		27 mm 20 mm 13 mm	Compact, side-view type Free-cut	FU-31
		3 mm(Centre of detecting distance) 3 mm(Centre of detecting distance) 3 mm(Centre of detecting distance)	Almost unaffected by target colour and background Free-cut	FU-37
		6±1 mm 6±1 mm 6±1 mm	Free-cut	FU-38
		0 to 4 mm 0 to 4 mm 0 to 4 mm	Almost unaffected by target background, side-by-side detection available Free-cut	FU-38V
		—	Liquid level detection by sensor head immersion. Teflon® covered for high durability against chemicals. FU-94C is heat resistant up to 200°C. Free-cut	FU-93
		—		FU-94C
		Transparent tube of ø4 to ø26	Detects liquid level through a transparent tube. Designed to be mounted to tubes of various sizes. Free-cut	FU-95

Selection Chart

Heat-resistant fibre unit

Type	Configuration	Detecting distance	Feature	Model
Thrubeam	M4	370 mm 300 mm 150 mm	Heat-resistance: 300°C, glass fibre	FU-84C
	M4	760 mm 640 mm 320 mm	Heat-resistance: 105°C, plastic fibre (Free-cut)	FU-86
		500 mm 400 mm 200 mm	Heat-resistance: 180°C, plastic fibre (Free-cut)	FU-88
	5 mm dia.	2500 mm 2200 mm 1100 mm	Oil-proof, chemical-proof, Teflon® fibre (Free-cut)	FU-92
		870 mm 700 mm 350 mm	Oil-proof, chemical-proof, Teflon® side-view fibre (Free-cut)	FU-96
Reflective	2.1 mm dia. M4	180 mm 120 mm 60 mm	Heat-resistance: 350°C, glass fibre with sleeve	FU-81C
	M4 2.1 mm dia.	210 mm 140 mm	Heat-resistance: 300°C, glass fibre with sleeve	FU-82C
	M4	70 mm	Heat-resistance: 300°C, glass fibre	FU-83C
	M6	300 mm 200 mm 100 mm	Heat-resistance: 105°C, plastic fibre (Free-cut)	FU-85
		210 mm 140 mm 70 mm	Heat-resistance: 180°C, plastic fibre (Free-cut)	FU-87
	4.5 mm dia.	110 mm 85 mm 60 mm	Oil-proof, chemical-proof, Teflon® fibre (Free-cut)	FU-91

(Free-cut) Free-cut fibre unit

[SUPER TURBO, TURBO, FINE]

Lens attachment

	Type	Configuration	Applicable fibre unit	Detecting distance FINE	TURBO	SUPER TURBO	Feature	Model
Reflective	Focusing lens		FU-35FA(Z)	7±2 with beam spot diameter of 0.4 mm			Focuses light beams for precise aiming. Improves the stability for the minute target detection.	F-2HA
			FU-21X	7±2 with beam spot diameter of 0.2 mm				
	Long detecting distance focusing lens		FU-35FA(Z)	0 to 20 with beam spot diameter of 4 mm				F-3HA
	Long detecting distance, high- focusing lens		FU-35FA(Z)	15±2 with beam spot diameter of 0.5 mm				NEW F-4HA
Thrubeam	Side-view		FU-7F,86	400	800	1000	Space-saving, side-view type	F-1[1]
			FU-77	260	540	670		
			FU-78	220	440	550		
			FU-84C	220	440	550		
	Long detecting distance		FU-7F,86	1800	3600	3600[2]	Greatly increases the detecting distance. Aperture angle: 15°	F-2
			FU-77	1500	3000	3600		
			FU-78	1200	2400	3000		
			FU-84C	1500	3000	3600		
	Ultra-long detecting distance		FU-7F	3000	3600[2]	3600[2]	Greatly increases the detecting distance. Aperture angle: 8°	NEW F-4
			FU-77	2500	3600[2]	3600[2]		
			FU-78	2000	3600[2]	3600[2]		

1. When using the F-1 at a temperature of 70°C or more, specify the "Heat-resistant F-1".
2. "3600" is assumed as maximum because the fibre cable has the length of 2 m.

Amplifier specifications

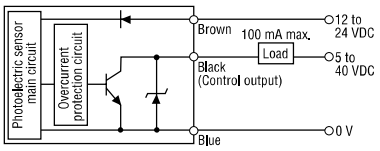
Model	NPN	FS-V11	FS-V12	FS-V10[1]
	PNP	FS-V11P	FS-V12P	———
Light source		Red LED		
Response time		250 µs (FINE)/500 µs (TURBO)/ 1 ms (SUPER TURBO)		410 µs to 1.7 ms[2]
Operation mode		LIGHT-ON/DARK-ON (switch-selectable)		
Indicators		Output indicator: Red LED Digital LED monitor: Red LED Bar graph LED monitor: Green/Orange LED[3] Calibration indicator: Orange LED[3]		
Timer function		OFF-delay: 40 ms, 10 ms / Timer OFF (switch selectable)		
Control output		NPN or PNP open-collector: 100 mA (40 V max.), Residual voltage: 1 V max.		
Protection circuit		Reverse polarity protection, Over-current protection, Surge absorber		
Power supply voltage		12 to 24 VDC±10%, Ripple (P-P) 10% max.		
Current consumption		50 mA max.		
Ambient illumination		Incandescent lamp: 10,000 lux max., Sunlight: 20,000 lux max.		
Ambient temperature		-10 to +55 °C [4]		
Relative humidity		35 to 85%		
Vibration		10 to 55 Hz, 1.5 mm double amplitude in X, Y and Z directions for two hours.		
Shock immunity		500 m/s² in X, Y, and Z directions, three times each.		
Housing material		Body/Cover: Polycarbonate		
Weight (including 2-m cable)		Approx. 80 g	Approx. 45 g	Approx. 20 g

1.FS-V10 has no output wire and FS-R0 should be used for issuing output.
2.The response time varies depending on the number of expansion units connected.
3.The orange LED is normally part of the bar graph LED monitor. It is used as a calibration indicator during the setting of the sensitivity.
4.When several units are connected, the allowable ambient temperature changes depending on the following conditions.
To connect several units, be sure to mount them to a DIN rail (metal DIN rail). Make sure that the output current is 20 mA max.
- When 3 to 10 units are connected: -10 to +50°C
- When 11 to 16 units are connected: -10 to +45°C

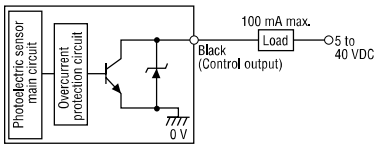
Input/Output circuit

NPN

FS-V11

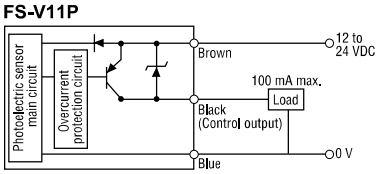


FS-V12

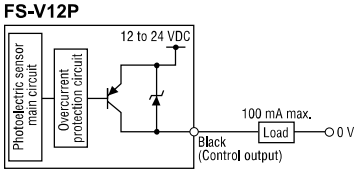


PNP

FS-V11P

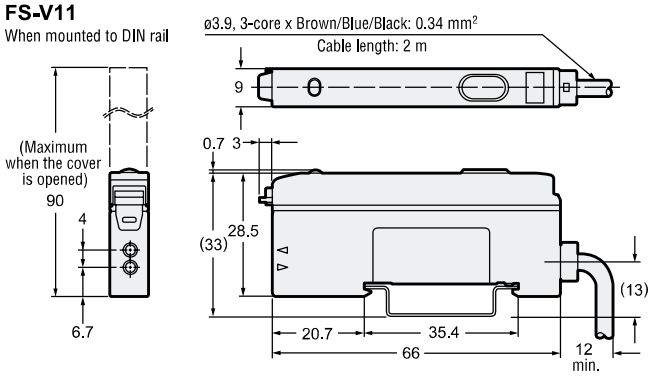


FS-V12P

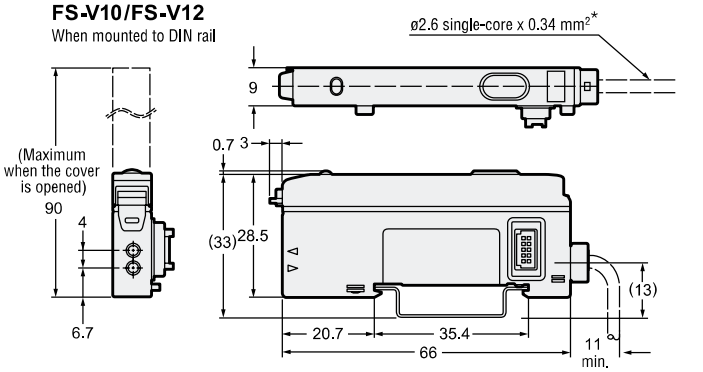


Dimensions

FS-V11
When mounted to DIN rail

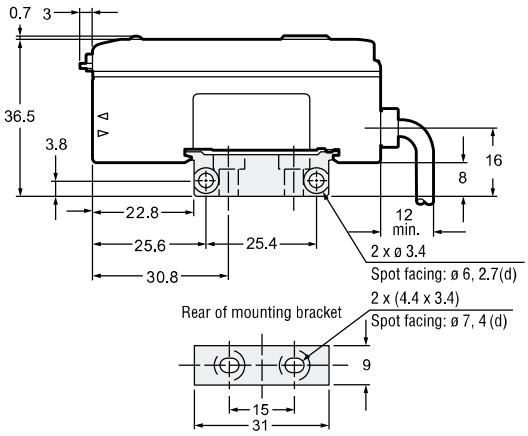


FS-V10/FS-V12
When mounted to DIN rail

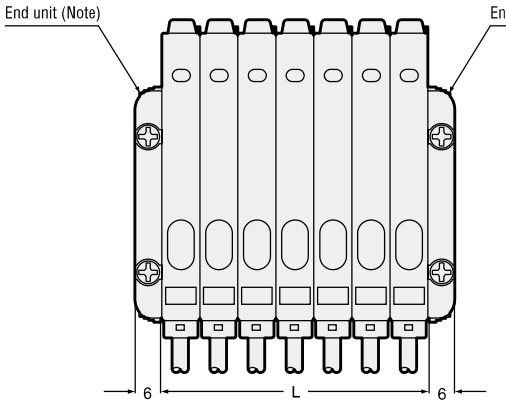


*FS-V10 has no output wire.

When mounting bracket (supplied with FS-V11) is attached



When several units are connected



Note: When using expansion units, be sure to use the end unit.

No. of units	L
1	9
2	18
3	27
4	36
5	45
6	54
7	63
8	72
9	81
10	90
11	99
12	108
13	117
14	126
15	135
16	144
17	153

Hints on correct use

- To extend the cable length, use 24 AWG cable. Limit the length of cable extension to no more than 100 m. (To connect several units, contact Keyence for further information.)
- If the amplifier cable is placed together with power lines or high voltage lines in the same conduit, detection errors may occur due to noise interference, or the sensor may be damaged. Isolate the amplifier cable from these lines.
- When using a commercially available switching regulator, ground the frame ground terminal and ground terminal.
- Do not use the FS-V10 Series outdoors, or in a place where extraneous light can enter the light-receiving surface directly.
- With the maximum sensitivity setting, the detecting distance may vary due to the difference in characteristics of each unit.
- If the wiring is incorrect, the unit may heat up or the sensitivity setting may fluctuate.

Visit our website for other Keyence products at http://www.keyence.co.uk

Specifications are subject to change without notice.

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