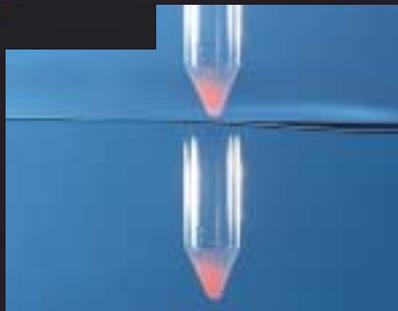
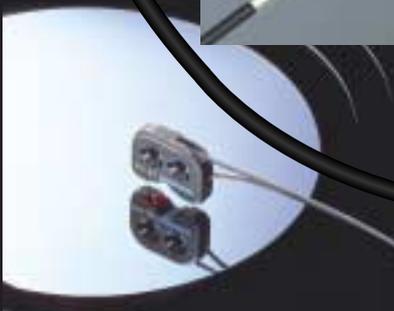


Hybrid Fibreoptic Sensor FS-V10 Series

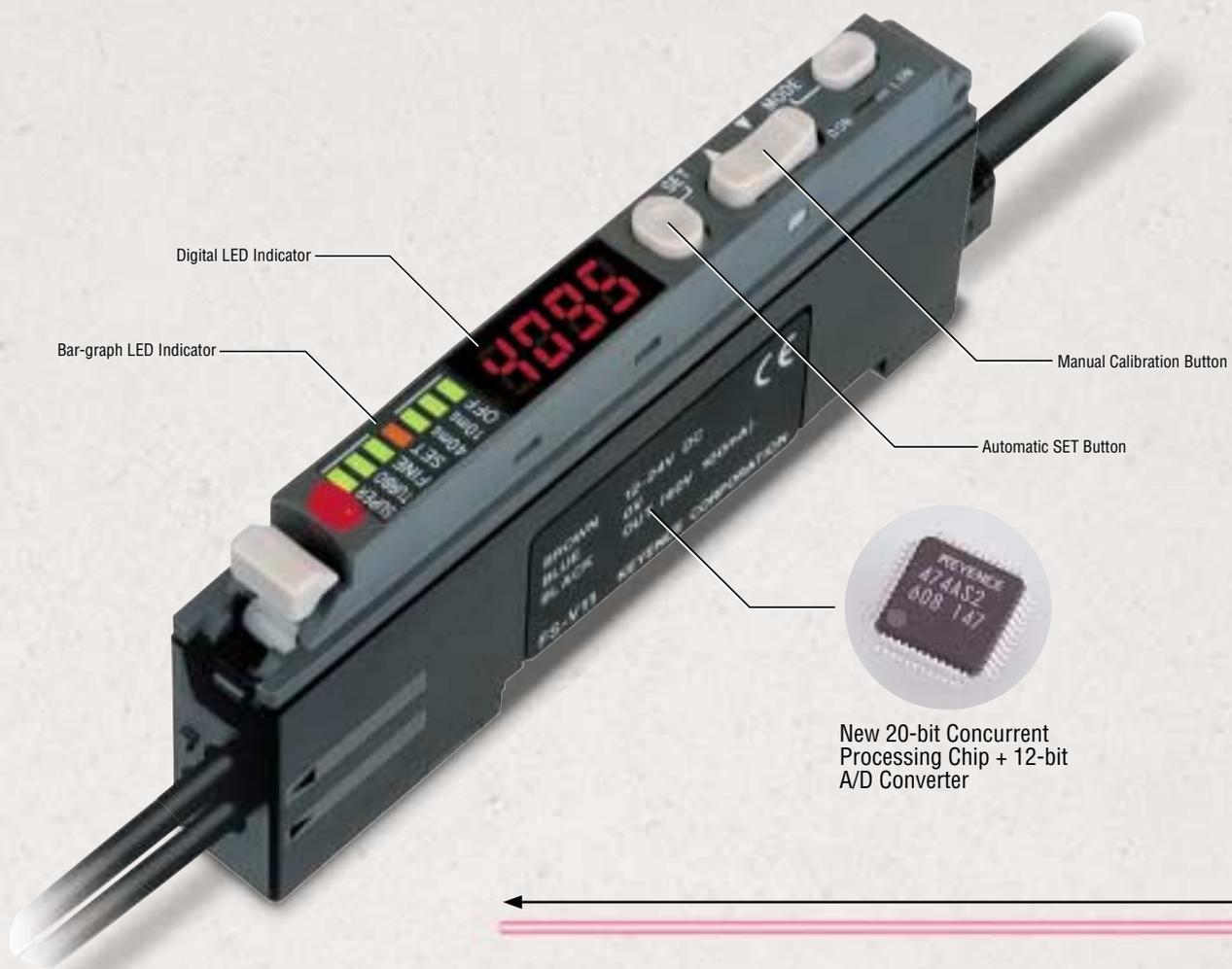


A Revolutionary High Power Digital Amplifier

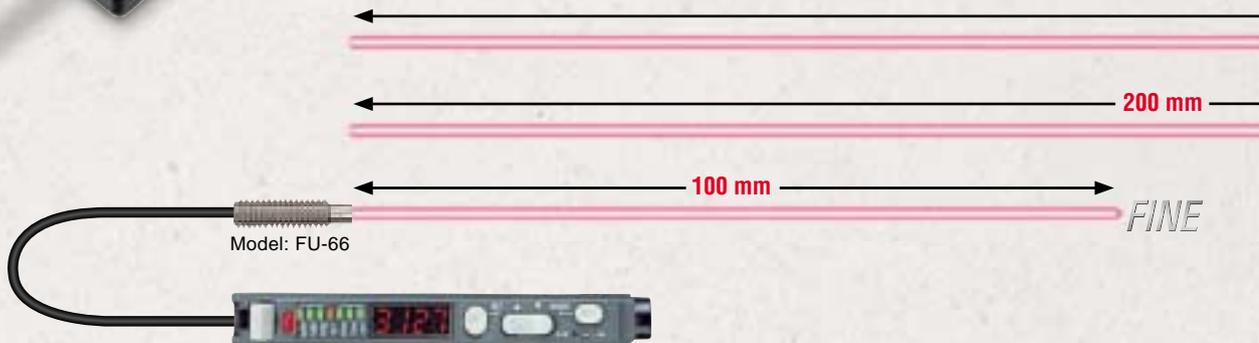


Keyence's HYBRID Amplifier Delivers Both High Accuracy & High Power

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



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

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



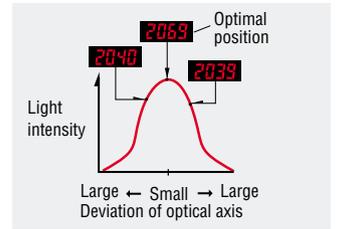
Hybrid Digital

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 stability (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.

AUTO SET button Manual button

Sensitivity UP Sensitivity DOWN

300 mm

TURBO

SUPER TURBO

High Power

The FS-V10 amplifier can be used for precise detection of wire as thin as 0.01mm in diameter using a threbeam 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%.



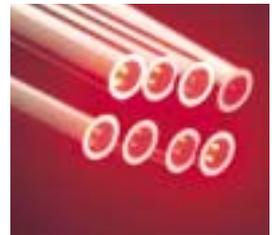
Inspection Required

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)

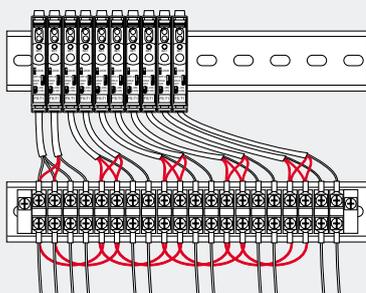


1-line Wire Connection System Significantly Reduces Wiring Time

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.

When 10 units are used

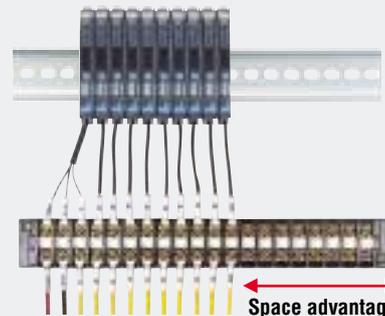
Conventional system



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



1-line system



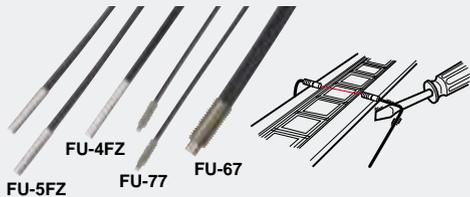
No. of terminal blocks	12 pairs
No. of wires	24
No. of crossover wires	0
Man-hours	50 minutes Approx.

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

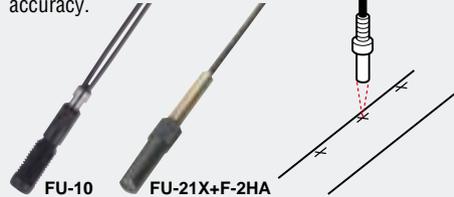
Fibre Unit Variations

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.



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

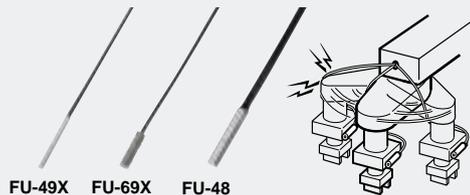
Compact Reflective Fibre Unit
FU-38/38V/38R
 Ideal for detection in tight spaces, such as a suction arm of a robot or inside a conveyor. Detection is almost unaffected by the target's background.



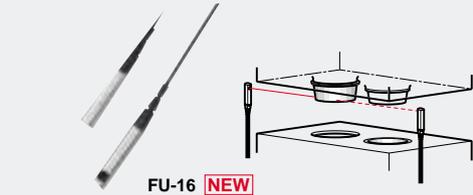
Area Detection Fibre Unit
FU-12
 FU-12 can detect a target within a 10mm detecting width. It is also suitable for detecting vibrating or minute targets.



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.



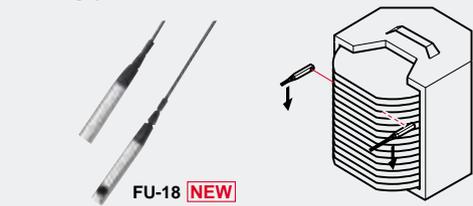
Long Detecting Distance, Side View Fibre Unit
FU-16
 The FU-16 offers a long detecting distance of 1.7m and a narrow beam with an aperture angle of 6°.



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.



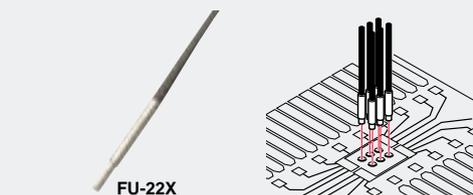
Wafer Mapping Fibre Unit
FU-18
 The FU-18 ensures stable wafer mapping by detecting narrow gaps between the wafers.



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 conventional models.)



Selection Chart

Fibre unit

Type	Configuration	Detecting distance	Feature	Model	
Thrubeam		760 mm	Long detecting distance (3 mm dia.)	FU-5F	
		640 mm	Long detecting distance type with sleeve	FU-73	
		320 mm	Long detecting distance (M4)	FU-7F	
		570 mm 460 mm 230 mm	Break-free fibre with a minimum bend radius of 2 mm	FU-77	
		370 mm 300 mm 150 mm	High-flex fibre with a minimum bend radius of 4 mm	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	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	FU-59 FU-79	
		150 mm 120 mm 75 mm	Thin sleeve	FU-75F	
		250 mm 200 mm 100 mm	Space-saving, side-view type	FU-34	
		80 mm 60 mm 30 mm	Side-view type with thin sleeve	FU-32	
		1700 mm 1300 mm 800 mm	Long detecting distance Side-view type	FU-16	
		1000 mm 800 mm 600 mm	Area detection fibre with a detecting width of 10 mm	FU-12	
		1300 mm 1000 mm 650 mm	Wafer mapping type	FU-18	
	Reflective		300 mm 200 mm 100 mm	Long detecting distance	FU-4F
			55 mm 40 mm 25 mm	Coaxial fibre suitable for positioning	FU-23X
		55 mm 40 mm 25 mm	High-flex fibre with a minimum bend radius of 4 mm	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)	FU-6F	
		180 mm 130 mm 65 mm	Break-free fibre with a minimum bend radius of 2 mm	FU-67	
		240 mm 160 mm 80 mm	Coaxial fibre suitable for positioning	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	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 15 mm)	NEW FU-11	

Type	Configuration	Detecting distance	Feature	Model
Reflective		300 mm 200 mm 100 mm	Long detecting distance (M4)	FU-66
		55 mm 40 mm 25 mm	High-flex fibre with a minimum bend radius of 4 mm	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	FU-35FA
		130 mm 80 mm (0.01 dia. gold wire) 45 mm (0.01 dia. gold wire)	Break-free fibre with a minimum bend radius of 2 mm	FU-4FZ 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	FU-35FZ
		45 mm 35 mm (0.01 dia. gold wire) 20 mm (0.01 dia. gold wire)	Thin sleeve	FU-63Z
		70 mm	Flush-mounting type with sleeve	FU-43
		50 mm	Screw-mounting type with sleeve	FU-63
		30 mm	Flat type with sleeve	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	FU-33
		27 mm 20 mm 13 mm	Compact, side-view type	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	FU-37 FU-38
		6±1 mm 6±1 mm 6±1 mm	Almost unaffected by target background, side-by-side detection available	FU-38V
		0 to 4 mm 0 to 4 mm 0 to 4 mm	Liquid level detection by sensor head immersion. Teflon® covered for high durability against chemicals. FU-94C is heat resistant up to 200°C.	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.	FU-95

Selection Chart

Heat-resistant fibre unit

Type	Configuration	Detecting distance	Feature	Model
Thrubeam		370 mm (SUPER TURBO) 300 mm (TURBO) 150 mm (FINE)	Heat-resistance: 300°C, glass fibre	FU-84C
		760 mm (SUPER TURBO) 640 mm (TURBO) 320 mm (FINE)	Heat-resistance: 105°C, plastic fibre	FU-86
		500 mm (SUPER TURBO) 400 mm (TURBO) 200 mm (FINE)	Heat-resistance: 180°C, plastic fibre	FU-88
		2500 mm (SUPER TURBO) 2200 mm (TURBO) 1100 mm (FINE)	Oil-proof, chemical-proof, Teflon® fibre	FU-92
Reflective		180 mm (SUPER TURBO) 120 mm (TURBO) 60 mm (FINE)	Heat-resistance: 350°C, glass fibre with sleeve	FU-81C
		210 mm (SUPER TURBO)	Heat-resistance: 300°C, glass fibre with sleeve	FU-82C
		140 mm (TURBO) 70 mm (FINE)	Heat-resistance: 300°C, glass fibre	FU-83C
		300 mm (SUPER TURBO) 200 mm (TURBO) 100 mm (FINE)	Heat-resistance: 105°C, plastic fibre	FU-85
		210 mm (SUPER TURBO) 140 mm (TURBO) 70 mm (FINE)	Heat-resistance: 180°C, plastic fibre	FU-87
		110 mm (SUPER TURBO) 85 mm (TURBO) 60 mm (FINE)	Oil-proof, chemical-proof, Teflon® fibre	FU-91
			Free-cut fibre unit	
			[SUPER TURBO, TURBO, FINE]	

Lens attachment

Type	Configuration	Applicable fibre unit	Detecting distance			Feature	Model
			FINE	TURBO	SUPER TURBO		
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
Thrubeam	Long detecting distance, high-focusing lens	FU-35FA(Z)	15±2 with beam spot diameter of 0.5 mm			Space-saving, side-view type	NEW F-4HA
		FU-7F,86	400	800	1000		F-1 ¹
Side-view	FU-77	260	540	670			
	FU-78	220	440	550			
	FU-84C	220	440	550			
	FU-7F,86	1800	3600	3600 ²			
Long detecting distance	FU-77	1500	3000	3600	Greatly increases the detecting distance. Aperture angle: 15°	F-2	
	FU-78	1200	2400	3000			
	FU-84C	1500	3000	3600			
	FU-7F	3000	3600 ²	3600 ²			
Ultra-long detecting distance	FU-77	2500	3600 ²	3600 ²	Greatly increases the detecting distance. Aperture angle: 8°	NEW F-4	
	FU-78	2000	3600 ²	3600 ²			
	FU-7F	3000	3600 ²	3600 ²			

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

Amplifier specifications

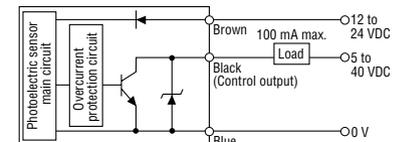
Model	NPN	FS-V11	FS-V12	FS-V10 ¹
	PNP	FS-V11P	FS-V12P	—
Light source	Red LED			
Response time	250 μs (FINE)/500 μs (TURBO)/1 ms (SUPER TURBO)			410 μs to 1.7 ms ²
Operation mode	LIGHT-ON/DARK-ON (switch-selectable)			
Indicators	Output indicator: Red LED Digital LED monitor: Red LED Bar graph LED monitor: 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/s ² 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	

- FS-V10 has no output wire and FS-R0 should be used for issuing output.
- The response time varies depending on the number of expansion units connected.
- 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.
- 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

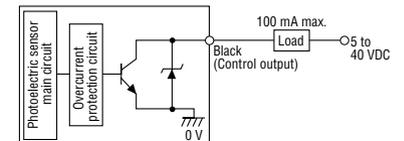
Input/Output circuit

NPN

FS-V11

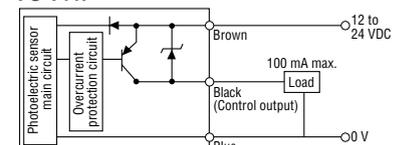


FS-V12

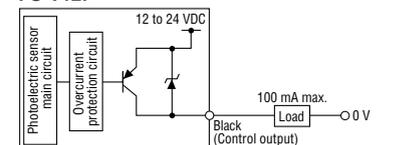


PNP

FS-V11P



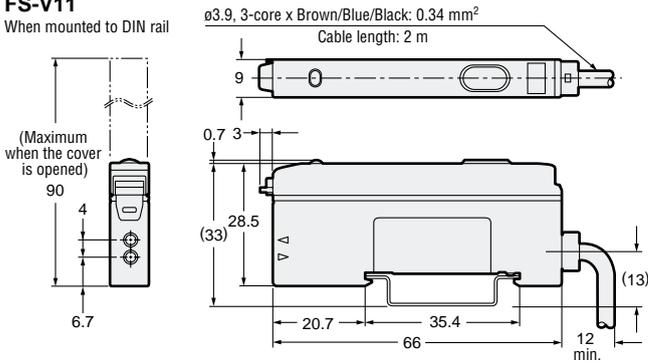
FS-V12P



Dimensions

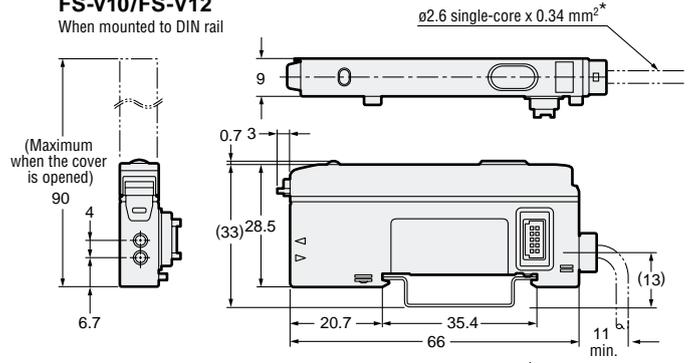
FS-V11

When mounted to DIN rail



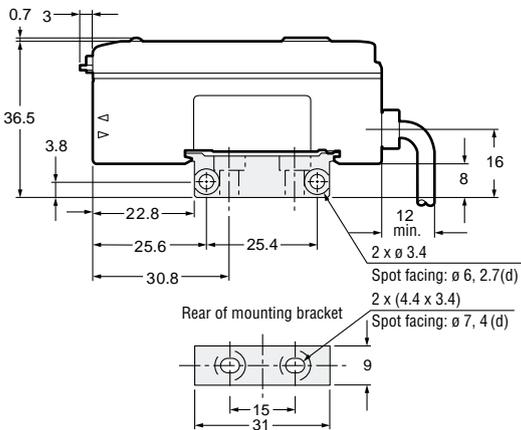
FS-V10/FS-V12

When mounted to DIN rail

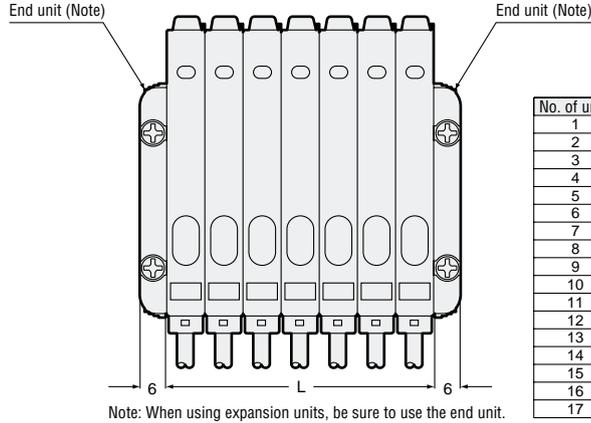


*FS-V10 has no output wire.

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.

INFORMATION

All about Sensors, Vision and Measuring System

1. Easy-to-find Sensor Selection Guide
2. 132 "3D" Application Guide
3. Illustrated Technical Guide



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Specifications are subject to change without notice.

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