KEYENCE

Digital Fibre Optic Sensors

FS-V30 Series

CE cULus

MEGA POWER

Fibre Optic Sensors

The New Standard in Simplicity

MEGA-Power, MEGA-Easy & MEGA-Stable

KEYENCE has further improved the top selling FS fibre sensors.
New features on the FS-V30 will help you to solve your sensing needs.

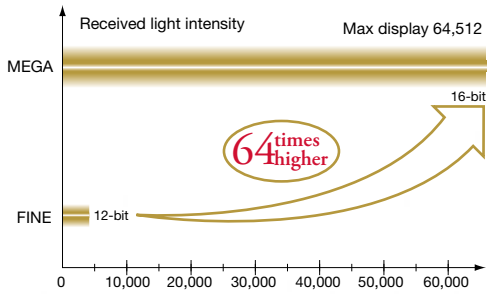
Digital Fibre Optic Sensors

FS-V30

World's most powerful beam

64 times more powerful beam than conventional models

Stable detection in harsh environments.
Longer detecting distance with miniaturized fibres.



World's first power booster switch

Easy power control

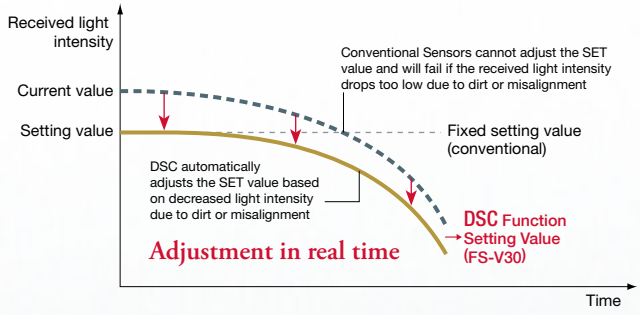
The highest power setting can be selected with a DIP switch.

DIP switch

World's first automatic setting value tracking function

Not affected by environmental changes over time

Equipped with the DSC Function, which adjusts the setting value as it tracks the current value in real time.

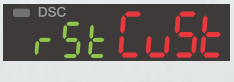


Program memory

Reload your application settings

Operators or users may accidentally change the settings on the FS. In this case, conventional models require resetting. The FS-V30 saves your settings into memory for fast recovery.

Saving your settings



Load the settings

Highly stable detection

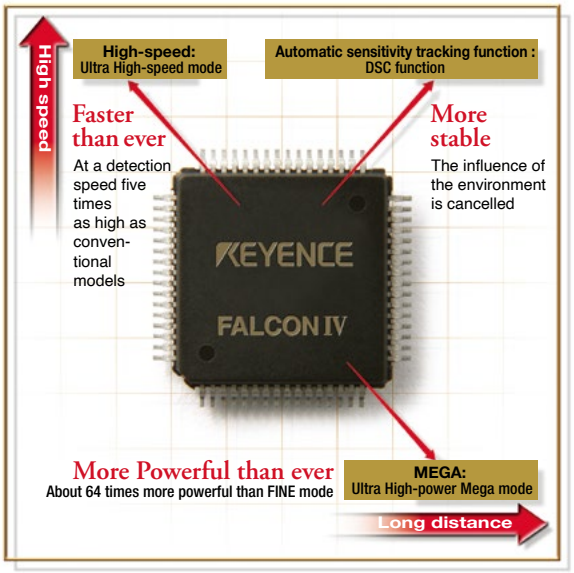
The improved ASIC significantly improves performance.

KEYENCE has developed a special 16-bit CPU for fibre sensors

Powered by the FALCON IV

Dynamic range 64 times higher than conventional models.

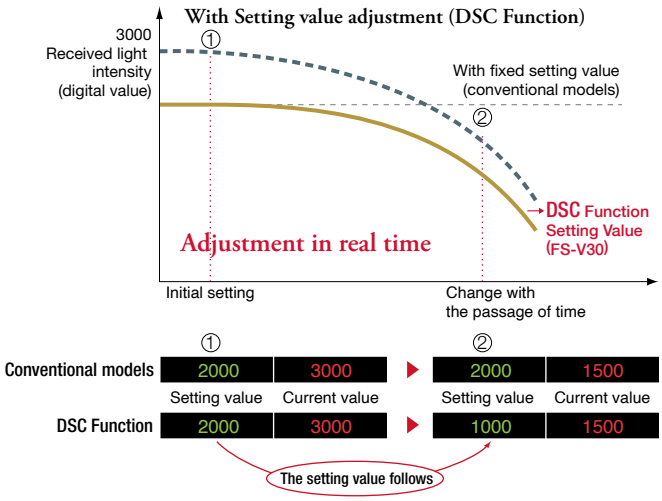
Introducing the FALCON IV, our latest upgrade in a revolutionary line of custom CPU's designed by KEYENCE specifically for our fibre optic sensors.The FALCON IV is equipped to simultaneously control several functions: high-speed computing of received light intensity, adjusting the setting value in real time and dual digital display. Compared with conventional CPU's which operate sequentially, the FALCON IV calculates all information in parallel. This achieves higher performance and speed.



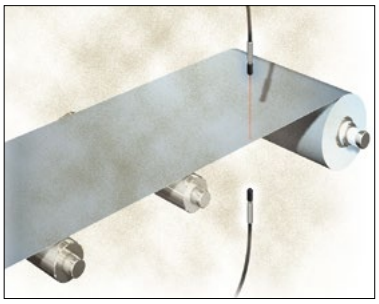
Automatic sensitivity tracking function [WORLD's BEST]

Automatically adjust the setting value.

The DSC (Dynamic Stability Control) Function automatically adjusts the threshold according to received light intensity variations due to dust or dirt in real time. This function allows maintenance free operation over extended periods of time, saving time and money.



Sensitivity is configured by simply pressing the SET button. The sensitivity can be set as a percentage (+/-99%) of the received light intensity.

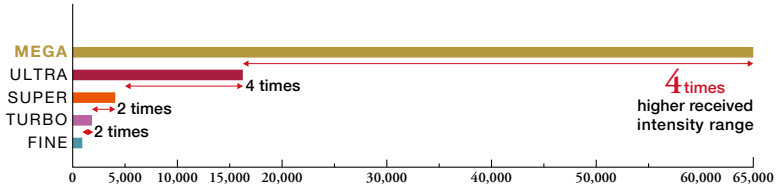


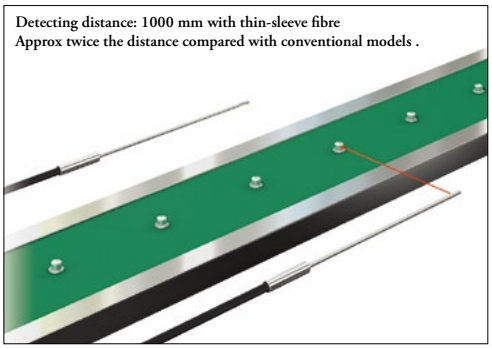
Detecting a thin target using thrubeam type

Highest power [WORLD's BEST]

More reliable detection in harsh environments. Longer detection distance with thin-sleeve fibres.

The FALCON IV chip provides the highest power - MEGA mode.
This power is essential for reliable detection in harsh environments.
It also increases the detection range of miniaturized fibres.





Detecting the position of targets using a thin fibre.

MAXIMUM DISPLAY

Set button
Automatic calibration setting.

Highly visible dual digital display
The dual screen differentiates the size of the setting value and current value for high visibility.

Digital trim pot
More convenient than ever while maintaining an easy single button operation.

Mode button
Monitor and operation mode selection.

Output selection button
Light-ON or Dark-ON output selection.

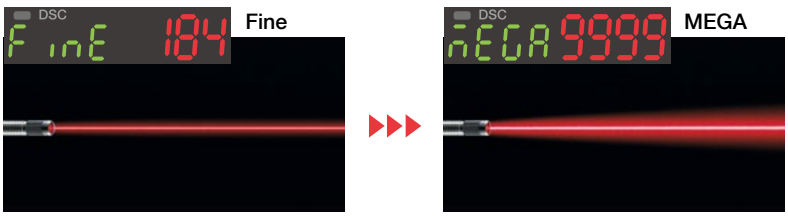
Bright and clear operation indicator
Twice the size of conventional indicators.

Power booster switch
Quickly switch to MEGA high-power mode using this DIP switch.

Equipped with a Power booster switch

Power selection without a complicated procedure.

Conventional models require complicated menu operations to select the power settings. Power settings can be adjusted using a single DIP switch.



The illustration shows simulated light beams

New Sensor Options

Wide variety

Various amplifier designs applicable to any job.

1-output
M8 connector type

FS-V31C(P)
FS-V32C(P)

Cable type

FS-V31(P)
FS-V32(P)

2-output
M8 connector type

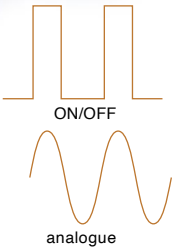
FS-V33C(P)
FS-V34C(P)

Cable type

FS-V33(P)
FS-V34(P)

Analogue output

FS-V31M



2-output type Output 1 is used for detection. Output 2 can be selected to output when a counter, alarm or limit has been reached.

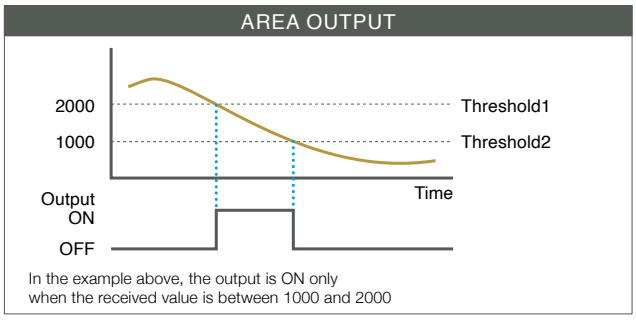
Analogue output type Outputs 1 to 5 V according to the detection quantity (digital display). It can be used for a wide range of applications such as position control or multi-level detection.

M8 connector type is also available.

Area output

Ignore background interference.

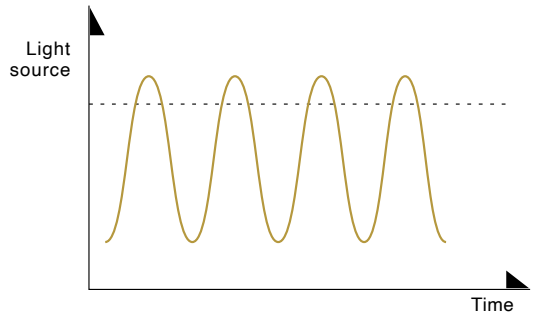
Set an upper and lower detection level.
The FS-V30 will output when the received signal is between the setting limits.

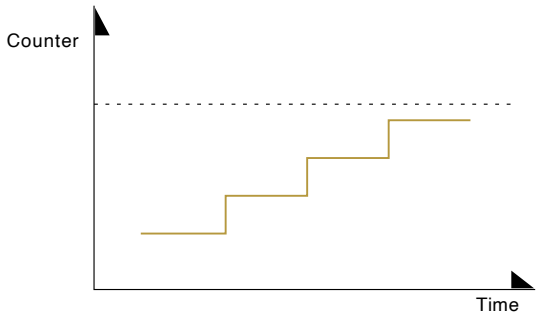


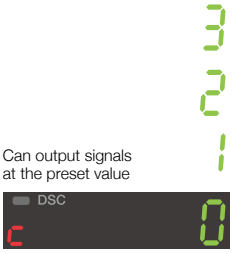
Counter mode

Simultaneous count of workpieces

The Counter function can easily count work pieces without the need for external counters or a PLC.







* Counter function is available only on a 2 output unit

Preventing operational errors

Password lock function

With the Password Lock function, only authorized operators can modify the settings on the FS-V30. Since the Password Levels are selectable, operation errors can be prevented.

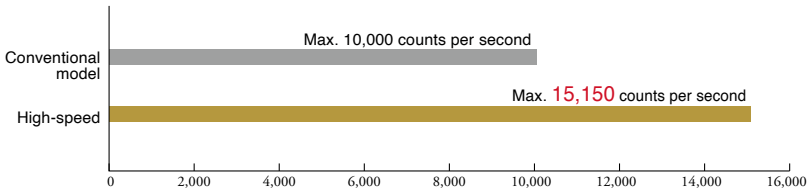
	Threshold value settings	MENU Settings	Power modes/ Light-on/Dark-on
LEVEL 1	Locked	Locked	Locked
LEVEL 2	Unlocked	Locked	Locked
LEVEL 3	Unlocked	Unlocked	Locked

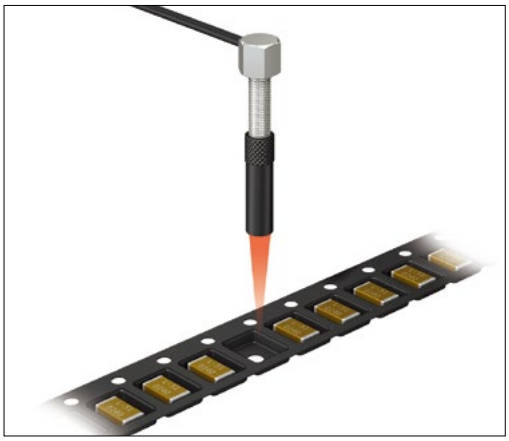
Highest speed [WORLD's BEST]

Amazing 33 µs response speed!

33 µs response allows the FS-V30 to detect up to 15,150 workpieces per second. In addition, minute targets can be set on-the-fly with simple, one touch calibration.

*Conventional models count max. 10,000 targets per second even in high-speed mode

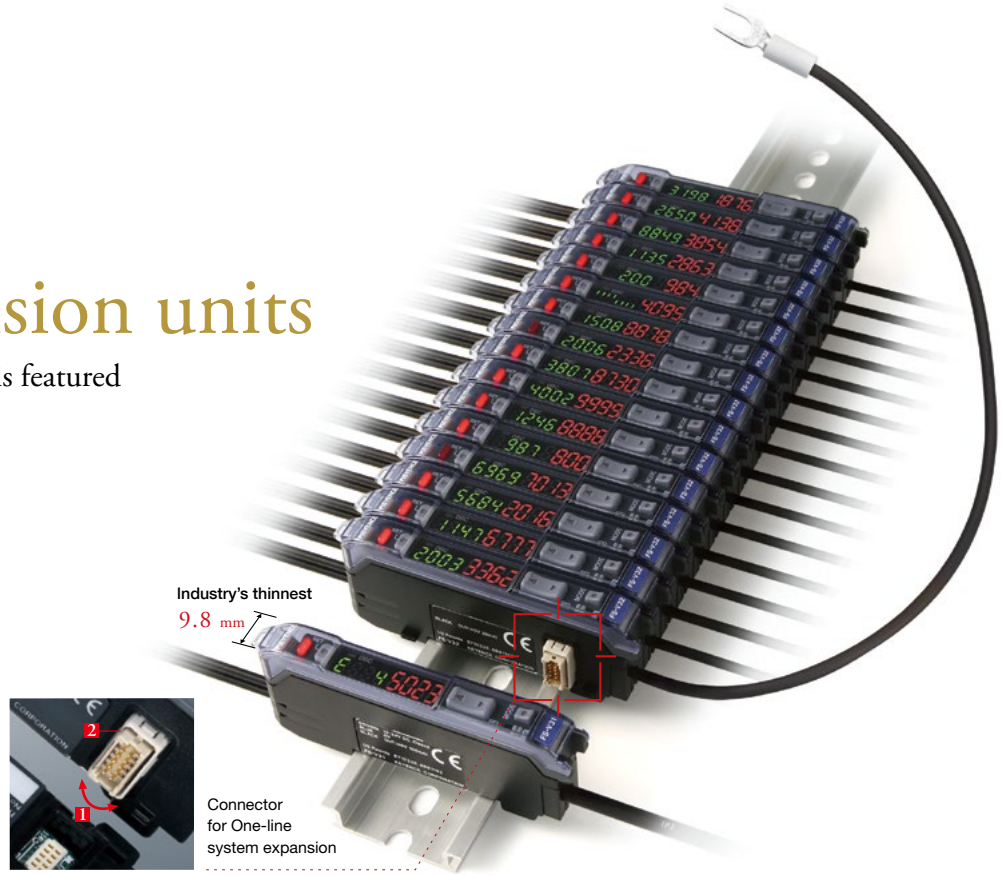




Counting components

Reliable expansion units

KEYENCE's original 1-Line system is featured on the FS-V30 Series.



[1-Line system]

Power is connected through the side connector. Expansion units have a single output wire.

1 Shock absorber function incorporated
The connector is provided with a spring mechanism for shock absorption.

2 Dust cover provided
The dust cover prevents the exposure of the connector pins.

Interference prevention function up to 16 units

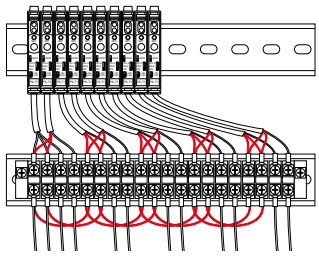
Reliable detection with stable interference prevention.

The FS-V30 electrically delays the timing of light emission between connected units. Up to 16 connected units can utilise the interference prevention function providing stable system performance.

MODE	FinE	Turb	SuPr	ULtr	MEGA
Std (Standard)	4 units	8 units			
dobl (Double)	8 units	16 units			

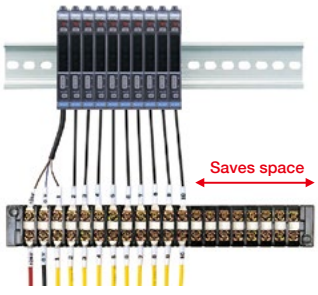
Wire saving connection method (when 10 units are used)

Conventional method



Nunber of terminal blocks : 20
Number of wires : 58
Nunber of jumper wires : 8
Required working time : 120 min.

Single-line method



Nunber of terminal blocks : 12
Number of wires : 24
Nunber of jumper wires : 0
Required working time : 50 min.

Combination with other sensor models is possible

A full line of models showing proven results and high reliability.

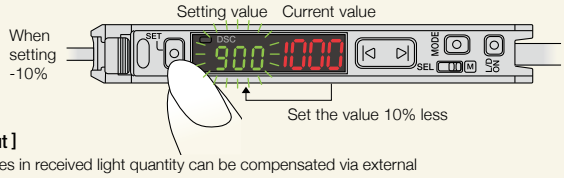
It is possible to combine the FS-V30 sensors with other KEYENCE 1-line sensors. Fibre, Colour, Laser, Photoelectric and Proximity sensors are all available in the 1-line system.

From left to right
FS-V31:____Fibre optic sensor
CZ-V22A:__ RGB digital colour sensor
LV-12SA:__ Digital laser sensor
PS-T2:____ Photoelectric sensor with separate amplifier
ES-M2:____ Long-distance separate amplifier proximity sensor

Adjustment/external setting

%Tuning

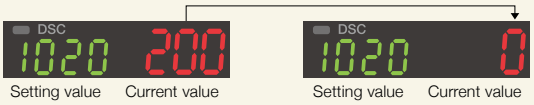
You can set the sensitivity with just the touch of a button. When light intensity values fluctuate due to dust or misalignment, you can adjust the sensitivity by a fixed percentage. (+/-99%)



[External Input]
Small differences in received light quantity can be compensated via external input. This ability provides continuous and stable detection.

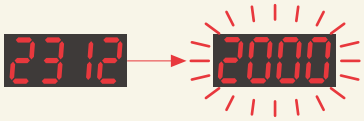
Shift Function

Adjust the current received light intensity to “0”. For example. you can zero the received light intensity from a reflective sensor so that the background will display “0” This function is effective when there are only small differences between targets received light intensity.



Display scaling

You can adjust the light intensity on the display.
In this way, each amplifier can display the same value for the same target. (1 output type only)



Fibre transmission stop input

When the external input is activated, LED transmission will stop on the Main unit and all connected Sub units.

[Example of use] •Troubleshooting at sensor startup
•Preventing interference with other sensors

External tuning

Sensitivity can also be externally set by a PLC.
The external input works the same as the SET button.

Improved operation

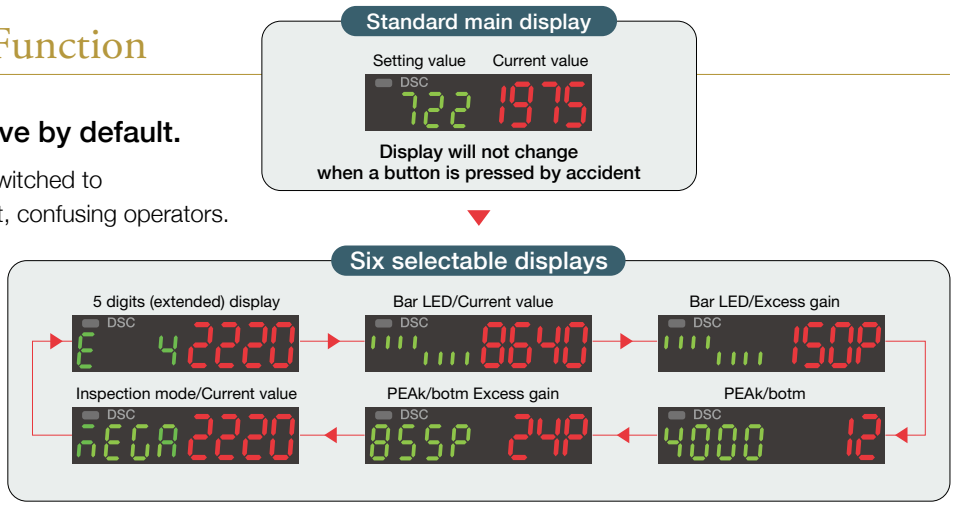
Ergonomic button layout

The amplifier was designed for ease of use, and error prevention.The SET value and the Current value on the display are different heights and colours, improving visibility. The SET button and manual buttons are separated to prevent operator error. In addition, the SET button and manual buttons are higher and larger than the other buttons, for easy setup.

Display customizing Function

Only the main display is active by default.

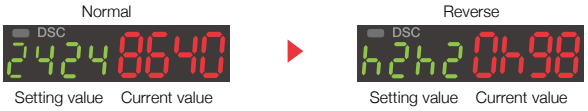
Conventional models can be easily switched to unwanted display modes by accident, confusing operators. The FS-V30 will only display the Setting Value and the Current Value by default. If operators prefer to display an analternate format, such as Bar LED's, they can select from 6 additional options in the menu.



Useful functions to cope with various applications

Inverted display

Depending on the mounting direction, some displays may be inverted. The digital display on the FS-V30 can be inverted, providing easy to read displays.

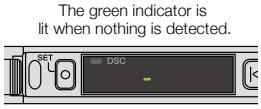


Power saving

POWER SAVING FUNCTION

The lowest power consumption in its class thanks to the MEGA FALCON chip.

The display can be turned off to reduce power consumption

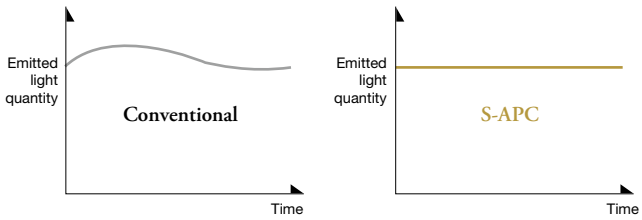


Harsh environments/Changes over time

S-APC MODE + 4-ELEMENT LED

The ultimate in long term stability.

The selectable S-APC function maintains a constant light level over time. The 4-element LED prevents diode deterioration over an extended period of time. Together, these functions make the FS-V30 series the easy choice for long-term, maintenance-free operation.



EDGE INSPECTION MODE

Unaffected by dirt or temperature change.

This mode ignores slight variations of light intensity by dirt or temperature, and detects only the targets. It can detect slight differences of light intensity without readjustment of the sensitivity.

[Timer Function]

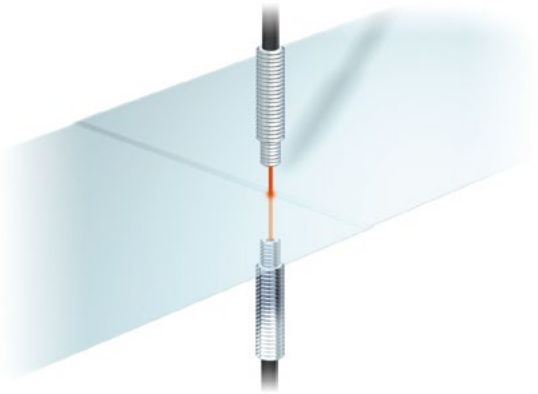
Equipped with 5 timer Functions. The Timer function can be individually set for each output 1and 2 from 0.1 ms to 9999 ms.

- ON-delay
- OFF-delay
- One-shot
- ON-delay with OFF-delay
- ON-delay with One-shot

Preventing saturation

ATTENUATE FUNCTION

In situations where fibre units have to be mounted in close proximity to a highly reflective background, the amplifier may saturate. The selectable attenuation function adjusts transmission intensity, allowing the FS-V30 Series to be used in close proximity (enabled) or from long distance (disabled)

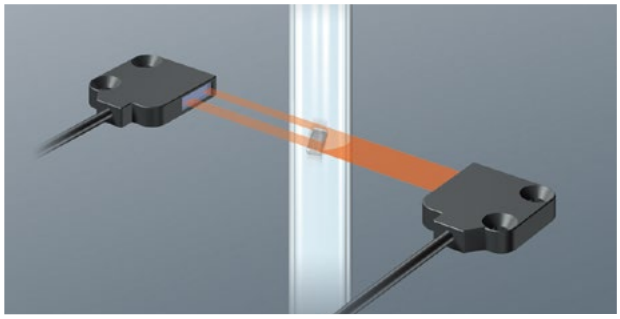


Simple sensitivity settings

FULLY AUTOMATIC CALIBRATION

No need to stop targets

When detecting falling or minute targets, it is very difficult to make sensitivity adjustments to manual fibre-optic sensors. Fully automatic calibration is unique to digital sensors. A suitable sensitivity is set by pressing the SET button while the target passes through the sensiting area.

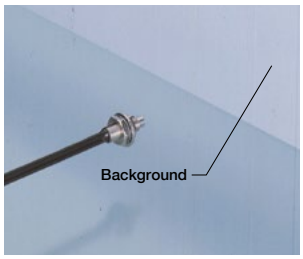


Detecting dropping targets

MAXIMUM SENSITIVITY SETTING

Ignore backgrounds

The sensitivity of the FS-V30 can be set to the maximum level to ignore background surfaces. This feature also makes it possible to detect targets while suppressing the influence of dust.



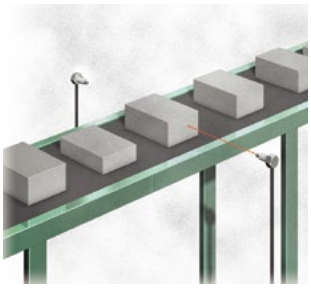
Background is not detected

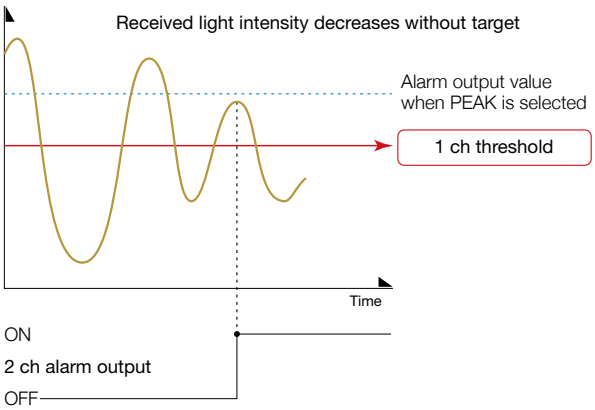
Sensor turns ON when the target enters the sensing area

Application modes for the 2 output type sensors

LIMIT MODE

When dust builds up on the sensor, the maximum light intensity will decrease. This mode sets an alarm value which can notify operators when the peak level of light intensity becomes too low.





ALARM MODE

Conventional models display “END APC” when the APC Function ends. The FS-V30 sends an alarm signal while displaying “END APC”. It can also be used as an adjustment alarm output when using the DSC Function.

OTHER FS SENSORS

TRIM-POT TYPE

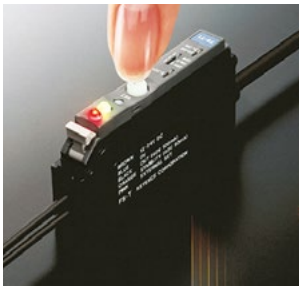
FS-M Series

- Fine adjustment by using a multi-turn trimmer
- Ultra-high-speed response model FS-M1H is also available

TEACHING TYPE

FS-T Series

- Fully-automatic calibration by pressing a button
- Green LED light source model FS-T1G is also available



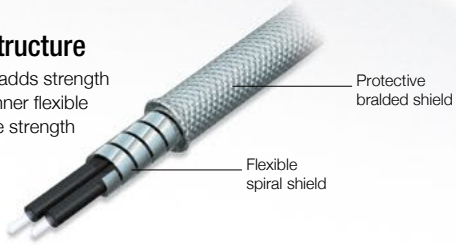
All fibre units are available for same-day shipment.

Our technical sales staff will select the best unit for you.

Stainless steel armour

Stainless jacket structure

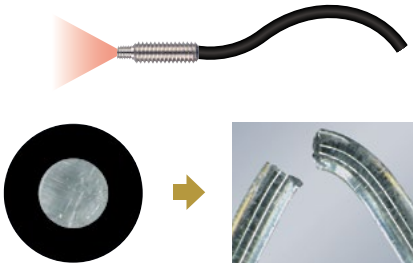
The outer braided shield adds strength against pulling, and the inner flexible spiral shield increases the strength against side impact.



Tough Flex

Conventional fibre

Minimum bending radius : R 25 mm

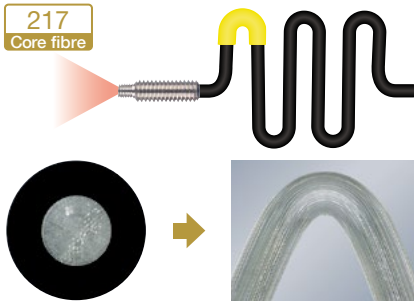


Single-core fibre

A single-core fibre that is exposed to excessive bending will easily break.

ToughFlex fibre

Minimum bending radius : R 2 mm

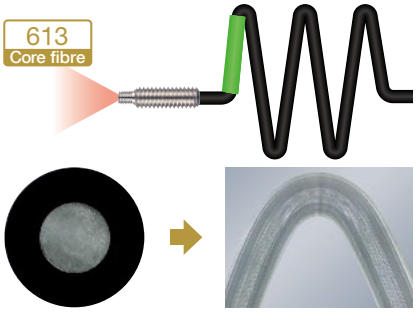


217-core fibre

A 217-core fibre is hardly affected by excessive bending.

Super ToughFlex fibre

Minimum bending radius : R 0.5 mm



613-core fibre

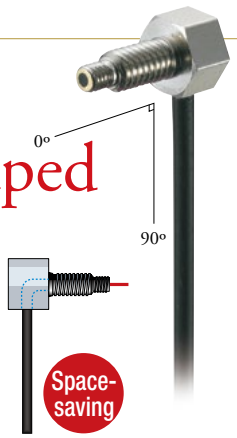
A 613-core fibre offers the best performance.

KEYENCE ONLY

Hex-shaped

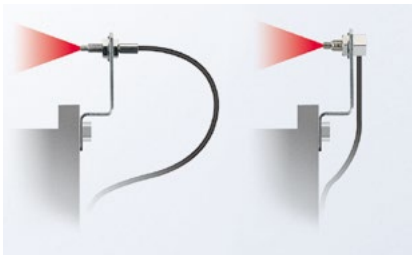
Unbreakable fibre

The cable features a unbreakable fibre with the tip of the fibre bent at a right angle, like a periscope. This design requires far less space than conventional models. (Patent pending)



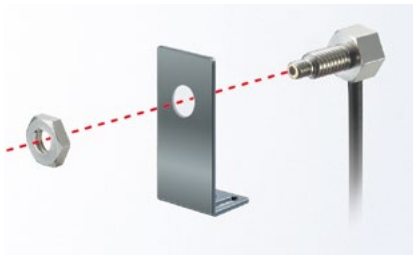
Space-saving, trouble-free

All Hex-shaped fibre units allow neat cable routing and require less space for installation.
This eliminates problems such as entangled cables.



Easy mounting

Secure the unit with a single nut. Your current, standard fibre unit can be replaced without additional preparation or modification.

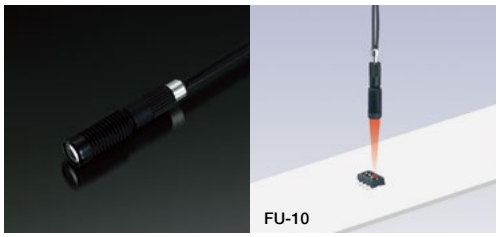


Standard

Reflective
▶ P.14
Thrubeam
▶ P.17

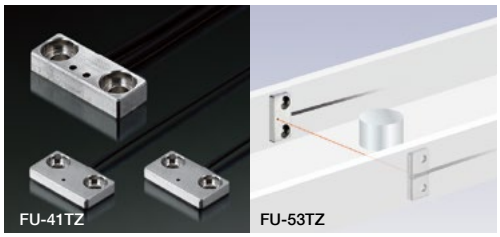
Small Beam Spot

▶ P.17



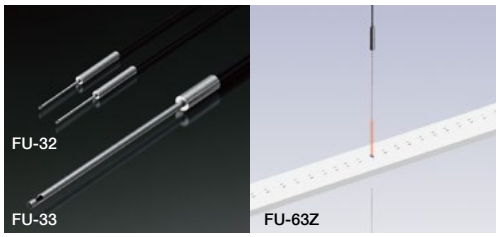
Flat

Reflective
▶ P.14
Thrubeam
▶ P.18



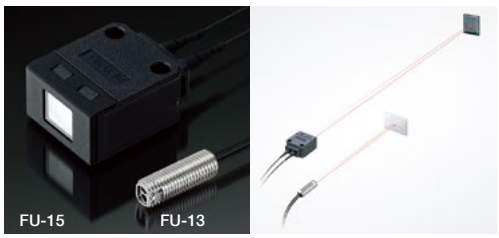
Sleeve

Reflective
▶ P.15
Thrubeam
▶ P.18



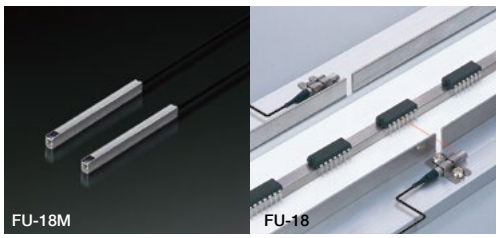
Retro-reflective

▶ P.15



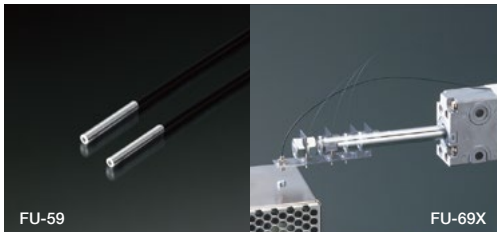
Narrow beam

▶ P.18



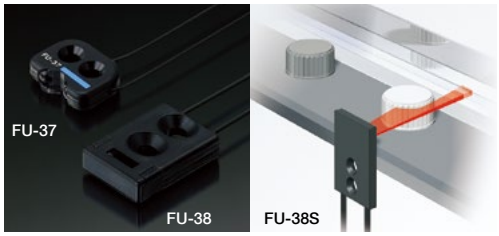
High-Flex

Reflective
▶ P.15
Thrubeam
▶ P.18



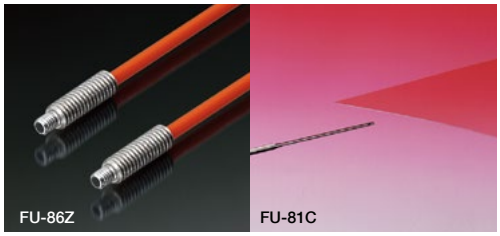
Definite-reflective

▶ P.15



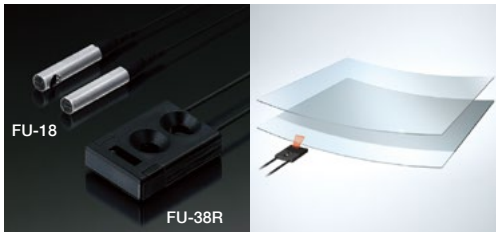
Heat Resistant

Reflective
▶ P.16
Thrubeam
▶ P.19



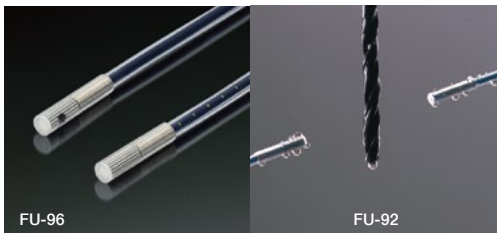
LCD/ Semi-conductor

▶ P.15



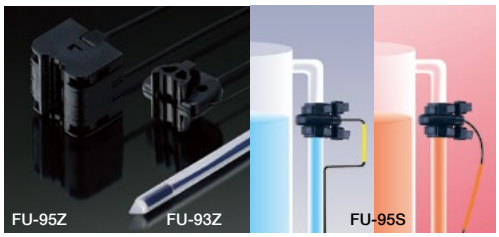
Chemical proof

Reflective
▶ P.16
Thrubeam
▶ P.19



Liquid Level

▶ P.16



Unit: mm

Category: Reflective Standard (MEGA FINE)

Type		Shape	Detecting distance 2. MEGA / FINE	Smallest 1. detectable object	Minimum bend radius	Features	Model
Standard	ToughFlex	-40 to +50°C	350 / 50	ø0.005 (gold wire)	R2	Hex-shaped (Approx. 10 g)	FU-66TZ Free-cut 2 m
		-40 to +50°C	500 / 75	ø0.005 (gold wire)	R2	Hex-shaped (Approx. 32 g)	FU-67TZ Free-cut 2 m
		-40 to +50°C	400 / 60	ø0.005 (gold wire)	R2	R2 M4 (Approx. 10 g)	FU-66Z Free-cut 2 m
		-40 to +50°C	500 / 85	ø0.005 (gold wire)	R0.5	R0.5 M6 (Approx. 25 g)	FU-67V Free-cut 2 m
		-40 to +50°C	500 / 85	ø0.005 (gold wire)	R2	R2 M6 (Approx. 21 g)	FU-67 Free-cut 2 m
		-40 to +50°C	400 / 60	ø0.005 (gold wire)	R2	R2 ø3 (Approx. 8 g)	FU-4FZ Free-cut 2 m
		-40 to +50°C	680 / 125	ø0.005 (gold wire)	R2	Long-deteting distance M6 (Approx. 22 g)	FU-61Z Free-cut 2 m
	Armoured	-40 to +50°C	500 / 75	ø0.005 (gold wire)	R10	Hex-shaped Armoured (Approx. 32 g)	FU-67TG 1 m
		-40 to +50°C	500 / 85	ø0.005 (gold wire)	R10	R10 Armoured (Approx. 29g)	FU-67G 1 m
	Standard	-40 to +70°C	700 / 125	ø0.005 (gold wire)	R25	Long-deteting distance M4 (Approx. 10 g)	FU-66 Free-cut 2 m
		-40 to +70°C	700 / 125			Long-deteting distance M6 (Approx. 21 g)	FU-6F Free-cut 2 m
		-40 to +70°C	700 / 125			Long-deteting distance ø3 (Approx. 8 g)	FU-4F Free-cut 2 m
		-40 to +70°C	950 / 200	ø0.005 (gold wire)	R25	Long-deteting distance M6 (Approx. 21 g)	FU-61 Free-cut 2 m

1. The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.
2. Standard target: White matte paper (Reflective type only.)

Category: Reflective Flat/Coaxial (MEGA FINE)

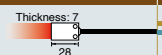
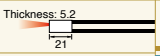
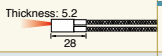
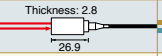
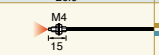
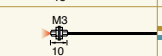
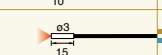
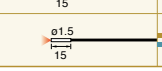
Type		Shape	Detecting distance 2. MEGA / FINE	Smallest 1. detectable object	Minimum bend radius	Features	Model
Flat head (with mounting hole)	Side-view	-40 to +50°C	1 to 90 / 1 to 25	ø0.005 (gold wire)	R2	Compact side-view type (Approx. 4 g)	FU-47TZ Free-cut 1 m
	Top-view	-40 to +50°C	2 to 60 / 2 to 10	ø0.005 (gold wire)	R2	Ultra-thin, flat-ON (Approx. 5 g)	FU-41TZ Free-cut 1 m
		-40 to +50°C	1 to 320 / 1 to 37	ø0.005 (gold wire)	R2	Flat-on versatile (Approx. 24 g)	FU-42TZ Free-cut 2 m
	End-view	-40 to +50°C	1 to 90 / 1 to 25	ø0.005 (gold wire)	R2	Compact, top-view	FU-44TZ Free-cut 1 m
Coaxial	High-power	-40 to +70°C	560 / 100	ø0.005 (gold wire)	R25	Suitable for positioning M8 (Approx. 18 g)	FU-25 Free-cut 2 m
		-40 to +70°C	680 / 125	ø0.005 (gold wire)	R25	Suitable for positioning ø3 (Approx. 4 g)	FU-23X 50 cm
	Lens attachment available	-40 to +70°C	340 / 45 Lens: F-2HA, F-3HA, F-4HA, F-5HA, F-6HA	ø0.005 (gold wire)	R25	0.4 spot diameter with F-2HA (Approx. 6 g)	FU-35FA Free-cut 1 m
		-40 to +50°C	200 / 32	ø0.005 (gold wire)	R10	M3, 0.4 spot diameter with F-2HA Armoured (Approx. 15 g)	FU-2303 1 m
		-40 to +50°C				M3, 0.4 spot diameter with F-2HA Armoured (Approx. 15 g)	FU-35FG Free-cut 1 m
		-40 to +50°C	Lens: F-2HA, F-3HA, F-4HA, F-5HA, F-6HA		R2	M3, 0.4 spot diameter with F-2HA (Approx. 6 g)	FU-35FZ Free-cut 1 m
		-40 to +50°C	180 / 30 Lens: F-2HA, F-3HA, F-4HA	ø0.005 (gold wire)	R10	Hex-shaped armoured (Approx. 32 g)	FU-35TG 1 m
		-40 to +50°C	180 / 30 Lens: F-2HA, F-3HA, F-4HA, F-6HA	ø0.005 (gold wire)	R2	Hex-shaped (Approx. 7 g)	FU-35TZ Free-cut 1 m
		-40 to +70°C	90 / 15 Lens: F-2HA, F-6HA	ø0.005 (gold wire)	R25	0.2 spot diameter with F-2HA (Approx. 4 g)	FU-21X 50 cm
		-40 to +70°C	55 / 8 Lens: F-2HA	ø0.005 (gold wire)	R10	0.1 spot diameter with F-2HA (Approx. 4 g)	FU-24X 50 cm

1. The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.
2. Standard target: White matte paper (Reflective type only.)

Unit: mm

Category: Reflective — Area/High-power/Retro-reflective/High-Flex

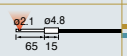
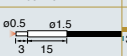
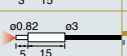
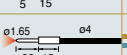
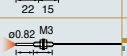
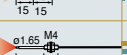
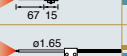
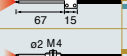
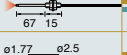
(MEGA FINE)

Type		Shape	Detecting distance 2. MEGA / FINE	Smallest 1. detectable object	Minimum bend radius	Features	Model
Area		-40 to +70°C 	5 to 160 5 to 120	ø0.005 (gold wire) (Parallel)	R25	Area detection width of 15 (Approx. 19 g)	FU-11 Free-cut 2 m
High-Power		-40 to +50°C 	30 to 1500 30 to 150	ø0.3 copper wire (Vertical)	R2	Long-detecting distance Narrow beam (8) type (Approx. 23 g)	FU-40 Free-cut 2 m
		-40 to +50°C 		ø0.3 copper wire (Vertical)	R10	Long-detecting distance Narrow beam (8)type Armoured (Approx. 50 g)	FU-40G 1 m
Retro- reflective	Super small	-40 to +50°C 	60 to 480 3.	—	R2	M6 Super small (Approx. 8 g)	FU-13 Free-cut 2 m
	Long-detecting distance	-40 to +55°C 	100 to 3200 100 to 630	—	R10	Square-shape, long-distance (Approx. 12 g)	FU-15 Free-cut 2 m
High-Flex	M4	-40 to +70°C 	160 35	ø0.005 (gold wire)	R4	High-flex fibre M4 (Approx. 8 g)	FU-68 Free-cut 2 m
	M3	-40 to +70°C 	75 20	ø0.005 (gold wire)	R4	High-flex fibre M3 (Approx. 3 g)	FU-69X 1 m
	ø3	-40 to +70°C 	160 35	ø0.005 (gold wire)	R4	High-flex fibre ø3 (Approx. 7 g)	FU-48 Free-cut 2 m
	ø1.5	-40 to +70°C 	75 20	ø0.005 (gold wire)	R4	High-flex fibre ø1.5 (Approx. 3 g)	FU-49X 1 m

1. The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.
2. Standard target: White matte paper (Reflective type only.)
3. When the R-2 (OP95388) is used: MEGA offers 10 to 940 mm and FINE, 10 to 125 mm.

Category: Reflective — Thin-sleeve

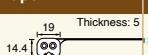
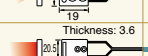
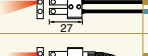
(MEGA FINE)

Type		Shape	Detecting distance 2. MEGA / FINE	Smallest 1. detectable object	Minimum bend radius	Features	Model
Thin-sleeve	Side-view	Do not bend sleeve. -40 to +70°C 	85 17	ø0.005 (copper wire)	R10	Compact Side-view (Approx. 5 g)	FU-31 Free-cut 2 m
		Min. bend radius of sleeve: 25 -40 to +70°C 	180 25	ø0.005 (copper wire)	R25	Long-sleeve Side-view (Approx. 10 g)	FU-33 Free-cut 1 m
	End-view	Do not bend sleeve. -40 to +70°C 	15 3	ø0.005 (gold wire)	R10	Thin-sleeve (Approx. 10 g)	FU-46 1 m
		Do not bend sleeve. -40 to +70°C 	45 8	ø0.005 (gold wire)	R2	Thin-sleeve (Approx. 4 g)	FU-45X 50 cm
		Do not bend sleeve. -40 to +70°C 	180 37	ø0.005 (gold wire)	R25	Thin-sleeve ø4 (Approx. 8 g)	FU-43 Free-cut 2 m
		Do not bend sleeve. -40 to +70°C 	45 8	ø0.005 (gold wire)	R4	Thin-sleeve (Approx. 8 g)	FU-65X 50 cm
		Min. bend radius of sleeve: 10 -40 to +70°C 	180 37	ø0.005 (gold wire)	R25	Long-sleeve M4 (Approx. 10 g)	FU-63 Free-cut 2 m
		Min. bend radius of sleeve: 10 -40 to +70°C 	180 37	ø0.005 (gold wire)	R25	Long-sleeve Flat type (Approx. 10 g)	FU-63T Free-cut 2 m
		Min. bend radius of sleeve: 10 -40 to +50°C 	130 25	ø0.005 (gold wire)	R2	R2 M4 with sleeve (Approx. 10 g)	FU-63Z Free-cut 2 m
	Coaxial narrow beam	Do not bend sleeve. -40 to +70°C 	48 10	ø0.005 (gold wire)	R25	Thin-sleeve Narrow-beam type (Approx. 4 g)	FU-22X 50 cm

1. The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.
2. Standard target: White matte paper (Reflective type only.)

Category: Reflective — Definite-reflective

(MEGA FINE)

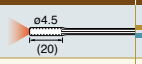
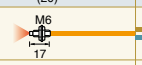
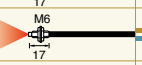
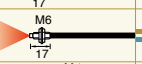
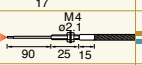
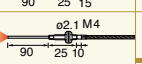
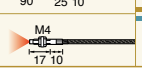
Type		Shape	Detecting distance 2. MEGA / FINE	Smallest 1. detectable object	Minimum bend radius	Features	Model
Definite-reflective	Short-detecting distance	-40 to +70°C 	3 centre of detecting distance	ø0.005 (gold wire)	R10	Compact, straight (Approx. 6 g)	FU-37 Free-cut 2 m
		-40 to +70°C 	6 centre of detecting distance	ø0.005 (gold wire)	R10	Thin-profile, standard (Approx. 5 g)	FU-38 Free-cut 2 m
		-40 to +70°C 	0 to 4	ø0.08 (copper wire)	R10	Thin-profile, short-detecting distance (Approx. 5 g)	FU-38V Free-cut 2 m
	Long-detecting distance	-40 to +70°C 	0 to 26	—	R5	Long-detecting distance, definite-reflective (Approx. 20 g)	FU-38S Free-cut 2 m
		-40 to +70°C 	0 to 14	ø0.3 (copper wire)	R25	Thin-profile, long-detecting distance (Approx. 20 g)	FU-38R Free-cut 2 m
	Heat-resistant	-40 to +180°C 	2.5 to 65 2.5 to 16	—	R35	Heat resistance: 180°C definite reflective (Approx. 45 g)	FU-38H Free-cut 2 m
		-40 to +250°C 	2.5 to 65 2.5 to 16	—	R25	Heat resistance: 250°C definite reflective (Approx. 45 g)	FU-38K 1 m

1. The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.
2. Standard target: White matte paper (Reflective type only.)

Unit: mm

Category: Reflective — Oil-proof/Chemical proof/Heat-resistant

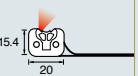
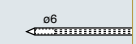
(MEGA FINE)

Type		Shape	Detecting distance 2. MEGA / FINE	Smallest 1. detectable object	Minimum bend radius	Features	Model
Oil-proof, Chemical proof		-30 to +70°C 	220 / 75	ø0.005 (gold wire)	R40	FEP fibre (Approx. 32 g)	FU-91 Free-cut 2 m
Heat-resistant	100°C	-40 to +100°C 	460 / 80	ø0.005 (gold wire)	R5	R5 Heat resistance: 100°C (Approx. 25 g)	FU-85Z Free-cut 2 m
	105°C	-40 to +105°C 	680 / 120	ø0.005 (gold wire)	R25	Heat resistance: 105°C, M6 (Approx. 21 g)	FU-85 Free-cut 2 m
	180°C	-60 to +180°C 	570 / 90	ø0.005 (gold wire)	R35	Heat resistance: 180°C, M6 (Approx. 33 g)	FU-87 Free-cut 2 m
	350°C	-30 to +350°C 	400 / 75	ø0.005 (gold wire)	R25	Heat resistance: 350°C with sleeve (Approx. 24 g)	FU-81C 1 m
	300°C	-40 to +300°C 	420 / 90	ø0.005 (gold wire)	R25	Heat resistance: 300°C with sleeve (Approx. 29 g)	FU-82C 1 m
	300°C	-40 to +300°C 		ø0.005 (gold wire)	R25	Heat resistance: 300°C, M4 (Approx. 23 g)	FU-83C 1 m

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

Category: Reflective — Liquid-level

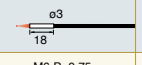
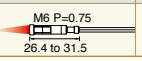
(MEGA FINE)

Type		Shape	Detecting distance 2. MEGA / FINE	Smallest 1. detectable object	Minimum bend radius	Features	Model
Liquid-level	Tube-mountable	-40 to +70°C 	Transparent tube of 4 to 26 dia.	—	R5	16 beam axes (Approx. 23 g)	FU-95S Free-cut 2 m
		 FU-95Z: -40 to +50°C FU-95: -40 to +70°C FU-95HA: -40 to +105°C			R2	R2 (Approx. 7 g)	FU-95Z Free-cut 2 m
					R25	Heat resistance: 105°C (Approx. 7 g)	FU-95HA Free-cut 2 m
					R10	R10 (Approx. 7 g)	FU-95 Free-cut 2 m
	Immersion	 FU-93Z: -40 to +50°C FU-93: -40 to +70°C	Liquid (except for milky white liquids)	—	R0.5 2.	Liquid level detection by sensor head immersion. PFA-sheathed (Approx. 78g)	FU-93Z Free-cut 2 m
					R25 2.	Liquid level detection by sensor head immersion. PFA-sheathed (Approx. 78g)	FU-93 Free-cut 2 m

1. The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.
2. The minimum bend radius of the PFA-sheathed section is R40 mm. The 80-mm section from the tip cannot be bent.

Category: Reflective — Reflective, small beam spot

(MEGA FINE)

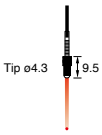
Type	Shape	Detecting distance 2. MEGA / FINE	Smallest 1. detectable object	Minimum bend radius	Features	Model
Ultra-small beam spot	-40 to +70°C 	5 ±1 with beam spot diameter of 0.1	—	R25	Minute target detection Space saving (ø3) (Approx. 2 g)	FU-20 50 cm
Adjustable beam spot	-40 to +70°C 	10 to 30 with beam spot diameter of 0.9 to 3.5	—	R25	Beam spot can be adjusted according to target size. (Approx. 5 g)	FU-10 Free-cut 2 m

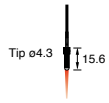
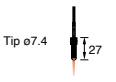
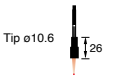
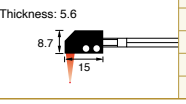
1. The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.
2. Standard target: White mat paper (Reflective type only.)

Unit: mm

Category: Reflective — Lens for reflective type

(MEGA FINE)

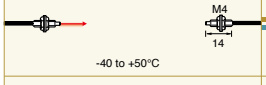
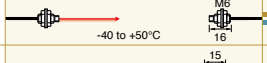
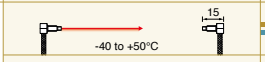
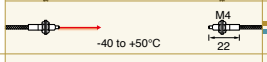
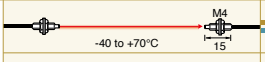
Type	Shape	Applicable fibre units	Detecting distance 1. MEGA / FINE	Features	Model
Parallel beam		FU-35FZ FU-2303 FU-35FG FU-35TZ FU-35TG FU-35FA	38 / 28 35 / 25 65 / 45	4 mm beam spot diameter (within the detecting of 0 to 20)	F-3HA

Type	Shape	Applicable fibre units	Spot diameter	Features	Model
Small Beam Spot — Short-detecting distance		FU-24X	7 ±2 with beam spot diameter of 0.1 2. — 7 ±2 with beam spot diameter of 0.1 2. —	Suitable for small targets (Approx. 1 g)	F-2HA
		FU-21X	7 ±2 with beam spot diameter of 0.2 2. — 7 ±2 with beam spot diameter of 0.2 2. —		
		FU-35FZ FU-2303 FU-35FG FU-35TZ FU-35TG FU-35FA	7 ±2 with beam spot diameter of 0.4 3.		
Small Beam Spot — Medium-detecting distance		FU-35FZ FU-2303 FU-35FG FU-35TZ FU-35TG FU-35FA	15 ±2 with beam spot diameter of 0.5	Suitable for small targets (Approx. 2 g)	F-4HA
Small Beam Spot — Long-detecting distance		FU-21X	35 ±3 with beam spot diameter of 1.0	Long-detecting distance, small beam spot (Approx. 5 g)	F-6HA
		FU-35FZ FU-2303 FU-35FG FU-35TZ FU-35FA	35 ±3 with beam spot diameter of 2.0		
Small Beam Spot — Side-view		FU-21X	8 to 30 with beam spot diameter of 0.5 to 3.0 4. — 8 to 30 with beam spot diameter of 0.5 to 3.0 4. —	Space-saving, side-view (Approx. 2 g)	F-5HA
		FU-35FZ FU-2303 FU-35FG FU-35FA	8 to 30 with beam spot diameter of 0.5 to 3.0 4.		

1. When the FS-V30 is used. Standard target: White matte paper (Reflective type only.)
2. FINE, TURBO, or SUPER must be used.
3. FINE, TURBO, SUPER, or HIGH SPEED must be used.
4. With the FU-35FA/FZ/FG, FINE, TURBO, SUPER, or ULTRA must be used.

Category: Thrubeam — Standard

(MEGA FINE)

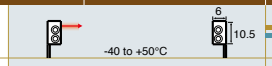
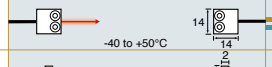
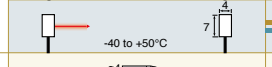
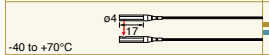
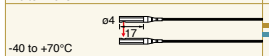
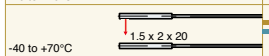
Type	Shape	Detecting distance MEGA / FINE	Smallest 1. detectable object	Minimum bend radius	Features	Model
Standard — ToughFlex		1400 / 250	ø0.005 (gold wire)	R2	Hex-Shaped (Approx. 43 g)	FU-77TZ Free-cut 2 m
		1700 / 300 Lens: F-1, F-2, F-4, F-5	ø0.005	R0.5	R0.5 M4 (Approx. 25 g)	FU-77V Free-cut 2 m
				R2	R2 M4 (Approx. 21 g)	FU-77 Free-cut 2 m
		1700 / 300 Lens: F-1, F-2, F-4, F-5	ø0.005	R2	R2 ø3 (Approx. 19 g)	FU-5FZ Free-cut 2 m
		2400 / 450	ø0.005	R2	R2 M6 (Approx. 25 g)	FU-71Z Free-cut 2 m
Armoured		1400 / 250	ø0.005 (gold wire)	R10	Hex-Shaped Armoured (Approx. 43 g)	FU-77TG 1 m
		1700 / 300 Lens: F-1, F-2, F-4, F-5	ø0.005	R10	R10 Armoured (Approx. 39 g)	FU-77G 1 m
Standard		2300 / 400 Lens: F-1, F-2, F-4, F-5	ø0.005	R25	Long-detecting distance M4 (Approx. 21 g)	FU-7F Free-cut 2 m
		2300 / 400 Lens: F-1, F-2, F-4, F-5	ø0.005	R25	Long-detecting distance ø3 (Approx. 19 g)	FU-5F Free-cut 2 m
		2600 / 550	ø0.005	R25	Long-detecting distance M6 (Approx. 25 g)	FU-71 Free-cut 2 m
		1000 / 190 Lens: F-1, F-2, F-4, F-5	ø0.005	R4	R4 (Approx. 9 g)	FU-78 Free-cut 2 m

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

Unit: mm

Category: Thrubeam — Flat/Built-in lens, side-view/Top-view

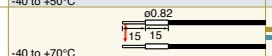
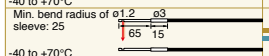
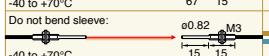
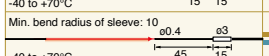
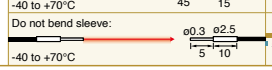
(MEGA FINE)

Type		Shape	Detecting distance MEGA / FINE	Smallest 1. detectable object	Minimum bend radius	Features	Model
Flat head (with mounting hole)	Side-view		330 / 55	ø0.005 (gold wire)	R2	Compact side-view type (Approx. 5 g)	FU-57TZ Free-cut 1 m
	End-view		380 / 75	ø0.005	R2	Ultra-thin, side-view (Approx. 5 g)	FU-51TZ Free-cut 1 m
			1300 / 250	ø0.005	R2	Long-detecting distance, thin,side-view (Approx. 15 g)	FU-52TZ Free-cut 2 m
	Top-view		250 / 50	ø0.005	R2	Ultra-thin, flat-ON (Approx. 10 g)	FU-53TZ Free-cut 1 m
			1300 / 250	ø0.005	R2	General-purpose, flat view (Approx. 25 g)	FU-54TZ Free-cut 2 m
Built-in lens, side-view			3200 / 630	ø0.1	R2	Ultra-long-detecting distance, side-view (Approx. 8 g)	FU-16Z Free-cut 2 m
			3600 2. / 950		R10		FU-16 Free-cut 2 m
			3200 / 800		R10	Ultra-narrow-beam, side-view (Approx. 8 g)	FU-18 Free-cut 2 m
			850 / 240	ø0.02, (opaque target)	R10	Mapping (Approx. 6 g)	FU-18M Free-cut 2 m
Built-in lens, end-view			3600 2. / 2300	ø0.1	R2	Long-distance, square-rod head (Approx. 8 g)	FU-50 Free-cut 2 m

1. The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.
2. "3600" is assumed as maximum because the fibre cable has the length of 2 m .

Category: Thrubeam — Area/Thin-sleeve

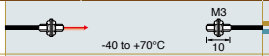
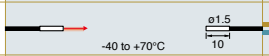
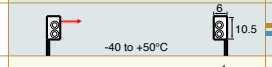
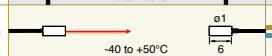
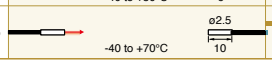
(MEGA FINE)

Type		Shape	Detecting distance MEGA / FINE	Smallest 1. detectable object	Minimum bend radius	Features	Model
Area			1700 / 700	ø1.2 (TURBO mode) ø0.3 (FINE mode)	R2	Area detection fibre with a detecting width of 10 (Approx. 23 g)	FU-12 Free-cut 2 m
Thin-sleeve	Side-view		300 / 38	ø0.005	R25	Side-view type with thin sleeve (Approx. 5 g)	FU-32 Free-cut 1 m
			640 / 125	ø0.005	R25	Long-detecting distance, side-view (Approx. 17 g)	FU-34 Free-cut 2 m
	End-view		2300 / 400	ø0.005	R25	Long-detecting distance with sleeve (Approx. 24 g)	FU-73 Free-cut 2 m
			400 / 95	ø0.005	R10	Thin sleeve (Approx. 10 g)	FU-75F Free-cut 1 m
			160 / 32	ø0.005	R10	Thin sleeve (Approx. 10 g)	FU-76F Free-cut 2 m
			25 / 5	ø0.005	R10	Thin sleeve (Approx. 3 g)	FU-56 50 cm

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

Category: Thrubeam — High-flex/Extra-thin core fibre

(MEGA FINE)

Type		Shape	Detecting distance MEGA / FINE	Smallest 1. detectable object	Minimum bend radius	Features	Model
High-flex	M3		500 / 125	ø0.005	R4	High-flex M3 (Approx. 6 g)	FU-79 Free-cut 1 m
	ø1.5		500 / 125	ø0.005	R4	High-flex ø1.5 (Approx. 6 g)	FU-59 Free-cut 1 m
	Side-view		320 / 50	ø0.005 (gold wire)	R4	Compact side-view type (Approx. 5 g)	FU-57TE Free-cut 1 m
Extra-thin core fibre	ø1.0		150 / 32	ø0.005	R10	Ultra thin (Approx. 8 g)	FU-58 50 cm
	ø2.5		25 / 5	ø0.005	R10	Thin (Approx. 3 g)	FU-55 50 cm

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

Unit: mm

Category: Thrubeam — Heat-resistant/Oil-proof,Chemical proof

(MEGA FINE)

Type		Shape	Detecting distance MEGA / FINE	Smallest [1] detectable object	Minimum bend radius	Features	Model
Heat-resistant	100°C	-40 to +100°C, M4, 15	1400 / 300 Lens: F-1, F-2, F-4, F-5	ø0.005	R5	R5 Heat resistance: 100°C, (Approx. 25 g)	FU-86Z Free-cut 2 m
	105°C	-40 to +105°C, M4, 15	2300 / 400 Lens: F-1, F-2, F-4, F-5		R25	Heat resistance: 105°C, M4 (Approx. 22 g)	FU-86 Free-cut 2 m
	180°C	-40 to +180°C, M4, 17	1300 / 250	ø0.005	R25	Heat resistance: 180°C, M4 (Approx. 36 g)	FU-88 Free-cut 2 m
	300°C	-40 to +300°C, M4, 25	950 / 180 Lens: F-2	ø0.005	R25	Heat resistance: 300°C, M4 (Approx. 66 g)	FU-84C 2 m
Oil-proof, Chemical proof		-40 to +70°C, ø5, (22)	3600 [2] / 1300	ø0.2	R40	FEP fibre (Approx. 71 g)	FU-92 Free-cut 2 m
		-40 to +70°C, ø5, (23)	2700 / 430	ø0.1		FEP fibre, side-view type (Approx. 71 g)	FU-96 Free-cut 2 m

1. The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.
2. "3600" is assumed as maximum because the fibre cable has the length of 2 m .

Category: Thrubeam — Lens for thrubeam type

(MEGA FINE)

Type	Shape	Applicable fibre units	Detecting distance MEGA / FINE	Features	Model
Ultra-long detecting distance, narrow beam	ø4.3, 9.5	FU-77TZ, FU-77, FU-77V	3600 [2] / 3200	Greatly increases the detecting distance. Aperture angle: 8 (Approx. 1 g)	F-4 Heat resistance: 70°C
		FU-77TG/ 77G	1800 / 1800		
		FU-7F	3600 [2] / 3600 [2]		
		FU-78	3600 [2] / 2500		
Long-detecting distance	ø4, 7.9	FU-77, FU-77TZ, FU-77V, FU-84C	3600 [2] / 1900	Greatly increases the detecting distance. Aperture angle: 15 (Approx. 2 g)	F-2 Heat resistance: 300°C
		FU-77TG/ 77G	1800 / 1800		
		FU-78	3600 [2] / 1500		
		FU-7F, FU-86	3600 [2] / 2300		
		FU-86Z	3600 [2] / 2000		
Side-view	9.3, 16.7	FU-77, FU-77V	3600 [2] / 2300	Narrow-beam, side-view type (Approx. 10 g)	F-5 Heat resistance: 105°C
		FU-77G	1800 / 1800		
		FU-78	3600 [2] / 2300		
		FU-7F, FU-86	3600 [2] / 3600 [2]		
		FU-86Z	3600 [2] / 2500		
	ø4, 9.5	FU-77/77G, FU-77V	1800 / 400	Space-saving, side-view type (Approx. 2 g)	F-1 [1] Heat resistance: 70°C
		FU-7F, FU-86Z	2500 / 500		
		FU-86Z	1900 / 400		
		FU-78, FU-84C	1400 / 300		

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.

Model	Type	Features	Detecting distance [1] [Unit: mm]					
			MEGA	ULTRA TURBO	SUPER TURBO	TURBO	FINE	HIGH SPEED
FU-10	Reflective	Small beam spot Adjustable beam spot	10 to 30 with beam spot diameter of 0.9 to 3.5 (10 to 30 with beam spot diameter of 0.9 to 3.5)					10 to 30 (10 to 30)
FU-11	Reflective	Area	5 to 160 (5 to 160)	5 to 160 (5 to 160)	5 to 150 (5 to 150)	5 to 140 (5 to 130)	5 to 120 (5 to 90)	5 to 70 (5 to 55)
FU-12	Thrubeam	Area	1700 (1400)	1400 (1100)	1200 (950)	950 (750)	700 (550)	320 (180)
FU-13	Retro-Reflective	Retro-reflective Super small	60 to 480 (60 to 380) [2]	60 to 380 (60 to 300) [2]	60 to 190 (60 to 150) [2]	60 to 125 (60 to 100) [2]	—	—
FU-15	Retro-Reflective	Retro-reflective Long-detecting distance	100 to 3200 (100 to 2500)	100 to 2500 (100 to 2000)	100 to 1250 (100 to 1000)	100 to 940 (100 to 750)	100 to 630 (100 to 500)	100 to 500 (100 to 400)
FU-16	Thrubeam	Built-in lens, side-view	3600 (3600) [3]	3600 [3] (3000)	2000 (1500)	1500 (1200)	950 (750)	500 (280)
FU-16Z	Thrubeam	Built-in lens, side-view	3200 (2500)	2500 (2000)	1300 (1000)	1000 (800)	630 (500)	380 (220)
FU-18	Thrubeam	Built-in lens, side-view	3200 (2500)	2500 (2000)	1500 (1200)	1200 (1000)	800 (650)	480 (260)
FU-18M	Thrubeam	Built-in lens, side-view	850 (800)	700 (650)	360 (330)	300 (280)	240 (220)	130 (110)
FU-20	Reflective	Small beam spot ø0.1	5±1 with beam spot diameter of 0.1					—
FU-21X	Reflective	Coaxial Lens attachment available	90 (70)	70 (56)	35 (28)	25 (20)	15 (12)	10 (7)
FU-22X	Reflective	Sleeve Coaxial, narrow beam	48 (40)	42 (34)	15 (12)	13 (10)	10 (8)	6 (4)
FU-23X	Reflective	Coaxial High power	680 (550)	550 (440)	370 (300)	250 (200)	125 (100)	85 (60)
FU-2303	Reflective	Coaxial Lens attachment available	200 (160)	160 (130)	80 (65)	60 (45)	32 (25)	22 (17)
FU-24X	Reflective	Coaxial Lens attachment available	55 (45)	45 (36)	22 (18)	15 (12)	8 (7)	6 (4)
FU-25	Reflective	Coaxial High power	560 (470)	520 (430)	300 (240)	200 (160)	100 (80)	70 (50)
FU-31	Reflective	Sleeve Side-view	85 (68)	68 (54)	34 (27)	25 (20)	17 (13)	11 (8)
FU-32	Thrubeam	Sleeve Side-view	300 (230)	230 (180)	100 (75)	75 (60)	38 (30)	25 (15)
FU-33	Reflective	Sleeve Side-view	180 (150)	150 (120)	75 (60)	50 (40)	25 (20)	18 (14)
FU-34	Thrubeam	Sleeve Side-view	640 (520)	500 (400)	320 (250)	250 (200)	125 (100)	90 (50)
FU-35FA	Reflective	Coaxial Lens attachment available	340 (270)	270 (220)	140 (110)	90 (70)	45 (35)	30 (25)
FU-35FG	Reflective	Coaxial Lens attachment available	200 (160)	160 (130)	80 (65)	60 (45)	32 (25)	22 (17)
FU-35FZ	Reflective	Coaxial Lens attachment available	200 (160)	160 (130)	80 (65)	60 (45)	32 (25)	22 (17)
FU-35TG	Reflective	Coaxial Lens attachment available	180 (140)	140 (110)	75 (60)	55 (42)	30 (23)	20 (16)
FU-35TZ	Reflective	Coaxial Lens attachment available	180 (140)	140 (110)	75 (60)	55 (42)	30 (23)	20 (16)
FU-37	Reflective	Definite-reflective Short-detecting distance	3 (centre of detecting distance)					
FU-38	Reflective	Definite-reflective Short-detecting distance	6 (centre of detecting distance)					
FU-38H	Reflective	Definite-reflective Heat-resistant	2.5 to 65 (2.5 to 55)	2 to 55 (2.5 to 44)	2.5 to 27 (2.5 to 22)	2.5 to 22 (2.5 to 19)	2.5 to 16 (2.5 to 12)	2.5 to 10 (2.5 to 7)
FU-38K	Reflective	Definite-reflective Heat-resistant	2.5 to 65 (2.5 to 55)	2 to 55 (2.5 to 44)	2.5 to 27 (2.5 to 22)	2.5 to 22 (2.5 to 19)	2.5 to 16 (2.5 to 12)	2.5 to 10 (2.5 to 7)
FU-38R	Reflective	Definite-reflective Long detecting distance	0 to 14 (0 to 14)					0 to 12 (0 to 9)
FU-38S	Reflective	Definite-reflective Long detecting distance	0 to 26 (0 to 26)					0 to 15 (0 to 10)
FU-38V	Reflective	Definite-reflective Short-detecting distance	0 to 4 (0 to 4)					2 1.4 (2 1.4)
FU-40	Reflective	High-power	30 to 1500 (30 to 1200)	30 to 1100 (30 to 850)	30 to 400 (30 to 320)	30 to 260 (30 to 220)	30 to 150 (30 to 120)	30 to 100 (30 to 80)
FU-40G	Reflective	High-power	30 to 1500 (30 to 1200)	30 to 1100 (30 to 850)	30 to 400 (30 to 320)	30 to 260 (30 to 220)	30 to 150 (30 to 120)	30 to 100 (30 to 80)
FU-41TZ	Reflective	Flat head (with mounting hole) Flat-view	2 to 60 (2 to 50)	2 to 50 (2 to 40)	2 to 25 (2 to 20)	2 to 20 (2 to 16)	2 to 10 (2 to 8)	2 to 6 (2 to 4)
FU-42TZ	Reflective	Flat head (with mounting hole) Flat-view	1 to 320 (1 to 250)	1 to 250 (1 to 200)	1 to 120 (1 to 100)	1 to 75 (1 to 60)	1 to 37 (1 to 30)	1 to 30 (1 to 25)
FU-43	Reflective	Sleeve Top-view	180 (150)	150 (120)	85 (70)	60 (50)	37 (30)	24 (16)
FU-44TZ	Reflective	Flat head (with mounting hole) Top-view	1 to 90 (1 to 75)	1 to 75 (1 to 60)	1 to 45 (1 to 37)	1 to 37 (1 to 30)	1 to 25 (to 20)	1 to 9 (1 to 6)
FU-45X	Reflective	Sleeve Top-view	45 (35)	35 (28)	18 (14)	13 (10)	8 (6)	5 (4)
FU-46	Reflective	Sleeve Top-view	15 (12)	12 (10)	8 (7)	6 (5)	3 (2)	1.6 (1.1)

NOTE: Standard target: White matte paper (Reflective type only.).
1. Each detecting distance in parentheses shows the data when the S-APC function is ON. S-APC will be always turned ON when the high-resolution or high-speed mode is selected.
2. When the R-2 (OP-95388) is used, MEGA (10 to 940 mm)/ULTRA (10 to 750 mm)/SURER (10 to 380 mm)/TURBO (10 to 250 mm)/FINE (10 to 125 mm)
3. "3600" is assumed as maximum because the fibre cable has the length of 2 m.

Model	Type	Features	Detecting distance [1] [Unit: mm]					
			MEGA	ULTRA TURBO	SUPER TURBO	TURBO	FINE	HIGH SPEED
FU-47TZ	Reflective	Flat head (with mounting hole) Side-view	1 to 90 (1 to 75)	1 to 75 (1 to 60)	1 to 45 (1 to 37)	1 to 37 (1 to 30)	1 to 25 (1 to 20)	1 to 12 (1 to 8)
FU-48	Reflective	High-Flex ø3	160 (130)	130 (110)	70 (55)	50 (40)	35 (28)	22 (17)
FU-49X	Reflective	High-Flex ø1.5	75 (60)	60 (50)	32 (25)	25 (20)	20 (16)	13 (10)
FU-4F	Reflective	Standard	700 (530)	520 (430)	350 (250)	230 (180)	125 (100)	80 (55)
FU-4FZ	Reflective	Standard Unbreakable	400 (320)	320 (260)	160 (130)	120 (90)	60 (45)	40 (30)
FU-50	Thrubeam	Built-in lens, Top-view	3600 (3600) [2]	3600 (3600) [2]	3600 (3600) [2]	3600 [2] (3200)	2300 (1800)	1500 (850)
FU-51TZ	Thrubeam	Flat head (with mounting hole) Top-view	380 (280)	300 (230)	180 (150)	150 (120)	75 (60)	45 (25)
FU-52TZ	Thrubeam	Flat head (with mounting hole) Top-view	1300 (1000)	1100 (850)	620 (500)	500 (400)	250 (200)	160 (100)
FU-53TZ	Thrubeam	Flat head (with mounting hole) Flat-view	250 (200)	200 (150)	130 (100)	100 (80)	50 (40)	40 (25)
FU-54TZ	Thrubeam	Flat head (with mounting hole) Flat-view	1300 (1000)	1100 (850)	620 (500)	500 (400)	250 (200)	160 (100)
FU-55	Thrubeam	Extra-thin core fibre ø2.5	25 (20)	20 (16)	15 (10)	10 (7)	5 (4)	—
FU-56	Thrubeam	Sleeve Top-view	25 (20)	20 (16)	15 (10)	10 (7)	5 (4)	—
FU-57TE	Thrubeam	High-Flex Side-view	320 (250)	250 (200)	140 (110)	100 (80)	50 (40)	30 (20)
FU-57TZ	Thrubeam	Flat head (with mounting hole) Side-view	330 (250)	250 (200)	150 (120)	110 (90)	55 (45)	35 (25)
FU-58	Thrubeam	Extra-thin core fibre ø1.0	150 (120)	130 (100)	65 (50)	50 (40)	32 (25)	20 (12)
FU-59	Thrubeam	High-Flex ø1.5	500 (380)	420 (330)	270 (200)	220 (170)	125 (100)	70 (35)
FU-5F	Thrubeam	Standard	2300 (1400)	1600 (1100)	950 (800)	800 (600)	400 (320)	220 (150)
FU-5FZ	Thrubeam	Standard Unbreakable	1700 (1300)	1300 (1100)	750 (600)	600 (460)	300 (230)	200 (140)
FU-61	Reflective	Standard	950 (780)	900 (720)	500 (400)	360 (280)	200 (150)	120 (80)
FU-61Z	Reflective	Standard Unbreakable	680 (550)	550 (450)	370 (280)	250 (200)	125 (100)	80 (60)
FU-63	Reflective	Sleeve Top-view	180 (150)	150 (120)	85 (70)	60 (50)	37 (30)	24 (16)
FU-63T	Reflective	Sleeve Top-view	180 (150)	150 (120)	85 (70)	60 (50)	37 (30)	24 (16)
FU-63Z	Reflective	Sleeve Top-view	130 (110)	110 (90)	55 (45)	43 (35)	25 (20)	13 (8)
FU-65X	Reflective	Sleeve Top-view	45 (35)	35 (28)	18 (14)	13 (10)	8 (6)	5 (4)
FU-66	Reflective	Standard	700 (530)	520 (430)	350 (250)	230 (180)	125 (100)	80 (55)
FU-66TZ	Reflective	Standard Unbreakable	350 (280)	280 (230)	150 (120)	100 (80)	50 (40)	35 (28)
FU-66Z	Reflective	Standard Unbreakable	400 (320)	320 (260)	160 (130)	120 (90)	60 (45)	40 (30)
FU-67	Reflective	Standard Unbreakable	500 (400)	400 (320)	220 (180)	170 (130)	85 (65)	50 (36)
FU-67G	Reflective	Standard ToughFlex	500 (400)	400 (320)	220 (180)	170 (130)	85 (65)	50 (36)
FU-67TG	Reflective	Standard ToughFlex	500 (400)	400 (320)	200 (160)	150 (120)	75 (60)	45 (33)
FU-67TZ	Reflective	Standard Unbreakable	500 (400)	400 (320)	200 (160)	150 (120)	75 (60)	45 (33)
FU-67V	Reflective	Standard Unbreakable	500 (400)	400 (320)	220 (180)	170 (130)	85 (65)	50 (36)
FU-68	Reflective	High-Flex M4	160 (130)	130 (110)	70 (55)	50 (40)	35 (28)	22 (17)
FU-69X	Reflective	High-Flex M3	75 (60)	60 (50)	32 (25)	25 (20)	20 (16)	13 (10)
FU-6F	Reflective	Standard	700 (530)	520 (430)	350 (250)	230 (180)	125 (100)	80 (55)
FU-71	Thrubeam	Standard	2600 (1900)	2000 (1600)	1350 (1000)	1000 (850)	550 (450)	330 (200)
FU-71Z	Thrubeam	Standard Unbreakable	2400 (1700)	1900 (1300)	1100 (900)	900 (700)	450 (350)	270 (160)
FU-73	Thrubeam	Sleeve Top-view	2300 (1400)	1600 (1100)	950 (800)	800 (600)	400 (320)	220 (150)
FU-75F	Thrubeam	Sleeve Top-view	400 (300)	340 (260)	180 (150)	150 (120)	95 (75)	50 (30)
FU-76F	Thrubeam	Sleeve Top-view	160 (130)	130 (100)	65 (50)	50 (40)	32 (25)	18 (10)

NOTE: Standard target: White matte paper (Reflective type only.).
1. Each detecting distance in parentheses shows the data when the S-APC function is ON. S-APC will be always turned ON when the high-resolution or high-speed mode is selected.
2. "3600" is assumed as maximum because the fibre cable has the length of 2 m .

Model	Type	Features	Detecting distance [1] [Unit: mm]					
			MEGA	ULTRA TURBO	SUPER TURBO	TURBO	FINE	HIGH SPEED
FU-77	Thrubeam	Standard Unbreakable	1700 (1300)	1300 (1100)	750 (600)	600 (460)	300 (230)	200 (140)
FU-77G	Thrubeam	Standard Tough Flex	1700 (1300)	1300 (1100)	750 (600)	600 (460)	300 (230)	200 (140)
FU-77TG	Thrubeam	Standard Tough Flex	1400 (1100)	1100 (880)	650 (500)	500 (400)	250 (200)	170 (110)
FU-77TZ	Thrubeam	Standard Unbreakable	1400 (1100)	1100 (880)	650 (500)	500 (400)	250 (200)	170 (110)
FU-77V	Thrubeam	Standard Unbreakable	1700 (1300)	1300 (1100)	750 (600)	600 (460)	300 (230)	200 (140)
FU-78	Thrubeam	Standard	1000 (750)	800 (600)	460 (370)	370 (300)	190 (150)	130 (75)
FU-79	Thrubeam	High-Flex M3	500 (380)	420 (330)	270 (200)	220 (170)	125 (100)	70 (35)
FU-7F	Thrubeam	Standard	2300 (1400)	1600 (1100)	950 (800)	800 (600)	400 (320)	220 (150)
FU-81C	Reflective	Heat-resistant 350°C	400 (360)	360 (280)	210 (170)	150 (120)	75 (60)	45 (35)
FU-82C	Reflective	Heat-resistant 300°C	420 (340)	420 (340)	260 (210)	180 (140)	90 (70)	55 (45)
FU-83C	Reflective	Heat-resistant 300°C	420 (340)	420 (340)	260 (210)	180 (140)	90 (70)	55 (45)
FU-84C	Thrubeam	Heat-resistant 300°C	950 (750)	750 (600)	460 (380)	380 (300)	180 (150)	130 (75)
FU-85	Reflective	Heat-resistant 105°C	680 (560)	560 (450)	370 (300)	250 (200)	120 (100)	80 (60)
FU-85Z	Reflective	Heat-resistant 100°C	460 (380)	380 (300)	220 (180)	160 (130)	80 (65)	50 (40)
FU-86	Thrubeam	Heat-resistant 105°C	2300 (1400)	1600 (1100)	950 (800)	800 (600)	400 (320)	220 (150)
FU-86Z	Thrubeam	Heat-resistant 100°C	1400 (1100)	1100 (850)	800 (600)	550 (440)	300 (250)	190 (110)
FU-87	Reflective	Heat-resistant 180°C	570 (460)	460 (360)	260 (210)	180 (140)	90 (70)	55 (45)
FU-88	Thrubeam	Heat-resistant 180°C	1300 (1000)	1000 (800)	620 (500)	500 (400)	250 (200)	180 (110)
FU-91	Reflective	Oil-proof, Chemical proof	220 (180)	220 (180)	135 (110)	110 (85)	75 (60)	45 (35)
FU-92	Thrubeam	Oil-proof, Chemical proof	3600 (3600) [2]	3600 (3600) [2]	3000 (2400)	2600 (2000)	1300 (1000)	750 (400)
FU-93	Reflective	Liquid-level Immersion	Liquid (except for milky white liquids)					—
FU-93Z	Reflective	Liquid-level Immersion	Liquid (except for milky white liquids)					—
FU-95	Reflective	Liquid-level Tube-mountable	Transparent tube of 4 to 26 dia.					—
FU-95HA	Reflective	Liquid-level Tube-mountable	Transparent tube of 4 to 26 dia.					—
FU-95S	Reflective	Liquid-level Tube-mountable	Transparent tube of 4 to 26 dia.					—
FU-95Z	Reflective	Liquid-level Tube-mountable	Transparent tube of 4 to 26 dia.					—
FU-96	Thrubeam	Oil-proof, Chemical proof	2700 (2200)	2200 (1700)	1100 (880)	880 (700)	430 (350)	240 (160)

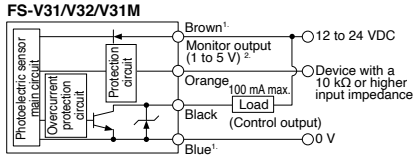
NOTE: Standard target: White matte paper (Reflective type only).
1. Each detecting distance in parentheses shows the data when the S-APC function is ON. S-APC will be always turned ON when the high-resolution or high-speed mode is selected.
2. "3600" is assumed as maximum because the fibre cable has the length of 2 m .

Input/Output Circuits

Cable type

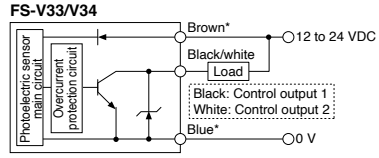
Output circuit

FS-V31/V32/V31M



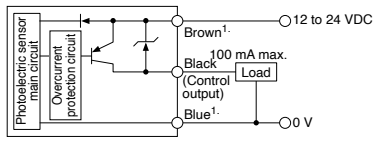
1. FS-V31/31M only. 2. FS-V31M only.

FS-V33/V34



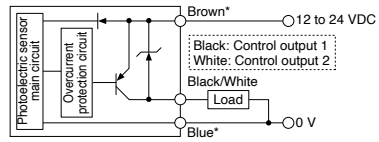
* FS-V33 only.

FS-V31P/V32P



1. FS-V31P only.

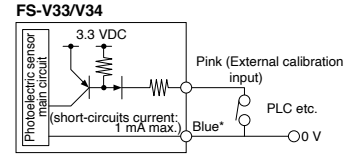
FS-V33P/V34P



* FS-V33P only.

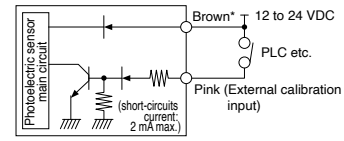
Input circuit

FS-V33/V34



1. FS-V33 only.

FS-V33P/V34P

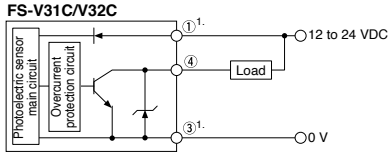


1. FS-V33P only.

Connector type

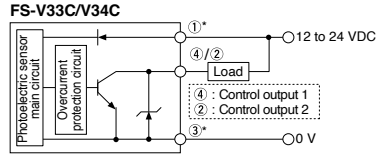
Output circuit

FS-V31C/V32C



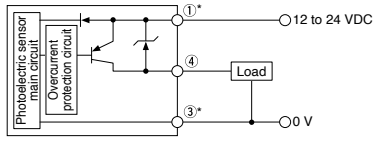
* FS-V31C only.

FS-V33C/V34C



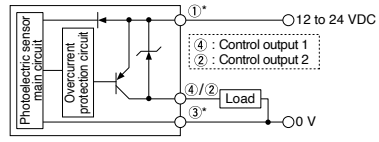
* FS-V33C only.

FS-V31CP/V32CP



* FS-V31CP only.

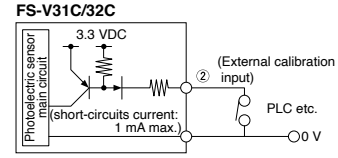
FS-V33CP/V34CP



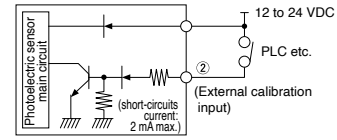
* FS-V33CP only.

Input circuit

FS-V31C/32C



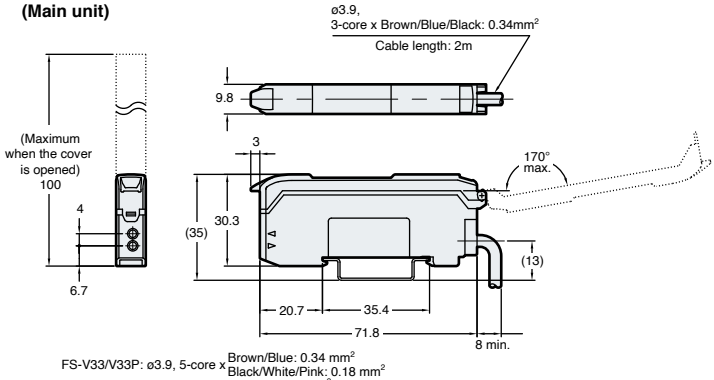
FS-V31CP/V32CP



Dimensions

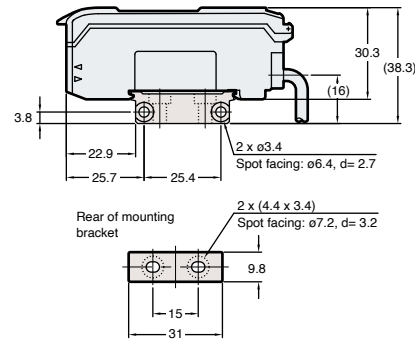
Unit: mm

FS-V31/V31P/V33/V33P/V31M (Main unit)

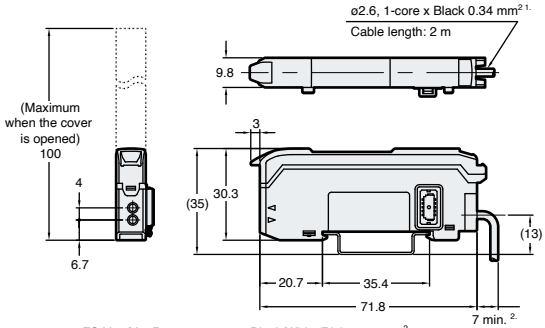


FS-V33/V33P: ø3.9, 5-core x Brown/Blue: 0.34 mm² / Black/White/Pink: 0.18 mm²
FS-V31M: ø3.9, 4-core x Brown/Blue: 0.34 mm² / Black/Orange: 0.18 mm²

When the mounting bracket (Optional) **OP-73880** is attached:

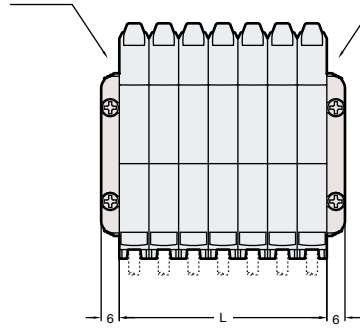


FS-V32/V32P/V34/V34P/V30 (Expansion unit)



1. FS-V34/V34P: ø3.9, 3-core x Black/White/Pink: 0.18 mm²
(The FS-V30 does not have connecting cables.)
2. FS-V34/V34P: 8 min.

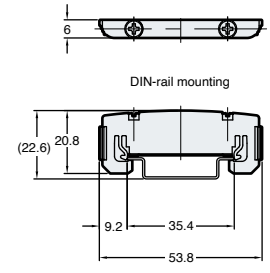
When several units are connected:
End unit



No. of units	L
1	19.6
2	29.4
3	39.2
4	49.0
5	58.8
6	68.6
7	78.4
8	88.2
9	98.0
10	107.8
11	117.6
12	127.4
13	137.2
14	147.0
15	156.8
16	166.6

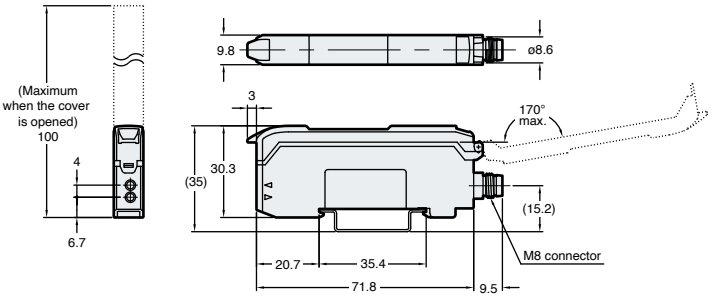
3. When using expansion units, be sure to use the end unit. (Optional)

End unit (Optional) OP-26751

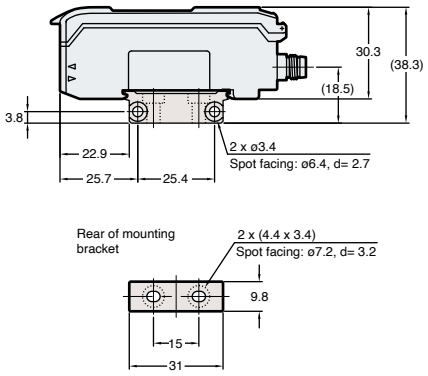


Unit: mm

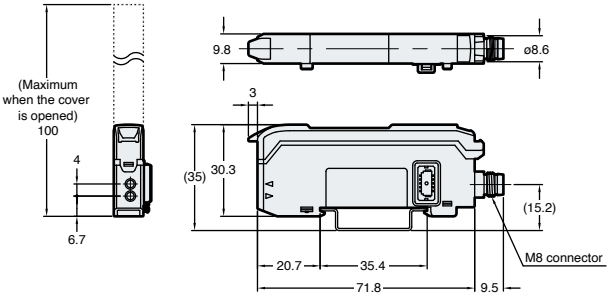
FS-V31C/V31CP/V33C/V33CP (Main unit)



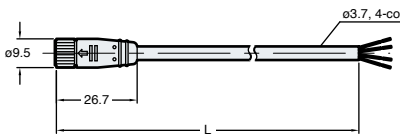
When the mounting bracket (Optional) **OP-73880** is attached:



FS-V32C/V32CP/V34C/V34CP (Expansion unit)

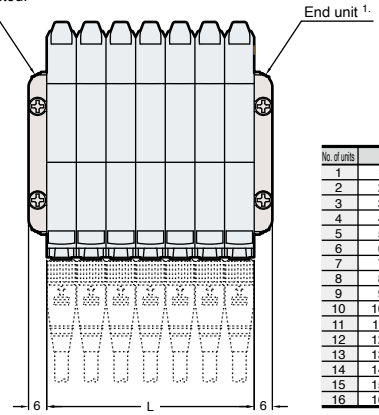


M8 connector cable (Optional)



	L (m)
OP-73864	2
OP-73865	10

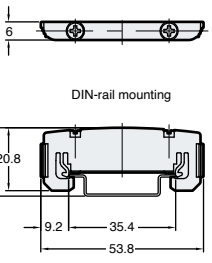
When several units are connected:
End unit



No. of units	L
1	19.6
2	29.4
3	39.2
4	49.0
5	58.8
6	68.6
7	78.4
8	88.2
9	98.0
10	107.8
11	117.6
12	127.4
13	137.2
14	147.0
15	156.8
16	166.6

1. When using expansion units, be sure to use the end unit. (Optional)

End unit (Optional) OP-26751



Specifications

Type		1-output with cable		1-output + 1-input with M8 connector		2-output + 1-input with cable		2-output with M8 connector		Monitor output	0-line
Model	NPN	**FS-V31**	**FS-V32**	**FS-V31C**	**FS-V32C**	**FS-V33**	**FS-V34**	**FS-V33C**	**FS-V34C**	**FS-V31M**	**FS-V30**
	PNP	**FS-V31P**	**FS-V32P**	**FS-V31CP**	**FS-V32CP**	**FS-V33P**	**FS-V34P**	**FS-V33CP**	**FS-V34CP**	–	–
Main unit/Expansion unit		Main unit	Expansion unit	Main unit	Expansion unit	Main unit	Expansion unit	Main unit	Expansion unit	Main unit	Expansion unit
Control output		1 output		1 output		2 outputs		2 outputs		1 output	N/A
Monitor output (1 to 5 V)		N/A		N/A		N/A		N/A		1 output	N/A
External input		N/A		1 input		1 input		N/A		N/A	N/A
Connector		–		M8		–		M8		–	–
Light source		Red, 4-element LED (Wavelength: 640 nm)									
Response time		33 µs (HIGH SPEED)/250 µs (FINE)/500 µs (TURBO)/1 ms (SUPER TURBO)/4 ms (ULTRA TURBO)/16 ms (MEGA TURBO)									193 µs to 16.7 ms
Output selection		LIGHT-ON/DARK-ON (switch-selectable)									
Display indicator		Operation indicator: Red LED/Dual digital monitor: Dual 7-segment display, Preset Value (4-digit green LED indicator) and Current Value (4-digit red LED indicator) illuminated together. Current Value range: 0 to 64,512; Excess gain: 0P to 999P, Hold function: Possible to display both peak and bottom hold values. Selectable from 5 variations Bar LED monitor: Excess gain displayed (85% to 115% in 7 steps), Scaling display									
Detection mode		Light intensity (area detection possible, automatic sensitivity-tracking function provided)/ [Limited light intensity/Count check/Abnormality detection] [1.]									
Timer function		OFF-delay timer/ON-delay timer/One-shot timer/ON-delay timer + OFF-delay timer/ON-delay timer + One-shot timer, selectable Timer duration selectable: 0.1 ms to 9,999 ms, Maximum error against the setting value: ±10% max.									
Counter function		N/A				65,535 max. count				N/A	
Control output	NPN	NPN open-collector 24 V, 100 mA max.[2.] (main unit only)/20 mA max. (when the expansion unit(s) is connected), Residual voltage: 1 V max.									
	PNP	PNP open-collector 24 V, 100 mA max.[2.] (main unit only)/20 mA max. (when the expansion unit(s) is connected), Residual voltage: 1 V max.									
Monitor output (**FS-V31M** only)		Voltage output: 1 to 5 V [3.], Load resistance: 10 kΩ min., Repeatability: ±0.5% of F.S., Response time: 1 ms									
External input [5.]		Input time: 2 ms (ON)/20 ms (OFF) min.									
Unit expansion		Up to 16 expansion units can be connected (a total of 17 units). Note that the 2-output type should be counted as two units.									
Power supply		12 to 24 VDC (±10%), ripple (p-p): 10% max., Class 2									
Current consumption [6.]	NPN	Normal: 710 mW max. (Using 24 V, 29 mA max., using 12 V, 40 mA max.)/Power saving: 540 mW max. (Using 24 V, 22 mA max., using 12 V, 28 mA max.)									
	PNP	750 mW max. (Using 24 V, 31 mA max., using 12 V, 40 mA max.)/Power saving 580 mW max. (Using 24 V, 24 mA max., using 12 V, 28 mA max.)				830 mW max. (Using 24 V, 35 mA max., using 12 V, 45 mA max.)/Power saving 660 mW max. (Using 24 V, 27 mA max., using 12 V, 32 mA max.)				–	–
Ambient illumination		Incandescent lamp: 20,000 lux max., Sunlight: 30,000 lux max.									
Ambient temperature		-10 to +55°C, No freezing [4.]									
Relative humidity		35 to 85%, No condensation									
Vibration resistance		10 to 55 Hz, double amplitude: 1.5 mm, 2 hours each in the X, Y and Z axis									
Shock resistance		500 m/s² in X, Y, and Z directions, 3 times respectively									
Housing		Polycarbonate									
Size		30.3 mm (H) x 9.8 mm (W) x 71.8 mm (D)									
Weight		Approx. 80 g	Approx. 45 g	Approx. 80 g	Approx. 45 g	Approx. 80 g	Approx. 70 g	Approx. 22 g	Approx. 22 g	Approx. 80 g	Approx. 25 g
Accessory		N/A									

1. Only 2-output type.
2. Total current of two outputs should be less than 100 mA.
3. Output range: 1 to 5 V for the display value 0 to 4,095 at HIGH SPEED/FINE/TURBO mode.
4. If more than one unit is used together, the ambient temperature varies with the conditions below. Mount the units on the DIN rail with mounting brackets and check that the output current is 20 mA or less.
   1 to 2 Units: -10 to +55°C, 3 to 10 Units: -10 to +50°C, 11 to 16 Units: -10 to +45°C
5. Only available on certain models.
6. When using the HIGH SPEED mode, the power consumption increases by 160 mW (7 mA).

Options

Type	Amplifier securing bracket (for main unit)	End unit (for expansion unit)	M8 connector cable (2 m) [1.]	M8 connector cable (10 m) [1.]
Model	OP-73880	OP-26751	OP-73864	OP-73865
Shape				

Note: To use the main unit only, use a DIN-rail or purchase the OP-73880 securing bracket. To add expansion units, use a DIN-rail and purchase the OP-26751 end unit, which should be placed at both ends of the connected units.

1. To use the FS-V31C(P)/V32C(P)/V33C(P)/V34C(P), purchase the OP-73864 or the OP-73865.

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