

**KEYENCE**

**NEW** Digital Fiber Optic Sensor

FS-V30 Series

CE cRU<sup>®</sup> US

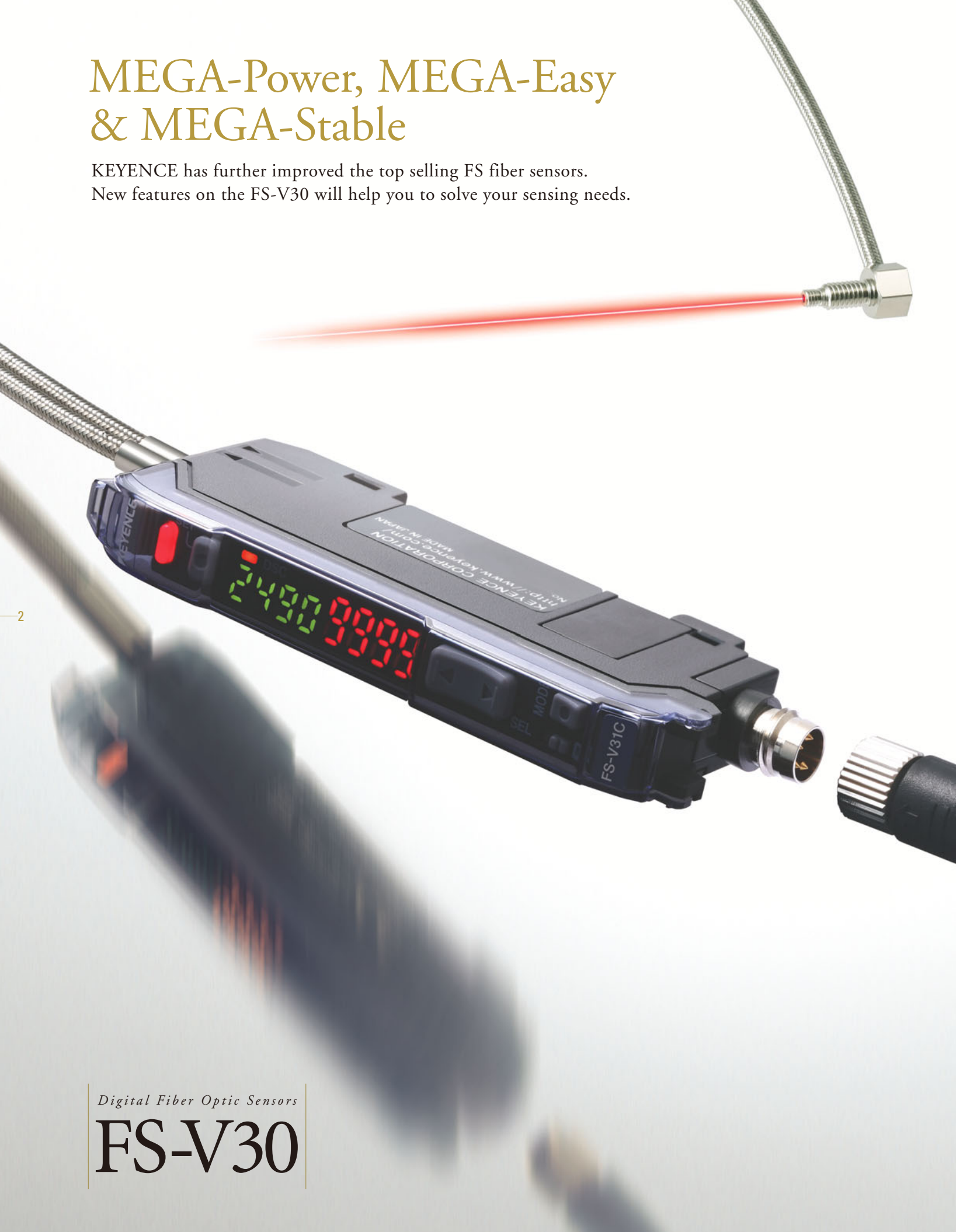
**MEGA POWER**

Fiber Optic Sensors  
The New Standard in Simplicity



# MEGA-Power, MEGA-Easy & MEGA-Stable

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



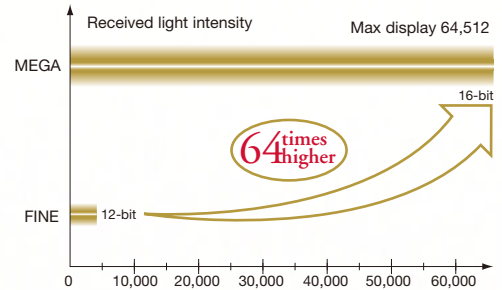
*Digital Fiber Optic Sensors*

# 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 fibers.



## World's first power booster switch

**Easy power control**

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

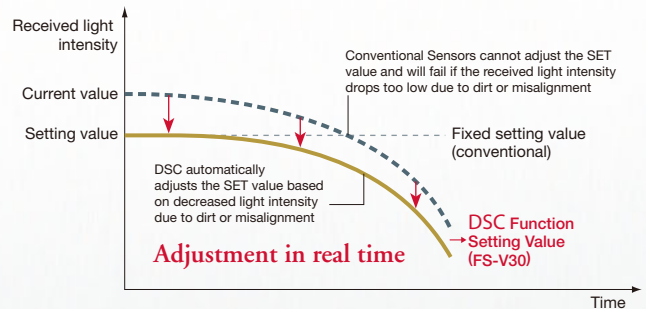


DIP switch

## 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

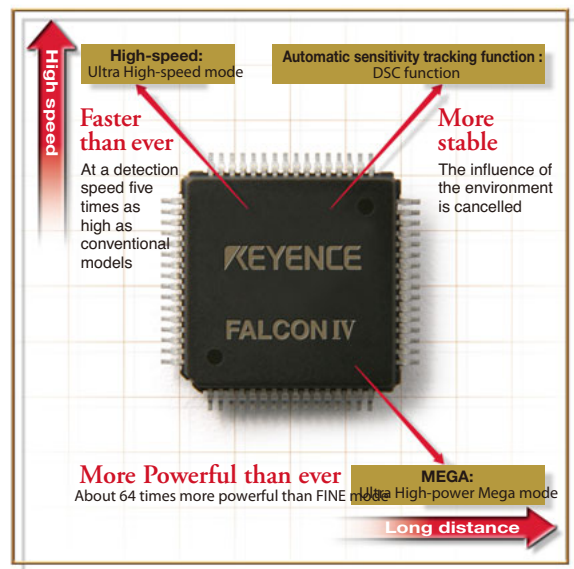
The improved ASIC significantly improves performance.

KEYENCE has developed a special 16-bit CPU for fiber 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 fiber 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.

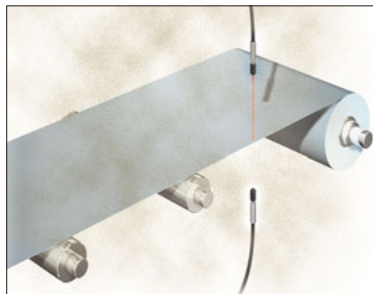


## Automatic sensitivity tracking function [WORLD'S BEST]

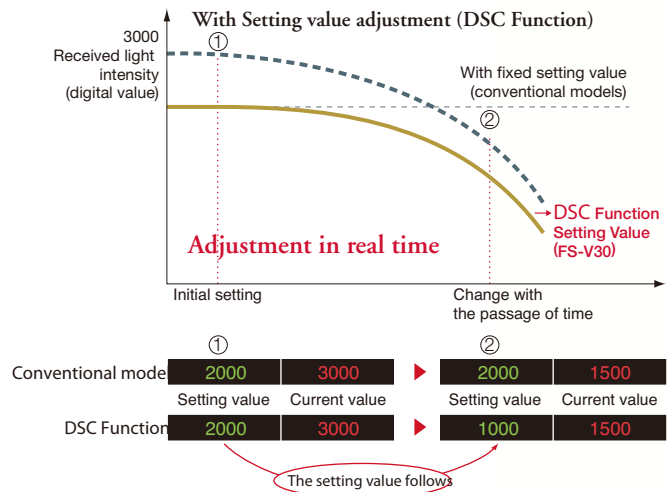
**Automatically adjust the setting value.**

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.



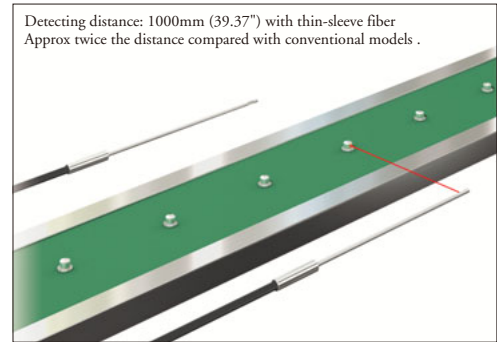
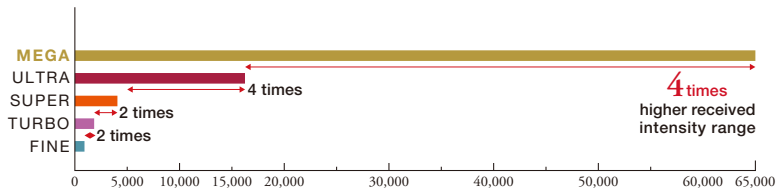
Detecting a thin target using thru-beam type



## Highest power [WORLD'S BEST]

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

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 fibers.



Detecting the position of targets using a thin fiber.



#### 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 [NEW]  
M8 connector  
FS-V31C(P)  
FS-V32C(P)



2-output [NEW]  
M8 connector  
FS-V33C(P)  
FS-V34C(P)



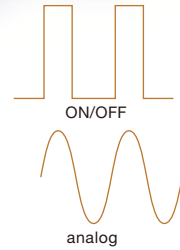
Analog output [NEW]  
FS-V31M



Cable [NEW]  
FS-V31(P)  
FS-V32(P)



Cable [NEW]  
FS-V33(P)  
FS-V34(P)



**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.

**Analog 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.

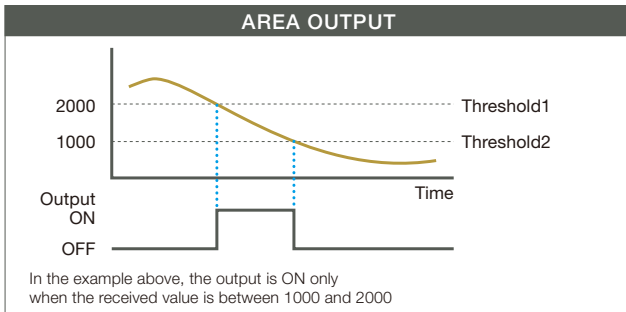


## Area output

### Ignore background interference.

Set an upper and lower detection level.

The FS-V30 will output when the received signal is between the setting limits.



## Preventing operational errors

### Password lock function

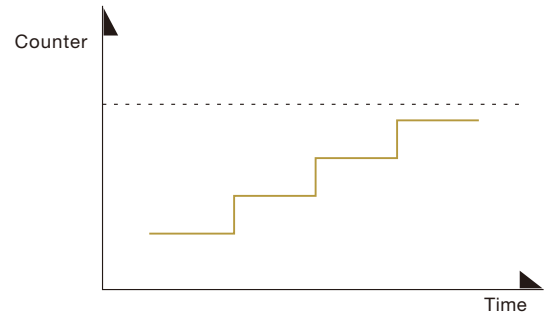
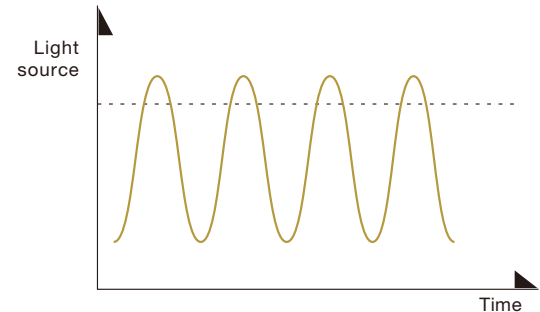
With the Password Lock function, only authorized operators can modify the settings on the FS-V30. Since the Password Levels are selectable, operation errors can be prevented.

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

## Counter mode

### Simultaneous count of workpieces

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

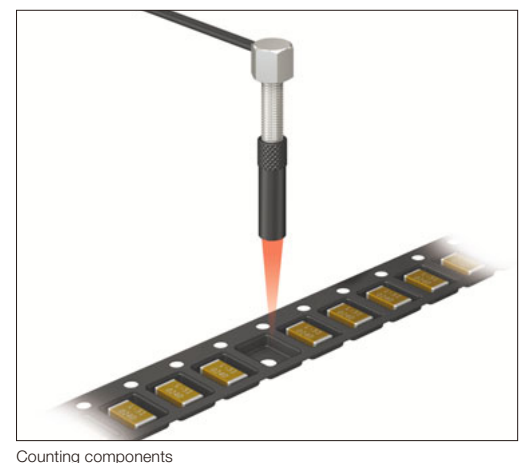
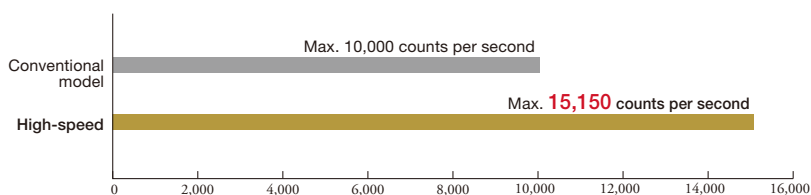


## Highest speed [WORLD'S BEST]

### 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



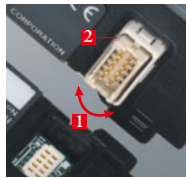
# Reliable expansion units

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

## [ 1-Line system ]

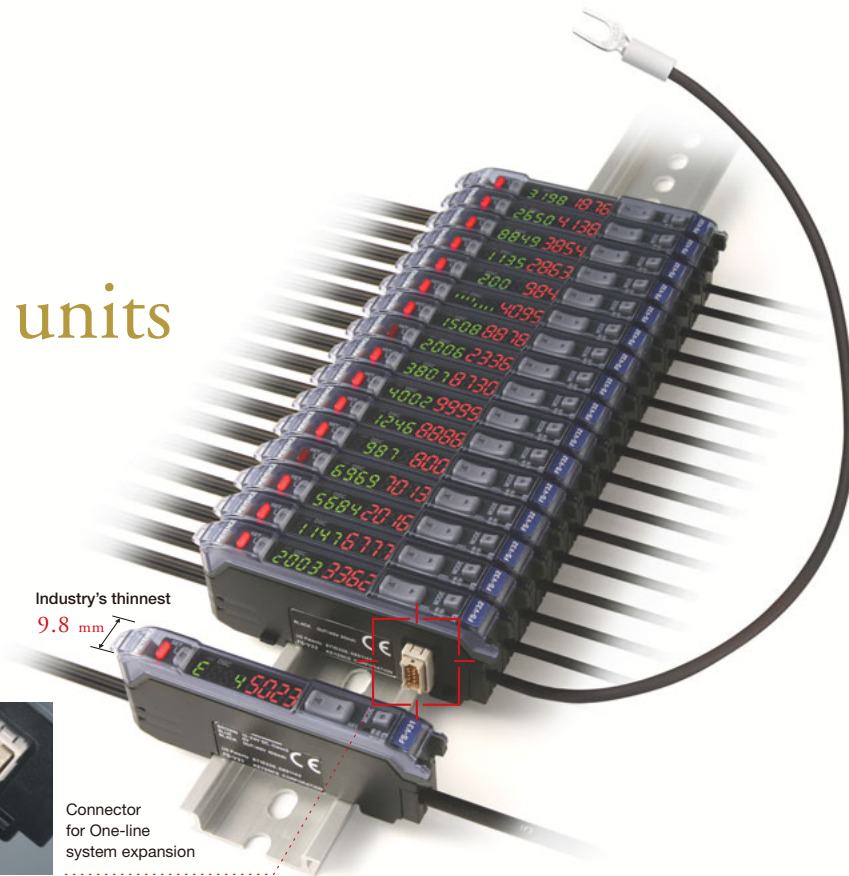
Power is connected through the side connector. Expansion units have a single output wire.

- 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.



Industry's thinnest  
9.8 mm

Connector for One-line system expansion



## Interference prevention function up to 16 units

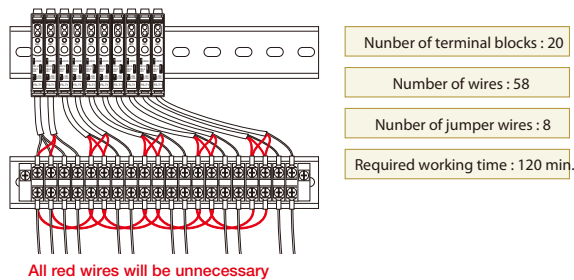
### Reliable detection with stable interference prevention.

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

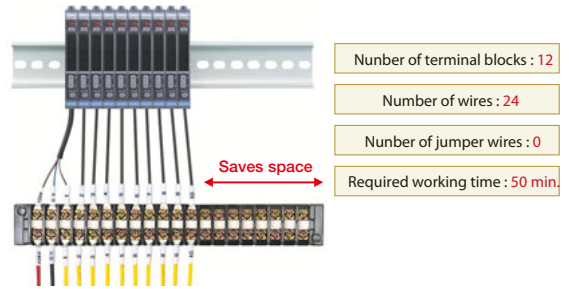
MODE	FinE	Turb	SuPr	ULtr	MEGA
Std (Standard)	4 units		8 units		
dobl (Double)	8 units		16 units		

## Wire saving connection method (when 10 units are used)

### Conventional method



### Single-line method



## 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. Fiber, Color, Laser, Photoelectric and Proximity sensors are all available in the 1-line system.



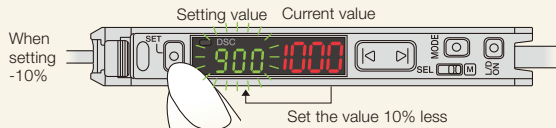
- From left to right
- FS-V31: Fiber optic sensor
  - CZ-V22A: RGB digital color sensor
  - LV-12SA: Digital laser sensor
  - PS-T2: Photoelectric sensor with separate amplifier
  - ES-M2: Long-distance separate amplifier proximity sensor



# 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.

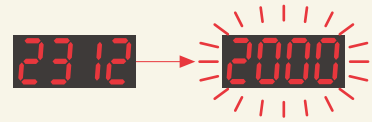
## Shift Function

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)



## Fiber 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

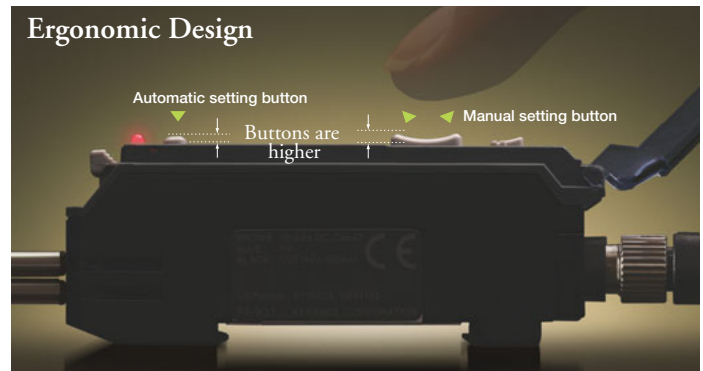
## External tuning

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 colors, 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.

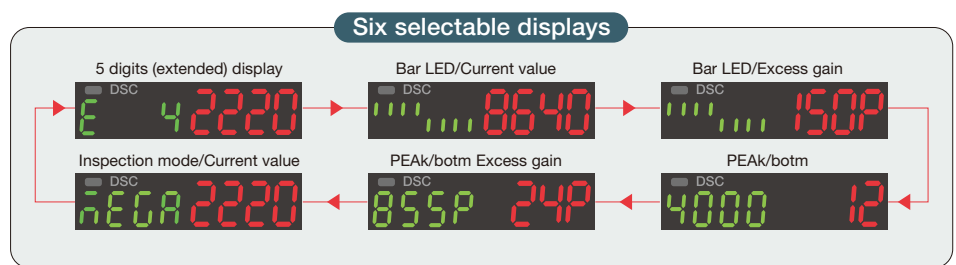
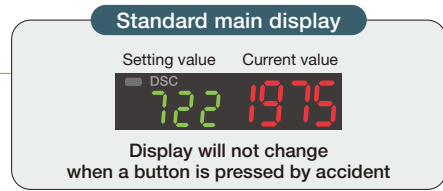


# Display customizing Function

## Only the main display is active by default.

Conventional models can be easily switched to unwanted display modes by accident, confusing operators.

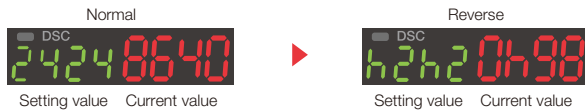
The FS-V30 will only display the Setting Value and the Current Value by default. If operators prefer to display an alternate format, such as Bar LED's, they can select from 6 additional options in the menu.



# 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.

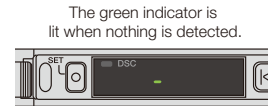


## Power saving

### 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

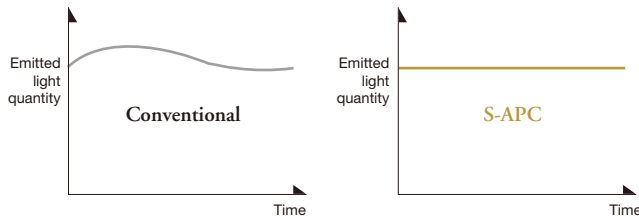


## Harsh environments/Changes over time

### 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]

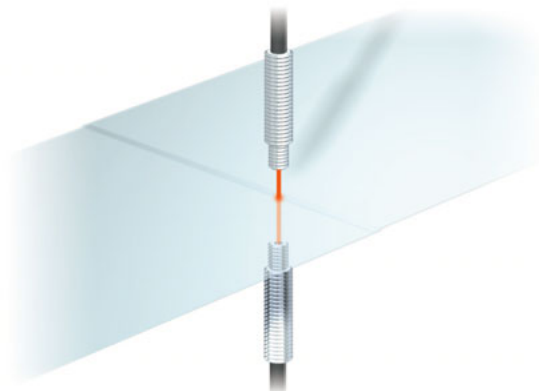
Equipped with 5 timer Functions. The Timer function can be individually set for each output 1 and 2 from 0.1 ms to 9999 ms.

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

## Preventing saturation

### ATTENUATE FUNCTION

In situations where fiber 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)

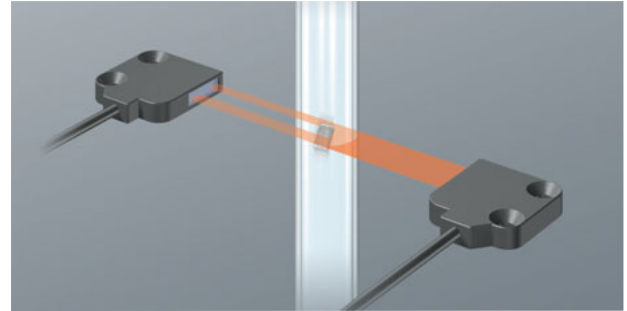


## Simple sensitivity settings

### FULL AUTOMATIC CALIBRATION

#### No need to stop targets

When detecting falling or minute targets, it is very difficult to make sensitivity adjustments to manual fiber-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 sensing area.

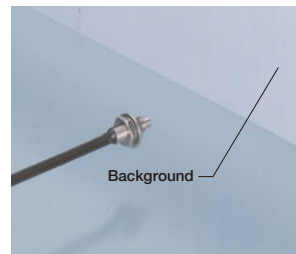


Detecting dropping targets

### 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

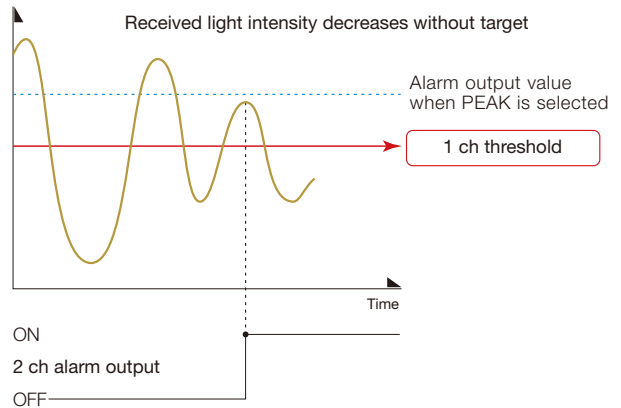
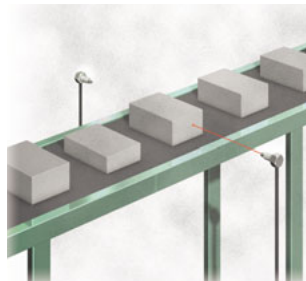


Sensor turns ON when the target enters the sensing area

## 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 fiber units are available for same-day shipment.

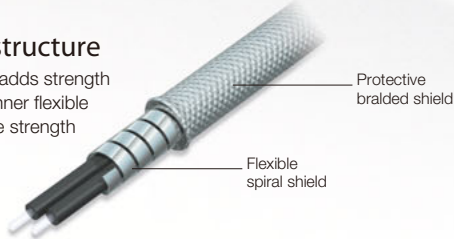
Our technical sales staff will select the best unit for you.

888-KEYENCE

## Stainless steel armor

### Stainless jacket structure

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



12

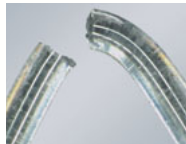
## Tough Flex

### Conventional fiber

Minimum bending radius : R0.98" 25 mm



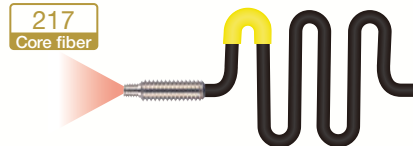
Single-core fiber



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

### ToughFlex fiber

Minimum bending radius : R0.08" 2 mm



217-core fiber



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

### Super ToughFlex fiber

Minimum bending radius : R0.02" 0.5 mm



613-core fiber



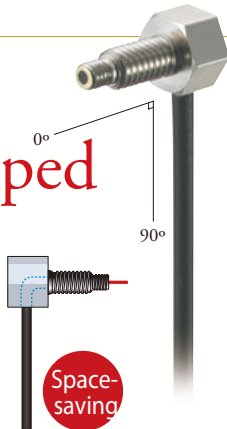
A 613-core fiber offers the best performance.

KEYENCE ONLY

## Hex-shaped

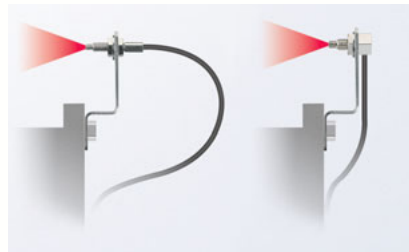
### Unbreakable fiber

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



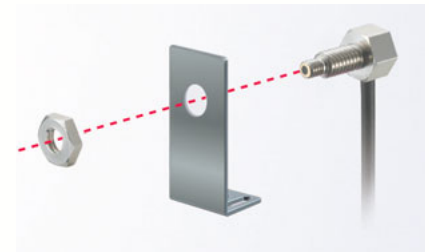
### Space-saving, trouble-free

All Hex-shaped fiber 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 fiber unit can be replaced without additional preparation or modification.



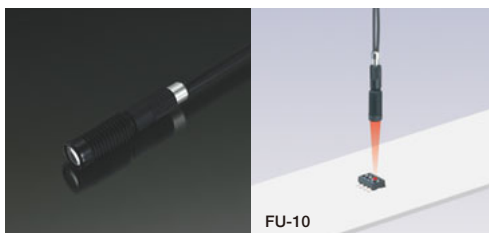
Standard

Reflective ▶ P.14  
Thrubeam ▶ P.17



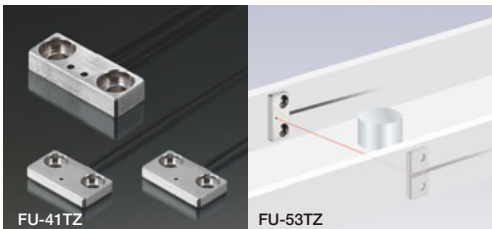
Small Beam Spot

▶ P.17



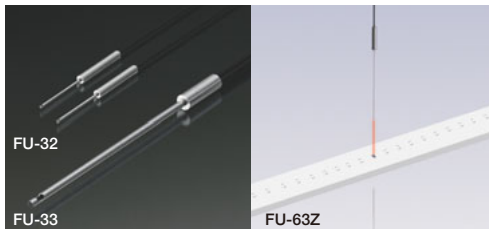
Flat

Reflective ▶ P.14  
Thrubeam ▶ P.18



Sleeve

Reflective ▶ P.15  
Thrubeam ▶ P.18



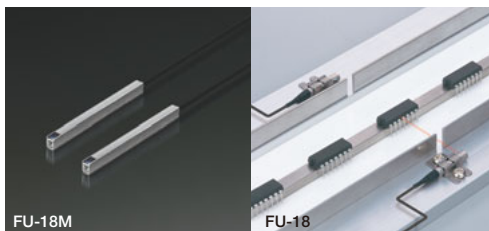
Retro-reflective

▶ P.15



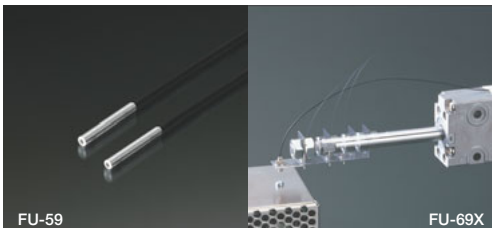
Narrow beam

▶ P.18



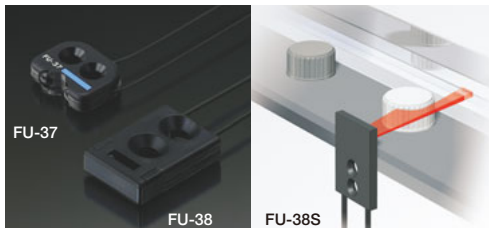
High-Flex

Reflective ▶ P.15  
Thrubeam ▶ P.18



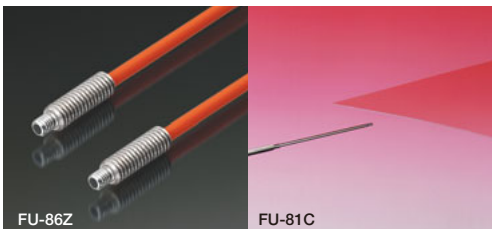
Definite-reflective

▶ P.15



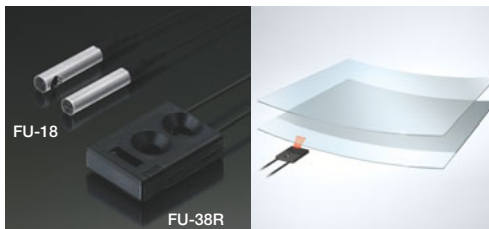
Heat Resistant

Reflective ▶ P.16  
Thrubeam ▶ P.19



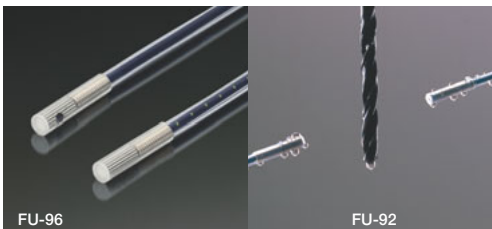
LCD/ Semi-conductor

▶ P.15



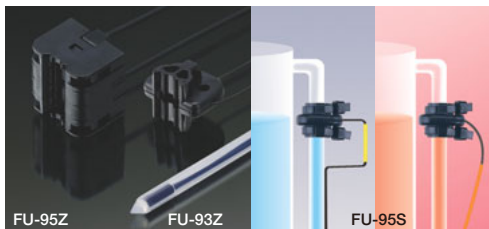
Chemical proof

Reflective ▶ P.16  
Thrubeam ▶ P.19



Liquid Level

▶ P.16



Unit: inch mm

Category		Reflective	Standard	Detecting distance <sup>2</sup>		Smallest <sup>1</sup> detectable object	Minimum bend radius	Features	Model		
Type	Shape	MEGA / FINE									
Standard	ToughFlex	M4	-40 to 122F (-40 to +50°C)	1.97" 50	13.78" 350	ø0.0002" ø0.005 (gold wire)	R0.08" R2	Hex-shaped (Approx. 10 g)	FU-66TZ <small>Free cut 6.6 m</small>		
				2.95" 75	19.69" 500	ø0.0002" ø0.005 (gold wire)	R0.08" R2	Hex-shaped (Approx. 32 g)	FU-67TZ <small>Free cut 6.6 m</small>		
		M4	-40 to 122F (-40 to +50°C)	0.59" 15	2.36" 60	15.75" 400	ø0.0002" ø0.005 (gold wire)	R0.08" R2	R0.08" R2 M4 (Approx. 10 g)	FU-66Z <small>Free cut 6.6 m</small>	
				0.63" 16	3.35" 85	19.69" 500	ø0.0002" ø0.005 (gold wire)	R0.02" R0.5	R0.02" R0.5 M6 (Approx. 25 g)	FU-67V <small>Free cut 6.6 m</small>	
		M6	-40 to 122F (-40 to +50°C)	0.63" 16	3.35" 85	19.69" 500	ø0.0002" ø0.005 (gold wire)	R0.08" R2	R0.08" R2 M6 (Approx. 21 g)	FU-67 <small>Free cut 6.6 m</small>	
				0.67" 17	2.36" 60	15.75" 400	ø0.0002" ø0.005 (gold wire)	R0.08" R2	R0.08" R2 ø0.12" ø3 (Approx. 8 g)	FU-4FZ <small>Free cut 6.6 m</small>	
	M6	-40 to 122F (-40 to +50°C)	0.67" 17	4.92" 125	26.77" 680	ø0.0002" ø0.005 (gold wire)	R0.08" R2	Long-detecting distance M6 (Approx. 22 g)	FU-61Z <small>Free cut 6.6 m</small>		
			M6	-40 to 122F (-40 to +50°C)	2.95" 75	19.69" 500	ø0.0002" ø0.005 (gold wire)	R0.39" R10	Hex-shaped Armored (Approx. 32 g)	FU-67TG <small>Free cut 3.3 m</small>	
	M6	-40 to 122F (-40 to +50°C)			0.67" 17	3.35" 85	19.69" 500	ø0.0002" ø0.005 (gold wire)	R0.39" R10	R0.39" R10 Armored (Approx. 29g)	FU-67G <small>Free cut 3.3 m</small>
			Standard	Standard	M4	-40 to 158F (-40 to +70°C)	0.59" 15	4.92" 125	27.56" 700	ø0.0002" ø0.005 (gold wire)	R0.98" R25
	0.67" 17	4.92" 125					27.56" 700	Long-detecting distance M6 (Approx. 21 g)	FU-6F <small>Free cut 6.6 m</small>		
	M6	-40 to 158F (-40 to +70°C)			0.67" 17	4.92" 125	27.56" 700	ø0.12" ø3	Long-detecting distance ø0.12" ø3 (Approx. 8 g)	FU-4F <small>Free cut 6.6 m</small>	
0.67" 17					7.87" 200	37.40" 950	ø0.0002" ø0.005 (gold wire)	R0.98" R25	Long-detecting distance M6 (Approx. 21 g)	FU-61 <small>Free cut 6.6 m</small>	

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	Detecting distance <sup>2</sup>		Smallest <sup>1</sup> detectable object	Minimum bend radius	Features	Model		
Type	Shape	MEGA / FINE									
Flat head (with mounting hole)	Side-view	0.28" 7.2	-40 to 122F (-40 to +50°C)	0.41" 10.5	0.04" to 3.54" 1 to 90	ø0.0002" ø0.005 (gold wire)	R0.08" R2	Compact side-view type (Approx. 4 g)	FU-47TZ <small>Free cut 3.3 m</small>		
				0.08" 2	0.08" to 0.98" 1 to 25	ø0.0002" ø0.005 (gold wire)	R0.08" R2	Ultra-thin, flat-ON (Approx. 5 g)	FU-41TZ <small>Free cut 3.3 m</small>		
	Top-view	0.16" 4	-40 to 122F (-40 to +50°C)	0.28" 7	0.08" to 0.39" 2 to 10	ø0.0002" ø0.005 (gold wire)	R0.08" R2	Flat-on versatile (Approx. 24 g)	FU-42TZ <small>Free cut 6.6 m</small>		
				0.28" 7	0.04" to 1.46" 1 to 37	0.04" to 12.60" 1 to 320	ø0.0002" ø0.005 (gold wire)	R0.08" R2	Flat-on versatile (Approx. 24 g)	FU-42TZ <small>Free cut 6.6 m</small>	
End-view	-40 to x122F (-40 to +50°C)	0.31" 8	-40 to x122F (-40 to +50°C)	0.26" 6.5	0.04" to 3.54" 1 to 90	ø0.0002" ø0.005 (gold wire)	R0.08" R2	Compact, top-view	FU-44TZ <small>Free cut 3.3 m</small>		
				0.26" 6.5	0.04" to 0.98" 1 to 25	ø0.0002" ø0.005 (gold wire)	R0.08" R2	Compact, top-view	FU-44TZ <small>Free cut 3.3 m</small>		
Coaxial	High-power	M6	-40 to 158F (-40 to +70°C)	0.67" 17	3.94" 100	22.05" 560	ø0.0002" ø0.005 (gold wire)	R0.98" R25	Suitable for positioning M8 (Approx. 18 g)	FU-25 <small>Free cut 6.6 m</small>	
				0.67" 17	4.92" 125	26.77" 680	ø0.0002" ø0.005 (gold wire)	R0.98" R25	Suitable for positioning ø0.12" ø3 (Approx. 4 g)	FU-23X <small>Free cut 19.69 50 cm</small>	
	Lens attachment available	M3	-40 to 158F (-40 to +70°C)	0.91" 23	1.77" 45	13.39" 340	ø0.0002" ø0.005 (gold wire)	R0.98" R25	0.016" 0.4 spot diameter with F-2HA (Approx. 6 g)	FU-35FA <small>Free cut 3.3 m</small>	
					0.71" 18	7.87" 200	ø0.0002" ø0.005 (gold wire)	R0.39" R10	M3, 0.016" 0.4 spot diameter with F-2HA Armored (Approx. 15 g)	FU-2303 <small>Free cut 3.3 m</small>	
		M3	-40 to 122F (-40 to +50°C)	0.67" 17	1.26" 32	7.87" 200	ø0.0002" ø0.005 (gold wire)	R0.08" R2	M3, 0.016" 0.4 spot diameter with F-2HA (Approx. 6 g)	FU-35FZ <small>Free cut 3.3 m</small>	
					1.18" 30	7.09" 180	ø0.0002" ø0.005 (gold wire)	R0.39" R10	Hex-shaped armored (Approx. 32 g)	FU-35TG <small>Free cut 3.3 m</small>	
		M3	-40 to 122F (-40 to +50°C)	0.67" 17	1.18" 30	7.09" 180	ø0.0002" ø0.005 (gold wire)	R0.08" R2	Hex-shaped (Approx. 7 g)	FU-35TZ <small>Free cut 3.3 m</small>	
					0.59" 15	3.54" 90	ø0.0002" ø0.005 (gold wire)	R0.98" R25	0.008" 0.2 spot diameter with F-2HA (Approx. 4 g)	FU-21X <small>Free cut 19.69 50 cm</small>	
		M3	-40 to 158F (-40 to +70°C)	0.59" 15	0.31" 8	2.17" 55	0.004" 0.1 spot diameter with F-2HA (Approx. 4 g)	ø0.0002" ø0.005 (gold wire)	R0.39" R10	0.004" 0.1 spot diameter with F-2HA (Approx. 4 g)	FU-24X <small>Free cut 19.69 50 cm</small>

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	Area/High-power/Retro-reflective/High-Flex		MEGA / FINE		MEGA	FINE	
Type	Shape	Detecting distance <sup>2</sup>			Smallest 1. detectable object	Minimum bend radius	Features	Model	
Area	Thickness: 0.28" 7 1.10" 28	0.20" to 6.30" 5 to 160 0.20" to 4.72" 5 to 120			ø0.002" ø0.005 (gold wire) (Parallel)	R0.98" R25	Area detection width of 0.50" 15 (Approx. 19 g)	FU-11 Free-cut 5.6 2 m	
		Thickness: 0.20" 5.2 0.83" 21	1.18" to 5.91" 30 to 150 1.18" to 59.06" 30 to 1500			ø0.012" ø0.3 (copper wire) (Vertical)	R0.08" R2	Long-detecting distance Narrow beam Slope (Approx. 23 g)	FU-40 Free-cut 5.6 2 m
			Thickness: 0.20" 5.2 1.10" 28				ø0.012" ø0.3 (copper wire) (Vertical)	R0.39" R10	Long-detecting distance Narrow beam (8)type Armored (Approx. 50 g)
Retro-reflective	Long-detecting distance small	Thickness: 0.11" 2.8 1.10" 26.9	0.39" to 2.36" 10 to 60.3 0.39" to 18.90" 10 to 480.3			—	R0.08" R2	M6 Super small (Approx. 8 g)	FU-13 Free-cut 5.6 2 m
			3.94" to 24.80" 100 to 630 3.94" to 125.98" 100 to 3200			—	R0.39" R10	Square-shape, long-distance (Approx. 12 g)	FU-15 Free-cut 5.6 2 m
High-Flex	M4	4-0 to 158F (-40 to +70°C)	M4 0.59" 15	6.30" 160 1.38" 35	ø0.002" ø0.005 (gold wire)	R0.16" R4	High-flex fiber M4 (Approx. 8 g)	FU-68 Free-cut 5.6 2 m	
	M3	4-0 to 158F (-40 to +70°C)	M3 0.39" 10	2.95" 75 0.79" 20	ø0.002" ø0.005 (gold wire)	R0.16" R4	High-flex fiber M3 (Approx. 3 g)	FU-69X Free-cut 5.6 2 m	
	ø0.12" ø3	4-0 to 158F (-40 to +70°C)	ø0.12" ø3 0.59" 15	6.30" 160 1.38" 35	ø0.002" ø0.005 (gold wire)	R0.16" R4	High-flex fiber ø0.12" ø3 (Approx. 7 g)	FU-48 Free-cut 5.6 2 m	
	ø0.06" ø1.5	4-0 to 158F (-40 to +70°C)	ø0.06" ø1.5 0.59" 15	2.95" 75 0.79" 20	ø0.002" ø0.005 (gold wire)	R0.16" R4	High-flex fiber ø0.06" ø1.5 (Approx. 3 g)	FU-49X Free-cut 5.6 2 m	
	4-0 to 158F (-40 to +70°C)	ø0.06" ø1.5 0.59" 15	2.95" 75 0.79" 20	ø0.002" ø0.005 (gold wire)	R0.16" R4	High-flex fiber ø0.06" ø1.5 (Approx. 3 g)	FU-49X Free-cut 5.6 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).
3. When the R-2 (OP95388) is used: MEGA offers 0.39" to 37.01" 10 to 940 mm and FINE, 0.39" to 4.92" 10 to 125 mm.

Category		Reflective	Thin-sleeve	MEGA / FINE		MEGA	FINE	
Type	Shape	Detecting distance <sup>2</sup>			Smallest 1. detectable object	Minimum bend radius	Features	Model
Thin-sleeve	Side-view	Do not bend sleeve.	ø0.08" ø0.11" ø2 ø2.8 0.59" 0.59" 15 15	3.35" 85 0.67" 17	ø0.002" ø0.005 (copper wire)	R0.39" R10	Compact Side-view (Approx. 5 g)	FU-31 Free-cut 5.6 2 m
		Min. bend radius of sleeve: 0.98" 25	ø0.09" ø0.10" ø2.1 ø4.8 2.56" 65 0.59" 15	7.09" 180 0.98" 25	ø0.002" ø0.005 (copper wire)	R0.98" R25	Long-sleeve Side-view (Approx. 10 g)	FU-33 Free-cut 5.6 2 m
		Do not bend sleeve.	ø0.02" ø0.05" ø0.5 ø1.5 0.12" 3 0.59" 15	0.59" 15 0.12" 3	ø0.002" ø0.005 (gold wire)	R0.39" R10	Thin-sleeve (Approx. 10 g)	FU-46 Free-cut 5.6 2 m
		Do not bend sleeve.	ø0.09" ø0.12" ø0.82 ø3 0.20" 3 0.59" 15	1.77" 45 0.31" 8	ø0.002" ø0.005 (gold wire)	R0.08" R2	Thin-sleeve (Approx. 4 g)	FU-45X Free-cut 5.6 2 m
		Do not bend sleeve.	ø0.06" ø0.16" ø4 ø0.82 M3 0.87" 22 0.59" 15	7.09" 180 1.46" 37	ø0.002" ø0.005 (gold wire)	R0.98" R25	Thin-sleeve ø0.16" ø4 (Approx. 8 g)	FU-43 Free-cut 5.6 2 m
		Do not bend sleeve.	ø0.03" ø0.06" ø0.82 M4 0.59" 15 0.59" 15	1.77" 45 0.31" 8	ø0.002" ø0.005 (gold wire)	R0.16" R4	Thin-sleeve (Approx. 8 g)	FU-65X Free-cut 5.6 2 m
	End-view	Min. bend radius of sleeve: 0.39" 10	ø0.06" ø1.65" ø4 ø1.65" M4 2.64" 67 0.59" 15	7.09" 180 1.46" 37	ø0.002" ø0.005 (gold wire)	R0.98" R25	Long-sleeve M4 (Approx. 10 g)	FU-63 Free-cut 5.6 2 m
		Min. bend radius of sleeve: 0.39" 10	ø0.06" ø1.65" ø4 ø1.65" M4 2.64" 67 0.59" 15	7.09" 180 1.46" 37	ø0.002" ø0.005 (gold wire)	R0.98" R25	Long-sleeve Flat type (Approx. 10 g)	FU-63T Free-cut 5.6 2 m
		Min. bend radius of sleeve: 0.39" 10	ø0.09" ø2 M4 2.64" 67 0.59" 15	5.12" 130 0.98" 25	ø0.002" ø0.005 (gold wire)	R0.08" R2	M4 with sleeve (Approx. 10 g)	FU-63Z Free-cut 5.6 2 m
		Do not bend sleeve.	ø0.07" ø0.10" ø1.77 ø2.5 2.64" 6 0.55" 14	1.89" 48 0.39" 10	ø0.002" ø0.005 (gold wire)	R0.98" R25	Thin-sleeve Narrow-beam type (Approx. 4 g)	FU-22X Free-cut 5.6 2 m
		Do not bend sleeve.	ø0.07" ø0.10" ø1.77 ø2.5 2.64" 6 0.55" 14	1.89" 48 0.39" 10	ø0.002" ø0.005 (gold wire)	R0.98" R25	Thin-sleeve Narrow-beam type (Approx. 4 g)	FU-22X Free-cut 5.6 2 m
		Do not bend sleeve.	ø0.07" ø0.10" ø1.77 ø2.5 2.64" 6 0.55" 14	1.89" 48 0.39" 10	ø0.002" ø0.005 (gold wire)	R0.98" R25	Thin-sleeve Narrow-beam type (Approx. 4 g)	FU-22X Free-cut 5.6 2 m
Coaxial narrow beam	Do not bend sleeve.	ø0.07" ø0.10" ø1.77 ø2.5 2.64" 6 0.55" 14	1.89" 48 0.39" 10	ø0.002" ø0.005 (gold wire)	R0.98" R25	Thin-sleeve Narrow-beam type (Approx. 4 g)	FU-22X Free-cut 5.6 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	Definite-reflective	MEGA / FINE		MEGA	FINE		
Type	Shape	Detecting distance <sup>2</sup>			Smallest 1. detectable object	Minimum bend radius	Features	Model	
Definite-reflective	Short-detecting distance	Thickness: 0.20" 5 0.57" 14.4	0.12" 3 center of detecting distance			ø0.002" ø0.005 (gold wire)	R0.39" R10	Compact, straight (Approx. 6 g)	FU-37 Free-cut 5.6 2 m
		Thickness: 0.16" 4 0.47" 0.75" 19	0.24" 6 center of detecting distance			ø0.002" ø0.005 (gold wire)	R0.39" R10	Thin-profile, standard (Approx. 5 g)	FU-38 Free-cut 5.6 2 m
		Thickness: 0.17" 4.3 0.47" 0.75" 19	0 to 0.16" 0 to 4			ø0.0031" ø0.08 (copper wire)	R0.39" R10	Thin-profile, short-detecting distance (Approx. 5 g)	FU-38V Free-cut 5.6 2 m
	Long-detecting distance	Thickness: 0.14" 3.6 0.81" 1.14" 29	0 to 1.02" 0 to 26			—	R0.20" R5	Long-detecting distance, definite-reflective (Approx. 20 g)	FU-38S Free-cut 5.6 2 m
		Thickness: 0.15" 3.8 0.87" 1.14" 29	0 to 0.55" 0 to 14			ø0.012" ø0.3 (copper wire)	R0.98" R25	Thin-profile, long-detecting distance (Approx. 20 g)	FU-38R Free-cut 5.6 2 m
	Heat-resistant	Thickness: 0.20" 5 1.05" 27	0.10 to 2.56" 2.5 to 65 0.10 to 0.63" 2.5 to 16			—	R1.38" R35	Heat resistance: 356F (180°C) definite reflective (Approx. 45 g)	FU-38H Free-cut 5.6 2 m
		Thickness: 0.20" 5 1.46" 37	0.10 to 2.56" 2.5 to 65 0.10 to 0.63" 2.5 to 16			—	R0.98" R25	Heat resistance: 482F (250°C) definite reflective (Approx. 45 g)	FU-38K Free-cut 5.6 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	Oil-proof/Chemical proof/Heat-resistant	Detecting distance 2		Smallest 1. detectable object	Minimum bend radius	Features	Model	
Type	Shape	MEGA / FINE								
Oil-proof, Chemical proof	Heat-resistant	M6							 	
									-22 to 158°F (-40 to +70°C)	 
									212°F (100°C)	 
									-40 to 212°F (-40 to +100°C)	 
									221°F (105°C)	 
									-40 to 221°F (-40 to +105°C)	 
									356°F (180°C)	 
									-76 to 356°F (-60 to +180°C)	 
662°F (350°C)	 									
-22 to 662°F (-30 to +350°C)	 									
572°F (300°C)	 									
-40 to 572°F (-40 to +300°C)	 									
572°F (300°C)	 									
-40 to 572°F (-40 to +300°C)	 									

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

Category		Reflective	Liquid-level	Detecting distance 2		Smallest 1. detectable object	Minimum bend radius	Features	Model		
Type	Shape	MEGA / FINE									
Liquid-level	Tube-mountable										
										-40 to 158°F (-40 to +70°C)	 
										Transparent tube of 0.16" to 1.02" 4 to 26 dia.	 
										 	
	Immersion			Liquid (except for milky white liquids)		 					
	 										

- The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.
- The minimum bend radius of the PFA-sheathed section is R1.57" R40 mm. The 3.15" 80 mm section from the tip cannot be bent.

Category		Reflective	Reflective, small beam spot	Detecting distance 2		Smallest 1. detectable object	Minimum bend radius	Features	Model
Type	Shape	MEGA / FINE							
Ultra-small beam spot			0.20" ±0.04 5 ±1 with beam spot diameter of 0.004" 0.1		 				
Adjustable beam spot			0.39" to 1.18" 10 to 30 with beam spot diameter of 0.04" to 0.14" 0.9 to 3.5		 				

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



Category		Reflective	Lens for reflective type		MEGA	FINE
Type	Shape	Applicable fiber units	Detecting distance 1.		Features	Model
			MEGA / FINE			
Parallel beam		FU-35FZ	1.50" 38		0.16" 4 mm beam spot diameter (within the detecting of 0 to 0.79" 20)	F-3HA
		FU-2303	1.10" 28			
		FU-35TZ	1.38" 35			
		FU-35TG	0.98" 25			
		FU-35FA	2.56" 65	1.77" 45		
Small Beam Spot	Short-detecting distance	FU-24X	0.28" ±0.08" 7 ±2 with beam spot diameter of 0.004" 0.1 <sup>2</sup>		Suitable for small targets (Approx. 1 g)	F-2HA
		FU-21X	0.28" ±0.08" 7 ±2 with beam spot diameter of 0.008" 0.2 <sup>2</sup>			
		FU-35FZ	0.28" ±0.08" 7 ±2 with beam spot diameter of 0.004" 0.1 <sup>2</sup>			
		FU-2303	0.28" ±0.08" 7 ±2 with beam spot diameter of 0.008" 0.2 <sup>2</sup>			
		FU-35TZ	0.28" ±0.08" 7 ±2 with beam spot diameter of 0.016" 0.4 <sup>3</sup>			
	Medium-detecting distance	FU-35FZ	0.59" ±0.08" 15 ±2 with beam spot diameter of 0.02" 0.5		Suitable for small targets (Approx. 2 g)	F-4HA
		FU-2303				
		FU-35TZ				
		FU-35FA				
	Long-detecting distance	FU-21X	1.38" ±0.12" 35 ±3 with beam spot diameter of 0.04" 1.0		Long-detecting distance, small beam spot (Approx. 5 g)	F-6HA
		FU-35FZ				
		FU-2303	1.38" ±0.12" 35 ±3 with beam spot diameter of 0.08" 2.0			
		FU-35FA				
	Side-view	FU-21X	0.31" to 1.18" 8 to 30 with beam spot diameter of 0.02" to 0.12" 0.5 to 3.0 <sup>4</sup>		Space-saving, side-view (Approx. 2 g)	F-5HA
		FU-35FZ				
		FU-2303	0.31" to 1.18" 8 to 30 with beam spot diameter of 0.02" to 0.12" 0.5 to 3.0 <sup>4</sup>			
FU-35FA						

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

Category		Thrubeam	Standard	Detecting distance		MEGA	FINE	
Type	Shape			MEGA / FINE	Smallest 1. detectable object	Minimum bend radius	Features	Model
Standard	ToughFlex		M4	9.84" 250	0.0002" ±0.005 (gold wire)	R0.08" R2	Hex-Shaped (Approx. 43 g)	FU-77TZ Free-cut 6.6/2 m
				11.81" 300	0.0002" ±0.005	R0.02" R0.5	R0.5 M4 (Approx. 25 g)	FU-77V Free-cut 6.6/2 m
				11.81" 300	0.0002" ±0.005	R0.08" R2	R0.08" R2 M4 (Approx. 21 g)	FU-77 Free-cut 6.6/2 m
				11.81" 300	0.0002" ±0.005	R0.08" R2	R0.08" R2 ±0.12" ±0.3 (Approx. 19 g)	FU-5FZ Free-cut 6.6/2 m
	Armored		M6	17.72" 450	0.0002" ±0.005	R0.08" R2	R0.08" R2 (Approx. 25 g)	FU-71Z Free-cut 6.6/2 m
				9.84" 250	0.0002" ±0.005 (gold wire)	R0.39" R10	Hex-Shaped Armored (Approx. 43 g)	FU-77TG Free-cut 6.6/2 m
				11.81" 300	0.0002" ±0.005	R0.39" R10	R0.39" R10 Armored (Approx. 39 g)	FU-77G Free-cut 6.6/2 m
				15.75" 400	0.0002" ±0.005	R0.98" R25	Long-detecting distance M4 (Approx. 21 g)	FU-7F Free-cut 6.6/2 m
	Standard		M4	15.75" 400	0.0002" ±0.005	R0.98" R25	Long-detecting distance ±0.12" ±0.3 (Approx. 19 g)	FU-5F Free-cut 6.6/2 m
				21.65" 550	0.0002" ±0.005	R0.98" R25	Long-detecting distance M6 (Approx. 25 g)	FU-71 Free-cut 6.6/2 m
				7.48" 190	0.0002" ±0.005	R0.16" R4	R0.16" R4 (Approx. 9 g)	FU-78 Free-cut 6.6/2 m

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

Category		Thrubeam	Flat/Built-in lens, side-view/Top-view		Detecting distance		Smallest 1. detectable object	Minimum bend radius	Features	Model
Type	Shape		MEGA / FINE	MEGA	FINE					
Flat head (with mounting hole)	Side-view		$0.24^6$ $0.41^1$ 10.5	$2.17^55$	$12.99^330$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$ (gold wire)	R0.08" R2	Compact side-view type (Approx. 5 g)	<b>FU-57TZ</b> 	
			$0.39^9$ 10	$2.95^75$	$14.96^380$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.08" R2	Ultra-thin, side-view (Approx. 5 g)	<b>FU-51TZ</b> 	
	End-view		$0.28^8$ 14	$9.84^250$	$51.18^1300$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.08" R2	Long-detecting distance, thin, side-view (Approx. 15 g)	<b>FU-52TZ</b> 	
			$0.28^8$ 7	$9.84^250$	$51.18^1300$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.08" R2	Ultra-thin, flat-ON (Approx. 10 g)	<b>FU-53TZ</b> 	
			$0.16^5$ 4	$9.84^250$	$51.18^1300$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.08" R2	General-purpose, flat view (Approx. 25 g)	<b>FU-54TZ</b> 	
			$0.28^8$ 7	$9.84^250$	$51.18^1300$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.08" R2			
Built-in lens, side-view		$\varnothing 0.16^4$ $0.8^7$ 17	$24.80^630$	$125.98^3200$	$\varnothing 0.0004^{\circ}$ $\varnothing 0.1$	R0.08" R2	Ultra-long-detecting distance, side-view (Approx. 15 g)	<b>FU-16Z</b> 		
		$\varnothing 0.16^4$ $0.8^7$ 17	$37.40^950$	$141.73^23600^2$	$\varnothing 0.0004^{\circ}$ $\varnothing 0.1$	R0.39" R10	Ultra-long-detecting distance, side-view (Approx. 8 g)	<b>FU-16</b> 		
		$\varnothing 0.16^4$ $0.8^7$ 17	$31.50^800$	$125.98^3200$	$\varnothing 0.0004^{\circ}$ $\varnothing 0.1$	R0.39" R10	Ultra-narrow-beam, side-view (Approx. 8 g)	<b>FU-18</b> 		
		$0.06^5 \times 0.08^5 \times 0.79^5$ $1.5 \times 2 \times 20$	$9.45^240$	$33.46^850$	$\varnothing 0.0008^{\circ}$ $\varnothing 0.02$ (opaque target)	R0.39" R10	Mapping (Approx. 6 g)	<b>FU-18M</b> 		
		$0.14 \times 0.16^3 \times 3.6 \times 4$ $0.47^1$ 12	$90.55^2300$	$141.73^23600^2$	$\varnothing 0.0004^{\circ}$ $\varnothing 0.1$	R0.08" R2	Long-distance, square-rod head (Approx. 8 g)	<b>FU-50</b> 		







- The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.
- "141.73" 3600" is assumed as maximum because the fiber cable has the length of 6.6" 2 m.

Category		Thrubeam	Area/Thin-sleeve		Detecting distance		Smallest 1. detectable object	Minimum bend radius	Features	Model
Type	Shape		MEGA / FINE	MEGA	FINE					
Area		Do not bend sleeve: $0.79^1$ 20	$27.56^700$	$66.93^1700$	$\varnothing 0.35^{\circ} \varnothing 1.2$ (TURBO mode) $\varnothing 0.01^{\circ} \varnothing 0.3$ (FINE mode)	R0.08" R2	Area detection fiber with a detecting width of 0.39" 10 (Approx. 23 g)	<b>FU-12</b> 		
Thin-sleeve	Side-view		$\varnothing 0.03^{\circ} \varnothing 0.82$ $0.59^9$ 15	$1.50^38$	$11.81^300$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.98" R25	Side-view type with thin sleeve (Approx. 5 g)	<b>FU-32</b> 	
			Min. bend radius of sleeve: $0.98^{\circ} 25$ $0.05^{\circ} \varnothing 1.2 \varnothing 0.12^{\circ} \varnothing 3$ $2.56^9$ 15	$4.92^125$	$25.20^640$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.98" R25	Long-detecting distance, side-view (Approx. 17 g)	<b>FU-34</b> 	
			Min. bend radius of sleeve: $0.39^{\circ} 10$ $\varnothing 0.06^{\circ} \varnothing 1.5$ $2.64^9$ 15	$15.75^400$	$90.55^2300$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.98" R25	Long-detecting distance with sleeve (Approx. 24 g)	<b>FU-73</b> 	
	End-view		Do not bend sleeve: $\varnothing 0.82$ M3	$3.74^95$	$15.75^400$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.39" R10	Thin sleeve (Approx. 10 g)	<b>FU-75F</b> 	
			Min. bend radius of sleeve: $0.39^{\circ} 10$ $\varnothing 0.4$ $\varnothing 0.016^{\circ} \varnothing 0.12^{\circ} \varnothing 3$ $1.77^9$ 45	$6.30^160$	$1.26^32$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.39" R10	Thin sleeve (Approx. 10 g)	<b>FU-76F</b> 	
			Do not bend sleeve: $\varnothing 0.3$ $\varnothing 0.012^{\circ} \varnothing 0.10^{\circ} \varnothing 2.5$ $0.20^{\circ} 5$	$0.98^25$	$0.20^{\circ} 5$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.39" R10	Thin sleeve (Approx. 3 g)	<b>FU-56</b> 	

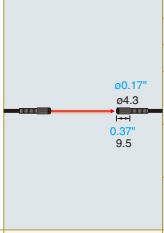
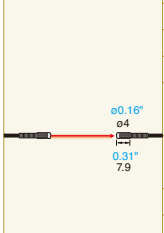
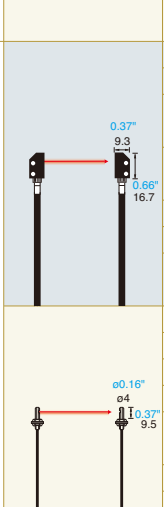
- The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.

Category		Thrubeam	High-flex/Extra-thin core fiber		Detecting distance		Smallest 1. detectable object	Minimum bend radius	Features	Model
Type	Shape		MEGA / FINE	MEGA	FINE					
High-flex	M3		$4.92^125$	$16.69^500$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.16" R4	High-flex M3 (Approx. 6 g)	<b>FU-79</b> 		
	$\varnothing 0.06$ $\varnothing 1.5$		$4.92^125$	$16.69^500$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.16" R4	High-flex $\varnothing 0.06^{\circ} \varnothing 1.5$ (Approx. 6 g)	<b>FU-59</b> 		
	Side-view		$0.24^6$ $0.41^1$ 10.5	$1.97^50$	$12.60^320$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$ (gold wire)	R0.16" R4	Compact side-view type (Approx. 5 g)	<b>FU-57TE</b> 	
Extra-thin core fiber	$\varnothing 0.04$ $\varnothing 1.0$		$5.91^150$	$1.26^32$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.39" R10	Ultra thin (Approx. 8 g)	<b>FU-58</b> 		
	$\varnothing 0.10$ $\varnothing 2.5$		$0.98^25$	$0.20^5$	$\varnothing 0.0002^{\circ}$ $\varnothing 0.005$	R0.39" R10	Thin (Approx. 3 g)	<b>FU-55</b> 		

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

Category		Thrubeam	Heat-resistant/Oil-proof,Chemical proof		Detecting distance		Smallest 1. detectable object	Minimum bend radius	Features	Model
Type	Shape	MEGA / FINE		MEGA / FINE						
Heat-resistant	212°F (100°C)	M4	11.81" 300	55.12" 1400	Lens: F-1, F-2, F-4, F-5		ø0.0002" ø0.005	R0.20" R5	R0.20" R5 Heat resistance: 212°F (100°C), M4 (Approx. 25 g)	FU-86Z  6.6' 2 m
	221°F (105°C)	M4	15.75" 400	90.55" 2300	Lens: F-1, F-2, F-4, F-5				R0.98" R25 Heat resistance: 221°F (105°C), M4 (Approx. 22 g)	FU-86  6.6' 2 m
	356°F (180°C)	M4	9.84" 250	51.18" 1300	Lens: F-2		ø0.0002" ø0.005	R0.98" R25 Heat resistance: 356°F (180°C), M4 (Approx. 36 g)	FU-88  6.6' 2 m	
	572°F (300°C)	M4	7.09" 180	37.40" 950	Lens: F-2		ø0.0002" ø0.005	R0.98" R25 Heat resistance: 572°F (300°C), M4 (Approx. 66 g)	FU-84C  6.6' 2 m	
Oil-proof, Chemical proof	ø0.20" ø5	(0.87") (22)	141.73" 3600 <sup>2</sup>	51.18" 1300	Lens: F-2		ø0.008" ø0.2	R1.57" R40	FEP fiber (Approx. 71 g)	FU-92  6.6' 2 m
	ø0.20" ø5 (0.31") (23)	(0.31") (23)	16.93" 430	106.30" 2700	Lens: F-2		ø0.004" ø0.1	R1.57" R40	FEP fiber, side-view type (Approx. 71 g)	FU-96  6.6' 2 m

1. The smallest detectable object was determined at the optimal detecting distance and sensitivity setting.  
 2. "141.73" 3600" is assumed as maximum because the fiber cable has the length of 6.6' 2 m.

Category		Thrubeam	Lenses for thrubeam type		Detecting distance		Smallest 1. detectable object	Minimum bend radius	Features	Model
Type	Shape	Applicable fiber units	MEGA / FINE		MEGA / FINE					
Ultra-long detecting distance, narrow beam		FU-77TZ	141.73" 3600 <sup>2</sup>	125.98" 3200			ø0.17" ø4.3 0.37" 9.5	R0.20" R5	Greatly increases the detecting distance. Aperture angle: 8° (Approx. 1 g)	F-4 Heat resistance: 158°F (70°C)
		FU-77	141.73" 3600 <sup>2</sup>	125.98" 3200						
		FU-77V	141.73" 3600 <sup>2</sup>	125.98" 3200						
		FU-77TG/77G	70.87" 1800	70.87" 1800						
		FU-7F	141.73" 3600 <sup>2</sup>	141.73" 3600 <sup>2</sup>						
		FU-78	141.73" 3600 <sup>2</sup>	98.43" 2500						
Long-detecting distance		FU-77	141.73" 3600 <sup>2</sup>	74.80" 1900			ø0.16" ø4 0.31" 7.9	R0.20" R5	Greatly increases the detecting distance. Aperture angle: 15° (Approx. 2 g)	F-2 Heat resistance: 572°F (300°C)
		FU-77TZ	141.73" 3600 <sup>2</sup>	74.80" 1900						
		FU-77V	141.73" 3600 <sup>2</sup>	74.80" 1900						
		FU-84C	141.73" 3600 <sup>2</sup>	74.80" 1900						
		FU-77TG/77G	70.87" 1800	70.87" 1800						
		FU-78	141.73" 3600 <sup>2</sup>	59.06" 1500						
		FU-7F	141.73" 3600 <sup>2</sup>	141.73" 3600 <sup>2</sup>						
		FU-86	90.55" 2300	90.55" 2300						
		FU-86Z	141.73" 3600 <sup>2</sup>	78.74" 2000						
		FU-86Z	141.73" 3600 <sup>2</sup>	98.43" 2500						
Side-view		FU-77	141.73" 3600 <sup>2</sup>	90.55" 2300			ø0.16" ø4 0.37" 9.3 0.38" 9.6 10.37" 9.5	R0.20" R5	Narrow-beam, side-view type (Approx. 10 g)	F-5 Heat resistance: 221°F (105°C)
		FU-77V	141.73" 3600 <sup>2</sup>	90.55" 2300						
		FU-77G	70.87" 1800	70.87" 1800						
		FU-78	141.73" 3600 <sup>2</sup>	90.55" 2300						
		FU-7F	141.73" 3600 <sup>2</sup>	141.73" 3600 <sup>2</sup>						
		FU-86	141.73" 3600 <sup>2</sup>	141.73" 3600 <sup>2</sup>						
		FU-86Z	141.73" 3600 <sup>2</sup>	98.43" 2500						
		FU-86Z	141.73" 3600 <sup>2</sup>	98.43" 2500						
		FU-77/77G	70.87" 1800	70.87" 1800						
		FU-77V	15.75" 400	15.75" 400						
		FU-7F	98.43" 2500	19.69" 500						
		FU-86Z	19.69" 500	19.69" 500						
		FU-86Z	74.80" 1900	15.75" 400						
		FU-78	55.12" 1400	11.81" 300						
FU-84C	11.81" 300	11.81" 300								

1. When using the F-1 at a temperature of 158°F (70°C) or more, specify the "Heat-resistant F-1".  
 2. "141.73" 3600" is assumed as maximum because the fiber cable has the length of 6.6' 2 m.

Model	Type	Features	Detecting distance 1: [Unit: inch/mm]					HIGH SPEED
			MEGA	ULTRA TURBO	SUPER TURBO	TURBO	FINE	
FU-10	Reflective	Small beam spot Adjustable beam spot	0.39' to 1.18' 10 to 30 with beam spot diameter of 0.04" to 0.14" 0.9 to 3.5 (0.39' to 1.18' 10 to 30 with beam spot diameter of 0.04" to 0.14" 0.9 to 3.5)					0.39' to 1.18' (0.39' to 1.18') 10 to 30 (10 to 30)
FU-11	Reflective	Area	0.20' to 6.30' (0.20" to 6.30") 5 to 160 (5 to 160)	0.20' to 6.30' (0.20" to 6.30") 5 to 160 (5 to 160)	0.20' to 5.91' (0.20" to 5.91") 5 to 150 (5 to 150)	0.20' to 5.51' (0.20" to 5.12") 5 to 140 (5 to 130)	0.20' to 4.72' (0.20" to 3.54") 5 to 120 (5 to 90)	0.20' to 2.76' (0.20" to 2.17") 5 to 70 (5 to 55)
FU-12	Thru-beam	Area	66.93" (55.12") 1700 (1400)	55.12" (43.31") 1400 (1100)	47.24" (37.40") 1200 (950)	37.40" (29.53") 950 (750)	27.56" (21.65") 700 (550)	12.60" (7.09") 320 (180)
FU-13	Retro-Reflective	Retro-reflective Super small	0.39' to 18.90' (0.39" to 14.96") <sup>2</sup> 10 to 480 (10 to 380) <sup>2</sup>	0.39' to 14.96' (0.39" to 11.81") <sup>2</sup> 10 to 380 (10 to 300) <sup>2</sup>	0.39' to 7.48' (0.39" to 5.91") <sup>2</sup> 10 to 190 (10 to 150) <sup>2</sup>	0.39' to 4.92' (0.39" to 3.94") <sup>2</sup> 10 to 125 (10 to 100) <sup>2</sup>	0.39' to 2.36' (0.39" to 1.97") <sup>2</sup> 10 to 60 (10 to 50) <sup>2</sup>	—
FU-15	Retro-Reflective	Retro-reflective Long-detecting distance	3.94' to 125.98' (0.39" to 98.43") 100 to 3200 (100 to 2500)	3.94' to 98.43' (0.39" to 78.74") 100 to 2500 (100 to 2000)	3.94' to 48.21' (3.94" to 39.37") 100 to 1250 (100 to 1000)	3.94' to 37.01' (3.94" to 29.53") 100 to 940 (100 to 750)	3.94' to 24.80' (3.94" to 19.69") 100 to 630 (100 to 500)	3.94' to 19.69' (3.94" to 15.75") 100 to 500 (100 to 400)
FU-16	Thru-beam	Built-in lens, side-view	141.73" (141.73") <sup>3</sup> 3600 (3600) <sup>3</sup>	141.73" (118.11") 3600 <sup>3</sup> (3000)	78.74" (59.06") 2000 (1500)	59.06" (47.2") 1500 (1200)	37.40" (29.53") 950 (750)	19.59" (11.02") 500 (280)
FU-16Z	Thru-beam	Built-in lens, side-view	125.98" (98.43") 3200 (2500)	98.43" (78.74") 2500 (2000)	51.18" (39.37") 1300 (1000)	39.37" (31.50") 1000 (800)	24.80" (19.69") 630 (500)	14.96" (8.66") 380 (220)
FU-18	Thru-beam	Built-in lens, side-view	125.98" (98.43") 3200 (2500)	98.43" (78.74") 2500 (2000)	59.06" (47.24") 1500 (1200)	47.24" (39.37") 1200 (1000)	31.50" (25.59") 800 (650)	18.90" (10.24") 480 (260)
FU-18M	Thru-beam	Built-in lens, side-view	33.46" (31.50") 850 (800)	27.56" (25.59") 700 (650)	14.17" (12.99") 360 (330)	11.81" (11.02") 300 (280)	9.45" (8.66") 240 (220)	5.12" (4.33") 130 (110)
FU-20	Reflective	Small beam spot ø0.004" ø0.1	0.20" ±0.04" 5 ±1 with beam spot diameter of 0.004" 0.1					—
FU-21X	Reflective	Coaxial Lens attachment available	3.54" (2.76") 90 (70)	2.76" (2.20") 70 (56)	1.38" (1.10") 35 (28)	0.98" (0.79") 25 (20)	0.59" (0.47") 15 (12)	0.39" (0.28") 10 (7)
FU-22X	Reflective	Sleeve Coaxial, narrow beam	1.89" (1.57") 48 (40)	1.65" (1.34") 42 (34)	0.59" (0.47") 15 (12)	0.51" (0.39") 13 (10)	0.39" (0.31") 10 (8)	0.24" (0.16") 6 (4)
FU-23X	Reflective	Coaxial High power	26.77" (21.65") <sup>3</sup> 680 (550)	21.65" (17.32") <sup>3</sup> 550 (440)	14.57" (11.81") <sup>3</sup> 370 (300)	9.84" (7.87") <sup>3</sup> 250 (200)	4.92" (3.94") <sup>3</sup> 125 (100)	3.35" (2.36") <sup>3</sup> 85 (60)
FU-2303	Reflective	Coaxial Lens attachment available	7.87" (6.30") 200 (160)	6.30" (5.12") 160 (130)	3.15" (2.56") 80 (65)	2.36" (1.77") 60 (45)	1.26" (0.98") 32 (25)	0.87" (0.67") 22 (17)
FU-24X	Reflective	Coaxial Lens attachment available	2.17" (1.77") 55 (45)	1.77" (1.42") 45 (36)	0.87" (0.71") 22 (18)	0.59" (0.47") 15 (12)	0.31" (0.28") 8 (7)	0.24" (0.16") 6 (4)
FU-25	Reflective	Coaxial High power	22.05" (18.50") 560 (470)	20.47" (16.93") 520 (430)	11.81" (9.45") 300 (240)	7.87" (6.30") 200 (160)	3.94" (3.15") 100 (80)	2.76" (1.97") 70 (50)
FU-31	Reflective	Sleeve Side-view	3.35" (2.68") 85 (68)	2.68" (2.13") 68 (54)	1.34" (1.06") 34 (27)	0.98" (0.79") 25 (20)	0.67" (0.51") 17 (13)	0.43" (0.31") 11 (8)
FU-32	Thru-beam	Sleeve Side-view	11.81" (9.06") 300 (230)	9.06" (7.09") 230 (180)	3.94" (2.95") 100 (75)	2.95" (2.36") 75 (60)	1.50" (1.18") 38 (30)	0.98" (0.59") 25 (15)
FU-33	Reflective	Sleeve Side-view	7.09" (5.91") 180 (150)	5.91" (4.72") 150 (120)	2.95" (2.36") 75 (60)	1.97" (1.57") 50 (40)	0.98" (0.79") 25 (20)	0.71" (0.55") 18 (14)
FU-34	Thru-beam	Sleeve Side-view	25.20" (20.47") 640 (520)	19.69" (15.75") 500 (400)	12.60" (9.84") 320 (250)	9.84" (7.87") 250 (200)	4.92" (3.94") 125 (100)	3.54" (1.97") 90 (50)
FU-35FA	Reflective	Coaxial Lens attachment available	13.39" (10.63") 340 (270)	10.63" (8.66") 270 (220)	5.51" (4.33") 140 (110)	3.54" (2.76") 90 (70)	1.77" (1.38") 45 (35)	1.18" (0.98") 30 (25)
FU-35FZ	Reflective	Coaxial Lens attachment available	7.87" (6.30") 200 (160)	6.30" (5.12") 160 (130)	3.15" (2.56") 80 (65)	2.36" (1.77") 60 (45)	1.26" (0.98") 32 (25)	0.87" (0.67") 22 (17)
FU-35TG	Reflective	Coaxial Lens attachment available	7.09" (5.51") 180 (140)	5.51" (4.33") 140 (110)	2.95" (2.36") 75 (60)	2.17" (1.65") 55 (42)	1.18" (0.91") 30 (23)	0.79" (0.63") 20 (16)
FU-35TZ	Reflective	Coaxial Lens attachment available	7.09" (5.51") 180 (140)	5.51" (4.33") 140 (110)	2.95" (2.36") 75 (60)	2.17" (1.65") 55 (42)	1.18" (0.91") 30 (23)	0.79" (0.63") 20 (16)
FU-37	Reflective	Definite-reflective Short-detecting distance	0.12" 3 (center of detecting distance)					
FU-38	Reflective	Definite-reflective Short-detecting distance	0.24" 6 (center of detecting distance)					
FU-38H	Reflective	Definite-reflective Heat-resistant	0.10' to 2.56' (0.10" to 2.17") 2.5 to 65 (2.5 to 55)	0.10' to 2.17' (0.10" to 1.73") 2 to 55 (2.5 to 44)	0.10' to 1.06' (0.10" to 0.87") 2.5 to 27 (2.5 to 22)	0.10' to 0.87' (0.10" to 0.75") 2.5 to 22 (2.5 to 19)	0.10' to 0.63' (0.10" to 0.47") 2.5 to 16 (2.5 to 12)	0.10' to 0.39' (0.10" to 0.28") 2.5 to 10 (2.5 to 7)
FU-38K	Reflective	Definite-reflective Heat-resistant	0.10' to 2.56' (0.10" to 2.17") 2.5 to 65 (2.5 to 55)	0.10' to 2.17' (0.10" to 1.73") 2 to 55 (2.5 to 44)	0.10' to 1.06' (0.10" to 0.87") 2.5 to 27 (2.5 to 22)	0.10' to 0.87' (0.10" to 0.75") 2.5 to 22 (2.5 to 19)	0.10' to 0.63' (0.10" to 0.47") 2.5 to 16 (2.5 to 12)	0.10' to 0.39' (0.10" to 0.28") 2.5 to 10 (2.5 to 7)
FU-38R	Reflective	Definite-reflective Long detecting distance	0" to 0.55" (0" to 0.55") 0 to 14 (0 to 14)					0" to 0.47" (0" to 0.35") 0 to 12 (0 to 9)
FU-38S	Reflective	Definite-reflective Long detecting distance	0" to 1.02" (0" to 1.02") 0 to 26 (0 to 26)					0" to 0.59" (0" to 0.39") 0 to 15 (0 to 10)
FU-38V	Reflective	Definite-reflective Short-detecting distance	0" to 0.16" (0" to 0.16") 0 to 4 (0 to 4)					0.08" ±0.06" (0.08" ±0.06") 2 ±1.4 (2 ±1.4)
FU-40	Reflective	High-power	1.18' to 59.06' (1.18" to 47.24") 30 to 1500 (30 to 1200)	1.18' to 43.31" (1.18" to 33.46") 30 to 1100 (30 to 850)	1.18' to 15.75' (1.18" to 12.60") 30 to 400 (30 to 320)	1.18' to 10.24" (1.18" to 8.66") 30 to 260 (30 to 220)	1.18' to 5.91" (1.18" to 4.72") 30 to 150 (30 to 120)	1.18' to 3.94" (1.18" to 3.15") 30 to 100 (30 to 80)
FU-40G	Reflective	High-power	1.18' to 59.06' (1.18" to 47.24") 30 to 1500 (30 to 1200)	1.18' to 43.31" (1.18" to 33.46") 30 to 1100 (30 to 850)	1.18' to 15.75' (1.18" to 12.60") 30 to 400 (30 to 320)	1.18' to 10.24" (1.18" to 8.66") 30 to 260 (30 to 220)	1.18' to 5.91" (1.18" to 4.72") 30 to 150 (30 to 120)	1.18' to 3.94" (1.18" to 3.15") 30 to 100 (30 to 80)
FU-41TZ	Reflective	Flat head (with mounting hole) Flat-view	0.08" to 2.36" (0.08" to 1.97") 2 to 60 (2 to 50)	0.08" to 1.97" (0.08" to 1.57") 2 to 50 (2 to 40)	0.08" to 0.98" (0.08" to 0.79") 2 to 25 (2 to 20)	0.08" to 0.74" (0.08" to 0.63") 2 to 20 (2 to 16)	0.08" to 0.34" (0.08" to 0.31") 2 to 10 (2 to 8)	0.08" to 0.24" (0.08" to 0.16") 2 to 6 (2 to 4)
FU-42TZ	Reflective	Flat head (with mounting hole) Flat-view	0.04" to 12.60" (0.04" to 9.84") 1 to 320 (1 to 250)	0.04" to 9.84" (0.04" to 7.87") 1 to 250 (1 to 200)	0.04" to 4.72" (0.04" to 3.94") 1 to 120 (1 to 100)	0.04" to 2.95" (0.04" to 2.36") 1 to 75 (1 to 60)	0.04" to 1.46" (0.04" to 1.18") 1 to 30 (1 to 25)	0.04" to 0.98" (0.04" to 0.87") 1 to 15 (1 to 10)
FU-43	Reflective	Sleeve Top-view	7.04" (5.91") 180 (150)	5.91" (4.72") 150 (120)	3.35" (2.76") 85 (70)	2.36" (1.97") 60 (50)	1.46" (1.18") 37 (30)	0.94" (0.63") 24 (16)
FU-44TZ	Reflective	Flat head (with mounting hole) Top-view	0.04" to 3.54" (0.04" to 2.95") 1 to 90 (1 to 75)	0.04" to 2.95" (0.04" to 2.36") 1 to 75 (1 to 60)	0.04" to 1.77" (0.04" to 1.46") 1 to 45 (1 to 37)	0.04" to 1.46" (0.04" to 1.18") 1 to 37 (1 to 30)	0.04" to 0.98" (0.04" to 0.79") 1 to 25 (1 to 20)	0.04" to 0.35" (0.04" to 0.24") 1 to 9 (1 to 6)
FU-45X	Reflective	Sleeve Top-view	1.77" (1.38") 45 (35)	1.38" (1.10") 35 (28)	0.71" (0.55") 18 (14)	0.51" (0.39") 13 (10)	0.31" (0.24") 8 (6)	0.20" (0.16") 5 (4)
FU-46	Reflective	Sleeve Top-view	0.59" (0.47") 15 (12)	0.49" (0.39") 12 (10)	0.31" (0.28") 8 (7)	0.24" (0.20") 6 (5)	0.12" (0.08") 3 (2)	0.06" (0.04") 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 (0.39" to 37.00" 10 to 940 mm)/ULTRA (0.39" to 29.53" 10 to 750 mm)/SURER (0.39" to 14.96" 10 to 380 mm)/TURBO (0.39" to 9.84" 10 to 250 mm)/FINE (0.39" to 4.92" 10 to 125 mm)  
 3. "141.73" 3600" is assumed as maximum because the fiber cable has the length of 6.6' 2 m.

Model	Type	Features	Detecting distance <sup>1</sup> : [Unit: inch/mm]					
			MEGA	ULTRA TURBO	SUPER TURBO	TURBO	FINE	HIGH SPEED
FU-47TZ	Reflective	Flat head (with mounting hole) Side-view	0.04" to 3.54" (0.04" to 2.95") 1 to 90 (1 to 75)	0.04" to 2.95" (0.04" to 2.36") 1 to 75 (1 to 60)	0.04" to 1.77" (0.04" to 1.46") 1 to 45 (1 to 37)	0.04" to 1.46" (0.04" to 1.18") 1 to 37 (1 to 30)	0.04" to 0.98" (0.04" to 0.79") 1 to 25 (1 to 20)	0.04" to 0.47" (0.04" to 0.31") 1 to 12 (1 to 8)
FU-48	Reflective	High-Flex ø0.12" ø3	6.30" (5.12") 160 (130)	5.12" (4.33") 130 (110)	2.76" (2.17") 70 (55)	1.97" (1.57") 50 (40)	1.38" (1.10") 35 (28)	0.87" (0.67") 22 (17)
FU-49X	Reflective	High-Flex ø0.06" ø1.5	2.95" (2.36") 75 (60)	2.36" (1.97") 60 (50)	1.26" (0.98") 32 (25)	0.98" (0.79") 25 (20)	0.79" (0.63") 20 (16)	0.51" (0.39") 13 (10)
FU-4F	Reflective	Standard	27.56" (20.87") 700 (530)	20.47" (16.93") 520 (430)	13.78" (9.84") 350 (250)	9.06" (7.09") 230 (180)	4.92" (3.94") 125 (100)	3.15" (2.17") 80 (55)
FU-4FZ	Reflective	Standard Unbreakable	15.75" (12.60") 400 (320)	12.60" (10.24") 320 (260)	6.30" (5.12") 160 (130)	4.72" (3.54") 120 (90)	2.36" (1.77") 60 (45)	1.57" (1.18") 40 (30)
FU-50	Thrubeam	Built-in lens, Top-view	141.73" (141.73") <sup>2</sup> 3600 (3600) <sup>2</sup>	141.73" (141.73") <sup>2</sup> 3600 (3600) <sup>2</sup>	141.73" (141.73") <sup>2</sup> 3600 (3600) <sup>2</sup>	141.73" (141.73") <sup>2</sup> 3600 <sup>2</sup> (3200)	90.55" (70.87") 2300 (1800)	59.06" (33.46") 1500 (850)
FU-51TZ	Thrubeam	Flat head (with mounting hole) Top-view	14.96" (11.02") 380 (280)	11.81" (9.06") 300 (230)	7.09" (5.91") 180 (150)	5.91" (4.72") 150 (120)	2.95" (2.36") 75 (60)	1.77" (0.98") 45 (25)
FU-52TZ	Thrubeam	Flat head (with mounting hole) Top-view	51.18" (39.37") 1300 (1000)	43.31" (33.46") 1100 (850)	24.41" (19.69") 620 (500)	19.69" (15.75") 500 (400)	9.84" (7.87") 250 (200)	6.30" (3.94") 160 (100)
FU-53TZ	Thrubeam	Flat head (with mounting hole) Flat-view	9.84" (7.87") 250 (200)	7.87" (5.91") 200 (150)	5.12" (3.94") 130 (100)	3.94" (3.15") 100 (80)	1.97" (1.57") 50 (40)	1.57" (0.98") 40 (25)
FU-54TZ	Thrubeam	Flat head (with mounting hole) Flat-view	51.18" (39.37") 1300 (1000)	43.31" (33.46") 1100 (850)	24.41" (19.69") 620 (500)	19.69" (15.75") 500 (400)	9.84" (7.87") 250 (200)	6.30" (3.94") 160 (100)
FU-55	Thrubeam	Extra-thin core fiber ø0.10" ø2.5	0.98" (0.79") 25 (20)	0.79" (0.63") 20 (16)	0.59" (0.39") 15 (10)	0.39" (0.28") 10 (7)	0.20" (0.16") 5 (4)	—
FU-56	Thrubeam	Sleeve Top-view	0.98" (0.79") 25 (20)	0.79" (0.63") 20 (16)	0.59" (0.39") 15 (10)	0.39" (0.28") 10 (7)	0.20" (0.16") 5 (4)	—
FU-57TE	Thrubeam	High-Flex Side-view	12.60" (9.84") 320 (250)	9.84" (7.87") 250 (200)	5.51" (4.33") 140 (110)	3.94" (3.15") 100 (80)	1.97" (1.57") 50 (40)	1.18" (0.79") 30 (20)
FU-57TZ	Thrubeam	Flat head (with mounting hole) Side-view	12.99" (9.84") 330 (250)	9.84" (7.87") 250 (200)	5.91" (4.72") 150 (120)	4.33" (3.54") 110 (90)	2.17" (1.77") 55 (45)	1.38" (0.98") 35 (25)
FU-58	Thrubeam	Extra-thin core fiber ø0.04" ø1.0	5.91" (4.72") 150 (120)	5.12" (3.94") 130 (100)	2.56" (1.97") 65 (50)	1.97" (1.57") 50 (40)	1.26" (0.98") 32 (25)	0.79" (0.47") 20 (12)
FU-59	Thrubeam	High-Flex ø0.06" ø1.5	19.69" (14.96") 500 (380)	16.54" (12.99") 420 (330)	10.63" (7.87") 270 (200)	8.66" (6.69") 220 (170)	4.92" (3.94") 125 (100)	2.76" (1.38") 70 (35)
FU-5F	Thrubeam	Standard	90.55" (55.12") 2300 (1400)	62.99" (43.31") 1600 (1100)	39.40" (31.50") 950 (800)	31.50" (23.62") 800 (600)	15.75" (12.60") 400 (320)	8.66" (5.91") 220 (150)
FU-5FZ	Thrubeam	Standard Unbreakable	66.93" (51.18") 1700 (1300)	51.18" (43.31") 1300 (1100)	29.53" (23.62") 750 (600)	23.62" (18.11") 600 (460)	11.81" (9.06") 300 (230)	7.87" (5.51") 200 (140)
FU-61	Reflective	Standard	37.40" (30.71") 950 (780)	35.43" (28.35") 900 (720)	19.69" (15.75") 500 (400)	14.17" (11.02") 360 (280)	7.87" (5.91") 200 (150)	4.72" (3.15") 120 (80)
FU-61Z	Reflective	Standard Unbreakable	26.77" (21.65") 680 (550)	21.65" (17.72") 550 (450)	14.57" (11.02") 370 (280)	9.84" (7.87") 250 (200)	4.92" (3.94") 125 (100)	3.15" (2.36") 80 (60)
FU-63	Reflective	Sleeve Top-view	7.09" (5.91") 180 (150)	5.91" (4.72") 150 (120)	3.35" (2.76") 85 (70)	2.36" (1.97") 60 (50)	1.46" (1.18") 37 (30)	0.94" (0.63") 24 (16)
FU-63T	Reflective	Sleeve Top-view	7.09" (5.91") 180 (150)	5.91" (4.72") 150 (120)	3.35" (2.76") 85 (70)	2.36" (1.97") 60 (50)	1.46" (1.18") 37 (30)	0.94" (0.63") 24 (16)
FU-63Z	Reflective	Sleeve Top-view	5.12" (4.33") 130 (110)	4.33" (3.54") 110 (90)	2.17" (1.77") 55 (45)	1.69" (1.38") 43 (35)	0.98" (0.79") 25 (20)	0.51" (0.31") 13 (8)
FU-65X	Reflective	Sleeve Top-view	1.77" (1.38") 45 (35)	1.38" (1.10") 35 (28)	0.71" (0.55") 18 (14)	0.51" (0.39") 13 (10)	0.31" (0.24") 8 (6)	0.20" (0.16") 5 (4)
FU-66	Reflective	Standard	27.56" (20.87") 700 (530)	20.47" (16.93") 520 (430)	13.78" (9.84") 350 (250)	9.06" (7.09") 230 (180)	4.92" (3.94") 125 (100)	3.15" (2.17") 80 (55)
FU-66TZ	Reflective	Standard Unbreakable	13.78" (11.02") 350 (280)	11.02" (9.06") 280 (230)	5.91" (4.72") 150 (120)	3.94" (3.15") 100 (80)	1.97" (1.57") 50 (40)	1.38" (1.10") 35 (28)
FU-66Z	Reflective	Standard Unbreakable	15.75" (12.60") 400 (320)	12.60" (10.24") 320 (260)	6.30" (5.12") 160 (130)	4.72" (3.54") 120 (90)	2.36" (1.77") 60 (45)	1.57" (1.18") 40 (30)
FU-67	Reflective	Standard Unbreakable	19.69" (15.75") 500 (400)	12.60" (12.60") 400 (320)	8.66" (7.09") 220 (180)	6.69" (5.12") 170 (130)	3.35" (2.56") 85 (65)	1.97" (1.42") 50 (36)
FU-67G	Reflective	Standard ToughFlex	19.69" (15.75") 500 (400)	15.75" (12.60") 400 (320)	8.66" (7.09") 220 (180)	6.69" (5.12") 170 (130)	3.35" (2.56") 85 (65)	1.97" (1.42") 50 (36)
FU-67TG	Reflective	Standard ToughFlex	19.69" (15.75") 500 (400)	15.75" (12.60") 400 (320)	7.87" (6.30") 200 (160)	5.91" (4.72") 150 (120)	2.95" (2.36") 75 (60)	1.77" (1.30") 45 (33)
FU-67TZ	Reflective	Standard Unbreakable	19.69" (15.75") 500 (400)	15.75" (12.60") 400 (320)	7.87" (6.30") 200 (160)	5.91" (4.72") 150 (120)	2.95" (2.36") 75 (60)	1.77" (1.30") 45 (33)
FU-67V	Reflective	Standard Unbreakable	19.69" (15.75") 500 (400)	15.75" (12.60") 400 (320)	8.66" (7.09") 220 (180)	6.69" (5.12") 170 (130)	3.35" (2.56") 85 (65)	1.97" (1.42") 50 (36)
FU-68	Reflective	High-Flex M4	6.30" (5.12") 160 (130)	5.12" (4.33") 130 (110)	2.76" (2.17") 70 (55)	1.97" (1.57") 50 (40)	1.38" (1.10") 35 (28)	0.87" (0.67") 22 (17)
FU-69X	Reflective	High-Flex M3	2.95" (2.36") 75 (60)	2.36" (1.97") 60 (50)	1.26" (0.98") 32 (25)	0.98" (0.79") 25 (20)	0.79" (0.63") 20 (16)	0.51" (0.39") 13 (10)
FU-6F	Reflective	Standard	27.56" (20.87") 700 (530)	20.47" (16.93") 520 (430)	13.78" (9.84") 350 (250)	9.06" (7.09") 230 (180)	4.92" (3.94") 125 (100)	3.15" (2.17") 80 (55)
FU-71	Thrubeam	Standard	102.36" (74.80") 2600 (1900)	78.74" (62.99") 2000 (1600)	53.15" (39.37") 1350 (1000)	39.37" (33.46") 1000 (850)	21.65" (17.72") 550 (450)	12.99" (7.87") 330 (200)
FU-71Z	Thrubeam	Standard Unbreakable	94.49" (66.93") 2400 (1700)	74.80" (51.18") 1900 (1300)	43.31" (35.43") 1100 (900)	35.43" (27.56") 900 (700)	17.72" (13.78") 450 (350)	10.63" (6.30") 270 (160)
FU-73	Thrubeam	Sleeve Top-view	90.55" (55.12") 2300 (1400)	62.99" (43.31") 1600 (1100)	37.40" (31.50") 950 (800)	31.50" (23.62") 800 (600)	15.75" (12.60") 400 (320)	8.66" (5.91") 220 (150)
FU-75F	Thrubeam	Sleeve Top-view	15.75" (11.81") 400 (300)	13.39" (10.24") 340 (260)	7.09" (5.91") 180 (150)	5.91" (4.72") 150 (120)	3.74" (2.95") 95 (75)	1.97" (1.18") 50 (30)

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. "141.73" 3600" is assumed as maximum because the fiber cable has the length of 6.6' 2 m.

Model	Type	Features	Detecting distance 1: [Unit: inch/mm]						
			MEGA	ULTRA TURBO	SUPER TURBO	TURBO	FINE	HIGH SPEED	
FU-76F	Thrubeam	Sleeve Top-view	6.30" (5.12") 160 (130)	5.12" (3.94") 130 (100)	2.56" (1.97") 65 (50)	1.97" (1.57") 50 (40)	1.26" (0.98") 32 (25)	0.71" (0.39") 18 (10)	
FU-77	Thrubeam	Standard Unbreakable	66.93" (51.18") 1700 (1300)	51.18" (43.31") 1300 (1100)	29.53" (23.62") 750 (600)	23.62" (18.11") 600 (460)	11.81" (9.06") 300 (230)	7.87" (5.51") 200 (140)	
FU-77G	Thrubeam	Standard Tough Flex	66.93" (51.18") 1700 (1300)	51.18" (43.31") 1300 (1100)	29.53" (23.62") 750 (600)	23.62" (18.11") 600 (460)	11.81" (9.06") 300 (230)	7.87" (5.51") 200 (140)	
FU-77TG	Thrubeam	Standard Tough Flex	55.12" (43.31") 1400 (1100)	43.31" (34.65") 1100 (880)	25.59" (19.69") 650 (500)	19.69" (15.75") 500 (400)	9.84" (7.87") 250 (200)	6.69" (4.33") 170 (110)	
FU-77TZ	Thrubeam	Standard Unbreakable	55.12" (43.31") 1400 (1100)	43.31" (34.65") 1100 (880)	25.59" (19.69") 650 (500)	19.69" (15.75") 500 (400)	9.84" (7.87") 250 (200)	6.69" (4.33") 170 (110)	
FU-77V	Thrubeam	Standard Unbreakable	66.93" (51.18") 1700 (1300)	51.18" (43.31") 1300 (1100)	29.53" (23.62") 750 (600)	23.62" (18.11") 600 (460)	11.81" (9.06") 300 (230)	7.87" (5.51") 200 (140)	
FU-78	Thrubeam	Standard	39.37" (29.53") 1000 (750)	31.50" (23.62") 800 (600)	18.11" (14.57") 460 (370)	14.57" (11.81") 370 (300)	7.48" (5.91") 190 (150)	5.12" (2.95") 130 (75)	
FU-79	Thrubeam	High-Flex M3	19.69" (14.96") 500 (380)	16.54" (12.99") 420 (330)	10.63" (7.87") 270 (200)	8.66" (6.69") 220 (170)	4.92" (3.94") 125 (100)	2.76" (1.38") 70 (35)	
FU-7F	Thrubeam	Standard	90.55" (55.12") 2300 (1400)	62.99" (43.31") 1600 (1100)	37.40" (31.50") 950 (800)	31.50" (23.62") 800 (600)	15.75" (12.60") 400 (320)	8.66" (5.91") 220 (150)	
FU-81C	Reflective	Heat-resistant 662°F (350°C)	15.75" (14.17") 400 (360)	14.17" (11.02") 360 (280)	8.27" (6.69") 210 (170)	5.91" (4.72") 150 (120)	2.95" (2.36") 75 (60)	1.77" (1.38") 45 (35)	
FU-82C	Reflective	Heat-resistant 572°F (300°C)	16.54" (13.39") 420 (340)	16.54" (13.39") 420 (340)	10.24" (8.27") 260 (210)	7.09" (5.51") 180 (140)	3.54" (2.76") 90 (70)	2.17" (1.77") 55 (45)	
FU-83C	Reflective	Heat-resistant 572°F (300°C)	16.54" (13.39") 420 (340)	16.54" (13.39") 420 (340)	10.24" (8.27") 260 (210)	7.09" (5.51") 180 (140)	3.54" (2.76") 90 (70)	2.17" (1.77") 55 (45)	
FU-84C	Thrubeam	Heat-resistant 572°F (300°C)	37.40" (29.53") 950 (750)	29.53" (23.62") 750 (600)	18.11" (14.96") 460 (380)	14.96" (11.81") 380 (300)	7.09" (5.91") 180 (150)	5.12" (2.95") 130 (75)	
FU-85	Reflective	Heat-resistant 221°F (105°C)	26.77" (22.05") 680 (560)	22.05" (17.72") 560 (450)	14.57" (11.81") 370 (300)	9.84" (7.87") 250 (200)	4.72" (3.94") 120 (100)	3.15" (2.36") 80 (60)	
FU-85Z	Reflective	Heat-resistant 212°F (100°C)	18.11" (14.96") 460 (380)	14.96" (11.81") 380 (300)	8.66" (7.09") 220 (180)	6.30" (5.12") 160 (130)	3.15" (2.56") 80 (65)	1.97" (1.57") 50 (40)	
FU-86	Thrubeam	Heat-resistant 221°F (105°C)	90.55" (55.12") 2300 (1400)	62.99" (43.31") 1600 (1100)	37.40" (31.50") 950 (800)	31.50" (23.62") 800 (600)	15.75" (12.60") 400 (320)	8.66" (5.91") 220 (150)	
FU-86Z	Thrubeam	Heat-resistant 212°F (100°C)	55.12" (43.31") 1400 (1100)	43.31" (34.46") 1100 (850)	31.50" (23.62") 800 (600)	21.65" (17.31") 550 (440)	11.81" (9.84") 300 (250)	7.48" (4.33") 190 (110)	
FU-87	Reflective	Heat-resistant 356°F (180°C)	22.44" (18.11") 570 (460)	18.11" (14.17") 460 (360)	10.24" (8.27") 260 (210)	7.09" (5.51") 180 (140)	3.54" (2.76") 90 (70)	2.17" (1.77") 55 (45)	
FU-88	Thrubeam	Heat-resistant 356°F (180°C)	51.18" (39.37") 1300 (1000)	39.37" (31.50") 1000 (800)	24.41" (19.69") 620 (500)	19.69" (15.75") 500 (400)	9.84" (7.87") 250 (200)	7.09" (4.33") 180 (110)	
FU-91	Reflective	Oil-proof, Chemical proof	8.66" (7.09") 220 (180)	8.66" (7.09") 220 (180)	5.31" (4.33") 135 (110)	4.33" (3.35") 110 (85)	2.95" (2.36") 75 (60)	1.77" (1.38") 45 (35)	
FU-92	Thrubeam	Oil-proof, Chemical proof	141.73" (141.73") <sup>2</sup> 3600 (3600) <sup>2</sup>	141.73" (141.73") <sup>2</sup> 3600 (3600) <sup>2</sup>	118.11" (94.49") 3000 (2400)	102.36" (78.74") 2600 (2000)	51.18" (39.37") 1300 (1000)	29.53" (15.75") 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 0.16" to 1.02" 4 to 26 dia.						—
FU-95HA	Reflective	Liquid-level Tube-mountable	Transparent tube of 0.16" to 1.02" 4 to 26 dia.						—
FU-95S	Reflective	Liquid-level Tube-mountable	Transparent tube of 0.16" to 1.02" 4 to 26 dia.						—
FU-95Z	Reflective	Liquid-level Tube-mountable	Transparent tube of 0.16" to 1.02" 4 to 26 dia.						—
FU-96	Thrubeam	Oil-proof, Chemical proof	106.30" (86.61") 2700 (2200)	86.61" (66.93") 2200 (1700)	43.31" (34.65") 1100 (880)	34.65" (27.56") 880 (700)	16.93" (13.78") 430 (350)	9.45" (6.30") 240 (160)	

NOTE: Standard target: White matte paper (Reflective type only).

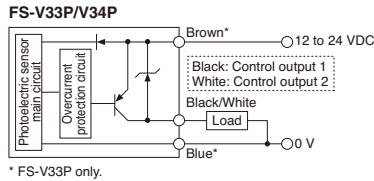
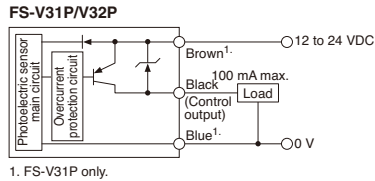
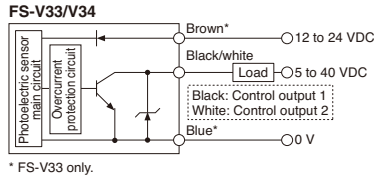
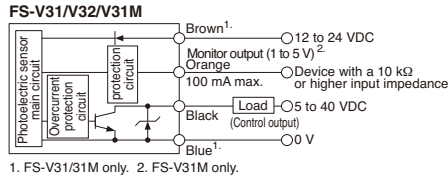
1. Each detecting distance in parentheses shows the data when the S-APC function is ON. S-APC will be always turned ON when the high-resolution or high-speed mode is selected.

2. "141.73" 3600" is assumed as maximum because the fiber cable has the length of 6.6' 2 m.

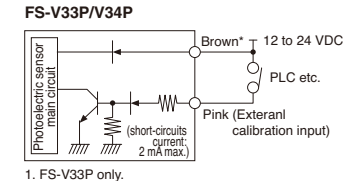
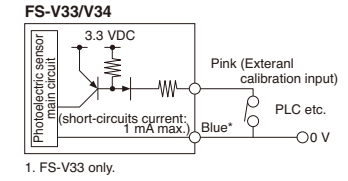
Input/Output Circuits

Cable type

Output circuit



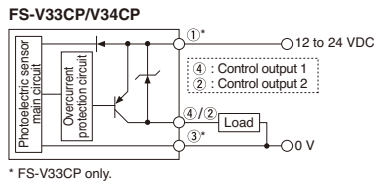
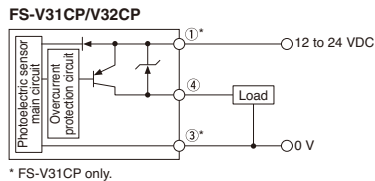
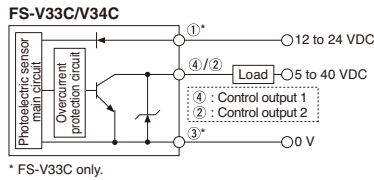
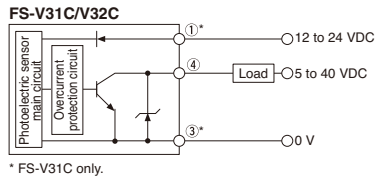
Input circuit



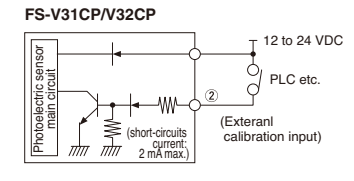
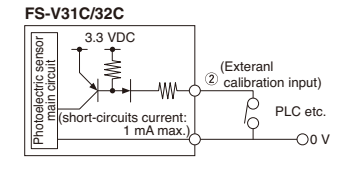
Connector type



Output circuit



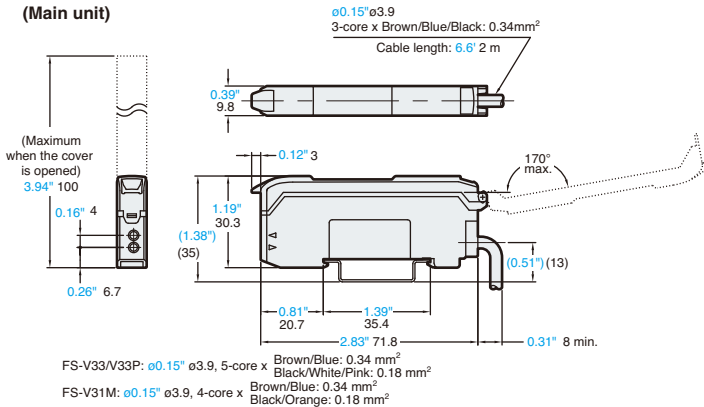
Input circuit



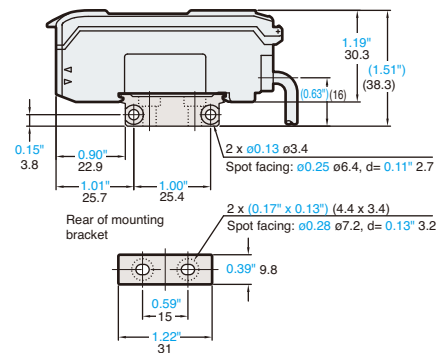
Dimensions

Unit: inch mm

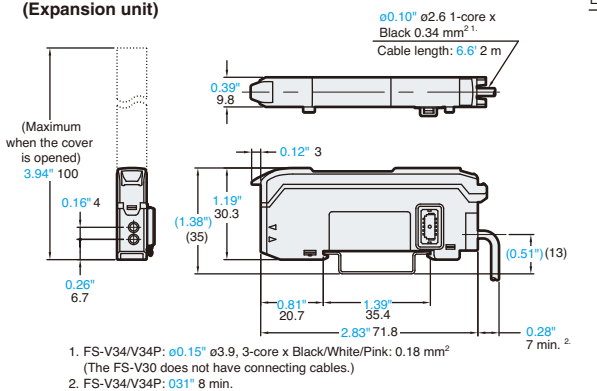
FS-V31/V31P/V33/V33P/V31M (Main unit)



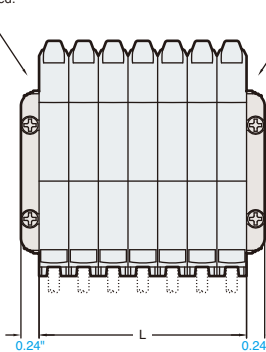
When the mounting bracket (Optional) OP-73880 is attached:



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

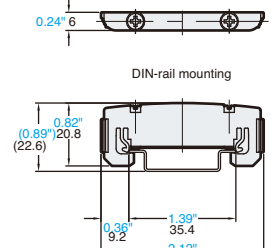


When several units are connected:

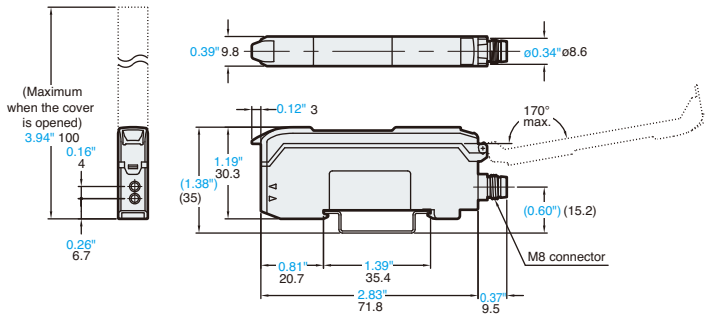


No. of units	L
1	0.77" 19.6
2	1.16" 29.4
3	1.54" 39.2
4	1.93" 49.0
5	2.31" 58.8
6	2.70" 68.6
7	3.09" 78.4
8	3.47" 88.2
9	3.86" 98.0
10	4.24" 107.8
11	4.63" 117.6
12	5.02" 127.4
13	5.40" 137.2
14	5.79" 147.0
15	6.17" 156.8
16	6.56" 166.6

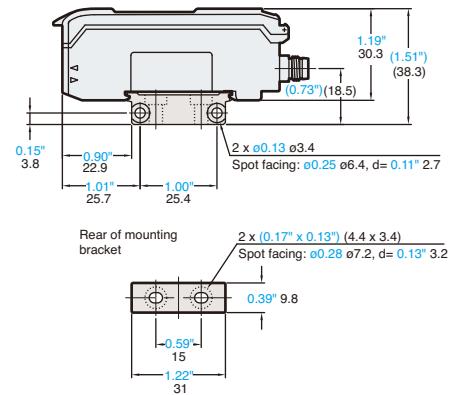
End unit (Optional) OP-26751



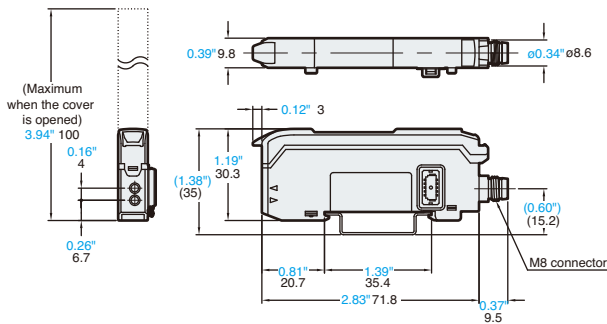
**FS-V31C/V31CP/V33C/V33CP (Main unit)**



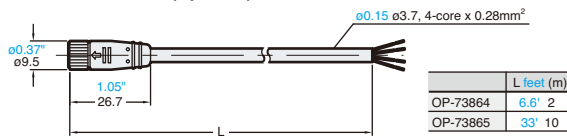
When the mounting bracket (Optional) **OP-73880** is attached:



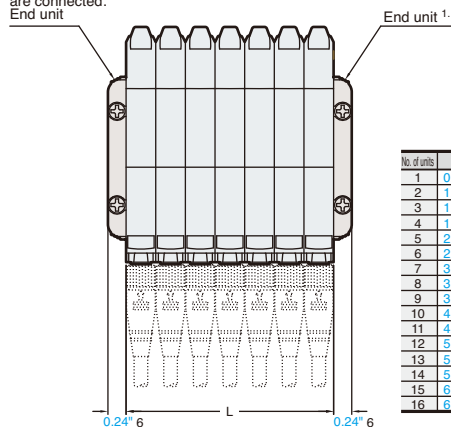
**FS-V32C/V32CP/V34C/V34CP (Expansion unit)**



**M8 connector cable (Optional)**

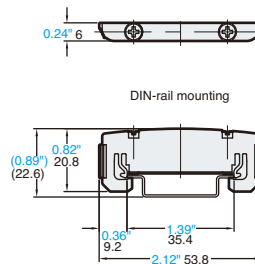


When several units are connected:  
End unit



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 64512; 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] <sup>1</sup> .									
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 9999 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 40 V, 100 mA max. <sup>2</sup> (main unit only)/20 mA max. (when the expansion unit(s) is connected), Residual voltage: 1 V max.								
		PNP	PNP open-collector 30 V, 100 mA max. <sup>2</sup> (main unit only)/20 mA max. (when the expansion unit(s) is connected), Residual voltage: 1 V max.								
Monitor output		Voltage output: 1 to 5 V <sup>3</sup> , Load resistance: 10 kΩ min., Repeatability: ±0.5% of F.S., Response time: 1 ms (FS-V31M only)									
External input <sup>4</sup>		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: 10% max. Class 2									
Current consumption		Normal operation: 990 mW (at 24 V: 42 mA max, at 12 V: 83 mA max.) / Power-saving mode: 820 mW (at 24 V: 34 mA max, at 12 V: 68 mA max.)									
Ambient illumination		Incandescent lamp: 20,000 lux max., Sunlight: 30,000 lux max.									
Ambient temperature		14 to 131°F (-10 to 55°C), No condensation <sup>5</sup> .									
Relative humidity		35 to 85%, No condensation									
Vibration		10 to 55 Hz, double amplitude: 0.06* 1.5 mm, 2 hours each in the X, Y and Z axis									
Shock		500 m/s <sup>2</sup> in X, Y, and Z directions, 3 times respectively									
Housing		Polycarbonate									
Size		1.19* 30.3 mm (H) x 0.39* 9.8 mm (W) x 2.83* 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 4096 at HIGH SPEED/FINE/TURBO mode.

4. FS-V31C(P)/V32C(P)/V33(P)/V34(P)

5. 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: 14 to 131°F (-10 to 55°C), 3 to 10 Units: 14 to 122°F (-10 to 50°C), 11 to 16 Units: 14 to 113°F (-10 to 45°C)

## Options

Type	Amplifier securing bracket (for main unit)	End unit (for expansion unit)	M8 connector cable (6.6' 2 m) <sup>1</sup>	M8 connector cable (33.0' 10 m) <sup>1</sup>
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.

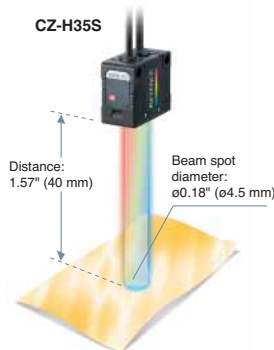
# OPTICAL SENSOR LINEUP

## SUPER RGB SENSOR

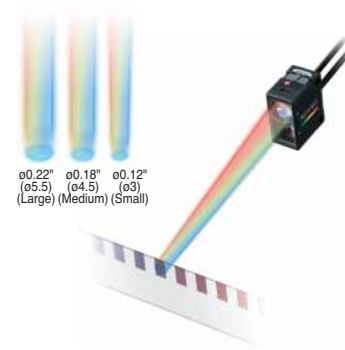


- 4 outputs x 2 ch
- UV Sensorhead available

Powerful, RGB Sensor, Transparent Targets, 16 bit Accuracy, Color Differentiation



**CZ-H35S**  
**Luster-cancel, Reflective Type**  
 Less affected by shape, position, inclination, and surface luster (Patent-pending)  
 The CZ-H35S maintains accurate detection despite changing target conditions.

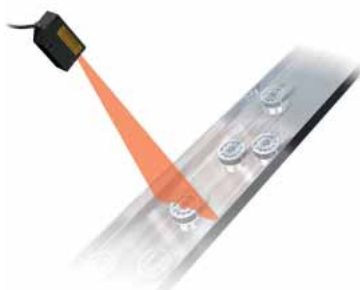


**CZ-H32**  
**Adjustable Spot, Reflective Type**  
**Adjustable Beam Spot**  
 Three beam spot sizes can be easily selected by adjusting the slide switch, allowing a wide range of targets to be inspected.

## LASER SENSOR (Hi-Power)



World's Smallest, Long Range, High Accuracy, Fast Response, Two Digital Displays



**LV-H42 Series**  
**Long Distance Straight-beam, Retro-reflective**

- Easy optical axis alignment
- Detection range up to 275.59" (7,000 mm)
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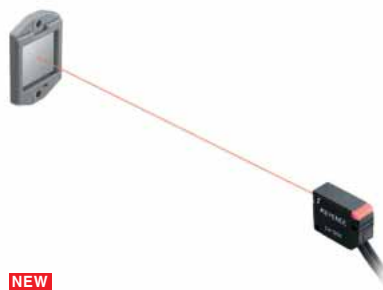
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**SAFETY INFORMATION**  
 Please read the instruction manual carefully in order to safely operate any KEYENCE product.

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