

A Return To Simplified Sensing



A Genuine All-Purpose Solution
Easier and More Stable Than Ever Before

THE POWER OF FIBER OPTIC SENSING

FLEXIBLE

Handle any and all applications with one high-powered amplifier and a variety of head options.

- Detect Anything
- Detect Anywhere



SIMPLE

Setup is handled quickly and easily with this intuitive amplifier.

- Easy to Read Display
- Innovative Fiber Units



RELIABLE

Detection remains stable in any situation or environment.

- Built-In Preventive Maintenance
- Clear Status Indication



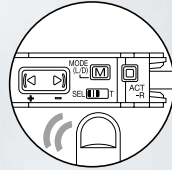
Flexible

Enhanced power makes the FS-N40 Series more capable than ever before.



NEO Parabolic LED

Power Select Switch



TERA Switch

Go from standard to high-power with the flick of a switch

Detect Anything



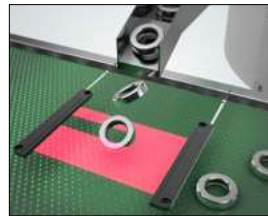
Contrasts/
Surface Finishes



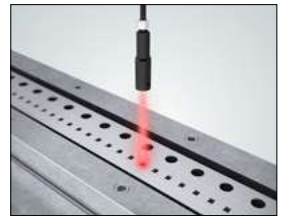
Distant
Targets



Transparent
Targets



Targets in
Varying Positions



Small
Targets

Detect Anywhere



Tight
Spaces



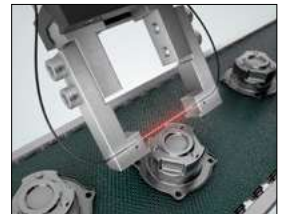
Oily/Wet
Environments



High Temperature
Environments



Environments with
Chemicals



On Robotic
Arms

Long Range and Stable Detection with Any Head

With industry leading high-power, the FS-N40 Series enables long range detection with even the thinnest of fiber heads. This also ensures detection remains stable in environment where build-up occurs.

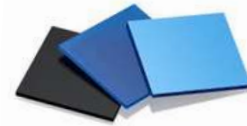


Thrubeam [1 mm 0.04" Cylindrical]	Previous (FINE)	FS-N40 (TERA)
	140 mm 5.51"	800 mm 31.50"
Reflective [M3 Threaded]	Previous (FINE)	FS-N40 (TERA)
	72 mm 2.83"	590 mm 23.23"

Increased Detection Capabilities

The FS-N40 Series has not only increased its power, but has also greatly improved its signal to noise ratio. This allows for consistent and reliable detection of changes in contrast, surface finish, and position.

Contrast changes



Surface finish changes



Simple position changes



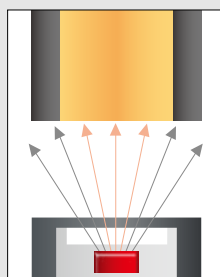
Deeper Understanding

New LED Module - "NEO Parabolic LED"

The high-power of the FS-N40 Series is derived from the use of a new LED module. This module boasts a high brightness LED and efficient circuit design, along with a parabolic mirror that ensures the majority of the light is transmitted into the fiber optic cable.

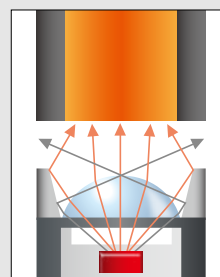
Evolution of LED Modules

Higher-power LED



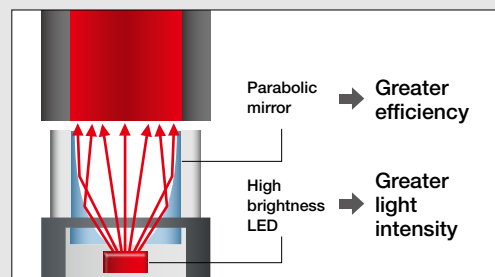
Most light is not transmitted

Lens + circular reflector



Some light is not transmitted

NEO Parabolic LED



All light is concentrated and transmitted

Simple

NEW INNOVATION

Easy to Read Display

No manuals required with this easy to understand interface.



■ Conventional Display



■ FS-N40 Display



Innovative OLED Display

The introduction of an OLED display places the FS-N40 Series leaps-and-bounds ahead of conventional fiber amplifiers. The ability to see clear and detailed information on a single screen dramatically reduces setup time.

Bar Graph Display

Simplify the display even further by representing the light intensity as a bar graph. This comes complete with a threshold point indicator and peak/bottom value flags.



Peak value ON/OFF point Bottom value

Easily Understandable Messages

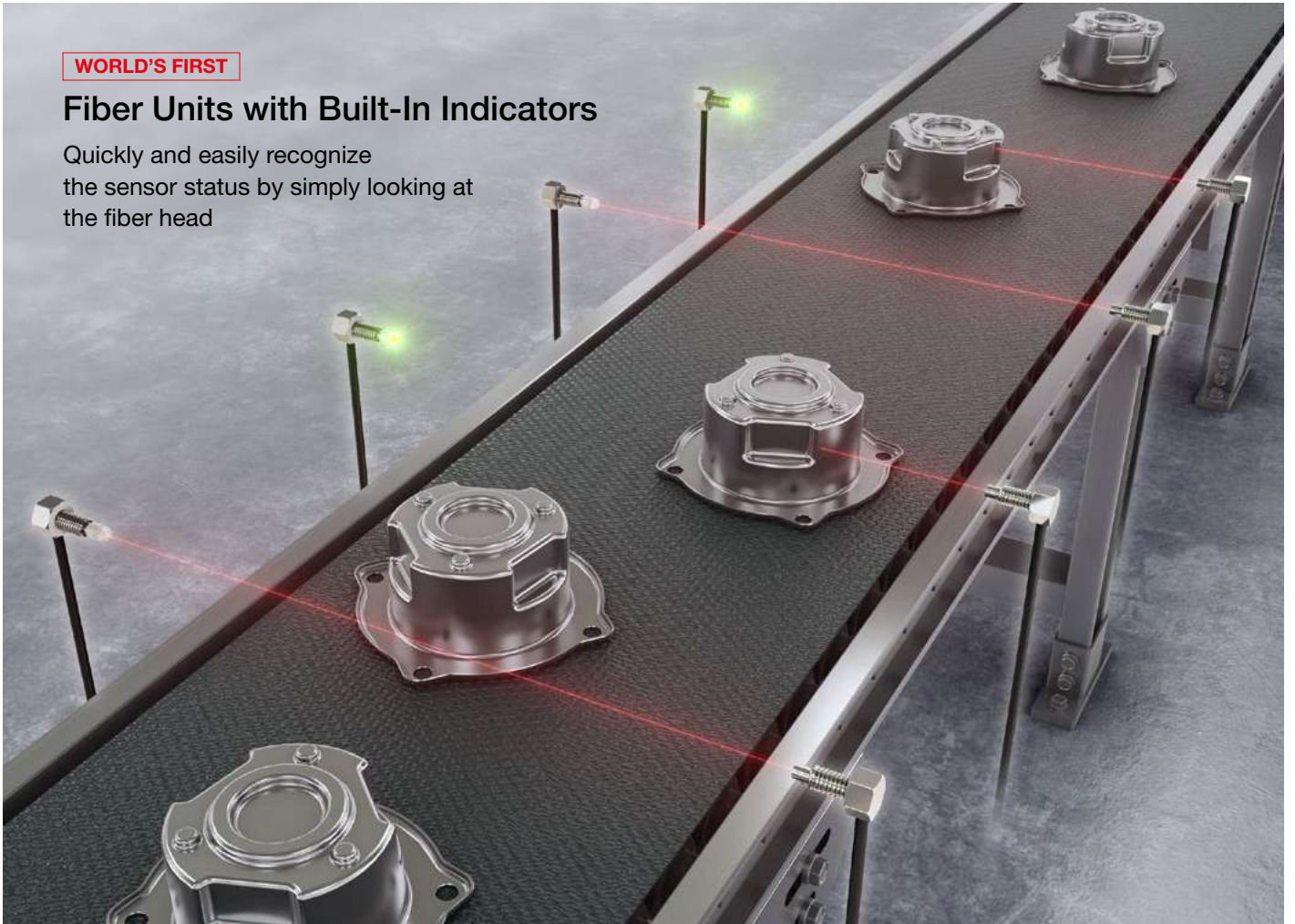
No need to decipher cryptic display messages. Identify any issues or scenarios that the sensor may be experiencing by simply reading the display.

System Error	Keys Locked
Low Intensity	Check Dip Switch
Saturate Cancel	PIN Code

WORLD'S FIRST

Fiber Units with Built-In Indicators

Quickly and easily recognize the sensor status by simply looking at the fiber head

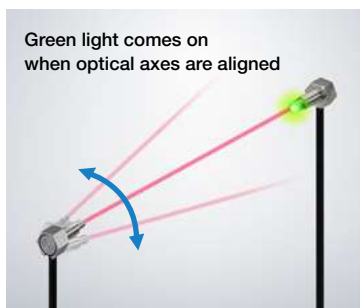


Integrated ON/OFF Status Indicators

It is no longer necessary to look inside of a control box and locate the proper amplifier to determine the detection status of a specific sensor. These innovative fiber heads, will light in Green when the output is ON for immediate recognition of the sensor status.

Alignment Assistance

Alignment has never been simpler with Optical Axis Assistance. The fiber unit illuminates when the two heads are aligned, eliminating the guesswork and time associated with alignment.



Green light comes on when optical axes are aligned

Easy Head Identification

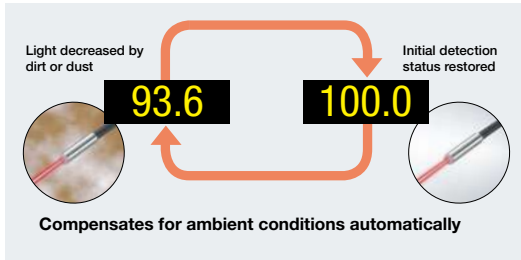
Quickly recognize which head is being programmed by lighting the fiber head in green. This prevents any unnecessary confusion during setup.



Built-In Preventive Maintenance Features

Harsh Environment Adjustment

Datum mode automatically adjusts the live and set values to compensate for build-up and maintain stable detection.



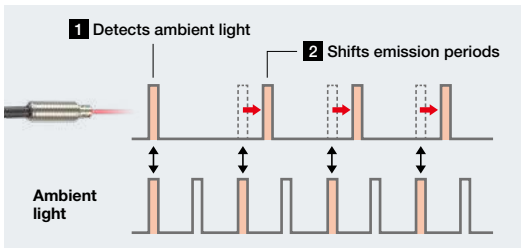
Automatic Power Control

When high precision detection is of the utmost concern, the light intensity can be automatically regulated to ignore the effects of power fluctuations.



Interference Prevention

Prevent interference between up to 16 units that are connected together (KEYENCE 1-Line System), or 2 units that are not connected together.



Heat Sink

Concerns about heat generation, and temperature induced strain on internal component, are eliminated with the built-in heat sink.



Customizable Interface for Clear Status Indications

Uniform Calibration and Display

With the push of a button, the set value and current value can be automatically calibrated to 50.0% and 100.0% respectively. This enables easy identification of detection statuses and maintenance needs at a glance.



Various Display Option

The FS-N40 Series offers countless display and sub-display options. This allows users to view the data how they see fit and ensures clear understanding.



Additional Features

Highly Visible Indicator

The highly visible indicator, with an area 8.7x larger than conventional models, ensure that the ON/OFF status of the sensor can be seen from a distance.



Saturation Canceling

A simple button combination is all that is needed to eliminate saturation and ensure stable detection of transparent, tiny, or highly reflective targets.



Network Compatibility

Industrial network integration is possible with the use of the KEYENCE NU Series. Multiple network options are available!



EtherNet/IP™
DeviceNet™
CC-Link V2
EtherCAT®

IO-Link Compatibility

(FS-N41C Only)

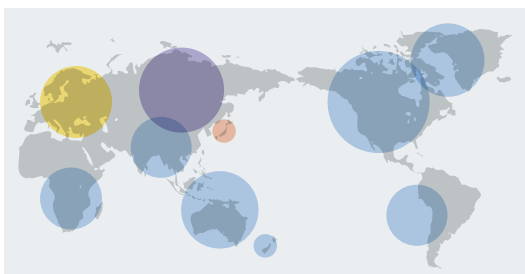
The FS-N41C amplifier can communicate a large variety of information over IO-Link. This includes the live value, set value, settings, and much more.



IO-Link

Selectable Language Options

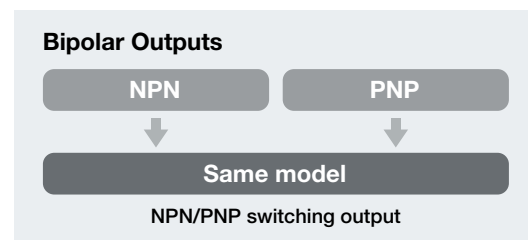
Language selection options for English, Japanese, Chinese, and German have been added to guarantee global ease-of-use.



Bipolar Outputs

(FS-N41C Only)

Regardless of NPN or PNP output needs, only one part number is required. The FS-N41C offers a bipolar selectable output.



Multi-Output Unit Dramatic Reductions in Cost and Time

Reduce Startup, Operation, and Maintenance Workloads

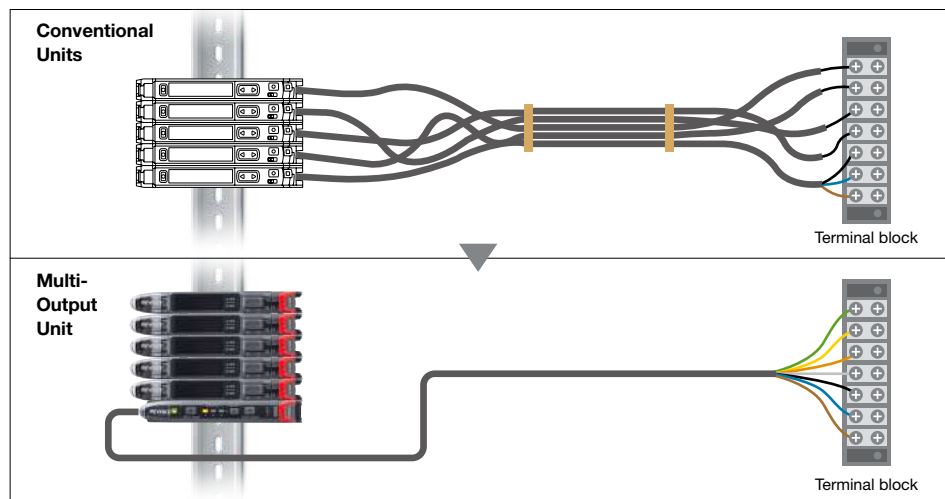
Multi-Output Unit
FS-MC8N/P



Fibers and cables on
one side ONLY

Reduced Cables

The Multi-Output Unit provides a clean cable layout with just one power supply/output cable coming from the device. Replacing or adding sensors has also never been easier; since now there is no longer a need to reroute cables.



Memory Function

The settings for up to 8 connected amplifiers can be saved on the Multi-Output Unit. If any of the amplifiers need to be replaced, the settings can be batch written to the new amplifiers, eliminating the need for any manual recalibration. Up to 3 memory banks can be configured to provide easy changeover between different runs on a machine.



Benefits During Every Stage of Use

Setup

Duplicate settings for fiber amplifiers installed on standard machines.

Changeover

Quickly switch between 3 bank of settings when running different parts.

Troubleshooting

Return the sensors to their correct settings with the push of a button.

Maintenance

When replacing a unit, transfer necessary settings in seconds.

Easily Add Amplifiers without Extra Wiring

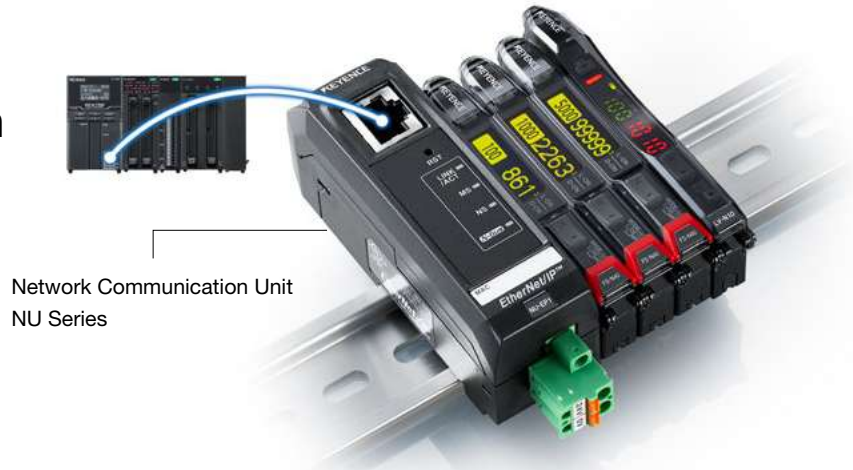
Adding amplifiers is a breeze with only one cable needing to be routed for the entire setup. Route this multi-core cable once and simply connect amplifiers as they become necessary.



Versatile Wiring and Expansion Options Options for Any Situation

When Network Compatibility is Necessary

Network
Communication
Unit



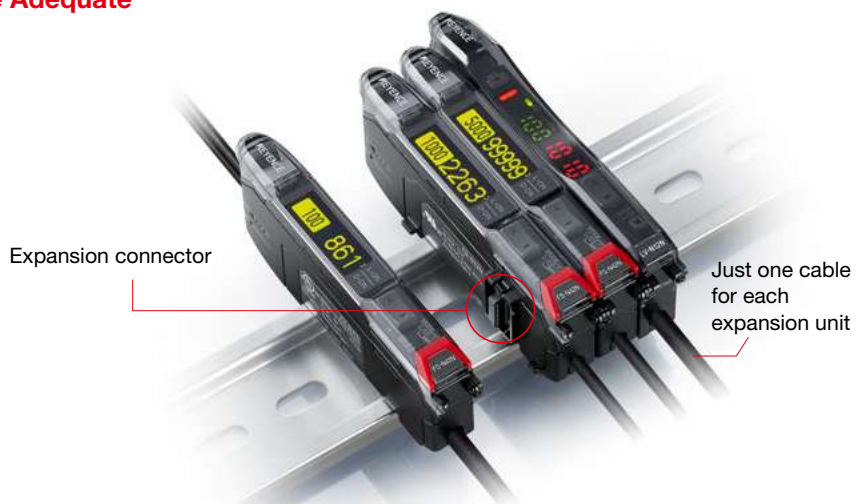
When Saving Space is Important

Multi-Output Unit



When Standard Connections are Adequate

Main Unit +
Expansion Units



Compatible with a range of open industrial networks

- Control multiple sensors at once via network communication

EtherNet/IP™

DeviceNet™

CC-Link V2

EtherCAT®

*EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

Increase Efficiency During Startup, Operation, and Maintenance

- Memory function enables speedy settings recovery and easy changeover
- Drastically decreases the number of necessary cables

Simplified Wiring

Easy Program Changeover

Effortless Maintenance

Best-Selling and Reliable Simplified Wiring

- Connect up to 17 amplifiers, featuring stable interference prevention

Lineup

Amplifier Units

Cable type



Type		Model		Control outputs	External input
		NPN output	PNP output		
Standard	Main unit	FS-N41N	FS-N41P	1	0
	Expansion unit	FS-N42N	FS-N42P		
2-Output	Main unit	FS-N43N	FS-N43P	2	1
	Expansion unit	FS-N44N	FS-N44P		

M8 Connector type



Type	Model		Control outputs	External input
	Switchable between NPN/PNP output			
Main unit	FS-N41C		2 ¹	1 ¹

¹Switchable between 2 control outputs or 1 control output + 1 external input. The system is not compatible with expansion units.

Zero line type



Type	Model	Control output
Expansion unit	FS-N40	None ¹

¹Counted as 1 output if expanded with Multi-Output Unit FS-MC8N/P or the NU Series communication unit.

Network Units

Type	Appearance	Network	Model
Communication unit		EtherNet/IP™	NU-EP1
		DeviceNet™	NU-DN1
		EtherCAT®	NU-EC1
		CC-Link	NU-CL1

Multi-Output Units



Type	Model		Separate control outputs	Common output	Common input
	NPN output	PNP output			
Main unit	FS-MC8N	FS-MC8P	8	1	1

Optional Parts (sold separately¹)

Description	Model
Amplifier securing bracket (for main unit) 	 OP-88245
End units¹ (when using expansion units) 	 OP-26751 (Set of 2) OP-26751
M8 connector cable 2 m 6.6' /10 m 32.8' 	 2 m 6.6' type OP-73864 10 m 32.8' type OP-73865
Expansion converter unit 	This adapter allows the FS-N40 series to connect to non-NEO type expansion units using the KEYENCE 1-Line System. OP-87199

¹ Multi-output units come with end units.

Network Unit Optional Parts (sold separately)

Model	Type
OP-79426	Version 1.10 supported CC-Link dedicated cable 20 m 65.6'
OP-79427	Version 1.10 supported CC-Link dedicated cable 100 m 328.1'
OP-51504	STP (Shielded twisted-pair) cable 0.2 m 0.7'
OP-51505	STP (Shielded twisted-pair) cable 0.5 m 1.6'
OP-51506	STP (Shielded twisted-pair) cable 1 m 3.3'
OP-51507	STP (Shielded twisted-pair) cable 3 m 9.8'
OP-51508	STP (Shielded twisted-pair) cable 5 m 16.4'
OP-51509	STP (Shielded twisted-pair) cable 10 m 32.8'
OP-84338¹	e-CON connector (2 pieces included)

¹ Use a cable with sheath outer diameter of 1.15 to 1.35 mm **0.045"** to **0.053"** and wire range of 0.1 to 0.5 mm² **0.000155** to **0.000775"**.
To connect a device using a cable other than as specified above, prepare an e-CON connector that conforms with its wire diameter.

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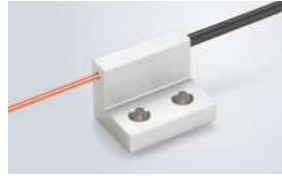


Solve Any and All Applications

Mounting/Space Constraints

Integrated Bracket Fibers

The fiber is already integrated into a L-shaped bracket for quick and painless installation.



Thrubeam Models

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Reflective Models

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Threaded and Hex-shaped Fibers

Threaded models can be easily mounted to a machine with one or two nuts. Hex-shaped models provide easy cable routing and prevent snagging.



Thrubeam Models

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Reflective Models

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Fiber Units

FU Series



Difficult Detection Targets

Long Distance Targets

By focusing the light being emitted, these fibers can see targets at distances that are too far for conventional fibers.



Thrubeam Models

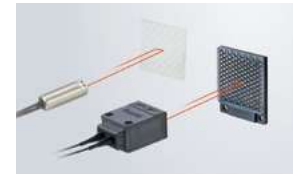
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Reflective Models

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Transparent Targets

The use of a reflector allows these fibers to stably detect transparent targets with ease.



Retro-Reflective Models

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Demanding Environments

High Traffic/Guarded

Perfect for high traffic environments, these guarded fibers will not be damaged by crushing, pinching, or snagging.



Thrubeam Models

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Reflective Models

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Oil/Chemical Exposure

The fluorocarbon resin coating allows these fiber units to be used in locations where oil or chemical exposure is constant.



Thrubeam Models

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Reflective Models

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Flat Bracket Fibers

These low profile fibers provide a compact design and integrated mounting holes for easy installation in tight spaces.



Thrubeam Models

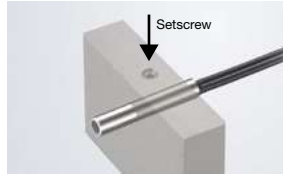
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Reflective Models

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Cylindrical Fibers

These fibers can fit in nearly any location and are held in place with a set screw.



Thrubeam Models

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Reflective Models

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Sleeve Type Fibers

These fibers feature a thin sleeve that can be routed into the necessary detection location, while being secured somewhere else.



Thrubeam Models

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Reflective Models

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Varied Position/Falling Targets

By looking over an area, instead of a fixed point, it is possible to detect falling targets or targets that are not in repeatable positions.



Thrubeam Models

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Reflective Models

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Small Targets

With the use of built-in or attachable lenses, the light is focused to a fine point for consistent small target detection.



Reflective Models

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Liquid Levels

It is possible to reliably detect liquid levels using fibers. This can be done through immersion or by attaching them to a transparent tube.



Reflective Models

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Robotic Arms/Constant Motion

With bend ratings of up to 50 million bends (typical value), these fibers are ideal for robotic integration or anywhere consistent bending occurs.



Thrubeam Models

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Reflective Models

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Vacuum Chambers

These specially designed fibers can be used in vacuum environments and still provide stable detection.



Thrubeam Models

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High Temperature Locations

Detect targets in high temperature environments with fibers that can withstand temperatures of up to 350°C 662°F.



Thrubeam Models

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Reflective Models



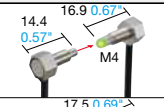


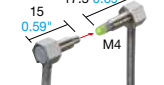


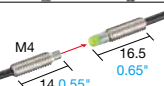


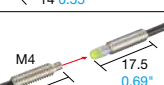


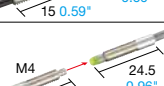


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Featured Fibers

NEW ACTIVE RECEIVER FIBER UNITS

Thrubeam



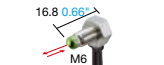





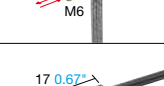


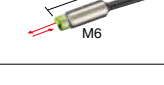


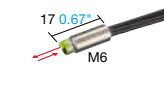


Threaded and Hex-Shaped Active Receiver Fibers

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ^{*1}			Optical axis diameter (mm inch)	Model Weight
				 TERA (Longest)  FINE (Initial)	Other power modes			
Size / Shape					MEGA ULTRA SUPER	TURBO HSPD S-HSPD		
Hex-shaped		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +60°C (-40 to +140°F)	R2 R0.08" ToughFlex	 3600 141.73"  640 25.20"	3100 122.05" 2100 82.68" 1300 51.18"	880 34.65" 320 12.60" 190 7.48"	Transmitter: ø1 ø0.04" Receiver: ø3.2 ø0.13"	FU-R77Z Approx. 25g
			1 m 3.3' Cut not allowed -40 to +60°C (-40 to +140°F)	R10 R0.39" Stainless Steel	 1800 70.87"  640 25.20"	1800 70.87" 1800 70.87" 1300 51.18"		880 34.65" 320 12.60" 190 7.48"
Threaded		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +60°C (-40 to +140°F)	R2 R0.08" ToughFlex	 3600 141.73"  880 34.65"	3600 141.73" 3000 118.11" 1800 70.87"	1300 51.18" 430 16.93" 240 9.45"		FU-R77 Approx. 21g
		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +60°C (-40 to +140°F)	R25 R0.98"	 3600 141.73"  1100 43.31"	3600 141.73" 3200 125.98" 2200 86.61"	1500 59.06" 540 21.26" 290 11.42"		FU-R77F Approx. 21g
		1 m 3.3' Cut not allowed -40 to +60°C (-40 to +140°F)	R10 R0.39" Stainless Steel	 1800 70.87"  880 34.65"	1800 70.87" 1800 70.87" 1800 70.87"	1300 51.18" 430 16.93" 240 9.45"		FU-R77G Approx. 41g

*1 When using the FS-N40 Series. "3600 mm 141.73" (1800 mm 70.87)" is assumed as the maximum because the fiber cable length is 2 m 6.6' (1 m 3.3').

Reflective



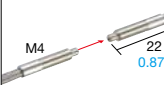
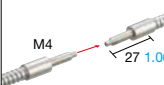
Threaded and Hex-Shaped Active Receiver Fibers

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ^{*1}			Model Weight
				 TERA (Longest)  FINE (Initial)	Other power modes		
Size / Shape					MEGA ULTRA SUPER	TURBO HSPD S-HSPD	
Hex-shaped		2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +60°C (-40 to +140°F)	R2 R0.08" ToughFlex	 790 31.10"  210 8.27"	710 27.96" 550 21.66" 470 18.50"	310 12.20" 90 3.54" 56 2.20"	FU-R67Z Approx. 25g
			1 m 3.3' Cut not allowed -40 to +60°C (-40 to +140°F)	R10 R0.39" Stainless Steel	 790 31.10"  210 8.27"	710 27.96" 550 21.66" 470 18.50"	310 12.20" 90 3.54" 56 2.20"
Threaded		2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +60°C (-40 to +140°F)	R2 R0.08" ToughFlex	 1100 43.31"  210 8.27"	900 35.43" 740 29.13" 490 19.29"	320 12.60" 110 4.33" 65 2.56"	FU-R67 Approx. 21g
		2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +60°C (-40 to +140°F)	R25 R0.98"	 1150 45.28"  300 11.81"	1100 43.31" 860 33.86" 570 22.44"	410 16.14" 140 5.51" 67 2.64"	FU-R67F Approx. 21g
		1 m 3.3' Cut not allowed -40 to +60°C (-40 to +140°F)	R10 R0.39" Stainless Steel	 1100 43.31"  210 8.27"	900 35.43" 740 29.13" 490 19.29"	320 12.60" 110 4.33" 65 2.56"	FU-R67G Approx. 29g

*1 When using the FS-N40 Series. Standard target: White matte paper (Reflective type only).



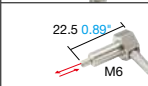
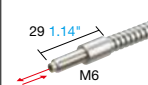
ARMOR GUARDED FIBER UNITS

Thrubeam

Type		Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ^{*1}			Optical axis diameter (mm inch)	Model Weight
Size / Shape	Detecting arrangement				TERA (Longest)	Other power modes			
						MEGA ULTRA SUPER	TURBO HSPD S-HSPD		
M4	Hex-shaped		1 m 3.3' Cut not allowed -40 to +50°C (-40 to +122°F)	R10 R0.39" Stainless Steel	1800 70.87" 1100 43.31" Lens attachment ▶ P25	1800 70.87" 1800 70.87" 1800 70.87"	1400 55.12" 430 16.93" 280 11.02"	ø1.13 ø0.04"	FU-77TG Approx. 43g
			1 m 3.3' Cut not allowed -40 to +50°C (-40 to +122°F)	R20 R0.79" Stainless Steel	1800 70.87" 1100 43.31" Lens attachment ▶ P25	1800 70.87" 1800 70.87" 1800 70.87"	1400 55.12" 430 16.93" 280 11.02"		FU-77MTG Approx. 100g
	Threaded		1 m 3.3' Cut not allowed -40 to +50°C (-40 to +122°F)	R10 R0.39" Stainless Steel	1800 70.87" 1100 43.31" Lens attachment ▶ P25	1800 70.87" 1800 70.87" 1800 70.87"	1400 55.12" 430 16.93" 280 11.02"		FU-77G Approx. 39g
			1 m 3.3' Cut not allowed -40 to +50°C (-40 to +122°F)	R20 R0.79" Stainless Steel	1800 70.87" 1100 43.31" Lens attachment ▶ P25	1800 70.87" 1800 70.87" 1800 70.87"	1400 55.12" 430 16.93" 280 11.02"		FU-77MG Approx. 100g

*1 When using the FS-N40 Series. "3600 mm 141.73" (1800 mm 70.87") is assumed as the maximum because the fiber cable length is 2 m 6.6' (1 m 3.3').

Reflective

Type		Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ^{*1}			Model Weight
Size / Shape	Detecting arrangement				TERA (Longest)	Other power modes		
						MEGA ULTRA SUPER	TURBO HSPD S-HSPD	
M3	Threaded		1 m 3.3' Cut not allowed -40 to +50°C (-40 to +122°F)	R10 R0.39" Stainless Steel	590 23.23" 130 5.12" Lens attachment ▶ P28	540 21.26" 420 16.54" 320 12.60"	190 7.48" 47 1.85" 28 1.10"	FU-2303 Approx. 20g
			1 m 3.3' Free-cut (ø1.3 ø0.05" × 2) spiral 30 cm 11.81" -40 to +50°C (-40 to +122°F)	R10 R0.39" Stainless Steel	590 23.23" 130 5.12" Lens attachment ▶ P28	540 21.26" 420 16.54" 320 12.60"	190 7.48" 47 1.85" 28 1.10"	FU-35FG Approx. 15g
M6	Hex-shaped		1 m 3.3' Cut not allowed -40 to +50°C (-40 to +122°F)	R10 R0.39" Stainless Steel	900 35.43" 380 14.96"	830 32.68" 730 28.74" 670 26.38"	520 20.47" 150 5.91" 89 3.50"	FU-67TG Approx. 32g
			1 m 3.3' Cut not allowed -40 to +50°C (-40 to +122°F)	R25 R0.98" Stainless Steel	900 35.43" 380 14.96"	830 32.68" 730 28.74" 670 26.38"	520 20.47" 150 5.91" 89 3.50"	FU-67MTG Approx. 80g
M6	Coaxial		1 m 3.3' Cut not allowed -40 to +50°C (-40 to +122°F)	R10 R0.39" Stainless Steel	580 22.83" 120 4.72" Lens attachment ▶ P28	530 20.87" 390 15.35" 250 9.84"	170 6.69" 45 1.77" 27 1.06"	FU-35TG Approx. 32g
			1 m 3.3' Cut not allowed -40 to +50°C (-40 to +122°F)	R25 R0.98" Stainless Steel	1100 43.31" 380 14.96"	1000 39.37" 830 32.68" 610 24.02"	500 19.69" 150 5.91" 88 3.46"	FU-67MG Approx. 70g
M6	Threaded		1 m 3.3' Cut not allowed -40 to +50°C (-40 to +122°F)	R10 R0.39" Stainless Steel	1100 43.31" 380 14.96"	1000 39.37" 830 32.68" 610 24.02"	500 19.69" 150 5.91" 88 3.46"	FU-67G Approx. 29g
			1 m 3.3' Cut not allowed -40 to +50°C (-40 to +122°F)	R10 R0.39" Stainless Steel	1100 43.31" 380 14.96"	1000 39.37" 830 32.68" 610 24.02"	500 19.69" 150 5.91" 88 3.46"	FU-67G Approx. 29g

*1 When using the FS-N40 Series. Standard target: White matte paper (Reflective type only.)

Threaded and Hex-Shaped Fibers

Type		Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Optical axis diameter (mm inch)	Model Weight	
Size / Shape	TERA (Longest) FINE (Initial)				Other power modes					
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD				
M4	Hex-shaped		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex		3600 141.73" 1100 43.31"	3600 141.73" 3000 118.11" 1900 74.80"	1400 55.12" 430 16.93" 280 11.02"	ø1.13 ø0.04"	FU-77TZ Approx. 25g
			2 m 6.6' Free-cut (ø2.2 ø0.09") -20 to +50°C (-4 to +122°F)	R1 R0.04" ToughFlex		3600 141.73" 2000 78.74"	3600 141.73" 3600 141.73"	2500 98.43" 1200 47.24" 720 28.35"	ø2.3 ø0.09"	FU-70TZ Approx. 22g
	Threaded		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +50°C (-40 to +122°F)	R0.5 R0.02" ToughFlex		3600 141.73" 1100 43.31"	3600 141.73" 3000 118.11" 1900 74.80"	1400 55.12" 430 16.93" 280 11.02"	ø1.13 ø0.04"	FU-77V Approx. 25g
			2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +70°C (-40 to +158°F)	R2 R0.08" ToughFlex		3600 141.73" 1500 59.06"	3600 141.73" 2600 102.36"	1400 55.12" 540 21.26" 310 12.20"	ø1 ø0.04"	FU-77 Approx. 21g
M6	Threaded		2 m 6.6' Free-cut (ø1.3 ø0.05") -40 to +70°C (-40 to +158°F)	R25 R0.98"		3600 141.73" 1500 59.06"	3600 141.73" 2800 102.36"	1900 74.80" 540 21.26" 310 12.20"	ø1 ø0.04"	FU-7F Approx. 21g
			2 m 6.6' Free-cut (ø1.3 ø0.05") -40 to +70°C (-40 to +158°F)	R4 R0.16"		3600 141.73" 760 29.92"	2800 110.24" 2100 82.68" 1300 51.18"	1000 39.37" 260 10.24" 180 7.09"	ø1 ø0.04"	FU-78 Approx. 9g
M6	Threaded		2 m 6.6' Free-cut (ø2.2 ø0.09") FU-71Z: -40 to +50°C (-40 to +122°F) FU-71: -40 to +70°C (-40 to +158°F)	R2 R0.08" ToughFlex		3600 141.73" 2000 78.74"	3600 141.73" 3600 141.73"	2700 106.30" 880 34.65" 540 21.26"	ø1.5 ø0.06"	FU-71Z Approx. 25g
			2 m 6.6' Free-cut (ø2.2 ø0.09") FU-71: -40 to +70°C (-40 to +158°F)	R25 R0.98"		3600 141.73" 2400 94.49"	3600 141.73" 3600 141.73"	3000 118.11" 1000 39.37" 590 23.23"	ø1.5 ø0.06"	FU-71 Approx. 25g



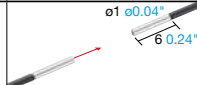




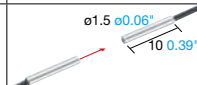




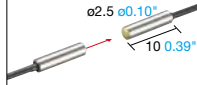


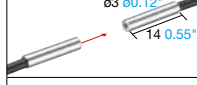




¹ When using the FS-N40 Series. "3600 mm 141.73" (1800 mm 70.87") is assumed as the maximum because the fiber cable length is 2 m 6.6' (1 m 3.3').

Integrated Bracket Fibers

Type		Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Optical axis diameter (mm inch)	Model Weight	
Beam emitting direction	Optical axis height				TERA (Longest) FINE (Initial)	Other power modes				
						MEGA ULTRA SUPER	TURBO HSPD S-HSPD			
Top	10 mm 0.39"		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex		3600 141.73" 790 31.10"	2900 114.17" 2200 86.61" 1300 51.18"	1000 39.37" 290 11.42" 170 6.69"	ø1.13 ø0.04"	FU-L51Z Approx. 30g
	15 mm 0.59"					3600 141.73" 3600 141.73"	3600 141.73" 3600 141.73"	3600 141.73" 2100 82.68" 1100 43.31"	ø3.5 ø0.14"	FU-L50Z Approx. 30g
	20 mm 0.79"					2900 114.17" 1800 70.87" 1100 43.31"	2500 98.43" 1800 70.87" 1100 43.31"	840 33.07" 270 10.63" 140 5.51"	ø1.13 ø0.04"	FU-L54Z Approx. 30g
Top (Built-in lens)	10 mm 0.39"		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex		3600 141.73" 3600 141.73"	3600 141.73" 2100 82.68" 1100 43.31"	ø3.5 ø0.14"	FU-L50Z Approx. 30g	
Side	10 mm 0.39"					2900 114.17" 680 26.77"	2500 98.43" 1800 70.87" 1100 43.31"	840 33.07" 270 10.63" 140 5.51"	ø1.13 ø0.04"	FU-L54Z Approx. 30g



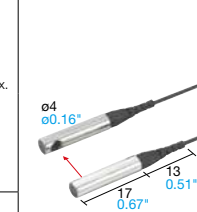






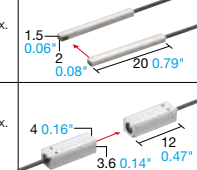


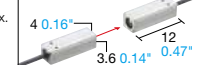


¹ When using the FS-N40 Series. "3600 mm 141.73" is assumed as the maximum because the fiber cable length is 2 m 6.6'.

Cylindrical (Set Screw Installation Fibers)

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Optical axis diameter (mm inch)	Model Weight
				 TERA (Longest)  FINE (Initial)	Other power modes			
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD		
ø1.0 ø0.04"		1 m 3.3' Free-cut (ø1.0 ø0.04") -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex High-flex	 800 31.50"  170 6.69"	700 27.56" 510 20.08" 360 14.17"	220 8.66" 64 2.52" 40 1.57"	ø0.5 ø0.02"	FU-58U Approx. 4g
		50 cm 19.69" Cut not allowed -40 to +50°C (-40 to +122°F)	R10 R0.39"	 400 15.75"  85 3.35"	380 14.96" 270 10.63" 180 7.09"	120 4.72" 40 1.57" 23 0.91"	ø0.265 ø0.01"	FU-58 Approx. 8g
ø1.5 ø0.06"		1 m 3.3' Free-cut (ø1.0 ø0.04") -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex High-flex	 800 31.50"  170 6.69"	700 27.56" 510 20.08" 360 14.17"	220 8.66" 64 2.52" 40 1.57"	ø0.5 ø0.02"	FU-59U Approx. 4g
		1 m 3.3' Free-cut (ø1.0 ø0.04") -40 to +70°C (-40 to +158°F)	R4 R0.16" High-flex	 1500 59.06"  350 13.78"	1200 47.24" 900 35.43" 600 23.62"	440 17.32" 130 5.12" 77 3.03"	ø0.7 ø0.03"	FU-59 Approx. 3g
ø2.5 ø0.10"		50 cm 19.69" Cut not allowed -40 to +70°C (-40 to +158°F)	R10 R0.39"	 73 2.87"  16 0.63"	55 2.17" 41 1.61" 27 1.06"	21 0.83" 5 0.20" 2 0.08"	ø0.125 ø0.005"	FU-55 Approx. 3g
		Do not bend sleeve. ø2.5 ø0.10" ø0.3 ø0.01" 5 0.39" 10 0.20"		50 cm 19.69" Cut not allowed -40 to +70°C (-40 to +158°F)	FU-56 Approx. 3g			
ø3 ø0.12"		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex	 3600 141.73"  1100 43.31"	3600 141.73" 3000 118.11" 1900 74.80"	1400 55.12" 430 16.93" 280 11.02"	ø1.13 ø0.04"	FU-5FZ Approx. 19g
		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +70°C (-40 to +158°F)	R25 R0.98"	 3600 141.73"  1500 59.06"	3600 141.73" 3600 141.73" 2600 102.36"	1900 74.80" 540 21.26" 310 12.20"	ø1 ø0.04"	FU-5F Approx. 19g

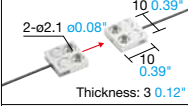



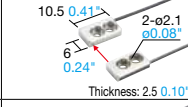

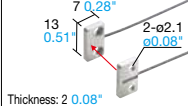

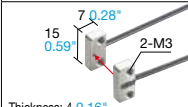
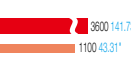
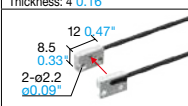
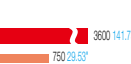
¹ When using the FS-N40 Series. "3600 mm 141.73" is assumed as the maximum because the fiber cable length is 2 m 6.6'.

Focused Beam/High-Power Fibers

Type	Beam emitting direction	Aperture angle	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Optical axis diameter (mm inch)	Model Weight
						 TERA (Longest)  FINE (Initial)	Other power modes			
							MEGA ULTRA SUPER	TURBO HSPD S-HSPD		
Side		Approx. 6°	ø4 ø0.16"	2 m 6.6' Free-cut (ø1.0 ø0.04") -40 to +50°C (-40 to +122°F) FU-16Z: -40 to +70°C (-40 to +158°F) FU-16/18: -40 to +70°C (-40 to +158°F)	R2 R0.08" ToughFlex	 3600 141.73"  2300 90.55"	3600 141.73" 3600 141.73" 3600 141.73"	3000 118.11" 1300 51.18" 770 30.31"	ø2.5 ø0.10"	FU-16Z Approx. 8g
						 3600 141.73"  3300 137.80"	3600 141.73" 3600 141.73" 3600 141.73"	3600 141.73" 1700 66.93" 1000 39.37"		FU-16 Approx. 8g
		Approx. 2°	R10 R0.39"	 3600 141.73"  2900 114.17"	3600 141.73" 3600 141.73" 3600 141.73"	3600 141.73" 1600 62.99" 840 33.07"	FU-18 Approx. 8g			
Top		Approx. 3°	1.5 ø0.06" 2 0.08"	2 m 6.6' Free-cut (ø1.0 ø0.04") -40 to +70°C (-40 to +158°F)	R2 R0.08" ToughFlex	 3000 118.11"  610 24.02"	2200 86.61" 1500 59.06" 1100 43.31"	900 35.43" 350 13.78" 230 9.06"	ø1 ø0.04"	FU-18M Approx. 6g
Top		Approx. 6°	4 0.16" 3.6 0.14" 0.47"	2 m 6.6' Free-cut (ø1.0 ø0.04") -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex	 3600 141.73"  3600 141.73"	3600 141.73" 3600 141.73" 3600 141.73"	3600 141.73" 2900 114.17" 1400 55.12"	ø2.8 ø0.11"	FU-50 Approx. 8g

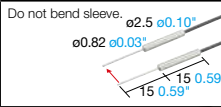

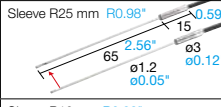

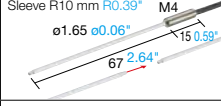

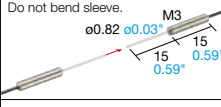
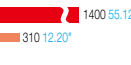
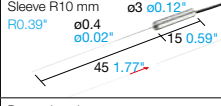

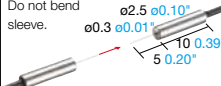

¹ When using the FS-N40 Series. "3600 mm 141.73" is assumed as the maximum because the fiber cable length is 2 m 6.6'.

Flat Bracket Fibers

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Optical axis diameter (mm inch)	Model Weight	
				TERA (Longest) FINE (Initial)	Other power modes				
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD			
Top	 2- $\phi 2.1$ $\phi 0.08^*$ 10 0.39" Thickness: 3 0.12"	1 m 3.3' Free-cut ($\phi 1.0$ $\phi 0.04^*$) -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex		950 37.40" 220 8.66"	810 31.89" 570 22.44" 370 14.57"	270 10.63" 90 3.54" 50 1.97"	$\phi 0.5$ $\phi 0.02^*$	FU-51TZ Approx. 5g
	 2- $\phi 3.2$ $\phi 0.13^*$ 14 0.55" Thickness: 3.5 0.14"	2 m 6.6' Free-cut ($\phi 1.3$ $\phi 0.05^*$) -40 to +50°C (-40 to +122°F)			3600 141.73" 1100 43.31"	3600 141.73" 3100 122.05" 1900 74.80"	1400 55.12" 420 16.54" 250 9.84"	$\phi 1$ $\phi 0.04^*$	FU-52TZ Approx. 15g
Side	 10.5 0.41" 2- $\phi 2.1$ $\phi 0.08^*$ 6 0.24" Thickness: 2.5 0.10"	1 m 3.3' Free-cut ($\phi 1.0$ $\phi 0.04^*$) -40 to +50°C (-40 to +122°F)			950 37.40" 220 8.66"	810 31.89" 570 22.44" 370 14.57"	270 10.63" 90 3.54" 50 1.97"	$\phi 0.5$ $\phi 0.02^*$	FU-57TZ Approx. 5g
Flat	 13 0.51" 7 0.28" 2- $\phi 2.1$ $\phi 0.08^*$ Thickness: 2 0.08"	1 m 3.3' Free-cut ($\phi 1.0$ $\phi 0.04^*$) -40 to +50°C (-40 to +122°F)			740 29.13" 170 6.69"	570 22.44" 400 15.75" 300 11.81"	220 8.66" 86 3.39" 39 1.54"	$\phi 1$ $\phi 0.04^*$	FU-53TZ Approx. 10g
	 15 0.59" 7 0.28" 2-M3 Thickness: 4 0.16"	2 m 6.6' Free-cut ($\phi 2.2$ $\phi 0.09^*$) -40 to +50°C (-40 to +122°F)			3600 141.73" 1100 43.31"	3600 141.73" 2700 106.30" 1800 70.87"	1300 51.18" 400 15.75" 240 9.45"	$\phi 1$ $\phi 0.04^*$	FU-54TZ Approx. 25g
	 12 0.47" 8.5 0.33" 2- $\phi 2.2$ $\phi 0.09^*$ Thickness: 3.5 0.14"	2 m 6.6' Free-cut ($\phi 2.2$ $\phi 0.09^*$) -40 to +50°C (-40 to +122°F)			3600 141.73" 750 29.53"	3200 125.98" 2500 98.43" 1500 59.06"	1100 43.31" 400 15.75" 240 9.45"	$\phi 1.13$ $\phi 0.04^*$	FU-56TZ Approx. 20g

¹ When using the FS-N40 Series. "3600 mm 141.73'" is the maximum because the fiber cable length is 2 m 6.6'.

Sleeve Type Fibers

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Optical axis diameter (mm inch)	Model Weight	
				TERA (Longest) FINE (Initial)	Other power modes				
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD			
Side	 Do not bend sleeve. $\phi 2.5$ $\phi 0.10^*$ $\phi 0.82$ $\phi 0.03^*$ 15 0.59" 15 0.59"	1 m 3.3' Free-cut ($\phi 1.3$ $\phi 0.05^*$) -40 to +70°C (-40 to +158°F)	R25 R0.98"		690 27.17" 140 5.51"	540 21.26" 420 16.54" 280 11.02"	180 7.09" 56 2.20" 32 1.26"	$\phi 0.6$ $\phi 0.02^*$	FU-32 Approx. 5g
	 Sleeve R25 mm R0.98" $\phi 3$ $\phi 0.12^*$ 65 2.56" $\phi 1.2$ $\phi 0.05^*$ 15 0.59"	2 m 6.6' Free-cut ($\phi 2.2$ $\phi 0.09^*$) -40 to +70°C (-40 to +158°F)			2800 110.24" 610 24.02"	2200 86.61" 1700 66.93" 1100 43.31"	770 30.31" 190 7.48" 120 4.72"	$\phi 1$ $\phi 0.04^*$	FU-34 Approx. 17g
Top	 Sleeve R10 mm R0.39" M4 $\phi 1.65$ $\phi 0.06^*$ 67 2.64" 15 0.59"	2 m 6.6' Free-cut ($\phi 2.2$ $\phi 0.09^*$) -40 to +70°C (-40 to +158°F)			3600 141.73" 1400 55.12"	3600 141.73" 3600 141.73" 2400 94.49"	1800 70.87" 540 21.26" 330 12.99"	$\phi 0.265$ $\phi 0.01^*$	FU-73 Approx. 24g
	 Do not bend sleeve. $\phi 0.82$ $\phi 0.03^*$ M3 15 0.59" 15 0.59"	1 m 3.3' Free-cut ($\phi 1.0$ $\phi 0.04^*$) -40 to +70°C (-40 to +158°F)			1400 55.12" 310 12.20"	1100 43.31" 850 33.46" 570 22.44"	400 15.75" 120 4.72" 90 3.54"	$\phi 0.5$ $\phi 0.02^*$	FU-75F Approx. 10g
	 Sleeve R10 mm R0.39" $\phi 3$ $\phi 0.12^*$ $\phi 0.4$ $\phi 0.02^*$ 45 1.77" 15 0.59"	1 m 3.3' Free-cut ($\phi 1.0$ $\phi 0.04^*$) -40 to +70°C (-40 to +158°F)			390 15.35" 85 3.35"	370 14.57" 260 10.24" 180 7.09"	120 4.72" 40 1.57" 20 0.79"	$\phi 0.265$ $\phi 0.01^*$	FU-76F Approx. 10g
	 Do not bend sleeve. $\phi 2.5$ $\phi 0.10^*$ $\phi 0.3$ $\phi 0.01^*$ 10 0.39" 5 0.20"	50 cm 19.69" Cut not allowed -40 to +70°C (-40 to +158°F)			73 2.87" 16 0.63"	56 2.17" 41 1.61" 27 1.06"	21 0.83" 5 0.20" 2 0.08"	$\phi 0.125$ $\phi 0.005^*$	FU-56 Approx. 3g

¹ When using the FS-N40 Series. "3600 mm 141.73'" is the maximum because the fiber cable length is 2 m 6.6'.

Oil/Chemical Resistant Fibers

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Optical axis diameter (mm inch)	Model Weight
				TERA (Longest) FINE (Initial)	Other power modes			
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD		
Top		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +70°C (-40 to +158°F)	R40 R1.57"		3600 141.73" 3600 141.73" 3600 141.73"	3600 141.73" 2400 94.49" 1500 59.06"	ø3.7 ø0.15"	FU-92 Approx. 71g
		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +70°C (-40 to +158°F)			3600 141.73" 3600 141.73" 3600 141.73"	3600 141.73" 3600 141.73" 1900 74.80"	ø6 ø0.24"	FU-98 Approx. 70g
Side		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +70°C (-40 to +158°F)	R25 ² R0.98"		3600 141.73" 3600 141.73" 2000 78.74"	3100 122.05" 860 33.86" 570 22.44"	ø2.8 ø0.11"	FU-96 Approx. 71g
		2 m 6.6' Free-cut (ø2.2 ø0.09") 0 to +60°C (0 to +140°F)			3600 141.73" 3600 141.73" 3600 141.73"	3600 141.73" 3600 141.73" 2400 94.49"	ø3.7 ø0.15"	FU-96T Approx. 35g
Side (oil resistant)		2 m 6.6' Free-cut (ø2.2 ø0.09") -20 to +100°C (-4 to +212°F)	R2 R0.08" ToughFlex		3600 141.73" 3600 141.73" 2000 78.74"	2500 98.43" 1000 39.37" 790 31.10"	ø2.3 ø0.09"	FU-80TZ Approx. 30g
		2 m 6.6' Free-cut (ø2.2 ø0.09") -20 to +100°C (-4 to +212°F)			3600 141.73" 3600 141.73" 3600 141.73"	3600 141.73" 3600 141.73" 2900 114.17"	ø4.3 ø0.17"	FU-80MTZ Approx. 55g



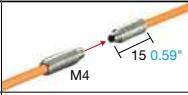


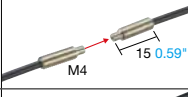


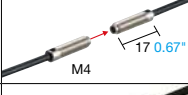


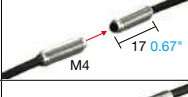


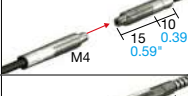





¹ When using the FS-N40 Series. "3600 mm 141.73" is assumed as the maximum because the fiber cable length is 2 m 6.6'.
² Fibers cannot be bent within 25 mm 0.98" of the end of the case screw cap.

High-Flex Fibers (Repeated Bending Fibers)

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Optical axis diameter (mm inch)	Model Weight	
				TERA (Longest) FINE (Initial)	Other power modes				
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD			
ø1.0 ø0.04"		1 m 3.3' Free-cut (ø1.0 ø0.04") -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex High-flex		800 31.50" 170 6.69"	700 27.56" 510 20.08" 360 14.17"	220 8.66" 64 2.52" 40 1.57"	ø0.5 ø0.02"	FU-58U Approx. 4g
ø1.5 ø0.06"		1 m 3.3' Free-cut (ø1.0 ø0.04") -40 to +50°C (-40 to +122°F)							FU-59U Approx. 4g
M3		1 m 3.3' Free-cut (ø1.0 ø0.04") -40 to +50°C (-40 to +122°F)							FU-79U Approx. 4g
M4 Built-in lens		1 m 3.3' Free-cut (ø1.0 ø0.04") -40 to +50°C (-40 to +122°F)							R1 R0.04" ToughFlex High-flex
		2 m 6.6' Free-cut (ø1.0 ø0.04") -20 to +50°C (-4 to +122°F)		3600 141.73" 3500 137.80" 2100 82.68"	1400 55.12" 410 16.14" 210 8.27"	FU-70TU Approx. 8g			
ø1.5 ø0.06"		1 m 3.3' Free-cut (ø1.0 ø0.04") -40 to +70°C (-40 to +158°F)	R4 R0.16" High-flex		1500 59.06" 350 13.78"	1200 47.24" 900 35.43" 600 23.62"	440 17.32" 130 5.12" 77 3.03"	ø0.7 ø0.03"	FU-59 Approx. 3g
M3		1 m 3.3' Free-cut (ø1.0 ø0.04") -40 to +70°C (-40 to +158°F)							FU-79 Approx. 6g
6 × 10.5 × 2.5 0.24" × 0.41" × 0.10"		1 m 3.3' Free-cut (ø1.0 ø0.04") -40 to +70°C (-40 to +158°F)							



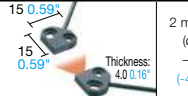

















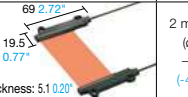


¹ When using the FS-N40 Series. "3600 mm 141.73" (1800 mm 70.87") is assumed as the maximum because the fiber cable length is 2 m 6.6' (1 m 3.3').

Heat Resistant Fibers

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Optical axis diameter (mm inch)	Model Weight
				 TERA (Longest)  FINE (Initial)	Other power modes			
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD		
100°C ³ (212°F)		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +100°C (-40 to +212°F)	R5 R0.20" ToughFlex	 3600 141.73"  1200 47.24"	3600 141.73" 3600 141.73" 2100 82.68"	1500 59.06" 460 18.11" 260 11.02"	ø1 ø0.04"	FU-86Z Approx. 25g
105°C ³ (221°F)		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +105°C (-40 to +221°F)	R25 R0.98"	 3600 141.73"  1400 55.12"	3600 141.73" 3600 141.73" 2600 102.36"	1900 74.80" 540 21.26" 320 12.60"		FU-86A Approx. 22g
150°C ⁴ (302°F)		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +150°C (-40 to +302°F)	R20 R0.79"	 3600 141.73"  620 24.41"	3200 125.98" 2100 82.68" 1300 51.18"	860 33.86" 400 15.75" 230 9.06"	ø1.5 ø0.06"	FU-86H Approx. 35g
180°C ⁵ (356°F)		2 m 6.6' Free-cut (ø2.2 ø0.09") -60 to +180°C (-76 to +356°F)	R35 R1.38"	 3600 141.73"  680 26.77"	3200 125.98" 2200 86.61" 1400 55.12"	940 37.01" 450 17.72" 260 10.24"		FU-88 Approx. 36g
200°C (392°F)		2 m 6.6' Cut not allowed -40 to +200°C (-40 to +392°F)	R8 R0.31"	 2900 114.17"  460 18.11"	2100 82.68" 1500 59.06" 1100 43.31"	810 31.89" 300 11.81" 170 6.69"	ø1 ø0.04"	FU-88K Approx. 30g
300°C (572°F)		2 m 6.6' Cut not allowed -40 to +300°C (-40 to +572°F)	R25 R0.98"	 2900 114.17"  460 18.11"	2100 82.68" 1500 59.06" 1100 43.31"	810 31.89" 300 11.81" 170 6.69"	ø1 ø0.04"	FU-84C Approx. 66g



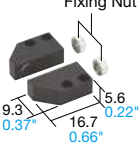

¹ When using the FS-N40 Series, "3600 mm 141.73" is assumed as the maximum because the fiber cable length is 2 m 6.6'.
² Use the fiber sensor under dry conditions. Allow some margin for the temperature upper limit when selecting a heat-resistant fiber unit.
³ The recommended maximum ambient temperature during operation is 90°C (194°F) when constantly using the fiber unit in a high-temperature environment.
⁴ The recommended maximum ambient temperature during operation is 130°C (266°F) when constantly using the fiber unit in a high-temperature environment.
⁵ The recommended maximum ambient temperature during operation is 150°C (302°F) when constantly using the fiber unit in a high-temperature environment.

Area/Array Fibers

Type	Detecting method	Optical axis width	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Optical axis diameter (mm inch)	Model Weight
						 TERA (Longest)  FINE (Initial)	Other power modes			
							MEGA ULTRA SUPER	TURBO HSPD S-HSPD		
Array	5 mm 0.20"		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +70°C (-40 to +158°F)	R4 ² R0.16"	 3600 141.73"  810 31.89"	3600 141.73" 2300 90.56" 1400 55.12"	910 35.83" 340 13.39" 200 7.87"	Approx. 6 × 0.3 0.24" × 0.01"	FU-A05 Approx. 20g	
	10 mm 0.39"		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +70°C (-40 to +158°F)		 3600 141.73"  1100 43.31"	3600 141.73" 3200 125.98" 2100 82.68"	1500 59.06" 610 24.02" 350 13.78"	Approx. 11 × 0.3 0.43" × 0.01"	FU-A10 Approx. 20g	
	40 mm 1.57"		2 m 6.6' Free-cut (not including the 50 mm 1.97" spiral section) -20 to +50°C (-4 to +122°F)	R10 R0.39"	 3600 141.73"  1000 39.37"	3600 141.73" 3200 125.98" 2100 82.68"	1500 59.06" 610 24.02" 350 13.78"	Approx. 40 × 0.25 1.57" × 0.01"	FU-A40 Approx. 70g	
	100 mm 3.94"		2 m 6.6' Free-cut (not including the 50 mm 1.97" spiral section) -20 to +50°C (-4 to +122°F)		 3600 141.73"  2500 98.43"	3600 141.73" 3200 125.98" 2000 78.74"	1400 55.12" 540 21.26" 310 12.20"	Approx. 100 × 0.25 3.94" × 0.01"	FU-A100 Approx. 110g	
Area	10 mm 0.39"		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex	 3600 141.73"  2500 98.43"	3600 141.73" 3600 141.73" 3600 141.73"	2800 110.24" 1000 39.37" 580 22.83"	10 × 3 0.39" × 0.12" (With 1.0 mm 0.04" wide slit)	FU-12 Approx. 23g	
	11 mm 0.43"		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +50°C (-40 to +122°F)		 3600 141.73"  3600 141.73"	3600 141.73" 3600 141.73" 3600 141.73"	3600 141.73" 2200 86.61" 1200 47.24"	11 × 2 0.43" × 0.08" (With 0.5 mm / 1.0 mm 0.02"/0.04" wide slit)	FU-E11 Approx. 20g	
	40 mm 1.57"		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +50°C (-40 to +122°F)		 3600 141.73"  3600 141.73"	3600 141.73" 3600 141.73" 3600 141.73"	3600 141.73" 3600 141.73" 3600 141.73"	40 × 3 1.57" × 0.12" (0.5 × 20 mm 0.02" × 0.79" / 0.5 × 30 mm 0.02" × 1.18" slit options available)	FU-E40 Approx. 30g	

¹ When using the FS-N40 Series, "3600 mm 141.73" is assumed as the maximum because the fiber cable length is 2 m 6.6'.
² R10 R0.39" for the first 10 mm 0.39" of cable from the housing.

Detecting Distances Using Thrubeam Lenses

Type	Appearance (mm inch)	Ambient temperature	Model Weight	Applicable fiber units	Detecting distance (mm inch) ^{*1}							
					TERA	MEGA	ULTRA	SUPER	TURBO	FINE	HSPD	S-HSPD
Ultra-long detecting distance Aperture Angle: Approx. 8°	Tip: $\phi 4.3$ $\phi 0.17^{\circ}$ 	-40 to +70°C (-40 to +158°F)	F-4 Approx. 1g	FU-77TZ/ 77V/77	3600 141.73*				2700 106.30*	1700 66.93*		
				FU-7F	3600 141.73*				3200 125.98*	2000 78.74*		
				FU-78	3600 141.73*				2500 98.43*	1400 55.12*		
				FU-77G/77TG/ 77MG/77MTG	1800 70.87*				1700 66.93*			
Long-detecting distance Aperture Angle: Approx. 15°	Tip: $\phi 4$ $\phi 0.16^{\circ}$ 	-40 to +300°C (-40 to +572°F)	F-2 Approx. 2g	FU-77TZ/77V/ 77/84C/88K	3600 141.73*				2100 82.68*	1100 43.31*		
				FU-7F/86A	3600 141.73*				2500 98.43*	1400 55.12*		
				FU-86Z	3600 141.73*				1900 74.80*	1000 39.37*		
				FU-78	3600 141.73*				1600 62.99*	900 35.43*		
				FU-77G/77TG/ 77MG/77MTG	1800 70.87*				1100 43.31*			
Side-view with mounting holes	Fixing Nut 	-40 to +105°C (-40 to +221°F)	F-5 Approx. 10g	FU-77V/77	3600 141.73*				2600 102.36*	1600 62.99*		
				FU-7F/86A	3600 141.73*				3100 122.05*	1900 74.80*		
				FU-86Z	3600 141.73*				2900 114.17*	1800 70.87*		
				FU-78	3600 141.73*				2300 90.55*	1300 51.18*		
				FU-77G/77MG	1800 70.87*				1600 62.99*			
Side-view	Tip: $\phi 4$ $\phi 0.16^{\circ}$ 	-40 to +70°C ² (-40 to +158°F)	F-1 Approx. 2g	FU-77V/77	3600 141.73*	3200 125.98*	2200 86.61*	1600 62.99*	530 20.87*	300 11.81*		
				FU-77G/77MG	1800 70.87*				1600 62.99*	530 20.87*	300 11.81*	
				FU-7F/86A	3600 141.73*				2700 106.30*	2300 90.55*	630 24.80*	370 14.57*
				FU-86Z	3600 141.73*				2400 94.49*	2000 78.74*	590 23.23*	350 13.78*
				FU-78/84C/88K	3600 141.73*	3000 118.11*	1900 74.80*	1300 51.18*	960 37.80*	360 14.17*	200 7.87*	

1 The maximum sensing distance of 3600 mm 141.73 (1800 mm 70.87*) is possible because the fiber length on one side is 2 m 6.6* (1 m 3.3*).

*2 When using the F-1 at a temperature of 70°C (158°F) or more, specify the "Heat-resistant F-1".

Slit For FU-E40 (Sold Separately)

Slit Type	With OP-84365 attached	With OP-84366 attached	
Optical Axis Size	30 x 0.5 mm 1.18" x 0.02"	20 x 0.5 mm 0.79" x 0.02"	
Detecting distance for each power mode (mm inch) ^{*1}	TERA	3600 141.73*	3600 141.73*
	MEGA	3600 141.73*	3600 141.73*
	ULTRA	3500 137.80*	2300 90.55*
	SUPER	1500 59.06*	930 36.61*
	TURBO	760 29.92*	510 20.08*
	FINE	460 18.11*	330 12.99*
	S-HSPD	160 6.30*	110 4.33*
S-HSPD	80 3.15*	56 2.20*	
Slit weight (transmitter/receiver set)	Approx. 4g		

OP-84365



OP-84366



1 When using the FS-N40 Series, "3600 mm 141.73" is assumed as the maximum because the fiber cable length is 2 m 6.6*.

Threaded and Hex-Shaped Fibers

Type		Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Model Weight	
Size / Shape	Detecting arrangement				TERA (Longest) FINE (Initial)	Other power modes			
						MEGA ULTRA SUPER	TURBO HSPD S-HSPD		
M3	Hex-shaped		1 m 3.3' Free-cut (ø1.3 ø0.05" × 2) -40 to +50°C (-40 to +122°F)	R2 R0.08* ToughFlex	580 22.83" 120 4.72" Lens attachment ▶ P28	530 20.87" 390 15.35" 250 9.84"	170 6.69" 45 1.77" 27 1.06"	FU-35TZ Approx. 7g	
	Threaded	Coaxial		1 m 3.3' Free-cut (ø1.3 ø0.05" × 2) -40 to +50°C (-40 to +122°F)	R2 R0.08* ToughFlex	590 23.23" 130 5.12" Lens attachment ▶ P28	540 21.26" 420 16.54" 320 12.60"	190 7.48" 47 1.85" 28 1.10"	FU-35FZ Approx. 6g
				1 m 3.3' Free-cut (ø1.3 ø0.05" × 2) -40 to +70°C (-40 to +158°F)	R25 R0.98*	1000 39.37" 200 7.87" Lens attachment ▶ P28	780 30.71" 600 23.62" 420 16.54"	270 10.63" 76 2.99" 49 1.93"	FU-35FA Approx. 6g
				50 cm 19.69" Cut not allowed FU-21X : -40 to +70°C (-40 to +158°F) FU-24X : -40 to +50°C (-40 to +122°F)	R10 R0.39*	300 11.81" 63 2.48" Lens attachment ▶ P28	220 8.66" 150 5.91" 91 3.58"	68 2.68" 23 0.91" 15 0.59"	FU-21X Approx. 4g
M4	Hex-shaped		2 m 6.6' Free-cut (ø1.3 ø0.05" × 2) -40 to +50°C (-40 to +122°F)	R2 R0.08* ToughFlex	800 31.50" 250 9.84"	750 29.53" 660 25.98" 460 18.11"	370 14.57" 100 3.94" 60 2.36"	FU-66TZ Approx. 10g	
	Threaded	Parallel		2 m 6.6' Free-cut (ø1.3 ø0.05" × 2) FU-66Z : -40 to +50°C (-40 to +122°F) FU-66 : -40 to +70°C (-40 to +158°F)	R25 R0.98*	1200 47.24" 340 13.39"	1000 39.37" 750 29.53" 550 21.66"	430 16.93" 110 4.33" 66 2.60"	FU-66Z Approx. 10g
				2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +50°C (-40 to +122°F)	R2 R0.08* ToughFlex	900 35.43" 380 14.96"	830 32.68" 730 28.74" 670 26.38"	520 20.47" 150 5.91" 89 3.50"	FU-67TZ Approx. 25g
M6	Hex-shaped		2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +50°C (-40 to +122°F)	R2 R0.08* ToughFlex	900 35.43" 380 14.96"	830 32.68" 730 28.74" 670 26.38"	520 20.47" 150 5.91" 89 3.50"	FU-67TZ Approx. 25g	
	Threaded	Parallel		2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +50°C (-40 to +122°F)	R0.5 R0.02* ToughFlex	1100 43.31" 380 14.96"	1000 39.37" 830 32.68" 610 24.02"	500 19.69" 150 5.91" 88 3.46"	FU-67V Approx. 25g
				2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +50°C (-40 to +122°F)	R2 R0.08* ToughFlex	1500 59.06" 550 21.66"	1300 51.18" 1100 43.31" 780 30.71"	640 25.20" 230 9.06" 140 5.51"	FU-61Z Approx. 22g
				2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +50°C (-40 to +122°F)	R2 R0.08* ToughFlex	1100 43.31" 380 14.96"	1000 39.37" 830 32.68" 610 24.02"	500 19.69" 150 5.91" 88 3.46"	FU-67 Approx. 21g
				2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +70°C (-40 to +158°F)	R2 R0.08* ToughFlex	2400 94.49" 600 23.62"	2200 86.61" 1300 51.18" 1000 39.37"	680 26.77" 270 10.63" 180 7.09"	FU-61 Approx. 21g
			2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +70°C (-40 to +158°F)	R25 R0.98*	1400 55.12" 480 18.90"	1200 47.24" 1000 39.37" 780 30.71"	550 21.65" 220 8.66" 130 5.12"	FU-6F Approx. 21g	
Coaxial		2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +70°C (-40 to +158°F)	R25 R0.98*	790 31.10" 290 11.42"	780 30.71" 750 29.53" 680 26.77"	450 17.72" 210 8.27" 120 4.72"	FU-25 Approx. 18g		

¹ When using the FS-N40 Series. Standard target: White matte paper (Reflective type only)

Cylindrical (Set Screw Installation Fibers)

Type		Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ^{*1}			Model Weight
Size	TERA (Longest) FINE (Initial)				Other power modes			
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD		
ø1.5 ø0.06"		1 m 3.3' Cut not allowed -40 to +70°C (-40 to +158°F)	R4 R0.16" High-flex	280 11.02" 59 2.32"	250 9.84" 170 6.69" 130 5.12"	91 3.58" 25 0.98" 14 0.55"	FU-49X Approx. 3g	
		1 m 3.3' Cut not allowed -40 to +70°C (-40 to +158°F)	R10 R0.39"	64 2.52" 8 0.31"	46 1.81" 30 1.18" 22 0.87"	14 0.55" 3 0.12" 1 0.04"	FU-46 Approx. 2g	
ø2 ø0.08"		1 m 3.3' Free-cut (ø1.0 ø0.04" x 2) -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex High-flex	290 11.42" 59 2.32"	220 8.66" 180 7.09" 110 4.33"	80 3.15" 20 0.83" 12 0.47"	FU-49U Approx. 4g	
ø2.5 ø0.10"		50 cm 19.69" Cut not allowed -40 to +70°C (-40 to +158°F)	R25 R0.98"	160 6.30" 42 1.65"	120 4.72" 100 3.94" 76 2.99"	54 2.13" 20 0.79" 11 0.43"	FU-22X Approx. 4g	
ø3 ø0.12"		2 m 6.6' Free-cut (ø1.3 ø0.05" x 2) FU-4FZ: -40 to +50°C (-40 to +122°F) FU-4F: -40 to +70°C (-40 to +158°F)	R2 R0.08" ToughFlex	1200 47.24" 340 13.39"	1000 39.37" 750 29.53" 550 21.65"	430 16.93" 110 4.33" 66 2.60"	FU-4FZ Approx. 8g	
		1 m 3.3' Free-cut (ø1.0 ø0.04" x 2) -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex High-flex	290 11.42" 59 2.32"	220 8.66" 180 7.09" 110 4.33"	80 3.15" 21 0.83" 12 0.47"	FU-48U Approx. 4g	
		2 m 6.6' Free-cut (ø1.0 ø0.04" x 2) -40 to +70°C (-40 to +158°F)	R4 R0.16" High-flex	500 19.69" 90 3.54"	350 13.78" 270 10.63" 190 7.48"	120 4.72" 32 1.26" 18 0.71"	FU-48 Approx. 7g	
		50 cm 19.69" Cut not allowed -40 to +70°C (-40 to +158°F)	R25 R0.98"	850 33.46" 330 12.99"	830 32.68" 730 28.74" 660 25.98"	540 21.26" 220 8.66" 180 7.09"	FU-23X Approx. 4g	
		50 cm 19.69" Cut not allowed -40 to +70°C (-40 to +158°F)	R4 R0.16"	120 4.72" 33 1.30"	100 3.94" 83 3.27" 68 2.68"	46 1.81" 11 0.43" 6 0.24"	FU-45X Approx. 4g	

*1 When using the FS-N40 Series. Standard target: White matte paper (Reflective type only)

Integrated Bracket Fibers

Type		Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ^{*1}			Model Weight
Beam emitting direction	Optical axis height				TERA (Longest) FINE (Initial)	Other power modes		
						MEGA ULTRA SUPER	TURBO HSPD S-HSPD	
Top	10 mm 0.39"		2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex	1200 47.24" 310 12.20"	1000 39.37" 780 30.71" 580 22.83"	470 18.50" 150 5.91" 90 3.54"	FU-L41Z Approx. 25g

*1 When using the FS-N40 Series. Standard target: White matte paper (Reflective type only)

Reflective

Focused Beam/High-Power Fibers

Type		Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹⁾			Model Weight
Beam emitting direction	Aperture angle				TERA (Longest) FINE (Initial)	Other power modes MEGA ULTRA SUPER	TURBO HSPD S-HSPD	
Top	Approx. 8°	 Thickness: 5.2 0.20" 21 0.83"	2 m 6.6' Free-cut (ø2.2 ø0.09" x 2) -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex	 30 to 2700 1.18" to 106.30" 30 to 530 1.18" to 20.87"	30 to 2400 1.18" to 94.49" 30 to 2100 1.18" to 82.68"	30 to 690 1.18" to 27.17" 30 to 270 1.18" to 10.63"	FU-40 Approx. 23g
		 Thickness: 5.2 0.20" 21 0.83"	1 m 3.3' Cut not allowed -40 to +50°C (-40 to +122°F)	R10 R0.39" Stainless Steel		30 to 1200 1.18" to 47.24"	30 to 220 1.18" to 8.66"	FU-40G Approx. 50g

¹⁾ When using the FS-N40 Series. Standard target: White matte paper (Reflective type only)

Small Spot Reflective Fibers

Lens Attachment (Small Spot) + Fiber Unit

Type	Beam spot diameter (mm inch)	Focal distance (mm inch)	Lens Attachment			Fiber Unit		
			Appearance (mm inch)	Ambient temperature Weight	Model	Appearance	Minimum bend radius (mm inch)	Model
Small Spot	Approx. ø0.1 ø0.004"	7±2 0.28"±0.08"	 Tip: ø4.3 ø0.17" 15.6 0.61"	-30 to +70°C (-22 to +158°F) Approx. 1g	F-2HA		R10 R0.39"	FU-24X
	Approx. ø0.2 ø0.01"						R25 R0.98"	FU-21X
	Approx. ø0.4 ø0.02"						R2 R0.08" ToughFlex	FU-35FZ
							R10 R0.39" Stainless Steel	FU-35FG/ 2303
							R25 R0.98"	FU-35FA
							R2 R0.08" ToughFlex	FU-35TZ
	Approx. ø0.5 ø0.02"	15±2 0.59"±0.08"	 Tip: ø7.4 ø0.29" 27 1.06"	-30 to +70°C (-22 to +158°F) Approx. 2g	F-4HA		R2 R0.08" ToughFlex	FU-35FZ
							R10 R0.39" Stainless Steel	FU-35FG/ 2303
							R2 R0.08" ToughFlex	FU-35TZ
							R10 R0.39" Stainless Steel	FU-35TG
							R25 R0.98"	FU-35FA
							R2 R0.08" ToughFlex	FU-35TZ
Approx. ø1.0 ø0.04"	35±3 1.38"±0.12"	 Tip: ø10.6 ø0.42" 26 1.02"	-40 to +70°C (-40 to +158°F) Approx. 5g	F-6HA		R25 R0.98"	FU-21X	
						R2 R0.08" ToughFlex	FU-35FZ	
						R10 R0.39" Stainless Steel	FU-35FG/ 2303	
						R2 R0.08" ToughFlex	FU-35TZ	
						R25 R0.98"	FU-35FA	
					Approx. ø2.0 ø0.08"			

Lens Attachment (Parallel Beam) + Fiber Unit

Type	Beam spot diameter (mm inch)	Lens Attachment			Fiber Unit			Detecting distance (mm inch)*				
		Appearance (mm inch)	Ambient temperature Weight	Model	Appearance	Minimum bend radius (mm inch)	Model	TERA (Longest)	Other power modes			
								MEGA	TURBO	HSPD	S-HSPD	
Parallel Beam Spot	Approx. $\phi 4$ $\phi 0.16$ " (within the detecting range of 0 to 20 mm 0 to 0.79 "*)		-30 to +70°C (-22 to +158°F) Approx. 2g	F-3HA		R2 R0.08" ToughFlex	FU-35FZ		76 2.99"	76 2.99"	68 2.68"	68 2.68"
						R10 R0.39" Stainless Steel	FU-35FG/ 2303	66 2.60"	76 2.99"	32 1.26"	25 0.98"	
						R25 R0.98"	FU-35FA	100 3.94"	100 3.94"	100 3.94"	100 3.94"	
						R2 R0.08" ToughFlex	FU-35TZ	68 2.68"	68 2.68"	54 2.13"	54 2.13"	
						R10 R0.39" Stainless Steel	FU-35TG	50 1.97"	68 2.68"	39 1.54"	30 1.18"	

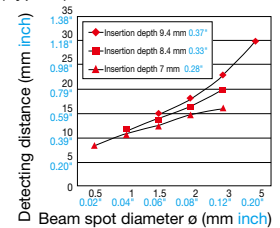
*1 When using the FS-N40 Series. Standard target: White matte paper (Reflective type only.)

Lens Attachment (Variable Beam Spot Sizes)

Type	Beam spot diameter (mm inch)	Focal distance (mm inch)	Lens Attachment			Fiber Unit		
			Appearance (mm inch)	Ambient temperature Weight	Model	Appearance	Minimum bend radius (mm inch)	Model
Side-view adjustable spot	$\phi 0.5$ to 3 $\phi 0.02$ " to $\phi 0.12$ "	8 to 30 0.31 " to $\phi 1.18$ "		-30 to +70°C (-22 to +158°F) Approx. 2g	F-5HA		R2 R0.08" ToughFlex	FU-35FZ
							R10 R0.39" Stainless Steel	FU-35FG/ 2303
							R25 R0.98"	FU-35FA

F-5HA+FU-35FZ

Target width vs. operating range (Typical)

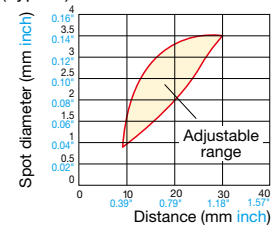


Built-In Lens Variable Beam Spot

Type	Beam spot diameter (mm inch)	Focal distance (mm inch)	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Model Weight	Minimum bend radius (mm inch)
Adjustable beam spot	$\phi 0.9$ to 3.5 $\phi 0.04$ " to $\phi 0.14$ "	10 to 30 0.39 " to 1.18 "		2 m 6.6' Free-cut ($\phi 1.3$ $\phi 0.05$ " $\times 2$) -40 to +70°C (-40 to +158°F)	FU-10 Approx. 5g	R25 R0.98"
				2 m 6.6' Cut not allowed -40 to +70°C (-40 to +158°F)	FU-2540 Approx. 30g	R25 R0.98"

FU-10

Adjustable range of spot diameter (Typical)



Ultra-Small Beam Spot

Type	Beam spot diameter (mm inch)	Focal distance (mm inch)	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Model Weight	Minimum bend radius (mm inch)
Small Spot	Approx. $\phi 0.1$ $\phi 0.004$ "	5 to 20 "		50 cm 19.69" Cut not allowed -40 to +70°C (-40 to +158°F)	FU-20 Approx. 2g	R25 R0.98"

* Cannot be used with the FS-N40 Series in S-HSPD/HSPD mode.

Reflective

Definite-Reflective Fibers

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Beam spot diameter (mm inch)	Model Weight	
				TERA (Longest) FINE (Initial)	Other power modes				
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD			
Top		2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +70°C (-40 to +158°F)	R25 R0.98"	15 to 150 0.59" to 5.91" 15 to 55 0.59" to 2.17"	15 to 110 0.59" to 4.33" 15 to 100 0.59" to 3.94" 15 to 76 0.59" to 2.99"	15 to 64 0.59" to 2.52" 15 to 39 0.59" to 1.54" 15 to 27 0.59" to 1.06"	—	FU-40S Approx. 25g	
Side		2 m 6.6' Free-cut (ø1.0 ø0.04" × 2) -40 to +70°C (-40 to +158°F)	R10 R0.39"	3 0.12" center of detecting distance 3 0.12" center of detecting distance 3 0.12" center of detecting distance	3 0.12" center of detecting distance 3 0.12" center of detecting distance 3 0.12" center of detecting distance	3 0.12" center of detecting distance 3 0.12" center of detecting distance 3 0.12" center of detecting distance	Approx. 4.5 0.18" Approx. 3.5 0.14" (At distance of 3 0.12")	FU-37 Approx. 6g	
		2 m 6.6' Free-cut (ø1.0 ø0.04" × 2) -40 to +70°C (-40 to +158°F)		6 0.24" center of detecting distance 6 0.24" center of detecting distance	6 0.24" center of detecting distance 6 0.24" center of detecting distance	6 0.24" center of detecting distance 6 0.24" center of detecting distance	Approx. ø1.5 ø0.06" (At distance of 6 0.24")	FU-38 Approx. 5g	
Flat		2 m 6.6' Free-cut (ø1.0 ø0.04" × 2) -40 to +70°C (-40 to +158°F)	R25 R0.98"	0 to 4 0" to 0.16" 0 to 4 0" to 0.16"	0 to 4 0" to 0.16" 0 to 4 0" to 0.16"	0 to 4 0" to 0.16" 0 to 4 0" to 0.16"	—	FU-38V Approx. 5g	
		2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +60°C (-40 to +140°F)		8 to 89 0.31" to 3.50" 8 to 54 0.31" to 2.13"	8 to 64 0.31" to 2.52" 8 to 61 0.31" to 2.40" 8 to 59 0.31" to 2.32"	8 to 57 0.31" to 2.24" 8 to 36 0.31" to 1.42" 10 to 26 0.39" to 1.02"	—	FU-38L Approx. 20g	
		2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +70°C (-40 to +158°F)		R5 R0.20"	0 to 25 0" to 0.98" 0 to 25 0" to 0.98"	0 to 25 0" to 0.98" 0 to 25 0" to 0.98"	0 to 25 0" to 0.98" 0 to 25 0" to 0.98"	—	FU-38S Approx. 20g
		2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +70°C (-40 to +158°F)		R25 R0.98"	0 to 14 0" to 0.55" 0 to 14 0" to 0.55"	0 to 14 0" to 0.55" 0 to 14 0" to 0.55"	0 to 14 0" to 0.55" 0 to 14 0" to 0.55"	—	FU-38R Approx. 20g

¹ When using the FS-N40 Series. Standard target: White matte paper (Reflective type only)

Flat Bracket Fibers

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Model Weight
				TERA (Longest) FINE (Initial)	Other power modes		
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD	
Top		1 m 3.3' Free-cut (ø1.0 ø0.04" × 2) -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex	1 to 370 0.04" to 14.57" 1 to 66 0.04" to 2.60"	1 to 270 0.04" to 10.63" 1 to 200 0.04" to 7.87" 1 to 130 0.04" to 5.12"	1 to 100 0.04" to 3.94" 1 to 22 0.04" to 0.87" 1 to 10 0.04" to 0.39"	FU-44TZ Approx. 3g
Side		1 m 3.3' Free-cut (ø1.0 ø0.04" × 2) -40 to +50°C (-40 to +122°F)		1 to 370 0.04" to 14.57" 1 to 66 0.04" to 2.60"	1 to 270 0.04" to 10.63" 1 to 200 0.04" to 7.87" 1 to 130 0.04" to 5.12"	1 to 100 0.04" to 3.94" 1 to 22 0.04" to 0.87" 1 to 10 0.04" to 0.39"	FU-47TZ Approx. 4g
Flat		1 m 3.3' Free-cut (ø1.0 ø0.04" × 2) -40 to +50°C (-40 to +122°F)		2 to 180 0.08" to 7.09" 2 to 42 0.08" to 1.65"	2 to 150 0.08" to 5.91" 2 to 110 0.08" to 4.33" 2 to 74 0.08" to 2.91"	2 to 52 0.08" to 2.05" 2 to 13 0.08" to 0.51" 2 to 4 0.08" to 0.16"	FU-41TZ Approx. 5g
		2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +50°C (-40 to +122°F)		1 to 1000 0.04" to 39.37" 1 to 120 0.04" to 4.72"	1 to 820 0.04" to 32.28" 1 to 540 0.04" to 21.26" 1 to 320 0.04" to 12.60"	1 to 220 0.04" to 8.66" 1 to 85 0.04" to 3.35" 1 to 79 0.04" to 3.11"	FU-42TZ Approx. 24g
		2 m 6.6' Free-cut (ø2.2 ø0.09" × 2) -40 to +50°C (-40 to +122°F)	1 to 1000 0.04" to 39.37" 1 to 120 0.04" to 4.72"	1 to 820 0.04" to 32.28" 1 to 540 0.04" to 21.26" 1 to 320 0.04" to 12.60"	1 to 220 0.04" to 8.66" 1 to 85 0.04" to 3.35" 1 to 79 0.04" to 3.11"	FU-43TZ Approx. 22g	

¹ When using the FS-N40 Series. Standard target: White matte paper (Reflective type only)

Sleeve Type Fibers

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Model Weight
				TERA (Longest) FINE (Initial)	Other power modes		
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD	
Side		2 m 6.6' Free-cut (ø1.0 ø0.04" × 2) -40 to +70°C (-40 to +158°F)	R10 R0.39"	340 13.39" 59 2.32"	290 11.42" 220 8.66" 130 5.12"	85 3.35" 22 0.87" 12 0.47"	FU-31 Approx. 5g
		1 m 3.3' Free-cut (ø2.2 ø0.09" × 2) -40 to +70°C (-40 to +158°F)	R25 R0.98"	750 29.53" 83 3.27"	540 21.26" 420 16.54" 230 9.06"	150 5.91" 54 2.13" 31 1.22"	FU-33 Approx. 10g

¹ When using the FS-N40 Series. Standard target: White matte paper (Reflective type only)

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ^{*1}			Model Weight
				TERA (Longest) FINE (Initial)	Other power modes		
Beam emitting direction					MEGA ULTRA SUPER	TURBO HSPD S-HSPD	
Top	Sleeve section cannot be bent 	50 cm 19.69" Cut not allowed -40 to +70°C (-40 to +158°F)	R4 R0.16"	150 5.91" 33 1.30"	110 4.33" 92 3.62" 68 2.68"	46 1.81" 13 0.51" 7 0.28"	FU-65X Approx. 5g
	Min. bend radius of sleeve: R10 	2 m 6.6' Free-cut (ø1.3 ø0.05" × 2) -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex	580 22.83" 90 3.54"	420 16.54" 280 11.02" 170 6.69"	120 4.72" 29 1.14" 17 0.67"	FU-63Z Approx. 10g
	Min. bend radius of sleeve: R10 	2 m 6.6' Free-cut (ø1.3 ø0.05" × 2) -40 to +70°C (-40 to +158°F)	R25 R0.98"	640 25.20" 130 5.12"	500 19.69" 390 15.35" 250 9.84"	170 6.69" 50 1.97" 30 1.18"	FU-63 Approx. 10g
	Min. bend radius of sleeve: R10 	2 m 6.6' Free-cut (ø1.3 ø0.05" × 2) -40 to +70°C (-40 to +158°F)	R10 R0.39"	64 2.52" 8 0.31"	46 1.81" 30 1.18" 22 0.87"	14 0.55" 3 0.12" 1 0.04"	FU-63T Approx. 10g
	Sleeve section cannot be bent 	50 cm 19.69" Cut not allowed -40 to +70°C (-40 to +158°F)	R4 R0.16"	120 4.72" 33 1.30"	100 3.94" 83 3.27" 68 2.68"	46 1.81" 11 0.43" 6 0.24"	FU-45X Approx. 4g
	Sleeve section cannot be bent 	2 m 6.6' Free-cut (ø1.3 ø0.05" × 2) -40 to +70°C (-40 to +158°F)	R25 R0.98"	640 25.20" 130 5.12"	500 19.69" 390 15.35" 250 9.84"	170 6.69" 50 1.97" 30 1.18"	FU-43 Approx. 8g
	Sleeve section cannot be bent 	1 m 3.3' Cut not allowed -40 to +70°C (-40 to +158°F)	R10 R0.39"	64 2.52" 8 0.31"	46 1.81" 30 1.18" 22 0.87"	14 0.55" 3 0.12" 1 0.04"	FU-46 Approx. 2g
Coaxial, narrow beam 10°	Sleeve section cannot be bent 	50 cm 19.69" Cut not allowed -40 to +70°C (-40 to +158°F)	R25 R0.98"	160 6.30" 42 1.65"	120 4.72" 100 3.94" 76 2.99"	54 2.13" 20 0.79" 11 0.43"	FU-22X Approx. 4g

*1 When using the FS-N40 Series. Standard target: White matte paper (Reflective type only.)






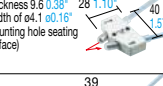





High-Flex Fibers (Repeated Bending Fibers)

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ^{*1}			Model Weight			
				TERA (Longest) FINE (Initial)	Other power modes					
Size					MEGA ULTRA SUPER	TURBO HSPD S-HSPD				
ø2 ø0.08"		1 m 3.3' Free-cut (ø1.0 ø0.04" × 2) -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex High-flex	290 11.42" 59 2.32"	220 8.66" 180 7.09" 110 4.33"	80 3.15" 21 0.83" 12 0.47"	FU-49U Approx. 4g			
ø3 ø0.12"		1 m 3.3' Free-cut (ø1.0 ø0.04" × 2) -40 to +50°C (-40 to +122°F)					FU-48U Approx. 4g			
M3		1 m 3.3' Free-cut (ø1.0 ø0.04" × 2) -40 to +50°C (-40 to +122°F)					FU-69U Approx. 4g			
ø1.5 ø0.06"		1 m 3.3' Cut not allowed -40 to +70°C (-40 to +158°F)	R4 R0.16" High-flex	280 11.02" 59 2.32"	250 9.84" 170 6.69" 130 5.12"	91 3.58" 25 0.98" 14 0.55"	FU-49X Approx. 3g			
M3		1 m 3.3' Cut not allowed -40 to +70°C (-40 to +158°F)					FU-69X Approx. 3g			
ø3 ø0.12"		2 m 6.6' Free-cut (ø1.0 ø0.04" × 2) -40 to +70°C (-40 to +158°F)					500 19.69" 90 3.54"	350 13.78" 270 10.63" 190 7.48"	120 4.72" 32 1.26" 18 0.71"	FU-48 Approx. 7g
M4		2 m 6.6' Free-cut (ø1.0 ø0.04" × 2) -40 to +70°C (-40 to +158°F)								FU-68 Approx. 8g

*1 When using the FS-N40 Series. Standard target: White matte paper (Reflective type only.)






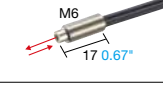


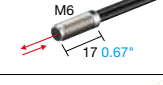


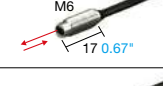


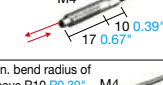
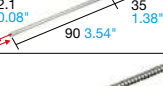


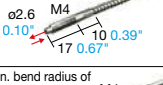
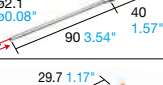


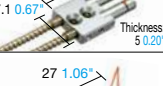


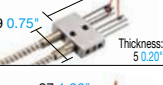



Reflective

Oil/Chemical Resistant Fibers

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Standard target to be detected	Model Weight
				 TERA (Longest)  FINE (Initial)	Other power modes			
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD		
Top		2 m 6.6' Free-cut (ø1.3 ø0.05" x 2) -40 to +70°C (-40 to +158°F)	R40 R1.57"	 310 12.20"  200 7.87"	310 12.20" 290 11.42" 250 9.84"	210 8.27" 130 5.12" 95 3.74"	—	FU-91 Approx. 32g
		2 m 6.6' Free-cut (ø1.3 ø0.05" x 2) -40 to +60°C (-40 to +140°F)		 8 to 20 0.31" to 0.79"  8 to 20 0.31" to 0.79"	8 to 20 0.31" to 0.79" 8 to 20 0.31" to 0.79" 8 to 20 0.31" to 0.79"	8 to 20 0.31" to 0.79" 8 to 20 0.31" to 0.79" 8 to 20 0.31" to 0.79"	200 x 200 mm 7.67" x 7.87" t = 0.7 mm 0.03" Glass substrate	FU-97P Approx. 75g
		2 m 6.6' Free-cut (ø1.3 ø0.05" x 2) -40 to +85°C (-40 to +185°F)		 8 to 20 0.31" to 0.79"  8 to 20 0.31" to 0.79"	8 to 20 0.31" to 0.79" 8 to 20 0.31" to 0.79" 8 to 20 0.31" to 0.79"	8 to 20 0.31" to 0.79" 8 to 20 0.31" to 0.79" 8 to 20 0.31" to 0.79"		FU-97S Approx. 90g

¹ When using the FS-N40 Series. Standard target: White matte paper (Reflective type only.)

Heat Resistant Fibers

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Model Weight
				 TERA (Longest)  FINE (Initial)	Other power modes		
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD	
100°C ² (212°F)		2 m 6.6' Free-cut (ø2.2 ø0.09" x 2) -40 to +100°C (-40 to +212°F)	R5 R0.20" ToughFlex	 900 35.43"  290 11.42"	810 31.89" 700 27.56" 520 20.47"	430 16.93" 150 5.91" 86 3.39"	FU-85Z Approx. 25g
105°C ² (221°F)		2 m 6.6' Free-cut (ø2.2 ø0.09" x 2) -40 to +105°C (-40 to +221°F)	R25 R0.98"	 1200 47.24"  420 16.54"	1100 43.31" 860 33.86" 630 24.80"	530 20.87" 210 8.27" 130 5.12"	FU-85A Approx. 21g
150°C ³ (302°F)		2 m 6.6' Free-cut (ø2.2 ø0.09" x 2) -40 to +150°C (-40 to +302°F)	R20 R0.79"	 1100 43.31"  290 11.42"	950 37.40" 870 34.25" 650 25.59"	540 21.26" 150 5.91" 90 3.54"	FU-85H Approx. 35g
180°C ⁴ (356°F)		2 m 6.6' Free-cut (ø2.2 ø0.09" x 2) -60 to +180°C (-76 to +356°F)	R35 R1.38"	 1200 47.24"  370 14.57"	1000 39.37" 890 35.04" 670 26.38"	560 22.05" 170 6.69" 100 3.94"	FU-87 Approx. 33g
200°C (392°F)		1 m 3.3' Cut not allowed -40 to +200°C (-40 to +392°F)	R8 R0.31"				FU-87K Approx. 15g
300°C (572°F)		1 m 3.3' Cut not allowed -40 to +300°C (-40 to +572°F)	R25 R0.98"	 790 31.10"  350 13.78"	770 30.31" 670 26.38" 600 23.62"	500 19.69" 170 6.69" 100 3.94"	FU-82C Approx. 29g
		1 m 3.3' Cut not allowed -40 to +300°C (-40 to +572°F)					
350°C (662°F)		1 m 3.3' Cut not allowed -30 to +350°C (-22 to +662°F)		 670 26.38"  250 9.84"	650 25.59" 590 23.23" 550 21.65"	470 18.50" 140 5.51" 90 3.54"	FU-81C Approx. 24g
250°C (482°F)		2 m 6.6' Cut not allowed -40 to +250°C (-40 to +482°F)	R25 R0.98"	 8 to 86 0.31" to 3.39"  8 to 51 0.31" to 2.01"	8 to 62 0.31" to 2.44" 8 to 57 0.31" to 2.24" 8 to 54 0.31" to 2.13"	8 to 51 0.31" to 2.01" 8 to 30 0.31" to 1.18" 9 to 23 0.35" to 0.91"	FU-38LK Approx. 70g
		1 m 3.3' Cut not allowed -40 to +250°C (-40 to +482°F)		 2.5 to 150 0.10" to 5.91"  2.5 to 27 0.10" to 1.06"	2.5 to 110 0.10" to 4.33" 2.5 to 93 0.10" to 3.66" 2.5 to 45 0.10" to 1.77"	2.5 to 37 0.10" to 1.46" 2.5 to 17 0.10" to 0.67" 2.5 to 10 0.10" to 0.39"	FU-38K Approx. 45g
180°C ⁶ (356°F)		2 m 6.6' Free-cut (ø2.2 ø0.09" x 2) -40 to +180°C (-40 to +356°F)	R35 R1.38"				FU-38H Approx. 45g

¹ When using the FS-N40 Series. Standard target: White matte paper (Reflective type only.)

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

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

⁴ The recommended maximum ambient temperature during operation is 90°C (194°F) when constantly using the fiber unit in a high-temperature environment.

⁵ The recommended maximum ambient temperature during operation is 130°C (266°F) when constantly using the fiber unit in a high-temperature environment.

⁶ The recommended maximum ambient temperature during operation is 150°C (302°F) when constantly using the fiber unit in a high-temperature environment.

Area/Array Fibers

Type		Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Model Weight
Detecting method	Optical axis width				TERA (Longest) FINE (Initial)	Other power modes		
						MEGA ULTRA SUPER	TURBO HSPD S-HSPD	
Array	10 mm 0.39" (at distance of 4mm 0.16")		2 m 6.6' Free-cut (ø2.2 ø0.09" x 2) -40 to +70°C (-40 to +158°F)	R4 ² R0.16"	1200 47.24" 250 9.84"	1100 43.31" 780 30.71" 440 17.32"	300 11.81" 100 3.94" 58 2.28"	FU-A05D Approx. 20g
	15 mm 0.59" (at distance of 4mm 0.16")		2 m 6.6' Free-cut (ø2.2 ø0.09" x 2) -40 to +70°C (-40 to +158°F)			FU-A10D Approx. 20g		
Area	15 mm 0.59" (at distance of 15mm 0.59")		2 m 6.6' Free-cut (ø2.2 ø0.09" x 2) -40 to +70°C (-40 to +158°F)	R25 R0.98"	5 to 210 0.20" to 8.27" 5 to 210 0.20" to 8.27"	5 to 210 0.20" to 8.27" 5 to 210 0.20" to 8.27" 5 to 210 0.20" to 8.27"	5 to 210 0.20" to 8.27" 5 to 160 0.20" to 6.30" 5 to 110 0.20" to 4.33"	FU-11 Approx. 19g

¹ When using the FS-N40 Series. Standard target: White matte paper (Reflective type only.) ² R10 R0.39" for the first 10 mm 0.39" of cable from the housing.

Liquid-Level Fibers

Type			Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Accessories	Model Weight
Detecting method	Transparent tube diameter (mm inch)	Beam axes					
Tube-mountable	ø4 to 26 ø0.16" to 1.02"	16		2 m 6.6' Free-cut (ø2.2 ø0.09" x 2) -40 to +70°C (-40 to +158°F)	R5 R0.20"	Binding band x 2 Nonslip rubber x 2	FU-95S Approx. 23g
		1		FU-95Z: -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex	Binding band x 2 Nonslip rubber x 2 Spacer x 2 Screw x 2 Nut x 2	FU-95Z Approx. 7g
				FU-95HA: -40 to +105°C (-40 to +221°F) FU-95: -40 to +70°C (-40 to +158°F)	R10 R0.39" R10 R0.39"		FU-95HA Approx. 7g
	More than ø26 1.02" recommended	16		2 m 6.6' Free-cut (ø2.2 ø0.09" x 2) -40 to +70°C (-40 to +158°F)	R5 R0.20"	—	FU-95W Approx. 20g

* The recommended maximum ambient temperature during operation is 90°C (194°F) when constantly using the fiber unit in a high-temperature environment.

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)		Model Weight
			PFA-sheathed section	Fiber	
Immersion		2 m 6.6' Free-cut (ø1.3 ø0.05" x 2) FU-93Z: -40 to +50°C (-40 to +122°F) FU-93: -40 to +70°C (-40 to +158°F)	R40" R1.57"	R0.5 R0.02" ToughFlex R25 R0.98"	FU-93Z Approx. 78g FU-93 Approx. 78g

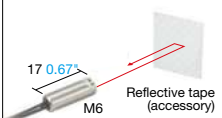
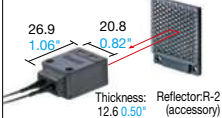
* Not bendable up to 80 mm 3.15" from the tip.

Helpful Usage Tips

- Use the timer function on the fiber optic amplifier if chattering occurs due to dripping or bubbles in the liquid.
- Do not pull or push the fiber unit. 30N every three seconds maximum for the FU-93 Series, and 10N every three seconds maximum for the FU-95 Series.
- Stable detection may not be possible in the following cases (FU-93 Series):
If a bubble adheres to the tip of the sensor;
If foreign material adheres to the tip of the sensor;
When detecting highly adhesive liquid;
When detecting high temperature liquids such as strong acid or strong alkali (Liquid with PFA mixed or penetrated, or fluorinated acid.); and opalescent liquid or liquid that colors PFA.
- A tube whose wall thickness is 3 mm 0.12" or greater may make detection difficult. (FU-95 Series)
- FU-95 Series cannot be used for opaque tubes.
- Use the Display Scaling function of the FS-N40/N10 Series to adjust the displayed light intensity.
- With the FU-93/93Z, the sensor and PFA case are inserted into a thermo fitted tube 80 mm 3.15", up to the tip, in order to secure them in place. Take care to avoid cutting this tube, which will result in looseness.

Retro-Reflective

Retro-Reflective Fibers

Type	Appearance (mm inch)	Fiber unit length (Diameter) Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ^{*1}			Model Weight
				<div style="display: flex; align-items: center;"> <div style="width: 15px; height: 10px; background-color: red; margin-right: 5px;"></div> TERA (Longest) <div style="width: 15px; height: 10px; background-color: orange; margin-left: 10px; margin-right: 5px;"></div> FINE (Initial) </div>	Other power modes		
					MEGA ULTRA SUPER	TURBO HSPD S-HSPD	
M6		2 m 6.6' Free-cut (ø1.0 ø0.04" × 2) -40 to +50°C (-40 to +122°F)	R2 R0.08" ToughFlex	<div style="display: flex; align-items: center;"> <div style="width: 15px; height: 10px; background-color: red; margin-right: 5px;"></div> 30 to 1100 1.18" to 43.31" <div style="width: 15px; height: 10px; background-color: orange; margin-left: 10px; margin-right: 5px;"></div> 30 to 220 1.18" to 8.66" </div>	30 to 1000 1.18" to 39.37" 30 to 810 1.18" to 31.89" 30 to 550 1.18" to 21.65"	30 to 380 1.18" to 14.96" — —	FU-13 Approx. 8g
Square type		2 m 6.6' Free-cut (ø1.0 ø0.04" × 2) -20 to +55°C (-4 to +131°F)	R10 R0.39"	<div style="display: flex; align-items: center;"> <div style="width: 15px; height: 10px; background-color: red; margin-right: 5px;"></div> 100 to 14000 3.94" to 551.18" <div style="width: 15px; height: 10px; background-color: orange; margin-left: 10px; margin-right: 5px;"></div> 100 to 2200 3.94" to 91.55" </div>	100 to 10000 3.94" to 393.70" 100 to 8500 3.94" to 334.65" 100 to 4200 3.94" to 165.35"	100 to 2800 3.94" to 110.24" 100 to 1700 3.94" to 66.93" 100 to 1200 3.94" to 47.24"	FU-15 Approx. 12g



*1 When using the FS-N40 Series.

Reflector/Reflective Tape Specifications (Optional Parts)

Type	Power modes	R-2 (OP-95388)  51.2 × 61 mm 2.02" × 2.40"	R-3 (OP-96436)  35 × 42 mm 1.38" × 1.65"	R-5  14 × 36 mm 0.55" × 1.42"	Reflective tape (OP-96629)  40 × 30 mm 1.57" × 1.18"
FU-13	TERA (mm inch)	10 to 2200 0.39" to 86.61"	10 to 1800 0.39" to 70.87"	10 to 1200 0.39" to 47.24"	30 to 1100 1.18" to 43.31"
	MEGA (mm inch)	10 to 2000 0.39" to 78.74"	10 to 1700 0.39" to 66.93"	10 to 1100 0.39" to 43.31"	30 to 1000 1.18" to 39.37"
	ULTRA (mm inch)	10 to 1600 0.39" to 62.99"	10 to 1300 0.39" to 51.18"	10 to 910 0.39" to 35.83"	30 to 810 1.18" to 31.89"
	SUPER (mm inch)	10 to 1100 0.39" to 43.31"	10 to 920 0.39" to 36.22"	10 to 630 0.39" to 24.80"	30 to 550 1.18" to 21.65"
	TURBO (mm inch)	10 to 760 0.39" to 29.92"	10 to 600 0.39" to 23.62"	10 to 380 0.39" to 14.96"	30 to 380 1.18" to 14.96"
	FINE (mm inch)	10 to 460 0.39" to 18.11"	10 to 360 0.39" to 14.17"	10 to 230 0.39" to 9.06"	30 to 220 1.18" to 8.66"
	HSPD (mm inch)	10 to 250 0.39" to 9.84"	10 to 200 0.39" to 7.87"	10 to 120 0.39" to 4.72"	—
	S-HSPD (mm inch)	10 to 230 0.39" to 9.06"	10 to 180 0.39" to 7.09"	—	—
FU-15	TERA (mm inch)	100 to 14000 3.94" to 551.18"	100 to 9500 3.94" to 374.02"	100 to 4400 3.94" to 173.23"	Reflective tape cannot be used.
	MEGA (mm inch)	100 to 10000 3.94" to 393.70"	100 to 6800 3.94" to 267.72"	100 to 4000 3.94" to 157.48"	
	ULTRA (mm inch)	100 to 8500 3.94" to 334.65"	100 to 6100 3.94" to 240.16"	100 to 3700 3.94" to 145.67"	
	SUPER (mm inch)	100 to 4200 3.94" to 165.35"	100 to 3300 3.94" to 129.92"	100 to 2400 3.94" to 94.49"	
	TURBO (mm inch)	100 to 2800 3.94" to 110.24"	100 to 2200 3.94" to 86.61"	100 to 1900 3.94" to 74.80"	
	FINE (mm inch)	100 to 2300 3.94" to 90.55"	100 to 1800 3.94" to 70.87"	100 to 1800 3.94" to 70.87"	
	HSPD (mm inch)	100 to 1700 3.94" to 66.93"	100 to 1200 3.94" to 47.24"	100 to 1200 3.94" to 47.24"	
	S-HSPD (mm inch)	100 to 1200 3.94" to 47.24"	100 to 920 3.94" to 36.22"	100 to 920 3.94" to 36.22"	

Fiber Unit Adapter Options

Fibers with a cable diameter of 1.0 mm 0.04" or 1.3 mm 0.05" come with an adapter to connect to the fiber amplifier. If you lose the adapter, purchase the appropriate adapter listed here.

Appearance	Cable diameter	Adaptor
	ø1.3 ø0.05"	Adaptor A (OP-26500)
	ø1.0 ø0.04"	Adaptor B (OP-26501)

Vacuum Environment Type Fibers

Type		Heat resistant temperatures	Appearance (mm inch)	Ambient temperature	Minimum bend radius (mm inch)	Detecting distance (mm inch) ¹			Model Weight
Detecting Dimensions method	Description					TERA (Longest) FINE (Initial)	Other power modes		
						MEGA ULTRA SUPER	TURBO HSPD S-HSPD		
Thrubeam	Vacuum side	350°C (662°F)	M4×P0.7 SUS304 	1 m 3.3' Cut not allowed -40 to +350°C (-40 to +662°F)	R25 R0.98"		1800 70.87" 1200 47.24" 850 33.46"	610 24.02" 210 8.27" 110 4.33"	FU-V84 Approx. 55g
		350°C (662°F)	M4×P0.7 SUS304 	1 m 3.3' Cut not allowed -40 to +350°C (-40 to +662°F)					FU-V84L Approx. 60g
	Air side	70°C (158°F)	Across-flats: 8 0.31" 	2 m 6.6' Free-cut (ø2.2 ø0.09") -40 to +70°C (-40 to +158°F)					FU-V7FN Approx. 30g

¹ When using the FS-N40 Series.

Type		Appearance (mm inch)	Ambient temperature	Material	Accessories	Model Weight
Description	Heat resistant temperatures					
Optical integrator for thrubeam set	200°C (392°F)		-10 to +200°C (14 to +392°F)	Fiber: Multi-component glass	M5nut, spring washer, washer two (2) each O-ring (2): Fluoro-rubber (JIS Type 4D)	FU-VJ1 Approx. 25g

Type		Appearance (mm inch)	Ambient temperature	Applicable fiber units	Detecting distance (mm inch) ²								Model Weight
Description	Heat resistant temperatures				TERA	MEGA	ULTRA	SUPER	TURBO	FINE	HSPD	S-HSPD	
Vacuum long-distance lens	350°C (662°F)	End ø4 ø0.16" 	-10 to +350°C (14 to +662°F)	FU-V84 FU-V84L	5600 220.47"	5600 220.47"	5600 220.47"	4400 173.23"	3000 118.11"	2200 86.61"	1000 39.37"	740 29.13"	F-V2 Approx. 2g

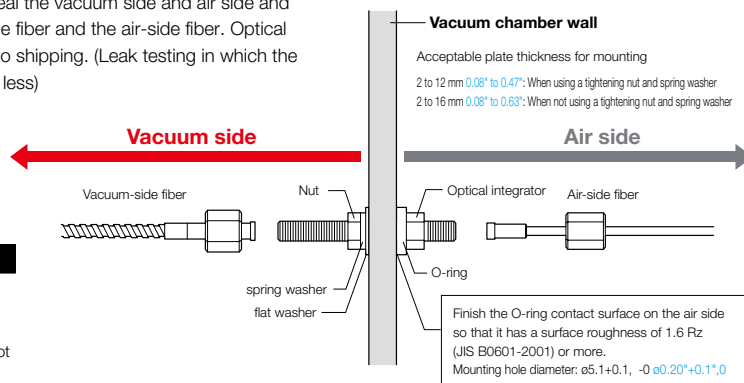
² When using the FS-N40 Series.

Type		Appearance (mm inch)	Ambient temperature	Features	Accessories	Model Weight
Description	Heat resistant temperatures					
2 channel chamber flange	200°C (392°F)		-10 to +200°C (14 to +392°F)	With this part, two sets of optical integrators (four optical integrators in total) can be connected to the four through holes. This part has an outer diameter of 70 mm 2.76" and is sealed with a V40 O-ring. For details on the shape, see "Dimensions."	O-ring (1) Material: Fluoro-rubber (JIS Type 4D)	FU-VJ2 Approx. 280g

Attaching the Optical Integrator

An optical integrator can be used to seal the vacuum side and air side and transmit light between the vacuum-side fiber and the air-side fiber. Optical integrators undergo leak testing prior to shipping. (Leak testing in which the leak amount is 1×10^{-10} Pa·m³/sec or less)

PRECAUTIONS
Be careful when breaking the seal as the vacuum side fiber and optical coupler are placed in a package containing deaerator after being cleaned with alcohol. They are not baked after cleaning, so bake before use.



Specifications

Amplifier Units

Model	NPN output	FS-N41N	FS-N42N	FS-N43N	FS-N44N	FS-N41C ¹ (Selectable output)	FS-N40
	PNP output	FS-N41P	FS-N42P	FS-N43P	FS-N44P		
Cable/connector	Cable					M8 Connector ²	-
Main unit/expansion unit	Main unit	Expansion unit	Main unit	Expansion unit	Main unit	Expansion unit	
Number of control outputs	1	1	2	2	2 ³	None ⁴	
Number of external inputs	-	-	1	1	1 ³	-	
Light source LED	Transmitter side: Red, four-element LED (wavelength: 660 nm)						
Response time	23 μs (S-HSPD ⁵)/50 μs (HSPD ⁵)/250 μs (FINE)/500 μs (TURBO)/ 1 ms (SUPER)/4 ms (ULTRA)/16 ms (MEGA)/64 ms (TERA)						
Control output	Open-collector, 30 V or less 100 mA or less per output, 100 mA or less total for 2 outputs (when used as a solitary unit) / 20 mA or less (when used as an expansion unit)						-
	Residual voltage	NPN 1.4 V or less (output current: 10 mA or less) / 2 V or less (output current: 10 to 100 mA) PNP 1.6 V or less (output current: 10 mA or less) / 2.2 V or less (output current: 10 to 100 mA)					-
External input	Input time: 2 ms (ON) / 20 ms (OFF) or longer ⁷						
Unit expansion (excluding the FS-N41C)	Up to 16 units (17 units connected in total including the main unit). However, each dual output type will be treated as two expansion units.						
Protection circuit	Protection against reverse power connection, output overcurrent, output surge, and reverse output connection						
Mutual interference prevention	S-HSPD / HSPD: 0 units, FINE: 4 units, TURBO / SUPER / ULTRA / MEGA / TERA: 8 units (The mutual interference prevention values are twice those shown here when Double is set.)						
Power supply	Power supply voltage		10 to 30 VDC (including 10% ripple (P-P) or less), class 2 or LPS ⁸				
	Power consumption ⁹	NPN FS-N40	During normal operation: 870 mW or less (34 mA or less at 24 V / 62 mA or less at 12 V) ECO ON: 800 mW or less (31 mA or less at 24 V / 56 mA or less at 12 V) ECO FULL: 710 mW or less (28 mA or less at 24 V / 49 mA or less at 12 V)				
		PNP FS-N41C	Single output type (FS-N41P / N42P) and FS-N41C During normal operation: 910 mW or less (36 mA or less at 24 V / 65 mA or less at 12 V) ECO ON: 840 mW or less (33 mA or less at 24 V / 60 mA or less at 12 V) ECO FULL: 750 mW or less (30 mA or less at 24 V / 52 mA or less at 12 V)				
		Dual output type (FS-N43P / N44P) During normal operation: 990 mW or less (39 mA or less at 24 V / 72 mA or less at 12 V) ECO ON: 920 mW or less (36 mA or less at 24 V / 66 mA or less at 12 V) ECO FULL: 830 mW or less (33 mA or less at 24 V / 59 mA or less at 12 V)					
Ambient light	Incandescent lamp: 20,000 lx or less, sunlight: 30,000 lx or less						
Ambient temperature	-20°C -4°F to +55°C +131°F (no freezing) ¹⁰						
Vibration resistance	10 to 55 Hz; double amplitude 1.5 mm 0.06"; 2 hours each for X, Y, and Z axes						
Shock resistance	500 m / s ² ; 3 times each for X, Y, and Z axes						
Case material	Main unit and cover: polycarbonate						
Weight	Approx. 78 g	Approx. 48 g	Approx. 83 g	Approx. 73 g	Approx. 25 g	Approx. 23 g	

*1 IO-Link Specification V.1.1/COM2 (38.4 kbps) is supported.

*2 Ensure the cable length is 30 m 98.4' or less for the M8 connector type. Ensure the cable length is 20 meters 65.6' or less when connecting by way of IO-Link.

*3 Output 2 and the external input are selectable.

*4 This counts as 1 output when connecting multiple units to the FS-MC8N/P, NU Series.

*5 Restrictions when S-HSPD is selected

- Output 2 of dual output types (FS-N43N / N43P / N44N / N44P / N41C) is fixed to OFF.
- IO-Link communication (FS-N41C) cannot be used.
- Area detection, Area % Mode, DATUM, Rising edge, and Falling edge cannot be selected for Detection Mode.
- Output timer, Limit Detection, and Display Gain cannot be used.
- FULL cannot be selected for the ECO function.

*6 Restrictions when HSPD is selected

- Display Gain cannot be used.

*7 The input time becomes 25 ms (ON)/25 ms (OFF) when external calibration input is selected.

*8 When expanding the system to 9 or more units, use a power supply voltage of 12 V or higher.

*9 The load current is excluded. The power consumption including the load when the maximum number of units are connected is 38 W max.

*10 When expanded by 1 to 2 units: -20°C -4°F to +55°C +131°F. When expanded by 3 to 10 units: -20°C -4°F to +50°C +122°F.

When expanded by 11 to 16 units: -20°C -4°F to +45°C +113°F. When using 2 outputs, 1 unit is counted as 2 units.

The prescribed values for the ambient temperature assume that the sensor amplifier has been mounted on a DIN rail installed on a metal surface.

Exercise special care when installing the product in an airtight space.

Multi-Output Unit

Model	NPN output	FS-MC8N
	PNP output	FS-MC8P
Number of inputs and outputs	Separate control outputs: 8, common output: 1, common input: 1	
Response time	Depends on the response time settings of the connected expansion units	
Unit expansion	Up to 8 expansion units can be connected. (However, each dual output type will be treated as 2 expansion units.) Allowable passing current: 1200 mA or less	
Indicators	STATUS indicator (green and red two-color display) MEMORY indicator (orange) LOCK indicator (orange)	
Separate control output, common output	NPN output	NPN open-collector, 30 V or less, 20 mA or less per output, residual voltage: 1.4 V or less
	PNP output	PNP open-collector, 30 V or less, 20 mA or less per output, residual voltage: 1.6 V or less
External input time	Input time of the connected expansion units +11 ms	
Protection circuit	Protection against reverse power connection, reverse output connection, output overcurrent, and output surge	
Power supply	Power supply voltage¹	10 to 30 VDC (including 10% ripple (P-P) or less), class 2 or LPS
	Power consumption²	690 mW or less (when used as a solitary unit) (26 mA or less at 24 V/38 mA or less at 12 V [excluding the load current])
Environmental resistance	Ambient temperature	-20°C -4°F to +55°C +131°F (no freezing)
	Vibration resistance	10 to 55 Hz; double amplitude 1.5 mm 0.06"; 2 hours each for X, Y, and Z axes
	Shock resistance	500 m/s ² ; 3 times each for X, Y, and Z axes
Case material	Main unit and cover: polycarbonate	
Weight	Approx. 110 g	

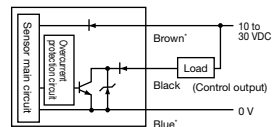
¹ Match the rated power supply voltage of the expansion units to be connected to the system.

² The power consumption including the load when the maximum number of units are connected is 38 W max.

I/O Circuit Diagrams

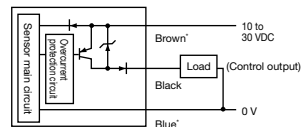
Amplifier Units (Cable Type)

FS-N41N/N42N



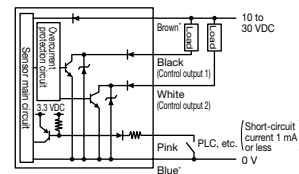
*FS-N41N only

FS-N41P/N42P



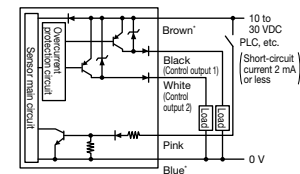
*FS-N41P only

FS-N43N/N44N



*FS-N43N only

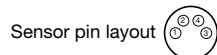
FS-N43P/N44P



*FS-N43P only

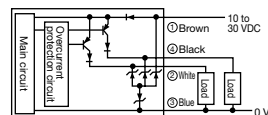
Amplifier Unit (M8 Connector Type FS-N41C)

Select PNP or NPN and the function of I/O pin (2) during the initial settings.

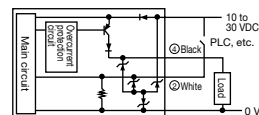


When using the sensor in PNP mode

[OUT1 + OUT2 selected]

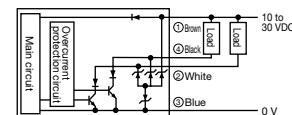


[OUT1 + INPUT selected]

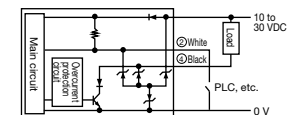


When using the sensor in NPN mode

[OUT1 + OUT2 selected]



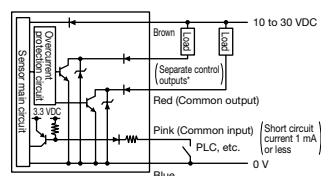
[OUT1 + INPUT selected]



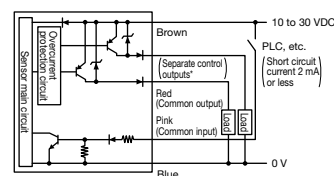
The wire colors indicate the colors when using an OP-73864/73865 M8 connector cable (sold separately).

Multi-Output Unit

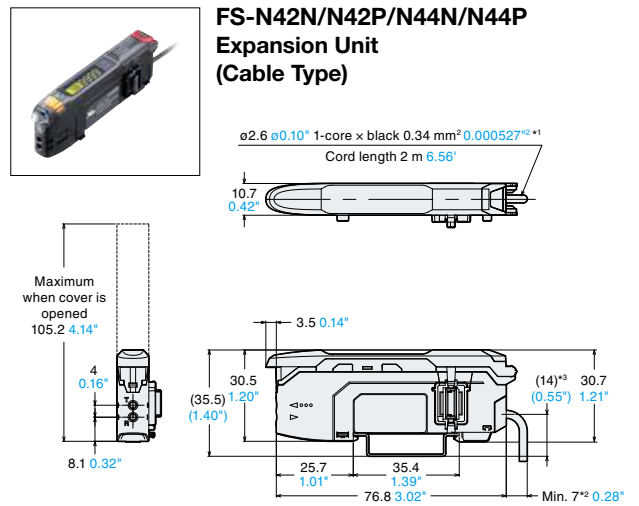
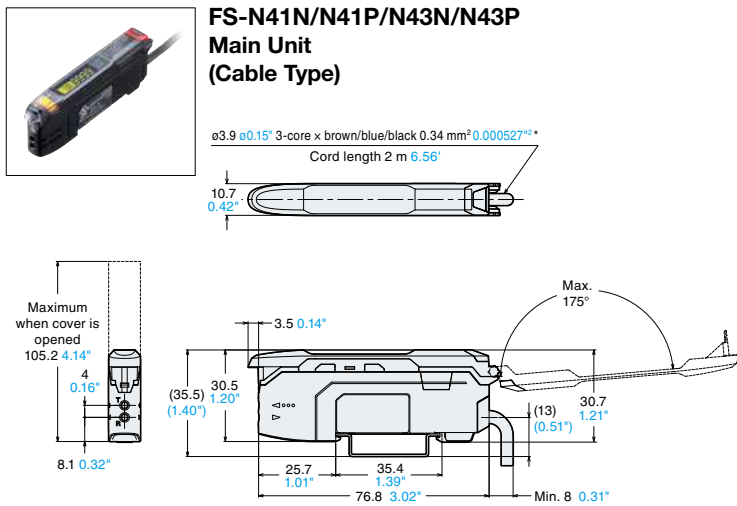
FS-MC8N



FS-MC8P

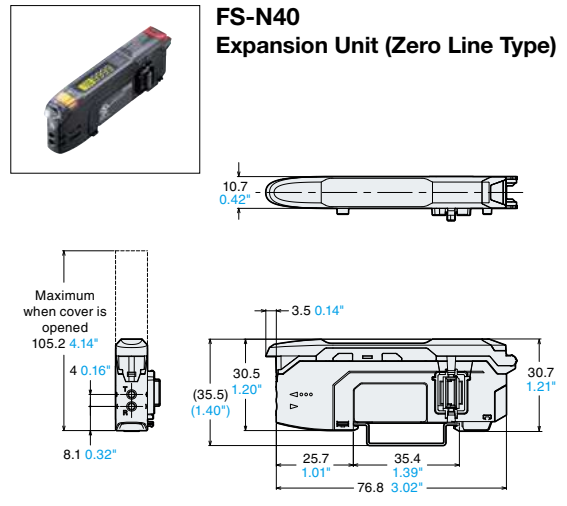
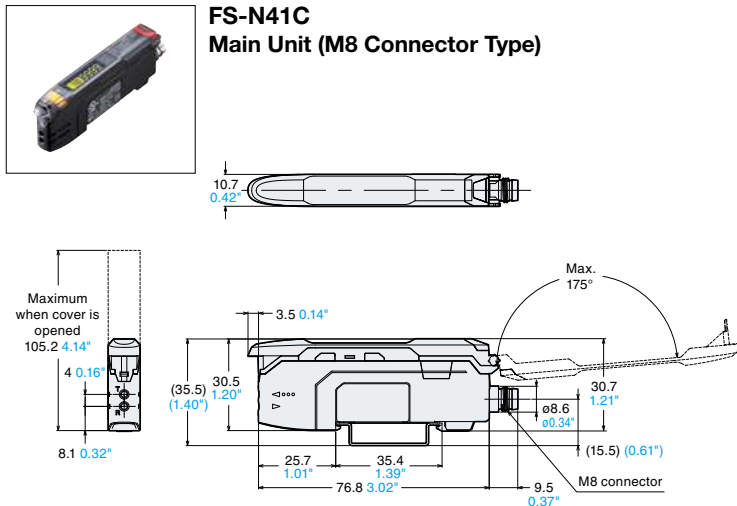


* Black, white, orange, yellow, green, purple, gray, pink / purple

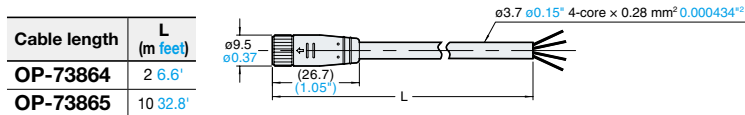


* FS-N43N/N43P is $\phi 3.9$ $\phi 0.15$, 5-core x brown/blue 0.34 mm² 0.000527^{**}, black/white/pink 0.18 mm² 0.000279^{**}

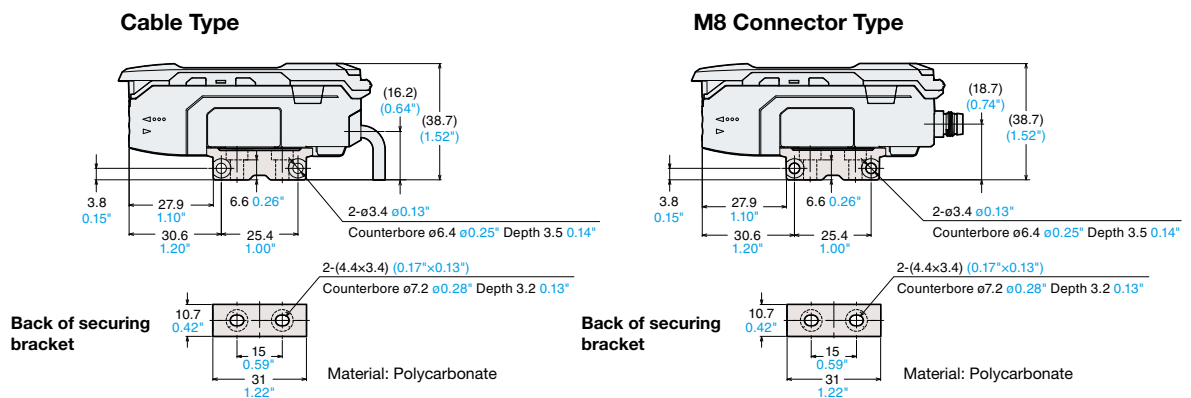
*1. FS-N44N/N44P is $\phi 3.9$ $\phi 0.15$, 3-core x black/white/pink 0.18 mm² 0.000279^{**}
 *2. Minimum 8 for FS-N44N/N44P
 *3. (13) for FS-N44N/N44P



M8 Connector Cable (Optional Part, Sold Separately)

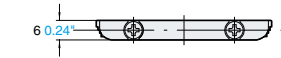


Amplifier Securing Bracket (OP-88245 Optional Part, Sold Separately)

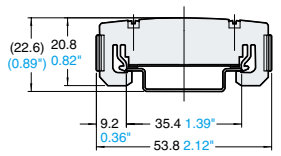


Common to All Models

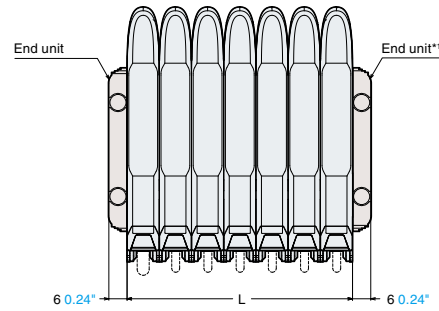
End Unit
(OP-26751 Optional Part, Sold Separately)



When Mounted on a DIN Rail



When Several Units are Connected



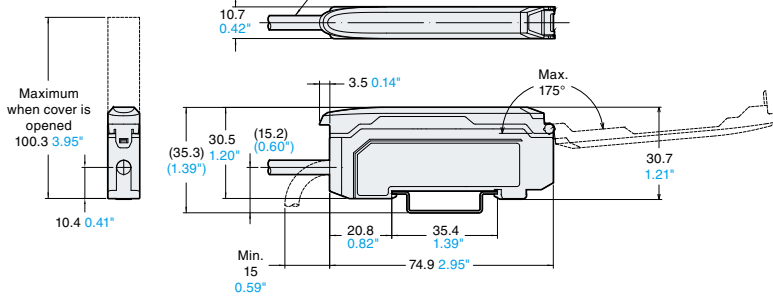
Total Number	L (mm inch)
1	10.7 0.42"
2	21.4 0.84"
3	32.1 1.26"
4	42.8 1.69"
5	53.5 2.11"
6	64.2 2.53"
7	74.9 2.95"
8	85.6 3.37"
9	96.3 3.79"
10	107 4.21"
11	117.7 4.63"
12	128.4 5.06"
13	139.1 5.48"
14	149.8 5.90"
15	160.5 6.32"
16	171.2 6.74"
17	181.9 7.16"

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

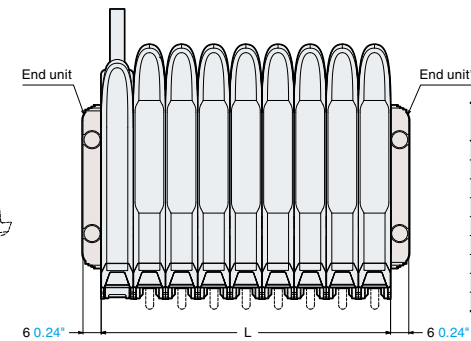


FS-MC8N/P
Multi-Output Unit

ø4.7 ø0.19" 12-core x brown/blue 0.20 mm² 0.000310"²,
black/white/gray/orange/green/pink/purple/
yellow/red/pink-purple 0.15 mm² 0.0002325"²
Cable length: 2 m 6.6'



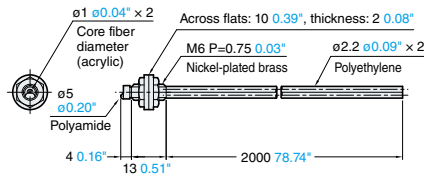
Multi-Output Unit + Unit Expansion



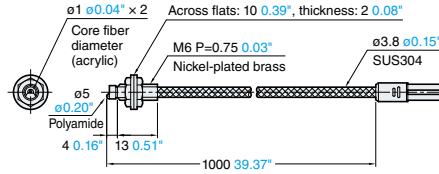
Total Number	L (mm inch)
1	10.7 0.42"
2	21.4 0.84"
3	32.1 1.26"
4	42.8 1.69"
5	53.5 2.11"
6	64.2 2.53"
7	74.9 2.95"
8	85.6 3.37"
9	96.3 3.79"

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

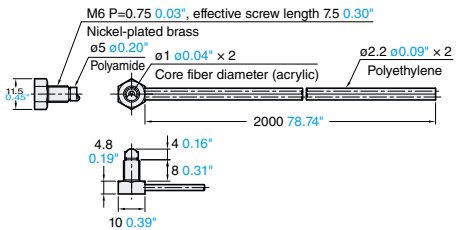
FU-R6F/R67



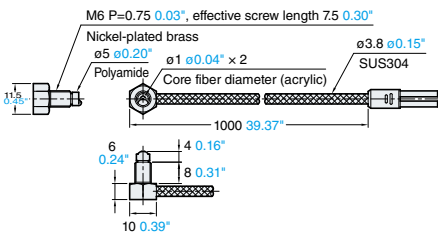
FU-R67G



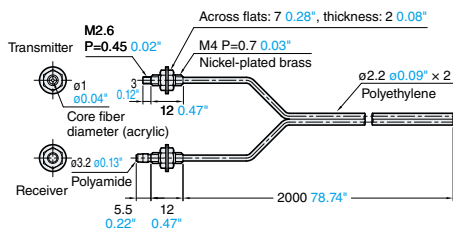
FU-R67TZ



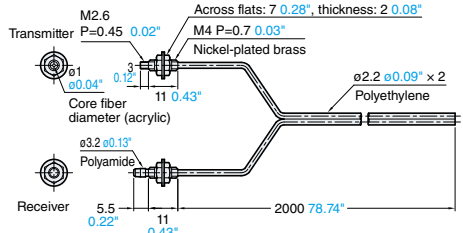
FU-R67TG



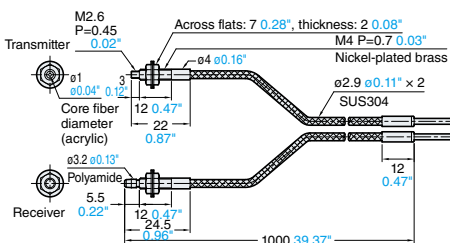
FU-R7F



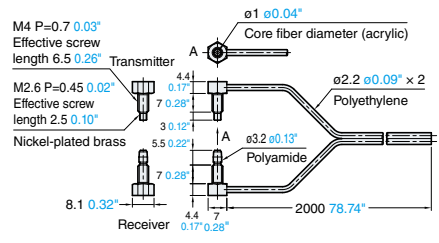
FU-R77



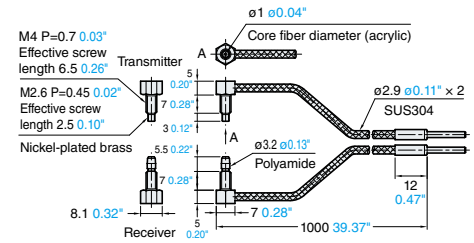
FU-R77G



FU-R77TZ



FU-R77TG




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