Industry largest selection/ cost effective fiber units

Selection of optimal fiber units and options is possible from among 200 models

Related products

Fiber amplifier
D3RF
P.110

Fiber amplifier
BRF
P.130

Selection guide

Mounting method

01 Easy mounting P.31

Square type with mounting hole that can be mounted easily.

02 Thread type P.35

Type that can be mounted with a threaded nut.

03 Cylindrical type P.39

Type that can be mounted with a set screw. Compact and space-saving.

04 Sleeve type (straight view) P.43

Features a narrow tip that enables highly flexible mounting and is easy to position.

05 Sleeve type (side view) P.47

Ideal for detection in narrow spaces thanks to its 90° deflection.

Ease of handling

06 Flexible R4/R2 (R4 mm, R2 mm) P.49

Flexible type that can be mounted to moving parts.

07 Flexible R1 (R1 mm) P.52

Flexible type that can be bent in 1 mm radius. Also prevents problems caused by catching.

08 Flexible R2 (R2 mm) P.58

Flexible type that can be bent in 2 mm radius. Nut type is also available.

Beam shape/detection type

09 Retro-reflective type P.60

Optimal for transparent object detection. An ultra-thin type for wafer mapping is also available.

10 Small object detection P.63

Type optimal for detecting small workpieces using a spot lens or superfine fiber.

11 Screen/Array P.66

Optimal for when workpiece passage locations are not fixed.

12 Limited diffuse reflective type P.70

Performs detection when distances are limited. Optimal for alignment or mapping.

13 Narrow view/wafer mapping P.74

Type featuring a built-in lens and narrow aperture that minimizes light leakage.

Environmental resistance

14 Heat resistant (130°C or below) P.77

Fiber unit with a heat resistance of 130°C or below. Free cut types are also available.

15 Heat resistant (180 to 200°C) P.80

Fiber unit with a maximum heat resistance of 180°C to 200°C. Free cut types are also available.

16 Heat resistant (250 to 350°C) P.85

Fiber unit with a maximum heat resistance of 250°C to 350°C.

17 Chemical resistant P.89

Fiber portion is protected from chemicals and oils using a fluoroplastic coating.

18 Vacuum resistant P.91

Optimal for use in vacuum chambers. Also features a heat resistance of up to 300°C.

Liquid detection type

19 Liquid level/leakage/water detection P.94

A pipe-mounted type, liquid level contact type, leakage detection type and water detection type are available.

Lens for through-beam

20 Lens for through-beam type P.98

Long distance lens for extending sensing distance and side-view lens to minimize space.

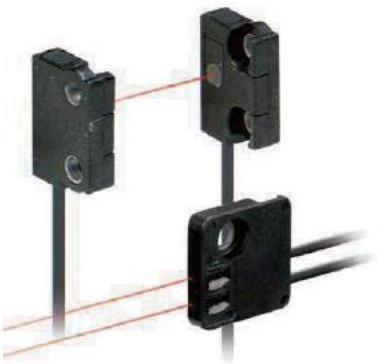
Model

01 Easy mounting

Related products

Fiber amplifier
D3RF
P.110

Fiber amplifier
BRF
P.130



Square type with mounting hole that can be installed easily

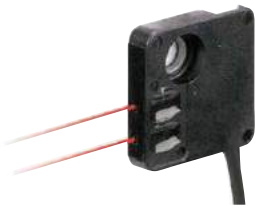
- **An adjustable mounting type that switches between Head ON/Side ON switchable type is also available**
- **Head ON, Side ON and Flat ON types are available.**
- **Bending radius of R1 mm or R4 mm**

Head ON/Side ON switchable type

Switchable direction

Because the direction of the cable from the sensor head can be switchable, you can switch from Head ON to Side ON easily. It will help reducing inventory of the fiber cable. The bending radius is R1 mm which helps flexibility of installing the fiber cable.

For Side ON



For Head ON

Through-beam type: NF-TE02, NF-TE04 Diffuse type: NF-DE02, NF-DE04

Line up of Head ON, Side ON and Flat ON types

Compact and long-distance detecting Head ON, Side ON, and Flat ON types are available. Selection from among these easy-to-mount types.

Head ON Type

Through-beam type: NF-TR11, NF-TR06

Side ON Type

Through-beam type:
NF-TR12, NF-TR05

Flat ON Type

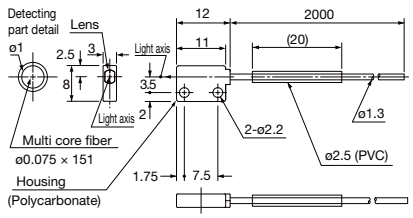
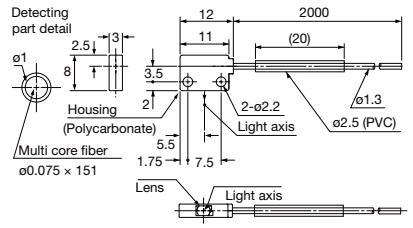
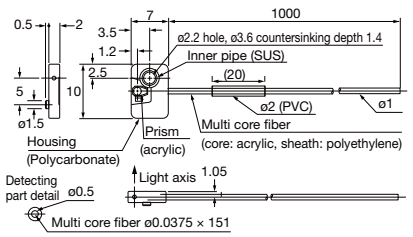
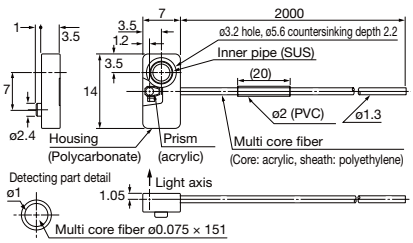
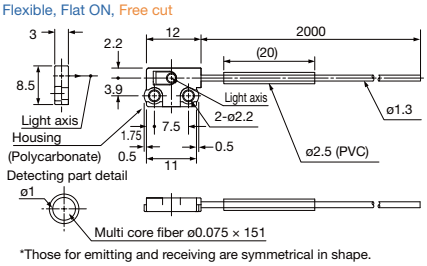
Through-beam type:
NF-TE01, NF-TE03
NF-TE05, NF-TR13
Diffuse type:
NF-DE01, NF-DE03

*Image shows NF-TE05.

Line up of R1 mm and R4 mm type

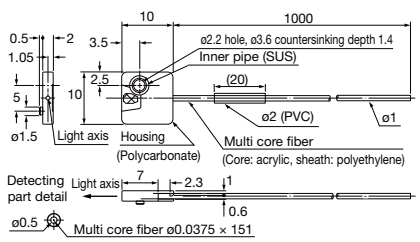
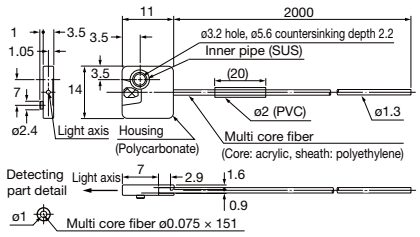
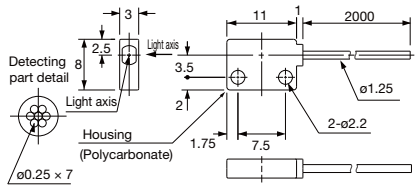
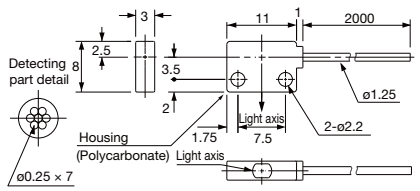
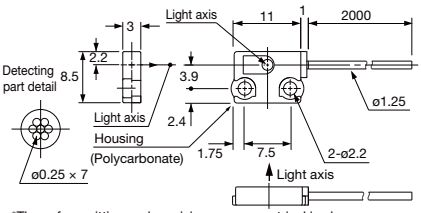
Available fiber cables include an easy-to-handle flexible R1 mm and a flexible R4 mm optimal for mounting to moving parts. Selectable based on the application.

Easy mounting fiber units (through-beam type)

Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	Flexible, Head ON, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,580 4-LG 3,060 3-ST 1,980 2-FS 1,350 1-HS 530	Long 2,700 Std 1,600 Fast 850	1,600	-40 to +60°C	R1	NF-TR11
	Flexible, Side ON, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,150 3-ST 2,000 2-FS 1,200 1-HS 540	Long 2,700 Std 1,500 Fast 1,000	1,300	-40 to +60°C	R1	NF-TR12
	Flexible, Flat ON, Free cut 	7-EL 1,190 6-UL 1,120 5-PL 980 4-LG 850 3-ST 550 2-FS 310 1-HS 100	Long 600 Std 350 Fast 200	220	-40 to +60°C	R1	NF-TE01
	Flexible, Flat ON, Free cut 	7-EL 1,890 6-UL 1,770 5-PL 1,540 4-LG 1,350 3-ST 880 2-FS 520 1-HS 170	Long 900 Std 500 Fast 350	450	-40 to +60°C	R1	NF-TE03
	Flexible, Flat ON, Free cut  *Those for emitting and receiving are symmetrical in shape.	7-EL 2,450 6-UL 2,300 5-PL 2,010 4-LG 1,710 3-ST 1,150 2-FS 650 1-HS 220	Long 1,200 Std 650 Fast 330	500	-40 to +60°C	R1	NF-TR13

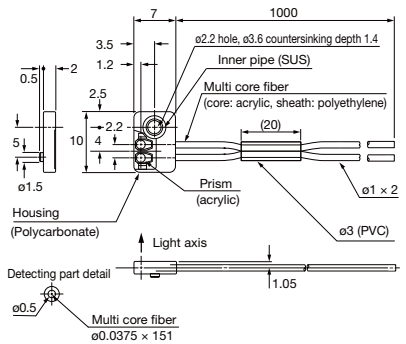
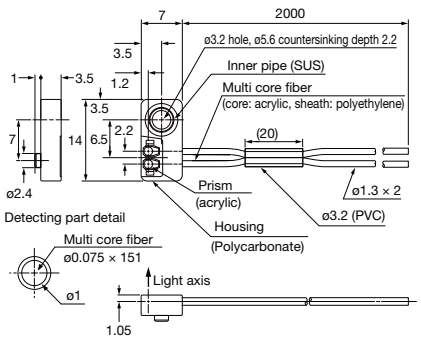
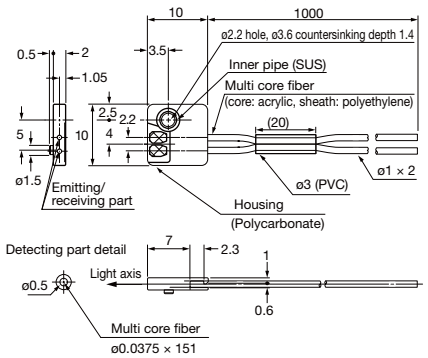
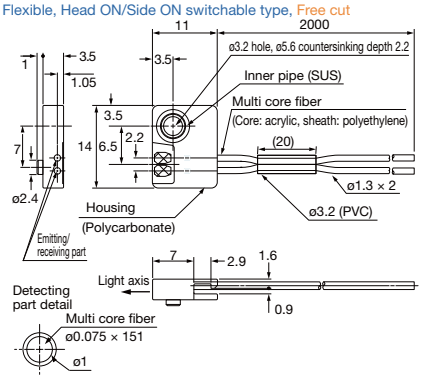
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Easy mounting fiber units (through-beam type)

Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	Flexible, Head ON/Side ON switchable type, Free cut 	7-EL 430 6-UL 400 5-PL 350 4-LG 300 3-ST 190 2-FS 120 1-HS 36	Long 250 Std 120 Fast 55	110	-40 to +60°C	R1	NF-TE02 Switchable direction
	Flexible, Head ON/Side ON switchable type, Free cut 	7-EL 1,340 6-UL 1,260 5-PL 1,090 4-LG 960 3-ST 630 2-FS 390 1-HS 130	Long 750 Std 450 Fast 250	280	-40 to +60°C	R1	NF-TE04 Switchable direction
	Flexible, Head ON, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,580 4-LG 3,060 3-ST 1,980 2-FS 1,400 1-HS 500	Long 2,700 Std 1,600 Fast 850	1,100	-40 to +60°C	R4	NF-TR06
	Flexible, Side ON, Free cut  *Those for emitting and receiving are symmetrical in shape.	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,150 3-ST 2,000 2-FS 1,100 1-HS 320	Long 2,700 Std 1,300 Fast 600	1,100	-40 to +60°C	R4	NF-TR05
	Flexible, Flat ON, Free cut  *Those for emitting and receiving are symmetrical in shape.	7-EL 1,600 6-UL 1,510 5-PL 1,320 4-LG 1,150 3-ST 750 2-FS 410 1-HS 130	Long 750 Std 450 Fast 280	300	-40 to +60°C	R4	NF-TE05

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Easy mounting fiber units (diffuse type)

Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	Flexible, Flat ON, Free cut 	7-EL 140 6-UL 135 5-PL 110 4-LG 99 3-ST 70 2-FS 34 1-HS 10	Long 60 Std 30 Fast 10 to 16	30	-40 to +60°C	R1	NF-DE01
	Flexible, Flat ON, Free cut 	7-EL 490 6-UL 450 5-PL 400 4-LG 350 3-ST 225 2-FS 117 1-HS 41	Long 250 Std 100 Fast 60	100	-40 to +60°C	R1	NF-DE03
	Flexible, Head ON/Side ON switchable type, Free cut 	7-EL 160 6-UL 150 5-PL 130 4-LG 117 3-ST 77 2-FS 43 1-HS 12	Long 65 Std 35 Fast 20	30	-40 to +60°C	R1	NF-DE02 Switchable direction
	Flexible, Head ON/Side ON switchable type, Free cut 	7-EL 480 6-UL 450 5-PL 390 4-LG 340 3-ST 225 2-FS 117 1-HS 45	Long 250 Std 120 Fast 80	100	-40 to +60°C	R1	NF-DE04 Switchable direction

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

02 Thread type

Related products

Fiber amplifier
D3RF
P.110

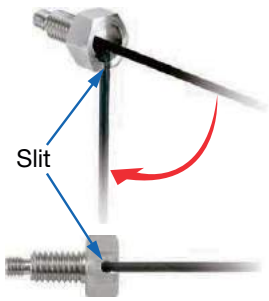
Fiber amplifier
BRF
P.130

Type that can be mounted with a threaded nut Fiber units

- **Adjustable mounting type that switches between straight view and side view also available**
- **A metal sheath type that protects against cable breakage, as well as lens attachable models are available.**

New concept Straight view/side view switchable type Switchable direction

The NF-TR14 can be used as a side view type by bending the fiber cable to fit the slit in the side of the nut. This fiber unit is a completely new concept that allows switching between side view and straight view according to mounting conditions.



For straight view

For side view

Metal sheath type Breakage prevention

Stainless steel mesh structure sheath protects the fiber cable and prevents fiber cable breakage due to snagging. The bending radius R10 mm allows the cable to bend in tight areas without breaking.

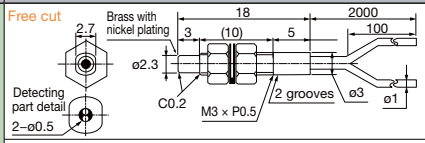
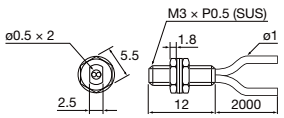
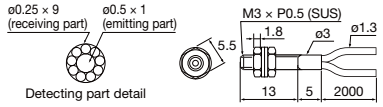
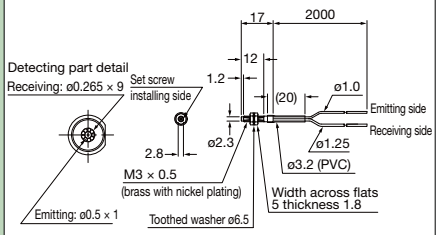
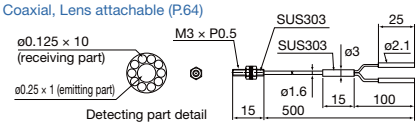
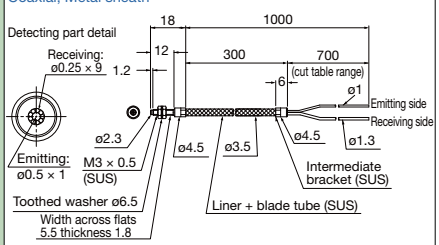
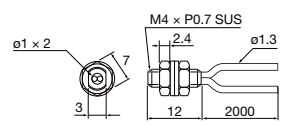
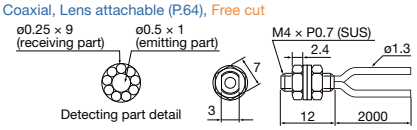
Through-beam type: NF-TJ01 Diffuse type: NF-DJ01, NF-DJ02

Thread type fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	M3	Free cut	7-EL 3,500 6-UL 2,100 5-PL 1,600 4-LG 1,400 / 3-ST 1,000 2-FS 550 1-HS 175	Long 1,000 Std 500 Fast 250	450	-40 to +70°C	R25	NF-TM01
		Free cut	7-EL 900 6-UL 550 5-PL 400 4-LG 350 / 3-ST 250 2-FS 140 1-HS 45	Long 350 Std 200 Fast 90	120	-40 to +70°C	R15	NF-TM02
	M4	Lens attachable (P.98), Free cut	7-EL 4,000 6-UL 3,000 5-PL 2,200 4-LG 1,900 / 3-ST 1,400 2-FS 750 1-HS 250	Long 1,800 Std 800 Fast 450	700	-40 to +70°C	R30	NF-TB01 Low cost
		Lens attachable (P.98), Free cut	7-EL 4,000 6-UL 2,000 5-PL 1,600 4-LG 1,400 / 3-ST 1,000 2-FS 550 1-HS 175	Long 1,000 Std 500 Fast 250	450	-40 to +70°C	R25	NF-TB02
		Metal sheath, Lens attachable (P.98)	7-EL 1,590 6-UL 1,440 5-PL 1,260 4-LG 1,140 3-ST 740 2-FS 410 1-HS 130	Long 350 Std 220 Fast 110	300	-40 to +60°C	R10	NF-TJ01 Breakage prevention
		Nut type, Straight view/side view switchable type, Flexible, Free cut	7-EL 3,800 6-UL 2,700 5-PL 2,200 4-LG 1,800 / 3-ST 1,200 2-FS 800 1-HS 300	Long 1,300 Std 600 Fast 300	400	-40 to +60°C	R2	NF-TR14 Switchable direction
		Nut type, Free cut	7-EL 2,500 6-UL 1,400 5-PL 1,300 4-LG 1,000 / 3-ST 750 2-FS 350 1-HS 100	Long 800 Std 600 Fast 200	350	-40 to +70°C	R25	NF25-T Space-saving
		Elbow type, Lens attachable (P.98), Free cut	7-EL 1,440 6-UL 1,350 5-PL 1,170 4-LG 1,060 3-ST 690 2-FS 430 1-HS 130	Long 750 Std 450 Fast 200	350	-40 to +70°C	R25	NF-TB06
	M12	Super long distance with large lens, Fiber length 20 m, Free cut	7-EL 38,000 6-UL 25,000 5-PL 20,000 4-LG 18,000 / 3-ST 12,000 2-FS 7,000 1-HS 1,800	Long 12,000 Std 6,500 Fast 3,500	2,800	-40 to +70°C	R30	NF-TX01

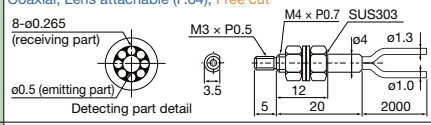
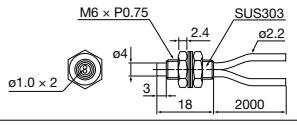
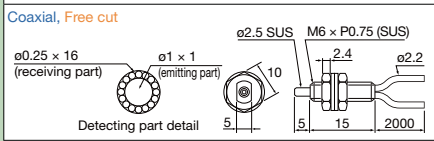
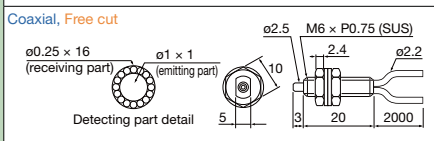
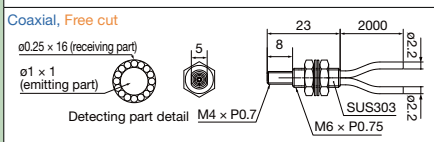
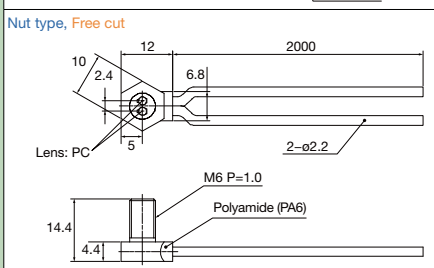
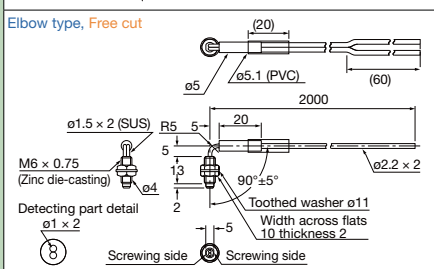
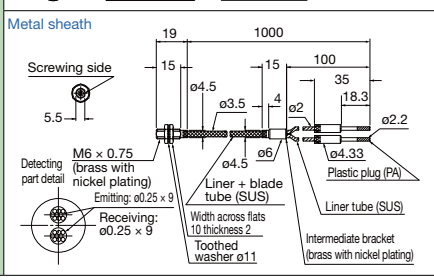
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Thread type fiber units (through-beam type/diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	M3	Free cut 	7-EL 300 6-UL 160 5-PL 150 4-LG 120 3-ST 80 2-FS 40 1-HS 10	Long 100 Std 50 Fast 25	35	-40 to +70°C	R15	FD-TT2 Low cost
		Standard, Free cut 	7-EL 400 6-UL 200 5-PL 190 4-LG 160 3-ST 100 2-FS 50 1-HS 10	Long 100 Std 60 Fast 30	45	-40 to +70°C	R15	NF-DS06
		Coaxial, Lens attachable (P.64), Free cut 	7-EL 500 6-UL 300 5-PL 250 4-LG 225 3-ST 150 2-FS 100 1-HS 30	Long 250 Std 120 Fast 50	70	-40 to +70°C	R15	NF-DT01
		Coaxial, Free cut 	7-EL 310 6-UL 290 5-PL 260 4-LG 220 3-ST 140 2-FS 70 1-HS 20	Long 170 Std 80 Fast 45	55	-40 to +60°C	R25	NF-DB07
		Coaxial, Lens attachable (P.64) 	7-EL 180 6-UL 110 5-PL 100 4-LG 85 3-ST 60 2-FS 40 1-HS 12	Long 70 Std 40 Fast 15	20	-40 to +70°C	R15	NF-DK21
		Coaxial, Metal sheath 	7-EL 180 6-UL 170 5-PL 150 4-LG 130 3-ST 80 2-FS 40 1-HS 10	Long 120 Std 50 Fast 30	50	-40 to +60°C	R10	NF-DJ01 Breakage prevention
	M4	Standard, Free cut 	7-EL 1,100 6-UL 650 5-PL 550 4-LG 450 3-ST 350 2-FS 200 1-HS 60	Long 400 Std 250 Fast 100	160	-40 to +70°C	R25	NF-DM01
		Coaxial, Lens attachable (P.64), Free cut 	7-EL 500 6-UL 300 5-PL 250 4-LG 225 3-ST 150 2-FS 100 1-HS 30	Long 250 Std 120 Fast 50	70	-40 to +70°C	R15	NF-DM02

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Thread type fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	M4	Coaxial, Lens attachable (P.64), Free cut 	7-EL 680 6-UL 370 5-PL 270 4-LG 230 3-ST 150 2-FS 90 1-HS 20	Long 140 Std 70 Fast 30	70	-40 to +70°C	R15	NF-DM02-G4
	M6	Standard, Free cut 	7-EL 1,200 6-UL 750 5-PL 650 4-LG 550 3-ST 400 2-FS 250 1-HS 80	Long 400 Std 250 Fast 100	160	-40 to +70°C	R25	NF-DK06
		Coaxial, Free cut 	7-EL 1,200 6-UL 750 5-PL 650 4-LG 550 3-ST 400 2-FS 250 1-HS 75	Long 450 Std 250 Fast 100	150	-40 to +70°C	R25	NF-DB01 Low cost
		Coaxial, Free cut 	7-EL 1,200 6-UL 750 5-PL 650 4-LG 575 3-ST 400 2-FS 250 1-HS 75	Long 450 Std 250 Fast 100	150	-40 to +70°C	R25	NF-DB03
		Coaxial, Free cut 	7-EL 1,200 6-UL 650 5-PL 550 4-LG 500 3-ST 300 2-FS 150 1-HS 50	Long 450 Std 250 Fast 100	80	-40 to +70°C	R25	NF-DB04
		Nut type, Free cut 	7-EL 550 6-UL 330 5-PL 240 4-LG 200 3-ST 150 2-FS 90 1-HS 23	Long 120 Std 80 Fast 25	45	-40 to +70°C	R25	NF25-D Space-saving
		Elbow type, Free cut 	7-EL 540 6-UL 510 5-PL 450 4-LG 390 3-ST 250 2-FS 140 1-HS 40	Long 300 Std 150 Fast 60	100	-40 to +70°C	R25	NF-DB09
		Metal sheath 	7-EL 440 6-UL 410 5-PL 360 4-LG 310 3-ST 200 2-FS 100 1-HS 30	Long 280 Std 150 Fast 70	100	-40 to +70°C	R10	NF-DJ02 Breakage prevention

- The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper (1000 × 1000 mm white paper for NF25-D).
- Install use with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

03 Cylindrical type

Related products

Fiber amplifier
D3RF
P.110

Fiber amplifier
BRF
P.130

Set screw mounted compact fiber unit

- **Compact and space-saving.**
- **Selection is possible from among three types including fine core, side view and standard.**

Choose from following three types according to the application

Super narrow type Fine core

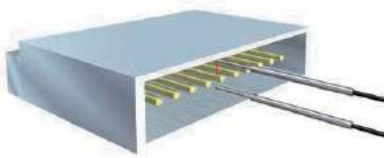
Through-beam type: NF-TR04, NF-TM03
NF-TR03, NF-TP01
Diffuse type: NF-DP01, NF-DR05

Fiber unit with a core diameter of ø0.25 to 0.5 mm. Recommended for small object detection or high accuracy positioning purposes.

Side view type

Through-beam type:
NF-TG05, NF-TS08
NF-TV08, NF-TS22V
Diffuse type: NF-DR12

Connector pin detection

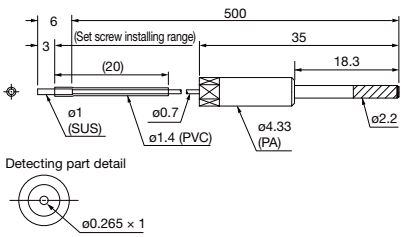
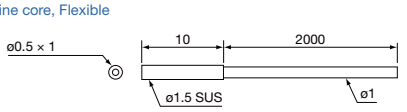
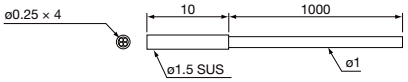
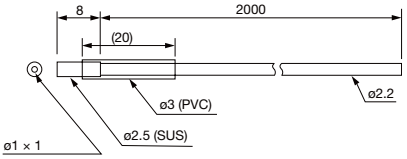
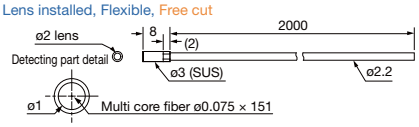
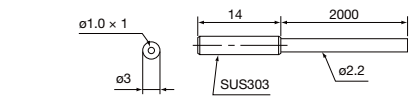
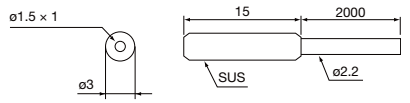
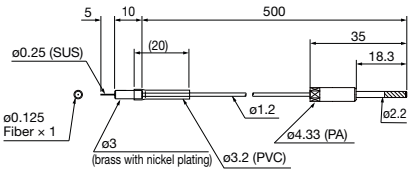


Can be installed in narrow spaces. Sleeve type is also available.

Standard type

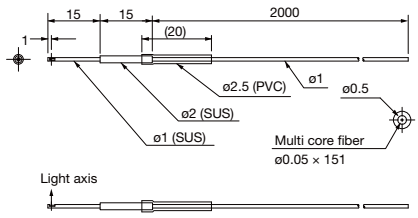
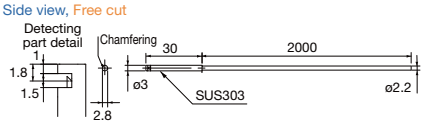
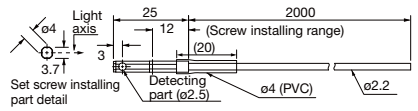
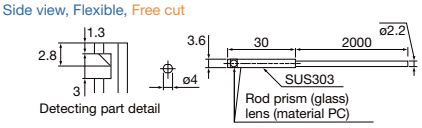
Standard straight view type.

Cylindrical fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	ø1	Fine core, Flexible 	7-EL 54 6-UL 50 5-PL 44 4-LG 38 3-ST 25 2-FS 15 1-HS 5	Long 30 Std 18 Fast 8	10	-40 to +60°C	R4	NF-TR04 Fine core
	ø1.5	Fine core, Flexible 	7-EL 900 6-UL 550 5-PL 400 4-LG 350 3-ST 250 2-FS 140 1-HS 45	Long 350 Std 200 Fast 90	120	-40 to +70°C	R15	NF-TM03 Fine core Low cost
		Fine core, Flexible, Free cut 	7-EL 850 6-UL 550 5-PL 450 4-LG 400 3-ST 275 2-FS 150 1-HS 50	Long 350 Std 200 Fast 90	110	-40 to +70°C	R4	NF-TR03 Fine core
	ø2.5	Free cut 	7-EL 1,710 6-UL 1,530 5-PL 1,350 4-LG 1,230 3-ST 800 2-FS 480 1-HS 160	Long 900 Std 550 Fast 250	350	-40 to +70°C	R25	NF-TB07 Low cost
	ø3	Lens installed, Flexible, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,150 4-LG 2,790 3-ST 1,800 2-FS 1,000 1-HS 340	Long 2,300 Std 1,300 Fast 550	550	-40 to +60°C	R1	NF-TR10
		Flexible, Free cut 	7-EL 4,000 6-UL 2,000 5-PL 1,600 4-LG 1,400 3-ST 1,000 2-FS 550 1-HS 180	Long 800 Std 400 Fast 200	360	-40 to +70°C	R2	NF-TK05
		Free cut 	7-EL 4,000 6-UL 3,000 5-PL 2,400 4-LG 2,100 3-ST 1,500 2-FS 800 1-HS 220	Long 1,800 Std 800 Fast 450	700	-40 to +70°C	R30	NF-TS07
		ø0.25 fine sleeve: 5 mm long 	7-EL 27 6-UL 25 5-PL 21 4-LG 18 3-ST 12 2-FS 7 1-HS 2	Long 6 Std 3.5 Fast 2	1	-40 to +70°C	R5	NF-TP01 Fine core

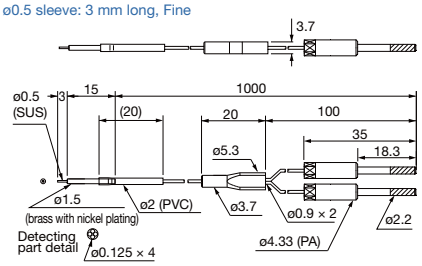
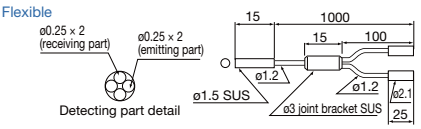
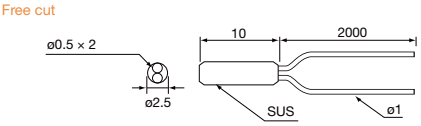
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Cylindrical fiber units (through-beam type: side view type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Side view Through-beam type	ø2	ø1 sleeve: 15 mm long, Side view, Flexible, Free cut 	7-EL 160 6-UL 150 5-PL 130 4-LG 110 3-ST 76 2-FS 45 1-HS 11	Long 90 Std 50 Fast 25	20	-40 to +60°C	R1	NF-TG05
	ø3	Side view, Free cut 	7-EL 2,500 6-UL 1,900 5-PL 1,300 4-LG 1,100 / 3-ST 800 2-FS 400 1-HS 140	Long 800 Std 400 Fast 200	180	-40 to +70°C	R25	NF-TS08
	ø4	Side view, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,240 / 3-ST 2,100 2-FS 1,600 1-HS 530	Long 2,800 Std 2,100 Fast 1,000	1,000	-40 to +60°C	R25	NF-TV08
		Side view, Flexible, Free cut 	7-EL 3,500 6-UL 3,500 5-PL 3,500 4-LG 3,000 / 3-ST 2,000 2-FS 1,000 1-HS 300	Long 1,800 Std 1,000 Fast 500	700	-40 to +70°C	R1	NF-TS22V

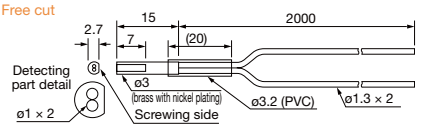
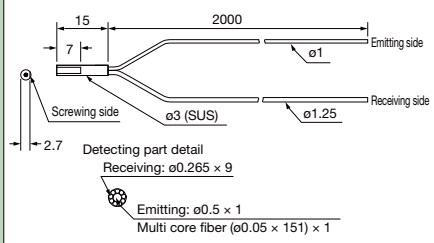
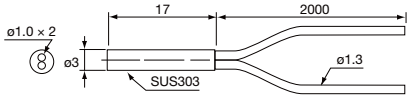
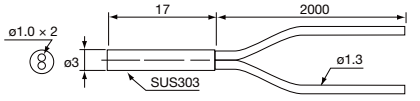
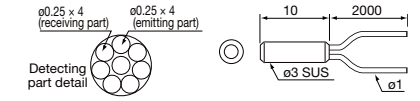
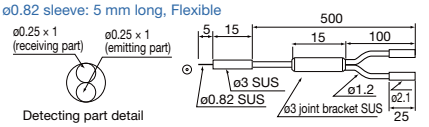
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Cylindrical fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	ø1.5	ø0.5 sleeve: 3 mm long, Fine 	7-EL 28 6-UL 26 5-PL 23 4-LG 20 3-ST 13 2-FS 3 1-HS 1	Long 18 Std 5 Fast Unusable	3	-40 to +60°C	R10	NF-DP01 Fine core
		Flexible 	7-EL 300 6-UL 180 5-PL 150 4-LG 130 / 3-ST 80 2-FS 45 1-HS 18	Long 70 Std 30 Fast 15	20	-40 to +70°C	R4	NF-DR04
	ø2.5	Free cut 	7-EL 400 6-UL 200 5-PL 190 4-LG 160 / 3-ST 100 2-FS 50 1-HS 10	Long 100 Std 60 Fast 30	45	-40 to +70°C	R15	NF-DT03

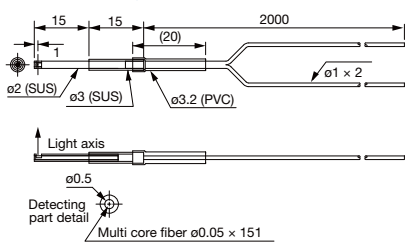
●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Cylindrical fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	ø3	Free cut 	7-EL 690 6-UL 640 5-PL 560 4-LG 490 / 3-ST 320 2-FS 190 1-HS 60	Long 400 Std 200 Fast 100	150	-40 to +70°C	R25	NF-DB10 Standard item
		Coaxial, Flexible, Free cut 	7-EL 270 6-UL 250 5-PL 210 4-LG 180 3-ST 120 2-FS 60 1-HS 20	Long 120 Std 70 Fast 35	55	-40 to +60°C	R2	NF-DR11
		Free cut 	7-EL 1,200 6-UL 750 5-PL 650 4-LG 550 / 3-ST 400 2-FS 200 1-HS 80	Long 400 Std 250 Fast 100	160	-40 to +70°C	R25	NF-DK04 Low cost
		Flexible, Free cut 	7-EL 850 6-UL 550 5-PL 450 4-LG 375 / 3-ST 275 2-FS 170 1-HS 55	Long 300 Std 180 Fast 80	110	-40 to +70°C	R2	NF-DK04Z
		Flexible, Free cut 	7-EL 450 6-UL 250 5-PL 190 4-LG 160 / 3-ST 120 2-FS 70 1-HS 25	Long 120 Std 50 Fast 25	35	-40 to +70°C	R4	NF-DR03
		ø0.82 sleeve: 5 mm long, Flexible 	7-EL 190 6-UL 125 5-PL 75 4-LG 65 / 3-ST 45 2-FS 25 1-HS 8	Long 40 Std 15 Fast 5	10	-40 to +70°C	R4	NF-DR05 Fine core

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Cylindrical fiber units (diffuse type: side view type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	ø3	ø2 sleeve: 15 mm long, Flexible, Free cut 	7-EL 53 6-UL 50 5-PL 43 4-LG 36 3-ST 20 2-FS 12 1-HS 4	Long 25 Std 12 Fast 5	10	-40 to +60°C	R1	NF-DR12

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

04 Sleeve type (straight view)

Related products

Fiber units
Sleeve type (Side view)
P.47

Fiber amplifier
D3RF
P.110

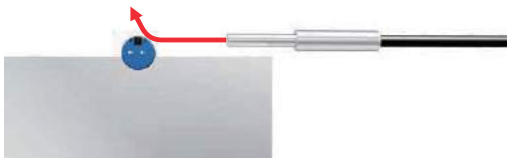
The fine tip makes mounting highly flexible and adjusting position very easy

- **Long sleeve type can be bent**
- **Thread type and cylindrical type available**

Flexible mounting Bendable sleeve

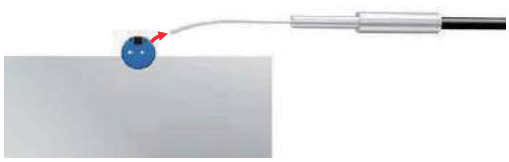
Long sleeve type can be bent (up to R10 mm). Fine tuning of the sensing position is possible even after the mounting position has been determined.

No sleeve



Difficult to change detection point after mounting

Bendable sleeve type



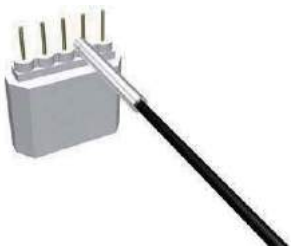
Fine tuning possible even after mounting

Bendable sleeve type
Through-beam type: NF-TB05, NF-TB03, NF-TH09
Diffuse type: NF-DB08, NF-DM03, NF-DR10, NF-DH05, NF-DB06, NF-DB02, NF-DH04
*Please bend the sleeve at an angle of 90° or less.

Easy position adjustment

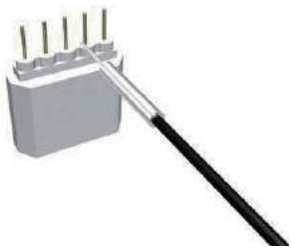
Position adjustment for the detection point can be easily performed when mounting due to the fact that the sleeve type has a fine tip and the workpiece is not hidden by the tip even when approaching the workpiece for detection.

No sleeve



Difficult to see small workpieces and difficult to adjust position.

Fine sleeve type

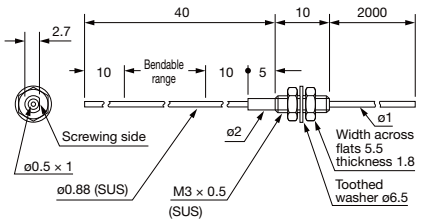
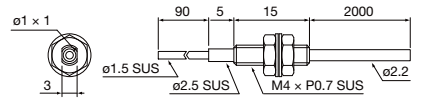
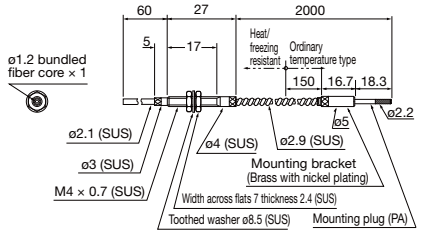
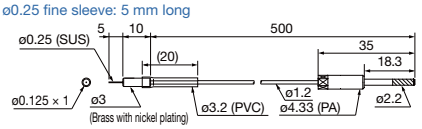
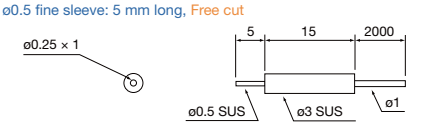


The tip does not get in the way, making position adjustment easy.

Fine sleeve type
Through-beam type: NF-TB05, NF-TP01, NF-TT01
Diffuse type: NF-DB05, NF-DT04, NF-DT02, NF-DP01, NF-DR05, NF-DR07

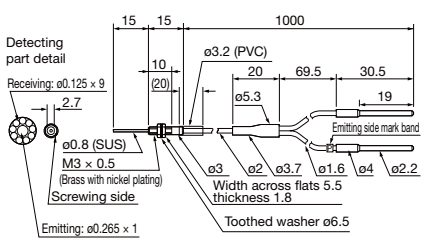
Fiber units Sleeve type (straight view)

Sleeve fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	M3	ø0.88 sleeve: 40 mm long, Free cut 	7-EL 470 6-UL 450 5-PL 380 4-LG 340 3-ST 220 2-FS 120 1-HS 45	Long 270 Std 140 Fast 80	100	-40 to +70°C	Fiber R25 Sleeve R10	NF-TB05 Bendable sleeve
	M4	ø1.5 sleeve: 90 mm long, Free cut 	7-EL 4,000 6-UL 1,900 5-PL 1,900 4-LG 1,600 3-ST 1,200 2-FS 550 1-HS 180	Long 1,000 Std 600 Fast 250	450	-40 to +70°C	Fiber R25 Sleeve R15	NF-TB03 Bendable sleeve
	ø3	ø2.1 sleeve: 60 mm long, Heat resistant 	7-EL 1,350 6-UL 1,260 5-PL 1,120 4-LG 900 3-ST 630 2-FS 410 1-HS 120	Long 750 Std 450 Fast 220	300	-30 to +350°C or -60 to +200°C	Fiber R25 Sleeve R10	NF-TH09 Bendable sleeve
		ø0.25 fine sleeve: 5 mm long 	7-EL 27 6-UL 25 5-PL 21 4-LG 18 3-ST 12 2-FS 7 1-HS 2	Long 6 Std 3.5 Fast 2	1	-40 to +70°C	R5	NF-TP01 Fine core
		ø0.5 fine sleeve: 5 mm long, Free cut 	7-EL 170 6-UL 110 5-PL 80 4-LG 70 3-ST 50 2-FS 25 1-HS 8	Long 80 Std 40 Fast 20	30	-40 to +70°C	R15	NF-TT01 Low cost

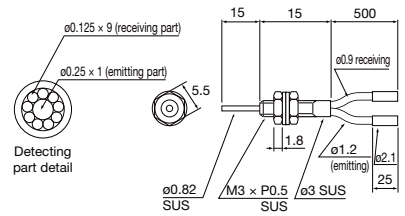
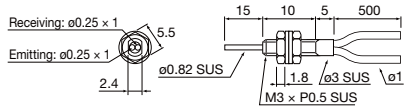
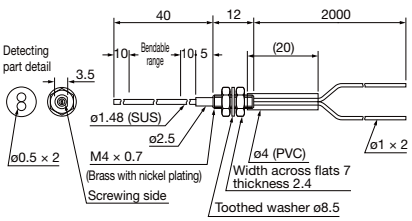
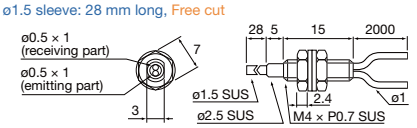
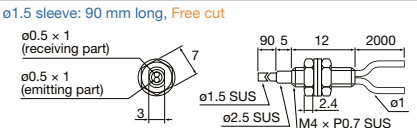
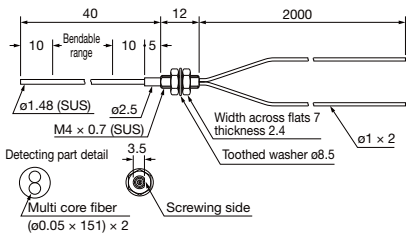
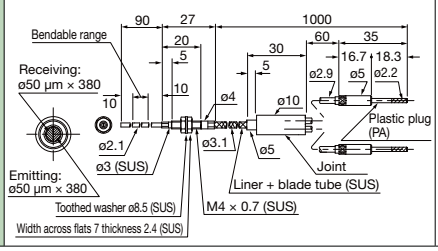
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Sleeve fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	M3	ø0.8 sleeve: 15 mm long, Coaxial 	7-EL 99 6-UL 90 5-PL 80 4-LG 70 3-ST 40 2-FS 20 1-HS 7	Long 50 Std 25 Fast 14	20	-20 to +60°C	R25	NF-DB05 Fine core

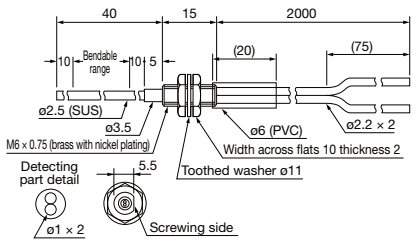
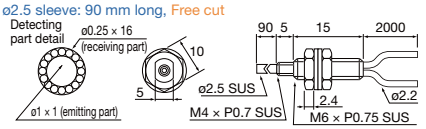
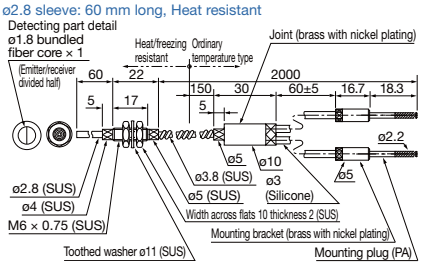
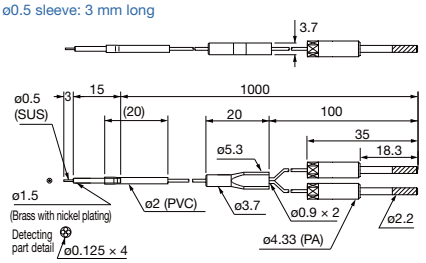
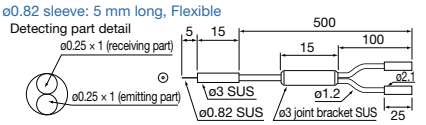
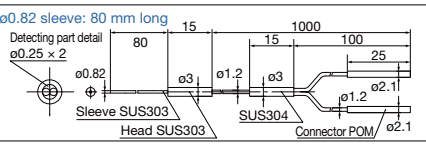
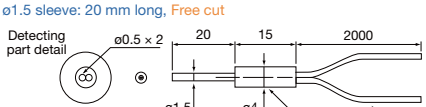
●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Sleeve fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	M3	ø0.82 sleeve: 15 mm long, Flexible Coaxial 	7-EL 240 6-UL 120 5-PL 100 4-LG 85 3-ST 60 2-FS 35 1-HS 10	Long 70 Std 40 Fast 15	15	-40 to +70°C	R4	NF-DT04
		ø0.82 sleeve: 15 mm long Flexible, Free cut 	7-EL 190 6-UL 125 5-PL 70 4-LG 65 3-ST 45 2-FS 25 1-HS 8	Long 40 Std 15 Fast 5	10	-40 to +70°C	R4	NF-DT02
	M4	ø1.48 sleeve: 40 mm long, Free cut 	7-EL 195 6-UL 180 5-PL 160 4-LG 140 3-ST 90 2-FS 50 1-HS 15	Long 110 Std 50 Fast 30	40	-40 to +70°C	Fiber R25 Sleeve R10	NF-DB08 Bendable sleeve
		ø1.5 sleeve: 28 mm long, Free cut 	7-EL 450 6-UL 240 5-PL 220 4-LG 190 3-ST 120 2-FS 60 1-HS 16	Long 100 Std 60 Fast 30	45	-40 to +70°C	R15	NF-DT05
		ø1.5 sleeve: 90 mm long, Free cut 	7-EL 450 6-UL 240 5-PL 220 4-LG 190 3-ST 120 2-FS 60 1-HS 16	Long 120 Std 50 Fast 30	45	-40 to +70°C	Fiber R15 Sleeve R10	NF-DM03 Bendable sleeve
		ø1.48 sleeve: 40 mm long, Flexible, Free cut 	7-EL 140 6-UL 135 5-PL 110 4-LG 95 3-ST 65 2-FS 30 1-HS 10	Long 60 Std 35 Fast 17	30	-40 to +60°C	Fiber R1 Sleeve R10	NF-DR10 Bendable sleeve
		ø2.1 sleeve: 90 mm long, Heat resistant 	7-EL 1,110 6-UL 1,050 5-PL 910 4-LG 800 3-ST 520 2-FS 190 1-HS 50	Long 750 Std 250 Fast 80	200	-30 to +350°C or -60 to +200°C	Fiber R25 Sleeve R10	NF-DH05 Bendable sleeve

- The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
- Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Sleeve fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	M6	ø2.5 sleeve: 40 mm long, Free cut 	7-EL 680 6-UL 630 5-PL 550 4-LG 480 3-ST 320 2-FS 180 1-HS 50	Long 400 Std 240 Fast 110	130	-40 to +70°C	Fiber R25 Sleeve R10	NF-DB06 Bendable sleeve
		ø2.5 sleeve: 90 mm long, Free cut 	7-EL 1,100 6-UL 750 5-PL 750 4-LG 650 / 3-ST 450 2-FS 300 1-HS 80	Long 450 Std 250 Fast 100	150	-40 to +70°C	Fiber R25 Sleeve R20	NF-DB02 Bendable sleeve
		ø2.8 sleeve: 60 mm long, Heat resistant 	7-EL 950 6-UL 900 5-PL 780 4-LG 680 3-ST 450 2-FS 200 1-HS 59	Long 650 Std 250 Fast 80	300	-30 to +350°C or -60 to +200°C	Fiber R25 Sleeve R10	NF-DH04 Bendable sleeve
	ø1.5	ø0.5 sleeve: 3 mm long 	7-EL 28 6-UL 26 5-PL 23 4-LG 20 3-ST 13 2-FS 3 1-HS 1	Long 18 Std 5 Fast Unusable	3	-40 to +60°C	R10	NF-DP01 Fine core
	ø3	ø0.82 sleeve: 5 mm long, Flexible 	7-EL 190 6-UL 125 5-PL 75 4-LG 65 / 3-ST 45 2-FS 25 1-HS 8	Long 40 Std 15 Fast 5	10	-40 to +70°C	R4	NF-DR05
		ø0.82 sleeve: 80 mm long 	7-EL 90 6-UL 50 5-PL 45 4-LG 40 / 3-ST 25 2-FS 10 1-HS 4	Long 35 Std 18 Fast 10	7	-40 to +70°C	R25	NF-DR07
	ø4	ø1.5 sleeve: 20 mm long, Free cut 	7-EL 400 6-UL 200 5-PL 190 4-LG 160 / 3-ST 100 2-FS 50 1-HS 16	Long 100 Std 60 Fast 12	45	-40 to +70°C	R15	NF-DK43 Low cost

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

05 Sleeve type (side view)

Related products

Fiber units
Sleeve type (Straight view)
P.43

Fiber amplifier
D3RF
P.110

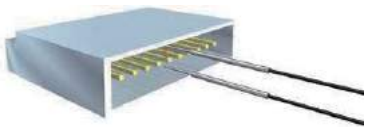
Side angle light beam provides optimal detection in narrow places

A wide range of variations including flexible types and heat resistant types

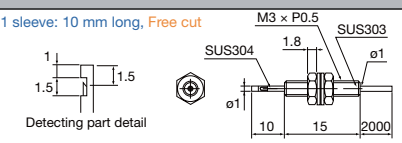
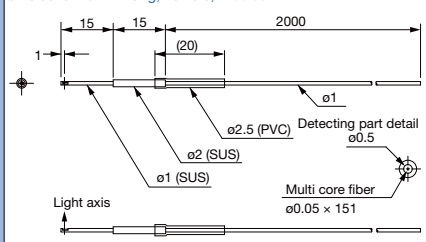
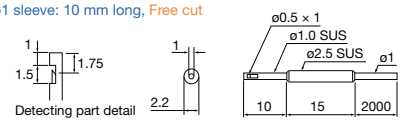
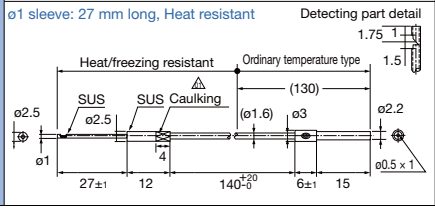
Possible to detect objects in narrow space Thin sleeve

The fine tipped side view sleeve type eliminates mounting space problems. Optimal for detection in complex areas, such as for connector pin detection.

Connector pin detection

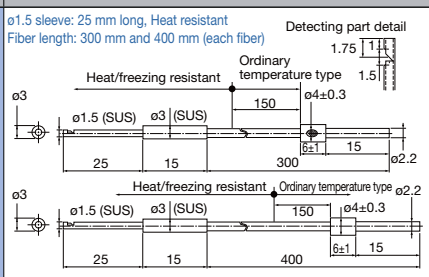
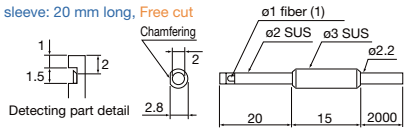
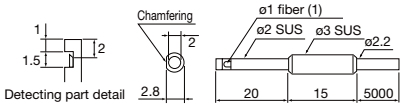


Sleeve fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	M3	ø1 sleeve: 10 mm long, Free cut 	7-EL 650 / 6-UL 450 / 5-PL 300 / 4-LG 250 / 3-ST 200 / 2-FS 100 / 1-HS 25	Long 200 / Std 150 / Fast 60	75	-40 to +70°C	R15	NF-TV04 Thin sleeve
	ø2	ø1 sleeve: 15 mm long, flexible, Free cut 	7-EL 160 / 6-UL 150 / 5-PL 130 / 4-LG 110 / 3-ST 76 / 2-FS 45 / 1-HS 11	Long 90 / Std 50 / Fast 25	20	-40 to +60°C	R1	NF-TG05 Thin sleeve
	ø2.5	ø1 sleeve: 10 mm long, Free cut 	7-EL 650 / 6-UL 450 / 5-PL 300 / 4-LG 250 / 3-ST 200 / 2-FS 100 / 1-HS 25	Long 200 / Std 150 / Fast 60	75	-40 to +70°C	R15	NF-TV02 Thin sleeve
		ø1 sleeve: 27 mm long, Heat resistant Detecting part detail 	7-EL 450 / 6-UL 260 / 5-PL 240 / 4-LG 200 / 3-ST 140 / 2-FS 70 / 1-HS 20	Long 120 / Std 80 / Fast 50	50	-40 to +200°C	R30	NF-TH04S-27V2 Made-to-order products Thin sleeve

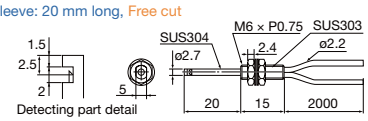
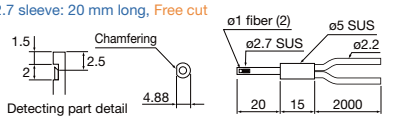
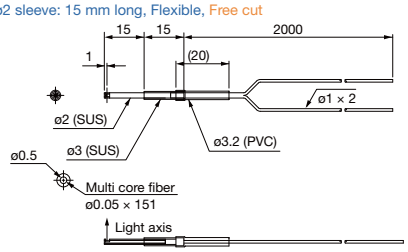
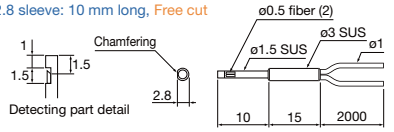
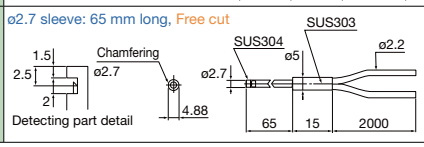
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Sleeve fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	ø3	ø1.5 sleeve: 25 mm long, Heat resistant Fiber length: 300 mm and 400 mm (each fiber) 	7-EL 1,600 6-UL 850 5-PL 800 4-LG 600 3-ST 400 2-FS 200 1-HS 60	Long 350 Std 250 Fast 150	150	-40 to +200°C	R30	NF-TH05S-A Made-to-order products
		ø2 sleeve: 20 mm long, Free cut 	7-EL 2,000 6-UL 1,300 5-PL 1,000 4-LG 900 3-ST 600 2-FS 300 1-HS 100	Long 800 Std 400 Fast 200	320	-40 to +70°C	R25	NF-TV01
		ø2 sleeve: 20 mm long 5 m long, Free cut 	7-EL 1,700 6-UL 1,100 5-PL 850 4-LG 750 3-ST 500 2-FS 250 1-HS 85	Long 600 Std 300 Fast 150	200	-40 to +70°C	R25	NF-TV01-5

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Sleeve fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	M6	ø2.7 sleeve: 20 mm long, Free cut 	7-EL 680 6-UL 400 5-PL 350 4-LG 300 3-ST 200 2-FS 100 1-HS 30	Long 200 Std 120 Fast 50	90	-40 to +70°C	R25	NF-DV03
	ø3	ø2.7 sleeve: 20 mm long, Free cut 	7-EL 680 6-UL 400 5-PL 350 4-LG 300 3-ST 200 2-FS 100 1-HS 30	Long 200 Std 120 Fast 50	90	-40 to +70°C	R25	NF-DV01
		ø2 sleeve: 15 mm long, Flexible, Free cut 	7-EL 53 6-UL 50 5-PL 43 4-LG 36 3-ST 20 2-FS 12 1-HS 4	Long 25 Std 12 Fast 5	10	-40 to +60°C	R1	NF-DR12
		ø2.8 sleeve: 10 mm long, Free cut 	7-EL 230 6-UL 110 5-PL 85 4-LG 75 3-ST 55 2-FS 30 1-HS 8	Long 80 Std 30 Fast 7	15	-40 to +70°C	R15	NF-DV02
	ø5	ø2.7 sleeve: 65 mm long, Free cut 	7-EL 680 6-UL 400 5-PL 350 4-LG 300 3-ST 200 2-FS 100 1-HS 30	Long 200 Std 120 Fast 50	90	-40 to +70°C	R25	NF-DK33

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

06 Flexible R4/R2 (R4 mm, R2 mm)

Related products

Fiber units Flexible R1 (R1 mm) P.52

Fiber units Flexible R2 (R2 mm) P.58

Flexible type fiber units can be mounted at moving parts

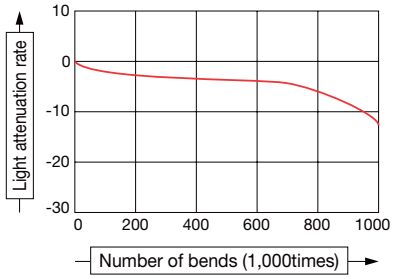
- **Withstands 800,000 cycle bending test**
- **Limited diffuse reflective types optimized for glass substrate alignment is also available**

Withstands 800,000 cycle bending test

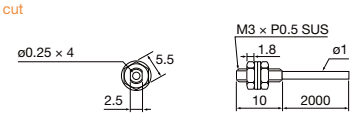
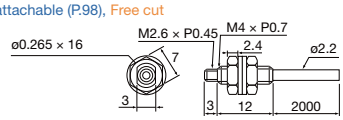
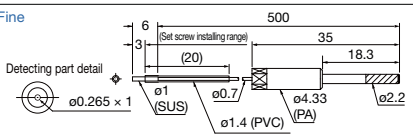
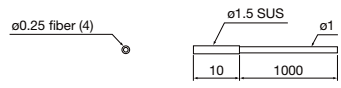
Withstands 800,000 cycle bending test at a load of 50 g !*
Because of high photo-conductivity with a less than 10% light deterioration rate, this sensor is optimal for mounting on moving parts such as robot arms.

*Measurement conditions: Bending angle of 90°, load of 50 g, bending radius of 4 mm, light attenuation rate of less than 10%

Bend cycles and light attenuation rate



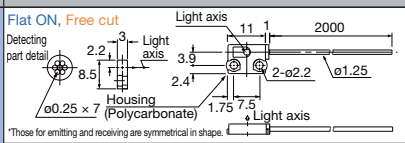
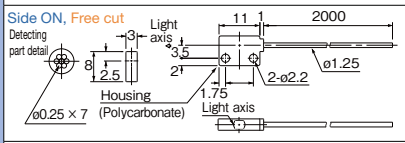
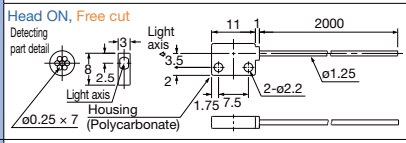
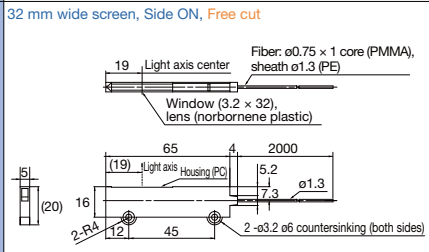
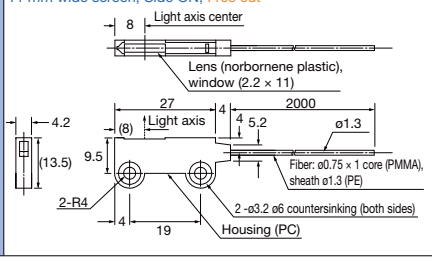
Flexible fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	M3	Free cut 	7-EL 850 6-UL 550 5-PL 450 4-LG 400 / 3-ST 275 2-FS 150 1-HS 50	Long 350 Std 200 Fast 90	110	-40 to +70°C	R4	NF-TR02
	M4	Lens attachable (P.98), Free cut 	7-EL 4,000 6-UL 1,800 5-PL 1,400 4-LG 1,200 / 3-ST 850 2-FS 500 1-HS 175	Long 800 Std 400 Fast 250	330	-40 to +70°C	R4	NF-TR01 Standard item
	ø1	Fine 	7-EL 54 6-UL 50 5-PL 44 4-LG 38 / 3-ST 25 2-FS 15 1-HS 5	Long 30 Std 18 Fast 8	10	-40 to +60°C	R4	NF-TR04
	ø1.5	Fine, Free cut 	7-EL 850 6-UL 550 5-PL 450 4-LG 400 / 3-ST 275 2-FS 150 1-HS 50	Long 350 Std 200 Fast 90	110	-40 to +70°C	R4	NF-TR03

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

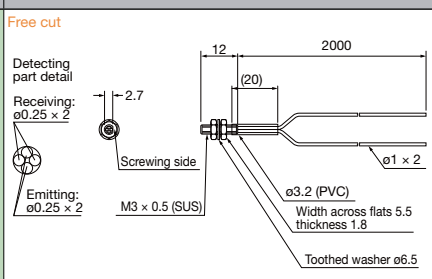
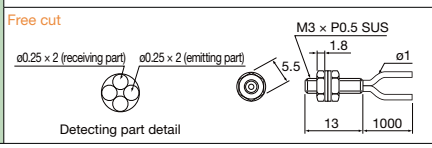
Fiber units Flexible R4/R2 (R4 mm, R2 mm)

Flexible fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	Square	Flat ON, Free cut 	7-EL 1,600 6-UL 1,510 5-PL 1,320 4-LG 1,150 3-ST 750 2-FS 410 1-HS 130	Long 750 Std 450 Fast 280	300	-40 to +60°C	R4	NF-TE05
		Side ON, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,150 3-ST 2,000 2-FS 1,100 1-HS 320	Long 2,700 Std 1,300 Fast 600	1,100	-40 to +60°C	R4	NF-TR05
		Head ON, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,580 4-LG 3,060 3-ST 1,980 2-FS 1,400 1-HS 500	Long 2,700 Std 1,600 Fast 850	1,100	-40 to +60°C	R4	NF-TR06
	Screen	32 mm wide screen, Side ON, Free cut 	7-EL 3,700 6-UL 3,700 5-PL 3,700 4-LG 3,700 3-ST 3,700 2-FS 3,000 1-HS 2,500	Long 3,700 Std 3,000 Fast 2,500	2,500	-40 to +60°C	R2	NF-TZ08 Renewal Collimated light
		11 mm wide screen, Side ON, Free cut 	7-EL 3,700 6-UL 3,000 5-PL 3,000 4-LG 3,000 3-ST 2,500 2-FS 2,000 1-HS 1,500	Long 3,500 Std 2,500 Fast 1,800	2,500	-40 to +70°C	R2	NF-TZ10 Renewal Collimated light

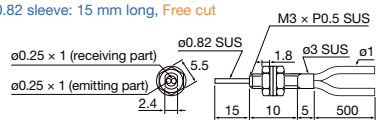
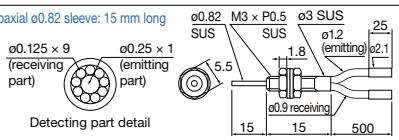
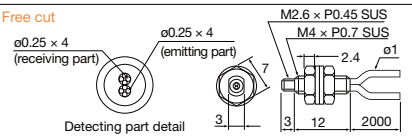
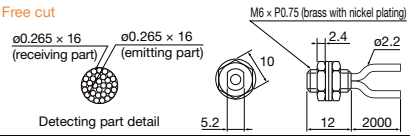
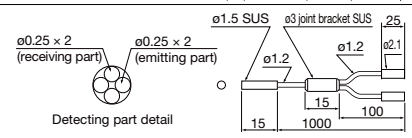
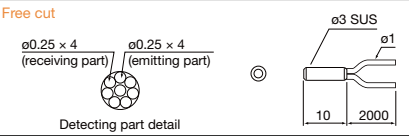
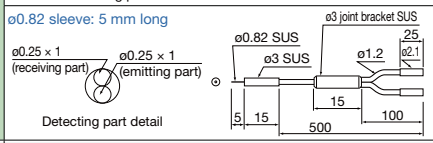
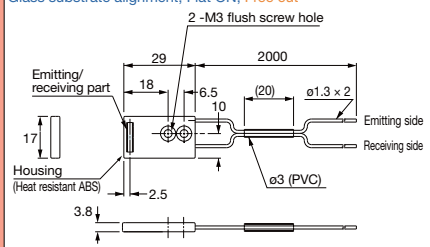
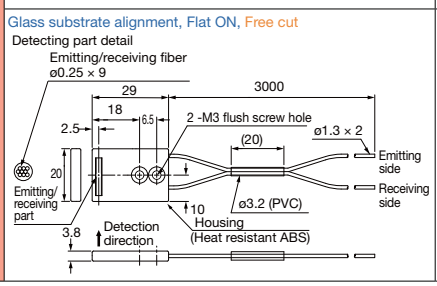
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Flexible fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	M3	Free cut 	7-EL 88 6-UL 80 5-PL 70 4-LG 60 3-ST 40 2-FS 20 1-HS 7	Long 40 Std 20 Fast 14	20	-40 to +70°C	R4	NF-DR08
		Free cut 	7-EL 300 6-UL 180 5-PL 130 4-LG 100 3-ST 80 2-FS 45 1-HS 16	Long 70 Std 30 Fast 15	20	-40 to +70°C	R4	NF-DR02

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Flexible fiber units (diffuse type/limited diffuse reflective type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	M3	ø0.82 sleeve: 15 mm long, Free cut 	7-EL 190 6-UL 125 5-PL 70 4-LG 65 3-ST 45 2-FS 25 1-HS 8	Long 40 Std 15 Fast 5	10	-40 to +70°C	R4	NF-DT02
	M3	Coaxial ø0.82 sleeve: 15 mm long 	7-EL 240 6-UL 120 5-PL 100 4-LG 85 3-ST 60 2-FS 35 1-HS 10	Long 70 Std 40 Fast 15	15	-40 to +70°C	R4	NF-DT04
	M4	Free cut 	7-EL 300 6-UL 180 5-PL 140 4-LG 120 3-ST 80 2-FS 45 1-HS 16	Long 120 Std 50 Fast 25	35	-40 to +70°C	R4	NF-DR06
	M6	Free cut 	7-EL 1,100 6-UL 700 5-PL 600 4-LG 500 3-ST 350 2-FS 230 1-HS 70	Long 350 Std 200 Fast 80	130	-40 to +70°C	R4	NF-DR01 Standard item
	ø1.5		7-EL 300 6-UL 180 5-PL 150 4-LG 130 3-ST 80 2-FS 45 1-HS 18	Long 70 Std 30 Fast 15	20	-40 to +70°C	R4	NF-DR04
	ø3	Free cut 	7-EL 450 6-UL 250 5-PL 190 4-LG 160 3-ST 120 2-FS 70 1-HS 25	Long 120 Std 50 Fast 25	35	-40 to +70°C	R4	NF-DR03
	ø3	ø0.82 sleeve: 5 mm long 	7-EL 190 6-UL 125 5-PL 75 4-LG 65 3-ST 45 2-FS 25 1-HS 8	Long 40 Std 15 Fast 5	10	-40 to +70°C	R4	NF-DR05
Limited diffuse reflective type	Square	Glass substrate alignment, Flat ON, Free cut 	7-EL 0 to 23 6-UL 0 to 23 5-PL 0 to 22 4-LG 0 to 22 3-ST 0 to 21 2-FS 0 to 20 1-HS 5 to 13	Long 0 to 23 Std 0 to 17 Fast 0 to 12	15	0 to +70°C	R4	NF-DC06
	Square	Glass substrate alignment, Flat ON, Free cut 	7-EL 0 to 38 6-UL 0 to 38 5-PL 0 to 38 4-LG 0 to 38 3-ST 0 to 34 2-FS 0 to 31 1-HS 4 to 22	Long 0 to 36 Std 0 to 30 Fast 0 to 15	Unusable	0 to +70°C	R4	NF-DC04

- The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
- Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

07 Flexible R1 (R1 mm)

Related products

Fiber units
Flexible R4/R2
(R4 mm, R2 mm)
P.49

Fiber units
Flexible R2
(R2 mm)
P.58

Fiber with 1 mm bending radius for the smallest possible bends

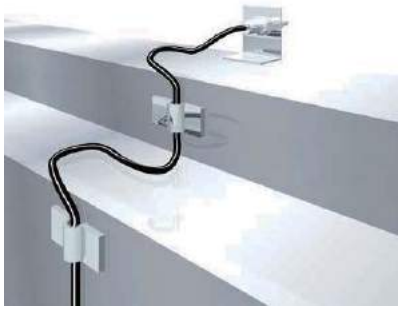
- **Extra space is unnecessary as the bending radius is 1 mm. Also prevents snagging.**
- **Over 20 types are available, including through-beam types and diffuse types**

Thanks to highly-flexible fibers

The fiber unit for the flexible type (R1 mm) has an allowable bending radius of 1 mm ! Cable can be installed without worrying about damaging the fiber.

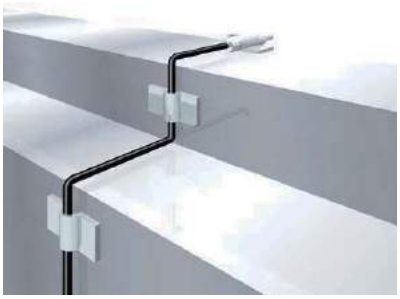
*If fibers are to be bent repeatedly, such as when mounted on moving parts, please select a flexible fiber→P.49

Standard fiber



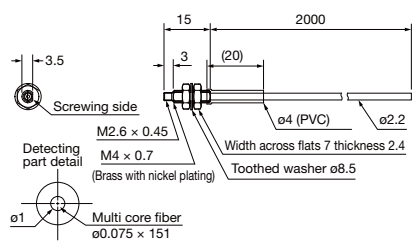
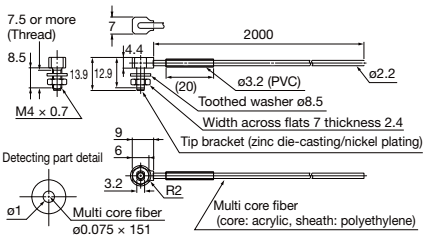
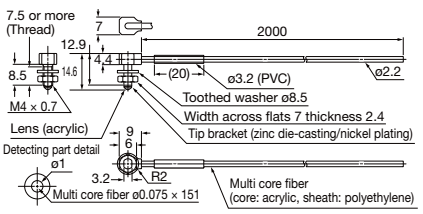
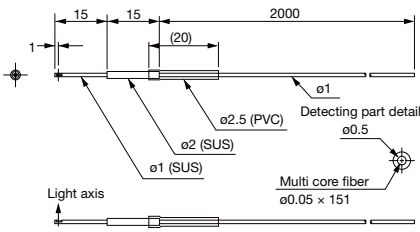
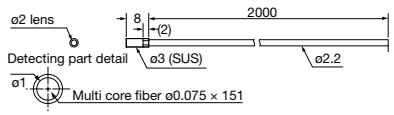
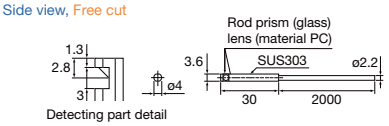
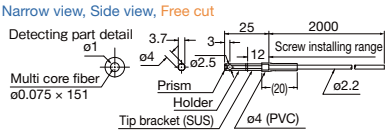
Space is needed because the bending radius is large. Also, you may have problems when snagged.

Flexible fiber



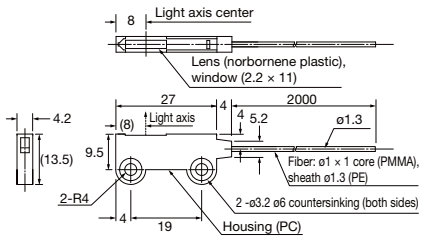
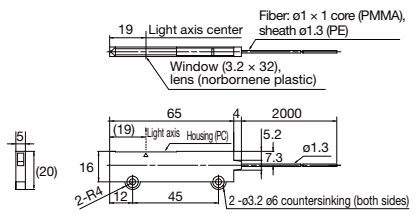
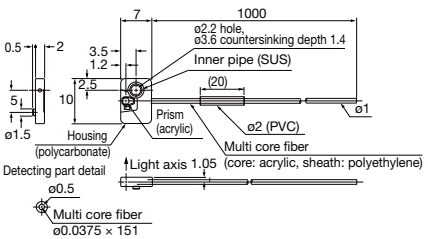
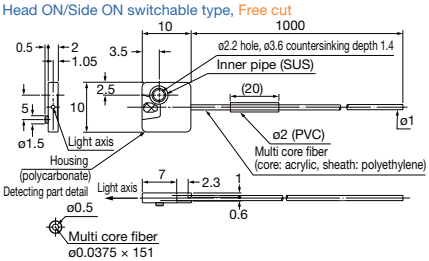
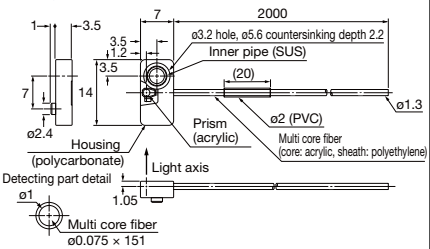
Extra space is unnecessary as the bending radius is 1 mm.
No more worrying about snagging.

Flexible R1 mm fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	M4	Lens attachable (P.98), Free cut 	7-EL 4,000 6-UL 2,000 5-PL 1,600 4-LG 1,400 3-ST 1,000 2-FS 550 1-HS 180	Long 800 Std 400 Fast 200	360	-40 to +60°C	R1	NF-TK77 Low cost
	M4	Nut type, Free cut 	7-EL 1,530 6-UL 1,440 5-PL 1,260 4-LG 1,000 3-ST 720 2-FS 420 1-HS 140	Long 800 Std 450 Fast 250	300	-40 to +60°C	R1	NF-TR08
	M4	Nut type, Lens installed, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,150 3-ST 1,980 2-FS 1,000 1-HS 320	Long 2,300 Std 1,300 Fast 550	800	-40 to +60°C	R1	NF-TR09
	ø2	ø1 sleeve: 15 mm long, Side view, Free cut 	7-EL 160 6-UL 150 5-PL 130 4-LG 110 3-ST 76 2-FS 45 1-HS 11	Long 90 Std 50 Fast 25	20	-40 to +60°C	R1	NF-TG05
	ø3	Lens installed, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,150 4-LG 2,790 3-ST 1,800 2-FS 1,000 1-HS 340	Long 2,300 Std 1,300 Fast 550	550	-40 to +60°C	R1	NF-TR10
	ø4	Side view, Free cut 	7-EL 3,500 6-UL 3,500 5-PL 3,500 4-LG 3,000 3-ST 2,000 2-FS 1,000 1-HS 300	Long 1,800 Std 1,000 Fast 500	700	-40 to +70°C	R1	NF-TS22V
	ø5	Narrow view, Side view, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,300 3-ST 2,100 2-FS 1,500 1-HS 520	Long 2,500 Std 1,600 Fast 800	1,000	-40 to +60°C	R1	NF-TG02

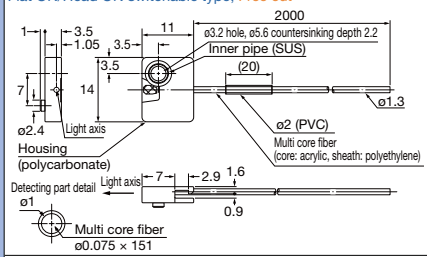
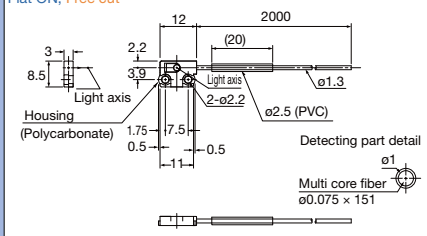
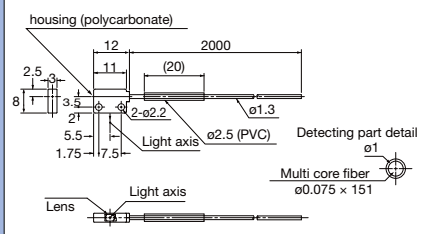
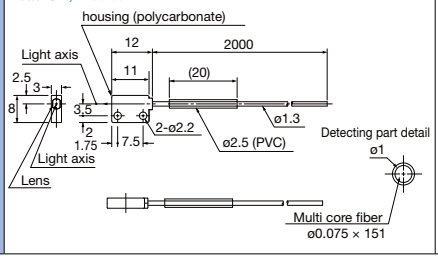
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Flexible R1 mm fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	Screen	11 mm wide screen, Side ON, Free cut 	7-EL 3,700 6-UL 3,000 5-PL 3,000 4-LG 3,000 3-ST 2,500 2-FS 2,000 1-HS 1,000	Long 3,000 Std 2,500 Fast 1,200	2,000	-40 to +55°C	R1	NF-TZ09 Renewal Collimated light
		32 mm wide screen, Side ON, Free cut 	7-EL 3,700 6-UL 3,700 5-PL 3,700 4-LG 3,700 3-ST 3,700 2-FS 3,000 1-HS 2,500	Long 3,700 Std 3,000 Fast 2,500	2,500	-40 to +55°C	R1	NF-TZ07 Renewal Collimated light
	Square	Flat ON, Free cut 	7-EL 1,190 6-UL 1,120 5-PL 980 4-LG 850 3-ST 550 2-FS 310 1-HS 100	Long 600 Std 350 Fast 200	220	-40 to +60°C	R1	NF-TE01
		Head ON/Side ON switchable type, Free cut 	7-EL 430 6-UL 400 5-PL 350 4-LG 300 3-ST 190 2-FS 120 1-HS 36	Long 250 Std 120 Fast 55	110	-40 to +60°C	R1	NF-TE02 Switchable direction
		Flat ON, Free cut 	7-EL 1,890 6-UL 1,770 5-PL 1,540 4-LG 1,350 3-ST 880 2-FS 520 1-HS 170	Long 900 Std 500 Fast 350	450	-40 to +60°C	R1	NF-TE03

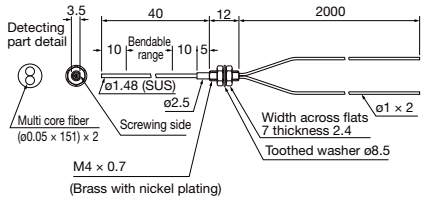
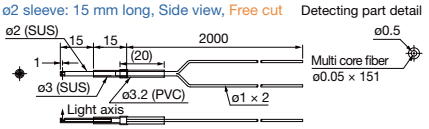
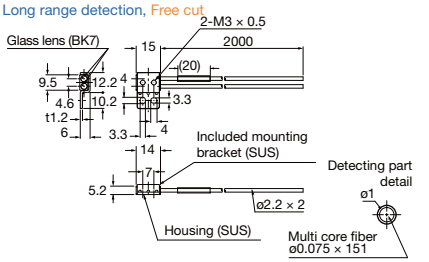
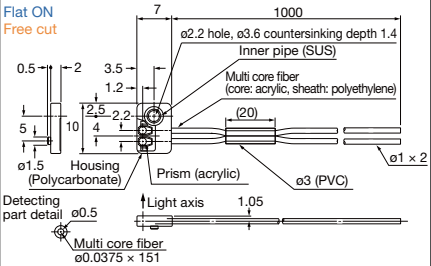
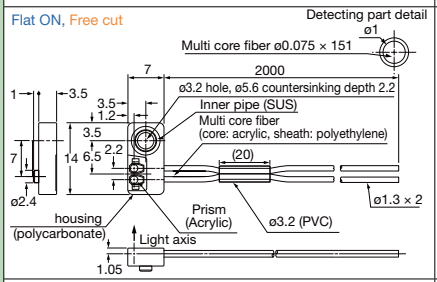
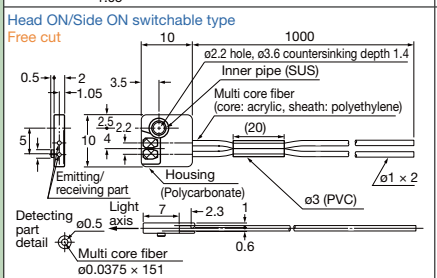
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Flexible R1 mm fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	Square	Flat ON/Head ON switchable type, Free cut 	7-EL 1,340 6-UL 1,260 5-PL 1,090 4-LG 960 3-ST 630 2-FS 390 1-HS 130	Long 750 Std 450 Fast 250	280	-40 to +60°C	R1	NF-TE04 Switchable direction
		Flat ON, Free cut  *Those for emitting and receiving are symmetrical in shape.	7-EL 2,450 6-UL 2,300 5-PL 2,010 4-LG 1,710 3-ST 1,150 2-FS 650 1-HS 220	Long 1,200 Std 650 Fast 330	500	-40 to +60°C	R1	NF-TR13
		Side ON, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,150 3-ST 2,000 2-FS 1,200 1-HS 540	Long 2,700 Std 1,500 Fast 1,000	1,300	-40 to +60°C	R1	NF-TR12
		Head ON, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,580 4-LG 3,060 3-ST 1,980 2-FS 1,350 1-HS 530	Long 2,700 Std 1,600 Fast 850	1,600	-40 to +60°C	R1	NF-TR11

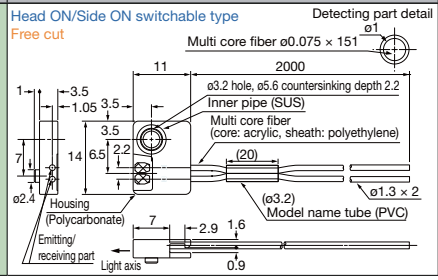
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Flexible R1 mm fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	M4	ø1.48 sleeve: 40 mm long, Free cut 	7-EL 140 6-UL 135 5-PL 110 4-LG 95 3-ST 65 2-FS 30 1-HS 10	Long 60 Std 35 Fast 17	30	-40 to +60°C	Fiber R1 Sleeve R10	NF-DR10 Bendable sleeve
	ø3	ø2 sleeve: 15 mm long, Side view, Free cut 	7-EL 53 6-UL 50 5-PL 43 4-LG 36 3-ST 20 2-FS 12 1-HS 4	Long 25 Std 12 Fast 5	10	-40 to +60°C	R1	NF-DR12
	Square	Long range detection, Free cut 	7-EL 1,070 6-UL 990 5-PL 880 4-LG 770 3-ST 500 2-FS 310 1-HS 90	Long 600 Std 380 Fast 200	250	-40 to +60°C	R1	NF-DR09
		Flat ON Free cut 	7-EL 140 6-UL 135 5-PL 110 4-LG 99 3-ST 70 2-FS 34 1-HS 10	Long 60 Std 30 Fast 10 to 16	30	-40 to +60°C	R1	NF-DE01
		Flat ON, Free cut 	7-EL 490 6-UL 450 5-PL 400 4-LG 350 3-ST 225 2-FS 117 1-HS 41	Long 250 Std 100 Fast 60	100	-40 to +60°C	R1	NF-DE03
		Head ON/Side ON switchable type Free cut 	7-EL 160 6-UL 150 5-PL 130 4-LG 117 3-ST 77 2-FS 43 1-HS 12	Long 65 Std 35 Fast 20	30	-40 to +60°C	R1	NF-DE02 Switchable direction

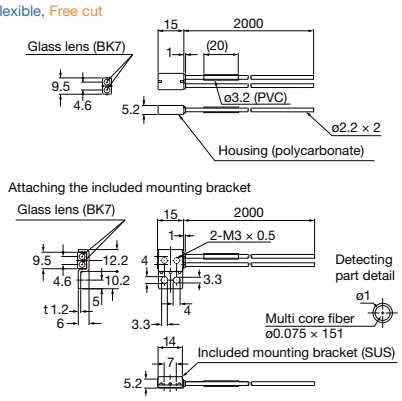
- The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
- Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Flexible R1 mm fiber units (diffuse type)

Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type / Square	Head ON/Side ON switchable type Free cut 	7-EL 480 6-UL 450 5-PL 390 4-LG 340 3-ST 225 2-FS 117 1-HS 45	Long 250 Std 120 Fast 80	100	-40 to +60°C	R1	NF-DE04 Switchable direction

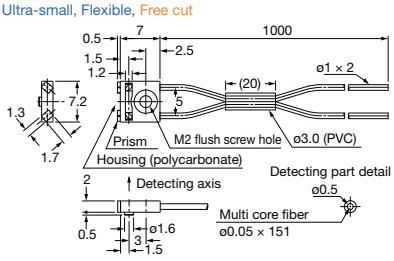
●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Flexible R1 mm fiber units (retro-reflective type)

Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Retro-reflective type	Flexible, Free cut 	7-EL 1,390 6-UL 1,300 5-PL 1,140 4-LG 990 3-ST 640 2-FS 520 1-HS 260	Long 850 Std 750 Fast 10 to 550	600	-25 to +55°C	R1	NF-RR01

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Flexible R1 mm fiber units (limited diffuse reflective type)

Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Limited diffuse reflective type	Ultra-small, Flexible, Free cut 	7-EL 0 to 9 6-UL 0 to 8 5-PL 0 to 7 4-LG 0 to 6 3-ST 2 to 5 2-FS 2 to 3 1-HS 1 to 2	Long 1 to 7 Std 1 to 5.5 Fast 1 to 3	3	-20 to +60°C	R1	NF-DC08

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

08 Flexible R2 (R2 mm)

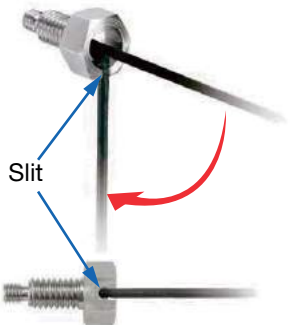
Related products
Fiber units Flexible R1 (R1 mm) P.52
Fiber units Flexible R4/R2 (R4 mm, R2 mm) P.49

Easy to handle fiber with a bending radius of 2 mm

- **Adjustable mounting type that switches between straight view and side view also available**
- **40 mm wide screen fiber type is available**

New concept Straight view/side view switchable type Switchable direction

The NF-TR14 can be used as a side view type by bending the fiber cable to fit the slit in the side of the nut. This fiber unit is a completely new concept that allows switching between side view and straight view according to mounting conditions.



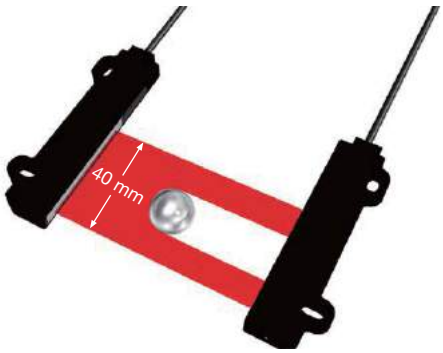
For straight view

For side view

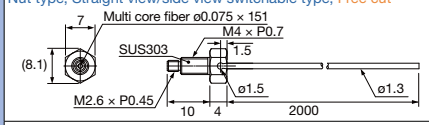
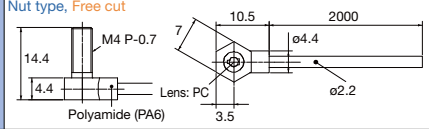
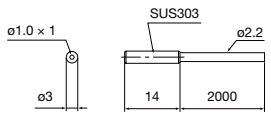
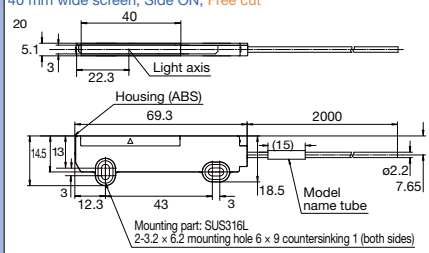
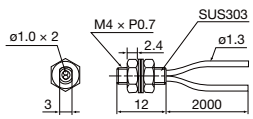
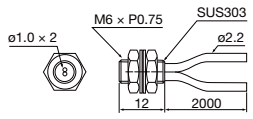
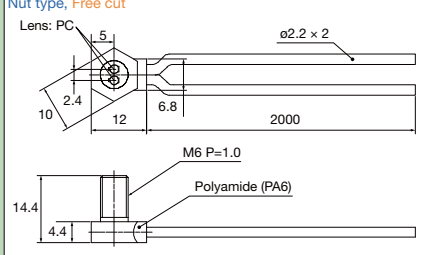
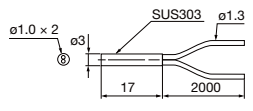
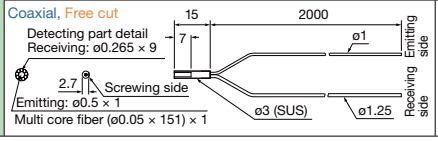
40 mm wide screen type

The NF-TS40 is a through-beam type capable of detecting within a 40 mm wide area. It emits collimated light like that of a laser beam even at a 40 mm width thanks to its unique optical design. This fiber unit demonstrates its strength in the detection of workpieces with complex shapes and in detecting falling objects.

Other screen array fibers→P.66



Flexible R2 mm fiber units (through-beam type/diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	M4	Nut type, Straight view/side view switchable type, Free cut 	7-EL 3,800 6-UL 2,700 5-PL 2,200 4-LG 1,800 3-ST 1,200 2-FS 800 1-HS 300	Long 1,300 Std 600 Fast 300	400	-40 to +60°C	R2	NF-TR14 Switchable direction
	M4	Nut type, Free cut 	7-EL 2,000 6-UL 1,000 5-PL 950 4-LG 800 3-ST 550 2-FS 250 1-HS 80	Long 600 Std 500 Fast 150	270	-40 to +70°C	R2	NF02-TK Space-saving
	ø3	Free cut 	7-EL 4,000 6-UL 2,000 5-PL 1,600 4-LG 1,400 3-ST 1,000 2-FS 550 1-HS 180	Long 800 Std 400 Fast 200	360	-40 to +70°C	R2	NF-TK05
	Screen	40 mm wide screen, Side ON, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,600 3-ST 3,600 2-FS 3,600 1-HS 2,500	Long 3,600 Std 3,600 Fast 3,000	3,600	-40 to +60°C	R2	NF-TS40 Collimated light
Diffuse type	M4	Free cut 	7-EL 1,200 6-UL 750 5-PL 650 4-LG 550 3-ST 400 2-FS 250 1-HS 80	Long 300 Std 180 Fast 80	110	-40 to +70°C	R2	NF-DK66
	M6	Free cut 	7-EL 1,200 6-UL 750 5-PL 650 4-LG 550 3-ST 400 2-FS 250 1-HS 80	Long 300 Std 180 Fast 80	110	-40 to +70°C	R2	NF-DK67
	M6	Nut type, Free cut 	7-EL 550 6-UL 330 5-PL 230 4-LG 200 3-ST 150 2-FS 90 1-HS 18	Long 65 Std 45 Fast 10	15	-40 to +70°C	R2	NF02-DK Space-saving
	ø3	Free cut 	7-EL 850 6-UL 550 5-PL 450 4-LG 375 3-ST 275 2-FS 170 1-HS 55	Long 300 Std 180 Fast 80	110	-40 to +70°C	R2	NF-DK04Z
	ø3	Coaxial, Free cut 	7-EL 270 6-UL 250 5-PL 210 4-LG 180 3-ST 120 2-FS 60 1-HS 20	Long 120 Std 70 Fast 35	55	-40 to +60°C	R2	NF-DR11

- The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper (1000 × 1000 mm white paper for NF02-DK).
- Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

09 Retro-reflective type

Related products
Fiber amplifier D3RF P.110
Fiber amplifier BRF P.130

Stable detection of transparent workpieces

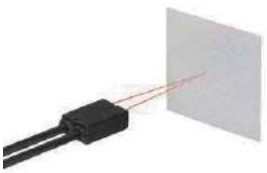
- **Built-in polarizing filter type and narrow view type available**
- **Extremely thin design with a thickness of just 2 mm. Wafer mapping with retro-reflective type. (NF-RG01)**

Stable detection of transparent workpieces

Built-in polarizing filter type and narrow view type

NF-RR01 with a built-in polarizing filter is minimally affected by reflected light from the surface of glass or film. NF-RB02 (Side ON) with narrow view design is also available. Please select based on the application.

NF-RR01 (built-in polarizing filter type)



NF-RB02 (narrow view, Side ON)

Wafer mapping with retro-reflective type

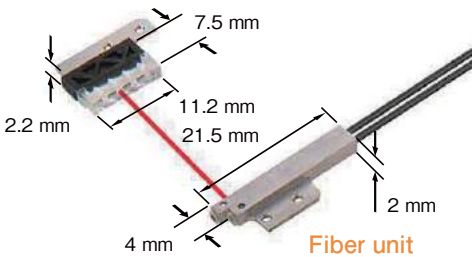
Ultra-thin fiber units and reflectors

Ultra-thin

Ultra-thin design with a thickness of just 2 mm. Wafer mapping that was only possible on through-beam types which require much cable installation made possible on retro-reflective types. Of course since this is a space-saving side view type, the fiber cable can be easily handled.

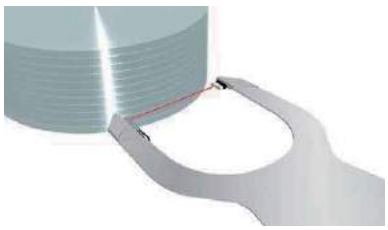
*Reflector thickness is 2.2 mm.

Reflector (included)



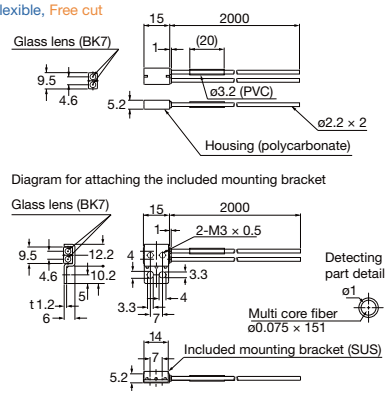
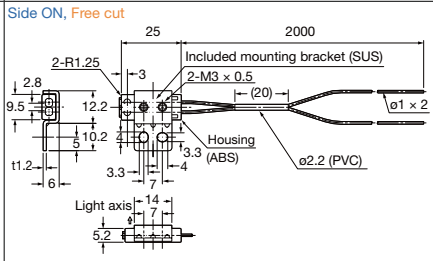
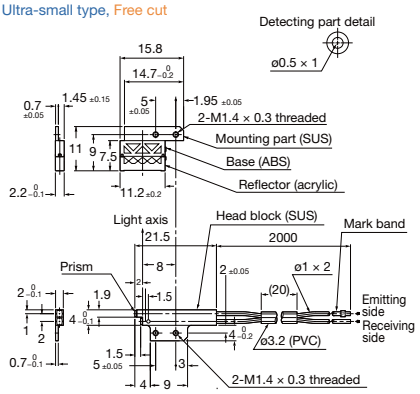
Fiber unit
NF-RG01

Mounting on robot arm



Wafer mapping with the NF-RG01 retro-reflective type.
This type allows for a reduction in the required work hours for cable installation and processing work hours compared to a through-beam type.

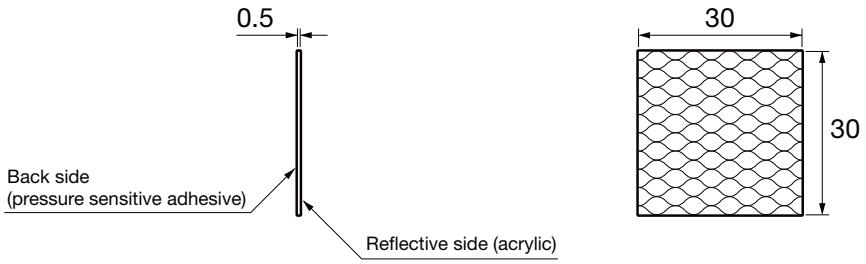
Retro-reflective type fiber units (built-in polarizing filter/narrow view/wafer mapping)

Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Built-in polarizing filter	Flexible, Free cut 	7-EL 1,390 6-UL 1,300 5-PL 1,140 4-LG 990 3-ST 640 2-FS 520 1-HS 260	Long 850 Std 750 Fast 10 to 550	600	-25 to +55°C	R1	NF-RR01
Narrow view	Side ON, Free cut 	7-EL 410 6-UL 380 5-PL 340 4-LG 290 3-ST 180 2-FS 150 1-HS 90	Long 250 Std 200 Fast 200	200	-40 to +60°C	R10	NF-RB02
Wafer mapping	Ultra-small type, Free cut 	7-EL 590 6-UL 550 5-PL 480 4-LG 420 3-ST 270 2-FS 180 1-HS 70	Long 350 Std 230 Fast 230	Unusable	-40 to +60°C	R10	NF-RG01 Ultra-thin

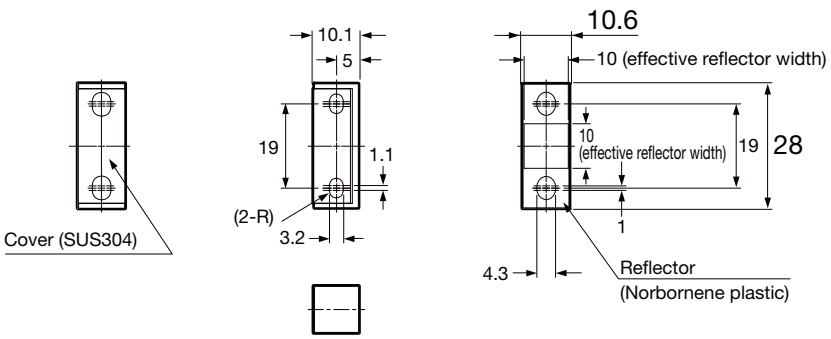
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Reflector dimensions

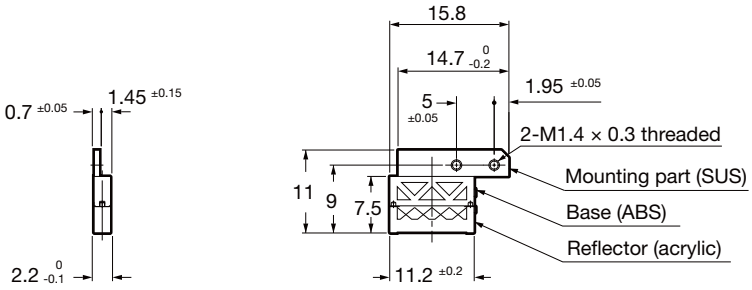
DG3030 (NF-RR01 included reflective sheet)



P31 (NF-RB02 included reflector)



NF-RG01 included reflector



10 Small object detection

Related products

Fiber amplifier
D3RF
P.110

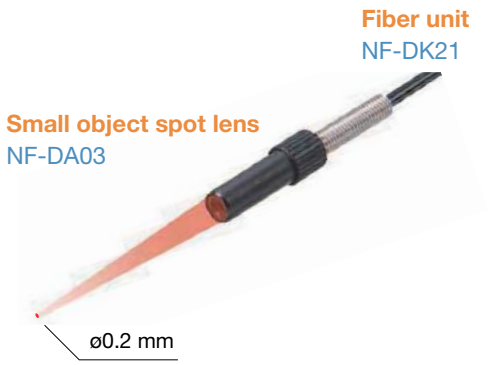
Fiber amplifier
BRF
P.130

Small object detection with spot lens and fine core

- **A small spot focus lens with adjustable spot size is available**
- **Suitable for handling small objects with a ø0.125 mm fine core (NF-TP01, NF-DP01)**

Stable detection of small objects with spot lens

Fine spot lens NF-DA03 and coaxial diffuse fiber unit NF-DK21 enables ø0.2 mm spot.



Adjustable spot size

The NF-DA06 comes with a small spot lens where sensing distance and spot size can be adjusted through the amount of fiber inserted. It is possible to change the spot size between ø0.9 and 1.9 mm with a distance of between 20 and 40 mm. The NF-DA07, with its space-saving side view, is also available.

Detects small objects with a core diameter of ø0.125 mm

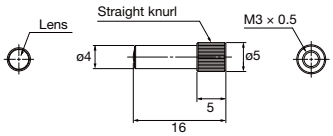
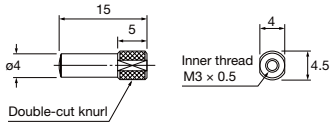
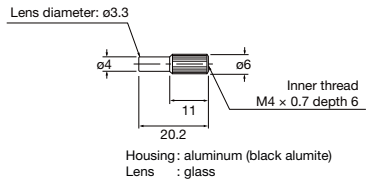
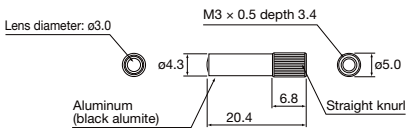
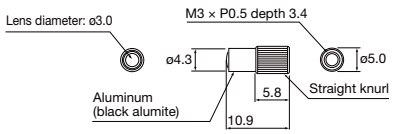
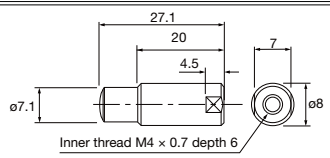
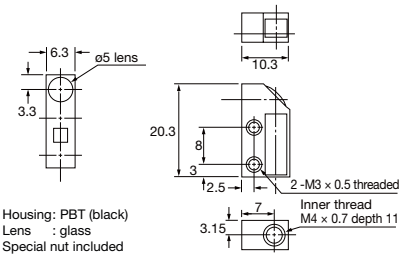
Fine core

The NF-TP01 through-beam type and the NF-DP01 diffuse type use a ø0.125 mm fine core. Suitable for small object detection. The position of the fiber can be easily adjusted by attaching a sleeve.

NF-TP01 Fine core diameter: ø0.125 mm

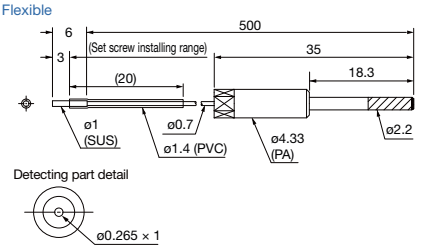
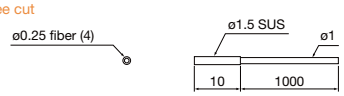
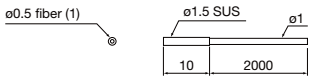
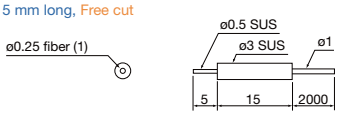
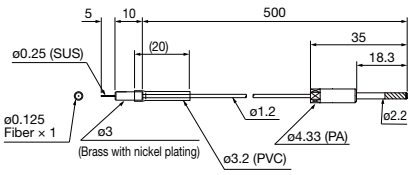
NF-DP01 Fine core diameter: ø0.125 mm (4 cores)

Small object detection lens (for diffuse type fibers)

Type	Features/dimensions (unit: mm)	Spot size and supported fiber Parentheses indicate dia. of the smallest detectable object	Center sensing distance	Ambient temperature	Model
Small object spot lens	Housing: aluminum (black alumite) Lens : acrylic 	Approx. ø0.2 mm: NF-DK21 Approx. ø0.4 mm: NF-DT01 (ø0.005 mm metal wire)	7 mm	-20 to +60°C	NF-DA03 Small
	Housing: aluminum (black alumite) Lens : glass 	Approx. ø0.3 mm: NF-DK21 Approx. ø0.5 mm: NF-DT01 (ø0.005 mm metal wire)	7.5 mm	-40 to +70°C	NF-DA04
Small spot lens		Approx. ø0.5 mm: NF-DM02 (ø0.005 mm metal wire)	6 mm	-40 to +70°C	NF-DA05
		Approx. ø0.2 mm: NF-DK21 (ø0.005 mm metal wire) Approx. ø0.4 mm: NF-DT01 (ø0.01 mm metal wire)	6 mm	-40 to +70°C	NF-DA01
		Approx. ø1.2 mm: NF-DK21 (ø0.005 mm metal wire) Approx. ø1.4 mm: NF-DT01 (ø0.01 mm metal wire)	15 mm	-40 to +70°C	NF-DA02
Spot size Adjustable lens	 Housing: aluminum (black alumite) Lens : glass	Approx. ø0.9 to 1.9 mm: NF-DM02-G4 (ø0.2 mm metal wire)	Approx. 20 to 40 mm	-40 to +70°C	NF-DA06
Side view Lens with adjustable spot size	 Housing: PBT (black) Lens : glass Special nut included	Approx. ø0.8 to 3.2 mm: NF-DM02-G4 (ø0.1 mm metal wire)	Approx. 9 to 17 mm	-40 to +70°C	NF-DA07

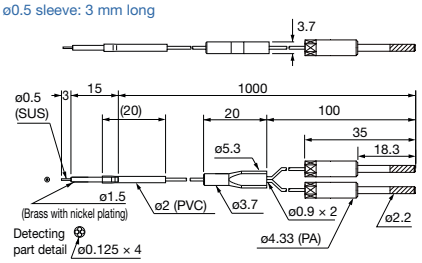
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.
●The values for the smallest detectable object are typical values when set for the best to detect small objects on the fiber amplifier side.

Small object detection fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance Parentheses indicate dia. of the smallest detectable object Unit: mm D3RF	D2RF	BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	ø1	Flexible 	7-EL 54 6-UL 50 5-PL 44 4-LG 38 3-ST 25 2-FS 15 1-HS 5 (ø0.02 metal wire)	Long 30 Std 18 Fast 8 (ø0.02 metal wire)	10 (ø0.02 metal wire)	-40 to +60°C	R4	NF-TR04
	ø1.5	Flexible, Free cut 	7-EL 850 6-UL 550 5-PL 450 4-LG 400 3-ST 275 2-FS 150 1-HS 50 (ø0.1 metal wire)	Long 350 Std 200 Fast 90 (ø0.1 metal wire)	110 (ø0.1 metal wire)	-40 to +70°C	R4	NF-TR03
		Free cut 	7-EL 900 6-UL 550 5-PL 400 4-LG 350 3-ST 250 2-FS 140 1-HS 45 (ø0.1 metal wire)	Long 350 Std 200 Fast 90 (ø0.1 metal wire)	120 (ø0.1 metal wire)	-40 to +70°C	R15	NF-TM03
	ø3	ø0.5 sleeve: 5 mm long, Free cut 	7-EL 170 6-UL 110 5-PL 80 4-LG 70 3-ST 50 2-FS 25 1-HS 8 (ø0.1 metal wire)	Long 80 Std 40 Fast 20 (ø0.1 metal wire)	30 (ø0.1 metal wire)	-40 to +70°C	R15	NF-TT01
		ø0.25 fine sleeve: 5 mm long 	7-EL 27 6-UL 25 5-PL 21 4-LG 18 3-ST 12 2-FS 7 1-HS 2 (ø0.02 metal wire)	Long 6 Std 3.5 Fast 2 (ø0.02 metal wire)	1 (ø0.02 metal wire)	-40 to +70°C	R5	NF-TP01 Fine core

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.
●The values for the smallest detectable object are typical values when set for the best to detect small objects on the fiber amplifier side.

Small object detection fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance Parentheses indicate dia. of the smallest detectable object Unit: mm D3RF	D2RF	BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	ø1.5	ø0.5 sleeve: 3 mm long 	7-EL 28 6-UL 26 5-PL 23 4-LG 20 3-ST 13 2-FS 3 1-HS 1 (ø0.02 metal wire)	Long 18 Std 5 Fast Unusable (ø0.02 metal wire)	3 (ø0.02 metal wire)	-40 to +60°C	R10	NF-DP01 Fine core

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.
●The values for the smallest detectable object are typical values when set for the best to detect small objects on the fiber amplifier side.

11 Screen/Array

Related products
Fiber amplifier D3RF P.110
Fiber amplifier BRF P.130

Fiber units for detecting with light screen

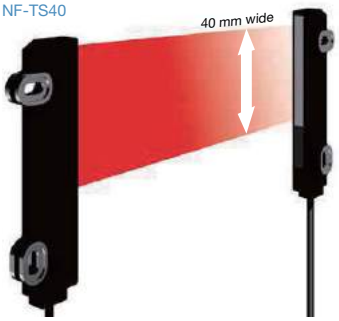
Optimal for detection of complex shapes and when workpiece passage locations are not fixed.

Screen fiber

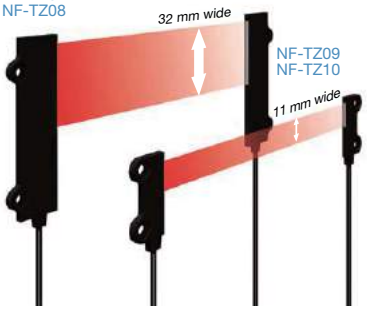
New through-beam type

New models for 32 mm wide and 11 mm wide types in addition to new 40 mm wide type. Five models are available as optimal solutions for the detection of workpieces with complex shapes, as well as for the detection of workpiece passage locations and shapes that are not fixed.

NF-TS40



NF-TZ07
NF-TZ08



Upgrades from the previous model

NF-TZ08	Bending radius changed from R10 mm
NF-TZ10	to a flexible R2 mm.

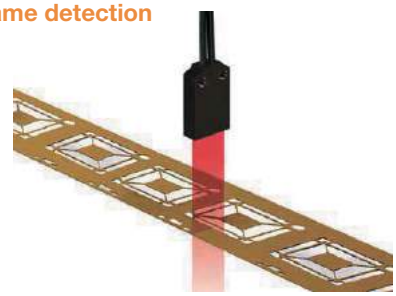
*Small changes only in sensing distance for NF-TZ09.

Slit masks for small object detection and short-distance light saturation are included for NF-TZ07, -TZ08, -TZ09, and -TZ10

Head ON diffuse type

The NF-DZ01 diffuse type enables a detection area with a spot size of 2 × 15 mm (at a distance of 15 mm). Optimal for the detection of workpieces with complex shapes and drilled workpieces such as lead frames.

Lead frame detection



Collimated light like laser beam

Collimated light like laser beam achieved through unique optical design. Because there is little light leakage even for mounting in complex areas, superior detection stability is achieved.

Photoelectric Sensors
Specialized Photoelectric Sensors
Laser Displacement Sensors
Fiber Units
Easy mounting
Thread type
Cylindrical type
Sleeve type
Flexible R4/R2
Flexible R1/R2
Retro-reflective
Small object detection
Screen/Array
Limited diffuse
Narrow view/ wafer mapping
Heat resistant
Chemical resistant
Vacuum resistant
Liquid level/liquid leakage/ water detection
Lens for through-beam type
Correct use

Difference between screen fiber and array fiber

Screen fiber

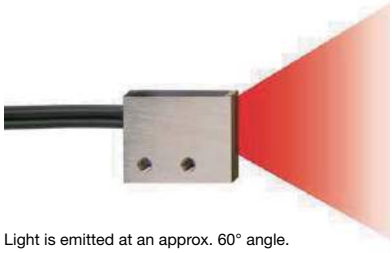
Collimated light

This screen fiber collimates light into a band through the lens.
Able to detect finer light differences than array fibers as a through-beam type due to collimated light.

Light path: almost parallel.

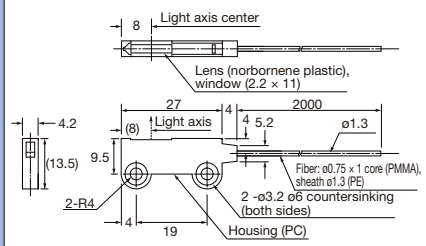
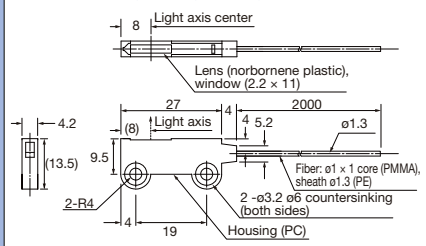
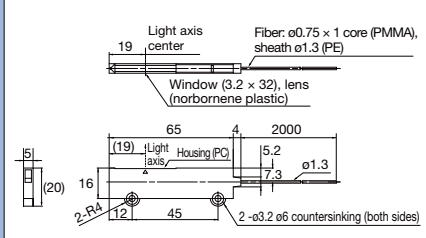
Array fiber

This array fiber aligns the fiber cores and emits light in a band.
Easy to perform light axis adjustment as a through-beam type because the light expands. Because there is more light received when detecting small objects at a short-distance when using diffuse types as compared to screen fibers, stable detection is possible.



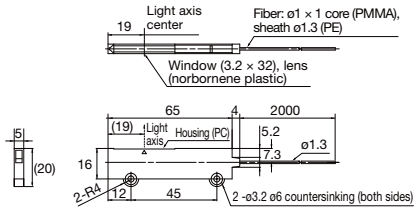
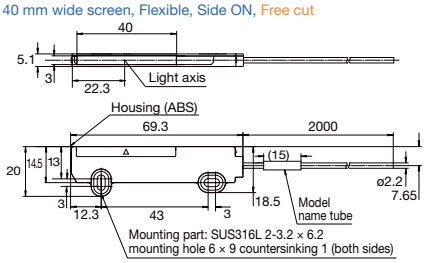
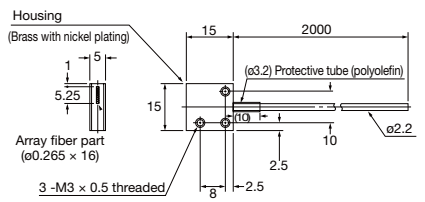
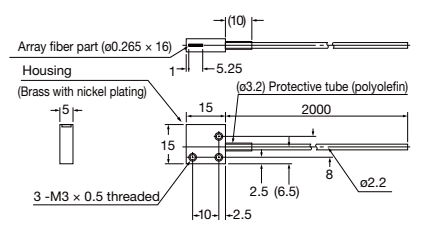
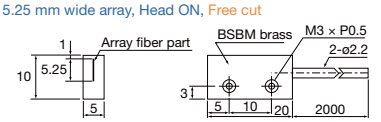
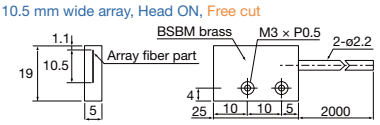
Light is emitted at an approx. 60° angle.

Screen / Array fiber units (through-beam type)

Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	11 mm wide screen, Flexible, Side ON, Free cut 	7-EL 3,700 6-UL 3,000 5-PL 3,000 4-LG 3,000 3-ST 2,500 2-FS 2,000 1-HS 1,500	Long 3,500 Std 2,500 Fast 1,800	2,500	-40 to +70°C	R2	NF-TZ10 Renewal Collimated light
	11 mm wide screen, Flexible, Side ON, Free cut 	7-EL 3,700 6-UL 3,000 5-PL 3,000 4-LG 3,000 3-ST 2,500 2-FS 2,000 1-HS 1,000	Long 3,000 Std 2,500 Fast 1,200	2,000	-40 to +55°C	R1	NF-TZ09 Renewal Collimated light
	32 mm wide screen, Flexible, Side ON, Free cut 	7-EL 3,700 6-UL 3,700 5-PL 3,700 4-LG 3,700 3-ST 3,700 2-FS 3,000 1-HS 2,500	Long 3,700 Std 3,000 Fast 2,500	2,500	-40 to +60°C	R2	NF-TZ08 Renewal Collimated light

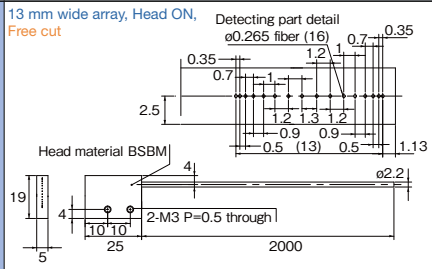
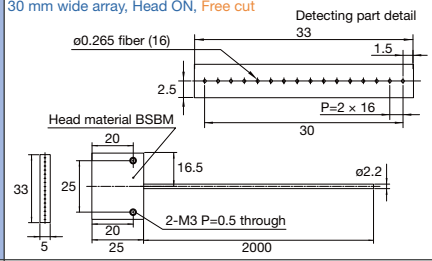
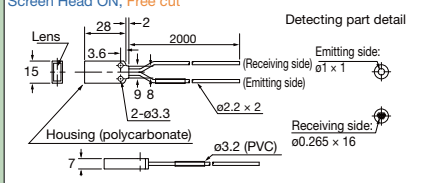
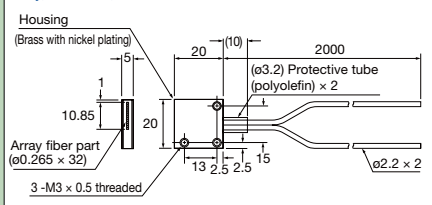
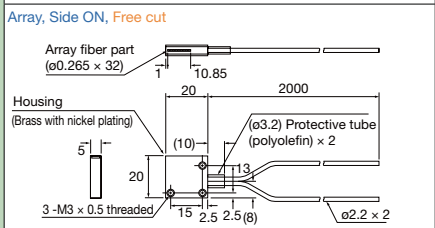
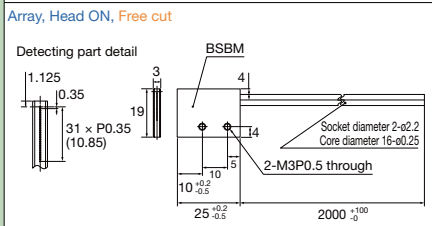
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Screen / Array fiber units (through-beam type)

Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	32 mm wide screen, Flexible, Side ON, Free cut 	7-EL 3,700 6-UL 3,700 5-PL 3,700 4-LG 3,700 3-ST 3,700 2-FS 3,000 1-HS 2,500	Long 3,700 Std 3,000 Fast 2,500	2,500	-40 to +55°C	R1	NF-TZ07 Renewal Collimated light
	40 mm wide screen, Flexible, Side ON, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,600 3-ST 3,600 2-FS 3,600 1-HS 2,500	Long 3,600 Std 3,600 Fast 3,000	3,600	-40 to +60°C	R2	NF-TS40 Collimated light
	5.25 mm wide array, Head ON, Free cut 	7-EL 1,350 6-UL 1,260 5-PL 1,170 4-LG 990 3-ST 660 2-FS 400 1-HS 130	Long 650 Std 400 Fast 250	300	-40 to +70°C	R25	NF-TZ05
	5.25 mm wide array, Side ON, Free cut 	7-EL 1,440 6-UL 1,350 5-PL 1,170 4-LG 1,080 3-ST 710 2-FS 430 1-HS 130	Long 650 Std 400 Fast 250	300	-40 to +70°C	R25	NF-TZ06
	5.25 mm wide array, Head ON, Free cut 	7-EL 4,000 6-UL 1,600 5-PL 1,000 4-LG 900 3-ST 650 2-FS 330 1-HS 100	Long 800 Std 500 Fast 250	330	-40 to +70°C	R25	NF-TS10
	10.5 mm wide array, Head ON, Free cut 	7-EL 4,000 6-UL 1,600 5-PL 1,000 4-LG 900 3-ST 650 2-FS 330 1-HS 100	Long 800 Std 500 Fast 250	330	-40 to +70°C	R25	NF-TS14

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Screen / Array fiber units (through-beam type/diffuse type)

Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	13 mm wide array, Head ON, Free cut 	7-EL 4,000 6-UL 1,500 5-PL 1,400 4-LG 1,200 3-ST 800 2-FS 400 1-HS 100	Long 850 Std 500 Fast 250	350	-40 to +70°C	R25	NF-TS28
	30 mm wide array, Head ON, Free cut 	7-EL 4,000 6-UL 1,400 5-PL 1,200 4-LG 1,000 3-ST 700 2-FS 300 1-HS 100	Long 650 Std 500 Fast 250	200	-40 to +70°C	R25	NF-TS19
Diffuse type	Screen Head ON, Free cut 	7-EL 620 6-UL 580 5-PL 500 4-LG 440 3-ST 280 2-FS 210 1-HS 59	Long 350 Std 250 Fast 100	Unusable	-40 to +60°C	R25	NF-DZ01 Collimated light
	Array, Head ON, Free cut 	7-EL 600 6-UL 560 5-PL 490 4-LG 430 3-ST 270 2-FS 270 1-HS 51	Long 320 Std 170 Fast 85	130	-40 to +70°C	R25	NF-DZ02
	Array, Side ON, Free cut 	7-EL 530 6-UL 500 5-PL 440 4-LG 370 3-ST 250 2-FS 140 1-HS 45	Long 320 Std 170 Fast 85	100	-40 to +70°C	R25	NF-DZ03
	Array, Head ON, Free cut 	7-EL 950 6-UL 500 5-PL 450 4-LG 400 3-ST 250 2-FS 100 1-HS 40	Long 300 Std 180 Fast 80	35	-40 to +70°C	R25	FD-ML02

- The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
- Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

12 Limited diffuse reflective type

Related products

Fiber amplifier
D3RF
P.110

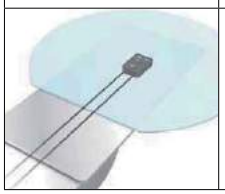
Fiber amplifier
BRF
P.130

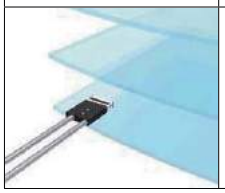
Detection at a limited distance for mapping and alignment

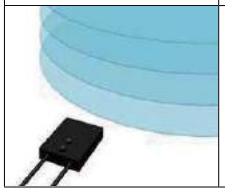
Most number of models in the industry with 14 total models

Detects glass substrate

Five types for detecting existence, five types for alignment, and one for mapping are available, making for a total of 11. Selection is possible between flexible types, heat resistant types, and vacuum resistant types.

Existence detection	NF-DC38	NF-DC07	NF-DH08	NF-DH06	NF-DN02
	Low cost 	Standard 	Heat resistant to 180°C 	Heat resistant to 300°C 	Vacuum resistant/heat resistant to 300°C 

Alignment	NF-DC05	NF-DC06	NF-DC04	NF-DH10	NF-DH11
	Standard  Also supports PCB deflection	Flexible  Also supports PCB deflection	Flexible  For long range alignment	Heat resistant to 250°C  Also supports PCB deflection	Long range, heat resistant to 250°C  Also supports PCB deflection

Wafer mapping	NF-DC03
	Standard  Also detects glass substrate of 0.5 mm in thickness

For mapping with through-beam type and retro-reflective type fibers→P.74

General-purpose use

Three general-purpose models are available

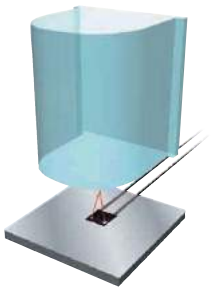
NF-DC09 (Head ON)

NF-DC08 (Small Flat ON)

NF-DC39 (Flat ON)

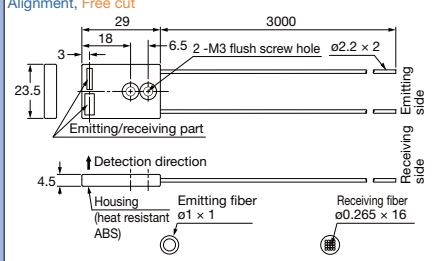
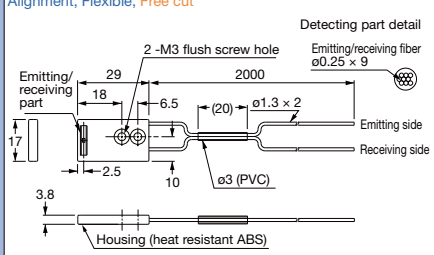
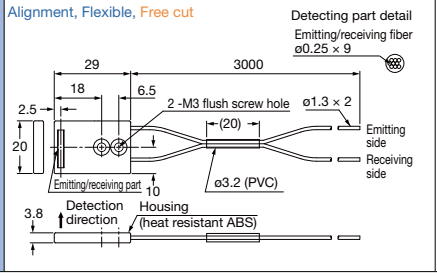
Cap orientation detection

Hoop existence detection



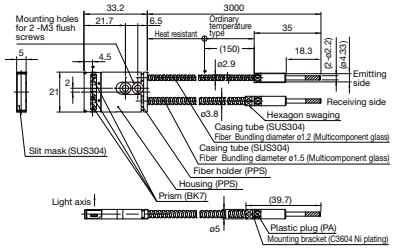
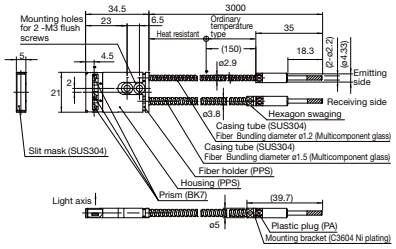
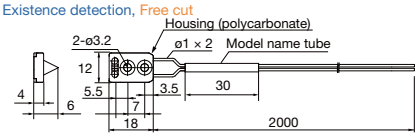
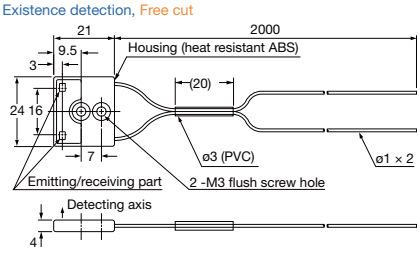
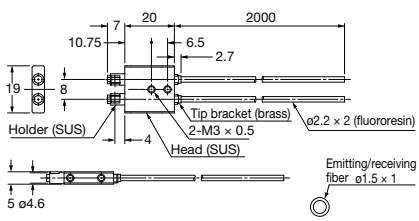
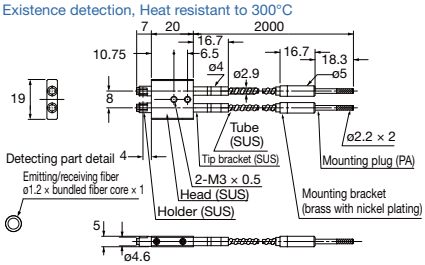
Wafer notch detection

Limited diffuse reflective type fiber units (glass substrate detection)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Glass substrate detection	Flat ON	Alignment, Free cut 	7-EL 3 to 44 6-UL 4 to 39 5-PL 4 to 38 4-LG 4 to 37 3-ST 4 to 35 2-FS 6 to 29 1-HS 9 to 18	Long 7 to 32 Std 10 to 25 Fast 10 to 18	15	0 to +70°C	R25	NF-DC05
		Alignment, Flexible, Free cut 	7-EL 0 to 23 6-UL 0 to 23 5-PL 0 to 22 4-LG 0 to 22 3-ST 0 to 21 2-FS 0 to 20 1-HS 5 to 13	Long 0 to 23 Std 0 to 17 Fast 0 to 12	15	0 to +70°C	R4	NF-DC06
		Alignment, Flexible, Free cut 	7-EL 0 to 38 6-UL 0 to 38 5-PL 0 to 38 4-LG 0 to 38 3-ST 0 to 34 2-FS 0 to 31 1-HS 4 to 22	Long 0 to 36 Std 0 to 30 Fast 0 to 15	Unusable	0 to +70°C	R4	NF-DC04

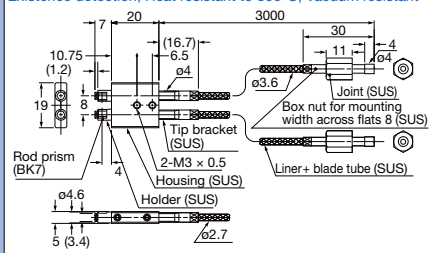
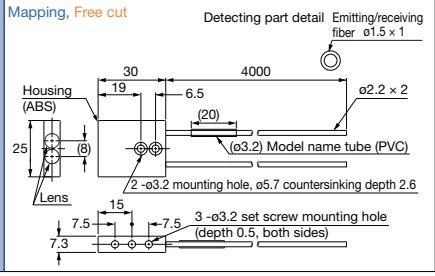
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Limited diffuse reflective type fiber units (glass substrate detection)

Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Glass substrate detection / Flat ON	Alignment, Heat resistant to 250°C 	7-EL 2 to 28 6-UL 2 to 24 5-PL 2 to 23 4-LG 3 to 23 3-ST 3 to 20 2-FS 3 to 18 1-HS 4 to 11	Long 4 to 20 Std 4 to 20 Fast 4 to 15	4 to 17	-20 to +250°C (Normal temperature side: -20 to +70°C)	R25	NF-DH10
	Alignment, Heat resistant to 250°C 	7-EL 2 to 45 6-UL 3 to 40 5-PL 3 to 39 4-LG 3 to 38 3-ST 4 to 35 2-FS 6 to 28 1-HS 8 to 19	Long 6 to 38 Std 7 to 30 Fast 8 to 25	8 to 25	-20 to +250°C (Normal temperature side: -20 to +70°C)	R25	NF-DH11
	Existence detection, Free cut 	7-EL 0 to 12 6-UL 0.5 to 11 5-PL 1.5 to 10 4-LG 1.5 to 10 3-ST 2.5 to 8 2-FS 3.5 to 7.5 1-HS 4.5 to 6	Long 2 to 9 Std 4 to 8 Fast 5 to 6	3.5 to 7	-40 to +60°C	R10	NF-DC38 Low cost
	Existence detection, Free cut 	7-EL 3 to 16 6-UL 3 to 14 5-PL 4 to 14 4-LG 5 to 14 3-ST 5 to 13 2-FS 5 to 11 1-HS 7 to 8	Long 4 to 15 Std 5 to 12 Fast 7 to 10	7	-40 to +60°C	R10	NF-DC07
	Existence detection, Heat resistant to 180°C, Free cut 	7-EL 0 to 35 6-UL 0 to 28 5-PL 0 to 25 4-LG 0 to 22 3-ST 0 to 20 2-FS 0 to 9 1-HS 3 to 4	Long 0 to 20 Std 0 to 10 Fast 0 to 8	10	-60 to +180°C	R25	NF-DH08
	Existence detection, Heat resistant to 300°C 	7-EL 0 to 40 6-UL 0 to 34 5-PL 0 to 22 4-LG 0 to 18 3-ST 0 to 17 2-FS 0 to 9 1-HS 0 to 4	Long 0 to 15 Std 0 to 10 Fast 0 to 8	6	-30 to +300°C or -60 to +200°C	R25	NF-DH06

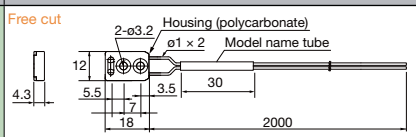
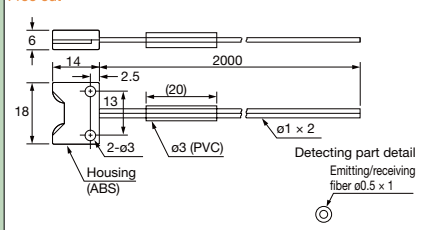
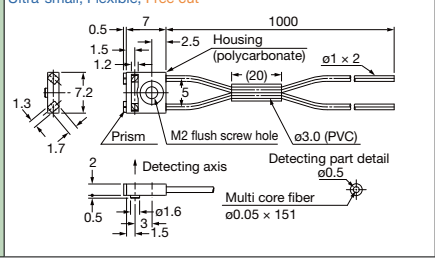
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Limited diffuse reflective type fiber units (glass substrate detection)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Glass substrate detection	Flat ON	Existence detection, Heat resistant to 300°C, Vacuum resistant 	7-EL 0 to 22 6-UL 0 to 12 5-PL 0 to 11 4-LG 0 to 9 3-ST 0 to 7 2-FS 3 to 4 1-HS Unusable	Long 0 to 8 Std 2.5 to 5 Fast Unusable	3	-30 to +300°C	R18	NF-DN02
	Head ON	Mapping, Free cut 	7-EL 2 to 310 6-UL 3 to 160 5-PL 4 to 130 4-LG 5 to 120 3-ST 5 to 110 2-FS 10 to 95 1-HS 12 to 60	Long 10 to 55 Std 10 to 45 Fast 13 to 35	55	-40 to +60°C	R25	NF-DC03

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Limited diffuse reflective fiber units (general-purpose)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
General-purpose	Flat ON	Free cut 	7-EL 1.5 to 4 6-UL 0 to 4 5-PL 0 to 4 4-LG 0 to 4 3-ST 0 to 4 2-FS 0 to 4 1-HS 0 to 4	Long 0 to 4 Std 0 to 4 Fast 0 to 4	0 to 4	-40 to +60°C	R10	NF-DC39 Low cost
	Head ON	Free cut 	7-EL 0 to 15 6-UL 5 to 12 5-PL 5 to 11 4-LG 6 to 11 3-ST 6 to 10 2-FS 7 to 9 1-HS 6 to 7	Long 4.5 to 11 Std 4.5 to 10 Fast 4.5 to 10	6	-40 to +70°C	R10	NF-DC09
	Flat ON	Ultra-small, Flexible, Free cut 	7-EL 0 to 9 6-UL 0 to 8 5-PL 0 to 7 4-LG 0 to 6 3-ST 2 to 5 2-FS 2 to 3 1-HS 1 to 2	Long 1 to 7 Std 1 to 5.5 Fast 1 to 3	3	-20 to +60°C	R1	NF-DC08

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

13 Narrow view/wafer mapping

Related products
Fiber amplifier D3RF P.110
Fiber amplifier BRF P.130

Featuring a built-in lens and narrow aperture that minimizes light leakage.

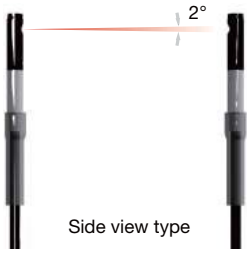
- **Long range detection together with minimized light leakage**
- **Retro-reflective type and diffuse type also available for wafer mapping**

Ultra-narrow view and ultra-thin type

Aperture 2° or less Ultra-narrow view

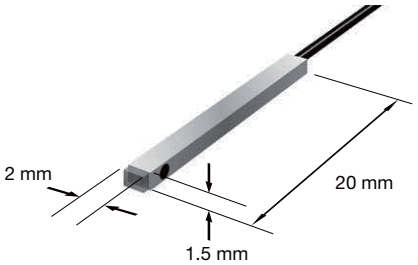
Ultra-narrow view which restricted the spread of light to the limit. Optimal for wafer mapping due to a design that minimizes light leakage.

Straight view: NF-TG01 Side view: NF-TG02, NF-TG03



Ultra-thin type: NF-TG04 Ultra-thin

Ultra-thin design with a thickness of just 1.5 mm. Almost no mounting space needed. Of course, since this is a side view type, the fiber cable can be easily handled.



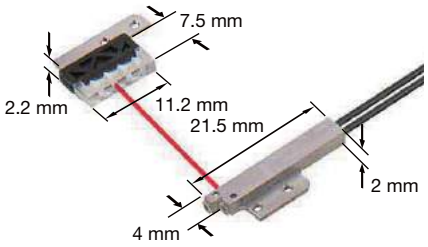
Retro-reflective types and diffuse types are also available

Ultra-thin fiber units and reflectors

Ultra-thin design with a thickness of just 2 mm. Wafer mapping that was only possible on through-beam types which require much cable installation is now possible on retro-reflective types. Of course, since this is a space-saving side view type, the fiber cable can be easily handled.

*Reflector thickness is 2.2 mm.

Retro-reflective type NF-RG01 Ultra-thin

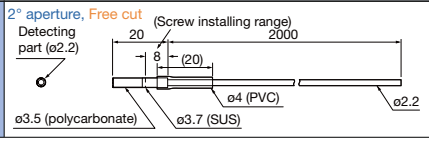


Diffuse type and limited diffuse reflective type are also available

Diffuse type NF-DR09

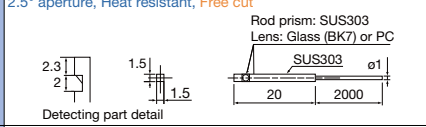
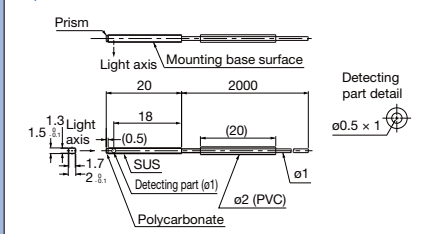
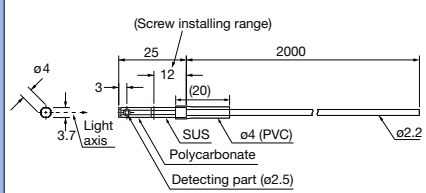
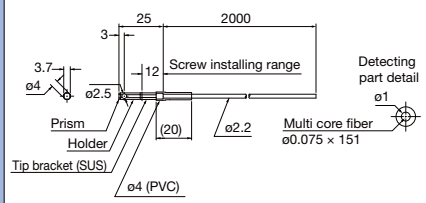
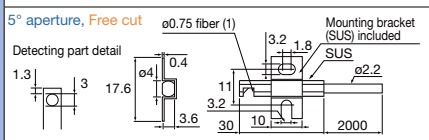
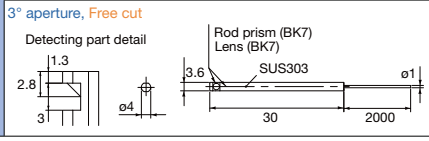
Limited diffuse reflective type NF-DC03

Narrow view/wafer mapping fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	ø3.7	2° aperture, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,200 3-ST 2,100 2-FS 2,000 1-HS 790	Long 3,000 Std 2,000 Fast 1,300	2,300	-40 to +60°C	R25	NF-TG01 Ultra-narrow view

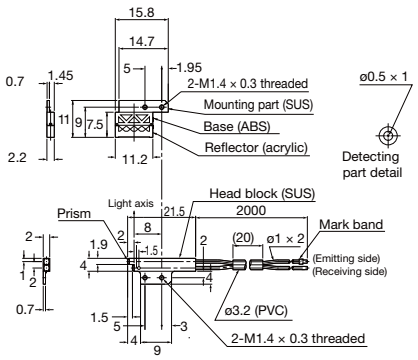
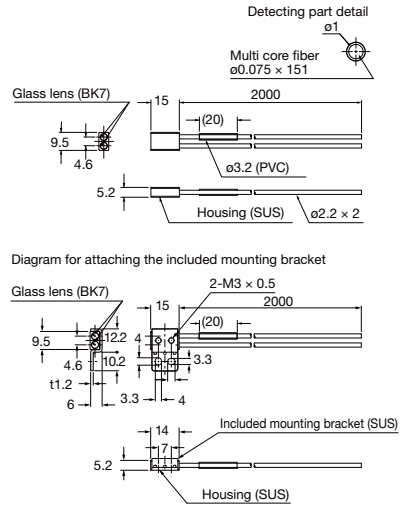
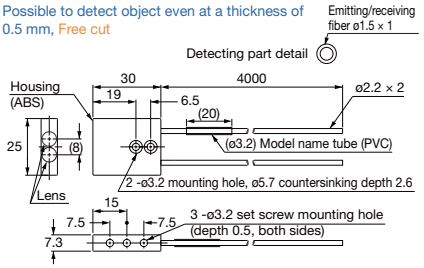
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Narrow view/wafer mapping fiber units (through-beam type: side view)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Side view Through-beam type	1.5 × 1.5	2.5° aperture, Heat resistant, Free cut 	7-EL 2,300 6-UL 1,200 5-PL 1,100 4-LG 950 3-ST 600 2-FS 300 1-HS 100	Long 600 Std 300 Fast 100	200	-40 to +105°C	R10	NF-TS25
	2 × 1.5	3° aperture, Free cut 	7-EL 1,000 6-UL 900 5-PL 790 4-LG 690 3-ST 450 2-FS 260 1-HS 90	Long 500 Std 300 Fast 150	220	-40 to +60°C	R10	NF-TG04 Ultra-thin
	ø4	2° aperture, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,300 3-ST 2,100 2-FS 1,780 1-HS 510	Long 2,500 Std 1,600 Fast 800	900	-40 to +60°C	R25	NF-TG03 Ultra-narrow view
		2° aperture, Flexible, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,300 3-ST 2,100 2-FS 1,500 1-HS 520	Long 2,500 Std 1,600 Fast 800	1,000	-40 to +60°C	R1	NF-TG02 Ultra-narrow view
		5° aperture, Free cut 	7-EL 4,000 6-UL 4,000 5-PL 4,000 4-LG 3,000 3-ST 2,800 2-FS 2,000 1-HS 1,000	Long 4,000 Std 3,000 Fast 2,000	1,700	-40 to +70°C	R25	NF-TS12
		3° aperture, Free cut 	7-EL 4,000 6-UL 4,000 5-PL 4,000 4-LG 1,000 3-ST 2,000 2-FS 1,000 1-HS 300	Long 3,000 Std 1,600 Fast 700	750	-40 to +70°C	R25	NF-TS22

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Narrow view/wafer mapping fiber units (retro-reflective type/diffuse type/limited diffuse reflective type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Retro-reflective type	4 × 2	Wafer mapping, Ultra-small type, Free cut 	7-EL 590 6-UL 550 5-PL 480 4-LG 420 3-ST 270 2-FS 180 1-HS 70	Long 350 Std 230 Fast 130	Unusable	-40 to +60°C	R10	NF-RG01 Ultra-thin
Diffuse type	Square	Long range detection, Flexible, Free cut  Diagram for attaching the included mounting bracket	7-EL 1,070 6-UL 990 5-PL 880 4-LG 770 3-ST 500 2-FS 310 1-HS 90	Long 600 Std 380 Fast 200	250	-40 to +60°C	R1	NF-DR09
Limited diffuse reflective type	Square	Possible to detect object even at a thickness of 0.5 mm, Free cut 	7-EL 2 to 310 6-UL 3 to 160 5-PL 4 to 130 4-LG 5 to 120 3-ST 5 to 110 2-FS 10 to 95 1-HS 12 to 60	Long 10 to 55 Std 10 to 45 Fast 13 to 35	55	-40 to +60°C	R25	NF-DC03

- The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
- Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

14 Heat resistant (130°C or below)

Related products

Fiber units
Heat resistant
(180 to 200°C)
P.80

Fiber units
Heat resistant
(250 to 350°C)
P.85

Fiber units for ambient temperatures of 130°C or below

This heat resistant series offers most models in the industry at 30 models (according to in-house survey)

Non-protruding cables Space-saving

Because the cables of NF25-DH and NF25-TH heat resistant nut type fiber units do not protrude even when mounted to the conveyer side, no extra space is needed. Also, they eliminate worries regarding cable breakage caused by snagging on tools during work.

Straight type Extra space needed

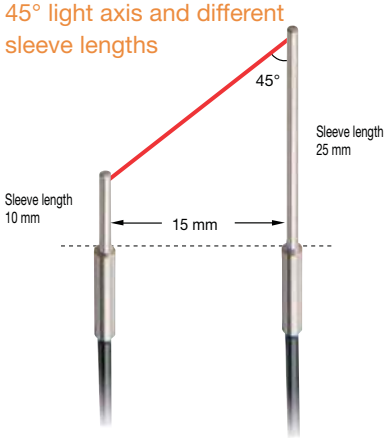
Nut type Non-protruding cables

Low cost nut type→P.35
Flexible R2 mm nut type→P.58

Fiber units with 45° angle light axis and different sleeve lengths

An angled light axis is needed when mounting workpieces for detecting transparent glass substrates with through-beam type fibers. The light axis of the NF-TH06 is angled at 45° and the sleeve lengths for the emitting and receiving fibers differ, making it possible to simplify the mounting jig and installation.

NF-TH06
45° light axis and different sleeve lengths



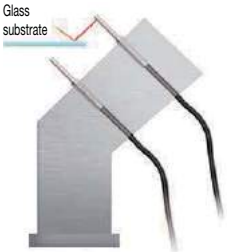
Angle detection using conventional fiber units

Vertical mounting

The light passes through the glass and detection is unstable when installed vertically to a glass substrate.

Angled mounting

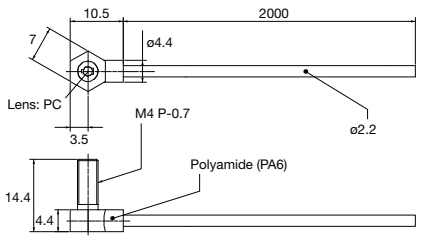
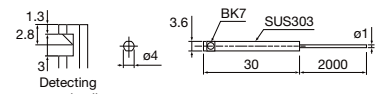
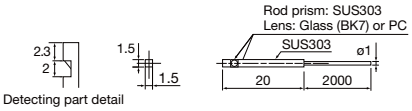
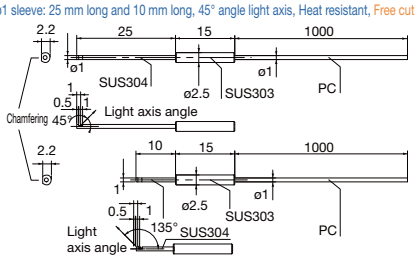
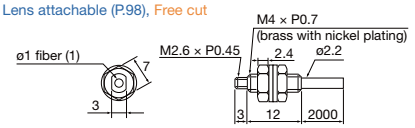
Although the detection is stable, mounting bracket with a complex shape is needed when mounting at an angle.



NF-TH06 provides stable detection and simple mounting

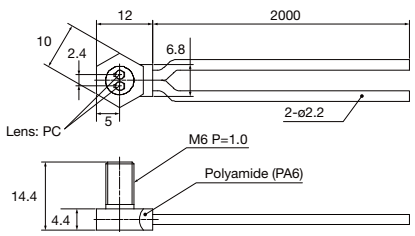
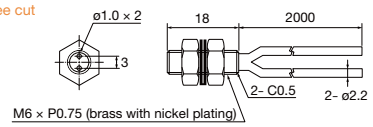
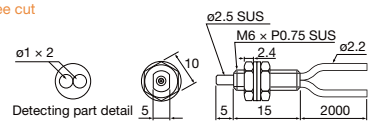
Fiber units Heat resistant (130°C or below)

Heat resistant <130°C or below> fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	105°C	Nut type, Free cut 	7-EL 2,000 6-UL 1,100 5-PL 1,000 4-LG 900 3-ST 600 2-FS 300 1-HS 90	Long 750 Std 500 Fast 170	300	-40 to +105°C	R25	NF25-TH Space-saving
		Side view, Free cut 	7-EL 3,500 6-UL 2,300 5-PL 2,000 4-LG 1,800 3-ST 1,200 2-FS 600 1-HS 170	Long 1,300 Std 700 Fast 400	500	-40 to +105°C	R10	NF-TS22M
		Narrow view, Side view, Free cut 	7-EL 2,300 6-UL 1,200 5-PL 1,100 4-LG 950 3-ST 600 2-FS 300 1-HS 100	Long 600 Std 300 Fast 100	200	-40 to +105°C	R10	NF-TS25
		ø1 sleeve: 25 mm long and 10 mm long, 45° angle light axis, Heat resistant, Free cut 	7-EL 100 6-UL 55 5-PL 50 4-LG 40 3-ST 30 2-FS 10 1-HS 4	Long 28 Std 20 Fast 15	16	-40 to +105°C	R10	NF-TH06
	100°C	Lens attachable (P.98), Free cut 	7-EL 2,400 6-UL 1,400 5-PL 1,000 4-LG 900 3-ST 700 2-FS 300 1-HS 100	Long 700 Std 400 Fast 200	300	-40 to +100°C (Note)	R25	NF-TH01 Low cost

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.
Note: Light intensity retention rate of 90% or above after 2000 continuous work hours.

Heat resistant <130°C or below> fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	105°C	Free cut 	7-EL 650 6-UL 350 5-PL 280 4-LG 240 3-ST 175 2-FS 100 1-HS 25	Long 120 Std 80 Fast 25	15	-40 to +105°C	R25	NF25-DH Space-saving
		Free cut 	7-EL 950 6-UL 500 5-PL 450 4-LG 400 3-ST 250 2-FS 130 1-HS 40	Long 300 Std 180 Fast 80	160	-40 to +105°C	R25	FD-3SD1(100) Standard item
	100°C	Free cut 	7-EL 850 6-UL 550 5-PL 450 4-LG 375 3-ST 275 2-FS 170 1-HS 55	Long 250 Std 150 Fast 50	110	-40 to +100°C (Note)	R25	NF-DH02 Low cost

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper (1000 × 1000 mm white paper for NF25-DH).
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.
Note: Light intensity retention rate of 85% or above after 1000 continuous work hours.

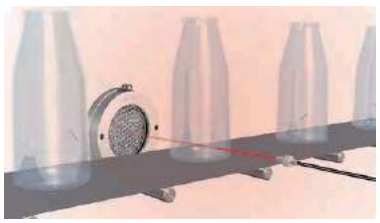
Heat resistant reflector

Possible to detect as retro-reflective type if the SW50 heat resistant reflector is used for the heat resistant diffuse type fiber. Demonstrates its strength in transparent object detection under high temperatures.

Reflector heat resistant to 300°C

SW50
ø80 × 20 mm (ø50 mm reflective surface)

Glass bottle detection under high temperatures



15 Heat resistant (180 to 200°C)

Related products
Fiber units
Heat resistant
(130°C or below)
P.77
Fiber units
Heat resistant
(250 to 350°C)
P.85

Fiber units for ambient temperatures of 180 to 200°C

- **New concept joint type also available**
- **This heat resistant series offers the most models in the industry at 30 models** (according to in-house survey)

Various selection

Selection is possible from among 13 types of fiber units for ambient temperatures of 180 to 200°C. A wide variation of through-beam types is available to fix customer's applications, including standard and joint types, as well as straight view and side view types.

Through-beam type (standard types)

Straight view			Side view	
NF-TH10	NF-TH11	NF-TH02	NF-TH04S-27V2	NF-TH05S-A
Heat resistant to 200°C	Heat resistant to 200°C	Heat resistant to 180°C	Heat resistant to 200°C	Heat resistant to 200°C
				
Lens attachable	Lens attachable	Free cut	ø1 sleeve	ø1.5 sleeve

Through-beam type (joint types)

Straight view			Side view	
NF-TH12	NF-TH13	NF-TH14	NF-TH15	NF-TH16
Heat resistant to 200°C	Heat resistant to 200°C	Heat resistant to 200°C	Heat resistant to 200°C	Heat resistant to 200°C
				
Ordinary temperature fiber section is free cut	Ordinary temperature fiber section is free cut	Ordinary temperature fiber section is free cut	Ordinary temperature fiber section is free cut	Ordinary temperature fiber section is free cut

Diffuse type

Coaxial	Standard
NF-DH07	NF-DH01
Heat resistant to 200°C	Heat resistant to 200°C
	
Metal sheath	Free cut

Limited diffuse reflective type

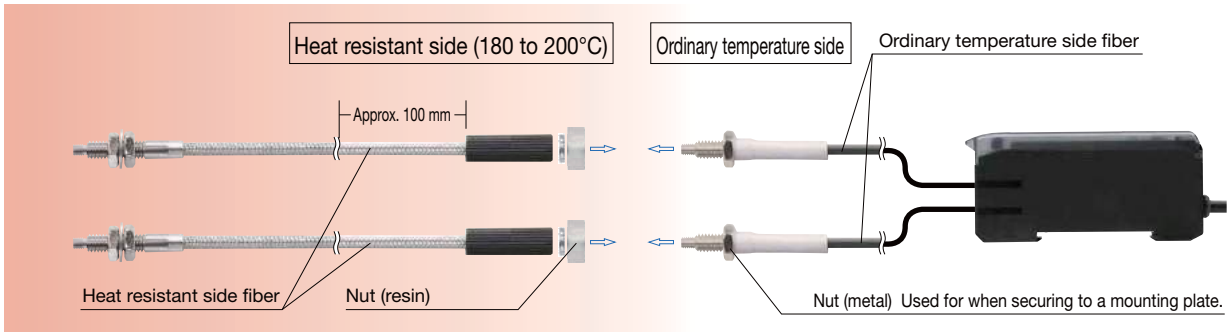
Glass substrate detection
NF-DH08
Heat resistant to 180°C

Free cut

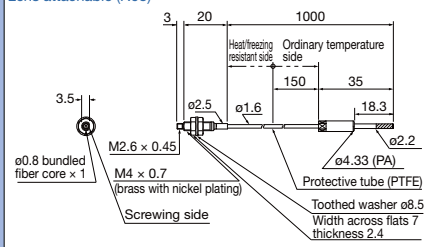
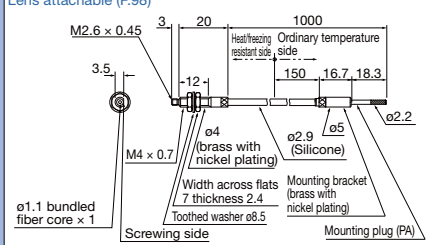
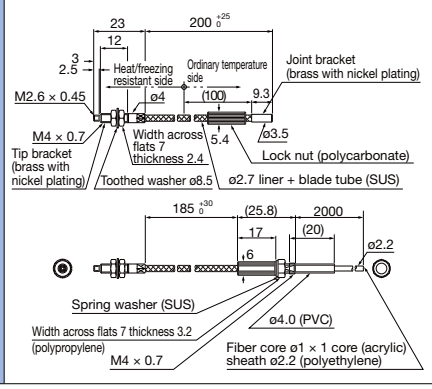
Photoelectric Sensors
Specialized Photoelectric Sensors
Laser Displacement Sensors
Fiber Units
Easy mounting
Thread type
Cylindrical type
Sleeve type
Flexible R4/R2
Flexible R1/R2
Retro-reflective
Small object detection
Screen/Array
Limited diffuse
Narrow view/ wafer mapping
Heat resistant
Chemical resistant
Vacuum resistant
Liquid level/liquid leakage/ water detection
Lens for through-beam type
Correct use

New concept joint type

By using joints for the free cut ordinary temperature fiber and heat resistant fiber, it is easy to attach/remove the fibers, and makes it possible to adjust the fiber length.



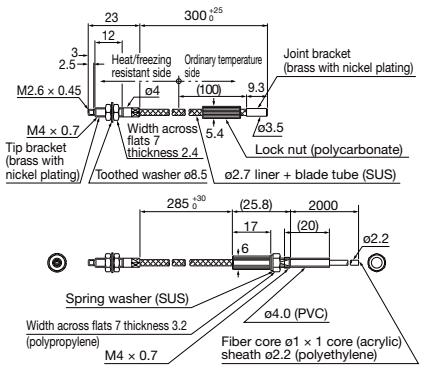
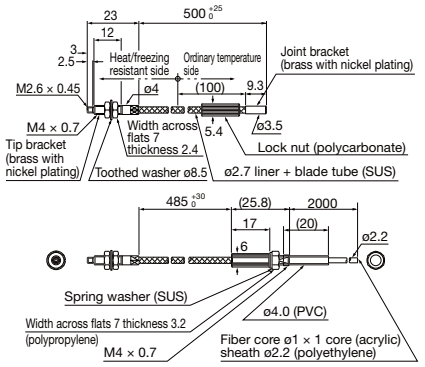
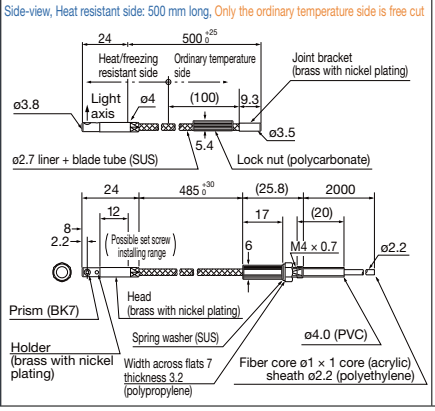
Heat resistant <180 to 200°C or below> fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	200°C	Lens attachable (P.98) 	7-EL 570 6-UL 540 5-PL 460 4-LG 410 3-ST 270 2-FS 160 1-HS 45	Long 350 Std 180 Fast 85	110	-60 to +200°C	R10	NF-TH10
		Lens attachable (P.98) 	7-EL 1,350 6-UL 1,260 5-PL 1,130 4-LG 990 3-ST 630 2-FS 360 1-HS 110	Long 750 Std 450 Fast 220	280	-60 to +200°C	R25	NF-TH11 Standard item
		Lens attachable (P.98), Heat resistant side: 200 mm long Only the ordinary temperature side is free cut 	7-EL 1,080 6-UL 990 5-PL 900 4-LG 790 3-ST 510 2-FS 290 1-HS 90	Long 550 Std 350 Fast 170	220	-60 to +200°C	Heat resistant side R18 Ordinary temperature side R25	NF-TH12

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

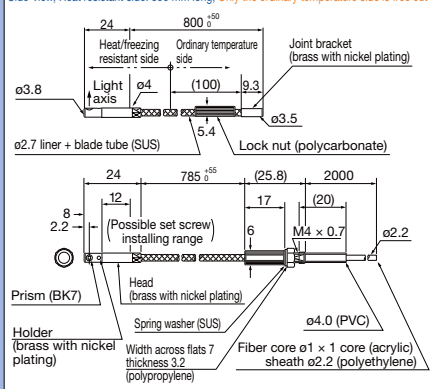
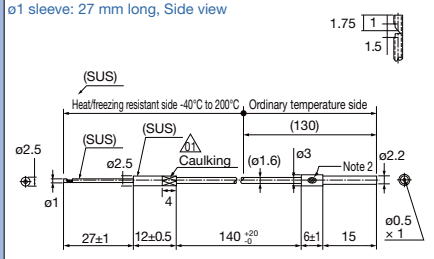
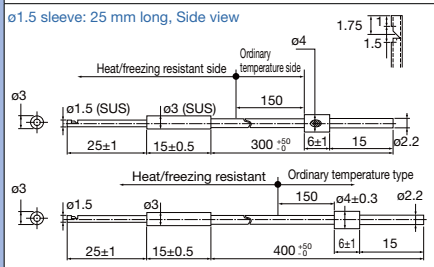
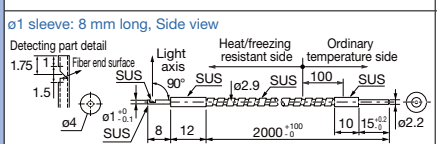
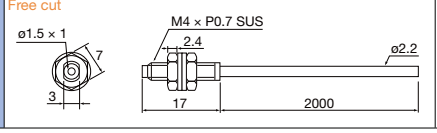
Fiber units Heat resistant (180 to 200°C)

Heat resistant <180 to 200°C or below> fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	200°C	Heat resistant side: 300 mm long, Only the ordinary temperature side is free cut 	7-EL 1,080 6-UL 990 5-PL 900 4-LG 790 3-ST 510 2-FS 290 1-HS 90	Long 550 Std 350 Fast 170	220	-60 to +200°C	Heat resistant side R18 Ordinary temperature side R25	NF-TH13
		Heat resistant side: 500 mm long, Only the ordinary temperature side is free cut 	7-EL 1,080 6-UL 990 5-PL 900 4-LG 790 3-ST 510 2-FS 290 1-HS 90	Long 550 Std 350 Fast 170	220	-60 to +200°C	Heat resistant side R18 Ordinary temperature side R25	NF-TH14
		Side-view, Heat resistant side: 500 mm long, Only the ordinary temperature side is free cut 	7-EL 900 6-UL 870 5-PL 760 4-LG 660 3-ST 430 2-FS 260 1-HS 80	Long 500 Std 300 Fast 150	150	-60 to +200°C	Heat resistant side R18 Ordinary temperature side R25	NF-TH15

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

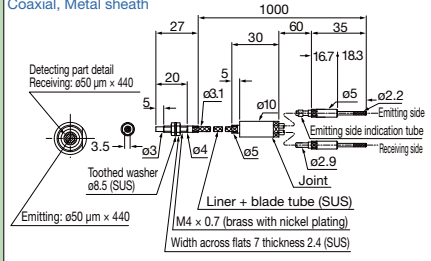
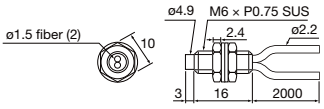
Heat resistant <180 to 200°C or below> fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	200°C	Side-view, Heat resistant side: 800 mm long, Only the ordinary temperature side is free cut 	7-EL 900 6-UL 870 5-PL 760 4-LG 660 3-ST 430 2-FS 260 1-HS 80	Long 500 Std 300 Fast 150	150	-60 to +200°C	Heat resistant side R18 Ordinary temperature side R25	NF-TH16
		ø1 sleeve: 27 mm long, Side view 	7-EL 450 6-UL 260 5-PL 240 4-LG 200 3-ST 140 2-FS 70 1-HS 20	Long 120 Std 80 Fast 50	50	-40 to +200°C	R30	NF-TH04S-27V2 Made-to-order products
		ø1.5 sleeve: 25 mm long, Side view 	7-EL 1,600 6-UL 850 5-PL 800 4-LG 600 3-ST 400 2-FS 200 1-HS 60	Long 350 Std 250 Fast 150	150	-40 to +200°C	R30	NF-TH05S-A Made-to-order products
		ø1 sleeve: 8 mm long, Side view 	7-EL 300 6-UL 160 5-PL 150 4-LG 100 3-ST 90 2-FS 40 1-HS 14	Long 125 Std 60 Fast 30	50	-40 to +200°C	R50	NF-TH07
	180°C	Free cut 	7-EL 4,000 6-UL 2,200 5-PL 1,700 4-LG 1,500 3-ST 1,000 2-FS 550 1-HS 180	Long 1,000 Std 700 Fast 350	600	-40 to +180°C (Note)	R35	NF-TH02 Standard item

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.
Note: Light intensity retention rate of 85% or above after 1000 continuous work hours.

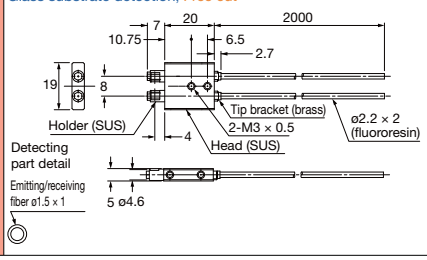
Fiber units Heat resistant (180 to 200°C)

Heat resistant <180 to 200°C or below> fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	200°C	Coaxial, Metal sheath 	7-EL 1,280 6-UL 1,200 5-PL 1,050 4-LG 920 3-ST 600 2-FS 230 1-HS 59	Long 850 Std 320 Fast 100	200	-60 to +200°C	R25	NF-DH07
	180°C	Free cut 	7-EL 1,100 6-UL 840 5-PL 750 4-LG 650 3-ST 450 2-FS 300 1-HS 100	Long 450 Std 250 Fast 150	210	-40 to +180°C (Note)	R35	NF-DH01

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.
Note: Light intensity retention rate of 85% or above after 1000 continuous work hours.

Heat resistant <180 to 200°C or below> fiber units (limited diffuse reflective type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Limited diffuse reflective type	180°C	Glass substrate detection, Free cut 	7-EL 0 to 35 6-UL 0 to 28 5-PL 0 to 25 4-LG 0 to 22 3-ST 0 to 20 2-FS 0 to 9 1-HS 3 to 4	Long 0 to 20 Std 0 to 10 Fast 0 to 8	10	-60 to +180°C	R25	NF-DH08

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.
Note: Light intensity retention rate of 85% or above after 1000 continuous work hours.

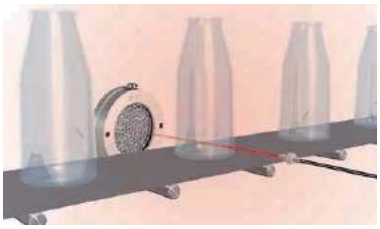
Heat resistant reflector

Possible to detect as retro-reflective type if the SW50 heat resistant reflector is used for the heat resistant diffuse type fiber. Demonstrates its strength in transparent object detection under high temperatures.

Reflector heat resistant to 300°C

SW50
ø80 × 20 mm (ø50 mm reflective surface)

Glass bottle detection under high temperatures

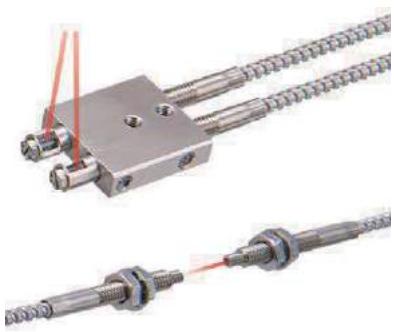


16 Heat resistant (250 to 350°C)

Related products

Fiber units
Heat resistant
(130°C or below)
P.77

Fiber units
Heat resistant
(180 to 200°C)
P.80



Fiber units for ambient temperatures of 250 to 350°C

- **Limited diffuse reflective types are optimal for glass substrate alignment**
- **This heat resistant series offers the most models in the industry at 30 models** (according to in-house survey)

Through-beam type/Diffuse type/Limited diffuse reflective type

Two through-beam types, three diffuse types, and three limited diffuse reflective types are available.
We offer a total of 8 variations to suit any high-temperature application.

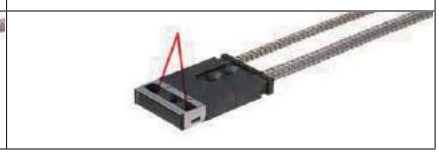
Through-beam type

Standard	60 mm sleeve
NF-TH08	NF-TH09
	

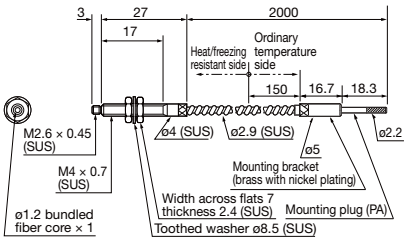
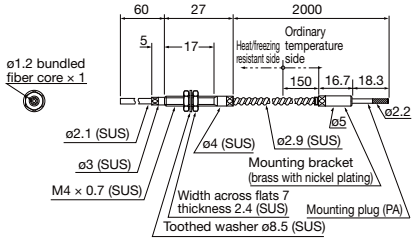
Diffuse type

Coaxial	60 mm sleeve	90 mm sleeve
NF-DH03	NF-DH04	NF-DH05
		

Limited diffuse reflective type

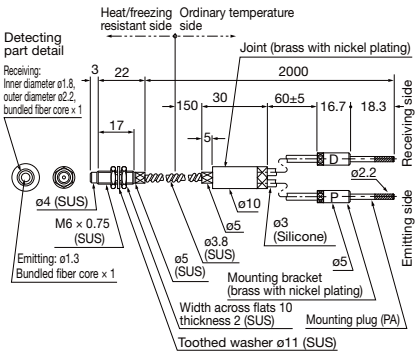
Glass substrate detection	Glass substrate alignment	
NF-DH06	NF-DH10	NF-DH11
		

Heat resistant <250 to 350°C or below> fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	350°C	Lens attachable (P.98) 	7-EL 1,440 6-UL 1,350 5-PL 1,240 4-LG 1,080 3-ST 710 2-FS 430 1-HS 130	Long 750 Std 450 Fast 220	300	-30 to +350°C or -60 to +200°C	R25	NF-TH08 Standard item
		ø2.1 sleeve: 60 mm long 	7-EL 1,350 6-UL 1,260 5-PL 1,120 4-LG 900 3-ST 630 2-FS 410 1-HS 120	Long 750 Std 450 Fast 220	300	-30 to +350°C or -60 to +200°C	Fiber R25 Sleeve R10	NF-TH09

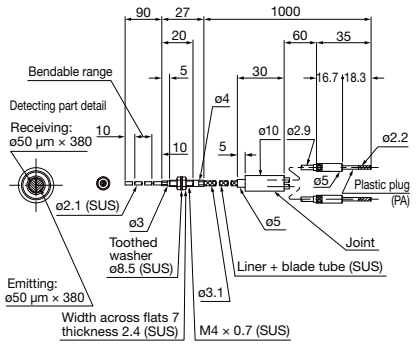
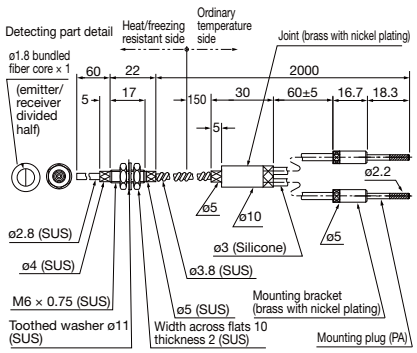
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Heat resistant <250 to 350°C or below> fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	350°C	Coaxial 	7-EL 940 6-UL 890 5-PL 770 4-LG 670 3-ST 440 2-FS 190 1-HS 50	Long 650 Std 250 Fast 80	150	-30 to +350°C or -60 to +200°C	R25	NF-DH03 Standard item

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Heat resistant <250 to 350°C or below> fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	350°C	ø2.1 sleeve: 90 mm long 	7-EL 1,110 6-UL 1,050 5-PL 910 4-LG 800 3-ST 520 2-FS 190 1-HS 50	Long 750 Std 250 Fast 80	200	-30 to +350°C or -60 to +200°C	Fiber R25 Sleeve R10	NF-DH05
		ø2.8 sleeve: 60 mm long 	7-EL 950 6-UL 900 5-PL 780 4-LG 680 3-ST 450 2-FS 200 1-HS 59	Long 650 Std 250 Fast 80	300	-30 to +350°C or -60 to +200°C	Fiber R25 Sleeve R10	NF-DH04

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

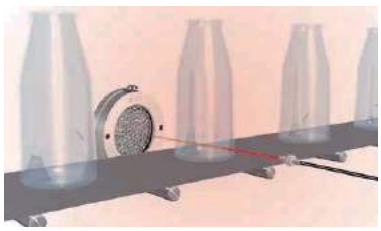
Heat resistant reflector

Possible to detect as retro-reflective type if the SW50 heat resistant reflector is used for the heat resistant diffuse type fiber. Demonstrates its strength in transparent object detection under high temperatures.

Reflector heat resistant to 300°C

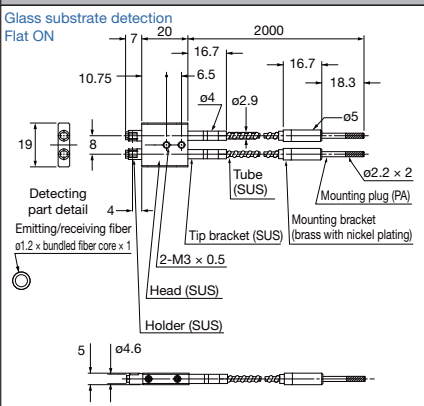
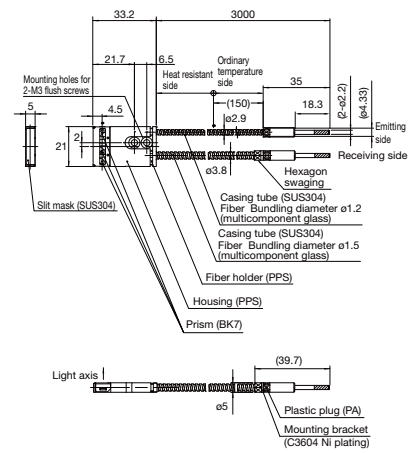
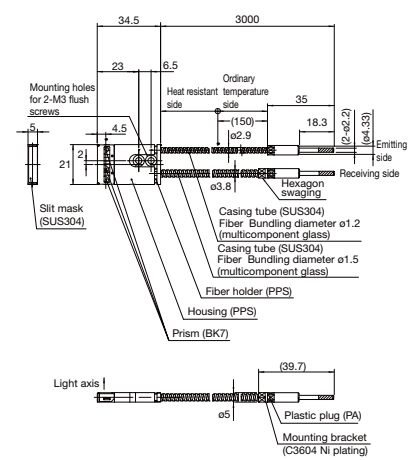
SW50
ø80 × 20 mm (ø50 mm reflective surface)

Glass bottle detection under high temperatures



Fiber units Heat resistant (250 to 350°C)

Heat resistant <250 to 350°C or below> fiber units (limited diffuse reflective type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Limited diffuse reflective type	300°C	Glass substrate detection Flat ON 	7-EL 0 to 40 6-UL 0 to 34 5-PL 0 to 22 4-LG 0 to 18 3-ST 0 to 17 2-FS 0 to 9 1-HS 0 to 4	Long 0 to 15 Std 0 to 10 Fast 0 to 8	6	-30 to +300°C or -60 to +200°C	R25	NF-DH06
	250°C	Glass substrate alignment Flat ON 	7-EL 2 to 28 6-UL 2 to 24 5-PL 2 to 23 4-LG 3 to 23 3-ST 3 to 20 2-FS 3 to 18 1-HS 4 to 11	Long 4 to 20 Std 4 to 20 Fast 4 to 15	4 to 17	-20 to +250°C (Ordinary temperature side: -20 to +70°C)	R25	NF-DH10
	250°C	Glass substrate alignment Flat ON 	7-EL 2 to 45 6-UL 3 to 40 5-PL 3 to 39 4-LG 3 to 38 3-ST 4 to 35 2-FS 6 to 28 1-HS 8 to 19	Long 6 to 38 Std 7 to 30 Fast 8 to 25	8 to 25	-20 to +250°C (Ordinary temperature side: -20 to +70°C)	R25	NF-DH11

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

17 Chemical resistant

Related products

Fiber amplifier
D3RF
P.110

Fiber amplifier
BRF
P.130

Fiber portion is protected from chemicals and oils using a fluoroplastic coating.

Select an optimal model from among 7 through-beam types and 1 diffuse type

For use with various chemicals

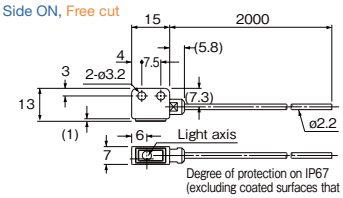
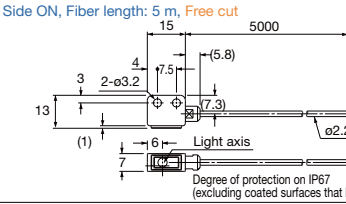
The detecting part and fiber portion are protected from chemicals by using a fluoroplastic coating. Selection of an optimal model is possible from among 7 through-beam types and 1 diffuse type.

Chemical resistance

Chemical resistance		
Chemical type	Typical examples	Resistance
Inorganic acids	Hydrochloric acid, sulfuric acid, nitric acid, phosphoric acid, chromic acid	✓
Organic acids	Acetic acid, oxalic acid, formic acid, oleic acid, phthalic acid	✓
Alkali	Caustic soda, caustic potash, ammonia water, calcium hydroxide	✓
Salts	Sodium chloride, magnesium sulfate, lead nitrate, potassium chlorate	✓
Alcohols	Ethanol, butyl alcohol, glycerol	✓
Glycols		✓
Ketones	Acetone, methyl ethyl ketone	✓
Esters	Butyl acetate, dibutyl, phthalate	✓
Ethers	Ethyl ether, dibutyl ether	✓
Amines	Dibutyl amine, triethanolamine	✓
Aliphatics	Propane, butadiene, cyclohexane, kerosene	✓
Aromatics	Benzene, toluene, xylene, aniline	✓
Organic halogen compounds (chlorine)	Carbon tetrachloride, trichlene, ethylene sulfide	✓

Oil resistance	
Resistance for fire resistant fluids	Resistance
Fire resistant fluid mineral oil	✓
Water-glycolic phosphoric acid	✓
Ester chlorinated hydrocarbons	✓
Diester oil	✓
Silicone ester oil	✓
Low aniline point oils	✓
High aniline point oils	✓

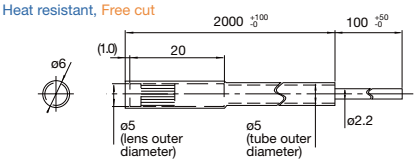
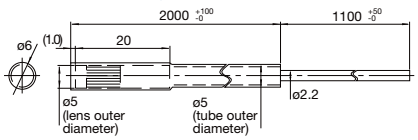
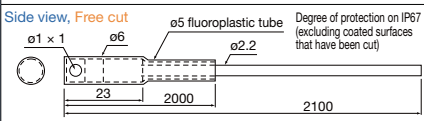
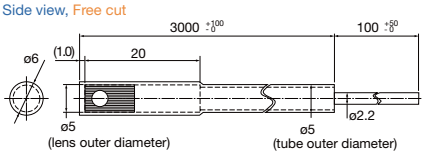
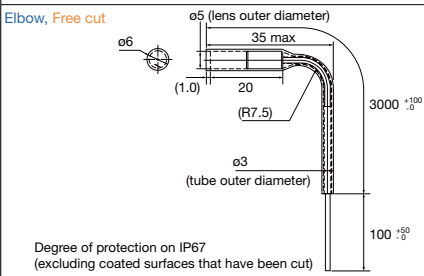
Chemical resistant fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF	Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	Square	Side ON, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,150	3-ST 2,000 2-FS 2,000 1-HS 760	Long 3,500 Std 2,500 Fast 1,300	2,000	0 to +60°C	R25	NF-TY05
		Side ON, Fiber length: 5 m, Free cut 	7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,200	3-ST 2,000 2-FS 1,600 1-HS 550	Long 3,000 Std 2,000 Fast 1,000	1,500	0 to +60°C	R25	NF-TY05-5

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

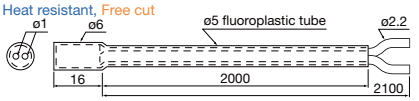
Fiber units Chemical resistant

Chemical resistant fiber units (through-beam type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF		Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	ø6	Heat resistant, Free cut  Degree of protection on IP67 (excluding coated surfaces that have been cut)	7-EL 4,000 6-UL 4,000 5-PL 4,000 4-LG 3,000	3-ST 2,800 2-FS 2,000 1-HS 700	Long 3,500 Std 2,500 Fast 1,200	2,000	-40 to +105°C	R60	NF-TY01
		Heat resistant, Fiber length: 3 m, Free cut  Degree of protection on IP67 (excluding coated surfaces that have been cut)	7-EL 4,000 6-UL 4,000 5-PL 4,000 4-LG 3,500	3-ST 3,000 2-FS 1,700 1-HS 500	Long 2,200 Std 1,300 Fast 550	650	-40 to +105°C	R60	NF-TY01-3
		Side view, Free cut 	7-EL 4,000 6-UL 3,500 5-PL 2,800 4-LG 2,000	3-ST 1,500 2-FS 700 1-HS 200	Long 1,500 Std 800 Fast 400	500	-40 to +70°C	R60	NF-TY02
		Side view, Free cut  Degree of protection on IP67 (excluding coated surfaces that have been cut)	7-EL 4,000 6-UL 3,500 5-PL 3,000 4-LG 2,000	3-ST 1,500 2-FS 700 1-HS 200	Long 1,500 Std 800 Fast 400	480	-40 to +70°C	Fiber R25 Tube R60	NF-TY02-TF3
		Elbow, Free cut  Degree of protection on IP67 (excluding coated surfaces that have been cut)	7-EL 4,000 6-UL 4,000 5-PL 3,500 4-LG 3,000 3-ST 2,200 2-FS 1,000 1-HS 300		Long 3,000 Std 1,700 Fast 800	900	-55 to +70°C	Fiber R20 Tube R20	NF-TY03-TF3

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Chemical resistant fiber units (diffuse type)

Type		Features/dimensions (mm)	Sensing distance (mm) D3RF		Sensing distance (mm) D2RF	Sensing distance (mm) BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	ø6	Heat resistant, Free cut  Degree of protection on IP67 (excluding coated surfaces that have been cut)	7-EL 440 6-UL 280 5-PL 250 4-LG 225	3-ST 160 2-FS 145 1-HS 85	Long 100 Std 70 Fast 50	45	-40 to +100°C	R60	NF-DY01 Only in industry

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

18 Vacuum resistant

Related products

Fiber amplifier
D3RF
P.110

Fiber amplifier
BRF
P.130

Can be used in vacuums and high temperatures up to 300°C

- **Vacuum resistant through-beam types, diffuse types, and limited diffuse reflective types are available**
- **Long range lenses and side view lenses for through-beam types are also available**

Through-beam type/Diffuse type/Limited diffuse reflective type

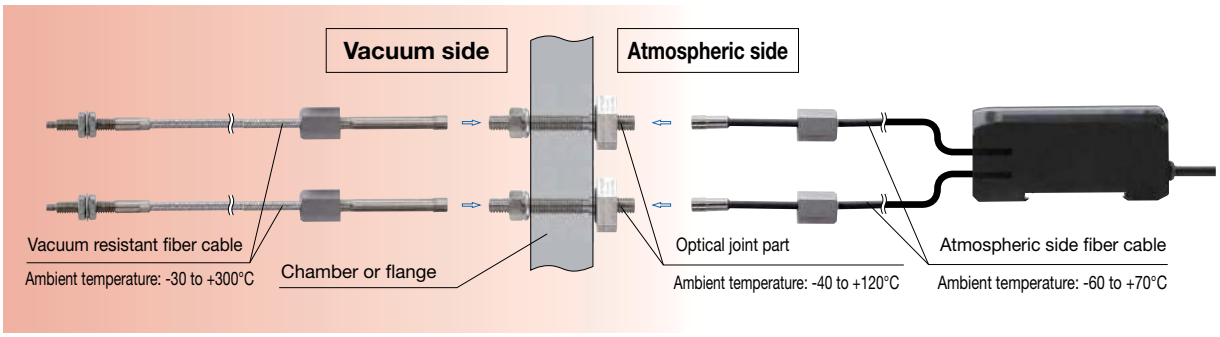
Three types of vacuum resistant detection methods are available including through-beam type, Diffuse type, and limited diffuse reflective type. Please select based on the mounting style and application. Also, vacuum resistant long range lenses and side view lenses for through-beam types are also available.

NF-TN01 (through-beam type)

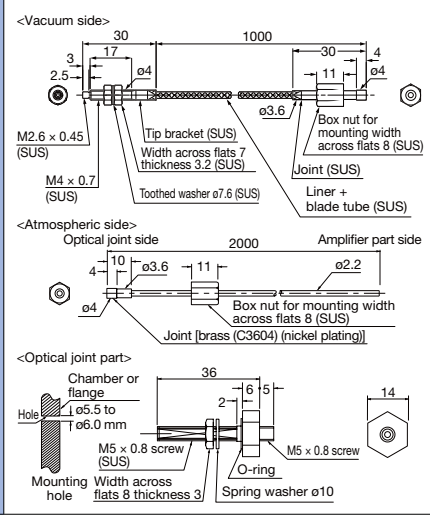
NF-DN01 (diffuse type)

NF-DN02 (limited diffuse reflective type)

Product composition



Vacuum resistant fiber cable (through-beam type)

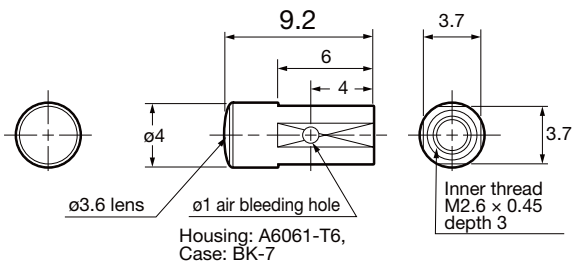
Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	D2RF	BRF	Ambient temperature	Bending radius (mm)	Model
Through-beam type	Lens attachable, Free cut (atmospheric side) 	7-EL 790 6-UL 740 5-PL 640 4-LG 560 3-ST 360 2-FS 210 1-HS 70	Long 450 Std 280 Fast 130	150	-30 to +300°C	Vacuum side R18 Atmospheric side R25	NF-TN01 Standard item

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Lens for vacuum resistant fiber cable

Long range lens (for NF-TN01)

NF-TA06 (2 pieces)

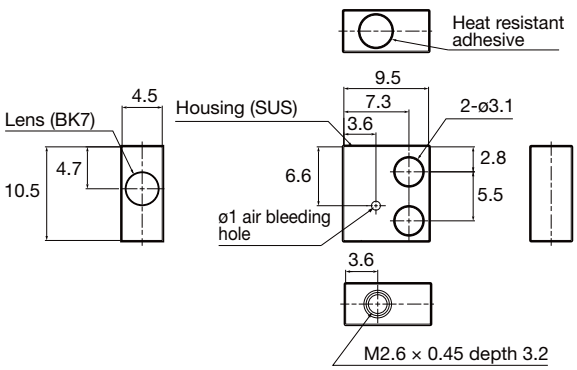


Sensing distance (mm) D3RF	D2RF	BRF
7-EL 3,500 6-UL 3,200 5-PL 2,800 4-LG 2,500 3-ST 1,200 2-FS 950 1-HS 300	Long 3,500 Std 1,500 Fast 900	1,000

Ambient temperature: -60 to +350°C

Side view lens (for NF-TN01)

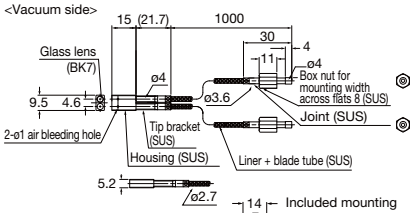
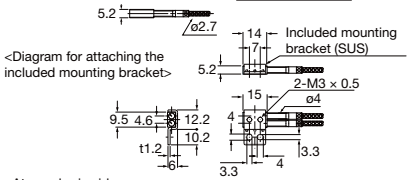
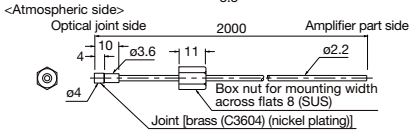
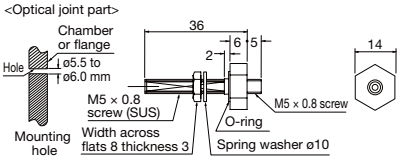
NF-TA07 (2 pieces)



Sensing distance (mm) D3RF	D2RF	BRF
7-EL 3,500 6-UL 3,200 5-PL 2,800 4-LG 2,500 3-ST 2,300 2-FS 1,000 1-HS 350	Long 3,500 Std 1,700 Fast 700	1,000

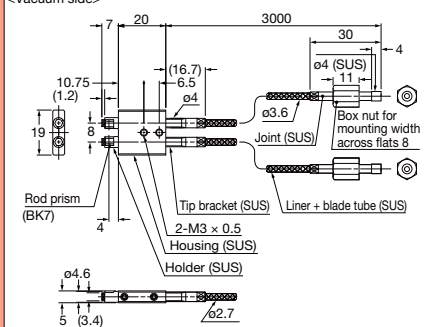
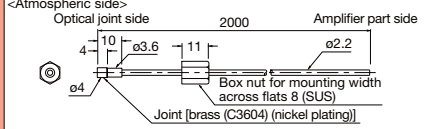
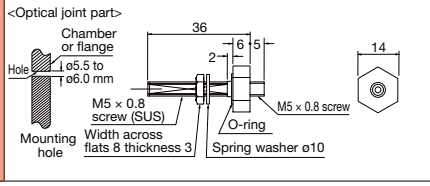
Ambient temperature: -30 to +300°C

Vacuum resistant fiber cable (diffuse type)

Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	D2RF	BRF	Ambient temperature	Bending radius (mm)	Model
Diffuse type	Free cut (atmospheric side) <Vacuum side>  <Diagram for attaching the included mounting bracket>  <Atmospheric side>  <Optical joint part>  	7-EL 470 6-UL 450 5-PL 390 4-LG 340 3-ST 220 2-FS 135 1-HS 41	Long 5 to 250 Std 5 to 200 Fast 10 to 70	100	-30 to +300°C	Vacuum side R18 Atmospheric side R25	NF-DN01

●The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Vacuum resistant fiber cable (limited diffuse reflective type)

Type	Features/dimensions (mm)	Sensing distance (mm) D3RF	D2RF	BRF	Ambient temperature	Bending radius (mm)	Model
Limited diffuse reflective type	Glass substrate detection, Free cut (atmospheric side) <Vacuum side>  <Atmospheric side>  <Optical joint part>  	7-EL 0 to 22 6-UL 0 to 12 5-PL 0 to 11 4-LG 0 to 9 3-ST 0 to 7 2-FS 3 to 4 1-HS Unusable	Long 0 to 8 Std 2.5 to 5 Fast Unusable	3	-30 to +300°C	Vacuum side R18 Atmospheric side R25	NF-DN02

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

19 Liquid level/liquid leakage/water detection

Related products
Fiber amplifier
D3RF
D3IF
P.110
Fiber amplifier
BRF
BIF
P.130

Fiber units for detecting liquid

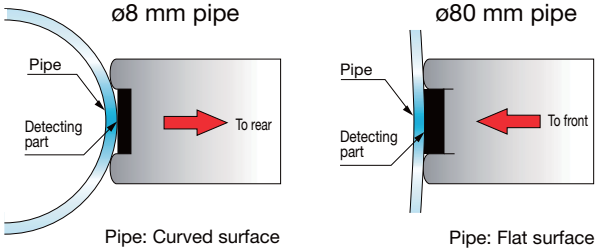
- **Select based on applications for liquid level, liquid leakage, and water detection**
- **Array type NF-DF07 that can be mounted on ø8 to ø80 mm pipes**
- **A liquid accumulation prevention structure is used for all liquid level contact type models.**

Liquid level detection 1: Pipe-mounted type

Array type mountable on ø8 to ø80 mm pipes and tolerant to air bubbles: NF-DF07

In order to detect the liquid level without being affected by bubbles or water droplets, the number of cores and the array length of the array type NF-DF07 have been optimized to 18 × 8.75 mm. As a result of an optical design that can perform detections without malfunctioning, stable liquid level detection becomes possible.

A detection surface slide structure has been adopted that can bring the detection surface into close contact regardless of the pipe diameter. It can be installed on large diameter pipes up to a maximum of ø80 mm.



Liquid level detection 2: Liquid level contact type

A liquid accumulation prevention structure is used for all liquid level contact type models.

Multi step tip design prevents accumulation of liquid at the tip of the sensor head. This design is useful for preventing malfunctions.


Without liquid accumulation prevention structure

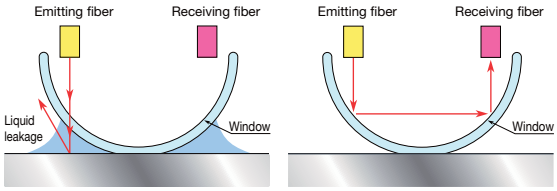

With liquid accumulation prevention structure

Liquid leakage detection

Detects leakage (liquid leakage) to liquid leakage pan: NF-DW02

Detection theory

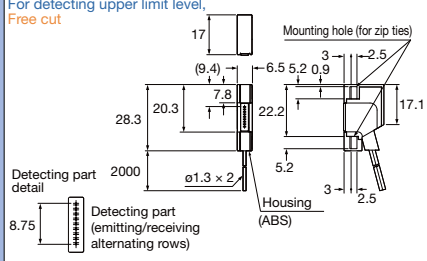
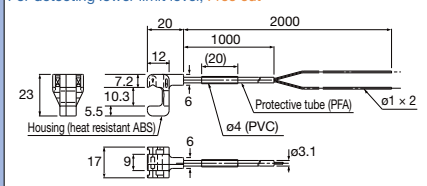
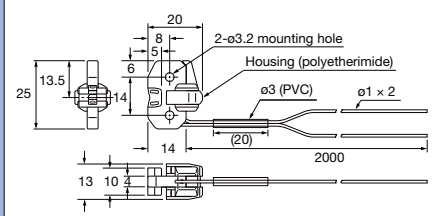
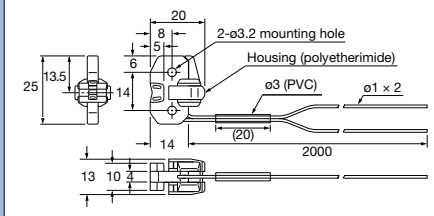
When there is liquid leakage, light from the emitting fiber will be diffused in the liquid leakage causing light to not be detected.



Light from the emitting fiber is reflected by the liquid leakage and not detected by the receiving fiber.

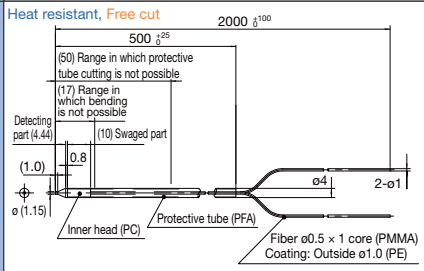
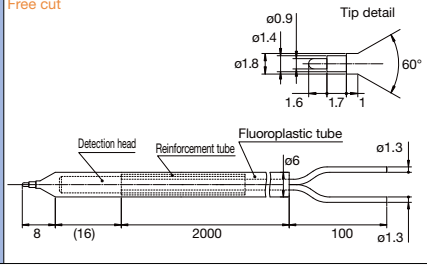
Light from the emitting fiber is reflected by the window and detected by the receiving fiber.

Liquid level detection fiber

Type		Dimensions (unit: mm)	Details	Ambient temperature	Bending radius (mm)	Model
Liquid level detection	Pipe-mounted	For detecting upper limit level, Free cut 	For transparent pipes with outer diameter of ø8 mm or more (When used with included zip ties: ø8 to 80 mm) An array type tolerant to air bubbles	-40 to +70°C	R10	NF-DF07
		For detecting lower limit level, Free cut 	For PFA pipes with outer diameter of ø3 to 10 mm and thickness of 0.3 to 1 mm, or pipes with same level of transparency	-20 to +60°C	Protective tube R20 Fiber R4	NF-TF01
		For detecting upper limit level, Heat resistant, Free cut 	For PFA pipes with outer diameter of ø6 to 26 mm and thickness of 1 mm, or pipes with same level of transparency With mounting position adjusting lever	-40 to +100°C	R10	NF-DF05
		For detecting upper limit level, Heat resistant, Free cut 	For transparent pipes with outer diameter of ø6 to 26 mm and thickness of 1 to 3 mm With mounting position adjusting lever	-40 to +100°C	R10	NF-DF04

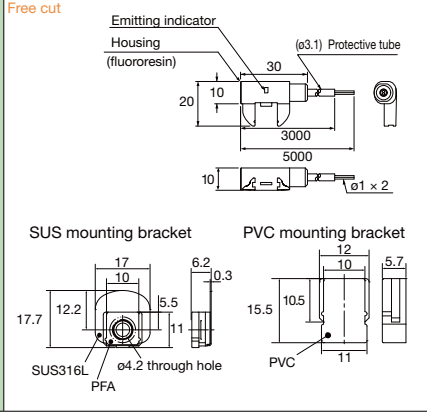
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Liquid level detection fiber

Type		Dimensions (unit: mm)	Details	Ambient temperature	Bending radius (mm)	Model
Liquid level detection (Liquid level contact type)	ø4	Heat resistant, Free cut 	Liquid level contact type, liquid accumulation prevention structure Protective tube: Fluoroplastic 500 mm long (can be cut) Heat resistant to +105°C	-40 to +105°C	Protective tube R20 Fiber R10	NF-DF08
	ø6	Free cut 	Liquid level contact type, liquid accumulation prevention structure Protective tube: Fluoroplastic 2 m long (can be cut)	-40 to +70°C	R60	NF-DF03 Standard item

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Liquid leakage detection fiber

Type		Dimensions (unit: mm)	Details	Ambient temperature	Bending radius (mm)	Model
Liquid leakage detection	Square	Free cut 	SEMI S2 supported Through use of capillary phenomenon can also detect minor liquid leakage and viscous liquid Included mounting brackets can be purchased separately. NF-DA52 (SUS mounting bracket) NF-DA53 (PVC mounting bracket)	-20 to +50°C	Protective tube R20 Fiber R4	NF-DW02

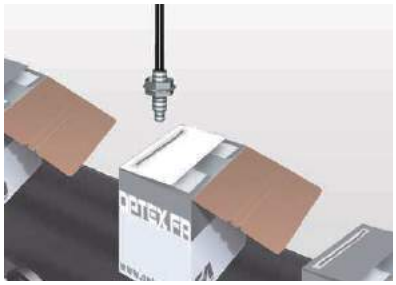
●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Water detection fiber

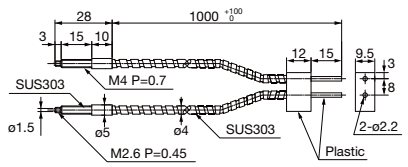
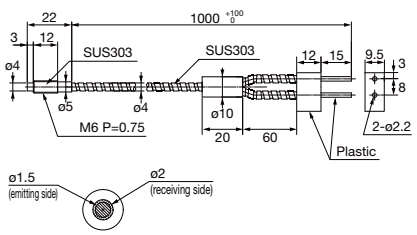
Fiber unit specialized for D3IF and BIF fiber amplifiers for detecting water. The detection of contents (through-beam type) or adhesives inside transparent bottles, as well as detection of colorless water or chemicals on the production is now possible.

Detection of chemicals in transparent bottles

Detection of adhesives



Water detection fiber units (through-beam type/diffuse type)

Type		Dimensions (unit: mm)	Sensing distance (mm)		Ambient temperature	Bending radius (mm)	Model
			D3IF-TN	BIF			
Through-beam type	M4	Heat resistant 	7-EL 650 6-UL 350 5-PL 300 4-LG 250 3-ST 230 2-FS 150 1-HS 60	100	-40 to +200°C	R25	NF-TW01
Diffuse type	M6	Heat resistant 	7-EL 280 6-UL 125 5-PL 110 4-LG 100 3-ST 85 2-FS 45 1-HS 20	30	-40 to +200°C	R25	NF-DW01

- Use D3IF-TN or BIF-WN/-CWN fiber amplifiers for water detection
- The sensing distances for the diffuse type fiber units are values on 500 × 500 mm white paper.
- Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

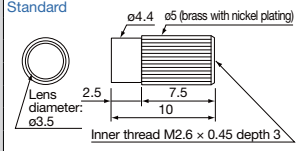
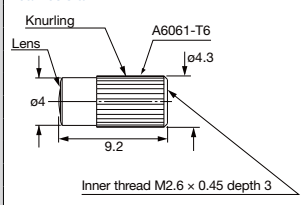
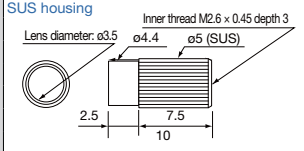
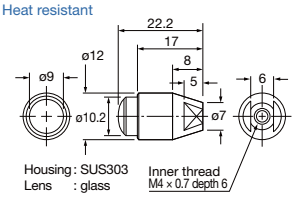
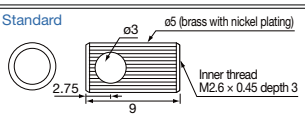
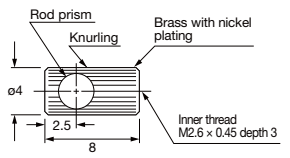
20 Lens for through-beam type

Related products
Lens for small object detection
NF-DA P.64
Vacuum resistant Lens for fiber
NF-TA P.92

Lenses for through-beam type fiber units selectable from 6 models

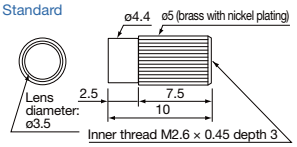
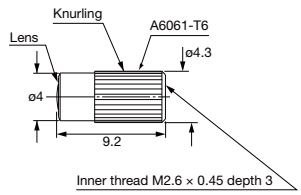
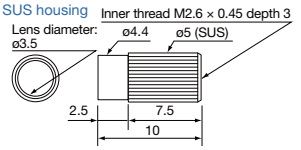
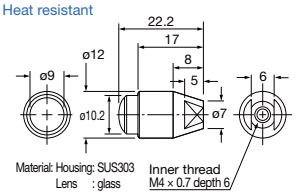
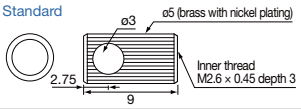
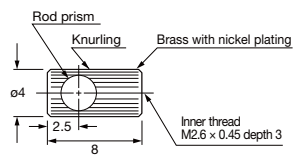
- Long distance lens for extending sensing distance
- Side-view lens for space saving

Lens for through-beam type fiber units (fiber amplifier: D3RF)

Type	Dimensions (mm)	Applicable fiber units	D3RF sensing distance (mm) 7-EL	6-UL	5-PL	4-LG	3-ST	2-FS	1-HS	Ambient temperature	Model
Long range lens	Standard 	NF-TB01	4,000	4,000	4,000	4,000	4,000	2,500	800	-40 to +100°C	NF-TA01 (2 pieces)
		NF-TB02	4,000	4,000	4,000	4,000	4,000	4,000	1,800		
		NF-TB06	4,000	4,000	4,000	4,000	4,000	4,000	1,500		
		NF-TJ01	2,000	2,000	2,000	2,000	2,000	2,000	750		
		NF-TR01	4,000	4,000	4,000	4,000	4,000	4,000	1,800		
		NF-TK77	4,000	4,000	4,000	4,000	4,000	4,000	2,000		
		NF-TH01	4,000	4,000	3,200	2,700	2,500	1,400	500		
	Heat resistant 	NF-TB01	4,000	4,000	4,000	4,000	4,000	2,000	360	-40 to +350°C	NF-TA03 (2 pieces) Low cost
		NF-TB02	4,000	4,000	4,000	4,000	4,000	4,000	1,200		
		NF-TB06	4,000	4,000	4,000	4,000	4,000	4,000	1,200		
		NF-TJ01	2,000	2,000	2,000	2,000	2,000	2,000	600		
		NF-TR01	4,000	4,000	4,000	4,000	4,000	2,000	800		
		NF-TK77	4,000	4,000	4,000	4,000	4,000	2,000	600		
		NF-TH01	4,000	4,000	4,000	4,000	4,000	2,000	1,200		
		NF-TH08	4,000	4,000	4,000	4,000	4,000	2,000	800		
		NF-TH10	2,000	2,000	2,000	2,000	2,000	2,000	750		
		NF-TH11	2,000	2,000	2,000	2,000	2,000	2,000	1,000		
	SUS housing 	NF-TB01	4,000	4,000	4,000	4,000	4,000	2,500	800	-40 to +100°C	NF-TA01S (2 pieces)
		NF-TB02	4,000	4,000	4,000	4,000	4,000	4,000	1,800		
		NF-TB06	4,000	4,000	4,000	4,000	4,000	4,000	1,500		
		NF-TJ01	2,000	2,000	2,000	2,000	2,000	2,000	650		
		NF-TR01	4,000	4,000	4,000	4,000	4,000	4,000	1,800		
		NF-TK77	4,000	4,000	4,000	4,000	4,000	4,000	2,000		
		NF-TH01	4,000	4,000	3,200	2,700	2,500	1,400	500		
Ultra-long range lens	Heat resistant 	NF-TB01	4,000	4,000	4,000	4,000	4,000	4,000	4,000	-60 to +350°C	NF-TA04 (2 pieces)
		NF-TB02	4,000	4,000	4,000	4,000	4,000	4,000	4,000		
		NF-TB06	4,000	4,000	4,000	4,000	4,000	4,000	4,000		
		NF-TJ01	2,000	2,000	2,000	2,000	2,000	2,000	2,000		
		NF-TR01	4,000	4,000	4,000	4,000	4,000	4,000	4,000		
		NF-TK77	4,000	4,000	4,000	4,000	4,000	4,000	4,000		
		NF-TH01	4,000	4,000	4,000	4,000	4,000	4,000	4,000		
		NF-TH08	4,000	4,000	4,000	4,000	4,000	4,000	4,000		
		NF-TH10	2,000	2,000	2,000	2,000	2,000	2,000	2,000		
		NF-TH11	2,000	2,000	2,000	2,000	2,000	2,000	2,000		
Side-view lens	Standard 	NF-TB01	3,600	2,500	2,000	1,600	1,200	650	200	-40 to +70°C	NF-TA02 (2 pieces)
		NF-TB02	4,000	3,500	3,000	2,400	1,800	1,000	300		
		NF-TJ01	2,000	1,900	1,600	1,500	950	600	200		
		NF-TR01	4,000	3,300	2,400	2,000	1,500	900	200		
		NF-TK77	4,000	3,500	3,000	2,400	1,800	950	300		
	Heat resistant 	NF-TB01	4,000	2,400	2,300	2,000	1,200	800	250	-60 to +300°C	NF-TA05 (2 pieces) Low cost
		NF-TB02	4,000	2,400	2,300	2,000	1,200	800	250		
		NF-TJ01	2,000	1,900	1,700	1,500	950	600	200		
		NF-TR01	4,000	1,700	1,600	1,300	850	550	160		
		NF-TK77	4,000	1,900	1,700	1,500	950	600	200		
		NF-TH01	4,000	1,500	1,300	1,200	800	450	160		
		NF-TH08	4,000	1,600	1,500	1,200	800	550	170		
		NF-TH10	2,000	1,100	1,000	850	600	300	100		
		NF-TH11	4,000	1,400	1,200	1,100	700	400	150		

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Lens for through-beam type fiber units (fiber amplifier: D2RF, BRF)

Type	Dimensions (mm)	Applicable fiber units	Sensing distance (mm)				Ambient temperature	Model
			D2RF			BRF		
			Long	Std	Fast			
Long range lens	Standard 	NF-TB01	3,500	3,500	1,500	3,000	-40 to +100°C	NF-TA01 (2 pieces)
		NF-TB02	3,500	3,500	1,500	3,500		
		NF-TB06	3,500	3,500	3,500	3,500		
		NF-TJ01	1,500	1,500	1,500	1,500		
		NF-TR01	3,500	3,500	3,000	3,000		
		NF-TK77	3,500	3,500	3,000	3,500		
		NF-TH01	3,500	3,500	2,500	3,500		
	Heat resistant 	NF-TB01	3,500	3,500	600	3,500	-40 to +350°C	NF-TA03 (2 pieces) Low cost
		NF-TB02	3,500	3,500	3,000	3,500		
		NF-TB06	3,500	3,500	2,800	3,500		
		NF-TJ01	1,500	1,500	1,500	1,500		
		NF-TR01	3,500	3,500	2,000	2,500		
		NF-TK77	3,500	3,500	1,700	3,500		
		NF-TH01	3,500	3,500	2,700	3,500		
		NF-TH08	3,500	3,500	1,900	2,100		
		NF-TH10	1,500	1,500	1,500	1,500		
		NF-TH11	1,500	1,500	1,500	1,500		
	SUS housing 	NF-TB01	3,500	3,500	1,500	3,000	-40 to +100°C	NF-TA01S (2 pieces)
		NF-TB02	3,500	3,500	1,500	3,500		
		NF-TB06	3,500	3,500	3,500	3,500		
		NF-TJ01	1,500	1,500	1,500	1,500		
		NF-TR01	3,500	3,500	3,000	3,000		
		NF-TK77	3,500	3,500	3,000	3,500		
		NF-TH01	3,500	3,500	2,500	3,500		
Ultra-long range lens	Heat resistant 	NF-TB01	3,500	3,500	3,500	3,500	-60 to +350°C	NF-TA04 (2 pieces)
		NF-TB02	3,500	3,500	3,500	3,500		
		NF-TB06	3,500	3,500	3,500	3,500		
		NF-TJ01	1,500	1,500	1,500	1,500		
		NF-TR01	3,500	3,500	3,500	3,500		
		NF-TK77	3,500	3,500	3,500	3,500		
		NF-TH01	3,500	3,500	3,500	3,500		
		NF-TH08	3,500	3,500	3,500	3,500		
		NF-TH10	1,500	1,500	1,500	1,500		
		NF-TH11	1,500	1,500	1,500	1,500		
Side-view lens	Standard 	NF-TB01	1,500	800	400	600	-40 to +70°C	NF-TA02 (2 pieces)
		NF-TB02	1,500	1,000	450	600		
		NF-TJ01	1,500	800	450	500		
		NF-TR01	1,000	700	450	500		
		NF-TK77	1,500	800	450	600		
	Heat resistant 	NF-TB01	1,800	900	400	500	-60 to +300°C	NF-TA05 (2 pieces) Low cost
		NF-TB02	1,800	900	400	500		
		NF-TJ01	1,300	600	300	400		
		NF-TR01	1,100	600	250	350		
		NF-TK77	1,300	600	300	400		
		NF-TH01	1,000	500	250	400		
		NF-TH08	1,100	600	250	350		
		NF-TH10	700	300	180	300		
		NF-TH11	900	500	250	350		

●Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Correct use

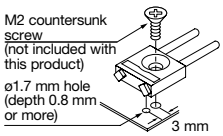
⚠ Do not use this product as a detection device for protecting the human body.

Mounting

Mounting fibers with positioning bosses

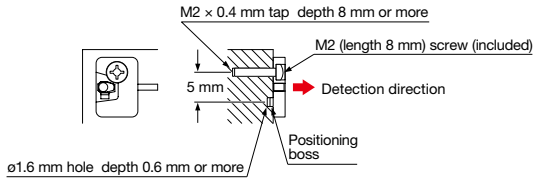
<NF-DC08>

· Use an M2 countersunk screw (not included with this product). The positioning boss insertion holes on the bottom surface need to be ø1.7 mm and at least 0.8 mm deep.

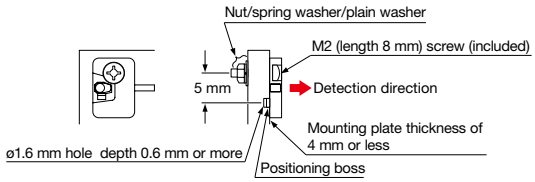


<NF-TE01/NF-DE01 (Flat ON type)>

If cutting a tap into the mounting surface



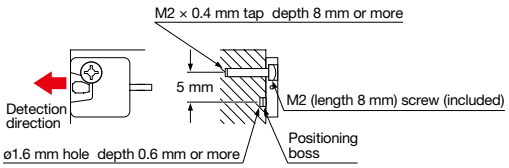
If using the included screw/nut



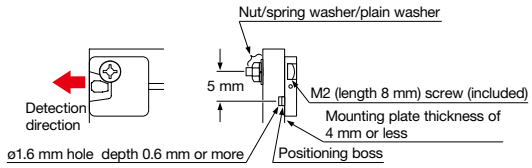
(Note 1): The above diagram shows NF-TE01. The same mounting method is used for NF-DE01.
(Note 2): Through-beam type fibers have the same shape. When mounting, pay attention to the positions of the mounting screw hole and positioning boss hole.

<NF-TE02/NF-DE02 (Head ON type)>

If cutting a tap into the mounting surface

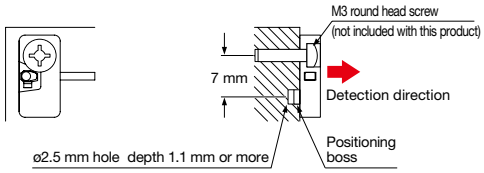


If using the included screw/nut



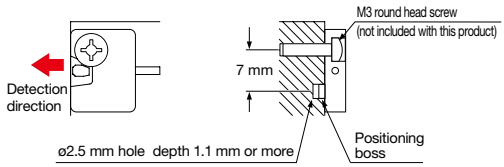
(Note 1): The above diagram shows NF-TE02. The same mounting method is used for NF-DE02.
(Note 2): Through-beam type fibers have the same shape. When mounting, pay attention to the positions of the mounting screw hole and positioning boss hole.

<NF-TE03/NF-DE03 (Flat ON type)>



(Note 1): The above diagram shows NF-TE03. The same mounting method is used for NF-DE03.
(Note 2): Through-beam type fibers have the same shape. When mounting, pay attention to the positions of the mounting screw hole and positioning boss hole.

<NF-TE04/NF-DE04 (Head ON type)>

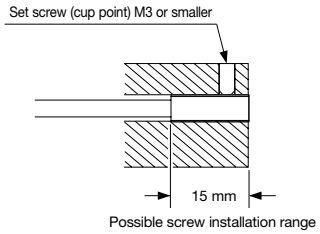


(Note 1): The above diagram shows NF-TE04. The same mounting method is used for NF-DE04.
(Note 2): Through-beam type fibers have the same shape. When mounting, pay attention to the positions of the mounting screw hole and positioning boss hole.

Mounting NF-DR09/-RR01

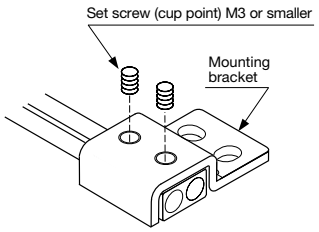
<If not using the included mounting bracket>

· Using a set screw (cup point of M3 or smaller), mount within 15 mm of head portion bracket edge.



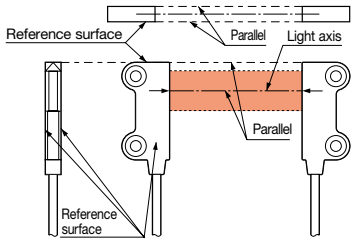
<If using the included mounting bracket>

· The head portion can be secured even without use of a set screw.
· If using a set screw, secure using a set screw with an M3 cup point.



Mounting through-beam type screen fibers (NF-TZ07/-TZ08/-TZ09/-TZ10)

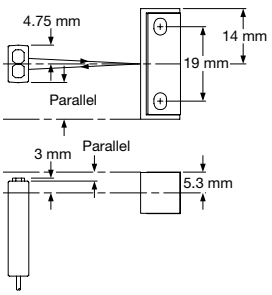
- Please be aware that because the aperture angle of this product is extremely narrow, light may not be taken in depending on installation conditions.
- When installing, determine a reference surface as shown in the diagram below while paying sufficient attention in regards to light axis shifting and slanting. Install so that emitting/receiving fibers are parallel.



Mounting NF-RB02

- Because the aperture angle of this product is extremely narrow, light may not be taken in depending on installation conditions.
- As shown in the diagram below, install so that the centers of the fiber head and reflector are aligned. Pay attention for light axis shifting and slanting.

<Side ON type/NF-RB02>



<Notes regarding NF-RB02>

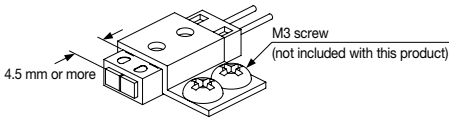
- If detecting items such as transparent objects, detection may be unstable if the objects are within range of 0 to 20 mm from the window.

If mounting using the included fiber mounting bracket

- If using the fiber mounting bracket to mount a Side ON type fiber, mount so that there is no interference with the detecting part.

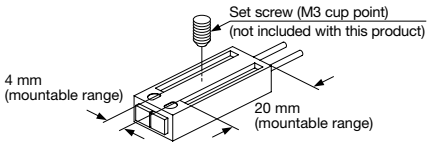
If mounting using the included fiber mounting bracket

- The fiber mounting bracket can be used to secure the fiber without use of an M3 set screw.



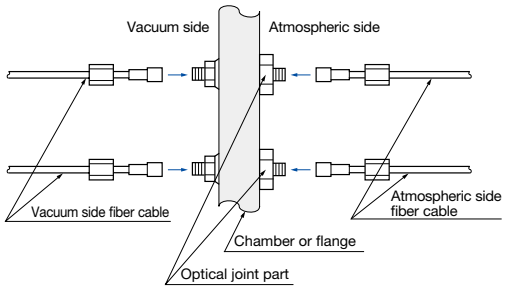
If mounting using an M3 set screw (cup point)

- Secure with an M3 set screw within the mounting range shown in the diagram below.



Mounting vacuum resistant fibers (NF-TN01/-DN01)

<Structure of vacuum resistant fibers>

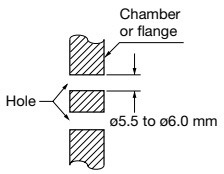


Leakage amount: 1.33 × 10^{-10} Pa·m^3/s [He] or less

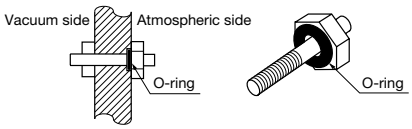
<Mounting>

1. Drill two holes into the vacuum chamber wall (chamber or flange).

(Note 1): Make the holes ø5.5 to ø6.0 mm.



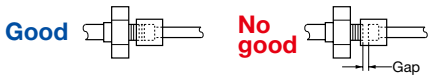
2. Mount the optical joint part to the vacuum chamber wall. When mounting to the vacuum chamber wall, the O-ring included with this product must be attached and the side to which it is attached must be the atmospheric side.



Correct use

3. Mount the atmospheric side fiber cable bracket to the atmospheric side of the optical joint part.

(Note 1): Tighten the nut securely.
If the nut is loose, there may be a gap, causing the sensing distance to drop.



4. Mount the vacuum side fiber nut to the vacuum side of the optical joint part.

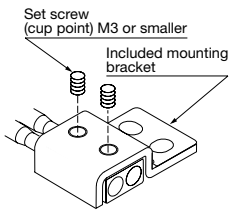
(Note 1): Tighten the nut securely.
If the nut is loose, there may be a gap, causing the sensing distance to drop.

5. Secure the tip of the vacuum side fiber.

<For NF-DN01>

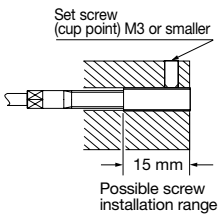
If using a mounting bracket

· Tighten using a set screw (cup point of M3 or smaller).
· By mounting the mounting bracket to the housing, it is possible to automatically secure the head without using a set screw.



If not using a mounting bracket

· As shown in the diagram to the right, using a set screw (cup point of M3 or smaller), secure within 15 mm of head portion edge.



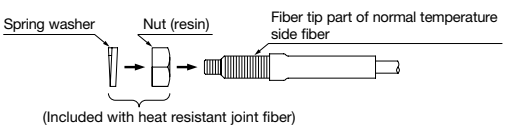
Mounting heat resistant joint fibers (NF-TH12/-TH13/-TH14/-TH15/-TH16)

<Connecting heat resistant joint fibers to Ordinary temperature side fibers>

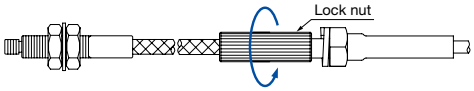
· Use the following procedure to connect normal temperature side fibers.

Procedure

1. Attach the plastic nut included with the heat resistant joint fiber and spring washer as far as possible on the fiber tip of the normal temperature side fiber.

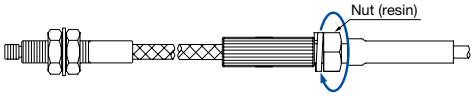


2. Mount the heat resistant joint fiber and normal temperature side fiber using a lock nut.



(Note 1): Do not secure the lock nut using the plastic nut and spring washer from Procedure 1.

3. To prevent the lock nut from becoming loose, secure using the plastic nut used for mounting in Procedure 1.

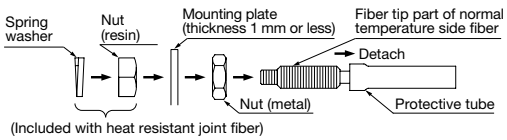


<If mounting connecting parts to the mounting plate>

· If securing parts that connect the heat resistant joint fiber and normal temperature side fiber to the mounting plate using the included metal nuts, use the procedure below.
· The mounting plate thickness needs to be 1 mm or thinner.

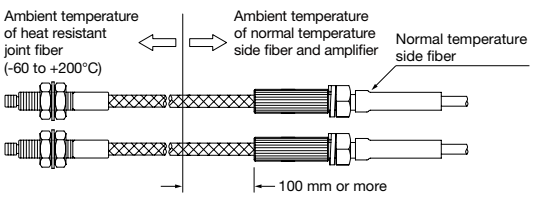
Procedure

1. Remove the protective tube from the normal temperature side fiber, attach the included metal nut from the tip of the fiber and move it to the fiber part.
2. Insert the tip of the fiber into the mounting plate.
3. Connect the heat resistant joint fiber to the normal temperature side fiber using the same procedure from <Connecting heat resistant joint fibers to normal temperature side fibers>
4. Tighten the metal nut mounted in Procedure 1 to the mounting plate.



<Operating Temperature>

· In order to protect normal temperature side fibers and amplifiers, keep the heat resistant joint fiber at least 100 mm from the boundary of the normal temperature side as shown in the diagram below.



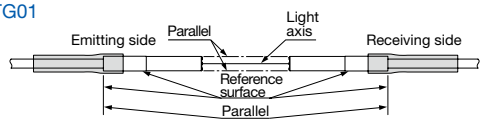
Mounting narrow view/wafer mapping fibers (NF-TG01/-TG02/-TG03/-TG04)

· Please be aware that because the aperture angle of this product is extremely narrow, light may not be taken in depending on installation conditions.

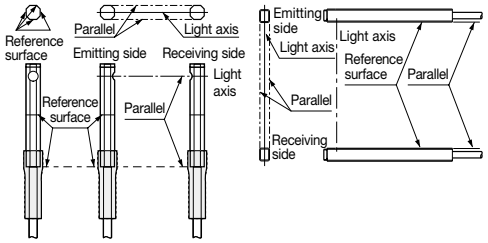
<Through-beam type>

· When installing, determine a reference surface as shown in the diagram below while paying sufficient attention in regards to light axis shifting and slanting. Install so that emitting/receiving fibers are parallel.

NF-TG01



NF-TG02/-TG03/-TG04

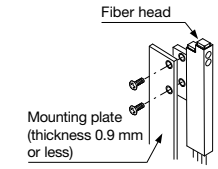


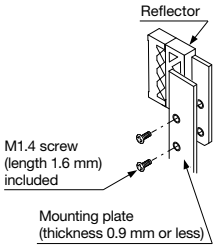
<Reflective type>

· Use the included 1.6 mm M1.4 screws to mount the fiber head and reflector to the mounting plate as shown in the diagram to the right. The mounting plate needs to have a thickness of 0.9 mm or thinner.

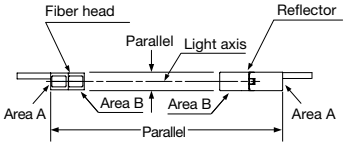
· Use a thread lock compound to tighten screws when mounting them in places with vibrations or shocks.

· Install the parts so that the mounting holes for the fiber head and reflector are parallel to one another and so that parts A, B and C are each parallel as shown in the diagrams below. Pay sufficient attention for light axis shifting and slanting.

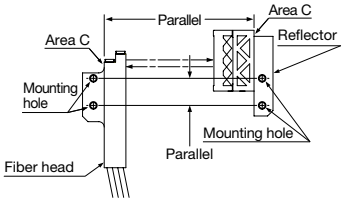




<Overhead view>

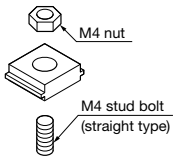


<Side view>

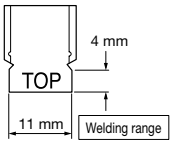


Mounting liquid leakage detection fibers (NF-DW02)

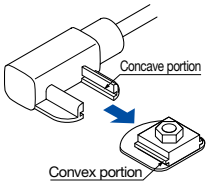
· If using an SUS mounting bracket, thread a welded M4 stud bolt through the mounting hole on the mounting bracket and attach an M4 nut (not included with this product).



· If using a PVC mounting bracket, glue it to the mounting surface so that the side with “TOP” is facing up. Also, weld it within the welding area as shown in the diagram to the right.

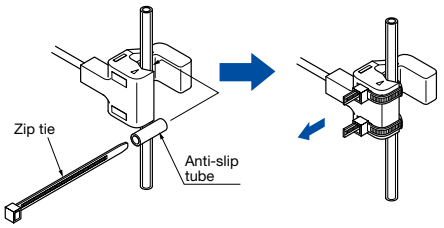


· Slide the convex portion of the mounting bracket attached to the steel case into the concave portion on the fiber until a “click” is heard.

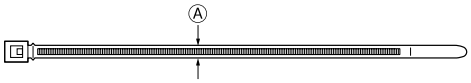


Mounting pipe-mounted liquid level detection fibers (NF-TF01)

· Use the included zip ties and anti-slip tubes for mounting as shown in the diagram below. Also, use two zip ties on the upper and lower part to attach it securely, and cut off the any part of the zip ties that stick out.



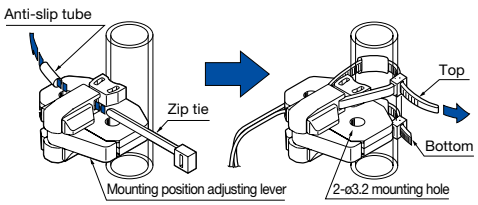
· When additional zip ties are necessary, please use zip ties with a thickness 2.5 mm or smaller as shown by Ⓐ in the diagram below.



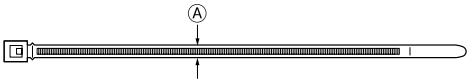
Correct use

Mounting pipe-mounted liquid level detection fibers (NF-DF04/-DF05)

· Use the included zip ties and anti-slip tubes for mounting as shown in the diagram below. When mounting the fiber, make sure that the mounting position adjusting lever is in the closed position as shown in the diagram below. Also, use two zip ties on the upper and lower part to attach it securely, and cut off the any part of the zip ties that stick out.



· When additional zip ties are necessary, please use zip ties with a thickness 2.5 mm or smaller as shown by Ⓐ in the diagram below.



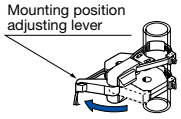
· M3 screws, plain washers and spring washers must be used when using the mounting holes.
(M3 screws, plain washers and spring washers are not included with this product.)

<Adjusting the positions of pipe-mounted liquid level detection fibers>

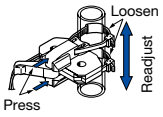
· The attachment position can be easily readjusted when using zip ties to mount this product.

Adjustment method

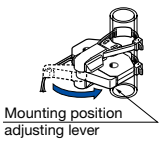
1. Pull the mounting position adjusting lever open in the direction of the arrow.



2. Push the moveable part in the direction of the arrow to loosen the zip tie, and readjust the mounting position.



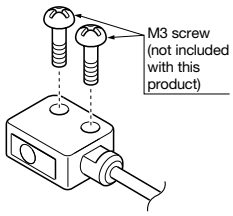
3. Close the mounting position adjusting lever in the direction of the arrow to return it to its original position.



(Note 1): Sensitivity settings must be reconfigured after readjusting the mounting position.
(Note 2): The positioning lever is for readjusting the mounting position on this device, not for tightening the zip ties. Tightening the zip ties while the mounting position adjusting lever is open and then closing the mounting position adjusting lever will damage the fibers.

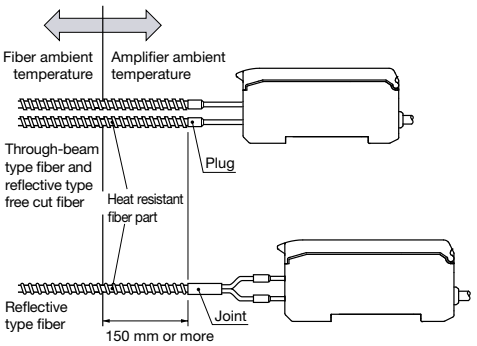
Mounting chemical resistant angled-head fibers (NF-TY05)

· Use M3 screws and tighten them to a torques of 0.3 N·m or less.



Notes regarding usage of heat resistant fibers

· In order to protect amplifiers, keep the heat resistant fiber part at least 150 mm from the boundary of the normal temperature side as shown in the diagram below.



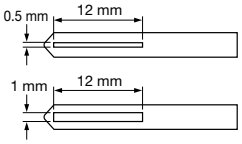
· Do not directly expose amplifiers to radiation heat or hot air.
· The tip bracket of the heat resistant fiber (up to 350°C) and stainless steel sheath may change color when used at high temperatures, but this does not affect their detection capability.

Notes about slit masks included with NF-TZ07/-TZ08/-TZ09/-TZ10

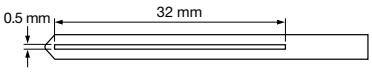
· There are two types of slit masks included with these products (one type for NF-TZ07/-TZ08).
These slit masks can be used when detecting small objects or for preventing light saturation when using the fibers at close range. However, applying slit masks shortens the sensing distance.
Because the slit masks are of an adhesive type, when applying them to the fibers, align the slit projection with the top of the fiber as shown in the diagram on the upper right.

■ Included slit masks

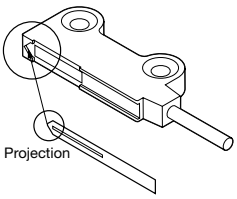
<NF-TZ09/-TZ10>



<NF-TZ07/-TZ08>



■ How to apply



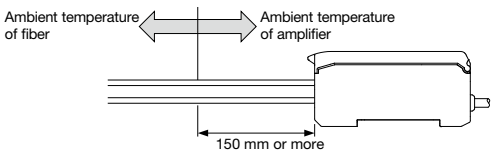
For NF-TY01(-□)/-TY02(-□)/-TY03-TF3/ -TY04/-TY05(-□)/-DY01

· Avoid use with the chemicals listed below. Chemicals that may erode PFA including fused alkali metals (sodium, potassium, lithium, etc.), fluorine gas (F_2), ClF_3, OF_2 (including gaseous form), etc. Also, chemicals with high permeability including high temperature hydrofluoric acid, nitric acid, chlorine, etc.

■ Notes regarding usage of NF-TY04/-DY01 (heat resistant type)

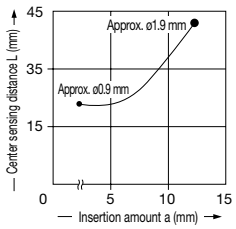
· In order to protect amplifiers, keep the heat resistant fiber part at least 150 mm from the boundary of the normal temperature side as shown in the diagram on the right.

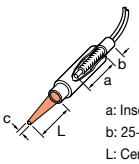
· Do not directly expose amplifiers to radiation heat or hot air.



Notes regarding usage of NF-DA06

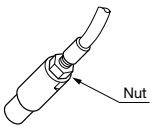
· Spot size and sensing distance can be adjusted depending on the fiber insertion amount. Be aware that if inserted too deeply, the fiber tip may become separated from the lens.



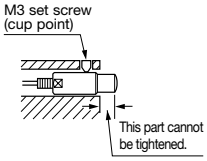


a: Insertion amount
b: 25–a
L: Center sensing distance
c: Spot size (ø)

· After setting the fiber and NF-DA06, secure using the nut included with the fiber to prevent moving caused by vibrations, etc.

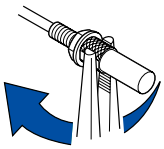


· If securing NF-DA06 using a set screw, use an M3 set screw (cup point).



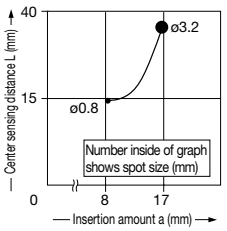
Notes regarding usage of NF-DA01/ -DA02/-DA03/-DA04/-DA05

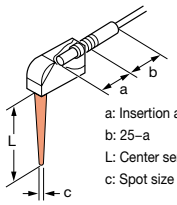
· If inserting fibers into NF-DA01/-DA02/-DA03/ -DA04/-DA05, inserting until the fiber comes to a stop.



Notes regarding usage of NF-DA07

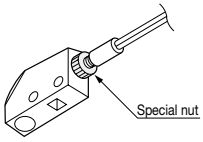
· Spot size and sensing distance can be adjusted depending on the fiber insertion amount.





a: Insertion amount
b: 25–a
L: Center sensing distance
c: Spot size (ø)

· After setting the fiber and NF-DA07, secure using the special nut included with NF-DA07 to prevent moving caused by vibrations, etc.



Correct use

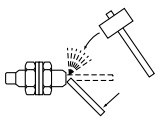
Notes regarding liquid leakage/liquid level detection/chemical resistant fibers

- Clean NF-DW02 by wiping away all liquids that have adhered to the head and mounting bracket using a soft cloth. Also pay sufficient attention to any condensation that has formed on the detecting part.
- If the tips of the NF-DW02/-TF01 fibers are too short, be aware that the correct amounts of light may not be taken in, resulting in unstable detection.
- When installing NF-DW02, be sure to use the special mounting bracket as a countermeasure to human error (improper installation, etc.) Failure to use the special bracket may result in unstable detection. However, if using a PVC mounting bracket on the black matte part of the housing, sensing of human error (improper installation) may not be possible. Please confirm before using.
- When cutting the protective tubes, take care not to damage the fiber sheath.
- Perform sensitivity settings for the NF-DW02 only after any liquids have been removed, the head has been mounted to the special mounting bracket, and the fiber has been attached to the amplifier. After performing the sensitivity adjustment, changing the fiber connection or installation will result in changes in the light detection volume, causing unstable detection. Changing fiber connections or installation during cleaning, etc., will have the same results. In such cases, perform amplifier sensitivity adjustments again.
- Amounts of light may decrease during extended periods of usage under conditions with high heat or humidity.
- Be aware that instability may occur in which a long period is necessary before detection stability can be regained if liquids incompatible with the materials of which the NF-DW02 head part is made (PFA) cause air bubbles to flood the detecting part. Always confirm the liquid to be detected before use.
- When cleaning the NF-DW02 confirm that the mounting bracket shows no scratching, contamination, or deformities.
- Water droplets adhered to the window will influence detection performance. Avoid use in areas where direct contact with water could be made. Also pay sufficient attention to any condensation that has formed on the pipe exterior.
- Be aware that the NF-TF01/-DF04/-DF05 may not be able detect some low-transparency liquids and highly-viscous liquids with stability.
- Incomplete pipe mounting of NF-TF01/-DF04/-DF05 may have a severe influenced on detection performance. Use the included anti-slip tubes and install the detecting part to the pipe so it does not move.
- For the NF-TF01 to detect in a stable manner, amplifier sensitivity adjustments must be performed when there is no liquid in the pipe and after the fiber has been installed. Also, sensitivity must be reconfigured if the fiber installation condition on the pipe is altered, or if its routing is changed.
- The NF-DF04/-DF05 cannot properly detect through opaque pipes.
- Attach the detecting part of the NF-DF04/-DF05 so it is secured to the pipe. Failure to do so will result in malfunction.
- Because the NF-DF04/-DF05 does not have a water resistant or chemical resistant structure, avoid areas where water or chemicals could come in contact.
- Because adherence of water droplets on the window of the NF-DF04/-DF05 will affect detection, pay sufficient attention to any condensation that has formed on the pipe exterior. Also be aware that water droplets formed on the inside of pipes, as well as air bubbles adhered on the inside will affect detection.

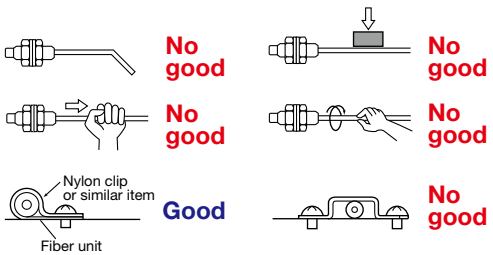
General notes

Regarding fiber units

1. Do not hit or damage the detection head surface.

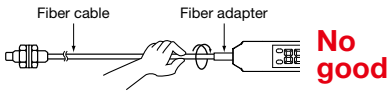


2. Do not bend or apply excessive force to the fiber.

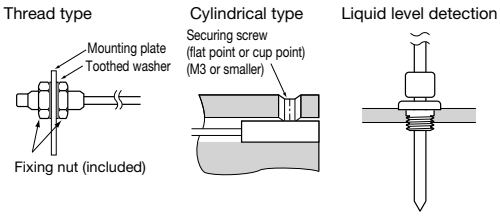


3. Do not apply excessive torque to the sensor head or use tools that do not match the nuts.

4. Do not twist in the gaps between the fiber cable and fiber adapter.



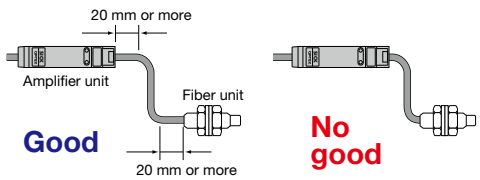
5. Depending on the bore shape of the sensor head, mount as shown in the diagrams below.



6. In the case of fibers that can be free cut, cut the tip with special fiber cutters before mounting to the fiber amplifier.

7. The fiber unit bending radius should be greater than the allowable bending radius. Excessive bending will shorted the sensing distance.

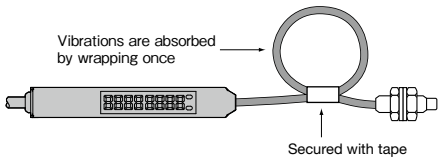
8. Allow for some wire to remain straight near the insertion and tip parts of the fiber unit.



9. Because sensing distance may decrease by as much as 20% depending on the conditions of cut surface of the fiber or connection conditions with the amplifier, we recommend using with sensing distance set at 80% or below.

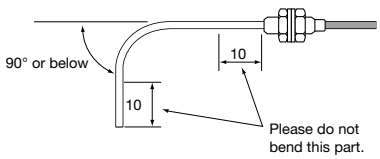
10. In areas subject to frequent vibration, secure so that the fiber unit itself will not vibrate. Especially work to limit vibrations from reaching connection points between the fiber and amplifier.

11. Use the method shown below to soften fiber head vibrations.



12. Do not use fiber units not protected with fluoroplastic in environments where organic solvents are used.

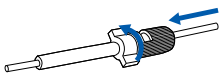
13. Do not bend the sleeve tip or base.



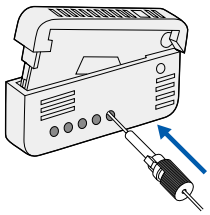
Regarding fiber cutters

Cutting procedure

1. Adjust the length in the direction of the arrow, turn the stopper and lock the fiber in place.



2. Insert the fiber into the fiber cutter and cut it.



3. The procedure is complete. (Correctly cut fiber)