

# 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.

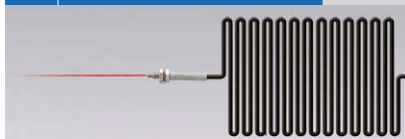
### Ease of handling

#### 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.

**12 Limited diffuse reflective type P.70**



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

**10 Small object detection P.63**



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

**13 Narrow view/wafer mapping P.74**



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

**11 Screen/Array P.66**



Optimal for when workpiece passage locations are not fixed.

## 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

Model	Page	Model	Page	Model	Page	Model	Page	Model	Page
FD-3SD1(100)	P.79	-DH02	P.79	-DR12	P.48	NF-TG01	P.75	-TR11	P.55
-ML02	P.69	-DH03	P.86		P.56	-TG02	P.53	-TR12	P.32
-TT2	P.37	-DH04	P.46	NF-DS06	P.37		P.75		P.55
NF02-DK	P.59		P.87	NF-DT01	P.37	-TG03	P.75	-TR13	P.32
-TK	P.59	-DH05	P.45	-DT02	P.45	-TG04	P.75		P.55
NF25-D	P.38		P.87		P.51	-TG05	P.41	-TR14	P.36
-DH	P.79	-DH06	P.72	-DT03	P.41		P.47		P.59
-T	P.36		P.88	-DT04	P.45	NF-TH01	P.78	NF-TS07	P.40
-TH	P.78	-DH07	P.84		P.51	-TH02	P.83	-TS08	P.41
NF-DA01	P.64	-DH08	P.72	-DT05	P.45	-TH04S-27V2	P.47	-TS10	P.68
-DA02	P.64		P.84	NF-DV01	P.48		P.83	-TS12	P.75
-DA03	P.64	-DH10	P.72	-DV02	P.48	-TH05S-A	P.48	-TS14	P.68
-DA04	P.64		P.88	-DV03	P.48		P.83	-TS19	P.69
-DA05	P.64	-DH11	P.72	-DW01	P.97	-TH06	P.78	-TS22	P.75
-DA06	P.64		P.88	-DW02	P.96	-TH07	P.83	-TS22M	P.78
-DA07	P.64	NF-DJ01	P.37	NF-DY01	P.90	-TH08	P.86	-TS22V	P.41
-DA52	P.96	-DJ02	P.38	-DZ01	P.69	-TH09	P.44		P.53
-DA53	P.96	NF-DK04	P.42	-DZ02	P.69		P.86	-TS25	P.75
NF-DB01	P.38	-DK04Z	P.42	-DZ03	P.69	-TH10	P.81		P.78
-DB02	P.46		P.59	NF-RB02	P.61	-TH11	P.81	-TS28	P.69
-DB03	P.38	-DK06	P.38	-RG01	P.61	-TH12	P.81	-TS40	P.59
-DB04	P.38	-DK21	P.37		P.76	-TH13	P.82		P.68
-DB05	P.44	-DK33	P.48	-RR01	P.57	-TH14	P.82	NF-TT01	P.44
-DB06	P.46	-DK43	P.46		P.61	-TH15	P.82		P.65
-DB07	P.37	-DK66	P.59	NF-TA01	P.98	-TH16	P.83	NF-TV01	P.48
-DB08	P.45	-DK67	P.59		P.99	NF-TJ01	P.36	-TV01-5	P.48
-DB09	P.38	NF-DM01	P.37	-TA01S	P.98		P.36	-TV02	P.47
-DB10	P.42	-DM02	P.37		P.99	NF-TK05	P.40	-TV04	P.47
NF-DC03	P.73	-DM02-G4	P.38	-TA02	P.98		P.59	-TV08	P.41
	P.76	-DM03	P.45		P.99	-TK77	P.53	NF-TW01	P.97
-DC04	P.51	NF-DN01	P.93	-TA03	P.98	NF-TM01	P.36	NF-TX01	P.36
	P.71	-DN02	P.73		P.99	-TM02	P.36	NF-TY01	P.90
-DC05	P.71		P.93	-TA04	P.98	-TM03	P.40	-TY01-3	P.90
-DC06	P.51	NF-DP01	P.41		P.99		P.65	-TY02	P.90
	P.71		P.46	-TA05	P.98	NF-TN01	P.92	-TY02-TF3	P.90
-DC07	P.72		P.65		P.99	NF-TP01	P.40	-TY03-TF3	P.90
-DC08	P.57	NF-DR01	P.51	-TA06	P.92		P.44	-TY05	P.89
	P.73	-DR02	P.50	-TA07	P.92		P.65	-TY05-5	P.89
-DC09	P.73	-DR03	P.42	NF-TB01	P.36	-TR01	P.49	NF-TZ05	P.68
-DC38	P.72		P.51	-TB02	P.36	-TR02	P.49	-TZ06	P.68
-DC39	P.73	-DR04	P.41	-TB03	P.44	-TR03	P.40	-TZ07	P.54
NF-DE01	P.34		P.51	-TB05	P.44		P.49		P.68
	P.56	-DR05	P.42	-TB06	P.36		P.65	-TZ08	P.50
-DE02	P.34		P.46	-TB07	P.40	-TR04	P.40		P.67
	P.56		P.51	NF-TE01	P.32		P.49	-TZ09	P.54
-DE03	P.34	-DR06	P.51		P.54	-TR05	P.33		P.67
	P.56	-DR07	P.46	-TE02	P.33		P.50	-TZ10	P.50
-DE04	P.34	-DR08	P.50		P.54	-TR06	P.33		P.67
	P.57	-DR09	P.56	-TE03	P.32		P.50		
NF-DF03	P.96		P.76		P.54	-TR08	P.53		
-DF04	P.95	-DR10	P.45	-TE04	P.33	-TR09	P.53		
-DF05	P.95		P.56		P.55	-TR10	P.40		
-DF07	P.95	-DR11	P.42	-TE05	P.33		P.53		
-DF08	P.96		P.59		P.50	-TR11	P.32		
NF-DH01	P.84	-DR12	P.42	NF-TF01	P.95				

01

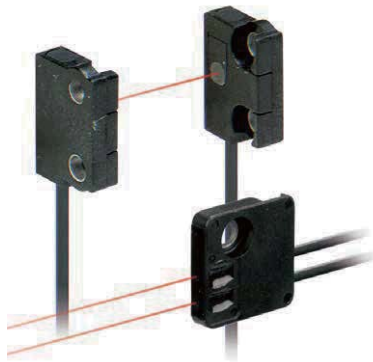
# Easy mounting

**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.

**Photoelectric Sensors**

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

Easy mounting fiber units (through-beam type)

Photoelectric Sensors

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

Through-beam type

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Through-beam type	<p>Flexible, Head ON, Free cut</p>	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
	<p>Flexible, Side ON, Free cut</p>	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
	<p>Flexible, Flat ON, Free cut</p>	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
	<p>Flexible, Flat ON, Free cut</p>	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
	<p>Flexible, Flat ON, Free cut</p>	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)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Through-beam type	<p>Flexible, Head ON/Side ON switchable type, Free cut</p> <p>Detecting part detail</p> <p>Multi core fiber <math>\phi 0.0375 \times 151</math></p>	<p>7-EL 430</p> <p>6-UL 400</p> <p>5-PL 350</p> <p>4-LG 300</p> <p>3-ST 190</p> <p>2-FS 120</p> <p>1-HS 36</p>	<p>Long 250</p> <p>Std 120</p> <p>Fast 55</p>	110	-40 to +60°C	R1	NF-TE02 Switchable direction
	<p>Flexible, Head ON/Side ON switchable type, Free cut</p> <p>Detecting part detail</p> <p>Multi core fiber <math>\phi 0.075 \times 151</math></p>	<p>7-EL 1,340</p> <p>6-UL 1,260</p> <p>5-PL 1,090</p> <p>4-LG 960</p> <p>3-ST 630</p> <p>2-FS 390</p> <p>1-HS 130</p>	<p>Long 750</p> <p>Std 450</p> <p>Fast 250</p>	280	-40 to +60°C	R1	NF-TE04 Switchable direction
	<p>Flexible, Head ON, Free cut</p> <p>Detecting part detail</p> <p>Multi core fiber <math>\phi 0.25 \times 7</math></p>	<p>7-EL 3,600</p> <p>6-UL 3,600</p> <p>5-PL 3,580</p> <p>4-LG 3,060</p> <p>3-ST 1,980</p> <p>2-FS 1,400</p> <p>1-HS 500</p>	<p>Long 2,700</p> <p>Std 1,600</p> <p>Fast 850</p>	1,100	-40 to +60°C	R4	NF-TR06
	<p>Flexible, Side ON, Free cut</p> <p>Detecting part detail</p> <p>Multi core fiber <math>\phi 0.25 \times 7</math></p> <p>*Those for emitting and receiving are symmetrical in shape.</p>	<p>7-EL 3,600</p> <p>6-UL 3,600</p> <p>5-PL 3,600</p> <p>4-LG 3,150</p> <p>3-ST 2,000</p> <p>2-FS 1,100</p> <p>1-HS 320</p>	<p>Long 2,700</p> <p>Std 1,300</p> <p>Fast 600</p>	1,100	-40 to +60°C	R4	NF-TR05
	<p>Flexible, Flat ON, Free cut</p> <p>Detecting part detail</p> <p>Multi core fiber <math>\phi 0.25 \times 7</math></p> <p>*Those for emitting and receiving are symmetrical in shape.</p>	<p>7-EL 1,600</p> <p>6-UL 1,510</p> <p>5-PL 1,320</p> <p>4-LG 1,150</p> <p>3-ST 750</p> <p>2-FS 410</p> <p>1-HS 130</p>	<p>Long 750</p> <p>Std 450</p> <p>Fast 280</p>	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.

Photoelectric Sensors

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

Easy mounting fiber units (diffuse type)

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

● 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.



### 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

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



Thread type fiber units (through-beam type)

Photoelectric Sensors

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

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

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model	
		D3RF	D2RF	BRF				
M4	Coaxial, Lens attachable (P64), Free cut 	7-EL: 680 6-UL: 150 5-PL: 370 4-LG: 270 3-ST: 230	3-ST: 140 2-FS: 90 1-HS: 70 Fast: 30	70	-40 to +70°C	R15	NF-DM02-G4	
	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 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: 450 2-FS: 250 1-HS: 75 Fast: 100	150	-40 to +70°C	R25	NF-DB01 <span>Low cost</span>	
	Coaxial, Free cut 	7-EL: 1,200 6-UL: 750 5-PL: 650 4-LG: 575	3-ST: 450 2-FS: 250 1-HS: 75 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 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 <span>Space-saving</span>	
	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 <span>Breakage prevention</span>	
	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 Fast: 100		-40 to +70°C	R25	NF25-D
		Coaxial, Free cut 	7-EL: 1,200 6-UL: 750 5-PL: 650 4-LG: 550	3-ST: 450 2-FS: 250 1-HS: 75 Fast: 100		-40 to +70°C	R25	NF-DB01
Coaxial, Free cut 		7-EL: 1,200 6-UL: 750 5-PL: 650 4-LG: 575	3-ST: 450 2-FS: 250 1-HS: 75 Fast: 100		-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 Fast: 100		-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		-40 to +70°C	R25	NF25-D	

●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  $\phi 0.25$  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

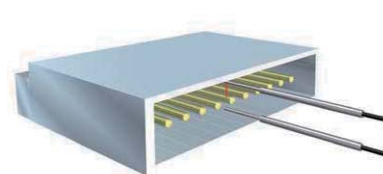
Can be installed in narrow spaces. Sleeve type is also available.

#### Standard type



Standard straight view type.

#### Connector pin detection



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

Cylindrical fiber units (through-beam type)

Photoelectric Sensors

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

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Through-beam type	<p>01</p> <p>Fine core, Flexible</p>	<p>7-EL 54</p> <p>6-UL 50</p> <p>5-PL 44</p> <p>4-LG 38</p> <p>3-ST 25</p> <p>2-FS 15</p> <p>1-HS 5</p>	<p>Long 30</p> <p>Std 18</p> <p>Fast 8</p>	10	-40 to +60°C	R4	<p>NF-TR04</p> <p>Fine core</p>
	<p>01.5</p> <p>Fine core, Flexible</p>	<p>7-EL 900</p> <p>6-UL 550</p> <p>5-PL 400</p> <p>4-LG 350</p> <p>3-ST 250</p> <p>2-FS 140</p> <p>1-HS 45</p>	<p>Long 350</p> <p>Std 200</p> <p>Fast 90</p>	120	-40 to +70°C	R15	<p>NF-TM03</p> <p>Fine core</p> <p>Low cost</p>
	<p>01.5</p> <p>Fine core, Flexible, Free cut</p>	<p>7-EL 850</p> <p>6-UL 550</p> <p>5-PL 450</p> <p>4-LG 400</p> <p>3-ST 275</p> <p>2-FS 150</p> <p>1-HS 50</p>	<p>Long 350</p> <p>Std 200</p> <p>Fast 90</p>	110	-40 to +70°C	R4	<p>NF-TR03</p> <p>Fine core</p>
	<p>02.5</p> <p>Free cut</p>	<p>7-EL 1,710</p> <p>6-UL 1,530</p> <p>5-PL 1,350</p> <p>4-LG 1,230</p> <p>3-ST 800</p> <p>2-FS 480</p> <p>1-HS 160</p>	<p>Long 900</p> <p>Std 550</p> <p>Fast 250</p>	350	-40 to +70°C	R25	<p>NF-TB07</p> <p>Low cost</p>
	<p>03</p> <p>Lens installed, Flexible, Free cut</p>	<p>7-EL 3,600</p> <p>6-UL 3,600</p> <p>5-PL 3,150</p> <p>4-LG 2,790</p> <p>3-ST 1,800</p> <p>2-FS 1,000</p> <p>1-HS 340</p>	<p>Long 2,300</p> <p>Std 1,300</p> <p>Fast 550</p>	550	-40 to +60°C	R1	NF-TR10
	<p>03</p> <p>Flexible, Free cut</p>	<p>7-EL 4,000</p> <p>6-UL 2,000</p> <p>5-PL 1,600</p> <p>4-LG 1,400</p> <p>3-ST 1,000</p> <p>2-FS 550</p> <p>1-HS 180</p>	<p>Long 800</p> <p>Std 400</p> <p>Fast 200</p>	360	-40 to +70°C	R2	NF-TK05
	<p>03</p> <p>Free cut</p>	<p>7-EL 4,000</p> <p>6-UL 3,000</p> <p>5-PL 2,400</p> <p>4-LG 2,100</p> <p>3-ST 1,500</p> <p>2-FS 800</p> <p>1-HS 220</p>	<p>Long 1,800</p> <p>Std 800</p> <p>Fast 450</p>	700	-40 to +70°C	R30	NF-TS07
	<p>03</p> <p>0.25 fine sleeve: 5 mm long</p>	<p>7-EL 27</p> <p>6-UL 25</p> <p>5-PL 21</p> <p>4-LG 18</p> <p>3-ST 12</p> <p>2-FS 7</p> <p>1-HS 2</p>	<p>Long 6</p> <p>Std 3.5</p> <p>Fast 2</p>	1	-40 to +70°C	R5	<p>NF-TP01</p> <p>Fine core</p>

●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)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Side view Through-beam type	<p>ø1 sleeve: 15 mm long, Side view, Flexible, Free cut</p>	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
	<p>Side view, Free cut</p>	7-EL 2,500 6-UL 1,900 5-PL 1,300 4-LG 1,100	3-ST 800 2-FS 400 1-HS 400 Fast 200	180	-40 to +70°C	R25	NF-TS08
	<p>Side view, Free cut</p>	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	1,000	-40 to +60°C	R25	NF-TV08
	<p>Side view, Flexible, Free cut</p>	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	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)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Diffuse type	<p>ø0.5 sleeve: 3 mm long, Fine</p>	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 <b>Fine core</b>
	<p>Flexible</p>	7-EL 300 6-UL 180 5-PL 150 4-LG 130	3-ST 80 2-FS 70 1-HS 30 Fast 15	20	-40 to +70°C	R4	NF-DR04
	<p>Free cut</p>	7-EL 400 6-UL 200 5-PL 190 4-LG 160	3-ST 100 2-FS 50 1-HS 10	45	-40 to +70°C	R15	NF-DT03

●The sensing distances for the diffuse type fiber units are values on 500 x 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)			Ambient temperature	Bending radius (mm)	Model	
		D3RF	D2RF	BRF				
Diffuse type	<b>Free cut</b> 	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	<b>NF-DB10</b> Standard item
	<b>Coaxial, Flexible, Free cut</b> 	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	<b>NF-DR11</b>
	<b>Free cut</b> 	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	<b>NF-DK04</b> Low cost
	<b>Flexible, Free cut</b> 	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	<b>NF-DK04Z</b>
	<b>Flexible, Free cut</b> 	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	<b>NF-DR03</b>
	<b>ø0.82 sleeve: 5 mm long, Flexible</b> 	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	<b>NF-DR05</b> 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)			Ambient temperature	Bending radius (mm)	Model	
		D3RF	D2RF	BRF				
Diffuse type	<b>ø2 sleeve: 15 mm long, Flexible, Free cut</b> 	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	<b>NF-DR12</b>

- 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

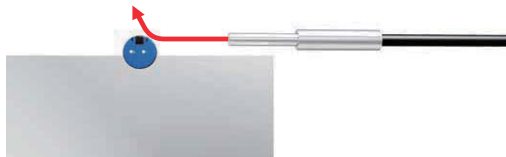


- Long sleeve type can be bent
- Thread type and cylindrical type available

### 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



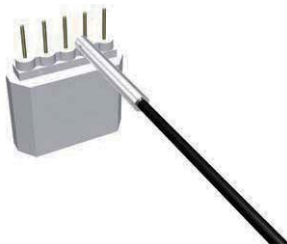
Fine tuning possible even after mounting

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

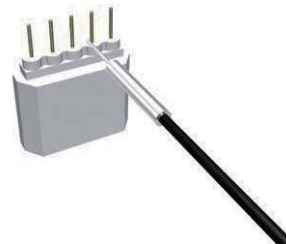
Position adjustment for the detection point can be easily performed when mounting due to the fact that the sleeve type has a fine tip and the workpiece is not hidden by the tip even when approaching the workpiece for detection.

#### 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

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

Sleeve fiber units (through-beam type)

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Through-beam type	<p>ø0.88 sleeve: 40 mm long, Free cut</p>	<p>7-EL 470 6-UL 450 5-PL 380 4-LG 340 3-ST 220 2-FS 120 1-HS 45</p>	<p>Long 270 Std 140 Fast 80</p>	100	-40 to +70°C	Fiber R25 Sleeve R10	NF-TB05 Bendable sleeve
	<p>ø1.5 sleeve: 90 mm long, Free cut</p>	<p>7-EL 4,000 6-UL 1,900 5-PL 1,900 4-LG 1,600</p>	<p>3-ST 1,200 2-FS 550 1-HS 180</p> <p>Long 1,000 Std Fast 250</p>	450	-40 to +70°C	Fiber R25 Sleeve R15	NF-TB03 Bendable sleeve
	<p>ø2.1 sleeve: 60 mm long, Heat resistant</p>	<p>7-EL 1,350 6-UL 1,260 5-PL 1,120 4-LG 900 3-ST 630 2-FS 410 1-HS 120</p>	<p>Long 750 Std 450 Fast 220</p>	300	-30 to +350°C or -60 to +200°C	Fiber R25 Sleeve R10	NF-TH09 Bendable sleeve
	<p>ø0.25 fine sleeve: 5 mm long</p>	<p>7-EL 27 6-UL 25 5-PL 21 4-LG 18</p>	<p>3-ST 12 2-FS 7 1-HS 2</p> <p>Long 6 Std 3.5 Fast 2</p>	1	-40 to +70°C	R5	NF-TP01 Fine core
<p>ø0.5 fine sleeve: 5 mm long, Free cut</p>	<p>7-EL 170 6-UL 110 5-PL 80 4-LG 70</p>	<p>3-ST 50 2-FS 25 1-HS 8</p> <p>Long 80 Std 40 Fast 20</p>	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)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Diffuse type	<p>ø0.8 sleeve: 15 mm long, Coaxial</p>	<p>7-EL 99 6-UL 90 5-PL 80 4-LG 70 3-ST 40 2-FS 20 1-HS 7</p>	<p>Long 50 Std 25 Fast 14</p>	20	-20 to +60°C	R25	NF-DB05 Fine core

● The sensing distances for the diffuse type fiber units are values on 500 x 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)

Photoelectric Sensors

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

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

●The sensing distances for the diffuse type fiber units are values on 500 x 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)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Diffuse type	<p>ø2.5 sleeve: 40 mm long, Free cut</p>	<p>7-EL 680 6-UL 630 5-PL 550 4-LG 480 3-ST 320 2-FS 180 1-HS 50</p>	<p>Long 400 Std 240 Fast 110</p>	130	-40 to +70°C	Fiber R25 Sleeve R10	NF-DB06 Bendable sleeve
	<p>ø2.5 sleeve: 90 mm long, Free cut</p>	<p>7-EL 1,100 6-UL 750 5-PL 750 4-LG 650</p>	<p>3-ST 450 2-FS 300 1-HS 80</p> <p>Long 450 Std 250 Fast 100</p>	150	-40 to +70°C	Fiber R25 Sleeve R20	NF-DB02 Bendable sleeve
	<p>ø2.8 sleeve: 60 mm long, Heat resistant</p>	<p>7-EL 950 6-UL 900 5-PL 780 4-LG 680 3-ST 450 2-FS 200 1-HS 59</p>	<p>Long 650 Std 250 Fast 80</p>	300	-30 to +350°C or -60 to +200°C	Fiber R25 Sleeve R10	NF-DH04 Bendable sleeve
	<p>ø0.5 sleeve: 3 mm long</p>	<p>7-EL 28 6-UL 26 5-PL 23 4-LG 20 3-ST 13 2-FS 3 1-HS 1</p>	<p>Long 18 Std 5 Fast Unusable</p>	3	-40 to +60°C	R10	NF-DP01 Fine core
	<p>ø0.82 sleeve: 5 mm long, Flexible</p>	<p>7-EL 190 6-UL 125 5-PL 75 4-LG 65</p>	<p>3-ST 45 2-FS 25 1-HS 8</p> <p>Long 40 Std 15 Fast 5</p>	10	-40 to +70°C	R4	NF-DR05
	<p>ø0.82 sleeve: 80 mm long</p>	<p>7-EL 90 6-UL 50 5-PL 45 4-LG 40</p>	<p>3-ST 25 2-FS 10 1-HS 4</p> <p>Long 35 Std 18 Fast 10</p>	7	-40 to +70°C	R25	NF-DR07
	<p>ø1.5 sleeve: 20 mm long, Free cut</p>	<p>7-EL 400 6-UL 200 5-PL 190 4-LG 160</p>	<p>3-ST 100 2-FS 50 1-HS 16</p> <p>Long 100 Std 60 Fast 12</p>	45	-40 to +70°C	R15	NF-DK43 Low cost

● The sensing distances for the diffuse type fiber units are values on 500 x 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.

Photoelectric Sensors

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

# 05 Sleeve type (side view)

Related products

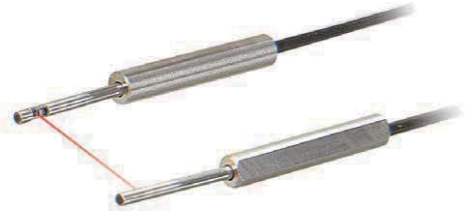
Fiber units  
Sleeve type (Straight view)  
● P.43

Fiber amplifier

**D3RF**  
● P.110



## Side angle light beam provides optimal detection in narrow places

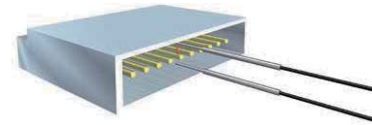


A wide range of variations including flexible types and heat resistant types

### 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)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Through-beam type	<b>M3</b> 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	<b>NF-TV04</b> <span style="background-color: #336699; color: white; padding: 2px;">Thin sleeve</span>
	<b>ø2</b> 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	<b>NF-TG05</b> <span style="background-color: #336699; color: white; padding: 2px;">Thin sleeve</span>
	<b>ø2.5</b> 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	<b>NF-TV02</b> <span style="background-color: #336699; color: white; padding: 2px;">Thin sleeve</span>
	<b>ø2.5</b> ø1 sleeve: 27 mm long, Heat resistant 	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	<b>NF-TH04S-27V2</b> (Made-to-order products) <span style="background-color: #336699; color: white; padding: 2px;">Thin sleeve</span>

● 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.

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



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

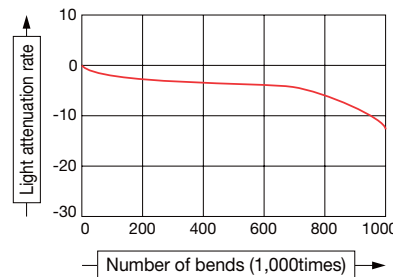


### Withstands 800,000 cycle bending test

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

●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.

Photoelectric Sensors

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



Flexible fiber units (through-beam type)

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model	
		D3RF	D2RF	BRF				
Square	<b>Flat ON, Free cut</b> 	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
	<b>Side ON, Free cut</b> 	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
	<b>Head ON, Free cut</b> 	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	<b>32 mm wide screen, Side ON, Free cut</b> 	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
	<b>11 mm wide screen, Side ON, Free cut</b> 	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)			Ambient temperature	Bending radius (mm)	Model	
		D3RF	D2RF	BRF				
Diffuse type	<b>Free cut</b> 	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
	<b>Free cut</b> 	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 x 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)			Ambient temperature	Bending radius (mm)	Model	
		D3RF	D2RF	BRF				
Diffuse type	<p>ø0.82 sleeve: 15 mm long, Free cut</p> <p>ø0.25 × 1 (receiving part) ø0.82 SUS M3 × P0.5 SUS                      ø0.25 × 1 (emitting part) 5.5 1.8 ø3 SUS ø1                      2.4 15 10 5 500</p>	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
	<p>Coaxial ø0.82 sleeve: 15 mm long</p> <p>ø0.125 × 9 (receiving part) ø0.25 × 1 (emitting part) ø0.82 SUS M3 × P0.5 SUS ø3 SUS                      5.5 1.8 ø1.2 (emitting) ø2.1 25                      ø0.9 receiving 15 15 500</p> <p>Detecting part detail</p>	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
	<p>Free cut</p> <p>ø0.25 × 4 (receiving part) ø0.25 × 4 (emitting part) M2.6 × P0.45 SUS M4 × P0.7 SUS                      7 2.4 ø1 3 3 12 2000</p> <p>Detecting part detail</p>	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
	<p>Free cut</p> <p>ø0.265 × 16 (receiving part) ø0.265 × 16 (emitting part) M6 × P0.75 (brass with nickel plating)                      10 2.4 ø2.2 12 2000</p> <p>Detecting part detail</p>	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 <span style="border: 1px solid black; padding: 2px;">Standard item</span>
	<p>Free cut</p> <p>ø0.25 × 2 (receiving part) ø0.25 × 2 (emitting part) ø1.5 SUS ø3 joint bracket SUS                      15 15 100 1000 25</p> <p>Detecting part detail</p>	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
	<p>Free cut</p> <p>ø0.25 × 4 (receiving part) ø0.25 × 4 (emitting part) ø3 SUS ø1                      10 2000</p> <p>Detecting part detail</p>	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
<p>ø0.82 sleeve: 5 mm long</p> <p>ø0.25 × 1 (receiving part) ø0.25 × 1 (emitting part) ø0.82 SUS ø3 SUS ø3 joint bracket SUS                      5 15 15 500 100 25</p> <p>Detecting part detail</p>	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	<p>Glass substrate alignment, Flat ON, Free cut</p> <p>2 -M3 flush screw hole                      Emitting/receiving part 29 18 6.5 (20) ø1.3 × 2                      17 3.8 2.5 ø3 (PVC)                      Housing (Heat resistant ABS)                      Emitting side Receiving side</p>	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	
	<p>Glass substrate alignment, Flat ON, Free cut</p> <p>Detecting part detail                      Emitting/receiving fiber ø0.25 × 9                      29 18 6.5 2 -M3 flush screw hole ø1.3 × 2                      20 3000 10 10 ø3.2 (PVC)                      Emitting side Receiving side                      Housing (Heat resistant ABS)                      Detection direction</p>	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.

Photoelectric Sensors

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

07

## Flexible R1 (R1 mm)

Related products

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

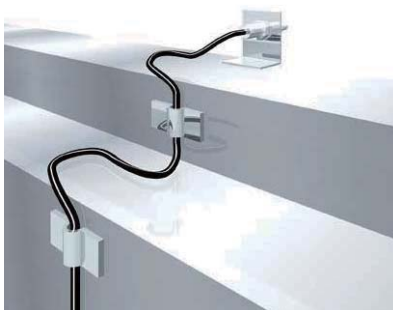
Over 20 types are available, including through-beam types and diffuse types

## 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.

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

Flexible R1 mm fiber units (through-beam type)

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

Photoelectric Sensors

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



Flexible R1 mm fiber units (through-beam type)

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Through-beam type Square	<p>Flat ON/Head ON switchable type, Free cut</p> <p>2000 ø3.2 hole: ø5.6 countersinking depth 2.2 Inner pipe (SUS) ø2 (PVC) Multi core fiber (core: acrylic, sheath: polyethylene) ø1.3 Housing (polycarbonate) Light axis Detecting part detail Multi core fiber ø0.075 x 151</p>	<p>7-EL 1,340 6-UL 1,260 5-PL 1,090 4-LG 960 3-ST 630 2-FS 390 1-HS 130</p>	<p>Long 750 Std 450 Fast 250</p>	280	-40 to +60°C	R1	NF-TE04 Switchable direction
	<p>Flat ON, Free cut</p> <p>2000 Light axis Housing (Polycarbonate) Detecting part detail Multi core fiber ø0.075 x 151</p>	<p>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</p>	<p>Long 1,200 Std 650 Fast 330</p>	500	-40 to +60°C	R1	NF-TR13
	<p>Side ON, Free cut</p> <p>2000 Light axis Housing (polycarbonate) Detecting part detail Multi core fiber ø0.075 x 151</p>	<p>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</p>	<p>Long 2,700 Std 1,500 Fast 1,000</p>	1,300	-40 to +60°C	R1	NF-TR12
	<p>Head ON, Free cut</p> <p>2000 Light axis Housing (polycarbonate) Detecting part detail Multi core fiber ø0.075 x 151</p>	<p>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</p>	<p>Long 2,700 Std 1,600 Fast 850</p>	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.

Photoelectric Sensors

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





## Flexible R1 mm fiber units (diffuse type)

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

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

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

- 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.52Fiber 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

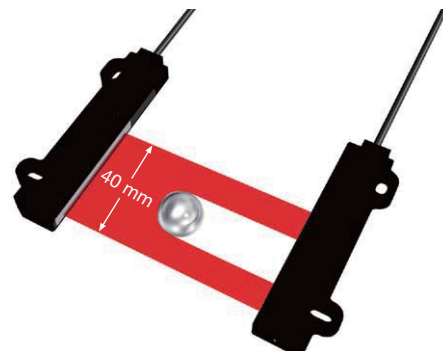
Switchable direction

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.



### 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)			Ambient temperature	Bending radius (mm)	Model	
		D3RF	D2RF	BRF				
Through-beam type	<p>Nut type, Straight view/side view switchable type, Free cut</p>	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	<b>NF-TR14</b> Switchable direction
	<p>Nut type, Free cut</p>	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	<b>NF02-TK</b> Space-saving
	<p>Free cut</p>	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	<b>NF-TK05</b>
	<p>40 mm wide screen, Side ON, Free cut</p>	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	<b>NF-TS40</b> Collimated light	
Diffuse type	<p>Free cut</p>	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	<b>NF-DK66</b>
	<p>Free cut</p>	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	<b>NF-DK67</b>
	<p>Nut type, Free cut</p>	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	<b>NF02-DK</b> Space-saving	
	<p>Free cut</p>	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	<b>NF-DK04Z</b>
	<p>Coaxial, Free cut</p>	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	<b>NF-DR11</b>

●The sensing distances for the diffuse type fiber units are values on 500 x 500 mm white paper (1000 x 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.

Photoelectric Sensors

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

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)

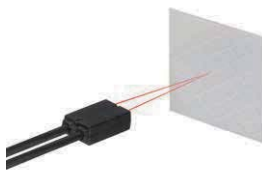
## Stable detection of transparent workpieces

## 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

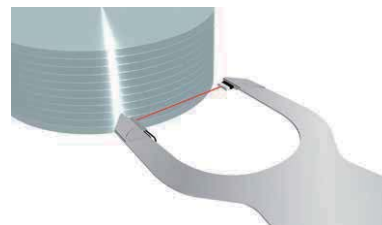
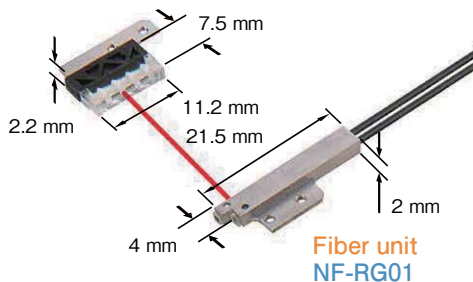
Ultra-thin

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)

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.

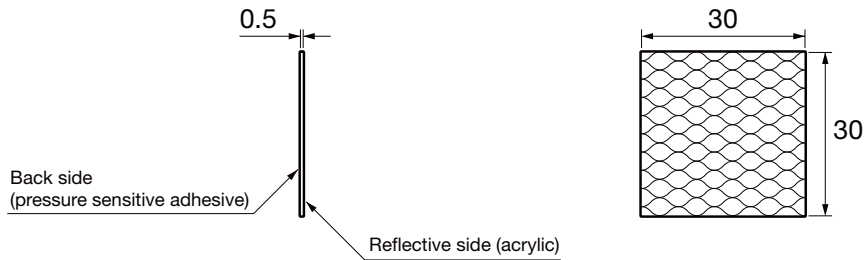
Retro-reflective type fiber units (built-in polarizing filter/narrow view/wafer mapping)

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Built-in polarizing filter	<p><b>Flexible, Free cut</b></p> <p>Glass lens (BK7) Housing (polycarbonate) Housing (polycarbonate) Glass lens (BK7) Included mounting bracket (SUS) Multi core fiber <math>\phi 0.075 \times 151</math></p>	<p>7-EL 1,390</p> <p>6-UL 1,300</p> <p>5-PL 1,140</p> <p>4-LG 990</p> <p>3-ST 640</p> <p>2-FS 520</p> <p>1-HS 260</p>	<p>Long 850</p> <p>Std 750</p> <p>Fast 10 to 550</p>	600	-25 to +55°C	R1	<b>NF-RR01</b>
	<p><b>Side ON, Free cut</b></p> <p>Included mounting bracket (SUS) Housing (ABS) Light axis Detecting part detail</p>	<p>7-EL 410</p> <p>6-UL 380</p> <p>5-PL 340</p> <p>4-LG 290</p> <p>3-ST 180</p> <p>2-FS 150</p> <p>1-HS 90</p>	<p>Long 250</p> <p>Std 200</p> <p>Fast 200</p>	200	-40 to +60°C	R10	<b>NF-RB02</b>
Wafer mapping	<p><b>Ultra-small type, Free cut</b></p> <p>Detecting part detail Mounting part (SUS) Base (ABS) Reflector (acrylic) Head block (SUS) Prism Mark band Emitting side Receiving side</p>	<p>7-EL 590</p> <p>6-UL 550</p> <p>5-PL 480</p> <p>4-LG 420</p> <p>3-ST 270</p> <p>2-FS 180</p> <p>1-HS 70</p>	<p>Long 350</p> <p>Std 230</p> <p>Fast 230</p>	Unusable	-40 to +60°C	R10	<b>NF-RG01</b> Ultra-thin

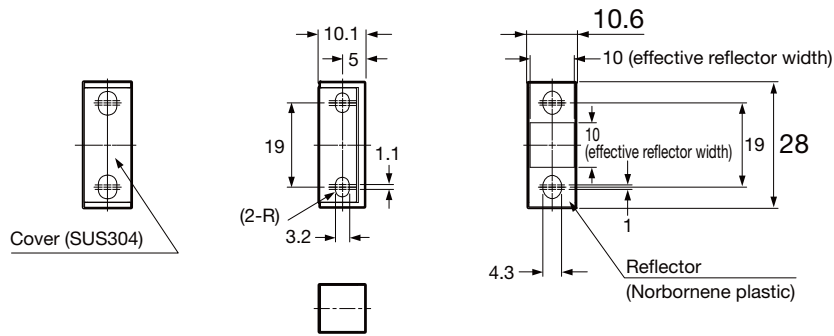
● Install with an ambient humidity between 35 and 85%. In the case of 85% RH, the ambient temperature should be between 0 and 40°C.

Reflector dimensions

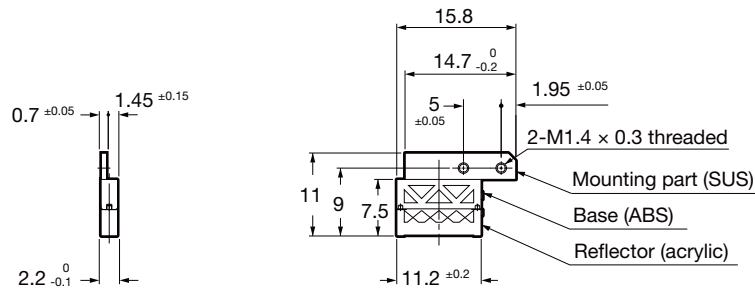
■ DG3030 (NF-RR01 included reflective sheet)



■ 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  $\varnothing 0.125$  mm fine core (NF-TP01, NF-DP01)

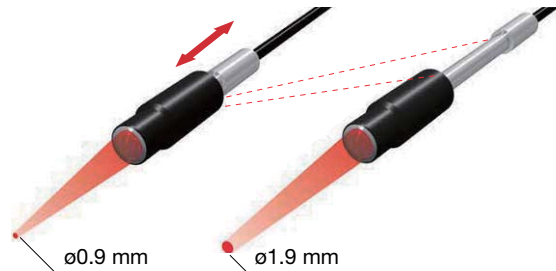
## Stable detection of small objects with spot lens

Fine spot lens NF-DA03 and coaxial diffuse fiber unit NF-DK21 enables  $\varnothing 0.2$  mm spot.Fiber unit  
NF-DK21Small object spot lens  
NF-DA03 $\varnothing 0.2$  mm

## 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  $\varnothing 0.9$  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.

## Adjustable spot size

 $\varnothing 0.9$  mm $\varnothing 1.9$  mmDetects small objects with a core diameter of  $\varnothing 0.125$  mm

Fine core

The NF-TP01 through-beam type and the NF-DP01 diffuse type use a  $\varnothing 0.125$  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:  $\varnothing 0.125$  mmNF-DP01 Fine core diameter:  $\varnothing 0.125$  mm (4 cores)Photoelectric  
SensorsPhotoelectric  
SensorsSpecialized  
Photoelectric  
SensorsLaser  
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

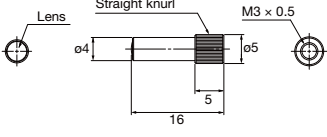
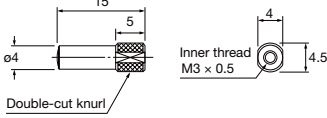
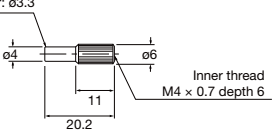
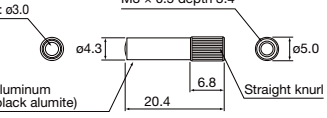
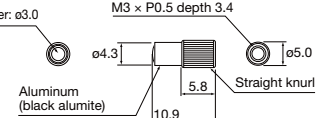
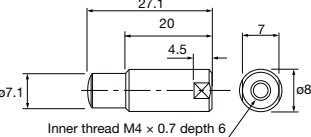
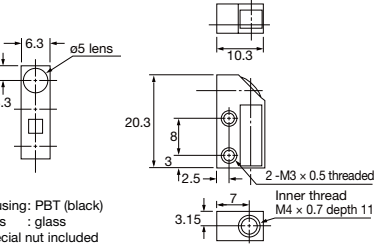
Heat resistant

Chemical  
resistantVacuum  
resistantLiquid level/liquid leakage/  
water detectionLens for  
through-beam type

Correct use



## 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. $\phi 0.2$ mm: NF-DK21 Approx. $\phi 0.4$ mm: NF-DT01 ( $\phi 0.005$ mm metal wire)	7 mm	-20 to +60°C	<b>NF-DA03</b> Small
	Housing: aluminum (black alumite) Lens : glass 	Approx. $\phi 0.3$ mm: NF-DK21 Approx. $\phi 0.5$ mm: NF-DT01 ( $\phi 0.005$ mm metal wire)	7.5 mm	-40 to +70°C	<b>NF-DA04</b>
Small spot lens	Lens diameter: $\phi 3.3$ 	Approx. $\phi 0.5$ mm: NF-DM02 ( $\phi 0.005$ mm metal wire)	6 mm	-40 to +70°C	<b>NF-DA05</b>
	Lens diameter: $\phi 3.0$ 	Approx. $\phi 0.2$ mm: NF-DK21 ( $\phi 0.005$ mm metal wire) Approx. $\phi 0.4$ mm: NF-DT01 ( $\phi 0.01$ mm metal wire)	6 mm	-40 to +70°C	<b>NF-DA01</b>
	Lens diameter: $\phi 3.0$ 	Approx. $\phi 1.2$ mm: NF-DK21 ( $\phi 0.005$ mm metal wire) Approx. $\phi 1.4$ mm: NF-DT01 ( $\phi 0.01$ mm metal wire)	15 mm	-40 to +70°C	<b>NF-DA02</b>
Spot size adjustable lens		Approx. $\phi 0.9$ to 1.9 mm: NF-DM02-G4 ( $\phi 0.2$ mm metal wire)	Approx. 20 to 40 mm	-40 to +70°C	<b>NF-DA06</b>
Side view Lens with adjustable spot size		Approx. $\phi 0.8$ to 3.2 mm: NF-DM02-G4 ( $\phi 0.1$ mm metal wire)	Approx. 9 to 17 mm	-40 to +70°C	<b>NF-DA07</b>

- 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			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Through-beam type	<p>Flexible</p> <p>Detecting part detail ø0.265 x 1</p>	<p>7-EL 54 6-UL 50 5-PL 44 4-LG 38 3-ST 25 2-FS 15 1-HS 5</p> <p>(ø0.02 metal wire)</p>	<p>Long 30 Std 18 Fast 8</p> <p>(ø0.02 metal wire)</p>	<p>10</p> <p>(ø0.02 metal wire)</p>	-40 to +60°C	R4	NF-TR04
	<p>Flexible, Free cut</p>	<p>7-EL 850 6-UL 550 5-PL 450 4-LG 400</p> <p>3-ST 275 2-FS 150 1-HS 50</p> <p>(ø0.1 metal wire)</p>	<p>Long 350 Std 200 Fast 90</p> <p>(ø0.1 metal wire)</p>	<p>110</p> <p>(ø0.1 metal wire)</p>	-40 to +70°C	R4	NF-TR03
	<p>Free cut</p>	<p>7-EL 900 6-UL 550 5-PL 400 4-LG 350</p> <p>3-ST 250 2-FS 140 1-HS 45</p> <p>(ø0.1 metal wire)</p>	<p>Long 350 Std 200 Fast 90</p> <p>(ø0.1 metal wire)</p>	<p>120</p> <p>(ø0.1 metal wire)</p>	-40 to +70°C	R15	NF-TM03
	<p>ø0.5 sleeve: 5 mm long, Free cut</p>	<p>7-EL 170 6-UL 110 5-PL 80 4-LG 70</p> <p>3-ST 50 2-FS 25 1-HS 8</p> <p>(ø0.1 metal wire)</p>	<p>Long 80 Std 40 Fast 20</p> <p>(ø0.1 metal wire)</p>	<p>30</p> <p>(ø0.1 metal wire)</p>	-40 to +70°C	R15	NF-TT01
<p>ø0.25 fine sleeve: 5 mm long</p> <p>Detecting part detail ø0.125 x 4</p>	<p>7-EL 27 6-UL 25 5-PL 21 4-LG 18 3-ST 12 2-FS 7 1-HS 2</p> <p>(ø0.02 metal wire)</p>	<p>Long 6 Std 3.5 Fast 2</p> <p>(ø0.02 metal wire)</p>	<p>1</p> <p>(ø0.02 metal wire)</p>	-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			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Diffuse type	<p>ø0.5 sleeve: 3 mm long</p> <p>Detecting part detail ø0.125 x 4</p>	<p>7-EL 28 6-UL 26 5-PL 23 4-LG 20 3-ST 13 2-FS 3 1-HS 1</p> <p>(ø0.02 metal wire)</p>	<p>Long 18 Std 5 Fast Unusable</p> <p>(ø0.02 metal wire)</p>	<p>3</p> <p>(ø0.02 metal wire)</p>	-40 to +60°C	R10	NF-DP01 Fine core

- The sensing distances for the diffuse type fiber units are values on 500 x 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

Photoelectric Sensors

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

## Fiber units for detecting with light screen

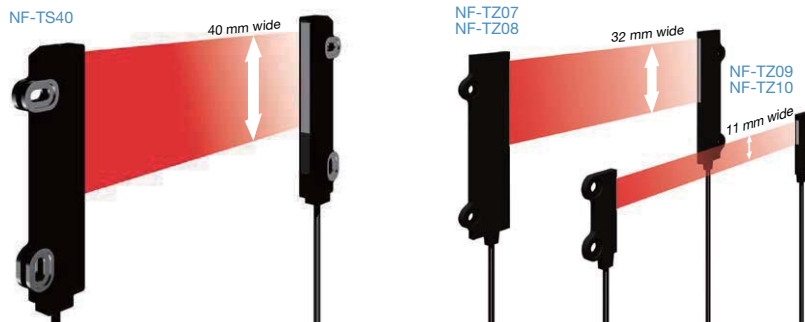


Optimal for detection of complex shapes and when workpiece passage locations are not fixed.

## 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.



## Upgrades from the previous model

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

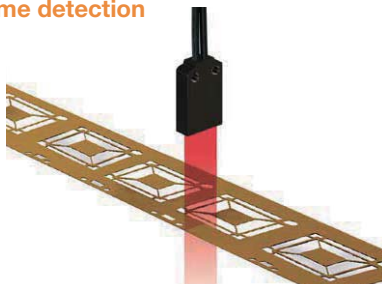
\*Small changes only in sensing distance for NF-TZ09.

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  $2 \times 15$  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.

## Difference between screen fiber and array fiber

### Screen fiber Collimated light

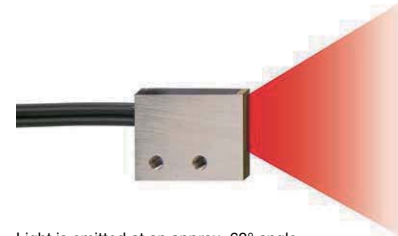
This screen fiber collimates light into a band through the lens. Able to detect finer light differences than array fibers as a through-beam type due to collimated light.



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)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
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	<b>NF-TZ10</b> <span style="background-color: #FF0000; color: white; padding: 2px;">Renewal</span> <span style="background-color: #90EE90; padding: 2px;">Collimated light</span>
	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	<b>NF-TZ09</b> <span style="background-color: #FF0000; color: white; padding: 2px;">Renewal</span> <span style="background-color: #90EE90; padding: 2px;">Collimated light</span>
	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	<b>NF-TZ08</b> <span style="background-color: #FF0000; color: white; padding: 2px;">Renewal</span> <span style="background-color: #90EE90; padding: 2px;">Collimated light</span>

●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)

Photoelectric Sensors

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

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

● 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)			Ambient temperature	Bending radius (mm)	Model	
		D3RF	D2RF	BRF				
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 x 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.

Photoelectric Sensors

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

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)



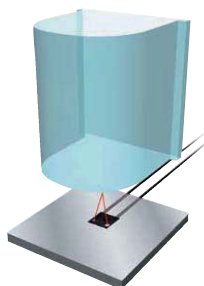
Cap orientation detection



**NF-DC08**  
(Small Flat ON)



Hoop existence detection



**NF-DC39**  
(Flat ON)



Wafer notch detection



## Limited diffuse reflective type fiber units (glass substrate detection)

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

●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.

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

Limited diffuse reflective type fiber units (glass substrate detection)

Photoelectric Sensors

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

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model	
		D3RF	D2RF	BRF				
Glass substrate detection	<p>Alignment, Heat resistant to 250°C</p>	<p>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</p>	<p>Long 4 to 20 Std 4 to 20 Fast 4 to 15</p>	<p>4 to 17</p>	<p>-20 to +250°C (Normal temperature side: -20 to +70°C)</p>	R25	NF-DH10	
	<p>Alignment, Heat resistant to 250°C</p>	<p>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</p>	<p>Long 6 to 38 Std 7 to 30 Fast 8 to 25</p>	<p>8 to 25</p>	<p>-20 to +250°C (Normal temperature side: -20 to +70°C)</p>	R25	NF-DH11	
	<p>Existence detection, Free cut</p>	<p>7-EL 0 to 12 6-UL 0.5 to 11 5-PL 1.5 to 10 4-LG 1.5 to 10</p>	<p>3-ST 2.5 to 8 2-FS 3.5 to 7.5 1-HS 4.5 to 6</p>	<p>Long 2 to 9 Std 4 to 8 Fast 5 to 6</p>	<p>3.5 to 7</p>	-40 to +60°C	R10	NF-DC38 <span style="background-color: red; color: white; padding: 2px;">Low cost</span>
	<p>Existence detection, Free cut</p>	<p>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</p>	<p>Long 4 to 15 Std 5 to 12 Fast 7 to 10</p>	<p>7</p>	-40 to +60°C	R10	NF-DC07	
	<p>Existence detection, Heat resistant to 180°C, Free cut</p>	<p>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</p>	<p>Long 0 to 20 Std 0 to 10 Fast 0 to 8</p>	<p>10</p>	-60 to +180°C	R25	NF-DH08	
	<p>Existence detection, Heat resistant to 300°C</p>	<p>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</p>	<p>Long 0 to 15 Std 0 to 10 Fast 0 to 8</p>	<p>6</p>	-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)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
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 Detecting part detail 	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)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
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	0 to 4	-40 to +60°C	R10	NF-DC39 <span style="background-color: red; color: white; padding: 2px;">Low cost</span>
	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

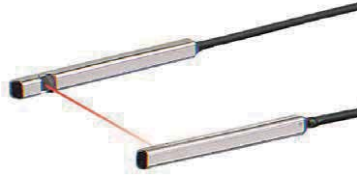
Fiber amplifier

D3RF  
P.110

Fiber amplifier

BRF  
P.130

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



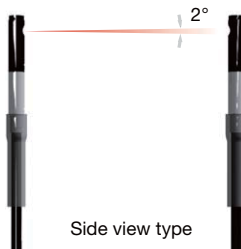
- Long range detection together with minimized light leakage
- Retro-reflective type and diffuse type also available for wafer mapping

## Ultra-narrow view and ultra-thin type

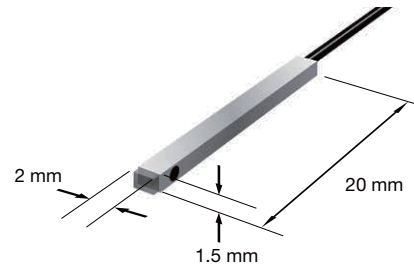
Aperture 2° or less Ultra-narrow view

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.

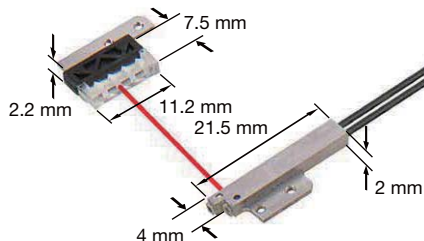


## Retro-reflective types and diffuse types are also available

## 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

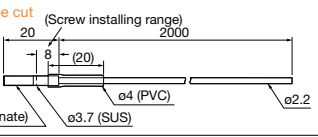
## Diffuse type and limited diffuse reflective type are also available

Diffuse type NF-DR09

Limited diffuse reflective type NF-DC03

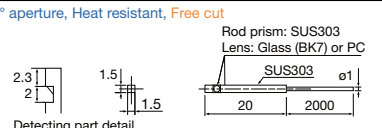
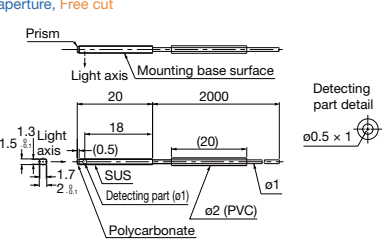
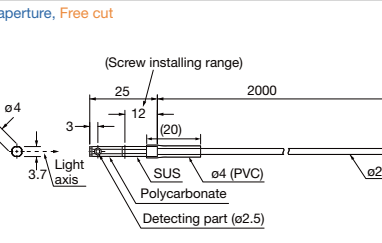
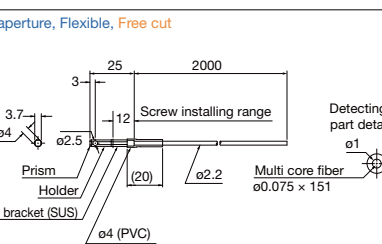
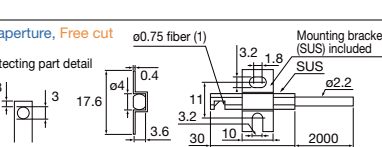
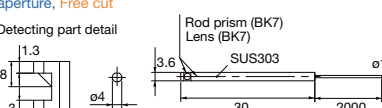


Narrow view/wafer mapping fiber units (through-beam type)

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Through-beam type ø3.7	2° aperture, Free cut Detecting part (ø2.2)  (Screw installing range) ø3.5 (polycarbonate) ø3.7 (SUS)	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	-40 to +60°C	R25	<b>NF-TG01</b> 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)			Ambient temperature	Bending radius (mm)	Model												
		D3RF	D2RF	BRF															
Side view Through-beam type	2.5° aperture, Heat resistant, Free cut Detecting part detail  Rod prism: SUS303 Lens: Glass (BK7) or PC	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	-40 to +105°C	R10	<b>NF-TS25</b>												
	3° aperture, Free cut Prism Light axis Mounting base surface Detecting part detail  ø0.5 x 1	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	-40 to +60°C				R10	<b>NF-TG04</b> Ultra-thin										
	2° aperture, Free cut (Screw installing range) Light axis  ø4 (PVC) Polycarbonate Detecting part (ø2.5)	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							-40 to +60°C	R25	<b>NF-TG03</b> Ultra-narrow view							
	2° aperture, Flexible, Free cut Detecting part detail  Multi core fiber ø0.075 x 151	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										-40 to +60°C	R1	<b>NF-TG02</b> Ultra-narrow view				
	5° aperture, Free cut Detecting part detail  ø0.75 fiber (1) Mounting bracket (SUS) included	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	-40 to +70°C	R25	<b>NF-TS12</b>
	3° aperture, Free cut Detecting part detail  Rod prism (BK7) Lens (BK7) SUS303	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			

● 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.

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

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

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Retro-reflective type	<p>Wafer mapping, Ultra-small type, Free cut</p> <p>4 x 2</p>	<ul style="list-style-type: none"> <li>7-EL 590</li> <li>6-UL 550</li> <li>5-PL 480</li> <li>4-LG 420</li> <li>3-ST 270</li> <li>2-FS 180</li> <li>1-HS 70</li> </ul>	<ul style="list-style-type: none"> <li>Long 350</li> <li>Std 230</li> <li>Fast 130</li> </ul>	Unusable	-40 to +60°C	R10	<p><b>NF-RG01</b></p> <p>Ultra-thin</p>
Diffuse type	<p>Long range detection, Flexible, Free cut</p> <p>Square</p>	<ul style="list-style-type: none"> <li>7-EL 1,070</li> <li>6-UL 990</li> <li>5-PL 880</li> <li>4-LG 770</li> <li>3-ST 500</li> <li>2-FS 310</li> <li>1-HS 90</li> </ul>	<ul style="list-style-type: none"> <li>Long 600</li> <li>Std 380</li> <li>Fast 200</li> </ul>	250	-40 to +60°C	R1	<p><b>NF-DR09</b></p>
Limited diffuse reflective type	<p>Possible to detect object even at a thickness of 0.5 mm, Free cut</p> <p>Square</p>	<ul style="list-style-type: none"> <li>7-EL 2 to 310</li> <li>6-UL 3 to 160</li> <li>5-PL 4 to 130</li> <li>4-LG 5 to 120</li> <li>3-ST 5 to 110</li> <li>2-FS 10 to 95</li> <li>1-HS 12 to 60</li> </ul>	<ul style="list-style-type: none"> <li>Long 10 to 55</li> <li>Std 10 to 45</li> <li>Fast 13 to 35</li> </ul>	55	-40 to +60°C	R25	<p><b>NF-DC03</b></p>

- The sensing distances for the diffuse type fiber units are values on 500 x 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



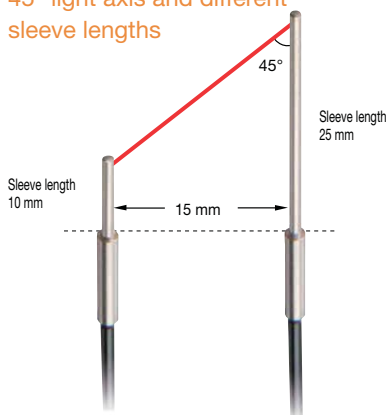
Low cost nut type → P.35  
 Flexible R2 mm nut type → P.58

## 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

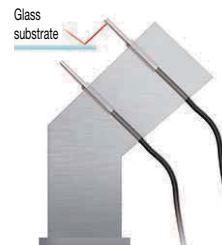
#### Vertical mounting

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

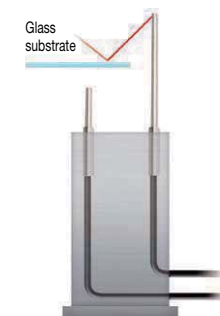


#### Angled mounting

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



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



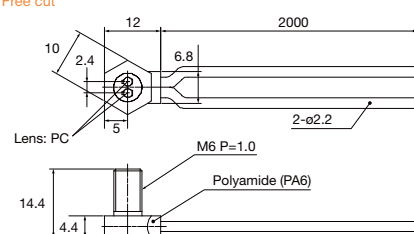
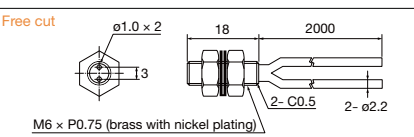
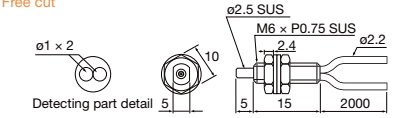
## Heat resistant &lt;130°C or below&gt; fiber units (through-beam type)

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model	
		D3RF	D2RF	BRF				
Through-beam type	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	<b>NF25-TH</b> 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	<b>NF-TS22M</b>
	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	<b>NF-TS25</b>
	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	<b>NF-TH06</b>	
	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	<b>NF-TH01</b> 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)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Diffuse type	<p>105°C</p> 	<p>7-EL 650</p> <p>6-UL 350</p> <p>5-PL 280</p> <p>4-LG 240</p> <p>3-ST 175</p> <p>2-FS 100</p> <p>1-HS 25</p>	<p>Long 120</p> <p>Std 80</p> <p>Fast 25</p>	15	-40 to +105°C	R25	<p><b>NF25-DH</b></p> <p>Space-saving</p>
	<p>Free cut</p> 	<p>7-EL 950</p> <p>6-UL 500</p> <p>5-PL 450</p> <p>4-LG 400</p>	<p>3-ST 250</p> <p>2-FS 130</p> <p>1-HS 40</p>	160	-40 to +105°C	R25	<p><b>FD-3SD1(100)</b></p> <p>Standard item</p>
	<p>Free cut</p> 	<p>7-EL 850</p> <p>6-UL 550</p> <p>5-PL 450</p> <p>4-LG 375</p>	<p>3-ST 275</p> <p>2-FS 170</p> <p>1-HS 55</p>	110	-40 to +100°C (Note)	R25	<p><b>NF-DH02</b></p> <p>Low cost</p>

- 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

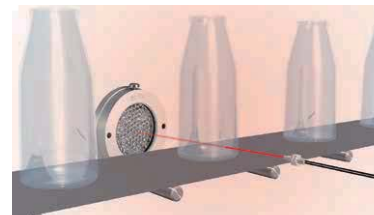
Possible to detect as retro-reflective type if the SW50 heat resistant reflector is used for the heat resistant diffuse type fiber. Demonstrates its strength in transparent object detection under high temperatures.

Reflector heat resistant to 300°C



**SW50**  
ø80 × 20 mm (ø50 mm reflective surface)

Glass bottle detection under high temperatures



# 1.5 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	
<b>NF-TH10</b> Heat resistant to 200°C	<b>NF-TH11</b> Heat resistant to 200°C	<b>NF-TH02</b> Heat resistant to 180°C	<b>NF-TH04S-27V2</b> Heat resistant to 200°C	<b>NF-TH05S-A</b> 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	
<b>NF-TH12</b> Heat resistant to 200°C	<b>NF-TH13</b> Heat resistant to 200°C	<b>NF-TH14</b> Heat resistant to 200°C	<b>NF-TH15</b> Heat resistant to 200°C	<b>NF-TH16</b> 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

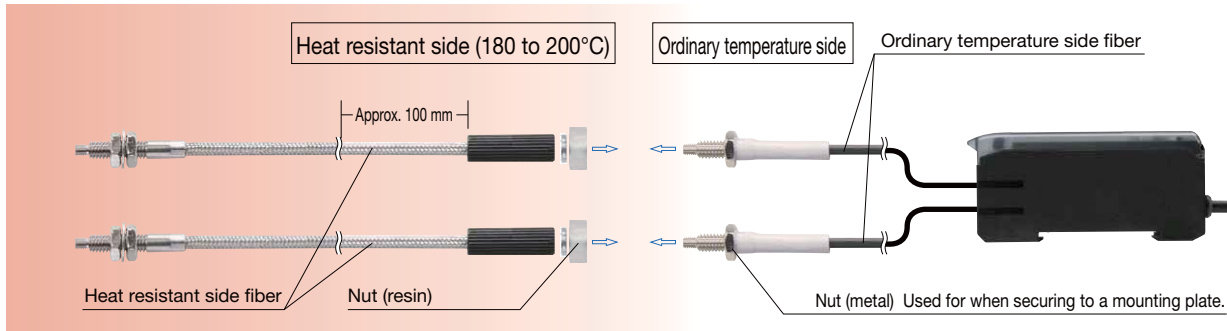
Coaxial	Standard
<b>NF-DH07</b> Heat resistant to 200°C	<b>NF-DH01</b> Heat resistant to 200°C
Metal sheath	Free cut

#### Limited diffuse reflective type

Glass substrate detection
<b>NF-DH08</b> Heat resistant to 180°C
Free cut

## 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)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
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 <span style="border: 1px solid orange; padding: 2px;">Standard item</span>
	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.

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

Photoelectric Sensors

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

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Through-beam type	<p>Heat resistant side: 300 mm long, Only the ordinary temperature side is free cut</p>	<p>7-EL 1,080 6-UL 990 5-PL 900 4-LG 790 3-ST 510 2-FS 290 1-HS 90</p>	<p>Long 550 Std 350 Fast 170</p>	220	-60 to +200°C	Heat resistant side R18 Ordinary temperature side R25	NF-TH13
	<p>Heat resistant side: 500 mm long, Only the ordinary temperature side is free cut</p>	<p>7-EL 1,080 6-UL 990 5-PL 900 4-LG 790 3-ST 510 2-FS 290 1-HS 90</p>	<p>Long 550 Std 350 Fast 170</p>	220	-60 to +200°C	Heat resistant side R18 Ordinary temperature side R25	NF-TH14
	<p>Side-view, Heat resistant side: 500 mm long, Only the ordinary temperature side is free cut</p>	<p>7-EL 900 6-UL 870 5-PL 760 4-LG 660 3-ST 430 2-FS 260 1-HS 80</p>	<p>Long 500 Std 300 Fast 150</p>	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)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Through-beam type	<p>Side-view, Heat resistant side: 800 mm long, Only the ordinary temperature side is free cut</p>	<p>7-EL 900 6-UL 870 5-PL 760 4-LG 660 3-ST 430 2-FS 260 1-HS 80</p>	<p>Long 500 Std 300 Fast 150</p>	150	-60 to +200°C	Heat resistant side R18 Ordinary temperature side R25	NF-TH16
	<p>o1 sleeve: 27 mm long, Side view</p>	<p>7-EL 450 6-UL 260 5-PL 240 4-LG 200 3-ST 140 2-FS 70 1-HS 20</p>	<p>Long 120 Std 80 Fast 50</p>	50	-40 to +200°C	R30	NF-TH04S-27V2 <small>Made-to-order products</small>
	<p>o1.5 sleeve: 25 mm long, Side view</p>	<p>7-EL 1,600 6-UL 850 5-PL 800 4-LG 600 3-ST 400 2-FS 200 1-HS 60</p>	<p>Long 350 Std 250 Fast 150</p>	150	-40 to +200°C	R30	NF-TH05S-A <small>Made-to-order products</small>
	<p>o1 sleeve: 8 mm long, Side view</p> <p>Detecting part detail</p>	<p>7-EL 300 6-UL 160 5-PL 150 4-LG 100</p> <p>3-ST 90 2-FS 40 1-HS 14</p>	<p>Long 125 Std 60 Fast 30</p>	50	-40 to +200°C	R50	NF-TH07
180°C	<p>Free cut</p>	<p>7-EL 4,000 6-UL 2,200 5-PL 1,700 4-LG 1,500</p> <p>3-ST 1,000 2-FS 550 1-HS 180</p>	<p>Long 1,000 Std 700 Fast 350</p>	600	-40 to +180°C (Note)	R35	NF-TH02 <small>Standard item</small>

●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.

Photoelectric Sensors

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





16

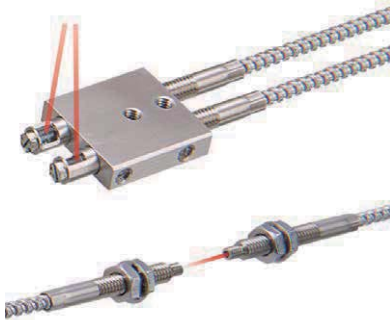
# Heat resistant (250 to 350°C)

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.


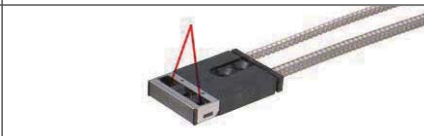
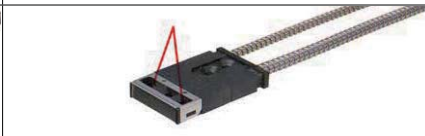
#### Through-beam type

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
		

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



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

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

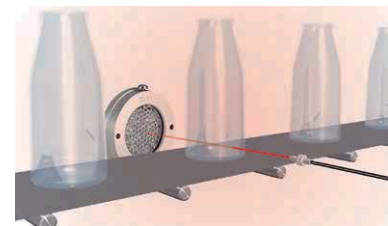
Possible to detect as retro-reflective type if the SW50 heat resistant reflector is used for the heat resistant diffuse type fiber. Demonstrates its strength in transparent object detection under high temperatures.

Reflector heat resistant to 300°C



SW50  
ø80 × 20 mm (ø50 mm reflective surface)

Glass bottle detection under high temperatures



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

Photoelectric Sensors

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

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Limited diffuse reflective type	<p>300°C</p> <p>Glass substrate detection Flat ON</p>	<p>7-EL 0 to 40</p> <p>6-UL 0 to 34</p> <p>5-PL 0 to 22</p> <p>4-LG 0 to 18</p> <p>3-ST 0 to 17</p> <p>2-FS 0 to 9</p> <p>1-HS 0 to 4</p>	<p>Long 0 to 15</p> <p>Std 0 to 10</p> <p>Fast 0 to 8</p>	6	-30 to +300°C or -60 to +200°C	R25	NF-DH06
	<p>250°C</p> <p>Glass substrate alignment Flat ON</p>	<p>7-EL 2 to 28</p> <p>6-UL 2 to 24</p> <p>5-PL 2 to 23</p> <p>4-LG 3 to 23</p> <p>3-ST 3 to 20</p> <p>2-FS 3 to 18</p> <p>1-HS 4 to 11</p>	<p>Long 4 to 20</p> <p>Std 4 to 20</p> <p>Fast 4 to 15</p>	4 to 17	-20 to +250°C (Ordinary temperature side: -20 to +70°C)	R25	NF-DH10
	<p>250°C</p> <p>Glass substrate alignment Flat ON</p>	<p>7-EL 2 to 45</p> <p>6-UL 3 to 40</p> <p>5-PL 3 to 39</p> <p>4-LG 3 to 38</p> <p>3-ST 4 to 35</p> <p>2-FS 6 to 28</p> <p>1-HS 8 to 19</p>	<p>Long 6 to 38</p> <p>Std 7 to 30</p> <p>Fast 8 to 25</p>	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)			Ambient temperature	Bending radius (mm)	Model	
		D3RF	D2RF	BRF				
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	<b>NF-TY05</b>
	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	<b>NF-TY05-5</b>

● 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.

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

Chemical resistant fiber units (through-beam type)

Photoelectric Sensors

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

Type	Features/dimensions (mm)	Sensing distance (mm)			Ambient temperature	Bending radius (mm)	Model	
		D3RF	D2RF	BRF				
Through-beam type ø6	<p>Heat resistant, Free cut</p> <p>Degree of protection on IP67 (excluding coated surfaces that have been cut)</p>	<p>7-EL 4,000 6-UL 4,000 5-PL 4,000 4-LG 4,000 3,000</p>	<p>3-ST 2,800 2-FS 2,000 1-HS 700</p>	<p>Long 3,500 Std 2,500 Fast 1,200</p>	2,000	-40 to +105°C	R60	NF-TY01
	<p>Heat resistant, Fiber length: 3 m, Free cut</p> <p>Degree of protection on IP67 (excluding coated surfaces that have been cut)</p>	<p>7-EL 4,000 6-UL 4,000 5-PL 4,000 4-LG 3,500</p>	<p>3-ST 3,000 2-FS 1,700 1-HS 500</p>	<p>Long 2,200 Std 1,300 Fast 550</p>	650	-40 to +105°C	R60	NF-TY01-3
	<p>Side view, Free cut</p> <p>Degree of protection on IP67 (excluding coated surfaces that have been cut)</p>	<p>7-EL 4,000 6-UL 3,500 5-PL 2,800 4-LG 2,000</p>	<p>3-ST 1,500 2-FS 700 1-HS 200</p>	<p>Long 1,500 Std 800 Fast 400</p>	500	-40 to +70°C	R60	NF-TY02
	<p>Side view, Free cut</p> <p>Degree of protection on IP67 (excluding coated surfaces that have been cut)</p>	<p>7-EL 4,000 6-UL 3,500 5-PL 3,000 4-LG 2,000</p>	<p>3-ST 1,500 2-FS 700 1-HS 200</p>	<p>Long 1,500 Std 800 Fast 400</p>	480	-40 to +70°C	Fiber R25 Tube R60	NF-TY02-TF3
	<p>Elbow, Free cut</p> <p>Degree of protection on IP67 (excluding coated surfaces that have been cut)</p>	<p>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</p>	<p>3-ST 160 2-FS 145 1-HS 85</p>	<p>Long 3,000 Std 1,700 Fast 800</p>	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)			Ambient temperature	Bending radius (mm)	Model	
		D3RF	D2RF	BRF				
Diffuse type ø6	<p>Heat resistant, Free cut</p> <p>Degree of protection on IP67 (excluding coated surfaces that have been cut)</p>	<p>7-EL 440 6-UL 280 5-PL 250 4-LG 225</p>	<p>3-ST 160 2-FS 145 1-HS 85</p>	<p>Long 100 Std 70 Fast 50</p>	45	-40 to +100°C	R60	NF-DY01 <small>Only in industry</small>

● 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)



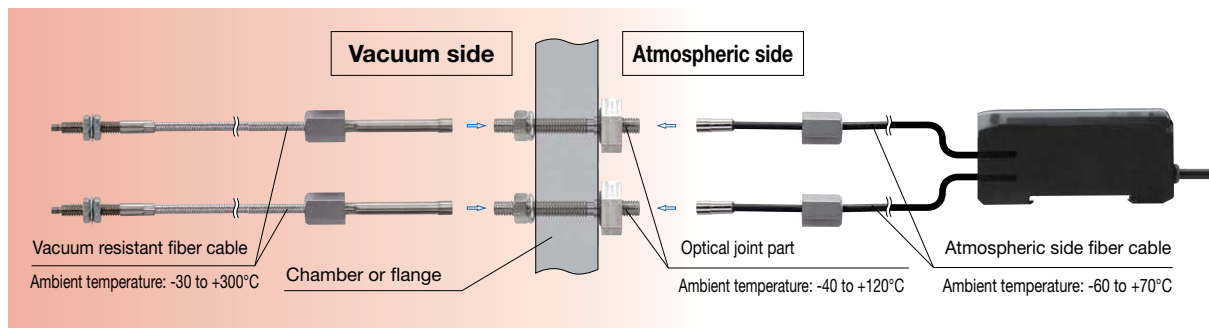
NF-DN01 (diffuse type)



NF-DN02 (limited diffuse reflective type)



### Product composition



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





Vacuum resistant fiber cable (diffuse type)

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

- 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)			Ambient temperature	Bending radius (mm)	Model
		D3RF	D2RF	BRF			
Limited diffuse reflective type	<p>Glass substrate detection, Free cut (atmospheric side)</p>	<p>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</p>	<p>Long 0 to 8 Std 2.5 to 5 Fast Unusable</p>	<p>3</p>	<p>-30 to +300°C</p>	<p>Vacuum side R18 Atmospheric side R25</p>	<p>NF-DN02</p>
	<p>&lt;Diagram for attaching the included mounting bracket&gt;</p>						

- 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.110Fiber amplifier  
BRF  
BIF  
P.130

## Fiber units for detecting liquid

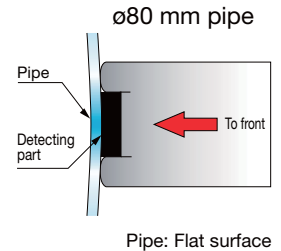
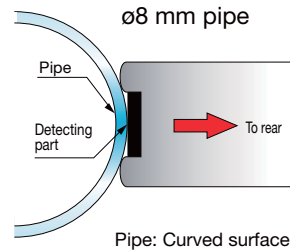
- Select based on applications for liquid level, liquid leakage, and water detection
- Array type NF-DF07 that can be mounted on  $\varnothing 8$  to  $\varnothing 80$  mm pipes
- A liquid accumulation prevention structure is used for all liquid level contact type models.

### Liquid level detection 1: Pipe-mounted type

#### Array type mountable on $\varnothing 8$ to $\varnothing 80$ 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  $18 \times 8.75$  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  $\varnothing 80$  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.



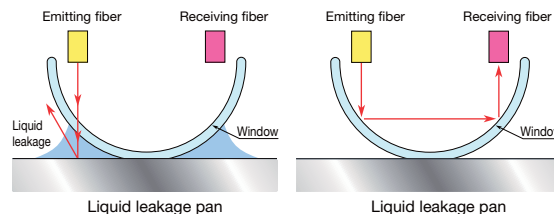
Liquid leakage detection

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	<p>For detecting upper limit level, Free cut</p>	<p>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</p>	-40 to +70°C	R10	NF-DF07
	<p>For detecting lower limit level, Free cut</p>	<p>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</p>	-20 to +60°C	Protective tube R20 Fiber R4	NF-TF01
	<p>For detecting upper limit level, Heat resistant, Free cut</p>	<p>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</p>	-40 to +100°C	R10	NF-DF05
	<p>For detecting upper limit level, Heat resistant, Free cut</p>	<p>For transparent pipes with outer diameter of ø6 to 26 mm and thickness of 1 to 3 mm With mounting position adjusting lever</p>	-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.

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

Liquid level detection fiber

Type	Dimensions (unit: mm)	Details	Ambient temperature	Bending radius (mm)	Model
Liquid level detection (Liquid level contact type)	<p>Heat resistant, Free cut</p>	<p>Liquid level contact type, liquid accumulation prevention structure                      Protective tube: Fluoroplastic 500 mm long (can be cut)                      Heat resistant to +105°C</p>	-40 to +105°C	Protective tube R20 Fiber R10	NF-DF08
	<p>Free cut</p>	<p>Liquid level contact type, liquid accumulation prevention structure                      Protective tube: Fluoroplastic 2 m long (can be cut)</p>	-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	<p>Free cut</p>	<p>SEMI S2 supported                      Through use of capillary phenomenon can also detect minor liquid leakage and viscous liquid</p>	-20 to +50°C	Protective tube R20 Fiber R4	NF-DW02
	<p>SUS mounting bracket</p> <p>PVC mounting bracket</p>	<p>Included mounting brackets can be purchased separately.                      NF-DA52 (SUS mounting bracket)                      NF-DA53 (PVC mounting bracket)</p>			

● 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.

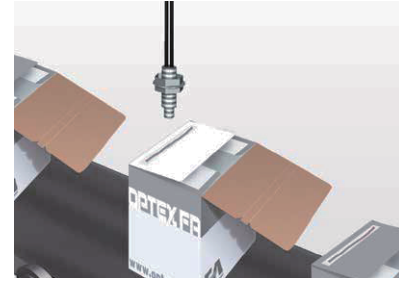
### Water detection fiber

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	Heat resistant 	7-EL <b>650</b> 6-UL <b>350</b> 5-PL <b>300</b> 4-LG <b>250</b> 3-ST <b>230</b> 2-FS <b>150</b> 1-HS <b>60</b>	100	-40 to +200°C	R25	<b>NF-TW01</b>
		7-EL <b>280</b> 6-UL <b>125</b> 5-PL <b>110</b> 4-LG <b>100</b> 3-ST <b>85</b> 2-FS <b>45</b> 1-HS <b>20</b>	30	-40 to +200°C	R25	<b>NF-DW01</b>
Diffuse type	Heat resistant 					

- 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.

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

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)							Ambient temperature	Model
			7-EL	6-UL	5-PL	4-LG	3-ST	2-FS	1-HS		
Long range lens	<b>Standard</b> 	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			
	<b>Heat resistant</b> 	NF-TB01	4,000	4,000	4,000	4,000	4,000	2,000	360	-40 to +350°C	NF-TA03 (2 pieces) <span style="background-color: red; color: white; padding: 2px;">Low cost</span>
		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			
<b>SUS housing</b> 	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			
Ultra-long range lens	<b>Heat resistant</b> 	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	<b>Standard</b> 	NF-TB01	3,600	2,500	2,000	1,600	1,200		
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		
NF-TH01	4,000			2,400	2,300	2,000	1,200	800	250		
<b>Heat resistant</b> 	NF-TB02		4,000	2,400	2,300	2,000	1,200	800	250	-60 to +300°C	NF-TA05 (2 pieces) <span style="background-color: red; color: white; padding: 2px;">Low cost</span>
	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.

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



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	<b>Standard</b> 	NF-TB01	3,500	3,500	1,500	3,000	-40 to +100°C	<b>NF-TA01</b> (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		
	<b>Heat resistant</b> 	NF-TB01	3,500	3,500	600	3,500	-40 to +350°C	<b>NF-TA03</b> (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		
<b>SUS housing</b> 	NF-TB01	3,500	3,500	1,500	3,000	-40 to +100°C	<b>NF-TA01S</b> (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	<b>Heat resistant</b> 	NF-TB01	3,500	3,500	3,500	3,500	-60 to +350°C	<b>NF-TA04</b> (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	<b>Standard</b> 	NF-TB01	1,500	800		
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		
<b>Heat resistant</b> 	NF-TB01		1,800	900	400	500	-60 to +300°C	<b>NF-TA05</b> (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.

Photoelectric Sensors

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