

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 conveyor 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



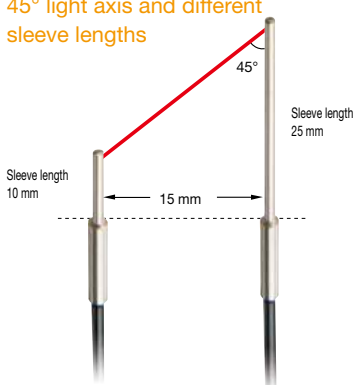
Low cost nut type → P.35
Flexible R2 mm nut type → P.58

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



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>Free cut</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>NF25-DH</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 300</p> <p>Std 180</p> <p>Fast 180</p> <p>80</p> | 160 | -40 to +105°C | R25 | <p>FD-3SD1(100)</p> <p>Standard item</p> |
| | <p>100°C</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>NF-DH02</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

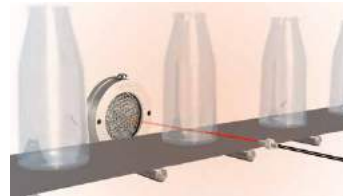
Possible to detect as retro-reflective type if the SW50 heat resistant reflector is used for the heat resistant diffuse type fiber. Demonstrates its strength in transparent object detection under high temperatures.

Reflector heat resistant to 300°C



SW50
ø80 × 20 mm (ø50 mm reflective surface)

Glass bottle detection under high temperatures



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

Notes for fiber sensor usage

Correct use

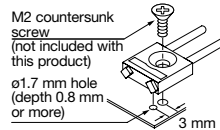
⚠ Do not use this product as a detection device for protecting the human body.

Mounting

■ Mounting fibers with positioning bosses

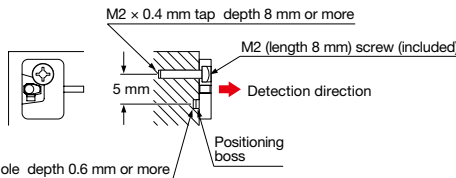
<NF-DC08>

- Use an M2 countersunk screw (not included with this product). The positioning boss insertion holes on the bottom surface need to be $\phi 1.7$ mm and at least 0.8 mm deep.

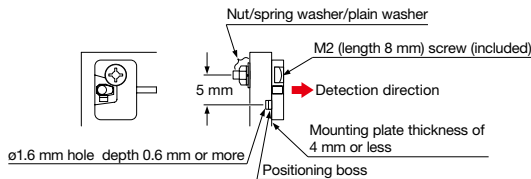


<NF-TE01/NF-DE01 (Flat ON type)>

If cutting a tap into the mounting surface



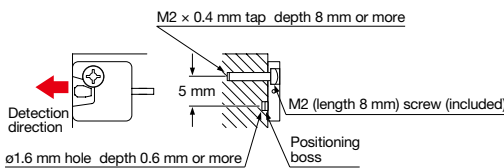
If using the included screw/nut



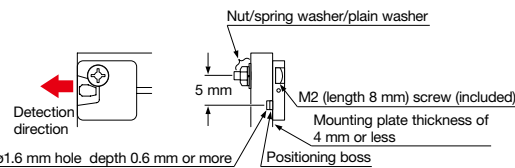
- (Note 1): The above diagram shows NF-TE01. The same mounting method is used for NF-DE01.
- (Note 2): Through-beam type fibers have the same shape. When mounting, pay attention to the positions of the mounting screw hole and positioning boss hole.

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

If cutting a tap into the mounting surface

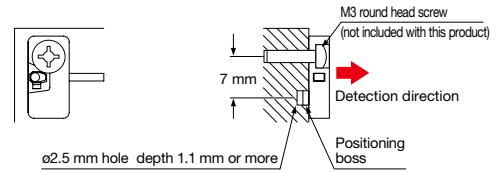


If using the included screw/nut



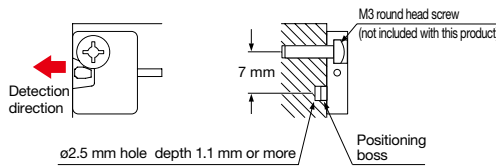
- (Note 1): The above diagram shows NF-TE02. The same mounting method is used for NF-DE02.
- (Note 2): Through-beam type fibers have the same shape. When mounting, pay attention to the positions of the mounting screw hole and positioning boss hole.

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



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

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

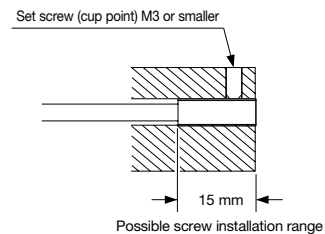


- (Note 1): The above diagram shows NF-TE04. The same mounting method is used for NF-DE04.
- (Note 2): Through-beam type fibers have the same shape. When mounting, pay attention to the positions of the mounting screw hole and positioning boss hole.

■ Mounting NF-DR09/-RR01

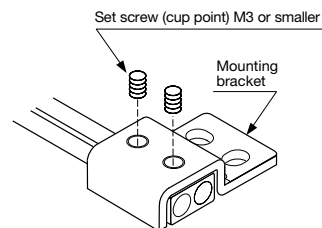
<If not using the included mounting bracket>

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



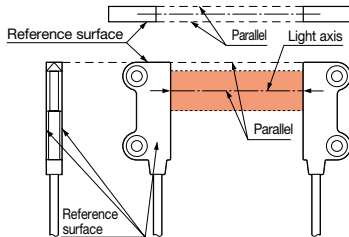
<If using the included mounting bracket>

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



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

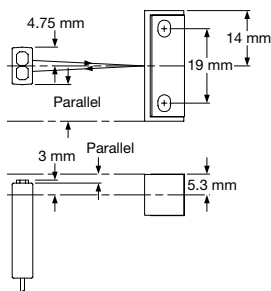
- Please be aware that because the aperture angle of this product is extremely narrow, light may not be taken in depending on installation conditions.
- When installing, determine a reference surface as shown in the diagram below while paying sufficient attention in regards to light axis shifting and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



Mounting NF-RB02

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

<Side ON type/NF-RB02>



<Notes regarding NF-RB02>

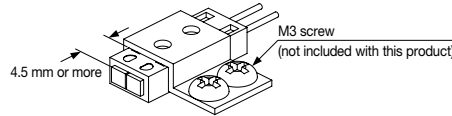
- If detecting items such as transparent objects, detection may be unstable if the objects are within range of 0 to 20 mm from the window.

If mounting using the included fiber mounting bracket

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

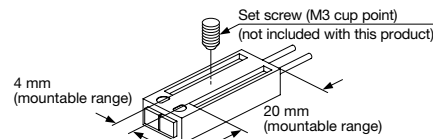
If mounting using the included fiber mounting bracket

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



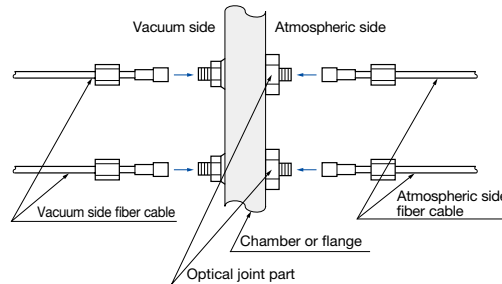
If mounting using an M3 set screw (cup point)

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



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

<Structure of vacuum resistant fibers>

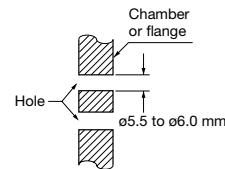


Leakage amount: 1.33×10^{-10} Pa·m³/s [He] or less

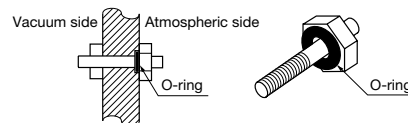
<Mounting>

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

(Note 1): Make the holes $\phi 5.5$ to $\phi 6.0$ mm.



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

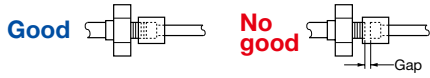


Notes for fiber sensor usage

Correct use

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

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



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

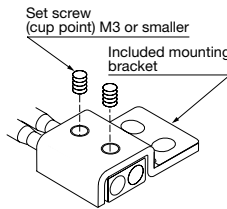
(Note 1): Tighten the nut securely.
If the nut is loose, there may be a gap, causing the sensing distance to drop.

5. Secure the tip of the vacuum side fiber.

<For NF-DN01>

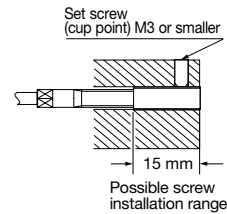
If using a mounting bracket

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



If not using a mounting bracket

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



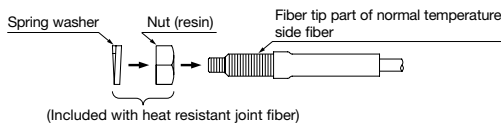
Mounting heat resistant joint fibers (NF-TH12/-TH13/-TH14/-TH15/-TH16)

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

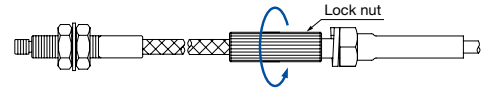
- Use the following procedure to connect normal temperature side fibers.

Procedure

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

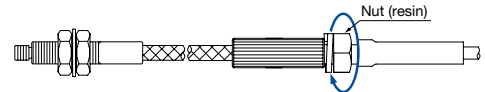


2. Mount the heat resistant joint fiber and normal temperature side fiber using a lock nut.



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

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

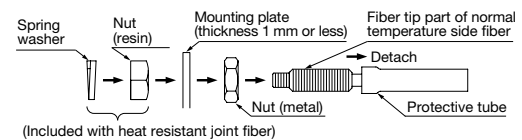


<If mounting connecting parts to the mounting plate>

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

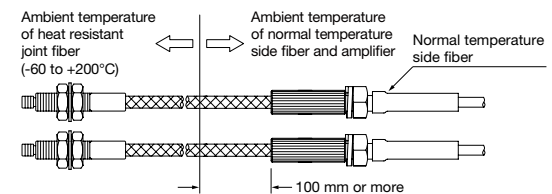
Procedure

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



<Operating Temperature>

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



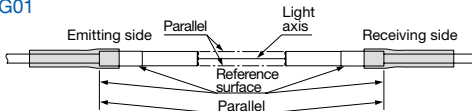
Mounting narrow view/wafer mapping fibers (NF-TG01/-TG02/-TG03/-TG04)

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

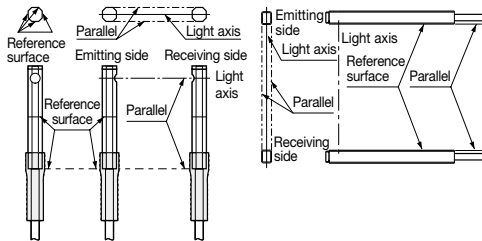
<Through-beam type>

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

NF-TG01



NF-TG02/-TG03/-TG04

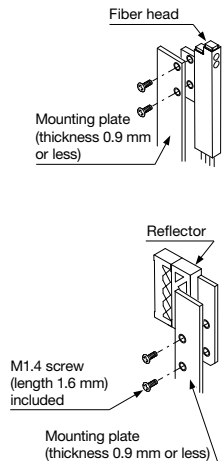


<Reflective type>

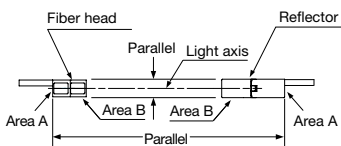
Use the included 1.6 mm M1.4 screws to mount the fiber head and reflector to the mounting plate as shown in the diagram to the right. The mounting plate needs to have a thickness of 0.9 mm or thinner.

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

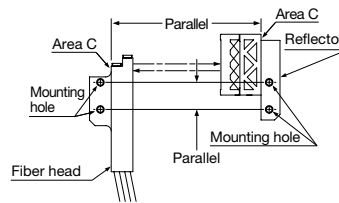
Install the parts so that the mounting holes for the fiber head and reflector are parallel to one another and so that parts A, B and C are each parallel as shown in the diagrams below. Pay sufficient attention for light axis shifting and slanting.



<Overhead view>

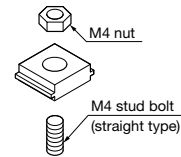


<Side view>

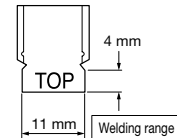


Mounting liquid leakage detection fibers (NF-DW02)

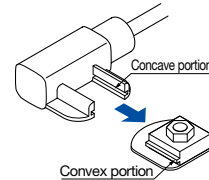
If using an SUS mounting bracket, thread a welded M4 stud bolt through the mounting hole on the mounting bracket and attach an M4 nut (not included with this product).



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

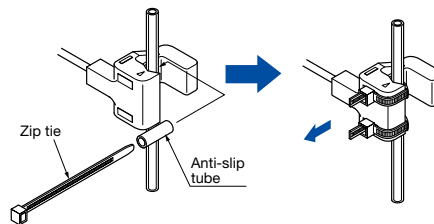


Slide the convex portion of the mounting bracket attached to the steel case into the concave portion on the fiber until a "click" is heard.

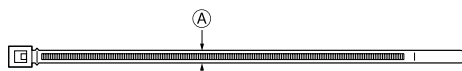


Mounting pipe-mounted liquid level detection fibers (NF-TF01)

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



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

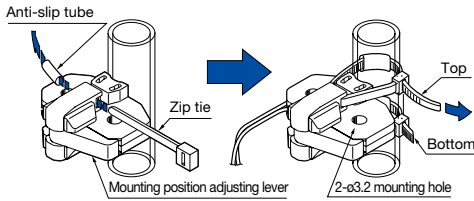


Notes for fiber sensor usage

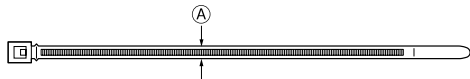
Correct use

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

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



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



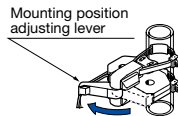
- M3 screws, plain washers and spring washers must be used when using the mounting holes. (M3 screws, plain washers and spring washers are not included with this product.)

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

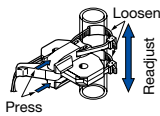
- The attachment position can be easily readjusted when using zip ties to mount this product.

Adjustment method

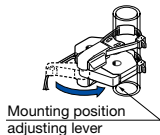
1. Pull the mounting position adjusting lever open in the direction of the arrow.



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



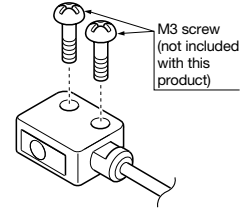
3. Close the mounting position adjusting lever in the direction of the arrow to return it to its original position.



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

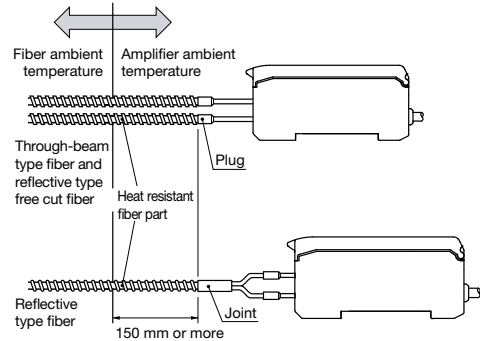
Mounting chemical resistant angled-head fibers (NF-TY05)

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



Notes regarding usage of heat resistant fibers

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



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

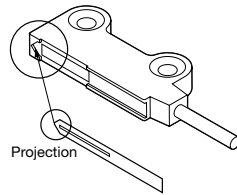
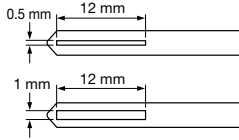
Notes about slit masks included with NF-TZ07/-TZ08/-TZ09/-TZ10

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

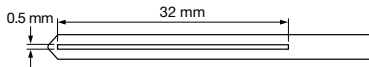
Included slit masks

How to apply

<NF-TZ09/-TZ10>



<NF-TZ07/-TZ08>

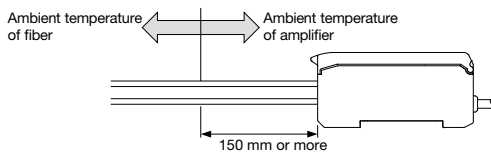


For NF-TY01(-□)/-TY02(-□)/-TY03-TF3/-TY04/-TY05(-□)/-DY01

- Avoid use with the chemicals listed below. Chemicals that may erode PFA including fused alkali metals (sodium, potassium, lithium, etc.), fluorine gas (F₂), ClF₃, OF₂ (including gaseous form), etc. Also, chemicals with high permeability including high temperature hydrofluoric acid, nitric acid, chlorine, etc.

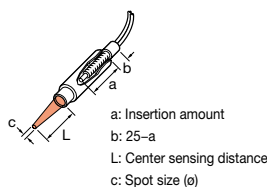
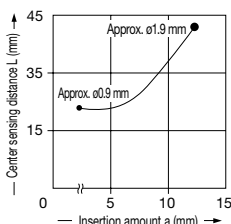
Notes regarding usage of NF-TY04/-DY01 (heat resistant type)

- In order to protect amplifiers, keep the heat resistant fiber part at least 150 mm from the boundary of the normal temperature side as shown in the diagram on the right.
- Do not directly expose amplifiers to radiation heat or hot air.

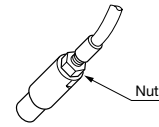


Notes regarding usage of NF-DA06

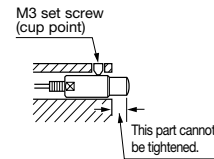
- Spot size and sensing distance can be adjusted depending on the fiber insertion amount. Be aware that if inserted too deeply, the fiber tip may become separated from the lens.



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

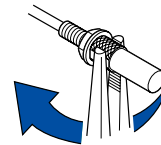


- If securing NF-DA06 using a set screw, use an M3 set screw (cup point).



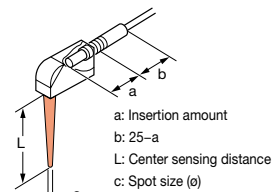
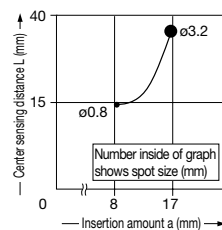
Notes regarding usage of NF-DA01/-DA02/-DA03/-DA04/-DA05

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

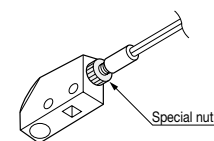


Notes regarding usage of NF-DA07

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



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



Photoelectric
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

Notes for fiber sensor usage

Correct use

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

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

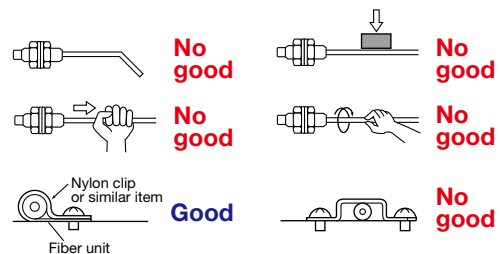
General notes

■ Regarding fiber units

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



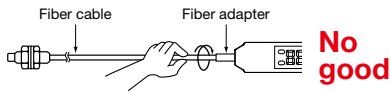
2. Do not bend or apply excessive force to the fiber.



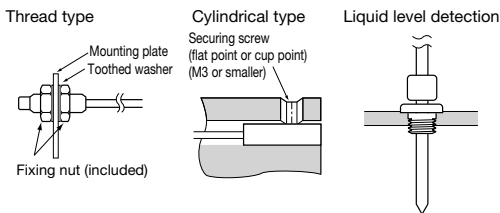
3. Do not apply excessive torque to the sensor head or use tools that do not match the nuts.



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



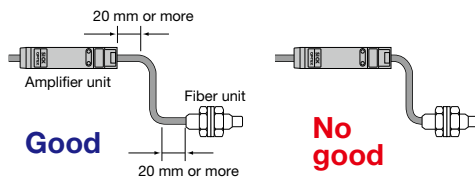
5. Depending on the bore shape of the sensor head, mount as shown in the diagrams below.



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

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

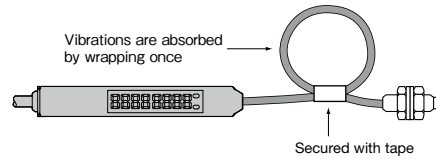
8. Allow for some wire to remain straight near the insertion and tip parts of the fiber unit.



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

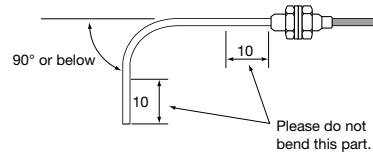
10. In areas subject to frequent vibration, secure so that the fiber unit itself will not vibrate. Especially work to limit vibrations from reaching connection points between the fiber and amplifier.

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



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

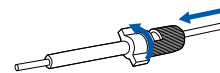
13. Do not bend the sleeve tip or base.



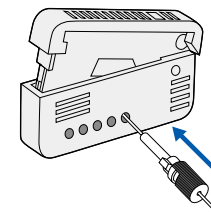
Regarding fiber cutters

Cutting procedure

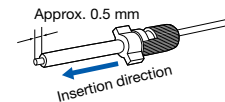
1. Adjust the length in the direction of the arrow, turn the stopper and lock the fiber in place.



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



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



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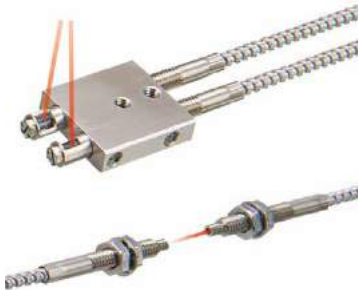
Heat resistant (250 to 350°C)

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 |
| | | |

Fiber units Heat resistant (250 to 350°C)

Heat resistant <250 to 350°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 | Lens attachable (P98) | 7-EL 1,440 6-UL 1,350 5-PL 1,240 4-LG 1,080 3-ST 710 2-FS 430 1-HS 130 | Long 750 Std 450 Fast 220 | 300 | -30 to +350°C or -60 to +200°C | R25 | NF-TH08 Standard item |
| | ø2.1 sleeve: 60 mm long | 7-EL 1,350 6-UL 1,260 5-PL 1,120 4-LG 900 3-ST 630 2-FS 410 1-HS 120 | Long 750 Std 450 Fast 220 | 300 | -30 to +350°C or -60 to +200°C | Fiber R25 Sleeve R10 | NF-TH09 |

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

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

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

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

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 350°C | <p>ø2.1 sleeve: 90 mm long</p> | <p>7-EL 1,110 6-SL 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> | <p>200</p> | <p>-30 to +350°C or -60 to +200°C</p> | <p>Fiber R25 Sleeve R10</p> | <p>NF-DH05</p> |
| | <p>ø2.8 sleeve: 60 mm long</p> | <p>7-EL 950 6-SL 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> | <p>300</p> | <p>-30 to +350°C or -60 to +200°C</p> | <p>Fiber R25 Sleeve R10</p> | <p>NF-DH04</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.

Heat resistant reflector

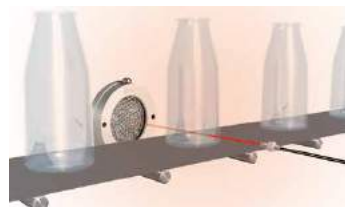
Possible to detect as retro-reflective type if the SW50 heat resistant reflector is used for the heat resistant diffuse type fiber. Demonstrates its strength in transparent object detection under high temperatures.

Reflector heat resistant to 300°C

Glass bottle detection under high temperatures



SW50
ø80 x 20 mm (ø50 mm reflective surface)



Notes for fiber sensor usage

Correct use

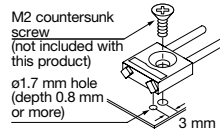
⚠ Do not use this product as a detection device for protecting the human body.

Mounting

■ Mounting fibers with positioning bosses

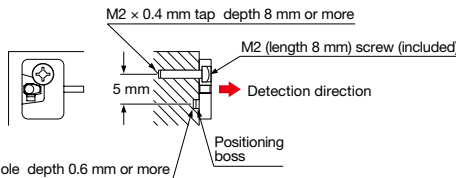
<NF-DC08>

- Use an M2 countersunk screw (not included with this product). The positioning boss insertion holes on the bottom surface need to be $\phi 1.7$ mm and at least 0.8 mm deep.

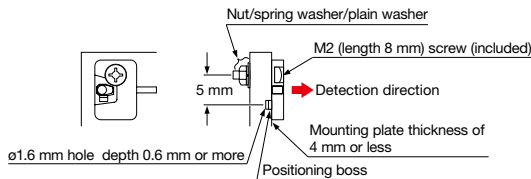


<NF-TE01/NF-DE01 (Flat ON type)>

If cutting a tap into the mounting surface



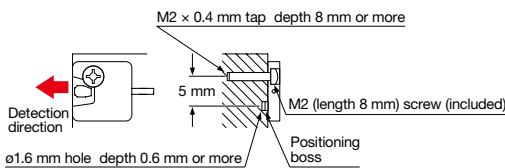
If using the included screw/nut



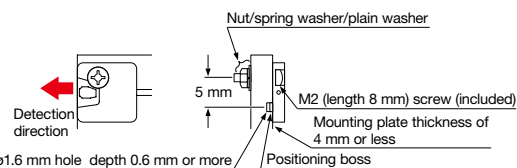
- (Note 1): The above diagram shows NF-TE01. The same mounting method is used for NF-DE01.
- (Note 2): Through-beam type fibers have the same shape. When mounting, pay attention to the positions of the mounting screw hole and positioning boss hole.

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

If cutting a tap into the mounting surface

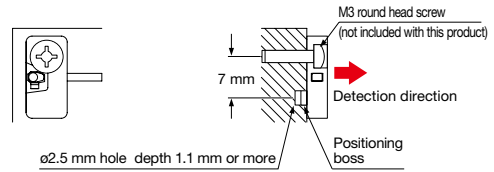


If using the included screw/nut



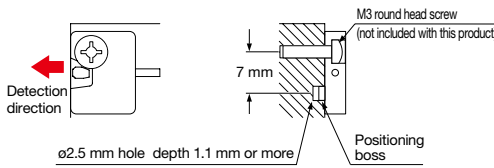
- (Note 1): The above diagram shows NF-TE02. The same mounting method is used for NF-DE02.
- (Note 2): Through-beam type fibers have the same shape. When mounting, pay attention to the positions of the mounting screw hole and positioning boss hole.

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



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

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

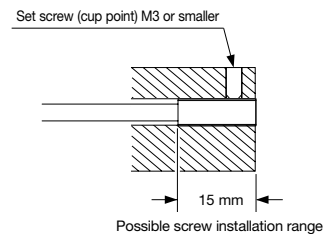


- (Note 1): The above diagram shows NF-TE04. The same mounting method is used for NF-DE04.
- (Note 2): Through-beam type fibers have the same shape. When mounting, pay attention to the positions of the mounting screw hole and positioning boss hole.

■ Mounting NF-DR09/-RR01

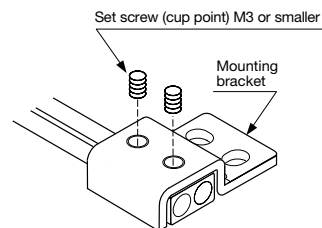
<If not using the included mounting bracket>

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



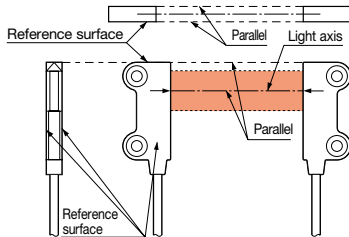
<If using the included mounting bracket>

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



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

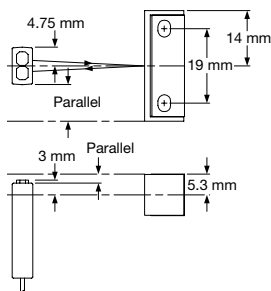
- Please be aware that because the aperture angle of this product is extremely narrow, light may not be taken in depending on installation conditions.
- When installing, determine a reference surface as shown in the diagram below while paying sufficient attention in regards to light axis shifting and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



Mounting NF-RB02

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

<Side ON type/NF-RB02>



<Notes regarding NF-RB02>

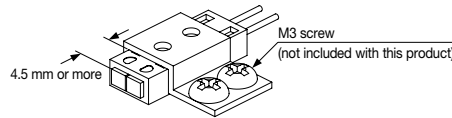
- If detecting items such as transparent objects, detection may be unstable if the objects are within range of 0 to 20 mm from the window.

If mounting using the included fiber mounting bracket

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

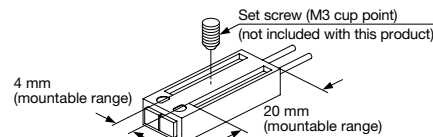
If mounting using the included fiber mounting bracket

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



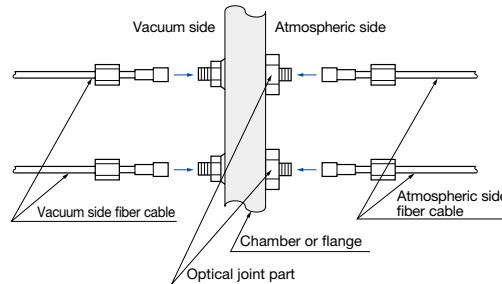
If mounting using an M3 set screw (cup point)

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



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

<Structure of vacuum resistant fibers>

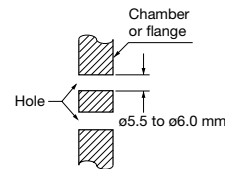


Leakage amount: 1.33×10^{-10} Pa·m³/s [He] or less

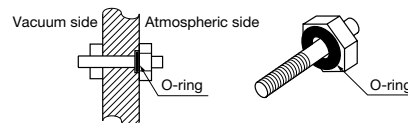
<Mounting>

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

(Note 1): Make the holes $\phi 5.5$ to $\phi 6.0$ mm.



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

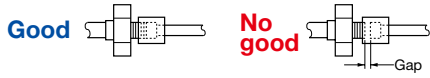


Notes for fiber sensor usage

Correct use

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

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



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

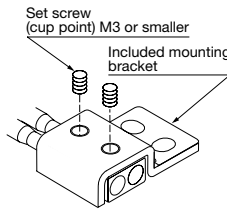
(Note 1): Tighten the nut securely.
If the nut is loose, there may be a gap, causing the sensing distance to drop.

- Secure the tip of the vacuum side fiber.

<For NF-DN01>

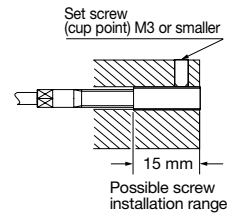
If using a mounting bracket

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



If not using a mounting bracket

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



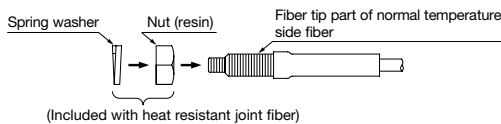
Mounting heat resistant joint fibers (NF-TH12/-TH13/-TH14/-TH15/-TH16)

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

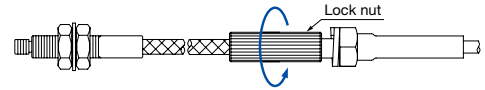
- Use the following procedure to connect normal temperature side fibers.

Procedure

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

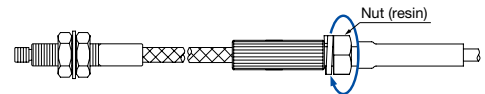


- Mount the heat resistant joint fiber and normal temperature side fiber using a lock nut.



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

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

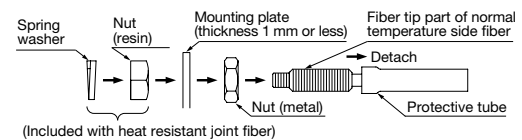


<If mounting connecting parts to the mounting plate>

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

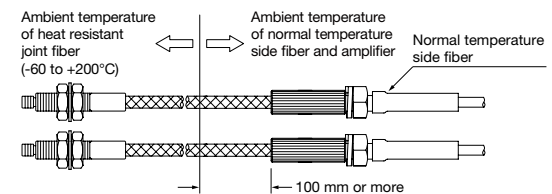
Procedure

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



<Operating Temperature>

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



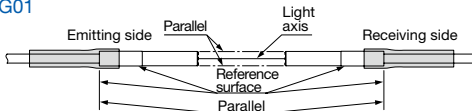
Mounting narrow view/wafer mapping fibers (NF-TG01/-TG02/-TG03/-TG04)

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

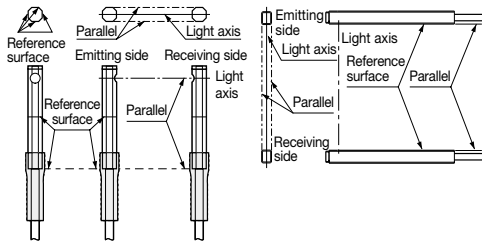
<Through-beam type>

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

NF-TG01

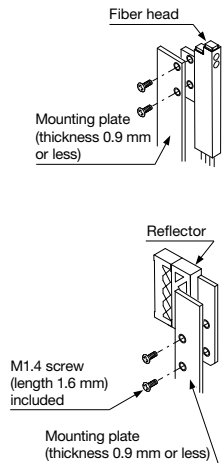


NF-TG02/-TG03/-TG04

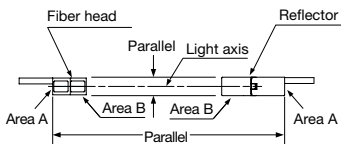


<Reflective type>

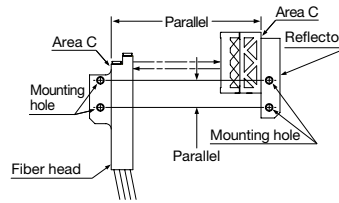
- Use the included 1.6 mm M1.4 screws to mount the fiber head and reflector to the mounting plate as shown in the diagram to the right. The mounting plate needs to have a thickness of 0.9 mm or thinner.
- Use a thread lock compound to tighten screws when mounting them in places with vibrations or shocks.
- Install the parts so that the mounting holes for the fiber head and reflector are parallel to one another and so that parts A, B and C are each parallel as shown in the diagrams below. Pay sufficient attention for light axis shifting and slanting.



<Overhead view>

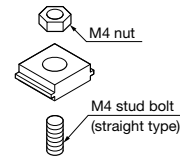


<Side view>

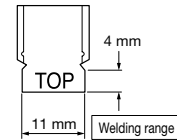


Mounting liquid leakage detection fibers (NF-DW02)

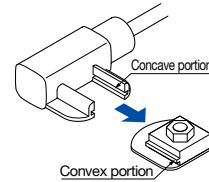
- If using an SUS mounting bracket, thread a welded M4 stud bolt through the mounting hole on the mounting bracket and attach an M4 nut (not included with this product).



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

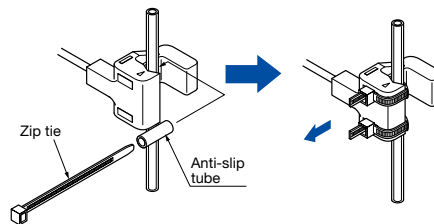


- Slide the convex portion of the mounting bracket attached to the steel case into the concave portion on the fiber until a "click" is heard.

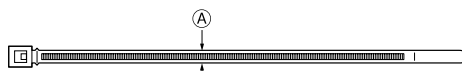


Mounting pipe-mounted liquid level detection fibers (NF-TF01)

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



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

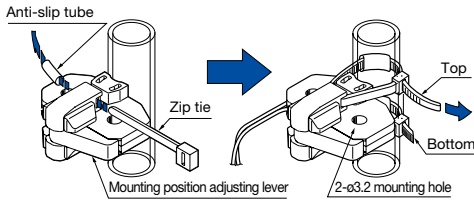


Notes for fiber sensor usage

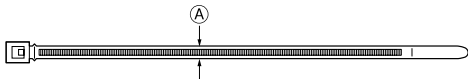
Correct use

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

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



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



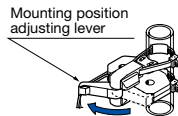
- M3 screws, plain washers and spring washers must be used when using the mounting holes. (M3 screws, plain washers and spring washers are not included with this product.)

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

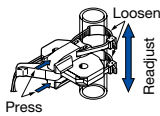
- The attachment position can be easily readjusted when using zip ties to mount this product.

■ Adjustment method

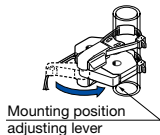
1. Pull the mounting position adjusting lever open in the direction of the arrow.



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



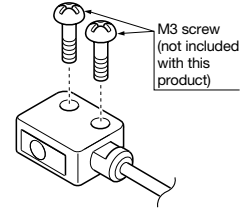
3. Close the mounting position adjusting lever in the direction of the arrow to return it to its original position.



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

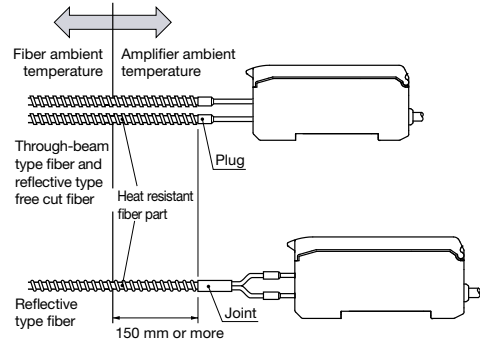
■ Mounting chemical resistant angled-head fibers (NF-TY05)

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



Notes regarding usage of heat resistant fibers

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



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

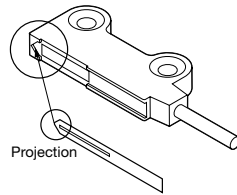
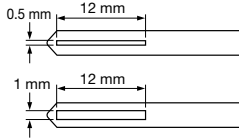
Notes about slit masks included with NF-TZ07/-TZ08/-TZ09/-TZ10

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

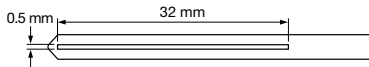
Included slit masks

How to apply

<NF-TZ09/-TZ10>



<NF-TZ07/-TZ08>

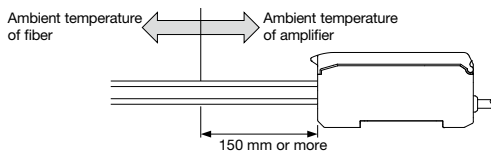


For NF-TY01(-□)/-TY02(-□)/-TY03-TF3/-TY04/-TY05(-□)/-DY01

- Avoid use with the chemicals listed below. Chemicals that may erode PFA including fused alkali metals (sodium, potassium, lithium, etc.), fluorine gas (F₂), ClF₃, OF₂ (including gaseous form), etc. Also, chemicals with high permeability including high temperature hydrofluoric acid, nitric acid, chlorine, etc.

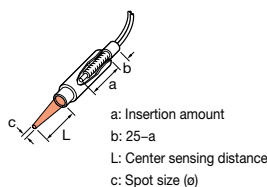
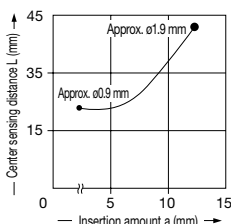
Notes regarding usage of NF-TY04/-DY01 (heat resistant type)

- In order to protect amplifiers, keep the heat resistant fiber part at least 150 mm from the boundary of the normal temperature side as shown in the diagram on the right.
- Do not directly expose amplifiers to radiation heat or hot air.

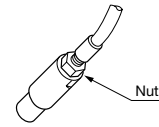


Notes regarding usage of NF-DA06

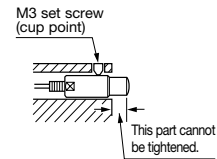
- Spot size and sensing distance can be adjusted depending on the fiber insertion amount. Be aware that if inserted too deeply, the fiber tip may become separated from the lens.



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

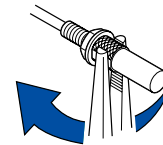


- If securing NF-DA06 using a set screw, use an M3 set screw (cup point).



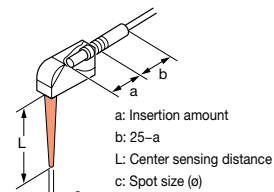
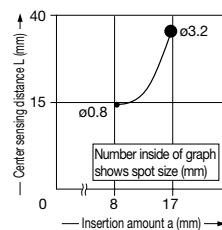
Notes regarding usage of NF-DA01/-DA02/-DA03/-DA04/-DA05

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

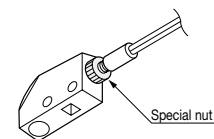


Notes regarding usage of NF-DA07

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



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



Photoelectric
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

Notes for fiber sensor usage

Correct use

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

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

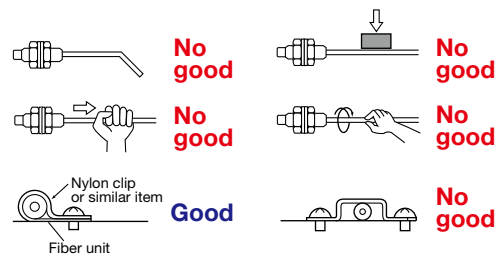
General notes

■ Regarding fiber units

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



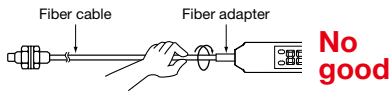
2. Do not bend or apply excessive force to the fiber.



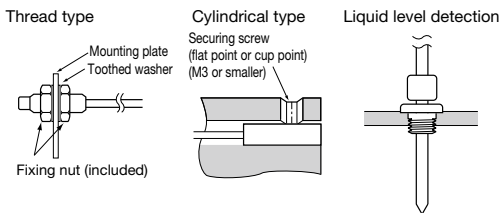
3. Do not apply excessive torque to the sensor head or use tools that do not match the nuts.



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



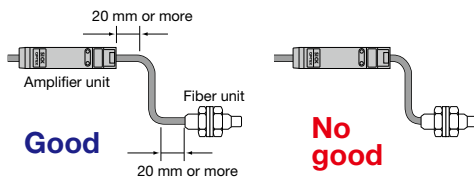
5. Depending on the bore shape of the sensor head, mount as shown in the diagrams below.



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

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

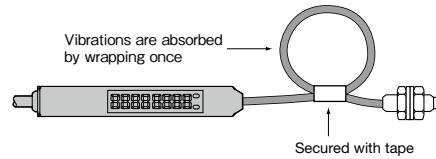
8. Allow for some wire to remain straight near the insertion and tip parts of the fiber unit.



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

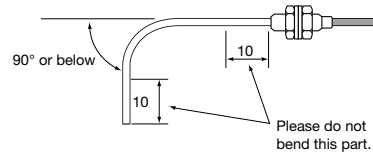
10. In areas subject to frequent vibration, secure so that the fiber unit itself will not vibrate. Especially work to limit vibrations from reaching connection points between the fiber and amplifier.

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



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

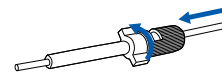
13. Do not bend the sleeve tip or base.



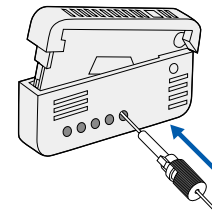
■ Regarding fiber cutters

Cutting procedure

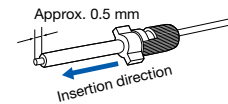
1. Adjust the length in the direction of the arrow, turn the stopper and lock the fiber in place.



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



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



Fiber units NF series

15 Heat resistant (180 to 200°C)

Related products

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



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



Fiber units for ambient temperatures of 180 to 200°C

New concept joint type also available

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






Various selection

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



Through-beam type (standard types)

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

Through-beam type (joint types)

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

Diffuse type

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

Limited diffuse reflective type

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



Fiber units Heat resistant (180 to 200°C)

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

| Type | Features/dimensions (mm) | Sensing distance (mm) | | | 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.

Fiber units Heat resistant (180 to 200°C)

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

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

- 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. Note: Light intensity retention rate of 85% or above after 1000 continuous work hours.

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

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

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

Heat resistant reflector

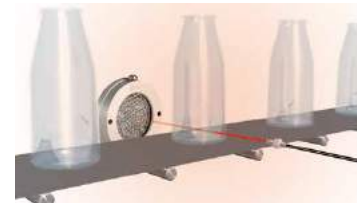
Possible to detect as retro-reflective type if the SW50 heat resistant reflector is used for the heat resistant diffuse type fiber. Demonstrates its strength in transparent object detection under high temperatures.

Reflector heat resistant to 300°C



SW50 ø80 x 20 mm (ø50 mm reflective surface)

Glass bottle detection under high temperatures



Notes for fiber sensor usage

Correct use

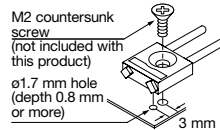
⚠ Do not use this product as a detection device for protecting the human body.

Mounting

■ Mounting fibers with positioning bosses

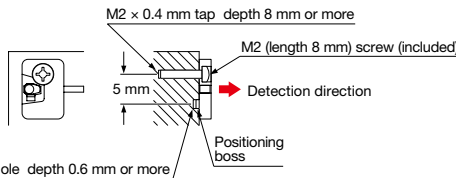
<NF-DC08>

- Use an M2 countersunk screw (not included with this product). The positioning boss insertion holes on the bottom surface need to be $\phi 1.7$ mm and at least 0.8 mm deep.

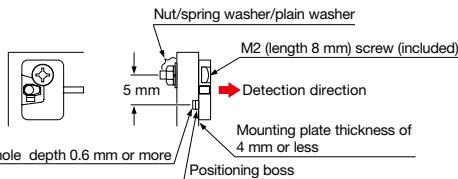


<NF-TE01/NF-DE01 (Flat ON type)>

If cutting a tap into the mounting surface



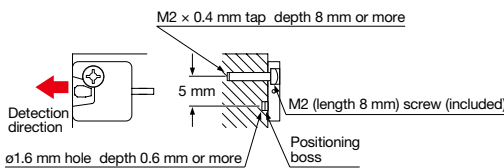
If using the included screw/nut



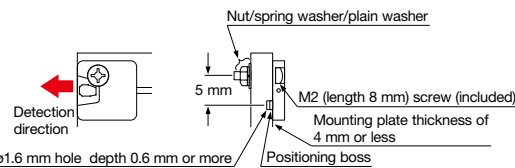
- (Note 1): The above diagram shows NF-TE01. The same mounting method is used for NF-DE01.
- (Note 2): Through-beam type fibers have the same shape. When mounting, pay attention to the positions of the mounting screw hole and positioning boss hole.

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

If cutting a tap into the mounting surface

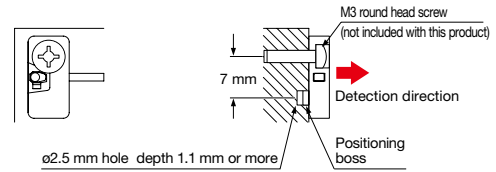


If using the included screw/nut



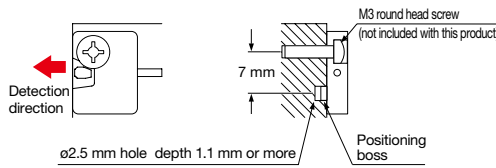
- (Note 1): The above diagram shows NF-TE02. The same mounting method is used for NF-DE02.
- (Note 2): Through-beam type fibers have the same shape. When mounting, pay attention to the positions of the mounting screw hole and positioning boss hole.

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



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

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

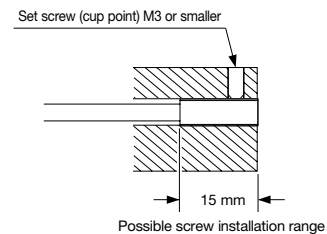


- (Note 1): The above diagram shows NF-TE04. The same mounting method is used for NF-DE04.
- (Note 2): Through-beam type fibers have the same shape. When mounting, pay attention to the positions of the mounting screw hole and positioning boss hole.

■ Mounting NF-DR09/-RR01

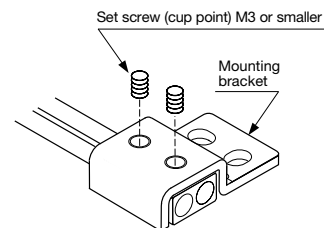
<If not using the included mounting bracket>

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



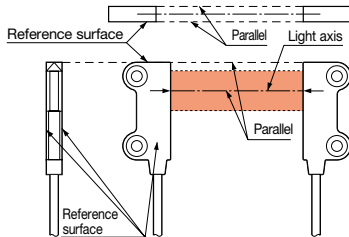
<If using the included mounting bracket>

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



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

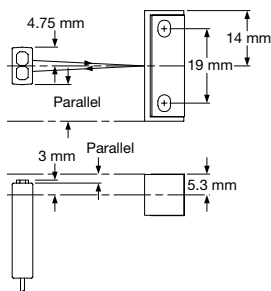
- Please be aware that because the aperture angle of this product is extremely narrow, light may not be taken in depending on installation conditions.
- When installing, determine a reference surface as shown in the diagram below while paying sufficient attention in regards to light axis shifting and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



Mounting NF-RB02

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

<Side ON type/NF-RB02>



<Notes regarding NF-RB02>

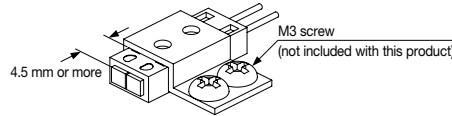
- If detecting items such as transparent objects, detection may be unstable if the objects are within range of 0 to 20 mm from the window.

If mounting using the included fiber mounting bracket

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

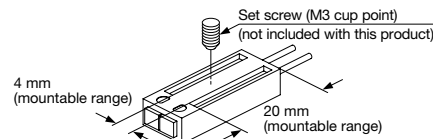
If mounting using the included fiber mounting bracket

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



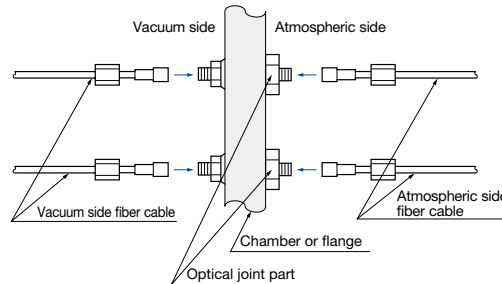
If mounting using an M3 set screw (cup point)

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



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

<Structure of vacuum resistant fibers>

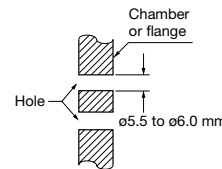


Leakage amount: 1.33×10^{-10} Pa·m³/s [He] or less

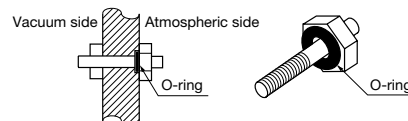
<Mounting>

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

(Note 1): Make the holes $\phi 5.5$ to $\phi 6.0$ mm.



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

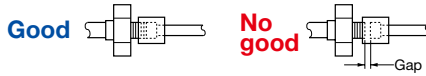


Notes for fiber sensor usage

Correct use

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

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



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

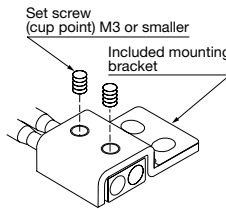
(Note 1): Tighten the nut securely.
If the nut is loose, there may be a gap, causing the sensing distance to drop.

- Secure the tip of the vacuum side fiber.

<For NF-DN01>

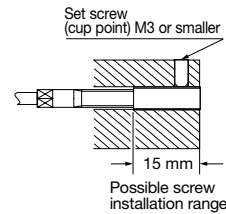
If using a mounting bracket

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



If not using a mounting bracket

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



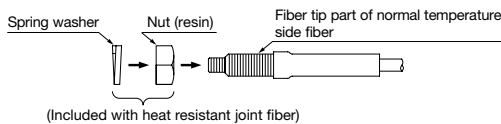
Mounting heat resistant joint fibers (NF-TH12/-TH13/-TH14/-TH15/-TH16)

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

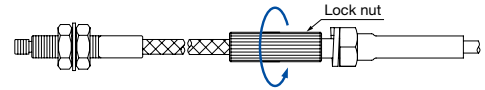
- Use the following procedure to connect normal temperature side fibers.

Procedure

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

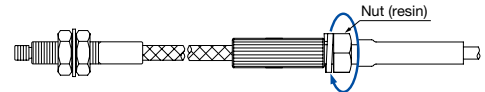


- Mount the heat resistant joint fiber and normal temperature side fiber using a lock nut.



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

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

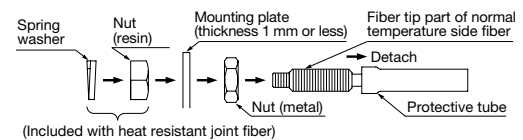


<If mounting connecting parts to the mounting plate>

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

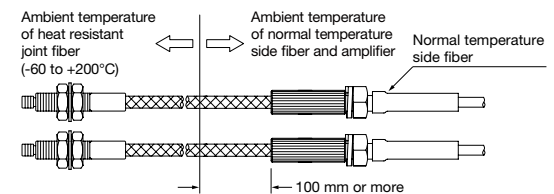
Procedure

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



<Operating Temperature>

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



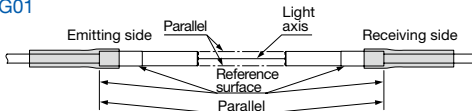
Mounting narrow view/wafer mapping fibers (NF-TG01/-TG02/-TG03/-TG04)

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

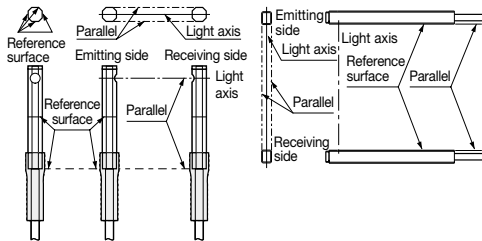
<Through-beam type>

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

NF-TG01



NF-TG02/-TG03/-TG04

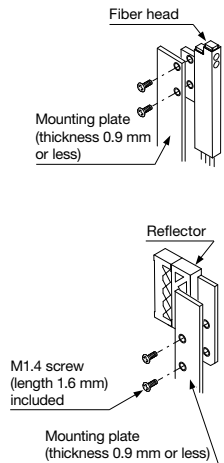


<Reflective type>

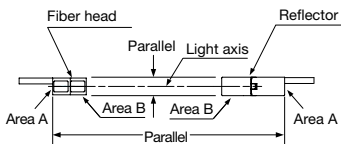
Use the included 1.6 mm M1.4 screws to mount the fiber head and reflector to the mounting plate as shown in the diagram to the right. The mounting plate needs to have a thickness of 0.9 mm or thinner.

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

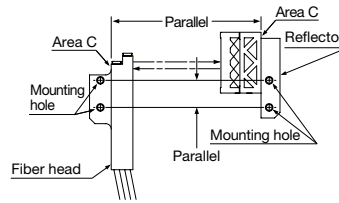
Install the parts so that the mounting holes for the fiber head and reflector are parallel to one another and so that parts A, B and C are each parallel as shown in the diagrams below. Pay sufficient attention for light axis shifting and slanting.



<Overhead view>

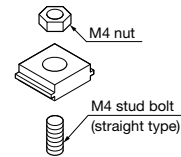


<Side view>

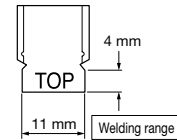


Mounting liquid leakage detection fibers (NF-DW02)

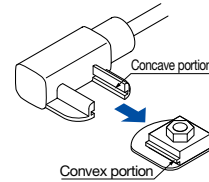
If using an SUS mounting bracket, thread a welded M4 stud bolt through the mounting hole on the mounting bracket and attach an M4 nut (not included with this product).



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

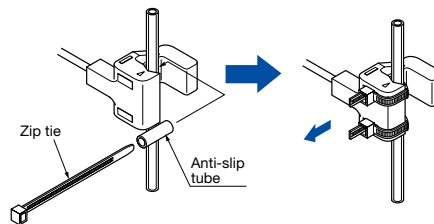


Slide the convex portion of the mounting bracket attached to the steel case into the concave portion on the fiber until a "click" is heard.

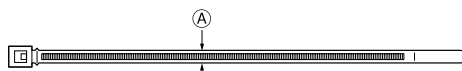


Mounting pipe-mounted liquid level detection fibers (NF-TF01)

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



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

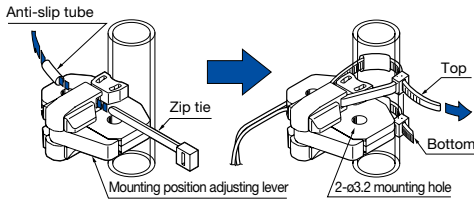


Notes for fiber sensor usage

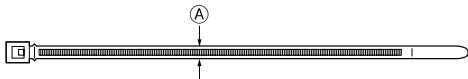
Correct use

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

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



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



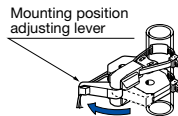
- M3 screws, plain washers and spring washers must be used when using the mounting holes. (M3 screws, plain washers and spring washers are not included with this product.)

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

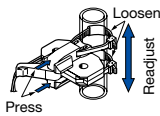
- The attachment position can be easily readjusted when using zip ties to mount this product.

■ Adjustment method

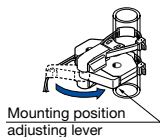
1. Pull the mounting position adjusting lever open in the direction of the arrow.



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



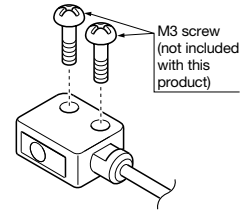
3. Close the mounting position adjusting lever in the direction of the arrow to return it to its original position.



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

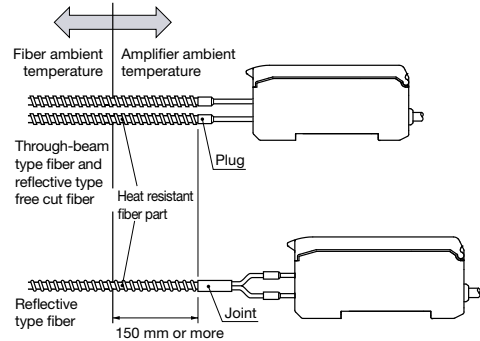
■ Mounting chemical resistant angled-head fibers (NF-TY05)

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



Notes regarding usage of heat resistant fibers

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



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

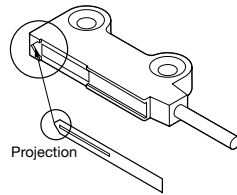
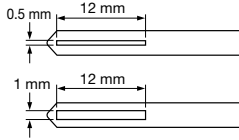
Notes about slit masks included with NF-TZ07/-TZ08/-TZ09/-TZ10

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

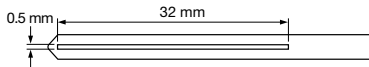
■ Included slit masks

■ How to apply

<NF-TZ09/-TZ10>



<NF-TZ07/-TZ08>

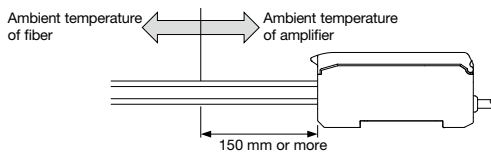


For NF-TY01(-□)/-TY02(-□)/-TY03-TF3/-TY04/-TY05(-□)/-DY01

- Avoid use with the chemicals listed below. Chemicals that may erode PFA including fused alkali metals (sodium, potassium, lithium, etc.), fluorine gas (F₂), ClF₃, OF₂ (including gaseous form), etc. Also, chemicals with high permeability including high temperature hydrofluoric acid, nitric acid, chlorine, etc.

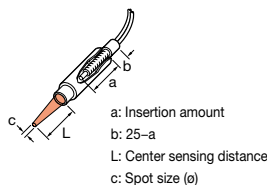
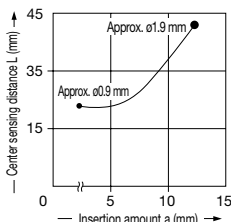
■ Notes regarding usage of NF-TY04/-DY01 (heat resistant type)

- In order to protect amplifiers, keep the heat resistant fiber part at least 150 mm from the boundary of the normal temperature side as shown in the diagram on the right.
- Do not directly expose amplifiers to radiation heat or hot air.

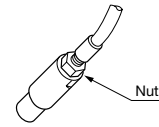


Notes regarding usage of NF-DA06

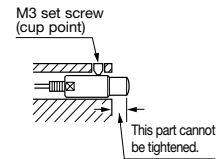
- Spot size and sensing distance can be adjusted depending on the fiber insertion amount. Be aware that if inserted too deeply, the fiber tip may become separated from the lens.



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

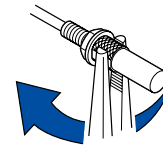


- If securing NF-DA06 using a set screw, use an M3 set screw (cup point).



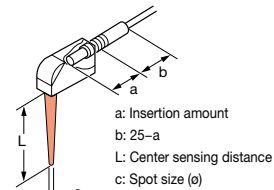
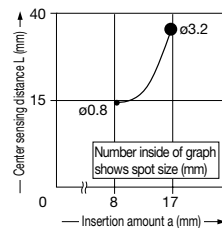
Notes regarding usage of NF-DA01/-DA02/-DA03/-DA04/-DA05

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

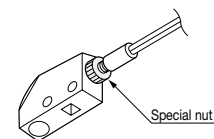


Notes regarding usage of NF-DA07

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



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



Photoelectric
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

Notes for fiber sensor usage

Correct use

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

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

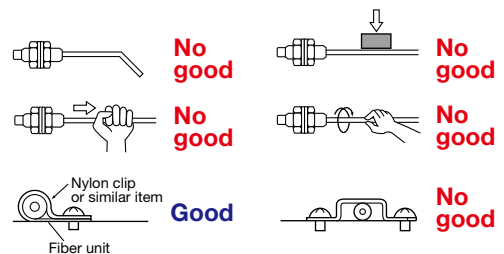
General notes

■ Regarding fiber units

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



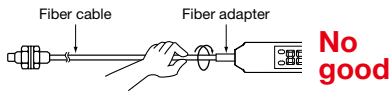
2. Do not bend or apply excessive force to the fiber.



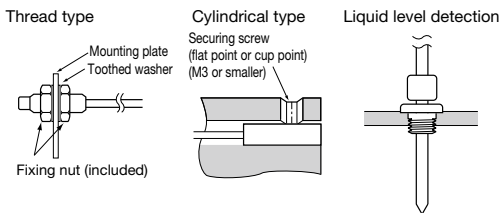
3. Do not apply excessive torque to the sensor head or use tools that do not match the nuts.



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



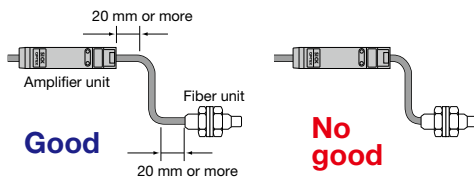
5. Depending on the bore shape of the sensor head, mount as shown in the diagrams below.



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

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

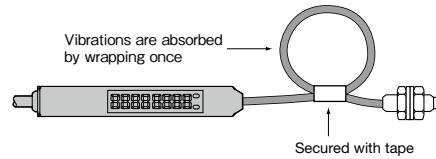
8. Allow for some wire to remain straight near the insertion and tip parts of the fiber unit.



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

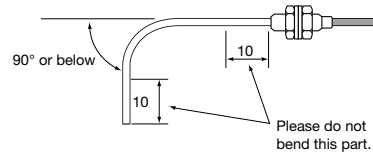
10. In areas subject to frequent vibration, secure so that the fiber unit itself will not vibrate. Especially work to limit vibrations from reaching connection points between the fiber and amplifier.

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



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

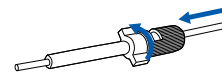
13. Do not bend the sleeve tip or base.



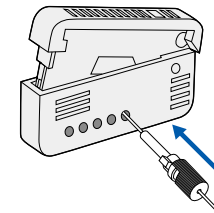
■ Regarding fiber cutters

Cutting procedure

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



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



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

