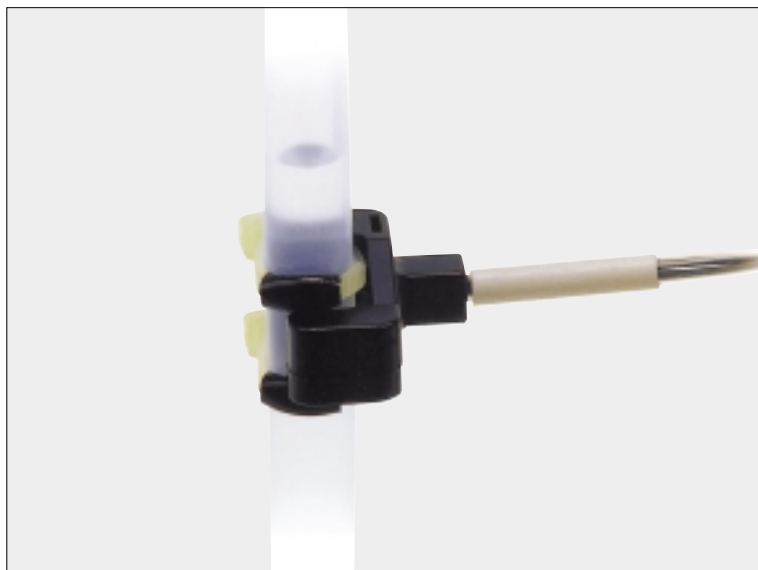


FT-F9 SERIES

New

Liquid Detection Fiber **Pipe-mountable liquid detection fiber**



Reliably detect liquid in pipe

Safer fiber type sensor

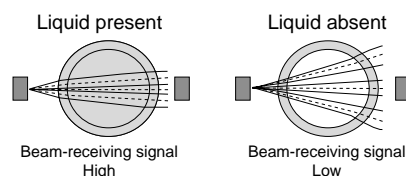
Because it is a fiber sensor, it is safe to use in dangerous areas where there is a risk of fires or explosions. It meets the stringent demands for higher safety levels placed by international standards including SEMI S2.

Easy to use and reliable detection

Even when the shape and thickness of the pipe vary, this sensor uses a method where the beam axis follows the diameter of the pipe, and so when compared to conventional methods, the shape and thickness of the pipe have no influence over the performance of this sensor.

Worry-free design that doesn't overlook liquid-absent condition and sensor malfunction

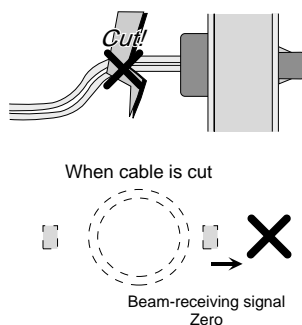
When liquid is present in the pipe, the lens effect of the liquid condenses the beam, so the sensor become to be in beam received condition.



Reliable detection not affected by bubbles or droplets

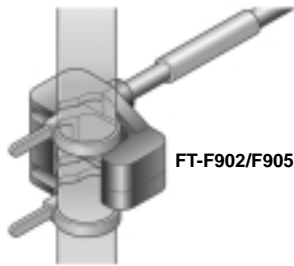
Problems encountered by conventional pipe-mountable sensors, such as bubbles, droplets, or liquid leakage, have been solved using the latest optical fiber techniques.

If the fiber is bent or faulty, if the cable is cut or disconnected, or if the sensor is not operating correctly, the output is the same as when the beam is not received (Liquid-absent condition).



APPLICATIONS

Detecting liquid in pipe



FT-F902/F905

ORDER GUIDE

Fiber

Appearance	Sensing object	Applicable pipe diameter (Note 2)	Fiber cable length ✂ : Free cut	Allowable bending radius	Model No.
	Liquid (Note 1)	Outer dia ϕ 3.0 to ϕ 10.0 mm (ϕ 0.118 to ϕ 0.394 in) PFA (fluorine resin) or equivalently transparent pipe, wall thickness 0.3 to 1.0 mm 0.012 to 0.039 in	: 2 m 6.562 ft	Protective tube R20 mm R0.787 in Fiber R4 mm R0.157 in	FT-F902
			: 5 m 16.404 ft		FT-F905

Notes: 1) Reliable detection may not be possible for unclear or heavily colored liquid.
2) Liquid in an opaque pipe cannot be detected correctly.

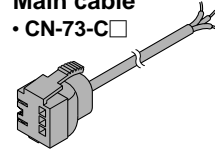
Amplifiers **Quick-connection cable is not supplied with the amplifier. Please order it separately.**

Type	Appearance	Model No.	Emitting element	Output
NPN output		FX-301-F	Red LED	NPN open-collector transistor
PNP output		FX-301P-F		PNP open-collector transistor

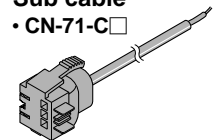
Quick-connection cable **Quick-connection cable is not supplied with the amplifier. Please order it separately.**

Type	Model No.	Description
Main cable	CN-73-C1	Length: 1 m 3.281 ft
	CN-73-C2	Length: 3 m 9.843 ft
	CN-73-C5	Length: 5 m 16.404 ft
Sub cable	CN-71-C1	Length: 1 m 3.281 ft
	CN-71-C2	Length: 3 m 9.843 ft
	CN-71-C5	Length: 5 m 16.404 ft

Main cable
• **CN-73-C**



Sub cable
• **CN-71-C**



End plates **End plates are not supplied with the amplifier. Please order it separately when the amplifiers are mounted in cascade.**

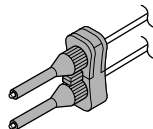
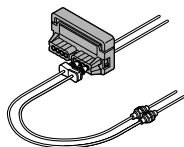
Appearance	Model No.	Description
	MS-DIN-E	When cascading multiple amplifiers, or when it moves depending on the way it is installed on DIN rail, these end plates ensure that all amplifiers are mounted together in a secure and fully connected manner. Two pcs. per set

FT-F9

ORDER GUIDE

Accessories

- **FX-CT2**
(Fiber cutter)
- **FX-AT4**
($\phi 1$ mm $\phi 0.039$ in fiber attachment)



SPECIFICATIONS

Type	2 m 6.562 ft fiber cable length	5 m 16.404 ft fiber cable length
Item Model No.	FD-F902	FD-F905
Applicable amplifiers	FX-301-F, FX-301P-F	
Sensing object	Liquid (Note 1)	
Applicable pipe diameter (Note 2)	Outer dia. $\phi 3.0$ to $\phi 10.0$ mm $\phi 0.118$ to $\phi 0.394$ in [PFA (fluorine resin) or equivalently transparent pipe, wall thickness 0.3 to 1.0 mm 0.012 to 0.039 in]	
Fiber cable length	2 m 6.562 ft (Free-cut)	5 m 16.404 ft (Free-cut)
Protective tube length	1 m 3.281 ft	3 m 9.843 ft
Allowable bending radius	Protective tube: R20 mm R0.787 in or more, Fiber cable R4 mm R0.157 in or more	
Bending durability	Fiber cable: 1,000,000 times or more (at R4 mm R0.157 in)	
Ambient temperature (Note 3)	- 20 to + 60 °C - 4 to + 140 °F (No dew condensation or icing allowed)(Note 3), Storage: - 20 to + 60 °C - 4 to + 140 °F	
Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH	
Material	Fiber cable	Fiber core: Acrylic, Fiber sheath: Vinyl chloride, Protective tube: PFA (Fluorine resin)
	Fiber head	Enclosure: Heat-resistant ABS, Lens: Acrylic
Accessories	Tying band: 2 pcs., Anti-slip tube: 2 pcs., FX-CT2 (Fiber cutter): 1 pc. FX-AT4 ($\phi 1$ mm $\phi 0.039$ in fiber attachment): 1 set for beam-emitting fiber and beam-receiving fiber. (Note 4)	

- Notes: 1) Reliable detection may not be possible for unclear or heavily colored liquid.
 2) Liquid in an opaque pipe cannot be detected correctly.
 3) Liquid being detected should also be kept within the rated ambient temperature range.
 4) Fiber attachments provided include **FX-AT4**, made for the **FX-301-F**, and **FX-D1-F** attachments.

PRECAUTIONS FOR PROPER USE

Refer to [p.1135~](#) for general precautions and [p.602~](#) for amplifier precautions.



This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body injury or property damage from dangerous parts of machinery. It is a normal object detection sensor.

Cautions

- There is a white stripe on the beam-emitting fiber cable. When setting the amplifier, put the fiber cable with white stripe into the beam-emitting side.
- Keep the lens of the fiber head intact. If it is scratched, the detectability will deteriorate. Wipe a dirt on the lens with a moist soft cloth. However, do not use any organic solvents.
- Since a water drop on the pipe's sensing surface can affect the sensing performance, avoid using this fiber head at a place where water splashes. Further, take sufficient care against dew condensation etc. on the pipe's outside wall.
- Do not apply excessive tensile force to the fiber cable.
- Bending radius of the fiber cable must be R4 mm R0.127 in or more. If the bending radius is smaller than the specified value, the sensing performance may deteriorate.
- Ensure that any strong extraneous light is not incident on the receiving face of the fiber head.
- The fiber cable can be cut for adjustment using the attached fiber cutter (**FX-CT2**), however, the sensing performance may decrease depending on the cut condition of the fiber cable and the connection to the amplifier.

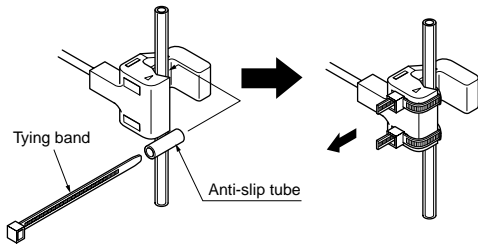
- Take care that shortening the fiber cable excessively may result in loss of reliable detection due to an insufficient light intensity difference. (As a reference, adjust the length of the fiber cable at 1 m 3.281 ft and when mounted on the pipe, the displayed digit value of the amplifier in liquid absent condition should be 3,500 or less.)
- Unclear or highly viscous liquid may not be stably detected.
- Take care not to scratch the fiber sheath while cutting the protective tube.
- The detection results may vary greatly if the this sensor is not firmly secured. Use the attached anti-slip tube to firmly secure it to the pipe so that it does not move.
- In order to obtain stable sensing, make sure to adjust the sensitivity of the amplifier after mounting the fiber in liquid absent condition in the pipe. In case of re-mounting the fiber to the pipe or change in layout, adjust the sensitivity of the amplifier again.
- Note that light intensity may decrease when used under high temperature and high humidity for a long period.

PRECAUTIONS FOR PROPER USE

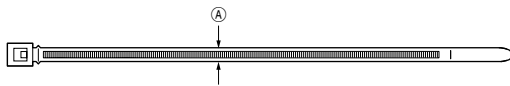
Refer to p.1135~ for general precautions and p.602~ for amplifier precautions.

Mounting

- Mount the fiber on a pipe with the attached tying bands and anti-slip tubes as shown in the figure below. Fasten two tying bands, as shown, and cut off the excess portions.



- If other tying bands are to be used, the dimension (A) shown in the figure below should be 2.5 mm 0.098 in or less.

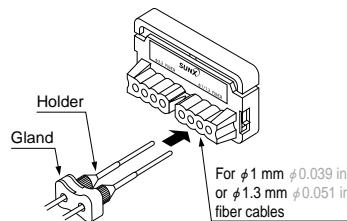


Mounting of fiber attachments (FX-AT4)

- When using the fiber attachment, mount as per the steps below.

For FX-301-F

- Mount the holders on the gland lightly.
- Notes: If both long holders and short holders are enclosed with the fiber cable, use the short holders.
- Insert the fiber cables into the holders, in condition ①.
 - Tighten the holders to fix the fiber cables at the desired length.
 - Insert the fiber cables, in condition ③, into the holes for $\phi 1.0$ mm $\phi 0.039$ in or $\phi 1.3$ mm $\phi 0.051$ in fiber cables of the fiber cutter (FX-CT2) from direction shown in the figure right.
 - Cut both fiber cables simultaneously. (At this time, insert the attachment to a position at which it stops. The fiber cables will be cut at a position approx. 0.5 mm 0.020 in from the holder.)
 - After cutting, insert the fiber cables to the fiber sensor amplifier immediately.

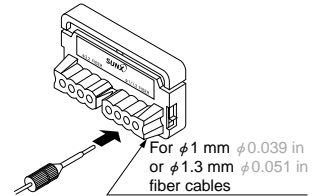


For FX-D1-F

- Thread the fiber cable through the gland and holder separately, and screw the gland into the holder clockwise.



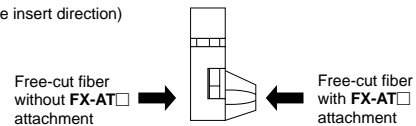
- Insert the fiber cables one by one into the holes for $\phi 1.0$ mm $\phi 0.039$ in or $\phi 1.3$ mm $\phi 0.051$ in fiber cable of the fiber cutter (FX-CT2) from the direction shown in the figure right. (At this time, insert the attachment to a position at which it stops. The fiber cables will be cut at a position approx. 0.5 mm 0.020 in from the holder.)



Fiber cutter (FX-CT2)

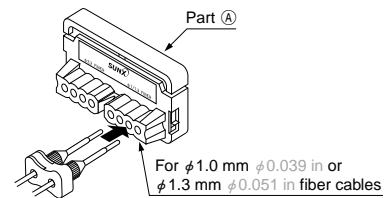
- To cut the fiber cables, insert them from the direction shown below.

(Fiber cable insert direction)



How to use fiber cutter (FX-CT2)

- Slide part (A) of the fiber cutter fully upward till it stops.
- Insert the fiber cables, mounted in the attachment, till they stop. (Take care that there are separate fiber insertion holes for $\phi 2.2$ mm $\phi 0.087$ in and $\phi 1.0$ mm $\phi 0.039$ in or $\phi 1.3$ mm $\phi 0.051$ in fiber cables.)
- Slide part (A) of the fiber cutter down to cut the fiber cables.



- Notes:
- The fiber cables should be cut in one stroke.
 - Once a fiber cable is cut off at a hole, do not use the hole again. If used, it degrades the cut surface quality and the detectability may deteriorate.
 - The blade cannot be replaced. Please purchase an additional fiber cutter, if required.
 - Note that the sensing range may be reduced by up to 20 % depending on the cut condition. Hence, decide the setting distance by taking sufficient margin.

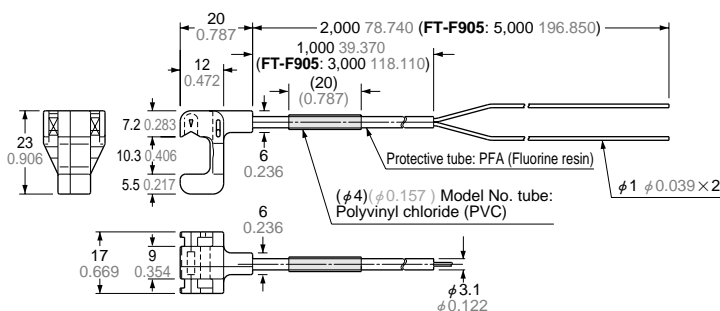
DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.co.jp/>. Refer to p.607 for amplifier dimensions.

FT-F902 FT-F905

Free-cut

With FX-AT4



Glass Substrate / Wafer Sensing
M-DW1
FD-L43
SH-72
M
HD-T1
EX-F70/F60
FD-F7
FT-F9
FX-301-F