Panasonic
INDUSTRY

NEW

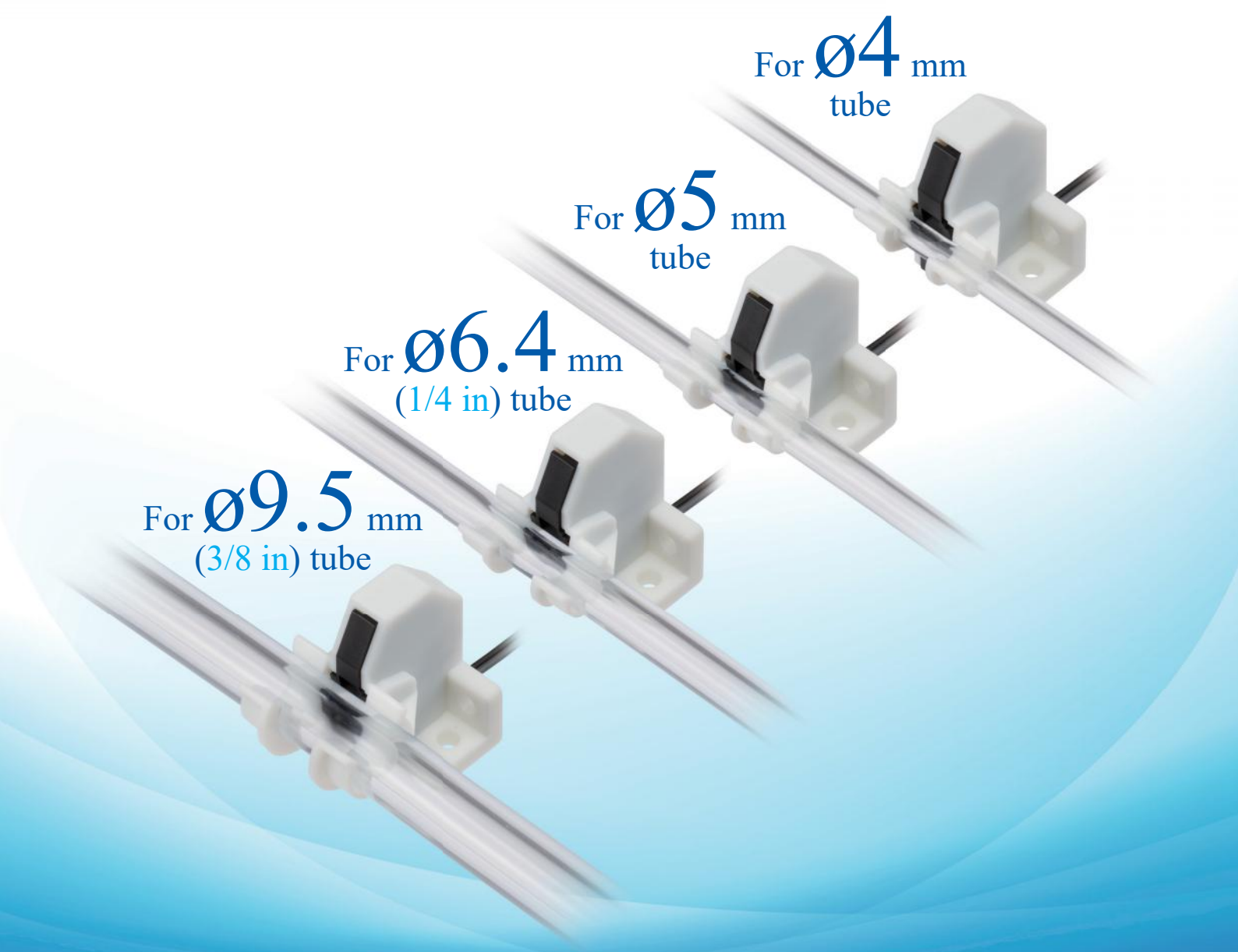
Compatible with ø4 mm / ø5 mm /
ø6.4 mm (1/4 in) / ø9.5 mm (3/8 in) tubes

Liquid Detection Fiber

FD-BEF□

Extremely Easy Installation and Removal of Tube!

Liquid Detection Fiber Sensor for Cell Culture Apparatus



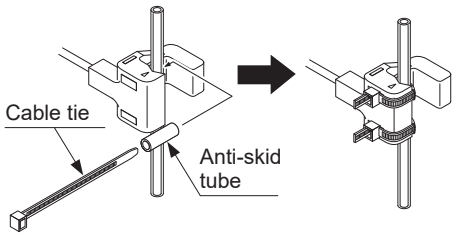
Liquid Detection Fiber Sensor easy enough to use for anyone in universities, research laboratories and production field

One-touch system for installation and removal of tube

No specialized technician required for the installation and removal of tube

Conventional system

Need Cable Tie

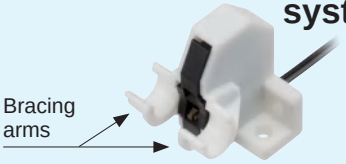


Difficult to replace tube

- Dedicated tool and cable ties are required for the replacement of tube.
- Risk of tube damage if the tube is replaced by a person not familiar with the replacement procedure.
- The tube and sensor must be secured in place by tightening the cable ties with appropriate tightening force to prevent tube deformation.
- Sensitivity adjustment must always be made after tube replacement.

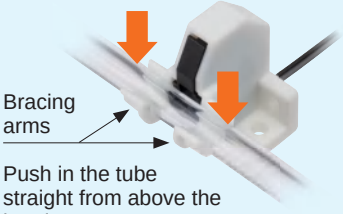
New system

Simple one-touch system for anyone



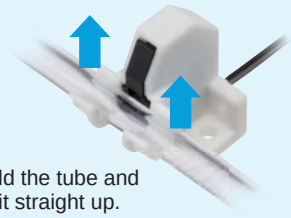
Two wide bracing arms hold flexible tube securely.

Tube installation



Push in the tube straight from above the bracing arms.

Tube removal



Hold the tube and lift it straight up.

* If the sensing is unstable due to the deviations of material or diameter of the replacement tube, adjust the amplifier's threshold setting and confirm stable sensing before using.

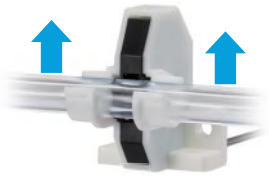
Applicable tubes: Silicone and PVC tubes

Liquid Detection Fiber accepts tubes that are commonly used with cell culture apparatus.

Applicable tubes	
Material	Diameter (Outside / Inside)
Silicone / PVC	ø4 × 2 mm
	ø5 × 3 mm
	ø6.4 × 3.2 mm (1/4 × 1/8 in)
	ø9.5 × 6.4 mm (3/8 × 1/4 in)

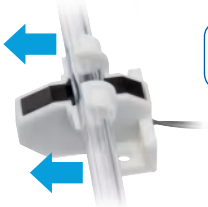
Two selectable removal direction

Mounting holes are designed to allow the sensor installation in two different orientations so that the tube removal direction can be selected.



Upward removal of tube

Install the sensor vertically for upward removal of tube.

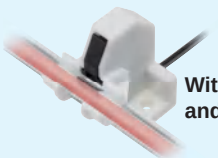
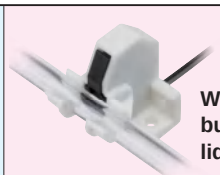


Sideway removal of tube

Install the sensor horizontally for sideway removal of tube.

Monitoring for prevention of nonattachment of tube

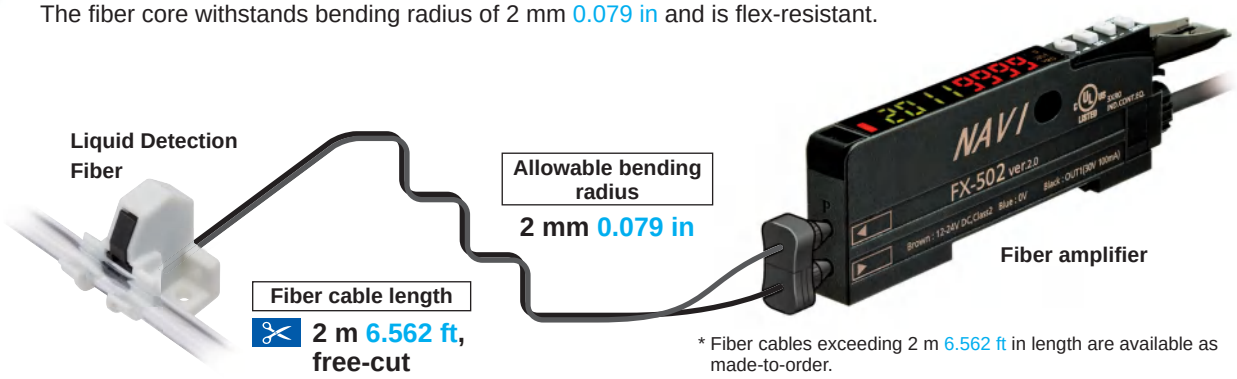
When the Liquid Detection Fiber is used in combination with the 2-output fiber amplifier (**FX-502**, **FX-502P**), the tube / liquid condition can be indicated in three patterns.

		 2-output fiber amplifier • FX-502 • FX-502P	 No tube	 With tube and liquid	 With tube but no liquid
Output 1 (Dark-ON)	Detection of liquid in tube		ON	ON	OFF
Output 2 (Light-ON)	Detection of tube		OFF	ON	ON

*Please refer to the instruction manual for setting method of fiber amplifier.

Flexible and robust fiber core allows for easy tube routing.

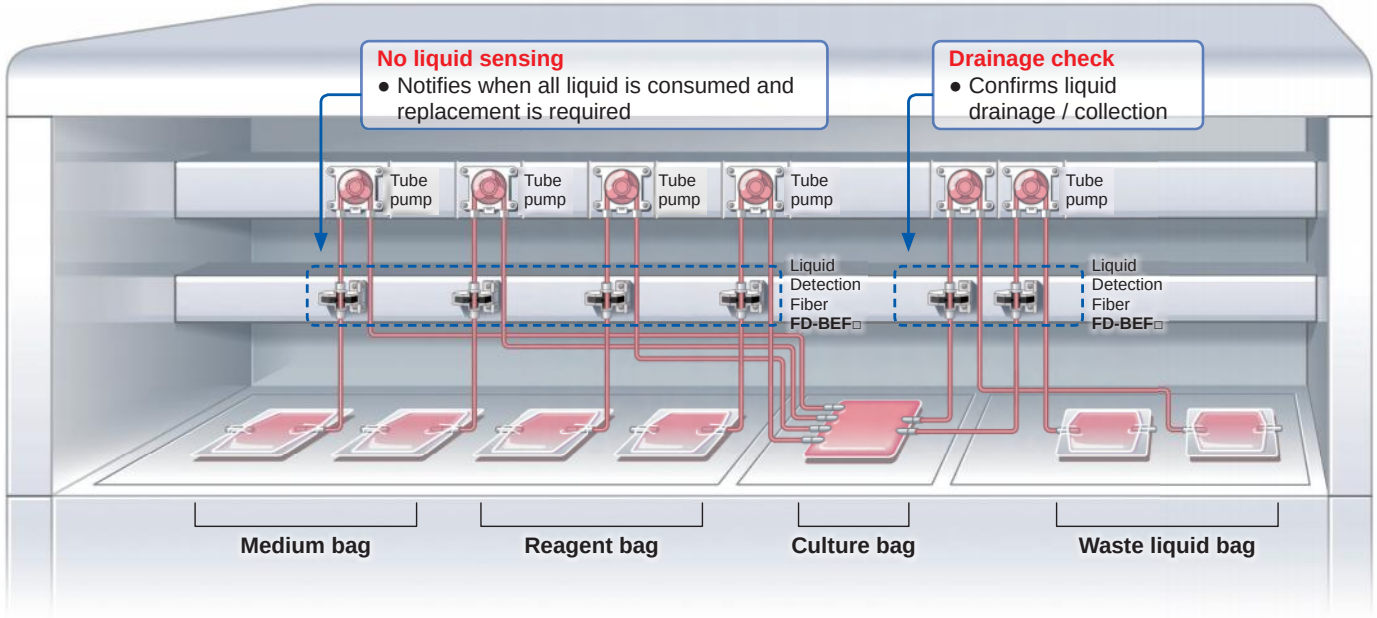
The fiber core withstands bending radius of 2 mm 0.079 in and is flex-resistant.



* Fiber cables exceeding 2 m 6.562 ft in length are available as made-to-order.

Application

Closed-container-type cell culture apparatus



System configuration

* Be sure to use the Liquid Detection Fiber in combination with a fiber amplifier.

Liquid Detection Fiber

Select the appropriate sensor model in accordance with the tube to be used.

For ø4 mm tube	For ø5 mm tube	For ø6.4 mm (1/4 in) tube	For ø9.5 mm (3/8 in) tube
• **FD-BEF40**	• **FD-BEF50**	• **FD-BEF64**	• **FD-BEF95**
			
• Applicable tube diameter (Outside diameter × Inside diameter): ø4 × 2 mm	• Applicable tube diameter (Outside diameter × Inside diameter): ø5 × 3 mm	• Applicable tube diameter (Outside diameter × Inside diameter): ø6.4 × 3.2 mm (1/4 × 1/8 in)	• Applicable tube diameter (Outside diameter × Inside diameter): ø9.5 × 6.4 mm (3/8 × 1/4 in)

Fiber Amplifier

Select the appropriate amplifier model in accordance with the application.

Recommended! Easy-to-operate, high-visibility **FX-500** series

■ Standard (1-output) type
- **FX-501**
- **FX-501P**

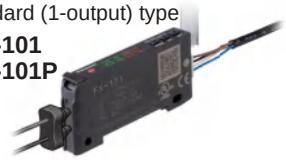
Detection purpose: No liquid sensing

■ 2-output type
- **FX-502**
- **FX-502P**

Detection purpose: No liquid sensing (Output 1) and detection of error such as tube nonconnection / disconnection, and power loss (Output 2)

Compact **FX-100** series

■ Standard (1-output) type
- **FX-101**
- **FX-101P**



Detection purpose: No liquid sensing

* For the details of fiber amplifiers, please refer to the **FX-500** / **FX-100** series digital fiber sensor catalog or visit our website.

SPECIFICATIONS

Refer to the catalog of the applicable product series or visit our website for fiber amplifiers.

Item \ Type	Model No.	For ø4 mm tube	For ø5 mm tube	For ø6.4 mm (1/4 in) tube	For ø9.5 mm (3/8 in) tube
Applicable amplifier		**FX-501**, **FX-501P**, **FX-502**, **FX-502P**, **FX-101**, **FX-101P**			
Sensing object		Transparent water or liquid with the same refractive index (Note 1)			
Allowable bending radius		R2 mm R0.079 in			
Fiber cable length		2 m 6.562 ft			
Ambient temperature		-40 to +70 °C -40 to +158 °F			
Ambient humidity		35 to 85 % RH			
Material		Tube installation part: Nylon Sensing part: ABS resin Lens: Polycarbonate			
Accessories		**FX-CT2** (Fiber cutter): 1 pc. **FX-AT4** (Fiber attachment for ø1 mm ø0.039 in): 1 pc.			

Notes: 1) It may not be possible to sense cloudy liquid, liquid with different refractive index, or liquid with high viscosity (liquid that causes the light to disperse).

■Applicable tubes

Type			For ø4 mm tube	For ø5 mm tube	For ø6.4 mm (1/4 in) tube	For ø9.5 mm (3/8 in) tube
Model No.			**FD-BEF40**	**FD-BEF50**	**FD-BEF64**	**FD-BEF95**
Applicable tube	Material		Clear / transparent flexible tube (flexible polyvinyl chloride and silicone)			
	Diameter (Note 2)	Outside	4 mm	5 mm	6.4 mm (1/4 in)	9.5 mm (3/8 in)
		Inside	2 mm	3 mm	3.2 mm (1/8 in)	6.4 mm (1/4 in)
Conformity confirmed tube (Note 3)	Silicone		3355L		Sani-Tech Ultra	
	PVC		LMT-55			

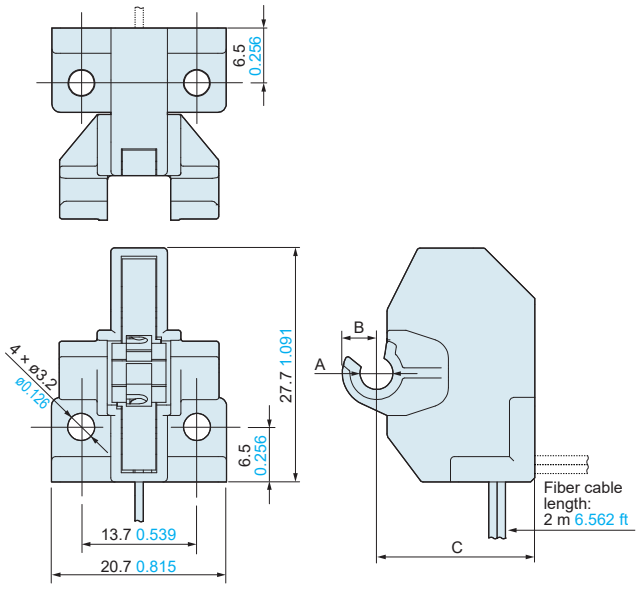
Notes: 2) With respect to tubes that are outside the specified diameter or wall thickness, no guarantee can be given for the sensing performance. There is a risk of damage.
3) Tubes manufactured by Saint-Gobain K.K. When using different tubes, be sure to check them with the actual product.

DIMENSIONS (Unit: mm in)

Refer to the catalog of the applicable product series or visit our website for fiber amplifiers.

FD-BEF□ Free-cut Fiber

<with **FX-AT4**>



Model No.	A	B	C
FD-BEF40	ø3.9 mm ø0.154 in	4.05 mm 0.159 in	18.75 mm 0.738 in
FD-BEF50	ø4.9 mm ø0.193 in	4.55 mm 0.179 in	19.25 mm 0.758 in
FD-BEF64	ø5.9 mm ø0.232 in	5.1 mm 0.201 in	19.8 mm 0.780 in
FD-BEF95	ø9.3 mm ø0.366 in	7.3 mm 0.287 in	21.5 mm 0.846 in

PRECAUTIONS FOR PROPER USE

- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet the laws and standards, such as OSHA, ANSI and IEC etc., for personnel protection applicable in each region or country.

- Firmly install the tube into the bracing arms. When installing the tube, make sure that the tube is in close contact with the sensing part. If it is not in close contact, the sensing performance may be affected.
- The tube is expected to be installed to and removed from the sensor manually approx. 3,000 times. However, periodically check the bracing arms and light intensity and replace the product if necessary.
- As water drops adhered to the sensing surface will affect the sensing performance, carefully check if dew condensation is not formed on the external surface of the tube. Also note that water drops running along the inner wall surface of the tube or bubbles adhered to the inner wall surface will affect the sensing performance.
- Do not use the sensor in a place where it is exposed to water or chemicals because the sensor is neither waterproof nor chemical resistant.
- Take care that the sensor is not directly exposed to fluorescent lamp from a rapid-starter lamp, a high frequency lighting device or sunlight etc., as it may affect the sensing performance.
- Be careful not to apply excessive tensile force to the fiber part.
- The allowable bending radius of the fiber part is as follows. If the fiber part is bent when using the sensor, individual differences may occur in the values displayed on the fiber amplifier. To use the sensor with less fluctuation in the display values, it is recommended that the bending radius be set to a value larger than the value shown below.

Allowable bending radius	
	To minimize fluctuation in the display values
R2 mm R0.079 in or more	R4 mm R0.157 in or more

- Be sure to cut the fiber before installing it to the fiber amplifier.
- When inserting the fiber into the fiber amplifier, use the fiber attachment (accessory).
- Do not apply any stress (such as excessive bending or pulling) to the fiber attachment after installing the fiber to the fiber attachment.

Please contact .....

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