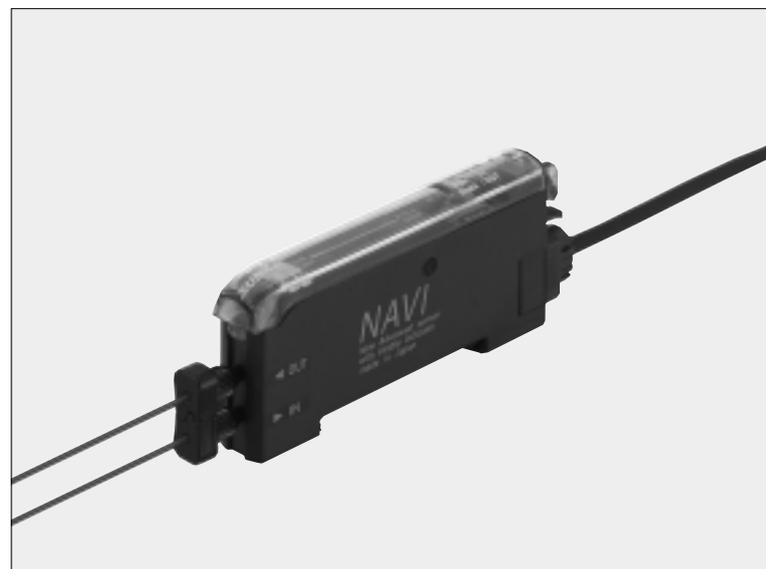


FX-301-F

New

Digital Fiber Sensor for Leak Detection / Liquid Detection Fibers Only



Easy operation even for beginners!
Optimum settings can be realized with simple operations

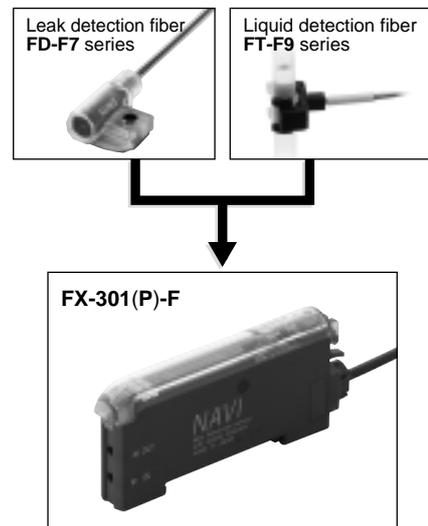
* Passed the UL 991 Environment Test



* UL 61010C-1 compatible, Passed the UL 991 Environment Test based on SEMI S2-0200.
 [Category applicable for semiconductor manufacturing: TWW2, Process Equipment]
 [Applicable standards: UL 61010C-1]
 [Additional test / evaluation standards as per intended use: UL991, SEMI S2-0200]

For use with leak detection or liquid detection fiber only

FX-301-F is designed specifically for use with the leak detection fiber (FD-F7 series) or the liquid detection fiber (FT-F9 series). You can easily set the optimum conditions.



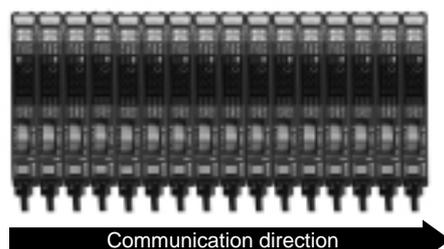
Easy to operate with individual / collective teaching mode

Individual teaching mode (TEACH)

After you select the FD-F7 series or the FT-F9 series with the jog switch, the optimum threshold level is automatically set by just pressing the jog switch.

Collective teaching mode (ALL)

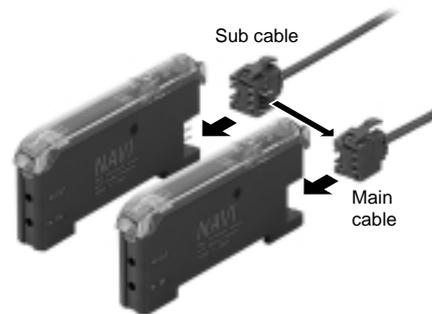
You can set the optimum sensitivity for all cascaded units in one step by the optical communications function. Moreover, since the settings are also copied to all units, the time involved is considerably reduced.



Collective teaching mode is possible for 16 units max.

Easy maintenance, as main and sub units are identical

Both main and sub units utilize the same amplifier body. This feature allows for easy mounting in the side-by-side configuration. The main and sub unit functions are distinguished only by the proper use of 3-core main cable and the 1-core sub cable. Moreover, by utilizing the same body for both main and sub units, inventory management and maintenance is simplified.



Flashing function incorporated

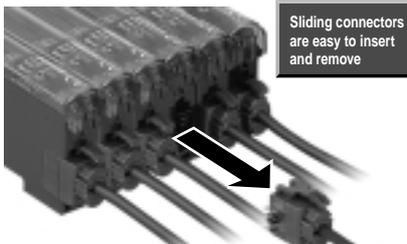
When the leak detection fiber is connected (F7 mode), if a leak is detected, you will recognize which fiber detects the leak at a single glance because the emitter will start flashing.

Long life and stable operational settings assure dependable performance

FX-301(P)-F incorporates our newly developed 'four-chemical emitting element', which eliminates such LED performance deterioration. This new element results in stable incident light levels that can be maintained almost indefinitely.

Wiring- and labor-saving design allows side-by-side configuration for up to sixteen units

Up to sixteen amplifiers can be connected in a side-by-side configuration. As the sub cable contains only one output line, a great amount of wiring and space can be saved. Also, special 'sliding' connectors have been provided for all main and sub cables, which can be detached merely by releasing the lock and pulling directly back, without having to slide the main amplifier body to the side. Using this connector system, only a minimal amount of space is required for regular maintenance.



Easy operation with MODE NAVI

MODE NAVI uses six indicators to display the amplifier's basic operations.

The current operating mode can be confirmed at a glance, so even a first time user can easily operate the amplifier without becoming confused.



MODE NAVI (MODE indicators)

Simple operation with easy access to advanced functions

Each mode can be selected using the large MODE key. Detailed functions and settings can be chosen using the large jog switch. Each setting mode can be easily confirmed by viewing the MODE indicator display.

The advanced features available in each mode can be easily viewed and smoothly selected from the digital display.

Two switches with distinct functions

Only two switches, the large jog switch and the large MODE key, are required for operation. Depressing the large MODE key sets the 'mode selection' and 'mode cancel' functions. The large jog switch is used to select from the detailed functions available within each mode, as well as to change numerical values after the mode has been chosen. The use of only two switches makes for very simple operations and easy maintenance.

Large MODE key

1

2

3

Large jog switch

Pressing the switch selects or cancels the operating mode

Moving the switch from side to side allows items to be selected

Pressing the switch then confirms the selected setting

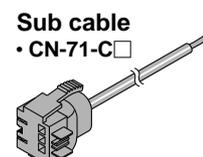
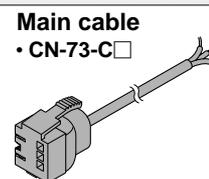
ORDER GUIDE

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

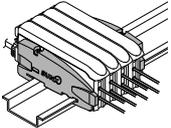
Type	Model No.	Description
Main cable	CN-73-C1	Length: 1 m 3.281 ft
	CN-73-C2	Length: 2 m 6.562 ft
	CN-73-C5	Length: 5 m 16.404 ft
Sub cable	CN-71-C1	Length: 1 m 3.281 ft
	CN-71-C2	Length: 2 m 6.562 ft
	CN-71-C5	Length: 5 m 16.404 ft



FX-301-F

ORDER GUIDE

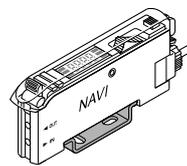
End plates End plates are not supplied with the amplifier. Please order it separately when the amplifiers are mounted in cascade.

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

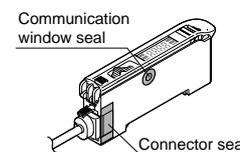
OPTIONS

Designation	Model No.	Description
Amplifier mounting bracket	MS-DIN-2	Mounting bracket for amplifier
Fiber sensor amplifier protection seal	FX-MB1	10 sets of 2 communication window seals and 1 connector seal Communication window seal: It prevents malfunction due to transmission signal from another amplifier, as well as, prevents effect on another amplifier. Connector seal: It prevents contact of any metal, etc., with the pins of the quick-connection cable.

Amplifier mounting bracket
• **MS-DIN-2**



Fiber sensor amplifier protection seal
• **FX-MB1**



SPECIFICATIONS

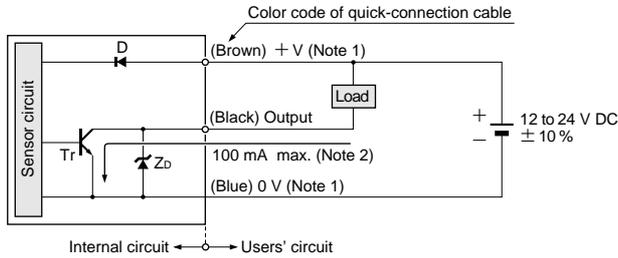
Item	Type	NPN output	PNP output
	Model No.	FX-301-F	FX-301P-F
Applicable fibers		FD-F7 series, FT-F9 series	
Supply voltage		12 to 24 V DC \pm 10 % Ripple P-P 10 % or less	
Power consumption		Normal operation: 960 mW or less (Current consumption 40 mA or less at 24 V supply voltage) ECO mode: 600 mW or less (Current consumption 25 mA or less at 24 V supply voltage)	
Output		NPN open-collector transistor • Maximum sink current: 100 mA (50 mA, if five, or more, amplifiers are connected in cascade.) • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 1.5 V or less [at 100 mA (50 mA, if five, or more, amplifiers are connected in cascade.) sink current]	PNP open-collector transistor • Maximum source current: 100 mA (50 mA, if five, or more, amplifiers are connected in cascade.) • Applied voltage: 30 V DC or less (between output and + V) • Residual voltage: 1.5 V or less [at 100 mA (50 mA, if five, or more, amplifiers are connected in cascade.) source current]
	Output operation	Leak setting (F7 mode): OFF with detection of leak, Liquid setting (F9 mode): Using the jog switch, choose the signal OFF condition between absence of liquid and presence of liquid.	
	Short-circuit protection	Incorporated	
Response time		250 μ s or less (Note 1)	
Sensitivity setting		Individual teaching / Collective teaching	
Operation indicator		Orange LED (lights up when the output is ON)	
Model indicator		Green LED [lights up during liquid setting (F9 mode)]	
MODE indicator		RUN: Green LED, TEACH · ALL · ADJ · DISP · OUT: Yellow LED	
Digital display		4 digit red LED display	
Fine sensitivity adjustment function		Incorporated	
Timer function		Delay timer [used only for liquid setting (F9 mode)] (Timer setting selectable from 10 ms, 100 ms, 1,000 ms, and none)	
Environmental resistance	Ambient temperature	0 to + 50 °C + 32 to + 122 °F (If 8 to 16 units are connected in cascade: 0 to + 45 °C + 32 to + 113 °F (No dew condensation), Storage: - 20 to + 70 °C - 4 to + 158 °F)	
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH	
	Ambient illuminance	Sunlight: 10,000 lx at the light-receiving face, Incandescent light: 3,000 lx at the light-receiving face	
	EMC	EN 50081-2, EN 50082-2, EN 60947-5-2	
	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure (Note 2)	
	Insulation resistance	20 M Ω , or more, with 250 V DC megger between all supply terminals connected together and enclosure (Note 2)	
	Vibration resistance	10 to 150 Hz frequency, 0.75 mm 0.030 in amplitude in X, Y and Z directions for two hours each	
	Shock resistance	98 m/s ² acceleration (10 G approx.) in X, Y and Z directions for five times each	
Emitting element		Red LED (modulated)	
Material		Enclosure: Heat-resistant ABS, Case cover: Polycarbonate, Switch: Acrylic	
Connecting method		Connector (Note 3)	
Cable extension		Extension up to total 100 m 328.084 ft is possible with 0.3 mm ² , or more, cable.	
Weight		20 g approx.	

Notes: 1) When detecting leak (output OFF) during leak setting (F7 mode), since the sensor flashes the emitted light, only the response action for turning the signal back to ON is delayed (1 sec. approx.).
 2) The voltage withstandability and the insulation resistance values given in the above table are for the amplifier only.
 3) The cable for amplifier connection is not supplied as an accessory. Make sure to use the optional quick-connection cable given below.
 Main cable (3-core): **CN-73-C1** (cable length 1 m 3.281 ft), **CN-73-C2** (cable length 2 m 6.562 ft), **CN-73-C5** (cable length 5 m 16.404 ft)
 Sub cable (1-core): **CN-71-C1** (cable length 1 m 3.281 ft), **CN-71-C2** (cable length 2 m 6.562 ft), **CN-71-C5** (cable length 5 m 16.404 ft)

I/O CIRCUIT AND WIRING DIAGRAMS

FX-301-F NPN output type

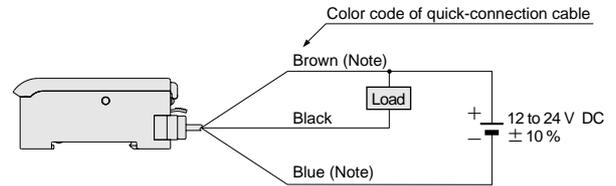
I/O circuit diagram



- Notes: 1) The quick-connection sub cable does not have +V (brown) and 0V (blue).
 2) 50 mA max., if five amplifiers, or more, are connected in cascade.
 3) Never connect several amplifiers in series (AND).

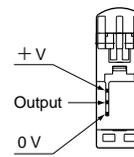
Symbols ... D : Reverse supply polarity protection diode
 Zd: Surge absorption zener diode
 Tr: NPN output transistor

Wiring diagram



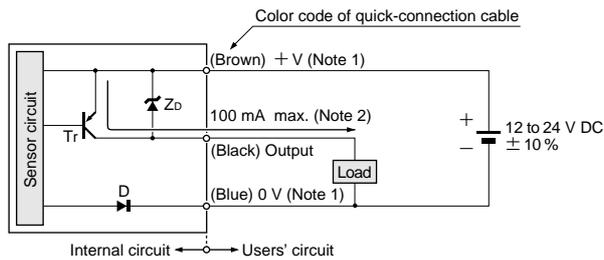
Note: The quick-connection sub cable does not have brown lead wire and blue lead wire.

Terminal arrangement diagram



FX-301P-F PNP output type

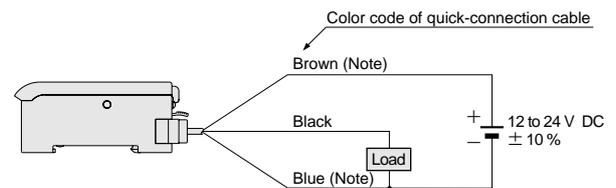
I/O circuit diagram



- Notes: 1) The quick-connection sub cable does not have +V (brown) and 0V (blue).
 2) 50 mA max., if five amplifiers, or more, are connected in cascade.
 3) Never connect several amplifiers in series (AND).

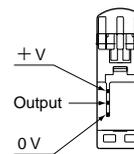
Symbols ... D : Reverse supply polarity protection diode
 Zd: Surge absorption zener diode
 Tr: PNP output transistor

Wiring diagram



Note: The quick-connection sub cable does not have brown lead wire and blue lead wire.

Terminal arrangement diagram



FX-301-F

PRECAUTIONS FOR PROPER USE

Refer to p.1135~ for general precautions, p.592~ for leak detection fiber precautions and p.596~ for liquid detection fiber precautions.

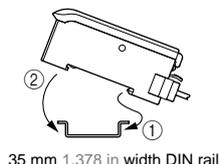


This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body injury or property damage from dangerous parts of machinery. It is a normal object detection sensor.

Mounting

How to mount the amplifier

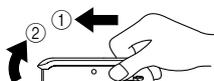
- Fit the rear part of the mounting section of the amplifier on a 35 mm 1.378 in width DIN rail.
- Press down the front part of the mounting section of the amplifier on the 35 mm 1.378 in width DIN rail.



How to remove the amplifier

- Push the amplifier forward.
- Lift up the front part of the amplifier to remove it.

Note: Take care that if the front part is lifted up without pushing the amplifier forward, the hook on the rear portion of the mounting section is likely to break.

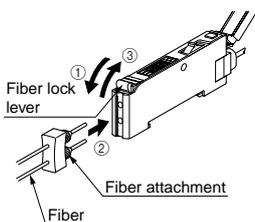


How to connect the fiber cables

- Make sure to fit the fiber attachment (FX-AT4), enclosed with the fiber, to the fibers. Please refer to the instruction manual of the fiber attachment for the fitting method.

- Snap the fiber lock lever down.
- Insert the fiber cables slowly into the inlets until they stop. (Note)
- Return the fiber lock lever to the original position, till it stops.

Note: In case the fiber cables are not inserted to a position where they stop, the sensing becomes unstable.

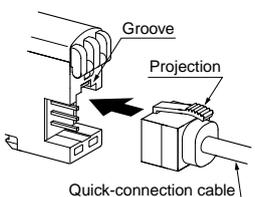


Connection

- Make sure that the power supply is off while connecting or disconnecting the quick-connection cable.

Connection method

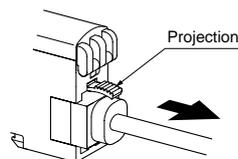
- Holding the connector of the quick-connection cable, align its projection with the groove at the top portion of the amplifier connector.
- Insert the connector till a click is felt.



Disconnection method

- Pressing the projection at the top of the quick-connection cable connector, pull out the connector.

Note: Take care that if the connector is pulled out without pressing the projection, the projection may break. Do not use a quick-connection cable whose projection has broken. Further, do not pull by holding the cable, as this can cause a cable-break.

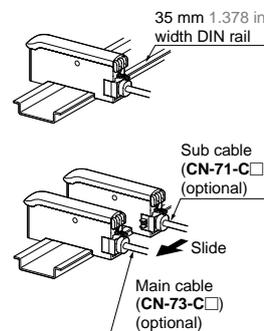


Cascading amplifiers

- Make sure that the power supply is off while cascading or removing the amplifiers.
- Make sure to check the allowable ambient temperature, as it depends on the number of amplifiers connected in cascade.
- In case two, or more, amplifiers are connected in cascade, make sure to mount them on a DIN rail.
- When connecting in cascade, mount the amplifiers close to each other, fitting them between the optional end plates (MS-DIN-E) mounted at the two ends.
- When the amplifiers move on the DIN rail depending on the attaching condition, fitting them between the optional end plates (MS-DIN-E) mounted at the two ends.
- Up to maximum 15 amplifiers can be added (total 16 amplifiers connected in cascade.)
- When connecting more than two amplifiers in cascade, use the sub cable (CN-71-C□) as the quick-connection cable for the second amplifier onwards.
- Since the model setting gets changed if collective teaching is done for the amplifiers in Leak setting (F7 mode) and in Liquid setting (F9 mode) mounted in cascade, note that collective teaching should not be done for amplifiers with different model settings mounted in cascade.
- Since the communication function of this amplifier and that of the fiber sensor FX-301/311/302 series is different, if these models are mounted in cascade, do not use the communication function.
- In case of cascading, wait for 10 minutes, or more, to use the teaching function after the power is switched on.

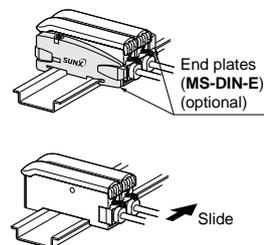
Cascading method

- Mount the amplifiers, one by one, on the 35 mm 1.378 in width DIN rail. (For details, refer to 'Mounting'.)
- Slide the sub units next to each other, and connect the quick-connection cables.
- Mount the optional end plates (MS-DIN-E) at both the ends to hold the amplifiers between their flat sides.
- Tighten the screws to fix the end plates (MS-DIN-E).



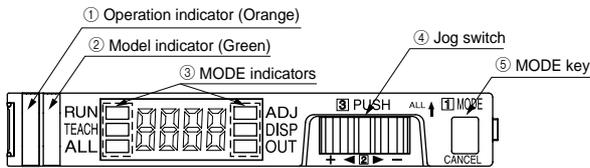
Dismantling method

- Loosen the screws of the end plates (MS-DIN-E).
- Remove the end plates (MS-DIN-E).
- Slide the sub units and remove them one by one. (For details, refer to 'Mounting'.)



PRECAUTIONS FOR PROPER USE Refer to p.1135~ for general precautions, p.592~ for leak detection fiber precautions and p.596~ for liquid detection fiber precautions.

Part description



- ① Operation indicator (Orange)... Lights up when output is ON.
- ② Model indicator (Green)... Lights up during liquid setting (F9 mode).
- ③ MODE indicators...
 - RUN (Green): Lights up during normal sensing operation.
 - TEACH (Yellow): Lights up when the individual teaching mode is selected.
 - ALL (Yellow): Lights up when the collective teaching mode is selected.
 - ADJ (Yellow): Lights up when the threshold value fine adjustment mode is selected or the sensitivity switching function is activated.
 - DISP (Yellow): Lights up when the digital display setting mode is selected or the timer function is activated.
 - OUT (Yellow): Lights up when the forced output mode is selected or the NO / NC switching function is activated.
- ④ Jog switch... Moving this switch in the '+' or '-' direction, allows different items to be viewed for selection and pressing the switch then confirms the selected setting.
- ⑤ MODE key... This key is used to select operating modes and to cancel settings during the configuration process.

Setting items

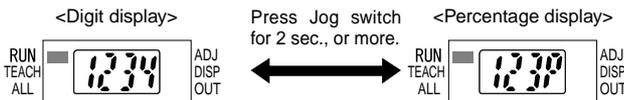
<p>RUN Run</p> <p>Normal sensing condition</p>	<p>TEACH Teaching</p> <p>Mode for teaching with one unit</p>	<p>ALL All</p> <p>Mode for teaching 2 or more units collectively</p>
<p>OUT Out</p> <p>Mode for turning the forced output ON or OFF regardless of the incident light intensity</p> <p>NO and NC can be selected (F9 mode only)</p>	<p>DISP Display</p> <p>Mode for shifting the digital display and switching to ECO mode</p> <p>Timer can be set (F9 mode only)</p>	<p>ADJ Adjust</p> <p>Fine-adjusts the threshold value</p> <p>Low, high, or automatic sensitivity can be selected</p>

RUN Mode

- When MODE indicator / RUN (green) lights up, the display setting or the sensitivity select setting can be checked. Refer to 'Sensitivity selection function' on p.605 for further details of sensitivity select setting.

How to change to 'percent display'

- When Jog switch is pressed for 2 sec., or more, the display changes as per the diagram below.

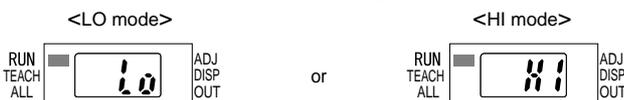


The incident light intensity is displayed within the range 0 to 4,000.

The incident light intensity is displayed in percentage (within 0 to 999) based on the threshold value as the reference.

How to check the sensitivity state

- If Jog switch is turned to '+' or '-' side, the present sensitivity state can be confirmed. After 2 sec., the display returns to 'digit display' or 'percent display'.



Operating in the low sensitivity mode.

Operating in the high sensitivity mode.

Individual teaching mode

- The sensitivity selection function is set to the automatic sensitivity setting (Auto) at the time of factory shipment. In case sensitivity selection setting is done, make sure to carry out 'teaching' after the sensitivity selection setting. For the sensitivity selection setting, refer to 'Sensitivity selection function' on p.605.

- When MODE indicator / TEACH (yellow) lights up, threshold value can be set on a single unit.

Step	Description	Display
①	Insert Leak detection fiber (FD-F7□) or Liquid detection fiber (FT-F9□). Press MODE key to light up MODE indicator / TEACH (yellow).	1234
②	Turn the jog switch to '+' or '-' side to set to either Leak (F7) mode (·f·) or Liquid (F9) mode (·f·). In case Liquid (F9) mode (·f·) is set, the model indicator (Green) lights up.	·f· ·f·
③	Press Jog switch in no-leak condition with Leak detection fiber (FD-F7□) or no-liquid condition with Liquid detection fiber (FT-F9□). Then, '!' on the display moves from left to right.	!
④	When teaching is accepted, the result of threshold value setting is displayed. • In case stable sensing is possible: 'Good' on the display blinks three times. • In case stable sensing is not possible: 'E··' on the display blinks. (Note 1)	Good E··
⑤	If the teaching result is 'Good', the sensor returns to RUN mode automatically and the incident light intensity is shown on the display. MODE indicator / RUN (green) lights up. The setting is complete.	1234

- Notes: 1) For details, refer to 'Error indication' on p.606.
 2) The initial setting at the time of factory shipment is Liquid (F9) mode (·f·).
 3) Do not move or bend the fiber cable after the sensitivity setting. Detection may become unstable.

FX-301-F

PRECAUTIONS FOR PROPER USE

Refer to p.1135~ for general precautions, p.592~ for leak detection fiber precautions and p.596~ for liquid detection fiber precautions.

Collective teaching mode

- When MODE indicator / ALL (yellow) lights up, a threshold value can be collectively set to amplifiers mounted in cascade.

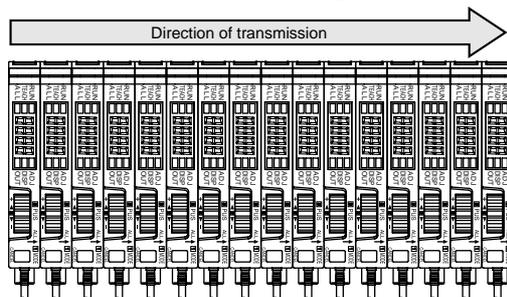
Step	Description	Display
①	Insert Leak detection fiber (FD-F7□) or Liquid detection fiber (FT-F9□). Press MODE key to light up MODE indicator / ALL (yellow).	1234
②	Turn the jog switch to '+' or '-' side to set to either Leak (F7) mode (·f·) or Liquid (F9) mode (·f9·). In case Liquid (F9) mode (·f9·) is set, the model indicator (green) lights up.	·f· ·f9·
③	Press Jog switch in no-leak condition with Leak detection fiber (FD-F7□) fitted or no-liquid condition with Liquid detection fiber fitted (FT-F9□). Then, '0' on the display moves from top left to top right and from bottom right to bottom left (twice).	0
④	When teaching is accepted, the result of threshold value setting is displayed. • In case stable sensing is possible: 'Good' on the display blinks three times. • In case stable sensing is not possible: 'Err' on the display blinks. (Note 1)	Good Err
⑤	If the teaching result is 'Good', the sensor returns to RUN mode automatically and the incident light intensity is shown on the display. MODE indicator / RUN (green) lights up. The setting is complete.	1234

- Notes: 1) For details, refer to 'Error indication' on p.606.
 2) In collective teaching, only an instruction of the teaching operation is transmitted, the threshold value is not copied. The threshold value taught at the respective amplifier is set.
 3) When the collective teaching is done, the setting conditions are copied. In case an individual setting condition is desired to be set, set it individually after the collective teaching.
 4) Do not move or bend the fiber cable after the sensitivity setting. Detection may become unstable.

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Mode	Digit display Percent display	Model setting	Digital display setting	Sensitivity selection function	Timer function	NO / NC selection function
Leak (F7) mode	○	○	○	○	×	×
Liquid (F9) mode	○	○	○	○	○	○

- 5) The collective teaching transmits the information only in the direction of the arrow shown on the amplifier operation panel. The collective teaching is also possible from the middle of the amplifiers mounted in cascade. Check the direction of the transmission before collective teaching is done.



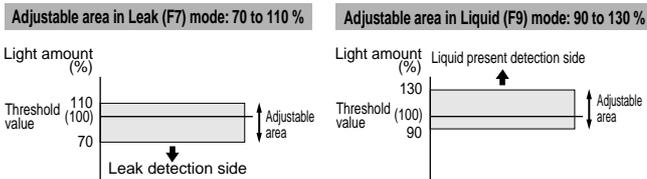
- 6) Since the model setting is also transmitted, do not carry out collective teaching when the amplifiers in Leak (F7) mode (·f·) and in Liquid (F9) mode (·f9·) are mixed in cascade connection.
 7) Do not move or bend the fiber cable after the sensitivity setting. Detection may become unstable.

Threshold value fine adjustment mode

- When MODE indicator / ADJ (yellow) lights up, the set threshold value can be fine adjusted.

Step	Description	Display
①	Press MODE key to light up MODE indicator / ADJ (yellow).	1234
②	Turn Jog switch to the '+' side, to increase the threshold value. Turn Jog switch to the '-' side, to decrease the threshold value.	1235
③	When Jog switch is pressed, the changed threshold value blinks 3 times and is confirmed.	1235
④	When MODE key is pressed 3 times, or for 2 sec., or more, the sensor returns to the RUN mode and the incident light intensity is shown in the display. MODE indicator / RUN (green) lights up. The setting is complete.	1234

Note: The adjustable area is limited as shown below. In order to adjust the threshold the outside the adjustable area, confirm it within the area once and then adjust it again.



Digital display setting mode

- When MODE indicator / DISP (yellow) lights up, the digital display can be switched to the light-up mode, the eco mode or the inverse mode.

Step	Description	Display
①	Press MODE key to light up MODE indicator / DISP (yellow).	Ecof
②	When Jog switch is turned to the '+' side or '-' side, the mode in the digital display changes. Ecof: This is the light-up mode in the digital display. The digital display always lights up. Econ: This is the eco mode. After confirmation, if key operation has not been done for 8 sec., or more, 'Ecof' flashes, and then the digital display is turned off. When a key operation is done after the display is turned off or when the collective teaching is carried out, the digital display lights up. Eurn: This is the inverse mode of the digital display. In the normal display condition, the display changes to the inverse display and in the inverse condition, the display changes to the normal display.	Ecof Econ Eurn
③	When Jog switch is pressed, the set display blinks 3 times and is confirmed.	Econ
④	When MODE key is pressed twice or for 1 sec., or more, the sensor returns to RUN mode and the incident light intensity is displayed. • MODE indicator / RUN (green) lights up. • The setting is complete.	1234

Note: The initial setting at the time of factory shipment is the light-up mode (Ecof).

PRECAUTIONS FOR PROPER USE Refer to p.1135~ for general precautions, p.592~ for leak detection fiber precautions and p.596~ for liquid detection fiber precautions.

Forced output mode

- When MODE indicator / OUT (yellow) lights up, the output can be compulsorily changed to ON or OFF regardless of the incident light intensity.

Step	Description	Display
①	Press MODE key to light up MODE indicator / OUT (yellow). (Present output state is displayed.)	
②	When Jog switch is turned to the '+' side or '-' side, the output is compulsorily changed to ON or OFF. Since the emitting element of the amplifier blinks, it is possible to check the fiber connected to the amplifier. When the output is compulsorily changed to ON, the operation indicator (orange) lights up.	
③	Press MODE key to return the sensor to step ①.	
④	When MODE key is pressed, the sensor returns to RUN mode and the incident light intensity is displayed. MODE indicator / RUN (green) lights up. The setting is complete.	

Sensitivity selection function

- If Jog switch is pressed for 3 sec., or more, when MODE indicator / ADJ (yellow) lights up, the sensitivity can be fixed to low sensitivity or high sensitivity, or set to automatic sensitivity.

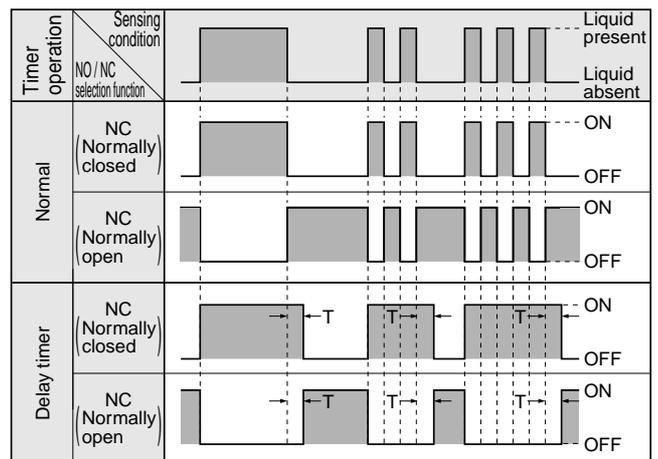
Step	Description	Display
①	Press MODE key to light up MODE indicator / ADJ (yellow).	
②	Press Jog switch for 3 sec. or more. (The sensor goes into the sensitivity setting condition.) MODE indicator / RUN (green) blinks.	
③	When Jog switch is turned to the '+' side or '-' side, the display and MODE indicator / RUN (green) blinks, and the sensitivity can be selected. $Auto$: Automatic sensitivity setting After selecting the automatic sensitivity, the optimum sensitivity is set by carrying out teaching. Lo : Low sensitivity setting Hi : High sensitivity setting	
④	When Jog switch is pressed, the setting display blinks 3 times and is confirmed.	
⑤	MODE indicator / TEACH (green) lights up and '·f·' or '·f·' is displayed. After sensitivity selection, carry out the teaching. For the setting method of teaching, refer to 'Individual teaching mode' on p.603.	

Note: The initial setting at the time of factory shipment is the automatic sensitivity setting ($Auto$).

Timer function [Liquid (F9) mode only]

- The timer setting can be done by pressing the jog switch for 3 sec., or more, when Liquid (F9) mode (·f·) has been set and MODE indicator / DISP (yellow) lights up. In case of Leak (F7) mode (·f·), the display does not change to the timer function. For the selection method of Leak (F7) mode / Liquid (F9) mode, refer to 'Individual teaching mode' on p.603 or 'Collective teaching mode' on p.604.
- This product incorporates a delay timer which reduces the effect of air bubbles, etc.

Time chart



Timer period: T = 10 ms, 100 ms, 1,000 ms

Step	Description	Display
①	Confirm if the sensor is in Liquid (F9) mode (·f·) in 'Individual teaching mode' or 'Collective teaching mode'.	
②	Press MODE key to light up MODE indicator / DISP (yellow).	
③	Press Jog switch for 3 sec., or more. (The sensor goes into the timer setting condition.) MODE indicator / RUN (green) blinks.	
④	When Jog switch is turned to the '+' side or '-' side, the display and MODE indicator / RUN (green) blinks, and the timer period can be chosen. nna : Without timer nn : 10 ms timer nnn : 100 ms timer $nnnn$: 1,000 ms timer	
⑤	When Jog switch is pressed, setting display blinks 3 times and is confirmed.	
⑥	The sensor returns to step ②.	
⑦	When MODE key is pressed twice or for 1 sec., or more, the sensor returns to RUN mode and the incident light intensity is displayed. MODE indicator / RUN (green) lights up. The setting is complete.	

Note: The initial setting at the time of factory shipment is the without timer (nna) condition.

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

FX-301-F

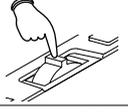
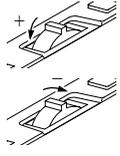
PRECAUTIONS FOR PROPER USE

Refer to p.1135~ for general precautions, p.592~ for leak detection fiber precautions and p.596~ for liquid detection fiber precautions.

NO / NC selection function [Liquid (F9) mode only]

- The NO / NC selection can be done by pressing the jog switch for 3 sec., or more, when Liquid (F9) mode ($\cdot F9\cdot$) has been set and MODE indicator / DISP (yellow) lights up. In case of Leak (F7) mode ($\cdot F7\cdot$), the display does not change to NO / NC selection function.

For the selection method of Leak (F7) mode / Liquid (F9) mode, refer to 'Individual teaching mode' on p.603 or 'Collective teaching mode' on p.604.

Step	Description	Display
①	Confirm if the sensor is in Liquid (F9) mode ($\cdot F9\cdot$) in 'Individual teaching mode' or 'Collective teaching mode'.	$\cdot F9\cdot$
②	Press MODE key to light up MODE indicator / OUT (yellow). 	$\cdot n\cdot$
③	Press Jog switch for 3 sec., or more. (The sensor goes into the NO / NC setting condition. MODE indicator / RUN (green) blinks. 	$\cdot n\cdot$
④	When Jog switch is turned to the '+' side or '-' side, the display and MODE indicator / RUN (green) blinks, and NO / NC can be chosen. $\cdot n\cdot$: Normally closed (OFF in liquid absent condition.) $\cdot n\cdot$: Normally open (OFF in liquid present condition.) 	$\cdot n\cdot$ $\cdot n\cdot$
⑤	When Jog switch is pressed, setting display blinks 3 times and is confirmed. 	$\cdot n\cdot$
⑥	The sensor returns to the step ②.	$\cdot n\cdot$
⑦	When MODE key is pressed, the sensor returns to RUN mode and the incident light intensity is displayed. MODE indicator / RUN (green) lights up. The setting is complete.	1234

Note: The initial setting at the time of factory shipment is the normal close ($\cdot n\cdot$) setting.

Error indication

- When an error is displayed, remedy as follows.

Error indication	Cause	Remedy
$\cdot E-1$	Excessive current flows due to a short-circuit.	Switch off the power supply and check the load.
$\cdot E-3$	The teaching is abnormal.	Check the installation condition of the fiber, or whether the fiber has come out, and then do teaching again. Press MODE key to cancel ' $\cdot E-3$ '. After the cancellation, the sensor operates at the set value conditions before the error. However, in case the sensitivity selection function has been set to the automatic sensitivity setting ($\cdot n\cdot$), the sensor operates at optimum sensitivity.
$\cdot E-5$	The communication is abnormal.	Check if the amplifiers mounted in cascade are disconnected. After the confirmation, do the teaching again.

Wiring

- Make sure that the power supply is off while wiring.
- Verify that the supply voltage variation is within the rating.
- Take care that if a voltage exceeding the rated range is applied, or if an AC power supply is directly connected, the sensor may get burnt or damaged.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this product, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- Make sure to use an isolation transformer for the DC power supply. If an auto-transformer (single winding transformer) is used, this product or the power supply may get damaged.
- In case a surge is generated in the used power supply, connect a surge absorber to the supply and absorb the surge.
- Take care that short-circuit or wrong wiring of the load may burn or damage the sensor.
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.
- Make sure to use the optional quick-connection cable for the connection of the amplifier. Extension up to total 100 m 328.084 ft is possible with 0.3 mm², or more, cable. However, in order to reduce noise, make the wiring as short as possible.

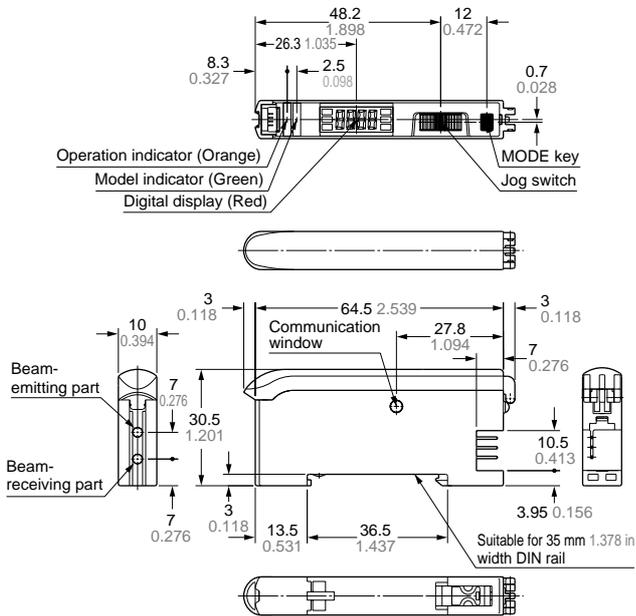
Others

- Do not use during the initial transient time (0.5 sec. approx.) after the power supply is switched on.
- Take care that the sensor is not directly exposed to fluorescent light from a rapid-starter lamp or a high frequency lighting device, as it may affect the sensing performance.
- Avoid dust, dirt, and steam.
- When the fiber head gets dusty or dirty etc. the sensitivity deteriorates. To keep stable detection, wipe the fiber head to remove dust or dirt etc. and carry out sensitivity teaching periodically.
- This sensor is suitable for indoor use only.
- Take care that the product does not come in direct contact with water, oil, grease, or organic solvents, such as, thinner, etc.
- This sensor cannot be used in an environment containing inflammable or explosive gases.
- Never disassemble or modify the sensor.

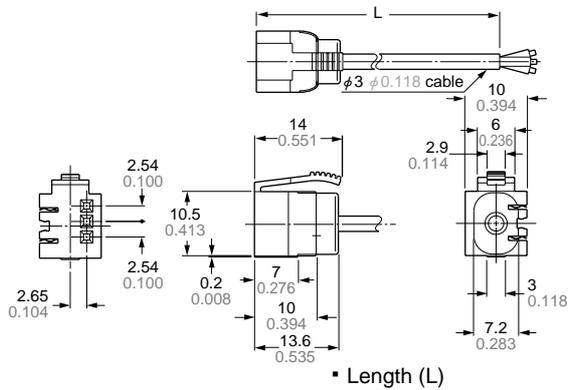
DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.co.jp/>
Refer to [p.593](#) for leak detection fiber dimensions and [p.597](#) for liquid detection fiber dimensions.

FX-301-F FX-301P-F Amplifier

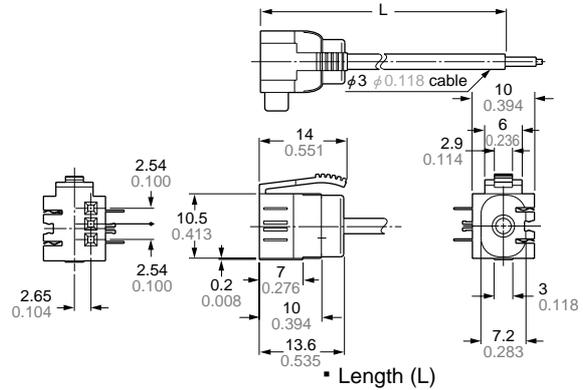


CN-73-C1 CN-73-C2 CN-73-C5 Main cable (Optional)



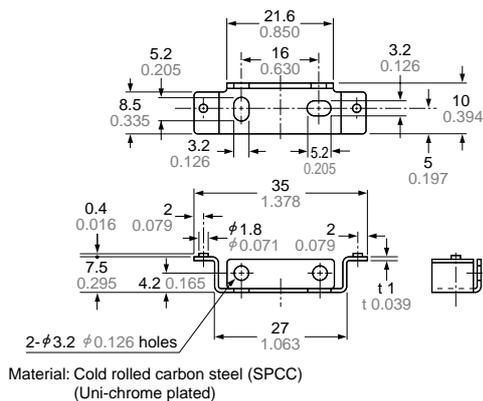
Model No.	Length (mm in)
CN-73-C1	1,000 39.390
CN-73-C2	2,000 78.740
CN-73-C5	5,000 196.850

CN-71-C1 CN-71-C2 CN-71-C5 Sub cable (Optional)



Model No.	Length (mm in)
CN-71-C1	1,000 39.390
CN-71-C2	2,000 78.740
CN-71-C5	5,000 196.850

MS-DIN-2 Amplifier mounting bracket (Optional)



MS-DIN-E End plates (Optional)

