

DIGITAL FIBER SENSOR

New

# FX-411 SERIES



Digital dual display

Large adjuster

## Just 'Look' and 'Turn'

Simple, easy-to-use fiber sensor



# Fiber sensors that are easy to understand and use, even for beginners

Operation is so simple that it can be understood without even needing to look at an instruction manual.

This is a new type of fiber sensor that emphasizes convenience in the workplace.

Find the threshold value and incident light intensity just by *'Looking'*

Use a screwdriver to adjust simply by *'Turning'*



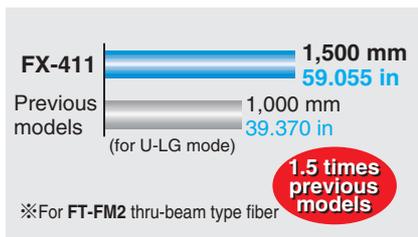
Industry's smallest in its class\*

※For digital dual-display fiber sensors  
As of April 2005 and based on research conducted by SUNX.

## Basic performance that is central to the design stage has been upgraded

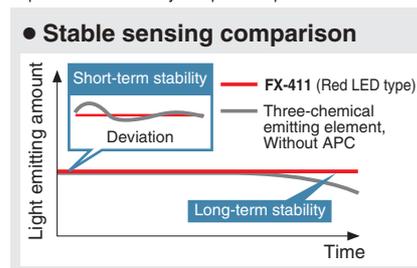
**Beam power greatly increased to give strong performance under adverse environments** Red LED type

The beam power has been greatly increased. This means a longer sensing distance and less trouble from problems such as dust. These sensors have ample performance for workplace needs.



**Improved stability over both long and short terms**

The red LED type sensors have a 'four-chemical emitting element' which maintains stability of light emissions for long-term operation. Furthermore, all models have an 'APC (Auto Power Control) circuit' which improves stability at times such as when the power is turned on. These features improve overall stability compared to previous models.



**Three types are available, with red, blue and green light**

Different sensors can be selected to suit the application.



# Dual display + Large adjuster

Therefore

- Explanations of how to operate the sensors can be given remotely by telephone with ease.
- Operations are carried out using basic tools (screwdrivers), which reduces the possibility of accidental operating errors.

## Emphasis on being easy to understand and easy to use

Work-place

### Incident light intensity and threshold value are displayed simultaneously

The incident light intensity and threshold value can be checked at the same time with no operations needed. In addition, no complex mode settings are needed when the values are adjusted.

### Large endless adjuster

New concept

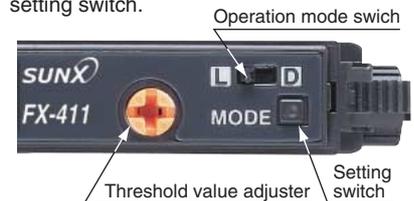
Standard screwdrivers can be used to turn the adjuster as well as precision screwdrivers. In addition, an 'endless' mechanism is used which eliminates the possibility of any damage being caused by turning the adjuster too far.



Everyday-use screwdriver is OK

### Easy-to-understand operating panel layout

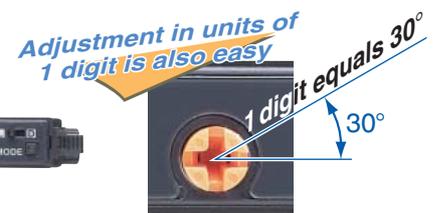
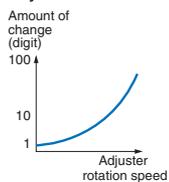
The threshold value adjuster and operation mode switch are large and easy to see, and they can be operated with the same sensitivity as general-purpose photoelectric sensors. Functions which are not commonly used can be operated using a non-obtrusive setting switch.



### Immediate setting possible using the R.S.S. adjuster\*

\*Rotation Speed Sensitivity

The sensitivity amount changes depending on the rotation speed of the adjuster, so that adjustment can be carried out speedily.

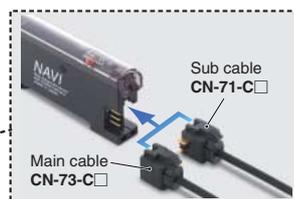
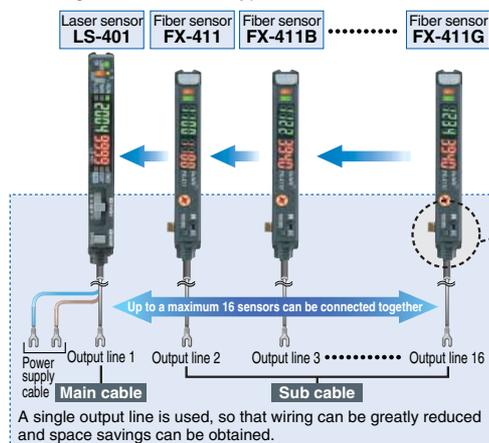


No need for the fine changes in force required for photoelectric sensors.

Design

### Excellent workability and ease of maintenance

The same quick-connection cable that is used for sensors such as the FX-300 series of digital fiber sensors is used. This means that they can be used together with other types of sensors such as laser sensors, and the number of power supply cables can be reduced.



Quick-connection cables can be used for power supply cascade wiring. Both main and sub units utilize the same amplifier body.

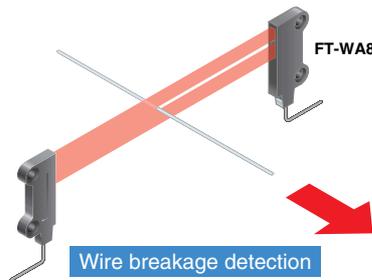
The sensors can be connected together with other sensors such as the FX-300 series of digital fiber sensors and the GA-311 of inductive proximity sensors. In addition, the SC series of sensor PLC connection units with MIL connector compatibility can also be used to further reduce the amount of wiring.

# Convenient functions backed up by technology

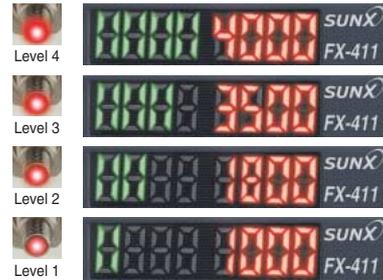
## Ideal for dealing with saturation / Light-emitting amount selection function

Red LED type New concept

In cases where the incoming light level can become saturated, such as during close-range sensing or when sensing transparent or minute objects, the sensor's light-emitting amount can be adjusted to provide more stable sensing without changing the response time.

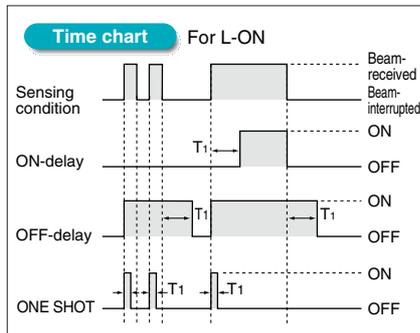


Light-emitting amount can be changed without changing response time.



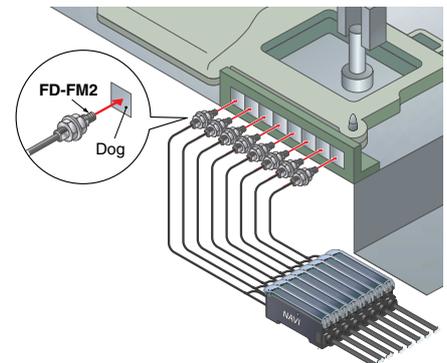
## Equipped with 3 types timers

Equipped with OFF-delay / ON-delay / ONE SHOT timer.  
(Timer period: 1 to 500 ms approx.)



## Interference prevention for up to 8 sets fiber heads (for U-LG)

The optical transmission function allows up to a maximum of eight sets of fiber heads (four sets for FAST and STD settings) to be installed in contact with each other without mutual interference occurring. (Set automatically when power is turned on.)



## Digital display upside-down / off function

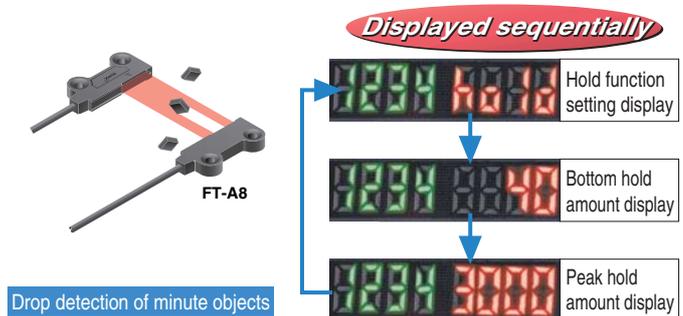
The digital display can be turned upside-down if required to suit the setup location. In addition, a stability indicator is also provided, so that the amount of light-receiving excess can be checked even when the display is turned off.



## Hold function

Peak and bottom hold values for the incident light intensity can be displayed. This is useful for checking the incident light intensity during tasks such as drop detection.

In addition, the peak and bottom values can be checked while looking at the threshold value, which makes adjustment much easier.



## Key lock function\* prevents wrong operation

This prevents the operator from changing the threshold value by mistake.



Press and hold setting switch for 5 seconds

\* Available in models manufactured since July 2005.

## ORDER GUIDE

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

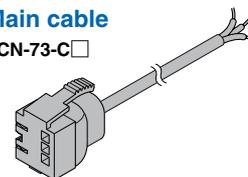
Type	Appearance	Model No.	Emitting element	Output
Connector type NPN output PNP output		<b>FX-411</b>	Red LED	NPN open-collector transistor
		<b>FX-411B</b>	Blue LED	
		<b>FX-411G</b>	Green LED	
		<b>FX-411P</b>	Red LED	PNP open-collector transistor
		<b>FX-411BP</b>	Blue LED	
		<b>FX-411GP</b>	Green LED	

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

Type	Model No.	Description
Main cable (3-core)	<b>CN-73-C1</b>	Length: 1 m <b>3.281 ft</b>
	<b>CN-73-C2</b>	Length: 2 m <b>6.562 ft</b>
	<b>CN-73-C5</b>	Length: 5 m <b>16.404 ft</b>
Sub cable (1-core)	<b>CN-71-C1</b>	Length: 1 m <b>3.281 ft</b>
	<b>CN-71-C2</b>	Length: 2 m <b>6.562 ft</b>
	<b>CN-71-C5</b>	Length: 5 m <b>16.404 ft</b>

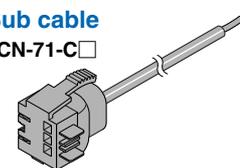
**Main cable**

- CN-73-C□

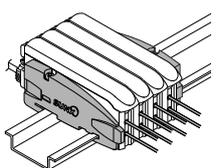


**Sub cable**

- CN-71-C□



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

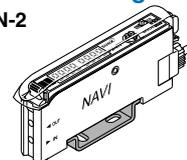
Appearance	Model No.	Description
	<b>MS-DIN-E</b>	When cascading multiple amplifiers, or when it moves depending on the way it is installed on a DIN rail, these end plates ensure that all amplifiers are mounted together in a secure and fully connected manner. <b>Two pcs. per set</b>

## OPTIONS

Designation	Model No.	Description
Amplifier mounting bracket	<b>MS-DIN-2</b>	Mounting bracket for amplifier
Fiber amplifier protective seal	<b>FX-MB1</b>	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.

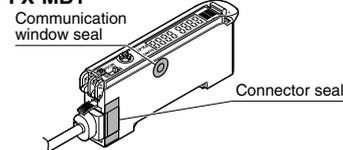
**Amplifier mounting bracket**

- MS-DIN-2



**Fiber amplifier protective seal**

- FX-MB1



## LIST OF FIBERS (TYPICAL)

Please contact our office for details on models which are not shown below.

### Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in)(Note 1)			Fiber cable length ✂: Free-cut	Bending radius	Model No.		
		Red LED	Blue LED	Green LED					
Threaded type	M4	Lens mountable	2,000 78.740	440 17.323	220 8.661	✂ 2 m 6.562 ft	R25	FT-B8	
			530 20.866	110 4.331	55 2.165				
		Tough flexible	400 15.748	75 2.953	40 1.575				
			1,500 59.055	230 9.055	120 4.724				
	M3	Lens mountable	340 13.386	60 2.362	30 1.181		✂ 1 m 3.281 ft	R10	FT-P81X
			240 9.449	40 1.575	22 0.866				
		Tough flexible	950 37.402	170 6.693	100 3.937				
			290 11.417	45 1.772	26 1.024				
Special	Wide area sensing	Note 2	3,500 137.795	900 35.433	400 15.748	✂ 2 m 6.562 ft	R1	FT-WA8	
			1,500 59.055	300 11.811	150 5.906				
		Note 2	3,500 137.795	900 35.433	400 15.748				
			1,500 59.055	300 11.811	150 5.906				
	M3	Lens mountable	450 17.717	85 3.346	38 1.496	✂ 2 m 6.562 ft	R25	FT-NFM2	
			130 5.118	20 0.787	10 0.394				
		Tough flexible	300 11.811	48 1.890	26 1.024				
			80 3.150	8 0.315	5 0.197				
Wide area sensing	Note 2	3,500 137.795	900 35.433	400 15.748	✂ 2 m 6.562 ft	R10	FT-A8		
		1,500 59.055	300 11.811	150 5.906					
	Note 2	3,500 137.795	900 35.433	400 15.748					
		1,500 59.055	300 11.811	150 5.906					

Notes: 1) Please take care that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.  
2) The fiber cable length practically limits the sensing range to 3,500 mm 137.795 in long.

### Reflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in)(Note 1, 2)			Fiber cable length ✂: Free-cut	Bending radius	Model No.	
		Red LED	Blue LED	Green LED				
Threaded type	M6	Lens mountable	650 25.591	160 6.299	86 3.386	✂ 2 m 6.562 ft	R25	FD-B8
			180 7.087	40 1.575	21 0.827			
		Coaxial	460 18.110	90 3.543	46 1.811			
			110 4.331	23 0.906	12 0.472			
	M4	Lens mountable	300 11.811	53 2.087	28 1.102	✂ 2 m 6.562 ft	R25	FD-NFM2
			70 2.756	11 0.433	7 0.276			
		Coaxial - Lens mountable	280 11.024	70 2.756	32 1.260			
			80 3.150	16 0.630	8 0.315			
	M3	Lens mountable (FX-MR3, FX-MR6)	170 6.693	35 1.378	16 0.630	✂ 1 m 3.281 ft (Note 3)	R10	FD-G6X
			40 1.575	8 0.315	4 0.157			
		Coaxial	150 5.906	26 1.024	12 0.472			
			32 1.260	5 0.197	3 0.118			
M4	Lens mountable	220 8.661	48 1.890	20 0.787	✂ 2 m 6.562 ft	R25	FD-G4	
		52 2.047	11 0.433	5 0.197				
	Coaxial	200 7.874	50 1.969	22 0.866				
		45 1.772	11 0.433	6 0.236				
M3	Lens mountable	200 7.874	50 1.969	22 0.866	✂ 1 m 3.281 ft (Note 3)	R10	FD-G6X	
		45 1.772	11 0.433	6 0.236				
	Coaxial	200 7.874	50 1.969	22 0.866				
		35 1.378	6 0.236	4 0.157				

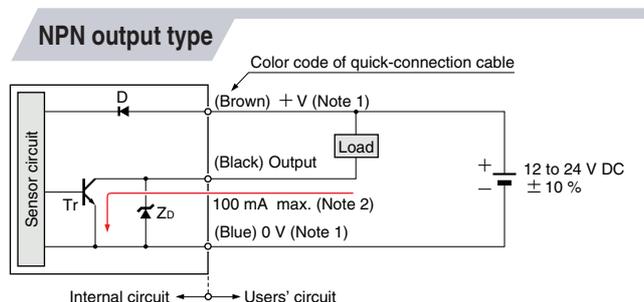
Notes: 1) The sensing range is specified for white non-glossy paper [200 × 200 mm 7.874 × 7.874 in (FD-B8, FD-FM2, FD-W8, FD-P81X: 400 × 400 mm 15.748 × 15.748 in)] as the object.  
2) Please take care that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.  
3) The allowable cutting range is 700 mm 27.559 in from the end that the amplifier inserted.

## SPECIFICATIONS

		NPN output			PNP output		
		Red LED	Blue LED	Green LED	Red LED	Blue LED	Green LED
Item	Model No.	FX-411	FX-411B	FX-411G	FX-411P	FX-411BP	FX-411GP
Supply voltage	12 to 24 V DC $\pm$ 10 % Ripple P-P 10 % or less						
Power consumption	<Red LED type> Normal operation: 960 mW or less (Current consumption 40 mA or less at 24 V supply voltage) ECO mode: 840 mW or less (Current consumption 35 mA or less at 24 V supply voltage)			<Blue LED / Green LED type> Normal operation: 720 mW or less (Current consumption 30 mA or less at 24 V supply voltage) ECO mode: 580 mW or less (Current consumption 24 mA or less at 24 V supply voltage)			
Output	<NPN output type> 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 (at 50 mA, if five, or more, amplifiers are connected in cascade) sink current.]			<PNP output type> 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 (at 50 mA, if five, or more, amplifiers are connected in cascade) source current.]			
	Utilization category	DC-12 or DC-13					
	Output operation	Switchable either Light-ON or Dark-ON					
	Short-circuit protection	Incorporated					
Response time	150 $\mu$ s or less (FAST), 500 $\mu$ s or less (STD), 4.5ms or less (U-LG) with setting switch						
Operation indicator	Orange LED (lights up when the output is ON)						
Stability indicator	Green LED (lights up under stable light received condition or stable dark condition)						
Timer function	Incorporated with variable ON-delay / OFF-delay / ONE SHOT timer, switchable either effective or ineffective. [Timer period (Note 2): 1 ms to 3 sec. approx. (1 to 10 ms: Setting possible in units of 1 ms, 10 to 100 ms: Setting possible in units of 10 ms, 100 to 500 ms: Setting possible in units of 50 ms, 500 ms to 1 sec.: Setting possible in units of 100 ms, 1 to 3 sec.: Setting possible in units of 500 ms)]						
Automatic interference prevention function	Incorporated (Up to four sets of fiber heads can be mounted close together. However, U-LG mode is 8 fiber heads.)(Note 3)						
Environmental resistance	Pollution degree	3 (Industrial environment)					
	Ambient temperature	- 10 to +55 $^{\circ}$ C + 14 to +131 $^{\circ}$ F (If 4 to 7 units are connected in cascade: - 10 to +50 $^{\circ}$ C + 14 to +122 $^{\circ}$ F, if 8 to 16 units are connected in cascade: - 10 to +45 $^{\circ}$ C + 14 to +113 $^{\circ}$ F (No dew condensation or icing allowed), Storage: - 20 to +70 $^{\circ}$ C - 4 to +158 $^{\circ}$ F					
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH					
	Ambient illuminance	Incandescent light: 3,000 lx or less at the light-receiving face					
	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure (Note 4)					
	Insulation resistance	20 M $\Omega$ , or more, with 250 V DC megger between all supply terminals connected together and enclosure (Note 4)					
	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 <sup>2</sup> acceleration (10 G approx.) in X, Y and Z directions for five times each					
Emitting element (modulated)	Red LED	Blue LED	Green LED	Red LED	Blue LED	Green LED	
Peak emission	650 nm 0.026 mil	470 nm 0.019 mil	525 nm 0.021 mil	650 nm 0.026 mil	470 nm 0.019 mil	525 nm 0.021 mil	
Material	Enclosure: Heat-resistant ABS, Case cover: Polycarbonate						
Cable extension	Extension up to total 100 m 328.084 ft (50 m 164.042 ft for 5 to 8 units, 20 m 65.617 ft for 9 to 16 units) is possible with 0.3 mm <sup>2</sup> , or more, cable.						
Weight	Net weight: 20 g approx., Gross weight: 30 g approx.						

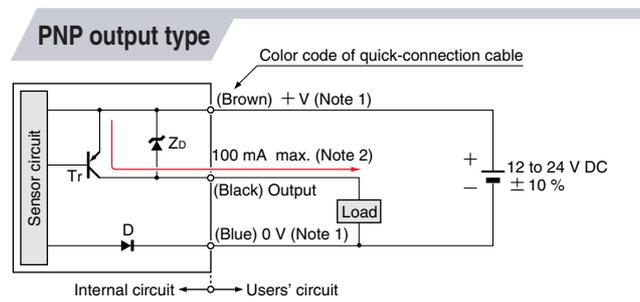
- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were ambient temperature +23  $^{\circ}$ C +73.4  $^{\circ}$ F  
 2) For models manufactured up until June 2005, the timer period is approx. 1 to 500 ms.  
 3) When the power supply is switched on, the light emission timing is automatically set for interference prevention.  
 4) The voltage withstandability and the insulation resistance values given in the above table are for the amplifier only.

## I/O CIRCUIT DIAGRAMS



- Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.  
 2) 50 mA max., if five amplifiers, or more, are connected together.

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



- Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.  
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Symbols ... D : Reverse supply polarity protection diode  
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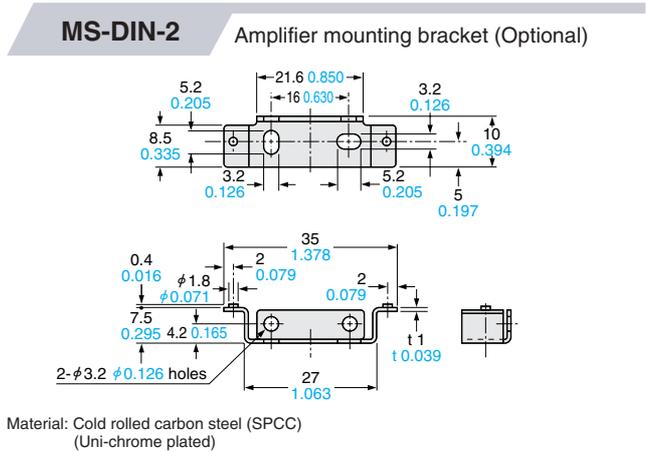
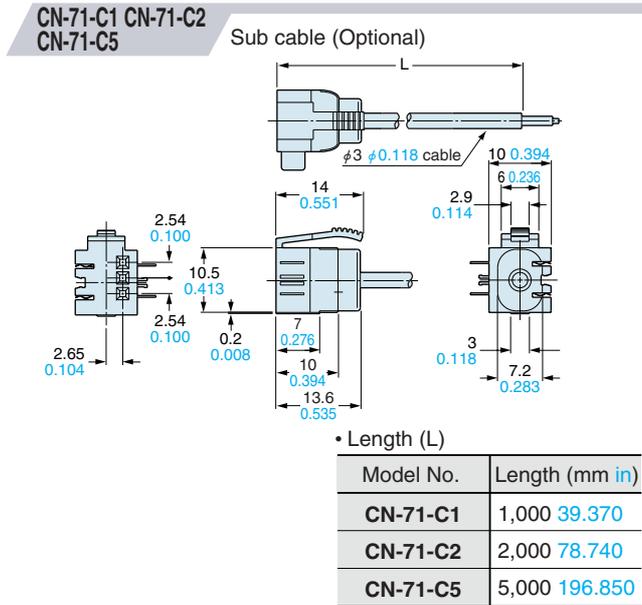
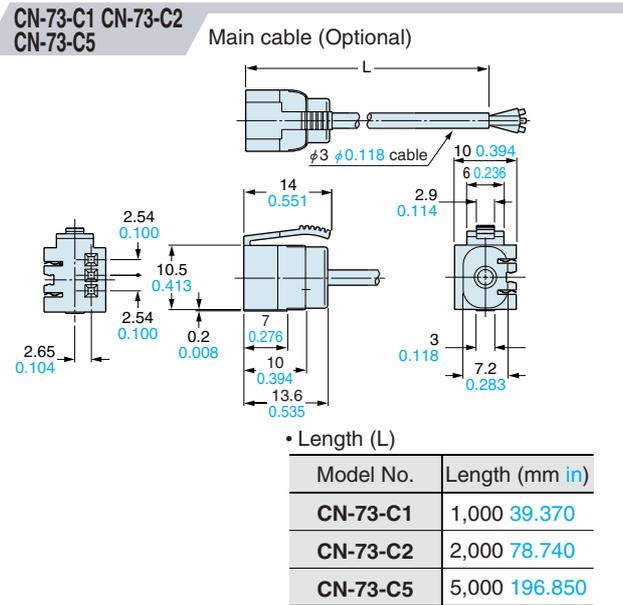
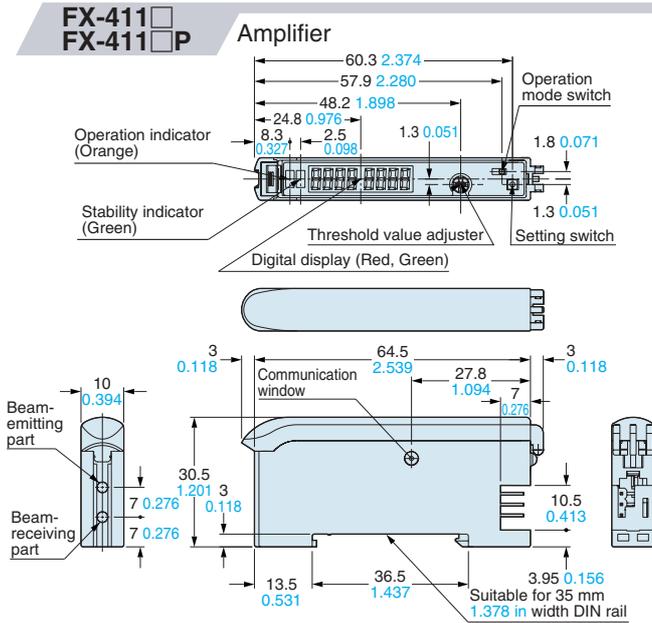
# PRECAUTIONS FOR PROPER USE



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

## DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.co.jp/>  
 The CAD data is available in 2-D (dxf) and 3-D (IGES, STEP and Parasolid) formats.



All information is subject to change without prior notice.



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