Panasonic
ideas for life

DIGITAL FIBER SENSOR
FX-500 SERIES Ver.2

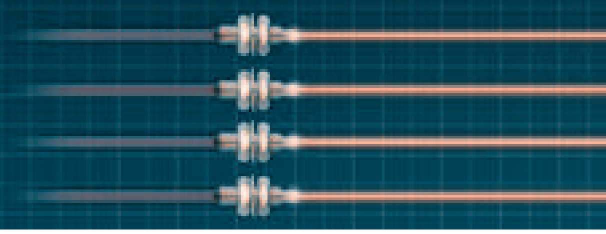
Conforming to EMC Directive | Listing | Certified

At the industry's leading edge

FX-SERIES HIGH END MODEL

Stability

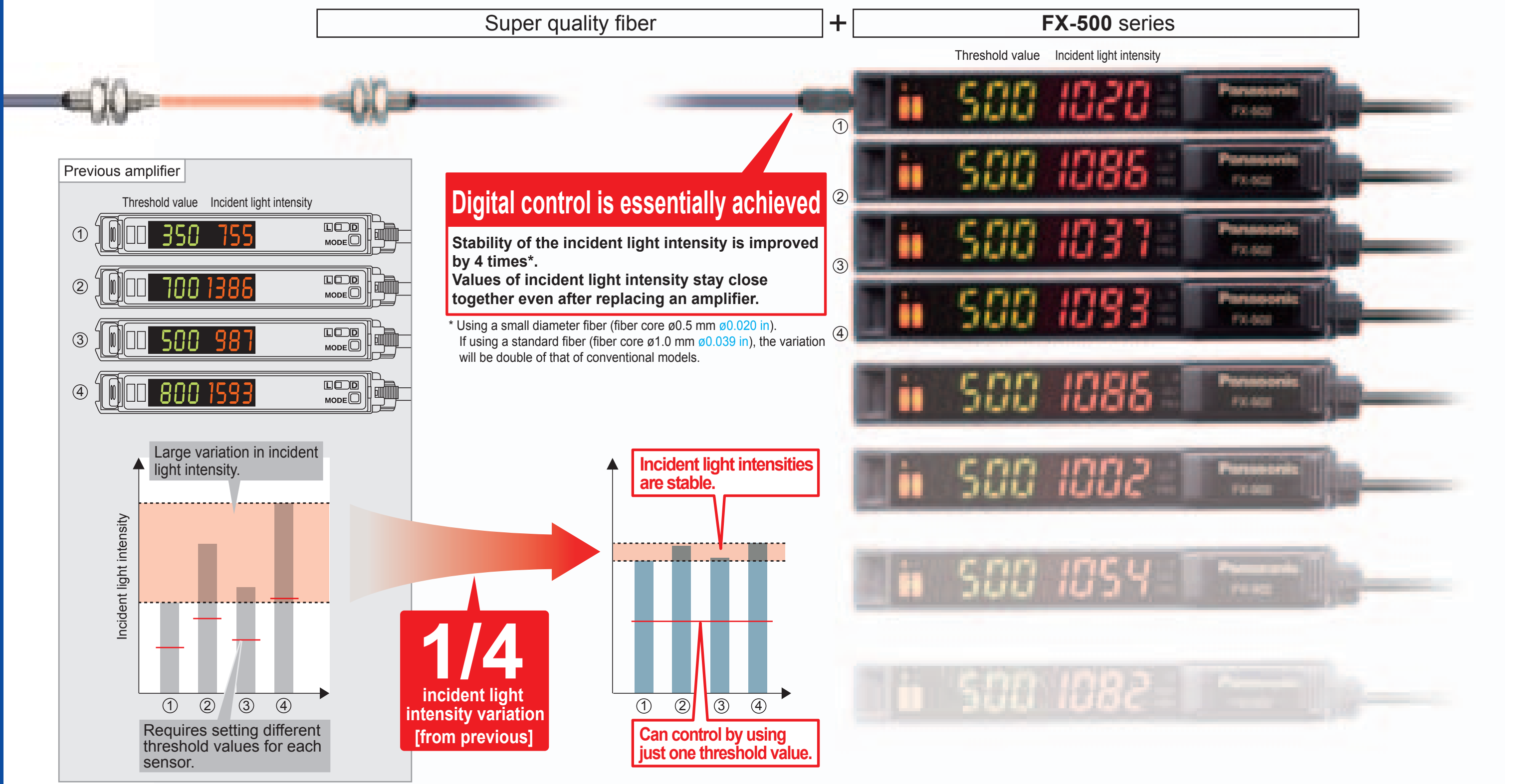
Industry leading stability



Decrease the variation among fiber sensors

High stability!

"Why are the values different even for the same detection?" "If we try to forcibly unify all the display values of incident light intensity, we will not be able to read the actual changes."
SUNX focuses on the variation among fiber sensors and aims for absolute digitalization.
When the **FX-500** series is used together with our super quality fiber, the incident light intensity variation among units is decreased to only 1/4 of that of conventional models.
By being close to absolute values instead of modified digital values, changes in detection that could not be found in the past can now be monitored.



Specifying just one value in an operation manual is possible

In the case where multiple fiber sensors are installed under the same operating conditions, the incident light intensities are nearly identical to each other, allowing for the specification of one threshold across all sensors.

Maintenance is easy on stabilized fiber sensors

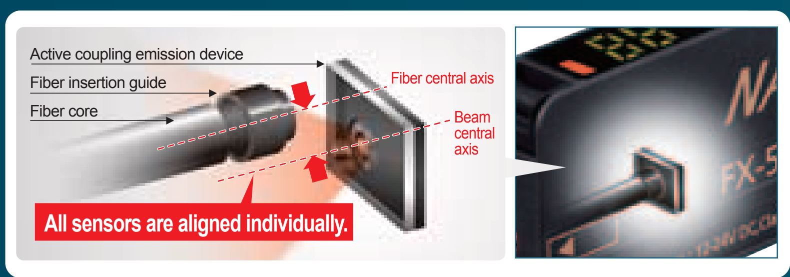
Because the incident light intensity is stable, the same threshold value can be used even when an amplifier is replaced. Also, copying of settings is easy when used together with optical communication.

Stability in incident light intensity and confidence in beam adjustment

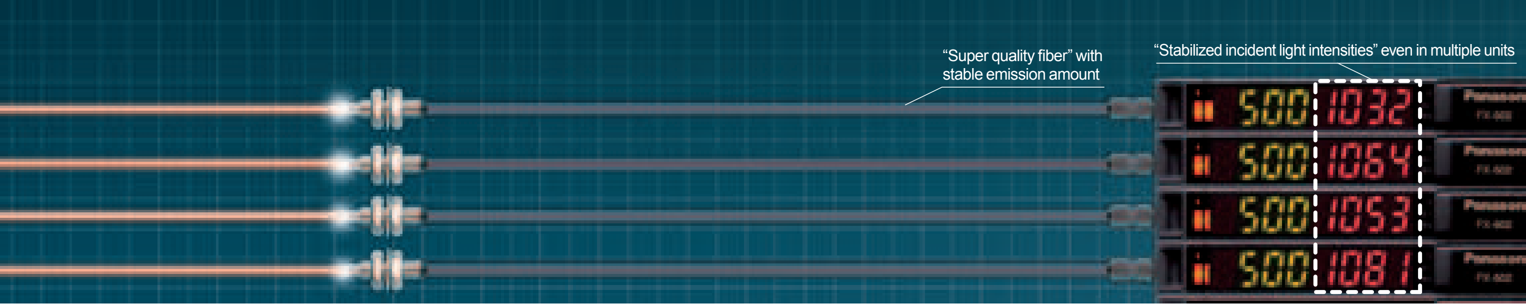
When setting up fiber sensors in a row in the same layout, all incident light intensities will display nearly identical values once beams are aligned. This helps to raise installation precision and prevent trouble from occurring before equipment is turned on.

Improved fiber coupling efficiency and suppressed variation among units

In each unit we have accurately aligned the central axis of the fiber with the central axis of the emitted light, which creates a high coupling efficiency that helps to reduce variation among units.

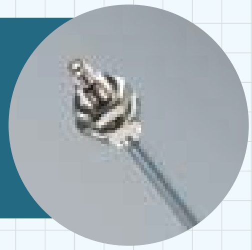


* Illustration is image only.



A quality that surpassed standard fiber

Introducing super quality fiber



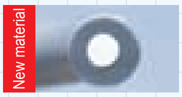
New fibers developed using a new manufacturing method adopted by our own factory along with a persistent quality control system

The basic performance of a standard fiber is greatly enhanced!

Stable emission intensity ±10

Variation in emission intensity of the fiber core is controlled down to less than ±10 %, achieving a stable detection.

ø2.2 mm ø0.087 in standard fiber



Single core standard fiber with high flexibility

In general, high-flexibility types adopt a multi-fiber core which may result in large variation in light emission.

Expanded temperature range

Ambient temperature [–40 to +70 °C –40 to +158 °F in previous]

–55 to +80 °C
–67 to +176 °F

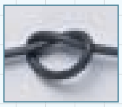
1.2 times more than previous

More flexible! R4

Bending radius [Previous is R25 mm R0.984 in]

R4 mm
R0.157 in

1/6 of that of previous



Integrated high-precision plug

The centering precision of the fiber core attached to the inserting plug is doubled.
As the insertion precision is increased, the variation among units can be greatly suppressed.

More bendable!

Bending durability [Previous is 1,000 times]

10 million times

10,000 times more than previous

±10

Variation in emission intensity is down to less than ±10 %

Under our new manufacturing method and quality control system, we have developed fiber heads that have a stabilized light emission. When used with the **FX-500** amplifier, a complete digital control is essentially achieved.

Super quality fiber reduces optical transmission loss to less than ±10 %

Point 1
The beam axis deviation of each unit is kept within ±2 ° and the beam axis centering precision is kept within ±150 µm ±5.906 mil.

Point 2
High precision polishing is accomplished by using the PCTM polishing technique. The specularity of the end face of the fiber is 5 times greater.

Point 3
A high precision integrated plug is achieved with the centering precision of the fiber core being ±40 µm 1.575 mil.

Approx. 2 times more than previous

* For custom-ordered fibers of your required length, contact the sales office near you.

Speed & Distance

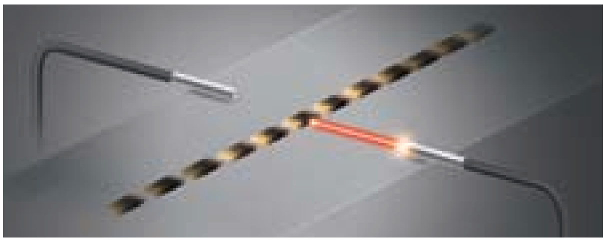
Industry leading sensing performance

Ultra high-speed & Ultra long range detection

The exclusive detection IC combined with the high intensity beam emitted from the active coupling emission device provides the capability of offering high-speed response time over a longer sensing range, opening up new possibilities for fiber sensor detection.

Max. 25 μs response time

FX-500 with its ultra high response time improves productivity.

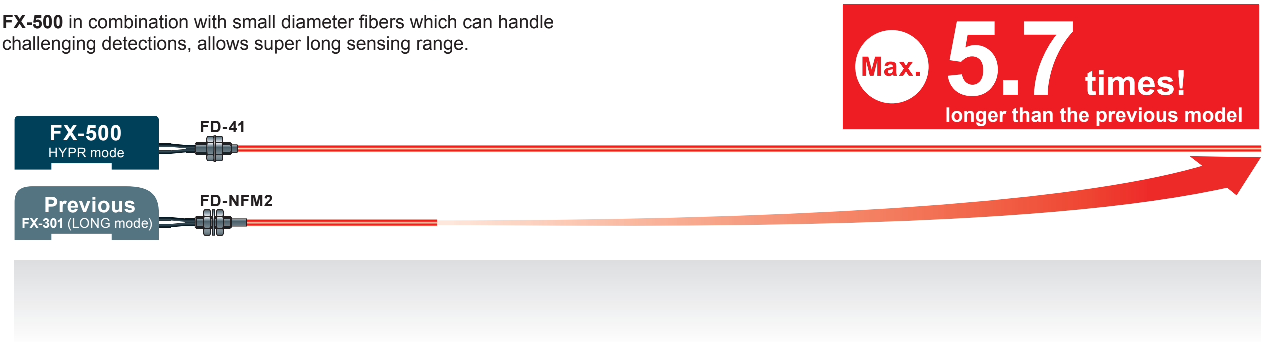


Performing minute object detection when using a small diameter fiber is now possible with a high response time and longer sensing range.

HYPR mode incorporated

(Hyper)

FX-500 in combination with small diameter fibers which can handle challenging detections, allows super long sensing range.



Long sensing range with small diameter fibers

Small diameter fibers with a compact head can perform long range and stable detection for minute objects.

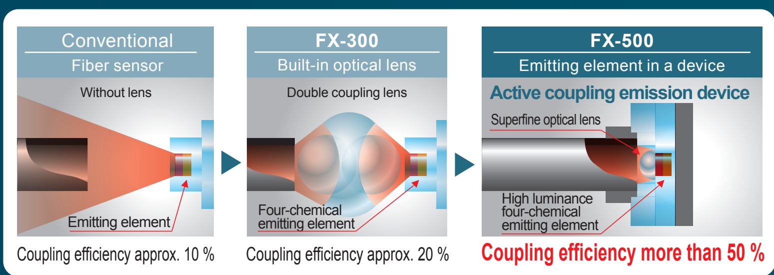
Long sensing range even in high speed mode

A high speed response time of 25 μs, which is 2.6 times more than previous, and a long sensing range are now possible in high speed mode.

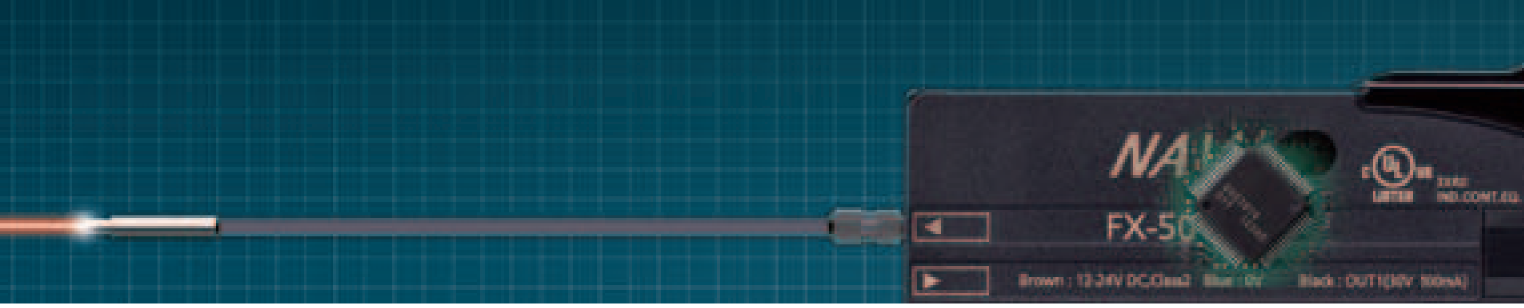
Satisfying both high speed and long range

The active coupling emission device efficiently focuses the beam through small diameter fibers

The super fine optical lens and emitting element are combined into one device enabling the beam emitted from the emitting element to be focused directly into the fiber.
Coupling efficiency is therefore increased by 50 % compared to standard fiber (core ø1 mm ø0.039 in). In particular, the small diameter fibers (core ø0.5 mm ø0.020 in) see a dramatic increase in light intensity, making challenging detections possible.



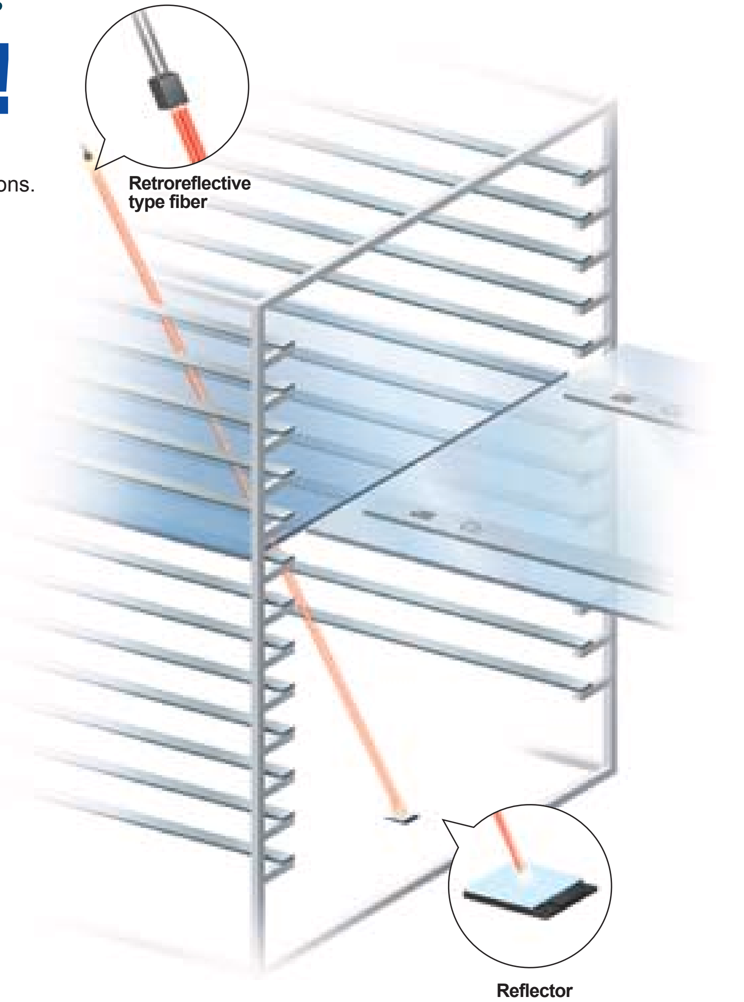
Coupling efficiency = (light intensity directed into the fiber / emission intensity of active coupling emission device) × 100　* Illustration is image only.



Sharp detection with suppressed hysteresis

A different accuracy!

FX-500 with its accurate detection catches fractional difference in light intensity, fulfilling high precision and low-hysteresis applications.

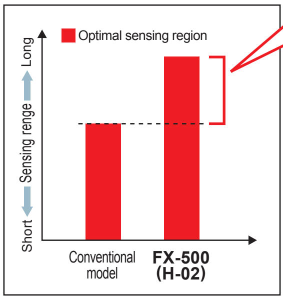


H-02 mode

Long range detection of small objects with small difference in light intensity

FX-500 series achieves a long sensing range by its suppressed hysteresis and high intensity beam. Detection of minute objects over a long range is now more accurate compared to the past.

■Comparison image of optimal sensing region

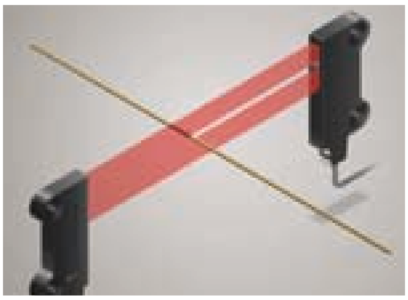


Long range detection of a glass target is now possible due to the ability of the sensor to detect small changes in light intensity.

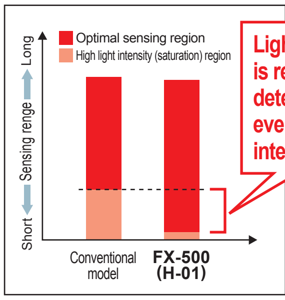
H-01 mode

Highly accurate detection while avoiding saturation

Even when the received light becomes saturated, the **FX-500** series cuts down hysteresis to the utmost limit in order to produce the optimal margin for detection.



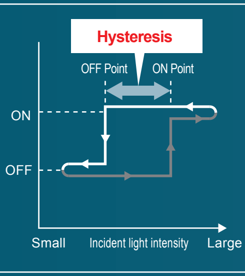
■Comparison image of optimal sensing region



Light saturated region is reduced, and detection is possible even under high light intensity.

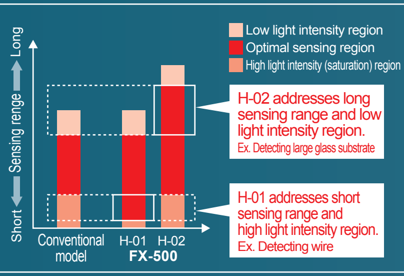
Three hysteresis modes

Hysteresis is the difference in incident light intensity at the points when the output turns ON and when the output turns OFF. Hysteresis was originally intended to be used as a measure against vibrations, but SUNX provides three hysteresis modes to suit the need of fiber sensors.



Mode table

Mode	Hysteresis amount	Light intensity	Description
H-01	Minimal	Small	Sharp detection with high accuracy is possible in this mode. Optimal for minute object detection where light saturates easily.
H-02	Small	Large	Initial setting mode. Accurate detection such as long range detection of a large glass substrate is possible.
H-03	Large	Large	A mode used for chattering prevention. Works in adverse environments such as vibration or dirt.

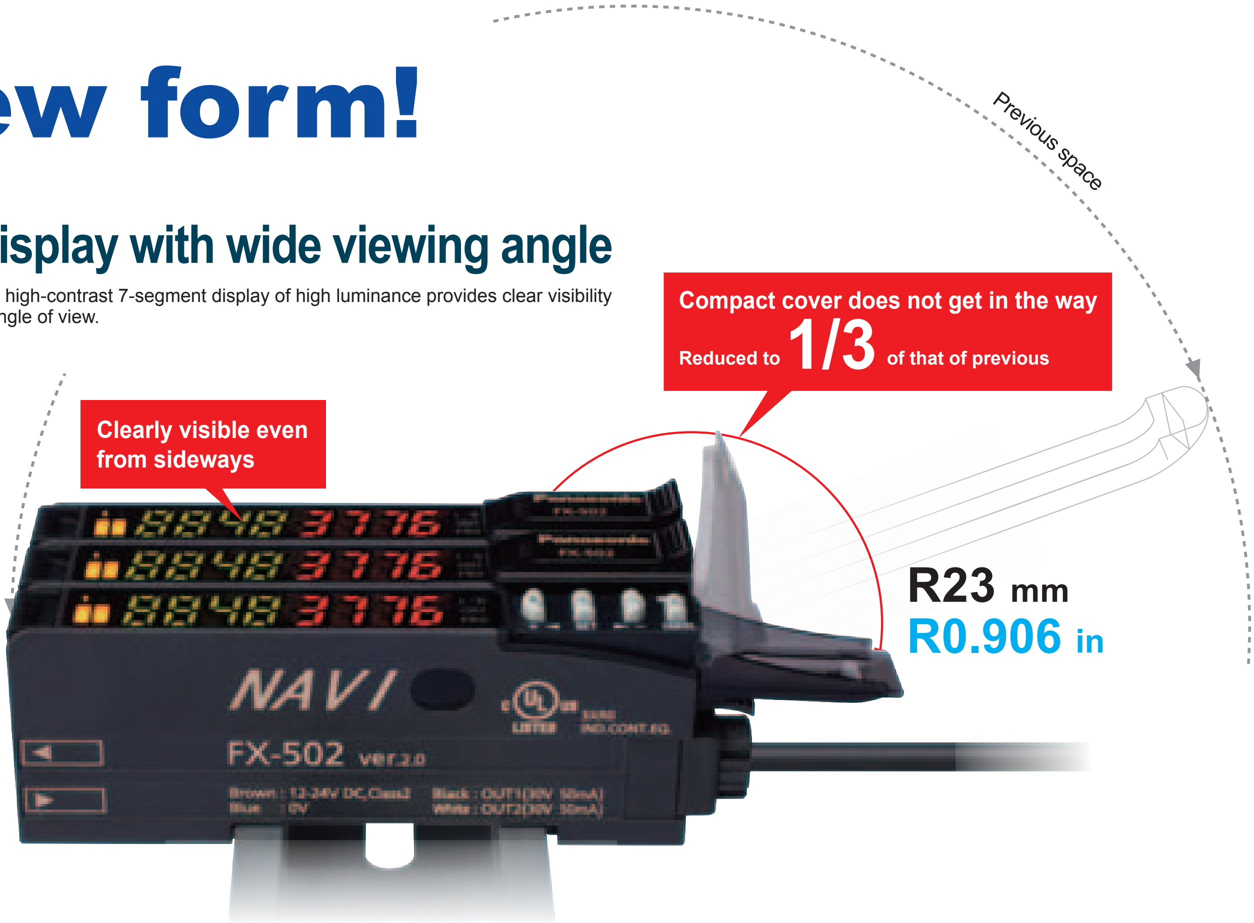


Class leading form and operability

New form!

Flat display with wide viewing angle

The large and high-contrast 7-segment display of high luminance provides clear visibility from a wide angle of view.



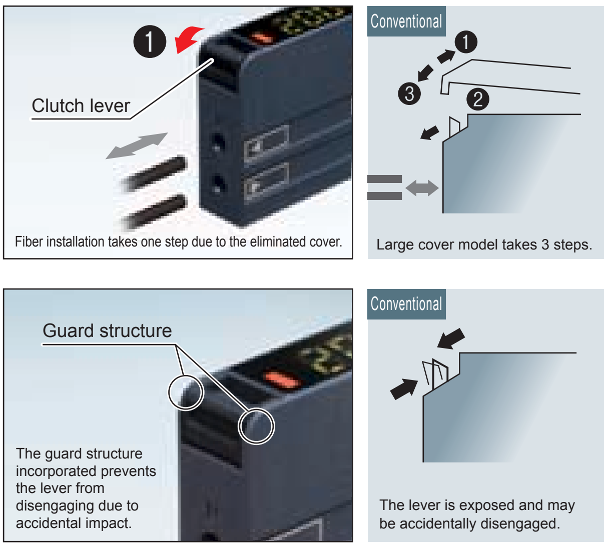
Streamlined fiber clutch

While the conventional fiber installation is done after opening up the cover, the **FX-500** series adopts a guard structure, eliminating the cover so that the fiber installation can be done in one step.

MODE NAVI + Direct setting

MODE NAVI uses three indicators and a dual display to show the amplifier's basic operations. The current operation mode can be confirmed at a glance, so even a first time user can easily operate the amplifier.

■Streamlined fiber clutch



Fiber installation takes one step due to the eliminated cover.

Large cover model takes 3 steps.

The guard structure incorporated prevents the lever from disengaging due to accidental impact.

The lever is exposed and may be accidentally disengaged.

■NAVI display (lights out during RUN mode)

L/D
Switches output operation.
L: Light-ON D: Dark-ON

CUST
Allows direct change by selecting one of the setting of response time / hysteresis / emitting power. (Initial setting: response time)

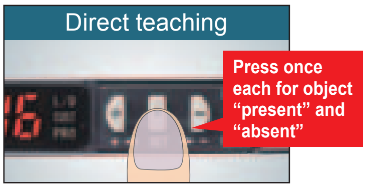
PRO
Allows the selection of advanced functions such as timer, copy, and memory functions.

■Direct setting

Direct adjustment

Threshold value can be changed during RUN mode.

Direct teaching

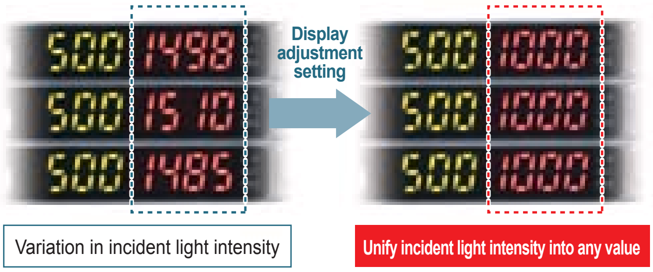


Teaching can be done during RUN mode.

A variety of functions at the industry's leading edge

Resolves variation in incident light intensity display
Display adjustment setting

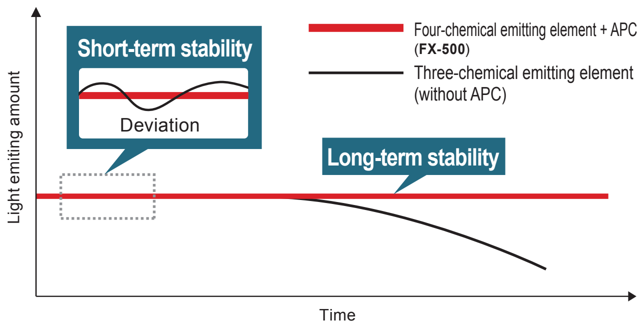
Even if there is no problem in detection, the variation in display may make it difficult for an operator to verify proper operation. By using the display adjustment setting, random values can be adjusted, and the visual variation can be resolved to help define proper operation in an operation manual.



Stable detection over long and short periods
Stabilized emission intensity

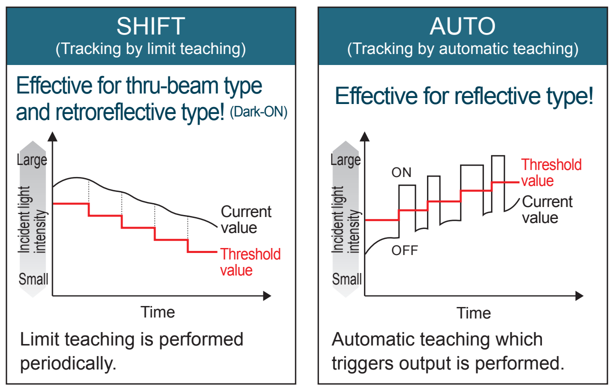
The "four-chemical emitting element" was first incorporated in the conventional model **FX-300** to maintain a stable level of light emission and has now become an industry standard. **FX-500** series continues to adopt the same emitting element as well as the "APC (Auto Power Control) circuit" which improves stability in short periods such as when the power is turned on.

■Stable sensing comparison



Saves maintenance time
Threshold tracking function

This function seeks changes in the light emitting amount resulting from changes in the environment over long periods (such as dust levels), so that the incident light intensity can be checked at desired intervals and the threshold values can be reset automatically.

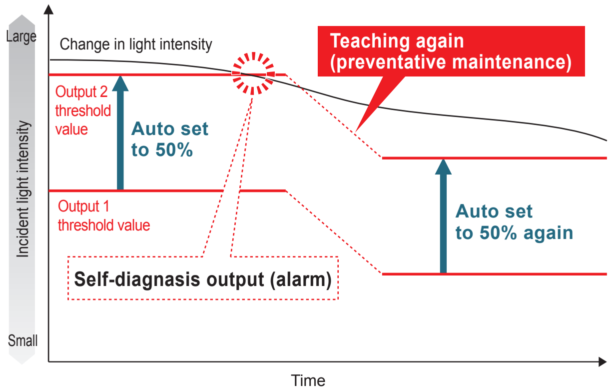


Suitable for preventative maintenance
Self-diagnosis output FX-502(P) / 505(P)-C2

FX-502(P) / **505(P)-C2** can set Output 2 as self-diagnosis output. When Output 1's threshold value teaching is carried out, Output 2 is set concurrently with the setting randomly shifted by the amount of surplus of threshold value.

■Detect drops in light intensity
(e.g. used in dusty environment)

Self-diagnosis can be used with the threshold tracking function for added effectiveness.



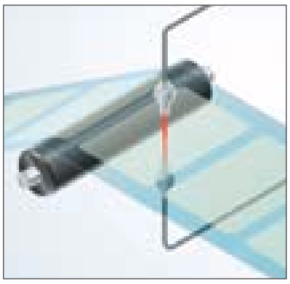
A variety of functions at the industry's leading edge

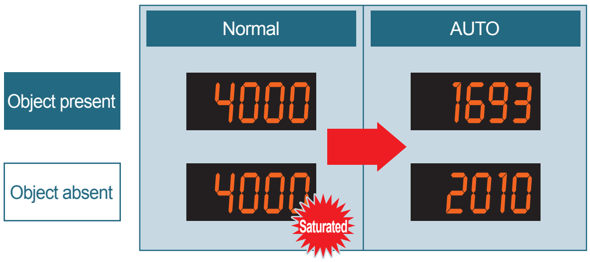
Stable detection while being eco-friendly

Emission power & gain setting

For cases when the incident light intensity saturates the receiver, the light intensity can be attenuated to the optimal level by AUTO without changing the response time. This allows for stable detection while maintaining an optimal S/N ratio and saves energy by controlling the emitting electric current.

■Detecting a transparent sheet





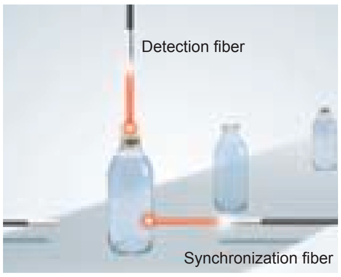
Auto mode (AUTO) and 3-level manual mode (3 levels: H / M / L [adjustable]) are incorporated.

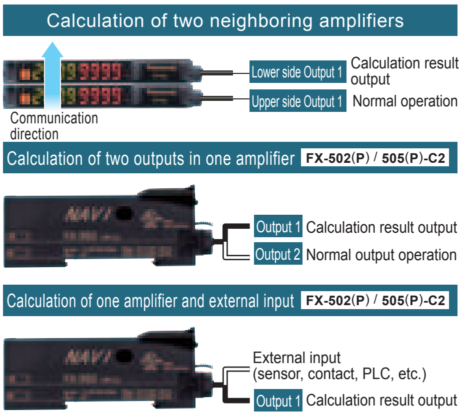
Built-in logic functions

No PLC necessary saving material and programming costs

■Logical calculation functions

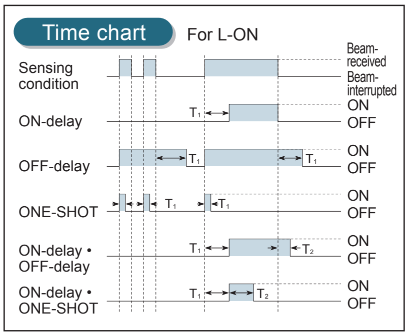
Three logical calculations (AND, OR, XOR), are selectable using Output 1 of multiple **FX-500** series amplifiers.
A PLC is not required which helps to reduce material and programming and costs.





■Equipped with 5 types timers

A wide variety of timer control operations can be carried out by these fiber sensors alone.

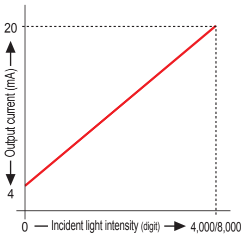


Timer period: 0.05 ms to 32 s
Output 1 has ON-delay • OFF-delay and ON-delay • ONE-SHOT timers.

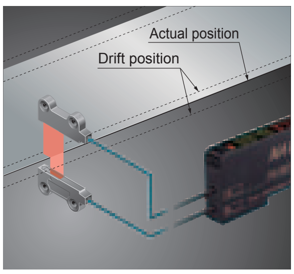
Analog control is possible

Analog output cable type FX-505(P)-C2

A 4 to 20 mA analog output represents the digital value of incident light intensity



■Edge tracking of film or sheet



Drifting path can be tracked as the light intensity changes.

8 data banks

Smooth setup changes

The number of data banks used for saving the setup conditions of the amplifier is increased to eight. Setup conditions can be saved and loaded to make setup changes easy at worksite that manufactures multiple models.

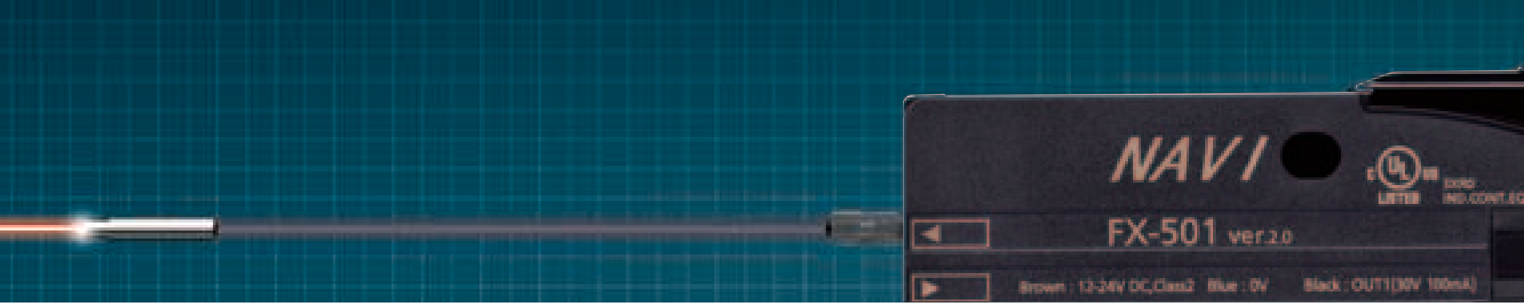
External input

Remote control improves work efficiency FX-502(P) / 505(P)-C2

Work efficiency can be improved by operating via a PLC output or other external signal.
(**FX-502**(**P**) can operate via external signal when switching from Output 2 to external input.)

■Functions operable by external input

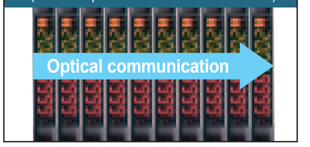
Full-auto / Limit / 2-point teaching	Display adjustment setting
Data bank load / save	Logical calculation (self-unit only)
Emission halt	Copying function lock (self-unit only)



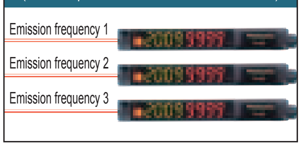
Selectable interference prevention

In addition to the automatic interference prevention function which is enabled through the optical communication of cascade connected amplifiers, an alternate frequency interference prevention function is also incorporated. So even for layouts where optical communication cannot be carried out, switching of emission frequencies allows interference prevention.

Automatic interference prevention
(When amplifiers are cascade connected)



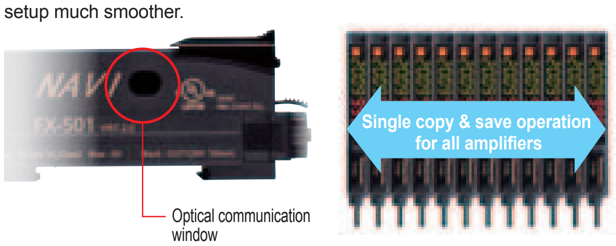
Alternate frequency interference prevention
(When amplifiers cannot be cascade connected)



* Refer to specifications for details of number of sensors allowed in interference prevention.

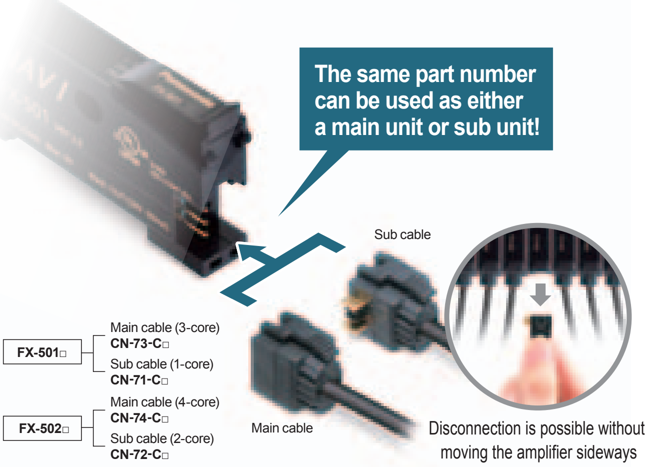
An optical communication function allows sensors to be adjusted simultaneously

The optical communication function allows the data that is currently set to be copied and saved all at once for all amplifiers connected together from the right side. This greatly reduces troublesome setup tasks and makes setup much smoother.



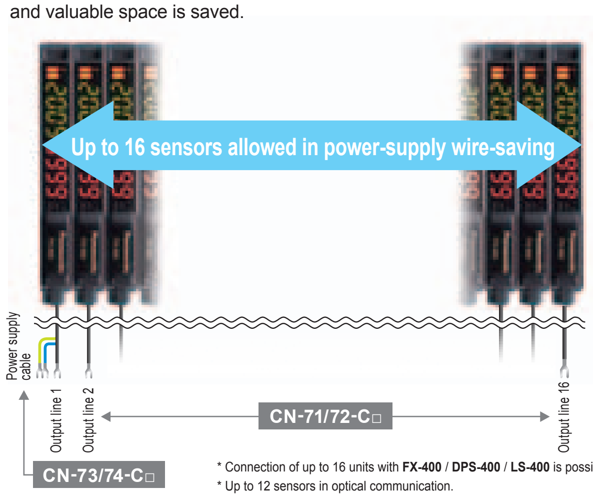
No need to specify a main unit or sub unit

All **FX-500** amplifiers can be used as either a main unit or a sub unit. Just use a main cable or a sub cable to distinguish the two. This reduces the costs of inventory management.



Wire-saving, space-saving

The quick-connection cables enable reduction in wiring. The connections and man-hours required for the relay terminal block setup can be reduced and valuable space is saved.



* Connection of up to 16 units with **FX-400** / **DPS-400** / **LS-400** is possible.
* Up to 12 sensors in optical communication.

PRO mode functions

PRO1	Response time setting
	Timer setting
	Hysteresis setting
	Shift amount setting
	Emission power setting
	Timer range setting
PRO2	Teaching lock setting
	Digital display item setting
	Digital display turning on setting
	ECO setting
	Period hold setting
PRO3	Data bank loading setting
	Data bank saving setting
	Back up setting
	Input / output setting *1
PRO4	Copy setting
	Copy action setting
	Copy lock setting
	Communication protocol setting
	External input setting *2

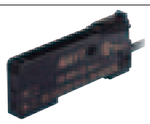
PRO5		Code setting
		Display adjustment setting
		Reset setting
		CUSTOM setting
		Interference prevention setting
PRO6	Sensing output mode	Normal mode
		Window comparator mode *3
		Rising differential mode
		Trailing differential mode
		Hysteresis mode
		Forced ON output mode
		Forced OFF output mode
		Self-diagnosis output mode *4
		Answer back output mode *5
PRO7		Logical operation setting *6
	Setting of threshold value tracking	Setting of threshold tracking
		Sensing output setting
		Storage cycle setting
		Algorithm setting

*1: **FX-502(P)** only *2: **FX-502(P)** and **FX-505(P)-C2** only *3: Output 1 only
*4: Output 2 only of **FX-502(P)** and **FX-505(P)-C2** *5: Output 2 only of **FX-505(P)-C2**
*6: **FX-501(P)** can do a part of operations.

ORDER GUIDE

Amplifiers

Quick-connection cable is not supplied with **FX-501(P)** and **FX-502(P)**. Please order it separately.

Type	Appearance	Model No.	Emitting element	Output	External input
Standard type		**FX-501**	Red LED	NPN open-collector transistor	———
		FX-501P		PNP open-collector transistor	
2-output type		**FX-502**		NPN open-collector transistor 2 outputs	Incorporated (Switchable with Output 2)
		FX-502P		PNP open-collector transistor 2 outputs	
Cable type		**FX-505-C2**		NPN open-collector transistor 2 outputs analog output	Incorporated
		FX-505P-C2		PNP open-collector transistor 2 outputs analog output	

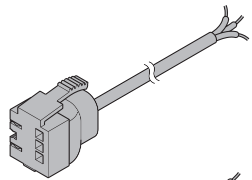
Quick-connection cables

For FX-501(P) Quick-connection cable is not supplied with the amplifier. Please order it separately.

Type	Model No.		Description
Main cable (3-core)	**CN-73-C1**	Length: 1 m 3.281 ft	0.15 mm² 3-core cabtyre cable, with connector on one end Cable outer diameter: ø3.0 mm ø0.118 in
	CN-73-C2	Length: 2 m 6.562 ft	
	CN-73-C5	Length: 5 m 16.404 ft	
Sub cable (1-core)	**CN-71-C1**	Length: 1 m 3.281 ft	0.15 mm² 1-core cabtyre cable, with connector on one end Cable outer diameter: ø3.0 mm ø0.118 in Connectable to a main cable up to 15 cables.
	CN-71-C2	Length: 2 m 6.562 ft	
	CN-71-C5	Length: 5 m 16.404 ft	

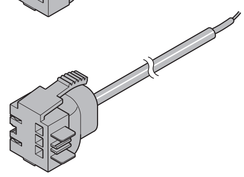
Main cable

- **CN-73-C□**



Sub cable

- **CN-71-C□**

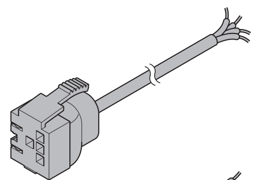


For FX-502(P) Quick-connection cable is not supplied with the amplifier. Please order it separately.

Type	Model No.		Description
Main cable (4-core)	**CN-74-C1**	Length: 1 m 3.281 ft	0.15 mm² 4-core cabtyre cable, with connector on one end Cable outer diameter: ø3.0 mm ø0.118 in
	CN-74-C2	Length: 2 m 6.562 ft	
	CN-74-C5	Length: 5 m 16.404 ft	
Sub cable (2-core)	**CN-72-C1**	Length: 1 m 3.281 ft	0.15 mm² 2-core cabtyre cable, with connector on one end Cable outer diameter: ø3.0 mm ø0.118 in Connectable to a main cable up to 15 cables.
	CN-72-C2	Length: 2 m 6.562 ft	
	CN-72-C5	Length: 5 m 16.404 ft	

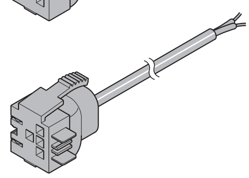
Main cable

- **CN-74-C□**



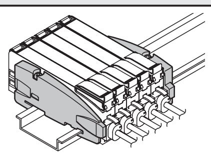
Sub cable

- **CN-72-C□**



End plates

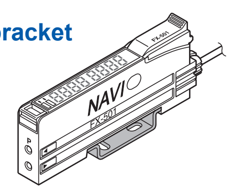
End plates are not supplied with the amplifier. Please order them separately when the amplifiers are mounted in cascade.

Appearance	Model No.	Description
	**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 clamp amplifiers into place on both sides. Make sure to use end plates when cascading multiple amplifiers together. Two pcs. per set

OPTIONS

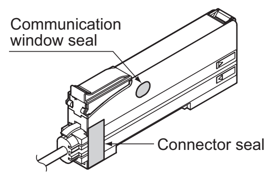
Amplifier mounting bracket

- **MS-DIN-2**



Amplifier protection seal

- **FX-MB1**
  10 sets of 2 communication window seals and 1 connector seal



SPECIFICATIONS

Item		Standard type	2-output type	Cable type
Model No.	NPN output	**FX-501**	**FX-502**	**FX-505-C2**
	PNP output	**FX-501P**	**FX-502P**	**FX-505P-C2**
Supply voltage		12 to 24 V DC $^{+10}_{-15}$ % 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, excluding analog output of cable type) ECO mode: 680 mW or less (current consumption 28 mA or less at 24 V supply voltage, excluding analog output of cable type)		
Output (2-output type and cable type: Output 1, Output 2)		<NPN output type> NPN open-collector transistor • Maximum sink current: 100 mA (2-output type and cable type are 50 mA) (Note 2) • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 2 V or less (Note 3) (at maximum sink current) <PNP output type> PNP open-collector transistor • Maximum source current: 100 mA (2-output type and cable type are 50 mA) (Note 2) • Applied voltage: 30 V DC or less (between output and +V) • Residual voltage: 2 V or less (Note 3) (at maximum source current)		
	Output points	1 point	2 points	
	Output operation	Switchable either Light-ON or Dark-ON by L/D mode		
	Short-circuit protection	Incorporated		
Response time		H-SP: 25 μs or less, FAST: 60 μs or less, STD: 250 μs or less, LONG: 2 ms or less, U-LG: 4 ms or less, HYPR: 24 ms or less, selectable		
Analog output (Cable type only)		Output current: 4 to 20 mA approx. [H-SP, FAST STD: At 0 to 4,000 digits, LONG: At 0 to 8,000 digits (Note 4)], Response time: 2 ms or less, Zero point: Within 4 mA ±1 % F.S., Span: Within 16 mA ±5 % F.S., Linearity: Within ±3 % F.S., Load resistance: 0 to 250 Ω		
External input (2-output type only, switchable with Output 2)		———	<NPN output type> NPN non-contact input • Signal condition High: +8 V to +V DC or Open Low: 0 to +1.2 V DC (at 0.5 mA source current) • Input impedance: 10 kΩ approx. <PNP output type> PNP non-contact input • Signal condition High: +4 V to +V DC (at 3 mA sink current) Low: 0 to +0.6 V DC or Open • Input impedance: 10 kΩ approx.	
Possible external input function		———	Emission halt / Teaching (Full-auto, Limit, 2-point) / Logic operation setting / Copy lock / Display adjustment / Data bank load / Data bank save, selectable	
Sensitivity setting		2-point teaching / Limit teaching / Full-auto teaching / Manual adjustment		
Incident light intensity display range		H-SP / FAST / STD: 0 to 4,000, LONG: 0 to 8,000, U-LG / HYPR: 0 to 9,999		
Timer function		Incorporated with variable OFF-delay / ON-delay /ONE SHOT / ON-delay • OFF-delay / ON-delay • ONE SHOT timer, switchable either effective or ineffective	<Output 1> Incorporated with variable OFF-delay / ON-delay /ONE SHOT / ON-delay • OFF-delay / ON-delay • ONE SHOT timer, switchable either effective or ineffective <Output 2> Incorporated with variable OFF-delay / ON-delay /ONE SHOT timer, switchable either effective or ineffective	
	Timer period	Timer range "ms": 0.5 ms approx., 1 to 9,999 ms approx., 1 ms approx., Timer range "sec.": 0.5 s approx., 1 to 32 s approx., 1 s approx., Timer range "1/10 ms": 0.05 ms approx., 0.1 to 999.9 ms approx., 0.1 ms approx., each output is set individually		
Light emitting amount selection function		Incorporated, 3 levels (each level 25 to 100 %) + Auto setting [1 level (25 to 100 %) when using H-SP mode]		
Interference prevention function		Incorporated (Note 5), selectable either automatic interference prevention or different frequency		
Various settings		Hysteresis setting / Shift amount setting / Emission power setting / Display turning setting / ECO setting / Data bank loading saving setting / Copying setting / Code setting / Reset setting / Logical calculation setting / Threshold tracking setting, etc.		
Protection		IP40 (IEC)		
Ambient temperature		-10 to +55 °C +14 to +131 °F [If 4 to 7 units are mounted in cascade: -10 to +50 °C +14 to +122 °F or if 8 to 16 units (cable type: 8 to 12 units) are mounted in cascade: -10 to +45 °C +14 to +113 °F] (No dew condensation or icing allowed), Storage: -20 to +70 °C -4 to +158 °F		
Emitting element (modulated)		Red LED (Peak emission wavelength: 643 nm 0.025 mil)		
Material		Enclosure, Case cover: Polycarbonate, Switch: Polyacetal		
Cable		———		0.2 mm² 6-core cabtyre cable, 2 m 6.562 ft long
Cable extension		———		Extension up to total 100 m 328.084 ft is possible with 0.3 mm², or more, cable. (however, supply voltage 12 V DC)
Weight		Net weight: 15 g approx., Gross weight: 70 g approx.		Net weight: 60 g approx., Gross weight: 100 g approx.
Accessory		**FX-MB1** (Amplifier protection seal): 1 set		

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
2) 50 mA max. if 5 or more standard types are connected together. (25 mA in case of 2-output type and cable type)
3) In case of using the quick-connection cable (cable length 5 m 16.404 ft) (optional).
4) If display adjustment was conducted, it is not in this range.
5) Number of sensor heads which is possible to be mounted closely in auto interference prevention function depends on response time as shown in table below. Number of sensor heads which is possible to be mounted closely in different frequency Interference prevention function is up to 3 units.

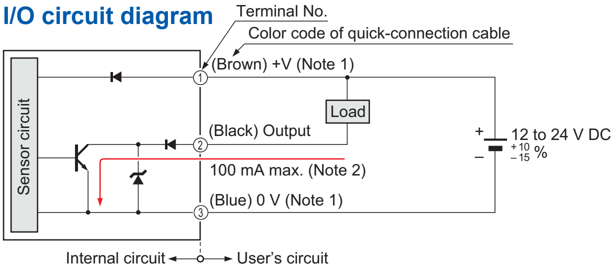
• Number of sensor heads mountable closely (Unit: set)

Response time	H-SP	FAST	STD	LONG	U-LG	HYPR
IP-1	0	2	4	8	8	12

I/O CIRCUIT AND WIRING DIAGRAMS

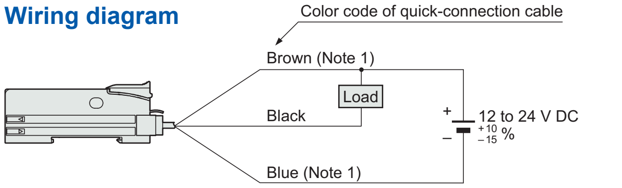
FX-501 NPN output type

I/O circuit diagram



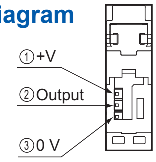
Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.
2) 50 mA max., if five amplifiers, or more, are connected together.

Wiring diagram



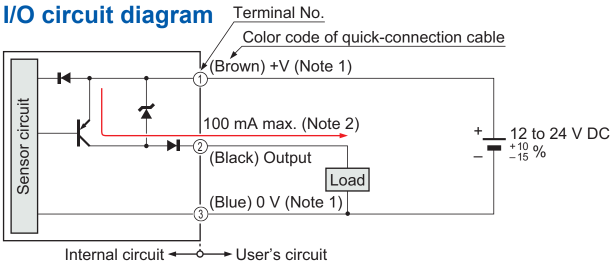
Note: The quick-connection sub cable does not have brown lead wire and blue lead wire.

Terminal arragement diagram



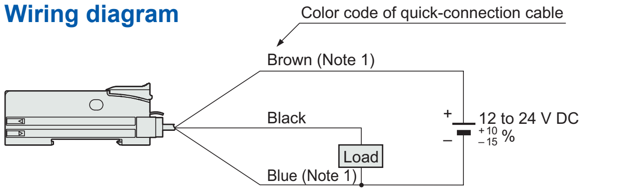
FX-501P PNP output type

I/O circuit diagram



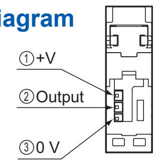
Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.
2) 50 mA max., if five amplifiers, or more, are connected together.

Wiring diagram



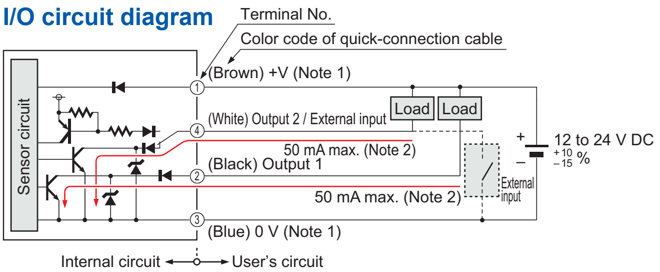
Note: The quick-connection sub cable does not have brown lead wire and blue lead wire.

Terminal arragement diagram



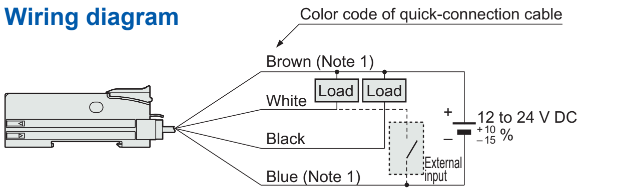
FX-502 NPN output type

I/O circuit diagram



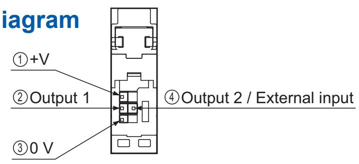
Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.
2) 25 mA max., if five amplifiers, or more, are connected together.

Wiring diagram



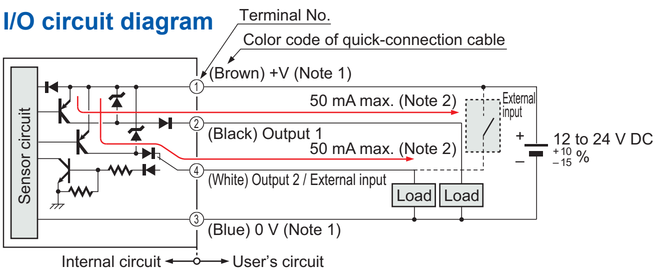
Note: The quick-connection sub cable does not have brown lead wire and blue lead wire.

Terminal arragement diagram



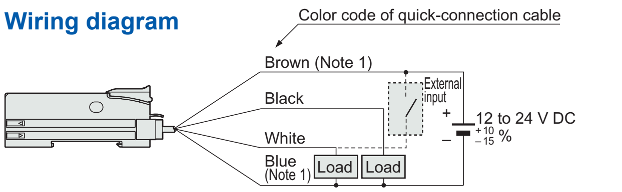
FX-502P PNP output type

I/O circuit diagram



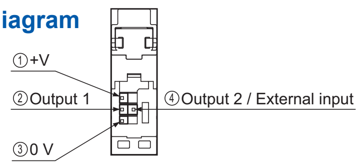
Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.
2) 25 mA max., if five amplifiers, or more, are connected together.

Wiring diagram



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

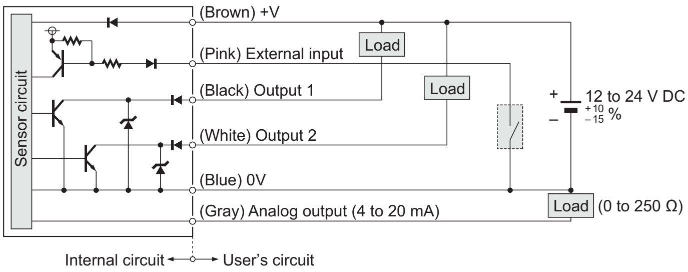
Terminal arragement diagram



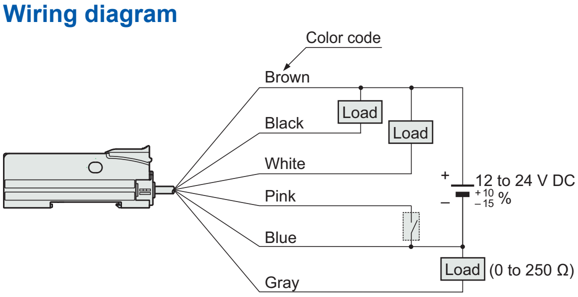
I/O CIRCUIT AND WIRING DIAGRAMS

FX-505-C2 — NPN output type

I/O circuit diagram

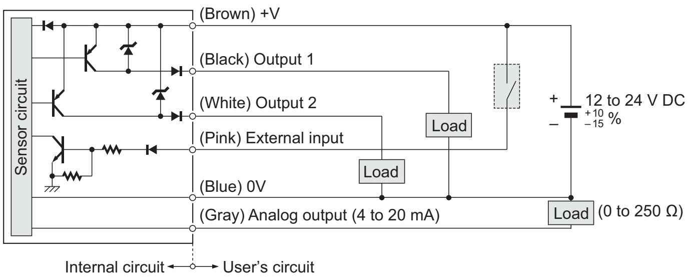


Wiring diagram

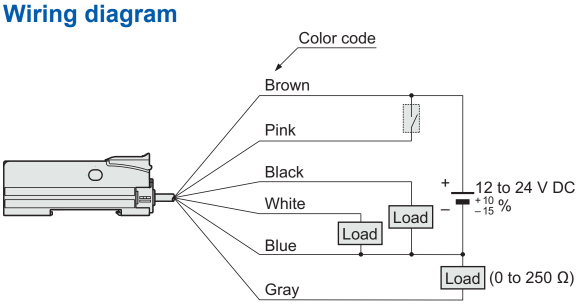


FX-505P-C2 — PNP output type

I/O circuit diagram



Wiring diagram



LIST OF FIBERS

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

Type				Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut (Note 1)	Sensing range FX-500 STD mode (mm in)
Super quality	Thru-beam	Threaded	M3	M3, 12	Tough FT-30	R2 Bending durability	2 m	400 15.748
			M4	M4, 15	Tough FT-40	R4 Bending durability		1,200 47.244
		Cylindrical	ø1.5	ø1.5, 10	Tough FT-S20	R2 Bending durability		400 15.748
			ø3	ø3, 10	Tough FT-S30	R4 Bending durability		1,200 47.244
	Reflective (Note 2)	Threaded	M3	M3, 12	Tough FD-30	R2 Bending durability		160 6.299
			M4	M4, 14	Tough FD-40			
			M6	M6, 17	Tough FD-60	R4 Bending durability		520 20.472
		Cylindrical	ø3	ø3, 10	Tough FD-S30			160 6.299
Threaded	Thru-beam	M3		M3, 12	Tough FT-31	R2 Bending durability	✂ 2 m	315 12.402
				M3, 12	FT-31W	R1		260 10.236
		M4		Lens mountable, M4, 15	FT-43	R4 Bending durability		1,400 55.118
				Lens mountable, M4, 15	Tough FT-42			1,130 44.488
				Lens mountable, M4, 15	FT-42W	R1		800 31.496
				Lens mountable, Stainless-jacketed, M4, 20	FT-45X	R4	1 m	1,200 47.244
			Elbow	Lens mountable, 15, M4	Tough FT-R40	R4 Bending durability	✂ 2 m	930 36.614
			Square head	M4, W7 × H9 × D13.9	FT-R41W	R1		800 31.496
				With expansion lens, M4, W7 × H9 × D14.4	FT-R42W			2,200 86.614
		M14	Long range	With expansion lens, M14, 40	Tough FT-140	R4 Bending durability	✂ 10 m	19,600 771.654 (Note 3)
	Reflective (Note 2)	M3		M3, 12	Tough FD-31	R2 Bending durability	✂ 2 m	125 4.921
				M3, 12	FD-31W	R1		80 3.150
				Coaxial, Lens mountable, M3, 17	Tough FD-32G	R2 Bending durability		200 7.874
				Coaxial, Lens mountable, Stainless-jacketed, M3, 18	FD-32GX	R2	✂ 1 m (Note 4)	
			Ultra-small diameter	Coaxial, Lens mountable, M3, 16	FD-EG30	R4	500 mm	48 1.890
				Coaxial, Lens mountable, M3, 16	FD-EG31			20 0.787

Type				Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut (Note 1)	Sensing range FX-500 STD mode (mm in)
Threaded	Reflective (Note 2)	M4		M4, 14	Tough FD-41	R2 Bending durability	✂ 2 m	125 4.921
				M4, 14	FD-41W	R1		270 10.630
				Coaxial, Lens mountable, M4, 25	Tough FD-42G	R2 Bending durability		200 7.874
				Coaxial, Lens mountable, M4, 25	FD-42GW	R1		150 5.906
		M6		M6, 17	FD-62	R4 Bending durability		520 20.472
				M6, 17	Tough FD-61			450 17.717
				M6, 17	FD-61W	R1		270 10.630
				Coaxial, M6, 17	Tough FD-61G	R4 Bending durability		420 16.535
				Stainless-jacketed, M6, 22	FD-64X	R4	1 m	280 11.024
			Elbow	15, M6	Tough FD-R60	R4 Bending durability	✂ 2 m	290 11.417
Cylindrical	Thru-beam	ø1		ø1, 6	Tough FT-S11	R2 Bending durability	500 mm	90 3.543
		ø1.5		ø1.5, 10	Tough FT-S21		✂ 2 m	315 12.402
				ø1.5, 10	FT-S21W	R1		260 10.236
		ø2.5		With lens, Long sensing range, ø2.5, 8	FT-S32	R10 Bending durability		3,100 122.047
		ø3		ø3, 10	FT-S31W	R1		800 31.496
		Ultra-small diameter	ø3	Narrow beam ø0.125mm, ø0.25, ø3, Sleeve part cannot be bent., 5, 15	Tough FT-E13	R2 Bending durability	✂ 1 m	15 0.591
				Narrow beam ø0.25mm, ø0.4, ø3, Sleeve part cannot be bent., 5, 15	Tough FT-E23			75 2.953
		Side-view	ø4	ø4, 13, 25	Tough FT-V40	R4 Bending durability	✂ 2 m	3,500 137.795
	Reflective (Note 2)	ø1.5		ø1.5, 10	Tough FD-S21	R2 Bending durability	1 m	80 3.150
		ø3		ø3, 15	Tough FD-S32	R4 Bending durability	✂ 2 m	420 16.535
				ø3, 15	FD-S32W	R1		270 10.630
				ø3, 10	Tough FD-S31	R2 Bending durability		125 4.921
				Coaxial, ø3, 15	FD-S33GW	R1		150 5.906
		Ultra-small diameter	ø1.5	ø1.5, ø0.48, 15, 3, Sleeve part cannot be bent.	FD-E13	R4	1 m	12 0.472
			ø3	ø3, ø0.63, 15, 5, Sleeve part cannot be bent.	FD-E23			55 2.165

Notes: 1) Note 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 sensing range is specified for white non-glossy paper.
3) The fiber cable length practically limits the sensing range.
4) The allowable cutting range is 700 mm 27.559 in from the end that the amplifier inserted.

LIST OF FIBERS

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

Type				Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut (Note 1)	Sensing range FX-500 STD mode (mm in)
Sleeve	Thru-beam	Threaded	M3	Sleeve 40mm M3 ø0.88 10	Tough FT-31S	R2 Bending durability (Note 3)	✂ 2 m	315 12.402
			M4	Sleeve 40mm M4 ø1.48 12	Tough FT-42S	R4 Bending durability (Note 3)		1,130 44.488
		Ultra-small diameter	ø3	Narrow beam ø0.125mm ø0.25 ø3 Sleeve part cannot be bent. 5 15	Tough FT-E13	R2 Bending durability	✂ 1 m	15 0.591
				Narrow beam ø0.25mm ø0.4 ø3 Sleeve part cannot be bent. 5 15	Tough FT-E23			75 2.953
		Side-view	ø2	ø1 ø2 Sleeve part cannot be bent. 20 15	Tough FT-V23	R4 Bending durability	✂ 2 m	450 17.717
				ø1 ø2 Sleeve part cannot be bent. 15 15	Tough FT-V25	R2 Bending durability		240 9.449
				ø1 ø2 Sleeve part cannot be bent. 15 15	FT-V24W	R1		110 4.331
			ø2.5	ø1.5 ø2.5 Sleeve part cannot be bent. 20 15	Tough FT-V30	R4 Bending durability		680 26.772

Type				Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut (Note 1)	Sensing range FX-500 STD mode (mm in)
Sleeve	Reflective (Note 2)	Threaded	Ultra-small diameter M3	Sleeve 15 mm M3 ø0.8 15 Sleeve part cannot be bent.	FD-EG30S	R4	1 m	50 1.969
			M4	Sleeve 40 mm M4 ø1.48 12	Tough FD-41S	R2 Bending durability (Note 3)	✂ 2 m	125 4.921
				Sleeve 40 mm M4 12 ø1.48	FD-41SW	R1 (Note 3)		80 3.150
			M6	Sleeve 40 mm M6 15 ø2.5	Tough FD-61S	R4 Bending durability (Note 3)		420 16.535
		Ultra-small diameter	ø1.5	ø1.5 ø0.48 15 13 Sleeve part cannot be bent.	FD-E13	R4	1 m	12 0.472
			ø3	ø3 ø0.63 15 5 Sleeve part cannot be bent.	FD-E23			55 2.165
		Cylindrical Side-view	ø3	Small diameter 15 15 ø3 ø1.5 Sleeve part cannot be bent.	Tough FD-V30	R2 Bending durability	✂ 2 m	65 2.559
				15 15 ø3 ø1.5 Sleeve part cannot be bent.	FD-V30W	R1		20 0.787
			ø5	15 20 ø5 ø2 Sleeve part cannot be bent.	Tough FD-V50	R4 Bending durability		120 4.724

Notes: 1) Note 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.
3) Bending radius of sleeve part is R10 mm or more.

Type	Designation	Shape of fiber head (mm)	Spot diameter (mm in) (Note)	Distance to focal point (mm in) (Note)	Lens: Model No.	Lens: Ambient temp.	Applicable fibers: Model No.	Fiber cable length ✂: Free-cut	Bending radius (mm)	Protection	Ambient temp.
Small spot	Finest spot lens	16 ø4	ø0.1 ø0.004	7±0.5 0.276±0.020	FX-MR6	–20 to +60 °C	FD-EG31	500 mm	R4	IP40	–20 to +60 °C
			ø0.2 ø0.008				FD-EG30				–40 to +70 °C
			ø0.4 ø0.016				Tough FD-42G	✂ 2 m	R2 Bending durability		–55 to +80 °C
							FD-42GW		R1		–40 to +60 °C
							Tough FD-32G		R2 Bending durability		–55 to +80 °C
							FD-32GX	✂ 1 m	R2		
		15 ø4	ø0.15 ø0.006	7.5±0.5 0.295±0.020	FX-MR3	–40 to +70 °C	FD-EG31	500 mm	R4		–20 to +60 °C
			ø0.3 ø0.012				FD-EG30				–40 to +70 °C
			ø0.5 ø0.020				Tough FD-42G	✂ 2 m	R2 Bending durability		–55 to +80 °C
							FD-42GW		R1		–40 to +60 °C
							Tough FD-32G		R2 Bending durability		–55 to +80 °C
							FD-32GX	✂ 1 m	R2		
	Pinpoint spot lens	20.2 ø4	ø0.5 ø0.020	6±1 0.236±0.039	FX-MR1	–40 to +70 °C	Tough FD-42G	✂ 2 m	R2		–55 to +80 °C
							FD-42GW		R1		–40 to +60 °C
	Zoom lens	27.1 ø7.1	ø0.7 to ø2.0 ø0.028 to ø0.079	Approx.18.5 to 43 Approx. 0.728 to 1.693	FX-MR2	–40 to +70 °C	Tough FD-42G		R2		–55 to +80 °C
							FD-42GW		R1		–40 to +60 °C
	Zoom lens (Side-view type)	W6.3 × H20.3 × D10.3	ø0.5 to ø3.0 ø0.020 to ø0.118	Approx.13 to 30 Approx. 0.512 to 1.181	FX-MR5	–40 to +70 °C	Tough FD-42G		R2		–55 to +80 °C
							FD-42GW		R1		–40 to +60 °C

Note: Spot diameter and distance to focal point are specified for **FX-500**/**FX-100** series.

LIST OF FIBERS

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

Type			Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut (Note 1)	Sensing range FX-500 STD mode (mm in)
Flat	Thru-beam		Top sensing W3 × H8 × D12	Tough FT-Z30H	R2 Bending durability	2 m	3,500 137.795
			Top sensing W3 × H8 × D12	FT-Z30HW	R1		
			Side sensing W3 × H12 × D8	Tough FT-Z30E	R2 Bending durability		3,400 133.858
			Side sensing W3 × H12 × D8	FT-Z30EW	R1		
			Front sensing W8.5 × H12 × D3	Tough FT-Z30	R2 Bending durability		2,100 82.677
			Front sensing W8.5 × H12 × D3	FT-Z30W	R1		1,500 59.055
		With boss	Front sensing W10 × H7 × D2	FT-Z20W		1 m	620 24.409
			Fiber bending type W2 × H10 × D10	FT-Z20HBW			260 10.236
			Front sensing W14 × H7 × D3.5	FT-Z40W		2 m	1,500 59.055
			Fiber bending type W3.5 × H14 × D11	FT-Z40HBW			800 31.496
	Reflective (Note 2)	With boss	Front sensing W10 × H7 × D2	FD-Z20W	R1	1 m	1 to 65 0.039 to 2.559
			Fiber bending type W2 × H10 × D10	FD-Z20HBW			2 to 85 0.079 to 3.346
			Front sensing W14 × H7 × D3.5	FD-Z40W		2 m	190 7.480
			Fiber bending type W3.5 × H14 × D11	FD-Z40HBW			260 10.236
Narrow beam	Thru-beam		ø3.5 ø3.7 20	Tough FT-KS40	R2 Bending durability	2 m	3,600 141.732 (Note 3)
			ø4 25	Tough FT-KV40			
			ø4 25	FT-KV40W	R1		
			1.5 × 2 20	Tough FT-KV26	R2 Bending durability		710 27.953
	Retroreflective (Note 4)	With polarizing filters	W5.2 × H9.5 × D16 W30 × H30 × D0.5	FR-Z50HW	R1		100 to 990 3.937 to 38.976
		Wafer mapping	W7.5 × H2.2 × D11.2 W4 × H2 × D21.5	Tough FR-KZ22E	R2 Bending durability		15 to 310 0.591 to 12.205
		Top sensing	W5.2 × H9.5 × D21 W10.6 × H28 × D10.1	Tough FR-KZ50H			20 to 300 0.787 to 11.811
		Side sensing	W9.5 × H25 × D5.2 W28 × H10.6 × D10.1	Tough FR-KZ50E			
	Reflective	Long range	W5.2 × H9.5 × D16	FD-Z50HW	R1		10 to 650 0.394 to 25.591

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut (Note 1)	Sensing range FX-500 STD mode (mm in)
Thru-beam	Wide beam	Sensing width 32mm W5 × H69 × D20	Tough FT-A32	R2 Bending durability	2 m	3,600 141.732 (Note 3)
		Allows flexible wiring Sensing width 32mm W5 × H69 × D20	FT-A32W	R1		
		Sensing width 11mm W4.2 × H31 × D13.5	Tough FT-A11	R2 Bending durability		
		Allows flexible wiring Sensing width 11mm W4.2 × H31 × D13.5	FT-A11W	R1		
	Array	Sensing width 5.5mm W5 × H15 × D15	Tough FT-AL05	R2 Bending durability		860 33.858
Reflective (Note 2)	Wide beam	W7 × H15 × D30	Tough FD-A16	R4 Bending durability		200 7.874
	Array	W5 × H20 × D20	Tough FD-AL11	R2 Bending durability		320 12.598
Convergent Reflective (Note 5)	Glass substrate detection	Mapping W25 × H7.3 × D30	FD-L32H	R4 Bending durability	4 m	0 to 56 0 to 2.205
		Alignment W20 × H29 × D3.8	Tough FD-L30A	R2 Bending durability	3 m	0 to 43 0 to 1.693
		Alignment W23.5 × H29 × D4.5	Tough FD-L31A	R4 Bending durability		4 to 33 0.157 to 1.299
		Alignment W17 × H29 × D3.8	Tough FD-L22A	R2 Bending durability	2 m	0 to 24 0 to 0.945
		Seating confirmation W18 × H29 × D3.8	Tough FD-L23		3 m	0 to 29 0 to 1.142
		Seating confirmation W12 × H19 × D3	Tough FD-L11	R4 Bending durability	2 m	0 to 9.5 0 to 0.374
		Seating confirmation W12 × H19 × D3	Tough FD-L10			0 to 5 0 to 0.197
		W24 × H21 × D4	Tough FD-L21	R2 Bending durability		1.5 to 16 0.059 to 0.630
		W24 × H21 × D4	FD-L21W	R1		3 to 14 0.118 to 0.551
	General purpose	W6 × H18 × D14	Tough FD-L20H	R2 Bending durability		23 0.906
	Ulta-small	W7.2 × H7.5 × D2	FD-L12W	R1	1 m	8 0.315
Retroreflective (Note 4)	With polarizing filters	W5.2 × H9.5 × D16 W30 × H30 × D0.5	FR-Z50HW	R1	2 m	100 to 990 3.937 to 38.976
	Wafer mapping	W7.5 × H2.2 × D11.2 W4 × H2 × D21.5	Tough FR-KZ22E	R2 Bending durability		15 to 310 0.591 to 12.205
	Narrow beam Top sensing	W5.2 × H9.5 × D21 W10.6 × H28 × D10.1	Tough FR-KZ50H			20 to 300 0.787 to 11.811
	Narrow beam Side sensing	W9.5 × H25 × D5.2 W28 × H10.6 × D10.1	Tough FR-KZ50E			

Notes: 1) Note 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 sensing range is specified for white non-glossy paper.
3) The fiber cable length practically limits the sensing range.
4) The sensing range is the possible setting range for the attached reflector. The fiber can detect an object less than setting range for the reflector.
5) The sensing range is specified for transparent glass 100 × 100 × t0.7 mm 3.937 × 3.937 × t0.028 in (**FD-L32H**: R edge, **FD-L21** and **FD-L21W**: t2 mm t0.079 in) (**FD-L20H**: white non-glossy paper, **FD-L10**: silicon wafers 100 × 100 mm 3.937 × 3.937 in).

LIST OF FIBERS

Tough : It is a fiber which possesses both unbreakable (bending radius: R10 mm, reciprocating bending: 180°) and bendable (bending radius: R4 mm or less) features.

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂ : Free-cut (Note 1)	Sensing range FX-500 STD mode (mm in)
Chemical-resistant	Thru-beam	Easy mounting • Rectangular head SEMI S2 compliant W7 × H15 × D13	**FT-Z802Y**	R25	✂ 2 m	3,100 122.047
		Heat-resistant 115 °C ø5.5 (25)	**FT-HL80Y**	R30	✂ 2 m (Note 3)	3,600 141.732 (Note 2)
		ø5.5 (25)	**FT-L80Y**			
		Side-view ø5.5 (25)	**FT-V80Y**			1,300 51.181

Type			Heat-resistant temp.	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂ : Free-cut (Note 1)	Sensing range FX-500 STD mode (mm in)
Heat-resistant	Thru-beam		350°C	Lens mountable (**FX-LE1/LE2/SV1**) M4 30	**FT-H35-M2**	R25	2 m	430 16.929
				Sleeve 60 mm M4 ø2.1 27	**FT-H35-M2S6**	Fiber R25 Sleeve R10		
			200°C	Allows flexible wiring Lens mountable (**FX-LE1/LE2/SV1**) M4 23	**FT-H20W-M1**	R10	1 m	470 18.504
				Lens mountable (**FX-LE1/LE2/SV1**) M4 23	**FT-H20-M1**	R25		540 21.260
			130°C	Lens mountable (**FX-LE2** only) M4 16	**FT-H13-FM2**		✂ 2 m	700 27.559
		Joint	200°C	Lens mountable (**FX-LE1/LE2/SV1**) M4 23	**FT-H20-J20-S** (Note 4)	Heat-resistant side R18 (Note 5)	✂ 200 mm (Note 6)	470 18.504
					FT-H20-J30-S (Note 4)		✂ 300 mm (Note 6)	
					FT-H20-J50-S (Note 4)		✂ 500 mm (Note 6)	
				Side-view ø3.8 24 ø4	**FT-H20-VJ50-S** (Note 4)			600 23.622
					FT-H20-VJ80-S (Note 4)		✂ 800 mm (Note 6)	
	Reflective (Note 7)	Threaded	350°C	Coaxial M6 25	**FD-H35-M2**	R25	2 m	260 10.236
				Sleeve 60 mm M6 ø2.8 22	**FD-H35-M2S6**	Fiber R25 Sleeve R10		
				Sleeve 90 mm M4 ø2.1 27	**FD-H35-20S**		1 m	
			200°C	Coaxial M6 28	**FD-H20-M1**	R25		330 12.992
				Coaxial M4 27	**FD-H20-21**			230 9.055
			130°C	M6 21	**FD-H13-FM2**		✂ 2 m	350 13.780
	Convergent reflective (Note 7)	Glass substrate detection	300°C	W19 × H27 × D5	**FD-H30-L32**	R25	2 m	17 0.669
			250°C	W21 × H33.2 × D5	**FD-H25-L43**		3 m	1.5 to 26 0.059 to 1.024
				W21 × H34.5 × D5	**FD-H25-L45**			5 to 42 0.197 to 1.654
			180°C	W19 × H27 × D5	**FD-H18-L31**		✂ 2 m	16 0.630

Type				Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂ : Free-cut (Note 1)	Sensing range FX-500 STD mode (mm in)
Vacuum-resistant	Thru-beam			300 °C Lens mountable (**FV-LE1/SV2**) M4 30	**FT-H30-M1V-S** (Note 9)	R18	1 m	270 10.630
	Reflective (Note 8)			300 °C, Rectangular head W9.5 × H5.2 × D15	**FD-H30-KZ1V-S** (Note 9)			20 to 200 0.787 to 7.874
	Convergent reflective (Note 8)			300 °C, Glass substrate detection W19 × H5 × D27	**FD-H30-L32V-S** (Note 9)		3 m	8 0.315
Metal-free	Thru-beam	Threaded	M4	M4 15	**FT-41**	R25	✂ 2 m	1,100 43.307
	Reflective		M4	Coaxial M4 25	**FD-G40**			140 5.512
			M6	Coaxial M6 20	**FD-G60**			420 16.535

Type				Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂ : Free-cut (Note 1)	Sensing range FX-500 STD mode (mm in)
Liquid leak / Liquid detection	Reflective	Contact type	Liquid level sensing	Heat resistant 125 °C Fluorine resin coating ø6	**FD-F8Y**	Protective tube R40 Fiber R15	✂ 2 m (Note 10)	Liquid surface not contacted: Beam received, Liquid surface contacted: Beam not received
				Heat resistant 105 °C Fluorine resin coating ø4	**FD-HF40Y**	Protective tube R20 Fiber R10	✂ 2 m	
				Heat resistant 70 °C Fluorine resin coating throughout the fiber ø4	**FD-F41Y**			
		Pipe-mountable type	Liquid leak detection	SEMI S2 compliant W20 × H30 × D10	**Tough** **FD-F71**	R4 Bending durability	✂ 5 m	Leak absent: Beam received, Leak present: Beam interrupted
			Liquid level sensing	Standard W25 × H13 × D20	**FD-F41**	R10	✂ 2 m	Leak absent: Beam received, Leak present: Beam interrupted
				For 1 mm thick PFA pipe W25 × H13 × D20	**FD-F4**			
			Liquid sensing	Mountable on pipe·array fiber W6.5 × H28.3 × D17	**Tough** **FD-FA93**	R4 Bending durability		
	Thru-beam			SEMI S2 compliant W23 × H20 × D17	**Tough** **FT-F93**	Protective tube R20 Fiber R2 Bending durability		Liquid absent: Beam not received, Liquid present: Beam received

Notes: 1) Note 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.
3) The allowable cutting range is 500 mm 19.685 in from the end that the amplifier inserted.
4) Heat-resistant side fiber + ordinary temperature fiber (**FT-FM2**, From production since October, 2012: **FT-42**) are sold together as a set.
5) R25 mm R0.984 in or more for ordinary temperature side.
6) Fiber length (fixed-length) for heat-resistant fiber side. Fiber length for ordinary temperature side is 2 m 6.562 ft (free-cut).
7) The sensing range of reflective type is the value for white non-glossy paper (50 × 50 mm 1.969 × 1.969 in glass substrate for **FD-H30-L32**, **FD-H18-L31**, transparent glass 100 × 100 × t0.7 mm 3.937 × 3.937 × t0.028 in for **FD-H25-L43** and **FD-H25-L45**).
8) The sensing range of reflective type is the value for transparent glass 100 × 100 × t0.7 mm 3.937 × 3.937 × t0.028 in.
9) Sold as a set comprising vacuum type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**).
10) The allowable cutting range is 1,000 mm 39.370 in from the end that the amplifier inserted.

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 laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

Wiring

- Make sure that the power supply is OFF while adding or removing the amplifiers.
- Note that if a voltage exceeding the reted range is applied, or if an AC power supply is directly connected, the product may get burnt or damaged.
- Note that short-circuit of the load or wrong wiring may burn or damage the product.
- 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.
- Verify that the supply voltage variation is within the rating.
- 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.
- 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.
- Make sure to use the quick-connection cable (optional) for the connection of the controller.
  Extension up to total 100 m 328.084 ft is possible with 0.3 mm^2 or more, cable.
  However, in order to reduce noise, make the wiring as short as possible.
- Make sure that stress by forcible bending or pulling is not applied to the sensor cable joint and fiber cable.

Others

- This product has been developed / produced for industrial use only.
- The specification may not be satisfied in a strong magnetic field.
- The ultra long distance (U-LG, HYPR) mode is more likely to be affected by extraneous noise since the sensitivity of that is higher than the other modes. Make sure to check the environment before use.
- Do not use during the initial transient time (H-SP, FAST, STD: 0.5 sec., LONG, U-LG, HYPR: 1 sec.) after the power supply is switched ON.
- This product is suitable for indoor use only.
- Avoid dust, dirt, and steam.
- Make sure that the product does not come in contact with oil, grease, organic solvents such as thinner, etc., strong acid or alkaline.
- This product cannot be used in an environment containing inflammable or explosive gases.
- Never disassemble or modify this product.
- This product adopts EEPROM. Settings cannot be done 100 thousand times or more because of the EEPROM's lifetime.

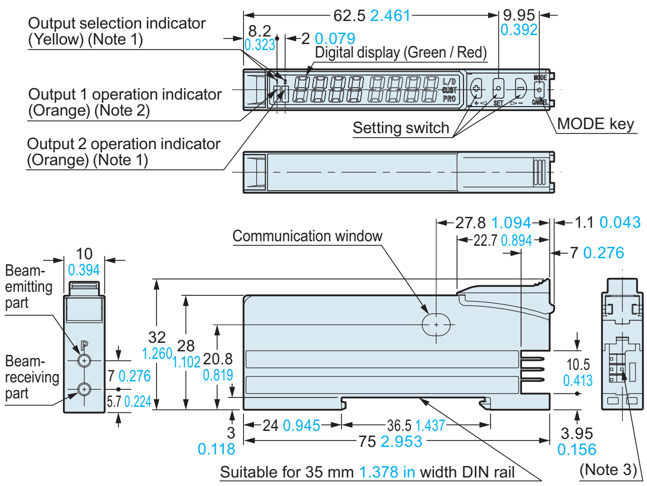
Disclaimer

The applications described in the catalog are all intended for examples only.
The purchase of our products described in the catalog shall not be regarded as granting of a license to use our products in the described applications.
We do NOT warrant that we have obtained some intellectual properties, such as patent rights, with respect to such applications, or that the described applications may not infringe any intellectual property rights, such as patent rights, of a third party.

DIMENSIONS (Unit: mm in)

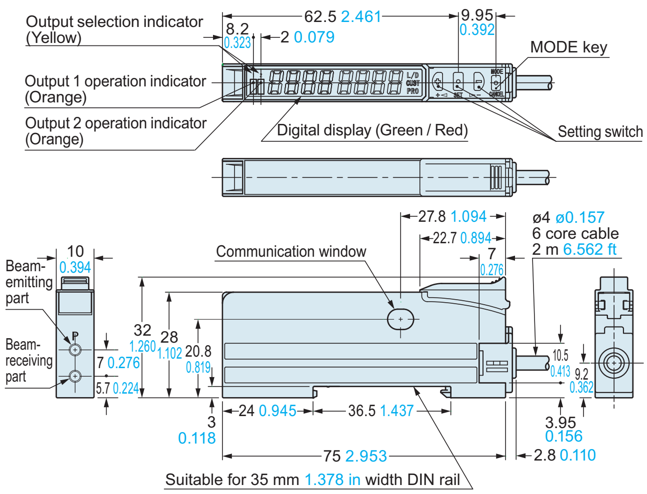
The CAD data in the dimensions can be downloaded from our website.

FX-501(P) FX-502(P) — Amplifier



Notes: 1) **FX-502(P)** only
2) **FX-501(P)**: Operation indicator
3) **FX-501(P)**: 3-pin, **FX-502(P)**: 4-pin

FX-505-C2 FX-505P-C2 — Amplifier

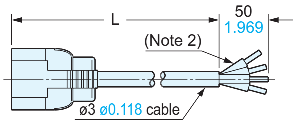


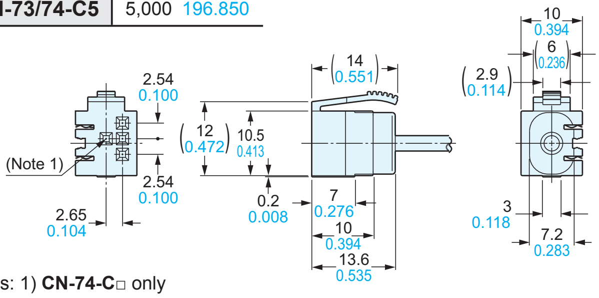
Note: The shape of setting switch and cable will be changed from production at the end of November, 2011. Please see drawing below.

CN-73-C□ CN-74-C□ — Main cable (Optional)

• Length L

Model No.	Length L
CN-73/74-C1	1,000 39.370
CN-73/74-C2	2,000 78.740
CN-73/74-C5	5,000 196.850



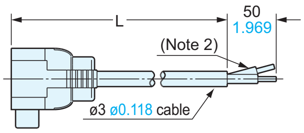


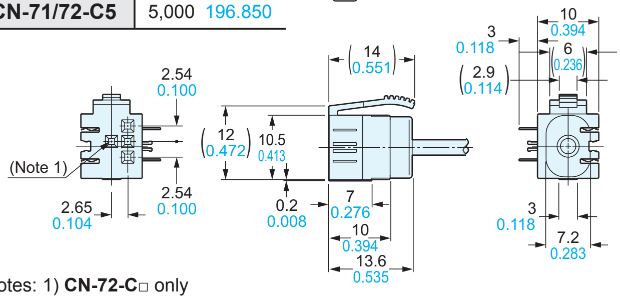
Notes: 1) **CN-74-C□** only
2) **CN-73-C□**: 3-core

CN-71-C□ CN-72-C□ — Sub cable (Optional)

• Length L

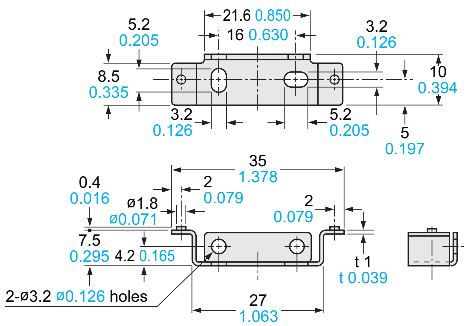
Model No.	Length L
CN-71/72-C1	1,000 39.370
CN-71/72-C2	2,000 78.740
CN-71/72-C5	5,000 196.850





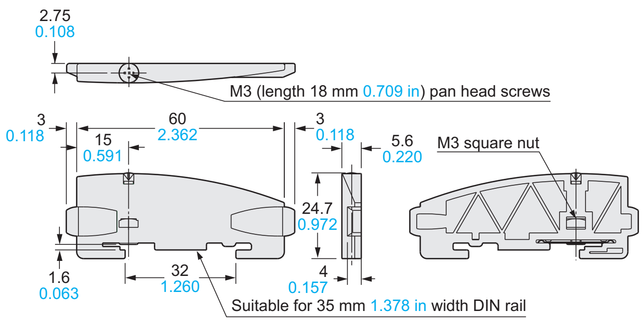
Notes: 1) **CN-72-C□** only
2) **CN-71-C□**: 1-core

MS-DIN-2 — Amplifier mounting bracket (Optional)



Material: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)

MS-DIN-E — End plate (Optional)



Material: Polycarbonate

Introduction of Related Products

Communication Unit for Open Network

SC-GU3 SERIES

The digital sensor can be connected directly to the 3 types of open network!

Other types of analog input sensors can also be connected!

CC-Link
SC-GU3-01

DeviceNet
SC-GU3-02

EtherCAT
SC-GU3-03

Scattered digital sensors can be centrally managed and set through an open network.

Applicable Digital Sensor	Digital Fiber Sensor	Digital Laser Sensor	Digital Pressure Sensor
	FX-501 FX-502	LS-403	DPS-401 DPS-402

Please contact ....

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