



**NEW** DIGITAL FIBER SENSOR

FX-500SERIES



**At the industry's  
leading edge**

FX-SERIES HIGH END MODEL





Sharp detection with suppressed hysteresis

# A different accuracy!

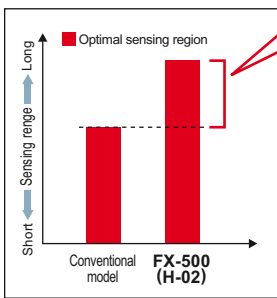
FX-500 with its accurate detection catches fractional difference in light intensity, fulfilling high precision and low-hysteresis applications.

## H-02 mode

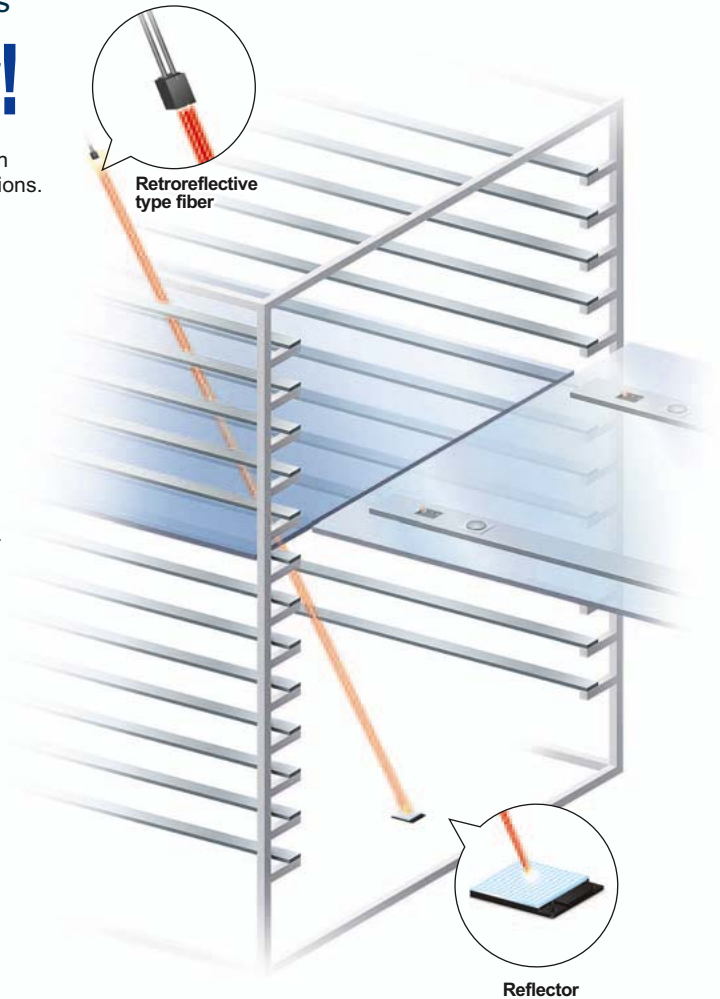
### Long range detection of small objects with small difference in light intensity

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



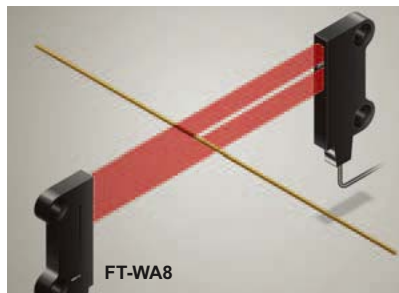
Long range detection of a glass target is now possible due to the ability of the sensor to detect small changes in light intensity.



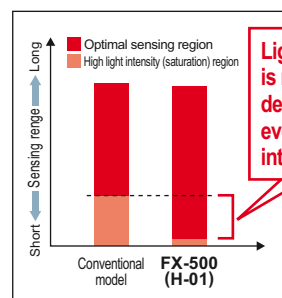
## H-01 mode

### 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.



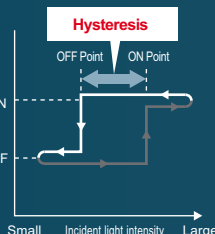
Comparison image of optimal sensing region



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

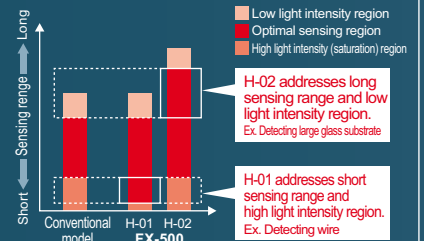
## Three hysteresis modes

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.



H-02 addresses long sensing range and low light intensity region. Ex. Detecting large glass substrate

H-01 addresses short sensing range and high light intensity region. Ex. Detecting wire

# A variety of functions at the industry's leading edge

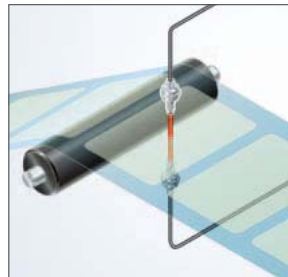
Stable detection while being eco-friendly

## Emission power & gain setting



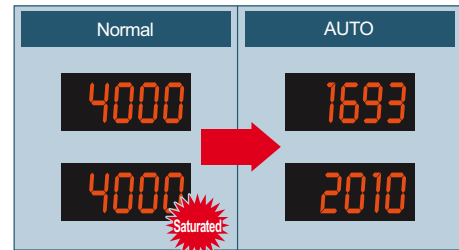
For cases when the incident light intensity saturates the receiver, the light intensity can be attenuated to the optimal level by AUTO without changing the response time. This allows for stable detection while maintaining an optimal S/N ratio and saves energy by controlling the emitting electric current.

### Detecting a transparent sheet



Object present

Object absent



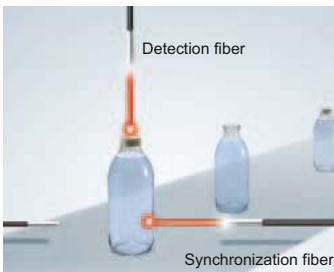
Auto mode (AUTO) and 3-level manual mode (3 levels: H / M / L [adjustable]) are incorporated.

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.



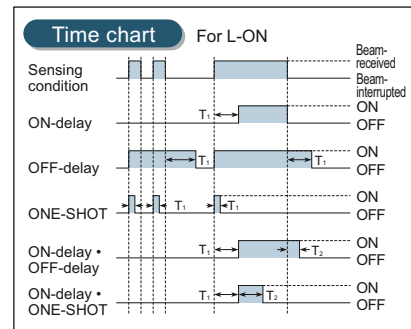
**Calculation of two neighboring amplifiers**

**Calculation of two outputs in one amplifier** FX-502(P) / 505(P)-C2

**Calculation of one amplifier and external input** FX-502(P) / 505(P)-C2

### Equipped with 5 types timers

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

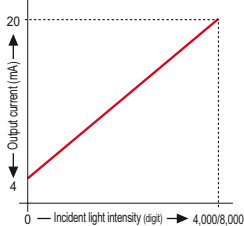


Timer period: 0.05 ms to 32 s  
Output 1 has ON-delay • OFF-delay and ON-delay • ONE-SHOT timers.

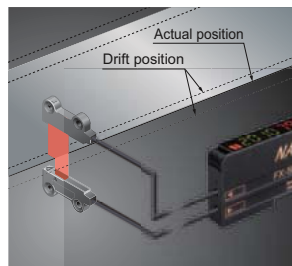
Analog control is possible

## 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.

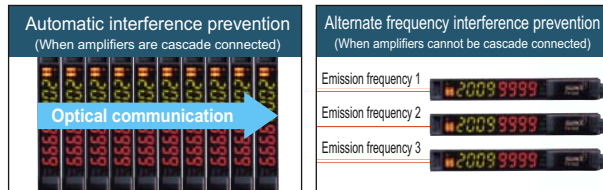
### Functions operable by external input

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.



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

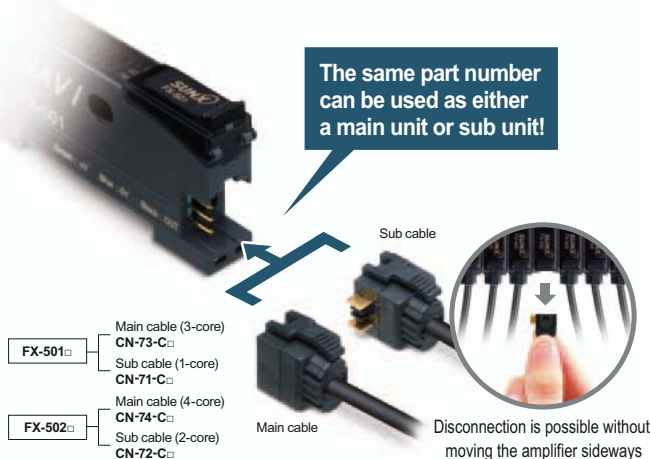
## An optical communication function allows sensors to be adjusted simultaneously

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.



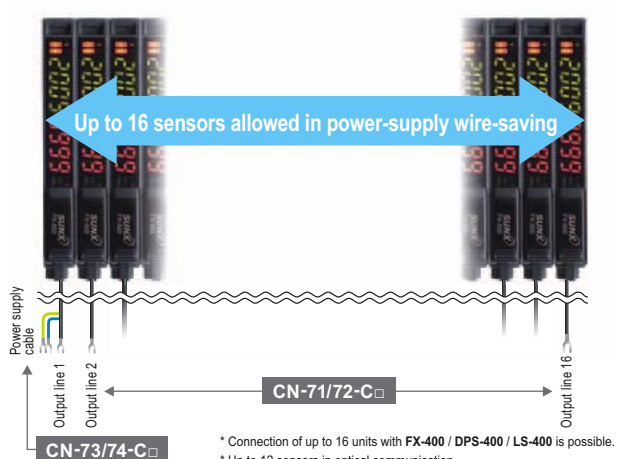
## No need to specify a main unit or sub unit

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.



### PRO mode functions

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

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

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

**SPECIFICATIONS**

Item	Model No.	Type	Standard type	2-output type	Cable type
		NPN output	<b>FX-501</b>	<b>FX-502</b>	<b>FX-505-C2</b>
		PNP output	<b>FX-501P</b>	<b>FX-502P</b>	<b>FX-505P-C2</b>
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, 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		<PNP output type> PNP open-collector transistor		
	<ul style="list-style-type: none"> <li>Maximum sink current: 100 mA</li> <li>(2-output type and cable type are 50 mA) (Note 2)</li> <li>Applied voltage: 30 V DC or less (between output and 0 V)</li> <li>Residual voltage: 2 V or less (Note 3) (at maximum sink current)</li> </ul>		<ul style="list-style-type: none"> <li>Maximum source current: 100 mA</li> <li>(2-output type and cable type are 50 mA) (Note 2)</li> <li>Applied voltage: 30 V DC or less (between output and +V)</li> <li>Residual voltage: 2 V or less (Note 3) (at maximum source current)</li> </ul>		
	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 $\mu$ s or less, FAST: 60 $\mu$ s or less, STD: 250 $\mu$ s 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 $\pm$ 1 % F.S., Span: Within 16 mA $\pm$ 5 % F.S., Linearity: Within $\pm$ 3 % F.S., Load resistance: 0 to 250 $\Omega$				
External input (2-output type only, switchable with Output 2)	—————		<NPN output type> NPN non-contact input	<PNP output type> PNP non-contact input	
			<ul style="list-style-type: none"> <li>Signal condition</li> <li>High: +8 V to +V DC or Open</li> <li>Low: 0 to +1.2 V DC (at 0.5 mA source current)</li> <li>Input impedance: 10 k<math>\Omega</math> approx.</li> </ul>	<ul style="list-style-type: none"> <li>Signal condition</li> <li>High: +4 V to +V DC (at 3 mA sink current)</li> <li>Low: 0 to +0.6 V DC or Open</li> <li>Input impedance: 10 k<math>\Omega</math> approx.</li> </ul>	
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		
	Timer period	<Output 2> Incorporated with variable OFF-delay / ON-delay / ONE SHOT timer, switchable either effective or ineffective			
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 <b>+14 to +131 °F</b> [If 4 to 7 units are mounted in cascade: -10 to +50 °C <b>+14 to +122 °F</b> or if 8 to 16 units (cable type: 8 to 12 units) are mounted in cascade: -10 to +45 °C <b>+14 to +113 °F</b> ] (No dew condensation or icing allowed), Storage: -20 to +70 °C <b>-4 to +158 °F</b>				
Emitting element (modulated)	Red LED (Peak emission wavelength: 650 nm <b>0.026 mil</b> )				
Material	Enclosure: Heat-resistant ABS (Cable type: Polycarbonate), Case cover: Polycarbonate, Switch: TPEE				
Cable	—————				0.2 mm <sup>2</sup> 6-core cabtyre cable, 2 m <b>6.562 ft</b> long
Cable extension	—————				Extension up to total 100 m <b>328.084 ft</b> is possible with 0.3 mm <sup>2</sup> , 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	<b>FX-MB1</b> (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)  
 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)

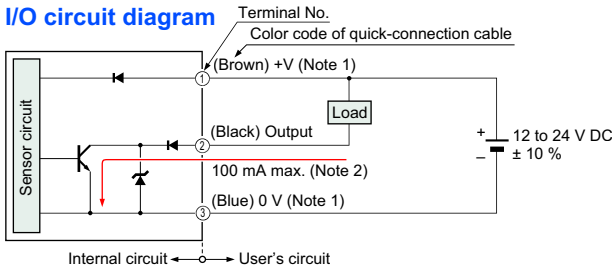
Response time	H-SP	FAST	STD	LONG	U-LG	HYPR
IP-1	0	2	4	8	8	12

I/O CIRCUIT AND WIRING DIAGRAMS

FX-501

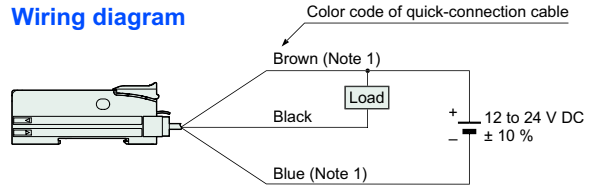
NPN output type

I/O circuit diagram



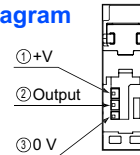
Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.  
2) 50 mA max., if five amplifiers, or more, are connected together.

Wiring diagram



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

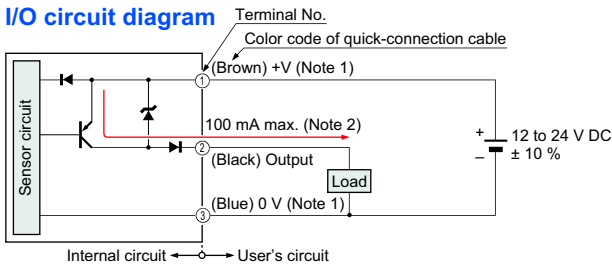
Terminal arrangement diagram



FX-501P

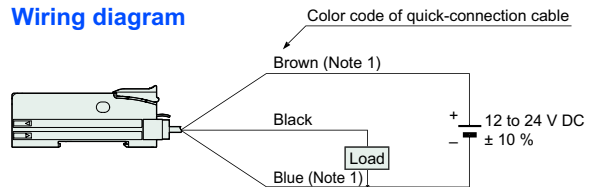
PNP output type

I/O circuit diagram



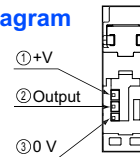
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Wiring diagram



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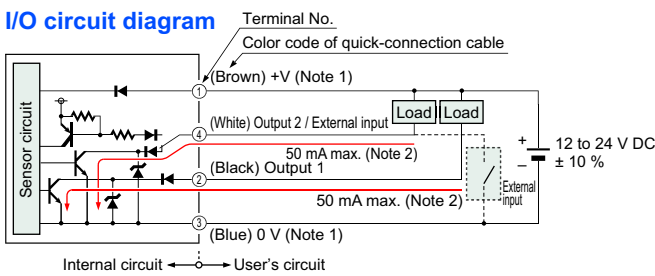
Terminal arrangement diagram



FX-502

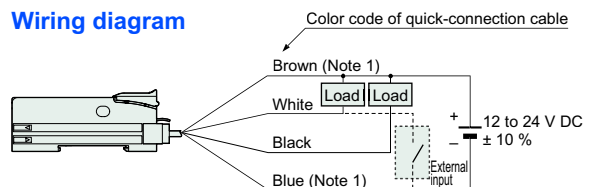
NPN output type

I/O circuit diagram



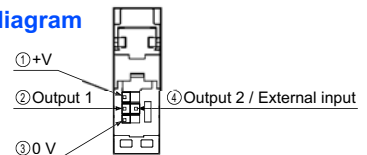
Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.  
2) 25 mA max., if five amplifiers, or more, are connected together.

Wiring diagram



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

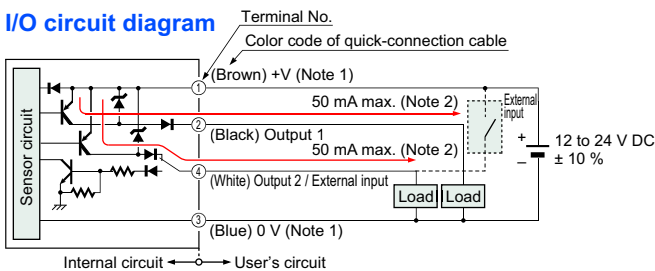
Terminal arrangement diagram



FX-502P

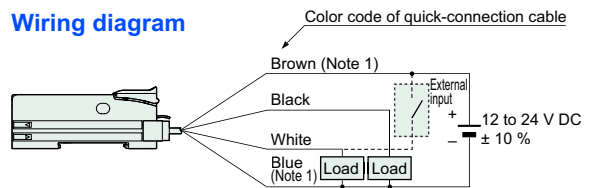
PNP output type

I/O circuit diagram



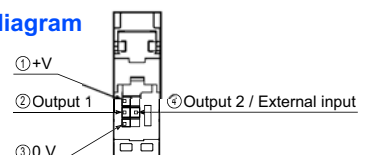
Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.  
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Wiring diagram



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Terminal arrangement diagram

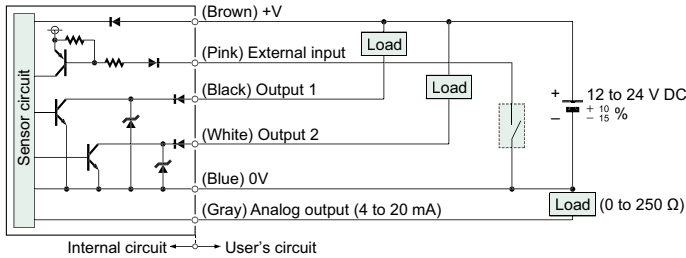


I/O CIRCUIT AND WIRING DIAGRAMS

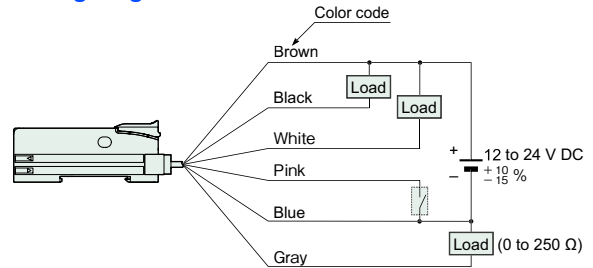
FX-505-C2

NPN output type

I/O circuit diagram



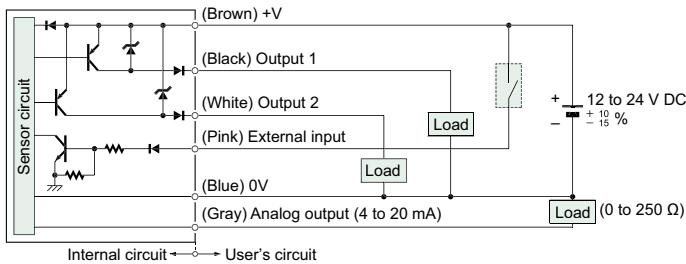
Wiring diagram



FX-505P-C2

PNP output type

I/O circuit diagram



Wiring diagram

