Long Range & Wide Area Photoelectric Sensor Amplifier Built-in
PX-2 SERIES

Related Information
■ General terms and conditions..... P.1
■ Glossary of terms..... P.983~
■ Sensor selection guide.....P.11~ / P.229~
■ General precautions..... P.986~

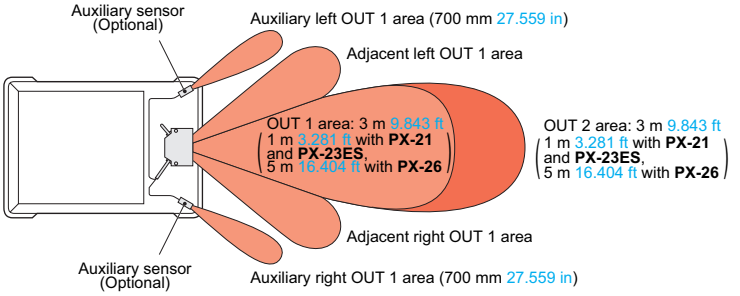
SUNX website http://www.sunx.com

CE Conforming to EMC Directive

Compact size sensor realizes wide sensing area & long sensing range

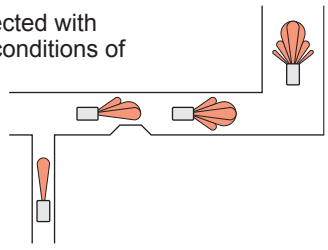
Ideal sensing area with very little null zone

The advanced optical system of the **PX-2** series reduces the null zones in front of an automatic guided vehicle (AGV).
The null zones at the sides are further minimized if auxiliary sensors which can be easily mounted with connectors are used.
(For **PX-24**, **PX-24ES**, **PX-23ES** and **PX-26**)



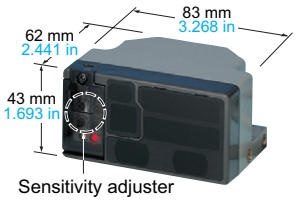
Sensing areas selectable as per route condition

Sensing areas can be selected with switches to suit the route conditions of an AGV.
Further, in case of **PX-24ES** and **PX-23ES**, the sensing areas can also be selected with external signals.



Compact size for space-saving

Its size is half of a conventional model, and the attached cable orientation is freely adjustable. Hence, it can also fit in a small AGV. Moreover, sensitivity adjustment can be done on the front face.



Long sensing range 5 m 16.404 ft type

PX-26 has a long sensing range of 5 m 16.404 ft. Even on a high-speed AGV, it can detect an object quite early so that slowing down and stopping are smooth.

Automatic interference prevention function

One **PX-2** sensor can simultaneously receive beams from 25 Nos. of other **PX-2** sensors without resulting in any interference. Even if AGVs are facing each other, the **PX-2** sensor on one AGV reliably detects the other AGVs. Hence, it can be safely used even at a place where several AGVs are moving.

Sleep function

The sensor can be put into the sleep (stand-by) condition when it is not used and can be restored to operating condition by an external signal.
Consequently battery is conserved as the power consumption is reduced to 1/5.

External sensitivity adjustment

The sensitivity of the sensor can be adjusted, within the range set by the manual adjuster, by an external input.
(For **PX-24**, **PX-24ES**, **PX-23ES** and **PX-26**)

FIBER SENSORS
LASER SENSORS
PHOTOELECTRIC SENSORS
MICRO PHOTOELECTRIC SENSORS
AREA SENSORS
SAFETY COMPONENTS
PRESSURE SENSORS
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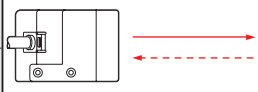
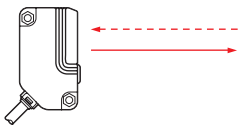
PARTICULAR USE SENSORS
SENSOR OPTIONS
WIRE-SAVING SYSTEMS
MEASUREMENT SENSORS
STATIC CONTROL DEVICES
LASER MARKERS
Selection Guide
Amplifier Built-in
CX-400
EX-10
EX-20
EX-30
EX-40
EQ-30
EQ-500
MQ-W
RX-LS200
RX
CY
PX-2
RT-610
Power Supply Built-in
NX5
VF
Amplifier-separated
SU-7 / SH
SS-A5 / SH
Other Products

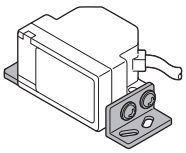
ORDER GUIDE

Main Sensor

Type	Appearance	Sensing range	Model No.
Standard type / Short sensing range		3 m 9.843 ft	**PX-22**
Standard type / Short sensing range		1 m 3.281 ft	**PX-21**
Auxiliary sensor connectable type			**PX-24**
Auxiliary sensor connectable type / With external control function / Short sensing range		3 m 9.843 ft	**PX-24ES**
Auxiliary sensor connectable type / With external control function / Short sensing range		1 m 3.281 ft	**PX-23ES**
Auxiliary sensor connectable type / Long sensing range		5 m 16.404 ft	**PX-26**
Auxiliary sensor		700 mm 27.559 in	**PX-SB1**

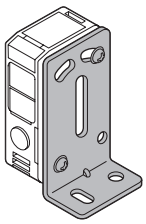
Accessories

- **MS-PX-2** (Main sensor mounting bracket)



Two bracket set
Four M4 (length 8 mm 0.315 in) screws with washers are attached.

- **MS-NX5-1** (Auxiliary sensor mounting bracket)



Two M4 (length 25 mm 0.984 in) screws with washers and two M4 nuts are attached.

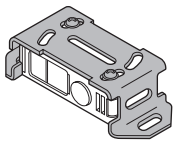
OPTIONS

Designation	Model No.	Description
Auxiliary sensor mounting bracket (Note)	**MS-NX5-2**	Foot biangled mounting bracket (Sensor protection bracket)
	MS-NX5-3	Back angled mounting bracket

Note: Refer to the **NX5** series (p.372) for dimensions of the auxiliary sensor mounting bracket.

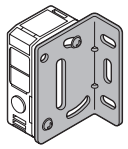
Auxiliary sensor mounting bracket

- **MS-NX5-2**



Two M4 (length 25 mm 0.984 in) screws with washers and two M4 nuts are attached.

- **MS-NX5-3**



Two M4 (length 25 mm 0.984 in) screws with washers and two M4 nuts are attached.

SPECIFICATIONS

Main sensors

Item \ Type	Standard model		Auxiliary sensor connectable model			
		Short sensing range		With external control function	Short sensing range	Long sensing range
Model No.	PX-22	PX-21	PX-24	PX-24ES	PX-23ES	PX-26
Sensing range (OUT 1 and OUT 2 areas) (Note 2)	3 m 9.843 ft	1 m 3.281 ft	3 m 9.843 ft		1 m 3.281 ft	5 m 16.404 ft
Hysteresis (Note 2)	15 % or less of operation distance					
Supply voltage	10 to 31 V DC including ripple					
Power consumption (Note 3)	Under operation: 1.5 W or less, Under sleep condition: 0.3 W or less (without auxiliary sensor)					
OUT1 (OR circuit among the effective center, left, right, adjacent left / right OUT 1 areas and the effective auxiliary left / right areas) OUT2 (OR circuit among the effective center, left and right OUT 2 areas)	NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 40 V DC or less (between OUT 1 / OUT 2 and 0 V) • Residual voltage: 1.5 V or less (at 100 mA sink current) 0.4 V or less (at 16 mA sink current)					
Utilization category	DC-12 or DC-13					
Output operation	Selectable either Light-ON or Dark-ON with a switch (Output operation of OUT 1 and OUT 2 is the same.)					
Short-circuit protection	Incorporated					
Extraneous light monitor output	———		NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 40 V DC or less (between extraneous light monitor output and 0 V) • Residual voltage: 1.5 V or less (at 100 mA sink current) 0.4 V or less (at 16 mA sink current)			
Output operation	———		ON when modulated beam other than its own (including auxiliary sensor's) light is received			
Short-circuit protection	———		———			
Response time	80 ms or less					
Operation indicators: OUT 1 area	Red LED (lights up when the beam is received in the effective OUT 1 areas)					
Operation indicators: OUT 2 area	Yellow LED (lights up when the beam is received in the effective OUT 2 areas)					
Sensitivity adjuster	Continuously variable adjusters (OUT 1, adjacent right OUT 1, adjacent left OUT 1 and OUT 2 areas are adjusted independently.)					
External sensitivity adjustment function	———		Sensitivity adjustment is possible with an analog input.			
Sensing area	Four sensing areas are selectable with dip switches.			Four sensing areas are selectable with dip switches, and eight sensing areas are selectable with external inputs.		Fixed
Sleep function	Operating / sleep selectable with external input					
Automatic interference prevention function	Optical interference from up to 25 units is prevented.					
Environmental resistance: Pollution degree	3 (Industrial environment)					
Environmental resistance: Protection	IP65 (IEC) (Refer to p.984 for details of standards.)					
Environmental resistance: Ambient temperature	–10 to +55 °C +14 to +131 °F (No dew condensation or icing allowed), Storage: –20 to +70 °C –4 to +158 °F					
Environmental resistance: Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH					
Environmental resistance: Ambient illuminance	Incandescent light: 3,000 ℓx at the light-receiving face					
Environmental resistance: EMC	EN 60947-5-2					
Environmental resistance: Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure					
Environmental resistance: Insulation resistance	20 MΩ, or more, with 500 V DC megger between all supply terminals connected together and enclosure					
Environmental resistance: Vibration resistance	10 to 500 Hz frequency, 3 mm 0.118 in amplitude (20 G max.) in X, Y and Z directions for two hours each					
Environmental resistance: Shock resistance	500 m/s² acceleration (50 G approx.) in X, Y and Z directions for three times each					
Emitting element	Infrared LED (Peak emission wavelength: 950 nm 0.037 mil, modulated)					
Material	Enclosure: ABS, Lens: Acrylic, Cover: Polycarbonate					
Cable	0.3 mm² 5-core cabtyre cable, 0.5 m 1.640 ft long (for input and output)		For input and output: 0.18 mm² 9-core (**PX-24ES** and **PX-23ES**: 12-core) cabtyre cable, 0.5 m 1.640 ft long For auxiliary sensor connection: 0.18 mm² 10-core connector attached cabtyre cable, 0.5 m 1.640 ft long			
Cable extension	Extension up to total 100 m 328.084 ft (10 m 32.808 ft for auxiliary sensor connection) is possible with 0.3 mm², or more, cable.					
Weight	Net weight: 210 g approx. Gross weight: 390 g approx.			Net weight: 220 g approx. Gross weight: 400 g approx.		Net weight: 210 g approx. Gross weight: 390 g approx.
Accessories	**MS-PX-2** (Main sensor mounting bracket): 1 set, Adjusting screwdriver: 1 pc., Matrix chart for sensing areas and external inputs: 1 sheet (**PX-24ES** and **PX-23ES** only)					

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
2) The sensing range is specified for white non-glossy paper (300 × 300 mm 11.811 × 11.811 in) as the object.
3) Obtain the current consumption by the following calculation.
Current consumption = Power consumption ÷ Supply voltage
(e.g.) When the supply voltage is 12 V, the current consumption (operating condition) is: 1.5 W ÷ 12 V = 0.125 A = 125 mA

SPECIFICATIONS

Auxiliary sensor (Note 2)

Item \ Model No.	PX-SB1
Applicable main sensor	**PX-24**, **PX-24ES**, **PX-23ES** or **PX-26**
Connectable units	Up to two **PX-SB1**'s can be connected to one main sensor.
Sensing range (Note 3)	700 mm 27.559 in
Supply voltage	Supplied from the main sensor
Current consumption	Current consumption of the main sensor increases by 30 mA approx. per auxiliary sensor.
Output	OR circuit with the main sensor's OUT 1
Operation indicator	Red LED (lights up when the beam is received)
Sensitivity adjuster	Continuously variable adjuster
Emitting element	Infrared LED (modulated)
Material	Polycarbonate
Cable	0.3 mm² 5-core cabtyre cable, 2 m 6.562 ft long
Cable extension	Extension up to total 10 m 32.808 ft is possible with 0.3 mm², or more, cable.
Weight	Net weight: 130 g approx., Gross weight: 240 g approx
Accessories	**MS-NX5-1** (Auxiliary sensor mounting bracket): 1 set, Adjusting screwdriver: 1 pc.

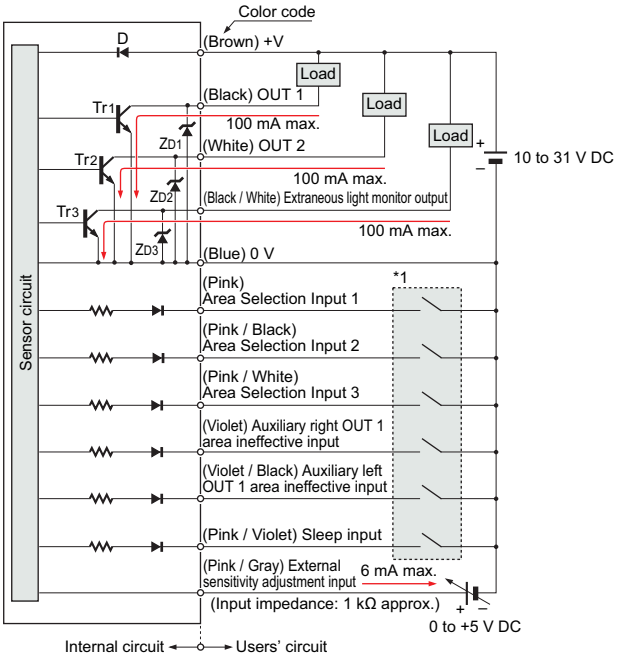
Specifications other than the above are identical with the main sensor.

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C +68 °F.
2) The auxiliary sensor cannot be used as a stand-alone unit.
3) The sensing range is specified for white non-glossy paper (300 × 300 mm 11.811 × 11.811 in) as the object.

I/O CIRCUIT AND WIRING DIAGRAMS

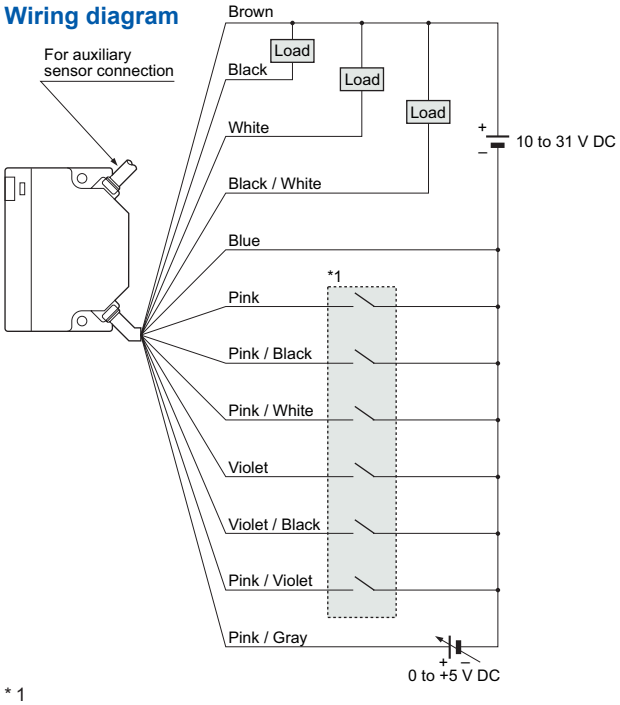
PX-24ES PX-23ES

I/O circuit diagram



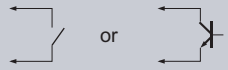
Symbols … D: Reverse supply polarity protection diode
Z_{D1}, Z_{D2}, Z_{D3}: Surge absorption zener diode
Tr_1, Tr_2, Tr_3 : NPN output transistor

Wiring diagram



*1

Non-voltage contact or NPN open-collector transistor

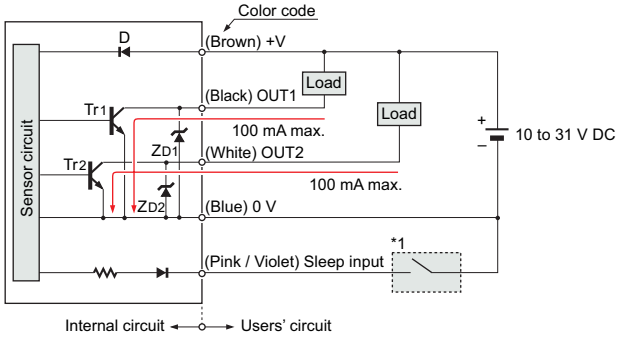


- Area selection input
  Low (0 to 1 V): Depends on the logic combination
  High (4.5 to 31 V, or open): Depends on the logic combination
- Auxiliary area ineffective input
  Low (0 to 1 V): Area ineffective
  High (4.5 to 31 V, or open): Area effective
- Sleep input
  Low (0 to 1 V): Sleep condition
  High [(supply voltage – 1 V) to 31 V, or open]: Operating condition

I/O CIRCUIT AND WIRING DIAGRAMS

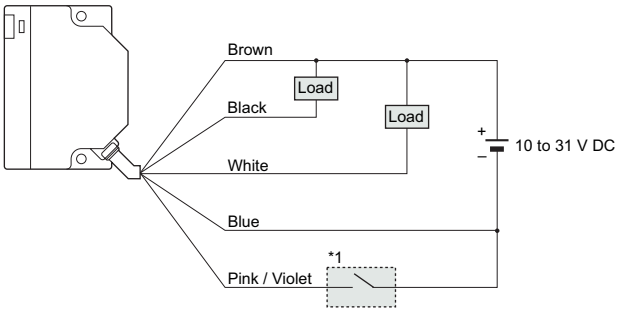
PX-22 PX-21

I/O circuit diagram



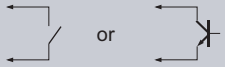
Symbols … D: Reverse supply polarity protection diode
ZD1, ZD2: Surge absorption zener diode
Tr1, Tr2 : NPN output transistor

Wiring diagram



* 1

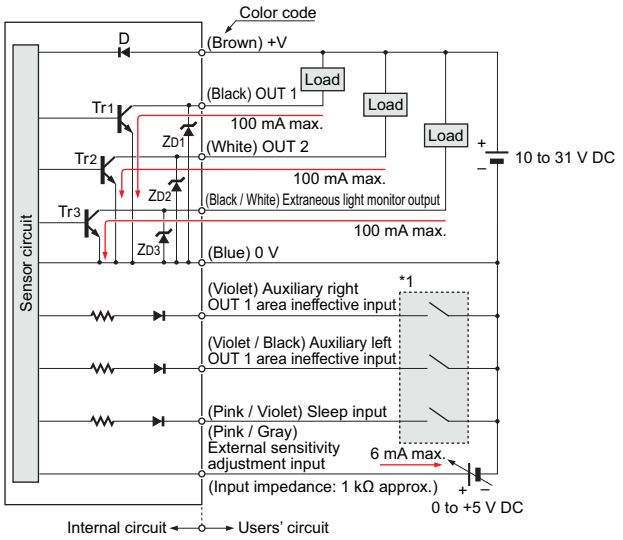
Non-voltage contact or NPN open-collector transistor



- Sleep input
  Low (0 to 1 V): Sleep condition
  High [(supply voltage – 1 V) to 31 V, or open]: Operating condition

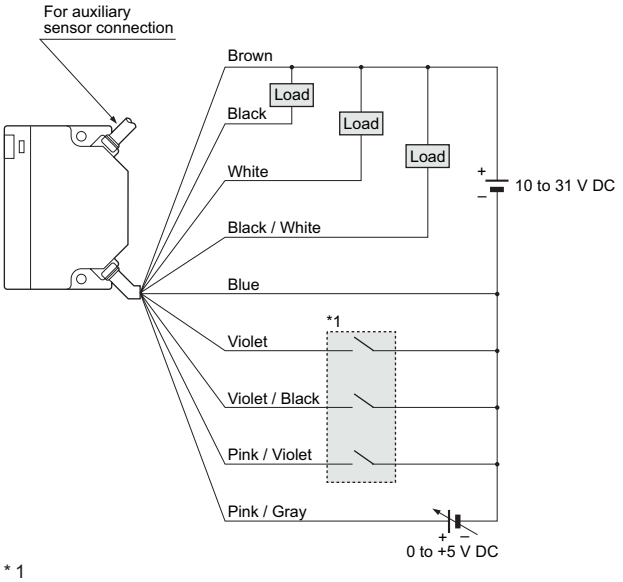
PX-24 PX-26

I/O circuit diagram



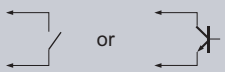
Symbols … D: Reverse supply polarity protection diode
ZD1, ZD2, ZD3: Surge absorption zener diode
Tr1, Tr2, Tr3 : NPN output transistor

Wiring diagram



* 1

Non-voltage contact or NPN open-collector transistor

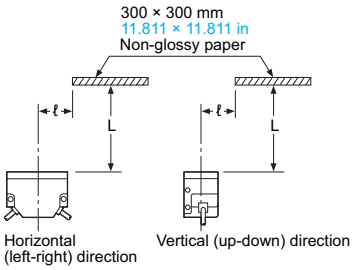


- Auxiliary area ineffective input
  Low (0 to 1 V): Area ineffective
  High (4.5 to 31 V, or open): Area effective
- Sleep input
  Low (0 to 1 V): Sleep condition
  High [(supply voltage – 1 V) to 31 V, or open]: Operating condition

SENSING CHARACTERISTICS (TYPICAL)

How to read sensing characteristics

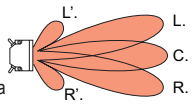
• Sensing field



Note: The sensitivity has been adjusted so that the maximum sensing range for white non-glossy paper (300 × 300 mm 11.811 × 11.811 in) is 3 m 9.843 ft (1 m 3.281 ft for **PX-21** and **PX-23ES**, 5 m 16.404 ft for **PX-26**) with the L., C. and R. areas effective.

Sensing area

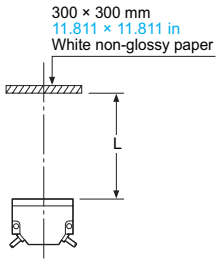
L. : Left area
C. : Center area
R. : Right area
L'. : Adjacent left OUT 1 area
R'. : Adjacent right OUT 1 area



Sensing object

Type of non-glossy paper
White non-glossy paper (lightness: 9)
Gray non-glossy paper (lightness: 5)
Black non-glossy paper (lightness: 2)

• Correlation between external sensitivity adjustment input voltage and sensing range



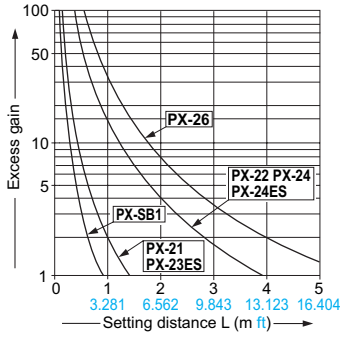
It shows the variation in the sensing range when the external input voltage is changed from 0 to +5 V with the sensitivity adjuster set at the maximum sensing range.

• Correlation between sensitivity adjuster and sensing range

Please note that due to the adjuster's characteristics it may be difficult to adjust the sensitivity at a close distance or near to rated sensing distances. (Refer to "**Correlation between sensitivity adjustor and sensing range**" below.)

All models

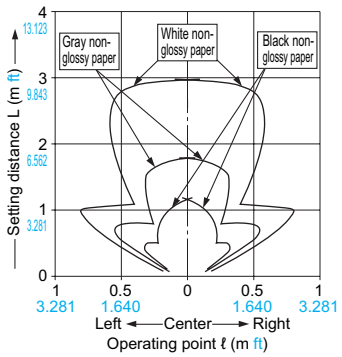
Correlation between setting distance and excess gain



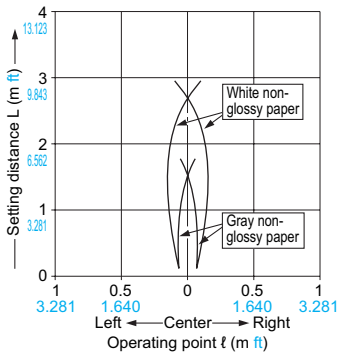
PX-22 PX-24 PX-24ES

Sensing fields

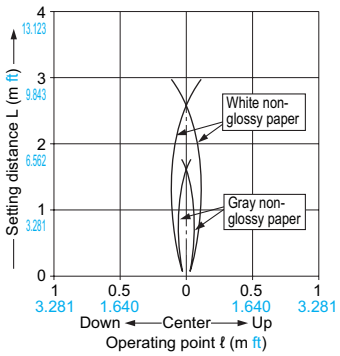
• All areas effective (Horizontal)



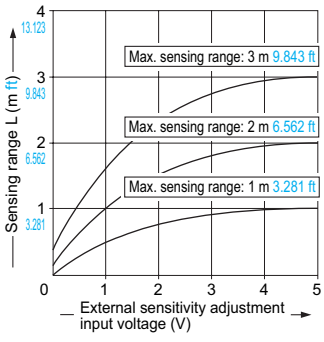
• C. area effective (Horizontal)



• All areas effective (Vertical)

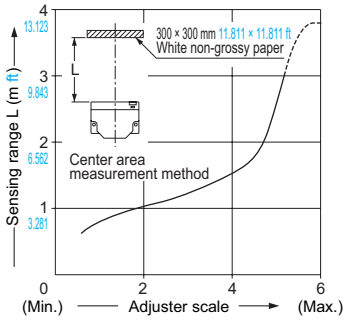


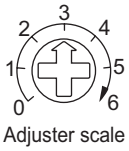
Correlation between external sensitivity adjustment input voltage and sensing range (Excluding PX-22)



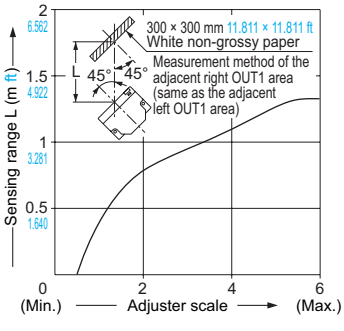
Correlation between sensitivity adjuster and sensing range

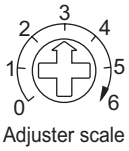
• OUT1(OUT2) area





• Adjacent right (left) OUT1 area



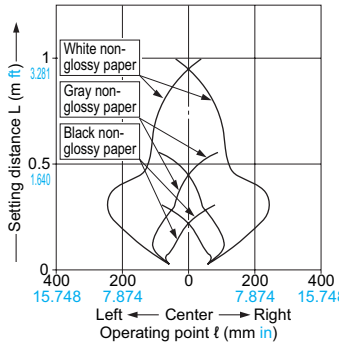


SENSING CHARACTERISTICS (TYPICAL)

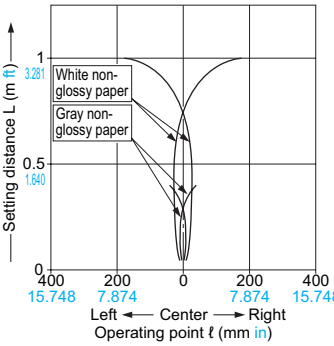
PX-21 PX-23ES

Sensing fields

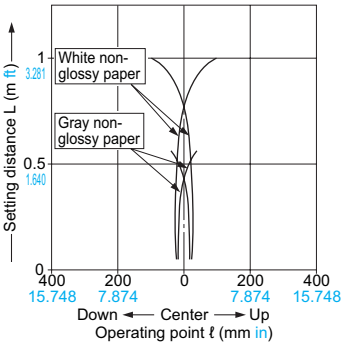
• All areas effective (Horizontal)



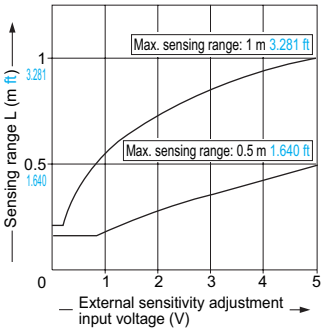
• C. area effective (Horizontal)



• All areas effective (Vertical)

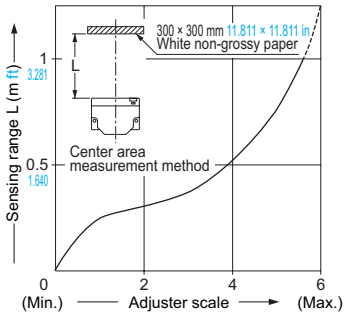


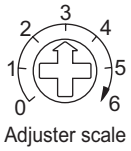
Correlation between external sensitivity adjustment input voltage and sensing range (PX-23ES only)



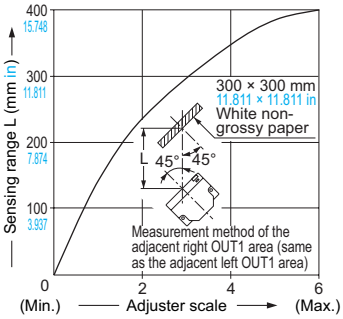
Correlation between sensitivity adjuster and sensing range

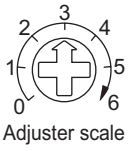
• OUT1 (OUT2) area





• Adjacent right (left) OUT1 area

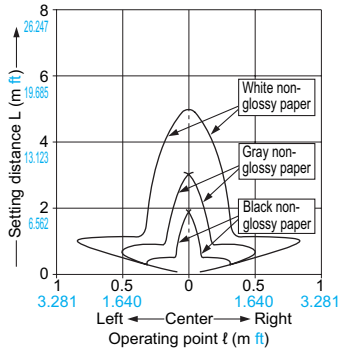




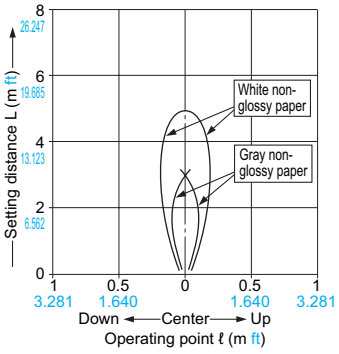
PX-26

Sensing fields

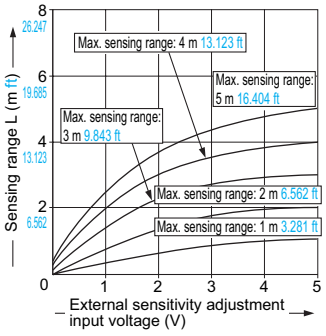
• Horizontal (Area selection not possible)



• Vertical (Area selection not possible)

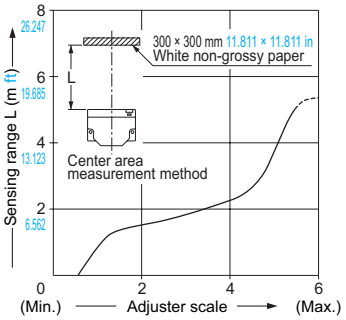


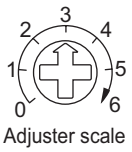
Correlation between external sensitivity adjustment input voltage and sensing range



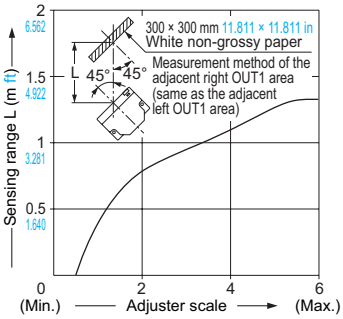
Correlation between sensitivity adjuster and sensing range

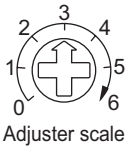
• OUT1 (OUT2) area





• Adjacent right (left) OUT1 area



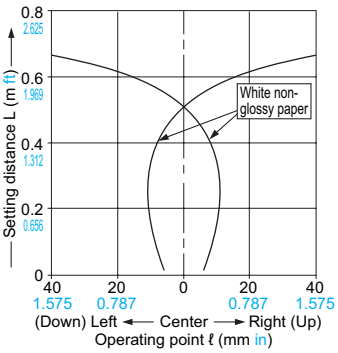


SENSING CHARACTERISTICS (TYPICAL)

PX-SB1

Sensing field

• Horizontal and vertical directions



PRECAUTIONS FOR PROPER USE

Refer to p.986~ for general precautions.

All models

• 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.

Hazard Indications

In this catalog, ⚠ WARNING and ⚠ CAUTION are indicated depending upon the level of danger. Please observe them strictly for the safe use of this sensor.

⚠ WARNING
'**WARNING**' indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

⚠ CAUTION
'**CAUTION**' indicates a hazardous situation that, if not avoided, may result in minor or moderate injury. Further, they also indicate the condition of risk of physical damage to machinery.

⚠ WARNING

• **Installation of a touch bumper**

You are requested to always install a touch bumper when this product is used on an automatic guided vehicle (AGV).

⚠ CAUTION

• **Use outside Japan**

This sensor conforms to the EMC Directive. However, it is not certified by a competent body in accordance with other country safety standards. Since each country has its regulations, please follow the local and national regulations of the country where this sensor is used.

⚠ CAUTION

• **Fail-safe measures**

This sensor is meant for proximity detection and does not possess control functions for safety maintenance. If fail-safe measures are required, consider their incorporation in the total system.
Further, do not connect the sensor output directly to a stopping mechanism (brake).

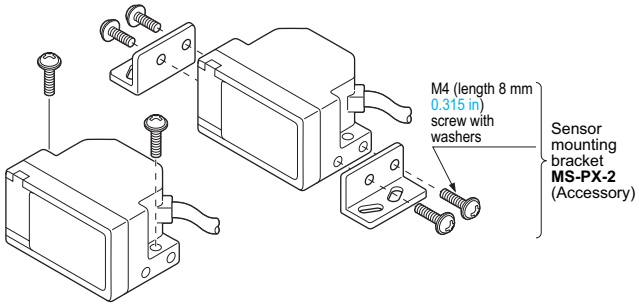
⚠ CAUTION

• **Periodical maintenance check**

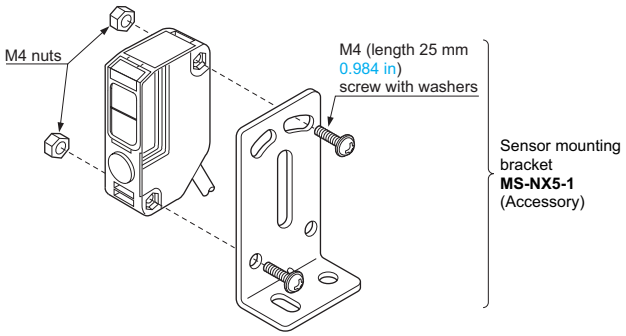
The person in charge must periodically confirm the performance of the product and maintain a record of such checks. In addition, whenever the operating environment of the product is changed due to system modification, etc., performance check must be done.

Mounting

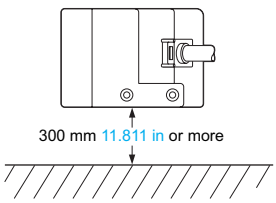
• The tightening torque for the main sensor should be 1.2 N·m or less.



• The tightening torque for **PX-SB1** (auxiliary sensor) should be 0.8 N·m or less.



• Mount the sensor, horizontally, at least 300 mm 11.811 in above the floor, to avoid reflection from the floor.



Selection Guide
Amplifier Built-in
CX-400
EX-10
EX-20
EX-30
EX-40
EQ-30
EQ-500
MQ-W
RX-LS200
RX
CY
PX-2
RT-610
Power Supply Built-in
NX5
VF
Amplifier-separated
SU-7 / SH
SS-A5 / SH
Other Products

PRECAUTIONS FOR PROPER USE

Refer to p.986~ for general precautions.

All models

Others

- Do not use during the initial transient time (0.7 sec.) after the power supply is switched on.
- Take care that an initial rush current (1.5 A approx. at 10 V DC and 5 A approx. at 31 V DC) will flow when the power supply is switched on.

PX-SB1

- This sensor must always be used with the applicable main sensor. This sensor does not work as a standalone unit. (It cannot be used with **PX-22** or **PX-21**.)

PX-24 PX-24ES PX-23ES PX-26

External sensitivity adjustment function

- The sensitivity can be adjusted, within the range set by the manual sensitivity adjuster, by an analog voltage (0 to +5 V) applied to the external sensitivity adjustment input. The sensitivity varies with the magnitude of the applied voltage.

Notes: 1) The sensitivity of the auxiliary sensor is not changed.
2) Sensitivity adjustment beyond the range set by the manual sensitivity adjuster is not possible.

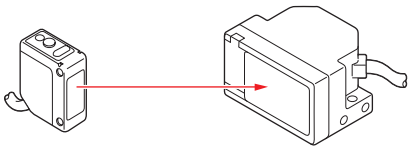
Input voltage	0 V ⟷ +5 V or open
Sensitivity	Minimum ⟷ Maximum (Maximum sensitivity set by the manual sensitivity adjuster)

Notes: 3) This wire should be insulated if it is not used.

Extraneous light monitor function

(Not incorporated in **PX-22** and **PX-21**)

- If the sensor receives modulated light other than its own (including auxiliary sensor's) light, the extraneous light monitor output turns ON. The operation of the extraneous light monitor output has absolutely no affect on sensing. It is useful for recognizing presence of other sensors near this sensor in case of intersecting AGV paths, etc.

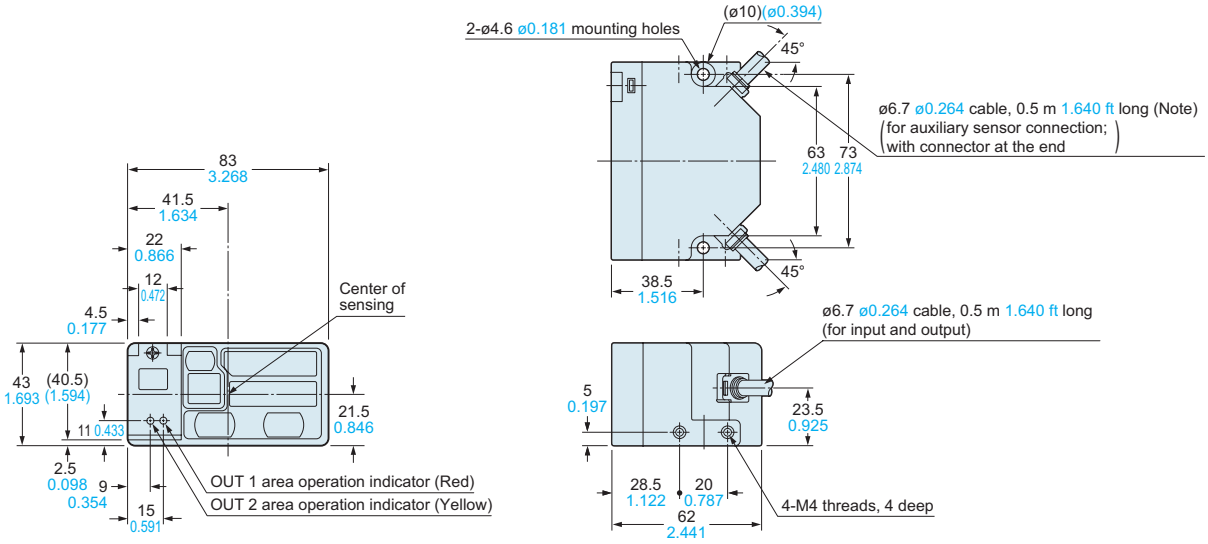


Note: The extraneous light monitor output is not incorporated with a short-circuit protection circuit. Do not connect it directly to a power supply or a capacitive load.

DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.com
Refer to the **NX5** series (p.372) for dimensions of the auxiliary sensor mounting bracket.

PX-2□ Main sensor



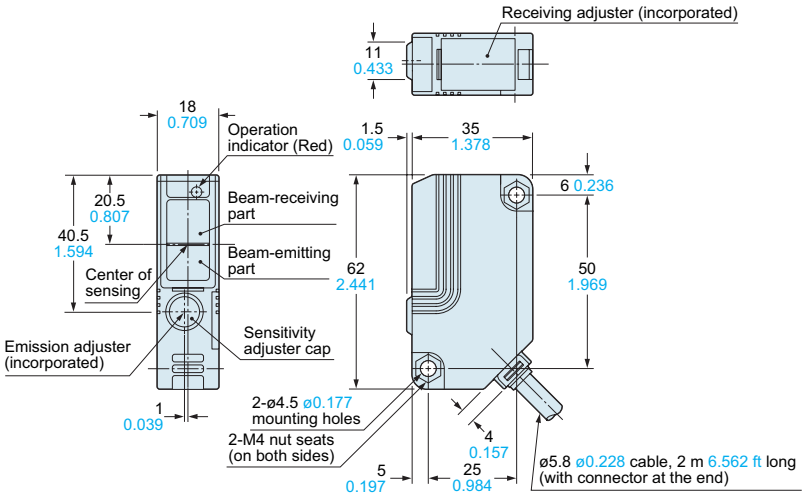
Note: **PX-22** and **PX-21** do not have this cable.

DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.com
Refer to the **NX5** series (p.372) for dimensions of the auxiliary sensor mounting bracket.

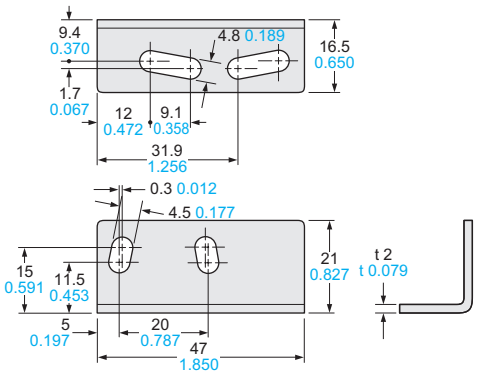
PX-SB1

Auxiliary sensor

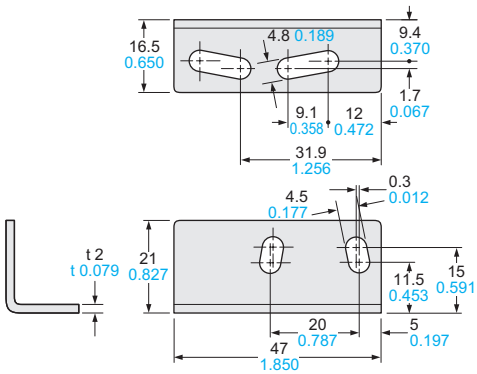


MS-PX-2

Main sensor mounting bracket (Accessory for **PX-2□**)



Left side



Right side

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

Four M4 (length 8 mm 0.315 in) screws with washers are attached.

Assembly dimensions

Mounting drawing with **PX-24**