

# Smart Laser Sensors

## E3NC

CSM\_E3NC\_DS\_E\_9\_3

### Ideal for Applications That Cannot Be Handled with Fiber Sensors or Photoelectric Sensors

- The lineup includes E3NC-L Sensors, which are ideal for presence detection, and E3NC-S Sensors, which are ideal for discriminations.
  - E3NC-L Sensors are available in Coaxial Retro-reflective Models, Long-distance Variable-spot Diffuse-reflective Models, and Small-spot Limited-reflective Models.
  - The E3NC-S Sensors include CMOS and provide stable detection of workpieces with different colors and inclined installation.
- Smart Tuning to achieve stable detection with easy setup.
- White on black display characters for high visibility.
- Flexible robot cables are used for the Sensor Heads.



Refer to the *Safety Precautions* on page 14.

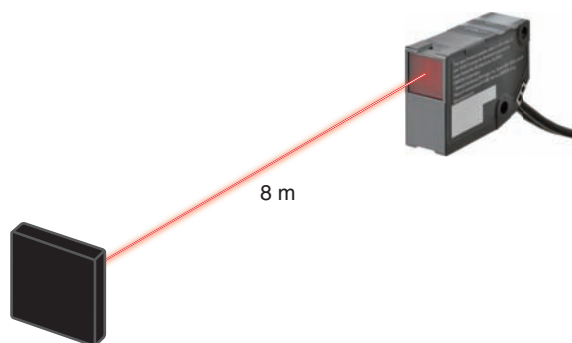


For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

## Features

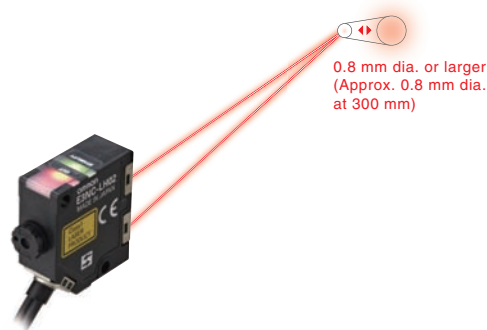
### Retro-reflective Models: E3NC-LH03

- Maximum sensing distance of 8 m.
- Stable detection of many types of workpieces.
- Stable detection of highly transparent films.



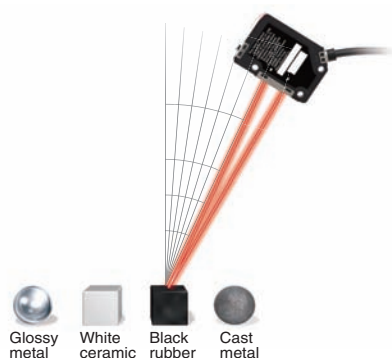
### Diffuse-reflective Models: E3NC-LH02 **PAT.P**

- Long-distance detection at up to 1.2 m.
- Spot can be adjusted to the workpiece or application.



### CMOS Laser, Reflective Models: E3NC-SH250H/SH250/SH100

- Stable detection even for different workpiece colors and materials.
- Stable detection for inclined Head installation and different workpiece shapes.









### Amplifier Units

- Same shape as Fiber Amplifier Units plus easy operation.
- Smart Tuning with one button.



## Ordering Information





### Sensor Heads: E3NC-L Compact Laser Sensor Series (Dimensions → page 17)

Sensing method	Appearance	Beam shape	Sensing distance				Laser class	Cable length	Model
Coaxial Retro-reflective with MSR function		Spot	 8 m *				Class 1	2 m	E3NC-LH03 2M
								5 m	E3NC-LH03 5M
Diffuse-reflective		Variable spot	 1.2 m					2 m	E3NC-LH02 2M
								5 m	E3NC-LH02 5M
Limited-reflective		Spot	 70±15 mm					2 m	E3NC-LH01 2M
								5 m	E3NC-LH01 5M

\* These values apply when an E39-R21, E39-R22, E39-RS10, or E39-RS11 Reflector is used. A Reflector is not included. Purchase a Reflector separately to match the intended use of the Sensor.

**Note:** Only an E3NC-LA□□ Amplifier Unit can be connected.





### Amplifier Units: E3NC-L Compact Laser Sensor Series (Dimensions → page 19)

Connecting method	Appearance	Inputs/outputs	Model	
			NPN output	PNP output
Pre-wired (2 m)		2 outputs + 1 input	E3NC-LA21 2M	E3NC-LA51 2M
Wire-saving Connector		1 output + 1 input	E3NC-LA7	E3NC-LA9
M8 Connector		1 output + 1 input	E3NC-LA24	E3NC-LA54
Connector for Sensor Communications Unit *		---	E3NC-LA0	

\* A Sensor Communications Unit is required if you want to use the Amplifier Unit on a network.





**Note:** Only an E3NC-LH□□ Sensor Head can be connected.

### Sensor Heads: E3NC-S Ultra-compact CMOS Laser Sensor Series (Dimensions → page 18)

Sensing method	Appearance	Beam shape	Measurement range				Laser class	Cable length	Model
Distance-settable		Spot	 35 to 250 mm				Class 2	2 m	E3NC-SH250H 2M
								2 m	E3NC-SH250 2M
			 35 to 100 mm				Class 1	2 m	E3NC-SH100 2M

**Note:** Only an E3NC-SA□□ Amplifier Unit can be connected.

## Amplifier Units: E3NC-S Ultra-compact CMOS Laser Sensor Series (Dimensions → page 19)

Connecting method	Appearance	Inputs/outputs	Model	
			NPN output	PNP output
Pre-wired (2 m)		2 outputs + 1 input	E3NC-SA21 2M	E3NC-SA51 2M
Wire-saving Connector		1 output + 1 input	E3NC-SA7	E3NC-SA9
M8 Connector		1 output + 1 input	E3NC-SA24	E3NC-SA54
Connector for Sensor Communications Unit *		---	E3NC-SA0	

\* A Sensor Communications Unit is required if you want to use the Amplifier Unit on a network.





**Note:** Only an E3NC-SH□□ or E3NC-SH□□H Sensor Head can be connected.

## Accessories (Sold Separately)

### Sensor Head Accessories

**Reflectors (Required for Retro-reflective Sensors) (Dimensions → page 21)**






A Reflector is not provided with the Sensor Head. It must be ordered separately.

Applicable Sensor Head	Appearance	Model	Quantity
E3NC-LH03		E39-R21	1
		E39-R22	
		E39-RS10	
		E39-RS11	

**Note:** Refer to the *Safety Precautions* on page 14 for how to attach the reflector.

**Sensor Head Mounting Brackets (Dimensions → page 22)**

A Mounting Bracket is not provided with the Sensor Head. It must be ordered separately as required.

Applicable Sensor Head	Appearance	Model	Quantity	Contents
E3NC-LH03		E39-L190	1	Mounting Bracket: 1 Nut plate: 1 Phillips screws (M3×18): 2
E3NC-LH02		E39-L185		
E3NC-LH01		E39-L186		
E3NC-SH250H E3NC-SH250 E3NC-SH100		E39-L187		
		E39-L188		

**Lens Attachments for Sensor Heads (Dimensions → page 21)**

A Lens Attachment is not provided with the Sensor Head. It must be ordered separately as required.

Applicable Sensor Head	Appearance	Model	Quantity
E3NC-LH03		E39-P51	1
E3NC-LH02		E39-P52	

**Note:** You can combine the Lens Attachment with an applicable Sensor Head to create a line beam.

## Ultra-compact CMOS Laser Sensor: E3NC-S

### Sensor Heads

Sensing method		Distance-settable		
Item	Model	E3NC-SH250H	E3NC-SH250	E3NC-SH100
Light source (wavelength)*1		Visible semiconductor laser diode (660 nm), 1 mW (average output: 220 μW) (JIS Class 2, IEC/EN Class 2, and FDA Class 2)	Visible semiconductor laser diode (660 nm), 0.5 mW (average output: 100 μW) (JIS Class 1, IEC/EN Class 1, and FDA Class 1)	
Measurement range		35 to 250 mm (display value: 350 to 2,500)		35 to 100 mm (display value: 350 to 1,000)
Standard detected level difference*2		35 to 180mm: 9 mm 180 to 250 mm: 25 mm		35 to 50 mm: 1.5 mm 50 to 100 mm: 3 mm
Beam size*3		Approx. 1 mm dia. at 250 mm		Approx. 0.5 mm dia. at 100 mm
Indicators		OUT indicator (orange), STABILITY indicator (green), and ST indicator (blue)		
Ambient illumination (Receiver side)		Incandescent lamp: 4,000 lx max., Sunlight: 8,000 lx max.	Incandescent lamp: 2,000 lx max., Sunlight: 4,000 lx max.	Incandescent lamp: 4,000 lx max., Sunlight: 8,000 lx max.
Ambient temperature range		Operating: -10 to 50°C; Storage: -25 to 70°C (with no icing or condensation)		
Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)		
Altitude		2,000 m max.		
Installation environment		Pollution degree 3 (as per IEC 60947-1)		
Insulation resistance		20 MΩ min. (at 500 VDC)		
Dielectric strength		1,000 VAC at 50/60 Hz for 1 min		
Vibration resistance (destruction)		10 to 55 Hz with a 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions		
Shock resistance (destruction)		500 m/s <sup>2</sup> 3 times each in X, Y, and Z directions		
Degree of protection		IEC IP67		
Connecting method		Pre-wired connector (Standard cable length: 2 m)		
Materials	Case	Polybutylene terephthalate (PBT)		
	Lens	Methacrylic resin (PMMA)		
	Cable	Vinyl chloride (PVC)		
Weight (packed state/Sensor Head only)		Approx. 125 g/approx. 75 g		
Accessories		Instruction Manual, laser warning label (E3NC-SH250H only)		

**Note:** Incorrect detection may occur outside the measurement range if the object has a high reflection factor.

\*1. These Sensors are classified as Class 1 laser devices under IEC 60825-1 and the regulations of Laser Notice No. 50 for FDA certification. CDRH (Center for Devices and Radiological Health) registration has been completed. (Accession Number: 1220691)

\*2. The values were measured at the center of the sensing distance using OMRON's standard sensing object (white ceramic).

\*3. Beam size: Defined at the 1/e<sup>2</sup> (13.5 %) of the central intensity at the measurement center distance.

Measurement may be influenced if there is light leakage outside the defined region and the surroundings of the target object have a high reflectance in comparison to the target object.

Also, when detecting a workpiece that is smaller than the beam size, a correct value may not be obtained.

## Amplifier Units

Item		Type	Standard models			Model for Sensor Communications Unit
		NPN output	E3NC-SA21	E3NC-SA7	E3NC-SA24	E3NC-SA0
		PNP output	E3NC-SA51	E3NC-SA9	E3NC-SA54	
		Connecting method	Pre-wired	Wire-saving Connector	M8 Connector	Connector for Sensor Communications Unit
Inputs/ outputs	Outputs	2 outputs		1 output		--- *1
	External inputs	1 input				
Power supply voltage *2		10 to 30 VDC, including 10% ripple (p-p)				Supplied from the connector through the Sensor Communications Unit
Power consumption *3		At Power Supply Voltage of 24 VDC Normal mode: 1,920 mW max. (Current consumption: 80 mA max.) Eco ON: 1,680 mW max. (Current consumption: 70 mA max.) Eco LO: 1,800 mW max. (Current consumption: 75 mA max.)				
Control outputs *4		Load power supply voltage: 30 VDC max., open-collector output Load current: Groups of 1 to 3 Amplifier Units: 100 mA max., Groups of 4 to 30 Amplifier Units: 20 mA max. <div><div>Residual voltage:</div><div>At load current of less than 10 mA: 1 V max. At load current of 10 to 100 mA: 2 V max.</div></div> OFF current: 0.1 mA max.				---
External inputs		Refer to *5.				
Indicators		7-segment displays (Sub digital display: green, Main digital display: white) Display direction: Switchable between normal and reversed. OUT indicator (orange), L/D indicator (orange), ST indicator (blue), ZERO indicator (green), and OUT selection indicator (orange, only on models with 2 outputs)				
Protection circuits		Power supply reverse polarity protection, output short-circuit protection, and output reverse polarity protection				Power supply reverse polarity protection and output short-circuit protection
Response time	Super-high-speed mode (SHS) *6	Operate or reset: 1.5 ms				
	High-speed mode (HS)	Operate or reset: 5 ms				
	Standard mode (Std)	Operate or reset: 10 ms				
	Giga-power mode (GIGA)	Operate or reset: 50 ms				
Sensitivity adjustment		Smart Tuning (2-point tuning, full auto tuning, 1-point tuning, tuning without workpiece, 2-point area tuning, 1-point area tuning, or area tuning without workpiece), or manual adjustment				
Maximum connectable Units		30				With E3NW-ECT: 30 units *7 With E3NW-CRT: 16 units With E3NW-CCL: 16 units
No. of Units for mutual interference prevention	Super-high-speed mode (SHS) *6	0				
	High-speed mode (HS)	2				
	Standard mode (Std)	2				
	Giga-power mode (GIGA)	2				
Functions	Timer	Select from timer disabled, OFF-delay, ON-delay, one-shot, or ON-delay + OFF-delay timer: 1 to 9,999 ms				
	Zero reset	Negative values can be displayed. (Threshold value is shifted.)				
	Resetting settings *8	Select from initial reset (factory defaults) or user reset (saved settings).				
	Eco mode *9	Select from OFF (digital display lit), ECO ON (digital display not lit), and ECO LO (digital display dimmed).				
	Bank switching	Select from banks 1 to 4.				
	Output 1	Select from Normal detection mode, Area detection mode, or hold mode.				
	Output 2	Select from Normal detection mode or Error output mode.	---		Select from Normal detection mode or Error output mode.	
	External input	Select from input OFF, tuning, laser OFF, zero reset, or bank switching.				---
	Keep function *10	Select from ON or OFF.				
	Background suppression*11	Select from ON or OFF.				
Hysteresis width		Select from standard setting or user setting.				

\*1. Two sensor outputs are allocated in the programmable logic controller PLC I/O table.

PLC operation via Communications Unit enables reading detected values and changing settings.

\*2. Applicable Sensor Head is the series of E3NC-SH□□ (Input/Output 10-30V DC Class 2).

\*3. At Power Supply Voltage of 10 to 30 VDC.

Normal mode: 2,250 mW max. (Current consumption: 75 mA max. at 30 VDC, 145 mA max. at 10 VDC)

Eco ON: 2,010 mW max. (Current consumption: 67 mA max. at 30 VDC, 125 mA max. at 10 VDC)

Eco LO: 2,130 mW max. (Current consumption: 71 mA max. at 30 VDC, 135 mA max. at 10 VDC)

\*4. The total for both outputs of a model with 2 outputs is 100 mA max. (Residual voltage: Load current of less than 10 mA: 1 V max., Load current of 10 to 100 mA: 2 V max.).

\*5. The following details apply to the input.

	Contact input (relay or switch)	Non-contact input (transistor)	Input time*5-1
NPN	ON: Shorted to 0 V (Sourcing current: 1 mA max.). OFF: Open or shorted to Vcc.	ON: 1.5 V max. (Sourcing current: 1 mA max.) OFF: Vcc – 1.5 V to Vcc (Leakage current: 0.1 mA max.)	ON: 9 ms min. OFF: 20 ms min.
PNP	ON: Shorted to Vcc (Sinking current: 3 mA max.). OFF: Open or shorted to 0 V.	ON: Vcc – 1.5 V to Vcc (Sinking current: 3 mA max.) OFF: 1.5 V max. (Leakage current: 0.1 mA max.)	

\*5-1. Input time is 25 ms (ON)/(OFF) only when (in tUnE) input is selected.

\*6. The mutual interference prevention function is disabled if the detection mode is set to super-high-speed mode.

\*7. When connected to an OMRON NJ-series Controller.

\*8. The bank is not reset by the user reset function or saved by the user save function.

\*9. Eco LO is supported for Amplifier Units manufactured in August 2014 or later.

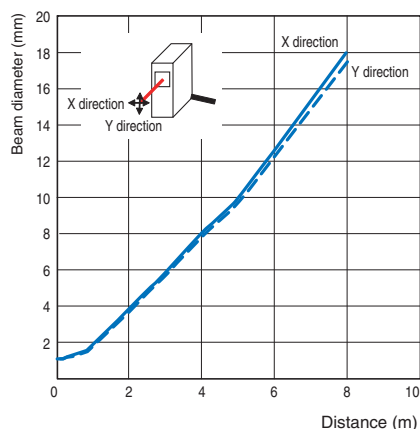
\*10. The output for a measurement error is set. ON: The value of the output from before the measurement error is retained. OFF: The output is turned OFF when a measurement error occurs.

\*11. Only the sensing object is detected when tuning.

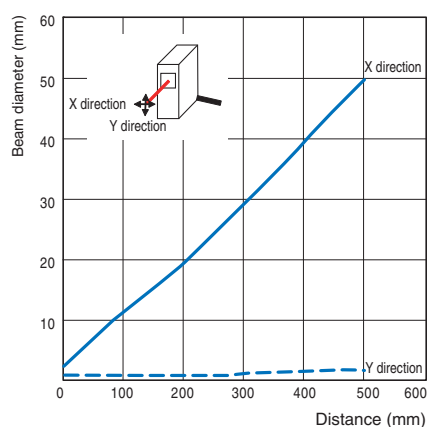
# Engineering Data (Reference Value)

## Beam Diameter Vs. Distance

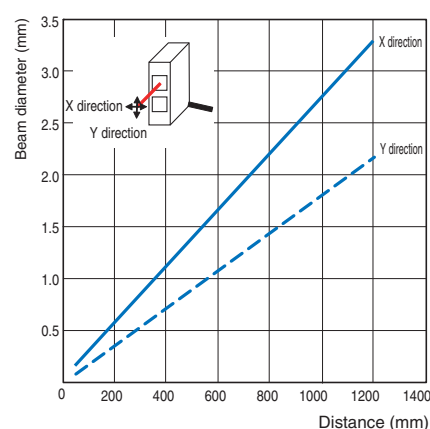
**Retro-reflective Model**  
**E3NC-LH03**



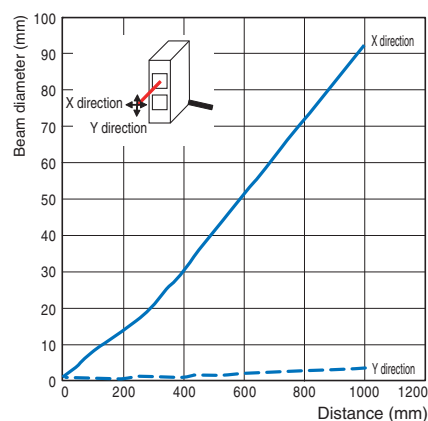
**Retro-reflective Model**  
**E3NC-LH03 + E39-P51**



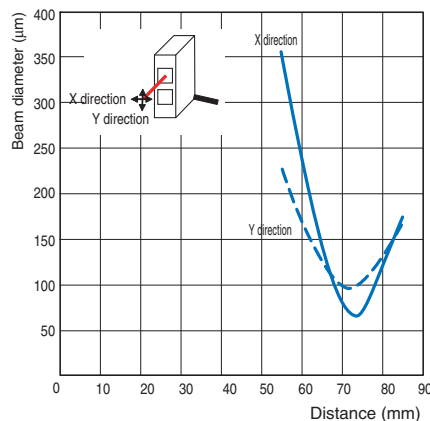
**Diffuse-reflective Model**  
**E3NC-LH02**



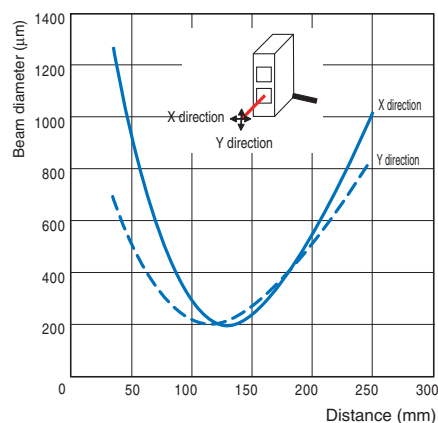
**Diffuse-reflective Model**  
**E3NC-LH02 + E39-P52**



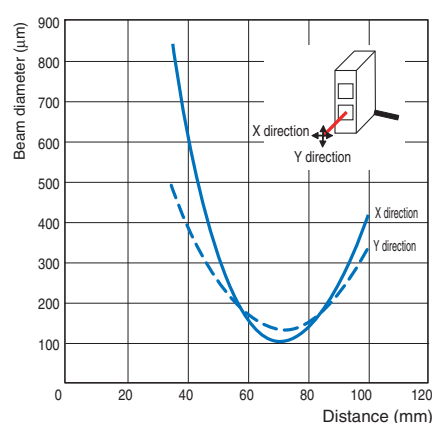
**Limited-reflective Model**  
**E3NC-LH01**



**Distance-settable Model**  
**E3NC-SH250/SH250H**



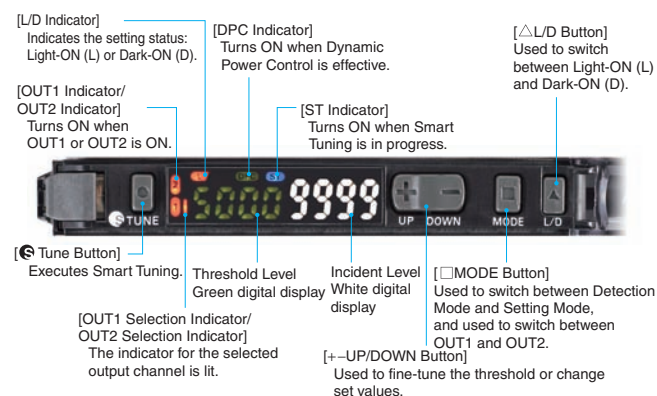
**Distance-settable Model**  
**E3NC-SH100**



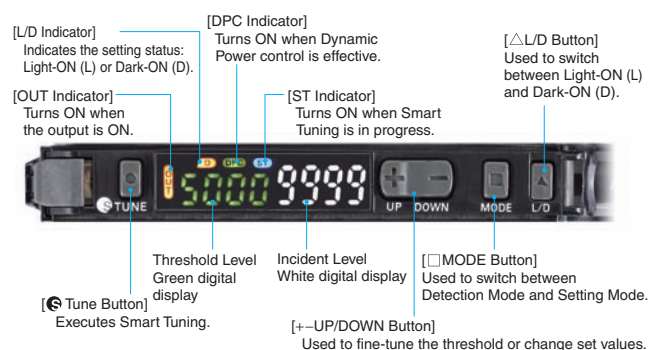
## Nomenclature

### Compact Laser Sensors

#### E3NC-LA21/LA51/LA0

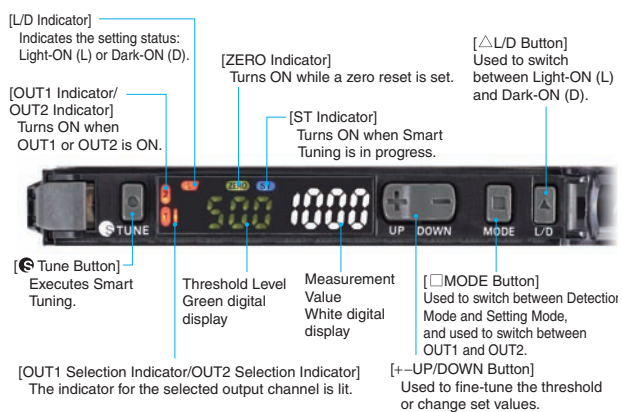


#### E3NC-LA7/LA9/LA24/LA54

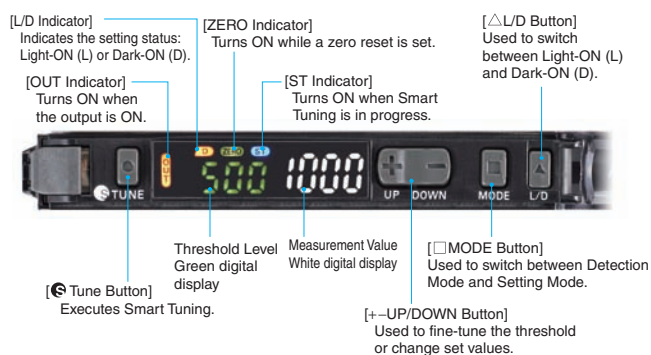


### Ultra-compact CMOS Laser Sensors

#### E3NC-SA21/SA51/SA0



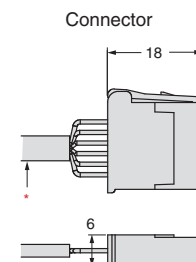
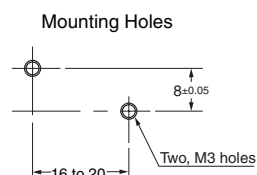
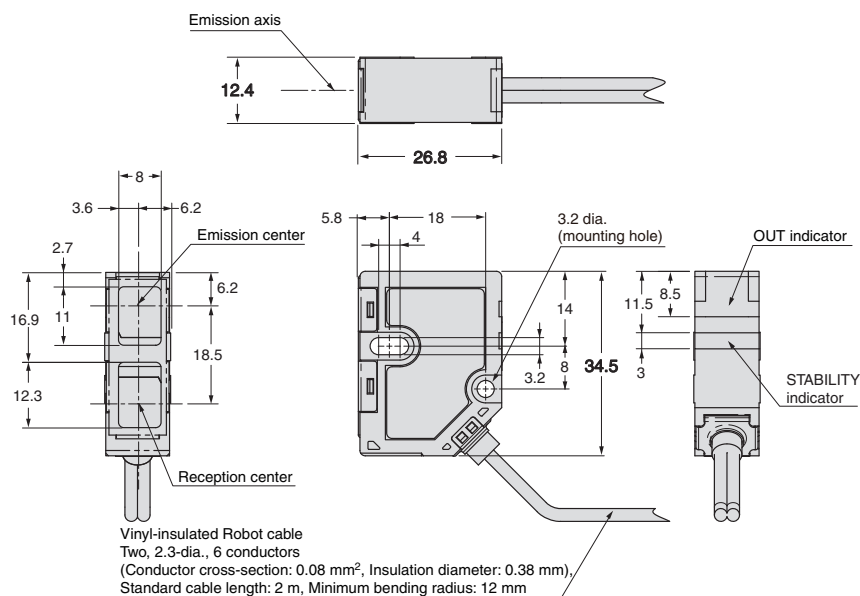
#### E3NC-SA7/SA9/SA24/SA54





### Limited-reflective Model

#### E3NC-LH01



\* A blue ID tube is attached.

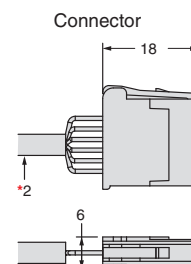
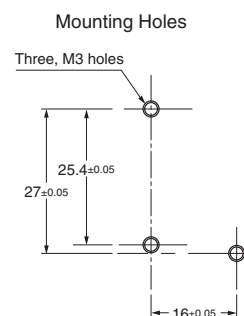
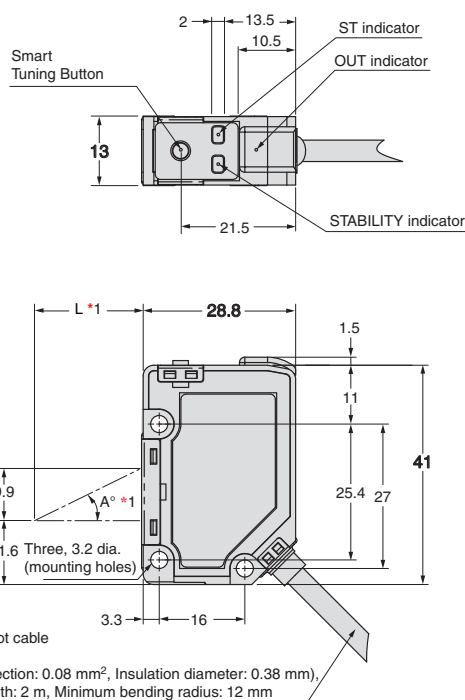
### Distance-settable Models

#### E3NC-SH250H E3NC-SH250 E3NC-SH100



\*1 E3NC-SH100  
L = 35 to 100 mm,  
A = 15.92° to 5.67°

E3NC-SH250H/250  
L = 35 to 250 mm,  
A = 15.92° to 2.27°



\*2 A white ID tube is attached.