

SS-A5

Amplifier-separated Manual Sensitivity Setting Photoelectric Sensor

MS-AJ

Sensor Mounting Stand

PM

Micro

PM2

NX5

Multi-voltage Type

VF

SU-7/SH

Amplifier-separated Type

SS-A5

CHX-SC2

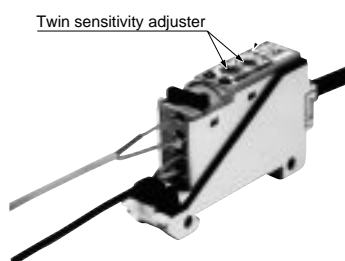
Sensor Checker



Twin Adjuster Enables Delicate Sensitivity Setting

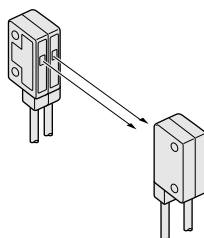
Twin Adjuster

Its twin adjuster enables easy optimum setting to suit the application.



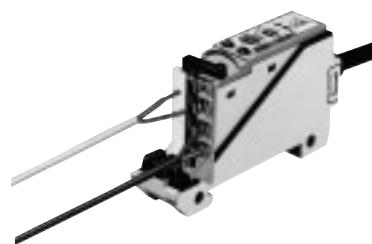
Automatic Interference Prevention

The **SS-A5** amplifier is incorporated with an automatic interference prevention function. Mutual interference does not occur even if two sensors are mounted adjacently.



Quick Sensor Head Connection

The **SS-A5** unique sensor head cable clamping mechanism reduces wiring time to 1/3 of conventional connection time. Just insert the cables into the amplifier and turn the lever. Even a screwdriver is not required.

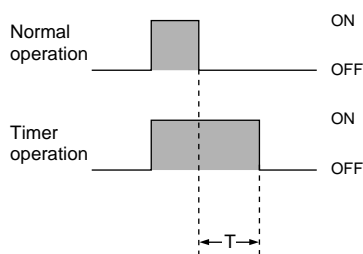


Self-diagnosis Output

SS-A5 incorporates a self-diagnosis output, which provides a signal in case of unstable operating conditions due to beam misalignment, soiling of lens, etc.

OFF-delay Timer

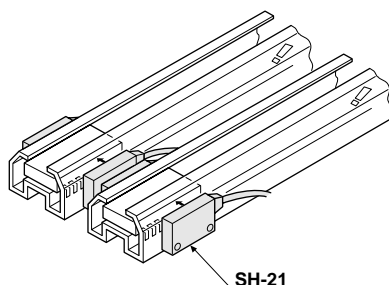
An OFF-delay timer which extends the output signal by a fixed period is incorporated. This is useful when the connected device has a slow response time or when small objects are being sensed and the output signal width is too small.



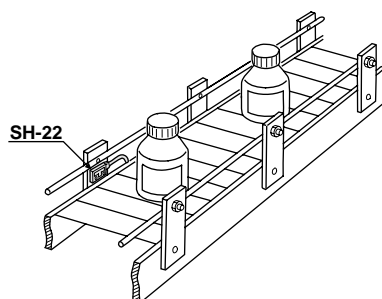
Timer period: T = 40ms approx.

APPLICATIONS

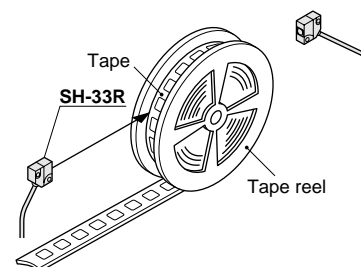
Detecting ICs in transparent sticks



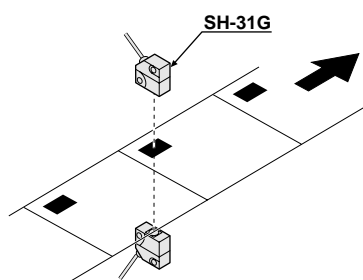
Detecting small bottles



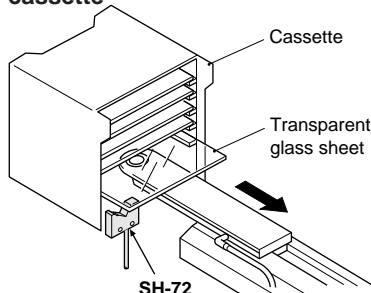
Sensing remaining tape



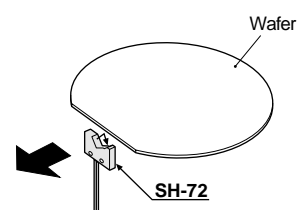
Detecting marks



Detecting transparent glass sheet in cassette



Detecting wafer



Ultra-slim Type/SH-2□

- Compact size: 0.3cm³
- Thickness: 3mm

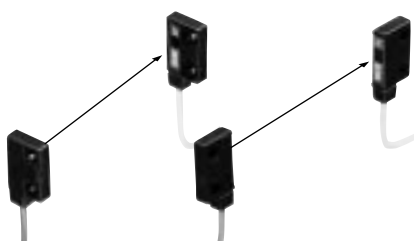


• Versatile mounting

- Diffuse reflective type sensor head
- Front sensing



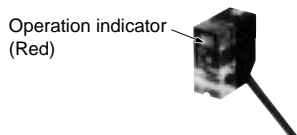
- Thru-beam type sensor head
- Front sensing
- Side sensing



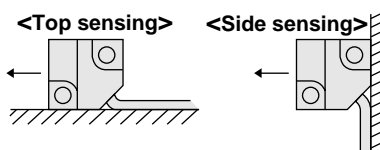
Ultra-small Type/SH-3□

• Sensor head with indicator

An operation indicator, which enables an easy check of the operation at site, has been incorporated.

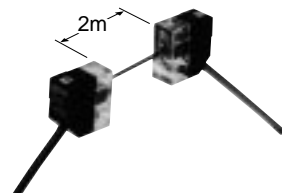


• Versatile, either top sensing or side sensing



• 2m long sensing range with red LED beam (SH-33R)

Visible red LED beam makes alignment easy.

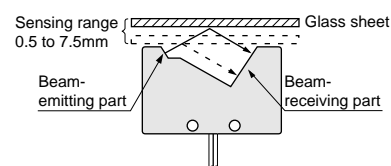


Glass Sheet Detection Sensor/SH-72

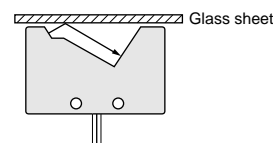


• Reliable glass sheet detection

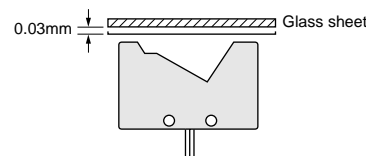
Its unique optical system enables stable detection of transparent glass sheet, as well as, specular film deposited glass sheet at the same distance.



• No dead zone



• Repeatability: 0.03mm



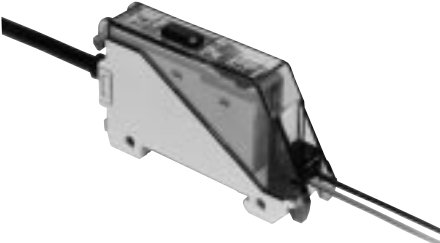
• Not affected by background

Sensor Mounting Stand	MS-AJ
Micro	PM
PM2	
Multi-voltage Type	NX5
VF	
Amplifier-separated Type	SU-7/SH
SS-A5	
Sensor Checker	CHX-SC2


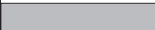

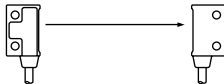


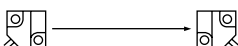



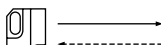




SS-A5

ORDER GUIDE

Amplifier

Appearance	Model No.
	SS-A5

Sensor heads

Type	Appearance		Sensing range	Model No.	Emitting element	Operation indicator	
Ultra-slim type	Thru-beam	Front sensing		 300mm	SH-21	Infrared LED	
		Side sensing					
	Diffuse reflective	Front sensing		 50mm	SH-22		
Ultra-small type	Thru-beam		 1m	SH-31R	Red LED	Incorporated	
			 100mm	SH-31G	Green LED		
			 2m	SH-33R	Red LED		
	Diffuse reflective		 100mm	SH-32R			
Glass sheet detection sensor			 0.5 to 7.5mm (with transparent glass sheet)	SH-72	Infrared LED		

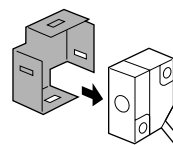
OPTIONS

Designation	Model No.	Description					
Slit mask (For SH-31R , SH-31G and SH-33R only)	OS-SS3	This is a convenient slit mask having four types of slits.					
		Slit size	Fitting	Sensing range			Min. sensing object
				SH-31R	SH-31G	SH-33R	
		0.5 × 3mm	One side	500mm	50mm	750mm	φ3mm
			Both sides	250mm	25mm	400mm	0.5 × 3mm
		1 × 3mm	One side	700mm	70mm	1,000mm	φ3mm
Both sides	500mm		50mm	750mm	1 × 3mm		
Sensor head mounting bracket (For the ultra-small type only)	MS-SS3-1	Mounting bracket for the ultra-small sensor head (The thru-beam type sensor head needs two brackets.)					
Amplifier mounting bracket	MS-FX-1	Mounting bracket for SS-A5					
Sensor checker (Note)	CHX-SC2	It is useful for beam alignment of thru-beam type sensors. The optimum receiver position is given by indicators, as well as, an audio signal.					

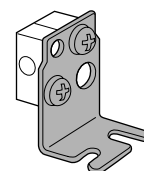
Note: Refer to P.378~ for details of the sensor checker **CHX-SC2**.

Slit mask

The sensor head and the slit mask are mounted together.

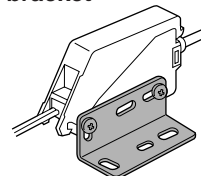


Sensor head mounting bracket



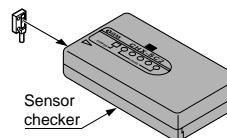
Two M3 (length 12mm) screws with washers are attached.

Amplifier mounting bracket



Two M3 (length 20mm) screws with washers are attached.

Sensor checker



SPECIFICATIONS

Refer to P.358~ for sensing characteristics.

Sensor heads

		Type	Ultra-slim type			Ultra-small type			Glass sheet detection sensor	
			Thru-beam		Diffuse reflective	Thru-beam				Diffuse reflective
			Front sensing	Side sensing		Red LED	Green LED	Red LED		
Item	Model No.	SH-21	SH-21E	SH-22	SH-31R	SH-31G	SH-33R	SH-32R	SH-72	
Applicable amplifier		SS-A5								
Sensing range		300mm		50mm (Note 1)	1m	100mm	2m	100mm (Note 1)	0.5 to 7.5mm (with transparent glass sheet)	
Sensing object		Min. ϕ 0.3mm opaque object (under the optimum condition) (Note 2)		Min. ϕ 0.3mm copper wire (with 3mm setting distance and at the max. sensitivity)	Min. ϕ 1mm opaque object with 1m setting distance and at the optimum sensitivity (Note 3)	Min. ϕ 1mm opaque object (with 100mm setting distance and at the optimum sensitivity) (Note 3)	Min. ϕ 1mm opaque object (with 2m setting distance and at the optimum sensitivity) (Note 3)	Opaque, translucent or transparent object	□24mm or more trans- parent glass, aluminum- evaporated mirror, etc.	
Hysteresis		_____		15% or less of operation distance	_____			15% or less of operation distance	5% or less of operation distance	
Repeatability (perpendicular to sensing axis)		0.03mm or less		0.15mm or less	0.1mm or less				0.03mm or less (along sensing axis)	
Operation indicator		_____			Red LED (lights up when the sensing output of the amplifier is ON, incorporated on the emitter of the thru-beam type sensor head)				_____	
Environmental resistance	Protection	IP62 (IEC)			IP66 (IEC)				_____	
	Ambient temperature	− 10 to + 60°C (Note 4) Storage: − 20 to + 70°C			− 25 to + 60°C (Note 4) Storage: − 30 to + 70°C				− 10 to + 60°C (Note 4) (including) storage	
	Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH								
	Ambient illuminance	Sunlight: 11,000 lx at the light-receiving face, Incandescent light: 3,500 lx at the light-receiving face								
	Vibration resistance	10 to 55Hz frequency, 1.5mm amplitude in X, Y and Z directions for two hours each								
	Shock resistance	500m/s ² acceleration (50G approx.) in X, Y and Z directions for three times each								
Emitting element		Infrared LED (modulated)			Red LED (modulated)	Green LED (modulated)	Red LED (modulated)		Infrared LED (modulated)	
Material		Enclosure: Polycarbonate (glass fiber reinforced)			Enclosure: ABS, Lens: Polycarbonate				Enclosure: Polycarbonate	
Cable		0.089mm ² (ultra-slim type: 0.057mm ²) single core (diffuse reflective type and glass sheet detection sensor: two parallel single core wires) shielded cable, 3m long								
Cable extension		Extension up to total 5m (ultra-small type: 10m) is possible with an equivalent cable (thru-beam type: both emitter and receiver).								
Weight		Emitter: 12g approx. Receiver: 12g approx.		24g approx.	Emitter: 10g approx. Receiver: 10g approx.			20g approx.	25g approx.	
Accessory		Sensor head mounting screw: 2 sets (SH-22: 1 set)			_____					

Notes: 1) The sensing range of the diffuse reflective type sensor is specified for white non-glossy paper (50 × 50mm) as the object.

2) The optimum condition is the condition when the sensitivity is adjusted so that the operation indicator just lights up at the given distance in the light received condition.

3) The optimum sensitivity stands for the sensitivity level when the operation indicator just lights up in the light received condition.

4) No dew condensation or icing is allowed.

Sensor Mounting Stand

MS-AJ

Micro

PM

PM2

Multi-voltage Type

NX5

VF

Amplifier-separated Type

SU-7/SH

Amplifier-separated Type

SS-A5

Sensor Checker

CHX-SC2

SS-A5

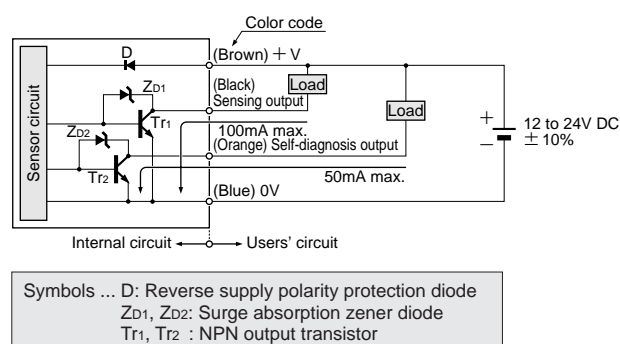
SPECIFICATIONS

Amplifier

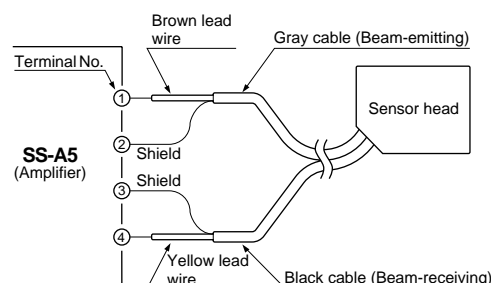
Type	Manual sensitivity setting amplifier	
Item	Model No.	SS-A5
Applicable sensor heads	SH-2□, SH-3□, SH-72	
Supply voltage	12 to 24V DC \pm 10% Ripple P-P 10% or less	
Current consumption	40mA or less	
Sensing output	NPN open-collector transistor • Maximum sink current: 100mA • Applied voltage: 30V DC or less (between sensing output and 0V) • Residual voltage: 1.5V or less (at 100mA sink current) 0.4V or less (at 16mA sink current)	
Output operation	Selectable either Light-ON or Dark-ON with the operation mode switch	
Short-circuit protection	Incorporated	
Self-diagnosis output	NPN open-collector transistor • Maximum sink current: 50mA • Applied voltage: 30V DC or less (between self-diagnosis output and 0V) • Residual voltage: 1V or less (at 50mA sink current) 0.4V or less (at 16mA sink current)	
Output operation	ON under stable sensing condition	
Short-circuit protection	Incorporated	
Response time	1ms or less	
Operation indicator	Red LED (lights up when the sensing output is ON)	
Stability indicator	Green LED (lights up under stable light received condition or stable dark condition)	
Sensitivity adjuster	Continuously variable twin adjusters	
Automatic Interference prevention function	Incorporated (Two units of sensors can be mounted closely.)	
Timer function	Approx. 40ms fixed OFF-delay timer, selectable either effective or ineffective	
Environmental resistance	Ambient temperature	- 25 to + 60°C (No dew condensation or icing allowed), Storage: - 30 to + 70°C
	Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH
	Noise immunity	Power line: 240Vp, and 0.5μs pulse width; Radiation: 300Vp, and 0.5μs pulse width (with noise simulator)
	Voltage withstandability	1,000V AC for one min. between all supply terminals connected together and enclosure
	Insulation resistance	20MΩ, or more, with 500V DC megger between all supply terminals connected together and enclosure
	Vibration resistance	10 to 55Hz frequency, 1.5mm amplitude in X, Y and Z directions for two hours each
	Shock resistance	100m/s ² acceleration (10G approx.) in X, Y and Z directions for three times each
Material	Enclosure: Heat-resistant ABS, Cover: Polycarbonate	
Cable	0.2mm ² 4-core cabtyre cable, 3m long	
Cable extension	Extension up to total 100m is possible with 0.3mm ² , or more, cable.	
Weight	120g approx.	
Accessories	MS-DIN-1 (Amplifier mounting bracket): 1 No., Adjusting screwdriver: 1 No., Adjuster cap: 1 No.	

I/O CIRCUIT AND WIRING DIAGRAMS

I/O circuit diagram



Wiring diagram to sensor head



PRECAUTIONS FOR PROPER USE

Refer to P.820~ for general precautions and P.360~ for precautions for sensor head.



This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body injury or property damage from dangerous parts of machinery. It is a normal object detection sensor.

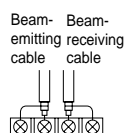
Always use the sensor head and the exclusive amplifier together as a set.

Cable extension for sensor head

- If the attached sensor head cables need to be extended, use two single core shielded cables of at least equivalent quality.

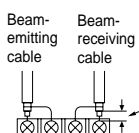
If a joint terminal or connector is used for extension, refer to the figures below. (The shielded extension cable must be of $\phi 1.45\text{mm}$ outer diameter.)

Connection with joint terminal



✗ NG

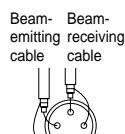
The beam-emitting cable and the beam-receiving cable should be separated from each other as much as possible.



○ OK

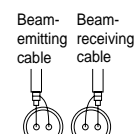
This distance should be as short as possible.

Connection with metal connector



✗ NG

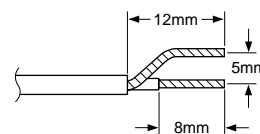
The beam-emitting cable and the beam-receiving cable must not be connected to one metal connector. Use two separate metal connectors.



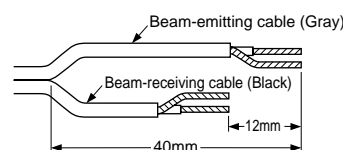
○ OK

Trimming sensor head cables

- Trim the ends of sensor head cables as follows.



- In case of the reflective type sensor heads, with two parallel cables, the beam-emitting cable must be longer than the beam-receiving cable as shown below.



Note: Do not solder the cable ends.

Connection to sensor head

<p>① Rotate the cable lock lever approx. 160° clockwise.</p> <p>② Insert the black beam-receiving cable's yellow inner wire into Terminal No. 4 and the outer woven shield wire into Terminal No. 3.</p>	<p>③ Rotate the cable lock lever approx. 90° counterclockwise. (The beam-receiving cable is hooked up.)</p> <p>④ Press the beam-receiving cable into the rubber retainer.</p> <p>⑤ Insert the gray beam-emitter cable's brown inner wire into Terminal No. 1 and the outer woven shield wire into Terminal No. 2.</p>	<p>⑥ Rotate the cable lock lever back to the 'LOCK' position. (The beam-emitter cable is hooked up.)</p> <p>⑦ Press the beam-emitter cable into the rubber retainer.</p>
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Sensor Mounting Stand
MS-AJ

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PM2

Multi-voltage Type
NX5
VF

Amplifier-separated Type
SU-7/SH

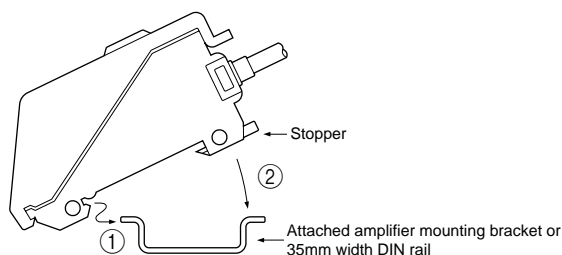
SS-A5

Sensor Checker
CHX-SC2

PRECAUTIONS FOR PROPER USE

Refer to P.820~ for general precautions and P.360~ for precautions for sensor head.

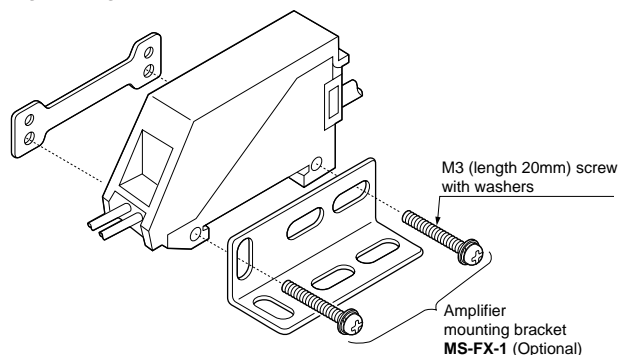
Mounting



- ① Fit the front part of the amplifier on the attached amplifier mounting bracket (**MS-DIN-1**) or a 35mm width DIN rail.
- ② Press down the rear part of the amplifier on the attached amplifier mounting bracket (**MS-DIN-1**) or the DIN rail to fit it.

※ To remove the amplifier, pull the stopper backwards.

- When the amplifier is fixed with screws and nuts, the tightening torque should be 0.58N·m or less.



Wiring

- The self-diagnosis output is not incorporated with a short-circuit protection circuit. Do not connect it directly to a power supply or a capacitive load.

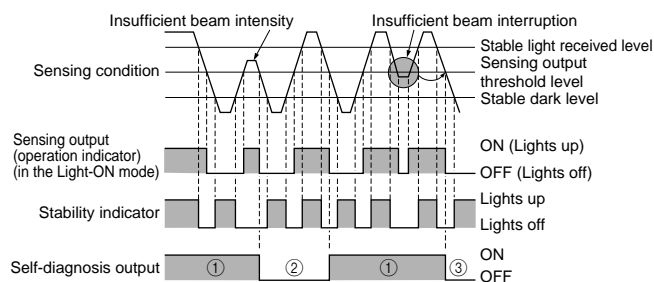
Others

- Do not use during the initial transient time (30ms) after the power supply is switched on.

Self-diagnosis function

- The sensor checks the incident light intensity, and if it is reduced due to dirt or dust, or beam misalignment, an output is generated.

Time chart



- ① The self-diagnosis output transistor stays in the 'ON' state during stable sensing.
- ② When the sensing output changes, if the incident light intensity does not reach the stable light received level or the stable dark level, the self-diagnosis output becomes OFF. Further, the self-diagnosis output changes state when the sensing output changes from Light to Dark state. (It is not affected by the operation mode switch).
- ③ In case of insufficient beam interruption, there will be a time lag before the self-diagnosis output turns OFF.

Timer operation

- If the timer operation mode switch is set to 'OFD', approx. 40ms fixed OFF delay timer operation is obtained. This function is useful if the output signal is so short that the connected device cannot respond.

Operation of timer operation mode switch

Timer operation mode switch setting		Sensing condition	Operation	Beam received Beam interrupted
Timer operation mode selection	Sensing mode selection			
OFD	MODE L D.	Light-ON normal operation	ON OFF	ON OFF
OFD	MODE L D.	Light-ON OFF-delay	ON OFF (T)	ON OFF (T)
OFD	MODE L D.	Dark-ON normal operation	ON OFF	ON OFF
OFD	MODE L D.	Dark-ON OFF-delay	ON OFF (T)	ON OFF (T)

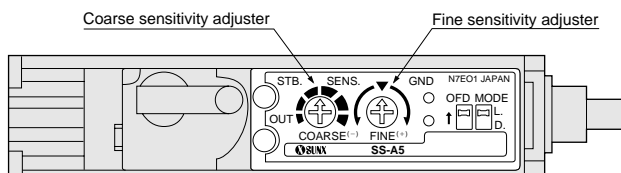
Timer period: T = 40ms approx.

PRECAUTIONS FOR PROPER USE

Refer to P.820~ for general precautions and P.360~ for precautions for sensor head.

Sensitivity adjustment

- The **SS-A5** amplifier incorporates a coarse sensitivity adjuster and a fine sensitivity adjuster. The sensitivity adjuster and the adjustment procedure are different depending on whether a coarse setting is to be done or a fine difference is to be sensed. Hence, adjust to the optimum sensitivity as per the procedure given below.



	Light received condition	Dark condition
Thru-beam		
Diffuse reflective		

Coarse sensing

Step	Adjustment	Coarse sensitivity adjuster	Fine sensitivity adjuster
①	Set the fine sensitivity adjuster at MAX. and the coarse sensitivity adjuster at MIN.		
②	Under the light received condition, turn the coarse sensitivity adjuster gradually clockwise. Find out the point (A) at which the sensor enters the Light state operation.	ON in the light received condition 	At MAX. position
③	Under the dark condition, turn the coarse sensitivity adjuster further clockwise until the sensor enters the Light state operation. Once it changes state, turn the coarse sensitivity adjuster gradually counterclockwise to determine the point (B) where the sensor re-enters the Dark state operation.	OFF in the dark condition 	
④	Set the adjuster at the center between the points (A) and (B).	Optimum sensitivity 	

Fine sensing

Step	Adjustment	Coarse sensitivity adjuster	Fine sensitivity adjuster
①	Set the fine sensitivity adjuster at the center and the coarse sensitivity adjuster at MIN.		Center
②	Under the light received condition, turn the coarse sensitivity adjuster gradually clockwise until the sensor enters the Light state operation.	ON in the light received condition 	Center
③	Next, turn the fine sensitivity adjuster counterclockwise until the sensor returns to the Dark state operation. Once it changes state, turn the fine sensitivity adjuster gradually clockwise to determine the point (A) where the sensor re-enters into the Light state operation.	Leave at above setting	ON in the light received condition Center
④	Under the dark condition, turn the fine sensitivity adjuster further clockwise until the sensor enters the Light state operation. Once it changes state, turn the fine sensitivity adjuster gradually counterclockwise to determine the point (B) when the sensor re-enters the Dark state operation.		OFF in the dark condition
⑤	Set the fine sensitivity adjuster at the center between the points (A) and (B).		Optimum sensitivity

Sensor Mounting Stand
MS-AJ

Micro
PM2

Multi-voltage Type
NX5
VF

Amplifier-separated Type
SU-7/SH

SS-A5

Sensor Checker
CHX-SC2

SS-A5

DIMENSIONS (Unit: mm)

Refer to P.366~ for dimensions for sensor head

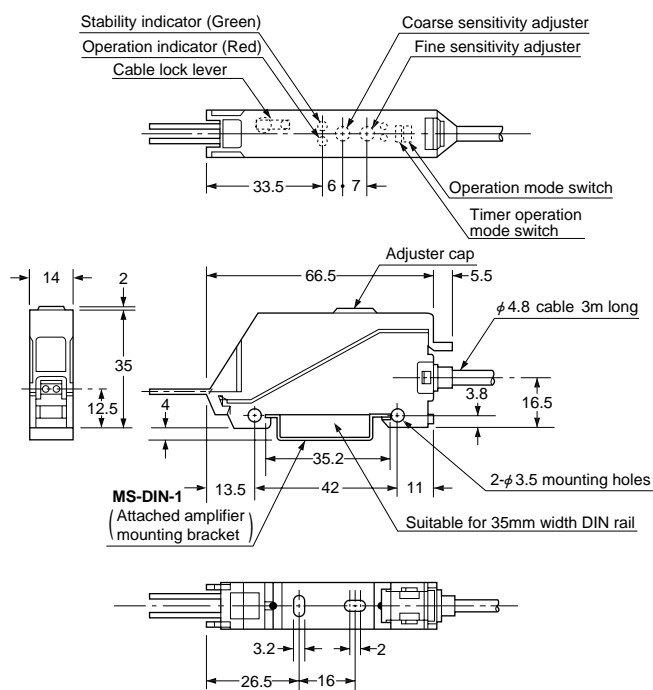
SS-A5

Amplifier

MS-DIN-1

Amplifier mounting bracket
(Accessory for **SS-A5**)

Assembly dimensions with attached amplifier mounting bracket



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

MS-FX-1

Amplifier mounting bracket (Optional)

