

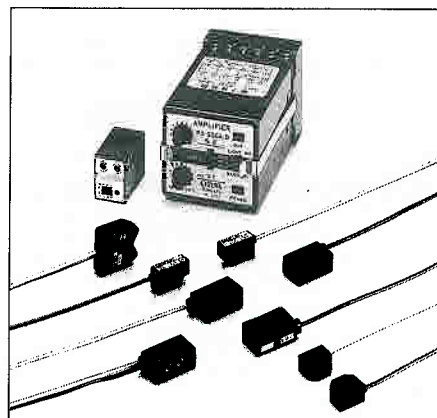
# Amplifier separated type

## RS-520/RT-410 series

# Beam sensors

### Worry-free space requirements – super small type

- **Various types of beam sensors**  
13 types of sensors, such as multi-purpose types and mark sensors up to limited-distance diffuse-reflective types to meet your various needs.
- **Super small type makes installation space requirements no problem**  
Extremely small beam sensors can be easily installed in narrow machine spaces.
- **Realization of stable detection**  
Even these small size beam sensors can perform over long distances: 2m for thru-beam type (RT-410-1), 20cm for diffuse-reflective type (RS-520H-1).



### APPLICATIONS

<p><b>Register mark detection</b></p> <p>• RT-410-1G • RT-410-1R</p> <p>Suitable for detection of marks which are printed on translucent film, and also of miniature objects.</p>	<p><b>Detection of bar codes on translucent film</b></p> <p>• RT-410-4R • RT-410-4G</p> <p>Job indicating bar codes printed on translucent film are detected and read.</p>	<p><b>Detection of parts for a machine</b></p> <p>• RS-520H-1 • RS-520H-4</p> <p>Suitable for detection of objects through a small opening due to its compact body.</p>
<p><b>Detection of tab on video cassettes</b></p> <p>• RS-520L</p> <p>Even small holes can be detected easily.</p>	<p><b>Positioning on wafer processing machine</b></p> <p>• RS-520L</p> <p>Accurate positioning on wafer processing machine.</p>	<p><b>Detection of color marks</b></p> <p>• RS-520MS-R • RS-520MS-G</p> <p>Detection of various colors.</p>

### OPTIONAL COMPONENTS (available by separate order)

Article	Mounting bracket (*1)	
Unit No.	MS-41	MS-52 (*2)
Content	For RT-410-3, RT-410-4...	For RT-410-1..., RS-520H-1, RS-520H-4/4N, RS-520L, RS-520MS-R/G

\*1: As screws are not attached, they have to be purchased separately.

\*2: When using thru-beam type, purchase two pieces of mounting bracket.

# RS-520/RT-410

## ■ SPECIFICATIONS (sensing probe)

Classification		Thru-beam						
		Multi-purpose	For mark detection		Super small	Narrow light beam	For mark detection of narrow light beam	
Item	Unit No.	RT-410-1	RT-410-1R	RT-410-1G	RT-410-3	RT-410-4	RT-410-4R	RT-410-4G
Amplifier units to be combined		PA-11, PA-11D, PS-930A, PS-930A-D						
Sensing distance		2m	80cm	20cm	1m	50cm	30cm	10cm
Detectable object		Opaque of over $\phi 5\text{mm}$						
Environmental resistance	Ambient temperature	- 10 to + 60°C (with no dew or ice condensation)						
	Ambient humidity	35 to 85%RH						
	Extraneous light	Sun light: 11,000 lx at light receiving face, Incandescent light: 3,500 lx at light receiving face						
	Vibration	1.5mm amplitude at frequency of 10 to 55Hz in each of X, Y and Z directions for 2 hours each in power OFF state						
	Shock	500m/s <sup>2</sup> (approx. 50G) impulse in each of X, Y and Z directions for 3 times each in power OFF state						
Emitting element		Infrared LED (modulated)	Red LED (modulated)	Green LED (modulated)	Infrared LED (modulated)		Red LED (modulated)	Green LED (modulated)
Grounding method		Projector: Floating, Detector: Direct grounding			Floating			
Material		Enclosure: Black zinc alloy die casting, Front cover: Acryl			Enclosure: Black PBT Front cover: Poly ether sulphone	Enclosure: Black polycarbonate, Lens: Acryl		
Cable		0.2mm <sup>2</sup> × 1 core with 1m of shielded cable						
Cable extension		Extensible up to 5m using 0.2mm <sup>2</sup> × 1 core shielded cable						
Weight		Approx. 55g			Approx. 25g	Approx. 35g		
Accessories		Insulation mounting bracket: 1 set						

Classification		Diffuse-reflective			Limited-distance diffuse-reflective	Mark sensor	
		Item	Unit No.	Narrow-view		Red light	Green light
RS-520H-1	RS-520H-4				RS-520H-4N		
Amplifier units to be combined		PA-11, PA-11D, PS-930A, PS-930A-D					
Sensing distance		20cm (*1)	10cm (*1)	5cm (*1)	8mm (center 5mm) (*2)	Center 12mm (spot: $\phi 2\text{mm}$ )	
Detectable object		Opaque, translucent and transparent					
Environmental resistance	Ambient temperature	- 10 to + 60°C (with no dew or ice condensation)					
	Ambient humidity	35 to 85%RH					
	Extraneous light	Sun light: 11,000 lx at light receiving face, Incandescent light: 3,500 lx at light receiving face					
	Vibration	1.5mm amplitude at frequency of 10 to 55Hz in each of X, Y and Z directions for 2 hours each in power OFF state					
	Shock	500m/s <sup>2</sup> (approx. 50G) impulse in each of X, Y and Z directions for 3 times each in power OFF state					
Emitting element		Infrared LED (modulated)				Red LED (modulated)	Green LED (modulated)
Grounding method		Direct grounding	Floating				
Material		Enclosure: Zinc alloy die casting Front cover: Acryl	Enclosure: Black polycarbonate, Lens: Acryl		Enclosure: Black ABS Lens: Glass	Enclosure: Black polycarbonate, Lens: Acryl	
Cable		Two parallel wires of 0.2mm <sup>2</sup> × 1 core with 1m of shielded cable					
Cable extension		Extensible up to 5m using 0.2mm <sup>2</sup> × 1 core shielded cable					
Weight		Approx. 35g	Approx. 30g				
Accessories		Insulation mounting bracket: 1 set					

\*1: Sensing distance of diffuse-reflective type is the value to a target of non-glossy white paper (20 × 20cm).  
 \*2: Sensing distance of limited-distance diffuse-reflective type is the value to silicon wafer.

# RS-520/RT-410

## ■ SPECIFICATIONS (amplifier unit)

Classification	Small type amplifier unit (for DC power)		Amplifier unit (for AC power)			
	Item	Unit No.	With timer	With timer		
		PA-11	PA-11D	PS-930A	PS-930A-D	
Power source	12 to 24V DC $\pm$ 10% Ripple P-P: Less than 10%			100/120 $\cdot$ 200/240V AC $\pm$ 10% 50/60Hz		
Current/voltage consumption	Less than 50mA			Less than 13VA (*1)		
Output	NPN transistor with pull-up resistor • Sink current: Max. 80mA • Residual voltage: Less than 1V at 80mA sink current PNP transistor: open collector • Source current: Max. 80mA • Residual voltage: Less than 1.5V at 80mA source current			relay contact 1c • Switching capacity: 250V 3A AC (resistive load) • Electrical life: Over 500,000 operations		
	Short-circuit protection	Included				
	Output operation	Light-ON/Dark-ON selectable with selection switch				
Response time	Less than 3ms			Less than 20ms		
Operation indicator	Red LED (illuminates when output is ON state)					
Sensitivity adjustor	Continuously variable adjustor equipped					
Timer (0.05 to 5 sec. variable)	Selectable from ON-delay, OFF-delay and ONE SHOT-delay			Selectable from ON-delay, OFF-delay and ONE SHOT-delay		
External synchronization					Included	
Environmental resistance	Ambient temperature	- 10 to +50°C (with no dew or ice condensation)				
	Ambient humidity	35 to 85%RH				
	Dielectric				AC 1,500V 50/60Hz for 1 min. (*1)	
	Insulation				More than 20M $\Omega$ at DC 500V (*1)	
	Vibration	1.5mm amplitude at frequency of 10 to 55Hz in each of X, Y and Z directions for 2 hours each in power OFF state			1.5mm amplitude at frequency of 10 to 30Hz in each of X, Y and Z directions for 2 hours each in power OFF state	
	Shock	300m/s <sup>2</sup> (approx. 30G) impulse in each of X, Y and Z directions for 3 times each in power OFF state			100m/s <sup>2</sup> (approx. 10G) impulse in each of X, Y and Z directions for 3 times each in power OFF state	
Material	Enclosure: Polycarbonate, Terminal part: PBT			Enclosure: ABS, Terminal part: Phenol		
Weight	Approx. 20g			Approx. 430g		
Accessories	Screwdriver: 1 pc.			TB-93 (terminal base with mounting bracket): 1 set		

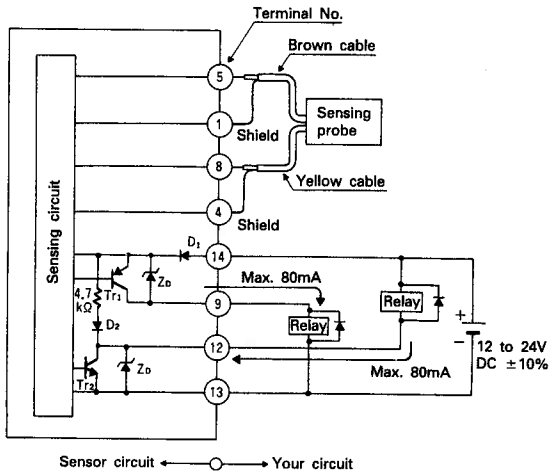
\*1: Dielectric and insulation resistance are the values between power source and output, and between relay contacts.

# RS-520/RT-410

## INPUT/OUTPUT AND TYPICAL CONNECTION DIAGRAMS

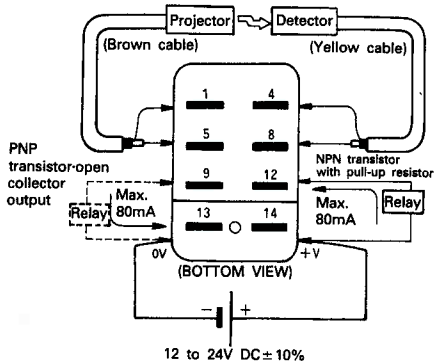
### PA-11, PA-11D

#### INPUT/OUTPUT Diagram



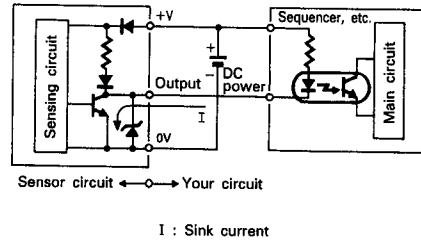
Where, D<sub>1</sub>: Reverse polarity protection diode  
 D<sub>2</sub>: Reverse current prevention diode  
 Z<sub>0</sub>: Surge absorption zener diode (V<sub>z</sub> ≈ 33V)  
 Tr<sub>1</sub>: PNP output transistor  
 Tr<sub>2</sub>: NPN output transistor

#### Connection



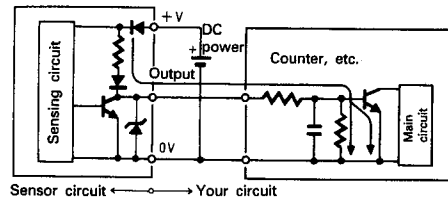
### NPN transistor output

For current-driven loads  
 (sequencer, counter and photo-coupler)



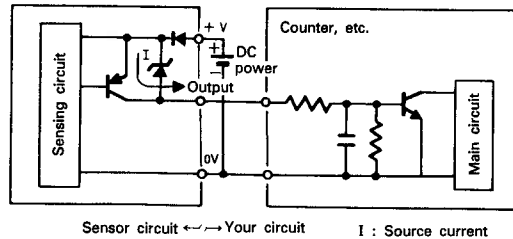
I : Sink current

For voltage-driven loads  
 (sequencer, counter and logic circuit)



### PNP transistor output

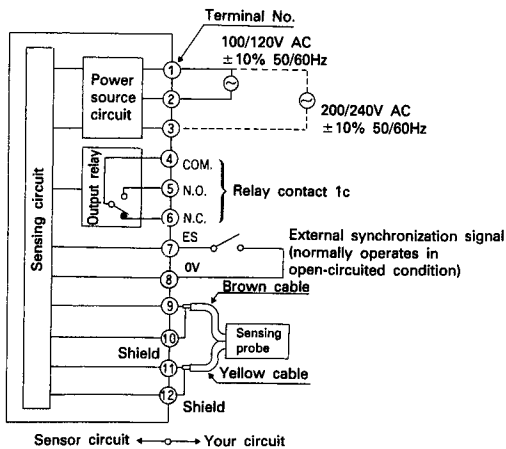
Suitable for connecting to voltage-driven loads  
 (A pull-up resistor is not required.)



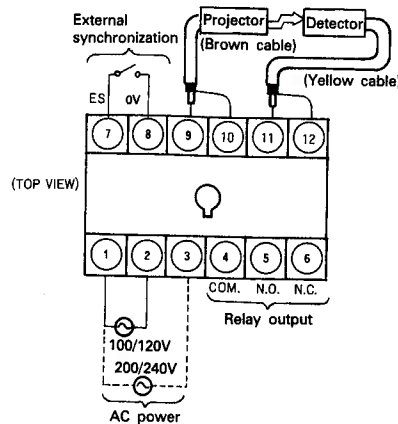
I : Source current

### PS-930A, PS-930A-D

#### INPUT/OUTPUT Diagram



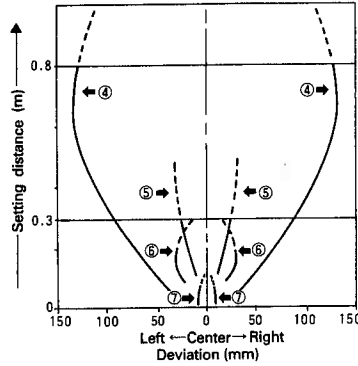
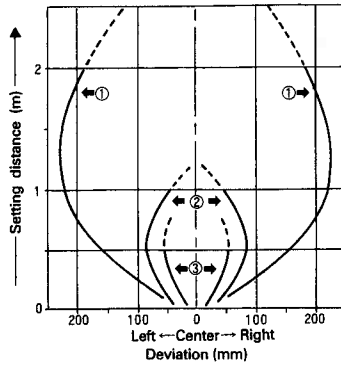
#### Connection



## SENSING FIELDS

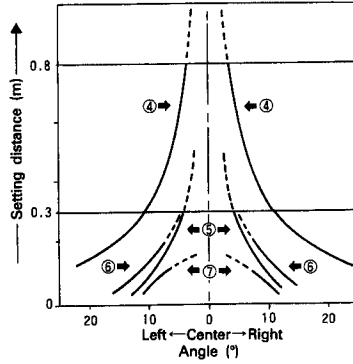
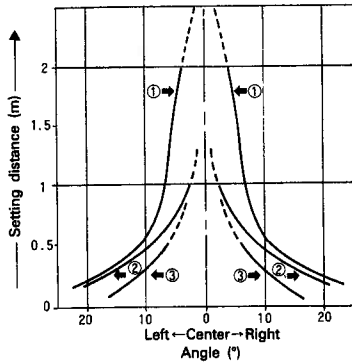
(These are typical sensing fields, and are subject to slight changes from unit to unit.)

### Parallel deviation

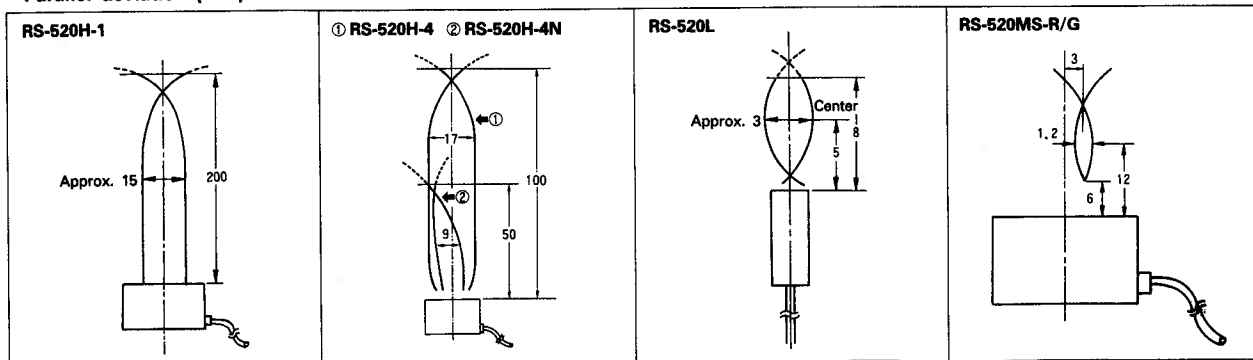


Curve	Unit No.
①	RT-410-1
②	RT-410-3
③	RT-410-4
④	RT-410-1R
⑤	RT-410-4R
⑥	RT-410-1G
⑦	RT-410-4G

### Angular deviation



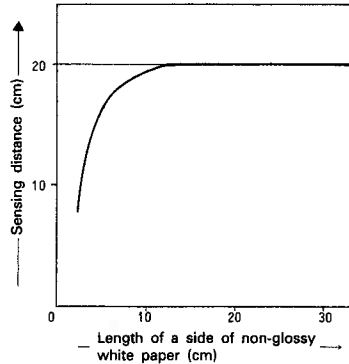
### Parallel deviation (mm)



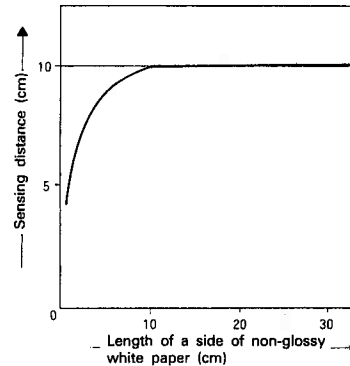
# RS-520/RT-410

## • Target size – Sensing distance correlation

RS-520H-1



RS-520H-4



Note that the sensing distance decreases if targets are smaller than the specified size (non-glossy white paper: 20×20cm) as shown in the graph at left.

(The curve shows the values obtained when the sensor is adjusted to detect 20×20cm non-glossy white paper at the rated sensing distance.)

## ■ TIMER AND EXTERNAL SYNCHRONIZATION FUNCTIONS

### • Timer functions

- Each unit suffixed D has the following three convenient timer functions.

#### ON-delay (OND)

Function: This function eliminates transient detections.

Application: This function is useful for detecting the passage of long objects only. (Ex. detection of a jamming on an assembly line)

#### OFF-delay (OFD)

Function: This function prolongs output signal for a predetermined time.

Application: This function is useful if equipment to be connected to a device has a slow response speed and cannot be activated by too quick signals from the sensor.

#### ONE SHOT-delay (OSD)

Function: Subsequent to each detection, this function outputs a signal which lasts for a predetermined time.

Application: This function is suitable equipment to be connected to a device requiring consistent-duration signals. It can also be effectively used to prolong individual short signals for the required time.

Other various applications are possible with these timer functions.

### • Selection switch and timer operation

Operation mode selection (*1)	Setting		Sensing state	Light receiving
	Timer mode selection			
	PS-930A-D	PA-11D	Operation	No light receiving
 LIGHT ON	 or	 or	Light-ON normal operation	ON
			Light-ON ON-delay	OFF
			Light-ON OFF-delay	ON
 DARK ON	 or	 or	Light-ON ONE SHOT-delay	ON
			Dark-ON normal operation	OFF
			Dark-ON ON-delay	ON
 DARK ON			Dark-ON OFF-delay	OFF
			Dark-ON ONE SHOT-delay	ON
			Dark-ON ONE SHOT-delay	OFF

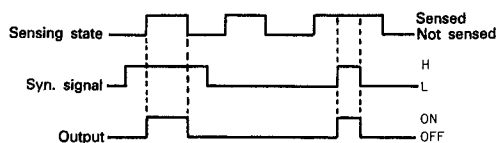
Timer T: 0.05 to 5 sec. variable

\*1: Switching direction for PS-930A-D will be the reverse.

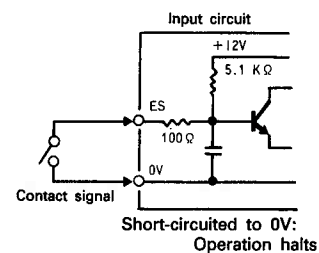
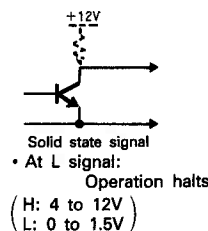
\*2: Please set the timer adjuster to min. In this case, the timer is fixed at 50ms delay.

### • External synchronization function (PS-930A, PS-930A-D)

Judgement timing freely determined by external sync. signal from limit switch, beam sensor, relay, etc.



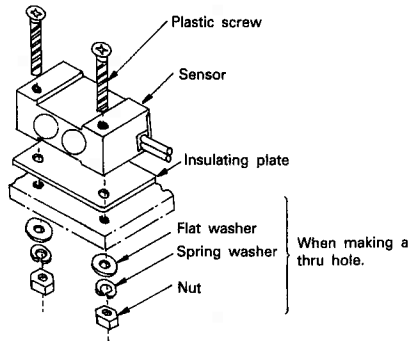
### Input circuit and connections



## FOR PROPER USE

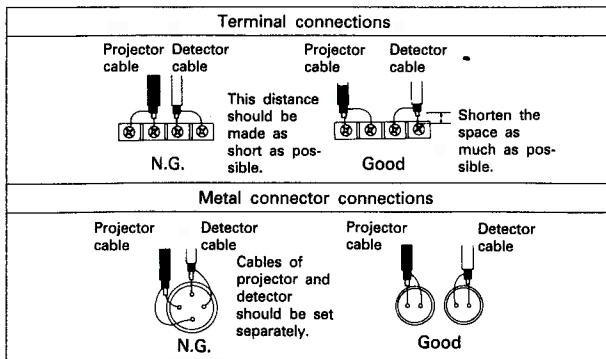
- Confirm the correct combination of sensor unit and amplifier unit.
- For **PA-11(D)**, please purchase a commercially available terminal base for mini-power relay. Suitable terminal base: AP-3822 (Matsushita Electric Works, Ltd.), SM2S-05B (IDEC Co.), TP514S1 (Fuji Electric Co., Ltd.) etc.
- **Enclosure grounding**  
In the following models, a direct grounding method (circuit 0V and enclosure is connected directly) is used to improve noise resistance. When DC 0V should not be electrically connected with mounting bracket, use insulating fittings.

- RT-410-1
- RT-410-1R
- RT-410-1G
- RS-520H-1



Do not use autotransformer (single volume transformer) to the power source to **PA-11 (D)**.

- If it is necessary to extend the cable, use two wires of equivalent of higher quality single core shielded cable. Do not substitute with a two-core shielded cable. For wiring, refer to the sketch below.

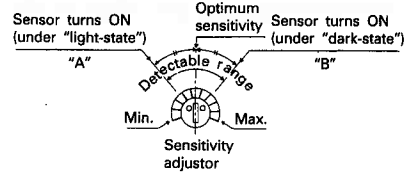


- When installing the beam sensors in a place where they are exposed to electrical noise, avoid the noise. Do not run sensor cables parallel to high-voltage lines or power lines, nor put them together in the same raceway.
- If a switching regulator is used for the power source of the sensor of **PA-11(D)**, be sure to ground the frame ground (F.G.) terminal to an actual ground.

## Sensitivity adjustment

1. First turn the adjustor to the min. position (full counter-clockwise).
2. Then, turn it slowly clockwise and check the point "A" at which the sensor becomes light receiving state with "light-state".
3. Remove the target to make "dark-state".
4. Turn the adjustor further clockwise to find the point "B" where the sensor becomes light receiving state due to the reflected lights from the background. If there exists no point where the sensor becomes light receiving state, the max. point (full clockwise point) is regarded as the point "B".
5. The optimum sensitivity is obtained by setting the reading at a midway between "A" and "B".

To make this adjustment, use the supplied screwdriver and turn the adjustor slowly. Too much force to the adjustor may cause damage.



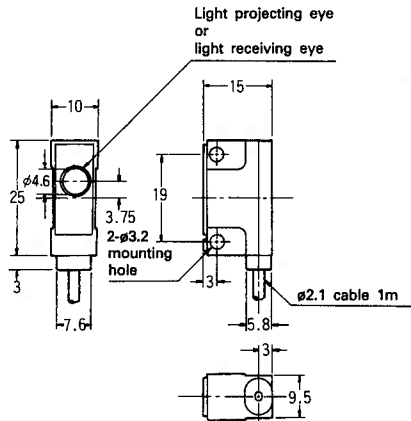
	"Light" state	"Dark" state
Thru-beam		
Diffuse-reflective		
Limited-distance diffuse-reflective		
Mark sensor	Red light	
	Green light	

- Do not use a beam sensor where it may be exposed to steam or dust, or where it may come in direct contact with water.
- Avoid places where the beam sensors are exposed to direct fluorescent lights with the rapid-starters or high frequency starters.

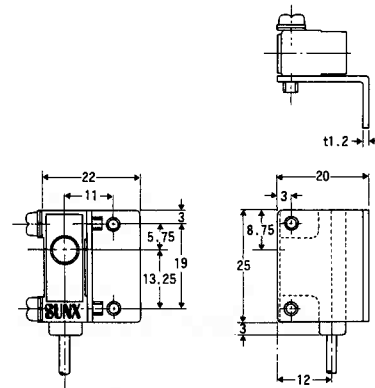
# RS-520/RT-410

## ■ DIMENSIONS (mm)

### ● RT-410-1...

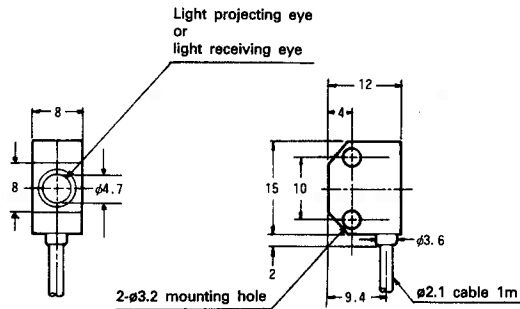


### ● Mounting of MS-52

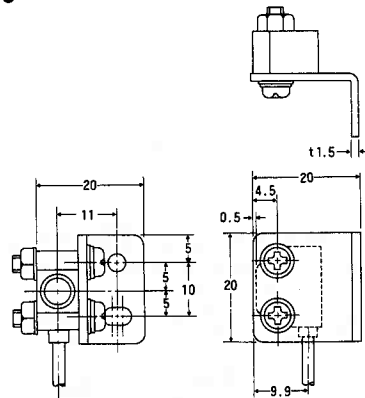


- MS-52 does not include screw. Prepare M3 P0.5 mounting screw (length: 15 mm) by separate order.

### ● RT-410-3

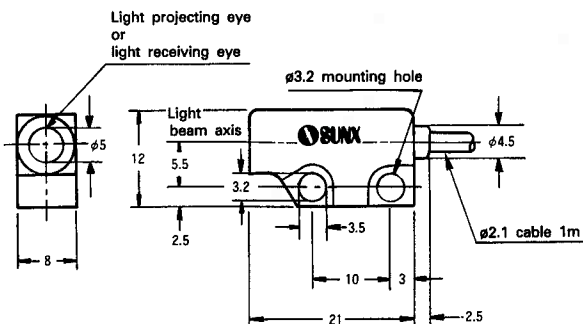


### ● Mounting of MS-41

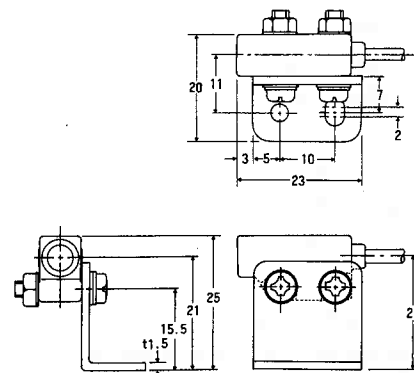


- Above diagram shows the mounting of MS-41R, mounting bracket for right side.
- MS-41 does not include screw, nut and flat washer. Prepare M3 mounting screw (length: 15mm), nut and flat washer by separate order.

### ● RT-410-4...

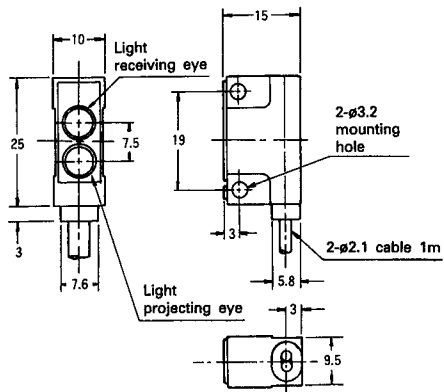


### ● Mounting of MS-41

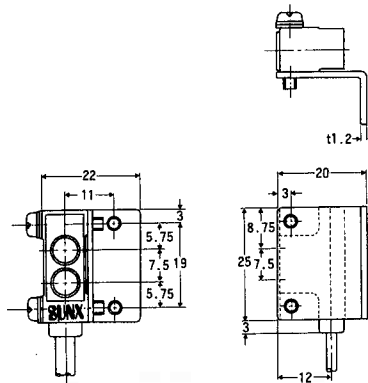


- Above diagram shows the mounting of MS-41L, mounting bracket for left side.
- MS-41 does not include screw, nut and flat washer. Prepare M3 mounting screw (length: 15mm), nut and flat washer by separate order.

● RS-520H-1

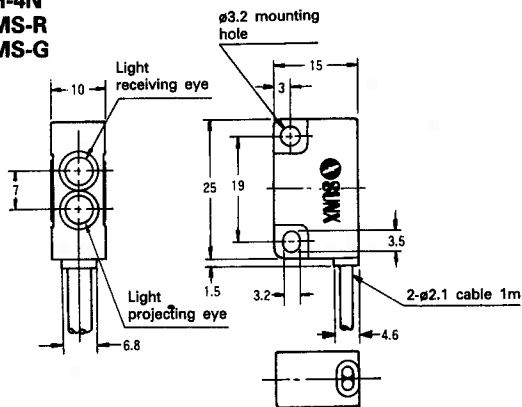


● Mounting of MS-52

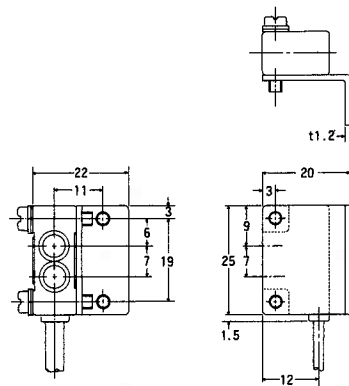


• MS-52 does not include screw.  
Prepare M3 P0.5 mounting screw (length: 15mm)  
by separate order.

● RS-520H-4  
● RS-520H-4N  
● RS-520MS-R  
● RS-520MS-G

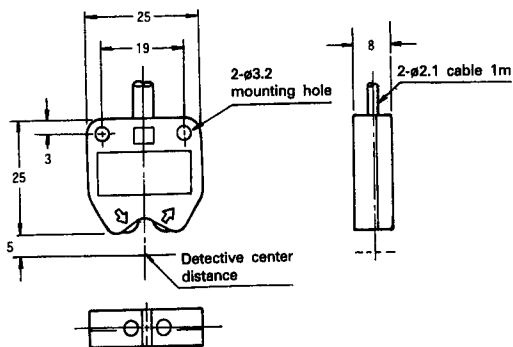


● Mounting of MS-52

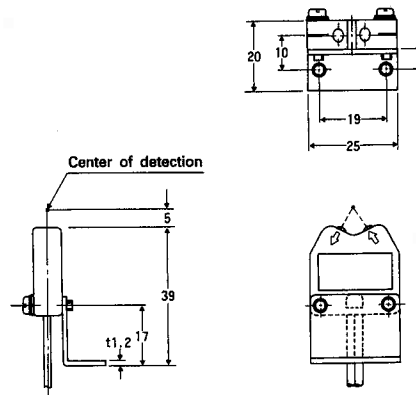


• MS-52 does not include screw.  
Prepare M3 P0.5 mounting screw (length: 15mm)  
by separate order.

● RS-520L



● Mounting of MS-52

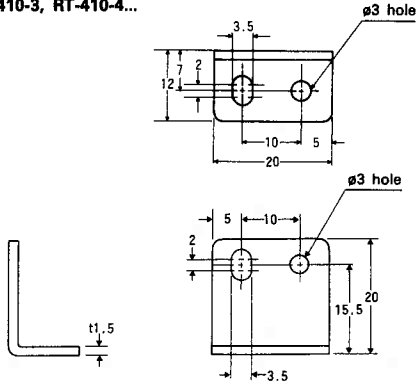


• MS-52 does not include screw.  
Prepare M3 P0.5 mounting screw (length: 15mm)  
by separate order.

# RS-520/RT-410

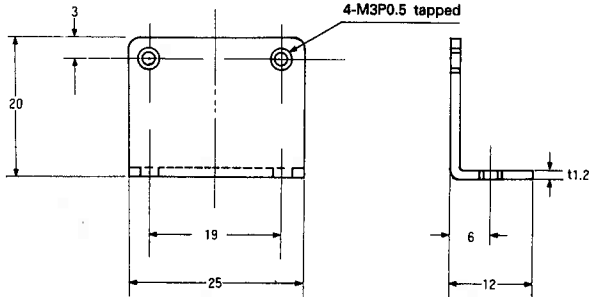
(mm)

● **MS-41 (optional)**  
For RT-410-3, RT-410-4...

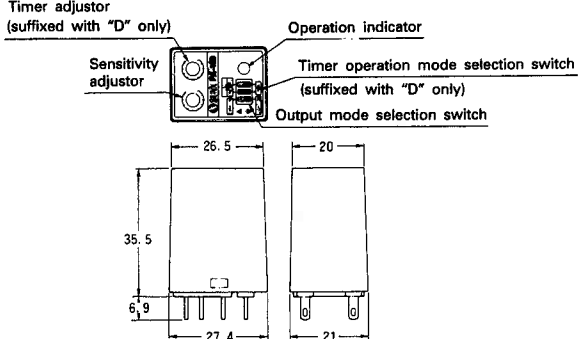


• One set of **MS-41** is one piece of mounting bracket for right side and one piece of mounting bracket for left side. Above diagram shows the mounting bracket for right side.

● **MS-52 (optional)**  
For RT-410-1... , RS-520...



● **PA-11**  
● **PA-11D (with timer)**



● **PS-930A**  
● **PS-930A-D (with timer)**

