

# Convergent Reflective Photoelectric Sensor **Amplifier Built-in**

## EX-40 SERIES

### Related Information

- General terms and conditions..... F-7
- Sensor selection guide ..... P.271~
- Glossary of terms / General precautions ..... P.1455~ / P.1458~
- Korea's S-mark..... P.1506



[panasonic.net/id/pidsx/global](http://panasonic.net/id/pidsx/global)

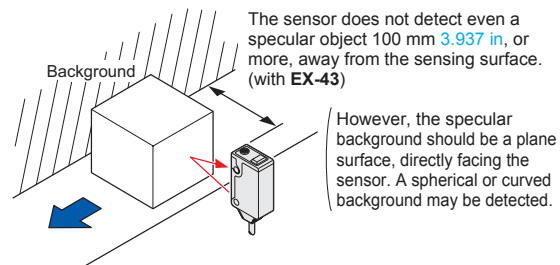
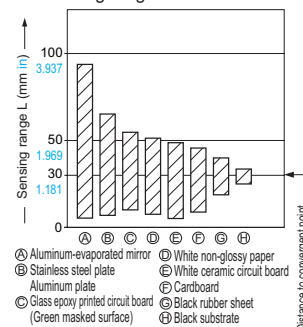


## Reliable object detection in limited area

### Stable convergent distance sensing

Due to convergent distance sensing, the color or material of the object has almost no effect. Further, the background also has very little effect, enabling stable sensing.

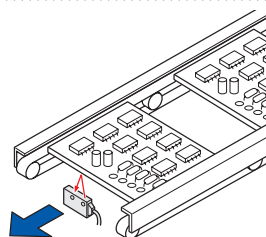
EX-43: Correlation between material and sensing range



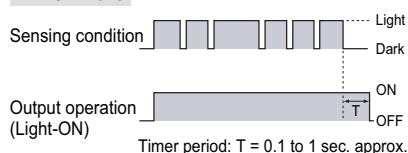
### FUNCTIONS

#### Variable OFF-delay timer

The spot-beam type EX-43T is incorporated with an OFF-delay timer. The variable OFF-delay timer is useful for detecting a printed circuit board regardless of small holes, cutouts, or electronic parts on it.



#### Time Chart



### MOUNTING / SIZE

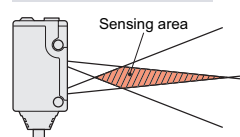
Compact size (W10 × H30 × D18 mm W0.394 × H1.181 × D0.709 in)

It can be installed in a limited space.

### VARIETIES

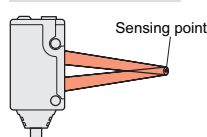
#### Various applications

##### Diffused beam type



Even in a limited sensing area, the sensor is not affected by small perforations or unevenness. It is suitable for presence detection.

##### Spot-beam type



- Visible red spot beam allows easy targeting.
- It is suitable for positioning because of its 0.05 mm 0.002 in repeatability.

Selection Guide
Amplifier Built-in
Power Supply Built-in
Amplifier-separated

CX-400

CY-100

EX-10

EX-20

EX-30

EX-40

CX-440

EQ-30

EQ-500

MQ-W

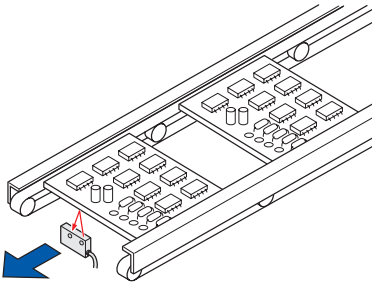
RX-LS200

RX

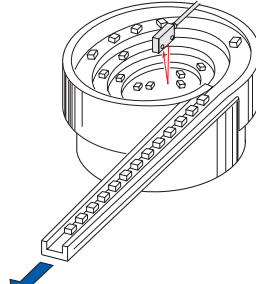
RT-610

## APPLICATIONS

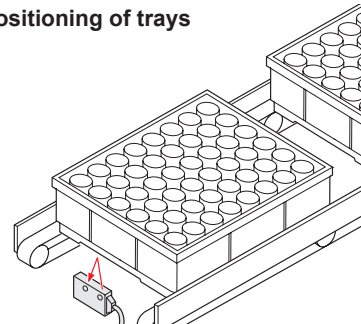
### Positioning of a PCB



### Sensing parts in feeder



### Positioning of trays



FIBER  
SENSORS

LASER  
SENSORS

PHOTO-  
ELECTRIC  
SENSORS

MICRO  
PHOTO-  
ELECTRIC  
SENSORS

AREA  
SENSORS

LIGHT  
CURTAINS /  
SAFETY  
COMPONENTS

PRESSURE /  
FLOW  
SENSORS

INDUCTIVE  
PROXIMITY  
SENSORS

PARTICULAR  
USE  
SENSORS

SENSOR  
OPTIONS

SIMPLE  
WIRE-SAVING  
UNITS

WIRE-SAVING  
SYSTEMS

MEASURE-  
MENT  
SENSORS

STATIC  
ELECTRICITY  
PREVENTION  
DEVICES

LASER  
MARKERS

PLC

HUMAN  
MACHINE  
INTERFACES

ENERGY  
CONSUMPTION  
VISUALIZATION  
COMPONENTS

FA  
COMPONENTS

MACHINE  
VISION  
SYSTEMS

UV  
CURING  
SYSTEMS

## ORDER GUIDE

Type	Appearance	Sensing range (Note 1)	Model No.	Output	Sensitivity adjuster	Timer function	Emitting element
Diffused beam type		5 to 38 mm <b>0.197 to 1.496 in</b> (Convergent point: 20 mm <b>0.787 in</b> )	<b>EX-42</b>	NPN open-collector transistor	Incorporated	Incorporated	Infrared LED
		10 to 70 mm <b>0.394 to 2.756 in</b> (Convergent point: 40 mm <b>1.575 in</b> )	<b>EX-44</b>				
Spot-beam type		20 to 35 mm <b>0.787 to 1.378 in</b> (Convergent point: 30 mm <b>1.181 in</b> )	<b>EX-43</b>				
With timer			<b>EX-43T</b>			Incorporated	Red LED

**NOTE:** Mounting bracket is not supplied with the sensor. Please select from the range of optional sensor mounting brackets (two types).

Note: The sensor does not detect even a specular background if it is separated by the distance specified below.

**EX-42**...150 mm **5.906 in** or more, **EX-44**...300 mm **11.811 in** or more, **EX-43** and **EX-43T**...100 mm **3.937 in** or more

(These are typical values. However, the specular background should be a plane surface, directly facing the sensor.)  
(A spherical or curved background may be detected.)

### 5 m 16.404 ft cable length type

5 m **16.404 ft** cable length type (standard: 2 m **6.562 ft**) is also available.

When ordering this type, suffix "-C5" to the model No.

(e.g.) 5 m **16.404 ft** cable length type of **EX-42** is "**EX-42-C5**".

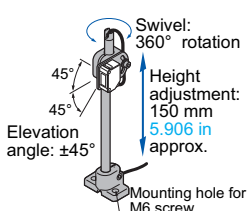
## OPTIONS

Designation	Model No.	Description
Sensor mounting bracket	<b>MS-EX40-1</b>	Rear mounting bracket
	<b>MS-EX40-2</b>	Bottom mounting bracket
Universal sensor mounting stand (Note)	<b>MS-AJ1</b>	Horizontal mounting type
	<b>MS-AJ2</b>	Vertical mounting type
	<b>MS-AJ1-A</b>	Horizontal mounting type
	<b>MS-AJ2-A</b>	Vertical mounting type

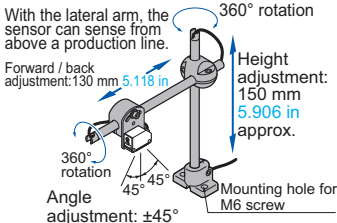
Note: Refer to p.979 for details of the universal sensor mounting stand **MS-AJ**.

### Universal sensor mounting stand

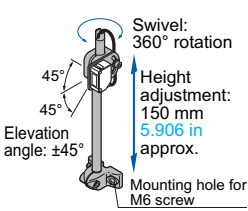
#### • MS-AJ1



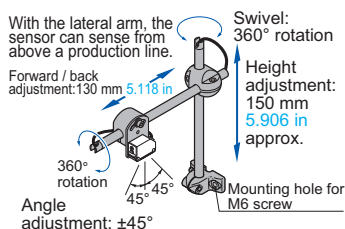
#### • MS-AJ1-A



#### • MS-AJ2

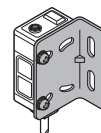


#### • MS-AJ2-A



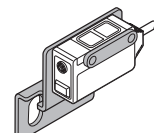
### Sensor mounting bracket

#### • MS-EX40-1



Two M3 (length 16 mm **0.630 in**) screws with washers are attached.

#### • MS-EX40-2



Two M3 (length 16 mm **0.630 in**) screws with washers are attached.

Selection  
Guide  
Amplifier  
Built-in  
Power Supply  
Built-in  
Amplifier-  
separated

**CX-400**

**CY-100**

**EX-10**

**EX-20**

**EX-30**

**EX-40**

**CX-440**

**EQ-30**

**EQ-500**

**MQ-W**

**RX-LS200**

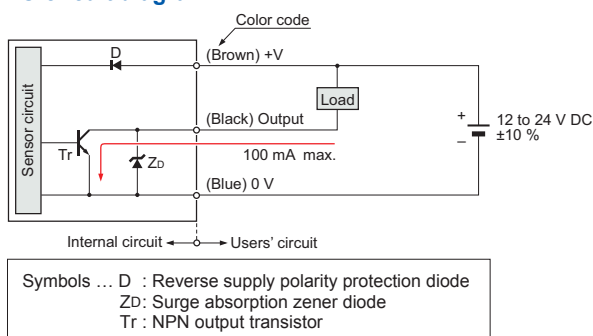
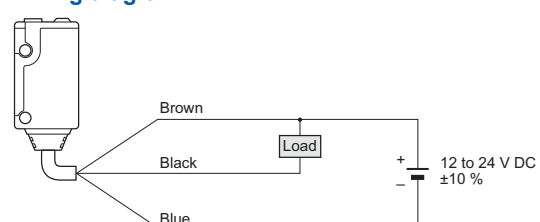
**RX**

**RT-610**

**SPECIFICATIONS**

Type		Diffused beam type		Spot-beam type	
			Long sensing range		With timer
Item	Model No.	EX-42	EX-44	EX-43	EX-43T
Sensing range		5 to 38 mm 0.197 to 1.496 in (Conv. point: 20 mm 0.787 in) with white non-glossy paper (50 × 50 mm 1.969 × 1.969 in)	10 to 70 mm 0.394 to 2.756 in (Conv. point: 40 mm 1.575 in) with white non-glossy paper (50 × 50 mm 1.969 × 1.969 in)	20 to 35 mm 0.787 to 1.378 in (Conv. point: 30 mm 1.181 in) with white non-glossy paper (50 × 50 mm 1.969 × 1.969 in)	
Min. sensing object		ø0.2 mm ø0.008 in copper wire (Setting distance: 20 mm 0.787 in)	ø0.2 mm ø0.008 in copper wire (Setting distance: 40 mm 1.575 in)	ø0.03 mm ø0.001 in gold wire (Setting distance: 30 mm 1.181 in)	
Hysteresis		15 % or less of operation distance with white non-glossy paper (50 × 50 mm 1.969 × 1.969 in)		10 % or less of operation distance with white non-glossy paper (50 × 50 mm 1.969 × 1.969 in)	
Repeatability (perpendicular to sensing axis)		0.1 mm 0.004 in or less (Setting distance: 20 mm 0.787 in)	0.2 mm 0.008 in or less (Setting distance: 40 mm 1.575 in)	0.05 mm 0.002 in or less (Setting distance: 30 mm 1.181 in)	
Supply voltage		12 to 24 V DC ±10 % Ripple P-P 10 % or less			
Current consumption		35 mA or less			
Output		NPN open-collector transistor			
		• Maximum sink current: 100 mA			
		• Applied voltage: 30 V DC or less (between 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)			
Utilization category		DC-12 or DC-13			
Output operation		Light-ON			
Short-circuit protection		Incorporated			
Response time		0.5 ms or less			
Operation indicator		Red LED (lights up when the output is ON)			
Stability indicator		Green LED (lights up under stable light received condition or stable dark condition)			
Sensitivity adjuster		_____	Continuously variable adjuster		_____
Timer function		_____			Variable OFF-delay timer (0.1 to 1 sec. approx.) (Note 2)
Environmental resistance	Pollution degree	3 (Industrial environment)			
	Protection	IP67 (IEC)			
	Ambient temperature	−25 to +55 °C −13 to +131 °F (No dew condensation or icing allowed), Storage: −30 to +70 °C −22 to +158 °F			
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH			
	Ambient illuminance	Incandescent light: 3,000 lx at the light-receiving face			
	EMC	EN 60947-5-2			
	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure			
	Insulation resistance	20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure			
	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			
Shock resistance		500 m/s <sup>2</sup> acceleration (50 G approx.) in X, Y and Z directions for three times each			
Emitting element		Infrared LED (Peak emission wavelength: 880 nm 0.035 mil, modulated)		Red LED (Peak emission wavelength: 680 nm 0.027 mil, modulated)	
Material		Polyallylate			
Cable		0.2 mm <sup>2</sup> 3-core cabtyre cable, 2 m 6.562 ft long			
Cable extension		Extension up to total 100 m 328.084 ft is possible with 0.3 mm <sup>2</sup> , or more, cable.			
Weight		Net weight: 45 g approx., Gross weight: 70 g approx.			
Accessory		_____	Adjusting screwdriver: 1 pc.		

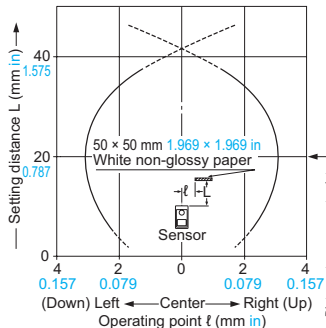
Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C **+73.4 °F**.  
2) The timer is always effective.

**I/O CIRCUIT AND WIRING DIAGRAMS****I/O circuit diagram****Wiring diagram**

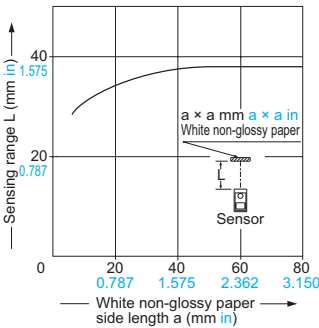
## SENSING CHARACTERISTICS (TYPICAL)

### EX-42

#### Sensing field



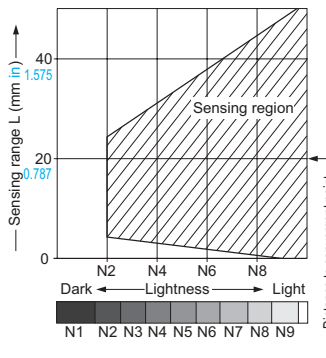
#### Correlation between sensing object size and sensing range



As the sensing object size becomes smaller than the standard size (white non-glossy paper 50 × 50 mm 1.969 × 1.969 in), the sensing range shortens, as shown in the left graph.

(For plotting the left graph, a sensor having a sensitivity such that it can just detect a 50 × 50 mm 1.969 × 1.969 in white non-glossy paper at a distance of 38 mm 1.496 in has been used.)

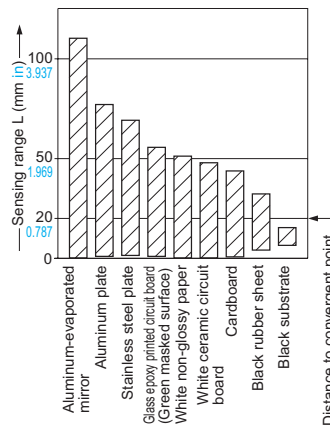
#### Correlation between lightness and sensing range



The sensing region (typical) is represented by oblique lines in the left figure. However, the sensitivity should be set with enough margin because of slight variation in products.

(Lightness shown on the left may differ slightly from the actual object condition.)

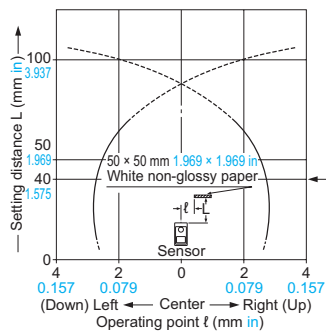
#### Correlation between material (50 × 50 mm 1.969 × 1.969 in) and sensing range



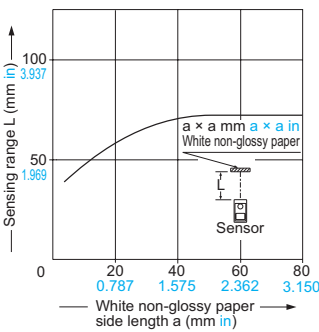
The bars in the graph indicate the sensing range (typical) for the respective material. However, there is a slight variation in the sensing range depending on the product. Further, if there is a reflective object (conveyor, etc.) in the background of the sensing object, since it affects the sensing, separate it by more than twice the sensing range shown in the left graph.

### EX-44

#### Sensing field



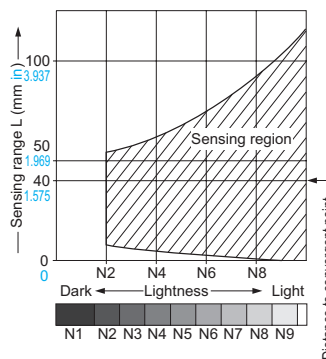
#### Correlation between sensing object size and sensing range



As the sensing object size becomes smaller than the standard size (white non-glossy paper 50 × 50 mm 1.969 × 1.969 in), the sensing range shortens, as shown in the left graph.

(For plotting the left graph, the sensitivity has been set such that a 50 × 50 mm 1.969 × 1.969 in white non-glossy paper is just detectable at a distance of 70 mm 2.756 in.)

#### Correlation between lightness and sensing range

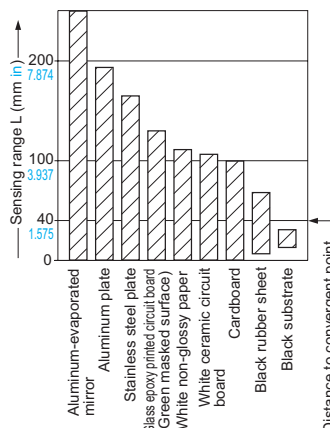


The sensing region (typical) is represented by oblique lines in the left figure. However, the sensitivity should be set with enough margin because of slight variation in products.

(The graph is drawn for the maximum sensitivity setting.)

(Lightness shown on the left may differ slightly from the actual object condition.)

#### Correlation between material (50 × 50 mm 1.969 × 1.969 in) and sensing range



The bars in the graph indicate the sensing range (typical) for the respective material. However, there is a slight variation in the sensing range depending on the product. Further, if there is a reflective object (conveyor, etc.) in the background of the sensing object, since it affects the sensing, separate it by more than twice the sensing range shown in the left graph, or adjust the sensitivity adjuster.

(The graph is drawn for the maximum sensitivity setting.)

FIBER SENSORS

LASER SENSORS

PHOTO-ELECTRIC SENSORS

MICRO PHOTO-ELECTRIC SENSORS

AREA SENSORS

LIGHT CURTAINS / SAFETY COMPONENTS

PRESSURE / FLOW SENSORS

INDUCTIVE PROXIMITY SENSORS

PARTICULAR USE SENSORS

SENSOR OPTIONS

SIMPLE WIRE-SAVING UNITS

WIRE-SAVING SYSTEMS

MEASURE-MENT SENSORS

STATIC ELECTRICITY PREVENTION DEVICES

LASER MARKERS

PLC

HUMAN MACHINE INTERFACES

ENERGY CONSUMPTION VISUALIZATION COMPONENTS

FA COMPONENTS

MACHINE VISION SYSTEMS

UV CURING SYSTEMS

Selection Guide

Amplifier Built-in

Power Supply Built-in

Amplifier-separated

CX-400

CY-100

EX-10

EX-20

EX-30

EX-40

CX-440

EQ-30

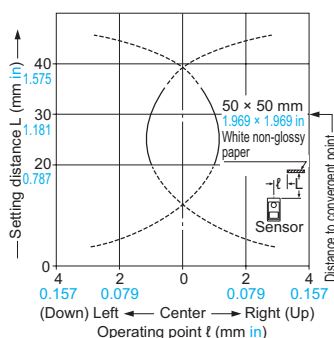
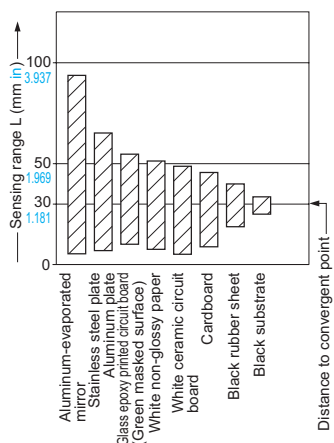
EQ-500

MQ-W

RX-LS200

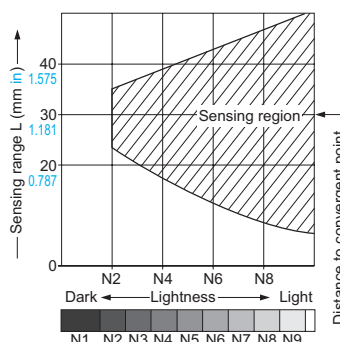
RX

RT-610

**SENSING CHARACTERISTICS (TYPICAL)****EX-43 EX-43T****Sensing field****Correlation between material (50 × 50 mm 1.969 × 1.969 in) and sensing range**

The bars in the graph indicate the sensing range (typical) for the respective material. However, there is a slight variation in the sensing range depending on the product. Further, if there is a reflective object (conveyor, etc.) in the background of the sensing object, since it affects the sensing, separate it by more than twice the sensing range shown in the left graph, or adjust the sensitivity adjuster.

(The graph is drawn for the maximum sensitivity setting. However, **EX-43T** does not incorporate the sensitivity adjuster.)

**Correlation between lightness and sensing range**

The sensing region (typical) is represented by oblique lines in the left figure. However, the sensitivity should be set with enough margin because of slight variation in products.

(The graph is drawn for the maximum sensitivity setting. However, **EX-43T** does not incorporate the sensitivity adjuster.)

(Lightness shown on the left may differ slightly from the actual object condition.)

**PRECAUTIONS FOR PROPER USE**

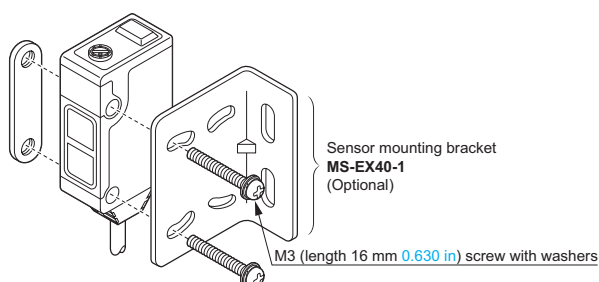
Refer to p.1458~ for general precautions.



- 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.

**Mounting**

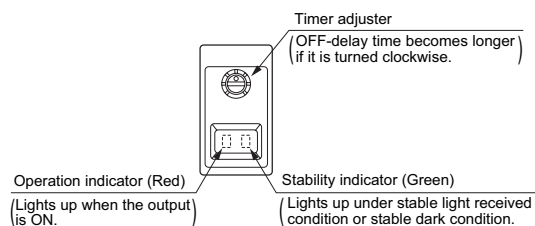
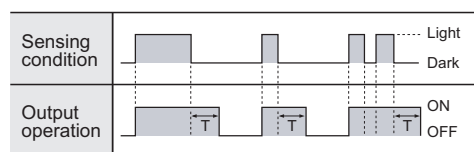
- With the optional sensor mounting bracket, the tightening torque should be 0.5 N·m or less.

**Others**

- Do not use during the initial transient time (50 ms) after the power supply is switched on.

**Timer function (Only for EX-43T)**

- The variable OFF-delay timer prolongs the output for a certain period (0.1 to 1 sec. approx.). It is useful when the connected device has a slow response time or when small objects are sensed and the signal width is small. (The timer is always effective.)

**Adjusters****Time chart**

Timer period: T = 0.1 to 1 sec. approx.

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**EX-40**

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RX

RT-610



