

# SA1U Heavy-duty Photoelectric Sensor

## Features

- Four sensing methods:
  - Through-beam
  - Polarized retro-reflective
  - Diffuse
  - Background suppression
- Up to 50m sensing range
- Universal voltage type: 24 to 240V AC / 12 to 240V DC
- DC voltage type: 12 - 24V DC
- IP67
- Adjustable time delay: 0.1 to 5 seconds
- Operation and stable LED indicators
- NO/NC relay output, 3A
- Interference prevention allows two units to be mounted in close proximity (polarized retro-reflective, diffuse and background suppression)
- Spring-up terminal block structure enables easy wiring



## Part Numbers

| Sensing Method                 | Detectable Object        | Sensing Range | Power Voltage                            | Control Output   | Included Accessories   | Time Delay Functions | Part Numbers |
|--------------------------------|--------------------------|---------------|--|--|--|----------------------|--------------|
| Through-beam<br>               | Opaque                   | 50m max.      | 24 to 240V AC (50/60Hz)<br>12 to 240V DC | Relay contact SPDT<br>250V AC/3A, 30V DC/3A (resistive load) | Sensitivity control screwdriver<br>Mounting bracket<br>Gland, gland washer<br>Gland gaskets*                       | Without              | SA1U-T50M    |
|                                |                          |               | 12 to 24V DC                             | NPN/PNP open collector                                       |  | With                 | SA1U-T50MT   |
| Polarized Retro-reflective<br> | Opaque<br>Mirror surface | 7m max.       | 24 to 240V AC (50/60Hz)<br>12 to 240V DC | Relay contact SPDT<br>250V AC/3A, 30V DC/3A (resistive load) | Sensitivity control screwdriver<br>Reflector (IAC-R5)<br>Mounting bracket<br>Gland, gland washer<br>Gland gaskets* | Without              | SA1U-P07M    |
|                                |                          |               | 12 to 24V DC                             | NPN/PNP open collector                                       |  | With                 | SA1U-P07MT   |
| Diffuse<br>                    | Opaque<br>Transparent    | 1m max.       | 24 to 240V AC (50/60Hz)<br>12 to 240V DC | Relay contact SPDT<br>250V AC/3A, 30V DC/3A (resistive load) | Sensitivity control screwdriver<br>Mounting bracket<br>Gland, gland washer<br>Gland gaskets*                       | Without              | SA1U-D01M    |
|                                |                          |               | 12 to 24V DC                             | NPN/PNP open collector                                       |  | With                 | SA1U-D01MT   |
| Background Suppression<br>     | Opaque                   | 2m max.       | 24 to 240V AC (50/60Hz)<br>12 to 240V DC | Relay contact SPDT<br>250V AC/3A, 30V DC/3A (resistive load) | Sensitivity control screwdriver<br>Mounting bracket<br>Gland, gland washer<br>Gland gaskets*                       | Without              | SA1U-B02M    |
|                                |                          |               | 12 to 24V DC                             | NPN/PNP open collector                                       |  | With                 | SA1U-B02MT   |

\*Two different-size gland gaskets are supplied. Select according to the cable diameter.

Small hole gasket: cable diameter ø8 to ø9 mm

Large hole gasket: cable diameter ø9 to ø10 mm

## Specifications

### Universal Voltage

| Sensing Method          | Through-beam   | Polarized Retro-reflective | Diffuse               | Background Suppression |
|-------------------------|--|----------------------------|-----------------------|------------------------|
| Part Number             | SA1U-T50M, SA1U-T50MT  | SA1U-P07M, SA1U-P07MT      | SA1U-D01M, SA1U-D01MT | SA1U-B02M, SA1U-B02MT  |
| Power Voltage           | 24 to 240V AC (21.6 to 264V AC) 50/60Hz, 12 to 240V DC (10.8 to 264V DC)   |                            |                       |                        |
| Power Consumption       | Projector: 3 VA maximum<br>Receiver: 3 VA maximum  |                            | 3 VA maximum          |                        |
| Control Output          | Relay contact SPDT, switching capacity: 250V AC/3A (resistive load), 30V DC/3A (resistive load)<br>Electrical life (minimum operations): 100,000 (NO contact), 50,000 (NC contact)<br>Mechanical life (minimum operations): 50,000,000 |                            |                       |                        |
| Minimum Applicable Load | 5V DC, 10 mA minimum (reference value)   |                            |                       |                        |
| Response Time           | 20 ms maximum  |                            |                       |                        |
| Insulation Resistance   | Between power and output terminals: 20 MΩ minimum (500V DC megger)   |                            |                       |                        |
| Dielectric Strength     | Between power and output terminals: 1500V AC, 1 minute, Between output terminals: 750V AC, 1 minute  |                            |                       |                        |
| Weight (approx.)        | Projector: 115g, Receiver: 130g  |                            | 130g                  |                        |

### DC Power Type

| Sensing Method        | Through-Beam   | Polarized Retro-reflective              | Diffuse                   | Background Suppression    |
|-----------------------|--|---|---------------------------|---------------------------|
| Part Number           | SA1U-T50MW<br>SA1U-T50MWT                                  | SA1U-P07MW<br>SA1U-P07MWT               | SA1U-D01MW<br>SA1U-D01MWT | SA1U-B02MW<br>SA1U-B02MWT |
| Power Voltage         | 12 to 24V DC (10 to 30V DC) ripple rate 10% p-p maximum    |   |                           |                           |
| Current Draw          | Projector: 20mA max<br>Receiver: 25mA max                  | 30mA maximum                            |                           |                           |
| Control Output        | Type   | NPN, PNP open collector (dual output)   |                           |                           |
|                       | Load Current   | NPN: 100 mA maximum, PNP: 100mA maximum |                           |                           |
|                       | Applied Voltage  | 30V DC maximum                          |                           |                           |
|                       | Voltage Drop   | NPN: 2.4V maximum, PNP: 2.4V maximum    |                           |                           |
| Response Time         | 1 ms maximum   |   |                           |                           |
| Insulation Resistance | Between live and dead parts: 20MΩ minimum (500V DC megger) |   |                           |                           |
| Dielectric Strength   | Between live and dead parts: 1000V AC, 1 minute            |   |                           |                           |
| Weight (approx.)      | Projector: 105g,<br>Receiver: 110g                         | 110g                                    |                           |                           |

### General Specifications

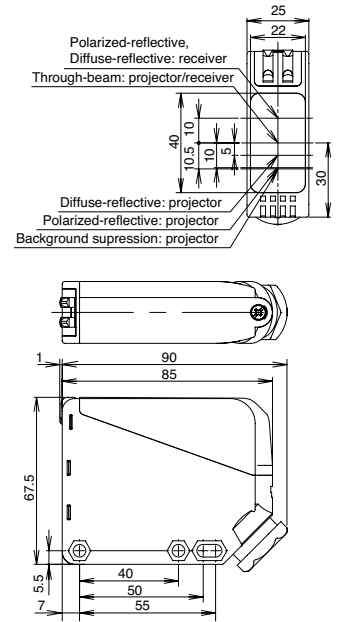
| Sensing Method            | Through-beam   | Polarized Retro-reflective                       | Diffuse                                    | Background Suppression                     |
|---------------------------|--|--|--|--|
| Sensing Distance          | 50m maximum  | 0.2 to 7m (when using supplied reflector IAC-R5) | 1m maximum (200 × 200mm white matte paper) | 0.2 to 2m (200 × 200 mm white matte paper) |
| Preset Distance           |  | —  |  | 0.4 to 2m (200 × 200 mm white matte paper) |
| Detectable Object         | Opaque   | Opaque/Mirror surface                            | Opaque/Transparent                         | Opaque                                     |
| Hysteresis                | —  | —  | 20% of sensing distance max.               | 15% of sensing distance max.               |
| Operation Mode            | Light ON or Dark ON (mode selector)  |  |  |  |
| Control Output            | [Projector]Power LED: Green<br>[Receiver] Operation LED: Yellow<br>Stable LED: Green   | Operation LED: Yellow<br>Stable LED: Green       |  | Operation LED: Yellow                      |
| Light Emitting Element    | Infrared LED (870nm)   | Red LED (660 nm)                                 | Infrared LED (870 nm)                      |  |
| Sensitivity Adjustment    | 1-turn control knob  |  |  | 8-turn control knob                        |
| Extraneous Light Immunity | Sunlight: 10,000 lux maximum, Incandescent lamp: 5,000 lux maximum                     |  |  |  |
| Vibration Resistance      | Damage limits: 10 to 55Hz, amplitude 1.5mm, 30 minutes in each axis                    |  |  |  |
| Shock Resistance          | Damage limits: 500 m/s <sup>2</sup> (50G), 3 shocks each in 6 axes 3 consecutive times |  |  |  |
| Operating Temperature     | -25 to +60°C (no freezing), storage temperature: -40 to +70°C                          |  |  |  |
| Operating Humidity        | 35 to 85% RH (no condensation), storage humidity: 35 to 85% RH                         |  |  |  |
| Connection Method         | Terminal block with M3 spring-up terminals   |  |  |  |
| Applicable Cable          | Outside diameter ø8 to ø10 mm (core 0.3 to 0.75mm <sup>2</sup> )                       |  |  |  |
| Cable Extension           | Extendable up to 100m with a cable of 0.3mm <sup>2</sup> minimum                       |  |  |  |
| Housing Material          | PBT (indicator cover: PC)  |  |  |  |
| Lens Material             | PC/PET   | PMMA   | PC/PET                                     |  |
| Degree of Protection      | IP67 (IEC/EN60529)   |  |  |  |

### Time Delay Specifications

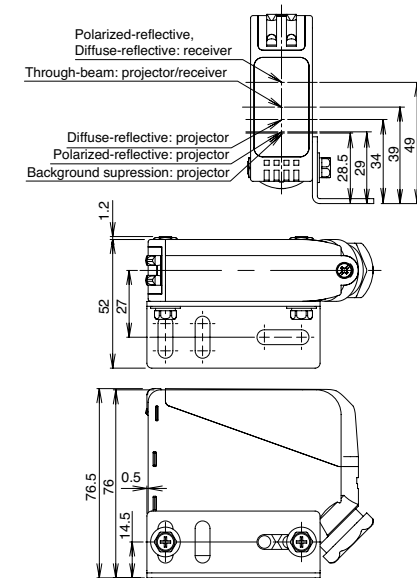
| Sensing Method                    | Through-beam   | Polarized Retro-reflective | Diffuse    | Background Suppression |
|-----------------------------------|--|----------------------------|------------|------------------------|
| Part Number                       | SA1U-T50MT   | SA1U-P07MT                 | SA1U-D01MT | SA1U-B02MT             |
| Time Range                        | 0.1 to 5.0 sec (adjusted with a 1-turn control knob)   |                            |            |                        |
| Time Delay Function               | One shot, ON delay, OFF delay, and normal (no time delay operation) modes                      |                            |            |                        |
| Temperature Effect of Time Delay  | ±10% maximum of the time delay at 20°C temperature rise within the operating temperature range |                            |            |                        |
| Repetitive Accuracy of Time Delay | ±1.0% maximum of the time delay for repetitive inputs at 10 seconds or more                    |                            |            |                        |

### Dimensions (mm)

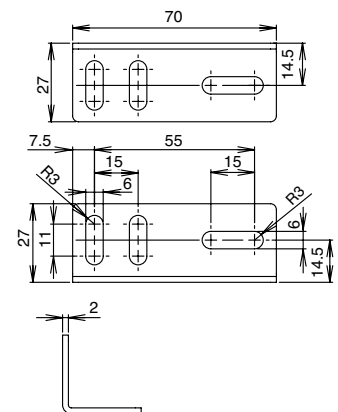
#### SA1U



#### SA1U with Mounting Bracket



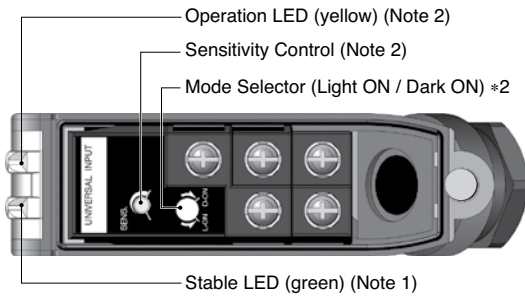
#### Mounting Bracket



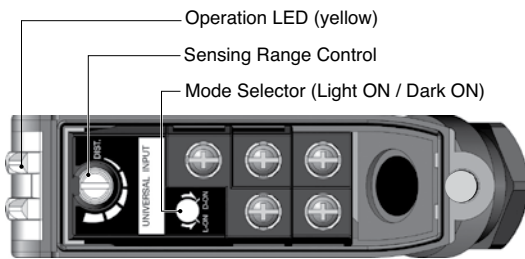
# Models

## Without Time Delay

SA1U-T50M  
SA1U-P07M  
SA1U-D01M



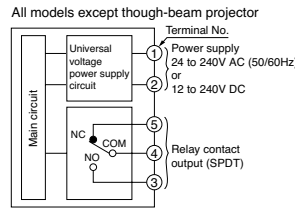
SA1U-B02M



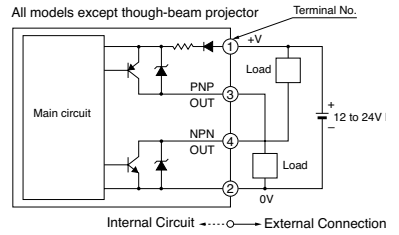
\*1: Power LED for through-beam projector  
\*2: Not available on through-beam projector

## Output Circuit / Connection Diagram

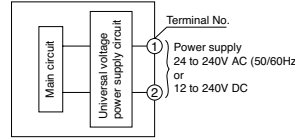
### Universal Voltage Type



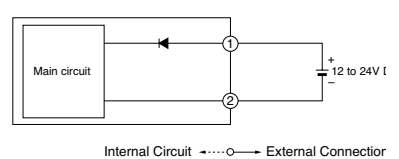
### DC Voltage Type



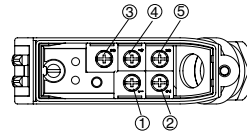
### Though-beam projector



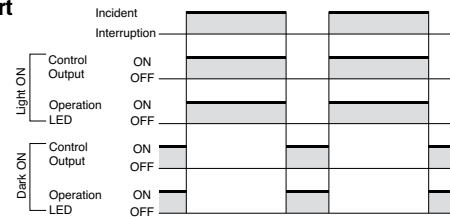
### Though-beam projector



## Terminal Arrangement

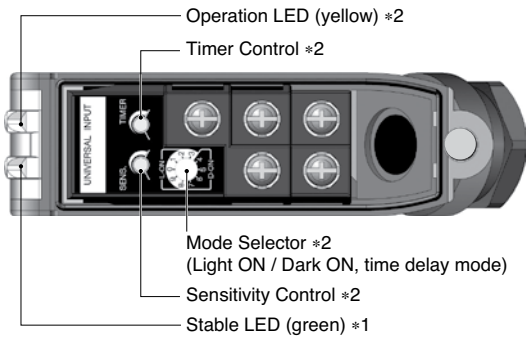


## Operation Chart

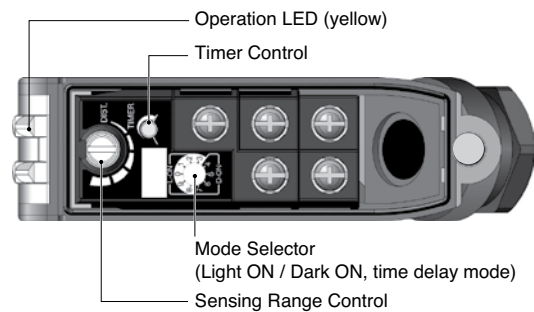


## With Time Delay

SA1U-T50MT  
SA1U-P07MT  
SA1U-D01MT



SA1U-B02MT



\*1: Power LED for through-beam projector  
\*2: Not available on through-beam projector

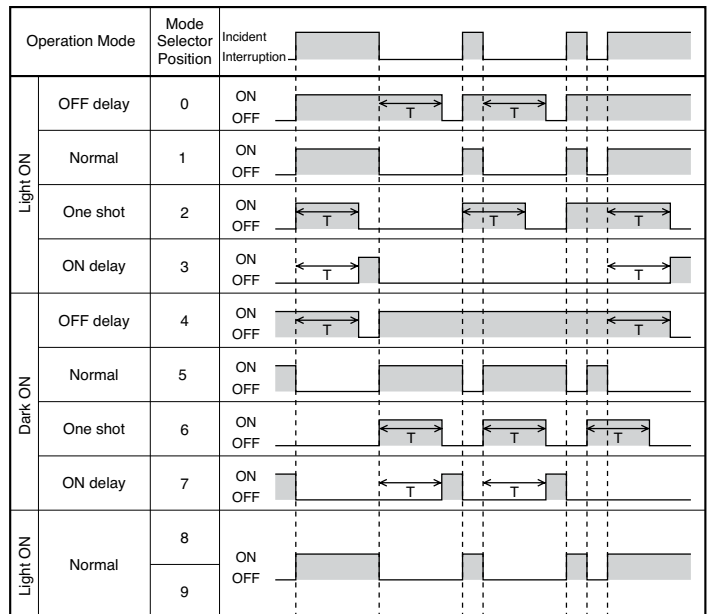
## Output Circuit / Connection Diagram

See the "Output Circuit / Connection Diagram" diagram above.

## Terminal Arrangement

See the "Terminal Arrangement" diagram above.

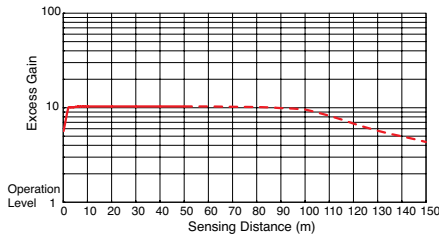
## Operation Chart



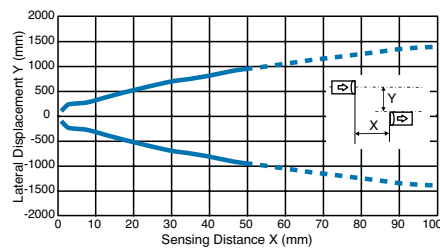
## Characteristics (Typical)

### Through-beam SA1U-T50M

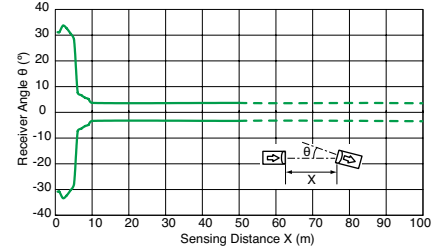
Excess Gain  
(transparency 1% ND filter is used)



Lateral Displacement  
(transparency 2.8% ND filter is used)

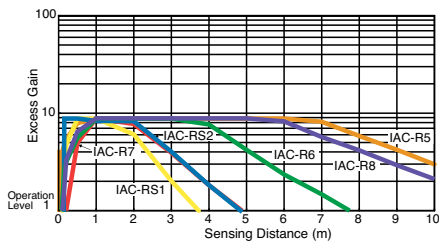


Angle

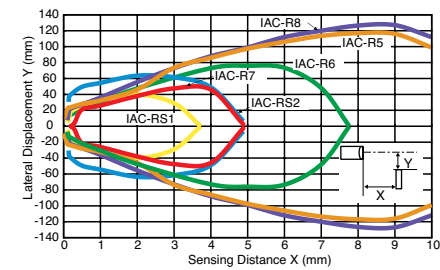


### Polarized Retro-reflective SA1U-P07M

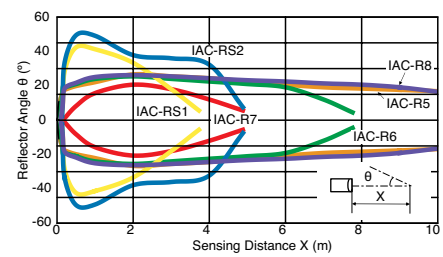
Excess Gain



Lateral Displacement

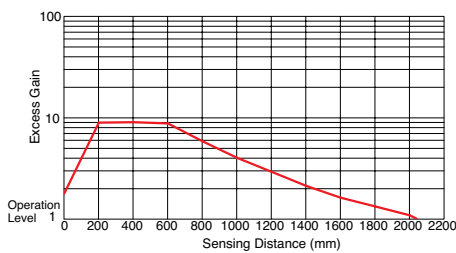


Angle

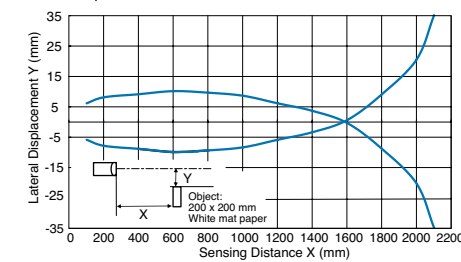


### Diffuse SA1U-D01M

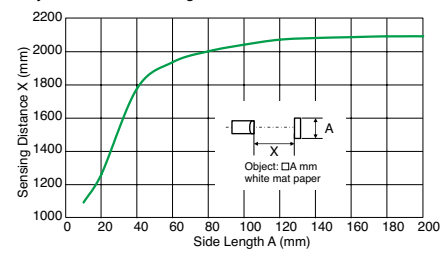
Excess Gain



Lateral Displacement

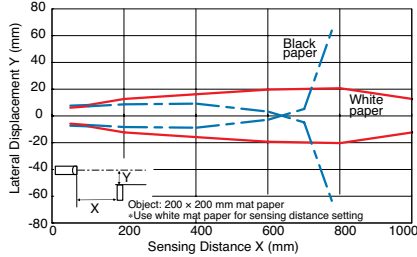


Object Size vs. Sensing Distance

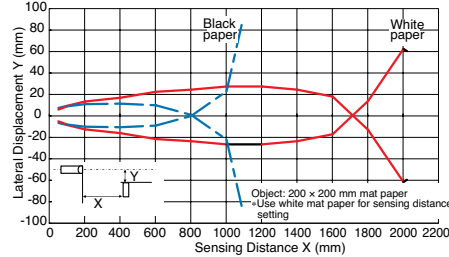


### Background Suppression SA1U-B02M

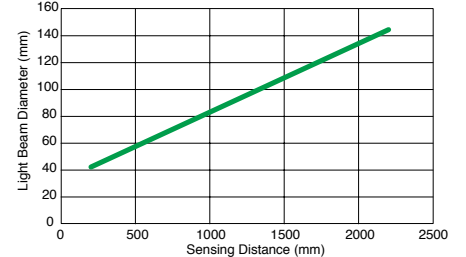
Lateral Displacement (preset 1m)



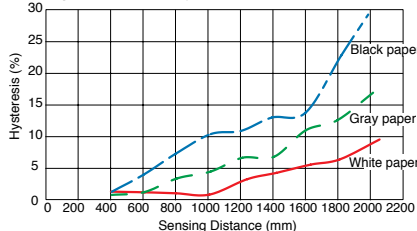
Lateral Displacement (preset 2m)



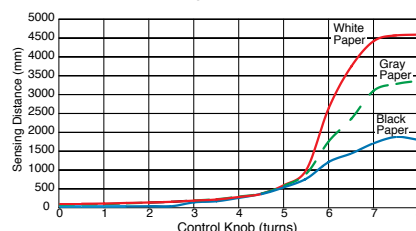
Light Beam Diameter



Sensing Distance vs. Hysteresis



Control Knob vs. Sensing Distance



Colored Matte Paper and Other Materials

