

# 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**

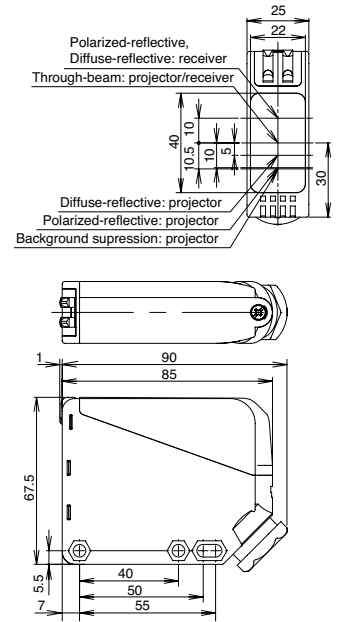
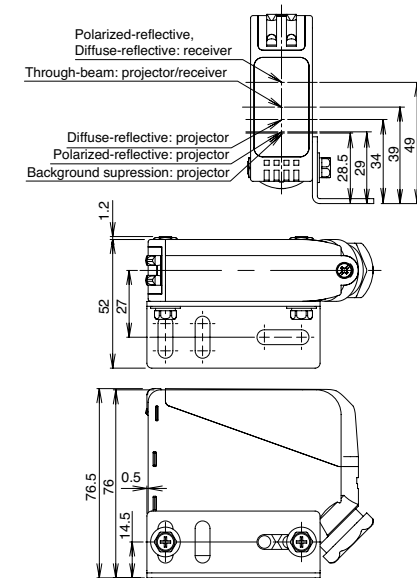
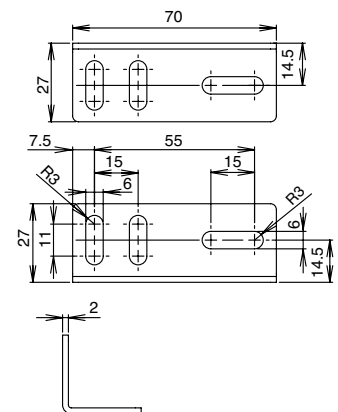
| Sensing Method        | Through-Beam                                               | Polarized Retro-reflective              | Diffuse                   | Background Suppression    |
|-----------------------|------------------------------------------------------------|-----------------------------------------|---------------------------|---------------------------|
| 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**

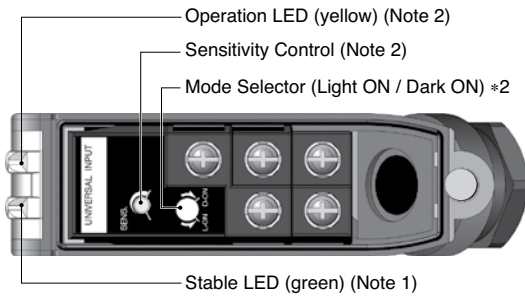
| Sensing Method                    | Through-beam                                                                                   | Polarized Retro-reflective | Diffuse    | Background Suppression |
|-----------------------------------|------------------------------------------------------------------------------------------------|----------------------------|------------|------------------------|
| 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**


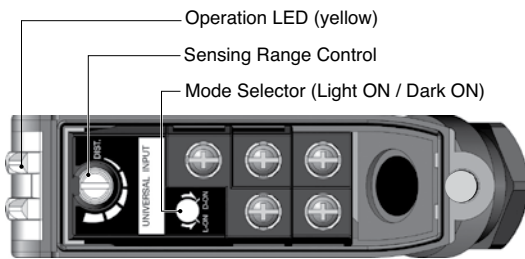
# Models

## Without Time Delay

SA1U-T50M  
SA1U-P07M  
SA1U-D01M



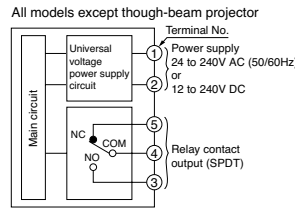
SA1U-B02M



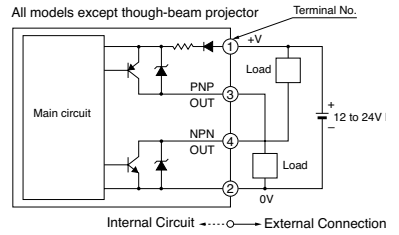
\*1: Power LED for through-beam projector  
\*2: Not available on through-beam projector

## Output Circuit / Connection Diagram

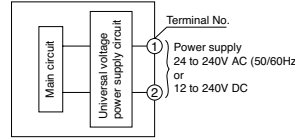
### Universal Voltage Type



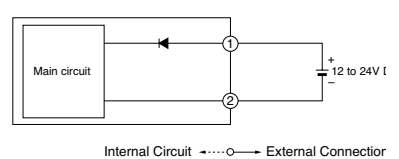
### DC Voltage Type



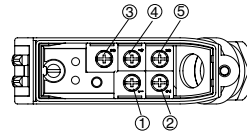
### Though-beam projector



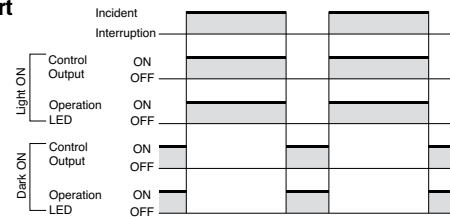
### Though-beam projector



## Terminal Arrangement

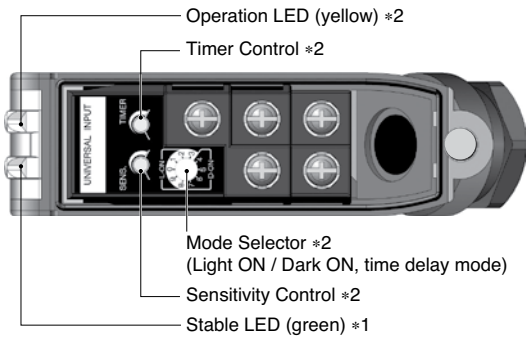


## Operation Chart

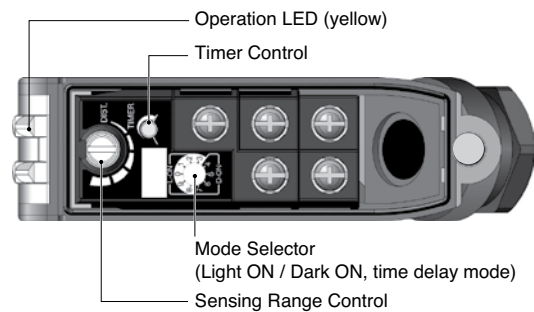


## With Time Delay

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

| Operation Mode | Mode Selector Position | Incident Interruption | Control Output | Operation LED |
|----------------|------------------------|-----------------------|----------------|---------------|
| Light ON       | OFF delay (0)          | ON                    | ON             | ON            |
|                | Normal (1)             | ON                    | ON             | ON            |
|                | One shot (2)           | ON                    | ON             | ON            |
|                | ON delay (3)           | ON                    | ON             | ON            |
| Dark ON        | OFF delay (4)          | ON                    | OFF            | OFF           |
|                | Normal (5)             | ON                    | OFF            | OFF           |
|                | One shot (6)           | ON                    | OFF            | OFF           |
|                | ON delay (7)           | ON                    | OFF            | OFF           |
| Light ON       | Normal (8)             | ON                    | ON             | ON            |
|                | Normal (9)             | OFF                   | ON             | ON            |