

INSTRUCTION SHEET

Photoelectric Switch with Built-in Power Supply  
SA1U Series

Universal Voltage · DC Power Types/With or Without Time-delay Outputs

Detection Mode	Universal Voltage Type	DC Power Type
Through-beam	SA1U-T50M (T)	SA1U-T50MW (T)
Polarized Retro-reflective	SA1U-P07M (T)	SA1U-P07MW (T)
Diffuse-reflective	SA1U-D01M (T)	SA1U-D01MW (T)
Background Suppression	SA1U-B02M (T)	SA1U-B02MW (T)

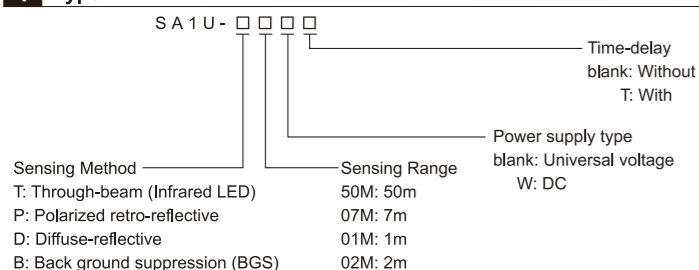
Confirm that the delivered product is what you have ordered.  
Read this instruction sheet to make sure of correct operation.  
Make sure that the instruction sheet is kept by the end user.

SAFETY PRECAUTIONS

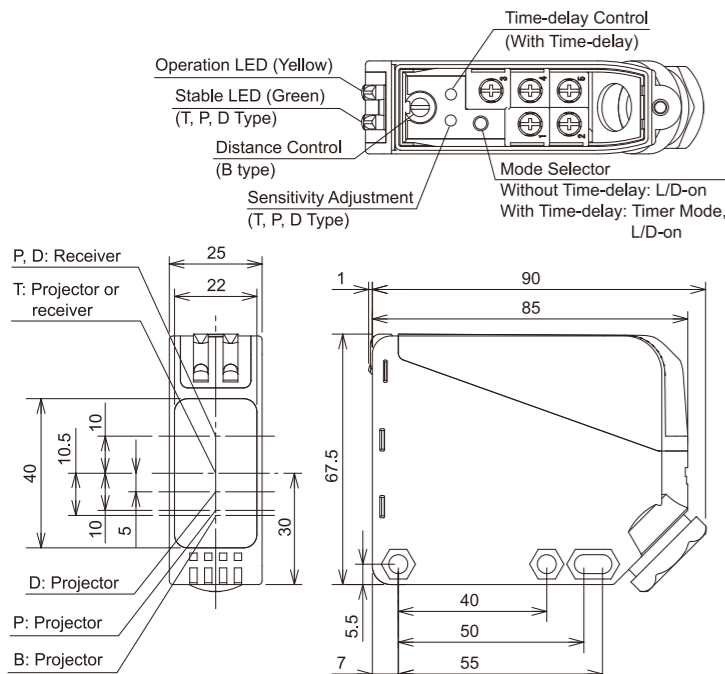
CAUTION

Caution notices are used where inattention might cause personal injury or damage to equipment.

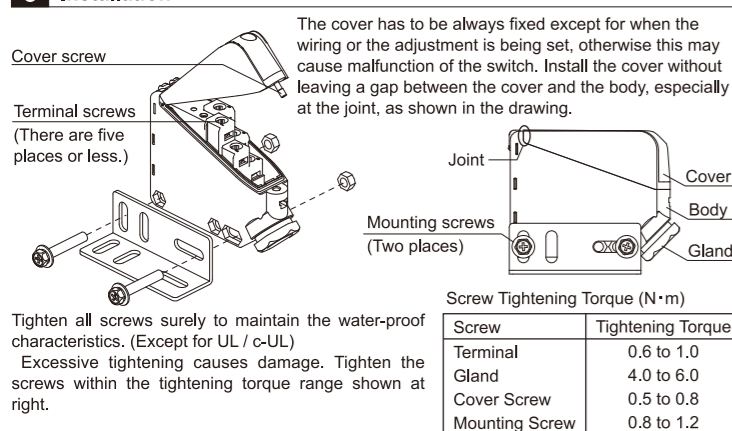
1 Type



2 Dimensions (mm)



3 Installation



4 Specifications

Type No.	Sensing Method		Through-beam	Polarized Retro-reflective	Diffuse-reflective	Background Suppression
	Universal Voltage	Without Time-delay	SA1U-T50M	SA1U-P07M	SA1U-D01M	SA1U-B02M
DC Power	With Time-delay	SA1U-T50MT	SA1U-P07MT	SA1U-D01MT	SA1U-B02MT	
	Without Time-delay	SA1U-T50MW	SA1U-P07MW	SA1U-D01MW	SA1U-B02MW	
Specifications	With Time-delay	SA1U-T50MWT	SA1U-P07MWT	SA1U-D01MWT	SA1U-B02MWT	
	Sensing Range	50m	0.2 to 7m (Using the attached reflector)	1m (200 × 200mm white mat paper)	0.2 to 2m (200 × 200mm white mat paper)	
Universal Voltage Type	Detectable Object	Opaque	Opaque/Specular	Opaque/Specular	Opaque	
	Hysteresis	-	-	20% maximum of operation distance	15% maximum of operation distance	
	Light Source Element	Infrared LED	Red LED	Infrared LED		
	Extraneous Light immunity	Sunlight 10000lx maximum, Incandescent lamp 5000lx maximum				
	Temperature Range	-25 to 60 °C (no freezing) (Note 1), Storage temperature: -40 to 70 °C (no freezing)				
	Operating Humidity	35 to 85% RH (storage temperature)				
	Degree of Protection	IP67 (IEC/EN60529) NEMA TYPE 1 (For UL / c-UL)				
	Power Voltage	21.6 to 264V AC 50/60Hz, 10.8 to 264V DC (Ripple p-p 10% maximum)				
	Power Consumption	Projector: 3 VA maximum Receiver: 3 VA maximum	3 VA maximum			
	Output	Electromechanical SPDT, Switching capacity: 250V AC · 3A (resistive load), 30V DC · 3A (resistive load)				
DC Power Type	Response Time	20ms maximum				
	Power Voltage	10 to 30V DC (Ripple p-p 10% maximum)				
	Power Consumption	Projector: 20 mA maximum Receiver: 25 mA maximum	30 mA maximum			
	Output	Configuration: NPN and PNP transistor open collector				
	Response Time	1 ms maximum				

Note 1: Maximum 50 °C in case of UL / c-UL Listed product.

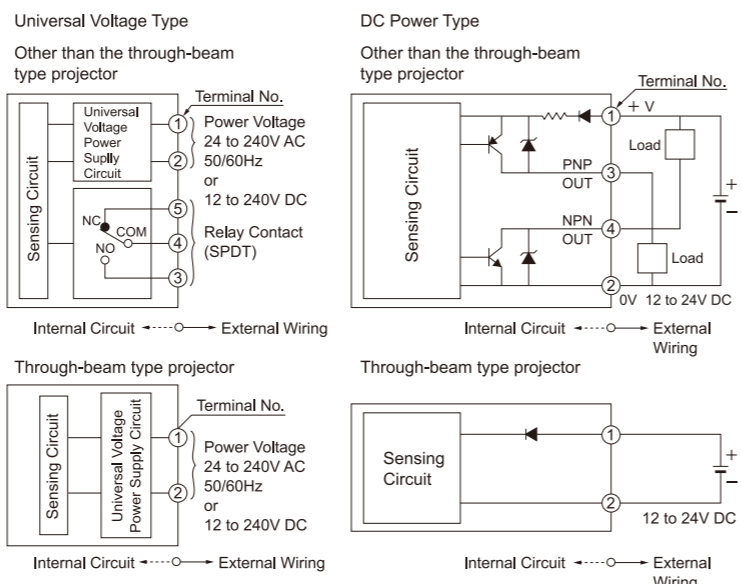
5 Notes for Operation

- Prevent incidence of reflected light from the floor or wall.
- Do not expose the photoelectric switch to sunlight or other direct light projections.
- Do not strike the photoelectric switch with a hammer when installing, otherwise the waterproof characteristics will be impaired. (Except for UL / c-UL)
- For preventing the transient state when turning power on, a circuit to turn output off (universal voltage: 50 ms, DC power: 100 ms) is contained. On the timer-function model, time-delay operation starts when the output is released from the off state. Take care of the operation when turning power on.
- Do not use the photoelectric switch under conditions exceeding the rated operating temperature, vibration resistance, and shock resistance.
- Use the photoelectric switch within the rated power voltage.
- When using a switching power supply, connect the FG (frame ground) terminal to a proper ground.
- When compliance with the EU Low Voltage Directive is required, connect an EN approved fuse outside the power terminals of the universal voltage type.
- When adjusting the sensitivity, adjusting the time-delay or selecting the mode (without Time-delay type), turn the control as shown below, to a torque of 0.03 N · m maximum.
- The cover has to be always fixed except for when the wiring or the adjustment is being set, otherwise this may cause malfunction of the switch. Install the cover maintain the water-proof characteristics, install the cover in a regulated position.
- Do not install the SA1U photoelectric switches in areas where the switches are subject to water, oil, and chemicals.
- For through-beam types, optional slits SA9Z-S15 and SA9Z-S16 are available to reduce the range of interference and to detect minute objects. When using the optional slit, take the following into consideration.
  - Wipe the lens surface of the switch with a soft dry cloth before sticking the adhesive tape side of the slit on to the lens surface.
  - When attaching the slit, align the ends of the slit with the ends of the lens.

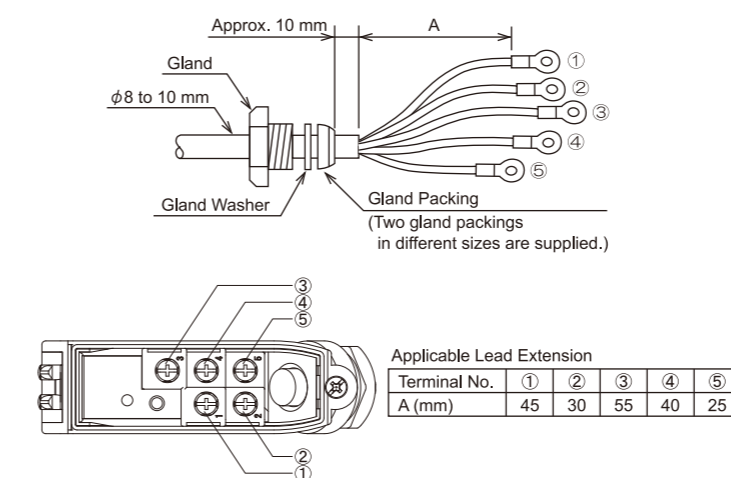
CAUTION

Type No. and the wiring diagram, are indicated on the housing and the cover.  
When installing the cover, confirm that the cover type agrees with the housing.

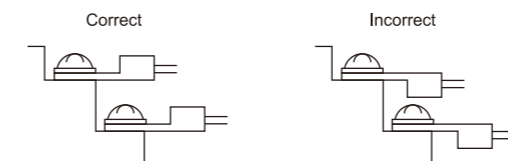
6 Wiring Diagram



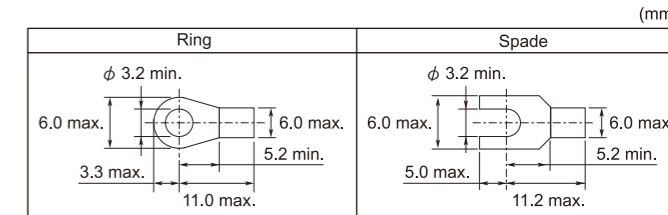
Cable Connection



- Connect wires starting from the lower terminals.
  - Install the cover using the captive screw. Use a cable of 8 to 10 mm in diameter to ensure water- and dust-proof characteristics (Except for UL / c-UL). Two gland packings are supplied; for cables of 8 to 9 mm and 9 to 10 mm in diameter. In case of UL / c-UL Listed product, use 9 to 10mm gland packing for Universal voltage type, use 8 to 9mm gland packing for DC power type. Use a proper gland packing and a gland washer, and tighten the gland firmly. Keep the cable insulation within 10 mm from the gland packing as shown above. Make sure that the gland washer is placed in the gland packing correctly.
- Use UL Listed cable for Universal voltage type, Type S or SJ, and 18AWG conductor. (For UL / c-UL)
  - Use UL Listed cable for DC power type, Type MTW, and 20AWG conductor. (For UL / c-UL)
  - Turn off the power supply before wiring.
  - Connect correctly to prevent damage.
  - The power voltage must not exceed the rated range.
  - The cable should not be run in the same wire duct with other power supply, motor, or electromagnetic lines because induction noise will cause malfunction or damage to the photoelectric switch.
  - Cable extension is allowed up to 100m using a cable with core wires of 0.3 mm<sup>2</sup> or more. On the DC power supply type, consider the voltage drop by the resistance of the cable.
  - When connecting crimping terminals, note the direction of the crimping part as shown.



Applicable Crimping Terminal Dimensions



- When using crimping terminals, wrap the terminal with insulating tubes.
- Each screw terminal can accept only one crimping terminal.

7 Optical Axis Alignment & Sensitivity Adjustment

- Through Beam Type: Direct the projector and the receiver face by eye measure and fasten them tentatively. Direct the receiver upward, downward, and sideways and lock the projector in the middle where the indicator on the receiver goes on.
- Polarized retro-reflective: Direct the sensor upward, downward, and sideways and lock the reflector in the middle where the indicator goes on or off.
- Diffuse-reflective: Place the sensing object and direct the sensor upward, downward, and sideways and lock the reflector in the middle where the indicator goes on or off. Without the sensing objects in place, check the indicator goes off. If the background influences, make the sensitivity adjustment as follows.
  - With the sensing object in place, turn the sensitivity adjusting control clockwise from MIN position until the indicator goes on (Point A).
  - Remove the object, then the indicator will go off. Turn the sensitivity adjusting control further clockwise until the indicator goes on again by detecting the background (Point B).
  - Set the sensitivity adjusting control at Point C, the middle point between A and B. NOTE: When adjusting the sensitivity, turn the control as shown below, to a torque of 0.03 N · m maximum.
  - Make the sensitivity adjustment of the background suppression (BGS) as follows. (At dark on operation, read lighting the operation indicator in a different way as turning off and adjust it.)
    - First, direct the sensor and place the object, turn the sensitivity adjusting control counterclockwise until the indicator goes off. Then turn the sensitivity adjusting control clockwise until the indicator goes on (Point A).
    - Remove the object, then the indicator will go off. Turn the sensitivity adjusting control further clockwise until the indicator goes on again by detecting the background (Point B) (\*1).
    - Set the sensitivity adjusting control at Point C, the middle point between A and B (\*2). \*1: Make one turn or more clockwise from point A and set the position as point C when the background is too far and the operation LED dose turn on. \*2: There may be more than 1 turn between points points A and B, since this photoelectric switch incorporates a 6-turn adjuster. \*3: Sensing range becomes longer when turned clockwise. \*4: Stable LED is not incorporated in BGS type.

8 Operation Chart (With time-delay outputs)

