

HS5D Miniature Interlock Switches

Key features:

- Detects detachment of head for enhanced safety
- Compact dimensions with up to three contacts
- The head orientation can be rotated, allowing 8 different actuator entries
- NC contacts with direct opening action (IEC/EN60947-5-1)
- M3 terminal screws for easy wiring
- Gold-plated contacts suitable for small loads

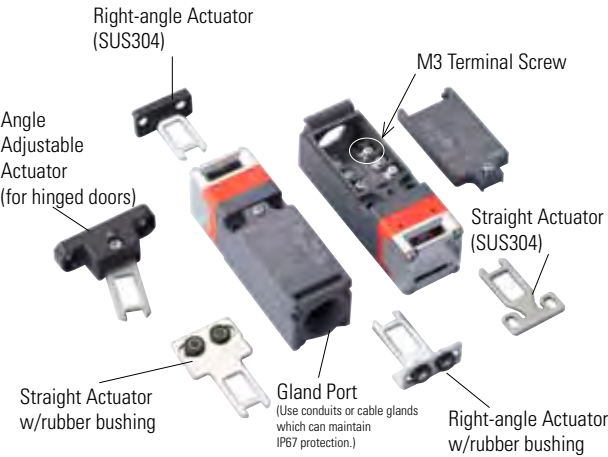


Part Numbers

| Contact Configuration | Gland Port Size | Plastic Head Type | Metal Head Type   |
|-----------------------|-----------------|-------------------|-------------------|
| 1NC-1NO<br>           | G1/2            | HS5D-11RN         | HS5D-11ZRN        |
|                       | PG13.5          | HS5D-11RNP        | HS5D-11ZRNP       |
|                       | M20             | HS5D-11RNM        | HS5D-11ZRNM       |
| 2NC<br>               | G1/2            | <b>HS5D-02RN</b>  | <b>HS5D-02ZRN</b> |
|                       | PG13.5          | HS5D-02RNP        | HS5D-02ZRNP       |
|                       | M20             | HS5D-02RNM        | HS5D-02ZRNM       |
| 2NC-1NO<br>           | G1/2            | <b>HS5D-12RN</b>  | <b>HS5D-12ZRN</b> |
|                       | PG13.5          | HS5D-12RNP        | HS5D-12ZRNP       |
|                       | M20             | HS5D-12RNM        | HS5D-12ZRNM       |
| 3NC<br>               | G1/2            | <b>HS5D-03RN</b>  | <b>HS5D-03ZRN</b> |
|                       | PG13.5          | HS5D-03RNP        | HS5D-03ZRNP       |
|                       | M20             | HS5D-03RNM        | HS5D-03ZRNM       |

Standard stock items in bold.

Parts Description



Actuator Keys (order separately)

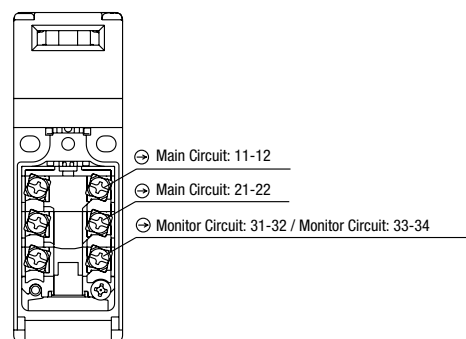
| Item | Part Number | Description                            |
|------|-------------|----------------------------------------|
|      | HS9Z-A51    | Straight                               |
|      | HS9Z-A51A   | Straight w/rubber bushings             |
|      | HS9Z-A52    | Right-angle                            |
|      | HS9Z-A52A   | Right-angle w/rubber bushings          |
|      | HS9Z-A55    | Angle Adjustable (vertical/horizontal) |
|      | HS9Z-A5P    | Plug Actuator                          |
|      | HS9Z-SH5    | Sliding Actuator                       |
|      | HS9Z-PH5    | Padlock Hasp                           |

Actuators are not included and must be ordered separately.

## Contact Configuration &amp; Operation Chart

| Type     | Contact Configuration                                                                                     | Contact Operation Chart (reference)                                                                                                                                                                                                                                                                                                                                                                                    |
|----------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HS5D-11* | <br>Main Circuit ⊕ 11 12 | <div>0 (Actuator Mounting Reference Position)</div> <div>Approx. 4.6    Approx. 6.7</div> <div>Approx. 26.4 (Travel: mm)</div> <div>  : Contact ON (closed)<br/>  : Contact OFF (open)         </div> <div>           11-12<br/>23-24         </div> |
|          | Monitor Circuit ⊕ 23 24                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| HS5D-02* | Main Circuit ⊕ 11 12                                                                                      | <div>Actuator removed completely</div> <div>Actuator inserted completely</div>                                                                                                                                                                                                                                                                                                                                         |
|          | Main Circuit ⊕ 21 22                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| HS5D-12* | Main Circuit ⊕ 11 12                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|          | Main Circuit ⊕ 21 22                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|          | Monitor Circuit ⊕ 33 34                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| HS5D-03* | Main Circuit ⊕ 11 12                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|          | Main Circuit ⊕ 21 22                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|          | Monitor Circuit ⊕ 31 32                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |

## Terminal Arrangement



The operation characteristics shown in the chart above are for the HS9Z-A51. For other actuator types, add 1.3 mm.  
The operation characteristics show the contact status when the actuator enters the entry slot of an interlock switch

## Specifications

|                                                     |                                                                                                                                                                                             |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicable Standards                                | ISO14119, EN1088, IEC60947-5-1, EN60947-5-1 (TÜV approval), GS-ET-15 (TÜV approval), UL508, CSA C22.2 No. 14, GB14048.5 (CCC approval), IEC60204-1/EN60204-1 (applicable standards for use) |
| Operating Temperature                               | −30 to +70°C (no freezing)                                                                                                                                                                  |
| Relative Humidity                                   | 45 to 85% (no condensation)                                                                                                                                                                 |
| Storage Temperature                                 | −40 to +80°C (no freezing)                                                                                                                                                                  |
| Pollution Degree                                    | 3                                                                                                                                                                                           |
| Impulse Withstand Voltage                           | 4 kV                                                                                                                                                                                        |
| Contact Resistance                                  | 50 mΩ maximum (initial value)                                                                                                                                                               |
| Insulation Resistance (500V DC megger)              | Between live and dead metal parts: 100 MΩ minimum<br>Between terminals of different poles: 100 MΩ minimum                                                                                   |
| Electric Shock Protection Class                     | Class II (IEC61140)                                                                                                                                                                         |
| Degree of Protection                                | IP67 (IEC60529)                                                                                                                                                                             |
| Shock Resistance                                    | Damage limits: 1000 m/s <sup>2</sup>                                                                                                                                                        |
| Vibration Resistance                                | Operating extremes: 10 to 55 Hz, amplitude 0.5 mm<br>Damage limits: 30 Hz, amplitude 1.5 mm                                                                                                 |
| Actuator Operating Speed                            | 0.05 to 1.0 m/s                                                                                                                                                                             |
| Direct Opening Travel                               | 10 mm minimum                                                                                                                                                                               |
| Direct Opening Force                                | 50N minimum                                                                                                                                                                                 |
| Operating Frequency                                 | 900 operations per hour                                                                                                                                                                     |
| Mechanical Durability                               | 1,000,000 operations minimum (GS-ET-15)                                                                                                                                                     |
| Electrical Durability                               | 100,000 operations minimum (AC-12 250V, 6A)<br>1,000,000 operations minimum (24V AC/DC, 100 mA)<br>(operation frequency: 900 operations per hour)                                           |
| Performance of Terminals 11-12 of Removed Head Unit | Mechanical damage limits: 10 operations min.<br>Insulation resistance: 100 MΩ (initial value)<br>Dielectric strength: 1000V, 1 minute (initial value)                                       |
| Conditional Short-circuit Current                   | 100A (250V) (note)                                                                                                                                                                          |
| Weight (approx.)                                    | Plastic head: 80g<br>Metal head: 110g                                                                                                                                                       |

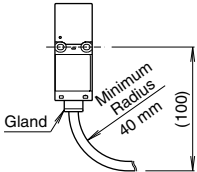
Contact Ratings

| Rated Operating Current (I <sub>e</sub> ) | Operating Voltage (U <sub>e</sub> ) |                        | 30V  | 125V    | 250V   |
|-------------------------------------------|-------------------------------------|------------------------|------|---------|--------|
|                                           | AC                                  | Resistive load (AC-12) | –    | 2.5A    | 1.5A   |
|                                           |                                     | Inductive load (AC-15) | –    | 1.5A    | 0.75A  |
|                                           | DC                                  | Resistive load (DC-12) | 2.5A | 1.1A    | 0.55A  |
|                                           |                                     |                        | (1A) | (0.22A) | (0.1A) |

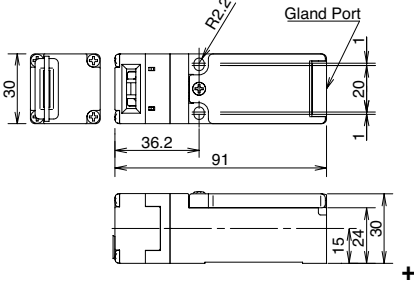
Installation Notes

Recommended Screw Torque

- Safety switch body installation (M4 screw): 1.0~1.5N·m
- Actuator installation (M4 screw): 1.0~1.5N·m

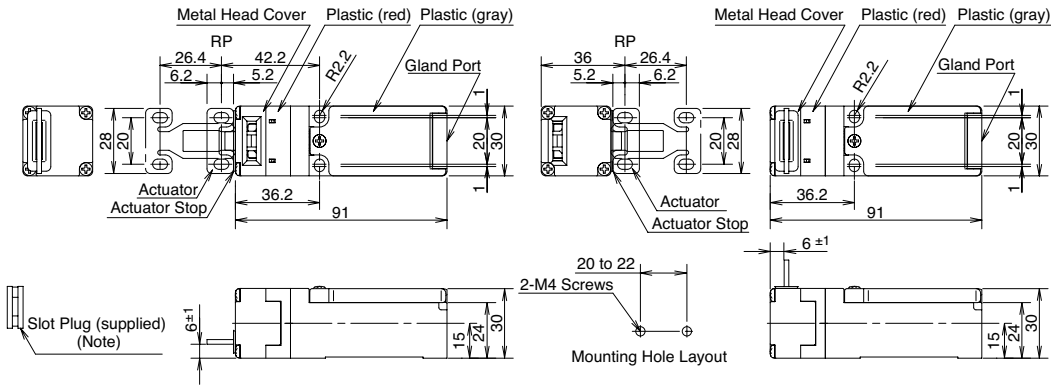


Dimensions and Mounting Hole Layouts

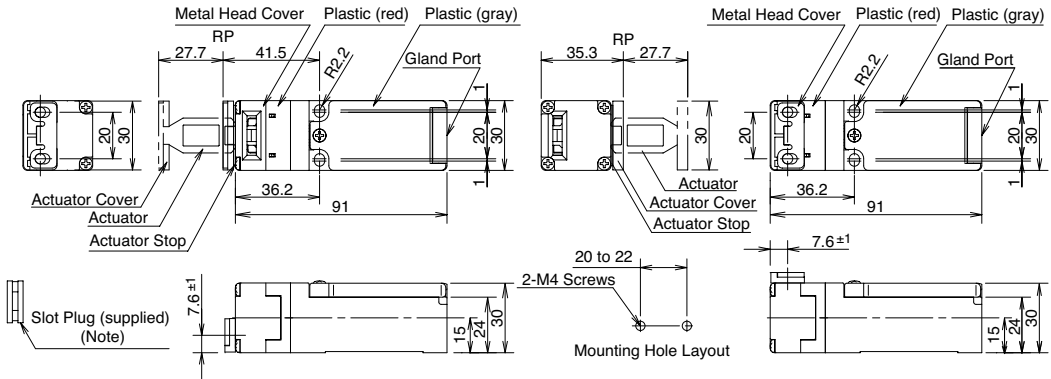


HS5D-□□ZRN□ (Metal Head)  
With HS9Z-A51 Straight Actuator

RP: Reference mounting position.

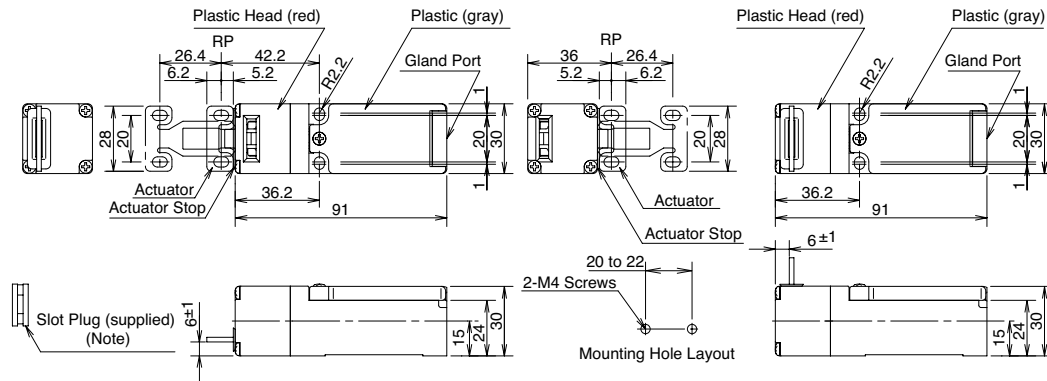


With HS9Z-A52 Right-angle Actuator

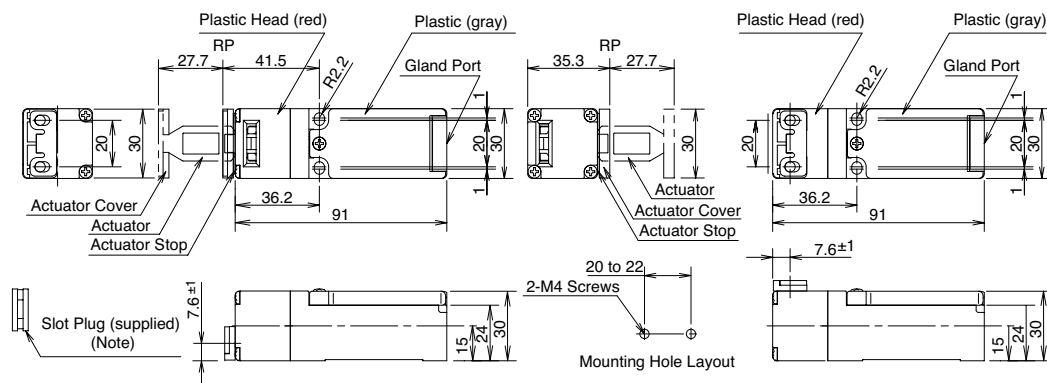


All dimensions in mm.

**HS5D-□□RN□ (Plastic Head)  
With HS9Z-A51 Straight Actuator**

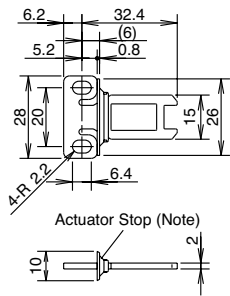


### With HS9Z-A52 Right-angle Actuator

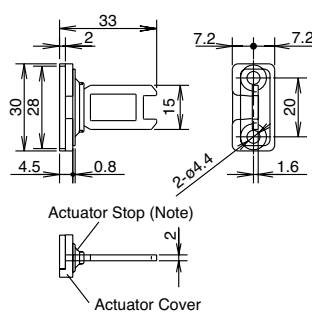


All dimensions in mm.

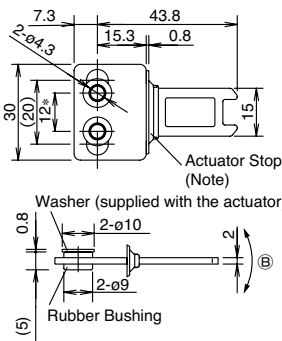
### Actuator Dimensions Straight (HS9Z-A51)



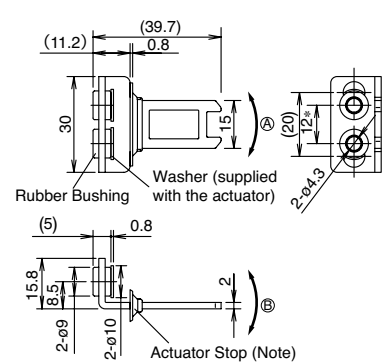
### Right-angle (HS9Z-A52)



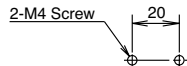
### Straight w/rubber bushing (HS9Z-A51A)



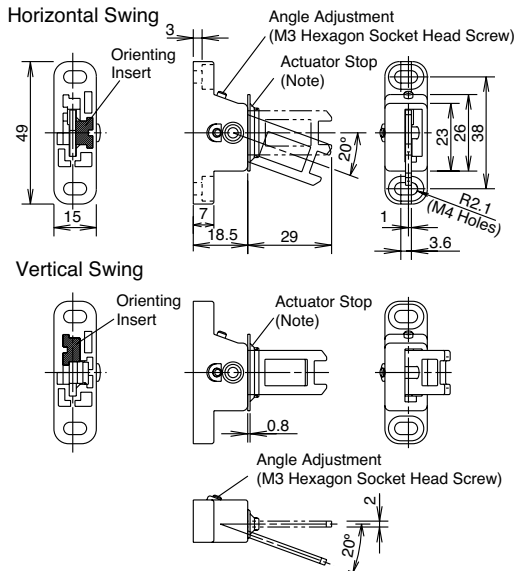
### Right-angle w/rubber bushing (HS9Z-A52A)



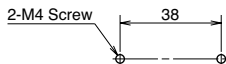
### Actuator Mounting Hole Layout (Straight, Right-angle)



### Angle Adjustable (HS9Z-A55)



### Actuator Mounting Hole Layout (Straight, Right-angle)



Note: The actuator stop is supplied with the actuator and used when adjusting the actuator position. Remove the actuator stop after the actuator position is determined.

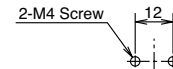
### Actuator Orientation (Angle Adjustable)

The angle of actuator swing can be changed using the orienting insert (white plastic) installed on the back of the actuator. Do not lose the orienting insert, otherwise the actuator will not operate properly.

The mounting center distance is set to 12 mm at factory. When 20-mm distance is required, adjust the distance by moving the rubber bushings.

(A)(B) The actuator has flexibility to the directions indicated by the arrows. When 20-mm distance is selected, the actuator swings vertically.

### Actuator Mounting Hole Layout (Straight w/rubber bushing) (Right-angle w/rubber bushing)

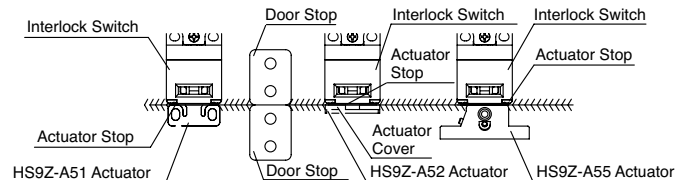


\*Mounting centers can be widened to 20 mm by moving the rubber cushions.

### Actuator Mounting Reference Position

As shown in the figure below, the mounting reference position of the actuator when inserted in the interlock switch is where the actuator stop placed on the actuator lightly touches the interlock switch.

Note: After mounting the actuator, remove the actuator stop from the actuator.



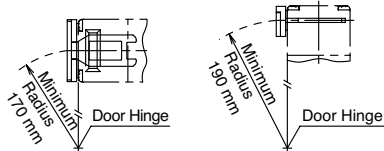
## Minimum Radius of Hinged Door

- When using the interlock switch for a hinged door, refer to the minimum radius of doors shown below. For the doors with small minimum radius, use angle adjustable actuators (HS9Z-A55).

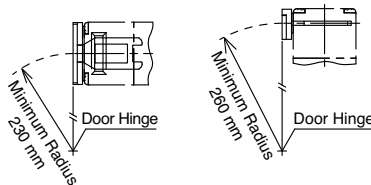
Note: Because deviation or dislocation of hinged door may occur in actual applications, make sure of the correct operation before installation.

### HS9Z-A52 Actuator

- When the door hinge is on the extension line of the interlock switch surface:

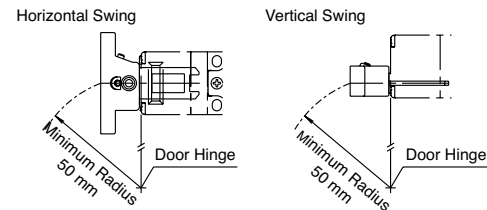


- When the door hinge is on the extension line of the actuator mounting surface:

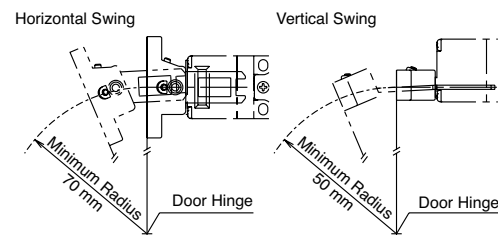


### When using the HS9Z-A55 Angle Adjustable Actuator

- When the door hinge is on the extension line of the interlock switch surface:



- When the door hinge is on extension line of the actuator mounting surface:



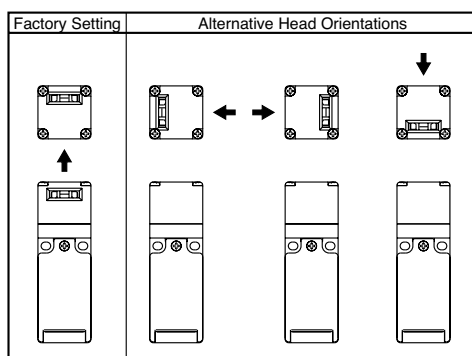
### Actuator Angle Adjustment for the HS9Z-A55

- Using the angle adjustment screw, the actuator angle can be adjusted (see figures "Actuator Dimensions" on page 13). Adjustable angle: 0 to 20°
- The larger the adjusted angle of the actuator, the smaller the applicable radius of the door opening. After installing the actuator, open the door. Then adjust the actuator so that its edge can be inserted properly into the actuator entry slot of the interlock switch.
- After adjusting the actuator angle, apply Loctite to the adjustment screw so that the screw will not loosen.

## Instructions

### Rotating the Head

- The head of the HS5D can be rotated by removing the four screws from the corners of the HS5D head and reinstalling the head in the desired orientation. When reinstalling the head, make sure that no foreign object enters the interlock switch. Tighten the screws tightly, because loose tightening may cause malfunction.
- Recommended screw tightening torque: 0.9 to 1.1 N·m



### Head Removal Detection Function

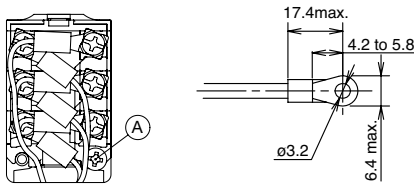
Only the NC contact of the main circuit (11-12) turns OFF (open) when the head is removed, such as when rotating the head. Because NC contacts of other than the main circuit (11-12) turn ON (closed), be sure to connect the main circuit (11-12) to the safety circuit.

### Recommended Tightening Torque

- Interlock Switch Mounting Screw:  $1.8 \pm 2.2$  N·m (two M4 screws)
- Housing Lid Screw: 0.2 to 0.4 N·m (M3 screw)
- Terminal Screw: 0.6 to 0.8 N·m (M3 screw)
- Connector: 2.7 to 3.3 N·m
- Actuators
  - HS9Z-A51:  $1.8 \pm 2.2$  N·m (two M4 screws)
  - HS9Z-A52:  $0.8 \pm 1.2$  N·m (two M4 Phillips screws)
  - HS9Z-A51A/A52A: 1.0 to 1.5 N·m (two M4 screws)
  - HS9Z-A55: 1.0 to 1.5 N·m (two M4 screws)
- The above recommended tightening torques of the mounting screws are the values confirmed with hex socket head bolts. When other screws are used and tightened to a smaller torque, make sure that the screws do not come loose after mounting.
- Mounting bolts must be provided by the user.
- To avoid unauthorized or unintended removal of the interlock switch and the actuator, it is recommended that the interlock switch and the actuator be installed in an unremovable manner, for example using special screws or welding the screws.

Applicable Crimping Terminal

When using crimping terminals, be sure to install insulation tubes on the crimping terminals to prevent electric shocks. When using stranded wires, make sure that loose wires do not cause short circuit. Also do not solder the terminal to prevent loose wires.



Applicable wire size (with insulation tube): 0.2 to 0.5 mm<sup>2</sup> (20 ~ 24 AWG)

Note: Do not remove screw A during wiring. Removing the screw may cause malfunction or damage.

Applicable Wire Size

0.5 to 1.5 mm<sup>2</sup> (16 ~ 20 AWG)

Applicable Cable Glands

Use a cable gland with a degree of protection IP67.

