

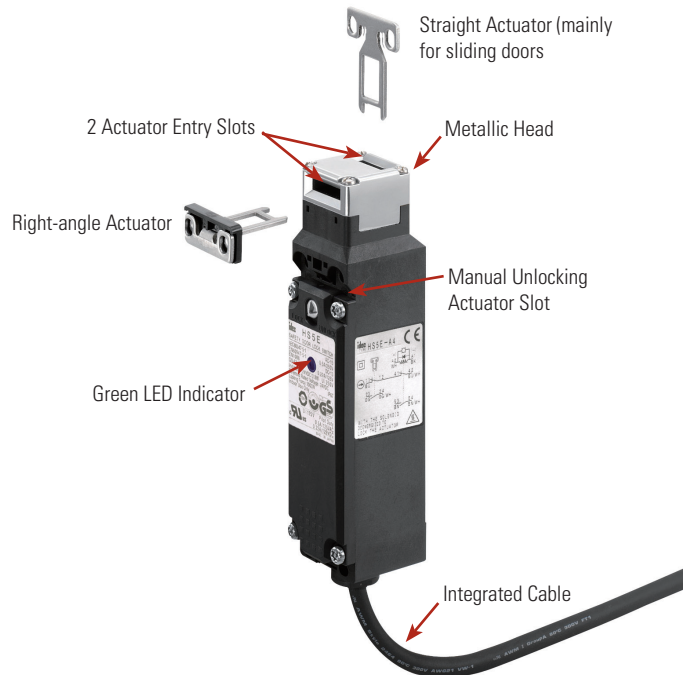
HS5E Miniature Interlock Switches with Solenoid

Spring Lock Type Features:

- Automatically locks the actuator without power applied to the solenoid
- After the machine stops, unlocking is completed by the solenoid, providing high safety features
- Manual unlocking is possible in the event of power failure or maintenance
- Gold-plated contacts

Solenoid Lock Type Features:

- The actuator is locked when energized
- The actuator is unlocked when de-energized
- Flexible locking function can be achieved for an application where locking is not required and sudden stopping of machine must be prevented
- Gold-plated contacts



Overview

XW Series E-Stops

Interlock Switches

Enabling Switches

Safety Control Relays

Light Curtains

AS-Interface Safety at Work

Part Numbers
Spring Lock Type (Power Solenoid to Unlock)

| Circuit Code | Contact Configuration | Cable Length | Part Number | | |
|--------------|-----------------------|--------------|-------------------|---------------------|---------------------------------|
| | | | Without LED | With LED | With LED and Rear Unlock Button |
| A | | 1m | HS5E-A4001 | HS5E-A4401-G | HS5E-A44L01-G |
| | | 3m | HS5E-A4003 | HS5E-A4403-G | HS5E-A44L03-G |
| | | 5m | HS5E-A4005 | HS5E-A4405-G | HS5E-A44L05-G |
| | | | | | |
| B | | 1m | HS5E-B4001 | HS5E-B4401-G | |
| | | 3m | HS5E-B4003 | HS5E-B4403-G | |
| | | 5m | HS5E-B4005 | HS5E-B4405-G | |
| | | | | | |
| C | | 1m | HS5E-C4001 | HS5E-C4401-G | HS5E-C44L01-G |
| | | 3m | HS5E-C4003 | HS5E-C4403-G | HS5E-C44L03-G |
| | | 5m | HS5E-C4005 | HS5E-C4405-G | HS5E-C44L05-G |
| | | | | | |
| D | | 1m | HS5E-D4001 | HS5E-D4401-G | HS5E-D44L01-G |
| | | 3m | HS5E-D4003 | HS5E-D4403-G | HS5E-D44L03-G |
| | | 5m | HS5E-D4005 | HS5E-D4405-G | HS5E-D44L05-G |
| | | | | | |
| F | | 1m | HS5E-F4001 | HS5E-F4401-G | HS5E-F44L01-G |
| | | 3m | HS5E-F4003 | HS5E-F4403-G | HS5E-F44L03-G |
| | | 5m | HS5E-F4005 | HS5E-F4405-G | HS5E-F44L05-G |
| | | | | | |
| G | | 1m | HS5E-G4001 | HS5E-G4401-G | HS5E-G44L01-G |
| | | 3m | HS5E-G4003 | HS5E-G4403-G | HS5E-G44L03-G |
| | | 5m | HS5E-G4005 | HS5E-G4405-G | HS5E-G44L05-G |
| | | | | | |
| H | | 1m | HS5E-H4001 | HS5E-H4401-G | |
| | | 3m | HS5E-H4003 | HS5E-H4403-G | |
| | | 5m | HS5E-H4005 | HS5E-H4405-G | |
| | | | | | |
| J | | 1m | HS5E-J4001 | HS5E-J4401-G | |
| | | 3m | HS5E-J4003 | HS5E-J4403-G | |
| | | 5m | HS5E-J4005 | HS5E-J4405-G | |
| | | | | | |

The contact configuration shows the status when the actuator is inserted and the switch is locked.
The contact configuration shows the status when the indicator is installed.
Actuators are not supplied with the interlock switch and must be ordered separately.
Standard stock items in bold

Dual Safety Circuit type

| Circuit Code | Contact Configuration | Cable Length | Part Number |
|--------------|-----------------------|--------------|----------------------|
| DD | | 1m | HS5E-DD4401-G |
| | | 3m | HS5E-DD4403-G |
| | | 5m | HS5E-DD4405-G |
| | | | |

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1. The contact configuration shows the status when the actuator is inserted and the switch is locked.
 2. Manual unlock key is included with the interlock switch.
 3. Actuators are not supplied with the interlock switch and must be ordered separately.
 4. Standard stock items in bold

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Four-circuit Independent Output Type (Spring Lock)

| Circuit Code | Contact Configuration | Cable Length | Part Number |
|--|-----------------------|--------------|----------------------|
| VA Door Monitor Circuit: 1NC, 1NO Lock Monitor Circuit: 1NC, 1NO | | 1m | HS5E-VA4401-G |
| | | 3m | HS5E-VA4403-G |
| | | 5m | HS5E-VA4405-G |
| VB Door Monitor Circuit: 1NC, 1NO Lock Monitor Circuit: 2NC | | 1m | HS5E-VB4401-G |
| | | 3m | HS5E-VB4403-G |
| | | 5m | HS5E-VB4405-G |
| VC Door Monitor Circuit: 2NC Lock Monitor Circuit: 1NC, 1NO | | 1m | HS5E-VC4401-G |
| | | 3m | HS5E-VC4403-G |
| | | 5m | HS5E-VC4405-G |
| VD Door Monitor Circuit: 2NC Lock Monitor Circuit: 2NC | | 1m | HS5E-VD4401-G |
| | | 3m | HS5E-VD4403-G |
| | | 5m | HS5E-VD4405-G |

The contact configuration shows the status when the actuator is inserted and the switch is locked. Actuators are not supplied with the interlock switch and must be ordered separately. Standard stock items in bold.

Four-circuit Independent Output Type (Solenoid Lock)

| Circuit Code | Contact Configuration | Cable Length | Part Number |
|--|-----------------------|--------------|-----------------------|
| VA Door Monitor Circuit: 1NC, 1NO Lock Monitor Circuit: 1NC, 1NO | | 1m | HS5E-VA7Y401-G |
| | | 3m | HS5E-VA7Y403-G |
| | | 5m | HS5E-VA7Y405-G |
| VB Door Monitor Circuit: 1NC, 1NO Lock Monitor Circuit: 2NC | | 1m | HS5E-VB7Y401-G |
| | | 3m | HS5E-VB7Y403-G |
| | | 5m | HS5E-VB7Y405-G |
| VC Door Monitor Circuit: 2NC Lock Monitor Circuit: 1NC, 1NO | | 1m | HS5E-VC7Y401-G |
| | | 3m | HS5E-VC7Y403-G |
| | | 5m | HS5E-VC7Y405-G |
| VD Door Monitor Circuit: 2NC Lock Monitor Circuit: 2NC | | 1m | HS5E-VD7Y401-G |
| | | 3m | HS5E-VD7Y403-G |
| | | 5m | HS5E-VD7Y405-G |

The contact configuration shows the status when the actuator is inserted and the switch is locked. Actuators are not supplied with the interlock switch and must be ordered separately. Standard stock items in bold.

Solenoid Lock Type (Remove Power to Unlock)

| Circuit Code | Contact Configuration | Cable Length | Part Number | |
|--------------|-----------------------|--------------|--------------------|----------------------|
| | | | Without LED | With LED |
| A | | 1m | HS5E-A7Y001 | HS5E-A7Y401-G |
| | | 3m | HS5E-A7Y003 | HS5E-A7Y403-G |
| | | 5m | HS5E-A7Y005 | HS5E-A7Y405-G |
| B | | 1m | HS5E-B7Y001 | HS5E-B7Y401-G |
| | | 3m | HS5E-B7Y003 | HS5E-B7Y403-G |
| | | 5m | HS5E-B7Y005 | HS5E-B7Y405-G |
| C | | 1m | HS5E-C7Y001 | HS5E-C7Y401-G |
| | | 3m | HS5E-C7Y003 | HS5E-C7Y403-G |
| | | 5m | HS5E-C7Y005 | HS5E-C7Y405-G |
| D | | 1m | HS5E-D7Y001 | HS5E-D7Y401-G |
| | | 3m | HS5E-D7Y003 | HS5E-D7Y403-G |
| | | 5m | HS5E-D7Y005 | HS5E-D7Y405-G |
| F | | 1m | HS5E-F7Y001 | HS5E-F7Y401-G |
| | | 3m | HS5E-F7Y003 | HS5E-F7Y403-G |
| | | 5m | HS5E-F7Y005 | HS5E-F7Y405-G |
| G | | 1m | HS5E-G7Y001 | HS5E-G7Y401-G |
| | | 3m | HS5E-G7Y003 | HS5E-G7Y403-G |
| | | 5m | HS5E-G7Y005 | HS5E-G7Y405-G |
| H | | 1m | HS5E-H7Y001 | HS5E-H7Y401-G |
| | | 3m | HS5E-H7Y003 | HS5E-H7Y403-G |
| | | 5m | HS5E-H7Y005 | HS5E-H7Y405-G |
| J | | 1m | HS5E-J7Y001 | HS5E-J7Y401-G |
| | | 3m | HS5E-J7Y003 | HS5E-J7Y403-G |
| | | 5m | HS5E-J7Y005 | HS5E-J7Y405-G |

The contact configuration shows the status when the actuator is inserted and the switch is locked.
 The contact configuration shows the status when the indicator is installed.
 Actuators are not supplied with the interlock switch and must be ordered separately.
 Standard stock items in bold

Actuator Keys & Accessories (order separately)

| Appearance | Part Number | Description | Item | Part Number | Description |
|------------|-------------|---|------|-------------|---|
| | HS9Z-A51 | Straight | | HS9Z-PH5 | Padlock Hasp (prevents unauthorized insertion of actuator) |
| | HS9Z-A52 | Right-angle | | HS9Z-SP51 | Mounting Plate (allows easy mounting to aluminum frames) |
| | HS9Z-A53 | Angle adjustable vertical operation | | HS9Z-T3 | Manual unlock key (long type - metal) |
| | HS9Z-A55 | Angle adjustable horizontal/vertical operation ¹ | | HS9Z-SH5 | Sliding Actuator |
| | HS9Z-A5P | Plug Actuator (allows switch to be used as interlock plug unit) | | | 1. The actuator tensile strength is 500N minimum. 2. Actuators are not included and must be included separately. |

Overview

XW Series E-Stops

Interlock Switches

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AS-Interface Safety at Work

Specifications

| | |
|-----------------------------------|---|
| Conforming Standards | ISO14119, IEC60947-5-1, EN60947-5-1 (TÜV approval), EN1088, GS-ET-19 (BG approval), UL508, CSA C22.2, No. 14, GB 140485.5 (CCC approval) IEC60204-1/EN60204-1 |
| Application Standards | IEC60204-1/EN60204-1 |
| Operating Temperature | -25 to 50°C (no freezing) |
| Relative Humidity | 45 to 85% (no condensation) |
| Storage Temperature | -40 to +80°C (no freezing) |
| Operating Environment | Degree of pollution: 3 |
| Impulse Withstand Voltage | 2.5 kV (between LED, solenoid and grounding: 0.5 kV) |
| Insulation Resistance (DC megger) | Between live and dead metal parts: 100 MΩ minimum Between live metal part and ground: 100 MΩ minimum Between live metal parts: 100 MΩ minimum Between Terminals of the same pole: 100 MΩ minimum |
| Electric Shock Protection Class | Class II (IEC61140) |
| Degree of Protection | IP67 (IEC60529) |
| Shock Resistance | Operating extremes: 100 m/s ² (10 G) Damage limits: 1000 m/s ² (100 G) |
| Vibration Resistance | Operating extremes: 10 to 55 H, amplitude 0.35 mm minimum Damage limits: 30 Hz, amplitude 1.5 mm minimum |
| Actuator Operating Speed | 0.05 to 1.0m/s |
| Direct Opening Travel | Actuator HS9Z-A51: 11mm minimum Actuator HS9Z-A52/A53/A55: 12mm minimum |
| Direct Opening Force | 80N minimum |
| Actuator Retention Force | 1400N minimum (GS-ET-19) |
| Operating Frequency | 900 operations per hour |
| Mechanical Life | 1,000,000 operations minimum (GS-ET-19) |
| Electrical Life | 100,000 operations minimum (operating frequency 900 operations per hour, rated load AC-12, 250V, 1A) |
| Conditional Short-circuit Current | 50A (250V) (Note: Use 250V/10A fast acting type fuse for short circuit protection.) |
| Cable | 21AWG - 8-core: 0.5mm ² or equivalent/core (HS5E-V types: No. 22AWG - 12-core :0.3mm ² on equivalent/ core) |
| Cable Diameter | ø7.6 mm |
| Weight (approx.) | 400g - 1m cable type, 580g - 3m cable type, 760g - 5m cable type |

Specifications

| | |
|-------------------------------------|---------------------------------------|
| Rated Voltage | 24V DC |
| Current | 266 mA |
| Coil Resistance | 90Ω (at 20°C) |
| Operating Voltage | Rated voltage x 85% or less (at 20°C) |
| Return Voltage | Rated voltage x 10% or more (at 20°C) |
| Maximum Continuous Applying Voltage | Rated voltage x 110% |
| Insulation Class | Class F |

Current Ratings

| | | | | | |
|---|----|---|------|-------|-------|
| Rated Insulation Voltage (U)² | | 250V (between LED, solenoid and grounding: 30V) | | | |
| Thermal Current (I _{th}) | | 2.5A | | | |
| Rated Voltage (U _e) | | 30V | 125V | 250V | |
| Rated Current (I _e) ³ | AC | Resistive load (AC12) | — | 2.5A | 1.5A |
| | | Inductive Load (AC15) | — | 1.5A | 0.75A |
| | DC | Resistive load (DC12) | 2.5A | 1.1A | 0.55A |
| | | Inductive Load (DC13) | 2.3A | 0.55A | 0.27A |



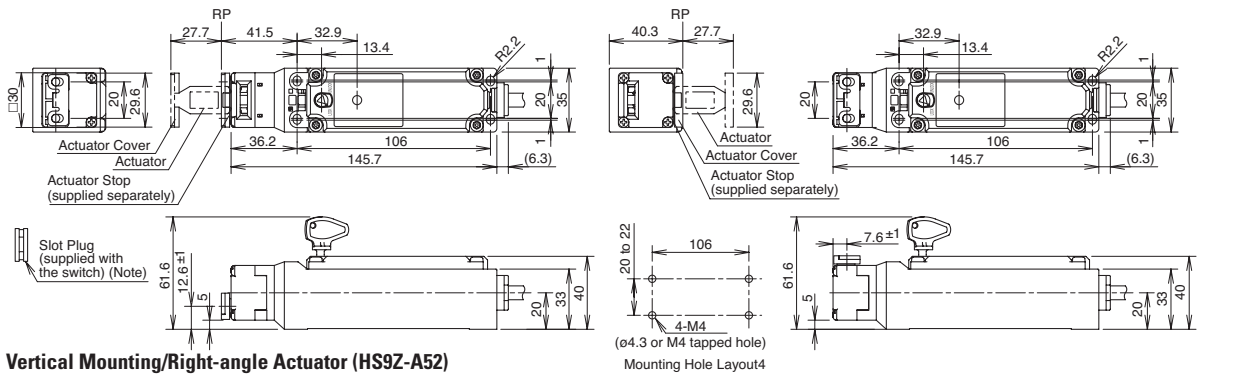
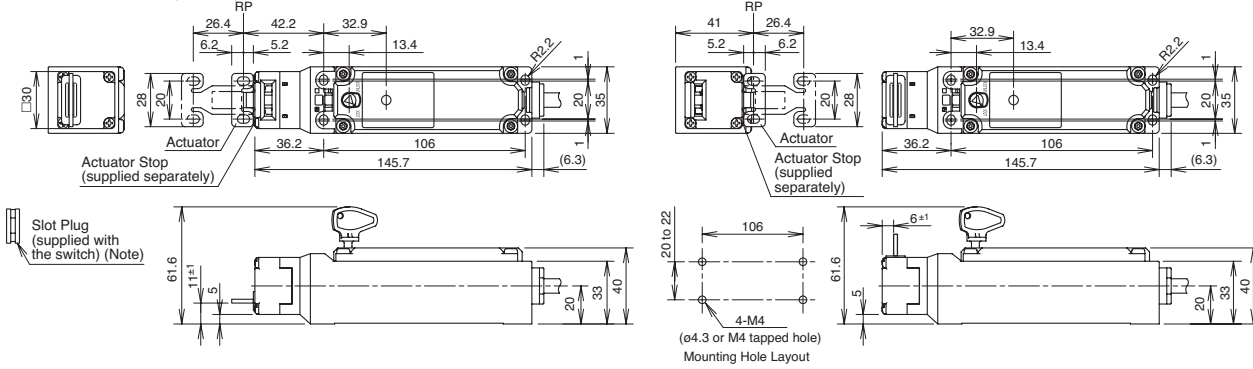
1. Minimum applicable load (reference value): 3V AC/DC, 5 mA
2. UL rating: 125V
3. TUV, BG rating: AC-15, 0.5A/250V, DC-13, 0.22A/125V
UL, c-UL rating: Pilot duty AC 0.5A/125V, Pilot duty DC 0.22A/125V

Pilot Light

| | |
|---------------|--------|
| Rated Voltage | 24V DC |
| Current | 10mA |
| Light Source | LED |
| Light Color | Green |

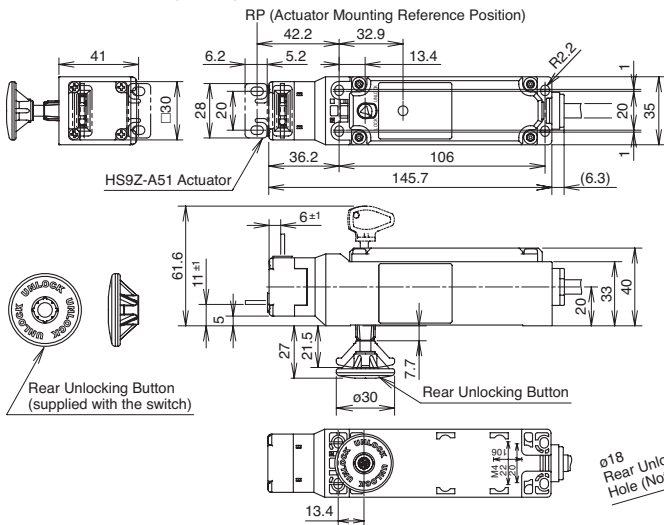
Dimensions (mm) and Mounting Hole Layouts

HS5E-□□4□-G (with indicator)
Horizontal Mounting/Straight Actuator (HS9Z-A51)



Vertical Mounting/Right-angle Actuator (HS9Z-A52)

HS5E-□44L□-G (rear unlocking button type)
Horizontal Mounting/Straight Actuator (HS9Z-A51)



Rear unlocking button mounting

- X ≤ 6 Panel mounting
- 6 < X < 23 Not mountable
- 23 ≤ X ≤ 33 Use HS9Z-FL53 rear unlocking button kit (Note)
- 33 < X ≤ 43 Use HS9Z-FL54 rear unlocking button kit (Note)

X = Panel thickness
 (including panel, mounting frame, and mounting plate)

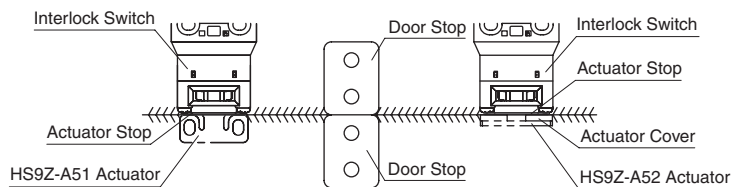
Note: See page 332 for details.

Note: With the mounting hole dimension, the rear unlocking button rod does not touch the hole even when the interlock switch moves sideways.

Actuator Mounting Reference Position

As shown in the figure on the right, 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.



Overview

XW Series E-Stops

Interlock Switches

Enabling Switches

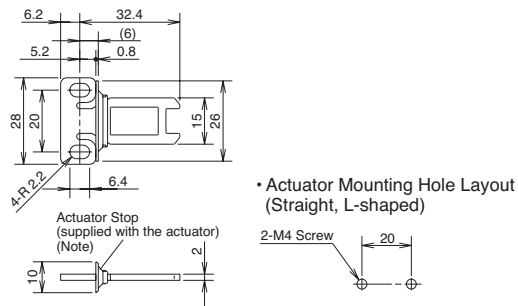
Safety Control Relays

Light Curtains

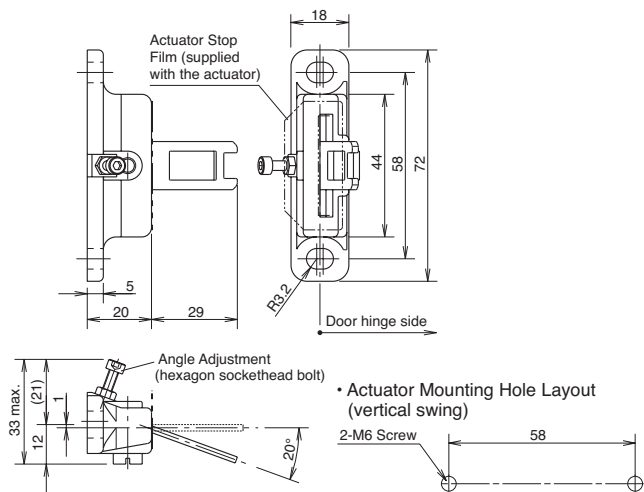
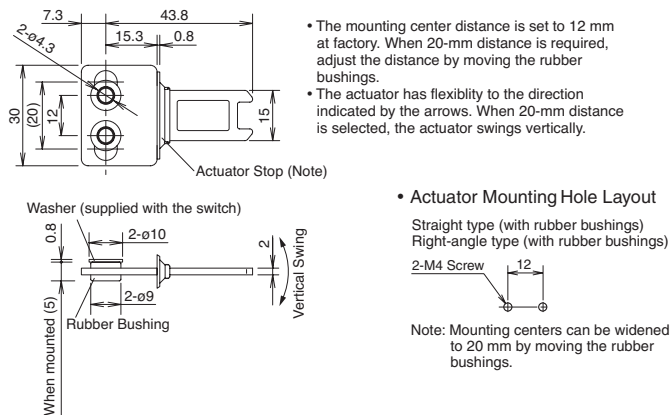
AS-Interface Safety at Work

Dimensions and Mounting Hole Layouts, continued

Straight Actuator (HS9Z-A51)



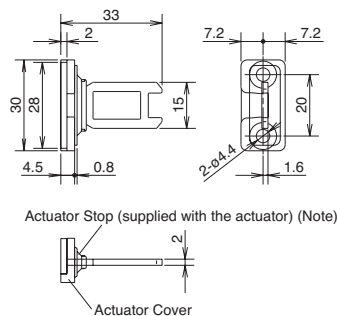
Straight Actuator w/Rubber Bushings (HS9Z-A51A)



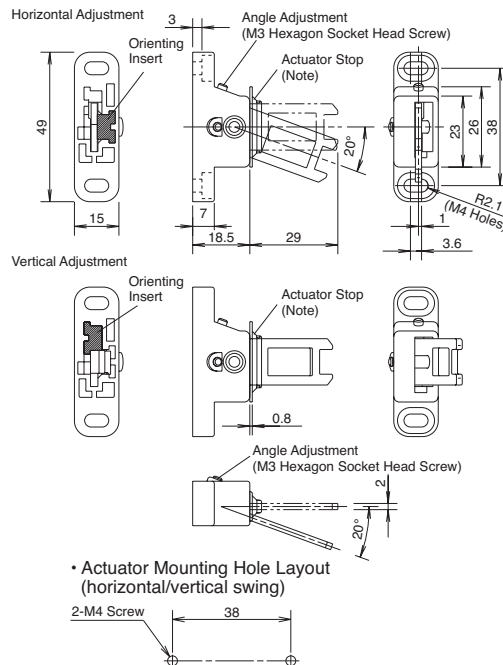
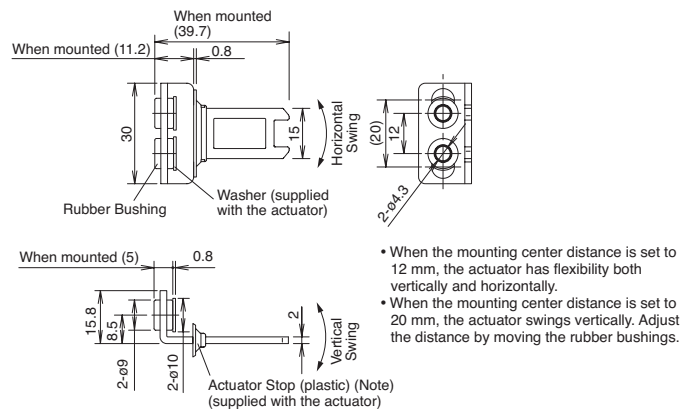
Actuator Orientation

The orientation of actuator swing (horizontal/vertical) can be changed using the orienting insert (white plastic) installed on the back of the actuator. Do not lose the orientating insert, otherwise the actuator will not swing properly.

Right-angle Actuator (HS9Z-A52)



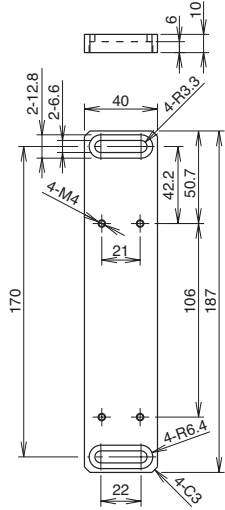
Right-angle Actuator w/Rubber Bushings (HS9Z-A52A)



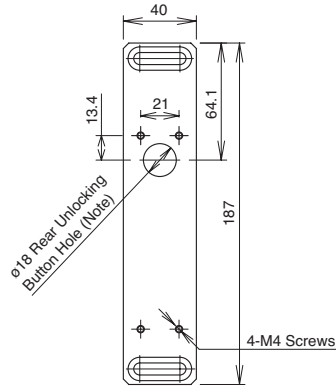
Dimensions and Mounting Hole Layouts, continued

Overview

Mounting Plate (HS9Z-SP51)

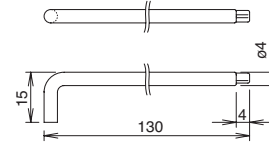


Drilling Rear Unlocking Button Hole

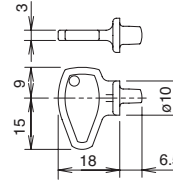


When installing the HS5E-□44□-G (rear unlocking button type), provide a rear unlocking button hole on the HS9Z-SP51.

Manual Unlocking Key (Metal) (HS9Z-T3)



Manual Unlocking Key (plastic)



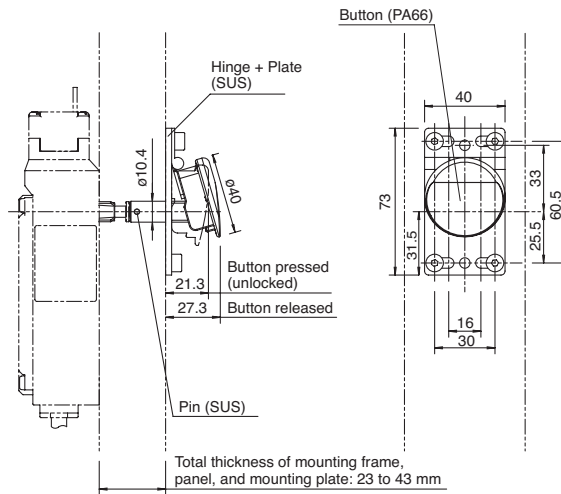
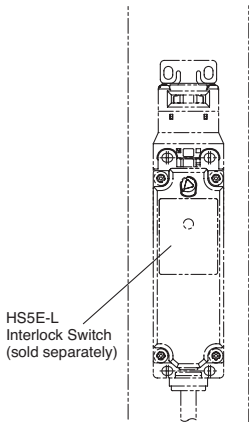
XW Series E-Stops

Interlock Switches

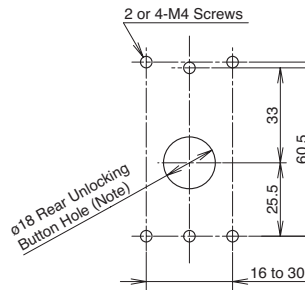
Material: Anodized aluminum A6063

Weight: Approx. 180g

Rear Unlocking Button Kit (HS9Z-FL5□)



Rear Unlocking Button Kit Mounting Hole Layout



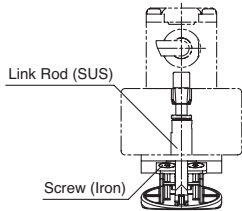
Note: With the mounting hole dimension, the rear unlocking button rod does not touch the hole even when the interlock switch moves sideways.

Enabling Switches

Safety Control Relays

Light Curtains

AS-Interface Safety at Work



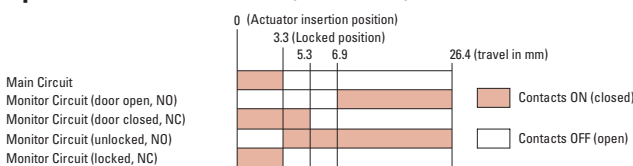
Circuit Diagrams and Operating Characteristics

Standard and Rear Unlocking Type - Spring Lock Type

| | | Status 1 | Status 2 | Status 3 | Status 4 | Manual Unlock | |
|----------------------------------|---|--|--|--|---|--|--------------------|
| Interlock Switch Status | | <ul style="list-style-type: none"> Door Closed Machine ready to operate Solenoid de-energized | <ul style="list-style-type: none"> Door Closed Machine cannot be operated Solenoid de-energized | <ul style="list-style-type: none"> Door Open Machine cannot be operated Solenoid de-energized | <ul style="list-style-type: none"> Door Open Machine cannot be operated Solenoid energized | <ul style="list-style-type: none"> Door Closed Machine cannot be operated Solenoid de-energized → energized | |
| Door Status | | | | | | Turn the manual unlock key (Note 1) Press the rear unlocking button (Note 2) | |
| Circuit Diagram (HS5E-A4) | | | | | | | |
| Door | | Closed (locked) | Closed (unlocked) | Open | Open | Closed (unlocked) | |
| Contact Configuration | HS5E-A4 Door Monitor (Actuator Inserted) Lock Monitor (Solenoid OFF) Main Circuit: 11-12 41-42 Monitor Circuit: 23-24 53-54 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) | |
| | HS5E-B4 Main Circuit: 11-12 41-42 Monitor Circuit: 23-24 51-52 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) | |
| | HS5E-C4 Main Circuit: 11-12 41-42 Monitor Circuit: 21-22 53-54 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) | |
| | HS5E-D4 Main Circuit: 11-12 41-42 Monitor Circuit: 21-22 51-52 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) | |
| | HS5E-F4 Main Circuit: 11-12 41-42 Monitor Circuit: 21-22 31-32 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) | |
| | HS5E-G4 Main Circuit: 11-12 41-42 Monitor Circuit: 21-22 33-34 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) | |
| | HS5E-H4 Main Circuit: 11-12 41-42 Monitor Circuit: 51-52 61-62 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) | |
| | HS5E-J4 Main Circuit: 11-12 41-42 Monitor Circuit: 51-52 63-64 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) | |
| | Solenoid Power A1-A2 (all types) | | OFF (de-energized) | ON (energized) | ON (energized) | OFF (de-energized) | OFF (de-energized) |

The above contact configuration shows the status when the actuator is inserted and locked.
 Main Circuit: Connected to the control circuit of machine drive part, sending interlock signals of the protective door.
 Monitor Circuit: Sends monitoring signals of protective door open/closed status or protective door lock/unlock status.

Operation Characteristics (reference)



The operation characteristics shown in the chart above are of 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.

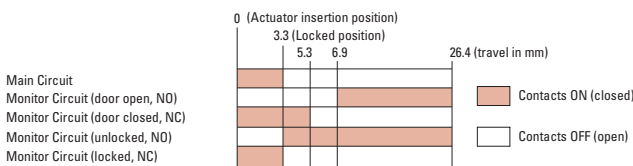
Standard Type - Solenoid Lock Type

| Interlock Switch Status | Status 1 | Status 2 | Status 3 | Status 4 | Manual Unlock | | |
|----------------------------------|---|--|--|---|-----------------------------|---|------------|
| | <ul style="list-style-type: none"> Door Closed Machine ready to operate Solenoid de-energized | <ul style="list-style-type: none"> Door Closed Machine cannot be operated Solenoid de-energized | <ul style="list-style-type: none"> Door Open Machine cannot be operated Solenoid de-energized | <ul style="list-style-type: none"> Door Open Machine cannot be operated Solenoid energized | | <ul style="list-style-type: none"> Door Closed Machine cannot be operated Solenoid de-energized energized | |
| Door Status | | | | | | | |
| Circuit Diagram (HS5E-A7Y) | | | | | | | |
| Door | Closed (locked) | Closed (unlocked) | Open | Open | Closed (unlocked) | | |
| Contact Configuration | HS5E-A7Y Door Monitor (Actuator inserted) Lock Monitor (Solenoid ON) Main Circuit: 11-12, 23-24, 41-42 Monitor Circuit: 23-24, 53-54 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) | |
| | HS5E-B7Y Main Circuit: 11-12, 23-24, 41-42 Monitor Circuit: 23-24, 51-52 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | HS5E-C7Y Main Circuit: 11-12, 21-22, 41-42 Monitor Circuit: 21-22, 53-54 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | HS5E-D7Y Main Circuit: 11-12, 21-22, 41-42 Monitor Circuit: 21-22, 51-52 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | HS5E-F7Y Main Circuit: 11-12, 21-22, 31-32, 41-42 Monitor Circuit: 21-22, 31-32 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | HS5E-G7Y Main Circuit: 11-12, 21-22, 33-34, 41-42 Monitor Circuit: 21-22, 33-34 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | HS5E-H7Y Main Circuit: 11-12, 51-52, 61-62, 41-42 Monitor Circuit: 51-52, 61-62 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | HS5E-J7Y Main Circuit: 11-12, 51-52, 63-64, 41-42 Monitor Circuit: 51-52, 63-64 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | Solenoid Power A1-A2 (all types) | ON (energized) | OFF (de-energized) | OFF (de-energized) | ON (energized) ² | OFF to ON ^{1,2} | |

The above contact configuration shows the status when the actuator is inserted and locked.
Main Circuit: Connected to the control circuit of machine drive part, sending interlock signals of the protective door.
Monitor Circuit: Sends monitoring signals of protective door open/closed status or protective door lock/unlock status.

- 1: Actuator can be unlocked manually for confirming the door movement before wiring and energizing, and also for emergency situation such as power failure.
- 2: When the operator is confined in a hazardous zone, the actuator can be unlocked manually by pressing the rear unlocking button.

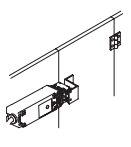
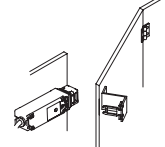
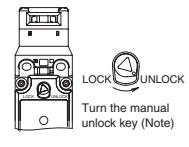
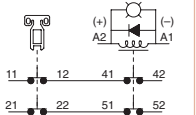
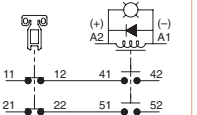
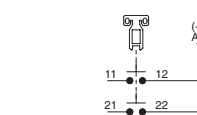
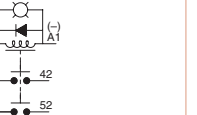
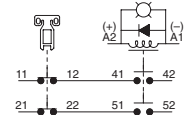
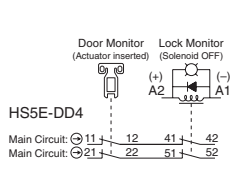
Operation Characteristics (reference)




The operation characteristics shown in the chart above are of 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.

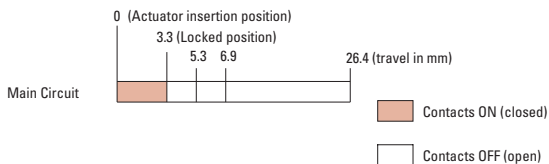
Dual Safety Circuit Type

| | | Status 1 | Status 2 | Status 3 | Status 4 | Manual Unlock |
|-----------------------------------|---|--|---|---|--|--|
| Interlock Switch Status | | <ul style="list-style-type: none"> Door Closed Machine ready to operate Solenoid de-energized | <ul style="list-style-type: none"> Door Closed Machine cannot be operated Solenoid energized | <ul style="list-style-type: none"> Door Open Machine cannot be operated Solenoid energized | <ul style="list-style-type: none"> Door Open Machine cannot be operated Solenoid de-energized | <ul style="list-style-type: none"> Door Closed Machine cannot be operated Solenoid de-energized |
| Door Status | |  | |  | |  |
| Circuit Diagram (HS5E-A7Y) | |  |  |  |  |  |
| Door | | Closed (locked) | Closed (unlocked) | Open | Open | Closed (unlocked) |
| Contact Configuration |  <p>Door Monitor (Actuator inserted) Lock Monitor (Solenoid OFF)</p> <p>HS5E-DD4</p> <p>Main Circuit: 11-12 41-42</p> <p>Main Circuit: 21-22 51-52</p> | Main Circuit 11-42 | ON (closed) | OFF (open) | OFF (open) | OFF (open) |
| | | Main Circuit 21-52 | ON (closed) | OFF (open) | OFF (open) | OFF (open) |
| | | Solenoid Power A1-A2 (all types) | OFF (de-energized) | ON (energized) | ON (energized) | OFF (de-energized) |

 The above contact configuration shows the status when the actuator is inserted and locked.
 Main Circuit: Connected to the control circuit of machine drive part, sending interlock signals of the protective door.

Note: Actuator can be unlocked manually for confirming the door movement before wiring and energizing, and also for emergency situation such as power failure.

Operation Characteristics (reference)



The operation characteristics shown in the chart above are of 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.

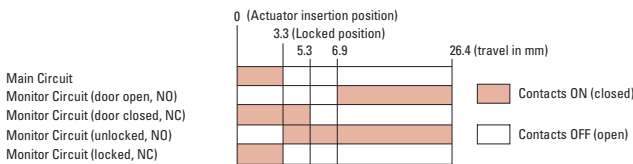
Standard Type - Solenoid Lock Type

| | | Status 1 | Status 2 | Status 3 | Status 4 | Manual Unlock | |
|---|--|--|---|---|--|--|-------------|
| Interlock Switch Status | | <ul style="list-style-type: none"> Door Closed Machine ready to operate Solenoid de-energized | <ul style="list-style-type: none"> Door Closed Machine cannot be operated Solenoid energized | <ul style="list-style-type: none"> Door Open Machine cannot be operated Solenoid energized | <ul style="list-style-type: none"> Door Open Machine cannot be operated Solenoid de-energized | <ul style="list-style-type: none"> Door Closed Machine cannot be operated Solenoid de-energized | |
| Door Status | | | | | | | |
| Circuit Diagram (HS5E-VA4) | | | | | | | |
| Door | | Closed (locked) | Closed (unlocked) | Open | Open | Closed (unlocked) | |
| Contact Configuration | HS5E-VA4 Door Monitor (Actuator inserted) Lock Monitor (Solenoid OFF) Monitor Circuit: 11-12, 23-24, 41-42, 53-54 Monitor Circuit: 11-12, 23-24, 41-42, 53-54 Monitor Circuit: 11-12, 23-24, 41-42, 53-54 | Main Circuit 11-42 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) |
| | | Monitor Circuit (door open) 23-24 | OFF (open) | OFF (open) | ON (closed) | ON (closed) | OFF (open) |
| | | Monitor Circuit (door open) 41-42 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | HS5E-VB4 Monitor Circuit: 11-12, 23-24, 41-42, 51-52 Monitor Circuit: 11-12, 23-24, 41-42, 51-52 Monitor Circuit: 11-12, 23-24, 41-42, 51-52 | Main Circuit 11-42 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) |
| | | Monitor Circuit (door open) 23-24 | OFF (open) | OFF (open) | ON (closed) | ON (closed) | OFF (open) |
| | | Monitor Circuit (door open) 41-42 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | HS5E-VC4 Monitor Circuit: 11-12, 21-22, 41-42, 53-54 Monitor Circuit: 11-12, 21-22, 41-42, 53-54 Monitor Circuit: 11-12, 21-22, 41-42, 53-54 | Main Circuit 11-42 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) |
| | | Monitor Circuit (door closed) 21-22 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) |
| | | Monitor Circuit (door open) 41-42 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | HS5E-VD4 Monitor Circuit: 11-12, 21-22, 51-52 Monitor Circuit: 11-12, 21-22, 51-52 Monitor Circuit: 11-12, 21-22, 51-52 | Main Circuit 11-42 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) |
| | | Monitor Circuit (door closed) 21-22 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) |
| | | Monitor Circuit (door open) 41-42 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| Solenoid Power A1-A2 (all types) | | OFF (de-energized) | ON (energized) | ON (energized) | OFF (de-energized) | OFF (de-energized) | |

The above contact configuration shows the status when the actuator is inserted and locked.
 Monitor Circuit: Sends monitoring signals of protective door open/closed status or protective door lock/unlock status.

Note: Actuator can be unlocked manually for confirming the door movement before wiring and energizing, and also for emergency situation such as power failure.

Operation Characteristics (reference)



The operation characteristics shown in the chart above are of 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.

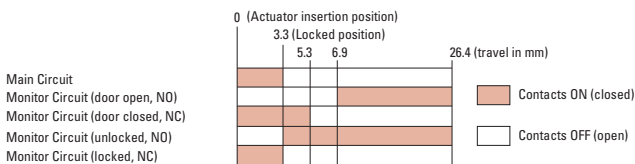
Standard Type - Solenoid Lock Type

| Interlock Switch Status | Status 1 | Status 2 | Status 3 | Status 4 | Manual Unlock | | |
|----------------------------------|---|--|--|---|--------------------|---|-------------|
| | <ul style="list-style-type: none"> Door Closed Machine ready to operate Solenoid energized | <ul style="list-style-type: none"> Door Closed Machine cannot be operated Solenoid de-energized | <ul style="list-style-type: none"> Door Open Machine cannot be operated Solenoid de-energized | <ul style="list-style-type: none"> Door Open Machine cannot be operated Solenoid energized | | <ul style="list-style-type: none"> Door Closed Machine cannot be operated Solenoid de-energized → energized | |
| Door Status | | | | | | | |
| Circuit Diagram (HS5E-VA4) | | | | | | | |
| Door | Closed (locked) | Closed (unlocked) | Open | Open | Closed (unlocked) | | |
| Contact Configuration | HS5E-VA7Y Monitor Circuit: 11-12, 23-24, 41-42, 53-54 Lock Monitor (Solenoid ON) | Main Circuit 11-42 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) |
| | | Monitor Circuit (door open) 23-24 | OFF (open) | OFF (open) | ON (closed) | ON (closed) | OFF (open) |
| | | Monitor Circuit (door open) 41-42 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | | Monitor Circuit (unlocked) 53-54 | OFF (open) | ON (closed) | ON (closed) | ON (closed) | ON (closed) |
| | HS5E-VB7Y Monitor Circuit: 11-12, 23-24, 41-42, 51-52 | Main Circuit 11-42 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) |
| | | Monitor Circuit (door open) 23-24 | OFF (open) | OFF (open) | ON (closed) | ON (closed) | OFF (open) |
| | | Monitor Circuit (door open) 41-42 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | | Monitor Circuit (locked) 51-52 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | HS5E-VC7Y Monitor Circuit: 11-12, 21-22, 23-24, 41-42, 53-54 | Main Circuit 11-42 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) |
| | | Monitor Circuit (door closed) 21-22 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) |
| | | Monitor Circuit (door open) 41-42 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | | Monitor Circuit (unlocked) 53-54 | OFF (open) | ON (closed) | ON (closed) | ON (closed) | ON (closed) |
| | HS5E-VD7Y Monitor Circuit: 11-12, 21-22, 41-42, 51-52 | Main Circuit 11-42 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) |
| | | Monitor Circuit (door closed) 21-22 | ON (closed) | ON (closed) | OFF (open) | OFF (open) | ON (closed) |
| | | Monitor Circuit (door open) 41-42 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| | | Monitor Circuit (locked) 51-52 | ON (closed) | OFF (open) | OFF (open) | OFF (open) | OFF (open) |
| Solenoid Power A1-A2 (all types) | OFF (de-energized) | ON (energized) | ON (energized) | OFF (de-energized) | OFF (de-energized) | | |

The above contact configuration shows the status when the actuator is inserted and locked.
 Monitor Circuit: Sends monitoring signals of protective door open/closed status or protective door lock/unlock status.

Note: Actuator can be unlocked manually for confirming the door movement before wiring and energizing, and also for emergency situation such as power failure.

Operation Characteristics (reference)



The operation characteristics shown in the chart above are of 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.

Operating Instructions

Minimum Radius of Hinged Door

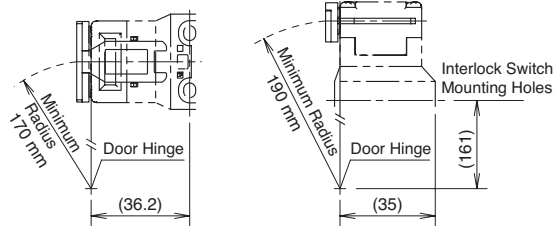
- When using the interlock switch for a hinged door, refer to the minimum radius of doors shown below. For the doors with small minimum radius, use angle adjustable actuators (HS9Z-A53 or HS9Z-A55).



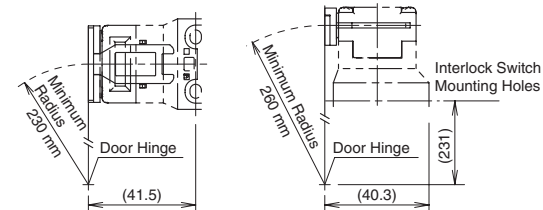
Because deviation or dislocation of hinged door may occur in actual applications, make sure of the correct operation before installation.

HS9Z-A52 Actuator

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

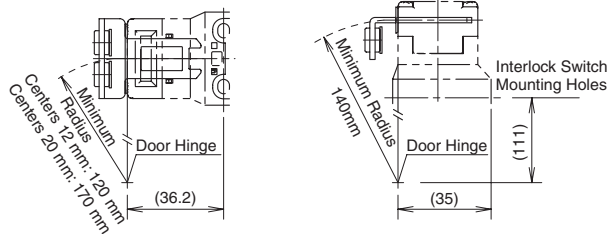


When the door hinge is on the extension line of the actuator mounting surface:

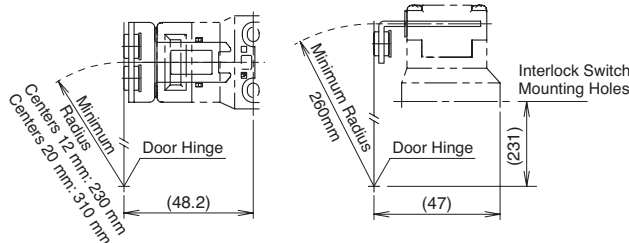


HS9Z-A52 Actuator (w/rubber bushings)

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:



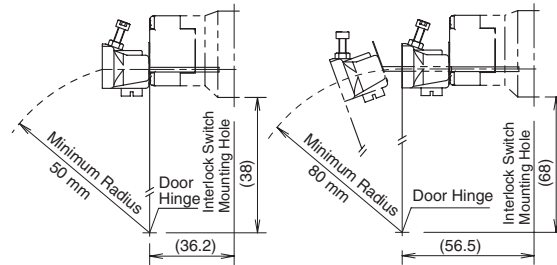
Actuator Angle Adjustment

- Using the angle adjustment screw, the actuator angle can be adjusted (refer to the dimensional drawing on page 330). 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 move.

When using the HS9Z-A53 Angle Adjustable (vertical) Actuator

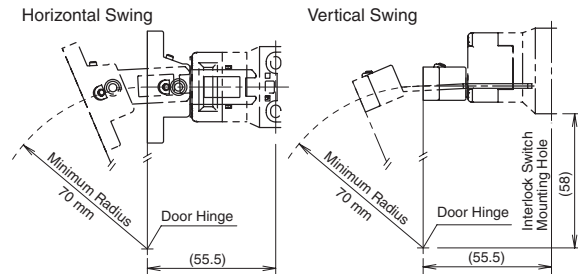
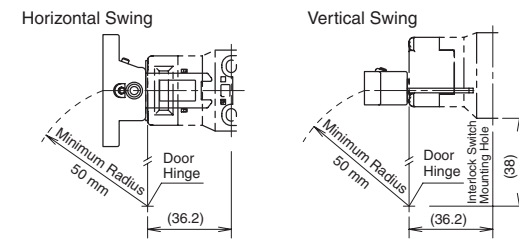
When the door hinge is on the extension line of the interlock switch surface: 50 mm

When the door hinge is on the extension line of the actuator mounting surface: 80 mm



When using the HS9Z-A55 Angle Adjustable (vertical/horizontal) Actuator

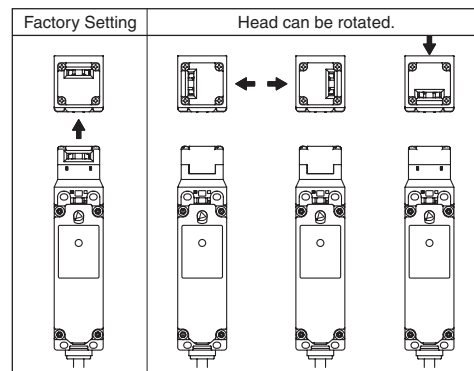
When the door hinge is on the extension line of the interlock switch surface: 50 mm



When the door hinge is on the extension line of the actuator mounting surface: 70 mm

Rotating the Head

The head of the HS5E can be rotated by removing the four screws from the corners of the HS5E head and reinstalling the head in the desired orientation. Before wiring the HS5E, replace the head if necessary. Before replacing the head, turn the manual unlock to the UNLOCK position using the manual unlock key. When reinstalling the head, make sure that no foreign object enters the interlock switch. Tighten the screws tightly, without leaving space between the head and body, otherwise the interlock switch may malfunction. Recommended tightening torque: 0.9 to 1.1 N·m.



Overview

XW Series E-Stops

Interlock Switches

Enabling Switches

Safety Control Relays

Light Curtains

AS-Interface Safety at Work

Instructions, continued

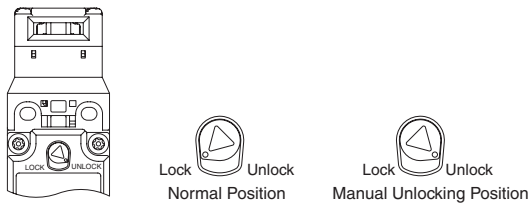
For Manual Unlocking

Spring lock type

The HS5E allows manual unlocking of the actuator to pre-check proper door movement before wiring or turning power on, as well as for emergency use such as a power failure.

Solenoid lock type

The solenoid lock type interlock switch normally does not need the manual unlock. However, only when the interlock switch would not release the actuator even though the solenoid is de-energized, the interlock switch can be unlocked manually. Unlock the interlock switch manually only when the solenoid is de-energized. Do not unlock the interlock switch manually when the solenoid is energized.

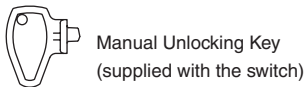


When locking or unlocking the interlock switch manually, turn the key fully using the manual unlock key supplied with the interlock switch.

Using the interlock switch with the key not fully turned (less than 90°) may cause damage to the interlock switch or operation failures (when manually unlocked, the interlock switch will keep the main circuit disconnected and the door unlocked).

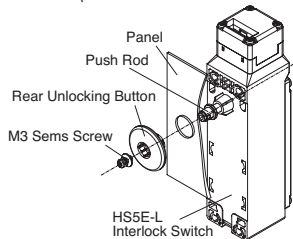
Do not apply excessive force to the manual unlock, otherwise the manual unlock will become damaged.

Do not leave the manual unlock key attached to the interlock switch during operation. This is dangerous because the interlock switch can always be unlocked while the machine is in operation.



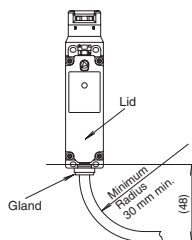
Installing the Rear Unlocking Button

After installing the interlock switch on the panel, place the rear unlocking button (supplied with the switch) on the push rod on the back of the interlock switch, and fasten the button using the M3 sems screw. Rear unlocking button can be installed alone when the total thickness of mounting frame and panel is 6 mm or less. When the total thickness of mounting frame, panel, and mounting plate is 23 to 43 mm, use the rear unlocking button kit (HS9Z-FL53 or HS9Z-FL54) sold separately.



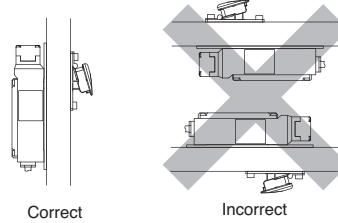
Cables

- When bending the cable during wiring, make sure that the cable radius is kept at 30 mm minimum.
- Solenoid has polarity. Be sure of the correct polarity when wiring.



Safety Precautions

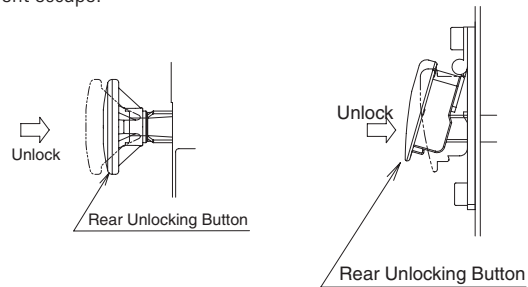
Install the rear unlocking button kit in the correct direction as shown below. Do not install the kit in incorrect directions, otherwise malfunction will be caused.



Do not apply strong force exceeding 100 m/s² to the interlock switch while the rear unlocking button is not pressed, otherwise malfunction will be caused.

Manual Unlocking using the Rear Unlocking Button

The rear unlocking button is used by the operator confined in a hazardous area for emergent escape.



How to operate

When the rear unlocking button is pressed, the interlock switch is unlocked and the door can be opened.

To lock the interlock switch, pull back the button.

When the button remains pressed, the interlock switch cannot be locked even if the door is closed, and the main circuit remains open.

Recommended Tightening Torque

- HS5E interlock switch: 1.8 to 2.2 N·m (four M4 screws) (Note)
- Rear unlocking button: 0.5 to 0.7 N·m
- Rear unlocking button kit: 4.8 to 5.2 N·m (M5 screw)
- Actuators
 - HS9Z-A51: 1.8 to 2.2 N·m (two M4 screws)
 - HS9Z-A52: 0.8 to 1.2 N·m (two M4 Phillips screws)
 - HS9Z-A51A/A52A: 1.0 to 1.5 N·m (two M4 screws)
 - HS9Z-A53: 4.5 to 5.5 N·m (two M6 screws)
 - HS9Z-A55: 1.0 to 1.5 N·m (two M4 screws)

Note: The above recommended tightening torque of the mounting screws are the values with hex socket head bolts. When other screws are used and tightened to a smaller torque, make sure that the screws do not become loose after mounting.

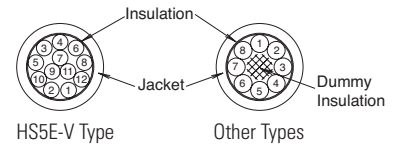
Instructions, continued

Wire Identification

Wires can be identified by color and a white line printed on the wire.

- HS5E-V: Wires of gray and gray/white insulation cannot be used.
- HS5E-DD: Wires of brown and brown/white insulation cannot be used.

| No. | Insulation | No. | Insulation | No. | Insulation | No. | Insulation |
|-----|------------|-----|-------------|-----|--------------|-----|------------|
| 1 | White | 4 | Blue | 7 | Blue/White | 10 | Pink/White |
| 2 | Black | 5 | Brown/White | 8 | Orange/White | 11 | Gray |
| 3 | Brown | 6 | Orange | 9 | Pink | 12 | Gray/White |



Terminal Number Identification

- When wiring, the terminal number of each contact can be identified by wire color.
- The following table shows the identification of terminal numbers.

| Type | Circuit Diagram |
|---------|--|
| HS5E-A | <p>Main Circuit: Blue 11 12 41 42 Blue/White Monitor Circuit: Orange 23 24 Orange/White Monitor Circuit: Brown 53 54 Brown/White</p> |
| HS5E-B | <p>Main Circuit: Blue 11 12 41 42 Blue/White Monitor Circuit: Orange 23 24 Orange/White Monitor Circuit: Brown 51 52 Brown/White</p> |
| HS5E-C | <p>Main Circuit: Blue 11 12 41 42 Blue/White Monitor Circuit: Orange 21 22 Orange/White Monitor Circuit: Brown 53 54 Brown/White</p> |
| HS5E-D | <p>Main Circuit: Blue 11 12 41 42 Blue/White Monitor Circuit: Orange 21 22 Orange/White Monitor Circuit: Brown 51 52 Brown/White</p> |
| HS5E-F | <p>Main Circuit: Blue 11 12 41 42 Blue/White Monitor Circuit: Orange 21 22 Orange/White Monitor Circuit: Brown 31 32 Brown/White</p> |
| HS5E-G | <p>Main Circuit: Blue 11 12 41 42 Blue/White Monitor Circuit: Orange 21 22 Orange/White Monitor Circuit: Brown 33 34 Brown/White</p> |
| HS5E-H | <p>Main Circuit: Blue 11 12 41 42 Blue/White Monitor Circuit: Brown 51 52 Brown/White Monitor Circuit: Orange 61 62 Orange/White</p> |
| HS5E-J | <p>Main Circuit: Blue 11 12 41 42 Blue/White Monitor Circuit: Brown 51 52 Brown/White Monitor Circuit: Orange 63 64 Orange/White</p> |
| HS5E-DD | <p>Main Circuit: Blue 11 12 41 42 Blue/White Main Circuit: Orange 21 22 51 52 Orange/White</p> |

| Type | Circuit Diagram |
|---------|---|
| HS5E-VA | <p>Monitor Circuit: Blue 11 12 Blue/White Pink 41 42 Pink/White Monitor Circuit: Orange 23 24 Orange/White Monitor Circuit: Brown 53 54 Brown/White</p> |
| HS5E-VB | <p>Monitor Circuit: Blue 11 12 Blue/White Pink 41 42 Pink/White Monitor Circuit: Orange 23 24 Orange/White Monitor Circuit: Brown 51 52 Brown/White</p> |
| HS5E-VC | <p>Monitor Circuit: Blue 11 12 Blue/White Pink 41 42 Pink/White Monitor Circuit: Orange 21 22 Orange/White Monitor Circuit: Brown 53 54 Brown/White</p> |
| HS5E-VD | <p>Monitor Circuit: Blue 11 12 Blue/White Pink 41 42 Pink/White Monitor Circuit: Orange 21 22 Orange/White Monitor Circuit: Brown 51 52 Brown/White</p> |



The above contact configuration shows the status when the actuator is inserted and locked.



When wiring, cut unnecessary wires such as the dummy insulation (white) and any unused wires.

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