

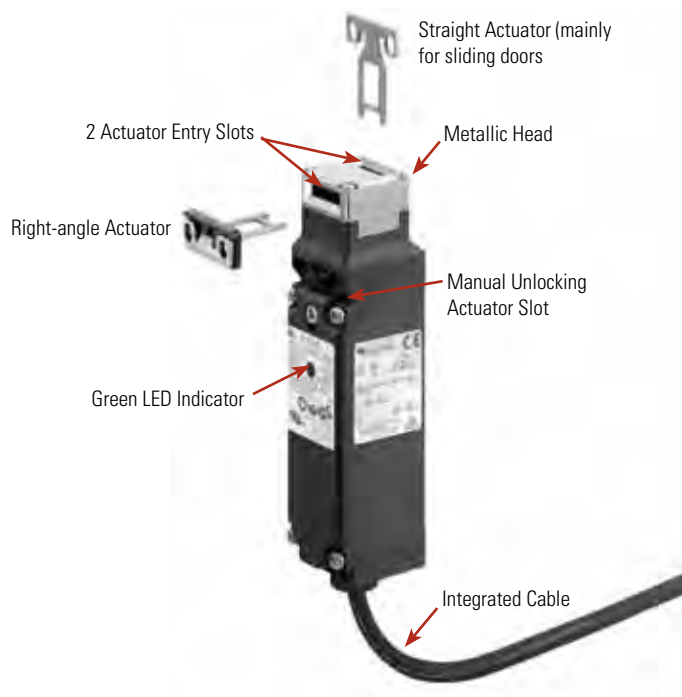
HS5E Miniature Interlock Switches with Solenoid

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 VA Lock)

Circuit Code	Contact Configuration	Cable Length	Part Number		
			Without LED	With LED	With LED and Rear Unlock Button
A	Door Monitor (Actuator Inserted) Lock Monitor (Solenoid OFF)	1m	HS5E-A4001	HS5E-A4401-G	HS5E-A44L01-G
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-A4003	HS5E-A4403-G	HS5E-A44L03-G
Door Monitor Circuit: 1NO	Monitor Circuit:	5m	HS5E-A4005	HS5E-A4405-G	HS5E-A44L05-G
Lock Monitor Circuit: 1NO	Monitor Circuit:				
B	Door Monitor (Actuator Inserted) Lock Monitor (Solenoid OFF)	1m	HS5E-B4001	HS5E-B4401-G	
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-B4003	HS5E-B4403-G	
Door Monitor Circuit: 1NO	Monitor Circuit:	5m	HS5E-B4005	HS5E-B4405-G	
Lock Monitor Circuit: 1NC	Monitor Circuit:				
C	Door Monitor (Actuator Inserted) Lock Monitor (Solenoid OFF)	1m	HS5E-C4001	HS5E-C4401-G	HS5E-C44L01-G
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-C4003	HS5E-C4403-G	HS5E-C44L03-G
Door Monitor Circuit: 1NC	Monitor Circuit:	5m	HS5E-C4005	HS5E-C4405-G	HS5E-C44L05-G
Lock Monitor Circuit: 1NO	Monitor Circuit:				
D	Door Monitor (Actuator Inserted) Lock Monitor (Solenoid OFF)	1m	HS5E-D4001	HS5E-D4401-G	HS5E-D44L01-G
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-D4003	HS5E-D4403-G	HS5E-D44L03-G
Door Monitor Circuit: 1NC	Monitor Circuit:	5m	HS5E-D4005	HS5E-D4405-G	HS5E-D44L05-G
Lock Monitor Circuit: 1NC	Monitor Circuit:				
F	Door Monitor (Actuator Inserted) Lock Monitor (Solenoid OFF)	1m	HS5E-F4001	HS5E-F4401-G	HS5E-F44L01-G
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-F4003	HS5E-F4403-G	HS5E-F44L03-G
Door Monitor Circuit: 2NC	Monitor Circuit:	5m	HS5E-F4005	HS5E-F4405-G	HS5E-F44L05-G
G	Door Monitor (Actuator Inserted) Lock Monitor (Solenoid OFF)	1m	HS5E-G4001	HS5E-G4401-G	HS5E-G44L01-G
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-G4003	HS5E-G4403-G	HS5E-G44L03-G
Door Monitor Circuit: 1NC, 1NO	Monitor Circuit:	5m	HS5E-G4005	HS5E-G4405-G	HS5E-G44L05-G
H	Door Monitor (Actuator Inserted) Lock Monitor (Solenoid OFF)	1m	HS5E-H4001	HS5E-H4401-G	
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-H4003	HS5E-H4403-G	
Door Monitor Circuit: 2NC	Monitor Circuit:	5m	HS5E-H4005	HS5E-H4405-G	
J	Door Monitor (Actuator Inserted) Lock Monitor (Solenoid OFF)	1m	HS5E-J4001	HS5E-J4401-G	
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-J4003	HS5E-J4403-G	
Door Monitor Circuit: 1NC, 1NO	Monitor Circuit:	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.

Dual Safety Circuit type

Circuit Code	Contact Configuration	Cable Length	Part Number
DD	Door Monitor (Actuator Inserted) Lock Monitor (Solenoid ON)	1m	HS5E-DD4401-G
		3m	HS5E-DD4403-G
		5m	HS5E-DD4405-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.

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.

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.

Overview

XW Series E-Stops

Interlock Switches

Enabling Switches

Safety Control Relays

Light Curtains

AS-Interface Safety at Work

Solenoid Lock Type (Remove Power to Unlock)

Circuit Code	Contact Configuration	Cable Length	Part Number	
			Without LED	With LED
A	Door Monitor (Actuator Inserted) Lock Monitor (Solenoid OFF)	1m	HS5E-A7Y001	HS5E-A7Y401-G
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-A7Y003	HS5E-A7Y403-G
Door Monitor Circuit: 1NO	Monitor Circuit:	5m	HS5E-A7Y005	HS5E-A7Y405-G
Lock Monitor Circuit: 1NO	Monitor Circuit:			
B		1m	HS5E-B7Y001	HS5E-B7Y401-G
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-B7Y003	HS5E-B7Y403-G
Door Monitor Circuit: 1NO	Monitor Circuit:	5m	HS5E-B7Y005	HS5E-B7Y405-G
Lock Monitor Circuit: 1NC	Monitor Circuit:			
C		1m	HS5E-C7Y001	HS5E-C7Y401-G
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-C7Y003	HS5E-C7Y403-G
Door Monitor Circuit: 1NC	Monitor Circuit:	5m	HS5E-C7Y005	HS5E-C7Y405-G
Lock Monitor Circuit: 1NO	Monitor Circuit:			
D		1m	HS5E-D7Y001	HS5E-D7Y401-G
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-D7Y003	HS5E-D7Y403-G
Door Monitor Circuit: 1NC	Monitor Circuit:	5m	HS5E-D7Y005	HS5E-D7Y405-G
Lock Monitor Circuit: 1NC	Monitor Circuit:			
F		1m	HS5E-F7Y001	HS5E-F7Y401-G
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-F7Y003	HS5E-F7Y403-G
Door Monitor Circuit: 2NC	Monitor Circuit:	5m	HS5E-F7Y005	HS5E-F7Y405-G
G		1m	HS5E-G7Y001	HS5E-G7Y401-G
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-G7Y003	HS5E-G7Y403-G
Door Monitor Circuit: 1NC, 1NO	Monitor Circuit:	5m	HS5E-G7Y005	HS5E-G7Y405-G
H		1m	HS5E-H7Y001	HS5E-H7Y401-G
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-H7Y003	HS5E-H7Y403-G
Door Monitor Circuit: 2NC	Monitor Circuit:	5m	HS5E-H7Y005	HS5E-H7Y405-G
J		1m	HS5E-J7Y001	HS5E-J7Y401-G
Main Circuit: 1NC+1NC	Main Circuit:	3m	HS5E-J7Y003	HS5E-J7Y403-G
Door Monitor Circuit: 1NC, 1NO	Monitor Circuit:	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.

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.		

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

Pilot Light

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

Current Ratings

Rated Insulation Voltage (U _i) 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)	—	2A	1A
		Inductive Load (AC15)	—	1A	0.5A
	DC	Resistive load (DC12)	2A	0.4A	0.2A
		Inductive Load (DC13)	1A	0.22A	0.1A

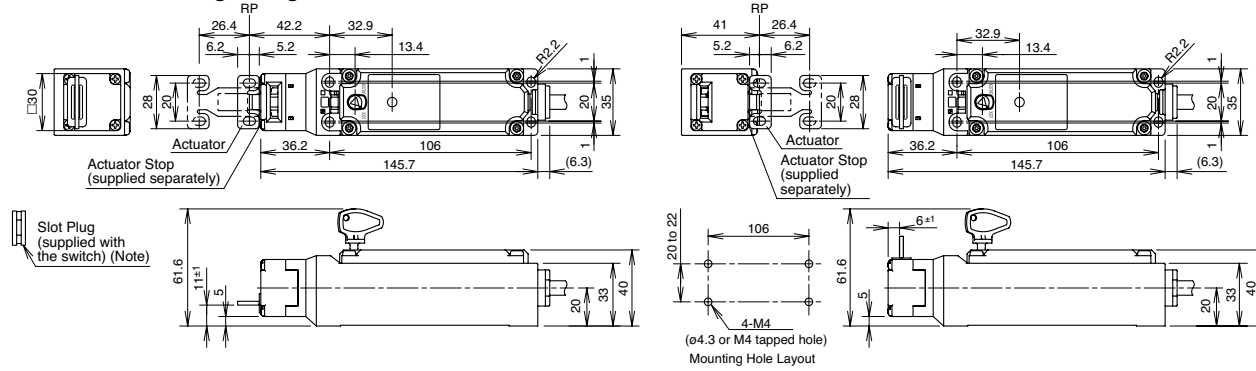


1. Minimum applicable load (reference value): 3V AC/DC, 5 mA
2. UL rating: 125V
3. TUV, BG rating: AC-15, 0.5A/250V, DC-13, 0.22A/125V
UL, c-UL rating: Pilot duty AC 0.5A/125V, Pilot duty DC 0.22A/125V

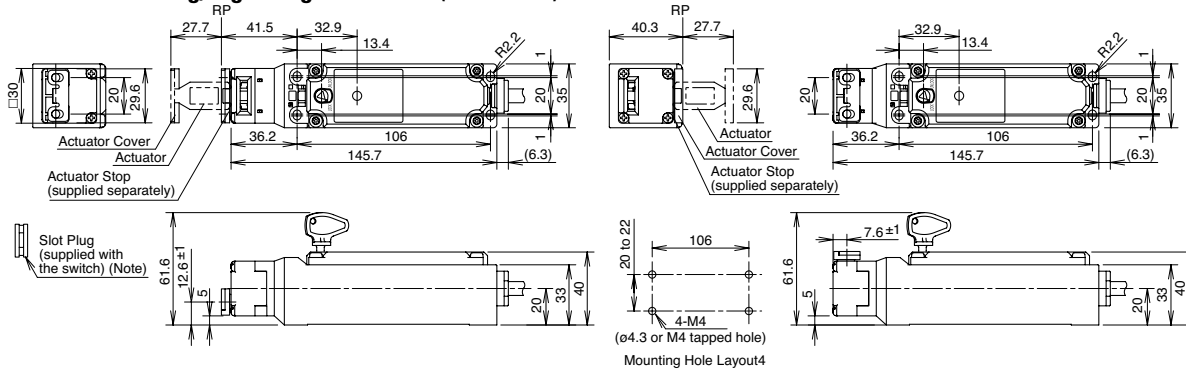
Dimensions (mm) and Mounting Hole Layouts

HS5E-□□4□-G (with indicator)

Horizontal Mounting/Straight Actuator (HS9Z-A51)

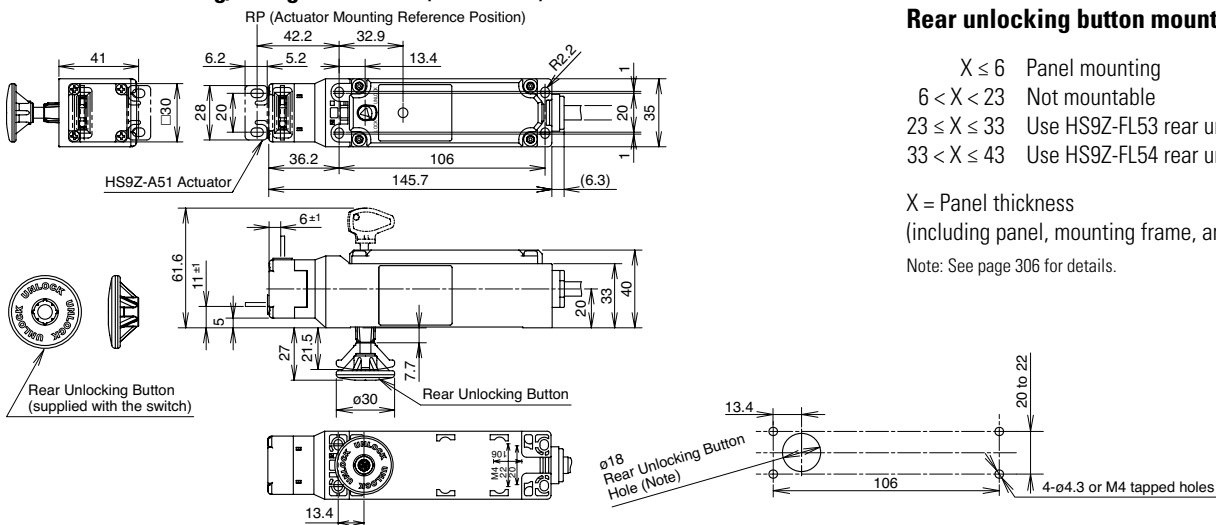


Vertical Mounting/Right-angle Actuator (HS9Z-A52)



HS5E-□44L□-G (rear unlocking button type)

Horizontal Mounting/Straight Actuator (HS9Z-A51)



Rear unlocking button mounting

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

X = Panel thickness

(including panel, mounting frame, and mounting plate)

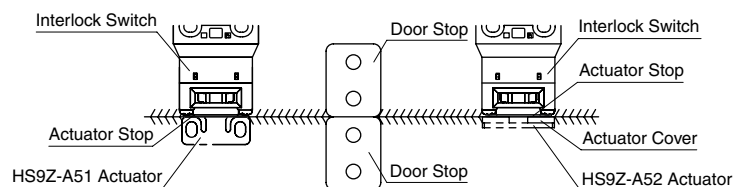
Note: See page 306 for details.

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

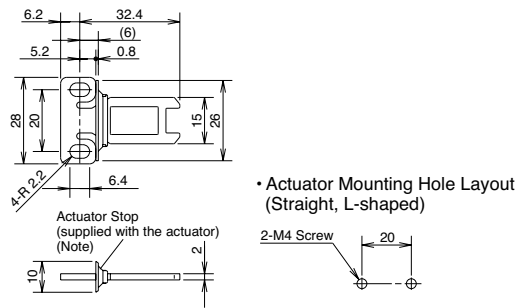
As shown in the figure on the right, the mounting reference position of the actuator when inserted in the interlock switch is where the actuator stop placed on the actuator lightly touches the interlock switch.

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

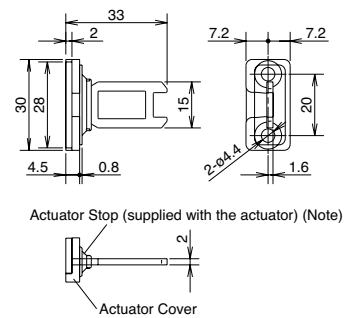


Dimensions and Mounting Hole Layouts, continued

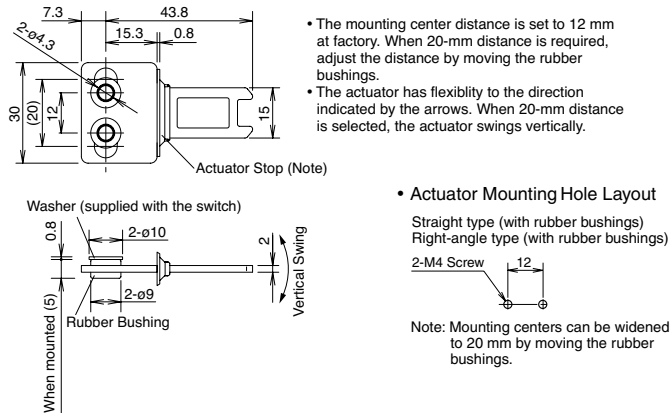
Straight Actuator (HS9Z-A51)



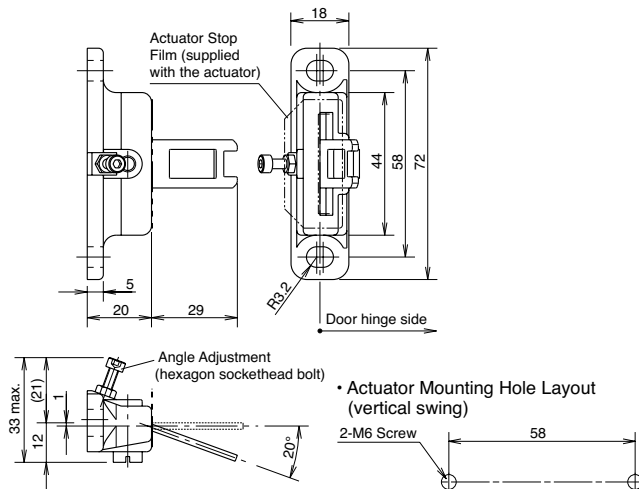
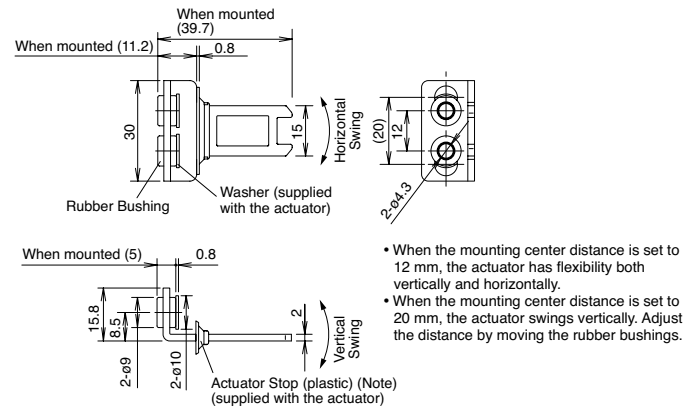
Right-angle Actuator (HS9Z-A52)



Straight Actuator w/Rubber Bushings (HS9Z-A51A)

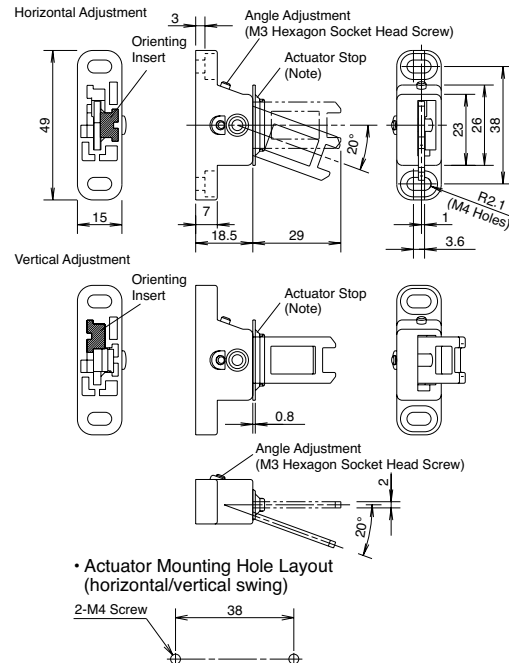


Right-angle Actuator w/Rubber Bushings (HS9Z-A52A)



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 orienting insert, otherwise the actuator will not swing properly.



Circuit Diagrams and Operating Characteristics

Standard and Rear Unlocking Type - Spring Lock Type

Interlock Switch Status		Status 1	Status 2	Status 3	Status 4	Manual Unlock
		- Door Closed - Machine ready to operate - Solenoid de-energized	- Door Closed - Machine cannot be operated - Solenoid de-energized	- Door Open - Machine cannot be operated - Solenoid de-energized	- Door Open - Machine cannot be operated - Solenoid energized	- Door Closed - Machine cannot be operated - Solenoid de-energized → energized
Door Status						
Circuit Diagram (HS5E-A4)						
Door		Closed (locked)	Closed (unlocked)	Open	Open	Closed (unlocked)
Contact Configuration	 Main Circuit: 11-12 41-42 Monitor Circuit: 23-24 53-54	ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
	 Main Circuit: 11-12 41-42 Monitor Circuit: 23-24 51-52	ON (closed)	OFF (open)	OFF (open)	ON (closed)	OFF (open)
	 Main Circuit: 11-12 41-42 Monitor Circuit: 21-22 53-54	ON (closed)	OFF (open)	OFF (open)	ON (closed)	ON (closed)
	 Main Circuit: 11-12 41-42 Monitor Circuit: 21-22 51-52	ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
	 Main Circuit: 11-12 41-42 Monitor Circuit: 21-22 31-32	ON (closed)	ON (closed)	OFF (open)	OFF (open)	ON (closed)
	 Main Circuit: 11-12 41-42 Monitor Circuit: 21-22 33-34	ON (closed)	ON (closed)	OFF (open)	OFF (open)	ON (closed)
	 Main Circuit: 11-12 41-42 Monitor Circuit: 51-52 61-62	ON (closed)	OFF (open)	OFF (open)	ON (closed)	OFF (open)
	 Main Circuit: 11-12 41-42 Monitor Circuit: 51-52 63-64	ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		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)

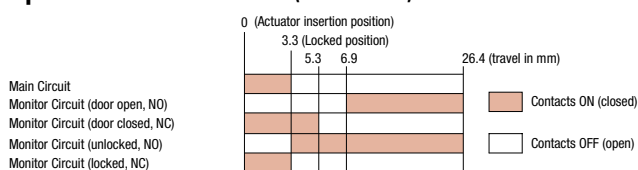


The above contact configuration shows the status when the actuator is inserted and locked.

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.

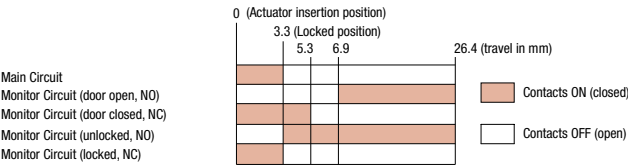
Standard Type - Solenoid Lock Type

Interlock Switch Status		Status 1	Status 2	Status 3	Status 4	Manual Unlock
		• Door Closed • Machine ready to operate • Solenoid de-energized	• Door Closed • Machine cannot be operated • Solenoid de-energized	• Door Open • Machine cannot be operated • Solenoid de-energized	• Door Open • Machine cannot be operated • Solenoid energized	• 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 	Main Circuit 11-42 ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		Monitor Circuit (door open) 23-24 OFF (open)	OFF (open)	ON (closed)	ON (closed)	OFF (open)
		Monitor Circuit (unlocked) 53-54 OFF (open)	ON (closed)	ON (closed)	ON (closed)	ON (closed)
	HS5E-B7Y 	Main Circuit 11-42 ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		Monitor Circuit (door open) 23-24 OFF (open)	OFF (open)	ON (closed)	ON (closed)	OFF (open)
		Monitor Circuit (locked) 51-52 ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
	HS5E-C7Y 	Main Circuit 11-42 ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		Monitor Circuit (door closed) 21-22 ON (closed)	ON (closed)	OFF (open)	OFF (open)	ON (closed)
		Monitor Circuit (unlocked) 53-54 OFF (open)	ON (closed)	ON (closed)	ON (closed)	ON (closed)
	HS5E-D7Y 	Main Circuit 11-42 ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
Contact Configuration		Monitor Circuit (door closed) 21-22 ON (closed)	ON (closed)	OFF (open)	OFF (open)	ON (closed)
		Monitor Circuit (locked) 51-52 ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
	HS5E-F7Y 	Main Circuit 11-42 ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		Monitor Circuit (door closed) 21-22 ON (closed)	ON (closed)	OFF (open)	OFF (open)	ON (closed)
		Monitor Circuit (door closed) 31-32 ON (closed)	ON (closed)	OFF (open)	OFF (open)	ON (closed)
	HS5E-G7Y 	Main Circuit 11-42 ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		Monitor Circuit (door closed) 21-22 ON (closed)	ON (closed)	OFF (open)	OFF (open)	ON (closed)
		Monitor Circuit (door open) 33-34 OFF (open)	OFF (open)	ON (closed)	ON (closed)	OFF (open)
	HS5E-H7Y 	Main Circuit 11-42 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)
Contact Configuration	HS5E-J7Y 	Main Circuit 11-42 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)		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.

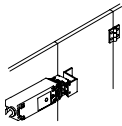
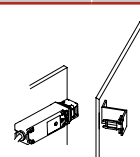
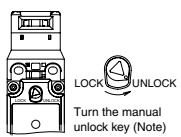
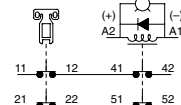
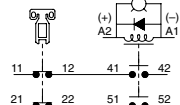
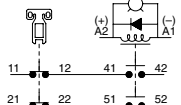
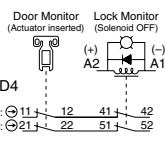
Operation Characteristics (reference)



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

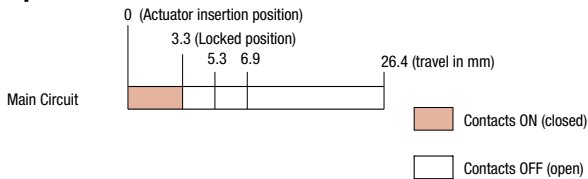
Interlock Switch Status		Status 1	Status 2	Status 3	Status 4	Manual Unlock
		- Door Closed - Machine ready to operate - Solenoid de-energized	- Door Closed - Machine cannot be operated - Solenoid energized	- Door Open - Machine cannot be operated - Solenoid energized	- Door Open - Machine cannot be operated - Solenoid de-energized	- 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	 Door Monitor (Actuator inserted) Lock Monitor (Solenoid OFF) HS5E-DD4 Main Circuit: 11-12 41-42 Main Circuit: 21-22 51-52	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.

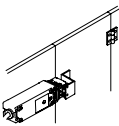
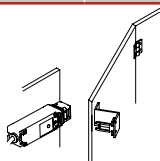
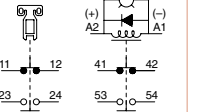
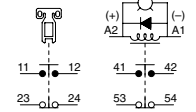
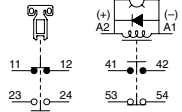
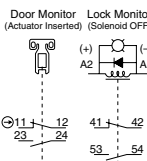
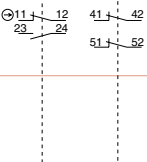
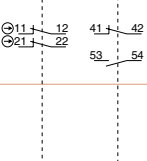
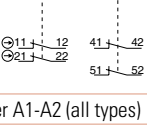
Operation Characteristics (reference)



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

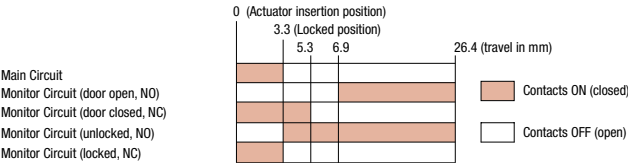
Interlock Switch Status		Status 1	Status 2	Status 3	Status 4	Manual Unlock	
		• Door Closed • Machine ready to operate • Solenoid de-energized	• Door Closed • Machine cannot be operated • Solenoid energized	• Door Open • Machine cannot be operated • Solenoid energized	• Door Open • Machine cannot be operated • Solenoid de-energized	• Door Closed • Machine cannot be operated • Solenoid de-energized	
Door Status						 Turn the manual unlock key (Note)	
Circuit Diagram (HS5E-VA4)							
Door		Closed (locked)	Closed (unlocked)	Open	Open	Closed (unlocked)	
Contact Configuration	 HS5E-VA4 Monitor Circuit: 11-12 Monitor Circuit: 23-24 Monitor Circuit: 41-42 Monitor Circuit: 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)
		Monitor Circuit (unlocked) 53-54	OFF (open)	ON (closed)	ON (closed)	ON (closed)	ON (closed)
	 HS5E-VB4 Monitor Circuit: 11-12 Monitor Circuit: 23-24 Monitor Circuit: 41-42 Monitor Circuit: 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-VC4 Monitor Circuit: 11-12 Monitor Circuit: 21-22 Monitor Circuit: 41-42 Monitor Circuit: 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-VD4 Monitor Circuit: 11-12 Monitor Circuit: 21-22 Monitor Circuit: 41-42 Monitor Circuit: 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.

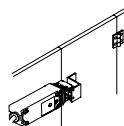
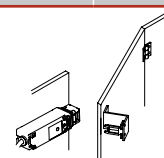
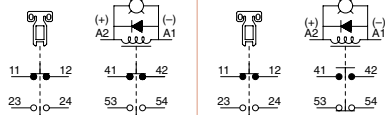
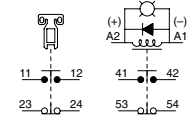
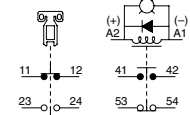
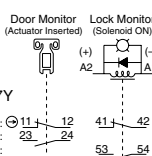
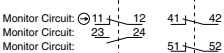
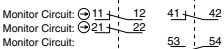
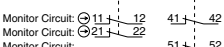
Operation Characteristics (reference)



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.

Standard Type - Solenoid Lock Type

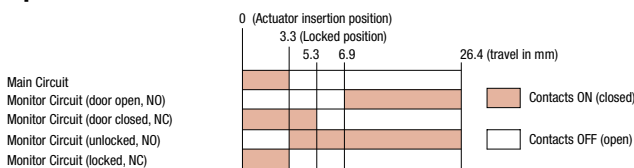
Interlock Switch Status		Status 1	Status 2	Status 3	Status 4	Manual Unlock	
		- Door Closed - Machine ready to operate - Solenoid energized	- Door Closed - Machine cannot be operated - Solenoid de-energized	- Door Open - Machine cannot be operated - Solenoid de-energized	- Door Open - Machine cannot be operated - Solenoid energized	- Door Closed - Machine cannot be operated - Solenoid de-energized → energized	
Door Status						  Manual Unlock Status	
Circuit Diagram (HS5E-VA4)							
Door		Closed (locked)	Closed (unlocked)	Open	Open	Closed (unlocked)	
Contact Configuration	HS5E-VA7Y 	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 	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 	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 	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

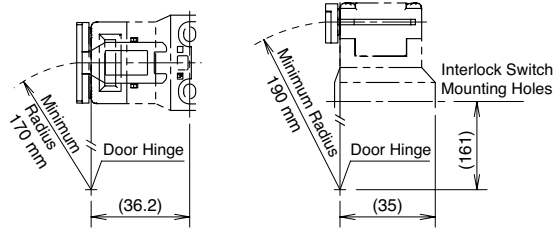
- When using the interlock switch for a hinged door, refer to the minimum radius of doors shown below. For the doors with small minimum radius, use angle adjustable actuators (HS9Z-A53 or HS9Z-A55).



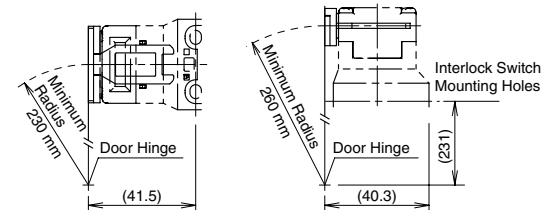
Because deviation or dislocation of hinged door may occur in actual applications, make sure of the correct operation before installation.

HS9Z-A52 Actuator

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

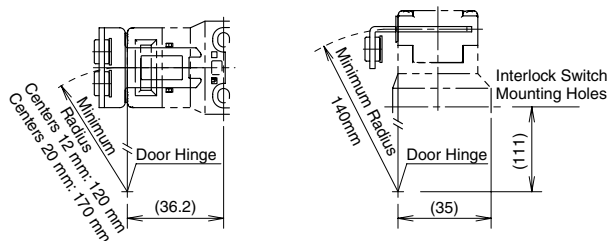


When the door hinge is on the extension line of the actuator mounting surface:

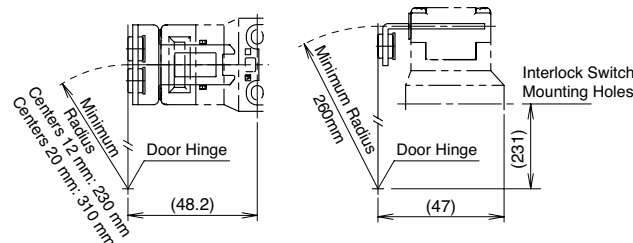


HS9Z-A52 Actuator (w/rubber bushings)

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:



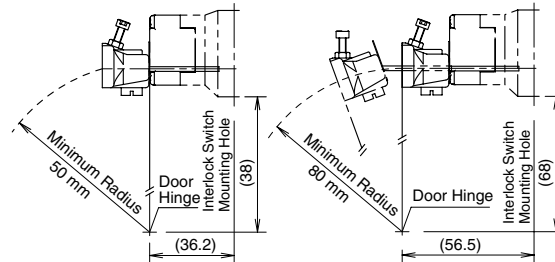
Actuator Angle Adjustment

- Using the angle adjustment screw, the actuator angle can be adjusted (refer to the dimensional drawing on page 304).
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

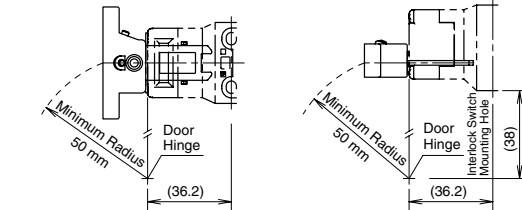


When using the HS9Z-A55 Angle Adjustable (vertical/horizontal) Actuator

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

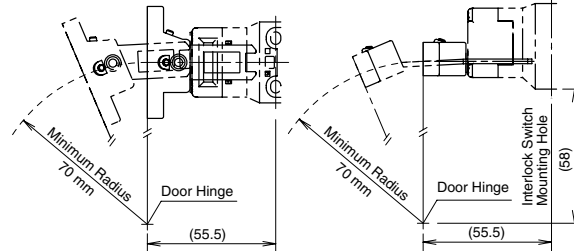
Horizontal Swing

Vertical Swing



Horizontal Swing

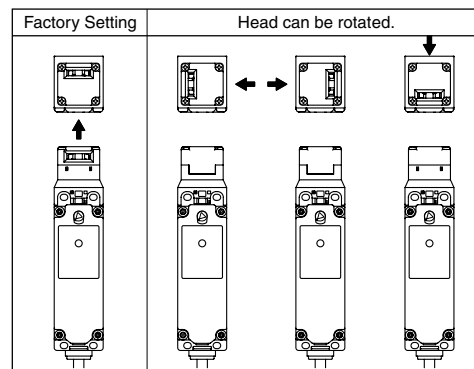
Vertical Swing



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.



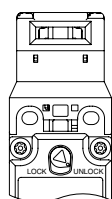
Instructions, continued

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.

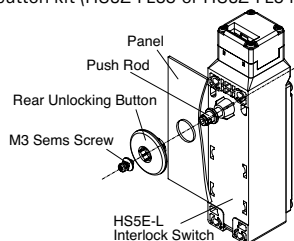
Do not leave the manual unlock key attached to the interlock switch during operation. This is dangerous because the interlock switch can always be unlocked while the machine is in operation.



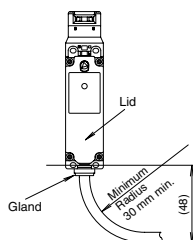
Manual Unlocking Key
(supplied with the switch)

Installing the Rear Unlocking Button

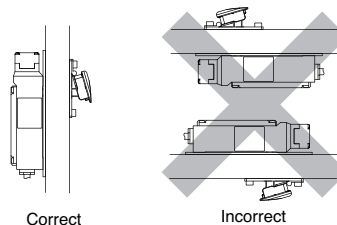
After installing the interlock switch on the panel, place the rear unlocking button (supplied with the switch) on the push rod on the back of the interlock switch, and fasten the button using the M3 semi screw. Rear unlocking button can be installed alone when the total thickness of mounting frame and 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**

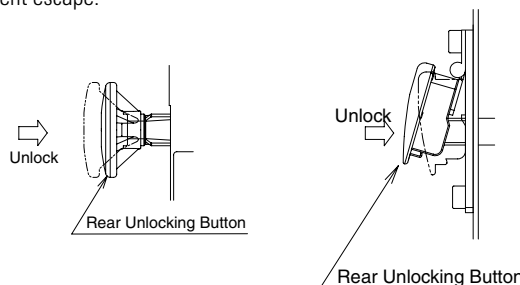
Install the rear unlocking button kit in the correct direction as shown below. Do not install the kit in incorrect directions, otherwise malfunction will be caused.



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.

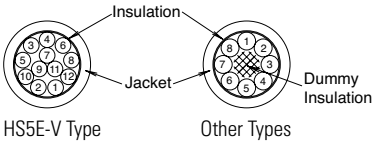
Instructions, continued

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		
HS5E-B		
HS5E-C		
HS5E-D		
HS5E-F		
HS5E-G		
HS5E-H		
HS5E-J		
HS5E-DD		

Type	Circuit Diagram	
HS5E-VA		
HS5E-VB		
HS5E-VC		
HS5E-VD		



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.