

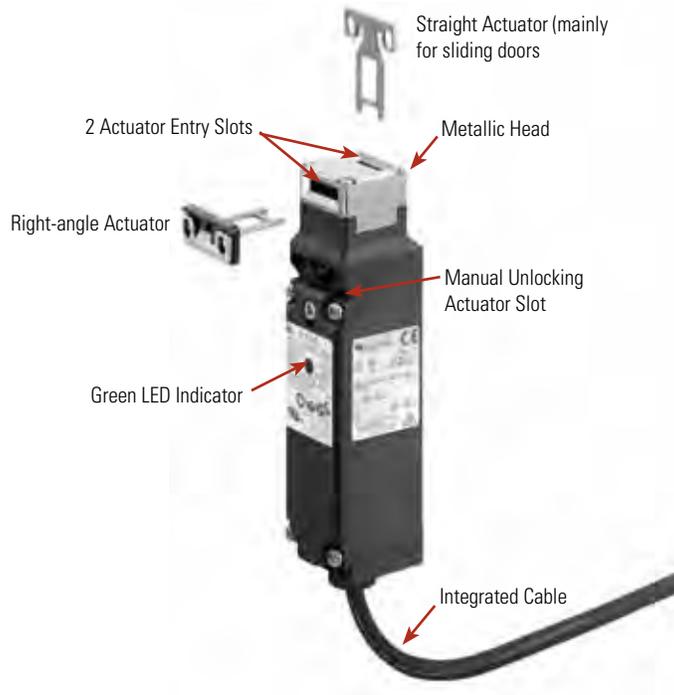
## HS5E Miniature Interlock Switches with Solenoid

### 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



**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		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.

**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

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

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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.

## 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.

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
3m	HS5E-B7Y003			HS5E-B7Y403-G
5m	HS5E-B7Y005			HS5E-B7Y405-G
C				1m
		3m	HS5E-C7Y003	HS5E-C7Y403-G
		5m	HS5E-C7Y005	HS5E-C7Y405-G
		D		1m
3m	HS5E-D7Y003			HS5E-D7Y403-G
5m	HS5E-D7Y005			HS5E-D7Y405-G
F				1m
		3m	HS5E-F7Y003	HS5E-F7Y403-G
		5m	HS5E-F7Y005	HS5E-F7Y405-G
		G		1m
3m	HS5E-G7Y003			HS5E-G7Y403-G
5m	HS5E-G7Y005			HS5E-G7Y405-G
H				1m
		3m	HS5E-H7Y003	HS5E-H7Y403-G
		5m	HS5E-H7Y005	HS5E-H7Y405-G
		J		1m
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.

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 <sup>1</sup>		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

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## 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 <sup>2</sup> (10 G) Damage limits: 1000 m/s <sup>2</sup> (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 <sup>2</sup> or equivalent/core (HS5E-V types: No. 22AWG - 12-core :0.3mm <sup>2</sup> 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

<b>Rated Insulation Voltage (U<sub>i</sub>)<sup>2</sup></b>		250V (between LED, solenoid and grounding: 30V)			
Thermal Current (I <sub>th</sub> )		2.5A			
Rated Voltage (U <sub>e</sub> )		30V	125V	250V	
Rated Current (I <sub>e</sub> ) <sup>3</sup>	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

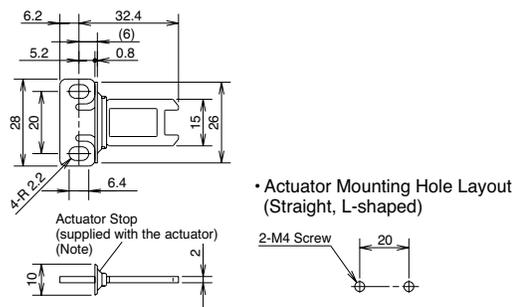
## Pilot Light

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

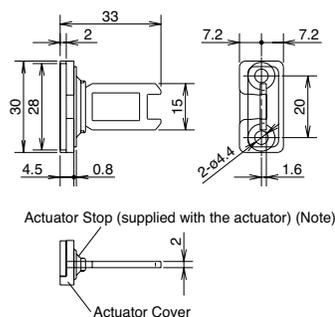


## Dimensions and Mounting Hole Layouts, continued

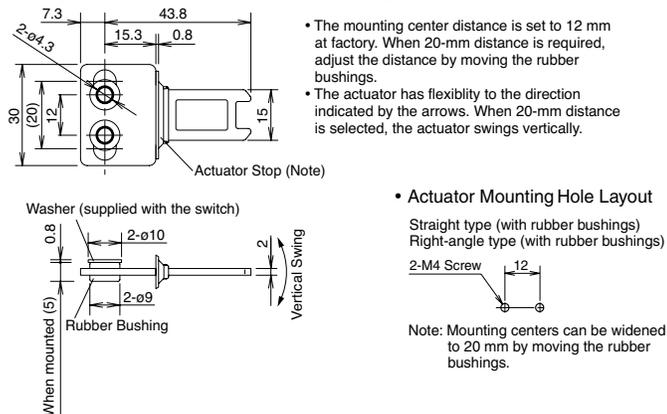
### Straight Actuator (HS9Z-A51)



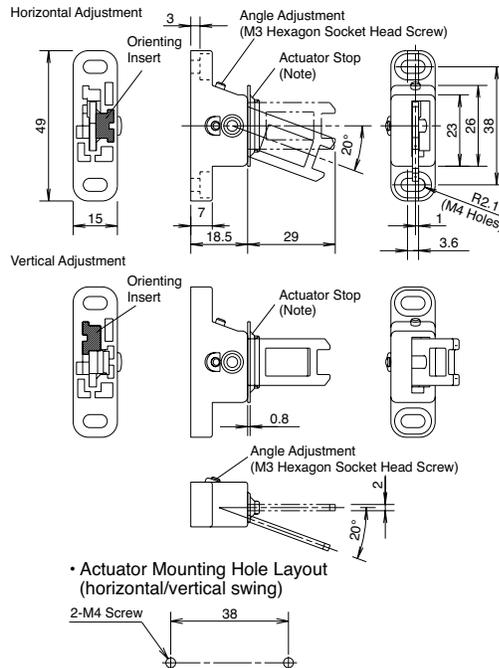
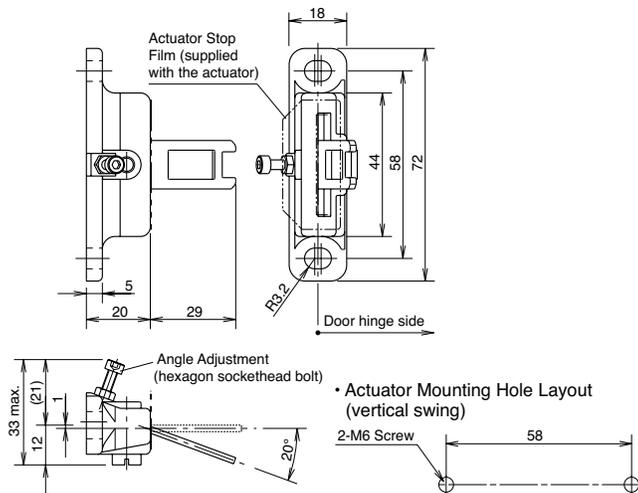
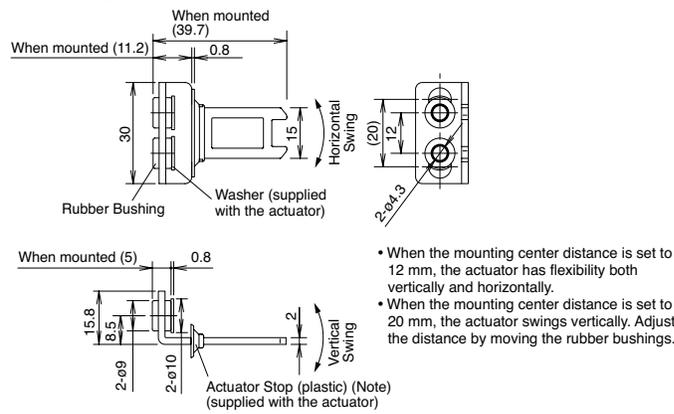
### Right-angle Actuator (HS9Z-A52)



### Straight Actuator w/Rubber Bushings (HS9Z-A51A)



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

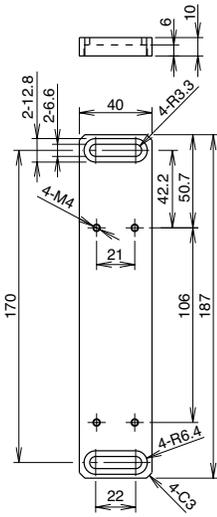


### Actuator Orientation

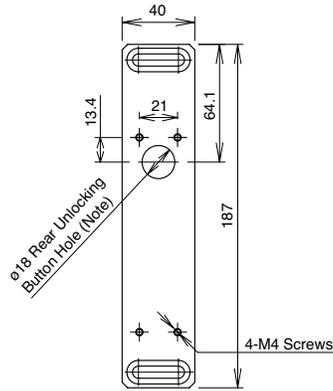
The orientation of actuator swing (horizontal/vertical) can be changed using the orienting insert (white plastic) installed on the back of the actuator. Do not lose the orientating insert, otherwise the actuator will not swing properly.

Dimensions and Mounting Hole Layouts, continued

Mounting Plate (HS9Z-SP51)

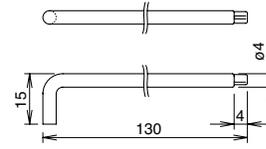


Drilling Rear Unlocking Button Hole

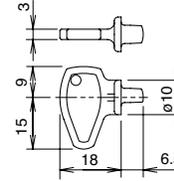


When installing the HS5E-□44L□-G (rear unlocking button type), provide a rear unlocking button hole on the HS9Z-SP51.

Manual Unlocking Key (Metal) (HS9Z-T3)

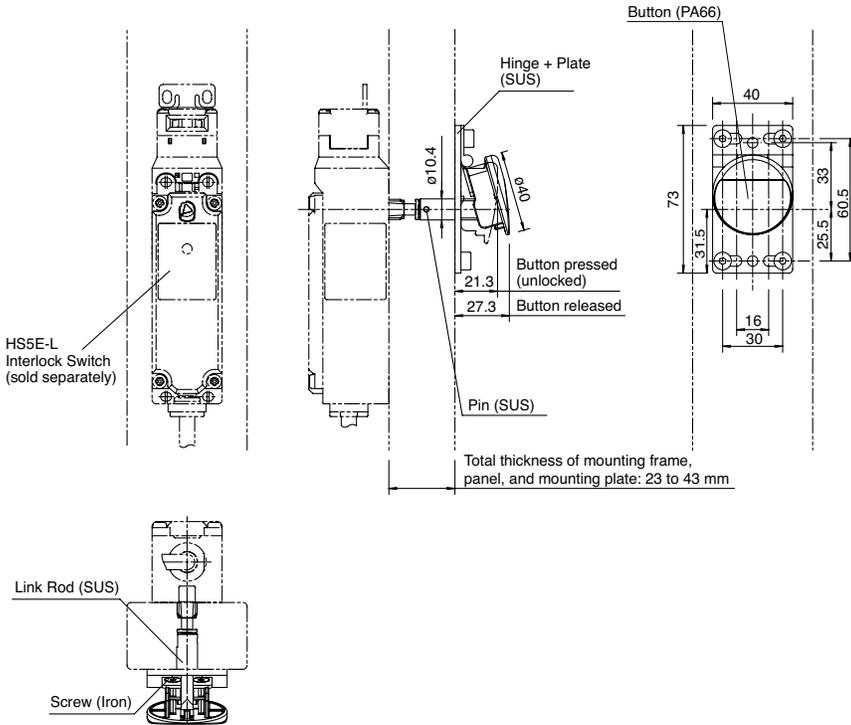


Manual Unlocking Key (plastic)

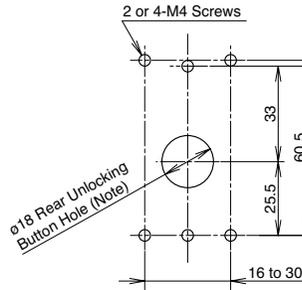


Material: Anodized aluminum A6063  
Weight: Approx. 180g

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.

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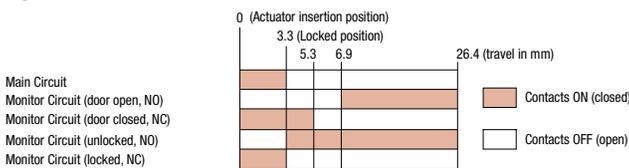
## Circuit Diagrams and Operating Characteristics

### Standard and Rear Unlocking Type - Spring Lock Type

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

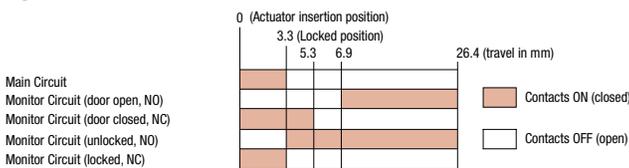
## Standard Type - Solenoid Lock Type

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

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.

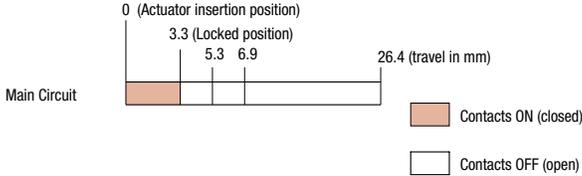
## Dual Safety Circuit Type

Interlock Switch Status		Status 1	Status 2	Status 3	Status 4	Manual Unlock
		<ul style="list-style-type: none"> <li>Door Closed</li> <li>Machine ready to operate</li> <li>Solenoid de-energized</li> </ul>	<ul style="list-style-type: none"> <li>Door Closed</li> <li>Machine cannot be operated</li> <li>Solenoid energized</li> </ul>	<ul style="list-style-type: none"> <li>Door Open</li> <li>Machine cannot be operated</li> <li>Solenoid energized</li> </ul>	<ul style="list-style-type: none"> <li>Door Open</li> <li>Machine cannot be operated</li> <li>Solenoid de-energized</li> </ul>	
Door Status						
Circuit Diagram (HS5E-A7Y)						
Door		Closed (locked)	Closed (unlocked)	Open	Open	Closed (unlocked)
Contact Configuration		Main Circuit 11-42 ON (closed)	OFF (open)	OFF (open)	OFF (open)	OFF (open)
		Main Circuit 21-52 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.  
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.

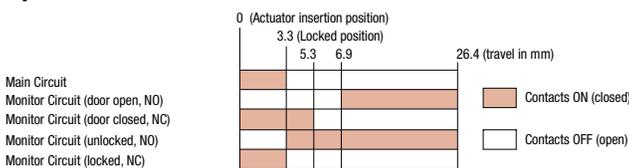
## Standard Type - Solenoid Lock Type

Interlock Switch Status	Status 1	Status 2	Status 3	Status 4	Manual Unlock		
	<ul style="list-style-type: none"> <li>Door Closed</li> <li>Machine ready to operate</li> <li>Solenoid de-energized</li> </ul>	<ul style="list-style-type: none"> <li>Door Closed</li> <li>Machine cannot be operated</li> <li>Solenoid energized</li> </ul>	<ul style="list-style-type: none"> <li>Door Open</li> <li>Machine cannot be operated</li> <li>Solenoid energized</li> </ul>	<ul style="list-style-type: none"> <li>Door Open</li> <li>Machine cannot be operated</li> <li>Solenoid de-energized</li> </ul>		<ul style="list-style-type: none"> <li>Door Closed</li> <li>Machine cannot be operated</li> <li>Solenoid de-energized</li> </ul>	
Door Status							
Circuit Diagram (HS5E-VA4)							
Door	Closed (locked)	Closed (unlocked)	Open	Open	Closed (unlocked)		
Contact Configuration	<b>HS5E-VA4</b> Door Monitor (Actuator Inserted) Lock Monitor (Solenoid OFF) 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)
		Monitor Circuit (unlocked) 53-54	OFF (open)	ON (closed)	ON (closed)	ON (closed)	ON (closed)
	<b>HS5E-VB4</b> 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)
	<b>HS5E-VC4</b> 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)
		Monitor Circuit (unlocked) 53-54	OFF (open)	ON (closed)	ON (closed)	ON (closed)	ON (closed)
<b>HS5E-VD4</b> 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.

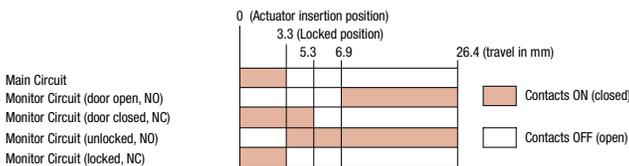
## Standard Type - Solenoid Lock Type

Interlock Switch Status	Status 1	Status 2	Status 3	Status 4	Manual Unlock		
	<ul style="list-style-type: none"> <li>Door Closed</li> <li>Machine ready to operate</li> <li>Solenoid energized</li> </ul>	<ul style="list-style-type: none"> <li>Door Closed</li> <li>Machine cannot be operated</li> <li>Solenoid de-energized</li> </ul>	<ul style="list-style-type: none"> <li>Door Open</li> <li>Machine cannot be operated</li> <li>Solenoid de-energized</li> </ul>	<ul style="list-style-type: none"> <li>Door Open</li> <li>Machine cannot be operated</li> <li>Solenoid energized</li> </ul>			
Door Status							
Circuit Diagram (HS5E-VA4)							
Door	Closed (locked)	Closed (unlocked)	Open	Open	Closed (unlocked)		
Contact Configuration	HS5E-VA7Y Door Monitor (Actuator inserted) Lock Monitor (Solenoid ON) Monitor Circuit: 11-12, 23-24, 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-VB7Y Monitor Circuit: 11-12, 23-24, 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, 53-54	Main Circuit 11-42	ON (closed)	ON (closed)	OFF (open)	OFF (open)	ON (closed)
		Monitor Circuit (door open) 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, 51-52	Main Circuit 11-42	ON (closed)	ON (closed)	OFF (open)	OFF (open)	ON (closed)	
	Monitor Circuit (door open) 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

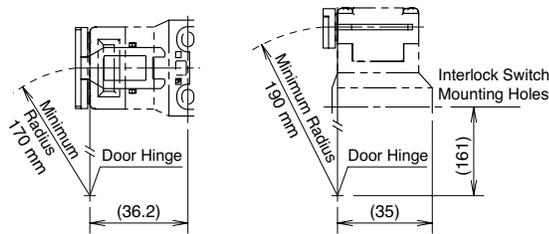
- When using the interlock switch for a hinged door, refer to the minimum radius of doors shown below. For the doors with small minimum radius, use angle adjustable actuators (HS9Z-A53 or HS9Z-A55).



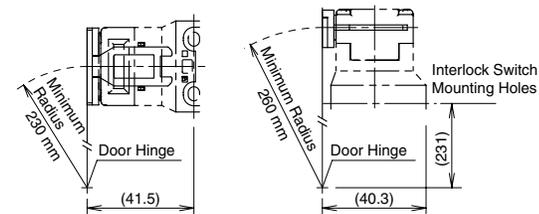
Because deviation or dislocation of hinged door may occur in actual applications, make sure of the correct operation before installation.

HS9Z-A52 Actuator

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

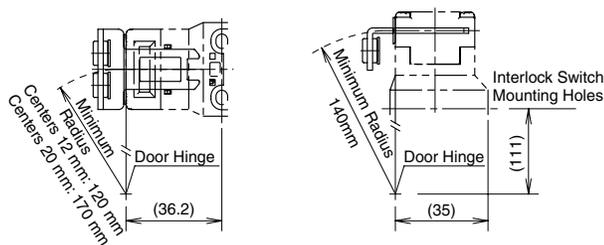


When the door hinge is on the extension line of the actuator mounting surface:

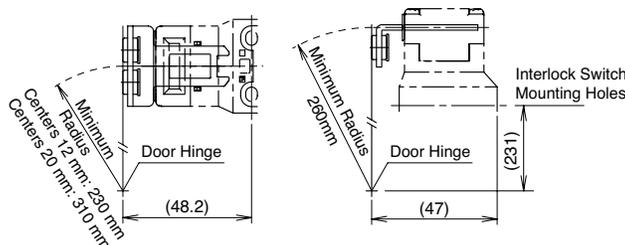


HS9Z-A52 Actuator (w/rubber bushings)

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:



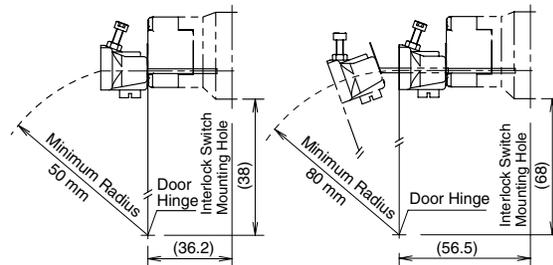
Actuator Angle Adjustment

- 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

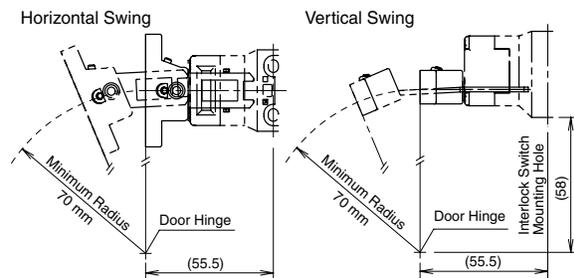
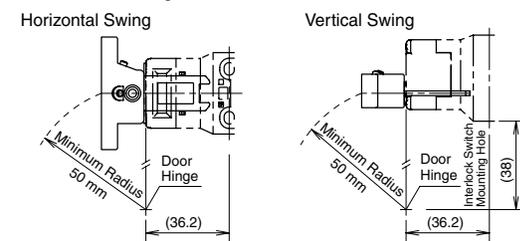
When the door hinge is on the extension line of the interlock switch surface: 50 mm

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

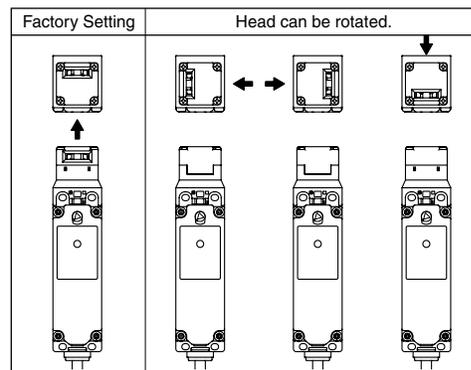
When the door hinge is on the extension line of the interlock switch surface: 50 mm



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

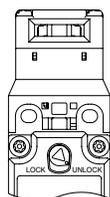
**For Manual Unlocking**

**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.

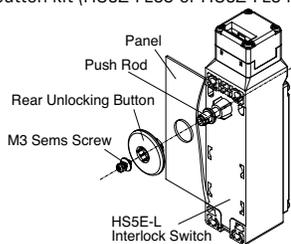
Do not leave the manual unlock key attached to the interlock switch during operation. This is dangerous because the interlock switch can always be unlocked while the machine is in operation.



Manual Unlocking Key (supplied with the switch)

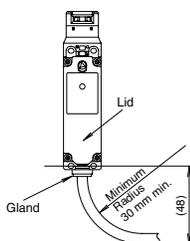
**Installing the Rear Unlocking Button**

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 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.



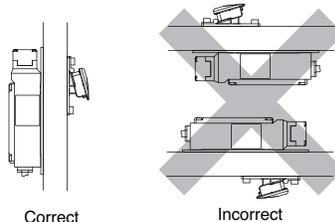
**Cables**

- 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**

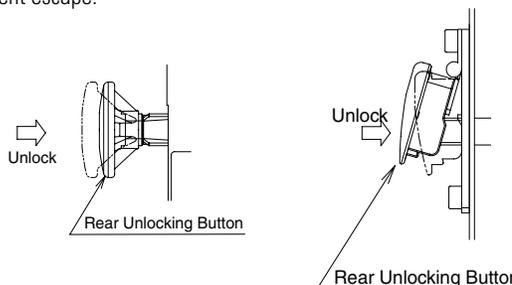
Install the rear unlocking button kit in the correct direction as shown below. Do not install the kit in incorrect directions, otherwise malfunction will be caused.



Do not apply strong force exceeding 100 m/s<sup>2</sup> 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.

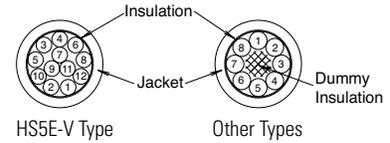
Instructions, continued

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