

HS5E-K Key Locking Safety Interlock Switches

Key features:

- Head removal detection circuitry.
- High-security pin tumbler key types are used. Sixteen types of key numbers are available, see page 330.
- Available with rear unlocking button for emergency escape.
- Accessory available for aluminum frame mounting.
- Gold-plated contacts.
- The locking strength is 1400N minimum. (GS-ET-19)
- The head orientation can be rotated, allowing 8 different actuator entries.
- Metal actuator entry slot ensures high durability.
- Actuator with rubber bushings alleviates the impact of the actuator entry slot.
- Environmentally-friendly. RoHs directive compliant.
- Double insulation structure. No need for grounding.
- Compact body: 35 × 40 × 146 mm



A single key used for interlock switch and selector switch prevents itself from being left in the lock.



Hostage key ensures that the person holding the key is not locked inside the hazardous area.



Hostage key prevents the machine from starting unexpectedly.

HS5E-K key interlock switches use a key to lock and unlock a door of safeguard. When the key is taken into a dangerous area, the interlock switch cannot be locked and the machine does not operate. Therefore, workers can be prevented from being locked in a dangerous area, and the system is prevented from restarting unexpectedly. Furthermore, because the key used for HS5E-K key interlock switches can also be used for HW series key selector switches (pin tumbler type), switching operation modes of systems and door unlocking can be performed using a single key. 16 types of key numbers are available, so that each system can have its own key, and a higher level of safety can be achieved.

Spring Lock Type (Power Solenoid to VA Lock)

Circuit Code	Contact Configuration	Key Removal Position	Cable Length	Part Number			
				Standard	With Rear Unlock Button		
VA		A (removable in all positions)	3m	HS5E-KVA003-2A	HS5E-KVA0L03-2A		
			5m	HS5E-KVA005-2A	HS5E-KVA0L05-2A		
		B (removal in UNLOCK position)	3m	HS5E-KVA003-2B	HS5E-KVA0L03-2B		
			5m	HS5E-KVA005-2B	HS5E-KVA0L05-2B		
		C (removable in LOCK position)	3m	HS5E-KVA003-2C	HS5E-KVA0L03-2C		
			5m	HS5E-KVA005-2C	HS5E-KVA0L05-2C		
		VD		A (removable in all positions)	3m	HS5E-KVD003-2A	HS5E-KVD0L03-2A
					5m	HS5E-KVD005-2A	HS5E-KVD0L05-2A
				B (removal in UNLOCK position)	3m	HS5E-KVD003-2B	HS5E-KVD0L03-2B
					5m	HS5E-KVD005-2B	HS5E-KVD0L05-2B
				C (removable in LOCK position)	3m	HS5E-KVD003-2C	HS5E-KVD0L03-2C
					5m	HS5E-KVD005-2C	HS5E-KVD0L05-2C

The contact configuration shows the status when the actuator is inserted and the switch is locked. Actuators are not supplied with interlock switches and must be ordered separately. Key number 500 is supplied as the default key in table above (500 not added to part number).

To order additional key types, specify key number at end of part number (special order). Example: HS5E-KVA003-2A501

501 to 515

Note: The key number is engraved on the cylinder.

Actuator Keys & Accessories

Appearance	Part Number	Description	Appearance	Part Number	Description	Appearance	Part Number	Description
	HS9Z-A51	Straight		HS9Z-A55	Angle adjustable horizontal/vertical operation ¹		HS9Z-SP51	Mounting Plate (allows easy mounting to aluminum frames)
	HS9Z-A52	Right-angle		HS9Z-A5P	Plug Actuator (allows switch to be used as interlock plug unit)		HS9Z-T3	Manual unlock key (long type - metal)
	HS9Z-A53	Angle adjustable vertical operation		HS9Z-PH5	Padlock Hasp (prevents unauthorized insertion of actuator)		HS9Z-SH5	Sliding Actuator

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

Enabling Switches

Safety Control Relays

Light Curtains

AS-Interface Safety at Work

Specifications

Applicable Standards	ISO14119, IEC60947-5-1, EN60947-5-1 (TÜV approval), EN1088, GS-ET-19 (TÜV approval), UL508 (UL recognition), CSA C22.2 No. 14 (c-UL recognized)
	IEC60204-1/EN60204-1 (applicable standards for use)
Operating Temperature	-25 to +70°C (No freezing)
Relative Humidity	45 to 85% (No condensation)
Storage Temperature	-40 to +80°C (No freezing)
Pollution Degree	3
Impulse Withstand Voltage	2.5 kV
Insulation Resistance (500V DC megger)	Between live and dead metal parts: 100 MΩ minimum (500V DC megger) Between live metal part and ground: 100 MΩ minimum (500V DC megger) Between live metal parts: 100 MΩ minimum (500V DC megger) Between terminals of the same pole: 100 MΩ minimum
Electric Shock Class	Class II (IEC61140)
Degree of Protection	IP65 (IEC60529)
Shock Resistance	Operating extremes: 100 m/s ² Damage limits: 1,000 m/s ²
Vibration Resistance	Operating extremes: 10 to 55 Hz, amplitude 0.35 mm Damage limits: 30 Hz, amplitude 1.5 mm
Actuator Operating Speed	0.05 to 1.0 m/s
Direct Opening Travel	Actuator HS9Z-A51: 11 mm minimum Actuator HS9Z-A51A/A52/A52A/A53/A55: 12 mm minimum
Direct Opening Force	80N minimum
Actuator Retention Force ¹	1,400N minimum (GS-ET-19)
Operating Frequency	900 operations per hour
Rear Unlocking Button Mechanical Durability	3,000 operations minimum (HS5E-K□L)
Mechanical Durability	1,000,000 operations minimum (GS-ET-19)
Electrical Durability	100,000 operations minimum (AC-12, 250V, 1A) 1,000,000 operations minimum (24V AC/DC, 100 mA) (Operating frequency: 900 operations per hour)
Performance between 41 and 42 when head is removed	Mechanical durability: 10 operations minimum Insulation resistance: 100 MΩ (initial value) Withstand voltage: 1,000V for 1 minute (initial value)
Conditional Short-circuit Current	50A (250V) ²
Cable	22 AWG (12-core, 0.3 mm ² or equivalent/core)
Cable Diameter	ø7.6 mm
Weight (approx.)	400g (HS5E-KVA003)

Key Cylinder Specifications

Operating Method	2-position maintained
Mechanical Durability	100,000 operations minimum
Insertion/Removal Durability	10,000 operations minimum
Operator Strength	1.0 N·m minimum
Direct Opening Force	0.6 N·m minimum
Direct Opening Angle	60° minimum



- See page 330 for actuator retention force.
- Use 250V/10A fast-blow fuse for short-circuit protection.

Contact Rating

Rated Insulation Voltage (U _i) ¹		250V			
Rated Thermal Current (I _{th})		Operating temperature: -25°C to 60°C: 2.5A max. 60° to 65°C: 1.5A max. 65°C to 70°C: 1.0A max.			
Rated Voltage (U _e)		30V	125V	250V	
Rated Current (I _e) ²	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



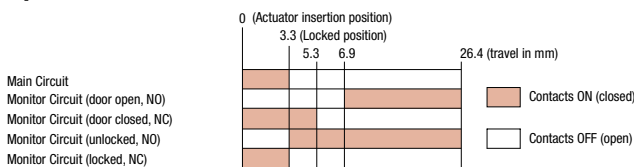
- Minimum applicable load (reference value) = 3V AC/DC, 5 mA
(Applicable range may vary with operating conditions and load types.)
- UL rating: 125V
 - TÜV rating: AC-15, 0.5A/250V, DC-13, 0.22A/125V
UL, c-UL rating: Pilot Duty AC 0.5A/125V, Pilot Duty DC 0.22A/125V

Standard Type - Solenoid Lock Type

Interlock Switch Status		Status 1	Status 2	Status 3	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 Closed Machine cannot be operated Solenoid de-energized energized 	
Door Status					<p>Press rear unlocking button. (Note)</p>	
Circuit Diagram (HS5E-KVA)						
Door		Closed (locked)	Closed (unlocked)	Open	Closed (unlocked)	
Type No. and Contact Configuration	HS5E-KVA	Main Circuit (door closed) 11-12	ON (closed)	ON (closed)	OFF (open)	ON (closed)
		Monitor Circuit (door open) 23-24	OFF (open)	OFF (open)	ON (closed)	OFF (open)
		Monitor Circuit (locked) 41-42	ON (closed)	OFF (open)	OFF (open)	ON (closed)
		Monitor Circuit (unlocked) 53-54	OFF (open)	ON (closed)	ON (closed)	ON (closed)
HS5E-KVD	Main Circuit (door closed) 11-12	ON (closed)	ON (closed)	OFF (open)	ON (closed)	
	Monitor Circuit (door open) 21-22	ON (closed)	ON (closed)	OFF (open)	OFF (open)	
	Monitor Circuit (locked) 41-42	ON (closed)	OFF (open)	OFF (open)	OFF (open)	
	Monitor Circuit (unlocked) 51-52	ON (closed)	OFF (open)	OFF (open)	OFF (open)	

Note: When the operator is confined in a hazardous area, the actuator can be unlocked manually by pressing the rear unlocking button, which should be accessed easily by the operator. The above contact configuration shows the status when the actuator is inserted and the switch is locked. 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.

Overview

XW Series E-Stops

Interlock Switches

Enabling Switches

Safety Control Relays

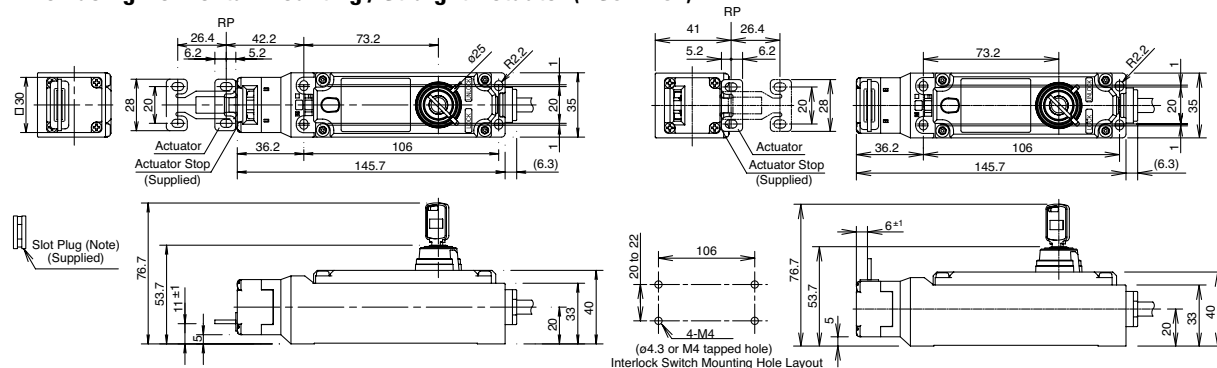
Light Curtains

AS-Interface Safety at Work

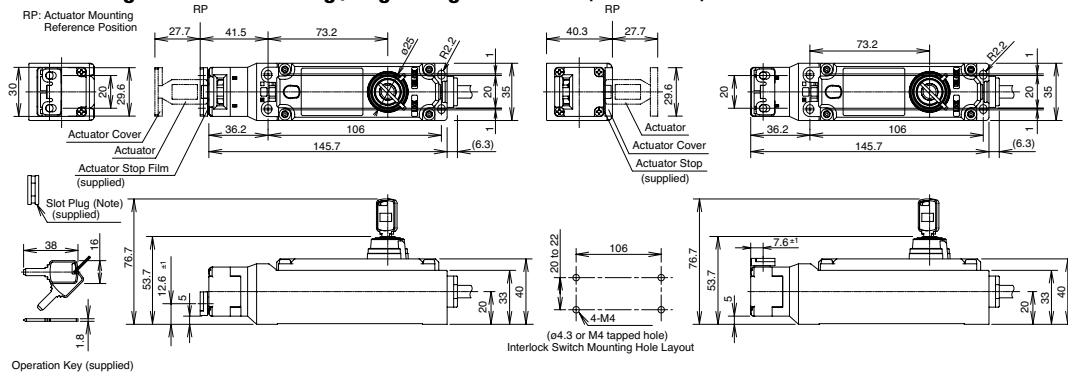
Dimensions (mm) and Mounting Hole Layouts

HS5E-K□

When using Horizontal Mounting / Straight Actuator (HS9Z-A51)

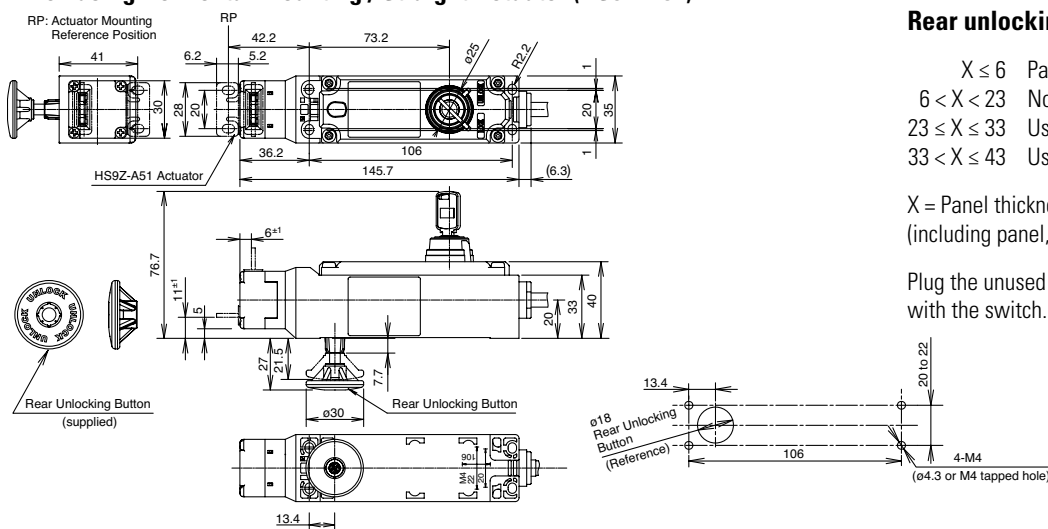


When using Vertical Mounting / Right-angle Actuator (HS9Z-A52)



HS5E-K□L (Rear Unlocking Button Type)

When using 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)

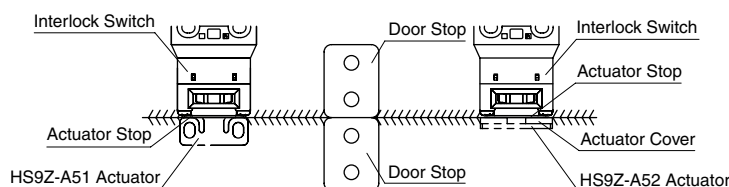
Plug the unused actuator entry slot using the plug supplied with the switch.

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

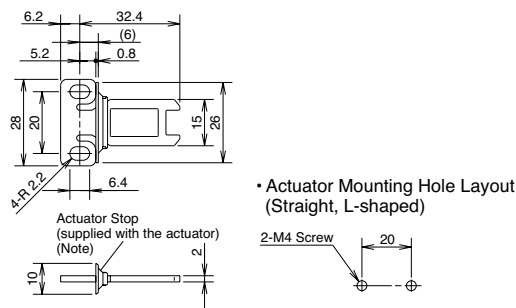
As shown in the figure on the right, the mounting reference position of the actuator when inserted in the interlock switch is where the actuator stop placed on the actuator lightly touches the interlock switch.

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

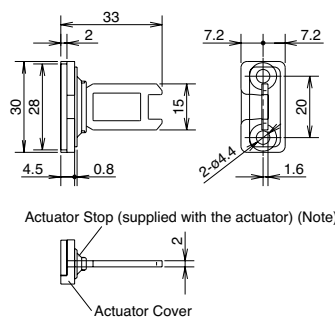


Dimensions and Mounting Hole Layouts, continued

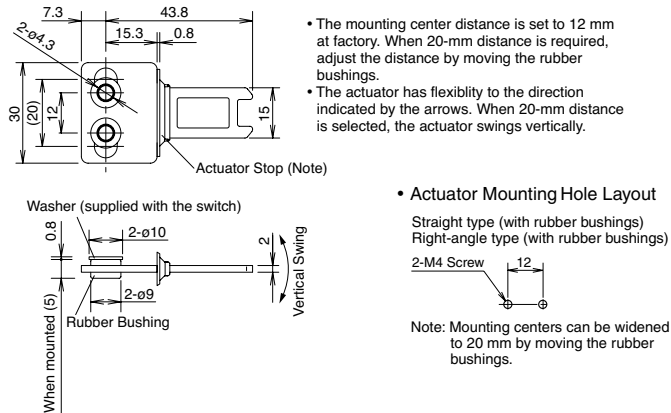
Straight Actuator (HS9Z-A51)



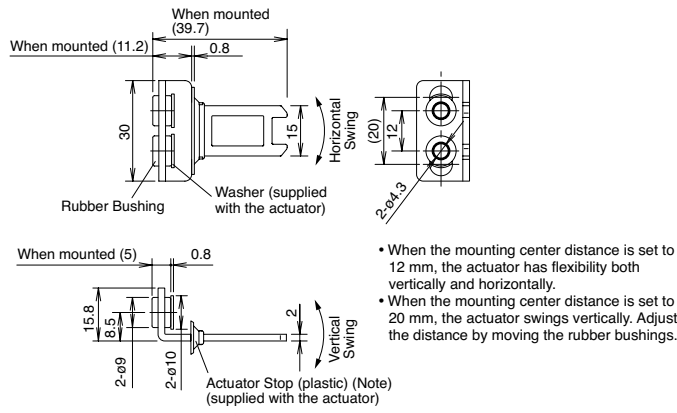
Right-angle Actuator (HS9Z-A52)



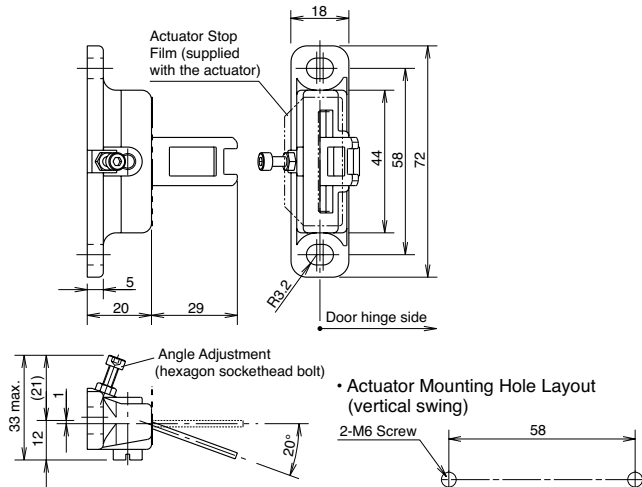
Straight Actuator w/Rubber Bushings (HS9Z-A51A)



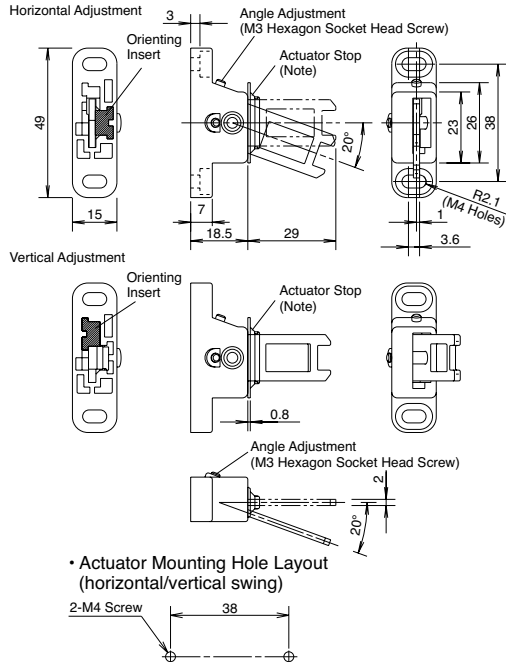
Right-angle Actuator w/Rubber Bushings (HS9Z-A52A)



Angle Adjustable Actuator (Vertical) (HS9Z-A53)



Angle Adjustable Actuator (Horizontal/Vertical) (HS9Z-A55)



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.

Overview

XW Series E-Stops

Interlock Switches

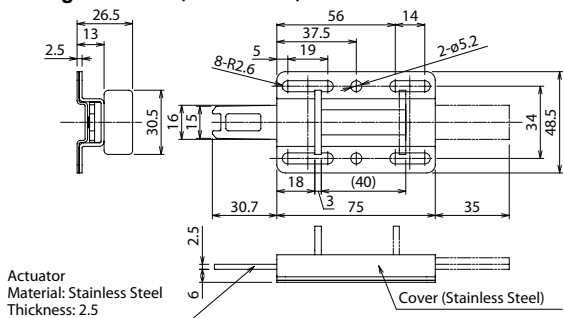
Enabling Switches

Safety Control Relays

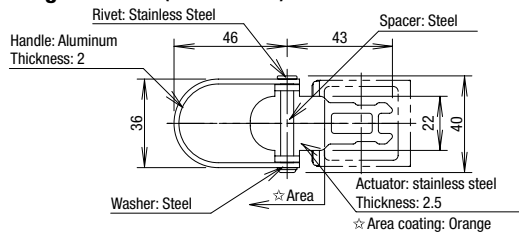
Light Curtains

AS-Interface Safety at Work

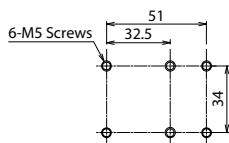
Sliding Actuator (HS9Z-SH5)



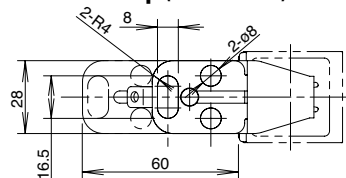
Plug Actuator (HS9Z-A5P)



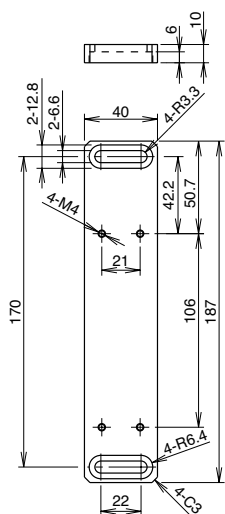
Panel Cut-out



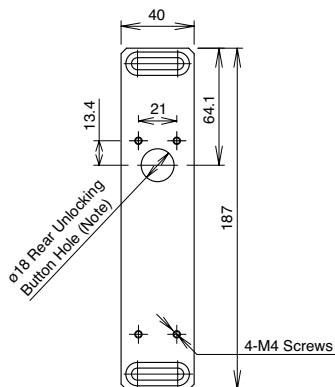
Padlock Hasp (HS9Z-PH5)



Mounting Plate (HS9Z-SP51)

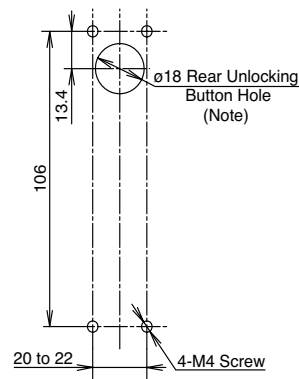


Drilling Rear Unlocking Button Hole



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

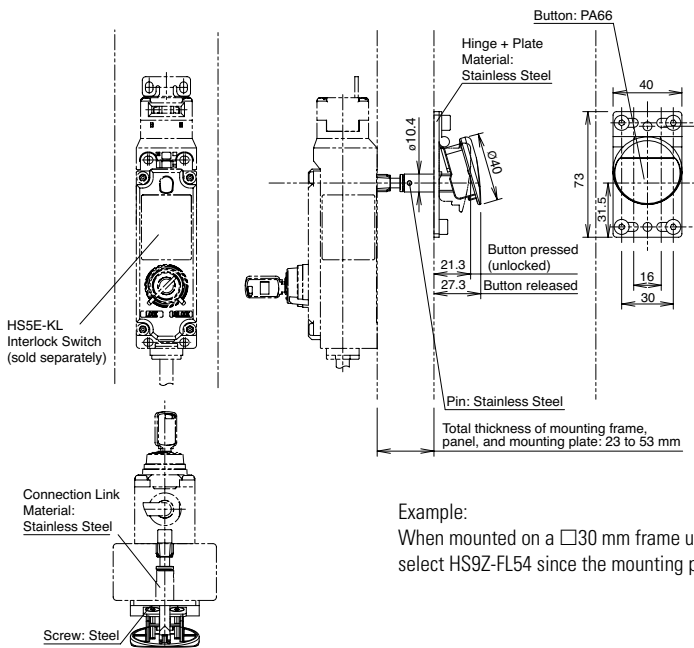
Manual Unlocking Key (Metal) (HS9Z-T3)



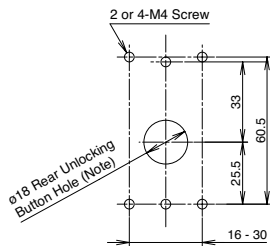
Material: Anodized aluminum A6063

Weight: Approx. 180g

Rear Unlocking Button Kit (HS9Z-FL5□)



Rear Unlocking Button Mounting Dimensions



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

Example:

When mounted on a □30 mm frame using the mounting plate above (HS9Z-SP51), select HS9Z-FL54 since the mounting part thickness (X) is 40 (X=10 + 30=40).

Operating Instructions

Minimum Radius of Hinged Door

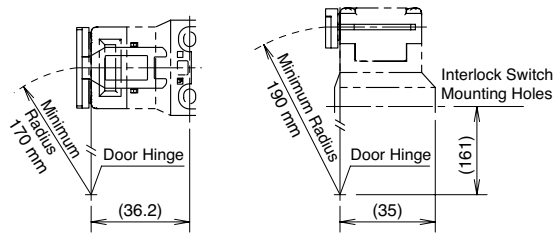
- When using the interlock switch for a hinged door, refer to the minimum radius of doors shown below. For the doors with small minimum radius, use angle adjustable actuators (HS9Z-A53 or HS9Z-A55).



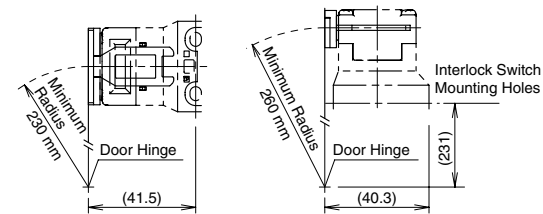
Because deviation or dislocation of hinged door may occur in actual applications, make sure of the correct operation before installation.

HS9Z-A52 Actuator

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

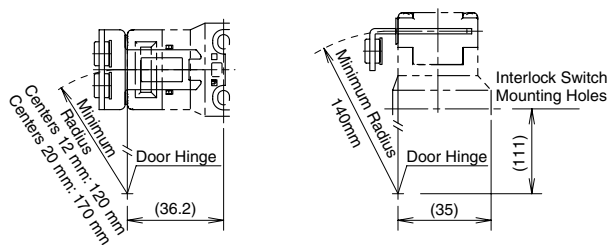


When the door hinge is on the extension line of the actuator mounting surface:

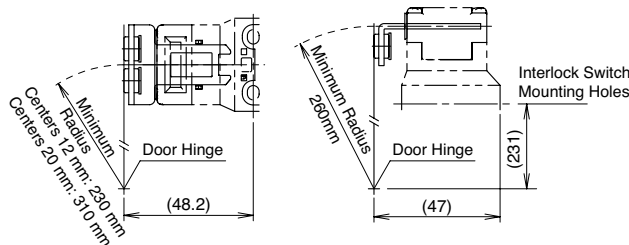


HS9Z-A52 Actuator (w/rubber bushings)

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:



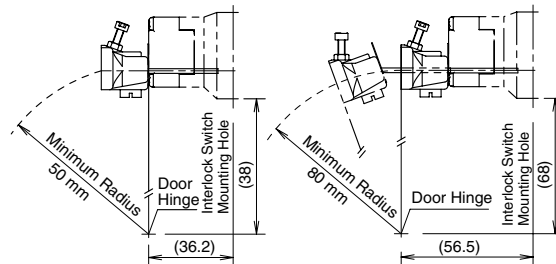
Actuator Angle Adjustment (vertical/horizontal)

- Using the angle adjustment screw, the actuator angle can be adjusted (refer to the dimensional drawing on page 333).
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

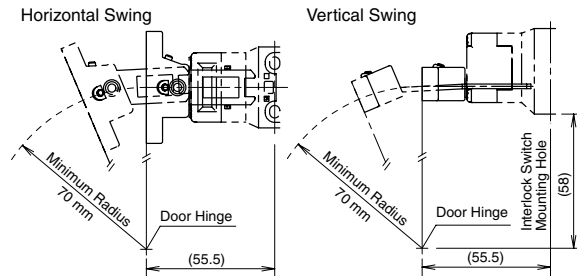
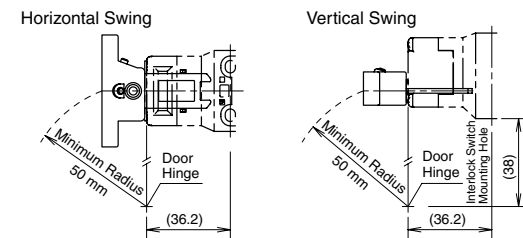
When the door hinge is on the extension line of the interlock switch surface: 50 mm

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

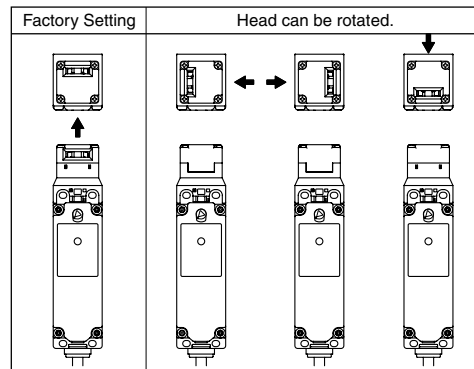
When the door hinge is on the extension line of the interlock switch surface: 50 mm



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

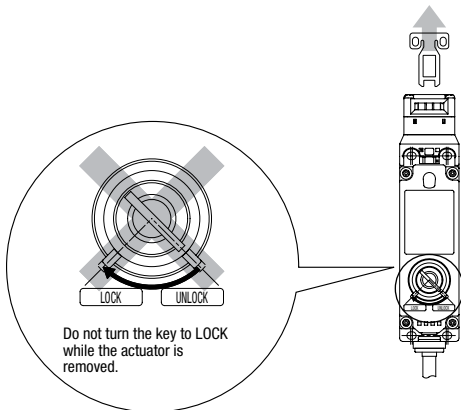
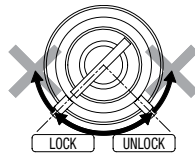
Head Removal Detection Circuitry

- Only the lock monitor circuit 41-42 turns off (open) when the head is removed, such as when the head is rotated. The other monitor circuit 51-52 turns ON (close). Be sure to connect the lock monitor circuit (41-42) to a safety circuit.
- When connecting the HS5E-K to a safety circuit, connect the door monitor circuits (11-12) and the lock monitor circuits (41-42) in series. (GS-ET-19)
- When rotating the head, make sure that the interlock switch is not wired or that the key position is in the UNLOCK position.

Key

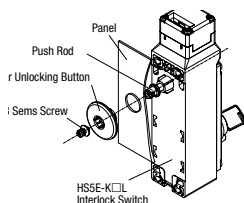
Follow the instructions below to avoid operating failures and damage.

- Insert the key completely.
- Do not remove or insert the key while turning the key.
- Other than the standard key number (500), 15 types of key numbers are available. Use a key with the same number as the number on the cylinder.
- Do not apply excessive force when turning the key. Otherwise operating failures and damage may occur.
- Do not turn the key to the LOCK side while the actuator is removed (door open). Otherwise, operating failures and breakdowns may occur.



Installing the Rear Unlocking Button (HS5E-K□L)

- 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 screw supplied with the switch. Rear unlocking buttons 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 53 mm, use the rear unlocking button kit (HS9Z-FL53, HS9Z-FL54, or HS9Z-FL55) sold separately.



Recommended Tightening Torque for Mounting Screws

- 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)

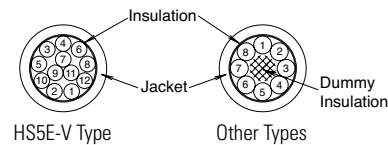
Note: The above recommended tightening torque of the mounting screws are the values with hex socket head bolts. When other screws are used and tightened to a smaller torque, make sure that the screws do not become loose after mounting.

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



Circuit Code Identification

- Circuit codes can be identified by the insulation color in each contact configuration.
- The following table shows the identification of circuit numbers.
- When wiring, cut unnecessary wires such as the dummy insulation (white) and any unused wires.

Type	Circuit Diagram	
HS5E-KVA	Monitor Circuit: Blue	→ 11 — 12 Blue/White
	Monitor Circuit: Pink	→ 41 — 42 Pink/White
	Monitor Circuit: Orange	→ 23 — 24 Orange/White
HS5E-KVD	Monitor Circuit: Blue	→ 11 — 12 Blue/White
	Monitor Circuit: Pink	→ 41 — 42 Pink/White
	Monitor Circuit: Orange	→ 21 — 22 Orange/White



The contact configuration shows the status where the actuator is inserted and the switch is locked.