



INSTRUCTION SHEET

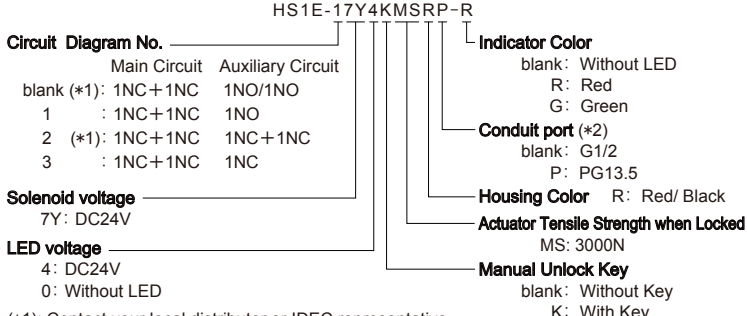
HS1E Safety Switch

Confirm that the delivered product is what you have ordered. Read this instruction sheet to make sure of correct operation. Make sure that the instruction sheet is kept by the end user.

SAFETY NOTE

CAUTION
Caution notices are used where inattention might cause personal injury or damage to equipment.

1 Type

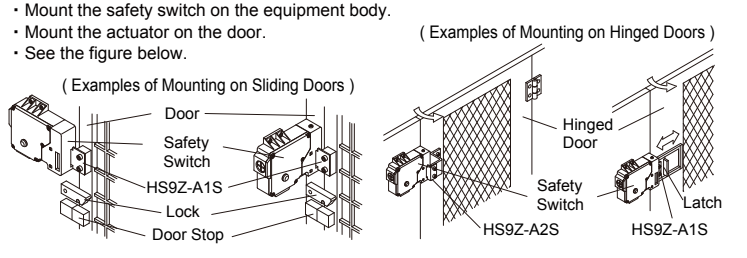


(*1): Contact your local distributor or IDEC representative
(*2): When using M20 conduit port, use with HW9Z-NM20 connector locking ring sold separately.

2 Specifications and Ratings

Applicable Standards	ISO14119, EN1088 IEC60947-5-1, EN60947-5-1 GS-ET-19, UL508, CSA C22.2 No.14, GB 14048. 5																																				
Standards for Use	IEC60204-1/EN60204-1																																				
Applicable Directives	89/392/EEC(Machine Directive) 73/23/EEC(Low voltage Directive)																																				
Operating Condition	Operating Temperature: -25 to +40°C (no freezing) Operating Humidity: 45 to 85% (no condensation) Storage Temperature: -40 to +80°C (no freezing) Pollution Degree: 3																																				
Thermal Current <Ith>	Main Circuit: 10A, Auxiliary Circuit: 3A																																				
Contact Ratings (Reference Values) <Ue, Ie>	<table border="1"> <tr> <td></td> <td>30V</td> <td>125V</td> <td>250V</td> </tr> <tr> <td>Main Circuit</td> <td>A Resistive load(AC-12) 10A</td> <td>10A</td> <td>6A</td> </tr> <tr> <td></td> <td>C Inductive load(AC-15) 10A</td> <td>5A</td> <td>3A</td> </tr> <tr> <td></td> <td>D Resistive load(DC-12) 6A</td> <td>-</td> <td>-</td> </tr> <tr> <td></td> <td>C Inductive load(DC-13) 3A</td> <td>0.9A</td> <td>-</td> </tr> <tr> <td>Auxiliary Circuit</td> <td>A Resistive load(AC-12) -</td> <td>3A</td> <td>3A</td> </tr> <tr> <td></td> <td>C Inductive load(AC-15) -</td> <td>-</td> <td>3A</td> </tr> <tr> <td></td> <td>D Resistive load(DC-12) 3A</td> <td>-</td> <td>-</td> </tr> <tr> <td></td> <td>C Inductive load(DC-13) -</td> <td>0.9A</td> <td>-</td> </tr> </table>		30V	125V	250V	Main Circuit	A Resistive load(AC-12) 10A	10A	6A		C Inductive load(AC-15) 10A	5A	3A		D Resistive load(DC-12) 6A	-	-		C Inductive load(DC-13) 3A	0.9A	-	Auxiliary Circuit	A Resistive load(AC-12) -	3A	3A		C Inductive load(AC-15) -	-	3A		D Resistive load(DC-12) 3A	-	-		C Inductive load(DC-13) -	0.9A	-
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Electric Shock Protection Class	Class II																																				
Degree of Protection	IP67(IEC60529)																																				
Vibration Resistance	Damage Limits: 1000m/s ²																																				
Shock Resistance	Operating Extremes: 10 to 55 Hz, half amplitude 0.35 mm Damage Limits: 30 Hz, half amplitude 1.5 mm																																				
Operating Frequency	900 operations/hour																																				
Operating Speed	0.05 to 1.0 m/s																																				
Actuator Tensile Strength when Locked	Bottom slot: 3000N min., Front slot: 2800N min. (GS-ET-19)																																				
Direct Opening Travel	11mm minimum																																				
Direct Opening Force	20N minimum																																				
Contact Resistance	100mΩ maximum (Initial value)																																				
Short-circuit protective device	250V, 10A fast acting type fuse																																				
Solenoid Rated Operating Voltage	24VDC 100%ED																																				
Solenoid Rated Current	292mA																																				
Solenoid Turn ON Voltage	Rated Voltage × 85% maximum (at 20°C)																																				
Solenoid Turn OFF Voltage	Rated Voltage × 10% minimum (at 20°C)																																				
Solenoid Rated Power Consumption	Approx. 7W																																				
Illuminated Part Rated Operating Voltage	24VDC																																				
Illuminated Part Rated Current	10mA																																				
Illuminated Part Light Source	LED lamp																																				
Lens Color	R(Red), G(Green) (φ 12 Lens)																																				
Weight	Approx. 500g																																				

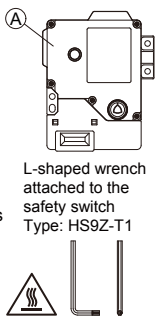
3 Mounting



4 Notes for Operation

Installation

- Regardless of door types, do not use the safety switch as a door stop. Install a mechanical door stop at the end of the door to protect the safety switch against an excessive force.
- Do not apply an excessive shock to the safety switch when opening or closing the door. A shock to the safety switch exceeding 1,000 m/s² may cause failure.
- Regardless of door types, do not use the safety switch as a door lock. Install a separated lock as shown in item 3.
- When opening the safety switch lid to wire, open the lid (A) only. (See the figure on the right.)
Never remove other screws, otherwise the safety switch may be damaged.
- The safety switch cover can be only removed or installed with the special L-shaped wrench supplied with the safety switch.
- Avoid foreign objects such as dust, liquid and oil from entering the safety switch while connecting a conduit or wiring.
- Entry of foreign objects in the actuator entry slot may affect the mechanism of the safety switch and cause a breakdown. If the operating atmosphere is contaminated, use a protective cover to prevent the entry of foreign objects into the safety switch through the actuator entry slots.
- Do not touch the solenoid while it is being energized, otherwise burning on hand will be caused (coil temperature rises up to approx. 100 degree C). Use heat-resistant wire when the solenoid touches wires.
- Use only the designated actuator for the HS1E.
Other actuators will cause a breakdown of the safety switch.

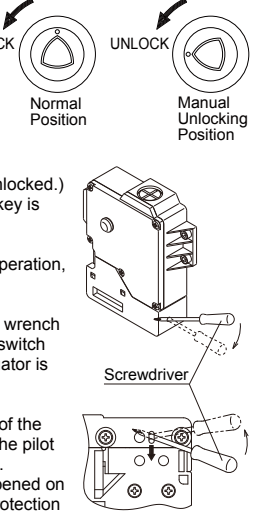


CAUTION

- Turn off the power to the safety switch before starting installation, removal, wiring, maintenance, and inspection on the safety switch. Failure to turn power off may cause electrical shocks or fire hazard.
- Use wires of a proper size to meet voltage and current requirements. Tighten the terminal screws to a recommended tightening torque of 0.9 to 1.1N·m. Loose terminal screws will cause unexpected heating and fire hazard during operation.
- Do not install the actuator in the location where the human body may come into contact. Otherwise injury may occur.
- Pay attention to the management of spare actuator. Safety function of safety switch will be lost in case the spare actuator is inserted into the safety switch.
- Ensure that the actuator is firmly fastened to the door (welding, rivet, special screw) in the appropriate location, so that the actuator cannot be removed easily.
- This safety switch is designed to lock the actuator while solenoid is being energized and to release it when the solenoid is disenergized. When the power to the solenoid is interrupted by faults. Such as disconnection consequently, the lock is released before a machine stops completely, therefore, it has possibilities that a worker would be exposed to hazards. This safety switch can be used only for the limited applications which do not especially need to be locked for safety.

Manual Unlocking

- In case the actuator is not unlocked when the solenoid is deenergized, the actuator can be unlocked manually. (Unlocking Method)
- HS1E with manual unlock key :
To change the normal position to the manual unlocking position as shown on the right, turn the key fully (90 degrees) using the red plastic key included with the safety switch. Using the safety switch with the key being not fully turned (less than 90 degrees) may cause damage to the safety switch or errors.
(note: when manually unlocked, the safety switch will keep the main circuit disconnected and the door unlocked.)
Do not attach the key to the safety switch intentionally (the key is designed to fall off when the operator's hand is off the key). In such case, safety standards become unapplied because the safety switch can be always unlocked during machine operation, and therefore will give hazardous conditions to workers.
- HS1E without manual unlock key :
Remove the screw at the side of the safety switch using the wrench for mounting the HS1E lid. Push the lever inside the safety switch toward the pilot light using a small screwdriver until the actuator is unlocked. See the figure on the right.
- Common :
Insert a small screwdriver from the hole of the reverse side of the safety switch. Push the pin inside the safety switch toward the pilot light using a small screwdriver until the actuator is unlocked. See the figure on the right. A hole for the lever should be opened on the mounting panel. When opening the hole, apply proper protection against water and other foreign objects.

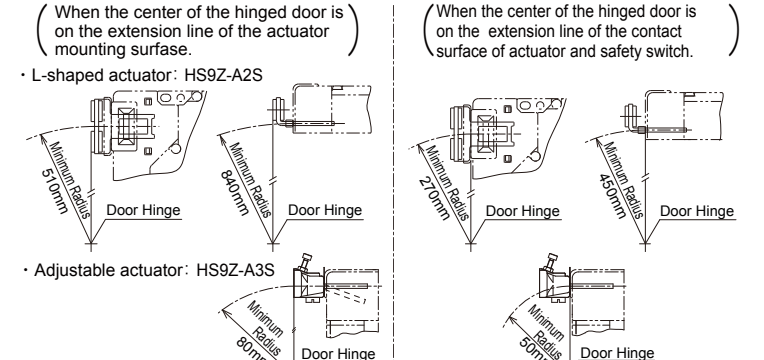


CAUTION

- While the solenoid is energized, do not unlock the actuator manually. Before manually unlocking the safety switch, make sure the machine has come to a complete stop. Manual unlocking during operation may unlock the safety switch before the machine stops, and the function of safety switch with solenoid is lost.

5 Adjustments

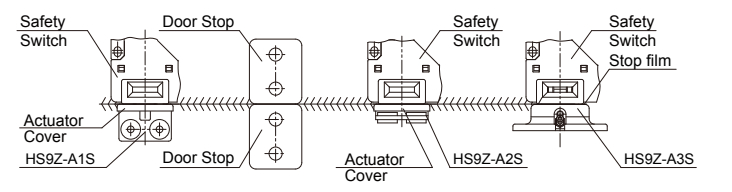
Minimum Radius of Hinged Door
When using the safety switch for a hinged door, the minimum radius of the applicable door is shown in the following figures.



Note:
The figures shown above are based on the condition that the actuator enters and exits the actuator entry slot smoothly when the door is closed or opened. Since there may be deviation or dislocation of the hinged door, make sure of correct operation in the actual application before installation.

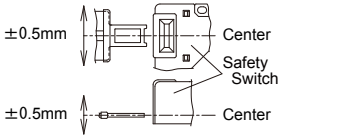
Actuator Mounting Reference Position

• As shown below, the mounting reference position of the actuator inserted into the safety switch is the actuator cover or stop film touches the safety switch lightly.
(After mounting the actuator, remove the actuator cover or stop film from the actuator.)

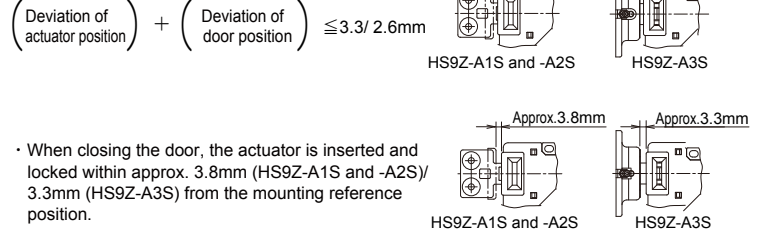


Actuator Mounting Tolerance

- Mounting tolerance of the actuator is 0.5mm from the center of the actuator to up, down, right, and, left.



- Actuator can move 3.3mm (HS9Z-A1S and -A2S)/ 2.6mm (HS9Z-A3S) from the mounting reference position without affecting the contact operation.



- When closing the door, the actuator is inserted and locked within approx. 3.8mm (HS9Z-A1S and -A2S)/ 3.3mm (HS9Z-A3S) from the mounting reference position.

Recommended Screw Tightening Torque

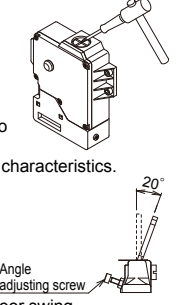
	Screw Tightening Torque	*3: The recommended tightening torques of the mounting screw are the values confirmed with hex socket head bolts. When other screws are used and tightened to a smaller torque, make sure that the screws do not become loose after mounting.
For mounting the safety switch (M5 screw) *3	3.2 to 3.8 N·m	*4: When rubber cushions (and spacers) are not used, use M6 screws and tighten to a torque of 4.5 to 5.5 N·m.
For mounting the actuator HS9Z-A1S, HS9Z-A2S (M5 screw) *3, *4	2.7 to 3.3 N·m	
HS9Z-A3S (M6 screw)	4.5 to 5.5 N·m	
For mounting the lid (M4)	0.9 to 1.1 N·m	
Terminal screw (M3.5)	0.9 to 1.1 N·m	
Connector (G1/2)	2.7 to 3.3 N·m	
Angle adjusting screw of HS9Z-A3S (M3 Hexagon Socket Head Screw)	0.8 N·m	

Rubber Cushions

Opening the Connector Hole

- Break a desired knockout to mount a connector using a hammer and a screwdriver.
- Remove the connector lock nut from inside the safety switch before breaking the knockout to open a connector hole.
- When breaking the knockout to open a connector hole, be careful not to damage the internal contact block.

Note: Cracks or burrs on the connector hole will degrade the waterproof characteristics.

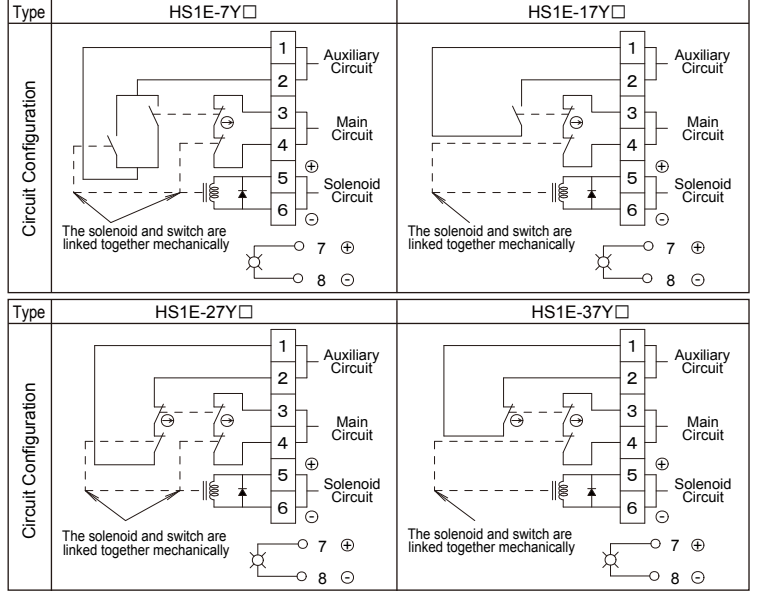


Adjusting the Angle Adjustable Actuator (HS9Z-A3S)

- Using the angle adjusting screw (M3 hexagon socket head screw), the actuator angle can be adjusted up to 20°.
- The larger the actuator angle, the smaller the applicable radius of the door swing.
- After installing the actuator, open the door. Then adjust the actuator angle so that the actuator enters the entry slot of the safety switch properly.
- After adjusting the actuator angle, apply loctite or the like on the adjusting screw to prevent loosening.

6 Wiring

Circuit Configuration



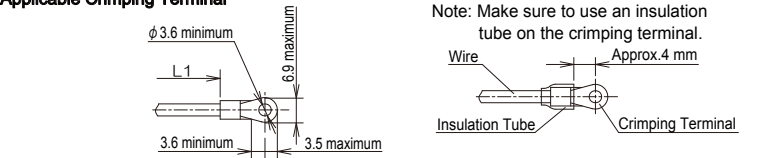
Operation Cycle

Door States		Closed	Closed	Open
Type	Main Circuit	* 3-4 : Closed	* 3-4 : Open	* 3-4 : Open
HS1E-7Y	Auxiliary Circuit	* 1-2 : Open	* 1-2 : Closed	* 1-2 : Closed
	Solenoid Power	* 5-6 : On	* 5-6 : Off	* 5-6 : Off / On
Type	Main Circuit	* 3-4 : Closed	* 3-4 : Open	* 3-4 : Open
HS1E-17Y	Auxiliary Circuit	* 1-2 : Open	* 1-2 : Open	* 1-2 : Closed
	Solenoid Power	* 5-6 : On	* 5-6 : Off	* 5-6 : Off / On
Type	Main Circuit	* 3-4 : Closed	* 3-4 : Open	* 3-4 : Open
HS1E-27Y	Auxiliary Circuit	* 1-2 : Closed	* 1-2 : Open	* 1-2 : Open
	Solenoid Power	* 5-6 : On	* 5-6 : Off	* 5-6 : Off / On
Type	Main Circuit	* 3-4 : Closed	* 3-4 : Open	* 3-4 : Open
HS1E-37Y	Auxiliary Circuit	* 1-2 : Closed	* 1-2 : Closed	* 1-2 : Open
	Solenoid Power	* 5-6 : On	* 5-6 : Off	* 5-6 : Off / On
		• Door is locked. • The machine can be operated.	• Door is unlocked. • The machine can not be operated.	• The machine can not be operated.

Wire Length Inside the Safety Switch

Wire Length: L1(mm)	Screw Terminal No.	Through Conduit Port	
		(I)	(II)
1	80±2	35±2	
2	70±2	35±2	
3	60±2	40±2	
4	50±2	45±2	
5	40±2	55±2	
6	35±2	55±2	
7	85±2	35±2	
8	60±2	80±2	
Wire Stripping Length: L2(mm)		7±1	

Recommended Wire Core Size : 0.5 to 1.25 mm²
Applicable Crimping Terminal

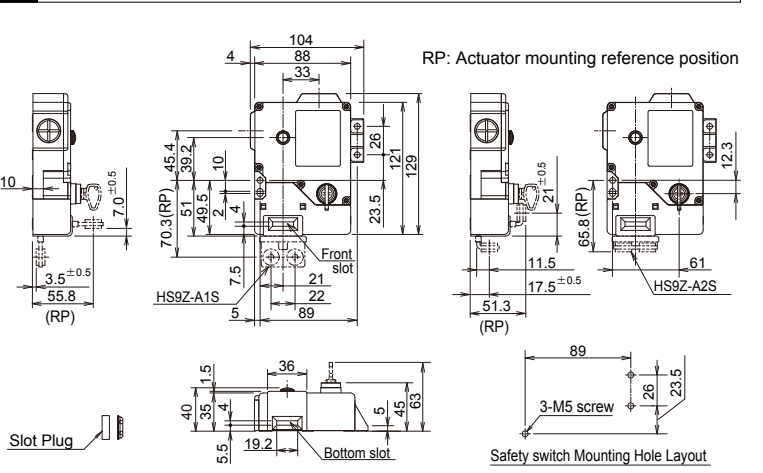


Applicable Connectors

Use a connector with a degree of protection IP67.
Applicable connector dimensions: See the figure on the right.
When using the M20 connector, replace the locking nut in the safety switch with the connector locking nut (HW9Z-NM20) sold separately.

- When using flexible conduit and metal connector
Applicable Flexible Conduit Example: Type VF-03(made by Nihon Flex)
Applicable Metal Connector Example(G1/2): Type RLC-103(made by Nihon Flex) (PG13.5): Type RBC-103PG13.5(made by Nihon Flex) (M20): RLC-103EC20(made by Nihon Flex)
- When using plastic connector, metal connector and multi-core cable
(G1/2)Applicable Plastic Connector Example: Type SCS-10□(made by Seiwa Electric)
Applicable Metal Connector Example : Type ALS-16□□(made by Nihon Flex) (PG13.5)Applicable Plastic Connector Example: Type ST13.5(made by LAPP)
Applicable Metal Connector Example : Type ABS-□□PG13.5(made by Nihon Flex) (M20)Applicable Plastic Connector Example: ST-M20 × 1.5(made by LAPP)
Applicable Metal Connector Example : ALS-□□EC20(made by Nihon Flex)
Note : Confirm the outside diameter of the multi-core cable, the connector type depends on the outside diameter of multi-core cable.
Note : When using ST-M20 × 1.5, use with gasket GP-M (Type No: GPM20, made by LAPP).

7 Dimensions



Note: Use the slot plug attached to the safety switch to close the unused actuator entry slot.

8 Precaution for Disposal

Dispose of HS1E Safety Switch as an industrial waste.