HS1C Series Full Size Interlock Switch with Locking Solenoid

HS1C

Key features include:

- **Rugged Aluminum Die-cast Housing**
- **With the actuator mounted on a movable door, and the switch on a machine, the door can be mechanically locked when closed.**
- **Greater Safety: The door is unlocked by a solenoid lock-release signal from a PLC or another source after the machine has stopped.**
- **In the event of power failure or for machine maintenance, the door can be unlocked using a special tool.**
- **Flexible Installation: The actuator can be accessed from two directions.**
- **Select from four different circuit configurations.**
- **IP67 Protection**

c UL us LISTED

TÜV PRODUCT SERVICE Bauart geprüft

EN1088
EN60947-5-1
IEC60947-5-1

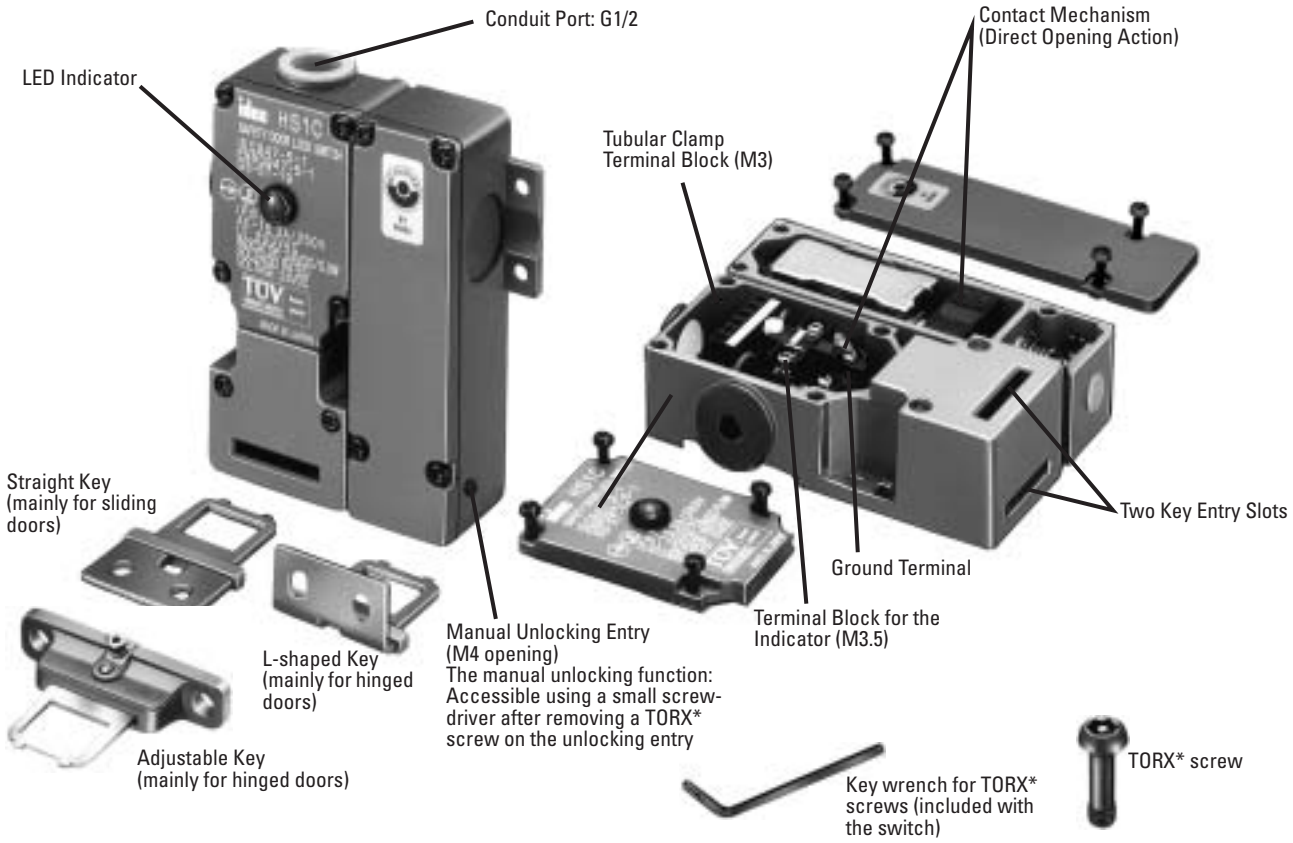
CE

GS-ET-15
BG standard in Germany

Certificate No.
2005010305145652

Direct Opening Action

HS1C Series Functionality



*TORX is a registered trademark of Camcar Textron.

Specifications

Specifications

Conforming to Standards			EN1088, IEC60947-5-1, EN60947-5-1 GS-ET-19			
Operating Temperature			–20 to +40°C (no freezing)			
Storage Temperature			–40 to +80°C			
Operating Humidity			85% RH maximum (no condensation)			
Altitude			2,000m maximum			
Rated Insulation Voltage (Ui)			300V (between LED or solenoid and ground: 60V)			
Impulse Withstand Voltage (Uimp)			4 kV (between LED or solenoid and ground: 2.5 kV)			
Insulation Resistance			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 1 (IEC61140)			
Pollution Degree			3 (IEC60947-5-1)			
Degree of Protection			IP67 (IEC60529)			
Vibration Resistance	**Operating Extremes**		10 to 55 Hz, amplitude 0.5 mm			
	Damage Limits		60 m/s^2 (approx.6G)			
Shock Resistance			1,000 m/s^2 (approx. 100G)			
Key Tensile Strength when Locked			1,500N minimum			
Operating Speed			1 m/sec maximum			
Positive Opening Travel			11 mm minimum			
Positive Opening Force			20N minimum			
Thermal Current (Ith)			Main circuit: 10A, Auxiliary circuit: 3A			
Rated Operating Current (Ie)			Rated operating voltage (Ue)	30V	125V	250V
	Main Circuit	AC	Resistive load (AC12) Inductive load (AC15)	10A 10A	10A 5A	6A 3A
		DC	Resistive load (DC12) Inductive load (DC13)	6A 3A	– 0.9A	– –
	Auxiliary Circuit	AC	Resistive load (AC12) Inductive load (AC15)	– –	3A –	3A 3A
		DC	Resistive load (DC12) Inductive load (DC13)	3A –	– 0.9A	– –
Contact Opening Distance			Main circuit: 1.7 mm max., Auxiliary circuit: 1.2 mm min.			
Operating Frequency			900 operations/hour			
Mechanical Life			1,000,000 operations			
Electrical Life			100,000 operations (rated load)			
Conditional Short-circuit Current			100A (IEC60947-5-1)			
Recommended Short Circuit Protection			250V, 10A fuse (Type D01 based on IEC60269-1, 60269-2)			
Solenoid Unit	**Rated Operating Voltage**		24V DC			
	Rated Current		415 mA			
	Coil Resistance		58Ω (at 20°C)			
	Energizing Voltage		Rated voltage × 85% maximum (at 20°C)			
	De-energizing Voltage		Rated voltage × 10% minimum (at 20°C)			
	Continuous Applicable Voltage		Rated voltage × 110%			
	Continuous Applicable Duration		Not specifically limited			
	Insulation Class		Class B			
Indicator	**Rated Operating Voltage**		24V DC			
	Rated Current		10 mA			
	Light Source		LED lamp			
	Lens Color		Red or Green (12 mm dia. Lens)			
Weight			660g			

Ordering Information

HS1C - R 1 4 4 R - R

- Indicator Color: R (Red), G (Green)
- Housing Color: R (Red)
- Solenoid & LED voltage: 4 (24V DC)
- Circuit Diagram No.

	Main Circuit	Auxiliary Circuit
Blank:	1NC+1NC	1NO/1NO
1:	1NC+1NC	1NO
2:	1NC+1NC	1NC+1NC
3:	1NC+1NC	1NC

Part Numbers

Part Numbers: Body

Item	Part Number	Description	Solenoid Unit
	HS1C-R①44R-*	HS1C with solenoid interlock (24V DC)	Attached on the right side of the base

1. *Special key wrench (HS9Z-T1) for removing the cover and manual unlocking is included with the switch.*
2. *Specify the circuit diagram No. in place of ①.*
3. *Specify the indicator color (R or G) in place of *.*
4. *Order the key separately (not included with the switch).*

Circuit Diagram No.

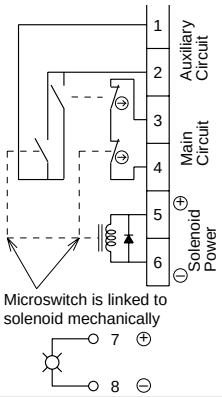
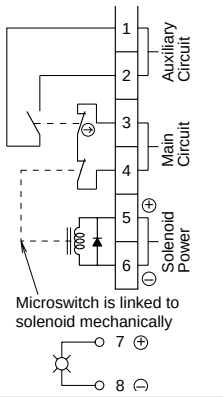
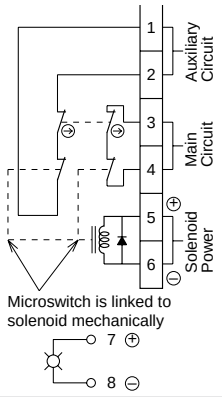
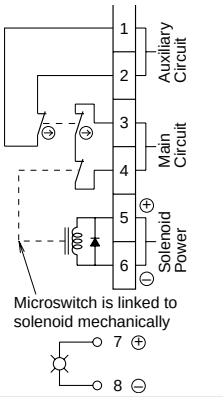
	Main Circuit	Auxiliary Circuit
Blank:	1NC+1NC	1NO/1NO
1:	1NC+1NC	1NO
2:	1NC+1NC	1NC+1NC
3:	1NC+1NC	1NC

Part Numbers: Keys, Wrench & Screwdriver

Item	Part Number	Description
	HS9Z-A1	Straight Key (Mainly for sliding doors)
	HS9Z-A2	L-shaped Key (Mainly for rotating doors)
	HS9Z-A3	Adjustable Key
	HS9Z-T1	Special Key Wrench (included with switch)

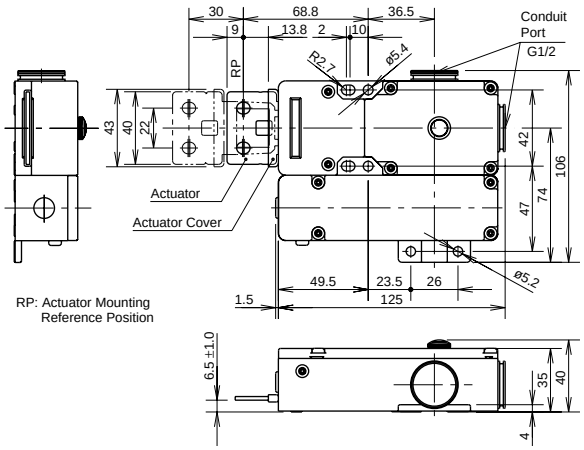
Circuit Diagrams

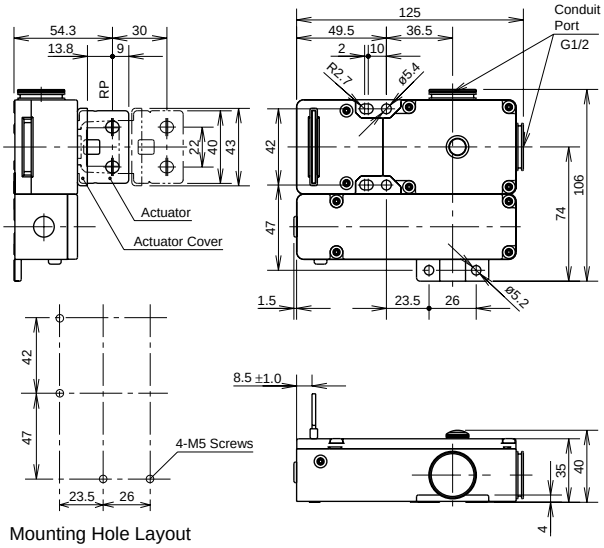
Circuit Diagrams

Circuit Diagram No. Blank	Circuit Diagram No. 1	Circuit Diagram No. 2	Circuit Diagram No. 3
			

Dimensions

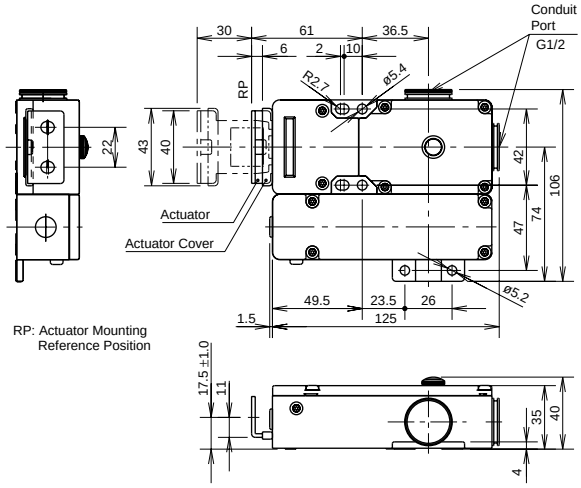
HS1C-R44R-* - using the straight key (HS9Z-A1)

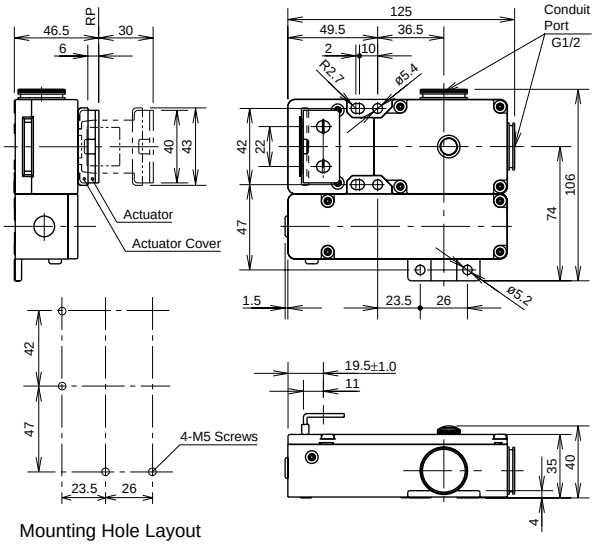




Mounting Hole Layout

HS1C-R44R-* - using the L-shaped key (HS9Z-A2)





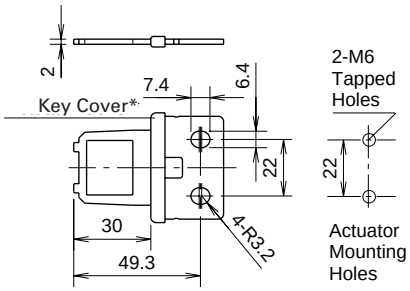
Mounting Hole Layout

All dimensions in mm.

Accessories

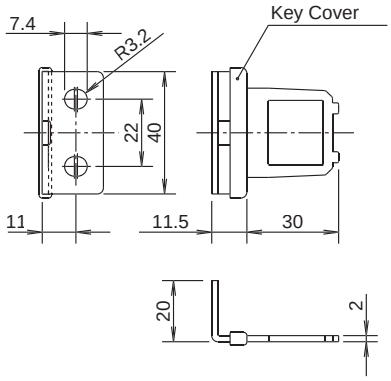
Straight Key (mainly for sliding doors)
HS9Z-A1

weight: 22g



L-Shaped Key (mainly for hinged doors)
HS9Z-A2

weight: 22g

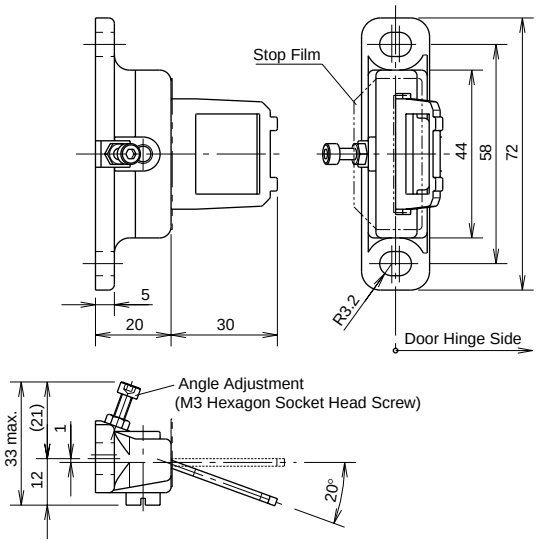


**After installing the key, remove the key cover.*

Adjustable Key

- **The key angle is adjustable (0° to 20°) for hinged doors.**
- **The minimum radius of the door opening can be as small as 100mm.**

For HS1/HS2 Series (HS9Z-A3)



All dimensions in mm.

Interlock Switch Safety Precautions

- In order to avoid electric shock or a fire, turn the power off before installation, removal, wire connection, maintenance, or inspection of the switch.
- If relays are used in the circuit between the safety switch and the load, consider degrees of the danger and use safety relays, since welded or sticking contacts of standard relays may invalidate the functions of the safety switch.
- Do not place a PLC in the circuit between the safety switch and the load. The safety security can be endangered in the event of a malfunction of the PLC.
- Do not disassemble or modify the switch. It may cause a breakdown or an accident.

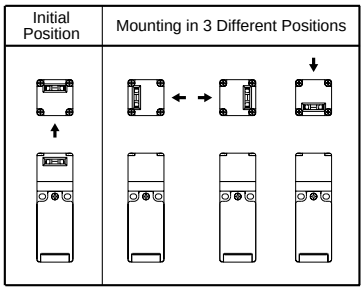
Operation Precautions - for all series

- 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 excessive force.
- Do not apply an excessive shock to the switch when opening or closing the door.
- A shock to the door exceeding 1,000 m/sec^2 (approx. 100G) may cause the contacts of the switch to chatter, and a malfunction of the switch may occur.
- For connection of wires, unscrew the cover. Unnecessary loosening of other screws may cause a malfunction of the switch.
- Prevent foreign objects such as dust and liquids from entering the switch while connecting a conduit or wiring.
- If the operating atmosphere is contaminated, use a protective cover to prevent the entry of foreign objects into the switch through the actuator entry slots.
- Entry of a considerable amount of foreign objects into the switch may affect the mechanism of the switch and cause a breakdown.
- Do not store the switches in a dusty, humid, or organic-gas atmosphere.

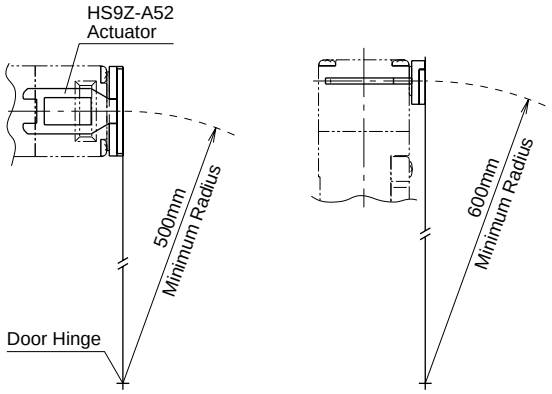
HS5B Precautions

For Rotating Head Directions

- The head of the HS5B can be rotated in 90° increments after removing the 4 screws on the corners of the head. Prevent entry of foreign objects into the switch during removal of the head. Tighten these screws with torque designated in the instruction sheet. Improper torque may cause errors.



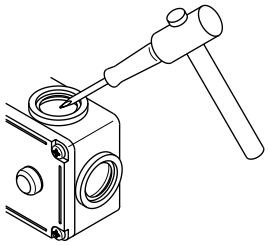
Minimum Radius of Hinged Doors



HS2B Precautions

Wire Connection

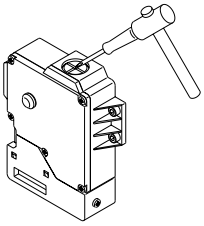
- The HS2B has 3 conduit ports, which are closed as a part of the molded switch housing.
- Make an opening for wire connection by breaking one of the conduit-port knockouts on the switch housing using a screwdriver.
- When breaking the conduit port, take care not to damage the contact block or other parts inside the switch.
- Cracks or burrs on the conduit entry may deteriorate the housing protection against water.
- When changing to another conduit port, close the unused opening with an optional plug (Type No. HS9Z-P1).

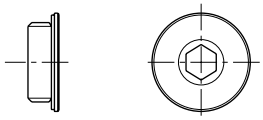


HS1E Precautions

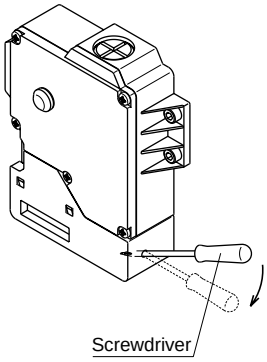
Wire Connection

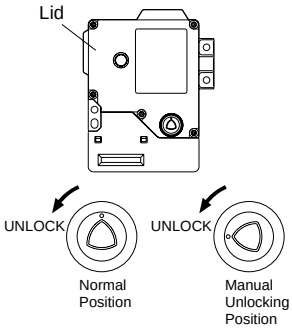
- Make an opening for wire connection by breaking one of the conduit-port knockouts on the switch housing using a screwdriver.
- Before breaking the knockout, temporarily remove the connector-fixing lock nut from the switch.
- When breaking the knockout, take care not to damage the contact block or other parts inside the switch.
- Cracks or burrs on the conduit entry may deteriorate the housing protection.
- When changing to the other conduit port, close the unused opening with an optional plug (accessory).





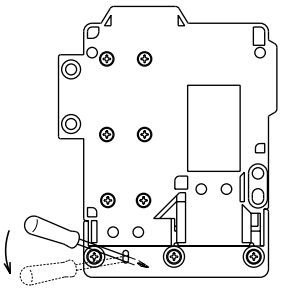
1. This unlocking method is intended for an escape from a machine when a person is locked in. For access to the unlocking entry, an access hole should be opened on the mounting panel. When opening the hole, apply proper protection against water or other foreign objects.
2. Caution: After the unlocking operation, put the screw back into the unlocking entry for safety.





Manual Unlocking

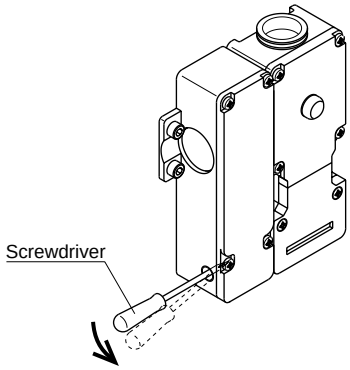
- Remove the screw located on the unlocking entry at the side of the switch using the key wrench included with the switch. Then insert a small screwdriver into the switch to push the lever inside of the switch toward the indicator until the actuator is unlocked (refer to the diagram on the right).
- Insert a small screwdriver into the elliptical hole on the back of the switch, then push the lever inside of the switch toward the indicator until the key is unlocked (refer to the diagram on the right).



HS1C Precautions

- Regardless of door type, do not use the safety switch as a locking device. Install a locking device independently, for example, using a metal latch (also applicable to Type HS1E).
- The safety switch cover can be only removed with the special key wrench supplied with the switch or with the optional screwdriver (applicable to HS1B and HS1E).
- Remove the screw located on the unlocking entry at the side of the switch using the key wrench included with the switch. Then insert a small screwdriver into the switch to push the lever inside of the switch toward the indicator until the actuator is unlocked (refer to the diagram on the right).

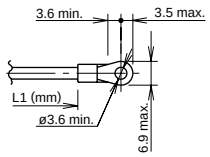
Caution: After the unlocking operation, put the screw back into the unlocking entry for safety.



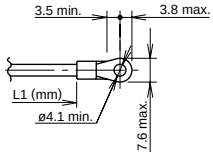
Operation Precautions

Applicable Crimping Terminals

- (Refer to the Crimping Terminal 1 or 2 shown in the drawing below.)
- HS1C
  Terminals No. 1 to 6: Use solid or stranded wires only (crimping terminals not applicable).
  Terminals No. 7 and 8: Crimping Terminal 1
  Ground Terminal: Crimping Terminal 2
- HS1B
  Ground Terminal: Crimping Terminal 2
  Other Terminals: Crimping Terminal 1
  HS2B, HS5B, and HS1E
  Crimping Terminal 1

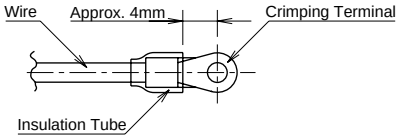


Crimping Terminal 1



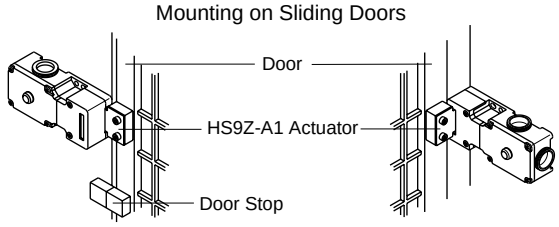
Crimping Terminal 2

Use an insulation tube on the crimping terminal.

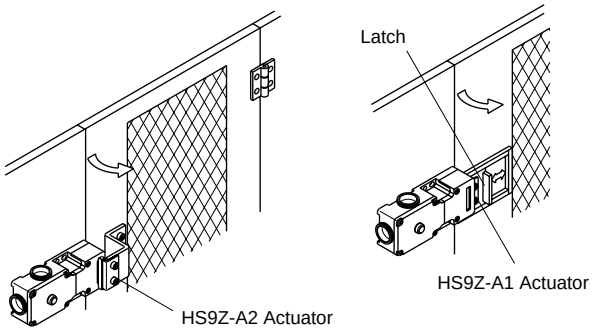


Installation Examples (see the diagrams below)

Mounting on Sliding Doors

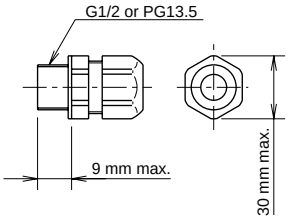


Mounting on Hinged Doors



Applicable Connectors (As shown below)

- Use connectors which maintain the IP67 protection.
- Applicable Connector Dimensions
- Flex Conduit: VF03 (Japan Flex) www.nipolex.co.jp
- Steel Connector (G1/2): ALC-103
  (PF13.5): RBC-103PG13.5



Recommended Screw Tightening Torque

- HS1C: 5.0±0.5 N-m (approx. 50±5 kgf-cm)
  (4 or 6 pcs of M5 hex socket head cap screws)
- HS1B: 5.0±0.5 N-m (approx. 50±5 kgf-cm)
  (2 or 4 pcs. of M5 hex socket head cap screws)
- HS2B: 5.0±0.5 N-m (approx. 50±5 kgf-cm)
  (2 pcs of M5 hex socket head cap screws)
- HS5B: 4.0±0.4 N-m (approx. 40±4 kgf-cm)
  (2 pcs of M4 hex socket head cap screws)
- HS1E: 5.0±0.5 N-m (approx. 50±5 kgf-cm)
  (4 or 6 pcs of M5 hex socket head cap screws)
- Key (HS9Z-A1/A2)
  5.0±0.5 N-m (approx. 50±5 kgf·cm)
- (2 pcs. of M6 hex socket head cap screws)
  Key (HS9Z-A51/A52)
- 2.0±0.2 N-m (approx. 20±2 kgf·cm)
  (2 pcs of M4 hex socket head cap screws)
- 1.0±0.2 N-m (approx. 10±2 kgf·cm)
  (2 pcs of M4 Phillips screws)

The screws are supplied by the user.

Applicable Wire Size

- HS1C: 0.5 to 0.75 mm2 (Terminals No.1, 2, 5 to 8)
  1.0 to 1.25 mm2 (Terminals No.3, 4, and grounding terminal)
- HS5B: 0.5 to 1.25 mm2
- HS1E: 0.5 to 1.25 mm2