

**HS1B Series Full Size Interlock Switch**

**HS1B**

**Key features include:**

- Rugged aluminum die-cast housing
- **Direct Opening Action:** If the door is forced open, the contacts are disconnected even if they are welded or stuck.
- Available with or without an indicator (red or green).
- Mounted on safety guards, the switch can detect access into a restricted area.
- **Flexible Installation:** Two key entries and three conduit ports are provided.
- Select from two circuit configurations (1NO-1NC or 2NC).
- Degree of Contact Protection: IP67



**B1 Safety Products**



EN1088  
EN60947-5-1  
IEC60947-5-1

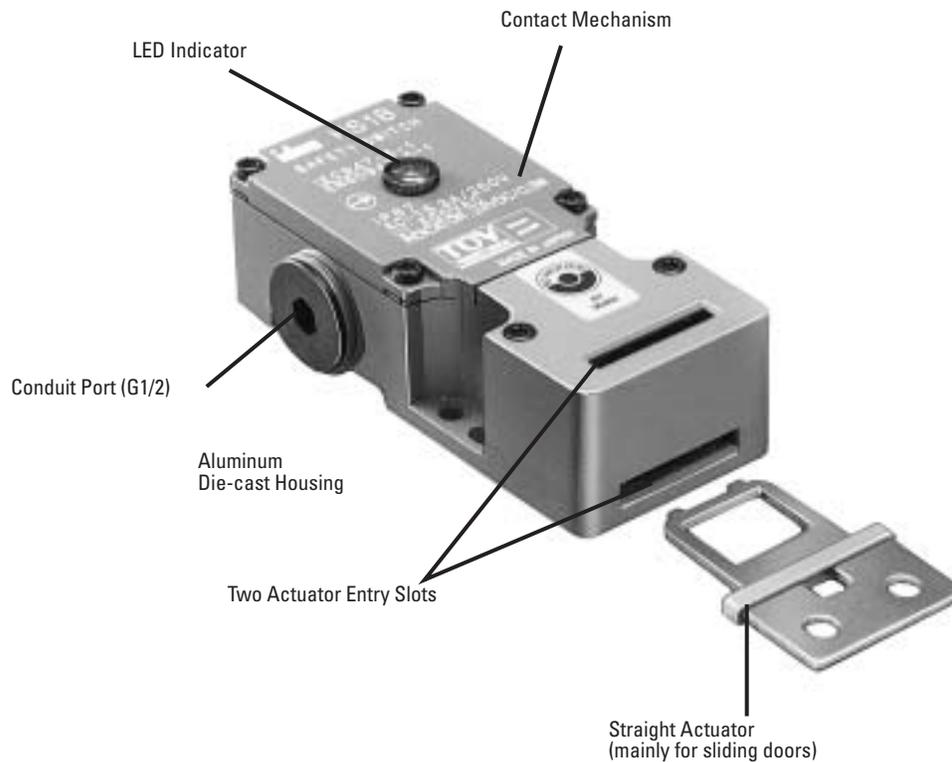


GS-ET-15  
BG standard in Germany



Direct Opening Action

**HS1B Series Functionality**



## Specifications

Specifications	<b>Conforming to Standards</b>		IEC60947-5-1, EN60947-5-1 GS-ET-15				
	<b>Operating Temperature</b>		-25 to +70°C (no freezing)				
	<b>Storage Temperature</b>		-40 to +80°C				
	<b>Operating Humidity</b>		85% RH maximum (no condensation)				
	<b>Altitude</b>		2,000m maximum				
	<b>Rated Insulation Voltage (Ui)</b>		300V (between LED and ground: 60V)				
	<b>Impulse Withstand Voltage (Uimp)</b>		4 kV (between LED and ground: 2.5 kV)				
	<b>Insulation Resistance</b>		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				
	<b>Electric Shock Protection Class</b>		Class I (IEC61140)				
	<b>Pollution Degree</b>		3 (IEC60947-5-1)				
	<b>Degree of Protection</b>		IP67 (IEC60529)				
	<b>Vibration Resistance</b>	<b>Operating Extremes</b>	10 to 55 Hz, amplitude 0.5mm p-p				
		<b>Damage Limits</b>	60 m/sec <sup>2</sup> (approx. 6G)				
	<b>Shock Resistance</b>		1,000 m/sec <sup>2</sup> (approx. 100G)				
	<b>Actuator Operating Speed</b>		1 m/sec maximum				
	<b>Positive Opening Travel</b>		11 mm minimum				
	<b>Positive Opening Force</b>		20N minimum				
	<b>Thermal Current (Ith)</b>		10A				
	<b>Rated Operating Current (Ie)</b>		Rated operating voltage (Ue)		30V	125V	250V
			AC	Resistive load (AC12)	10A	10A	6A
Inductive load (AC15)				10A	5A	3A	
DC	Resistive load (DC12)	8A	2.2A	1.1A			
	Inductive load (DC13)	4A	1.1A	0.6A			
<b>Operating Frequency</b>		900 operations/hour					
<b>Mechanical Life</b>		1,000,000 operations					
<b>Electrical Life</b>		100,000 operations (rated load)					
<b>Conditional Short-circuit Current</b>		100A (IEC60947-5-1)					
<b>Recommended Short Circuit Protection</b>		250V, 10A fuse (Type D01 based on IEC60269-1, 60269-2)					
Indicator	<b>Rated Operating Voltage</b>		24V DC				
	<b>Rated Current</b>		10 mA				
	<b>Light Source</b>		LED lamp				
	<b>Lens Color</b>		Red or Green (12 mm dia. Lens)				
<b>Weight</b>		Approx. 280g					

## Ordering Information

HS1B - 02 4 R - R

Indicator Color:  
R (Red),  
G (Green)

Housing Color:  
R (Red)

Indicator Rated Voltage:  
4 (24V DC)  
Blank (without indicator)

Circuit Configuration  
11: 1NO-1NC  
02: 2NC



Not necessary to specify color if indicator option not chosen.

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Safety Products

## Part Numbers

### Part Numbers: Body

Type	Contact Configuration	Pilot Light	Part Number
HS1B (alum. die-cast housing)	1NC-1NO	Without	HS1B-11R
		With	HS1B-114R-①
HS1B (alum. die-cast housing)	2NC	Without	HS1B-02R
		With	HS1B-024R-①



- The special key wrench (HS9Z-T1) for removing the cover and manual unlocking is included with the switch.
- Specify the indicator color code in place of ①: R (red) or G (green).
- Order the keys separately (not supplied with the switch).

### Part Numbers: Keys, Plug & Tools

Part Number	Description
HS9Z-A1	Straight Key (Mainly for sliding doors)
HS9Z-A2	L-shaped Key (Mainly for rotating doors)
HS9Z-A3	Adjustable Angle Key
HS9Z-P1	Plug for Conduit Opening
HS9Z-T1	Key Wrench (Torx head)*



\*Torx is a registered trademark of Camcar Textron.

Application Examples and Circuit Diagrams

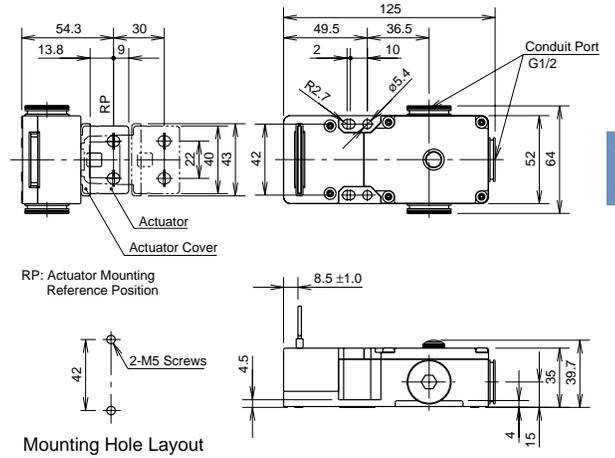
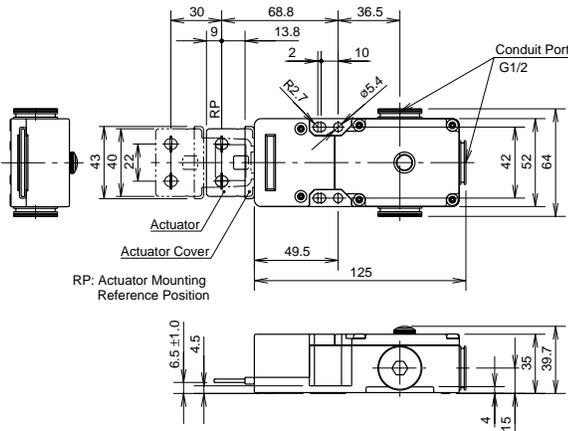
HS1B		Status 1	Status 2
Switch/ Door Status		<ul style="list-style-type: none"> <li>•Door closed</li> <li>•Machine ready to operate</li> </ul>	<ul style="list-style-type: none"> <li>•Door opened</li> <li>•Machine cannot be started</li> </ul>
Door			
HS2B-11 (1NO-1NC)	Circuit Diagram		
	Main Circuit	3-4: Closed	3-4: Open
	Aux. Circuit	1-2: Open	1-2: Closed
HS1B-02 (2NC)	Circuit Diagram		
	Main Circuit	3-4: Closed	3-4: Open
	Aux. Circuit	1-2: Closed	1-2: Open



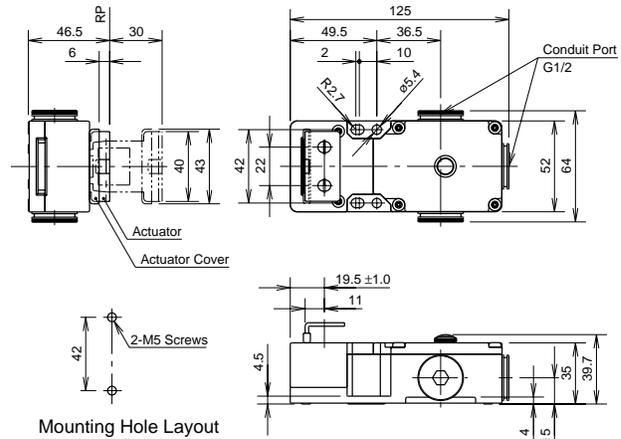
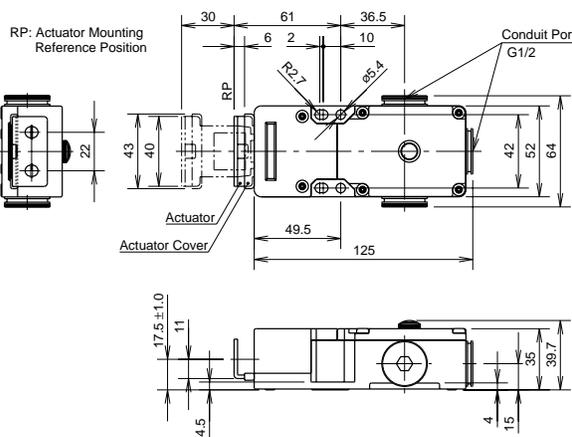
1. Main Circuit: used to enable the machine to start only when the main circuit is closed.  
Auxiliary Circuit: used to indicate whether the main circuit or door is open or closed.
2. Terminals + and - are used for the LED indicator, and are isolated from door status. Wire the terminals only when needed.

## Dimensions

### HS1B - using straight key (HS9Z-A1)



### HS1B - using the L-shaped Key (HS9Z-A2)



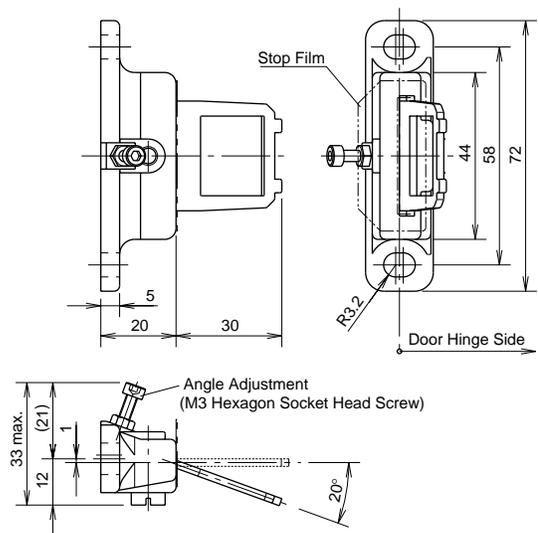
All dimensions in mm.

## Accessories

### 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)



## 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<sup>2</sup> (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.

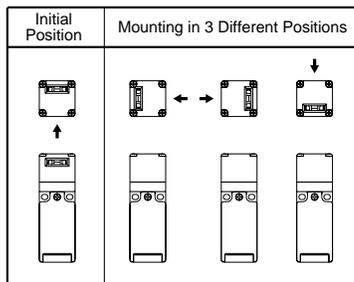
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Safety Products

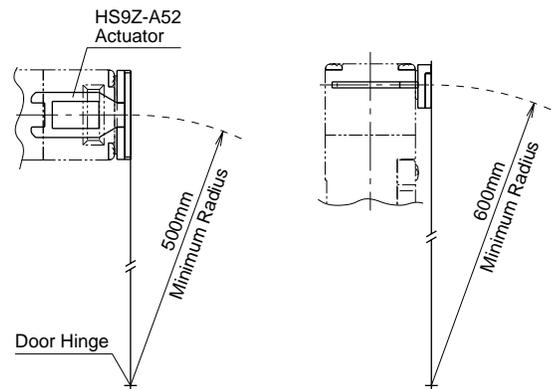
## HS5B Precautions

### 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.



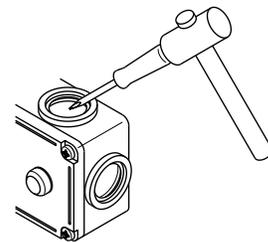
### Minimum Radius of Hinged Doors



## HS2B Precautions

### Wire Connection

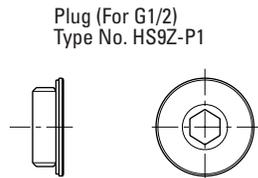
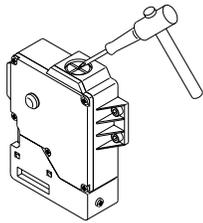
- The HS2B has 3 conduit ports, which are closed as a part of the molded switch housing.
- Make an opening for wire connection by breaking one of the conduit-port knockouts on the switch housing using a screwdriver.
- When breaking the conduit port, take care not to damage the contact block or other 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).



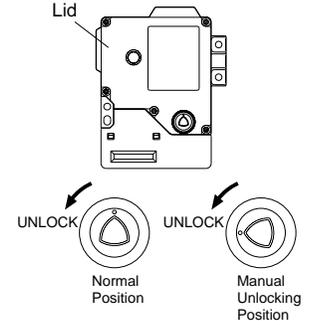
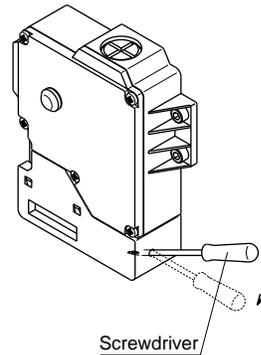
## HS1E Precautions

## 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).

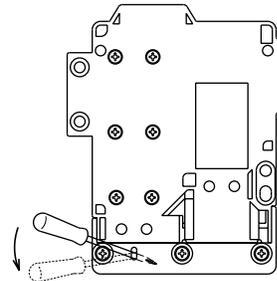


1. This unlocking method is intended for an escape from a machine when a person is locked in. For access to the unlocking entry, an access hole should be opened on the mounting panel. When opening the hole, apply proper protection against water or other foreign objects.
2. Caution: After the unlocking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

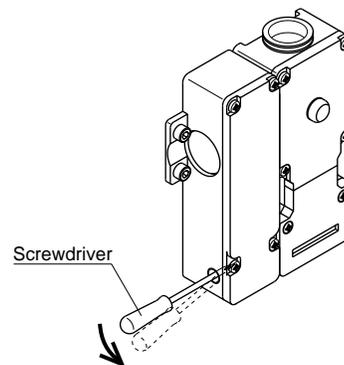


## HS1C Precautions

- 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).



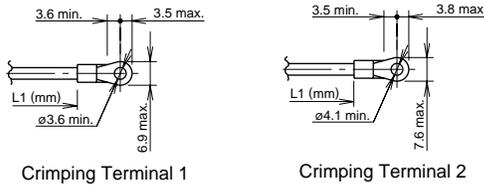
Caution: After the unlocking operation, put the screw back into the unlocking entry for safety.



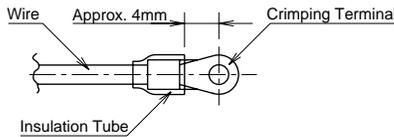
## Operation Precautions

### Applicable Crimping Terminals

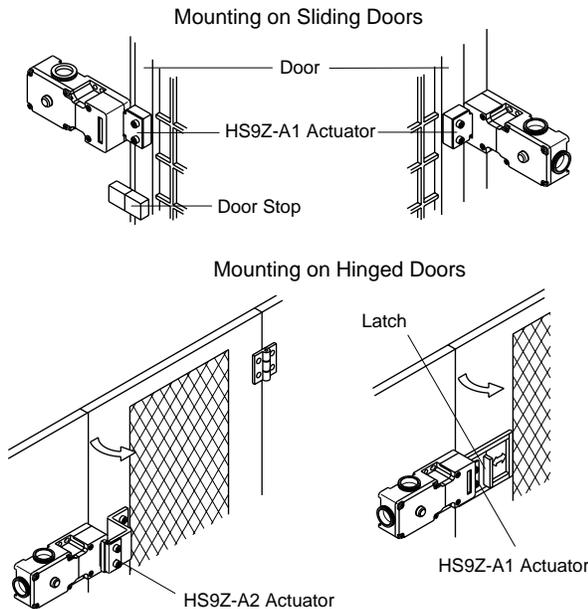
- (Refer to the Crimping Terminal 1 or 2 shown in the drawing below.)
- HS1C  
Terminals No. 1 to 6: Use solid or stranded wires only (crimping terminals not applicable).  
Terminals No. 7 and 8: Crimping Terminal 1  
Ground Terminal: Crimping Terminal 2
- HS1B  
Ground Terminal: Crimping Terminal 2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



Use an insulation tube on the crimping terminal.

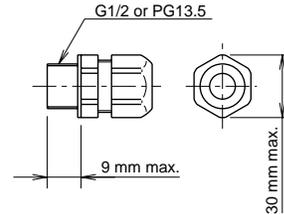


### Installation Examples (see the diagrams below)



### Applicable Connectors (As shown below)

- Use connectors which maintain the IP67 protection.
- Applicable Connector Dimensions
- Flex Conduit: VF03 (Japan Flex) [www.nipolex.co.jp](http://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 mm<sup>2</sup> (Terminals No.1, 2, 5 to 8)  
1.0 to 1.25 mm<sup>2</sup> (Terminals No.3, 4, and grounding terminal)
- HS5B: 0.5 to 1.25 mm<sup>2</sup>
- HS1E: 0.5 to 1.25 mm<sup>2</sup>