

# HS1B/HS2B Interlock Switches

## Machine stops when the door is opened.

- When mounting the actuator on a movable door and the interlock switch on a machine, opening or closing status of the door can be detected.
- Contact parts degree of protection: IP67 (IEC 60529)
- NC contacts feature direct opening mechanism (IEC/EN 60947-5-1).
- Special actuator prevents defeating (ISO 14119, EN 1088)
- Detects entry to hazardous area when mounted on safety guards.
- Two actuator entry slots and three conduit ports are provided.
- HS1B: Rugged die-cast aluminum housing
- HS2B: Compact and lightweight plastic housing



## Parts and Functions

• LED Indicator (optional) (green or red)

• M3.5 Screw Terminal Wiring

• Three Conduit Ports (G1/2) Use IP67 conduit or connector (see page 105 for details).

• Two Actuator Entry Slots

**HS1B (die-cast aluminum housing)**

• Three Conduit Ports (G1/2) Use IP67 conduit or connector (see page 105 for details).

• LED Indicator (optional)

• M3.5 Screw Terminals for Wiring (inside)

• Two Actuator Entry Slots

**HS2B (plastic housing)**

• Straight Actuator (SUS304) HS9Z-A1

• Right-angle Actuator (SUS304) HS9Z-A2

• Angle Adjustable Actuator for hinged doors HS9Z-A3

# HS1B/HS2B Interlock Switches

## Interlock Switch

| Model | Contact Configuration | Indicator | Part No.     |
|-------|-----------------------|-----------|--------------|
| HS1B  | 1NC-1NO<br>           | —         | HS1B-11R     |
|       |                       | With      | HS1B-114R-*  |
| HS1B  | 2NC<br>               | —         | HS1B-02R     |
|       |                       | With      | HS1B-024R-*  |
| HS2B  | 1NC-1NO<br>           | —         | HS2B-11NB    |
|       |                       | With      | HS2B-114NB-* |

The contact configuration represents the status when the actuator is inserted.

- Special key wrench HS9Z-T1 is supplied with the HS1B interlock switch.
- Specify an indicator color code in place of \* in the Part No.  
G: green, R: red
- Actuator is not attached to the interlock switch and must be ordered separately.

## Contact Ratings

|                               |    |                                    |      |      |      |
|-------------------------------|----|------------------------------------|------|------|------|
| Rated Insulation Voltage (Ui) |    | 300V (between LED and ground: 60V) |      |      |      |
| Rated Thermal Current (Ith)   |    | 10A                                |      |      |      |
| Rated Voltage (Ue)            |    | 30V                                | 125V | 250V |      |
| Rated Current (Ie) (Note)     | AC | Resistive load (AC-12)             | 10A  | 10A  | 6A   |
|                               |    | Inductive Load (AC-15)             | 10A  | 5A   | 3A   |
|                               | DC | Resistive load (DC-12)             | 8A   | 2.2A | 1.1A |
|                               |    | Inductive Load (DC-13)             | 4A   | 1.1A | 0.6A |

- Minimum applicable load (reference value): 3V AC/DC, 5 mA  
(Applicable range is subject to the operating conditions and load.)

## Specifications

|  |   |
|--|---|
| Applicable Standards                   | ISO14119<br>IEC60947-5-1<br>EN60947-5-1<br>(TÜV approved)<br>GS-ET-15 (TÜV approved)<br>UL508 (UL listed)<br>CSA C22.2 No.14<br>(c-UL listed)<br>IEC 60204-1/EN 60204-1 (applicable standards for use)    |
| Applicable Directive                   | 2006/95/EC (Low Voltage Directive) and 2006/42/EC (Machinery Directive)   |
| Operating Temperature                  | -20 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              | 4 kV  |
| Insulation Resistance (500V DC megger) | Between live and dead metal parts: 100 MΩ minimum<br>Between live metal part and ground: 100 MΩ minimum<br>Between live metal parts: 100 MΩ minimum<br>Between terminals of the same pole: 100 MΩ minimum |
| Electric Shock Protection              | HS1B: Class I (IEC 61140)<br>HS2B: Class II (IEC 61140)   |
| Degree of Protection                   | IP67 (IEC 60529)  |
| Shock Resistance                       | Damage limits: 1000 m/s <sup>2</sup>  |
| Vibration Resistance                   | Operating extremes:<br>10 to 55 Hz, amplitude 0.5 mm<br>Damage limits: 30 Hz, amplitude 1.5 mm  |
| Actuator Operating Speed               | 0.05 to 1.0 m/s   |
| Direct Opening Travel                  | 11 mm minimum   |
| Direct Opening Force                   | HS1B, HS2B (without actuator retaining mechanism):<br>20N minimum<br>HS2B (with actuator retaining mechanism):<br>36N minimum   |
| Operating Frequency                    | 900 operations per hour   |
| Mechanical Life                        | 1,000,000 operations minimum (GS-ET-15)   |
| Electrical Life                        | 100,000 operations minimum (operating frequency 900 operations per hour, load AC-12, 250V, 6A)  |
| Conditional Short-circuit Current      | 100A (250V) (Use 250V/10A fast-blow fuse for short-circuit protection.)   |
| Weight (approx.)                       | HS1B: 280g<br>HS2B: 130g  |

## Actuators, Special Key Wrench, and Plug

Actuator is not supplied with the interlock switch, and must be ordered separately.

| Description   | Part No. |
|---|----------|
| Straight Actuator (mainly for sliding doors)        | HS9Z-A1  |
| Right-angle Actuator (mainly for hinged doors)      | HS9Z-A2  |
| Angle Adjustable Actuator (mainly for hinged doors) | HS9Z-A3  |
| Special Key Wrench for HS1B                         | HS9Z-T1  |
| Conduit Port Plug for HS2B                          | HS9Z-P1  |

Note: Ratings approved by safety agencies: A300: AC-15 3A/250V

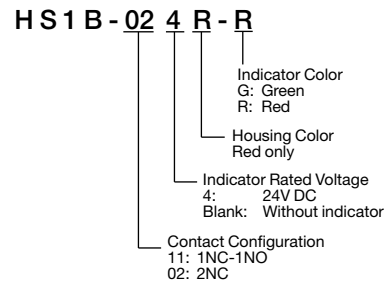
## Indicator

|               |                    |
|---------------|--------------------|
| Rated Voltage | 24V DC             |
| Rated Current | 10 mA              |
| Light Source  | LED                |
| Light Color   | G (green), R (red) |

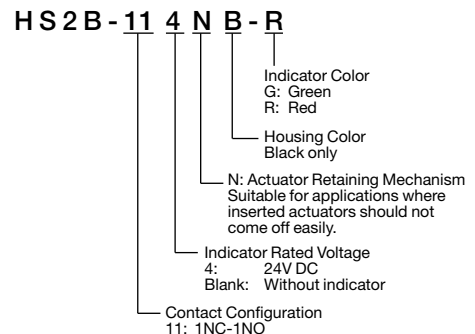
- The lens cannot be replaced.

## Part No. Development

### HS1B



### HS2B



# HS1B/HS2B Interlock Switches

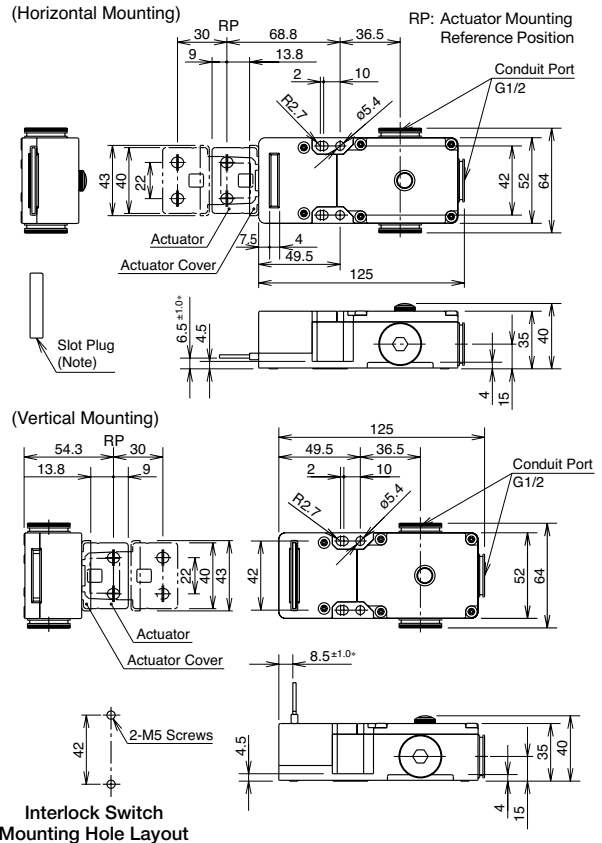
## Circuit Diagram and Operating Characteristics

| Interlock Switch Status         |                 | Status 1  | Status 2   |
|---------------------------------|-----------------|---|--|
|                                 |                 | <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 open</li> <li>Machine cannot be started</li> </ul> |
| Door                            |                 |   |  |
| HS1B-11<br>HS2B-11<br>(1NC-1NO) | Circuit Diagram |   |  |
|                                 | Main Circuit    | 3-4: Closed   | 3-4: Open  |
|                                 | Monitor Circuit | 1-2: Open   | 1-2: Closed  |
| HS1B-02<br>(2NC)                | Circuit Diagram |   |  |
|                                 | Main Circuit    | 3-4: Closed   | 3-4: Open  |
|                                 | Monitor Circuit | 1-2: Closed   | 1-2: Open  |

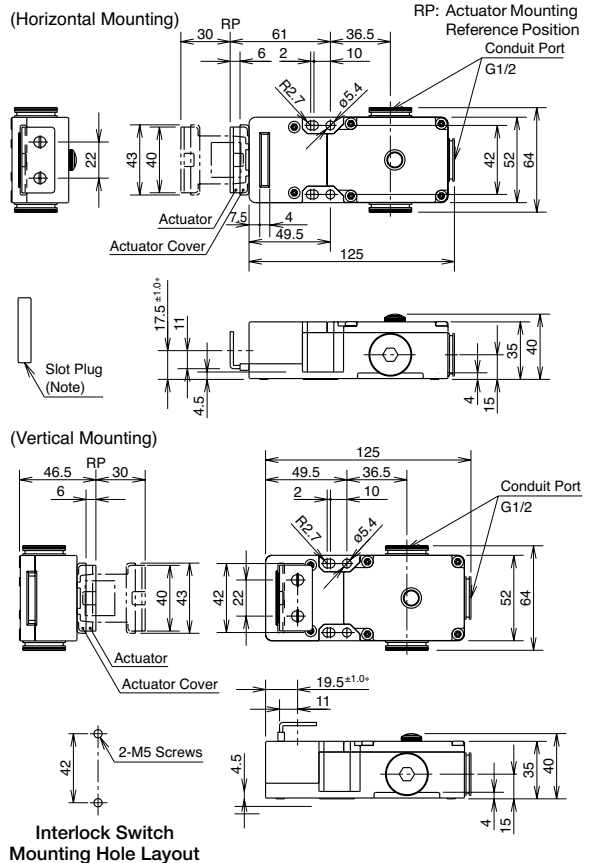
The LED indicator terminal is independent of door status, and thus can be wired as necessary.

## Dimensions

### HS1B using the Straight Actuator (HS9Z-A1)



### HS1B using the Right-angle Actuator (HS9Z-A2)



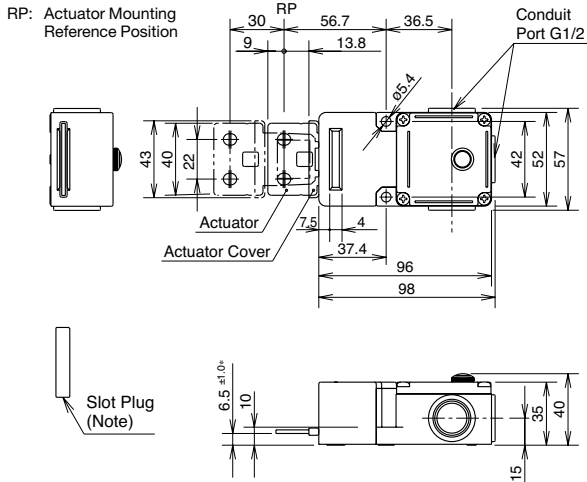
Note: Plug the unused actuator entry slot using the slot plug supplied with the interlock switch.

\* Actuator center position

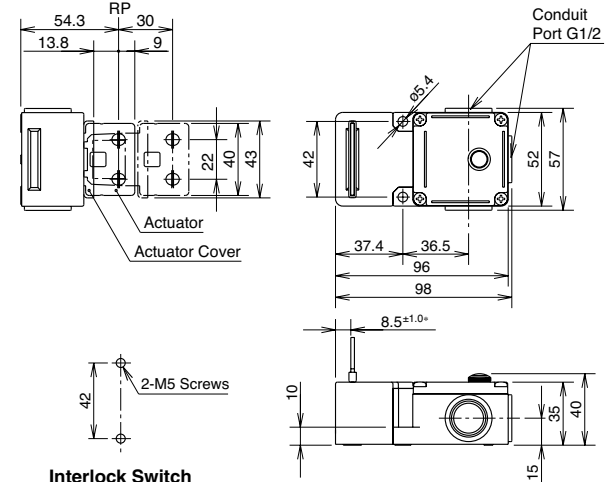
# HS1B/HS2B Interlock Switches

## HS2B using the Straight Actuator (HS9Z-A1)

(Horizontal Mounting)

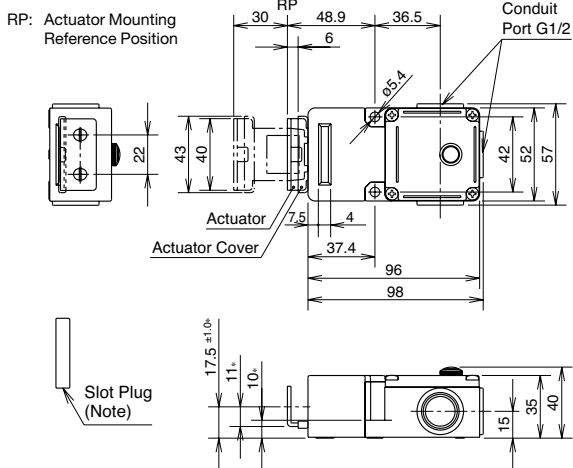


(Vertical Mounting)

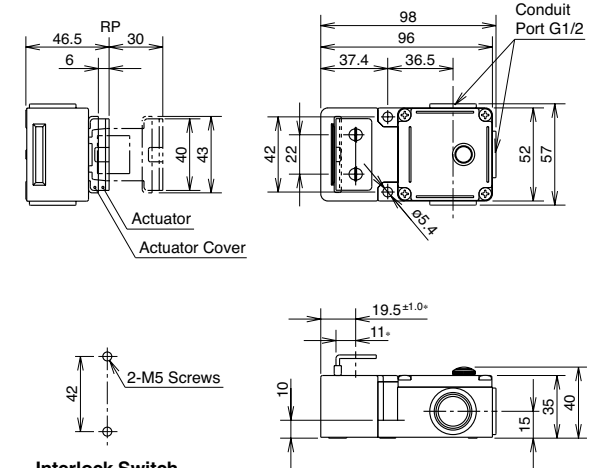


## HS2B using the Right-angle Actuator (HS9Z-A2)

(Horizontal Mounting)



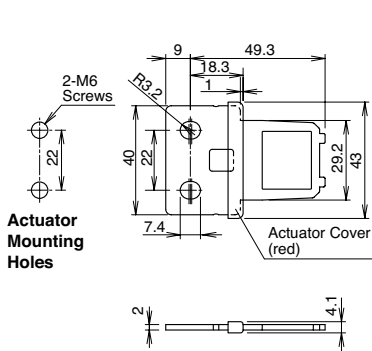
(Vertical Mounting)



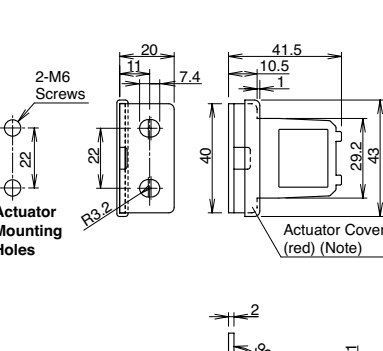
Note: Plug the unused actuator entry slot using the slot plug supplied with the interlock switch.

## Actuator Dimensions

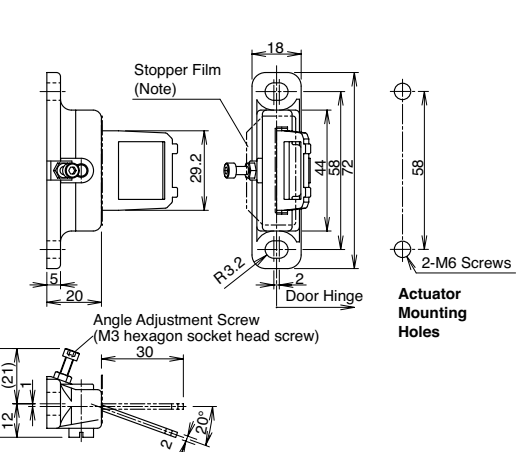
### Straight Actuator HS9Z-A1



### Right-angle Actuator HS9Z-A2



### Angle-adjustable Actuator HS9Z-A3



Note: The actuator cover and actuator stop films are supplied with the actuator and used when adjusting the actuator position. Remove the actuator cover and actuator stop film after the actuator position is determined.

# HS1B/HS2B Interlock Switches

## Safety Precautions

- In order to avoid electric shock or fire, turn power off before installation, removal, wire connection, maintenance, or inspection of the interlock switch.
- If relays are used in the circuit between the interlock switch and the load, consider the danger and use safety relays, since welded or sticking contacts of standard relays may invalidate the functions of the interlock switch. Perform risk assessment and establish a safety circuit which satisfies the requirement of the safety category.
- Do not place a PLC in the circuit between the interlock switch and the load. Safety security can be endangered in the event of a malfunction of the PLC.
- Do not disassemble or modify the interlock switch, otherwise a malfunction or an accident may occur.
- Do not install the actuator in the location where the human body may come into contact. Otherwise injury may occur.

## Instructions

- Regardless of door types, do not use the interlock switch as a door stop. Install a mechanical door stop at the end of the door to protect the interlock switch against excessive force.
- Do not apply excessive shock to the interlock switch when opening or closing the door. A shock to the interlock switch exceeding  $1,000 \text{ m/s}^2$  may cause damage to the interlock switch.
- When wiring, unscrew the cover with part number label only. Unnecessary loosening of other screws may cause a malfunction of the interlock switch.
- Prevent foreign objects such as dust and liquids from entering the interlock 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 interlock switch through the actuator entry slots.
- Entry of a considerable amount of foreign objects into the interlock switch may affect the mechanism of the interlock switch and cause a breakdown.
- Plug the unused actuator entry slot using the slot plug supplied with the interlock switch.
- Do not store the interlock switches in a dusty, humid, or organic-gas atmosphere.
- Use dedicated actuators only. When other actuators are used, the interlock switch may be damaged.
- Do not modify the actuator, otherwise it will damage the interlock switch.
- The HS1B cover uses special screws which cannot be removed or tightened by general drivers. Use the special wrench supplied with the interlock switch.

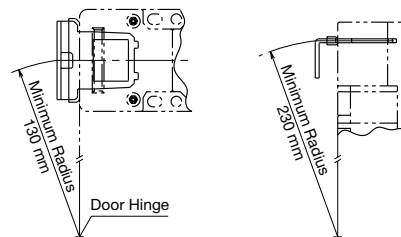
## Minimum Radius of Hinged Door

- 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 the angle adjustable actuator (HS9Z-A3).

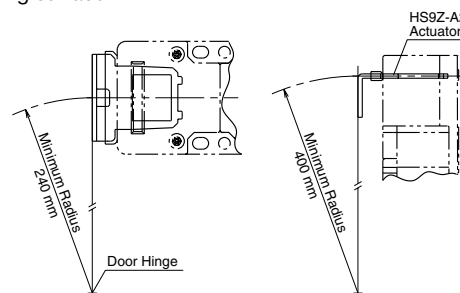
Note: Because deviation or dislocation of hinged door may occur in actual applications, make sure of the correct operation before installation.

## When using the HS9Z-A2 Right-angle Actuator

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

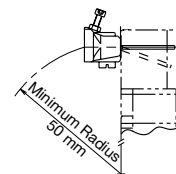


- When the door hinges on the extension line of the actuator mounting surface:

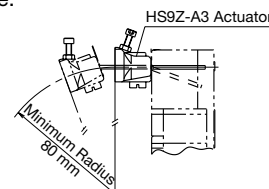


## When using the Angle-adjustable HS9Z-A3 Actuator

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



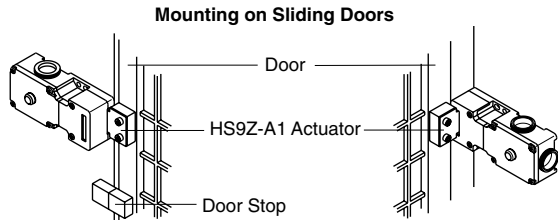
- When the door hinge is on the extension line of the actuator mounting surface:



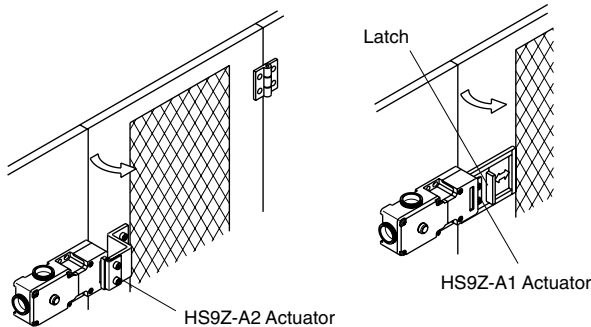
## Instructions

### Mounting Examples

Mount the interlock switch on a fixed machine or guard, and mount the actuator on the hinged door. Do not mount both interlock switch and actuator on the hinged doors, otherwise malfunction will occur.



#### Mounting on Hinged Doors



### Applicable Crimping Terminal

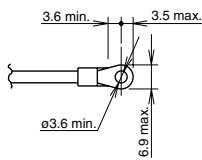
#### HS1B

Use Crimping Terminal 1 for terminals other than the ground terminal.

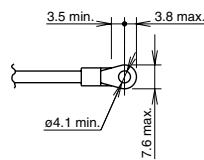
Use Crimping Terminal 2 for the ground terminal.

#### HS2B

Use Crimping Terminal 1 for all terminals.

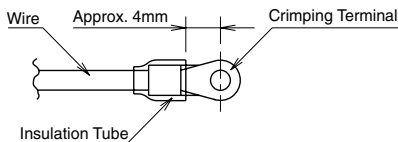


Crimping Terminal 1



Crimping Terminal 2

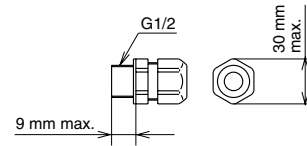
- Use an insulation tube on the crimping terminal.



- When using stranded wires, make sure that loose wires do not cause short circuit. Also, do not solder the terminal to prevent loose wires.

### Applicable Cable Glands

- Use IP67 cable gland.



Refer to the instruction sheet from the URL below for recommended cable glands.

[https://apac.idec.com/idec-apac/en/SGD/c/HS1B\\_2B\\_Series](https://apac.idec.com/idec-apac/en/SGD/c/HS1B_2B_Series)

### Applicable Wire Size

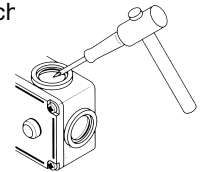
- 0.5 to 1.25 mm<sup>2</sup> (AWG20 to AWG16)

### Recommended Tightening Torque of Mounting Screws

- Interlock Switches
  - HS1B: 4.5 to 5.5 N·m (two M5 screws)
  - HS2B: 3.2 to 3.8 N·m (two M6 screws)
- Terminal screw: 0.9 to 1.1 N·m (M3.5 screws)
- Actuators (HS9Z-A1/A2/A3)
  - 4.5 to 5.5 N·m (two M6 screws)
- Mounting bolts must be provided by users.
- The above recommended tightening torques of the mounting screws 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 come loose after mounting.

### Conduit Port Opening (HS2B)

- The HS2B has three conduit ports, which are molded without opening.
- Make an opening for wire connection by breaking one of the conduit-port knockouts on the interlock switch housing using a screwdriver.
- When breaking the conduit port, take care not to damage the contact block and other parts inside the housing.
- 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 (Part No.: HS9Z-P1).



# Ordering Terms and Conditions

Thank you for using IDEC Products.

By purchasing products listed in our catalogs, datasheets, and the like (hereinafter referred to as "Catalogs") you agree to be bound by these terms and conditions. Please read and agree to the terms and conditions before placing your order.

## 1. Notes on contents of Catalogs

- (1) Rated values, performance values, and specification values of IDEC products listed in this Catalog are values acquired under respective conditions in independent testing, and do not guarantee values gained in combined conditions.  
Also, durability varies depending on the usage environment and usage conditions.
- (2) Reference data and reference values listed in Catalogs are for reference purposes only, and do not guarantee that the product will always operate appropriately in that range.
- (3) The specifications / appearance and accessories of IDEC products listed in Catalogs are subject to change or termination of sales without notice, for improvement or other reasons.
- (4) The content of Catalogs is subject to change without notice.

## 2. Note on applications

- (1) If using IDEC products in combination with other products, confirm the applicable laws / regulations and standards.  
Also, confirm that IDEC products are compatible with your systems, machines, devices, and the like by using under the actual conditions. IDEC shall bear no liability whatsoever regarding the compatibility with IDEC products.
- (2) The usage examples and application examples listed in Catalogs are for reference purposes only. Therefore, when introducing a product, confirm the performance and safety of the instruments, devices, and the like before use. Furthermore, regarding these examples, IDEC does not grant license to use IDEC products to you, and IDEC offers no warranties regarding the ownership of intellectual property rights or non-infringement upon the intellectual property rights of third parties.
- (3) When using IDEC products, be cautious when implementing the following.
  - i. Use of IDEC products with sufficient allowance for rating and performance
  - ii. Safety design, including redundant design and malfunction prevention design that prevents other danger and damage even in the event that an IDEC product fails
  - iii. Wiring and installation that ensures the IDEC product used in your system, machine, device, or the like can perform and function according to its specifications
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  - ii. Use in applications that require a high degree of reliability, such as provision systems for gas / waterworks / electricity, etc., systems that operate continuously for 24 hours, and settlement systems
  - iii. Use in applications where the product may be handled or used deviating from the specifications or conditions / environment listed in the Catalogs, such as equipment used outdoors or applications in environments subject to chemical pollution or electromagnetic interference  
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## 3. Inspections

We ask that you implement inspections for IDEC products you purchase without delay, as well as thoroughly keep in mind management/maintenance regarding handling of the product before and during the inspection.

## 4. Warranty

- (1) Warranty period  
The warranty period for IDEC products shall be one (1) year after purchase or delivery to the specified location. However, this shall not apply in cases where there is a different specification in the Catalogs or there is another agreement in place between you and IDEC.
- (2) Warranty scope  
Should a failure occur in an IDEC product during the above warranty period for reasons attributable to IDEC, then IDEC shall replace or repair that product, free of charge, at the purchase location / delivery location of the product, or an IDEC service base. However, failures caused by the following reasons shall be deemed outside the scope of this warranty.
  - i. The product was handled or used deviating from the conditions / environment listed in the Catalogs
  - ii. The failure was caused by reasons other than an IDEC product
  - iii. Modification or repair was performed by a party other than IDEC
  - iv. The failure was caused by a software program of a party other than IDEC
  - v. The product was used outside of its original purpose
  - vi. Replacement of maintenance parts, installation of accessories, or the like was not performed properly in accordance with the user's manual and Catalogs
  - vii. The failure could not have been predicted with the scientific and technical standards at the time when the product was shipped from IDEC
  - viii. The failure was due to other causes not attributable to IDEC (including cases of force majeure such as natural disasters and other disasters)Furthermore, the warranty described here refers to a warranty on the IDEC product as a unit, and damages induced by the failure of an IDEC product are excluded from this warranty.

## 5. Limitation of liability

The warranty listed in this Agreement is the full and complete warranty for IDEC products, and IDEC shall bear no liability whatsoever regarding special damages, indirect damages, incidental damages, or passive damages that occurred due to an IDEC product.

## 6. Service scope

The prices of IDEC products do not include the cost of services, such as dispatching technicians. Therefore, separate fees are required in the following cases.

- (1) Instructions for installation / adjustment and accompaniment at test operation (including creating application software and testing operation, etc.)
- (2) Maintenance inspections, adjustments, and repairs
- (3) Technical instructions and technical training
- (4) Product tests or inspections specified by you

The above content assumes transactions and usage within your region. Please consult with an IDEC sales representative regarding transactions and usage outside of your region. Also, IDEC provides no guarantees whatsoever regarding IDEC products sold outside your region.

# IDEC CORPORATION

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