



INSTRUCTION SHEET

Original Instructions
Interlock Switch with Solenoid
HS5L Series

*In order to verify if the product you are interested in is certified with the S mark, please check the following section on our website: "List of type numbers certified with the S mark"

Thank you for purchasing this IDEC product. Confirm that the delivered product is what you have ordered. Read this instruction sheet to make sure of correct operation.

SAFETY PRECAUTIONS

In this operation instruction sheet, safety precautions are categorized in order of importance to Warning and Caution :

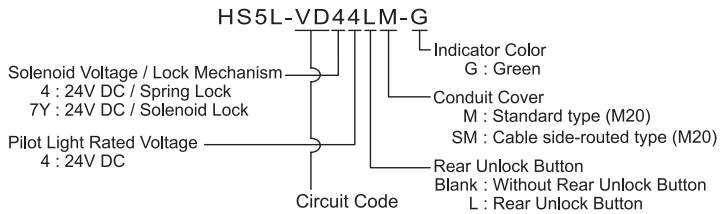
WARNING

Warning notices are used to emphasize that improper operation may cause severe personal injury or death.

CAUTION

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

1 Type



Contact Configuration

Standard type

Main circuit	Door monitor circuit	Lock monitor circuit		HS5L-□ 44M-G	HS5L-□ 44LM-G	HS5L-□ 7Y4M-G
-	1NC	1NC	XD	✓	-	✓
-	2NC	-	XF	-	-	-
-	1NC, 1NO	-	XG	-	-	✓
-	-	2NC	XH	✓	✓	✓
-	1NC, 1NO	1NC, 1NO	VA	✓	✓	✓
-	1NC, 1NO	2NC	VB	✓	✓	✓
-	2NC	1NC, 1NO	VC	✓	✓	✓
-	2NC	2NC	VD	✓	✓	✓
-	3NC	1NC	VF	✓	-	✓
-	2NC, 1NO	1NC	VG	✓	-	✓
-	1NC	3NC	VH	✓	-	-
-	1NC	2NC, 1NO	VJ	✓	-	-
-	1NO	3NC	VW	✓	-	-
-	1NO	2NC, 1NO	VX	✓	-	-
1NC+1NC	-	-	DD	✓	✓	-
1NC+1NC	-	-				
-	1NO	1NC	XB	-	-	-
-	-	1NC, 1NO	XJ	-	-	-
1NC+1NC	1NO	1NO	A	-	-	-
1NC+1NC	1NO	1NC	B	-	-	-
1NC+1NC	1NC	1NO	C	-	-	-
1NC+1NC	1NC	1NC	D	-	-	-
1NC+1NC	2NC	-	F	-	-	-
1NC+1NC	1NC, 1NO	-	G	-	-	-
1NC+1NC	-	2NC	H	-	-	-
1NC+1NC	-	1NC, 1NO	J	-	-	-
-	1NO	1NC, 1NO	TA	-	-	-
-	1NO	2NC	TB	-	-	-
-	1NC	1NC, 1NO	TC	-	-	-
-	1NC	2NC	TD	-	-	-
-	2NC	1NC	TF	-	-	-
-	1NC, 1NO	1NC	TG	-	-	-
-	-	3NC	TH	-	-	-
-	-	2NC, 1NO	TJ	-	-	-

Spring Lock Type Solenoid Lock Type

Rear Unlock Button

*1 Only type No. on ✓ mark are supplied as standard.
Contact IDEC for the other if required.

CAUTION

Solenoid lock type

- This interlock switch is designed to lock the actuator while the solenoid is energized and to release it when deenergized.
- When the power to the solenoid is interrupted by accident, such as disconnection, the lock is released before a machine stops completely. Then, the worker may be exposed to hazards.
- This interlock switch can be used only for limited applications which do not especially need to be locked for safety.

2 Specifications and Ratings

Applicable Standards		EN ISO / ISO14119, IEC60947-5-1, EN60947-5-1, GS-ET-19, UL508, CSA C22.2 No.14, GB/T14048. 5			
Standards for Use		IEC60204-1/EN60204-1			
Interlocking device Type / the level of coded		Type 2 Interlocking device / low level coded actuator (EN ISO / ISO14119)			
Applicable Directives		Low Voltage Directive, Machinery Directive RoHS Directive			
Operating Condition		Operating Temperature Operating Humidity Pollution Degree Altitude	-25 to +55°C (no freezing) 20 to 95%RH (no condensation) 3 (Inside 2) 2000m maximum		
Impulse withstand voltage (Uimp)		2.5kV (Between ground and LED, solenoid circuit : 0.5kV)			
Read Insulation voltage(Ui)		250V (Between ground and LED, solenoid circuit : 30V)			
		2.5A			
Thermal Current (th)			30V	125V	250V
Contact Ratings (Reference Values) (Ue, Ie,*2	AC	Resistive load (AC12)	-	2.5A	1.5A
		Inductive load (AC15)	-	1.5A	0.75A
	DC	Resistive load (DC12)	2.5A	1.1A	0.55A
		Inductive load (DC13)	2.3A	0.55A	0.27A
Class of Protection		Class II (IEC61140) *3 □			
Operating Frequency		900 operations/hour			
Operating Speed		0.05 to 1.0 m/s			
B10d		2,000,000 (EN ISO13849-1 Annex C Table C.1)			
Mechanical durability		2,000,000 operations minimum (GS-ET-19) The Rear Unlock Button: 3000 operations minimum (Type HS5L-□L)			
Electrical Durability		100,000 operations min. (AC-12 250V/1.5A) 2,000,000 operations min. (AC/DC 24V 100mA) (900 operations / hour)			
Shock Resistance		Operating Extremes: 100m/s², Damage Limits: 1000m/s²			
Vibration Resistance		Operating Extremes:10 to 55 Hz, half amplitude 0.35mm Damage Limits: 30 Hz, half amplitude 1.5mm			
Actuator Retention Force		Fzh=1,400N minimum F1max=1820N minimum (GS-ET-19) *4, *5 (Fzh=500N minimum: HS9Z-A55 actuator)			
Direct Opening Travel		11 mm minimum (actuator: HS9Z-A51,A5P) 12 mm minimum (for other actuators)			
Direct Opening Force		120N minimum			
Contact Resistance		50 mΩ maximum (initial value)			
Degree of Protection		IP67 (IEC60529) , Type 4X Indoor Use Only			
Conditional short circuit current		50A(250V)			
Short-circuit Protective Device		Use 250V / 10A fast acting type fuse *6			
Solenoid	Rated Operating Voltage	DC24V 100% duty cycle			
	Rated Current	200 mA (initial value)			
	Turn ON Voltage	Rated voltage x 85% maximum (at 20°C)			
	Turn OFF Voltage	Rated voltage x 10% minimum (at 20°C)			
	Rated Power Consumption	Approx. 5W			
Indicator	Rated Operating Voltage	DC24V 100% duty cycle			
	Rated Current	10 mA			
	Light Source	LED			
	Illumination Color	Green			

*2 Ratings approved by safety agencies

(1) TÜV/CCC rating AC-15 250V/0.75A

DC-13 30V/2.3A

(2) UL , c-UL rating AC-15 250V/0.75A ; Pilot Duty

DC-13 30V/1A ; Pilot Duty

The M20 threaded opening must be filled by a Listed or Recognized Component Liquid-Tight Flexible Cord Fitting in order to maintain the Tye 4X Indoor use only rating.

(3) KOSHA rating AC-15 250V/0.75A

DC-13 30V/1A

*3 Basic insulation of 2.5kV impulse withstand circuits and between contact circuit SELV(safety extra low voltage) or circuits (such as 230V AC circuits) at the same time, the SELV or PELV a requirements are met any more.

*4 The actuator retention force is rated at 1400N of static load. Do not apply a load higher than the rated value. When a higher load is expected to work on the actuator, provide an additional system consisting of another interlock switch without lock (such as the HS5D interlock switch) or a sensor to detect door opening and stop the machine.

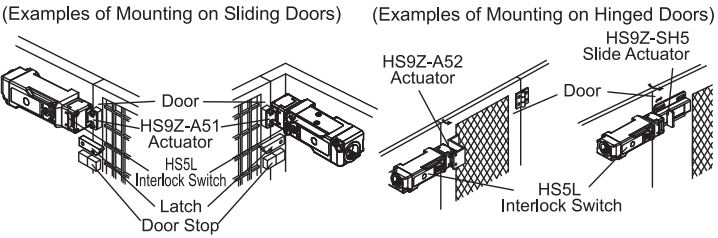
*5 F1max is maximum force. The actuator retention force Fzh is calculated in accordance with GS-ET-19:

$$F_{zh} = \frac{\text{maximum force (F1max)}}{\text{Safety coefficient (=1.3)}}$$

*6 Make sure that a fast acting fuse for short-circuit protection trips before overheating of the wires.

3 Mounting Examples

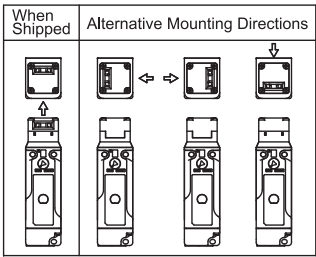
- Install the interlock switch on the immovable machine or guard, and install the actuator on the movable door. Do not install both interlock switch and actuator on the movable door, otherwise the angle of insertion of the actuator to the interlock switch may become inappropriate, and failure will occur.



The HS5L Head

- Changing the Mounting Directions of the HS5L Head

The head of the HS5L can be mounted in four directions by removing the four screws from the corners of the HS5L head.



WARNING

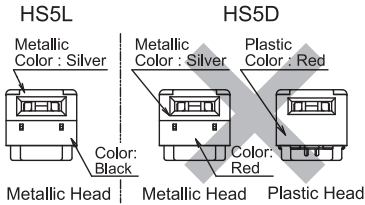
Mounting Directions of the HS5L Head

- Before changing the mounting direction of the HS5L head, turn the manual unlock to UNLOCK using the attached manual unlock key or disconnect wiring from the HS5L.
- If the head position is changed after wiring without taking the above action, the machine may start to operate and the worker may face danger.
- When replacing the HS5L head, make sure that no foreign object enters into the interlock switch. Tighten the screws tightly, without leaving space between the head and body, otherwise the interlock switch may malfunction.
- Don't remove the screws of head except when the mounting directions of head is changed.

Mounting the Head

- Do not use the metallic or plastic head for the HS5D (without lock type). Be sure to use the head for the HS5L and mount the correct head.

Take care particularly when using with the HS5D (without lock type).



HS5L Head Removal Detection Function (Only Spring Lock Type)

- When the actuator is operated, the operation of the monitor circuit (11-42) and (51-52) are the same. However, when the head is removed, disparity is detected (11-42: OFF, 51-52: ON). The disparity of the contacts detects the removal of the head.

		ACTUATOR UNLOCK	ACTUATOR LOCK	HEAD REMOVE
Lock Monitor Circuit (NC)				
Lock Monitor Circuit (NC)				

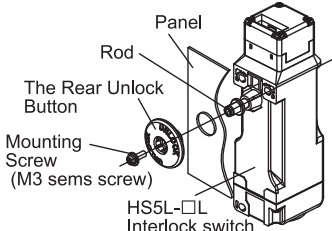
■ :Contact Closed □ :Contact Open

CAUTION

- The Head Removal Detection Function cannot be used with HS5L solenoid lock type products.
- When the head is removed from the device (e.g. when changing the mounting position of the head), the 41-42 lock monitor circuit opens (OFF position) and 51-52 monitor circuits close (ON position); so please make sure you connect the 41-42 lock monitor circuit to a safety circuit if you want to use the Head Removal Detection Function.
- The Head Removal Detection Function can only be used with the following spring-lock circuits: A,B,C,D,F,G, H, J, DD, VB, VD, VH, VJ, VW, VX, TB, TD, TH and TJ type circuits (lock monitor circuit NC: 2 circuits or more, excluding XH). This function cannot be used with other spring-lock type circuits and solenoid circuits.

Installing the Rear Unlock Button
(Type HS5L-□L)

- After installing the interlock switch on the panel, put the rear unlock button (supplied) on the rod on the back of the interlock switch, and fasten using the mounting screw. When installing on the aluminum frame of the thickness of 6mm or more, use the rear unlock button for frame kit (HS9Z-FL5□) sold separately.



CAUTION

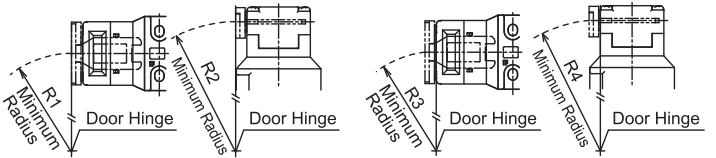
- After installing the rear unlock button, apply Loctite to the screw so that the screw does not become loose. The rod is made of stainless steel. The rear unlock button is glass-reinforced PA66 (66 nylon). The mounting screw is iron. Take the compatibility of plastic material and Loctite into consideration.

Minimum Radius of Hinged Door

- When using the interlock switch for a hinged door, the minimum radius of the applicable door is shown in the following figures.

When the center of the hinged door is on the extension line of the actuator mounting surface.

When the center of the hinged door is on the extension line of the contact surface of actuator and interlock switch.



		Minimum Radius			
		R1	R2	R3	R4
HS9Z-A52		230 mm	260 mm	170 mm	190 mm
HS9Z-A52	Mounting centers:12 mm	230 mm	260 mm	120 mm	140 mm
	Mounting centers:20 mm	310 mm		170 mm	
HS9Z-A53		80 mm (Vertical Swing)		50 mm (Vertical Swing)	
HS9Z-A55 HS9Z-A55S				50 mm (Vertical Swing)	
		70 mm (Horizontal Swing)	70 mm (Vertical Swing)	50 mm (Horizontal Swing)	50 mm (Vertical Swing)

CAUTION

- The values 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.

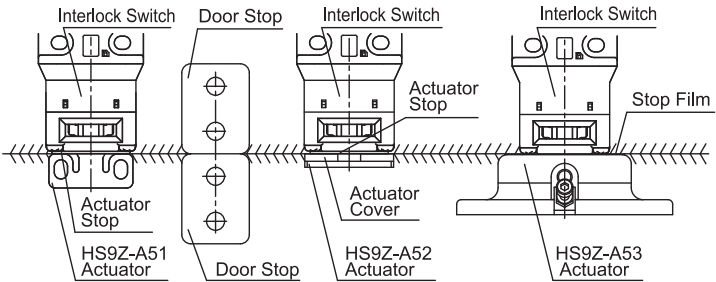
Adjusting the Angle Adjustable (vertical/horizontal) Actuator
(Type HS9Z-A53/A55/A55S)

- Using the angle adjustment screw (M3 hexagon socket set screw), the actuator angle can be adjusted up to 20°(refer to dimensions).
- 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 interlock switch properly.
- After adjusting the actuator angle, apply loctite or the like on the adjustment screw to prevent loosening.
(Type HS9Z-A53)
Tightening torque of angle adjustment screw : 0.8 N·m.
(Type HS9Z-A55/A55S)
Use screw locking agent that is compatible with the base material.
Base : PA66 (66 nylon) of glass reinforced grade
Angle adjustment screws : stainless steel

Actuator Mounting Reference Position

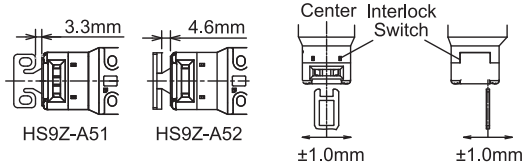
As shown below, the mounting reference position of the actuator inserted into the interlock switch is:

- (Type HS9Z-A53)
The actuator stop film placed on the actuator touches the interlock switch lightly.
(Except Type HS9Z-A53)
The actuator and actuator cover touches the actuator stop placed on the interlock switch lightly.
(After mounting the actuator, remove the actuator stop from the interlock switch.)



Actuator Mounting Tolerance

- Mounting tolerance of the actuator is 1.0 mm in the four lateral directions.
- Make sure the actuator can be inserted into the entry slot without any issue.
- When closing the door, the actuator is inserted and locked within a certain distance from the reference position. After the actuator has been locked, the contact operation is not affected by the actuator movement in the locked state.



	(Actuator deviation) + (Door movement)
HS9Z-A51	≤ 3.3mm
HS9Z-A52	
HS9Z-A51A	≤ 4.6mm
HS9Z-A52A	
HS9Z-A53	≤ 5.6mm
HS9Z-A55	
HS9Z-A55S	≤ 4.6mm

For Type HS9Z-A51A/A52A actuator

- When there is a displacement of interlock switch and actuator, the actuator may hit the entry slot of interlock switch hard, thus damaging the entry slot and actuator. The rubber cushions on the HS9Z actuator prevent the actuator from damaging the entry slot by absorbing the shock with movement flexibility. Do not, however, exert excessive shocks, otherwise the failure of interlock switch may be caused.
- The rubber cushions may deteriorate depending on the operating environment and conditions. Immediately replace the deformed or cracked rubber cushions with new ones.

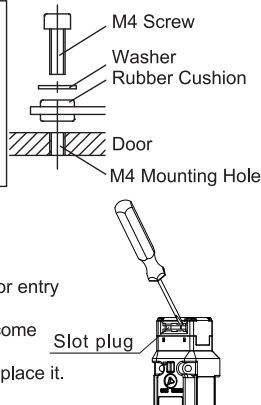
Recommended Screw Tightening Torque

Name or Use	Screw Tightening Torque
For mounting the interlock switch (M4 screw) *7	1.8 to 2.2 N•m
For mounting the cover(M3screw)	0.5 to 0.7 N•m
For mounting the HS5L head (M3)	0.9 to 1.1 N•m
For mounting the rear unlock button (M3 sems screw)	0.5 to 0.7 N•m
For mounting the actuator (HS9Z-A51: two M4 screws) *7	1.8 to 2.2 N•m
(HS9Z-A52: two M4 Phillips screws)	0.8 to 1.2 N•m
(HS9Z-A51A/A52A: two M4 screws) *7,8	1.0 to 1.5 N•m
(HS9Z-A53: two M6 screws) *7	4.5 to 5.5 N•m
(HS9Z-A55/A55S: two M4 screws) *7	1.0 to 1.5 N•m

CAUTION

*7 When the torque is not enough to recommended screw tightening torque, make sure that the screw do not become loose by using adhesive sealants etc. to keep right operation and mounting positioning.

*8 In the case of HS9Z-A51A and HS9Z-A52A, using two M4 screws and two attached washers, fasten the actuator securely on the door.



Installing the slot plug (In the case of a standard sale model. Please check other models.)

- When not in use, close up the interlock switch actuator entry slots with slot plugs to prevent dust from entering.
- The actuator entry slot vertical to the mounting panel come closed up with slot plugs at time of shipment. When replacing, please use the tool as shown and replace it.

4 Instruction

For Mounting

- Do not apply an excessive shock to the interlock switch when opening or closing the door. A shock to the interlock switch exceeding 1,000 m/s² may cause failure.
- Provide a door guide, and ensure that force is applied on the interlock switch only in the actuator insertion direction.
- Do not pull the actuator while it is locked. Also, regardless of door types, do not use the interlock switch as a door lock. Install a separate lock as shown in section 3.
- Entry of foreign objects in the actuator entry slot may affect the mechanism of the switch and cause a breakdown. 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.
- Make sure to install the product in a place where it cannot be damaged. Make sure to conduct a proper risk assessment evaluation before using the product, and use a shield or a cover to protect the product if need be.
- Continue for a long time energizing the solenoid, the switch temperature rises approximately 40°C above the ambient temperature (to approximately 95°C while the ambient temperature is 55°C). Keep hands off to prevent burns. If cables come into contact with the switch, use heat-resistant cables.
- Solenoid has polarity. Be sure to wire correctly. Do not apply voltage that exceed the rated voltage, otherwise the solenoid will be burnt out.
- Do not fasten and loosen the conduit at the bottom of the interlock switch.
- Use the dedicated actuators only. Other actuators will cause damage to the switch.
- Be careful not to injure yourself with the screwdriver tip when wiring the terminals.
- Be careful not to damage the square-shaped screwdriver port when inserting the driver into it in order to wire the terminals. Inserting the screwdriver with too much strength may damage the product.
- Before using the following accessories, be sure to refer to the instruction manual for the respective accessory and follow the instructions in the manual to ensure correct use.

HS9Z-DH5 / HS9Z-EH5 / HS9Z-SP51 / HS9Z-SH5 / HS9Z-BA5 / HS9Z-FL5

WARNING

- Turn off the power to the interlock switch before starting installation, removal, wiring, maintenance, and inspection on the interlock switch. Failure to turn power off may cause electrical shocks or fire hazard.
- Do not disassemble or modify the switch. Also do not attempt to disable the interlock switch function, otherwise a breakdown or an accident will result.

CAUTION

- HS5L Series Interlock Switches are Type 2 low-level coded interlocking devices (EN ISO / ISO14119). The following system installation & mounting instructions are EN ISO / ISO14119 requirements to prevent function failure from the interlock switch.
 - Using permanent fixing methods (e.g. welding, rivets, special screws...etc) to prevent dismantling or de-positioning of the interlock device. However, permanent fixing methods are not an adequate solution if you expect the interlock device to fail during the machinery lifetime, or if you need to replace the product in quick manner. In these situations, other measures (see 2.) should be put in place to reduce the risks of function failure.
 - At least one of the following measures should be applied to prevent function failure.
 - Mounting the interlock device in a place out of reach from workers
 - Using shielding protection to prevent physical obstruction of the device
 - Mounting the interlock device in a hidden position
 - Integrate status monitoring & cycling testing of the device to the control system to prevent product failure.
- Regardless of door types, do not use the interlock switch as a door stop. Install a mechanical door stop to the end of the door to protect the interlock switch against excessive force.
- Mount the actuator so that it will not hit the operator when the door is open, otherwise injury may be caused.
- Pay attention to the management of spare actuator. Safety function of door interlock switch will be lost in case the spare actuator is inserted into the interlock 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.
- Do not cut or remodel the actuator, otherwise failure will occur.
- If multiple safety components are wired in series, the Performance Level to EN ISO13849-1 will be reduced due to the restricted error detection under certain circumstance.
- The insulation of the cable has to withstand environmental influences.
- The entire concept of the control system, in which the safety component is integrated, must be validated to EN ISO13849-2.

For Manual Unlocking

- To change the normal position to the manual unlocking position as shown above, turn the key fully (90 degrees) using the special key included with the switch.
- Using the switch with the key being not fully turned (less than 90 degrees) may cause damage to the switch or errors.
- When manually unlocked, the switch will keep the main and lock monitor circuit disconnected and the door unlocked.

(Type HS5L-□4)

The HS5L allows manual unlocking of the actuator to precheck proper door operation before wiring or turning power on, as well as for emergency use such as a power failure. (Type HS5L-□7Y)

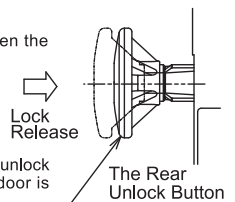
If the actuator is not unlocked although the solenoid is deenergized, the actuator can be unlocked manually.

CAUTION

- Before manually unlocking the interlock switch, make sure the machine has come to a complete stop. Manual unlocking during operation may unlock the switch before the machine stops, and the function of interlock switch with solenoid is lost.
- While the solenoid is energized, do not unlock the actuator manually (solenoid lock type).
- Do not apply excessive force (0.45 N•m or more) to the manual unlock key. Otherwise the manual unlock switch will be damaged. Do not attach the key to the switch intentionally (the key is designed to fall off when the operator's hand is off the key).
- Do not leave the manual unlock key attached to the switch during operation. This is dangerous because the switch can always be unlocked while the machine is in operation.

For the Rear Unlock Button (Type HS5L-□L)

- The rear unlock button is used for an emergency escape when the worker is confined in the safety hedge (the dangerous area). (The rear unlock button is according to EN ISO / ISO14119, GS-ET-19)
- The lock is released when the rear unlock button is pressed, and the door can be opened.
- To return to locked status, pull back the button. While the rear unlock button is depressed, the main circuit remains open and the door is unlocked.



CAUTION

- Install the HS5L to ensure that a worker can operate the rear unlock button from inside the safety hedge (the dangerous area). It is dangerous to install the HS5L in the position where the rear unlock button can be operated from outside the safety hedge (the dangerous area), because it is possible to unlock while the machine is operating.
- Use hand to press the button, and do not use a tool. Do not apply excessive force to the rear unlock button.

5 Contact Operation

Contact Configuration and Operation

Type *10	Contact Configuration *11	Contact Operation (reference)
		(Travel: mm) 0 (Actuator Mounting Reference Position) Approx. 3.3 (Lock) Approx. 5.3 Approx. 6.9 Approx. 26.4
HS5L-XD□	Monitor Circuit: 11-12 Monitor Circuit: 41-42	11-12 41-42
HS5L-XF□	Monitor Circuit: 11-12 Monitor Circuit: 21-22	11-12 21-22
HS5L-XG□	Monitor Circuit: 11-12 Monitor Circuit: 23-24	11-12 23-24
HS5L-XH□	Monitor Circuit: 41-42 Monitor Circuit: 51-52	41-42 51-52
HS5L-VA□	Monitor Circuit: 11-12 Monitor Circuit: 23-24 Monitor Circuit: 53-54	11-12 23-24 41-42 53-54
HS5L-VB□	Monitor Circuit: 11-12 Monitor Circuit: 23-24 Monitor Circuit: 51-52	11-12 23-24 41-42 51-52
HS5L-VC□	Monitor Circuit: 11-12 Monitor Circuit: 21-22 Monitor Circuit: 53-54	11-12 21-22 41-42 53-54
HS5L-VD□	Monitor Circuit: 11-12 Monitor Circuit: 21-22 Monitor Circuit: 51-52	11-12 21-22 41-42 51-52
HS5L-VF□	Monitor Circuit: 11-12 Monitor Circuit: 21-22 Monitor Circuit: 31-32	11-12 21-22 31-32 41-42
HS5L-VG□	Monitor Circuit: 11-12 Monitor Circuit: 21-22 Monitor Circuit: 33-34	11-12 21-22 33-34 41-42
HS5L-VH□	Monitor Circuit: 11-12 Monitor Circuit: 51-52 Monitor Circuit: 61-62	11-12 41-42 51-52 61-62
HS5L-VJ□	Monitor Circuit: 11-12 Monitor Circuit: 41-42 Monitor Circuit: 63-64	11-12 41-42 51-52 63-64
HS5L-VW□	Monitor Circuit: 13-14 Monitor Circuit: 51-52 Monitor Circuit: 61-62	13-14 51-52 61-62
HS5L-VX□	Monitor Circuit: 13-14 Monitor Circuit: 51-52 Monitor Circuit: 63-64	13-14 41-42 51-52 63-64
HS5L-DD□	Main Circuit: 11-12 Main Circuit: 21-22	11-42 21-52
[HS5L-XB□]	Monitor Circuit: 13-14 Monitor Circuit: 41-42	13-14 41-42
[HS5L-XJ□]	Monitor Circuit: 41-42 Monitor Circuit: 53-54	41-42 53-54
[HS5L-A□]	Main Circuit: 11-12 Monitor Circuit: 23-24 Monitor Circuit: 53-54	11-42 23-24 53-54
[HS5L-B□]	Main Circuit: 11-12 Monitor Circuit: 23-24 Monitor Circuit: 51-52	11-42 23-24 51-52
[HS5L-C□]	Main Circuit: 11-12 Monitor Circuit: 21-22 Monitor Circuit: 53-54	11-42 21-22 53-54
[HS5L-D□]	Main Circuit: 11-12 Monitor Circuit: 21-22 Monitor Circuit: 51-52	11-42 21-22 51-52
[HS5L-F□]	Main Circuit: 11-12 Monitor Circuit: 21-22 Monitor Circuit: 31-32	11-42 21-22 31-32
[HS5L-G□]	Main Circuit: 11-12 Monitor Circuit: 21-22 Monitor Circuit: 33-34	11-42 21-22 33-34
[HS5L-H□]	Main Circuit: 11-12 Monitor Circuit: 51-52 Monitor Circuit: 61-62	11-42 51-52 61-62
[HS5L-J□]	Main Circuit: 11-12 Monitor Circuit: 51-52 Monitor Circuit: 63-64	11-42 51-52 63-64
[HS5L-TA□]	Monitor Circuit: 13-14 Monitor Circuit: 53-54	41-42 13-14 53-54
[HS5L-TB□]	Monitor Circuit: 13-14 Monitor Circuit: 51-52	41-42 13-14 51-52
[HS5L-TC□]	Monitor Circuit: 11-12 Monitor Circuit: 53-54	41-42 11-12 53-54
[HS5L-TD□]	Monitor Circuit: 11-12 Monitor Circuit: 51-52	41-42 11-12 51-52
[HS5L-TF□]	Monitor Circuit: 11-12 Monitor Circuit: 21-22	41-42 21-12 21-22
[HS5L-TG□]	Monitor Circuit: 11-12 Monitor Circuit: 23-24	41-42 11-12 23-24
[HS5L-TH□]	Monitor Circuit: 41-42 Monitor Circuit: 51-52 Monitor Circuit: 61-62	41-42 51-52 61-62
[HS5L-TJ□]	Monitor Circuit: 41-42 Monitor Circuit: 51-52 Monitor Circuit: 63-64	41-42 51-52 63-64

(Actuator Completely Inserted) (Actuator Pulled Out)

■ :Contact Closed □ :Contact Open

- Contact operation is based on the condition that the actuator is inserted into the center of the interlock switch slot.
- Contact operation shows the HS9Z-A51 actuator.
(For other actuators, add 1.3 mm to contact operation.)
- Use main circuit or monitor circuit with for the input to safety circuit.
- Indicator turns on when solenoid is energized.

CAUTION

*9 This locking monitoring marking has been newly described in section 9.2.1 of EN ISO / ISO14119. It indicates that any devices with this marking meet the following EN ISO / ISO 14119 requirements:

- General (- General requirements for guard locking devices) (Section 5.7.1) *
- Locking monitoring (- Locking monitoring for guard locking devices) (Section 5.7.2.2)

When a lock monitor circuit (contact) has the locking monitoring marking, it means that one circuit (contact) can monitor the position and the locking function of the protective door. (The locking monitoring circuit (contact) turns ON only when the protective door is closed and locked.)

*note Both types of HS5L interlock switches - spring lock type switches and solenoid lock type switches - have obtained the locking monitoring certification marking. Based on risk assessment results, solenoid lock type switches can be used only for limited applications which do not especially need to be locked for safety.

*10 Type No. in [] are not supplied as standard. See 1. Type for standard.

*11 These are the image of locking position with actuator inserted.

Operation Cycle

• Spring Lock Type (HS5L-□4)

Door States	Closed	Closed	Open	Closed
Solenoid Power A1-A2	OFF	ON	ON/OFF	OFF
Manual Unlock Key	Turn the key to lock position	Turn the key to lock position	Turn the key to lock position	Turn the key to unlock position
Rear Unlock Button	Returned status	Returned status	Returned status	When operating the Button
Main Circuit 11-42 21-52	Closed	Open	Open	Open
Monitor Circuit 11-12 21-22 31-32	Closed	Closed	Open	Closed
Monitor Circuit 13-14 23-24 33-34	Open	Open	Closed	Open
Monitor Circuit 41-42 51-52 61-62	Closed	Open	Open	Open
Monitor Circuit 53-54 63-64	Open	Closed	Closed	Closed
	Door is locked. The machine can be operated.	Door is unlocked. The machine can not be operated.	The machine can not be operated.	Door is unlocked. The machine can not be operated.

• Solenoid Lock Type (HS5L-□7Y)

Door States	Closed	Closed	Open	Closed
Solenoid Power A1-A2	ON	OFF	OFF/ON *13	OFF *12 *13
Manual Unlock Key	Turn the key to lock position	Turn the key to lock position	Turn the key to lock position	Turn the key to unlock position
Rear Unlock Button	Returned status	Returned status	Returned status	When operating the Button
Main Circuit 11-42 21-52	Closed	Open	Open	Open
Monitor Circuit 11-12 21-22 31-32	Closed	Closed	Open	Closed
Monitor Circuit 13-14 23-24 33-34	Open	Open	Closed	Open
Monitor Circuit 41-42 51-52 61-62	Closed	Open	Open	Open
Monitor Circuit 53-54 63-64	Open	Closed	Closed	Closed
	Door is locked. The machine can be operated.	Door is unlocked. The machine can not be operated.	The machine can not be operated.	Door is unlocked. The machine can not be operated.

CAUTION

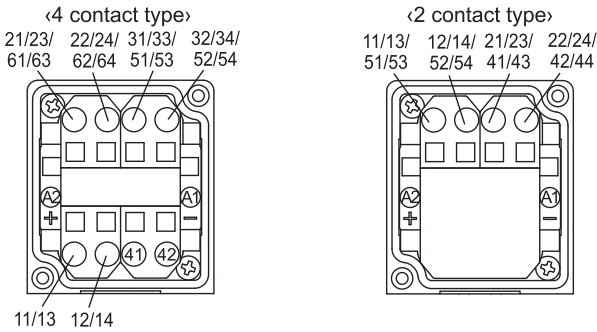
*12 Do not attempt manual unlocking when the solenoid is energized.

*13 Do not energize the solenoid for a long time while the door is open or when the door is unlocked manually.

6 Wiring

Terminal wiring method

• Terminal NO.



Note :

- The following type circuits are shipped with jumpers connecting the indicated terminals.
A,B,C,D,F,G,J type circuits: Jumper connecting 12-41
DD type circuit: Jumpers connecting 12-41 and 22-51
- When the NC contacts (11-12)/(21-22) of the door monitor circuit and NC contacts (41-42)/(51-52) of the lock monitor circuit are connected in series as inputs to the safety circuit, connect 12-41 or 22-51 before use.
- Recommended Wire Core Size : 0.3 to 1.5 mm² (AWG22 to 16)
- Wire length and example of layout

Type	Routing direction	Wire Length: L1
HS5L-□△*4M-G	Straight orientation	30 to 35mm
HS5L-□△*4LM-G		
HS5L-□△*4SM-G	Straight orientation	50 to 55mm
HS5L-□△*4LSM-G	Horizontal orientation	40 to 45mm

- For wiring, use the following applicable screwdriver.
(Tip shape of the driver is according to the standard of DIN5264)

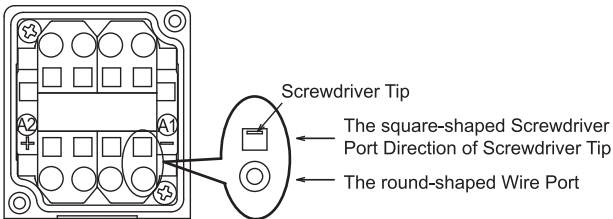
- In applications using ferrules for stranded wires, choose the ferrule listed in the table.

Applicable wire (stranded)	AWG	Part No.
mm ²		
0.34	22	S3TL-H034-10WT
0.5	20	S3TL-H05-12WA
0.75	18	S3TL-H075-12WW
1	17	S3TL-H10-12WY

- Recommendation tools (sold separately)

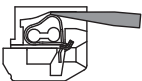
Name	Part No.	Note
Crimping tool	S3TL-CR06D	Overseas limited sale

- Wire insertion positions, screwdriver insertion positions, and the directions of screwdriver tip are shown below.

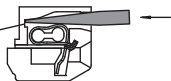


- Wiring Instructions

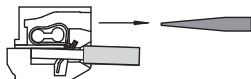
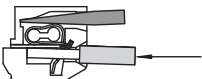
1. Insert the applicable screwdriver into the square-shaped port as shown, until the screwdriver tip touches the bottom of the spring.
2. Push in the screwdriver until it touches the bottom of the port. The wire port is now open, and the screwdriver is held in place. The screwdriver will not come off even if you release your hand.



Bottom of the Port

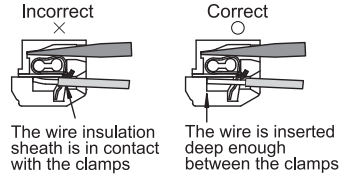


3. While the screwdriver is retained in the port, insert the wire or ferrule into the round-shaped wire port. Each wire port can accommodate one wire or ferrule.
4. Pull out the screwdriver. The connection is now complete.



CAUTION

- When using wire with insulation diameter of $\Phi 2.0$ mm or less, do not insert the wire too deep where the insulation inserts into the spring clamp opening. Otherwise conductive failure will be caused. Make sure that the wire insulation is stripped 8 to 9 mm and the wire is inserted to the bottom.
- Please only connect one wire per terminal port (according to the general requirements section (13.1.1) of IEC60204).

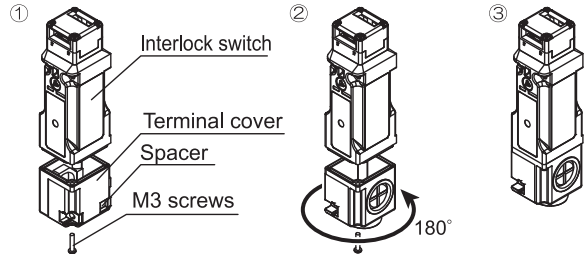


How to change the cable routing direction (cable side-routed type)

When using a cable side-routed type (HS5L-□△*SM-G), you can select from three orientations (straight, left and right) as the wiring direction. When the unit is shipped, the cover is installed so that wiring can be routed straight or in the left orientation. When using the unit with the wiring in the right orientation, refit the cover by the procedure below.

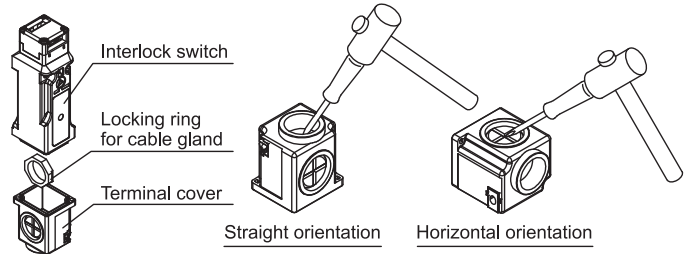
- ① Remove the cover mounting screws (M3 screws x 2), and remove the cover from the HS5L Interlock Switch main unit.
- ② Rotate the terminal cover 180 degrees as shown in the figure.
- ③ Install the cover on the Interlock Switch, and secure it in place with the cover mounting screws (M3 screws x 2).

* Before tightening the cover mounting screws, slide the spacer in the direction opposite the screw positions to prevent it from coming into contact with the screwdriver.



How to open conduit port (cable side-routed type)

- Before use, knock in the conduit port where the connector is to be connected, using a tool such as screwdriver as shown in the figures.
- Before opening the conduit port, remove the terminal cover from the HS5L Interlock Switch main unit, and remove the locking ring for the cable gland installed in the terminal cover.
- Be sure to remove any crack or burrs on the conduit port, as it will impair waterproof performance.

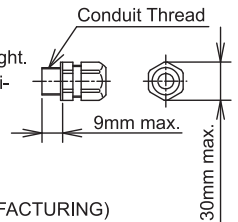


Applicable Connectors

Use a connector with a degree of protection IP67.

Applicable connector dimensions : See the figure on the right.

- When using plastic connector, metal connector and multi-core cable
(M20) Applicable Plastic Connector Example:
Type ST-M20×1.5 (made by LAPP)
Applicable Metal Connector Example:
Type C20M-□□20 (made by SANKEI MANUFACTURING)



Note : Confirm the outside diameter of the multi-core cable, the connector type depends on the outside diameter of multi-core cable.

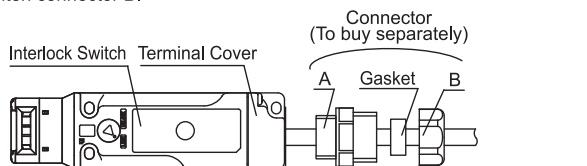
Note : When using ST-M20×1.5, use with gasket GP-M (Type No: GPM20, made by LAPP).

Note : If you use HS5L as Type 4X, please use M20 connectors that are certified the following.

Plastic connector: Type 4, 4X, 6 or 6P
Metal connector: Type 4X or 6P

Connectors' mounting method

- Loosen connector A and connector B, and insert the cable into these pieces in the following order :
connector B → waterproof gasket → connector A.
Do not tighten the connectors yet.
- Remove the terminal cover from the switch and insert the cable into the cover.
- Wire the terminals.
- Tighten connector A into the terminal cover.
Fix the terminal cover back into its original position. Tighten connector B.



Note : To unwire the terminals, disassemble the product in the following order:

turn off the power → loosen connector B → remove the terminal cover → remove the waterproof gasket from connector A* → loosen connector A

* Please remove the water-proof gasket carefully with tools such as tweezers. Be careful when removing the gasket as damages may affect its waterproof properties. Also, loosening connector A without removing the gasket first may damage the cable and provoke connection issues. Please make sure you re-insert the waterproof gasket properly into connector A when re-assembling the product.

CAUTION

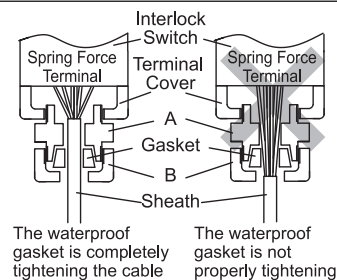
- Make sure not to lose any screw when removing the terminal cover from the switch.

- Please make sure the cable is inserted deep enough into the terminal cover so that the waterproof gasket can tighten the cable sheath completely and ensure its waterproof functions.

- Make sure you always tighten connector A before connector B, otherwise the wires which connect the terminals might get twisted or might break, and this might also damage the terminal ports.

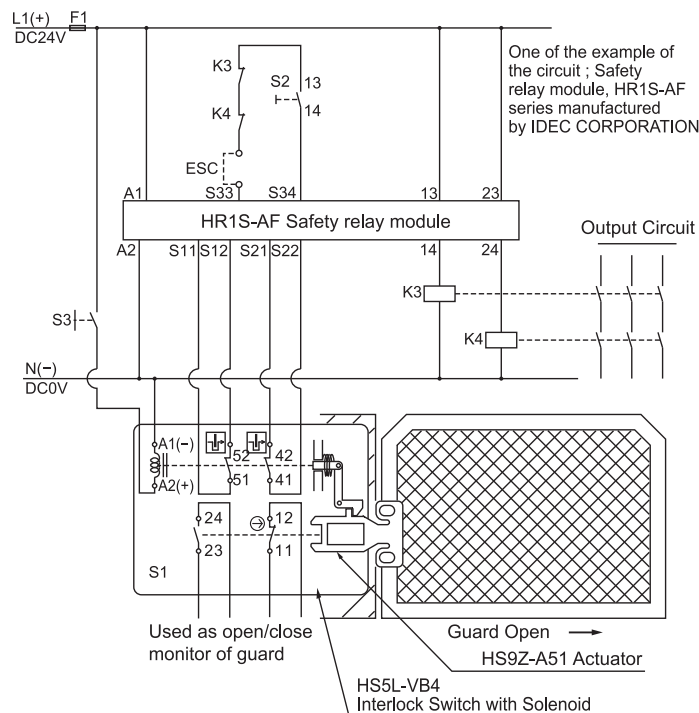
- When tightening the connectors, only use a tightening torque that is approved by the connectors' manufacturer to ensure waterproof properties of the product.

- Do not pull or twist the cable with excessive force, otherwise you might damage the wires inside of it.

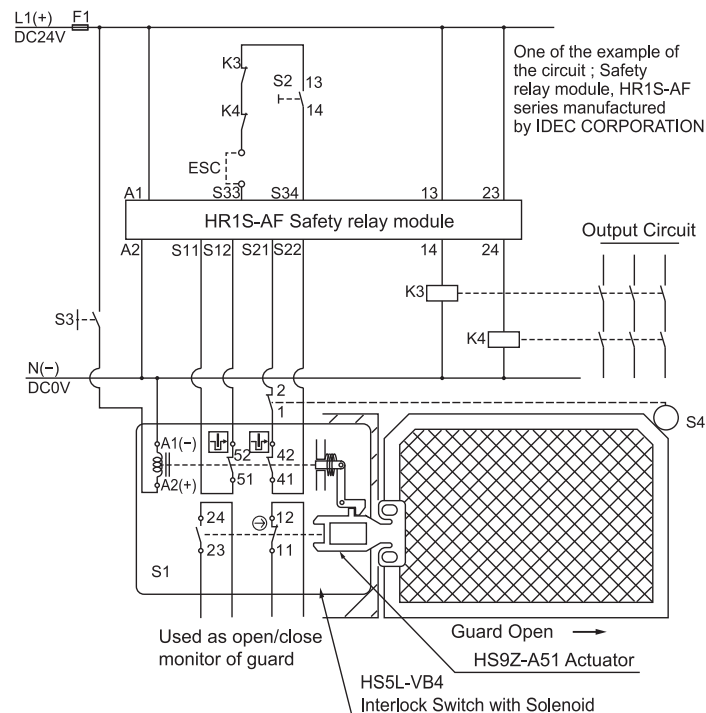
**7 Example of wiring Diagram realizing Safety Category****Example of a circuit diagram for Safety Category 3 (attainable PL = d)**

(Condition 1: To apply the fault exclusion of mechanical structural parts including the actuator → Make sure to use the product within the product specification range described in this manual and the version of the manual provided with the product.)

(Condition 2: Documentation of the reason for the machine/equipment manufacturer to have applied the fault exclusion based on EN ISO13849-1, EN ISO13849-2 or IEC62061.)

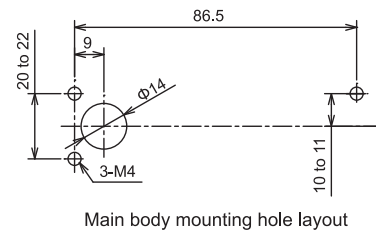


- S1: HS5L-VB4 Interlock Switch with Solenoid
S2: Start Switch (HW Series Momentary)
S3: Unlocking Enabling Switch
S4: Safety limit Switch
ESC: Outside start condition
K3, 4: Safety Contactor
F1: Outside fuse of safety relay module at power supply line

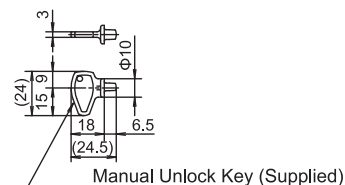
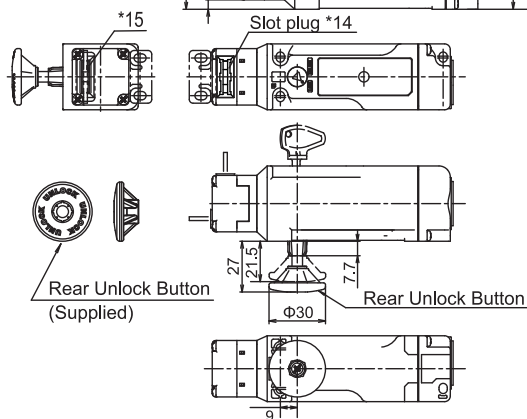
Example of a circuit diagram for Safety Category 4 (attainable PL = e)

Note: Use the monitoring device(Safety relay module) provided the capability to detect a cross short circuit. The insulation of the cable has to withstand environmental influences. If a control device other than the one shown in the draft is used, the used control device has to be equipped with a cross short circuit monitor.

Type : HS5L-□4M

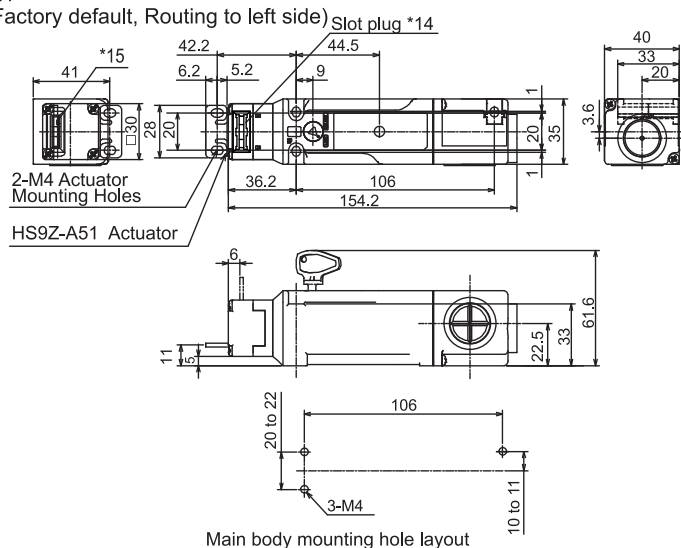


Type : HS5L-□4LM

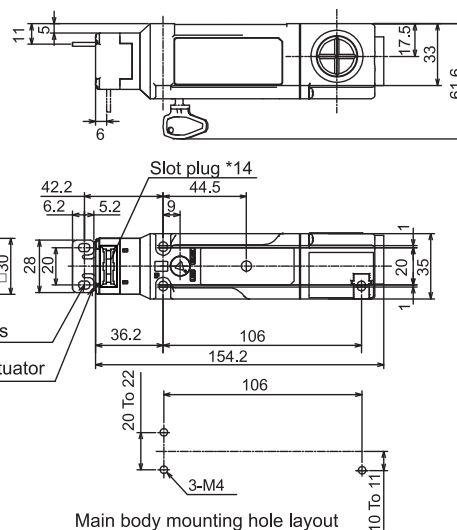


*14 The actuator entry slot vertical to the mounting panel
 *15 The actuator entry slot horizontal to the mounting panel
Note: When not in use, close up the interlock switch actuator entry slots with slot plugs to prevent dust from entering.
 (The actuator entry slot vertical to the mounting panel come closed up with slot plugs at time of shipment. In the case of a standard sale model. Please check other models.)

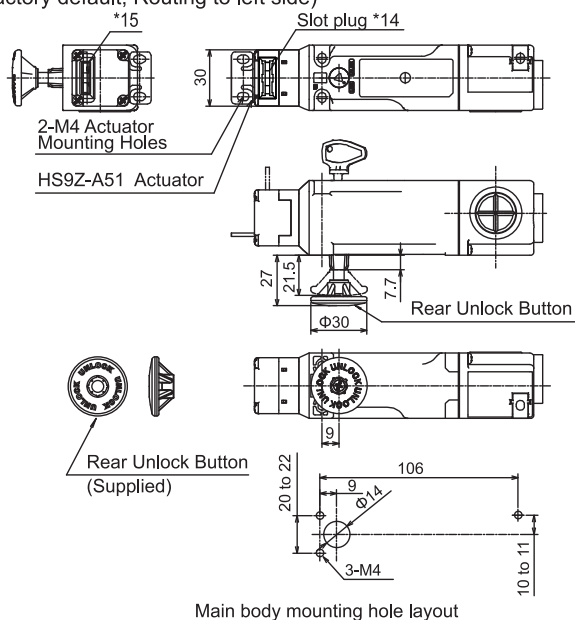
(Factory default, Routing to left side)



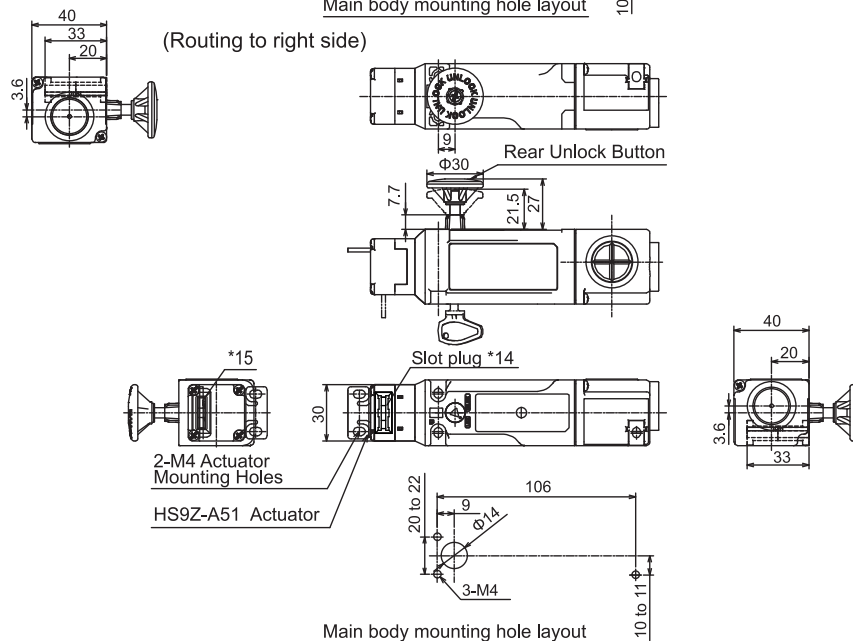
(Routing to right side)



(Factory default, Routing to left side)



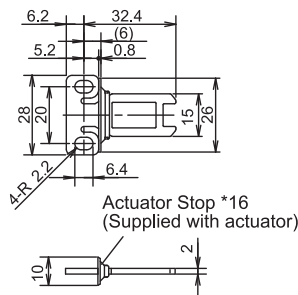
(Routing to right side)



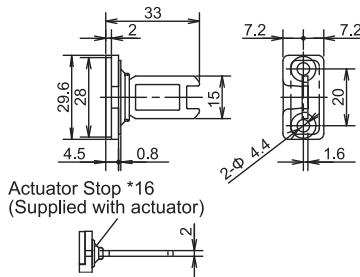
Accessories dimensions

(To be sold by separately)

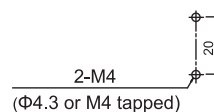
Type : HS9Z-A51



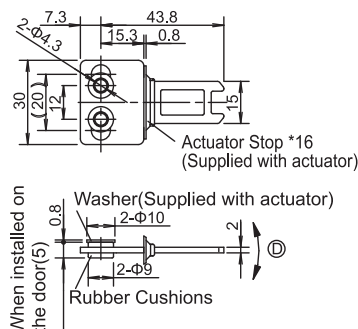
Type : HS9Z-A52



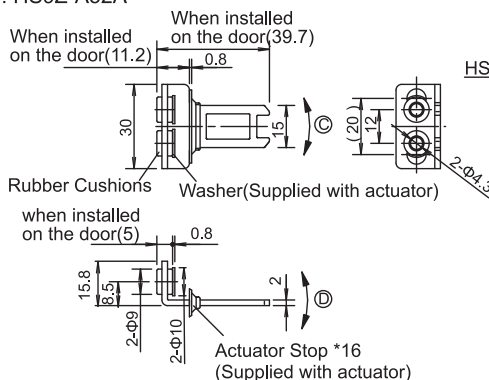
HS9Z-A51/A52 Actuator mounting hole layout



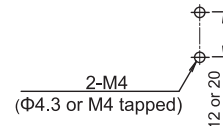
Type : HS9Z-A51A



Type : HS9Z-A52A



HS9Z-A51A/A52A Actuator mounting hole layout



* Make sure to use the product with the mounting pitch at either 12 mm or 20 mm.

*Mounting pitch is set to 12 mm in factory. When setting the mounting pitch to 20 mm, widen the pitch of rubber cushions to 20 mm.

* The actuator has movement flexibility to the directions shown in ㊦.

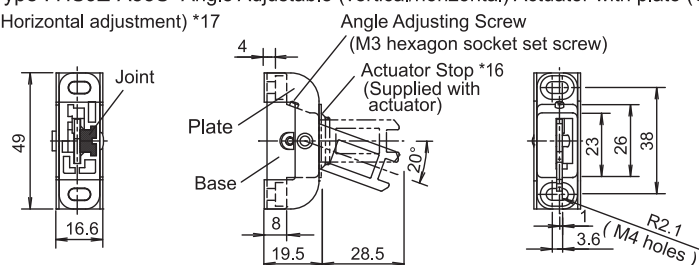
* Make sure to use the product with the mounting pitch at either 12 mm or 20 mm.

* When the mounting pitch is 12 mm (factory setting), the actuator has movement flexibility to the directions shown in ㊦ and ㊧.

* When the mounting pitch is 20 mm, the actuator has movement flexibility to the directions shown in ㊧. Side the rubber cushions together with the screws.

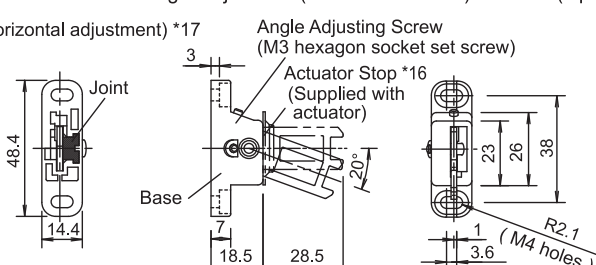
Type : HS9Z-A55S Angle Adjustable (vertical/horizontal) Actuator with plate (Option)

(Horizontal adjustment) *17

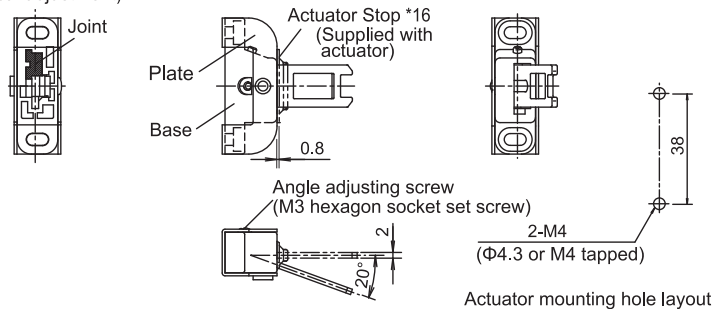


Type : HS9Z-A55 Angle Adjustable (vertical/horizontal) Actuator (Option)

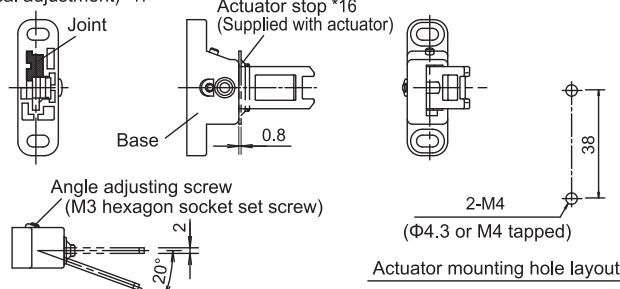
(Horizontal adjustment) *17



(Vertical adjustment) *17



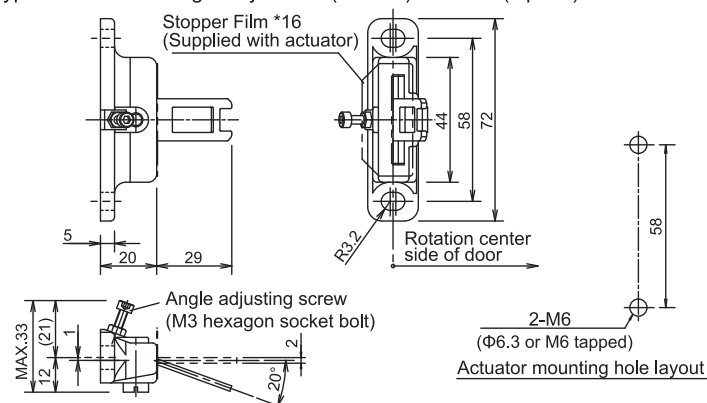
(Vertical adjustment) *17



Actuator mounting hole layout

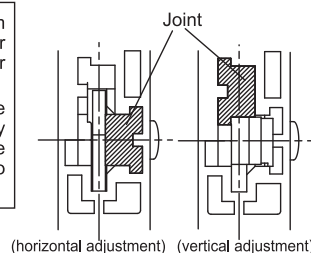
Actuator mounting hole layout

Type : HS9Z-A53 Angle Adjustable (vertical) Actuator (Option)



*16 The actuator stop and The Stopper film are used when adjusting the actuator position. Remove after the actuator position is determined.

*17 The direction of adjustable angle can be changed (vertical or horizontal) by changing the insertion direction of the joint. Do not lose the joints. Actuators do not operate normally without a joint.



(horizontal adjustment) (vertical adjustment)

9 Precaution for Disposal

Dispose of the HS5L interlock switch as an industrial waste.

IDEC CORPORATION <http://www.idec.com>

Manufacturer: IDEC CORP.
2-6-64 Nishimiyahara Yodogawa-ku, Osaka 532-0004, Japan
EU Authorized Representative: APEM SAS
55, Avenue Edouard Herriot BP1, 82303 Caussade Cedex, France

EU DECLARATION OF CONFORMITY
We, IDEC CORPORATION 2-6-64, Nishimiyahara Yodogawa-ku, Osaka 532-0004, Japan declare under our sole responsibility that the product:

Description: Interlock Switch
Model No: HS5L

Applied Union harmonized legislation and references to the relevant harmonization standards used or references the other technical specifications in relation to which conformity is declared.

Applicable EU Directive : Low Voltage Directive (2014/35/EU)
Machinery Directive (2006/42/EC)
RoHS Directive (2011/65/EU)
Applicable Standard(s) : EN 60947-5-1, GS-ET-19, EN IEC 63000

UK Authorized Representative: APEM COMPONENTS LIMITED
Drakes Drive, Long Crendon, Buckinghamshire, HP18 9BA, UK
Applicable UK Directive : Electrical Equipment (Safety) Regulations 2016,
Supply of Machinery (Safety) Regulations 2008,
The Restriction of the Use of Certain Hazardous Substances in
Electrical and Electronic Equipment Regulations 2012
Applicable Standard(s) : EN 60947-5-1, EN IEC 63000, EN ISO 14119