Interlock Switches with Solenoid

HS5L

Compact design with 2- and 4-contacts

(except some models)

- See website for details on approvals and standards.
- KOHSA (S mark) approved only on some models.

Additional Marking to indicate Locking Monitoring

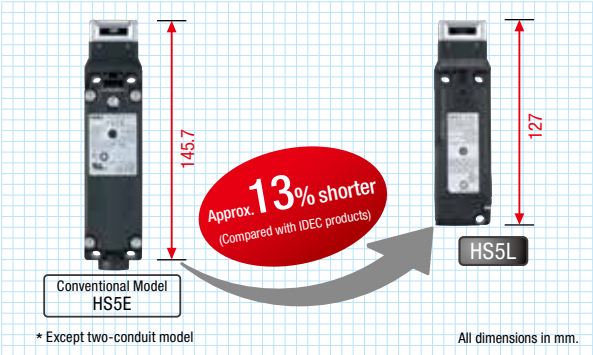
This new international marking for lock monitoring is described in clause 9.2.1 of ISO14119 and is used to satisfy the requirements shown below.
5.7.1 General requirements
5.7.2.2 Locking monitoring
The lock monitor circuit (contacts) with this marking can monitor both the status of protective door and locking function. (locking monitor contact [circuits] opens when the protective door is closed and locked)

Both spring lock and solenoid lock models of HS5L have marking for lock monitoring. Note that solenoid lock model can be used in applications where lock for safety purpose is found unnecessary after a risk assessment, e.g. locking is needed for purposes such as in production process.

	Features	Page
	2-Contact	E-033
	4-Contact	E-036

Compact Design

Size is reduced by 13% from conventional models.*
Mounts on small doors and aluminum frames of machines.
Compact design with 2- and 4-contacts reduce installation space.
Greater flexibility in machine design.



Compact with powerful 1400N locking strength

The size is greatly reduced while achieving the same 1400N (Fzh) locking strength as the conventional HS5E series. (GS-ET-19)

Gold-plated contacts suitable for small loads. Rear unlocking button

Door lock can be unlocked inside the barrier by a worker left inside a hazardous area.

The head orientation can be rotated, allowing 8 different entries. Angle Adjustable Actuator (vertical/horizontal) with Plate

A new addition to angle adjustable actuator. Retention force of 1400N.

Spring loaded actuator

IDEC patented spring loaded actuator locks the door safely when the door bounces. When the actuator is fully inserted (door closed completely), the door can tolerate a space of up to 16mm.

Patent acquired
* Accessory exclusive for HS5L.

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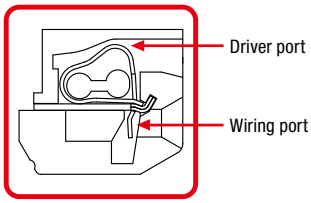
Spring clamp terminals

Spring clamp terminals offer excellent vibration resistance, preventing wires from loosening. No need for additional tightening.



Two-conduit Model

Cable can be connected to the right, left, or bottom (for straight cable orientation) of the terminal cover. Possible to use long marking tubes with the wiring cables.

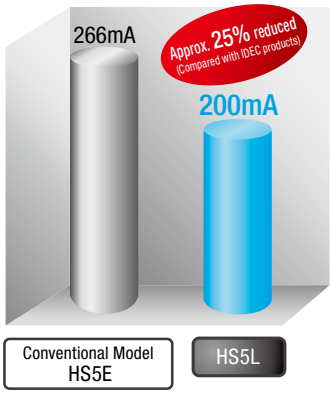
Left cable orientation

Right cable orientation

Straight cable orientation

Energy saving!

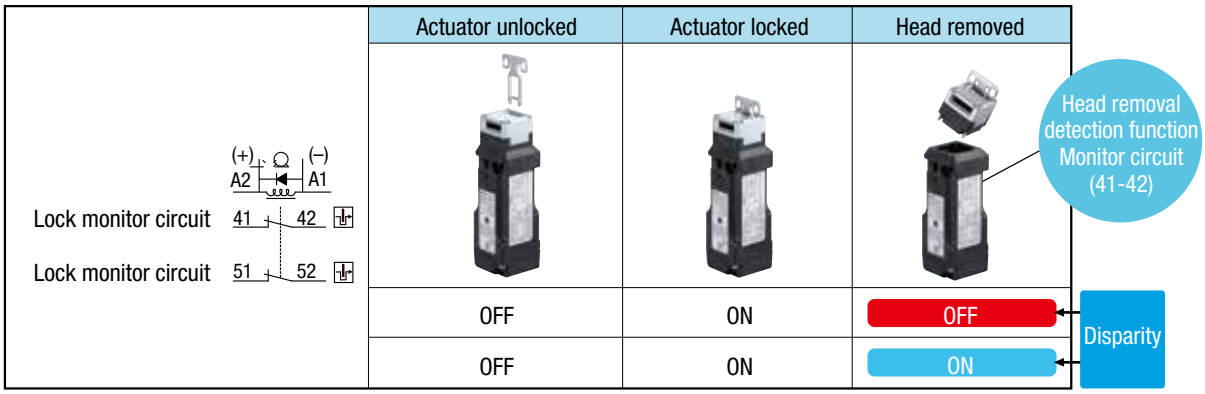
Solenoid energy consumption: 200mA Reduced by 25% from conventional HS5E series.



Head Removal Detection Circuitry

Head removal detection circuitry is employed in the HS5L. With this innovative function, the monitor circuit (41-42) turns off when the head is removed from the switch, such as when removing the head to change the head direction (applicable with the HS5L spring lock models). For example, for circuit codes: VB, VD and DD, which have two or more lock monitor circuits installed, removing the head results in disparity (41-42: OFF, 51-52: ON). This disparity is detected by the head removal detection function.

- **HS5L-VD44M-G (Lock monitor circuit)**



	Actuator unlocked	Actuator locked	Head removed
Lock monitor circuit 41-42	OFF	ON	OFF
Lock monitor circuit 51-52	OFF	ON	ON

Note: Head removal detection function is not a direct opening action mechanism.

Spring lock and Solenoid lock models available

Spring Lock

- Automatically locks the actuator without power applied to the solenoid.
- After the machine stops, unlocking is completed by the solenoid, providing high safety features.
- Manual unlocking is possible in the event of power failure or maintenance using a manual unlocking key.
- Head removal detection circuitry (spring lock models only).

Solenoid Lock

- The actuator is locked when energized.
- The actuator is unlocked when de-energized.
- Flexible locking function can be achieved, for an application where locking is not required and sudden stopping of a machine must be prevented.

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HS5L Interlock Switches with Solenoid (2-Contact)

Two-contact solenoid interlock switches ideal for use on applications such as food machines and injection molding machines.

Specifications

Applicable Standards	EN ISO14119 GS-ET-19 (TÜV approval) EN60947-5-1 (TÜV approval) UL508 (UL listed) CSA C22.2 No. 14 (c-UL listed) GB/T14048.5 (CCC approval) KS C IEC60947-5-1/S1-G-1/S2-E-4 (KOSHA approval) (*1)
	IEC60204-1/EN60204-1 (applicable standards for use)
Type and Coded level	Type 2 low level coded interlocking device (ISO14119)
Operating Temperature	–25 to + 55°C (no freezing)
Relative Humidity	20 to 95% (no condensation)
Storage Temperature	–40 to +80°C (no freezing)
Pollution Degree	3
Impulse Withstand Voltage	2.5kV (between LED, solenoid and grounding: 0.5kV)
Insulation Resistance (500V DC megger)	Between live and dead metal parts: 100MΩ min. Between terminals of different poles: 100MΩ min.
Electric Shock Protection	Class II (IEC61140)
Degree of Protection	IP67 (IEC60529) Type 4X Indoor Use Only
Shock Resistance	Operating extremes: 100m/s² (10G), Damage limits: 1000m/s² (100G)
Vibration Resistance	Operating extremes: 10 to 55Hz, amplitude 0.35 min. Damage limits: 30Hz, amplitude 1.5mm min.
Actuator Operating Speed	0.05 to 1.0m/s
Direct Opening Travel	11.0mm min. (Actuator: HS9Z-A51/A5P) 12.0mm min. (Actuator: HS9Z-A52/A51A/A52A/A53/A55/A55S/SH5/EH5L) 24.5mm min. (Actuator: HS9Z-BA5)
Direct Opening Force	120N min.
Actuator Retention Force (*2)	Fzh = 1400N min. (GS-ET-19) However, Fzh=500N min. when HS9Z-A55 is used
Operating Frequency	900 operations per hour
Rear Unlocking Button Mechanical Durability	3,000 times min. (HS5L-□□L)
Mechanical Durability	2,000,000 times min. (Operation frequency 900 times/hour, actuator insert/remove, solenoid operation) 100,000 times min. when using HS9Z-SH5/EH5L/DH5 (actuator insert/remove)
Electrical Durability	100,000 times min. (Operating Frequency: 900 operations per hour) 2,000,000 times min. (24V AC/DC, 100mA)
Conditional Short-circuit Current	50A (250V) (Use 250V/10A fast-blow fuse for short- circuit protection.)
Cable	0.3mm² min. and 1.5mm² max. or AWG22 min. to AWG16 max. strand wire or single wire
Weight (Approx.)	300g

*1) Not applicable for all models. Visit IDEC's website for details.
*2) See E-044 regarding actuator retention force.

Ratings

Contact Ratings

Rated Insulation Voltage (Ui)			250V (between LED, solenoid and grounding: 30V)		
Rated Current (Ith)			2.5A		
Rated Voltage (Ue)			30V	125V	250V
Rated Current (Ie)*	AC	Resistive Load (AC-12)	–	2.5A	1.5A
		Inductive Load (AC-15)	–	1.5A	0.75A
	DC	Resistive Load (DC-12)	2.5A	1.1A	0.55A
		Inductive Load (DC-13)	2.3A	0.55A	0.27A

- Minimum applicable load (reference): 3V AC/DC, 5mA
  (Applicable range may vary with operating conditions and load types.)

* UL, c-UL rating: Pilot Duty AC 0.75A/250V,
Pilot Duty DC 1.0A/30V
TÜV rating: AC-15 0.75A/250V, DC-13 2.3A/30V
CCC rating: AC-15 0.75A/250V, DC-13 2.3A/30V
KOSHA rating: AC-15 0.75A/250V, DC-13 1.0A/30V (*1)

Solenoid

Locking Mechanism	Spring Lock	Solenoid Lock
Rated Voltage	100% duty cycle 24V DC	
Rated Current	200mA (initial value)	
Coil Resistance	120Ω (at 20°C)	
Pickup Voltage	Rated voltage × 85% max. (at 20°C)	
Dropout Voltage	Rated voltage × 10% min. (at 20°C)	
Maximum Continuous Applicable Voltage	Rated voltage × 110%	
Maximum Continuous Applicable Time	Continuous	
Insulation Class	Class F	

Indicator

Rated Voltage	24V DC
Rated Current	10mA
Light Source	LED
Illumination Color	G (Green)

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HS5L Interlock Switches with Solenoid (2-Contact)

2-Contact

Package Quantity: 1

Circuit Code	Contact Configuration	Gland Port Size	Spring lock	Solenoid
			Part No.	
XD	Door Monitor (Actuator inserted) / Lock Monitor (Spring lock→Solenoid OFF, Solenoid lock→Solenoid ON) Door Monitor Circuit: 1NC Monitor Circuit: 11–12 Monitor Circuit: Lock Monitor Circuit: 1NC 41–42 (Note)	M20	HS5L-XD44M-G HS5L-XD44LM-G (Rear Unlocking Button Model)	HS5L-XD7Y4M-G
XF	Door Monitor Circuit: 2NC Monitor Circuit: 11–12 Monitor Circuit: 21–22		—	HS5L-XF7Y4M-G
XG	Door Monitor Circuit: 1NC,1NO Monitor Circuit: 11–12 Monitor Circuit: 23–24		—	HS5L-XG7Y4M-G
XH	Lock Monitor Circuit: 2NC		HS5L-XH44M-G	HS5L-XH7Y4M-G
XH	Monitor Circuit: 41–42 (Note) Monitor Circuit: 51–52 (Note)		HS5L-XH44LM-G (Rear Unlocking Button Model)	
XJ	Lock Monitor Circuit: 1NC, 1NO Monitor Circuit: 41–42 (Note) Monitor Circuit: 53–54		HS5L-XJ44M-G	HS5L-XJ7Y4M-G

- The contact configuration shows the status when the actuator is inserted and the switch is locked.
- Actuators are not supplied with the interlock switch and must be ordered separately.
- Contact us for details of two-conduit model. (Part No: HS5L- □□□□SM-G)

Note: Both spring lock and solenoid lock models of HS5L have marking for lock monitoring. Note that solenoid lock model can be used in applications where lock for safety purpose is found unnecessary after a risk assessment, e.g. locking is needed for purposes such as in production process.

Circuit Diagrams and Operating Characteristics

Spring Lock

Interlock Switch Status	Status 1	Status 2	Status 3	Status 4	When unlocking manually
	Door Closed Machine ready to operate Solenoid de-energized	Door Closed Machine cannot be operated Solenoid energized	Door open Machine cannot be operated Solenoid energized	Door open Machine cannot be operated Solenoid de-energized	Door Closed Machine cannot be operated Solenoid de-energized
Door Status					· Turn the manual unlock key (*1) · Press the rear unlocking button (*2)
Circuit Example: HS5L-XD4	(+) A2 (–) A1 11–12 41–42	(+) A2 (–) A1 11–12 41–42	(+) A2 (–) A1 11–12 41–42	(+) A2 (–) A1 11–12 41–42	(+) A2 (–) A1 11–12 41–42
Door	Closed (locked)	Closed (unlocked)	Open	Open	Closed (unlocked)
Part No. Circuit Diagram: HS5L-XD4 (Door Monitor (Actuator inserted), Lock Monitor (Solenoid OFF)) — Monitor Circuit (door closed) 11-12					
Part No. Circuit Diagram: HS5L-XD4 — Monitor Circuit (locked) 41-42					
Part No. Circuit Diagram: HS5L-XH4 — Monitor Circuit (locked) 41-42					
Part No. Circuit Diagram: HS5L-XH4 — Monitor Circuit (locked) 51-52					
Solenoid Power A1-A2 (common to all types)	OFF (de-energized)	ON (energized)	ON (energized)	OFF (de-energized)	OFF (de-energized)

- The contact configuration shows the status when the actuator is inserted and the switch is locked.
- Monitor Circuit: Sends monitoring signals of protective door open/closed status door monitor) or protective door lock/unlock status (lock monitor).

*1) Actuator can be unlocked manually for confirming the door movement before wiring and energizing, and also for emergency situation such as power failure.

*2) When an operator is confined within a dangerous zone, the actuator can be unlocked manually by pressing the rear unlocking button (rear unlocking button model).

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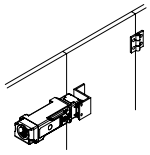
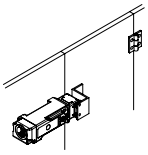
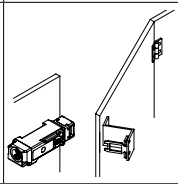
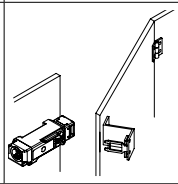
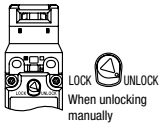
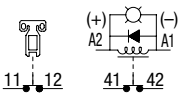
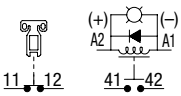
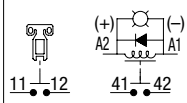
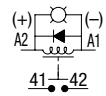
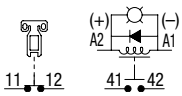
Circuit Diagrams and Operating Characteristics

Solenoid Lock

Interlock Switch Status	Status 1	Status 2	Status 3	Status 4	Unlocking using Manual Unlock Key
	Door Closed Machine ready to operate Solenoid energized	Door Closed Machine cannot be operated Solenoid de-energized	Door open Machine cannot be operated Solenoid de-energized	Door open Machine cannot be operated Solenoid energized	Door Closed Machine cannot be operated Solenoid de-energized → energized
Door Status					
Circuit Example: HS5L-XD7Y					
Door	Closed (locked)	Closed (unlocked)	Open	Open	Closed (unlocked)

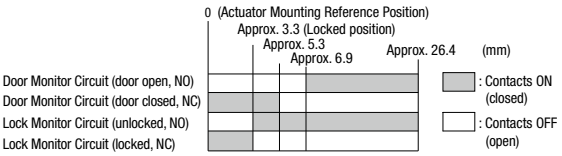
Part No. and Circuit Diagram

Part No.	Monitor Circuit	Status 1	Status 2	Status 3	Status 4	Unlocking using Manual Unlock Key
HS5L-XD7Y (Door Monitor (Actuator inserted); Lock Monitor (Solenoid ON); Monitor Circuit: 11–12; Monitor Circuit: 41–42 (*4))	Monitor Circuit (door closed) 11-12					
	Monitor Circuit (locked) 41-42					
HS5L-XF7Y (*3) (Monitor Circuit: 11–12; Monitor Circuit: 21–22)	Monitor Circuit (door closed) 11-12					
	Monitor Circuit (door closed) 21-22					
HS5L-XG7Y (*3) (Monitor Circuit: 11–12; Monitor Circuit: 23–24)	Monitor Circuit (door closed) 11-12					
	Monitor Circuit (door open) 23-24					
HS5L-XH7Y (Monitor Circuit: 41–42 (*4); Monitor Circuit: 51–52 (*4))	Monitor Circuit (locked) 41-42					
	Monitor Circuit (locked) 51-52					
HS5L-XJ7Y (Monitor Circuit: 41–42 (*4); Monitor Circuit: 53–54)	Monitor Circuit (locked) 41-42					
	Monitor Circuit (unlocked) 53-54					
Solenoid Power A1-A2 (all models)		OFF (energized)	OFF (de-energized)	OFF (de-energized)	ON (energized) (*2)	(*1) (*2) OFF (de-energized) → ON (energized)

- The contact configuration shows the status when the actuator is inserted and the switch is locked.
- Monitor Circuit: Sends monitoring signals of protective door open/closed status (door monitor) or protective door lock/unlock status (lock monitor).

*1) Do not unlock manually while the solenoid is energized.
*2) Do not energize the solenoid for a long period of time while the door is open or while the door is unlocked manually.
*3) Circuit codes XF and XG do not have signals to notify whether the switch is locked or unlocked. A different method should be used to check the lock status.
*4) Both spring lock and solenoid lock models of HS5L have marking for lock monitoring. Note that solenoid lock model can be used in applications where lock for safety purpose is found unnecessary after a risk assessment, e.g. locking is needed for purposes such as in production process.

Operation Characteristics (Reference)



- The operation characteristics shown in the chart above are for HS9Z-A51. For other actuators, add 1.3mm.
- See E-051 for HS9Z-BA5.
- The operation characteristics show the contact status when the actuator enters the entry slot of an interlock switch.

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HS5L Interlock Switch with Solenoid (4-Contact)

Four-contact solenoid interlock switches ideal for use on limited mounting spaces such as small doors.

Specifications

Applicable Standards	EN ISO14119 GS-ET-19 (TÜV approval) EN60947-5-1 (TÜV approval) UL508 (UL listed) CSA C22.2 No. 14 (c-UL listed) GB/T14048.5 (CCC approval) KS C IEC60947-5-1/S1-G-1/S2-E-4 (KOSHA approval) (*1)
	IEC60204-1/EN60204-1 (Applicable standards for use)
Type and Coded Level	Type 2 low level coded interlocking device (EN/ISO14119)
Operating Temperature	–25 to + 55°C (no freezing)
Relative Humidity	20 to 95% (no condensation)
Storage Temperature	–40 to +80°C (no freezing)
Pollution Degree	3
Impulse Withstand Voltage	2.5kV (between LED, solenoid and grounding: 0.5kV)
Insulation Resistance (500V DC megger)	Between live and dead metal parts: 100MΩ min. Between terminals of different poles: 100MΩ min.
Electric Shock Protection	Class II (IEC61140)
Degree of Protection	IP67 (IEC60529) Type 4X Indoor Use Only
Shock Resistance	Operating extremes: 100m/s² (10G) Damage limits: 1000m/s² (100G)
Vibration Resistance	Operating extremes: 10 to 55Hz, amplitude 0.35 min. Damage limits: 30Hz, amplitude 1.5mm min.
Actuator Operating Speed	0.05 to 1.0m/s
Direct Opening Travel	11.0mm min. (Actuator: HS9Z-A51/A5P) 12.0mm min. (Actuator: HS9Z-A52/A51A/A52A/A53/A55/A55S/SH5/EH5L) 24.5mm min. (Actuator: HS9Z-BA5)
Direct Opening Force	120N min.
Actuator Retention Force (*2)	Fzh = 1400N min. (GS-ET-19) However, Fzh=500N min. when HS9Z-A55 is used
Operating Frequency	900 operations per hour
Rear Unlocking Button Mechanical Durability	3,000 times min. (HS5L-□□L)
Mechanical Durability	2,000,000 times min. (Operation frequency 900 times/hour, actuator insert/remove, solenoid operation) 100,000 times min. when HS9Z-SH5/EH5L/DH5 (actuator insert/remove)
Electrical Durability	100,000 times min. (Operating Frequency: 900 operations per hour) 2,000,000 times min. (24V AC/DC, 100mA)
Conditional Short-circuit Current	50A (250V) (Use 250V/10A fast-blow fuse for short- circuit protection.)
Cable	0.3mm² min. and 1.5mm² max. or AWG22 min. to AWG16 max. strand wire or single wire
Weight (Approx.)	300g

*1) Not applicable for all models. Visit IDEC's website for details.
*2) See E-044 regarding actuator retention force.

Ratings

Contact Ratings

Rated Insulation Voltage (Ui)			250V (between LED, solenoid and grounding: 30V)		
Rated Current (Ith)			2.5A		
Rated Voltage (Ue)			30V	125V	250V
Rated Current (Ie)*	AC	Resistive Load (AC-12)	–	2.5A	1.5A
		Inductive Load (AC-15)	–	1.5A	0.75A
	DC	Resistive Load (DC-12)	2.5A	1.1A	0.55A
		Inductive Load (DC-13)	2.3A	0.55A	0.27A

- Minimum applicable load (reference): 3V AC/DC, 5mA
  (Applicable range may vary with operating conditions and load types.)

* UL, c-UL rating: Pilot Duty AC 0.75A/250V,
Pilot Duty DC 1.0A/30V
TÜV rating: AC-15 0.75A/250V, DC-13 2.3A/30V
CCC rating: AC-15 0.75A/250V, DC-13 2.3A/30V
KOSHA rating: AC-15 0.75A/250V, DC-13 1.0A/30V (*1)

Solenoid

Locking Mechanism	Spring Lock	Solenoid Lock
Rated Voltage	100% duty cycle 24V DC	
Rated Current	200mA (initial value)	
Coil Resistance	120Ω (at 20°C)	
Pickup Voltage	Rated voltage × 85% max. (at 20°C)	
Dropout Voltage	Rated voltage × 10% min. (at 20°C)	
Maximum Continuous Applicable Voltage	Rated voltage × 110%	
Maximum Continuous Applicable Time	Continuous	
Insulation Class	Class F	

Indicator

Rated Voltage	24V DC
Rated Current	10mA
Light Source	LED
Illumination Color	G (Green)

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APEM
Switches & Pilot Lights
Control Boxes
Emergency Stop Switches
Enabling Switches
Safety Products
Explosion Proof
Terminal Blocks
Relays & Sockets
Circuit Protectors
Power Supplies
LED Illumination
Controllers
Operator Interfaces
Sensors
AUTO-ID
Interlock Switches
Non-contact Interlock Switches
Safety Laser Scanners
Safety Light Curtains
Safety Modules
HS6B
HS6E
HS5D
HS5L
HS1L
Actuators for HS1/HS5/HS6
Actuators/ Padlock Hasp

HS5L Interlock Switches with Solenoid (4-Contact)

4-Contact (Spring Lock/Solenoid Lock)

Package Quantity: 1

Circuit Code	Contact Configuration	Gland Port Size	Spring lock	Solenoid
			Part No.	
VA	Door Monitor (Actuator inserted); Lock Monitor (Spring lock→Solenoid OFF, Solenoid lock→Solenoid ON); (+) A2, (–) A1 Door Monitor: 1NC, 1NO Monitor Circuit: 11–12 Monitor Circuit: 23–24 Monitor Circuit: Lock Monitor Circuit: 1NC,1NO 41–42 (Note) 53–54	M20	HS5L-VA44M-G	HS5L-VA7Y4M-G
			HS5L-VA44SM-G (two-conduit model)	HS5L-VA7Y4SM-G (two-conduit model)
VB	Door Monitor: 1NC, 1NO Monitor Circuit: 11–12 Monitor Circuit: 23–24 Monitor Circuit: Lock Monitor Circuit: 2NC 41–42 (Note) 51–52 (Note)		HS5L-VB44M-G	HS5L-VB7Y4M-G
				HS5L-VB7Y4SM-G (two-conduit model)
VC	Door Monitor: 2NC Monitor Circuit: 11–12 Monitor Circuit: 21–22 Monitor Circuit: Lock Monitor Circuit: 1NC,1NO 41–42 (Note) 53–54		HS5L-VC44M-G	HS5L-VC7Y4M-G
			HS5L-VC44SM-G (two-conduit model)	HS5L-VC7Y4SM-G (two-conduit model)
VD	Door Monitor: 2NC Monitor Circuit: 11–12 Monitor Circuit: 21–22 Monitor Circuit: Lock Monitor Circuit: 2NC 41–42 (Note) 51–52 (Note)		HS5L-VD44M-G	HS5L-VD7Y4M-G
			HS5L-VD44SM-G (two-conduit model)	HS5L-VD7Y4SM-G (two-conduit model)
VF	Door Monitor: 3NC Monitor Circuit: 11–12 Monitor Circuit: 21–22 Monitor Circuit: 31–32 Lock Monitor Circuit: 1NC 41–42 (Note)		HS5L-VF44M-G	HS5L-VF7Y4M-G
			HS5L-VF44SM-G (two-conduit model)	HS5L-VF7Y4SM-G (two-conduit model)
VG	Door Monitor: 2NC, 1NO Monitor Circuit: 11–12 Monitor Circuit: 21–22 Monitor Circuit: 33–34 Lock Monitor Circuit: 1NC 41–42 (Note)		HS5L-VG44M-G	HS5L-VG7Y4M-G
			HS5L-VG44SM-G (two-conduit model)	HS5L-VG7Y4SM-G (two-conduit model)
VH	Door Monitor: 1NC Monitor Circuit: 11–12 Lock Monitor Circuit: 3NC 41–42 (Note) 51–52 (Note) 61–62 (Note)		HS5L-VH44M-G	HS5L-VH7Y4M-G
VJ	Door Monitor: 1NC Monitor Circuit: 11–12 Lock Monitor Circuit: 2NC, 1NO 41–42 (Note) 51–52 (Note) 63–64		HS5L-VJ44M-G	HS5L-VJ7Y4M-G
VW	Door Monitor: 1NO Monitor Circuit: 13–14 Lock Monitor Circuit: 3NC 41–42 (Note) 51–52 (Note) 61–62 (Note)		HS5L-VW44M-G	HS5L-VW7Y4M-G
VX	Door Monitor: 1NO Monitor Circuit: 13–14 Lock Monitor Circuit: 2NC, 1NO 41–42 (Note) 51–52 (Note) 63–64		HS5L-VX44M-G	HS5L-VX7Y4M-G

- The contact configuration shows the status when the actuator is inserted and the switch is locked.
- Actuators are not supplied with the interlock switch and must be ordered separately.
- For safety circuit input, connect to the monitor circuit with marking.
- Contact us for details of two-conduit model. (Part No: HS5L-□□□□SM-G)

Note: Both spring lock and solenoid lock models of HS5L have marking for lock monitoring. Note that solenoid lock model can be used in applications where lock for safety purpose is found unnecessary after a risk assessment, e.g. locking is needed for purposes such as in production process.

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4-Contact/Rear Unlocking Button (Spring Lock)

Package Quantity: 1

Circuit Code	Contact Configuration	Gland Port Size	Spring lock Part No.
VA	Door Monitor (Actuator inserted) / Lock Monitor (Solenoid OFF) (+) A2 (–) A1 Door Monitor Circuit: 1NC,1NO Monitor Circuit: 11 12 Monitor Circuit: 23 24 Monitor Circuit: Lock Monitor Circuit: 1NC,1NO 41 42 53 54	M20	HS5L-VA44LM-G
VB	Door Monitor Circuit: 1NC,1NO Monitor Circuit: 11 12 Monitor Circuit: 23 24 Monitor Circuit: Lock Monitor Circuit: 2NC 41 42 51 52	M20	HS5L-VB44LM-G HS5L-VB44LSM-G (two-conduit model)
VC	Door Monitor Circuit: 2NC Monitor Circuit: 11 12 Monitor Circuit: 21 22 Monitor Circuit: Lock Monitor Circuit: 1NC,1NO 41 42 53 54	M20	HS5L-VC44LM-G
VD	Door Monitor Circuit: 2NC Monitor Circuit: 11 12 Monitor Circuit: 21 22 Monitor Circuit: Lock Monitor Circuit: 2NC 41 42 51 52	M20	HS5L-VD44LM-G HS5L-VD44LSM-G (two-conduit model)
VF	Door Monitor Circuit: 3NC Monitor Circuit: 11 12 Monitor Circuit: 21 22 Monitor Circuit: 31 22 Lock Monitor Circuit: 1NC 41 42	M20	HS5L-VF44LM-G
VJ	Door Monitor Circuit: 1NC Monitor Circuit: 11 12 Monitor Circuit: Monitor Circuit: Lock Monitor Circuit: 2NC, 1NO 41 42 51 52 63 64	M20	HS5L-VJ44LM-G
VH	Door Monitor Circuit: 1NC Monitor Circuit: 11 12 Monitor Circuit: Monitor Circuit: Lock Monitor Circuit: 3NC 41 42 51 52 61 62	M20	HS5L-VH44LM-G

- The contact configuration shows the status when the actuator is inserted and the switch is locked.
- Actuators are not supplied with the interlock switch and must be ordered separately.

4-Contact/Dual Safety Circuit (Spring Lock)

Package Quantity: 1

Circuit Code	Contact Configuration	Gland Port Size	Spring lock Part No.
DD	Main Circuit: 1NC+1NC 1NC+1NC Door Monitor (Actuator inserted) / Lock Monitor (Solenoid OFF) (+) A2 (–) A1 Main Circuit: 11 12 41 42 Main Circuit: 21 22 51 52	M20	HS5L-DD44M-G HS5L-DD44SM-G (two-conduit model)

- The contact configuration shows the status when the actuator is inserted and the switch is locked.
- Actuators are not supplied with the interlock switch and must be ordered separately.

4-Contact/Dual Safety Circuit/Rear Unlocking Button (Spring Lock)

Package Quantity: 1

Circuit Code	Contact Configuration	Gland Port Size	Spring lock Part No.
DD	Main Circuit: 1NC+1NC 1NC+1NC Door Monitor (Actuator inserted) / Lock Monitor (Solenoid OFF) (+) A2 (–) A1 Main Circuit: 11 12 41 42 Main Circuit: 21 22 51 52	M20	HS5L-DD44LM-G HS5L-DD44LSM-G (two-conduit model)

- The contact configuration shows the status when the actuator is inserted and the switch is locked.
- Actuators are not supplied with the interlock switch and must be ordered separately.

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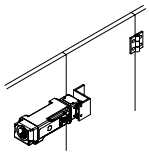
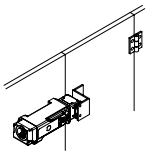
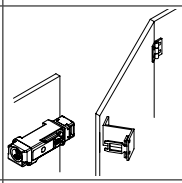
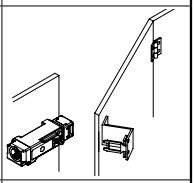
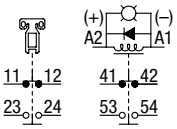
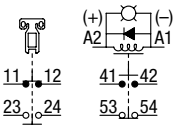
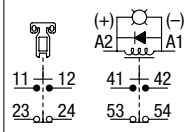
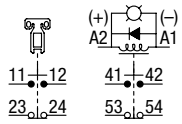
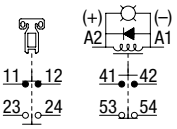
HS5L Interlock Switch with Solenoid (4-Contact)

Circuit Diagrams and Operating Characteristics

4-Contact/Rear Unlocking Button (Spring Lock)

Interlock Switch Status	Status 1	Status 2	Status 3	Status 4	When unlocking manually	
	Door Closed Machine ready to operate Solenoid de-energized	Door Closed Machine cannot be operated Solenoid energized	Door open Machine cannot be operated Solenoid energized	Door open Machine cannot be operated Solenoid de-energized	Door Closed Machine cannot be operated Solenoid de-energized	
Door Status					· Turn the manual unlock key (*1)	· Press the rear unlocking button (*2)
Circuit Example: HS5L-VA4						
Door	Closed (locked)	Closed (unlocked)	Open	Open	Closed (unlocked)	

Part No. and Circuit Diagram

Part No.	Monitor Circuit	Status 1	Status 2	Status 3	Status 4	When unlocking manually	
HS5L-VA4 (Door Monitor (Actuator inserted); Lock Monitor (Solenoid OFF); Monitor Circuit: 11–12, 41–42, 23–24, 53–54)	Monitor Circuit (door closed) 11–12						
	Monitor Circuit (door open) 23–24						
	Monitor Circuit (locked) 41–42						
	Monitor Circuit (unlocked) 53–54						
HS5L-VB4 (Monitor Circuit: 11–12, 41–42, 23–24, 51–52)	Monitor Circuit (door closed) 11–12						
	Monitor Circuit (door open) 23–24						
	Monitor Circuit (locked) 41–42						
	Monitor Circuit (locked) 51–52						
HS5L-VC4 (Monitor Circuit: 11–12, 41–42, 21–22, 53–54)	Monitor Circuit (door closed) 11–12						
	Monitor Circuit (door closed) 21–22						
	Monitor Circuit (locked) 41–42						
	Monitor Circuit (unlocked) 53–54						
HS5L-VD4 (Monitor Circuit: 11–12, 41–42, 21–22, 51–52)	Monitor Circuit (door closed) 11–12						
	Monitor Circuit (door closed) 21–22						
	Monitor Circuit (locked) 41–42						
	Monitor Circuit (locked) 51–52						
HS5L-VF4 (Monitor Circuit: 11–12, 41–42, 21–22, 31–32)	Monitor Circuit (door closed) 11–12						
	Monitor Circuit (door closed) 21–22						
	Monitor Circuit (door closed) 31-32						
	Monitor Circuit (locked) 41-42						
HS5L-VG4 (Monitor Circuit: 11–12, 41–42, 21–22, 33–34)	Monitor Circuit (door closed) 11–12						
	Monitor Circuit (door closed) 21-22						
	Monitor Circuit (door open) 33-34						
	Monitor Circuit (door locked) 41-42						
HS5L-VH4 (Monitor Circuit: 11–12, 41–42, 51–52, 61–62)	Monitor Circuit (door closed) 11-12						
	Monitor Circuit (locked) 41-42						
	Monitor Circuit (locked) 51-52						
	Monitor Circuit (unlocked) 61-62						
Solenoid Power A1-A2 (all models)		OFF (de-energized)	ON (energized)	ON (energized)	OFF (de-energized)	OFF (de-energized)	

- The contact configuration shows the status when the actuator is inserted and the switch is locked.
- Monitor Circuit: Sends monitoring signals of protective door open/closed status (door monitor) or protective door lock/unlock status (lock monitor).

*1) Actuator can be unlocked manually for confirming the door movement before wiring and energizing, and also for emergency situation such as power failure.

*2) When an operator is confined within a dangerous zone, the actuator can be unlocked manually by pressing the rear unlocking button (rear unlocking button model).

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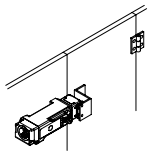
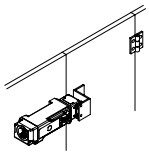
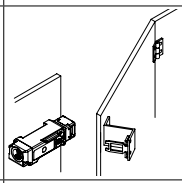
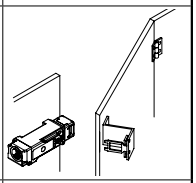
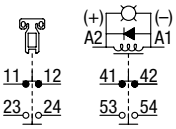
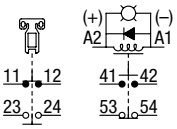
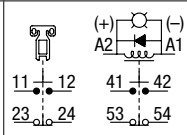
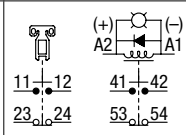
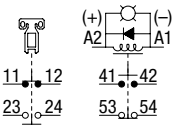
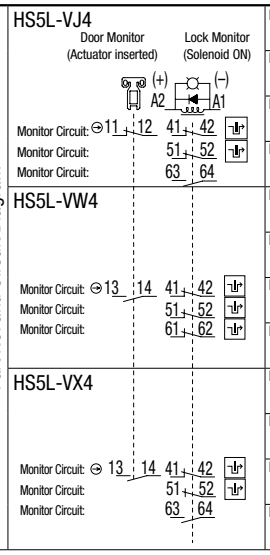
Circuit Diagrams and Operating Characteristics

4-Contact/Rear Unlocking Button (Spring Lock)

Interlock Switch Status	Status 1	Status 2	Status 3	Status 4	When unlocking manually	
	Door Closed Machine ready to operate Solenoid de-energized	Door Closed Machine cannot be operated Solenoid energized	Door open Machine cannot be operated Solenoid energized	Door open Machine cannot be operated Solenoid de-energized	Door Closed Machine cannot be operated Solenoid de-energized	
Door Status					· Turn the manual unlock key (*1)	· Press the rear unlocking button (*2)
Circuit Example: HS5L-VA4						
Door	Closed (locked)	Closed (unlocked)	Open	Open	Closed (unlocked)	

Part No. and Circuit Diagram



Monitor Circuit	Status 1	Status 2	Status 3	Status 4	When unlocking manually	
HS5L-VJ4: Monitor Circuit (door closed) 11-12						
HS5L-VJ4: Monitor Circuit (locked) 41-42						
HS5L-VJ4: Monitor Circuit (locked) 51-52						
HS5L-VJ4: Monitor Circuit (door locked) 63-64						
HS5L-VW4: Monitor Circuit (door open) 13–14						
HS5L-VW4: Monitor Circuit (locked) 41–42						
HS5L-VW4: Monitor Circuit (locked) 51–52						
HS5L-VW4: Monitor Circuit (locked) 61–62						
HS5L-VX4: Monitor Circuit (door open) 13–14						
HS5L-VX4: Monitor Circuit (locked) 41–42						
HS5L-VX4: Monitor Circuit (locked) 51–52						
HS5L-VX4: Monitor Circuit (unlocked) 63–64						
Solenoid Power A1-A2 (all models)	OFF (de-energized)	ON (energized)	ON (energized)	OFF (de-energized)	OFF (de-energized)	

- The contact configuration shows the status when the actuator is inserted and the switch is locked.
- Monitor Circuit: Sends monitoring signals of protective door open/closed status (door monitor) or protective door lock/unlock status (lock monitor).

*1) Actuator can be unlocked manually for confirming the door movement before wiring and energizing, and also for emergency situation such as power failure.

*2) When an operator is confined within a dangerous zone, the actuator can be unlocked manually by pressing the rear unlocking button (rear unlocking button model).

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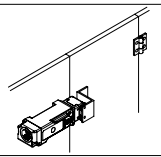
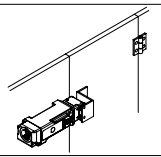
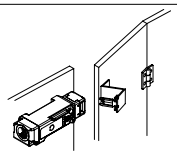
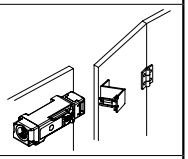
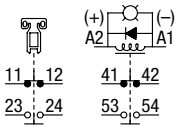
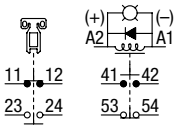
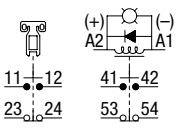
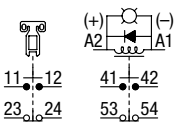
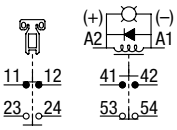
HS5L Interlock Switch with Solenoid (4-Contact)

Circuit Diagrams and Operating Characteristics

4-Contact (Solenoid Lock)

Interlock Switch Status	Status 1	Status 2	Status 3	Status 4	Unlocking using Manual Unlock Key
	Door Closed Machine ready to operate Solenoid energized	Door Closed Machine cannot be operated Solenoid de-energized	Door open Machine cannot be operated Solenoid de-energized	Door open Machine cannot be operated Solenoid energized	Door Closed Machine cannot be operated Solenoid de-energized → energized
Door Status					
Circuit Example: HS5L-VA7Y					
Door	Closed (locked)	Closed (unlocked)	Open	Open	Closed (unlocked)
Part No. and Circuit Diagram					
HS5L-VA7Y Door Monitor (Actuator inserted) / Lock Monitor (Solenoid ON) Monitor Circuit: ⊖11 12 41 42 (*3) Monitor Circuit: 23 24 Monitor Circuit: 53 54					
Monitor Circuit (door closed) 11–12					
Monitor Circuit (door open) 23–24					
Monitor Circuit (locked) 41–42					
Monitor Circuit (unlocked) 53–54					
HS5L-VB7Y Monitor Circuit: ⊖11 12 41 42 (*3) Monitor Circuit: 23 24 Monitor Circuit: 51 52 (*3)					
Monitor Circuit (door closed) 11–12					
Monitor Circuit (door open) 23–24					
Monitor Circuit (locked) 41–42					
Monitor Circuit (locked) 51–52					
HS5L-VC7Y Monitor Circuit: ⊖11 12 41 42 (*3) Monitor Circuit: ⊖21 22 Monitor Circuit: 53 54					
Monitor Circuit (door closed) 11–12					
Monitor Circuit (door closed) 21–22					
Monitor Circuit (locked) 41–42					
Monitor Circuit (unlocked) 53–54					
HS5L-VD7Y Monitor Circuit: ⊖11 12 41 42 (*3) Monitor Circuit: ⊖21 22 Monitor Circuit: 51 52 (*3)					
Monitor Circuit (door closed) 11–12					
Monitor Circuit (door closed) 21–22					
Monitor Circuit (locked) 41–42					
Monitor Circuit (locked) 51–52					
HS5L-VF7Y Monitor Circuit: ⊖11 12 41 42 (*3) Monitor Circuit: ⊖21 22 Monitor Circuit: ⊖31 32					
Monitor Circuit (door closed) 11–12					
Monitor Circuit (door closed) 21–22					
Monitor Circuit (locked) 31–32					
Monitor Circuit (locked) 41–42					
Solenoid Power A1-A2 (all models)	ON (energized)	OFF (de-energized)	OFF (de-energized)	ON (energized) (*2)	OFF (de-energized) (*1) (*2) → ON (energized)

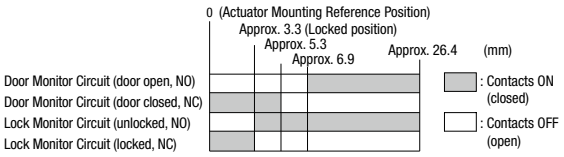
- The contact configuration shows the status when the actuator is inserted and the switch is locked.
- Monitor Circuit: Sends monitoring signals of protective door open/closed status (door monitor) or protective door lock/unlock status (lock monitor).

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

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

*3) Both spring lock and solenoid lock models of HS5L have marking for lock monitoring. Note that solenoid lock model can be used in applications where lock for safety purpose is found unnecessary after a risk assessment, e.g. locking is needed for purposes such as in production process.

Operating Characteristics (Reference)



- The operation characteristics shown in the chart above are for HS9Z-A51. For other actuators, add 1.3mm.
- See E-051 for HS9Z-BA5.
- The operation characteristics show the contact status when the actuator enters the entry slot of an interlock switch.

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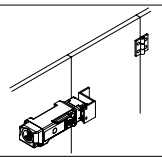
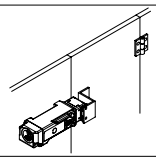
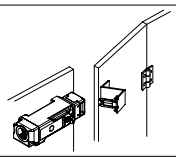
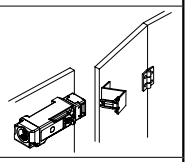
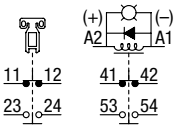
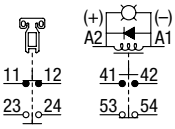
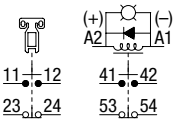
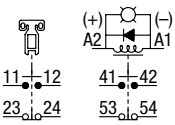
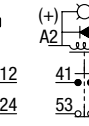
Circuit Diagrams and Operating Characteristics

4-Contact (Solenoid Lock)

Interlock Switch Status	Status 1	Status 2	Status 3	Status 4	Unlocking using Manual Unlock Key
	Door Closed Machine ready to operate Solenoid energized	Door Closed Machine cannot be operated Solenoid de-energized	Door open Machine cannot be operated Solenoid de-energized	Door open Machine cannot be operated Solenoid energized	Door Closed Machine cannot be operated Solenoid de-energized → energized
Door Status					
Circuit Example: HS5L-VA7Y					
Door	Closed (locked)	Closed (unlocked)	Open	Open	Closed (unlocked)
Part No. and Circuit Diagram					
HS5L-VG7Y Door Monitor (Actuator inserted) Lock Monitor (Solenoid ON) Monitor Circuit: ⊖ 11 12 41 42 (*3) Monitor Circuit: ⊖ 21 22 Monitor Circuit: 33 34					
Monitor Circuit (door closed) 11–12					
Monitor Circuit (door closed) 21-22					
Monitor Circuit (door open) 33-34					
Monitor Circuit (locked) 41-42					
HS5L-VH7Y Monitor Circuit: ⊖ 11 12 41 42 (*3) Monitor Circuit: 51 52 (*3) Monitor Circuit: 61 62 (*3)					
Monitor Circuit (door closed) 11–12					
Monitor Circuit (locked) 41-42					
Monitor Circuit (locked) 51-52					
Monitor Circuit (unlock) 63-64					
HS5L-VJ7Y Monitor Circuit: ⊖ 11 12 41 42 (*3) Monitor Circuit: 51 52 (*3) Monitor Circuit: 63 64					
Monitor Circuit (door open) 13–14					
Monitor Circuit (locked) 41-42					
Monitor Circuit (locked) 51-52					
Monitor Circuit (unlocked) 63-64					
HS5L-VW7Y Monitor Circuit: ⊖ 13 14 41 42 (*3) Monitor Circuit: 51 52 (*3) Monitor Circuit: 61 62 (*3)					
Monitor Circuit (door open) 13–14					
Monitor Circuit (locked) 41-42					
Monitor Circuit (locked) 51-52					
Monitor Circuit (locked) 61-62					
HS5L-VX7Y Monitor Circuit: ⊖ 13 14 41 42 (*3) Monitor Circuit: 51 52 (*3) Monitor Circuit: 63 64					
Monitor Circuit (door open) 13–14					
Monitor Circuit (locked) 41-42					
Monitor Circuit (locked) 51-52					
Monitor Circuit (unlocked) 63-64					
Solenoid Power A1-A2 (all models)	ON (energized)	OFF (de-energized)	OFF (de-energized)	ON (energized) (*2)	OFF (de-energized) (*1) (*2) → ON (energized)

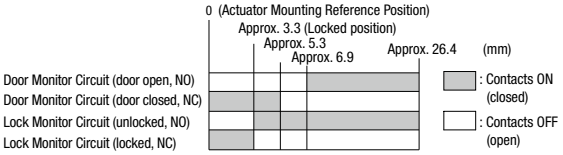
- The contact configuration shows the status when the actuator is inserted and the switch is locked.
- Monitor Circuit: Sends monitoring signals of protective door open/closed status (door monitor) or protective door lock/unlock status (lock monitor).

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

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

*3) Both spring lock and solenoid lock models of HS5L have marking for lock monitoring. Note that solenoid lock model can be used in applications where lock for safety purpose is found unnecessary after a risk assessment, e.g. locking is needed for purposes such as in production process.

Operating Characteristics (Reference)



- The operation characteristics shown in the chart above are for HS9Z-A51. For other actuators, add 1.3mm.
- See E-051 for HS9Z-BA5.
- The operation characteristics show the contact status when the actuator enters the entry slot of an interlock switch.

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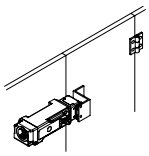
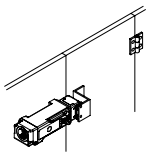
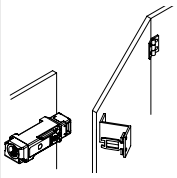
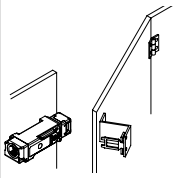
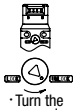
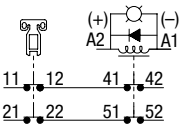
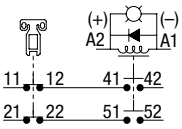
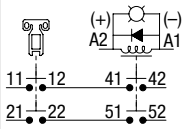
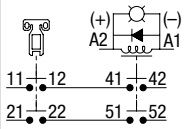
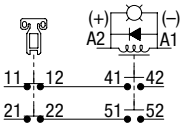
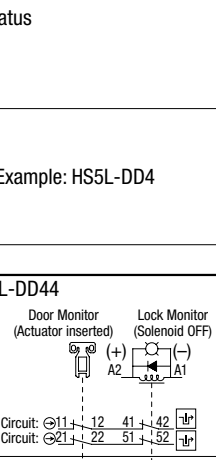
HS5L Interlock Switch with Solenoid (4-Contact)

Circuit Diagrams and Operating Characteristics

4-Contact/Dual Safety Circuit, 4-Contact/Dual Safety Circuit/Rear Unlocking Button (Spring Lock)

Interlock Switch Status	Status 1	Status 2	Status 3	Status 4	Unlocking using Manual Unlock Key
	Door Closed Machine ready to operate Solenoid de-energized	Door Closed Machine cannot be operated Solenoid energized	Door open Machine cannot be operated Solenoid energized	Door open Machine cannot be operated Solenoid de-energized	Door Closed Machine cannot be operated Solenoid de-energized
Door Status					 · Turn the manual unlock key (*1) · Press the rear unlocking button (*2)
Circuit Example: HS5L-DD4					
Door	Closed (locked)	Closed (unlocked)	Open	Open	Closed (unlocked)
Part No. and Circuit Diagram: HS5L-DD44 — Main Circuit 11–42					
Part No. and Circuit Diagram: HS5L-DD44 — Main Circuit 21–52					
Part No. and Circuit Diagram: HS5L-DD44L — Main Circuit 11–42					
Part No. and Circuit Diagram: HS5L-DD44L — Main Circuit 21–52					
Solenoid Power A1-A2 (all model)	OFF (de-energized)	ON (energized)	ON (energized)	OFF (de-energized)	OFF (de-energized)1

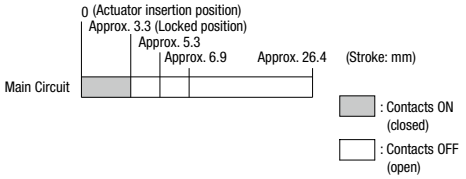


- The contact configuration shows the status when the actuator is inserted and the switch is locked.
- Main Circuit: Connected to the control circuit of machine drive part, sending interlock signals of the protective door.
- For safety circuit input, connect to the monitor circuit.

*1) Actuator can be unlocked manually for confirming the door movement before wiring and energizing, and also for emergency situation such as power failure.

*2) When an operator is confined within a dangerous zone, the actuator can be unlocked manually by pressing the rear unlocking button. (rear unlocking button model)

Operating Characteristics (Reference)



- The operation characteristics shown in the chart above are of the HS9Z-A51. For other actuators, add 1.3mm.
- See E-051 for HS9Z-BA5.
- The operation characteristics show the contact status when the actuator enters the entry slot of an interlock switch.

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Actuators for HS5 Series Interlock Switches

Actuator

Description	Part No.	Package Quantity	Remarks
Straight	HS9Z-A51	1	Actuator retention force is Fzh=1400N.
Straight with rubber bushings	HS9Z-A51A		
Right-angle	HS9Z-A52		
Right-angle with tubber bushings	HS9Z-A52A		
Angle adjustable (vertical)	HS9Z-A53		
Angle adjustable (vertical/horizontal) with plate	HS9Z-A55S		
Angle adjustable (vertical/horizontal)	HS9Z-A55		Actuator retention force is Fz=500N. When a retention force of 500N or more is required, use HS9Z-A55S.

• See E-064 for details on actuators.

Accessories

Description		Part No.	Package Quantity	Remarks
Sliding actuator (*1)		HS9Z-SH5	1	Actuator retention force is Fzh=1400N.
Door handle actuator (*1)	Handle unit for right-hand door	HS9Z-DH5RH		Choose according to the required opening side.
	Handle unit for left-hand door	HS9Z-DH5LH		
	Switch cover unit	HS9Z-DH5C		Used for installing the interlock switch inside.
Slide handle actuator		HS9Z-EH5L		
Spring loaded actuator (*1) (*2)		HS9Z-BA5		Actuator retention force is Fzh=1400N.
Plug actuator (*1)		HS9Z-A5P		
Padlock hasp (*1)		HS9Z-PH5		
Mounting plate (*3)		HS9Z-SP51		Used when installing the interlock switch on the aluminum frame.
Rear Unlocking Button Kit (*4)		HS9Z-FL53		Panel Thickness (*5) (X): 23 < X ≤ 33
		HS9Z-FL54		Panel Thickness (*5) (X): 33 < X ≤ 43
		HS9Z-FL55		Panel Thickness (*5) (X): 43 < X ≤ 53

*1) See E-064 to E-090 for details on accessories.

*2) HS9Z-BA5 can only be used for HS5L interlock switches. Also, HS9Z-BA5 can be used only on slide doors. Do not use on hinge doors.

*3) When mounting HS5L-□□□□L (rear unlocking button model) using a mounting plate, provide mounting holes on the mounting plate as shown below and user Rear Unlocking Button Kit (HS9Z-FL5 □).

*4) HS5L interlock switch rear unlocking button kit (When mounting HS5L-□L directly).

*5) Thickness of the frame or panel where the HS5L is mounted.

• Follow the instructions on catalog or instruction sheet for proper use of accessories.

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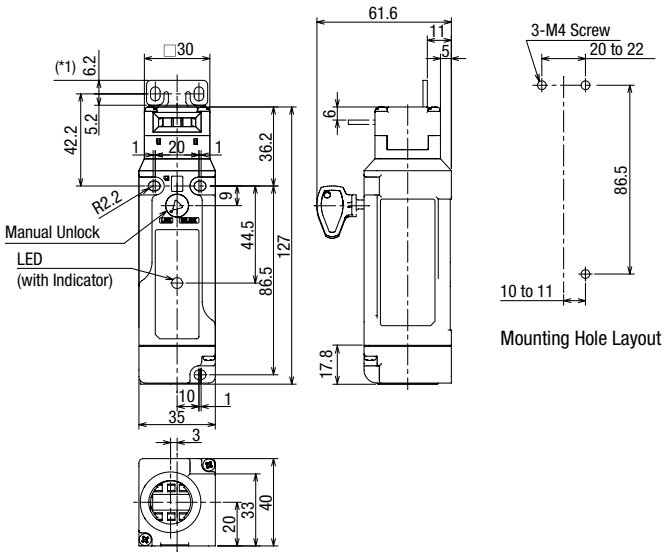
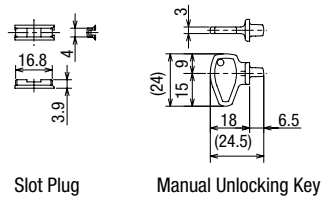
Interlock Switch Dimensions and Mounting Hole Layouts

HS5L-□□4M-G

When using Horizontal Mounting/Straight Actuator (HS9Z-A51)



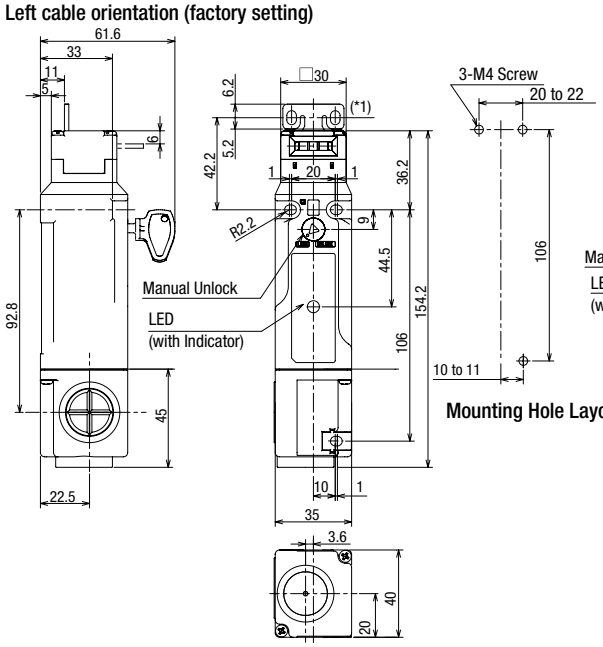
Accessories
(supplied)



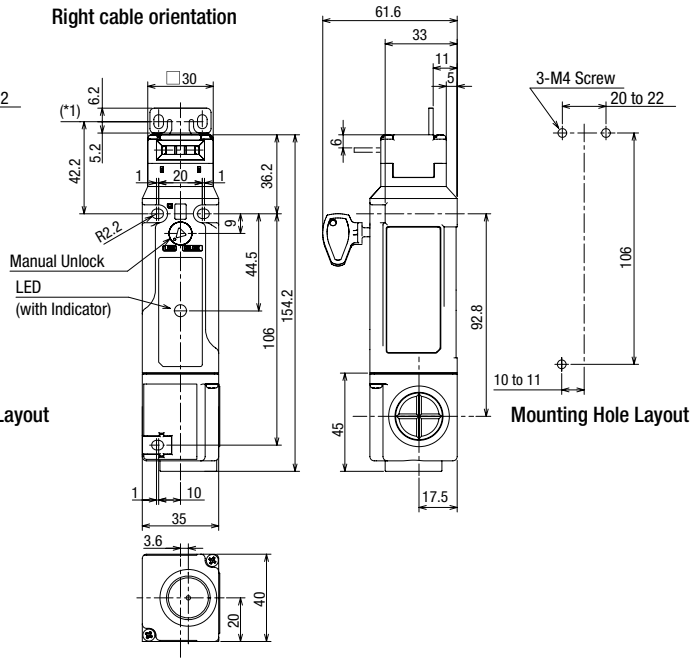
HS5L-□□4SM-G (two-conduit model)

When using Horizontal Mounting/Straight Actuator (HS9Z-A51)

Left cable orientation (factory setting)



Right cable orientation



*1) Actuator mounting reference position

IDEC
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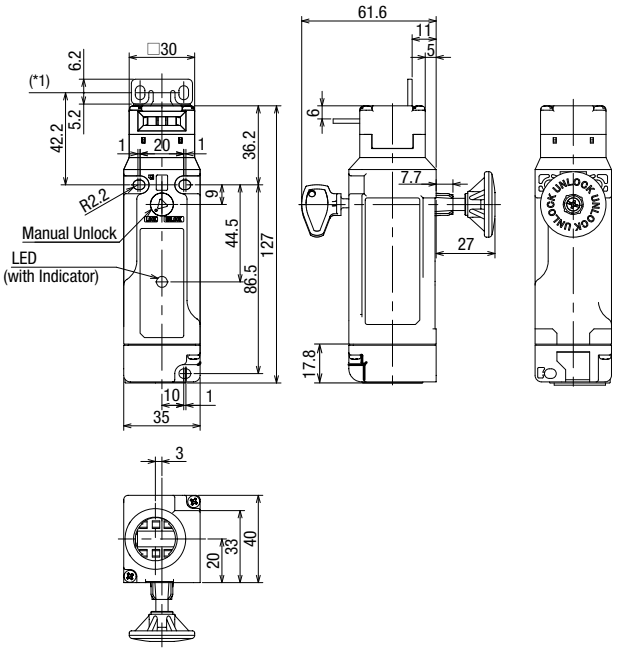
Interlock Switch Dimensions and Mounting Hole Layouts

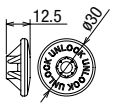
All dimensions in mm.

HS5L-□□4LM-G (with rear unlocking button)

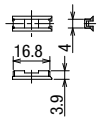
When using Horizontal Mounting/Straight Actuator (HS9Z-A51)



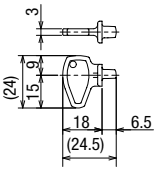
Accessories
(supplied)



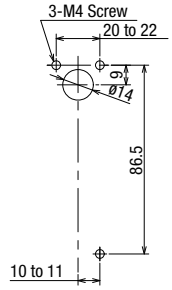
Rear Unlocking Button



Slot Plug



Manual Unlocking Key

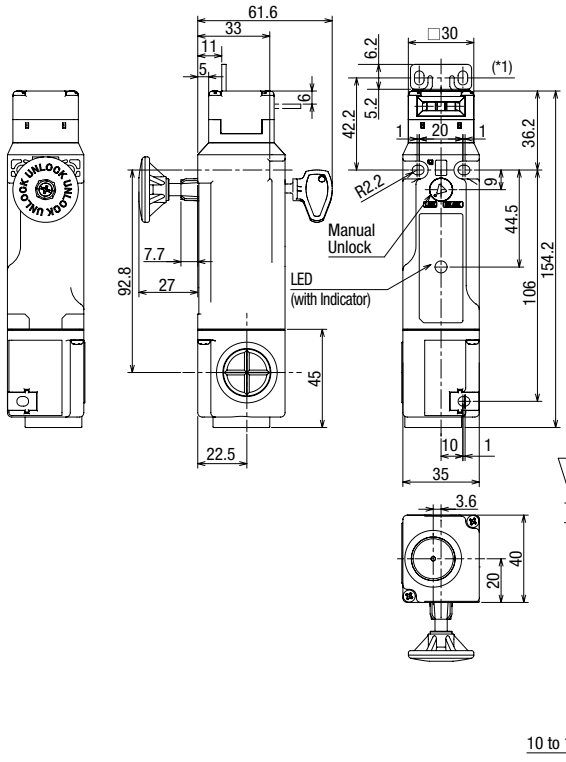


Mounting Hole Layout

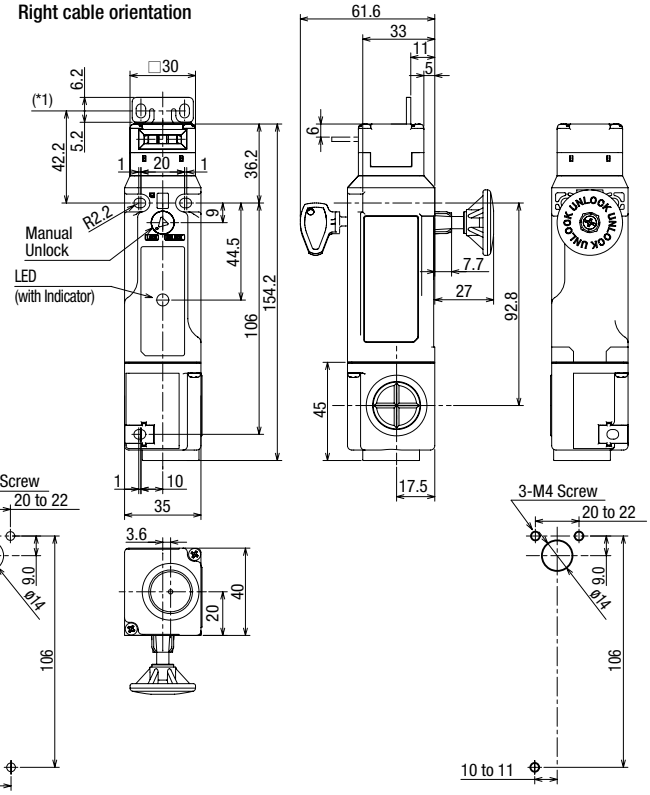
HS5L-□□4LSM-G (two-conduit model/rear unlocking button)

When using Horizontal Mounting/Straight Actuator (HS9Z-A51)

Left cable orientation (factory setting)



Right cable orientation



*1) Actuator mounting reference position

APEM
Switches & Pilot Lights
Control Boxes
Emergency Stop Switches
Enabling Switches
Safety Products
Explosion Proof
Terminal Blocks
Relays & Sockets
Circuit Protectors
Power Supplies
LED Illumination
Controllers
Operator Interfaces
Sensors
AUTO-ID
Interlock Switches
Non-contact Interlock Switches
Safety Laser Scanners
Safety Light Curtains
Safety Modules
HS6B
HS6E
HS5D
HS5L
HS1L
Actuators for HS1/HS5/HS6
Actuators/ Padlock Hasp

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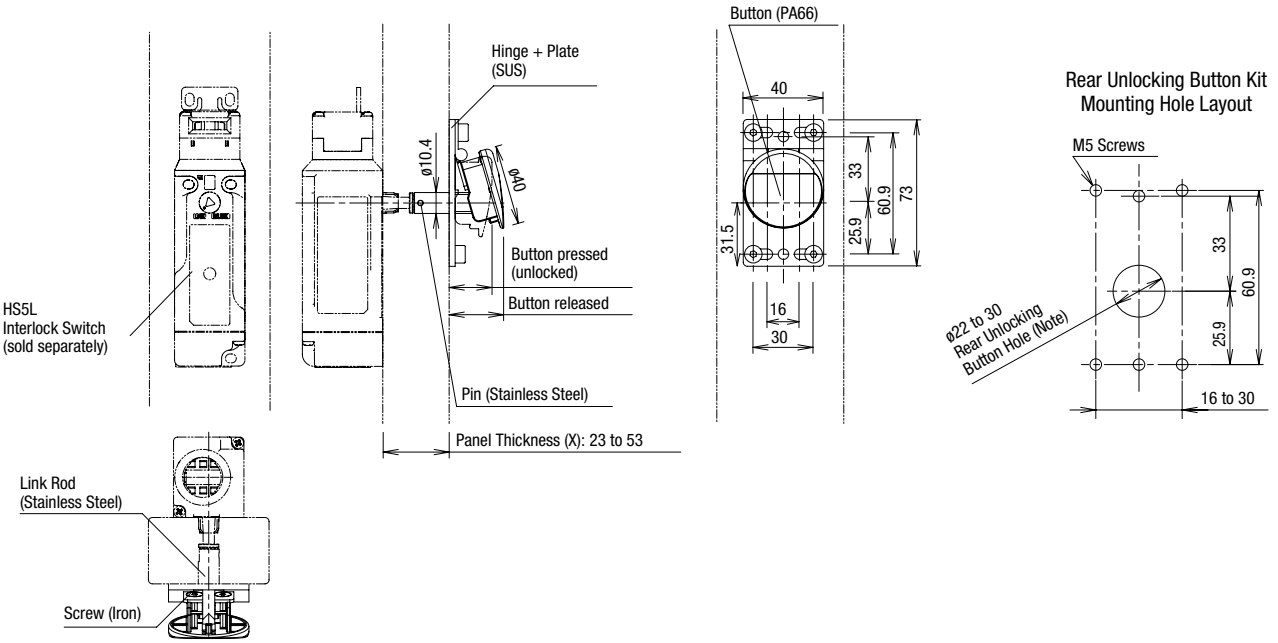
Interlock Switch Dimensions and Mounting Hole Layouts

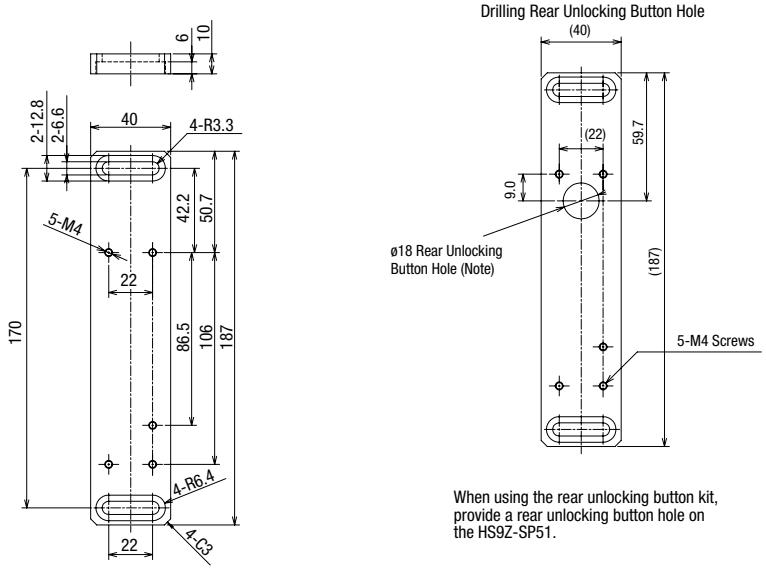
Dimensions

All dimensions in mm.

Rear Unlocking Button Kit (HS9Z-FL5□)



Mounting Plate (HS9Z-SP51)



When using the rear unlocking button kit, provide a rear unlocking button hole on the HS9Z-SP51.

Note: With the mounting hole dimension, the rear unlocking button rod does not touch the mounting hole even when the interlock switch moves sideways.

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Safety Precautions

- In order to avoid electric shock or fire, turn power off before installation, removal, wiring, maintenance, or inspection of the interlock switch.
- If relays are used in the circuit between the interlock switch and the load, use only safety relays, since welded or sticking contacts of standard relays may invalidate the functions of the interlock switch. Perform a risk assessment and make a safety circuit which satisfies the requirements 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 a location where a human body may come into contact. Otherwise injury may occur.
- Solenoid lock is locked when energized, and unlocked when de-energized. When energization is interrupted due to wire disconnection or other failures, the interlock switch may be unlocked causing possible danger to the operators. Solenoid lock must not be used in applications where locking is strictly required for safety. Perform a risk assessment and determine whether solenoid lock is appropriate.
- When changing the head orientation, disconnect the cable and turn the manual unlock to the UNLOCK position in advance. If the head orientation is changed when the cable is connected and the manual unlock is in the LOCK position, machines may start to operate, causing danger to the operators.
- HS5L interlock switches are Type 2 low level coded interlocking devices (ISO14119). According to ISO14119, the following is required to minimize defeat when installing and constructing systems:

1. Prevent dismantling or de-positioning of the elements of the interlocking device by use of non-detachable fixing (e.g. welding, gluing, one-way screws, riveting). However, use of non-detachable fixing can be an inappropriate solution in cases where a failure of the interlocking device during lifetime of the machinery can be expected and a fast change is necessary. In this case measures mentioned below, should be used to provide the required level of risk reduction.
2. Apply at least one out of the four measures below.

① Mounting out of reach.
② Physical obstruction or shielding.
③ Mounting in hidden position.
④ Integration of defeat monitoring by means of status monitoring/cyclic testing.

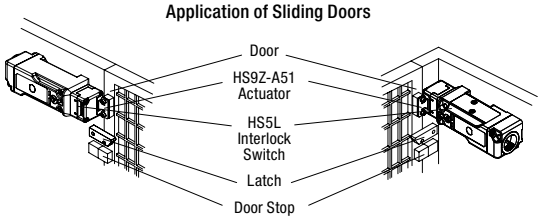
Instructions

- 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 1,000m/s^2 may cause damage to the interlock switch.
- Prevent foreign objects such as dust and liquids from entering the interlock switch while connecting a conduit or wiring.
- 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, or in an area subjected to direct sunlight.
- Use proprietary actuators only. When other actuators are used, the interlock switch may be damaged.
- The locking strength is rated at 1400N. Do not apply a load higher than the rated value. When a higher load is expected, 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.
- Regardless of door types, do not use the interlock switch as a door lock. Install a separate lock using a latch or other measures.
- While the solenoid is energized, the switch temperature rises approximately 40°C above the ambient temperature (to approximately 95°C while the ambient temperature is 55°C). To prevent burns, avoid touching. If cables come into contact with the switch, use heat-resistant cables.
- Although the HS9Z-A51A/A52A actuators alleviate shock when the actuator enters a slot in the interlock switch, make sure that excessive shock is not applied. If the Rubber Bushings become deformed or cracked, replace with new ones.

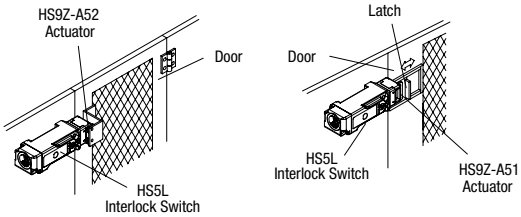
Mounting Examples

Refer to the following drawing for the installation. Mount the interlock switch to a fixed machine or guard, and actuator on the hinged door. Do not mount both interlock switch and actuator on the hinged doors. This may result in the actuator being inserted at a wrong angle to the interlock switch, resulting in malfunction.

Application of Sliding Doors



Application of Hinged Doors



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Instructions

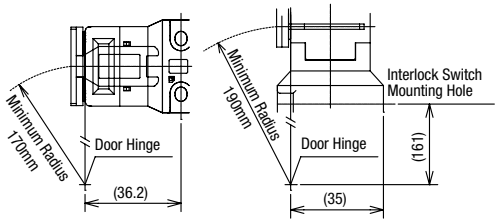
Minimum Radius of Hinged Door

When using the interlock switch for a hinged door, refer to the minimum radius of doors shown below. Especially for doors with a small turning radius, use vertical/horizontal movable actuators (HS9Z-A53/A55).

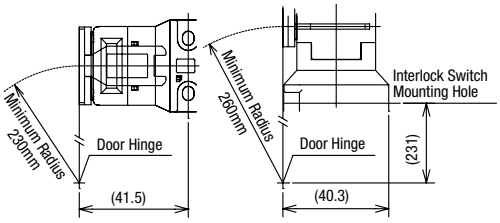
Note: Because deviation or dislocation of a hinged door may occur in actual applications, make sure of the correct operation by installing the actual machine first before use.

HS9Z-A52 Actuator

When the center of the hinged door is used as the reference for the interlock switch contact surface:

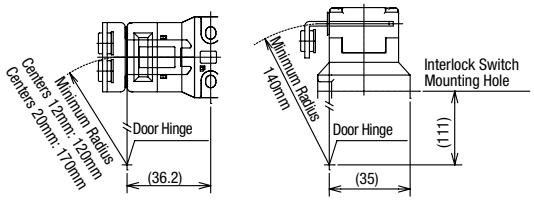


When the center of the hinged door is used as the reference for the actuator mounting surface:

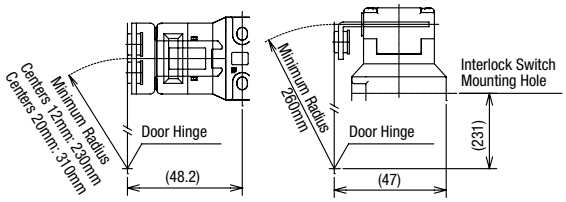


HS9Z-A52A Actuator (with Rubber Bushings)

When the center of the hinged door is used as the reference for the interlock switch contact surface:



When the center of the hinged door is used as the reference for the actuator mounting surface:



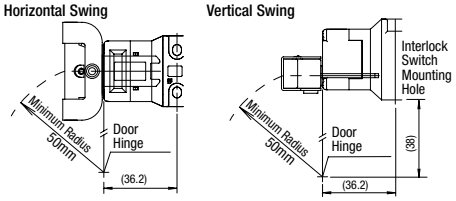
Actuator Angle Adjustment (vertical/horizontal)

- Using the angle adjustment screw, the actuator angle can be adjusted (refer to the dimensional drawing on E-064 to E-070). Adjustable angle: 0 to 20°
- The larger the adjusted angle of the actuator, the smaller the applicable radius of the door opening. After installing the actuator, open the door. Then adjust the actuator so that its edge can be inserted properly into the actuator entry slot of the interlock switch.
- After adjusting the actuator angle, apply Loctite to the adjustment screw so that the screw will not move.

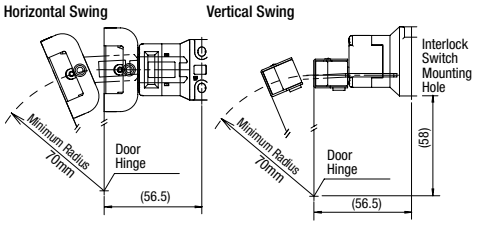
When using the HS9Z-A55S Angle Adjustable (vertical/horizontal) Actuator (w/Plate)

- When the center of the hinged door is used as the reference for the interlock switch contact surface: 50mm
- When the center of the hinged door is used as the reference for the actuator mounting surface: 70mm
- The HS9Z-A55S angle adjustable actuator is made of glass-reinforced PA66 (66 nylon) and the angle adjustment screw and plate are made of stainless steel. When using the screw locking agent, make sure that it is compatible with the base material.

When the center of the hinged door is used as the reference for the interlock switch contact surface:



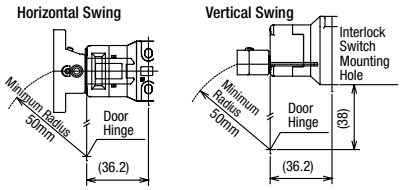
When the center of the hinged door is used as the reference for the actuator mounting surface:



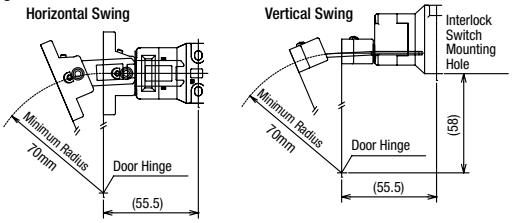
When using the HS9Z-A55 Angle Adjustable (vertical/horizontal) Actuator

- When the center of the hinged door is used as the reference for the interlock switch contact surface: 50mm
- When the center of the hinged door is used as the reference for the actuator mounting surface: 70mm
- The HS9Z-A55 angle adjustable actuator is made of glass-reinforced PA66 (66 nylon) and the angle adjustment screw is stainless steel. When using the screw locking agent, make sure that it is compatible with the base material.

When the center of the hinged door is used as the reference for the interlock switch contact surface:

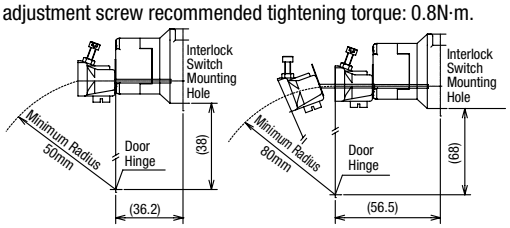


When the center of the hinged door is used as the reference for the actuator mounting surface:



When using the HS9Z-A53 Angle Adjustable (vertical) Actuator

- When the center of the hinged door is used as the reference for the interlock switch contact surface: 50mm
- When the center of the hinged door is used as the reference for the actuator mounting surface: 80mm
- Angle adjustment screw recommended tightening torque: 0.8N·m.



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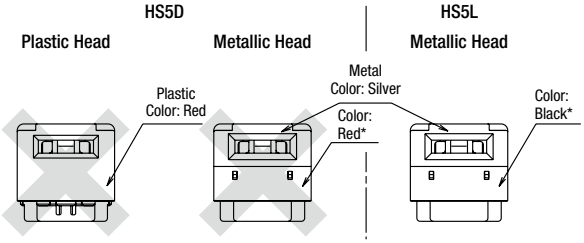
Instructions

Installing the Head

Do not use plastic and metallic heads of HS5D interlock switches on the HS5L. Be sure to use HS5L metallic heads.

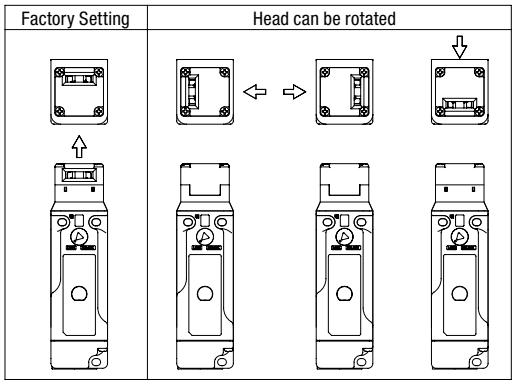
* The metal heads of the HS5D and HS5L look similar. When using these interlock switches adjacently, ensure that the heads are not interchanged.



* The metal head can be distinguished easily by the color of the plastic.

Rotating the Head

The head can be rotated by removing the four screws from the corners of the head and reinstalling the head in the desired orientation. However, when changing the mounting direction of the head after wiring, turn the manual lock release to the "UNLOCK" position using the enclosed manual lock release key first. When reinstalling the head, make sure that no foreign object enters the interlock switch. Tighten the screws tightly, without leaving a space between the head and body, otherwise the interlock switch may malfunction.
(Recommended tightening torque: 0.9 to 1.1 N·m)

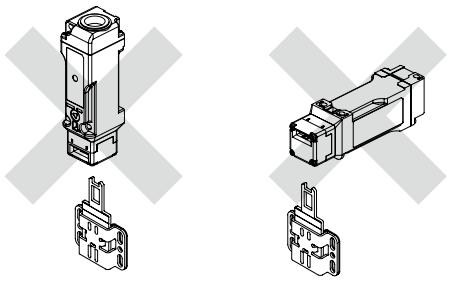


Head Removal Detection Function

- Solenoid locks interlock switches are not equipped with the head removal detection function.
- The head removal detection function is available only on spring lock interlock switches with circuits VB, VD, and DD having two or more lock monitor circuits. Removing the head will result in disparity (41-42: OFF, 51-52: ON). Note that this function cannot be detected with other models.
- Only the lock monitor circuit 41-42 turns off (open) when the head is removed, such as when the head is rotated. The other monitor circuit 51-52 turns ON (close). Be sure to connect the lock monitor circuit (41-42) to a safety circuit.

Spring Loaded Actuator

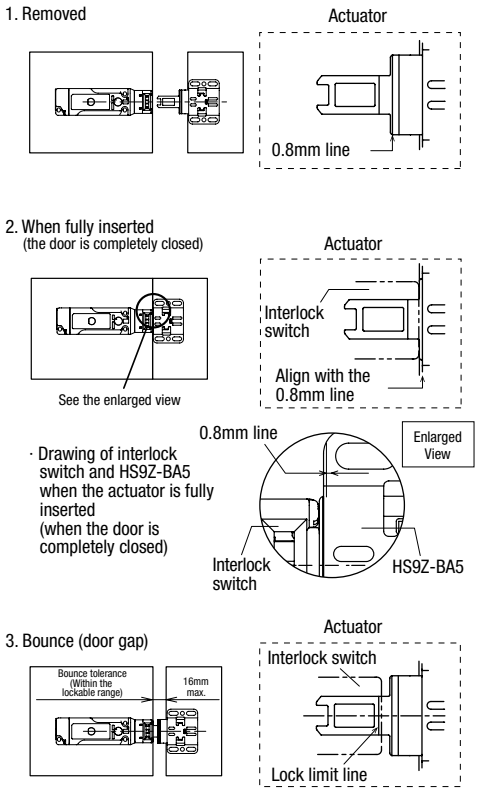
- When using the actuator, be careful of protruding ends.
- Regardless of door types, do not use the HS9Z-BA5 actuator as a door lock or a door stop.
- When an operator enters the hazardous zone, take safety measures such as using a HS9Z-PH5 padlock hasp so that the operator is not trapped inside and the machine cannot start by mistake.
- Use the actuator only on sliding doors. Do not use on hinged doors.
- As shown in the figure on the right, do not insert the sliding actuator from below. The actuator may fall out due to shocks.



- The HS9Z-BA5 actuator can only be used for HS5L interlock switches. Do not use the HS9Z-BA5 actuator for other products.
- Do not modify or disassemble the actuator.

Installation (when installation reference is 0.8mm)

- The actuator protrudes out when the actuator is not inserted (door is open) as shown in 1. in the drawing.
- The mounting reference position can be set to 0.8mm when the actuator is fully inserted and the actuator protrudes up to the 0.8mm line.



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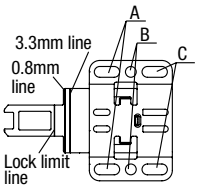
Instructions

Adjustment

Adjustment Procedure

1. Make a hole at A or C.
2. Fasten temporarily with screws, and check the actuator position.
3. Make a hole at B and fix the actuator using a screw or a rivet.

- 3.3mm line
  The mounting reference position is where the door is fully closed, and there is a 0.8mm space between the safety switch and HS9Z-BA5, but can be adjusted up to the 3.3mm line.
  The actuator is most securely locked when the mounting reference position is at the 0.8mm line. However, adjust between 0.8 to 3.3mm if the interlock switch is mounted on a door where the space might become smaller.
- Lock limit line
  When a door opens by bouncing, if the lock limit line is outside of the edge of the interlock switch, the force of the bounce may be too large so that the door may not lock.

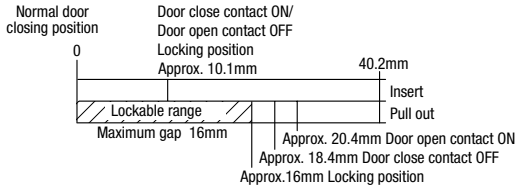


Safety Precautions

- The maximum gap of the door that can be locked is 16mm. (When mounting reference is a the 0.8mm line)
- If the safety distance and minimum gap does not satisfy the requirements of ISO13857, make the gap smaller by overlapping the doors or by providing sufficient distance from the hazardous source. If the required safety distance cannot be obtained, use the actuator other than spring loaded actuator.
- The operating characteristics may change when the actuator is used with the HS5L. Check the operating characteristics before use.

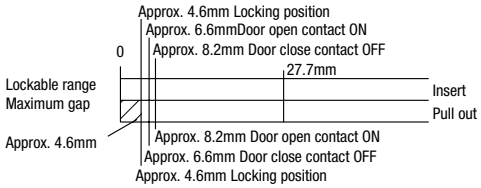
Characteristic Diagram (Reference)

When the mounting reference is at the 0.8mm line:



* Bounce can be tolerated to approximately 16mm.

[Reference] When using HS9Z-A51A with HS5L interlock switch:



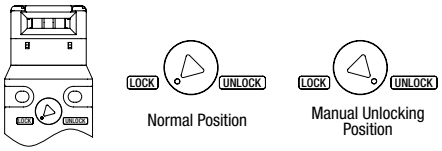
Manual Unlocking

Spring lock

The spring lock interlock switch allows manual unlocking of the actuator to precheck proper door movement before wiring or turning power on, as well as for emergency use such as a power failure.

Solenoid lock

The solenoid interlock switch does not unlock even when the solenoid is de-energized. However, the interlock switch can be unlocked manually in emergency cases.



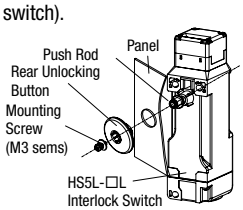
When locking or unlocking the interlock switch manually, turn the key fully using the manual unlock key supplied with the interlock switch as shown above. Using the interlock switch with the key not fully turned (less than 90°) may cause damage to the interlock switch or operation failures (when manually unlocked, the interlock switch will keep the main circuit disconnected and the door unlocked).
Do not apply excessive force to the manual unlock, otherwise the manual unlock will become damaged. Do not leave the manual unlock key attached to the interlock switch during operation. This is dangerous because the interlock switch can always be unlocked while the machine is in operation.

Safety Precautions

Before manually unlocking the interlock switch, make sure that the machine has come to a complete stop. Manual unlocking during operation may unlock the interlock switch before the machine stops, and the function of interlock switch with solenoid is lost.

Installing the Rear Unlocking Button (HS5L-☐L)

After installing the interlock switch on the panel, place the rear unlocking button (supplied with the switch) on the push rod on the back of the interlock switch, and fasten the button using M3 sems
screw (supplied with the switch).



When installing on a mounting frame
thicker than 6mm, use the rear unlocking button kit HS9Z-FL5☐ (sold separately).

Safety Precautions

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

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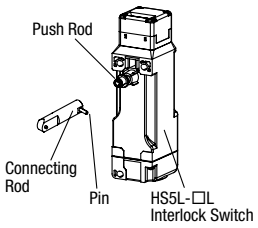
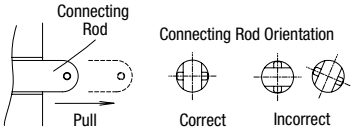
Instructions

Installing the Rear Unlocking Button Kit

1. Install the connecting rod onto the push rod on the HS5L-□L rear unlocking button interlock switch.
2. A pin is attached to the connecting rod. Insert the pin into the hole in the push rod, using pliers.



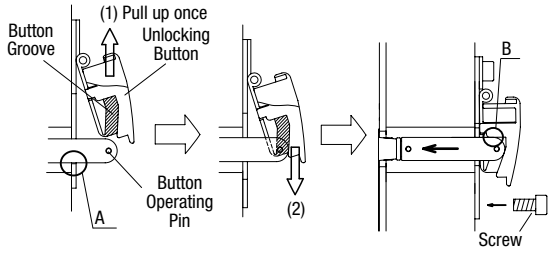
3. Pull the connecting rod from the hole in the mounting frame, and turn the button operating pin to the horizontal position.



Safety Precautions

- Ensure that the connecting rod is pulled out completely and it is horizontal to the interlock switch, otherwise the unlocking button cannot be installed.
  Note: Frame must be supplied by the user.
  When using an HS9Z-SP51 mounting plate (sold separately) to install the HS5L on a frame, provide a hole for the connecting rod on the frame and mounting plate.
  For the mounting hole layout of interlock switches, see dimensions on E-047.

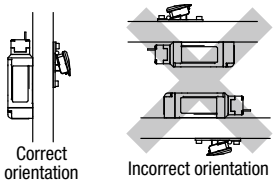
4. Install the unlocking button on the connecting rod by fitting the pin to the grooves on the back of the button, and fasten the base plate on the mounting frame using the screws.



5. After fastening the screws, check if locking and unlocking operations can be performed.

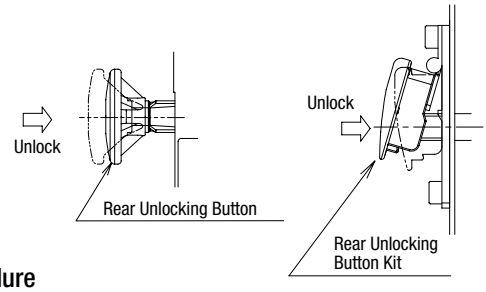
Safety Precautions

- Install the rear unlocking button kit in the correct direction as shown below. Do not install the kit in incorrect directions, otherwise malfunction may occur.
- Do not apply strong force exceeding 100m/s² to the interlock switch while the rear unlocking button is not pressed, otherwise malfunction may occur.



Unlocking the Manual Lock Using the Rear Unlocking Button

Use the rear unlocking button when a worker is locked inside a safety fence (hazard area). (Compliant with escape release described in ISO14119 [2003] and GS-ET-19)



Procedure

- When the rear unlocking button is pressed, the interlock switch is unlocked and the door can be opened.
- To lock the interlock switch, pull back the button.
- When the button remains pressed, the interlock switch cannot be locked even if the door is closed, and the main circuit remains open.

Safety Precautions

- Install the rear unlocking button in the place where only the operator inside the hazardous area can use it. Do not install the button in a place where an operator outside the hazardous area can use it, otherwise the interlock switch can be unlocked during usual machine operation, causing danger.
- Operate the rear unlocking button by hand only. Do not operate using a tool or with excessive force. Do not apply force to the button from the direction other than the proper direction, otherwise the button will be damaged.

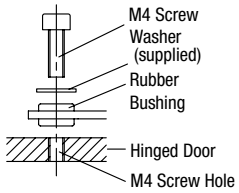
Recommended Tightening Torque

- HS5L interlock switch: 1.8 to 2.2 N·m (M4 screws × 3)*
- Lid mounting screw: 0.5 to 0.7 N·m (M3 screw × 2)
- Rear unlocking button: 0.5 to 0.7 N·m (M3 screw)
- Rear unlocking button kit: 4.8 to 5.2 N·m (M5 screw)
- Actuators

HS9Z-A51:	1.8 to 2.2 N·m (M4 screws × 2)*
HS9Z-A52:	0.8 to 1.2 N·m (M4 flat head screws × 2)
HS9Z-A51A/A52A:	1.0 to 1.5 N·m (M4 screws × 2)*
HS9Z-A53:	4.5 to 5.5 N·m (M6 screws × 2)*
HS9Z-A55:	1.0 to 1.5 N·m (M4 screws × 2)*
HS9Z-A55S:	1.0 to 1.5 N·m (M4 screws × 2)*
HS9Z-BA5:	4.5 to 5.5 N·m (M5 screws × 2/4)*

* If the mounting screw recommended tightening torque values above is not satisfied, check loosening after installation thoroughly.

- Mounting screws need to be prepared by the customer.
- To avoid unauthorized or unintended removal of the interlock switch and the actuator, it is recommended that the interlock switch and actuator are installed in a secure manner, for example using special screws or welding the screws (ISO14119).
- When installing the HS9Z-A51A and HS9Z-A52A actuators, use the washer (supplied with the actuator) on the hinged door, and mount tightly using two M4 screws.
  Mounting centers: 12mm (factory setting), adjustable to 20mm



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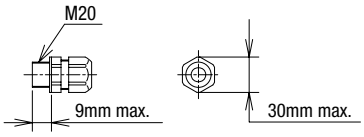
Instructions

Applicable Cable Glands

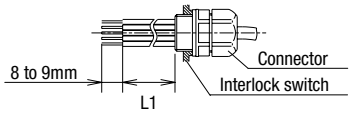
Use a cable gland with IP67 protection degree.

Applicable Cable Gland Dimensions



Refer to the instruction sheet from the URL below for recommended cable glands.
https://www.idec.com/en-apac/safety-explosion-protection/safety-components/safety-interlock/hs5l-miniature-locking

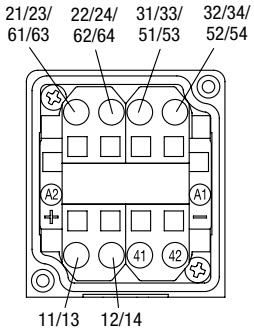
Lead-in Wire Length and Wiring Examples



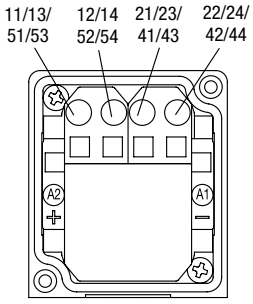
Part No.	Cable Orientation	Cable Length (L1)
HS5L-□□4M-G HS5L-□□4LM-G	Straight	30 to 35mm
HS5L-□□4SM-G HS5L-□□4LSM-G	Side (right or left)	50 to 55mm
		40 to 45mm

Terminal wiring diagram

4-Contact



2-Contact



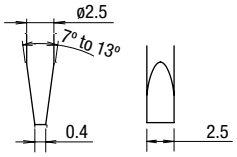
Notes:

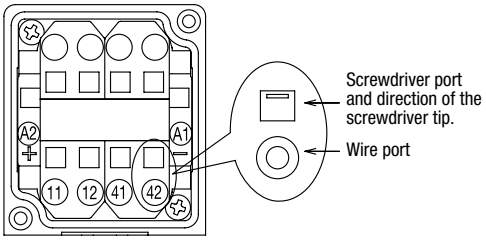
When connecting the NC contact (11-12, 21-22) of door monitor circuit and NC contacts (41-42, 51-52) of the lock monitor circuit in a series as an input to a safety circuit, connect 12-41 or 22-51.

Cautions for Wiring

Use the following applicable wiring. Stranded wire or solid wire (1 wire): 0.3 to 1.5mm² (AWG22 to AWG16)
Make sure to strip the wire insulation 8 to 9mm from the end. If the strip length is too short, the wire may fall out. If the strip length is too long, it may short circuit with other wires.
Twist the wires and make sure that there are no wire whiskers.
When using stranded wires without ferrules, make sure that the core wires have not been loosened.

- For wiring, use screwdrivers as shown in the right. (The shape of the tip of the screwdriver is in accordance with DIN5264)
- The inserting port of the wire and screwdriver, and direction of the tip is as shown in the diagram below.





- When using ferrules for stranded wires, use the ferrule listed in the following table.

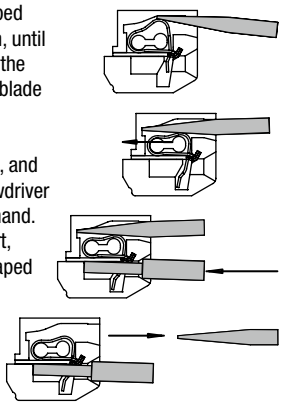
Applicable wire (stranded)	AWG	Part No.
0.34mm²	22	S3TL-H034-10WT
0.5mm²	20	S3TL-H05-12WA
0.75mm²	18	S3TL-H075-12WW
1mm²	17	S3TL-H10-12WY

Recommendation tools (sold separately)

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

Wire connection method

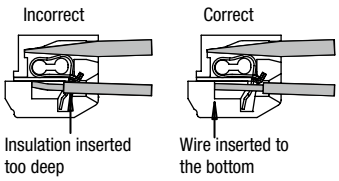
1. Insert the screwdriver into the square-shaped port from a slightly slanted angle as shown, until the screw-driver tip touches the bottom of the spring. Make sure that the direction of the blade edge is correct.
2. Push in the screwdriver until it touches the bottom of the port. The wire port is opened, and the screwdriver is held in place. The screwdriver will not come off even if you release your hand.
3. While the screwdriver is retained in the port, insert the wire or ferrule into the round-shaped wire port.
4. Pull out the screwdriver.
   The connection is now complete.



Safety Precautions

When using wires with insulation diameter of ø2.0mm or less, do not insert the wire too deeply where the insulation inserts into the spring clamp opening. Make sure that the wire insulation is stripped 8 to 9mm and the wire is inserted to the bottom.

If there is a need to insert the screwdriver while holding the interlock switch with hands, be careful not to injure your fingers with the tip of the screwdriver. Connect one wire to one wiring port.



(According to IEC 60204 (JIS 9960-1) 13.1.1 General Requirement)

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Instructions

Changing the cable orientation (two-conduit model)

Cable orientation can be changed on two-conduit models (HS5L-□□4SM-G/HS5L-□□4LSM-G). Straight, left, and right orientation is available.

When shipped, the terminal cover is installed on the HS5L for straight or left cable orientation.

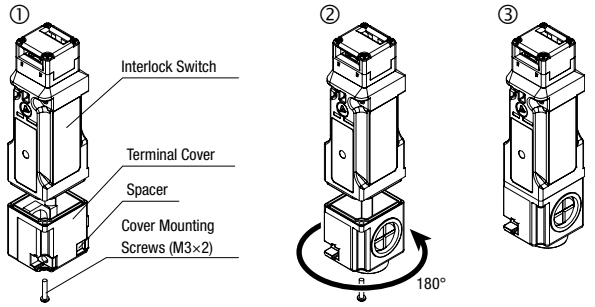
See below for mounting the cable rightward.

① Remove the cover mounting screws (M3×2) and remove the HS5L from the cover.

② Rotate the cover 180º.

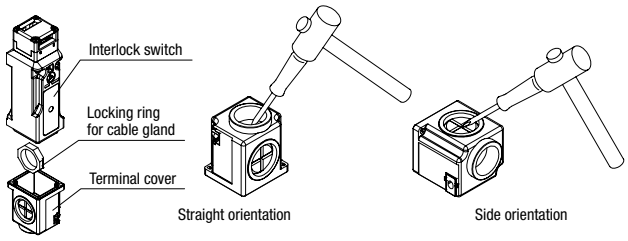
③ Re-intall the cover on the HS5L and fasten using the cover mounting screws.

Note: 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.



Opening conduit port

- Before use, knock out 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, and remove the locking ring for the cable gland installed in the terminal cover.
- Be sure to remove any cracks or burrs on the conduit port, as it will impair waterproof performance.

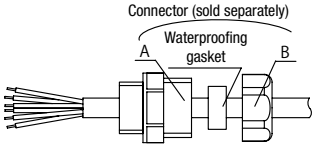


Connector Wiring

Perform wiring according to following procedures ① to ②.

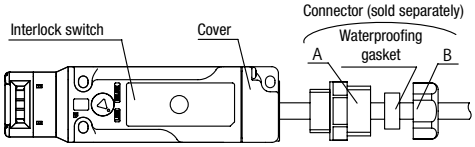
① Insert the cable into the connector. Leave A and B untightened.

② Open the cover and insert the cable into the cover.



③ Wire to the terminals.

④ Tighten in the order of A → Cover → B.

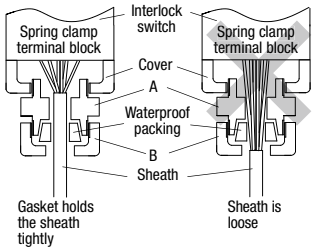


* To remove the wiring, turn the power off and then unwire in the order of B → cover (→waterproof gasket → A).

Note: When removing A, because the waterproofing gasket is tightly attached to the cable, pull out the gasket carefully with tweezers so that the gasket is not damaged before loosening A. Otherwise, the cable will rotate together with A when loosened, and might break due to excessive twisting. Also, when reassembling, place the gasket in the original position first.

Safety Precautions

- When opening the cover, be careful not to lose the cover mounting screw.
- When tightening connector B, insert the cable into the connector, and set it to a position where the gasket of the connector holds the cable sheath, otherwise, its waterproof performance might be impaired.
- Tighten the connector in order of A → B. If connector B is tightened first, the wiring connected to the spring clamp terminal may become twisted when tightening A, causing disconnection or malfunction.



Make sure that the entire bore surface of the gasket is in contact with the sheath.

- Tighten the connectors with tightening torque according to the torque value recommended by the connector manufacturer. Otherwise, waterproof performance might be impaired.
- Do not exert excessive load, pressure, or tensile force on the cable, otherwise, disconnection or malfunction might occur.

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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

(4) Continuing to use an IDEC product even after the performance has deteriorated can result in abnormal heat, smoke, fires, and the like due to insulation deterioration or the like. Perform periodic maintenance for IDEC products and the systems, machines, devices, and the like in which they are used.

(5) IDEC products are developed and manufactured as general-purpose products for general industrial products. They are not intended for use in the following applications, and in the event that you use an IDEC product for these applications, unless otherwise agreed upon between you and IDEC, IDEC shall provide no guarantees whatsoever regarding IDEC products.

i. Use in applications that require a high degree of safety, including nuclear power control equipment, transportation equipment (railroads / airplanes / ships / vehicles / vehicle instruments, etc.), equipment for use in outer space, elevating equipment, medical instruments, safety devices, or any other equipment, instruments, or the like that could endanger life or human health

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
If you would like to use IDEC products in the above applications, be sure to consult with an IDEC sales representative.

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.

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