

## D4JL Guard Lock Safety-door Switch

### World's Top\* Holding Force of 3,000 N

\*For plastic models, as of March 2005

- Two safety circuits and two monitor contacts provide an array of monitoring patterns.
- Standard gold-clad contacts enable use with ordinary loads and microloads.
- Models with trapped keys prevent workers from being locked in hazardous work areas.
- Models with rear release buttons allow people to unlock the Switch and escape if they are locked into hazardous areas.
- IP67 degree of protection

**Note:** Refer to "Precautions" on page 18.



**NEW**

## Features

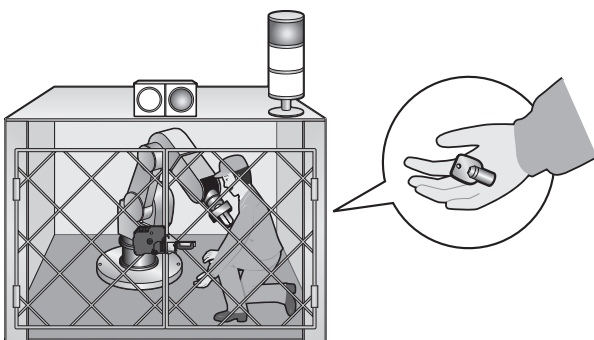
### Plastic Guard Lock Safety-door Switches Rank Among the Strongest in the World

A holding force of 3,000 N makes these Switches suitable for large, heavy doors.



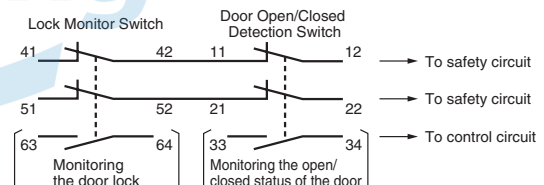
### Models with Trapped Keys

OMRON also offers Trapped Key Switches (on mechanical lock models only). The door can be opened only by supplying power to the solenoid to release the trapped key lock and then turning and removing the trapped key. As long as a person has the trapped key when he enters a hazardous area, he cannot be accidentally locked inside by someone else. A trapped key also serves to prevent someone from forgetting the key when entering a hazardous area because the trapped key must be removed to open the door. There are thirty different types of trapped keys available for use in applications with adjacent hazardous areas.



### Two Safety Circuits and Two Monitor Contacts

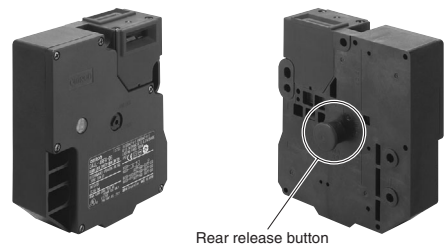
The D4JL has two safety circuits. It also has two contacts to separately monitor the open/closed status of the door and the status of the lock.



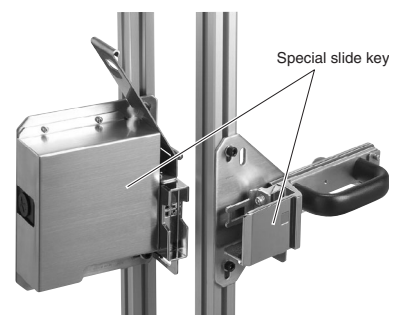
### Models with Rear Release Buttons

(See page 4 for a list of models.)

A Switch with a rear release button allows the door to be unlocked from inside a hazardous area in an emergency. OMRON also offers Switches with Special Slide Keys. Refer to the *D4NS/D4JL-mounting Slide Keys Catalog* for details.



Rear release button



Special slide key

# Model Number Structure

## ■ Model Number Legend

### Switches

D4JL-□□□□-□□-□□  
1 2 3 4 5 6 7

#### 1. Conduit Size

- 1: Pg13.5
- 2: G1/2
- 3: 1/2-14NPT (See note 2.)
- 4: M20

#### 2. Built-in Switch

- N: 2NC/1NO slow-action contacts plus 2NC/1NO slow-action contacts
- P: 2NC/1NO slow-action contacts plus 3NC slow-action contacts
- Q: 3NC slow-action contacts plus 2NC/1NO slow-action contacts
- R: 3NC slow-action contacts plus 3NC slow-action contacts

#### 3. Head Material

- F: Plastic

#### 4. Door Lock and Release

- A: Mechanical lock/24-VDC solenoid release
- G: 24-VDC Solenoid lock/Mechanical release

#### 5. Indicator

- C: 24 VDC (green LED indicator)
- D: 24 VDC (orange LED indicator)

#### 6. Release Key Type

- 5: Special release key (See note 3).
- 6: Special release key plus rear release button (See note 3).
- 7: Trapped key

#### 7. Trapped Key Type

- 01 to 30: 30 types (See note 4.)

**Note:** 1. A 24-VDC solenoid lock cannot be combined with a trapped key.

A 24-VDC solenoid lock cannot be combined with a special release key and rear release button.

- 2. Models with M20 conduits come with an M20 to 1/2-14NPT Adaptor.
- 3. Release keys are provided.
- 4. Thirty types of trapped keys are available. Specify the trapped key type in numerical order starting from 01 when ordering.

### Operation Keys

D4JL-K□  
1

#### 1. Operation Key Type

- 1: Horizontal mounting
- 2: Vertical mounting

## Ordering Information

### ■ Switches (Operation Keys are sold separately.)

#### Standard Models

Release key type	Indicator	Lock and release types	Contact configuration (door open/closed detection switch and lock monitor switch contacts)	Conduit opening	Model
Special release key	Green	Mechanical lock Solenoid release	2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFA-C5
				G1/2	D4JL-2NFA-C5
				1/2-14NPT	D4JL-3NFA-C5
				M20	D4JL-4NFA-C5
			2NC/1NO+3NC	PG13.5	D4JL-1PFA-C5
				G1/2	D4JL-2PFA-C5
				1/2-14NPT	D4JL-3PFA-C5
				M20	D4JL-4PFA-C5
			3NC+2NC/1NO	PG13.5	D4JL-1QFA-C5
				G1/2	D4JL-2QFA-C5
				1/2-14NPT	D4JL-3QFA-C5
				M20	D4JL-4QFA-C5
			3NC+3NC	PG13.5	D4JL-1RFA-C5
				G1/2	D4JL-2RFA-C5
				1/2-14NPT	D4JL-3RFA-C5
				M20	D4JL-4RFA-C5
		Solenoid lock Mechanical release	2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFG-C5
				G1/2	D4JL-2NFG-C5
				1/2-14NPT	D4JL-3NFG-C5
				M20	D4JL-4NFG-C5
			2NC/1NO+3NC	PG13.5	D4JL-1PFG-C5
				G1/2	D4JL-2PFG-C5
				1/2-14NPT	D4JL-3PFG-C5
				M20	D4JL-4PFG-C5
			3NC+2NC/1NO	PG13.5	D4JL-1QFG-C5
				G1/2	D4JL-2QFG-C5
				1/2-14NPT	D4JL-3QFG-C5
				M20	D4JL-4QFG-C5
			3NC+3NC	PG13.5	D4JL-1RFG-C5
				G1/2	D4JL-2RFG-C5
				1/2-14NPT	D4JL-3RFG-C5
				M20	D4JL-4RFG-C5
	Orange	Mechanical lock Solenoid release	2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFA-D5
				G1/2	D4JL-2NFA-D5
				1/2-14NPT	D4JL-3NFA-D5
				M20	D4JL-4NFA-D5
			2NC/1NO+3NC	PG13.5	D4JL-1PFA-D5
				G1/2	D4JL-2PFA-D5
				1/2-14NPT	D4JL-3PFA-D5
				M20	D4JL-4PFA-D5
			3NC+2NC/1NO	PG13.5	D4JL-1QFA-D5
				G1/2	D4JL-2QFA-D5
				1/2-14NPT	D4JL-3QFA-D5
				M20	D4JL-4QFA-D5
			3NC+3NC	PG13.5	D4JL-1RFA-D5
				G1/2	D4JL-2RFA-D5
				1/2-14NPT	D4JL-3RFA-D5
				M20	D4JL-4RFA-D5
		Solenoid lock Mechanical release	2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFG-D5
				G1/2	D4JL-2NFG-D5
				1/2-14NPT	D4JL-3NFG-D5
				M20	D4JL-4NFG-D5
			2NC/1NO+3NC	PG13.5	D4JL-1PFG-D5
				G1/2	D4JL-2PFG-D5
				1/2-14NPT	D4JL-3PFG-D5
				M20	D4JL-4PFG-D5
			3NC+2NC/1NO	PG13.5	D4JL-1QFG-D5
				G1/2	D4JL-2QFG-D5
				1/2-14NPT	D4JL-3QFG-D5
				M20	D4JL-4QFG-D5
			3NC+3NC	PG13.5	D4JL-1RFG-D5
				G1/2	D4JL-2RFG-D5
				1/2-14NPT	D4JL-3RFG-D5
				M20	D4JL-4RFG-D5

**Models with Rear Release Buttons**

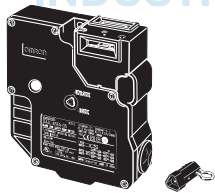
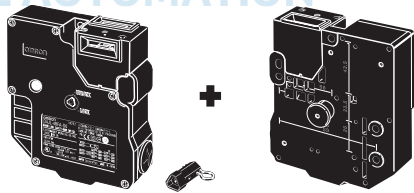
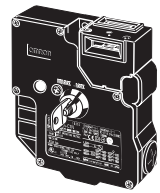
Release key type	Indicator	Lock and release types	Contact configuration (door open/closed detection switch and lock monitor switch contacts)	Conduit opening	Model	
Special release key	Green	Mechanical lock Solenoid release	2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFA-C6	
				G1/2	D4JL-2NFA-C6	
				1/2-14NPT	D4JL-3NFA-C6	
				M20	D4JL-4NFA-C6	
			2NC/1NO+3NC	PG13.5	D4JL-1PFA-C6	
				G1/2	D4JL-2PFA-C6	
				1/2-14NPT	D4JL-3PFA-C6	
				M20	D4JL-4PFA-C6	
			3NC+2NC/1NO	PG13.5	D4JL-1QFA-C6	
				G1/2	D4JL-2QFA-C6	
				1/2-14NPT	D4JL-3QFA-C6	
				M20	D4JL-4QFA-C6	
			3NC+3NC	PG13.5	D4JL-1RFA-C6	
				G1/2	D4JL-2RFA-C6	
				1/2-14NPT	D4JL-3RFA-C6	
				M20	D4JL-4RFA-C6	
	Orange			2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFA-D6
					G1/2	D4JL-2NFA-D6
					1/2-14NPT	D4JL-3NFA-D6
					M20	D4JL-4NFA-D6
				2NC/1NO+3NC	PG13.5	D4JL-1PFA-D6
					G1/2	D4JL-2PFA-D6
					1/2-14NPT	D4JL-3PFA-D6
					M20	D4JL-4PFA-D6
				3NC+2NC/1NO	PG13.5	D4JL-1QFA-D6
					G1/2	D4JL-2QFA-D6
					1/2-14NPT	D4JL-3QFA-D6
					M20	D4JL-4QFA-D6
				3NC+3NC	PG13.5	D4JL-1RFA-D6
					G1/2	D4JL-2RFA-D6
					1/2-14NPT	D4JL-3RFA-D6
					M20	D4JL-4RFA-D6

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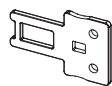

**Models with Trapped Keys**

Release key type	Indicator	Lock and release types	Contact configuration (door open/closed detection switch and lock monitor switch contacts)	Conduit opening	Model
Trapped key (See note.)	Green	Mechanical lock Solenoid release	2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFA-C7-01
				G1/2	D4JL-2NFA-C7-01
				1/2-14NPT	D4JL-3NFA-C7-01
				M20	D4JL-4NFA-C7-01
			2NC/1NO+3NC	PG13.5	D4JL-1PFA-C7-01
				G1/2	D4JL-2PFA-C7-01
				1/2-14NPT	D4JL-3PFA-C7-01
				M20	D4JL-4PFA-C7-01
			3NC+2NC/1NO	PG13.5	D4JL-1QFA-C7-01
				G1/2	D4JL-2QFA-C7-01
				1/2-14NPT	D4JL-3QFA-C7-01
				M20	D4JL-4QFA-C7-01
			3NC+3NC	PG13.5	D4JL-1RFA-C7-01
				G1/2	D4JL-2RFA-C7-01
				1/2-14NPT	D4JL-3RFA-C7-01
				M20	D4JL-4RFA-C7-01
	Orange		2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFA-D7-01
				G1/2	D4JL-2NFA-D7-01
				1/2-14NPT	D4JL-3NFA-D7-01
				M20	D4JL-4NFA-D7-01
			2NC/1NO+3NC	PG13.5	D4JL-1PFA-D7-01
				G1/2	D4JL-2PFA-D7-01
				1/2-14NPT	D4JL-3PFA-D7-01
				M20	D4JL-4PFA-D7-01
			3NC+2NC/1NO	PG13.5	D4JL-1QFA-D7-01
				G1/2	D4JL-2QFA-D7-01
				1/2-14NPT	D4JL-3QFA-D7-01
				M20	D4JL-4QFA-D7-01
			3NC+3NC	PG13.5	D4JL-1RFA-D7-01
				G1/2	D4JL-2RFA-D7-01
				1/2-14NPT	D4JL-3RFA-D7-01
				M20	D4JL-4RFA-D7-01

**Note:** Thirty types of trapped keys are available. Change the -01 suffix at the end of the model number to any suffix from -02 to -30 to order different types.

Release key position	Front	Front and rear release button	Front
Release key type	Special release key	Special release key	Trapped key
Switch appearance			

**■ Operation Keys**

Type	Model
Horizontal mounting 	D4JL-K1
Vertical mounting 	D4JL-K2

# Specifications

## Standards and EC Directives

### Conforms to the following EC Directives

- Machinery Directive
- Low Voltage Directive
- EN 1088
- EN 60204-1
- GS-ET-19
- CCC (Application scheduled)

### Approved Standards

Agency	Standard	File No.
TÜV Product Service	EN 60947-5-1 (Direct opening: approved)	Consult your OMRON representative for details.
UL (See note.)	UL 508, CSA C22.2 No.14	
CQC (CCC)	GB14048.5	Application scheduled

Note: CSA C22.2 No. 14 was certified by UL.

## Approved Standard Ratings

### TÜV (EN 60947-5-1)

Item	Utilization category	AC-15	DC-13
Rated operating current (Ie)		3 A	0.27 A
Rated operating voltage (Ue)		240 V	250 V

Note: Use a 10-A fuse type gI or gG that conforms to IEC 60269 as a short-circuit protection device. This fuse is not built into the Switch.

### UL/CSA (UL 508, CSA C22.2 No. 14)

#### A300

Rated voltage	Carry current	Current (A)		Volt-amperes (VA)	
		Make	Break	Make	Break
120 VAC	10 A	60	6	7,200	720
240 VAC		30	3		

## Solenoid Coil Characteristics

Item	Type	24 VDC
Rated operating voltage (100% ED)		24 VDC <sup>+10%</sup> <sub>-15%</sub>
Current consumption		Approx. 200 mA
Insulation		Class F (130°C max.)

## Indicator Characteristics

Item	Type	LED
Rated voltage		24 VDC
Current consumption		Approx. 1 mA
Color (LED)		Orange

## Characteristics

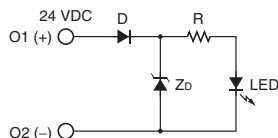
Degree of protection (See note 2.)		IP67 (EN 60947-5-1) (This applies for the Switch only. The degree of protection for the key hole is IP00.)
Durability (See note 3.)	Mechanical	1,000,000 operations min. (trapped key: 10,000 operations min., rear release button: 3,000 operations min.)
	Electrical	500,000 operations min. for a resistive load of 3 A at 250 VAC (See note 4.)
Operating speed		0.05 to 0.5 m/s
Operating frequency		30 operations/minute max.
Rated frequency		50/60 Hz
Direct opening force (See note 5.)		60 N min. (EN 60947-5-1)
Direct opening travel (See note 5.)		15 mm min. (EN 60947-5-1)
Holding force (See note 6.)		3,000 N min.
Insulation resistance		100 MΩ min. (at 500 VDC)
Minimum applicable load (See note 7.)		Resistive load of 1 mA at 5 VDC (N-level reference value)
Rated insulation voltage (U <sub>i</sub> )		300 V (EN 60947-5-1)
Rated open thermal current (I <sub>th</sub> )		10 A between terminals 12 and 41, 3 A between all other terminals (EN 60947-5-1)
Impulse withstand voltage (EN 60947-5-1)	Between terminals of same polarity	2.5 kV
	Between terminals of different polarity	4 kV
	Between other terminals and uncharged metallic parts	6 kV
Conditional short-circuit current		100 A (EN 60947-5-1) (See note 8.)
Pollution degree (operating environment)		3 (EN 60947-5-1)
Protection against electric shock		Class II (double insulation)
Contact resistance (initial value)		25 mΩ max. per contact
Vibration resistance	Malfunction	10 to 55 Hz, 0.75-mm single amplitude
Shock resistance	Destruction	1,000 m/s <sup>2</sup> min.
Ambient operating temperature		-10 to +55°C (with no icing)
Ambient operating humidity		95% max.
Weight		Approx. 650g

- Note: 1. The above values are initial values.
2. The degree of protection is tested using the method specified by the standard (EN 60947-5-1). Confirm that sealing properties are sufficient for the operating conditions and environment beforehand. Although the switch box is protected from dust or water penetration, do not use the D4JL in places where foreign material may enter through the key hole on the head, otherwise Switch damage or malfunctioning may occur.
3. The durability is for an ambient temperature of 5 to 35°C and an ambient humidity of 40% to 70%. For further conditions, consult your OMRON sales representative.
4. Do not pass a 3-A, 250-VAC load through more than two circuits.
5. These figures are minimum requirements for safe operation.
6. This figure is based on the GS-ET-19 evaluation method.
7. This value will vary with the switching frequency, environment, and reliability level. Confirm that correct operation is possible with the actual load beforehand.
8. Use a 10-A fuse type gI or gG that conforms to IEC 60269 as a short-circuit protection device.

# Connections

## Indicators

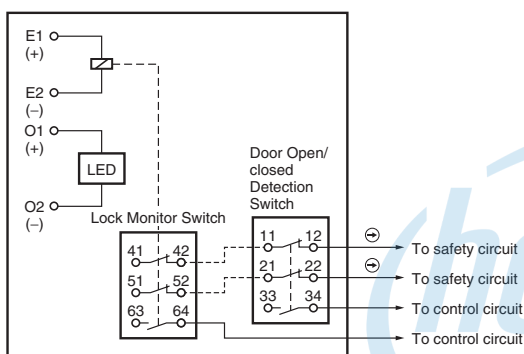
### Internal Circuit Diagram



## Circuit Connection Example

(Examples for the D4JL-□NF□-□)

- Terminals 11-42 and terminals 21-52 are connected internally and so connect terminals 12-41 and 22-51 for safety-circuit input. (GS-ET-19).



- Direct opening contacts used as safety-circuit input are indicated with the  $\ominus$  mark. Terminals 11-12 and terminals 21-22 are direct opening contacts.
- Do not connect the indicator directly to direct opening contacts. If indicator is connected in parallel with direct opening contacts, a short-circuit current may flow in the event that the indicator is damaged, causing equipment to malfunction.
- Do not switch standard loads for more than 2 circuits at the same time. Otherwise, the level of insulation may decrease.
- The solenoid terminals have polarity (E1: + and E2: -). Confirm the polarity before wiring.

## Contact Forms

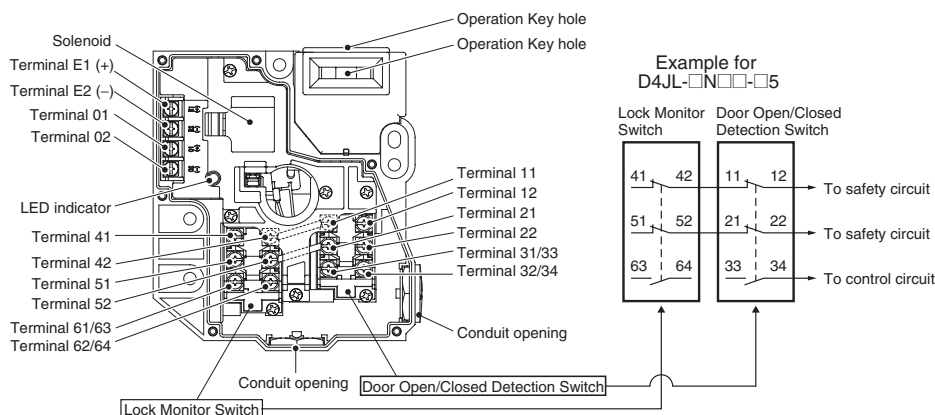
Indicates conditions where the Key is inserted and the lock is applied. Terminals 42-11 and terminals 52-21 are connected internally (as per BIA GS-ET-19).

Model	Contacts (door open/closed detection and lock monitor)	Contact forms		Operating pattern	Remarks
		Lock monitor	Door open/ closed detection		
D4JL-□NF□-□	2NC/1NO+2NC/1NO				NC contacts 11-12 and 21-22 have an approved direct opening mechanism ( $\ominus$ ). The terminals 41-12, 51-22, 33-34, and 63-64 can be used as unlike poles.
D4JL-□PF□-□	2NC/1NO+3NC				NC contacts 11-12 and 21-22 have an approved direct opening mechanism ( $\ominus$ ). The terminals 41-12, 51-22, 33-34, and 61-62 can be used as unlike poles.
D4JL-□QF□-□	3NC+2NC/1NO				NC contacts 11-12, 21-22 and 31-32 have an approved direct opening mechanism ( $\ominus$ ). The terminals 41-12, 51-22, 31-32, and 63-64 can be used as unlike poles.
D4JL-□RF□-□	3NC+3NC				NC contacts 11-12, 21-22, and 31-32 have an approved direct opening mechanism ( $\ominus$ ). The terminals 41-12, 51-22, 31-32, and 61-62 can be used as unlike poles.



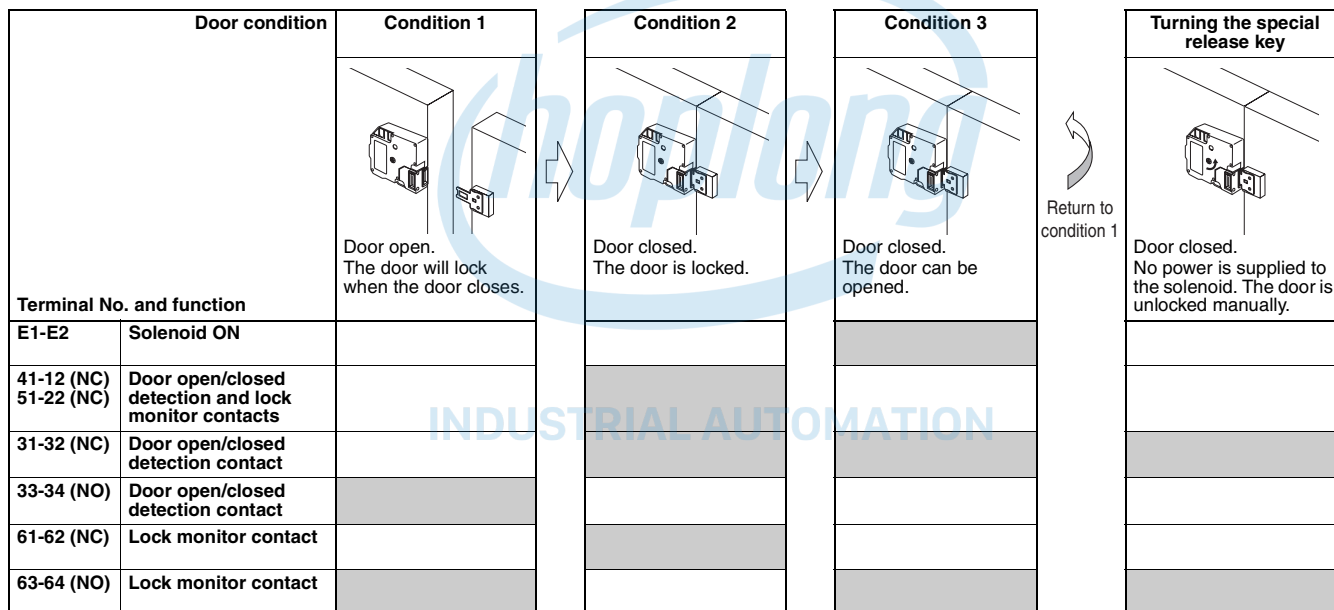
# Nomenclature

## ■ Structure of D4JL-□□□A-5 and D4JL-□□□G-□5

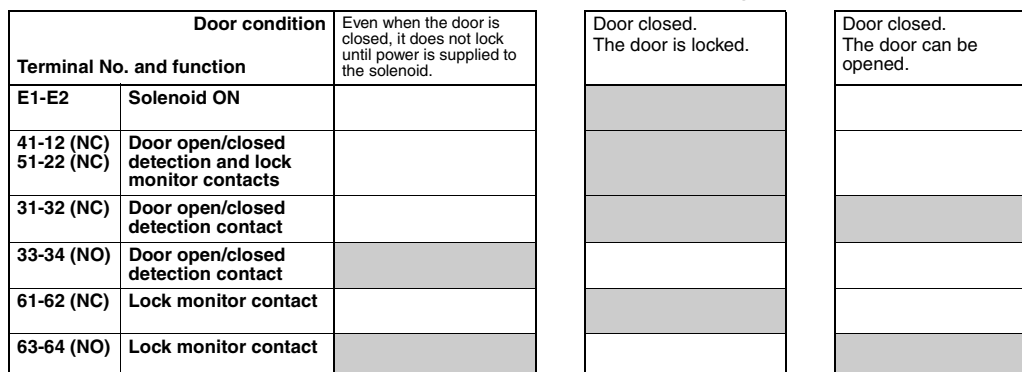


## ■ Operating Cycle Examples for Standard Models

### D4JL-□□□A-5 (Mechanical Lock Models with Special Release Keys)



### D4JL-□□□G-□5 (Solenoid Lock Models with Special Release Keys)



The shaded areas indicate the contact is closed and power is supplied to the solenoid.

Door open/closed detection and lock monitor contacts: Can be used in safety circuits because of the direct opening mechanisms.

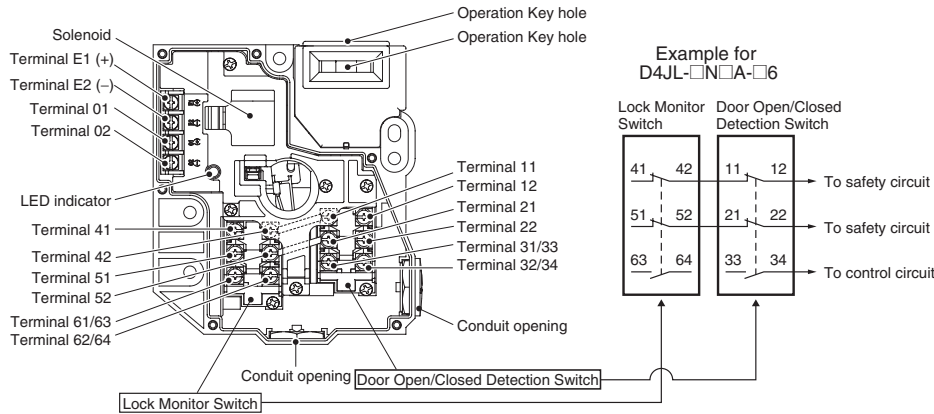
Door open/closed detection contact: Can be used to confirm whether the key is inserted and to monitor the open/closed status of a door.

Lock monitor contact: Can be used to confirm whether power is supplied to the solenoid and to monitor whether or not a door can be opened or closed.

**Note:** The door open/closed detection and lock monitor contact configuration depends on the model.



■ Structure of D4JL-□□□A-□6



■ Operating Cycle Examples for Models with Rear Release Buttons

D4JL-□□□A-□6 (Mechanical Lock Models with Special Release Keys and Rear Release Buttons)

Door condition		Condition 1	Condition 2	Condition 3	Turning the special release key	Pressing the rear release button
Terminal No. and function						
E1-E2	Solenoid ON					
41-12 (NC) 51-22 (NC)	Door open/ closed detection and lock monitor contacts					
31-32 (NC)	Door open/ closed detection contact					
33-34 (NO)	Door open/ closed detection contact					
61-62 (NC)	Lock monitor contact					
63-64 (NO)	Lock monitor contact					

The shaded areas indicate the contact is closed and power is supplied to the solenoid.

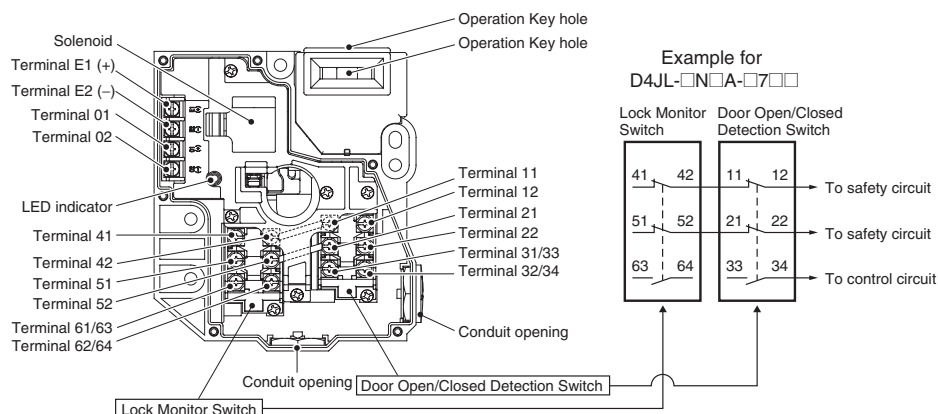
Door open/closed detection and lock monitor contacts: Can be used in safety circuits because of the direct opening mechanisms.

Door open/closed detection contact: Can be used to confirm whether the key is inserted and to monitor the open/closed status of a door.

Lock monitor contact: Can be used to confirm whether power is supplied to the solenoid and to monitor whether or not a door can be opened or closed.

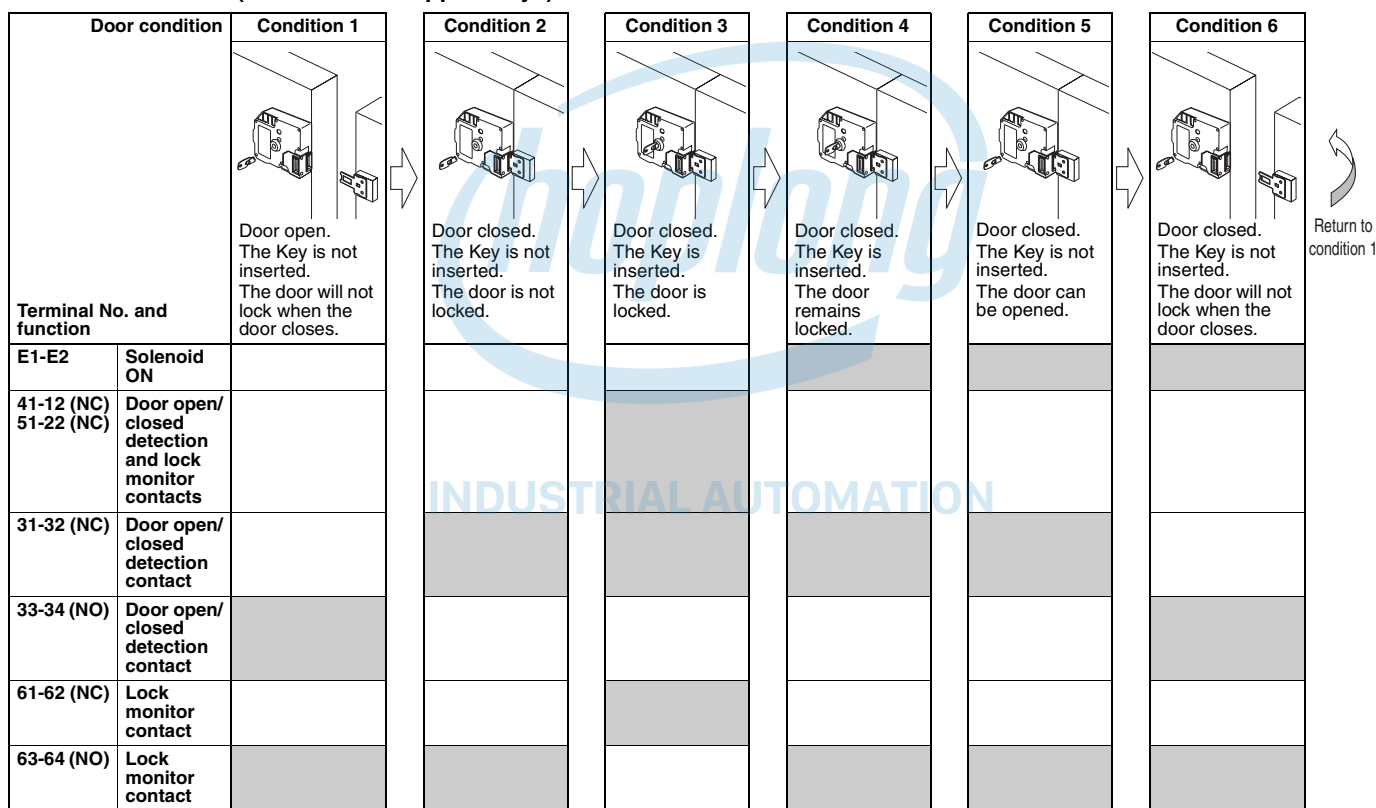
**Note:** The door open/closed detection and lock monitor contact configuration depends on the model.

## ■ Structure of D4JL-□□□A-□7-□□



## ■ Operating Cycle Examples for Models with Trapped Keys

### D4JL-□□□A-□7-□□ (Models with Trapped Keys)



The shaded areas indicate the contact is closed and power is supplied to the solenoid.

Door open/closed detection and lock monitor contacts: Can be used in safety circuits because of the direct opening mechanisms.

Door open/closed detection contact:

Can be used to confirm whether the key is inserted and to monitor the open/closed status of a door.

Lock monitor contact:

Can be used to confirm whether power is supplied to the solenoid and to monitor whether or not a key can be removed.

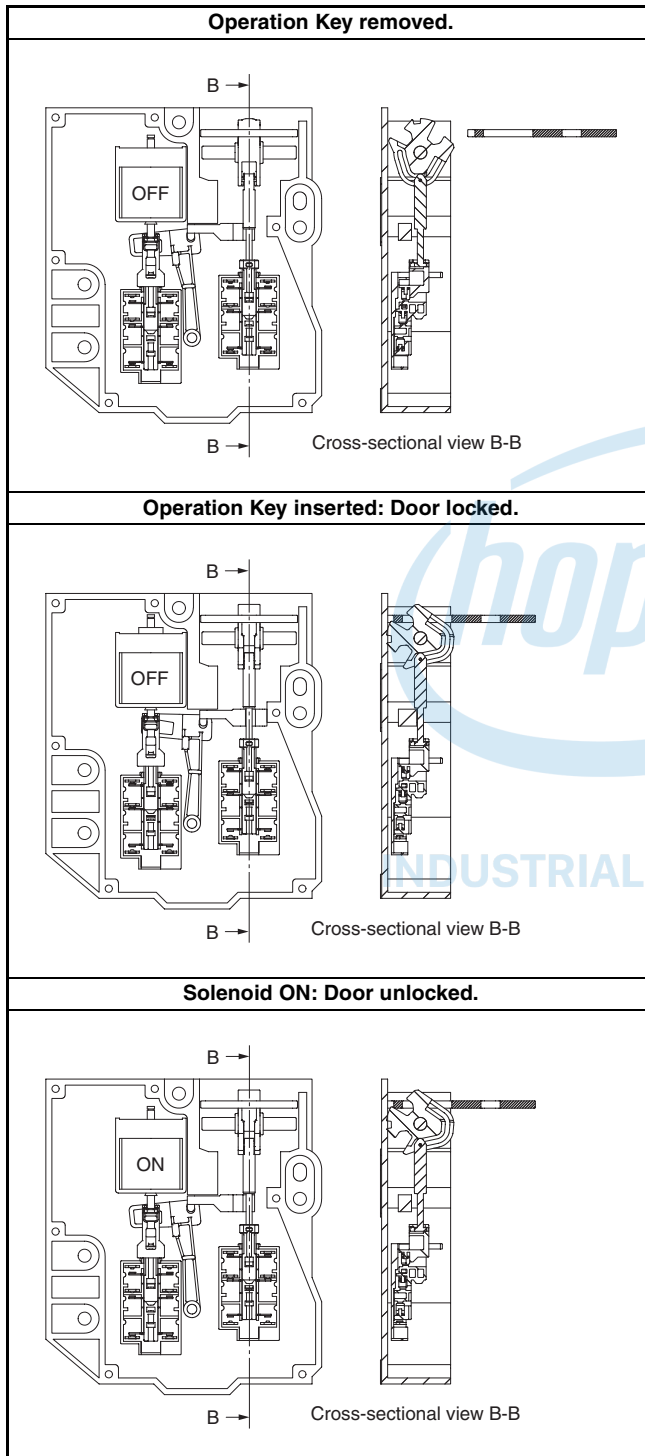
**Note:** 1. Door open/closed detection and lock monitor contact configuration depends on the model.

2. If power is supplied to the solenoid, the door cannot be unlocked until the Key is turned to the left and removed.

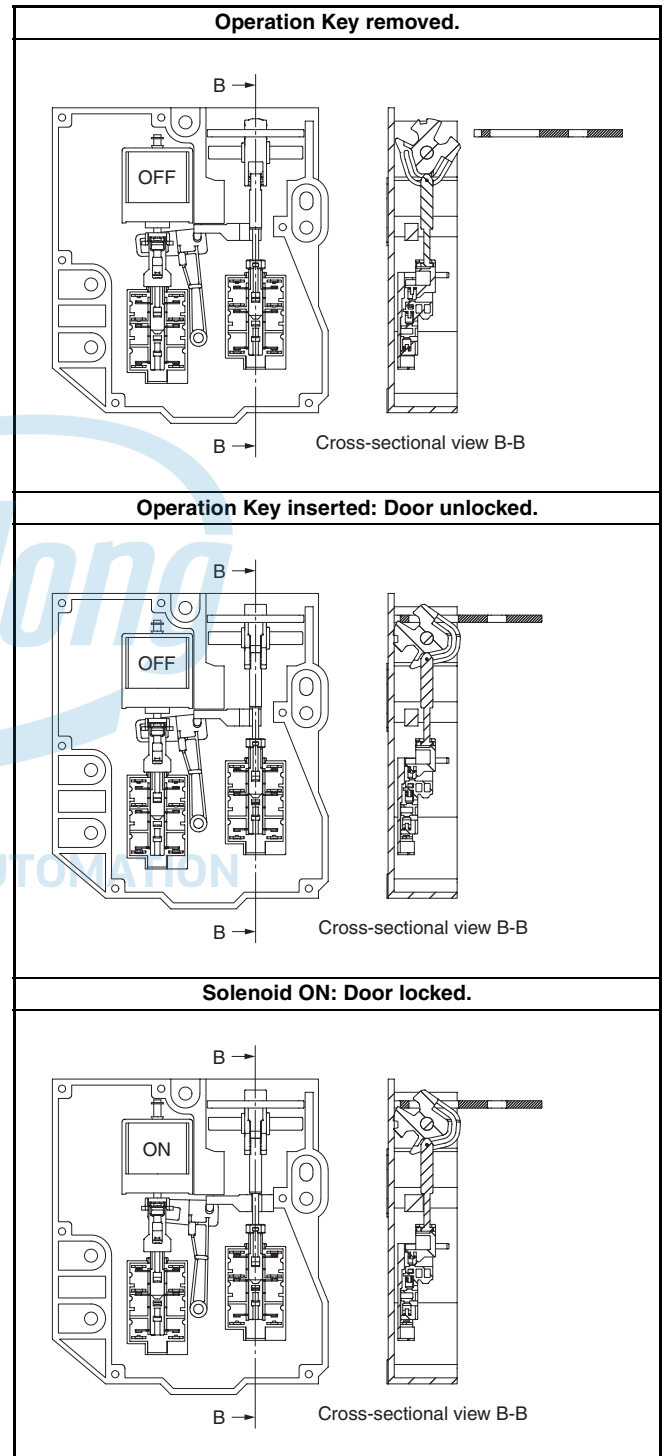
# Operation Method

## ■ Operation Principles

### Mechanical Lock Models

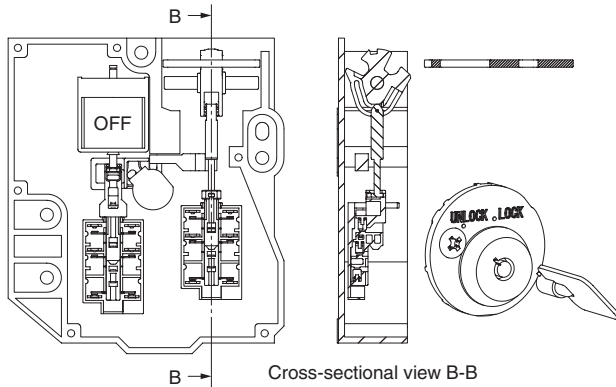


### Solenoid Lock Models

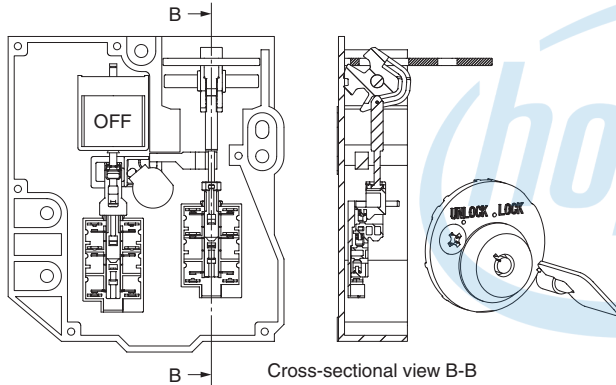


## Trapped Key Models

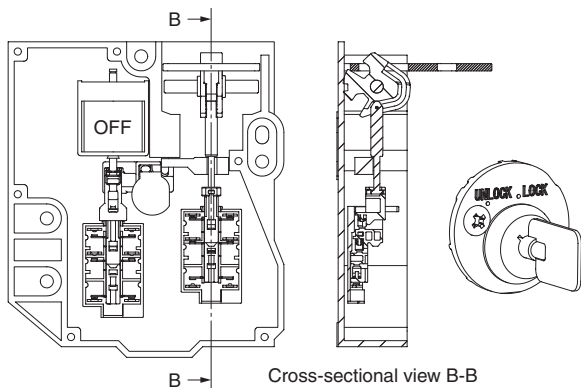
(1) Operation Key removed, solenoid OFF, and trapped key removed.



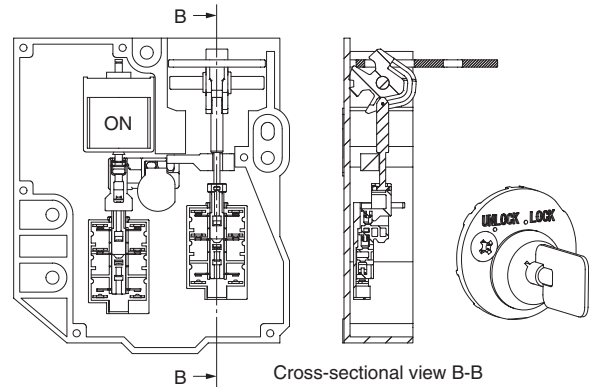
(2) Operation Key inserted, solenoid OFF, and trapped key removed. Status: Door unlocked.



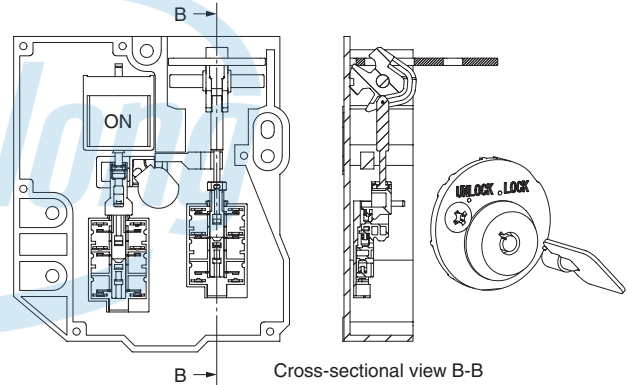
(3) Operation Key inserted, solenoid OFF, and trapped key inserted. Status: Door locked and trapped key cannot be removed.



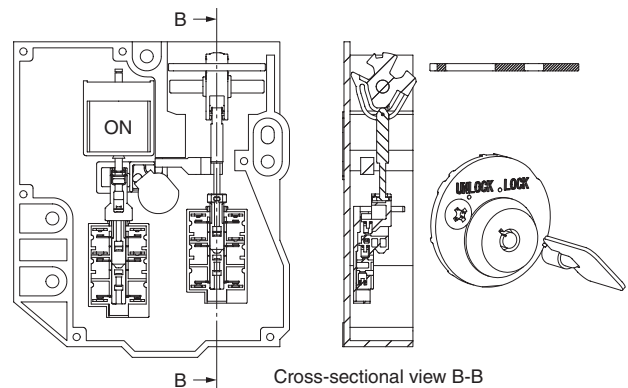
(4) Operation Key inserted, solenoid ON, and trapped key inserted. Status: Door locked and trapped key can be removed.



(5) Operation Key inserted, solenoid ON, and trapped key removed. Status: Door unlocked.



(6) Operation Key removed, solenoid ON, and trapped key removed.



# Dimensions

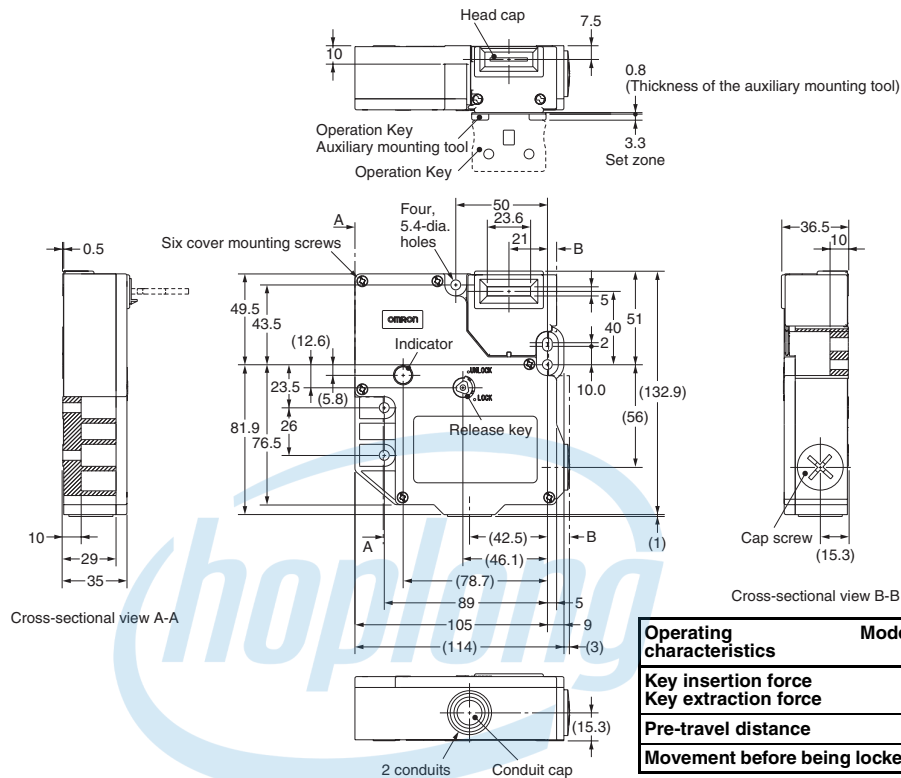
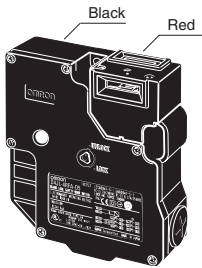
**Note:** All units are in millimeters unless otherwise indicated.

## ■ Dimensions and Operating Characteristics

### Switches

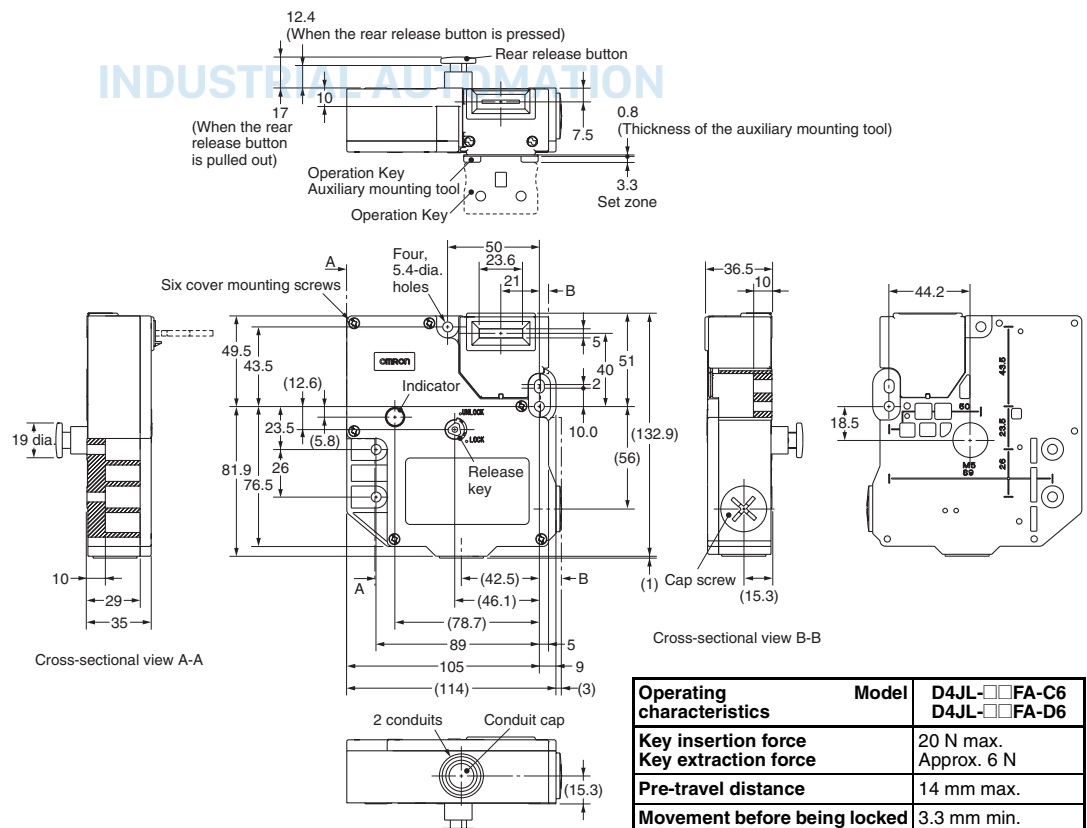
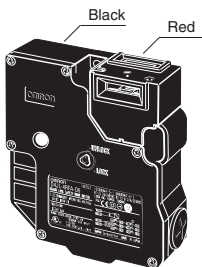
D4JL-□□F□-C5

D4JL-□□F□-D5

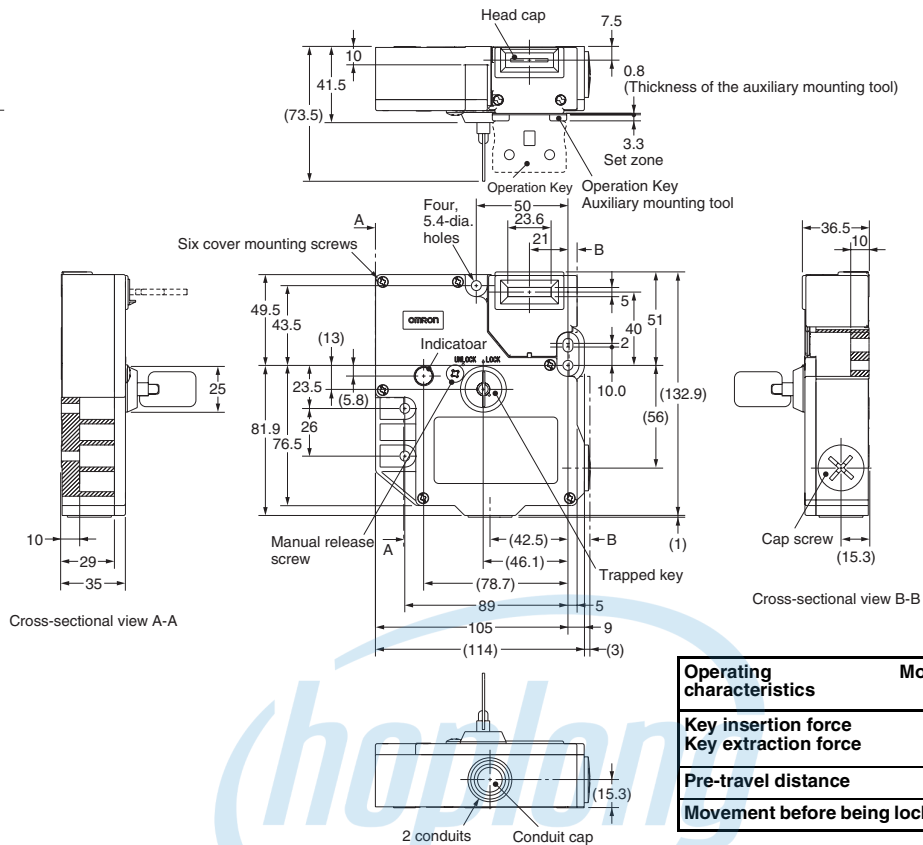
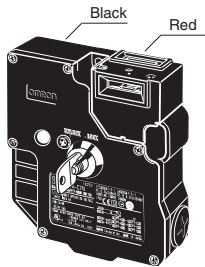


D4JL-□□FA-C6

D4JL-□□FA-D6



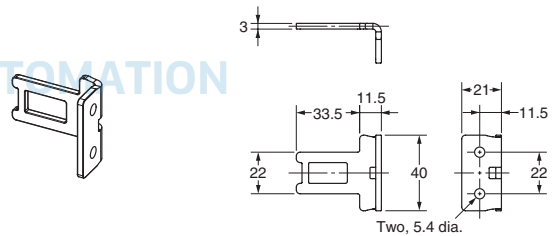
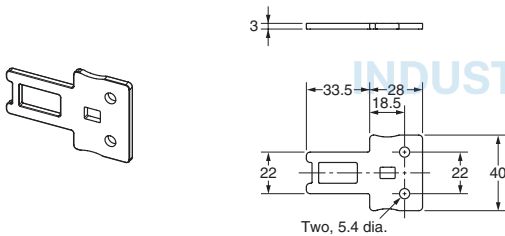
D4JL-□□FA-C7  
D4JL-□□FA-D7



## Operation Keys

D4JL-K1

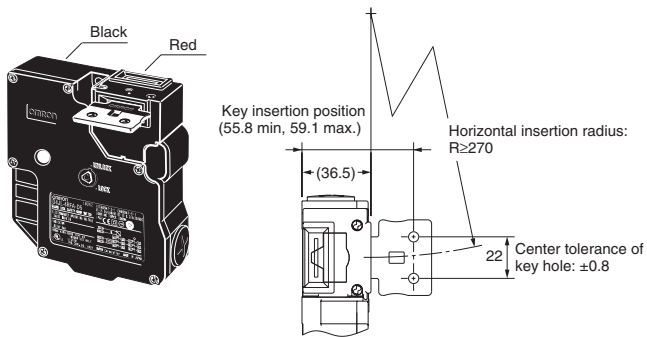
D4JL-K2



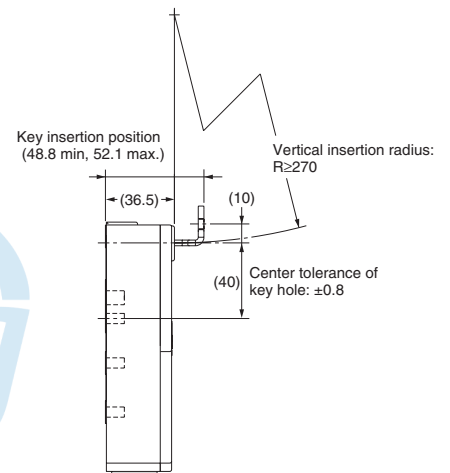
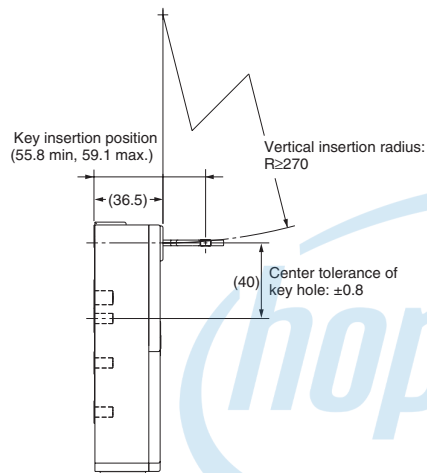
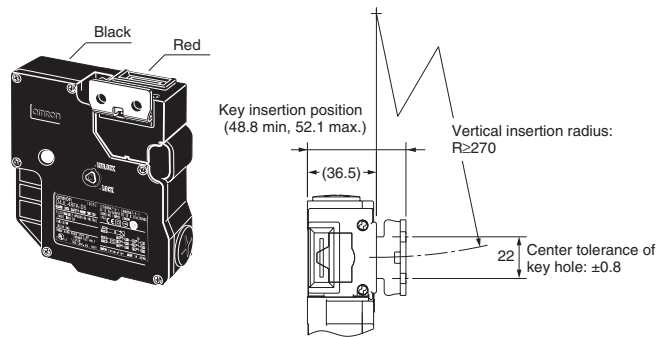
**Note:** Unless otherwise specified, a tolerance of  $\pm 0.4$  mm applies to all dimensions.

# With Operation Key Inserted

**D4JL+D4JL-K1**



**D4JL+D4JL-K2**



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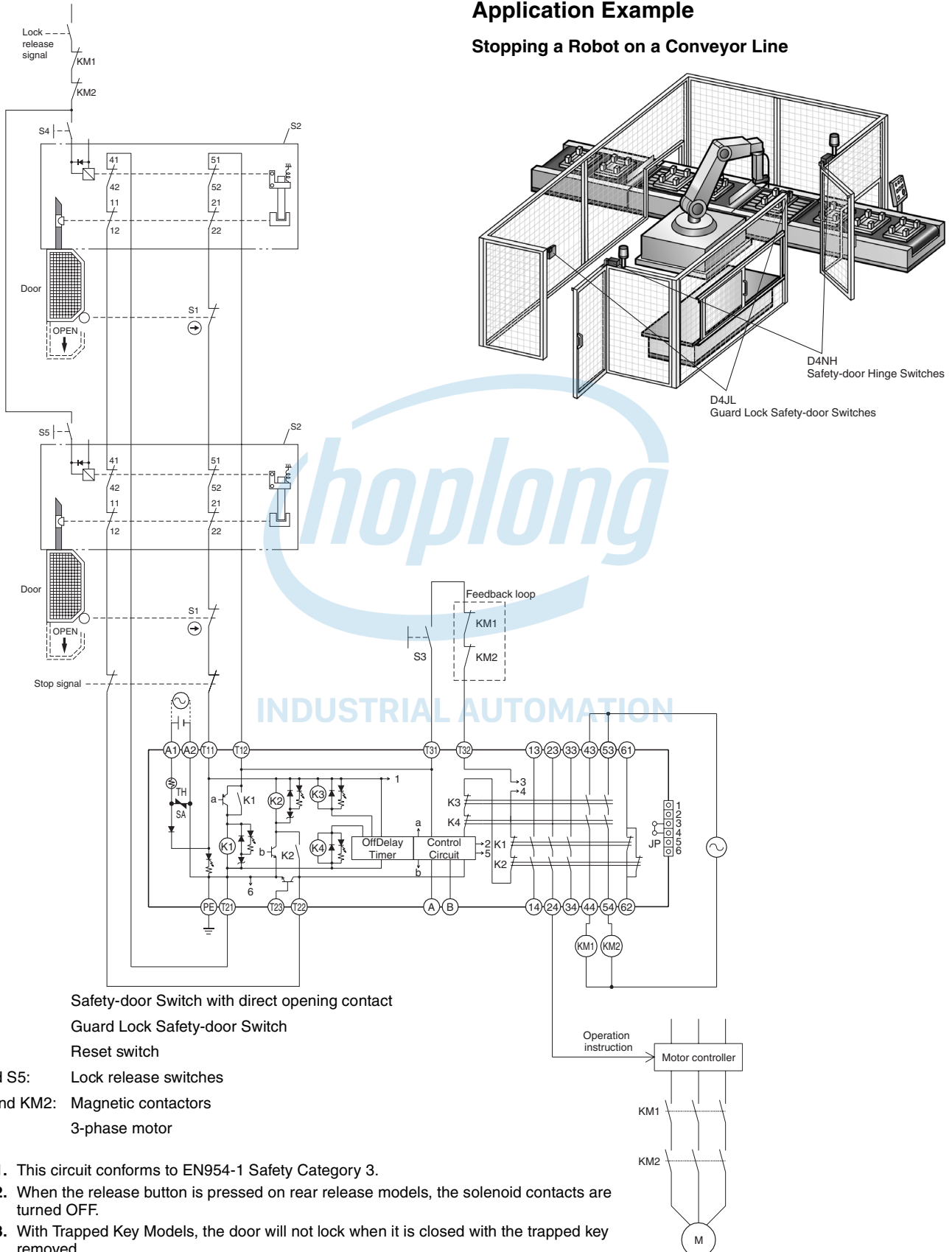


# Application Examples

## G9SA-321-T□ (24 VAC/VDC) + D4JL-□□□A-□□ (Mechanical Lock Models) Manual Reset

### Application Example

#### Stopping a Robot on a Conveyor Line

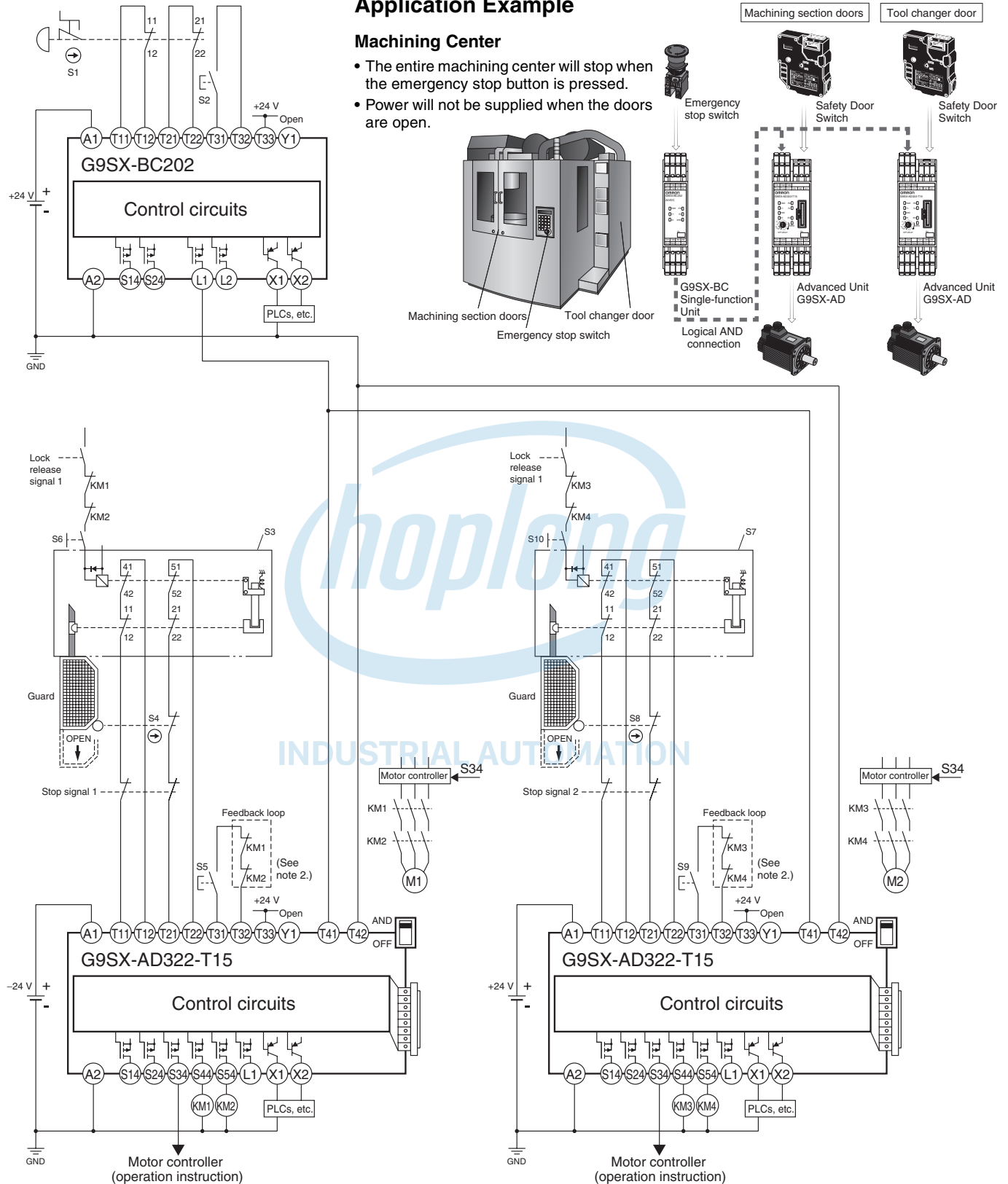


**G9SX-AD322-T15 (24 VDC) + D4JL-□□□A-□□ (Mechanical Lock Models)/Manual Reset**

**Application Example**

**Machining Center**

- The entire machining center will stop when the emergency stop button is pressed.
- Power will not be supplied when the doors are open.



- S1: Emergency stop switch  
 S3 and S7: Guard Lock Safety-door Switches  
 S2, S5, and S9: Reset switches  
 S6 and S10: Lock release switches  
 S4 and S8: Safety-door Limit Switches with direct opening contacts  
 KM1, KM2, KM3, and KM4: Magnetic contactors  
 M1 and M2: 3-phase motors

## Precautions

Refer to the OMRON *Safety Components Series Catalog* (Cat. No. Y106) for details about precautions common to all Switches.

### CAUTION

Do not insert the Operation Key when the door is open. The machine may operate, possibly causing injury.



Do not use metal conduits. If the Switch is made of resin, damage at the conduit section may cause electric shock.



Lock Strength for Guard Lock Safety-door Switches

- Do not apply force exceeding the lock strength. The Switch may be broken, and the system may continue to operate.
- Either install another locking component (e.g., a stopper) in addition to the Switch, or use a warning sticker or an indicator showing the lock status so that a force exceeding the lock strength is not applied.

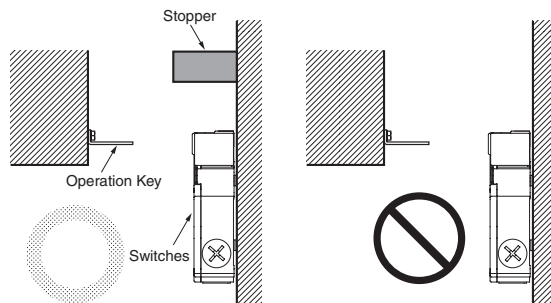


## Precautions for Safe Use

- Mount the Operation Key so that it will not come into contact with persons in the area when the door is opened and closed. Injury may result.
- Do not use the Switch in a startup circuit. Use it instead for a safety confirmation signal.
- Connect a fuse in series with the D4JL to protect it from short-circuit damage. The value of the breaking current of the fuse must be calculated by multiplying the rated current by 150% to 200%. When using the D4JL for an EN rating, use a 10-A fuse of type gI or gG that complies with IEC 60269.
- Do not use the Switch in atmospheres containing explosive or flammable gases.
- Do not drop the Switch. Doing so may prevent the Switch from functioning to its full capacity.
- Mount the Switch securely to prevent it from falling. Otherwise, injuries may occur.
- Do not use the Switch submerged in oil or water, or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch interior. (The IP67 degree of protection specification for the Switch specifies the amount of water penetration after the Switch is submerged in water for a certain period of time.)
- Although the switch body is protected from the ingress of dust or water, avoid the ingress of foreign substance through the key hole on the Head. Otherwise, accelerated wear or breaking may result.
- Always attach the cover after completing wiring and before using the Switch. Electric shock may occur if the Switch is used without the cover attached.
- Do not switch circuits for two or more standard loads (3 A at 250 VAC) at the same time. Doing so may adversely affect insulation performance.
- When using a metal connector, use a connector with a screw section not exceeding 9 mm. Otherwise, electric shock may occur.
- If the Adaptor is damaged when using a 1/2-14NPT connector, the seal may fail and electric shock may occur. Do not use metal connectors or conduits for this purpose.
- The durability of the Switch is greatly influenced by the switching conditions. Always test the switch under actual working conditions before application and use it in a switching circuit for which there are no problems with performance.

## Stopper Installation

- Do not use the Switch as a stopper. Be sure to install a stopper as shown in the following illustration when mounting the Switch so that the base of the Operation Key does not strike the Head.

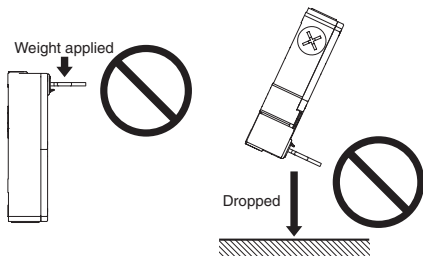


- The user must not maintain or repair equipment incorporating the Switch. Contact the manufacturer of the equipment for any maintenance or repairs required.
- Do not attempt to disassemble or modify the Switch. Doing so may cause the Switch to malfunction.

## ■ Precautions for Correct Use

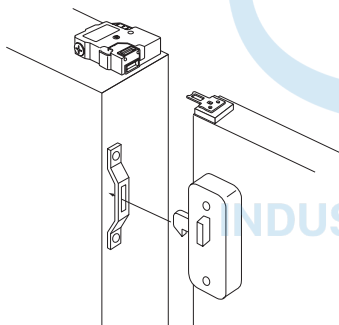
### Operation Key

- Be sure to use the designated Operation Key only. The Head has been designed so that operation is not possible with a screwdriver or other tools. Do not operate the Switch with anything other than the special OMRON Operation Key, otherwise the Switch may break or the safety of the system may not be maintained.
- Do not impose excessive force on the Operation Key inserted into the Switch or drop the Switch with the Operation Key inserted, otherwise the Operation Key may deform or break.



### Securing the Door

If the Operation Key on the closed door is pulled outside the set zone by force caused by vibration, the door's weight, or the door cushion rubber, the Switch may be damaged. Also, it may not be possible to unlock the Switch if weight is placed on the Operation Key. Secure the door with hooks so that it will remain within the set zone.

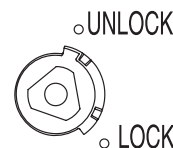


### Switch Contacts

The Switch contacts can be used with either standard loads or microloads. Once the contacts have been used to switch a load, however, they cannot be used to switch smaller loads.

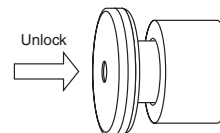
### Release Key

- The release key is used to unlock the Switch in case of emergency or if the power supply to the Switch stops.
- If the release key setting is changed from LOCK to UNLOCK using an appropriate tool, the lock will be released and the safety door can be opened (mechanical lock models only).
- After setting the release key to UNLOCK to, for example, change the head direction or perform maintenance, be sure to return it to the LOCK setting before resuming operation.
- The default setting is the LOCK position.
- If the release key is set to UNLOCK when the Switch is used for the door of a machine room to ensure the safety of people performing adjustment work inside, the door will not be locked when the door is closed and no power will be supplied to the equipment.
- Do not use the release key to start or stop machines.
- The auxiliary lock must be released using the release key only by authorized personnel.
- Do not impose a force exceeding 1 N·m on the release key screws. The release key may be damaged and may not operate properly.
- To prevent the release key from being used by unauthorized personnel, set it to LOCK and seal it with sealing wax.



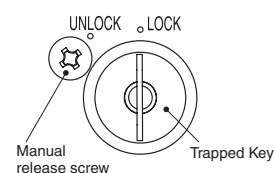
### Rear Release Button

- The rear release button is used for emergency escapes when someone locks a worker in the work area (hazardous area).
- The door can be unlocked by pressing the rear release button.
- After the rear release button is used to unlock the door, pull the button out to restore it to its original state. If the button is left pressed in, the door will not lock when the door is closed and power will not be supplied to the equipment.
- Mount the Switch so that the rear release button can be operated by a worker inside the work area (hazardous area).



### Trapped Key

- The trapped key is released when power is supplied to the solenoid. Turn the trapped key to the UNLOCK position and remove the key to unlock the door. The door cannot be unlocked solely by supplying power to the solenoid. As long as a worker has the trapped key with him when he enters the work area (hazardous area), he cannot be locked inside by another worker.
- Do not impose a force exceeding 1 N·m when operating the key. Otherwise, the Switch may be damaged and may not operate properly.



## Attaching a Cover

- Make sure the release key is set to the LOCK position before covering the D4JL.
- Use one of the following methods when covering a Trapped Key Switch.

When the Operation Key is removed (door open):

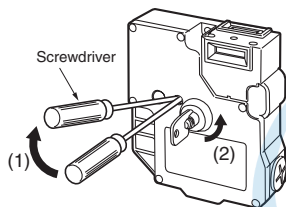
Cover with the trapped key removed (UNLOCK).

When the Operation Key is inserted (door closed):

Cover with the trapped key inserted (LOCK).

## Manual Release

- Manual release is used to unlock the Switch when power cannot be supplied to the solenoid, such as when power is interrupted or the equipment is being repaired.
  1. Use a Phillips screwdriver to remove the manual release screw. Use a precision screwdriver to press down the lever inside the Switch far enough to release the trapped key.
  2. The door is unlocked when the trapped key is turned to the UNLOCK position and removed.
- Do not use manual release to stop machines.
- After the Switch has been manually released, re-install the manual release screw in its proper position on the Switch using the specified torque.



## Hinged Doors

If the Switch is mounted too close to the hinge, the force imposed on the lock will be much larger than for locations far from the hinge and the lock may be damaged. Mount the Switch closer to the handle.

## Solenoid Lock Models

The solenoid lock locks the door only when power is supplied to the solenoid. The door will be unlocked if the power supply to the solenoid stops. Therefore, do not use the solenoid lock models for machines that may be operating and dangerous even after the machine stops operating.

## Mounting Methods

### Tightening Torque

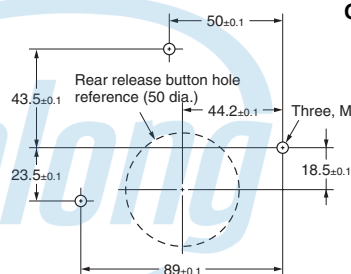
Be sure to tighten each screw of the Switch properly. Loose screws may result in malfunction.

Type	Tightening torque
Terminal screw	0.6 to 0.8 N·m
Cover mounting screw	0.7 to 0.9 N·m
Manual release screw	0.6 to 0.8 N·m
Operation Key mounting screw	2.4 to 2.8 N·m
Switch mounting screw	3.2 to 3.8 N·m
Connector	1.8 to 2.2 N·m (excluding 1/2-14NPT) 1.4 to 1.8 N·m (1/2-14NPT)
Cap screw	1.3 to 1.7 N·m

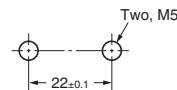
### Switch and Operation Key Mounting

- Mount the Switch and Operation Key securely to the applicable tightening torque with M5 screws.

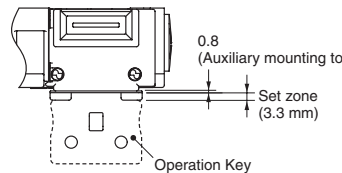
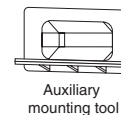
#### Mounting Holes for Switches



#### Mounting Holes for Operation Keys



- Do not operate the Switch with anything other than the special OMRON Operation Key. Otherwise, the Switch may be damaged and the safety of the system may not be maintained.
- Ensure that the alignment offset between the Operation Key and the key hole does not exceed  $\pm 0.8$  mm. If the Operation Key is offset or at an angle, premature wear or damage to the Switch may result.
- When inserting the Operation Key, install the provided mounting auxiliary tool in the key hole and use the tool to position the key in the key hole center and set zone.
- Remove the mounting auxiliary tool from the Switch after the Operation Key is properly inserted.
- Observe the specified insertion radius for the Operation Key and insert it in a direction perpendicular to the key hole.



## Securing Doors

When the door is closed (with the Operation Key inserted), it may be pulled beyond the set zone because of, for example, the door's weight, or the door cushion rubber.

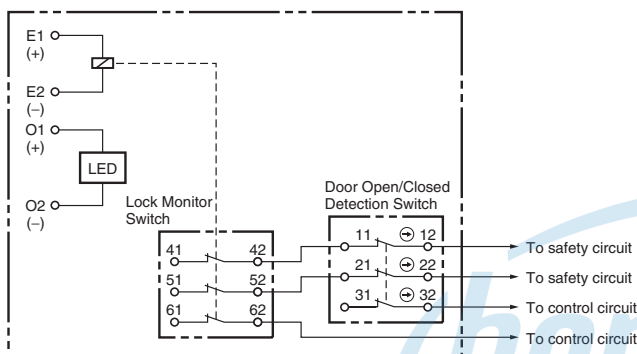
Use hooks to ensure that the door stays within the set zone.



## Wiring

### Circuit Connection Example

- Direct opening contacts used for safety circuit inputs are indicated with the  $\ominus$  mark. Terminals 12-41 and terminals 22-51 have direct opening contacts.
- Connect the indicators in parallel to the auxiliary circuits or terminals E1 and E2. Do not connect the indicators in parallel with the direct opening contact. If the indicators are broken, a short-circuit current may flow, causing equipment to malfunction.
- Do not switch circuits for two or more standard loads at the same time. Doing so may adversely affect insulation performance.
- The 24-VDC solenoid terminals have polarity (E1: +, E2: -). Confirm the polarity before wiring.
- The contact ON/OFF timing for Switches is not synchronized. Confirm performance before application.

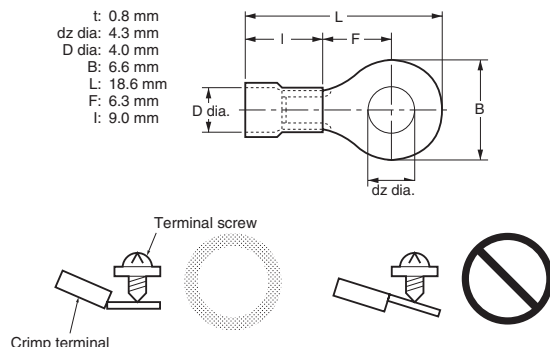


## Wiring

- Do not wire the Switch while power is being supplied. Doing so may result in electric shock.
- When connecting to the terminals via insulating tube and M3.5 crimp terminals, arrange the crimp terminals so that they do not rise up onto the case or the cover.
- Applicable lead wire size: AWG18 (0.3 to 0.75 mm<sup>2</sup>). Use lead wires of an appropriate length. Not doing so may result in excess length causing the cover to rise and not fit properly.
- Do not push crimp terminals into gaps in the case interior. Doing so may cause damage or deformation of the case.

### Recommended Crimp Terminals

Manufacturer	Model	Applicable wire
J.S.T. Mfg Co.	FN1.25-M4 (F Type) N1.25-M4 (Straight Type)	AWG22 to AWG16 (0.3 to 1.25 mm <sup>2</sup> )



## Processing the Conduit Opening

- Connect a recommended connector to the opening of the conduit and tighten the connector to the proper torque. The case may be damaged if excessive tightening torque is applied.
- When using a 1/2-14NPT conduit, wind sealing tape around the conduit end of the connector so that the enclosure will conform to IP67.
- Make sure that the outer diameter of the cable connected to the connector is correct.
- Attach and tighten a conduit cap to the unused conduit opening when wiring. The conduit cap is provided with the Switch.

## Recommended Connectors

Use a connector with a screw section not exceeding 9 mm. Otherwise, the screws will protrude into the case interior. The connectors given in the following table have connectors with screw sections not exceeding 9 mm. Use the following connectors to ensure conformance to IP67.

Size	Manufacturer	Model	Applicable cable diameter
G1/2	LAPP	ST-PF1/2 5380-1002	6.0 to 12.0 mm
PG13.5	LAPP	ST-13.5 5301-5030	6.0 to 12.0 mm
M20	LAPP	ST-M20 x 1.5 5311-1020	7.0 to 13.0 mm
1/2-14NPT	LAPP	ST-NPT1/2 5301-6030	6.0 to 12.0 mm

Use LAPP connectors together with Seal Packing (JPK-16, GP-13.5, or GPM20), and tighten to the applicable torque. Seal Packing is sold separately.

- Lapp product distributor: HAGITEC CO, LTD., Tel: 043-423-8741
- For a 1/2-14NPT conduit, use the above connector after attaching the provided Adaptor to the Switch and wrapping it with sealing tape.

## Operating Environment

- The Switch is intended for indoor use only. Do not use the Switch outdoors. Doing so may cause the Switch to malfunction.
- Do not use the Switch where corrosive gases (e.g., H<sub>2</sub>S, SO<sub>2</sub>, NH<sub>3</sub>, HNO<sub>3</sub>, or Cl<sub>2</sub>) are present or in locations subject to high temperature and humidity. Doing so may result in damage to the Switch caused by contact failure or corrosion.
- Do not use the Switch in the following locations.
  - Locations subject to severe temperature changes.
  - Locations subject to high humidity or condensation.
  - Locations subject to severe vibration.
  - Locations where the interior of the Protective Door may come into direct contact with cutting chips, metal filings, oil, or chemicals.
  - Locations where the Switch may come into contact with thinner or detergents.
  - Locations where explosive or flammable gases are present.

## Maintenance and Repairs

The user must not maintain or repair equipment incorporating the Switch. Contact the manufacturer of the equipment for any maintenance or repairs required.

## Storage

Do not store the Switch where corrosive gases (e.g., H<sub>2</sub>S, SO<sub>2</sub>, NH<sub>3</sub>, HNO<sub>3</sub>, or Cl<sub>2</sub>) or dust is present, or in locations subject to high temperature or high humidity.

### **Other Precautions**

- When attaching a cover, be sure that the seal rubber is in place and that there is no foreign material present. If the cover is attached with the seal rubber out of place or if foreign material is attached with the seal rubber, a proper seal will not be obtained.
- A Guard Lock Safety-door Switch will heat when power is supplied to the solenoid. Do not touch these Switches.
- Perform maintenance inspections periodically.
- Use the Switch with a load current that does not exceed the rated current.
- Do not use any screws to connect the cover other than the specified ones. The seal characteristics may be reduced.



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# Terms and Conditions of Sale

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- Discounts.** Cash discounts, if any, will apply only on the net amount of invoices sent to Buyer after deducting transportation charges, taxes and duties, and will be allowed only if (i) the invoice is paid according to Omron's payment terms and (ii) Buyer has no past due amounts.
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- Taxes.** All taxes, duties and other governmental charges (other than general real property and income taxes), including any interest or penalties thereon, imposed directly or indirectly on Omron or required to be collected directly or indirectly by Omron for the manufacture, production, sale, delivery, importation, consumption or use of the Products sold hereunder (including customs duties and sales, excise, use, turnover and license taxes) shall be charged to and remitted by Buyer to Omron.
- Financial.** If the financial position of Buyer at any time becomes unsatisfactory to Omron, Omron reserves the right to stop shipments or require satisfactory security or payment in advance. If Buyer fails to make payment or otherwise comply with these Terms or any related agreement, Omron may (without liability and in addition to other remedies) cancel any unshipped portion of Products sold hereunder and stop any Products in transit until Buyer pays all amounts, including amounts payable hereunder, whether or not then due, which are owing to it by Buyer. Buyer shall in any event remain liable for all unpaid accounts.
- Cancellation; Etc.** Orders are not subject to rescheduling or cancellation unless Buyer indemnifies Omron against all related costs or expenses.
- Force Majeure.** Omron shall not be liable for any delay or failure in delivery resulting from causes beyond its control, including earthquakes, fires, floods, strikes or other labor disputes, shortage of labor or materials, accidents to machinery, acts of sabotage, riots, delay in or lack of transportation or the requirements of any government authority.
- Shipping; Delivery.** Unless otherwise expressly agreed in writing by Omron:
  - Shipments shall be by a carrier selected by Omron; Omron will not drop ship except in "break down" situations.
  - Such carrier shall act as the agent of Buyer and delivery to such carrier shall constitute delivery to Buyer;
  - All sales and shipments of Products shall be FOB shipping point (unless otherwise stated in writing by Omron), at which point title and risk of loss shall pass from Omron to Buyer; provided that Omron shall retain a security interest in the Products until the full purchase price is paid;
  - Delivery and shipping dates are estimates only; and
  - Omron will package Products as it deems proper for protection against normal handling and extra charges apply to special conditions.
- Claims.** Any claim by Buyer against Omron for shortage or damage to the Products occurring before delivery to the carrier must be presented in writing to Omron within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products from Omron in the condition claimed.
- Warranties.** (a) **Exclusive Warranty.** Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied. (b) **Limitations.** OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) **Buyer Remedy.** Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty. See <http://oeweb.omron.com> or contact your Omron representative for published information.
- Limitation on Liability; Etc.** OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY. Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.
- Indemnities.** Buyer shall indemnify and hold harmless Omron Companies and their employees from and against all liabilities, losses, claims, costs and expenses (including attorney's fees and expenses) related to any claim, investigation, litigation or proceeding (whether or not Omron is a party) which arises or is alleged to arise from Buyer's acts or omissions under these Terms or in any way with respect to the Products. Without limiting the foregoing, Buyer (at its own expense) shall indemnify and hold harmless Omron and defend or settle any action brought against such Companies to the extent based on a claim that any Product made to Buyer specifications infringed intellectual property rights of another party.
- Property; Confidentiality.** Any intellectual property in the Products is the exclusive property of Omron Companies and Buyer shall not attempt to duplicate it in any way without the written permission of Omron. Notwithstanding any charges to Buyer for engineering or tooling, all engineering and tooling shall remain the exclusive property of Omron. All information and materials supplied by Omron to Buyer relating to the Products are confidential and proprietary, and Buyer shall limit distribution thereof to its trusted employees and strictly prevent disclosure to any third party.
- Export Controls.** Buyer shall comply with all applicable laws, regulations and licenses regarding (i) export of products or information; (ii) sale of products to "forbidden" or other proscribed persons; and (iii) disclosure to non-citizens of regulated technology or information.
- Miscellaneous.** (a) **Waiver.** No failure or delay by Omron in exercising any right and no course of dealing between Buyer and Omron shall operate as a waiver of rights by Omron. (b) **Assignment.** Buyer may not assign its rights hereunder without Omron's written consent. (c) **Law.** These Terms are governed by the law of the jurisdiction of the home office of the Omron company from which Buyer is purchasing the Products (without regard to conflict of law principles). (d) **Amendment.** These Terms constitute the entire agreement between Buyer and Omron relating to the Products, and no provision may be changed or waived unless in writing signed by the parties. (e) **Severability.** If any provision hereof is rendered ineffective or invalid, such provision shall not invalidate any other provision. (f) **Setoff.** Buyer shall have no right to set off any amounts against the amount owing in respect of this invoice. (g) **Definitions.** As used herein, "including" means "including without limitation"; and "Omron Companies" (or similar words) mean Omron Corporation and any direct or indirect subsidiary or affiliate thereof.

## Certain Precautions on Specifications and Use

- Suitability of Use.** Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases but the following is a non-exhaustive list of applications for which particular attention must be given:
  - Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
  - Use in consumer products or any use in significant quantities.
  - Energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
  - Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this Product.
 NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON'S PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
- Programmable Products.** Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.
- Performance Data.** Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.
- Change in Specifications.** Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.
- Errors and Omissions.** Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.



INDUSTRIAL AUTOMATION

Complete "Terms and Conditions of Sale" for product purchase and use are on Omron's website at [www.omron.com/oei](http://www.omron.com/oei) – under the "About Us" tab, in the Legal Matters section.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.**

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

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