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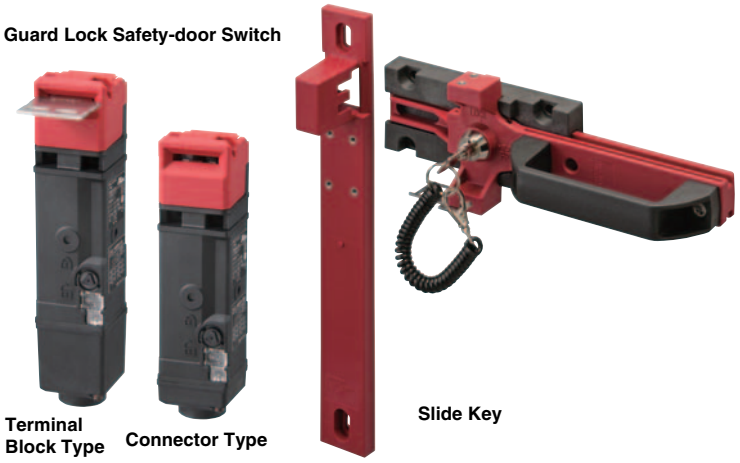
Guard Lock Safety-door Switch/D4SL-N-mounting Slide Key

# D4SL-N / D4SL-NSK10-LK□

## World's smallest Class 6-contact Guard Lock Safety-door Switch

### <Guard Lock Safety-door Switch D4SL-N>

- Wiring time is reduced with two types of wiring methods capable of one-touch attachment and removal.
- A wide variety of built-in switches can be used for various devices.
  (4-, 5-, and 6-contact models are available)
- Key holding force of 1,300 N.
- It is possible to change the key insertion point without detaching the head.
- Drive solenoids directly from the Controller.
- Conforms to ISO 14119.




### <Slide Key D4SL-NSK10-LK□>

- Lockout Key to prevent workers from becoming trapped inside the hazardous area.
- The vertical D4SL Guard Lock Safety-door Switch can be easily mounted on 40 × 40 mm aluminum frames.
- The plastic material makes the Slide Key suitable for lightweight doors.

⚠ **Be sure to read the "*Safety Precautions*" on page 22.**

# Model Number Structure

## Model Number Legend

### Switch (Standard type)

**D4SL-N (1)(2)(3)(4)-(5)(6)(7)**

#### (1) Conduit Size

| Contact Model | Conduit Size |
|---|---|
| 4-contact Model<br>5-contact Model<br>6-contact Model } Common | 2: G1/2<br>3: 1/2-14NPT *1<br>4: M20 |

#### (2) Built-in Switch

| Contact Model | Built-in Switch |
|---|---|
| 4-contact Model | Door monitor and Lock monitor are connected in series internally.<br>A: 1NC/1NO + 1NC/1NO<br>B: 1NC/1NO + 2NC<br>C: 2NC + 1NC/1NO<br>D: 2NC + 2NC<br>Door monitor and Lock monitor are NOT connected in series internally.<br>S: 1NC/1NO + 1NC/1NO<br>T: 1NC/1NO + 2NC<br>U: 2NC + 1NC/1NO<br>V: 2NC + 2NC |
| 5-contact Model | E: 2NC/1NO + 1NC/1NO<br>F: 2NC/1NO + 2NC<br>G: 3NC + 1NC/1NO<br>H: 3NC + 2NC |
| 6-contact Model | N: 2NC/1NO + 2NC/1NO<br>P: 2NC/1NO + 3NC<br>Q: 3NC + 2NC/1NO<br>R: 3NC + 3NC |

#### (3) Head Material

| Contact Model | Head Material |
|---|---|
| 4-contact Model | F: Resin |
| 5-contact Model<br>6-contact Model } Common | F: Resin<br>D: Metal |

#### (4) Door Lock and Release

| Contact Model | Door Lock and Release |
|---|---|
| 4-contact Model<br>5-contact Model<br>6-contact Model } Common | A: Mechanical lock/24VDC solenoid release<br>G: 24VDC solenoid lock/mechanical release |

#### (5) Indicator

| Contact Model | Indicator |
|---|---|
| 4-contact Model | –: None |
| 5-contact Model<br>6-contact Model } Common | D: 24VDC (orange LED indicator) |

#### (6) Release Key Type

| Contact Model | Release Key Type |
|---|---|
| 4-contact Model | –: Standard release key (metal) |
| 5-contact Model<br>6-contact Model } Common | –: Standard release key (metal)<br>4: Special release key (resin)<br>(Note:Release keys are provided.) |

#### (7) Connection Method

| Contact Model | Connection Method |
|---|---|
| 4-contact Model<br>5-contact Model<br>6-contact Model } Common | –: Terminal block<br>N: Connector *2 |

*1. M20, includes M20-to-1/2-14NPT conversion adapter.
*2. Connector cables are not included with the connector type and are to be purchased separately.

### Operation key

**D4SL-NK(1)(2)**

#### (1) Operation Key Type

1: Horizontal mounting
2: Vertical mounting
3: Adjustable mounting (horizontal)
5: Adjustable mounting (horizontal/vertical)

#### (2) Key Type

–: No cushion rubber
G: Cushion rubber
S: No cushion rubber, short type

# Ordering Information

## List of Models

| Release Key Type | Wiring method | Solenoid voltage/ Indicator | Lock and release type | Contact configuration (door open/closed detection switch and lock monitor switch contacts) | Conduit size (See Note.) | Model |
|---|---|---|---|---|---|---|
| Standard (metal) | Connector | 24VDC (Orange) | Mechanical lock Solenoid release | 6-contact Model Insert the built-in switch (N, P, Q or R) into the blank □. | G1/2 | **D4SL-N2□FA-DN** |
| | | | | | 1/2-14NPT | **D4SL-N3□FA-DN** |
| | | | | | M20 | **D4SL-N4□FA-DN** |
| | | | | 5-contact Model Insert the built-in switch (E, F, G or H) into the blank □. | G1/2 | **D4SL-N2□FA-DN** |
| | | | | | 1/2-14NPT | **D4SL-N3□FA-DN** |
| | | | | | M20 | **D4SL-N4□FA-DN** |
| | | 24VDC (without indicator) | | 4-contact Model Insert the built-in switch (A, B, C, D, S, T, U or V) into the blank □. | G1/2 | **D4SL-N2□FA-N** |
| | | | | | 1/2-14NPT | **D4SL-N3□FA-N** |
| | | | | | M20 | **D4SL-N4□FA-N** |
| | Terminal block | 24VDC (Orange) | | 6-contact Model Insert the built-in switch (N, P, Q or R) into the blank □. | G1/2 | **D4SL-N2□FA-D** |
| | | | | | 1/2-14NPT | **D4SL-N3□FA-D** |
| | | | | | M20 | **D4SL-N4□FA-D** |
| | | | | 5-contact Model Insert the built-in switch (E, F, G or H) into the blank □. | G1/2 | **D4SL-N2□FA-D** |
| | | | | | 1/2-14NPT | **D4SL-N3□FA-D** |
| | | | | | M20 | **D4SL-N4□FA-D** |
| | | 24VDC (without indicator) | | 4-contact Model Insert the built-in switch (A, B, C, D, S, T, U or V) into the blank □. | G1/2 | **D4SL-N2□FA** |
| | | | | | 1/2-14NPT | **D4SL-N3□FA** |
| | | | | | M20 | **D4SL-N4□FA** |
| | Connector | 24VDC (Orange) | Solenoid lock Mechanical release | 6-contact Model Insert the built-in switch (N, P, Q or R) into the blank □. | G1/2 | **D4SL-N2□FG-DN** |
| | | | | | 1/2-14NPT | **D4SL-N3□FG-DN** |
| | | | | | M20 | **D4SL-N4□FG-DN** |
| | | | | 5-contact Model Insert the built-in switch (E, F, G or H) into the blank □. | G1/2 | **D4SL-N2□FG-DN** |
| | | | | | 1/2-14NPT | **D4SL-N3□FG-DN** |
| | | | | | M20 | **D4SL-N4□FG-DN** |
| | | 24VDC (without indicator) | | 4-contact Model Insert the built-in switch (A, B, C, D, S, T, U or V) into the blank □. | G1/2 | **D4SL-N2□FG-N** |
| | | | | | 1/2-14NPT | **D4SL-N3□FG-N** |
| | | | | | M20 | **D4SL-N4□FG-N** |
| | Terminal block | 24VDC (Orange) | | 6-contact Model Insert the built-in switch (N, P, Q or R) into the blank □. | G1/2 | **D4SL-N2□FG-D** |
| | | | | | 1/2-14NPT | **D4SL-N3□FG-D** |
| | | | | | M20 | **D4SL-N4□FG-D** |
| | | | | 5-contact Model Insert the built-in switch (E, F, G or H) into the blank □. | G1/2 | **D4SL-N2□FG-D** |
| | | | | | 1/2-14NPT | **D4SL-N3□FG-D** |
| | | | | | M20 | **D4SL-N4□FG-D** |
| | | 24VDC (without indicator) | | 4-contact Model Insert the built-in switch (A, B, C, D, S, T, U or V) into the blank □. | G1/2 | **D4SL-N2□FG** |
| | | | | | 1/2-14NPT | **D4SL-N3□FG** |
| | | | | | M20 | **D4SL-N4□FG** |

**Note:** The recommended models for equipment and machinery being exported to Europe are those with an M20 conduit sizes, and for North America, the recommended models are those with a 1/2-14NPT conduit sizes.

| Release Key Type | Wiring method | Solenoid voltage/ Indicator | Lock and release type | Contact configuration (door open/closed detection switch and lock monitor switch contacts) | Conduit size (See Note.) | Model |
|---|---|---|---|---|---|---|
| Special (resin) | Connector | 24VDC (Orange) | Mechanical lock Solenoid release | 6-contact Model Insert the built-in switch (N, P, Q or R) into the blank □. | G1/2 | **D4SL-N2□FA-D4N** |
| | | | | | 1/2-14NPT | **D4SL-N3□FA-D4N** |
| | | | | | M20 | **D4SL-N4□FA-D4N** |
| | | | | 5-contact Model Insert the built-in switch (E, F, G or H) into the blank □. | G1/2 | **D4SL-N2□FA-D4N** |
| | | | | | 1/2-14NPT | **D4SL-N3□FA-D4N** |
| | | | | | M20 | **D4SL-N4□FA-D4N** |
| | Terminal block | | | 6-contact Model Insert the built-in switch (N, P, Q or R) into the blank □. | G1/2 | **D4SL-N2□FA-D4** |
| | | | | | 1/2-14NPT | **D4SL-N3□FA-D4** |
| | | | | | M20 | **D4SL-N4□FA-D4** |
| | | | | 5-contact Model Insert the built-in switch (E, F, G or H) into the blank □. | G1/2 | **D4SL-N2□FA-D4** |
| | | | | | 1/2-14NPT | **D4SL-N3□FA-D4** |
| | | | | | M20 | **D4SL-N4□FA-D4** |
| | Connector | | Solenoid lock Mechanical release | 6-contact Model Insert the built-in switch (N, P, Q or R) into the blank □. | G1/2 | **D4SL-N2□FG-D4N** |
| | | | | | 1/2-14NPT | **D4SL-N3□FG-D4N** |
| | | | | | M20 | **D4SL-N4□FG-D4N** |
| | | | | 5-contact Model Insert the built-in switch (E, F, G or H) into the blank □. | G1/2 | **D4SL-N2□FG-D4N** |
| | | | | | 1/2-14NPT | **D4SL-N3□FG-D4N** |
| | | | | | M20 | **D4SL-N4□FG-D4N** |
| | Terminal block | | | 6-contact Model Insert the built-in switch (N, P, Q or R) into the blank □. | G1/2 | **D4SL-N2□FG-D4** |
| | | | | | 1/2-14NPT | **D4SL-N3□FG-D4** |
| | | | | | M20 | **D4SL-N4□FG-D4** |
| | | | | 5-contact Model Insert the built-in switch (E, F, G or H) into the blank □. | G1/2 | **D4SL-N2□FG-D4** |
| | | | | | 1/2-14NPT | **D4SL-N3□FG-D4** |
| | | | | | M20 | **D4SL-N4□FG-D4** |

**Note:** The recommended models for equipment and machinery being exported to Europe are those with an M20 conduit sizes, and for North America, the recommended models are those with a 1/2-14NPT conduit sizes.

### Operation Keys

| Type | Model |
|---|---|
| Horizontal mounting | **D4SL-NK1** |
| Horizontal mounting (Short) | **D4SL-NK1S** |
| Horizontal mounting (Cushion rubber) | **D4SL-NK1G** |
| Vertical mounting | **D4SL-NK2** |
| Vertical mounting (Cushion rubber) | **D4SL-NK2G** |
| Adjustable (Horizontal) | **D4SL-NK3** |
| Adjustable (Horizontal/Vertical) | **D4SL-NK5** *NEW* |

### Connector Cables

| Cable length | Model |
|---|---|
| 1 m | **D4SL-CN1** |
| 3 m | **D4SL-CN3** |
| 5 m | **D4SL-CN5** |
| 10 m | **D4SL-CN10** *NEW* |

### Slide Key

| Type | Specifications | Contents | Model | Applicable Door Switch |
|---|---|---|---|---|
| | Weight: Approx. 0.6 kg<br>Mechanical durability:<br>20,000 operations min. | Slide Key: 1 (not yet mounted)<br>D4SL-N mounting plate: 1<br>Door Switch special mounting screws: 3<br>D4SL-NK1 (operation key): 1<br>D4SL-NK1 special mounting screws: 2<br>Lockout keys: 2<br>Lockout key strap: 1<br>Caution labels (stickers): 2 sheets<br>(English and Japanese) | **D4SL-NSK10-LK** | D4SL-N |
| | Weight: Approx. 0.1 kg | Inner Lever: 1 | **D4SL-SK10H *** | – |
| | Weight: Approx. 0.7 kg<br>Mechanical durability:<br>20,000 operations min. | Slide Key: 1 (not yet mounted)<br>Inner Lever: 1<br>D4SL-N mounting plate: 1<br>Door Switch special mounting screws: 3<br>D4SL-NK1 (operation key): 1<br>D4SL-NK1 special mounting screws: 2<br>Lockout keys: 2<br>Lockout key strap: 1<br>Caution labels (stickers): 2 sheets<br>(English and Japanese) | **D4SL-NSK10-LKH** | D4SL-N |

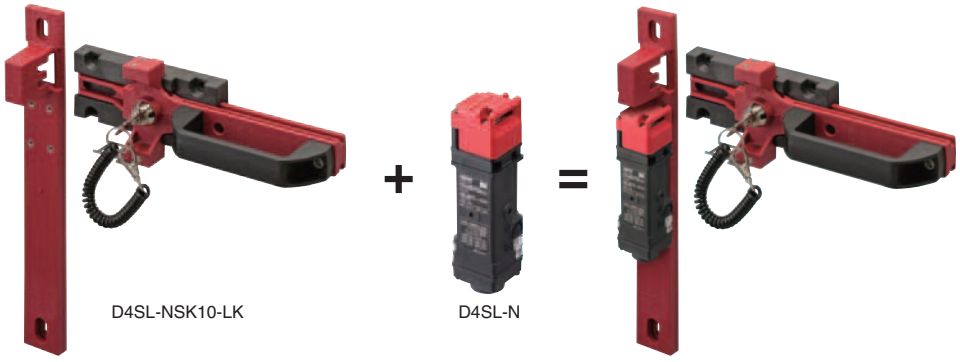
**Note: 1.** The Door Switch is not included. Select the Door Switch depending on the necessary number of contacts and the conduit size. The contents are provided as a total set, individual contents cannot be ordered separately.

**2.** Perform risk assessment for the equipment in question, configure relay units and other safety circuits, and use properly.

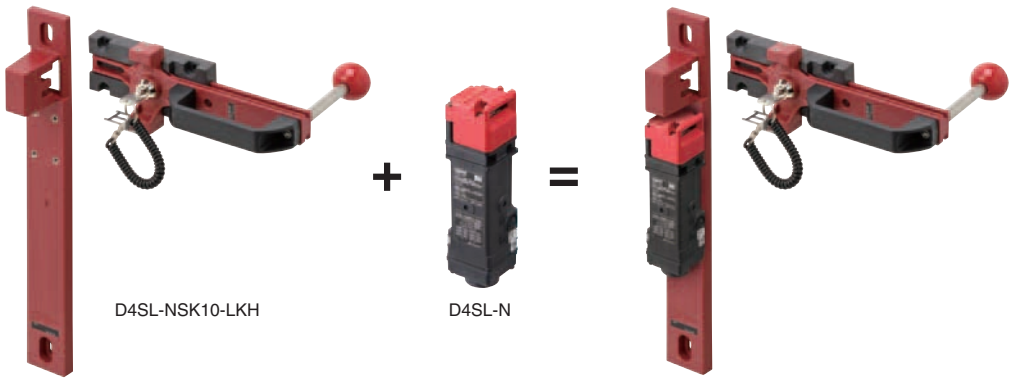
* The inner lever for D4SL-NSK10 that can not be used for other products and applications.

## Applicable Door Switches

### D4SL-NSK10-LK



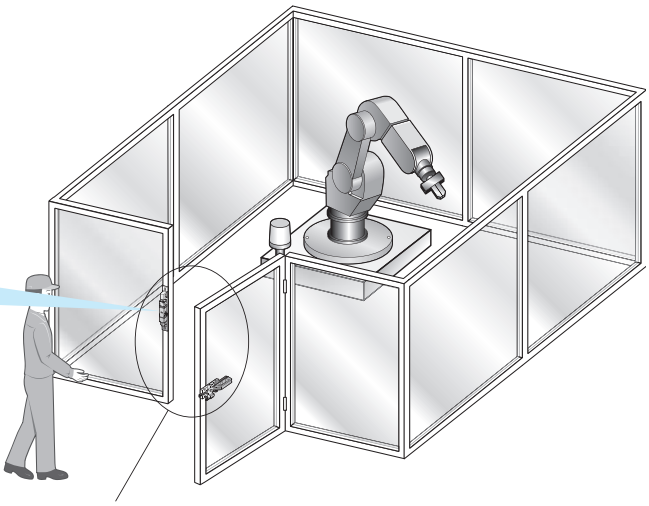

### D4SL-NSK10-LKH



# Features

## The lockout key prevents workers from becoming trapped without using a padlock.

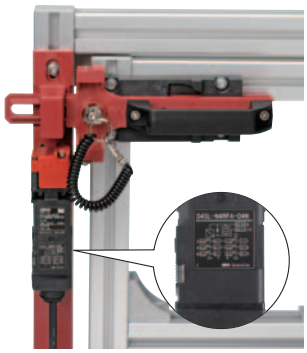
**Note:** Using LEDs of D4SL-N enables confirming whether the door is open or closed and locked or unlocked.



The handle-shaped fixture makes it easy to use the Door Switch.

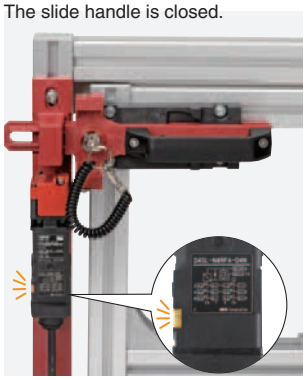
### Close door

Locked (power not supplied to solenoid) The slide handle is closed.

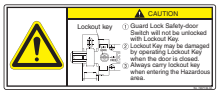


### Close door

Unlocked (power supplied to solenoid) The slide handle is closed.



The slide handle can be pulled.



Attach the supplied caution labels for display.

Lockout Key

Do not turn the key as in the figure above if the slide handle is closed.

### Left door

Door Opening to the Left.

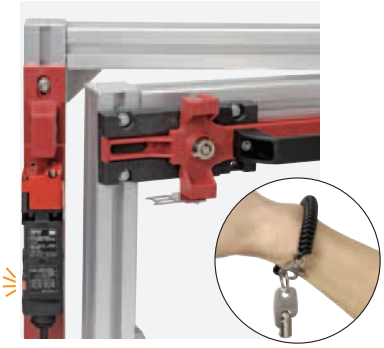
### Open door

The slide handle is open.

When the slide handle is open, the lockout key can be pulled regardless of whether power is being supplied to the solenoid or not.

### Open door

The slide handle is open.



The slide handle is secured at the position shown in the figure.
A worker holding the lockout key will not be trapped locked inside the hazardous area by another person.

### Open door

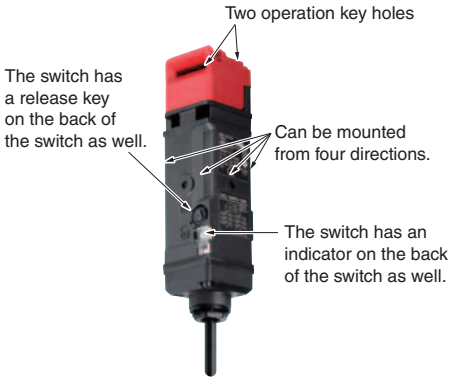
The slide handle is open.

If the lockout key is not mounted, the slide handle will not move and the door will not close.

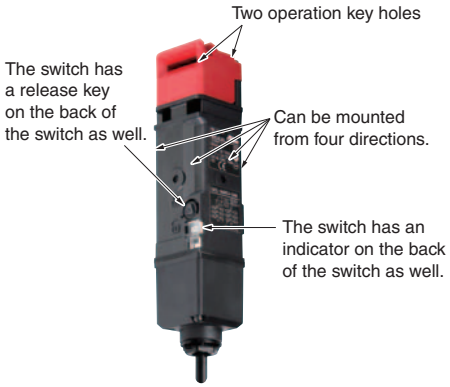
# Structure and Nomenclature

## Structure

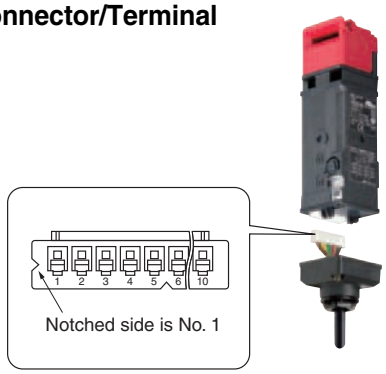
### D4SL-N□□□□-D□N Connector Type

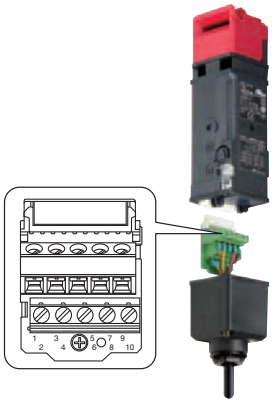



### D4SL-□□□□-D□ Terminal Block Type



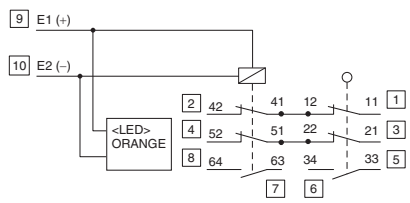

### Connector/Terminal



### Terminal Arrengement

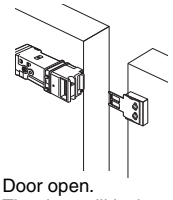
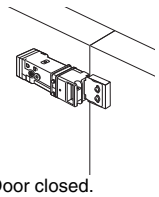
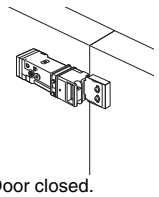
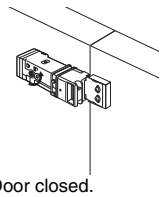
**for D4SL-N□N□□-D□**




**Note:** Numbers inside the boxes are terminal numbers printed on the product.

## Operating Cycle Examples for Standard Models

### D4SL-N□□□A-□ (Mechanical Lock Models)

| Door condition | Condition 1 | Condition 2 | Condition 3 | Return to condition 1 | Turning the special release key |
|---|---|---|---|---|---|
| |  |  |  | |  |
| | Door open. The door will lock when the door closes. | Door closed. The door is locked. | Door closed. The door can be opened. | | Door closed. No power is supplied to the solenoid. The door is unlocked manually. |
| **Terminal No. and Contact No.** / **Function** | | | | | |
| 9 E1- 10 E2 / Solenoid ON | | | ■ | | |
| 2 42- 1 11 (NC)<br>4 52- 3 21 (NC) / Door open/closed detection and lock monitor contacts | | ■ | | | |
| 3 21- 4 22 (NC)<br>5 31- 6 32 (NC) / Door open/closed detection contact | | ■ | ■ | | ■ |
| 5 33- 6 34 (NO) / Door open/closed detection contact | ■ | | | | |
| 1 41- 2 42 (NC)<br>7 61- 8 62 (NC) / Lock monitor contact | | ■ | | | |
| 7 63- 8 64 (NO) / Lock monitor contact | ■ | | ■ | | ■ |

### D4SL-N□□□G-□ (Solenoid Lock Models)

| Door condition | Even when the door is closed, it does not lock until power is supplied to the solenoid. | Door closed. The door is locked. | Door closed. The door can be opened. |
|---|---|---|---|
| **Terminal No. and Contact No.** / **Function** | | | |
| 9 E1- 10 E2 / Solenoid ON | | ■ | |
| 2 42- 1 11 (NC)<br>4 52- 3 21 (NC) / Door open/closed detection and lock monitor contacts | | ■ | |
| 3 21- 4 22 (NC)<br>5 31- 6 32 (NC) / Door open/closed detection contact | | ■ | ■ |
| 5 33- 6 34 (NO) / Door open/closed detection contact | ■ | | |
| 1 41- 2 42 (NC)<br>7 61- 8 62 (NC) / Lock monitor contact | | ▒ | |
| 7 63- 8 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: 1.** The door open/closed detection and lock monitor contact configuration depends on the model.

**2.** If a current is detected in the solenoid lock model (built-in switches; N, P, Q, R), before the door is closed, the door will remain unlocked. Be sure to supply power to the solenoid after the door is closed.

# Specifications

## Standards and EC Directives

**Conforms to the following EC Directives:**

- Machinery Directive
- Low Voltage Directive
- EMC Directive
- EN ISO 14119
- EN60204-1
- GS-ET-19

### Certified Standards

| Certification body | Standard | File No. |
|---|---|---|
| TÜV SÜD | EN60947-5-1(certified direct opening) | Consult your OMRON representative for details. |
| UL *1 | UL508, CSA C22.2 No.14 | E76675 |
| CQC (CCC) | GB14048.5 | 2012010305582059 |
| KOSHA *2 | EN60947-5-1 | Consult your OMRON representative for details. |

*1. Certification has been obtained for UL CSA C22.2 No. 14.
*2. Only certain models have been certified.

## Certified Standard Ratings

### TÜV (EN60947-5-1) CCC (GB14048.5)

| Utilization category | AC-15 | DC-13 |
|---|---|---|
| Rated operating current (Ie) | 1.5 A *1<br>1 A *2 | 0.22 A |
| Rated operating voltage (Ue) | 120 V | 125 V |

**Note:** Use a 4 A fuse that conforms to IEC60127 as a short-circuit protection device. This fuse is not included with the switch.
*1. 11-42, 21-52, 21-22
*2. Other terminals

### UL/CSA (UL508, CSA C22.2 No.14)

**C150**

| Rated voltage | Carry current | Current (A) | | Volt-amperes (VA) | |
|---|---|---|---|---|---|
| | | Make | Break | Make | Break |
| 120 VAC | 2.5 A | 15 | 1.5 | 1,800 | 180 |

**R150**

| Rated voltage | Carry current | Current (A) | | Volt-amperes (VA) | |
|---|---|---|---|---|---|
| | | Make | Break | Make | Break |
| 125 VDC | 1.0 A | 0.22 | 0.22 | 28 | 28 |

### Solenoid Coil Characteristics

| Item | 24 VDC |
|---|---|
| Rated operating voltage (100% ED) | 24 VDC $^{+10\%}_{-15\%}$ |
| Current consumption * | Power ON:<br>6-contact type Approx. 6.4 W at 0.26 A<br>4-contact/5-contact type Approx. 4.8 W at 0.2 A<br>Constant: Approx. 2.6 W (average) at 0.2 A (max.) |
| Insulation | Class E (to 120°C) |

* A starting current is applied to the solenoid for Approx. 10 seconds.
After this, the internal circuit switches to a constant current.

### Indicator

| Item | LED type |
|---|---|
| Rated voltage | 24 VDC |
| Current consumption | Approx.10 mA |
| Color (LED) | Orange |

## Characteristics

| | | |
|---|---|---|
| **Degree of protection *1** | | IP67 (EN60947-5-1) |
| **Durability *2** | **Mechanical** | 1,000,000 operations min. |
| | **Electrical** | 150,000 operations min. (1 A resistance at 125 VAC) *3 |
| **Operating speed** | | 0.05 to 1 m/s |
| **Operating frequency** | | 4- and 5-contact Model: 30 operations minute max.<br>6-contact Model: 5 operations minute max. |
| **Direct opening force *4** | | 60 N min. (EN60947-5-1) |
| **Direct opening travel *4** | | 15 mm min. (EN60947-5-1) |
| **Holding force *5** | | 1,300 N min. |
| **Contact resistance** | | 200 mΩ max. |
| **Minimum applicable load *6** | | 1 mA resistive load at 5 VDC (N-level reference value) |
| **Rated insulation voltage (Ui)** | | 150 V (EN60947-5-1) |
| **Rated frequency** | | 50/60 Hz |
| **Protection against electric shock** | | Class Ⅱ(double insulation) |
| **Pollution degree (operating environment)** | | 3 (EN60947-5-1) |
| **Impulse withstand voltage (EN60947-5-1)** | **Between terminals of same polarity** | 1.5 kV |
| | **Between terminals of different polarity** | 1.5 kV |
| | **Between other terminals and non-current carrying metallic parts** | 2.5 kV |
| **Insulation resistance** | | 100 Ω min. (at 500 VDC) |
| **Vibration resistance** | **Malfunction** | 10 to 55 Hz, 0.35 mm single amplitude |
| **Shock resistance** | **Malfunction** | 80 $m/s^2$ min. |
| | **Destruction** | 1,000 $m/s^2$ min. |
| **Conditional short-circuit current** | | 100 A (EN60947-5-1) |
| **Conventional free air thermal current (Ith)** | | 2.5A (11-42, 21-52, 21-22)<br>1A (Others) |
| **Ambient operating temperature** | | −10 to 55°C (with no icing) |
| **Ambient operations humidity** | | 95% max. |
| **Weight** | | Head: Resin<br>Approx. 290 g (Connector model)<br>Approx. 330 g (Terminal block model)<br>Head: Metal<br>Approx. 370 g (Connector model)<br>Approx. 410 g (Terminal block model) |

**Note: 1.** The above values are initial values.

**2.** 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.
The contact surfaces will become rough once they have been used and contact reliability for smaller loads may be reduced.

*1. The degree of protection is tested using the method specified by the standard (EN60947-5-1).
Confirm that sealing properties are sufficient for the operating conditions and environment beforehand.
Although the switch box is protected from dust, oil or water penetration, do not use the D4SL in places where cutting chips, oil, water or chemicals may enter through the key hole on the head, otherwise Switch damage or malfunctioning may occur.

*2. The durability is for an ambient temperature of 5 to 35°C and an ambient humidity of 40% to 70%. For more details, consult your OMRON representative.

*3. Do not pass the 1 A, 125 VAC load through more than 3 circuits.

*4. These figures are minimum requirements for safe operation.

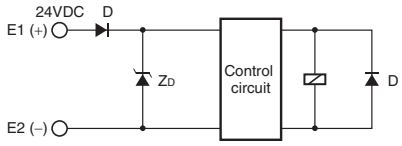
*5. This figure is based on the GS-ET-19 evaluation method.

*6. This value will vary with the switching frequency, environment, and reliability level.
Confirm that correct operation is possible with the actual load beforehand.

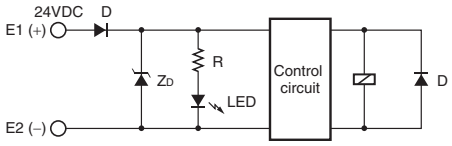
# Connection

## Internal Circuit Diagram

### Without indicator




### With indicator

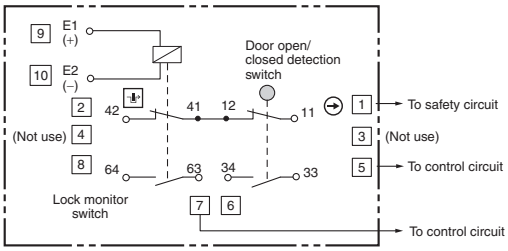



## Circuit Connection Example

- Direct opening contacts used as safety-circuit input are indicated with the mark.
- Do not switch circuits for three or more standard loads at the same time.
  Doing so may adversely affect insulation performance.
- DC solenoids have polarity. (E1: Positive, E2: Negative)
  Confirm terminal polarity before wiring.
- If a lock is required for safety, design the system so that the closing of the NC contacts on both the door open/closed detection switch and the lock monitor switch is detected.

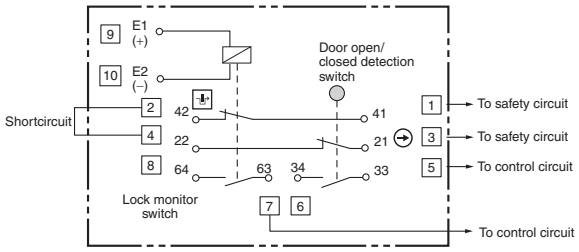
### Connection Example for D4SL-N□AF□-□

Contacts 12 and 41 are internally connected.



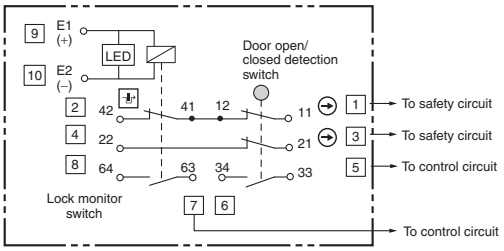

### Connection Example for D4SL-N□SF□-□

There is no internal connection, so connect contacts 22 and 42 or 21 and 42 externally.



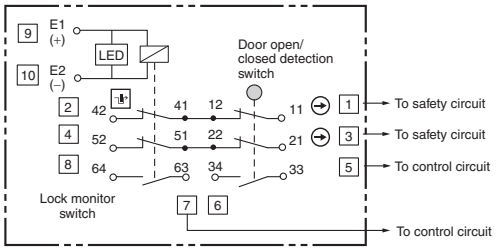

### Connection Example for D4SL-N□EF□-D□

Contacts 12 and 41 are internally connected.



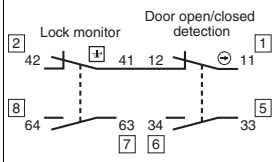
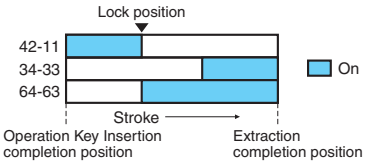
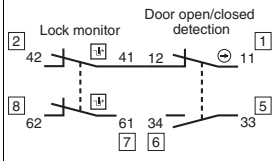
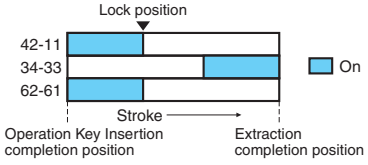
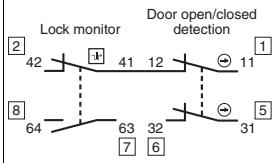
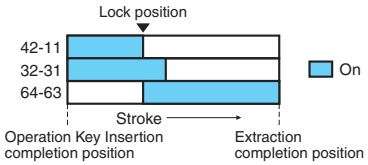
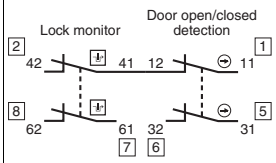
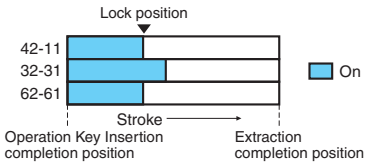
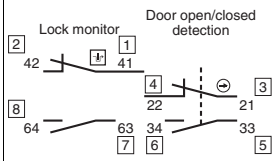
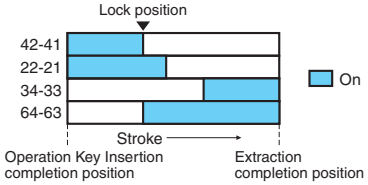
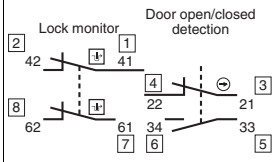
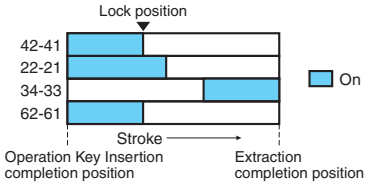
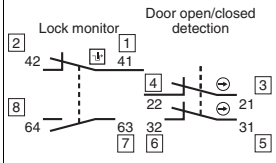
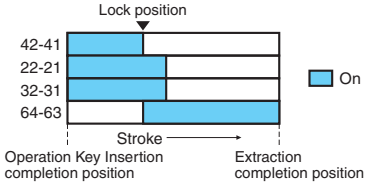
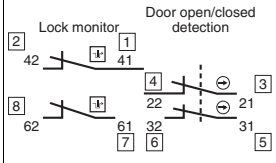
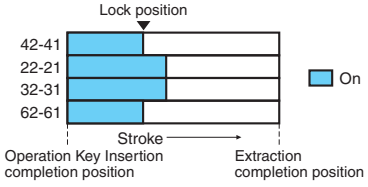

### Connection Example for D4SL-N□NF□-D□

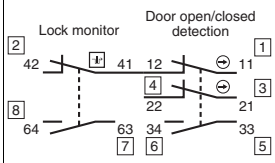
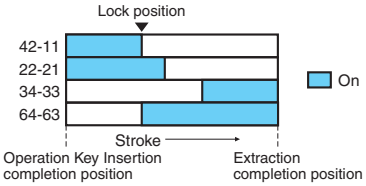
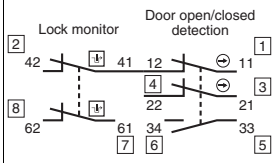
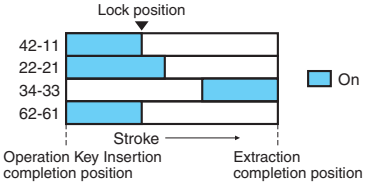
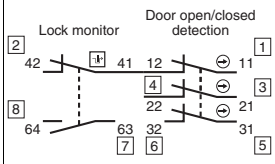
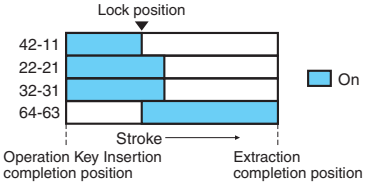
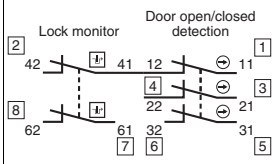
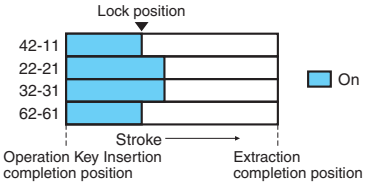
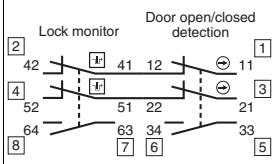
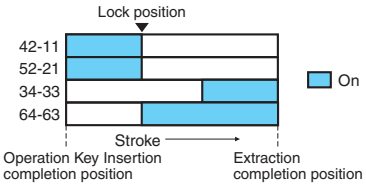
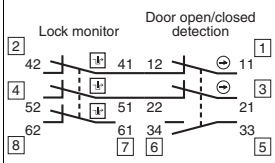
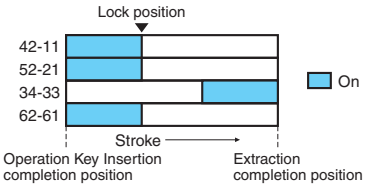
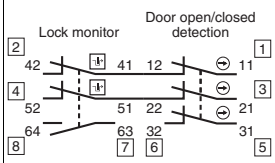
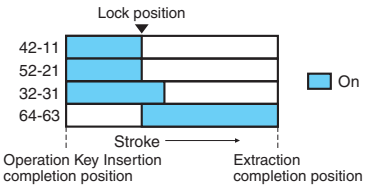
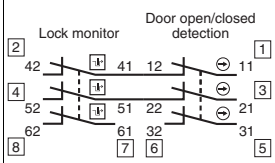
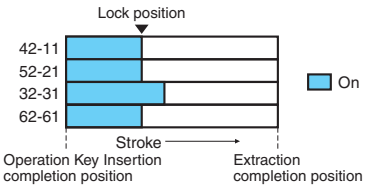
Contacts 12 and 41 and contacts 22 and 51 are internally connected.



## Contact Form

Indicates conditions where the Key is inserted and the lock is applied.

| Model | Contact (door open/ closed detection and lock monitor) | Contact Form | | Operating pattern | Remarks |
|---|---|---|---|---|---|
| | | Lock monitor | Door open/ closed detection | | |
| D4SL-N□A□□-□ | 1NC/1NO+ 1NC/1NO |  | |  | Only NC contact 11-12 has a certified direct opening mechanism. ⊖<br>The terminals 42-11, 34-33, and 64-63 can be used as unlike poles. |
| D4SL-N□B□□-□ | 1NC/1NO+2NC |  | |  | Only NC contact 11-12 has a certified direct opening mechanism. ⊖<br>The terminals 42-11, 34-33, and 62-61 can be used as unlike poles. |
| D4SL-N□C□□-□ | 2NC+1NC/1NO |  | |  | Only NC contact 11-12 and 31-32 has a certified direct opening mechanism. ⊖<br>The terminals 42-11, 32-31, and 64-63 can be used as unlike poles. |
| D4SL-N□D□□-□ | 2NC+2NC |  | |  | Only NC contact 11-12 and 31-32 has a certified direct opening mechanism. ⊖<br>The terminals 42-11, 32-31, and 62-61 can be used as unlike poles. |
| D4SL-N□S□□-□ | 1NC/1NO+ 1NC/1NO |  | |  | Only NC contact 21-22 has a certified direct opening mechanism. ⊖<br>The terminals 42-41, 22-21, 34-33, and 64-63 can be used as unlike poles. |
| D4SL-N□T□□-□ | 1NC/1NO+2NC |  | |  | Only NC contact 21-22 has a certified direct opening mechanism. ⊖<br>The terminals 42-41, 22-21, 34-33, and 62-61 can be used as unlike poles. |
| D4SL-N□U□□-□ | 2NC+1NC/1NO |  | |  | Only NC contact 21-22 and 31-32 has a certified direct opening mechanism. ⊖<br>The terminals 42-41, 22-21, 32-31, and 64-63 can be used as unlike poles. |
| D4SL-N□V□□-□ | 2NC+2NC |  | |  | Only NC contact 21-22 and 31-32 has a certified direct opening mechanism. ⊖<br>The terminals 42-41, 22-21, 32-31, and 62-61 can be used as unlike poles. |

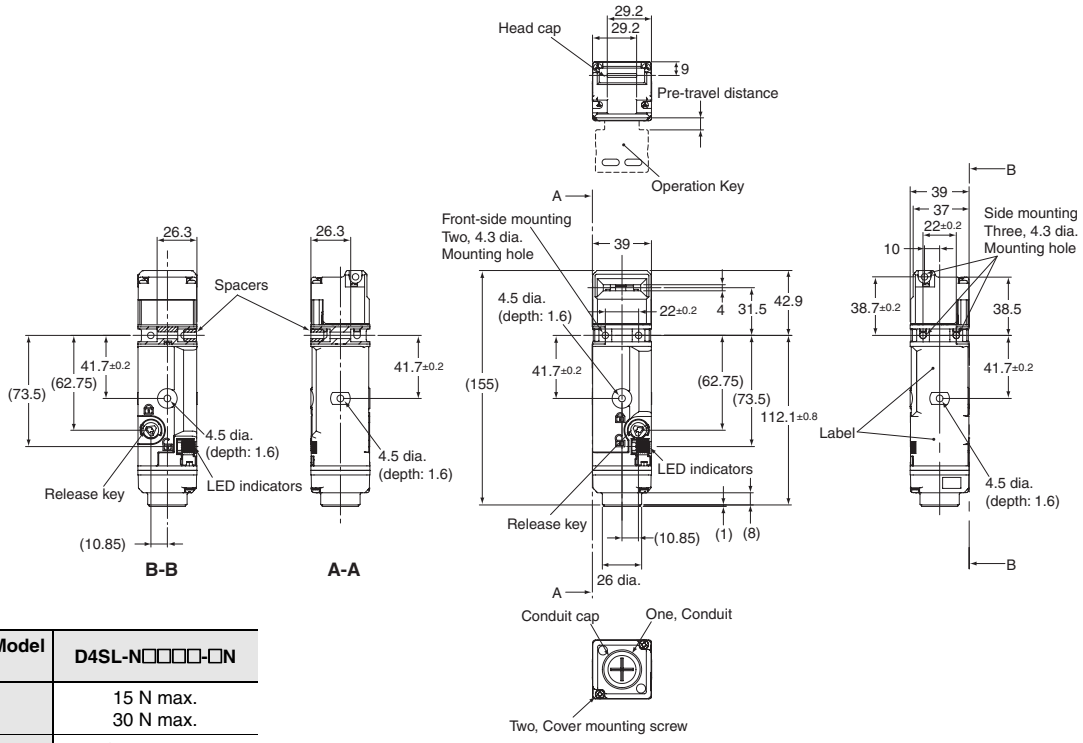
| Model | Contact (door open/ closed detection and lock monitor) | Contact Form | | Operating pattern | Remarks |
|---|---|---|---|---|---|
| | | Lock monitor | Door open/ closed detection | | |
| D4SL-N□E□□-□ | 2NC/1NO+ 1NC/1NO |  | |  | Only NC contact 11-12 and 21-22 has a certified direct opening mechanism. ⊖<br>The terminals 42-11, 22-21, 34-33, and 64-63 can be used as unlike poles. |
| D4SL-N□F□□-□ | 2NC/1NO+2NC |  | |  | Only NC contact 11-12 and 21-22 has a certified direct opening mechanism. ⊖<br>The terminals 42-11, 22-21, 34-33, and 62-61 can be used as unlike poles. |
| D4SL-N□G□□-□ | 3NC+1NC/1NO |  | |  | Only NC contact 11-12 ,21-22 and 31-32 has a certified direct opening mechanism. ⊖<br>The terminals 42-11, 22-21, 32-31, and 64-63 can be used as unlike poles. |
| D4SL-N□H□□-□ | 3NC+2NC |  | |  | Only NC contact 11-12 ,21-22 and 31-32 has a certified direct opening mechanism. ⊖<br>The terminals 42-11, 22-21, 32-31, and 62-61 can be used as unlike poles. |
| D4SL-N□N□□-□ | 2NC/1NO+ 2NC/1NO |  | |  | Only NC contact 11-12 and 21-22 has a certified direct opening mechanism. ⊖<br>The terminals 42-11, 52-21, 34-33, and 64-63 can be used as unlike poles. |
| D4SL-N□P□□-□ | 2NC/1NO+3NC |  | |  | Only NC contact 11-12 and 21-22 has a certified direct opening mechanism. ⊖<br>The terminals 42-11, 52-21, 34-33, and 62-61 can be used as unlike poles. |
| D4SL-N□Q□□-□ | 3NC+2NC/1NO |  | |  | Only NC contact 11-12 ,21-22 and 31-32 has a certified direct opening mechanism. ⊖<br>The terminals 42-11, 52-21, 32-31, and 64-63 can be used as unlike poles. |
| D4SL-N□R□□-□ | 3NC+3NC |  | |  | Only NC contact 11-12 ,21-22 and 31-32 has a certified direct opening mechanism. ⊖<br>The terminals 42-11, 52-21, 32-31, and 62-61 can be used as unlike poles. |

# Dimensions and Operating Characteristics

(Unit:mm)

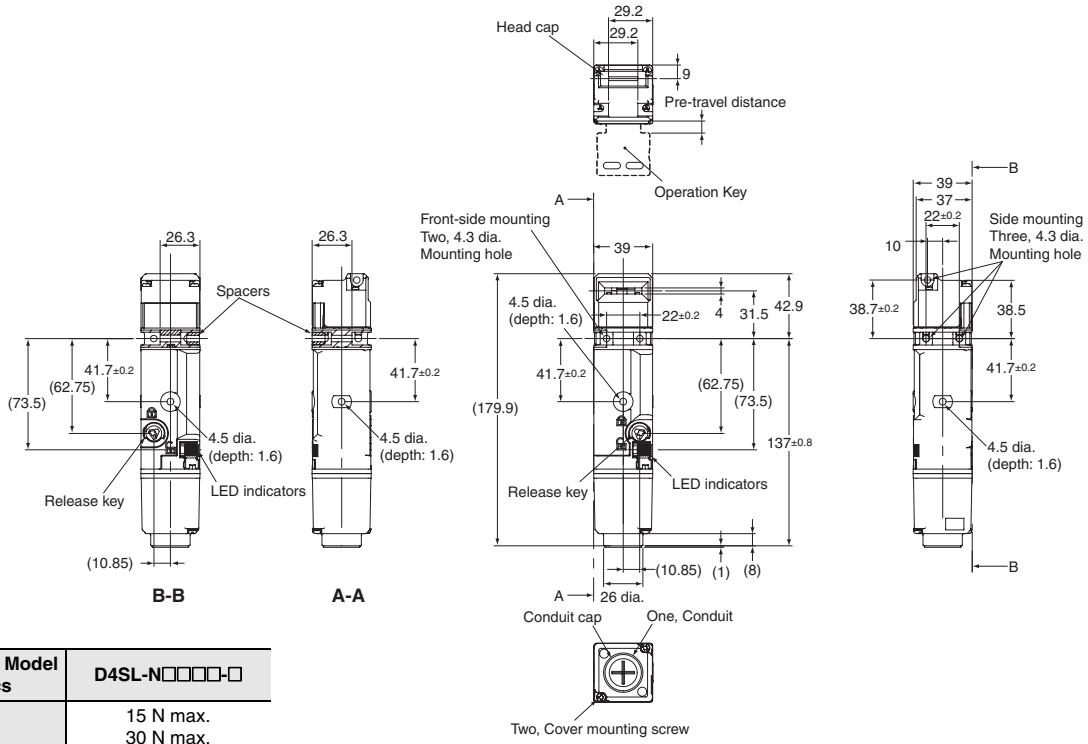
## Switches

### D4SL-N□□□□-□N (Connector Type)




| Model<br>Operating characteristics | D4SL-N□□□□-□N |
|---|---|
| Key insertion force<br>Key extraction force | 15 N max.<br>30 N max. |
| Pre-travel distance | 15 mm max. |
| Movement before being locked | 3 mm min. |

### D4SL-N□□□□-□ (Terminal Block Type)

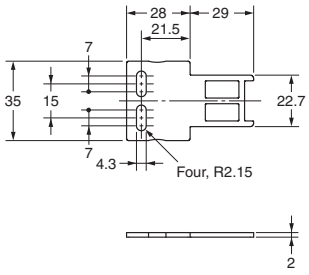



| Model<br>Operating characteristics | D4SL-N□□□□-□ |
|---|---|
| Key insertion force<br>Key extraction force | 15 N max.<br>30 N max. |
| Pre-travel distance | 15 mm max. |
| Movement before being locked | 3 mm min. |

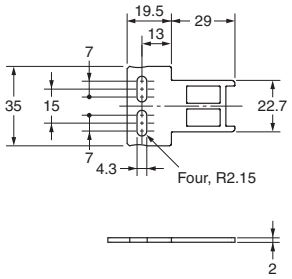
**Note:** Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

## Operation key

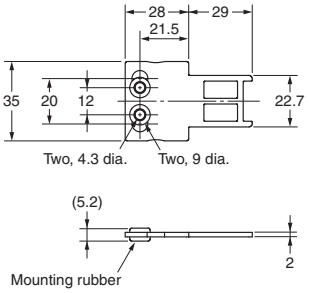
### D4SL-NK1



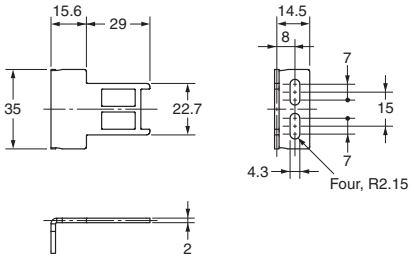

### D4SL-NK1S



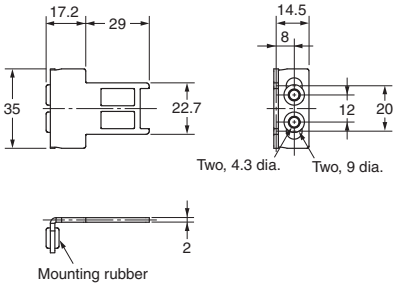

### D4SL-NK1G



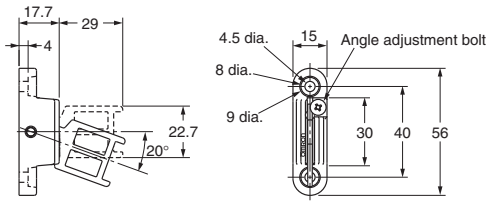

### D4SL-NK2



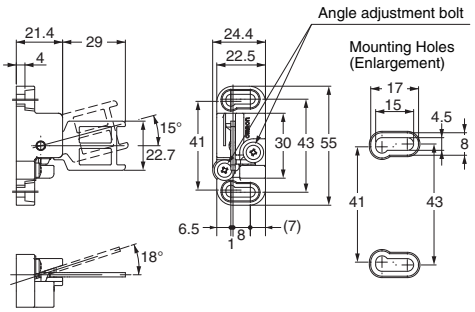

### D4SL-NK2G




### D4SL-NK3



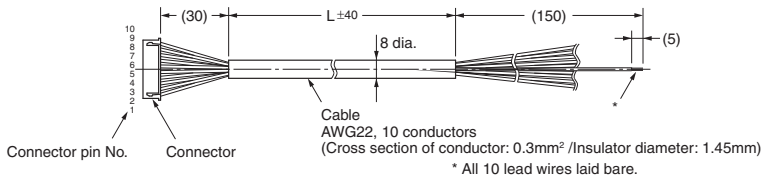

### D4SL-NK5




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

## Connector Cables

### D4SL-CN□

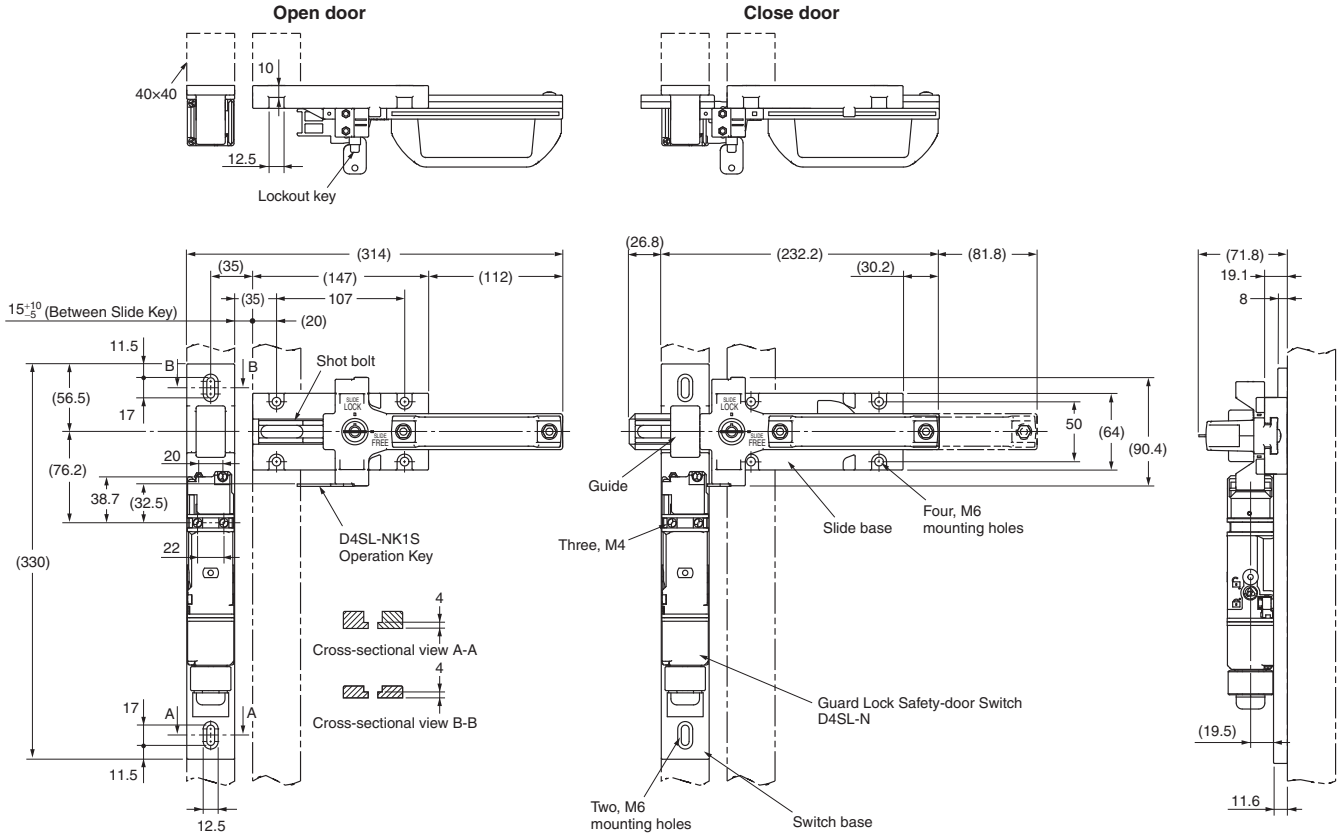



| Model | L size |
|---|---|
| D4SL-CN1 | 1 m |
| D4SL-CN3 | 3 m |
| D4SL-CN5 | 5 m |
| D4SL-CN10 | 10 m |

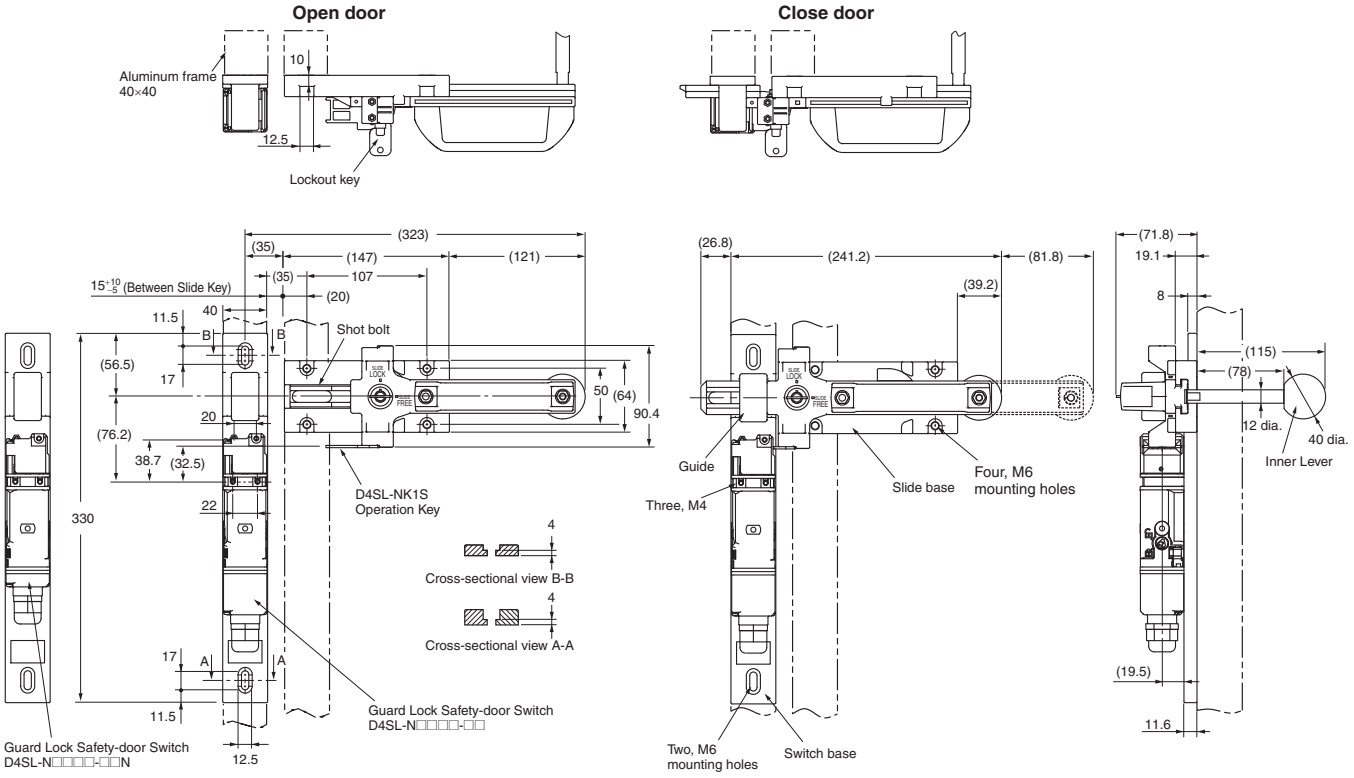
| Connector No. | Lead wire color | Connector No. | Lead wire color |
|---|---|---|---|
| 1 | Black | 6 | Green/White |
| 2 | Black/White | 7 | Yellow |
| 3 | Red | 8 | Yellow/White |
| 4 | Red/White | 9 | Brown |
| 5 | Green | 10 | Brown/White |

## Slide Key

### D4SL-NSK10-LK



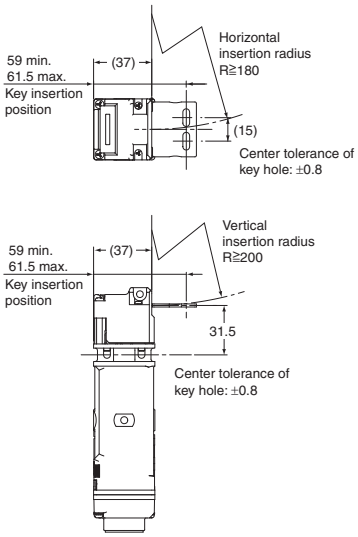
## D4SL-NSK10-LKH



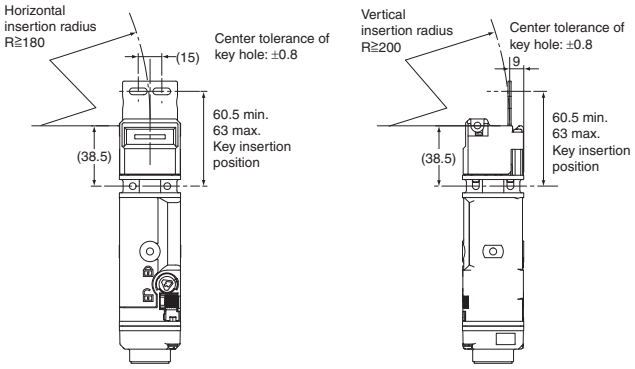

## Operation key Mounting

### D4SL-N+D4SL-NK1

#### With Front-inserted Operation Key

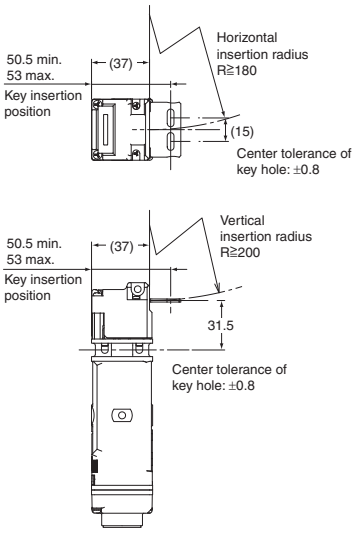



#### With Top-inserted Operation Key

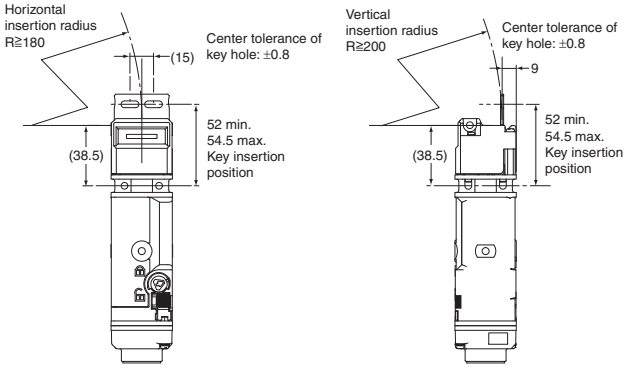


## D4SL-N+D4SL-NK1S

### With Front-inserted Operation Key

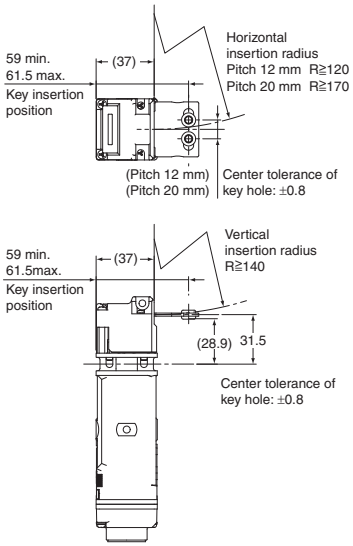



### With Top-inserted Operation Key

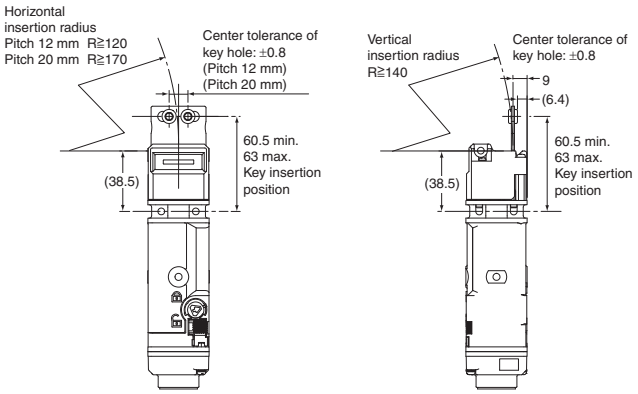



## D4SL-N+D4SL-NK1G

### With Front-inserted Operation Key

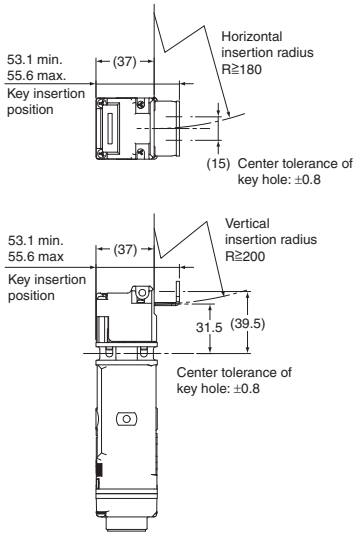



### With Top-inserted Operation Key

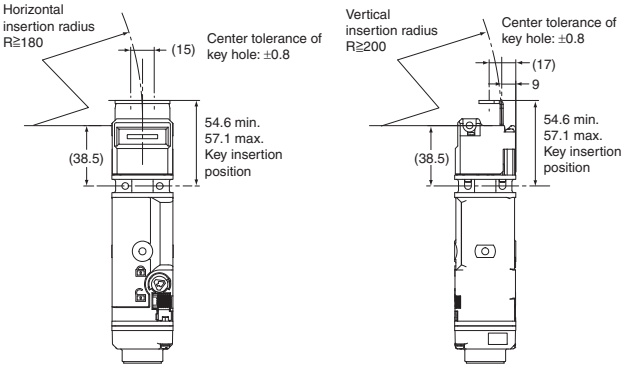



## D4SL-N+D4SL-NK2

### With Front-inserted Operation Key

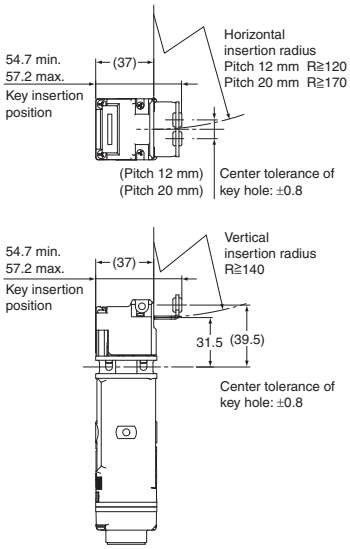



### With Top-inserted Operation Key

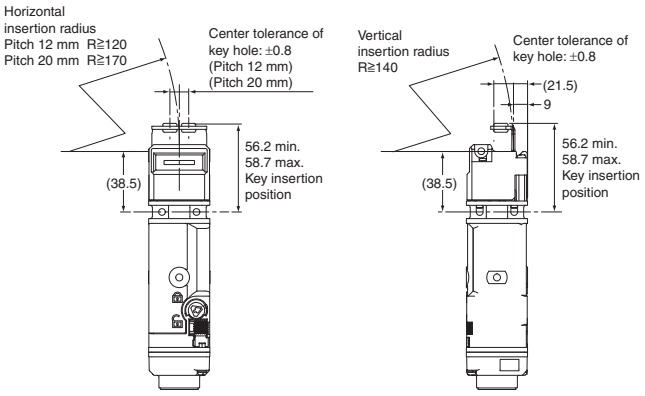


## D4SL-N+D4SL-NK2G

### With Front-inserted Operation Key

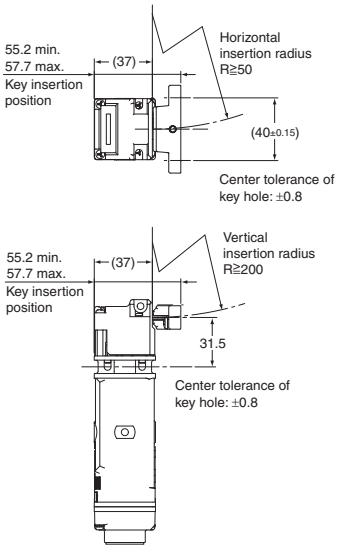



### With Top-inserted Operation Key

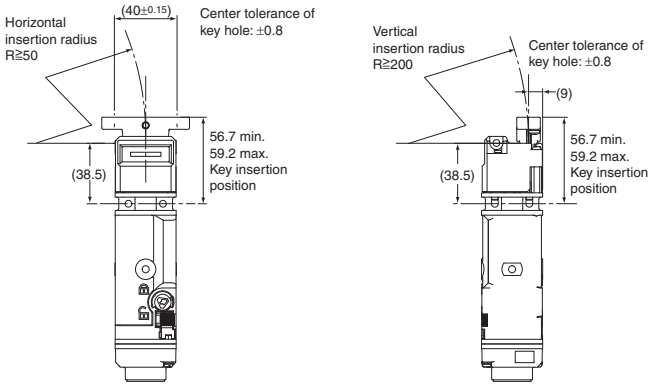



## D4SL-N+D4SL-NK3

### With Front-inserted Operation Key

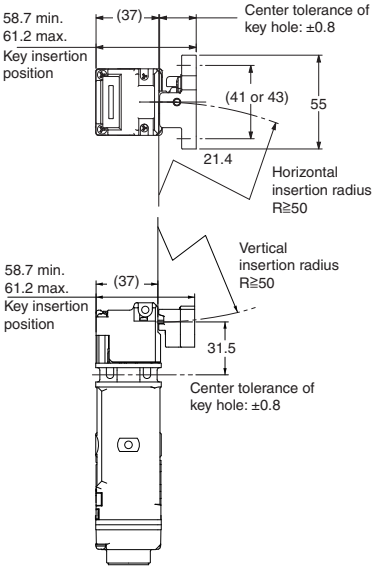



### With Top-inserted Operation Key

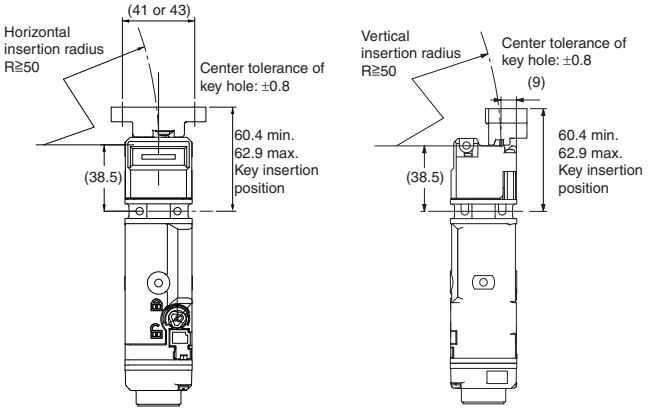



## D4SL-N+D4SL-NK5

### With Front-inserted Operation Key




### With Top-inserted Operation Key



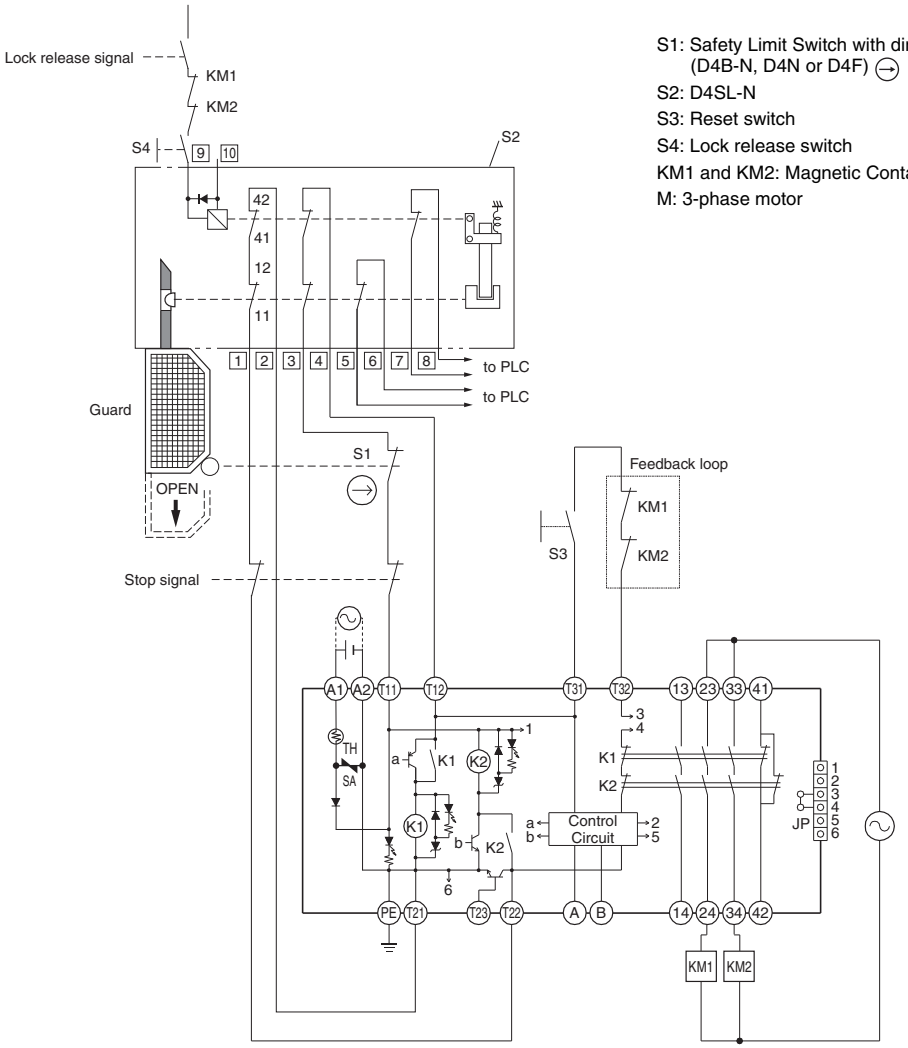
# Application Example

### D4SL-N Application Example

| PL/Safety Category | Applied models | Stop category | Reset method |
|---|---|---|---|
| Equivalent to PLe/4 | D4SL-N□R□A-□ Compact<br>Safety Door Switch with Magnetic Lock (mechanical lock)<br>G9SA-301 (24 VAC/DC)<br>Safety Relay Unit | 0 | Manual |

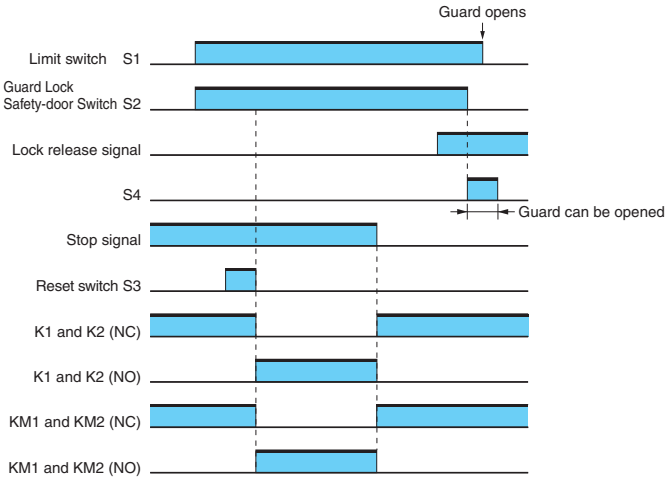
## Application Overview

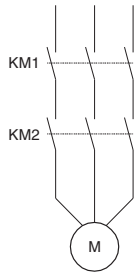
- If the guard is opened, it is detected with S2 and the power supply to the motor (M) is shut OFF.
- When the guard is closed, the lock status can be detected and the power supply to the motor (M) remains shut OFF until limit switch S3 is pressed.




S1: Safety Limit Switch with direct opening mechanism (D4B-N, D4N or D4F) ⊖
S2: D4SL-N
S3: Reset switch
S4: Lock release switch
KM1 and KM2: Magnetic Contactor
M: 3-phase motor

### Timing Chart




**Note: 1.** The above circuit diagram is for Category 3.
**2.** Numbers inside the boxes are terminal numbers printed on the product.

# Safety Precautions

Be sure to read the precautions **for All Safety Door Switches** in the website at:http://www.ia.omron.com/.

| | |
|---|---|
| ⚠ DANGER | **Indicates an imminently hazardous situation which, if not avoided, is likely to result in serious injury or may result in death. Additionally there may be severe property damage.** |
| ⚠ CAUTION | **Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.** |
| **Precautions for Safe Use** | **Supplementary comments on what to do or avoid doing, to use the product safely.** |
| **Precautions for Correct Use** | **Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction or undesirable effect on product performance.** |

## ⚠ DANGER

**Injury may occasionally occur. Always check to make sure that the safety functions operate correctly before using the machine. The safety functions may not operate correctly because of wiring mistakes, setting mistakes, or Switch malfunction, causing some machines to continue operating in situations where they should be stopped.**

## ⚠ CAUTION

**D4SL-N**

**Injury may occasionally occur. When the Switch function is damaged, some machines may continue operating in situations where they should be stopped.**
**Do not impose a force exceeding the key holding force.**
**Always provide a lock separate from the Switch, attach a warning seal to avoid excessive force applied to the Switch, or provide an indicator lamp to show the locked/unlocked status of the door.**

**D4SL-NSK10-LK□**

**Do not use this product mounted so that it slides vertically.**
**This may cause malfunction, resulting in personal injury.**

**Do not insert the operation key with the door open.**
**Devices may start to operate, resulting in injury.**

## Precautions for Safe Use

**D4SL-N**

### Operating Environment

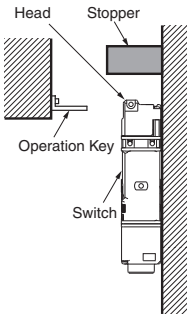
Do not use the Switch submersed in oil or water or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch. (The IP67 degree of protection of the Switch specifies the amount of water penetration after the Switch is submerged in water for a certain period of time.)

### Wiring

- Do not switch circuits for three or more standard loads (125 VAC, 1A). Doing so may adversely affect insulation performance.
- Do not allow the load current to exceed the rated value.
  For metal connector, use a connector with the screw length of 9 mm or less. Otherwise it may result in electric shock.
- Do not use metallic conduits. In the event of damage to the conduit opening, this may cause seal failure and may result in electric shock.
- Do not use a metal connector for a 1/2-14NPT connector. In the event of damage to the conversion adapter, this may cause seal failure and may result in electric shock.
- Always attach the cover after completing wiring and before using the Switch. Do not supply power when the cover is not attached. Electric shock may occur if the Switch is used without the cover attached.
- When using the terminal block type, make sure that foreign material does not adhere to the terminal block board. Otherwise a short circuit may occur between terminals and safety functions may fail to work properly.

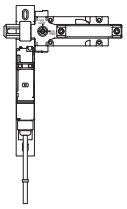
### Installation

- Make sure the Switch is mounted securely to prevent it from falling off. Otherwise injury may result.
- Do not use a Switch as a stopper.
  Be sure to install a stopper as shown in the following illustration so that the Operation Key does not touch the head.
  Do not subject the Switch to a shock that exceeds the Switch's shock resistance of 1,000 m/s$^2$.



## D4SL-NSK10-LK□

- Do not drop the Product. Doing so may prevent the Product from functioning to full capacity.
- Mount the Product securely to prevent it from falling. Otherwise, injury may occur.
- Do not attempt to disassemble or modify the Switch. Doing so may cause the Switch to malfunction.
- Make sure that the gap between the shot bolt and the guide is ±0.5 mm.
  Otherwise, excessive wear or damage may cause malfunction.
- To ensure safety, do not operate the Switch with anything other than the Slide Key Unit.
- Your hand may be injured by being pinched between the Operation Key and Switch when closing the door with your hand on the Product.
- Be careful to avoid pinching your hand when operating the Slide Handle.
- Do not impose a force of exceeding 1 N•m when operating the Lockout Key.
  Otherwise, the Product may be damaged and may not operate properly.
  To prevent damage, attach the supplied labels for display near the Product.
- Do not force the slide handle to move when the lockout key is not inserted. Doing so may damage the product and make operation impossible.
- Do not force the slide handle to move when the door is locked. Doing so may damage the product and make operation impossible.
- Do not close the door with the shot bolt removed. Doing so may damage the product and make operation impossible.
- Turn the Lockout Key to the "SLIDE LOCK" position and remove it when opening the door to prevent a third party from operating the Slide Handle.
- The durability of the Switch varies considerably depending on the switching conditions. Always confirm the usage conditions by using the Switch in an actual application, and use the Switch only for the number of switching operations given in the performance specifications.
- The user must not maintain or repair equipment incorporating the Switch. Contact the manufacturer of the equipment for any maintenance or repairs required.
- Refer to the *D4SL-N Guard Lock Safety-door Switch Instruction Sheet* about storage conditions, ambient conditions, Switch details, and handling methods.
- Do not apply excessive force in the direction of the slide. This may damage the product and cause it to malfunction.
- Do not force the switch or cable. This may damage the product. The cable should be fixed at a point separate from the switch.



## Precautions for Correct Use

### D4SL-N

#### Solenoid Lock Models

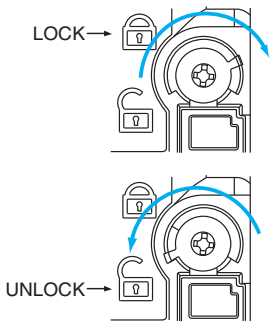
- Be sure to supply power to the solenoid after the door is closed (after the Operation Key is inserted).
- The solenoid lock locks the door only when power is supplied to the solenoid. Therefore, the door will be unlocked if the power supply to the solenoid stops. Therefore, do not use solenoid lock models for machines that may be operating and dangerous even after the machine stops operating.

#### Release Key

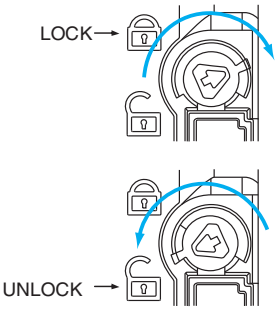
- The release key is used to unlock the Switch in case of emergency or if the power supply to the Switch stops.
- If the release key setting is changed from LOCK to UNLOCK, the lock will be released and the safety door can be opened (mechanical lock models only).

**Front**

**D4SL-N□□□□-□**

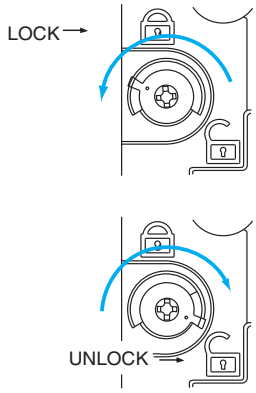



**D4SL-N□□□□-□4**

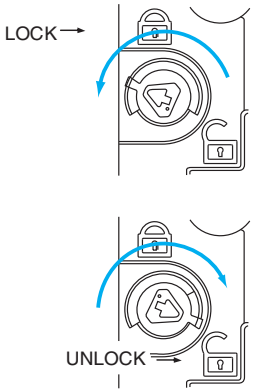



**Back**

**D4SL-N□□□□-□**




**D4SL-N□□□□-□4**




- After setting the release key to UNLOCK to, for example, perform maintenance, be sure to return it to LOCK setting before resuming operation.
- The release key is set in the unlock position at the factory for the D4SL-N□□□A and to the lock position for the D4SL-N□□□G.
- In the unlock position, even when the door of large machines or stamping machines is closed during preliminary adjustment, the door will remain unlocked and the machines will not be activated.
- Do not use the release key to start or stop machines.
- The auxiliary lock must be released only by authorized personnel.
- Do not impose a force exceeding 0.2 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.

#### Mounting Covers

- Confirm that the seal rubber has no defects before use. If the seal rubber is displaced or raised, or has foreign particles adhered to it, the sealing capability of the seal rubber will be adversely affected.

### Hinged Door

- 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 close to the handle.

## Mounting

### Appropriate Tightening Torque

Loose screws may result in malfunction. Tighten the screws to the specified torques.

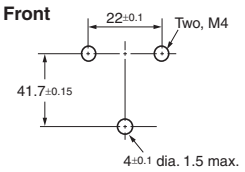
| | |
|---|---|
| **Cover mounting screw** | 0.4 to 0.5 N•m |
| **Operation Key mounting screw** | 2.4 to 2.8 N•m (D4SL-NK□ and -NK□S) |
| | 0.75 to 1.15 N•m (D4SL-NK□G) |
| **Switch mounting screw** | 0.75 to 1.15 N•m |
| **Connector** | 1.8 to 2.2 N•m (except 1/2-14NPT) |
| | 1.4 to 1.8 N•m (1/2-14NPT) |
| **Terminal screw** * **Terminal block type only** | 0.5 to 0.6 N•m (D4SL-N□□□□-□□) |

### Switch and Operation Key Mounting

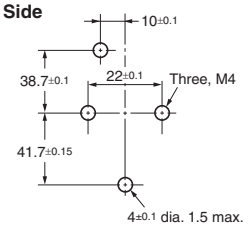
- Mount the Switch and Operation Key securely to the applicable tightening torque with M4 screws. Always use washers.
- The switch can be fastened more firmly by a stud (4 mm dia., 1.5 mm max height) inserted from back side at the hole of the switch.

**Switch mounting**

Front

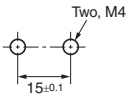



Side

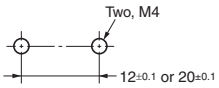



**Operation Key mounting**

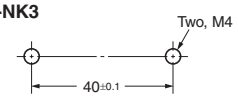
D4SL-NK1/-NK2



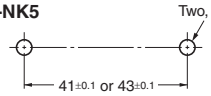

D4SL-NK1G/-NK2G




D4SL-NK3



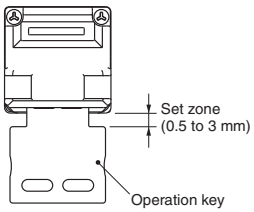

D4SL-NK5




- Do not impose excessive force on the key top while the operation key is inserted into the switch body or drop the switch with the operation key inserted to avoid the deformation of the key or the breakage of the switch body.
- Do not use the operation key other than dedicated OMRON's (D4SL-NK□). Otherwise switch may be damaged.
- Do not use the operation key D4SL-K□. A lock will not be closed and a machine will not be activated.
- Be sure that the operation key can be inserted properly to key hole with a tolerance of ±0.8 mm.
- Insert the operation key into the key hole according to the specified “operation key insertion radius in horizontal direction”.
- When mounting at the side of switch body, mount the switch with 3 points including the head.
- Attach cap heads to any operation key holes that are not being used.

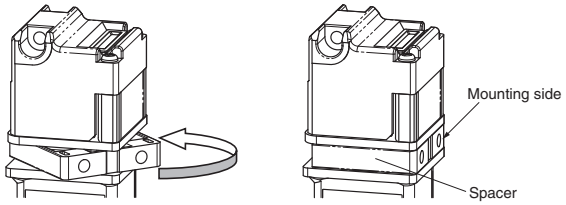
### Securing the Door

When the door is closed (with the Operation Key inserted), the Operation Key may exceed the set zone because of, for example, the door's own weight, machine vibration, or the door cushion rubber.
Secure the door with a stopper (hook) so that the Operation Key remains within the set zone.




### Spacer

Do not remove a spacer. Rotate the spacer in accordance with the Switch mounting direction. Use of the Switch without spacer will reduce the lock strength.



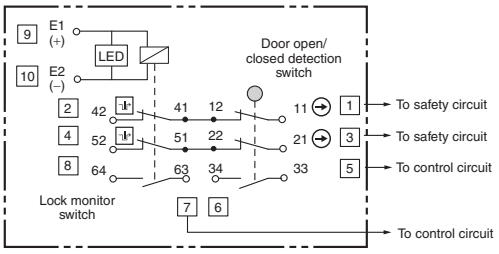

## Wiring

### Circuit Connection Example

- Direct opening contacts used as safety-circuit inputs are indicated with the ⊖ mark.
- DC solenoids have polarity. (E1: +, E2: –) Confirm terminal polarity before wiring.
- The current of the 24 VDC solenoid is different from when it is first turned ON as to when it is in operation. To take into account possible voltage drops, it is important to apply a rated operation voltage.
- To enable the 24 VDC solenoid, it is necessary to select the appropriate power supply capacity.
- The ON and OFF contact operation will not engage simultaneously.
  Be sure to confirm operation under actual operating conditions.
- If a lock is required for safety, design the system so that the closing of the NC contacts on both the door open/closed detection switch and the lock monitor switch is detected.

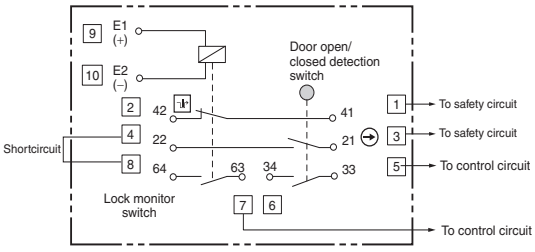
**(D4SL-N□N□□-D□)**

Contacts 12 and 41 and contacts 22 and 51 are internally connected.



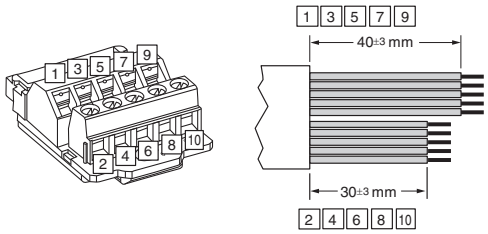

**(D4SL-N□SF□-□)**

There is no internal connection, so connect contacts 22 and 42 or 21 and 42 externally.



### Wiring Precautions for D4SL-N□□□□-□□

- Do not wire the Switch while power is being supplied. Doing so may result in electric shock.
- Do not let particles, such as small pieces of lead wire, enter the switch body when wiring.
- Do not directly wire the stranded wire to the terminal block.
- When connecting to the terminals via insulating tube and bar terminals, arrange the bar terminals so that they do not rise up onto the case or the cover.
- Applicable lead wire size: AWG22 to AWG18 (0.3 to 0.75 mm$^2$).
- Use lead wires of an appropriate length. Not doing so may result in excess length causing the cover to rise and not fit properly.
- Remove the terminal block board out of the unit to perform wiring. Be sure to insert the connector properly.
- Do not pull on the lead wires with excessive force. Doing so may disconnect them.



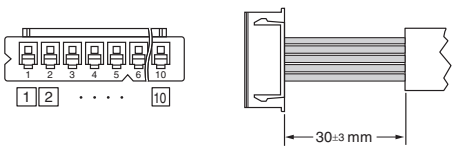

### Recommended Crimp Terminals

| Manufacturer | Model | Applicable wire lead |
|---|---|---|
| PHOENIX CONTACT | AI0.34-8 TQ | AWG22 |
| | AI0.5-8 WH | AWG20 |
| | AI0.75-8 GY | AWG18 |

L1: 14 mm max.
L2: 8 mm max.

### Wiring Precautions for D4SL-N□□□□-□□N

- Do not wire the Switch while power is being supplied. Doing so may result in electric shock.
- Do not let particles, such as small pieces of lead wire, enter the switch body when wiring.
- Applicable lead wire size: AWG24 to AWG22 (0.2 to 0.3 mm$^2$). Do not apply a current of 2 A or more when using AWG24.
- 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 pull on the lead wires with excessive force. Doing so may disconnect them.
- Do not forcibly insert the wired socket at the cable side into the connector or D4SL-N's conduit opening. Doing so may cause cable break.
  Be sure to insert the cable into the connector or D4SL's conduit opening before performing wiring to the socket, or insert the cable into the connector or conduit opening from the opposite side of the socket.

#### Applicable socket for cable side

| Manufacturer | Name | Model |
|---|---|---|
| J.S.T. Mfg Co. | Housing | XHP-10 |
| | Contact (applicable wire lead: AWG24 to AWG22) | SXH-001T-P0.6 |

### 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.
- Use the cable with the connector-specified outside diameter.
- For the 1/2-14NPT conduit, mount a provided conversion adapter to use the connector above.

### 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 | Remarks |
|---|---|---|---|---|
| G1/2 | LAPP | ST-PF1/2 5380-1002 | 6.0 to 12.0 mm | |
| | Ace Service Co. | LS-2G | 6.0 to 11.0 mm | Short type |
| M20 | LAPP | ST-M20×1.5 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 for G1/2, or GPM20 for M20), and tighten to the applicable torque. Seal Packing is sold separately.
- LAPP is a German manufacturer.
- Ace Service Co. is a Japanese manufacturer.