

Safety-Door Switch

Features Special Operation Key That Positively Pulls Apart Contacts, Contributing to Machine Safety

- The switch contact is opened by a positive opening mechanism (NC contacts only)
- Mounting pitch and shape of the switch box conforms to CENELEC (EN50041)
- Degree of protection of the switch box: IP67 (EN60947-5-1)
- Standards and EC Directives:
 - Conforms to the following EC Directives:
 - Machinery Directive
 - Low Voltage Directive
 - EN50041
 - EN1088
- Approved Standards



| Agency | Standard | File No. |
|---------------|------------------|----------------------------------|
| TÜV Rheinland | EN60947-5-1 | R9351022 (Positive opening:) |
| UL | UL508 | E76675 |
| CSA | CSA C22.2 No. 14 | LR45746 |
| BIA | GS-ET-15 | 9303323 |
| SUVA | SUVA | E6187.d |

Ordering Information

MODEL NUMBER LEGEND

Switch

D4BS - S

1 2 3

1. **Conduit**
 - 1: PG13.5 (1 conduit, European type)
 - 2: G1/2 (1 conduit, Japanese type)
 - 3: 1/2-14NPT (1 conduit, North American type)
 - 5: PG13.5 (3-conduit, European type)
 - 6: G1/2 (3-conduit, Japanese type)
 - 7: 1/2-14NPT (3-conduit, North American type)
2. **Built-in Switch**
 - 5: 1NC/1NO (Slow-action)
 - A: 2NC (Slow-action)
3. **Head Mounting Direction**
 - F: Four mounting directions possible (front-side mounting at shipping)



Operation Key

D4BS - K

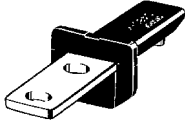
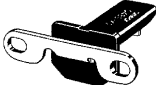
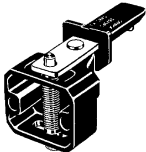
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1. **Operation Key Type**
 - 1: Horizontal mounting
 - 2: Vertical mounting
 - 3: Adjustable mounting (Horizontal)

■ SWITCHES

| Description | | | Part number | | |
|-------------------|---------------------------------|---------------------|---|-----------------------|-------------------|
| Conduit size/type | | Mounting direction | | 1NC/1NO (Slow-action) | 2NC (Slow-action) |
| 1-conduit | Pg13.5 (European type) | Front-side mounting |  | D4BS-15FS | D4BS-1AFS |
| | G1/2 (Japanese type) | | | D4BS-25FS | D4BS-2AFS |
| | 1/2-14NPT (North American type) | | | D4BS-35FS | D4BS-3AFS |
| 3-conduit | Pg13.5 (European type) | |  | D4BS-55FS | D4BS-5AFS |
| | G1/2 (Japanese type) | | | D4BS-65FS | D4BS-6AFS |
| | 1/2-14NPT (North American type) | | | D4BS-75FS | D4BS-7AFS |

■ OPERATION KEYS (ORDER SEPARATELY)

| Type | Part number |
|--|-------------|
| Horizontal mounting  | D4BS-K1 |
| Vertical mounting  | D4BS-K2 |
| Adjustable mounting (Horizontal)  | D4BS-K3 |

Specifications

■ APPROVED STANDARD RATINGS

TÜV (EN60947-5-1)

| | |
|------------------------------|-------|
| Utilization category | AC-15 |
| Rated operating current (Ie) | 2 A |
| Rated operating voltage (Ue) | 400 V |

Note: Use IEC269-compliant 10-A fuse type gI or gG as a short-circuit protective device.

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

A600

| Rated voltage | Carry current | Current | | Volt-amperes | |
|---------------|---------------|---------|-------|--------------|--------|
| | | Make | Break | Make | Break |
| 120 VAC | 10 A | 60 A | 6 A | 7,200 VA | 720 VA |
| 240 VAC | | 30 A | 3 A | | |
| 480 VAC | | 15 A | 1.5 A | | |
| 600 VAC | | 12 A | 1.2 A | | |

■ CHARACTERISTICS

| | |
|---|--|
| Degree of protection (see note 2) | IP67 (EN60947-5-1) |
| Life expectancy (see note 3) | Mechanical: 1,000,000 operations min. Electrical: 500,000 operations min. (10 A at 250 VAC, resistive load) |
| Operating speed | 0.1 m/s to 0.5 m/s |
| Operating frequency | 30 operations/min max. |
| Rated frequency | 50/60 Hz |
| Contact gap | 2 x 2 mm min. |
| Positive opening force (see note 4) | 19.61 N min. (EN60947-5-1) |
| Positive opening travel (see note 4) | 20 mm min. (EN60947-5-1) |
| Full stroke | 23 mm min. |
| Insulation resistance | 100 M Ω min. (at 500 VDC) between terminals of same or different polarity, between each terminal and ground, and between each terminal and non-current-carrying metal part |
| Contact resistance | 25 m Ω max. (initial value) |
| Rated insulation voltage (U _i) | 600 VAC (EN60947-5-1) |
| Conventional enclosed thermal current (I _{the}) | 20 A (EN60947-5-1) |
| Dielectric strength (U _{imp}) | Impulse dielectric strength (U _{imp}) 4 kV (EN60947-5-1) for 1 min between terminals of same or different polarity, between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal part |
| Switching overvoltage | 1,500 V max. (EN60947-5-1) |
| Conditional short-circuit current | 100 A (EN60947-5-1) |
| Short-circuit protective device (SCPD) | 10 A fuse type gI of gG (IEC 269) |
| Pollution degree (operating environment) | 3 (EN60947-5-1) |
| Insulation class | Class I (with ground terminal) |
| Vibration resistance | Malfunction: 10 to 500 Hz, 0.65-mm single amplitude |
| Shock resistance | Destruction: 1,000 m/s ² min. (IEC68-2-27) Malfunction: 300 m/s ² min. (IEC68-2-27) |
| Ambient temperature | Operating: -40°C to 80°C (with no icing) |
| Ambient humidity | Operating: 95% max. |
| Weight | Approx. 285 g (in the case of D4BS-15FS) |

Note: 1. The above figures are initial values.

- Although the Switch casing resists dust, oil, and water, make sure that the keyhole on the head is free from dust, oil, water, and chemical, or the D4BS may wear out, break, or malfunction.
- Life expectancy values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.
- These figures are minimum requirements for safe operation.

■ OPERATING CHARACTERISTICS

| | | |
|------------------------------|-------------------------------|-------------------------------|
| Model | D4BS-1□□S/D4BS-2□□S/D4BS-3□□S | D4BS-5□□S/D4BS-6□□S/D4BS-7□□S |
| Operating force (extraction) | 19.61 N max. | |
| Release force (insertion) | 19.61 N max. | |
| Pretravel (PT) | 10±5 mm | |
| Positive opening force | 19.61 N min. | |
| Positive opening stroke | 20 mm min. | |

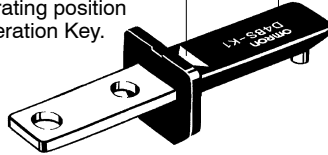
Nomenclature

Operation Key

D4BS's exclusive-use Operation Key is provided to assure accurate switching operation.

Set Zone Mark

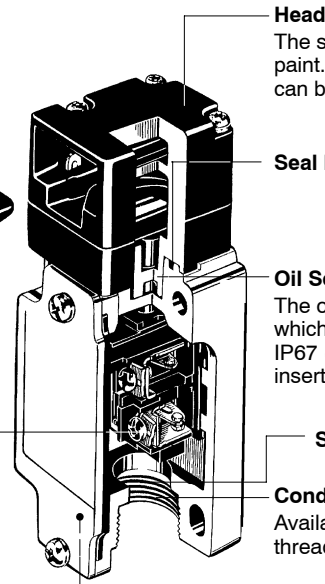
A triangular Set Zone Mark makes it easy to adjust the operating position when inserting the Operation Key.



Built-in Switch

A shearing force contact separating mechanism (NC contact) is employed, which positively pulls apart the contacts from each other by using shearing force if any abnormality such as contact welding should occur in the contact area.

There is a difference in level between the NC and NO terminal, which assures easy wiring.



Head

The switch head is coated with easy-to-see red paint. The mounting direction of the switch head can be varied to any of the four directions.

Seal Ring (NBR)

Oil Seal (NBR)

The operation plunger employs an oil seal, with which the switch box meets the requirements of IP67 (the sealing capability of the Operation Key's insertion mouth is IP00).

Seal Packing (NBR)

Conduit Opening

Available in three different types of conduit threads: Pg 13.5, G1/2, or 1/2-14NPT.

Ground Terminal Screw

A ground terminal is provided to improve safety. (Built into the Unit.)

Operation

■ **Contact Form (Diagrams Show State with Key Inserted)**

| Model | Contact form | Diagrams | Remarks |
|-----------|--------------|----------|---|
| D4BS-□5□S | 1NC/1NO | | <p>Only NC contact 11-12 has an approved positive opening mechanism. (→)</p> <p>Terminals 11-12 and 23-24 can be used as unlike poles.</p> |
| D4BS-□A□S | 2NC | | <p>NC contacts 11-12 and 21-22 have an approved positive opening mechanism. (→)</p> <p>Terminals 11-12 and 21-22 can be used as unlike poles.</p> |

Note: The terminal numbers are in accordance with EN50013, and the contact symbols are in accordance with IEC947-5-1.

Dimensions

Unit: mm

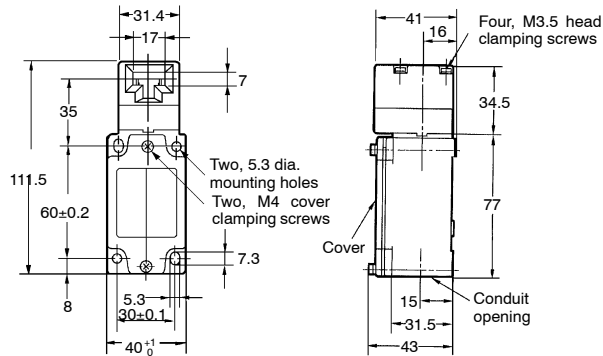
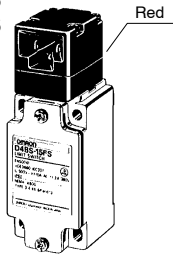
- Note: 1. A tolerance of ± 0.4 mm applies to all dimensions, unless a different tolerance is specifically indicated.
 2. The conduit thread varies with the model as follows:.

| Conduit type | Model |
|----------------------------|----------------------|
| Pg 13.5 (European) | D4BS-1□□S, D4BS-5□□S |
| G1/2 (Japanese) | D4BS-2□□S, D4BS-6□□S |
| 1/2-14NPT (North American) | D4BS-3□□S, D4BS-7□□S |

SWITCHES

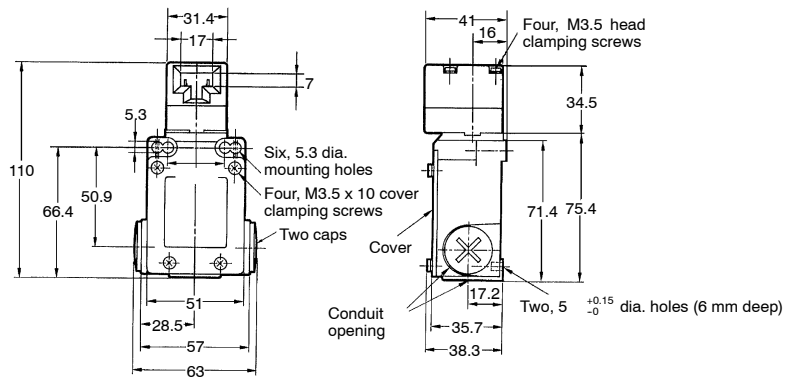
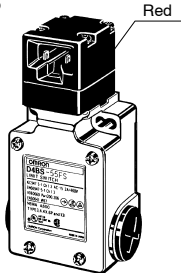
1-Conduit

- D4BS-1□□S
- D4BS-2□□S
- D4BS-3□□S



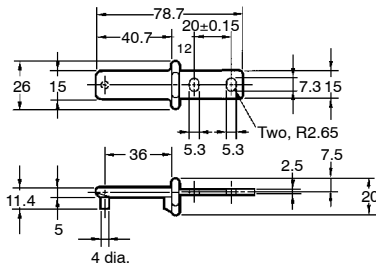
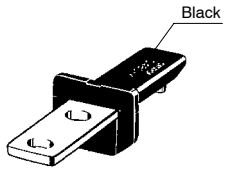
3-Conduit

- D4BS-5□□S
- D4BS-6□□S
- D4BS-7□□S

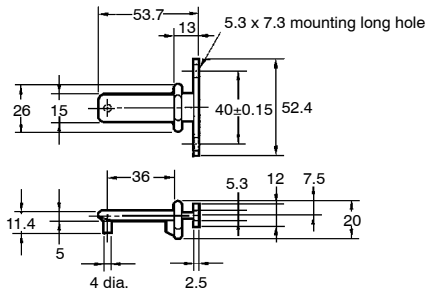
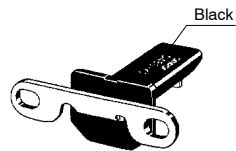


■ OPERATION KEYS

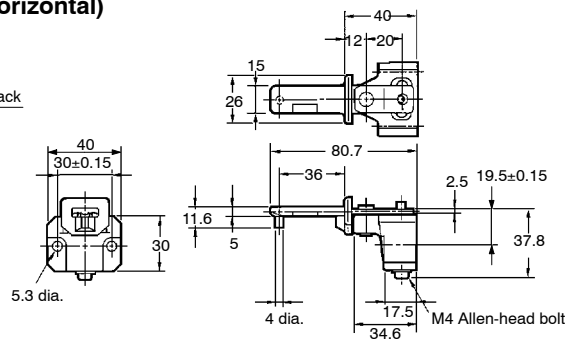
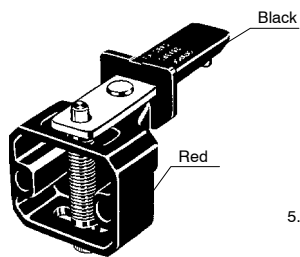
Horizontal Mounting
D4BS-K1



Vertical Mounting
D4BS-K2



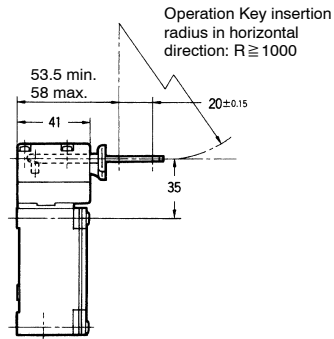
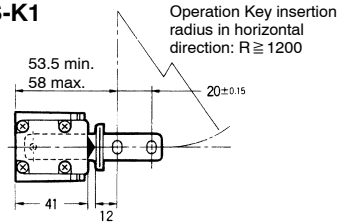
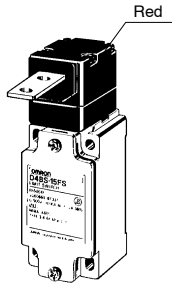
Adjustable mounting (Horizontal)
D4BS-K3



■ WITH OPERATION KEY INSERTED

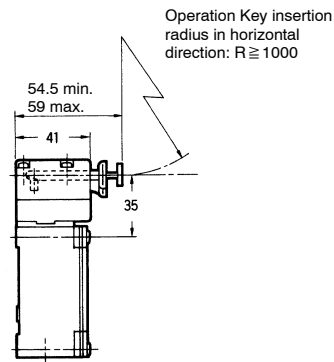
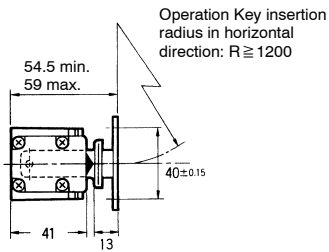
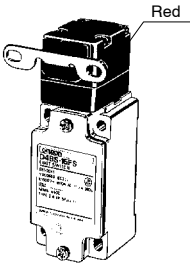
Horizontal Mounting

- D4BS-1□□S +D4BS-K1
- D4BS-2□□S +D4BS-K1
- D4BS-3□□S +D4BS-K1



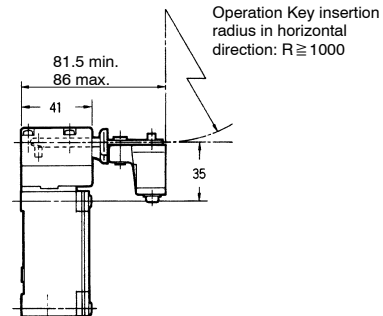
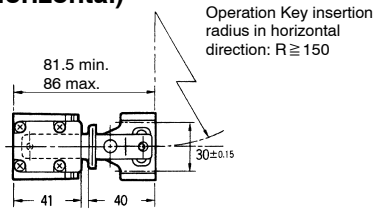
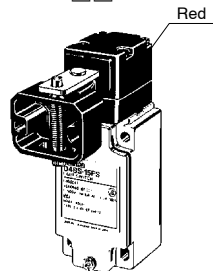
Vertical Mounting

- D4BS-1□□S +D4BS-K2
- D4BS-2□□S +D4BS-K2
- D4BS-3□□S +D4BS-K2



Adjustable mounting (Horizontal)

- D4BS-1□□S +D4BS-K3
- D4BS-2□□S +D4BS-K3
- D4BS-3□□S +D4BS-K3



Note: "R" is the Operation Key insertion radius.

Precautions

| |
|---|
|  CAUTION |
| Do not remove the Operation Key from the door intentionally and insert it to the Switch with the door open. The machine may start operating, and injury or death may be caused. |

Install the Operation Key so that it will not hit the operator when the door is open.

If the D4BS is to be used as a Switch in an emergency stop circuit or in a safety circuit for preventing accidents resulting in injuries or deaths, use NC contacts with a forced release mechanism and set the D4BS so that it will operate in positive opening mode.

Protect the D4BS with an appropriate cover and post a warning sign near the D4BS. If this is not done, the D4BS or Operation Key may be removed carelessly, resulting in serious injury due to unexpected operation of the machine.

To prevent the D4BS from damage due to circuit short-circuiting, connect a fuse with a breaking current 1.5 to 2 times larger than the rated current of the D4BS in series to the D4BS.

If the D4BS is used under EN-approved conditions, use a gl or gG 10-A fuse approved by IEC269.

■ CORRECT USE

Operating Environment

Make sure in advance that the environment is suitable, with no oil, water, or chemicals, as these may cause the seal to deteriorate, resulting in faulty contact, faulty isolation, current leakage, or burning.

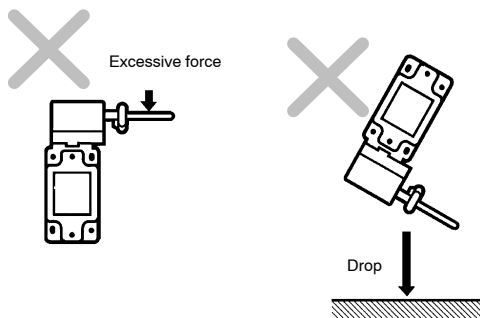
Do not use in the following locations:

- Locations subject to severe temperature changes
- Locations subject to high temperatures or condensation
- Locations subject to severe vibration
- Locations where the product may come into direct contact with processing waste or dust

Operation Key

Be sure to use a special Operation Key only. Do not operate the D4BS with anything other than the special Operation Key, or the D4BS may break or the safety of the system may not be maintained.

Do not impose excessive force on the Operation Key inserted into the D4BS or drop the D4BS with the Operation Key inserted, or the Operation Key may deform or break.

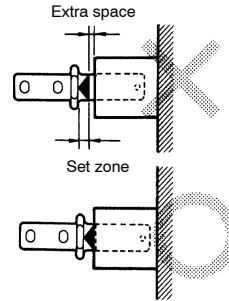


Secure the operation key with a one-way screw, or an equivalent, so that the operation key cannot be easily removed.

Door Security

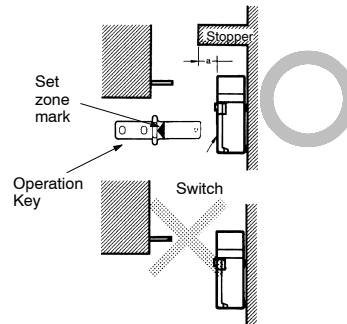
If the Operation Key on the closed door is continuously pulled in the opening direction by a force caused by vibration, the door by itself due to its weight, or cushion that may be attached to the door, damage to the D4BS may result.

Be sure to secure the door with a hook so that the Operation Key is inserted with the following set zone and without extra space.



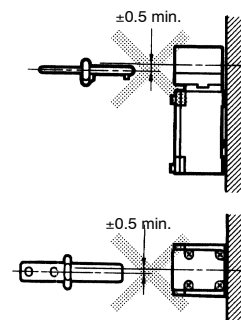
Mount with a Stopper

Be sure to install a stopper as shown in the following illustration when mounting the Safety-door Limit Switch. The range of space "a" must be determined according to the available set zone of the Operation Key.



Refer to *Dimensions* for the mounting dimension of the Operation Key and mount the Operation Key correctly. The Operation Key will soon become damaged or worn away if it is not mounted correctly.

Make sure that the Operation Key can be inserted properly with a tolerance of ± 0.5 mm in the upward, downward, left, or right direction, or damage to the D4BS may occur.



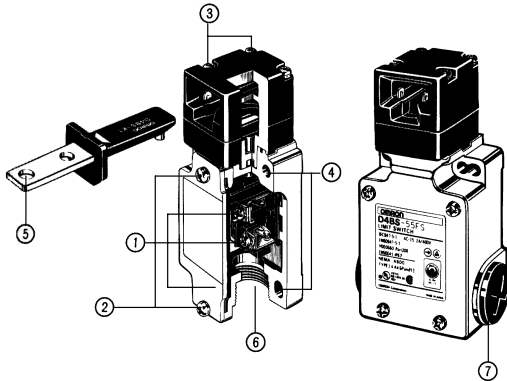
Operating Location

Make sure that the D4BS is located outside the safety door and that no metal dust, oil, or chemical will be sprayed onto the D4BS. Penetration of metal dust, oil, or a chemical, could cause operating failure.

MOUNTING

Tightening Torque

Be sure to tighten each screw of the D4BS properly, or the D4BS may soon malfunction.

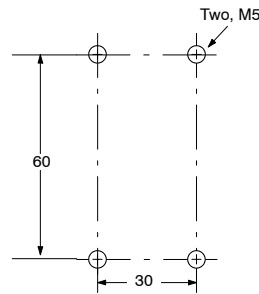


| No. | Type | Torque |
|-----|--|--------------------|
| 1 | Terminal screw (including ground terminal screw) | 0.59 to 0.78 N • m |
| 2 | Cover mounting screw (see note 1) | 1.18 to 1.37 N • m |
| 3 | Head mounting screw | 0.78 to 0.98 N • m |
| 4 | M5 switch mounting bolt (see note 2) | 4.90 to 5.88 N • m |
| 5 | Operation Key mounting screw | 2.35 to 2.75 N • m |
| 6 | Connector | 1.77 to 2.16 N • m |
| 7 | Cap screw | 1.27 to 1.67 N • m |

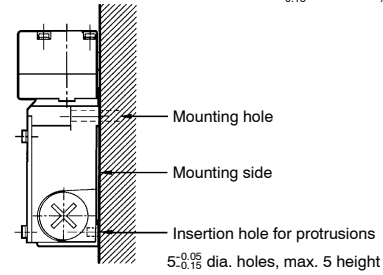
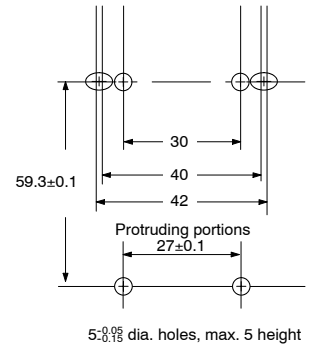
- Note: 1. Apply a torque of 0.78 o 0.88 N • m if the D4BS is a three-conduit model.
 2. Apply a torque of 4.90 to 5.88 N • m when using an Allen-head bolt. If it is a pan head screw, apply a torque of 2.35 to 2.75 N • m.

Mounting Dimensions (M5)

Standard Model



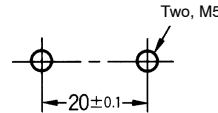
Three-conduit Model



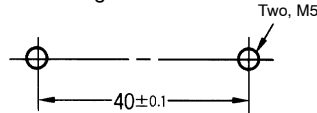
The D4BS can be mounted more securely by adding two protruding portions, each of which is 5 mm maximum in height and $5^{-0.05/-0.15}$ mm in diameter as shown below.

Operating Key Mounting Dimensions

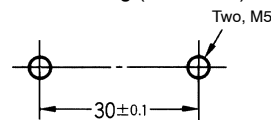
Horizontal Mounting



Vertical Mounting



Adjustable Mounting (Horizontal)



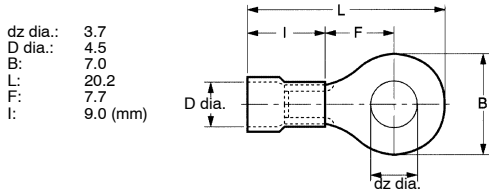
Changes in Head Mounting Direction

By removing the screws on the four corners of the head, the head can be reset in any of four directions. The head direction can be changed with or without the Operation Key inserted in the head. Make sure that no foreign materials penetrate through the head and that the head is tightened securely within the proper torque range.

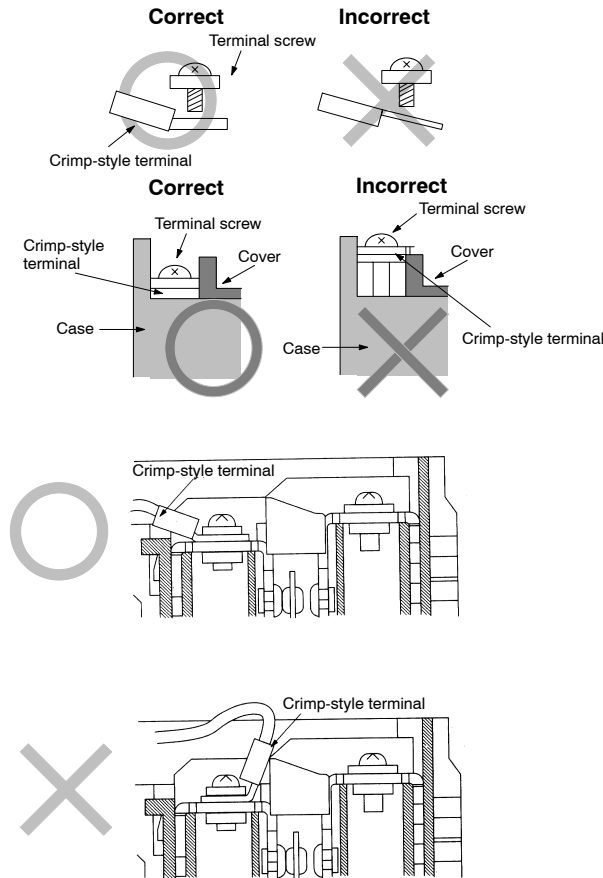
Wiring

Do not connect the lead wires directly to the terminals. Connect the lead wires through insulation tubes and M3.5 solderless terminals. Tighten each terminal screw within the proper torque range.

The proper lead wire is AWG20 to AWG14 (0.5 to 2.5 mm²) in size.



Make sure that all solderless terminals are correctly connected and located within the casing or cover as shown below.



Connector

Tighten the connector to a suitable torque. Excessive tightening torque may damage the casing.

If using a 1/2-14NPT conduit, apply sealing tape between connector and conduit opening so that the enclosure will conform to IP67. If using a Pg13.5 conduit, use an ABS-08 Pg13.5 connector or an ABS-12 Pg13.5 connector (manufactured by Nippon Flex).

When wiring a 3-conduit model, securely tighten the cap screw provided for unused conduit openings.

Maintenance and Repairs

The user must not maintain or repair equipment incorporating any D4BS model. Contact the manufacturer of the equipment for any maintenance or repairs required.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters into inches, divide by 25.4



OMRON ELECTRONICS LLC

One Commerce Drive
Schaumburg, IL 60173

847-843-7900

For US technical support or other inquiries:

800-556-6766

OMRON CANADA, INC.

885 Milner Avenue
Toronto, Ontario M1B 5V8

416-286-6465

OMRON ON-LINE

Global - <http://www.omron.com>
USA - <http://www.omron.com/oei>
Canada - <http://www.omron.ca>