

# Multiple Limit Switch VB

CSM\_VB\_DS\_E\_1\_1

## A New Monoblock Multiple Limit Switch Incorporating a Head Box with a Tough Head and Ensuring High Sealing Performance and a Mechanical Durability of 5,000,000 Operations

- Used for the sequential control of a variety of engineering machines and belt conveyor lines.
- Built-in oil filter shuts out oil and water.
- Approved by EN, IEC (Ground terminal models only.) and CCC (Chinese standard). Ask your OMRON representative for information on approved models.
- Ground terminal models bear the CE mark.



Be sure to read the "Safety Precautions" on page 4 and the "Precautions for All Limit Switches".

## Model Number Structure

### Model Number Legend

VB-□□□□□□  
1 2 3 4 5 6

#### 1. Number of Plungers

- 2: 2 plungers
- 3: 3 plungers
- 4: 4 plungers
- 5: 5 plungers
- 6: 6 plungers

#### 2. Actuator

- 1: Bevel plunger
- 2: Roller plunger

#### 3. Switch Box

- 1: Flange switch box with two conduit holes on the side
- 2: Flange switch box with four conduit holes
- 4: Non-flange switch box with two conduit holes on the side
- 5: Non-flange switch box with four conduit holes

#### 4. Scraper

- 1: NBR scraper
- 2: FPM scraper

#### 5. Contact

- None: 10 A (standard)
- A: 0.1 A (micro load)

#### 6. Ground Terminal

- None: Without ground terminal
- E: With ground terminal

## Ordering Information

### List of Models

| Shape of box                                                                                                                      |                 | With flange | Without flange |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------|----------------|
| Actuator *                                                                                                                        | Conduit         | Model       |                |
|                                                                                                                                   |                 |             |                |
| Roller plunger<br>(with a 6.8-dia. roller)<br> | Two on the side | VB-2211     | VB-2241        |
|                                                                                                                                   |                 | VB-3211     | VB-3241        |
|                                                                                                                                   |                 | VB-4211     | VB-4241        |
|                                                                                                                                   |                 | VB-5211     | VB-5241        |
|                                                                                                                                   |                 | VB-6211     | VB-6241        |
|                                                                                                                                   | Four            | VB-2221     | VB-2251        |
|                                                                                                                                   |                 | VB-3221     | VB-3251        |
|                                                                                                                                   |                 | VB-4221     | VB-4251        |
|                                                                                                                                   |                 | VB-5221     | VB-5251        |
|                                                                                                                                   |                 | VB-6221     | VB-6251        |
| Bevel plunger<br>                              | Two on the side | VB-2111     | VB-2141        |
|                                                                                                                                   |                 | VB-3111     | VB-3141        |
|                                                                                                                                   |                 | VB-4111     | VB-4141        |
|                                                                                                                                   |                 | VB-5111     | VB-5141        |
|                                                                                                                                   |                 | VB-6111     | ---            |
|                                                                                                                                   | Four            | VB-2121     | VB-2151        |
|                                                                                                                                   |                 | VB-3121     | VB-3151        |
|                                                                                                                                   |                 | VB-4121     | VB-4151        |
|                                                                                                                                   |                 | VB-5121     | ---            |
|                                                                                                                                   |                 | VB-6121     | ---            |

- Note:**
1. Other than the above models, minute load models switching 0.1 A are available. When ordering a minute load model, add the suffix A to the model number (i.e., VB-2211A for example).
  2. SC connectors can be connected to VB models.
  3. Models with ground terminals are also available. When ordering a ground terminal model, add the suffix E to the model number (i.e., VB-2211E for example).

\* Since the actuator is incorporated into the monoblock switch, the actuator cannot be replaced.

### Replaceable Switch Unit

| Rating              | Model    |
|---------------------|----------|
| Standard load model | VB-S101N |

## Specifications

### Approved Standards

| Agency        | Standards                   | File No.         | Approved models                                                   |
|---------------|-----------------------------|------------------|-------------------------------------------------------------------|
| TÜV Rheinland | EN60947-5-1<br>(IEC947-5-1) | J50062491        | Only models with ground terminals                                 |
| CCC (CQC)     | GB14048.5                   | 2003010305077628 | Ask your OMRON representative for information on approved models. |

### Ratings

#### Standard Model

| Rated voltage | Resistive load |    |
|---------------|----------------|----|
|               | NC             | NO |
| 125 VAC       | 10 A           |    |
| 250 VAC       | 10 A           |    |
| 125 VDC       | 0.6 A          |    |
| 250 VDC       | 0.3 A          |    |

**Note:** The above currents are steady-state currents.

| Inrush current | NC | 24 A max. |
|----------------|----|-----------|
|                | NO | 24 A max. |

#### Micro Load Ratings

| Rated voltage | Resistive load |
|---------------|----------------|
| 125 VAC       | 0.1 A          |
| 8 VDC         |                |
| 30 VDC        |                |

### Approved Standard Ratings

#### TÜV (EN60947-5-1) (Grand terminal models only) Standard Model

| Applicable category          | AC-15 | DC-15 |
|------------------------------|-------|-------|
| Rated operating current (Ie) | 2 A   | 2 A   |
| Rated operating voltage (Ue) | 250 V | 48 V  |

#### Micro Load Model

| Applicable category          | AC-14 | DC-15 |
|------------------------------|-------|-------|
| Rated operating current (Ie) | 0.1 A | 0.1 A |
| Rated operating voltage (Ue) | 125 V | 30 V  |

### CCC (GB14048.5)

| Applicable category and ratings |
|---------------------------------|
| AC-15 2 A/250 VAC               |

### Characteristics

|                                              |                                                           |                                                                                |
|----------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------|
| Degree of protection                         |                                                           | IP67                                                                           |
| Durability *                                 | Mechanical                                                | 5,000,000 operations min.                                                      |
|                                              | Electrical                                                | 300,000 operations min.<br>(10 A at 250 VAC, resistive load)                   |
| Operating speed                              |                                                           | 0.1 mm to 0.5 m/s                                                              |
| Operating frequency                          | Mechanical                                                | 120 operations min.                                                            |
|                                              | Electrical                                                | 30 operations min.                                                             |
| Rated frequency                              |                                                           | 50/60 Hz (AC)                                                                  |
| Insulation resistance                        |                                                           | 100 MΩ min. (at 500 VDC)                                                       |
| Contact resistance                           |                                                           | 15 mΩ max. (initial value)                                                     |
| Dielectric strength                          | Between terminals of same polarity                        | 1,000 VAC/U <sub>imp</sub> 4,000 VAC                                           |
|                                              | Between current-carrying metal parts and ground           | 1,500 VAC/U <sub>imp</sub> 4,000 VAC                                           |
|                                              | Between each terminal and non-current-carrying metal part | 1,500 VAC/U <sub>imp</sub> 4,000 VAC                                           |
|                                              | Between terminals of different polarity                   | U <sub>imp</sub> 4 kV (EN60947-5-1)                                            |
| Rated insulation voltage (Ui)                |                                                           | 300 VAC (EN60947-5-1)                                                          |
| Switching overvoltage                        |                                                           | 1,000 V max. (EN60947-5-1)                                                     |
| Pollution degree (operating environment)     |                                                           | 3 (EN60947-5-1)                                                                |
| Short-circuit protective device (SCPD)       |                                                           | 10 A fuse type gG or gI (IEC269)                                               |
| Conditional short-circuit current            |                                                           | 100 A (EN60947-5-1)                                                            |
| Conventional enclosed thermal current (Ithe) |                                                           | 5 A, 0.5 A (EN60947-5-1)                                                       |
| Protection against electric shock            |                                                           | Insulation class I (Use the grounding terminal or ground on the machine side.) |
| Vibration resistance                         | Malfunction                                               | 10 to 55 Hz, 1.5-mm double amplitude                                           |
| Shock resistance                             | Destruction                                               | 1,000 m/s <sup>2</sup> min.                                                    |
|                                              | Malfunction                                               | 200 m/s <sup>2</sup> min.                                                      |
| Ambient operating temperature                |                                                           | −10°C to 80°C (with no icing)                                                  |
| Ambient operating humidity                   |                                                           | 35% to 95%                                                                     |
| Weight                                       |                                                           | Approx. 580 g (in the case of VB-4211)                                         |

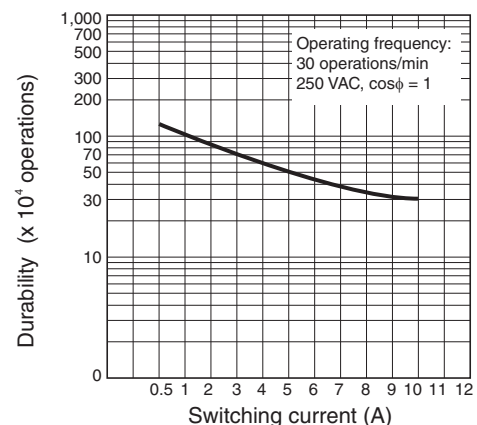
**Note:** The above values are initial values.

\* The 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.

### Engineering Data

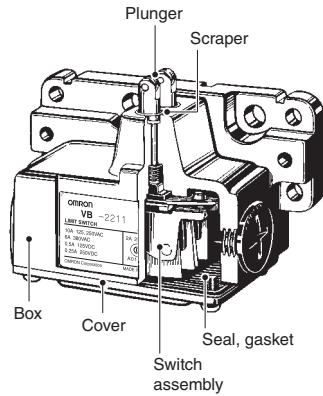
#### Electrical Durability (with more than 300,000 Operations)

(Ambient temperature: 5°C to 35°C; Ambient humidity: 40% to 70%)

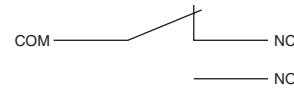


# Structure and Nomenclature

## Structure (VB-2211)

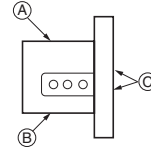


## Contact Form



### Position of conduit

- Two on the side .... A and B
- Four ..... A, B, and C

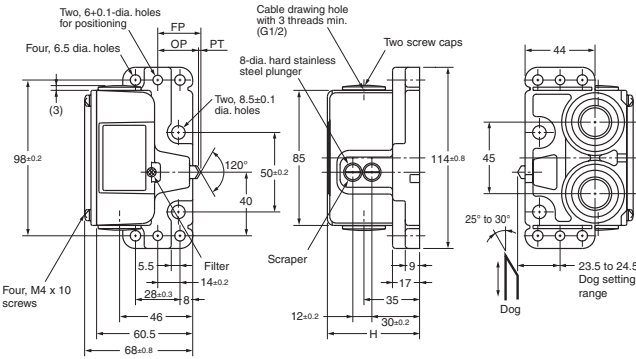


## Dimensions and Operating Characteristics

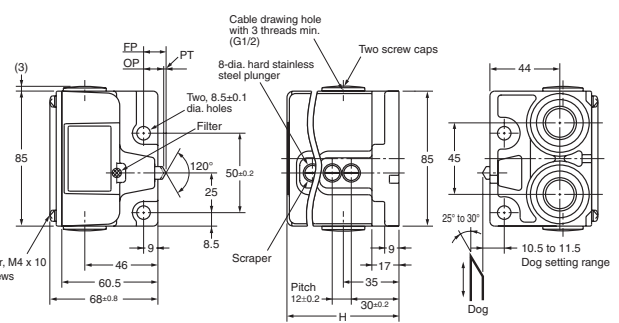
(Unit: mm)

**Switches** The actual model numbers of each of the above VB models have a figure 2 to 6, which indicate the number of plungers.

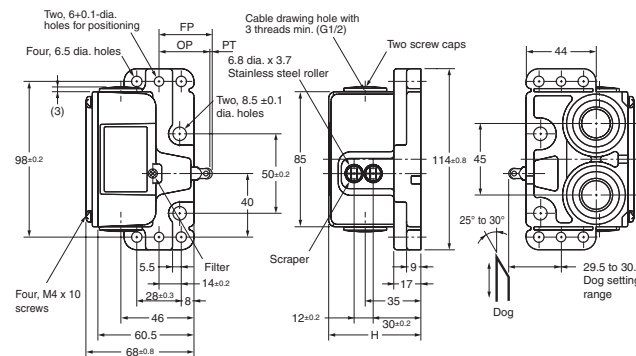
### Bevel Plunger VB-□111



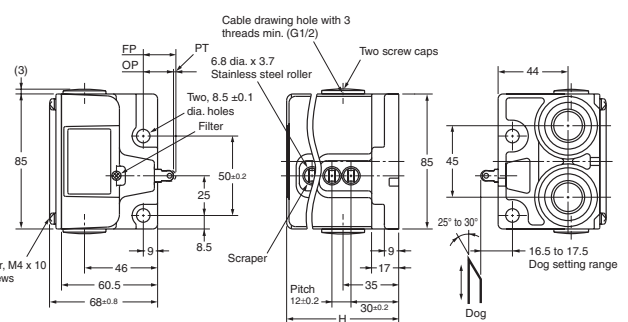
### Bevel Plunger VB-□141



### Roller Plunger VB-□211



### Roller Plunger VB-□241



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

| Model                            | VB-□221<br>VB-□211 | VB-□251<br>VB-□241   | VB-□121<br>VB-□111   | VB-□151<br>VB-□141   |
|----------------------------------|--------------------|----------------------|----------------------|----------------------|
| <b>Operating characteristics</b> |                    |                      |                      |                      |
| Operating force                  | OF max.            | 14.71 N              | 14.71 N              | 14.71 N              |
| Release force                    | RF min.            | 4.90 N               | 4.90 N               | 4.90 N               |
| Pretravel                        | PT max.            | 1.5 mm               | 1.5 mm               | 1.5 mm               |
| Overtravel *1                    | OT min.            | (3.5 mm)             | (3.5 mm)             | (3.5 mm)             |
| Movement Differential            | MD max.            | 0.5 mm               | 0.5 mm               | 0.5 mm               |
| Operating Position               | OP                 | 32±0.4 mm<br>(33 mm) | 19±0.4 mm<br>(20 mm) | 26±0.4 mm<br>(27 mm) |
| Free Position *1                 | FP max.            |                      |                      | 13±0.4 mm<br>(14 mm) |

**Note:** The operating characteristic values apply to a single switch.

\*1 The OT and FP values are reference values. The actual model numbers of each of the above VB models have a figure 2 to 6, which indicate the number of plungers.

| Number of plungers | Size H (mm) |
|--------------------|-------------|
| 2                  | 58          |
| 3                  | 70          |
| 4                  | 82          |
| 5, 6 *2            | 106         |

\*2 When five plungers are mounted in series, no outer actuator will be provided.

## Safety Precautions

Refer to **Safety Precautions for All Limit Switches.**

### Precautions for Safe Use

#### Connection

- Be sure to connect a fuse with a breaking current 1.5 to 2 times larger than the rated current to the Switch in series in order to protect the Switch from damage due to short-circuiting.
- If the VB is used for EN ratings, use a gI or gG 10-A fuse approved by IEC269.

#### Operation

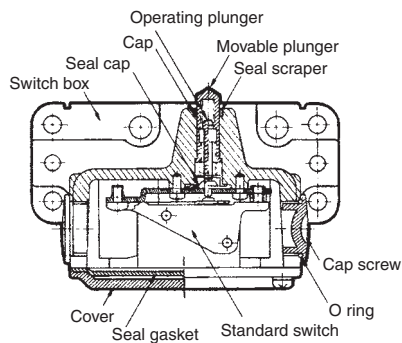
Make sure the notch of the plunger is not pressed into the scraper when operating the VB Multiple Limit Switch, otherwise chips or dust may penetrate into the VB Multiple Limit Switch.

#### Sealing

- The switch box and cover are made of die-cast aluminum and the mounting part of the Switch is covered with a seal cap, and ensure a sealing performance of more than  $98 \times 10^3$  Pa for the VB Multiple Limit Switch.

The filter on the side of the head prevents oil and water from penetrating into the interior of the VB Multiple Limit Switch while preventing the internal pressure of the VB Multiple Limit Switch from rising when the plunger is pressed.

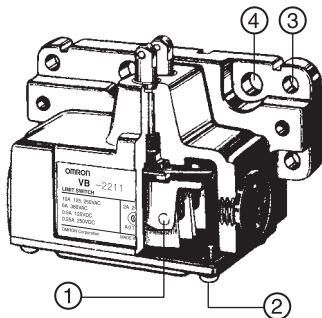
The seal scraper on the tip of the actuator prevents chips and dust from penetrating into the moving parts of the VB Multiple Limit Switch.



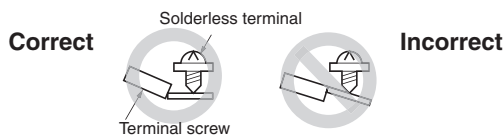
- Apply extra tightening to the cap screw on the conduit.
- In order to protect the plunger from abrasion and prolong its service life, apply a small amount of grease to the plunger and dog or cam that come into contact with the plunger. (Molybdenum disulfide grease is recommended.)

#### Appropriate Tightening Torque

- Tighten each cover mounting screw to a torque of 1.18 to 1.37 N·m.
- Tighten each switch terminal screw to a torque of 0.19 to 0.29 N·m if the mounting screw is M3 in size.



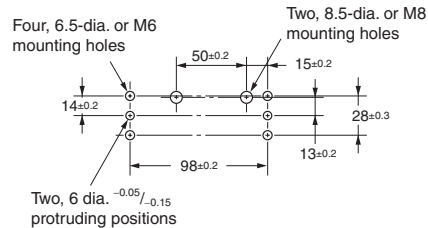
Be sure to wire each solderless terminal correctly with a screw as shown below.



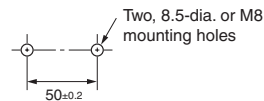
- Apply a torque of 5.88 to 6.86 N·m to tighten each mounting bolt of the casing if the mounting bolt is an Allen-head bolt that is M6 in size. Apply a torque of 8.04 to 9.22 N·m instead if the mounting bolt is an Allen-head bolt that is M8 in size.

#### Mounting Holes

##### With a Flange Switch Box



##### Without a Flange Switch Box

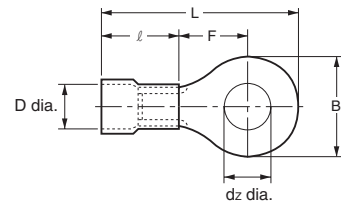


#### Wiring

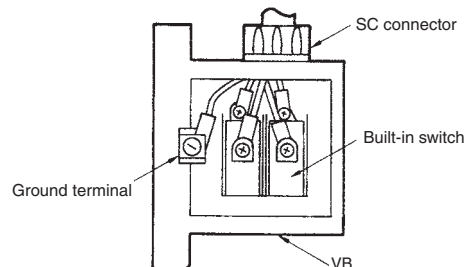
Connect a cable with a thickness of  $0.75 \text{ mm}^2$  to the VB Multiple Limit Switch through the M3 round solderless terminals with insulation covers.

#### Dimensions of Round Solderless Terminal

|          |          |
|----------|----------|
| dz dia.: | 3.2      |
| D dia.:  | 1.9      |
| B:       | 5.2      |
| L:       | 16.4     |
| F:       | 5.8      |
| ℓ:       | 8.0 (mm) |



#### Wiring (Ground Terminal Models)



Consult your OMRON representative for details on models with 3 to 6 plungers.

#### Others

- Carefully connect a conduit to each conduit hole and apply a seal or tape to seal the conduit hole so that cuttings or other materials will not penetrate through the conduit hole.
- Use the SC Connector. Consult your OMRON representative for details on SC Connectors.
- Make sure that the position of the actuator that is traveling does not exceed the overtravel (OT) position. Make sure that the operating stroke is 70% to 100% of the specified OT distance.

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