

# 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 *		Model	
Roller plunger (with a 6.8-dia. roller) 	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 	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 (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. (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 (I <sub>thn</sub> )		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	Malfuction	10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Destruction	1,000 m/s <sup>2</sup> min.
	Malfuction	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)

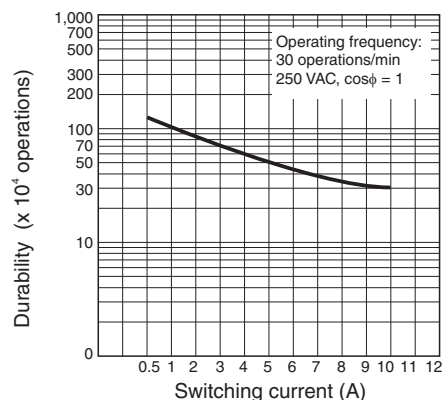
**Note:** The above values are initial values.

\* 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

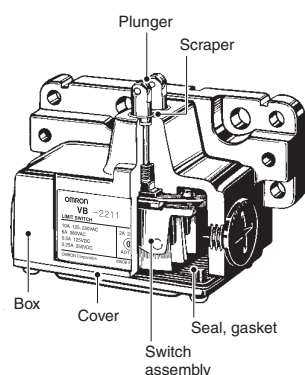
#### Electrical Durability (with more than 300,000 Operations)

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

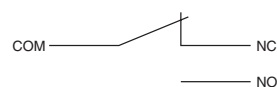


# Structure and Nomenclature

## Structure (VB-2211)

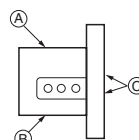


## Contact Form



### Position of conduit

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

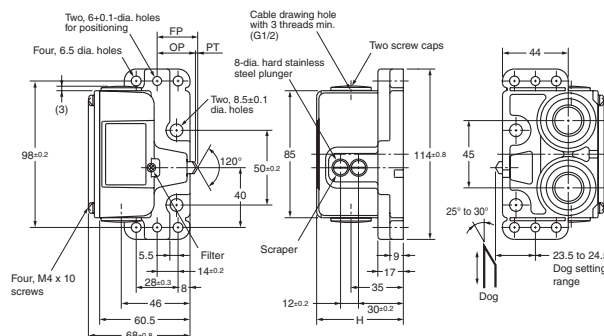


## Dimensions and Operating Characteristics

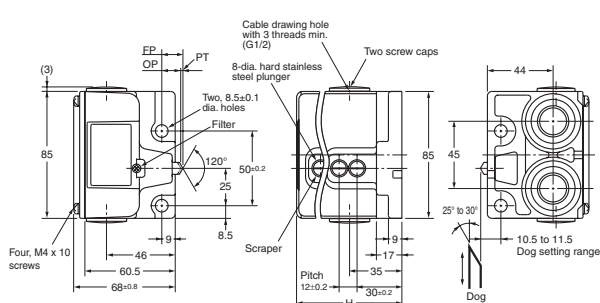
(Unit: mm)

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

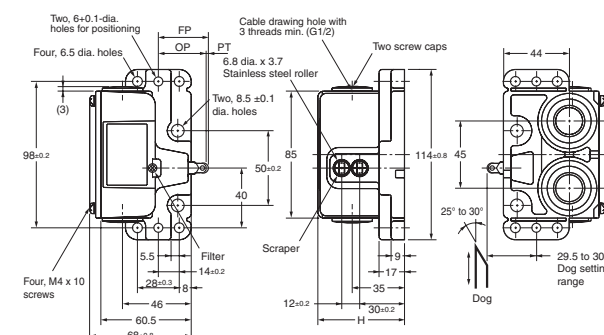
### Bevel Plunger VB-□111



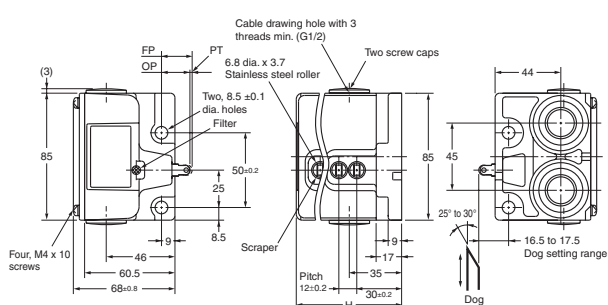
### Bevel Plunger VB-□141



### 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 VB-□211	VB-□251 VB-□241	VB-□121 VB-□111	VB-□151 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	19±0.4 mm	26±0.4 mm
Free Position *1	FP max.	(33 mm)	(20 mm)	(27 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 gl or gG 10-A fuse approved by IEC269.

#### Operation

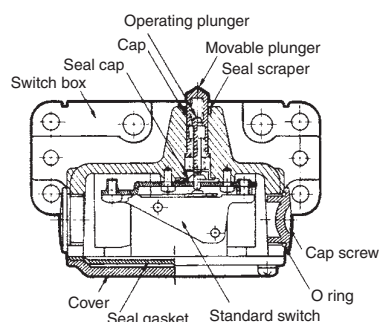
Make sure the notch of the plunger is not pressed into the scraper when operating the VB Multiple Limit Switch, otherwise chips or dust may penetrate into the VB Multiple Limit Switch.

#### 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.

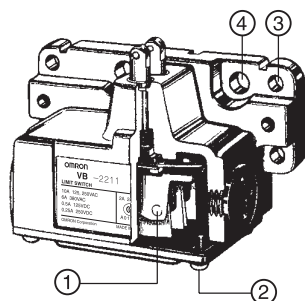
The seal scraper on the tip of the actuator prevents chips and dust from penetrating into the moving parts of the VB Multiple Limit Switch.



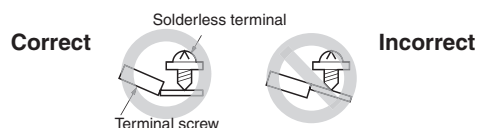
- Apply extra tightening to the cap screw on the conduit.
- In order to protect the plunger from abrasion and prolong its service life, apply a small amount of grease to the plunger and dog or cam that come into contact with the plunger. (Molybdenum disulfide grease is recommended.)

#### 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.



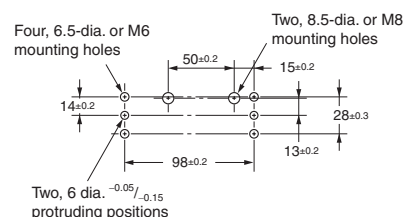
Be sure to wire each solderless terminal correctly with a screw as shown below.



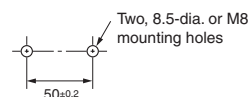
- Apply a torque of 5.88 to 6.86 N·m to tighten each mounting bolt of the casing if the mounting bolt is an Allen-head bolt that is M6 in size. Apply a torque of 8.04 to 9.22 N·m instead if the mounting bolt is an Allen-head bolt that is M8 in size.

#### Mounting Holes

##### With a Flange Switch Box



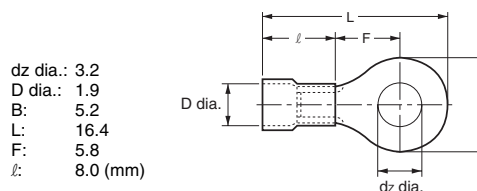
##### Without a Flange Switch Box



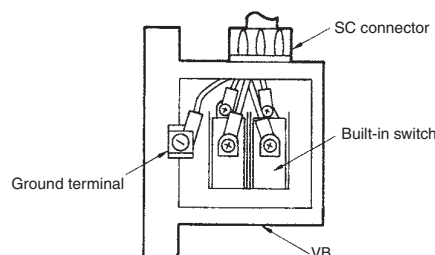
#### Wiring

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



#### 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.

## Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

## Warranty and Limitations of Liability

### WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

### LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

## Application Considerations

### SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

### PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

## Disclaimers

### CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

### DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

### PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

### ERRORS AND OMISSIONS

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

2009.11

In the interest of product improvement, specifications are subject to change without notice.

**OMRON Corporation**  
Industrial Automation Company

<http://www.ia.omron.com/>

(c)Copyright OMRON Corporation 2009 All Right Reserved.