

#### CSM\_ZC-\_55\_DS\_E\_3\_1

# Small, High-precision Enclosed Switch

- Small, High-precision Enclosed Switches with Built-in Basic Switches for High Repeatability and Durability of 10 Million Operations Minimum.
- Same mounting pitch as Z Basic Switch.
- Requires less operating force than conventional limit switches.
- Lineup includes modes with operation indicators for easy maintenance and inspection.
- Approved by EN, UL, CSA, and CCC (Chinese standard). (Ask your OMRON representative for Information on approved models.)

Be sure to read *Safety Precautions* on page 8 and *Safety Precautions for All Limit Switches.* 

### Model Number Structure

#### Model Number Legend

ZC-<u></u>55 (1)

D: Plunger Q: Panel mount plunger

(1) Actuator

- Q22: Panel mount roller plunger
- Q21: Panel mount crossroller plunger
- N22: Sealed roller plunger
- N21: Sealed crossroller plunger



For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

- W: Short hinge lever
- W1: Hinge lever
- W2: Short hinge roller lever
- W21: Hinge roller lever
- W3: One-way action short hinge roller lever
- W31: One-way action hinge roller lever

Actuator		Model	Appro	ved Star	ndards
Actuator		woder	UL	CSA	EN
Plunger	Δ	ZC-D55	•	•	•
Panel mount plunger	4	ZC-Q55	•	•	•
Panel mount roller plunger	0H	ZC-Q2255	•	•	•
Panel mount crossroller plunger	盘	ZC-Q2155	•	•	•
Sealed roller plunger	R	ZC-N2255	•	•	•
Sealed crossroller plunger	冎	ZC-N2155	•	•	•
Short hinge lever		ZC-W55	•	•	•
Hinge lever		ZC-W155	•	•	•
Short hinge roller lever	R	ZC-W255	•	•	•
Hinge roller lever	R	ZC-W2155	•	•	•
One-way action short hinge roller lever		ZC-W355	•	•	٠
One-way action hinge roller lever		ZC-W3155	•	•	●

### **Ordering Information**

- Note: 1. Use molded terminal models when using the Switch under one of the following conditions: a) dusty, b) high amount of dripping oil, or c) high humidity. Refer to *Molded Terminal Model* in page 2 for the details.
  - Models are available with lead outlets in three positions: right-hand, left-hand, and underside.

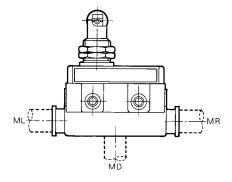
#### **Molded Terminal Model**

Use of the molded terminal model is recommended in locations subject to excessive dust, oil drips, or moisture. The molded terminal model will have the same dimensions and operating characteristics as the basic model in each. Not approved by UL, CSA or EN.

Actuator	Location of lead output Length	Left-hand	Right-hand	Underside
Plunger	1 M	ZC-D55-ML VCT 1M	ZC-D55-MR VCT 1M	ZC-D55-MD VCT 1M
Fluiger	3 M	ZC-D55-ML VCT 3M	ZC-D55-MR VCT 3M	ZC-D55-MD VCT 3M
Panel mount plunger	1 M	ZC-Q55-ML VCT 1M	ZC-Q55-MR VCT 1M	ZC-Q55-MD VCT 1M
Pallel mount plunger	3 M	ZC-Q55-ML VCT 3M	ZC-Q55-MR VCT 3M	-
Panel mount roller plunger	1 M	ZC-Q2255-ML VCT 1M	ZC-Q2255-MR VCT 1M	ZC-Q2255-MD VCT 1M
Fanel mount roller plunger	3 M	ZC-Q2255-ML VCT 3M	ZC-Q2255-MR VCT 3M	ZC-Q2255-MD VCT 3M
Papel mount crossreller plunger	1 M	ZC-Q2155-ML VCT 1M	ZC-Q2155-MR VCT 1M	ZC-Q2155-MD VCT 1M
Panel mount crossroller plunger	3 M	-	ZC-Q2155-MR VCT 3M	ZC-Q2155-MD VCT 3M
Sealed roller plunger	1 M	ZC-N2255-ML VCT 1M	ZC-N2255-MR VCT 1M	ZC-N2255-MD VCT 1M
	3 M	ZC-N2255-ML VCT 3M	ZC-N2255-MR VCT 3M	ZC-N2255-MD VCT 3M
Sealed crossroller plunger	1 M	ZC-N2155-ML VCT 1M	ZC-N2155-MR VCT 1M	ZC-N2155-MD VCT 1M
Sealed crossroller plunger	3 M	ZC-N2155-ML VCT 3M	ZC-N2155-MR VCT 3M	-
Short hinge lever	1 M	-	ZC-W55-MR VCT 1M	-
Hinge lever	1 M	ZC-W155-ML VCT 1M	ZC-W155-MR VCT 1M	ZC-W155-MD VCT 1M
Short hinge roller lever	1 M	ZC-W255-ML VCT 1M	ZC-W255-MR VCT 1M	ZC-W255-MD VCT 1M
Hinge roller lever 1		ZC-W2155-ML VCT 1M	ZC-W2155-MR VCT 1M	ZC-W2155-MD VCT 1M
One-way action short hinge roller lever	1 M	-	ZC-W355-MR VCT 1M	-

#### Location of lead output

<b>Right-hand</b>	MR
Left-hand	ML
Underside	MD



#### Lead Supplies

Leads S	pecifi- ation	Nominal cross-sectional area (mm <sup>2</sup> )	External diameter (mm)	Terminal connections
V.C.1 (vinyl ca cable	abtire	1.25	3 conductor: 10.5 dia.	Black: COM White: NO Red: NC

#### **Operation Indicator-equipped Models**

Some models can be equipped upon request with a operation indicator to facilitate maintenance and inspection. Because the indicator is incorporated in the Terminal Protective Cover, the dimensions of the Limit Switch are not affected. In this model, the lead wire is to be connected to the screw terminal. (A connecting washer is provided on the tip of the lead wire). The lead wire can be connected to either the NC or NO terminal. Operating characteristics are the same as the basic model from in each. Not approved by UL, CSA and EN.

Actuator	AC	DC (12VDC)	DC (24VDC)
Plunger	ZC-D55-L	-	ZC-D55-L4
Panel mount plunger	ZC-Q55-L	-	ZC-Q55-L4
Panel mount roller plunger	ZC-Q2255-L	ZC-Q2255-L2	ZC-Q2255-L4
Panel mount crossroller plunger	ZC-Q2155-L	-	ZC-Q2155-L4
Sealed roller plunger	ZC-N2255-L	ZC-N2255-L2	ZC-N2255-L4
Sealed crossroller plunger	ZC-N2155-L	ZC-N2155-L2	ZC-N2155-L4
Hinge lever	ZC-W155-L	-	ZC-W155-L4
Short hinge roller lever	ZC-W255-L	-	ZC-W255-L4
Hinge roller lever	ZC-W2155-L	-	ZC-W2155-L4

#### (For AC)

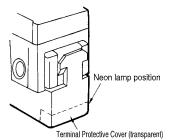
• The operating voltage range is from 90 to 250 VAC.

 The dimensions are the same as the standard type. The top of the Terminal Protective Cover is transparent to allow checking the operation easily.

#### (For DC)

• The DC-operated is provided with an LED indicator.

- There is no protective structure.
- Since a rectifier stack is incorporated into the unit to permit reversing the polarity, this type can also operate on AC power source.
- The LED projects from the housing for easy visibility.

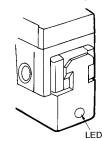


#### Contact Circuit

NC terminal	Power supply Neon lamp $R = 240 k\Omega$ Load Built-in switch
NO terminal	Power supply Built-in switch Load Neon lamp R = 240 kΩ

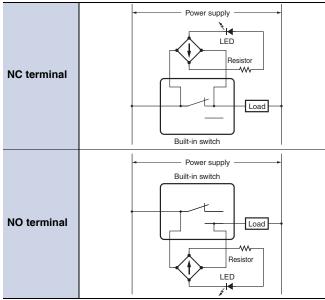
Note: If the wiring is as shown above, the operation of the respective parts will be as shown in the following table. The neon lamp is not wired when the Switch is delivered. Connect it as required.

Contact	Neon lamp	Load	Actuator	
NC	ON	Does not operate	Operates	
NC	OFF	Operates	Does not operate	
NO	ON	Does not operate	Does not operate	
	OFF	Operates	Operates	



Model	Voltage rating (V)	Leakage current (mA)	Internal resistance (kΩ)
L2	12	Approx.2.4	4.3
L4	24	Approx.1.2	18

#### Contact Circuit



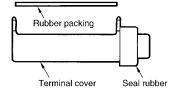
Note: If the wiring is as shown above, the operation of the respective parts will be as shown in the following table. The LED terminals are not wired when the Switch is delivered. Connect it as required.

I	Contact	LED	Load	Actuator
I	NC	ON Does not operate C		Operates
	NC	OFF	Operates	Does not operate
I	NO	ON	Does not operate	Does not operate
	NO	OFF	Operates	Operates

#### Accessories

	MODEL
ZC Terminal Cover	TERMINAL COVER FOR ZC55
ZC Seal Rubber	SC-R40
ZC Rubber Packing	ZC RUBBER PACKING

Note: The Switch is equipped with these 3 items as a standard.



# Specifications

## Approved Standards

Agency	Standard	File No.		
UL*	UL508	E76675		
TÜV Rheinland	EN60947-1, EN60947-5-1	J50041904		
CCC(CQC)	GB14048.5	2003010303077620		

Note: Ask your OMRON representative for information on approved models. \* UL certified for CSA C22.2 No. 14.

#### Ratings

Deted	Non-	induct	ive loa	ve load (A) Inductive load (A			A)	
Rated voltage	Resistive load		Lamp load		Inductive load		Motor load	
vonage	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	10		3	1.5	10		5	2.5
250 VAC	10		2.5	1.25	10		3	1.5
8 VDC	10		3	1.5	6		5	2.5
14 VDC	10		3	1.5	6		5	2.5
30 VDC	6		3	1.5	5		5	2.5
125 VDC	0.5		0.4	0.4	0.05		0.05	0.05
250 VDC	0.25		0.2	0.2	0.03		0.03	0.03
250 VDC	0.25		0.2	0.2	0.03		0.03	0.03

Inrush	NC	30 A max.
current	NO	15 A max.

Note: 1. The above figures are for steady-state currents.

- Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
- 3. Lamp load has an inrush current of 10 times the steady-state current.
- 4. Motor load has an inrush current of 6 times the steady-state current.
- 5. The above ratings were tested under the following conditions
  - according.
  - (1) Ambient temperature:+20±2°C

  - (2) Ambient humidity: 65±5%RH
    (3) Operating frequency:20 operations/min.

#### Characteristics

Degree of p	rotections	IP67		
Durability	Mechanical	10,000,000 operations min.		
Durability	Electrical	500,000 operations min.		
Operating s	peed	0.05 mm/s to 0.5 m/s *1		
Operating	Mechanical	120 operations/min		
frequency Electrical		20 operations/min		
Insulation r	esistance	100 MΩ min. (at 500 VDC)		
Contact res	istance	15 m $\Omega$ max. (initial value for the built- in switch when tested alone)		
Dielectric	Between non-continu- ous terminals	1,000 VAC, 50/60 Hz for 1 min		
strength	Between each terminal and non-current-carry- ing metal parts	2,000 VAC, 50/60 Hz for 1 min		
Rated insul	ation voltage (Ui)	1,000 VAC		
Pollution degree (operating environment)		3 (IEC947-5-1)		
Short-circuit protective device		10 A-fuse type gG (IEC 60269)		
Protection a	against electric shock	Class II		
Proof track	ing index (PTI)	175		
Switch cate	gory	D (IEC335)		
Rated operation	ating current (le)	10 A		
Rated opera	ating voltage (Ue)	250 VAC		
Vibration resistance	Malfunction	10 to 55 Hz, 1.5-mm double ampli- tude *2		
Shock	Destruction	1,000 m/s² max.		
resistance	Malfunction	300 m/s <sup>2</sup> max. (in case of plunger model) *1 *2		
Ambient op	erating temperature	-10°C to +80°C (with no icing)		
Ambient op	erating humidity	35% to 95%RH		
Weight		Approx. 92 g (in case of ZC- Q22(21)55)		

\*1. Only for models with plungers. (Contact your OMRON representative for information on other models.)

\*2. Less than 1 ms under a free state at the operating limits.

#### **Approved Standard Ratings** UL/CSA

#### A300

Voltage	Carry current	Curre	nt (A)	Volt-amperes (VA)	
	current	Make Break		Make	Break
120 VAC 240 VAC	10A	60 30	6 3	7,200	720

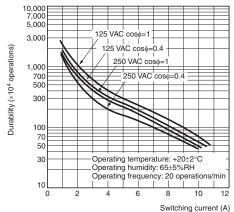
TÜVRheinland (EN60947-1, EN60947-5-1),

#### CCC (GB14048.5)

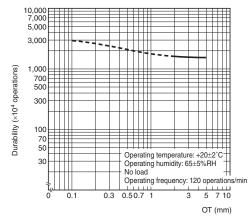
Applicable category and ratings	
AC-12 10 A/250 VAC	

# **Engineering Data**

### **Electrical Durability**



#### Mechanical Durability (for ZC-Q55)



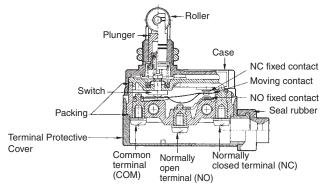
# ZC-⊡55

(Unit: mm)

## Structure and Nomenclature

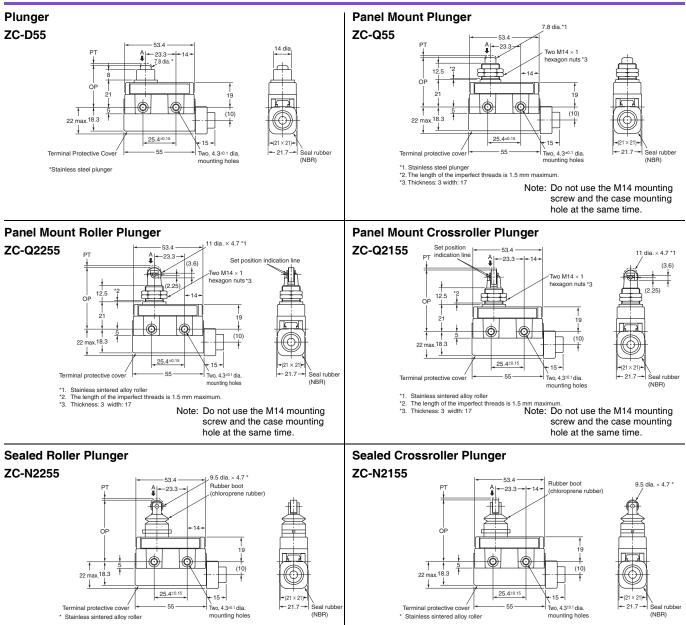
#### Structure

Changing the Terminal Protective Cover around allows the cable to be pulled out from either the right or the left.



Note: M4 binding head screws (with toothed washers) are used as the terminal screws.

# **Dimensions and Operating Characteristics**

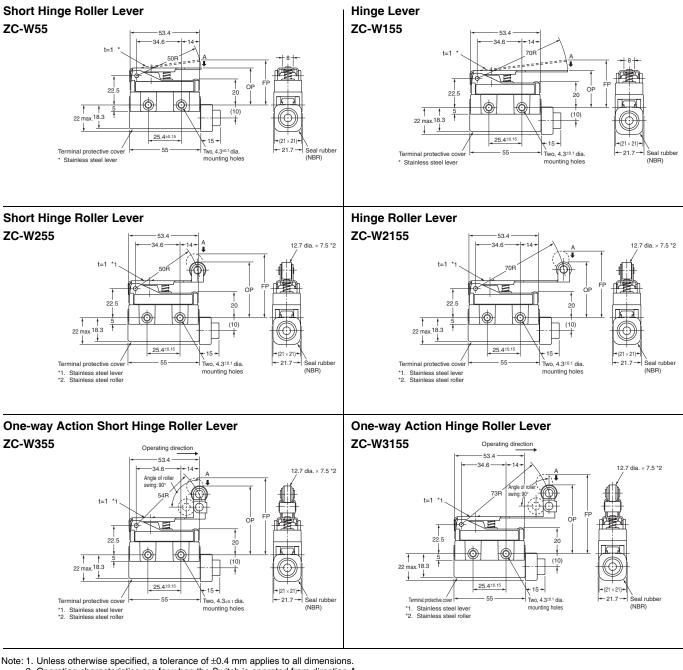


Note: 1. Unless otherwise specified, a tolerance of  $\pm 0.4$  mm applies to all dimensions. 2. Operating characteristics are for when the Switch is operated from direction A.

#### **Contact Form**

(COM)1	2(NC)
-	3(NO)

# **ZC-**



2. Operating characteristics are for when the Switch is operated from direction A.

<b>Operating Characterist</b>	ics	Model	ZC-D55	ZC-Q55	ZC-Q2255	ZC-Q2155	ZC-N2255 *	ZC-N2155 *
Operating force	OF	max.	11.8 N	11.8 N	11.8 N	11.8 N	6.86 N	6.86 N
Release force	RF	min.	4.9 N	4.9 N	4.9 N	4.9 N	1.67 N	1.67 N
Pretravel	PT	max.	1.5 mm					
Overtravel	ОТ	min.	2.4 mm	3 mm	3 mm	3 mm	2.5 mm	2.5 mm
Movement Differential	MD	max.	0.2 mm					
Free Position	FP	max.						
Operating Position	OP		32.4±0.8 mm	38.2±0.8 mm	47.4±0.8 mm	47.4±0.8 mm	47.4±0.8 mm	47.4±0.8 mm

\* Make sure that the permissible OT position is not exceeded.

<b>Operating Characteristi</b>	ics	Model	ZC-W55	ZC-W155	ZC-W255	ZC-W2155	ZC-W355	ZC-W3155
Operating force	OF	max.	3.92 N	2.75 N	3.92 N	2.75 N	3.92 N	2.75 N
Release force	RF	min.	0.78 N	0.59 N	0.78 N	0.59 N	0.78 N	0.59 N
Pretravel	PT	max.						
Overtravel	ОТ	min.	6 mm	8.4 mm	6 mm	8.4 mm	6 mm	8.4 mm
Movement Differential	MD	max.	1 mm	1.4 mm	1 mm	1.4 mm	1 mm	1.4 mm
Free Position	FP	max.	34.7 mm	36.7 mm	49.2 mm	51.3 mm	59.2 mm	61.2 mm
Operating Position	OP		28.5±1.2 mm	28.5±1.2 mm	43±1.2 mm	43±1.2 mm	53±1.2 mm	53±1.2 mm

Refer to Safety Precautions for All Limit Switches.

#### **Precautions for Correct Use**

#### **Operating Environment**

- Seal material may deteriorate if a Switch is used outdoor or where subject to special cutting oils, solvents, or chemicals. Always appraise performance under actual application conditions and set suitable maintenance and replacement periods.
- Install Switches where they will not be directly subject to cutting chips, dust, or dirt. The Actuator and Switch must also be protected from the accumulation of cutting chips or sludge.



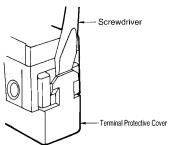
- Constantly subjecting a Switch to vibration or shock can result in wear, which can lead to contact interference with contacts, operation failure, reduced durability, and other problems.
   Excessive vibration or shock can lead to false contact operation or damage. Install Switches in locations not subject to shock and vibration and in orientations that will not produce resonance.
- The Switches have physical contacts. Using them in environments containing silicon gas will result in the formation of silicon oxide (SiO<sub>2</sub>) due to arc energy. If silicon oxide accumulates on the contacts, contact interference can occur. If silicon oil, silicon filling agents, silicon cables, or other silicon products are present near the Switch, suppress arcing with contact protective circuits (surge killers) or remove the source of silicon gas.

#### **Dog Angle**

When operating the roller type, be sure to set the dog angle to less than 30° (even when operating at a low speed). Operating the model at a dog angle exceeding 30° will soon cause abrasion or damage. Do not apply a twisting force to the plunger. Set the OT to 70% to 100% of the specified value so that the actuator will not exceed the OT.

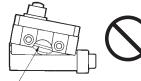
#### Handling

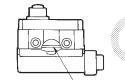
• When detaching the Terminal Protective Cover, insert a screwdriver and apply a force in the opening direction. Do not use excess force to remove the cover. Doing so may cause deformation in the fitting section and reduce the holding force.



• When mounting the Terminal Protective Cover to the case,

align the cover on the case and then press the cover down to mount it firmly. If the cover is pressed down in an inclined position, rubber packing will deform and thus affect the sealing capability.





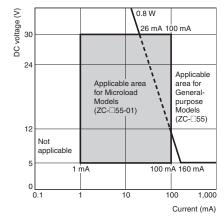
Rubber packing

Rubber packing

- A 8.5-dia. to 10.5-dia. cable can be applied as seal rubber for the lead wire outlet. (Use two- or three-core cable of VCT1.25 mm<sup>2</sup>.)
- Use weather-proof rubber (chloroprene rubber) as seal rubber for the ZC-N22(21)55.

#### **Micro Load Models**

Contact failure may occur is a General-purpose Switch is used to switch a microload circuit. Use Switches within the areas shown in the following chart. Even when using Microload Switches within the area shown below, contact wear will become more extreme with loads that generate surge current when switching and durability will be adversely affected. If necessary, insert a contact protective circuit. Microloads are indicated by N standard reference values. This value represents the failure rate at a 60% ( $\lambda$ 60) reliability level. (JIS C5003) The equation  $\lambda$ 60 = 0.5 × 10<sup>-6</sup>/operations indicates that a failure rate of 1/2,000,000 operations can be expected at a reliability level of 60%.



Model	ZC-□55-01	ZC-🗆 55
Minimum applicable load	5 VDC 1mA	5 VDC 160mA

#### Mounting

- When mounting the Switch with screws on a side surface, fasten the Switch with M4 screws and use washers, spring washers, etc., to ensure secure mounting.
- When mounting the Panel Mounttype Enclosed Switch (ZC-Q55, ZC-Q2255, or ZC-Q2155) with screws on a side surface, remove the hexagonal nuts from the actuator.

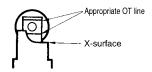
#### **Appropriate Tightening Torque**

A loose screw may result in a malfunction. Be sure to tighten each screw to the proper tightening torque as shown below.

No.	Туре	Appropriate Tightening Torque
(1)	Terminal screw	0.78 to 1.18 N⋅m
(2)	Panel mounting screw	4.90 to 7.84 N·m
(3)	Side mounting screw	1.18 to 1.47 N·m

#### Operation

With the ZC-Q22(21)55, an appropriate OT line is marked on the plunger. Set the OT so that it is between the two X-surface lines.



Mounting Holes Two, 4.3-dia. or M4 screw holes



## Mounting Holes



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## Omron:

 ZC-D55-MR VCT 1M
 ZC-N2155-MD-VCT-1M
 ZC-N2255L
 ZC-N2255-L3
 ZC-N2255-MD2-VCT-2M
 ZC-N2255-ML

 VCT 1M
 ZC-N2255-MR VCT 3M
 ZC-Q2155-L3
 ZC-Q2155-MD VCT 1M
 ZC-Q2155-MR VCT 1M
 ZC-Q2155-MR VCT

 5M
 ZC-Q2255-MD VCT 1M
 ZC-Q2255-MD VCT 3M
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