

*Changes for the Better*



## MELVAC VACUUM CONTACTORS & COMBINATION UNITS

*Multi-functional design to meet the requirements of the next generation*

# MELVAC VZ-D



 **MITSUBISHI ELECTRIC CORPORATION**  
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Specifications subject to change without notice.

# VZ-D SERIES FEATURES

## Compact & Lightweight

Using the latest technologies to make compact, lightweight products for various applications.

## Extremely Versatile Menu

Designing panels is simplified since the versatile menu of this series enables the most suitable selection of units to match the panelboard grade and the layout of the main-circuit conductor.

## Upgraded Safety

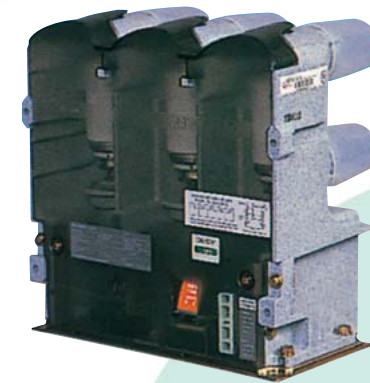
High-voltage components are fully enclosed by insulators with optimum design. Various safety functions are provided such as priority to open operation by electronic circuit.

## Energy Saving with less Operating Power

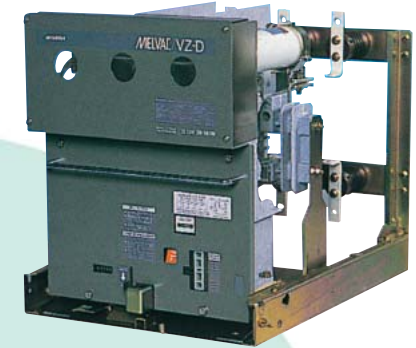
Types VZ2, VZ4 can be operated by small transformer (50VA)  
Ex: Mitsubishi Type PD-50HF for 6/3kV circuit and AC/DC power supply.

## Integrated Use

Integrated use of 6/3kV and AC/DC power supplies ensures highly logical panelboard designs for various specifications.

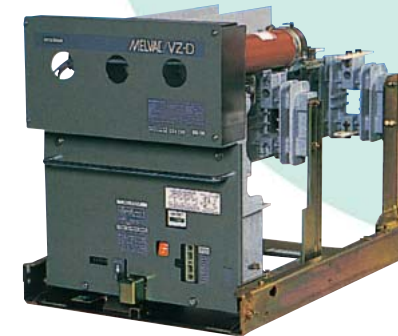


Fixed-type Contactor (P Type)

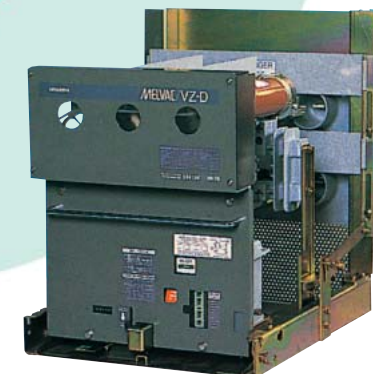


Thin Drawout-type Combination Unit (V Type)

The latest electronics technology achieves high performance and easy operation.



Standard Drawout-type Combination Unit (C Type)



Bushing Drawout-type Combination Unit (D Type)

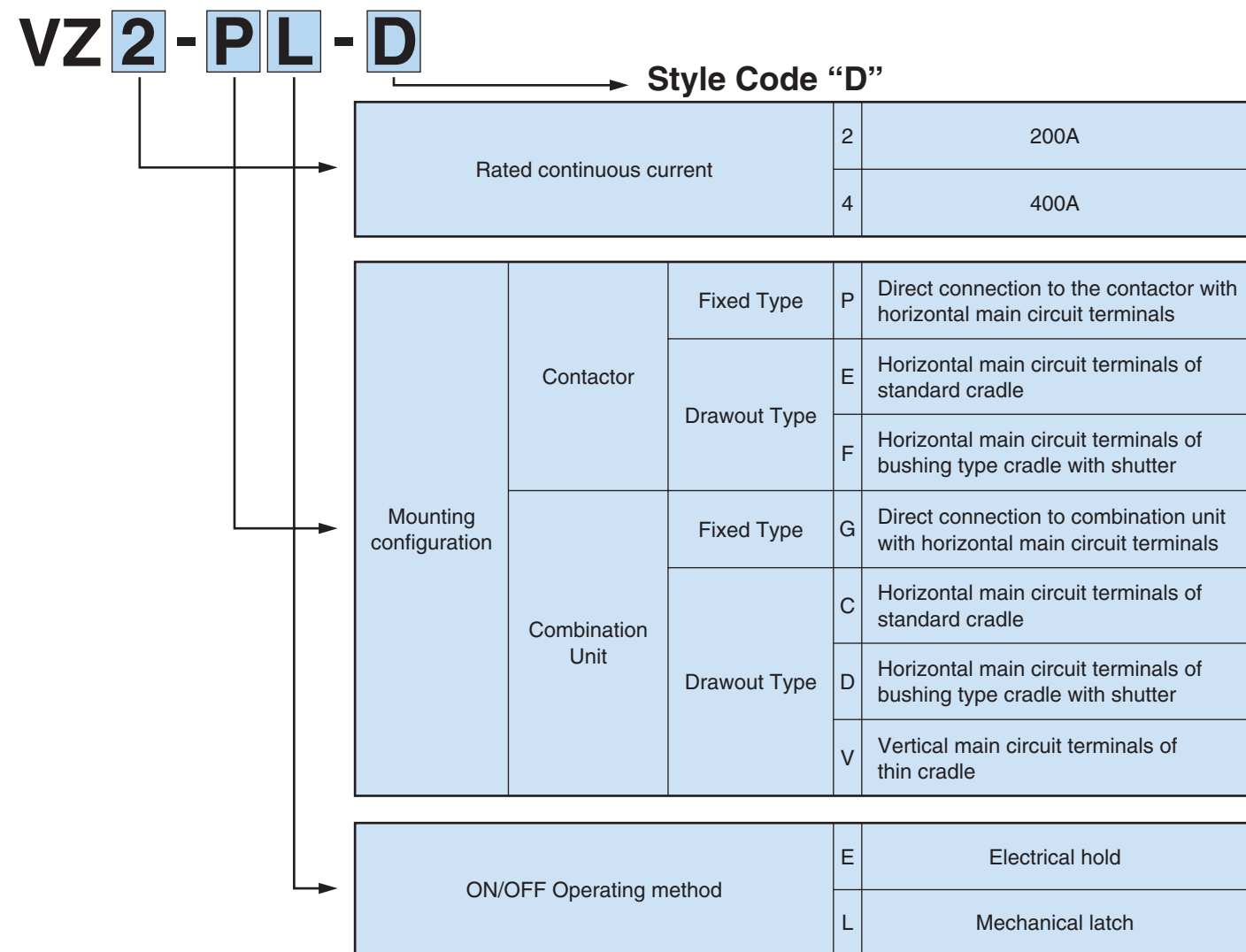
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### The following are also available:

- Standard Drawout Contactor (E-type)
- Bushing Drawout Contactor (F-type)
- Fixed Contactor (P-type)

### Standard Type Classification system



### Applicable standards

Table 1.1 Applicable standards

Type	Standards			
	JEM 1167 (1990)	IEC 470 (1974)	BS 775-2 (1974)	NEMA ICS (1978)
VZ2-□E-D			*1	*2
VZ2-□L-D	○	○	○	○
VZ4-□E-D				
VZ4-□L-D				

Note ○: Applicable

Remark \*1: 3.6kV 25MVA, 7.2kV 50MVA  
\*2: 5kV 25MVA

### Ratings and Specifications

Table 2.1 Ratings of Contactor

Item		Specification	
		VZ2-□□-D	VZ4-□□-D
Type			
Rated operational voltage (kV)		6.6/3.3	
Rated insulating voltage (kV)		7.2	
Rated operational current (A)		200	400
Rated frequency (Hz)		50/60	
Short-circuit breaking current (kA)		4	
Rated short-time withstand current (kA-S)		4-2	4-10, 8-0.5
Half-wave conduction current (kA crest value)		33 (peak)	60 (peak)
Closing capacity and breaking capacity (kA) 25times		1.6	3.2
Switching frequency (times/hour)		600	
Electrical and mechanical life (times)		250 x 10 <sup>3</sup>	
Rated withstand voltage		AC 22kV-1min. Impulse 60kV *1	
Maximum applicable capacity	Motor (kW)	750 (at 3.3kV) 1500 (at 6.6kV)	1500 (at 3.3kV) 3000 (at 6.6kV)
	Transformer (kVA)	1000 (at 3.3kV) 2000 (at 6.6kV)	2000 (at 3.3kV) 4000 (at 6.6kV)
	Capacitor (kVar)	750 (at 3.3kV) 1500 (at 6.6kV)	1200 (at 3.3kV) 2000 (at 6.6kV)
Weight (kg)		17	

\*1. Between contact is outside application.

Table 2.2 Ratings of combination unit

Item	Draw-out type		Fixed type	
	VZ2-□□-D	VZ4-□□-D	VZ2-□□-D	VZ4-□□-D
Type				
Rated operational voltage (kV)	6.6/3.3	6.6 (single use) 3.3 (single use)	6.6/3.3	6.6 (single use) 3.3 (single use)
Rated insulating voltage (kV)	7.2		7.2	
Rated operational current (A)	200	400	200	400
Rated frequency (Hz)	50/60		50/60	
Short-circuit breaking current (kA)	40 (Power fuse)		40 (Power fuse)	
Rated short-time withstand current (kA-S)	4-2	4-10, 8-0.5	4-2	4-10, 8-0.5
Half-wave conduction current (kA crest value)	33	60	33	60
Closing capacity and breaking capacity (kA) 25times	1.6	3.2	1.6	3.2
Switching frequency (times/hour)	600		600	
Electrical and mechanical life (times)	250 x 10 <sup>3</sup>		250 x 10 <sup>3</sup>	
Rated withstand voltage	AC 22kV-1min. Impulse 60kV *1		AC 22kV-1min. Impulse 60kV *1	
Maximum applicable capacity	Motor (kW)	750 (at 3.3kV) 1500 (at 6.6kV)	1500 (at 3.3kV) 3000 (at 6.6kV)	750 (at 3.3kV) 1500 (at 6.6kV) 3000 (at 6.6kV)
	Transformer (kVA)	1000 (at 3.3kV) 2000 (at 6.6kV)	2000 (at 3.3kV) 4000 (at 6.6kV)	1000 (at 3.3kV) 2000 (at 6.6kV) 4000 (at 6.6kV)
	Capacitor (kVar)*2	750 (at 3.3kV) 1500 (at 6.6kV)	1200 (at 3.3kV) 2000 (at 6.6kV)	750 (at 3.3kV) 1500 (at 6.6kV) 2000 (at 6.6kV)
Weight (without VT)*3	52	64 (for 6kV) 53 (for 3kV)	50	62 (for 6kV) 51 (for 3kV)

\*1. Between contact is outside application.

\*2. The figure shows the maximum installation capacity with a series reactor of 6% - 13%. Note that the indicated value assumes that there is no other capacitor in parallel.

\*3. The weight includes the power fuse with the maximum rating. Add 10kg VT, or 20 kg for two VTs when mounting VT(s).

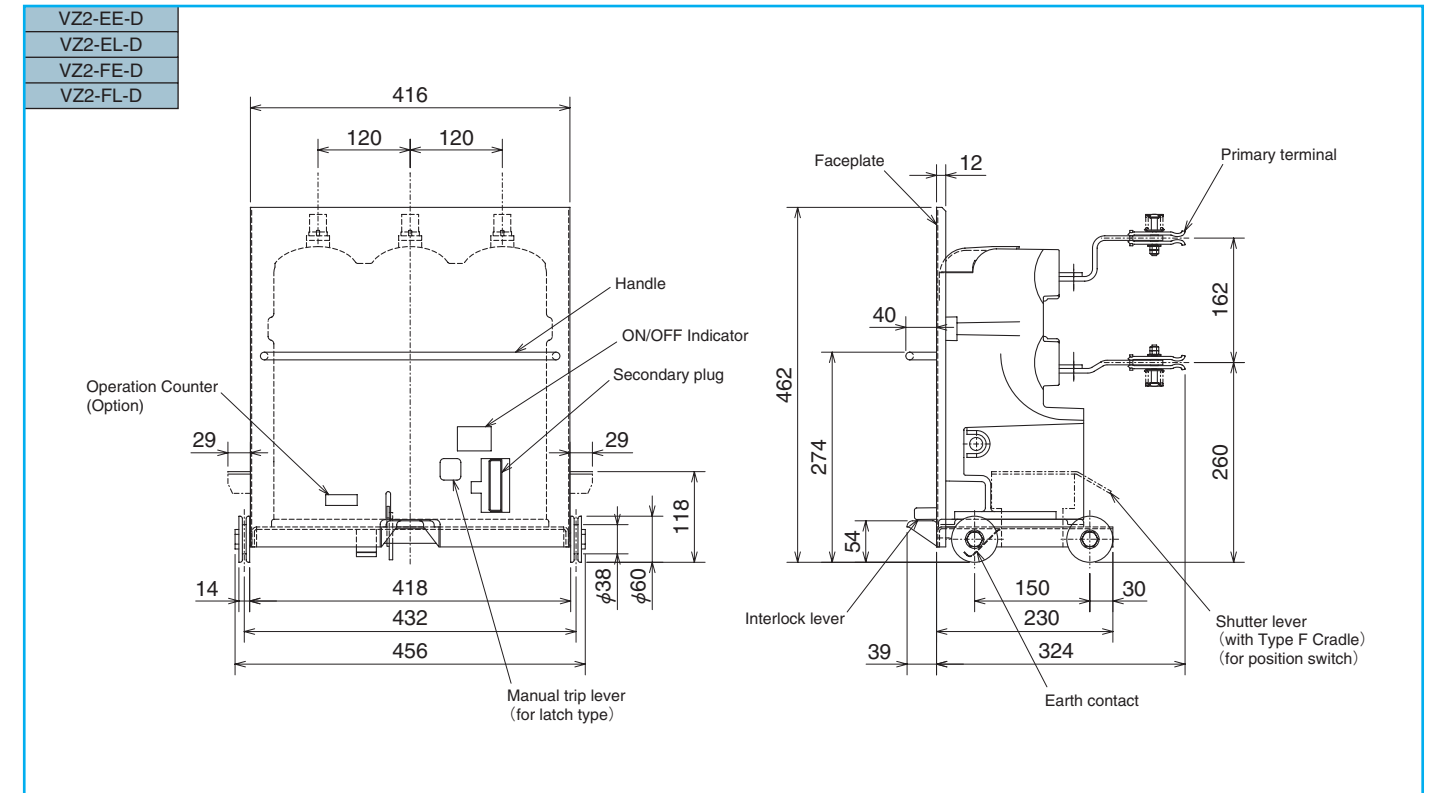
Weight of cradle (kg)	20 C-type 29 D-type 21 V-type	21 (for 6kV) C type 20 (for 3kV) C type 30 (for 6kV) D type 29 (for 3kV) D type	—	
Applicable Mitsubishi fuse link (A)	G5 ~ G200 M20 ~ M200 7.2kV for type V. Mounting isn't possible to M100-M200.	at 3.3kV G300, G400 M300, M400 at 6.6kV M300, M400	G5 ~ G200 M20 ~ M200	at 3.3kV G300, G400 M300, M400 at 6.6kV M300, M400

### Outline List

Mounting configuration		Type	VMC	Cradle	
Contactor	Fixed Type	200A	P P.4 fig. 3.1	—	
		400A			
	Drawout Type	200A	E	P.5 fig. 3.2	P.6 fig. 3.4
			F		P.6 fig. 3.5
400A		E	P.5 fig. 3.3	P.6 fig. 3.4	
		F		P.6 fig. 3.5	
Combination unit	Fixed Type	200A	P.7 fig. 3.6	—	
		400A			P.7 fig. 3.7
	Drawout Type	200A	C	P.8 fig. 3.8	P.9 fig. 3.10
			D		P.9 fig. 3.11
		400A	V	P.8 fig. 3.9	P.10 fig. 3.12
			C		P.10 fig. 3.14
D	P.10 fig. 3.13	P.10 fig. 3.15			

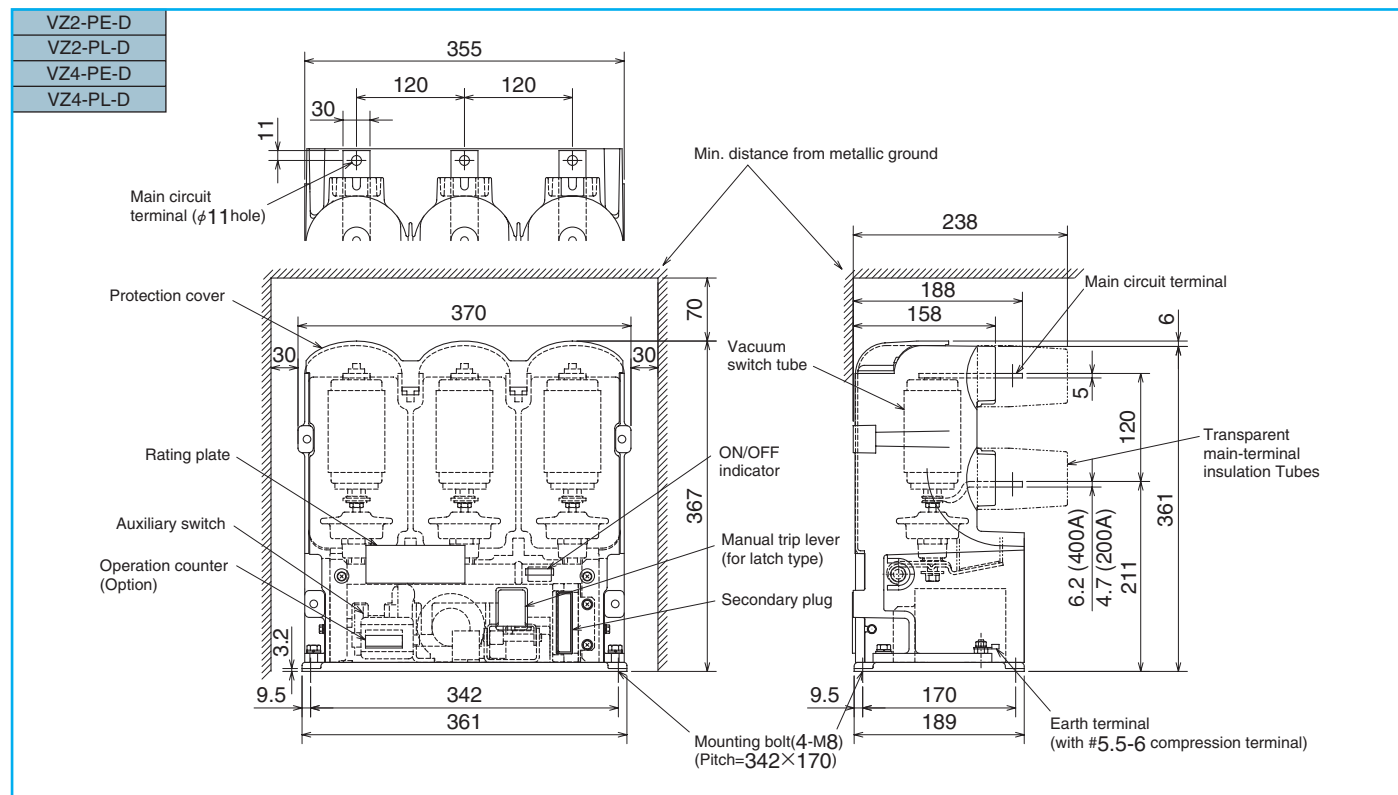
### Drawout-type Contactor

● Fig. 3.2

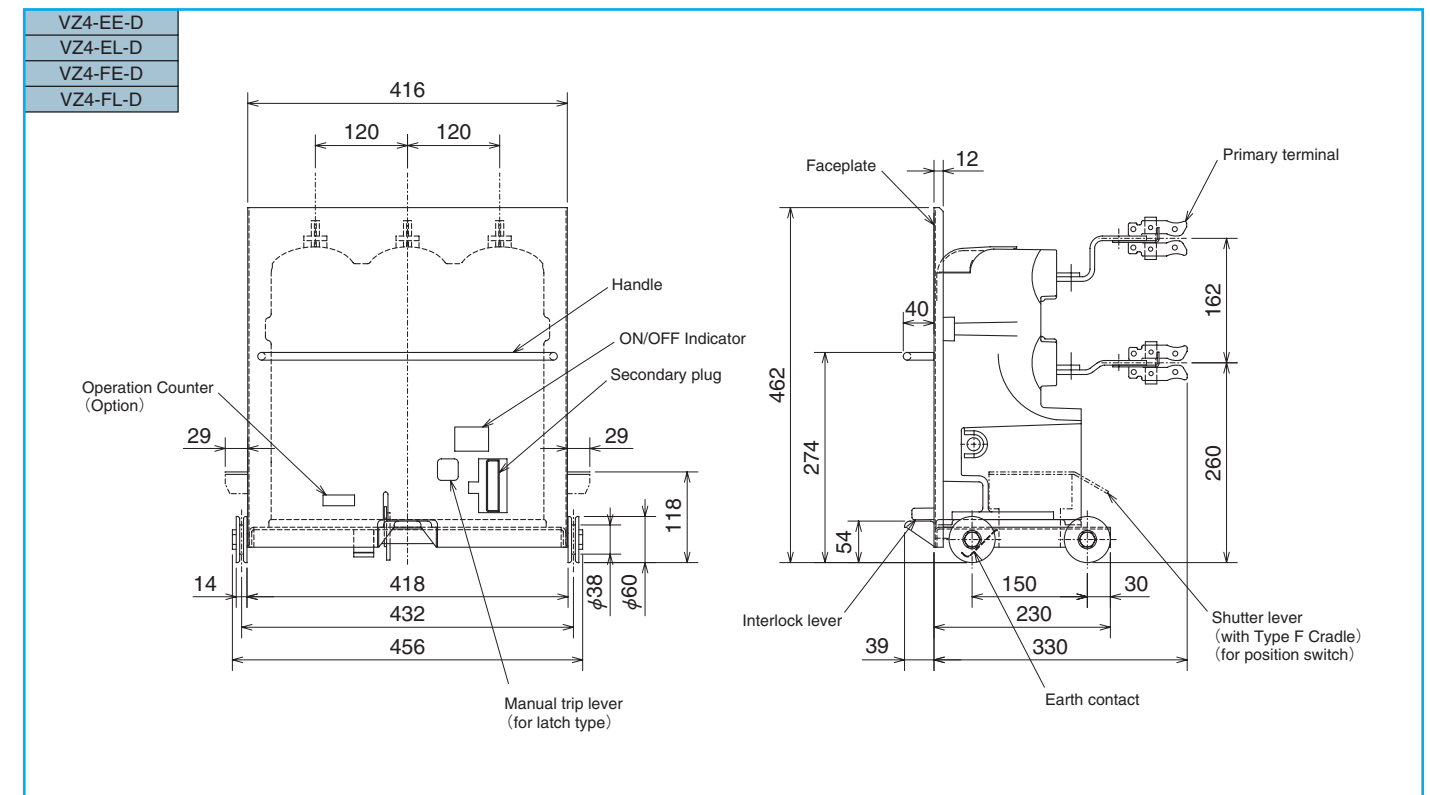


### Fixed-type Contactor

● Fig. 3.1

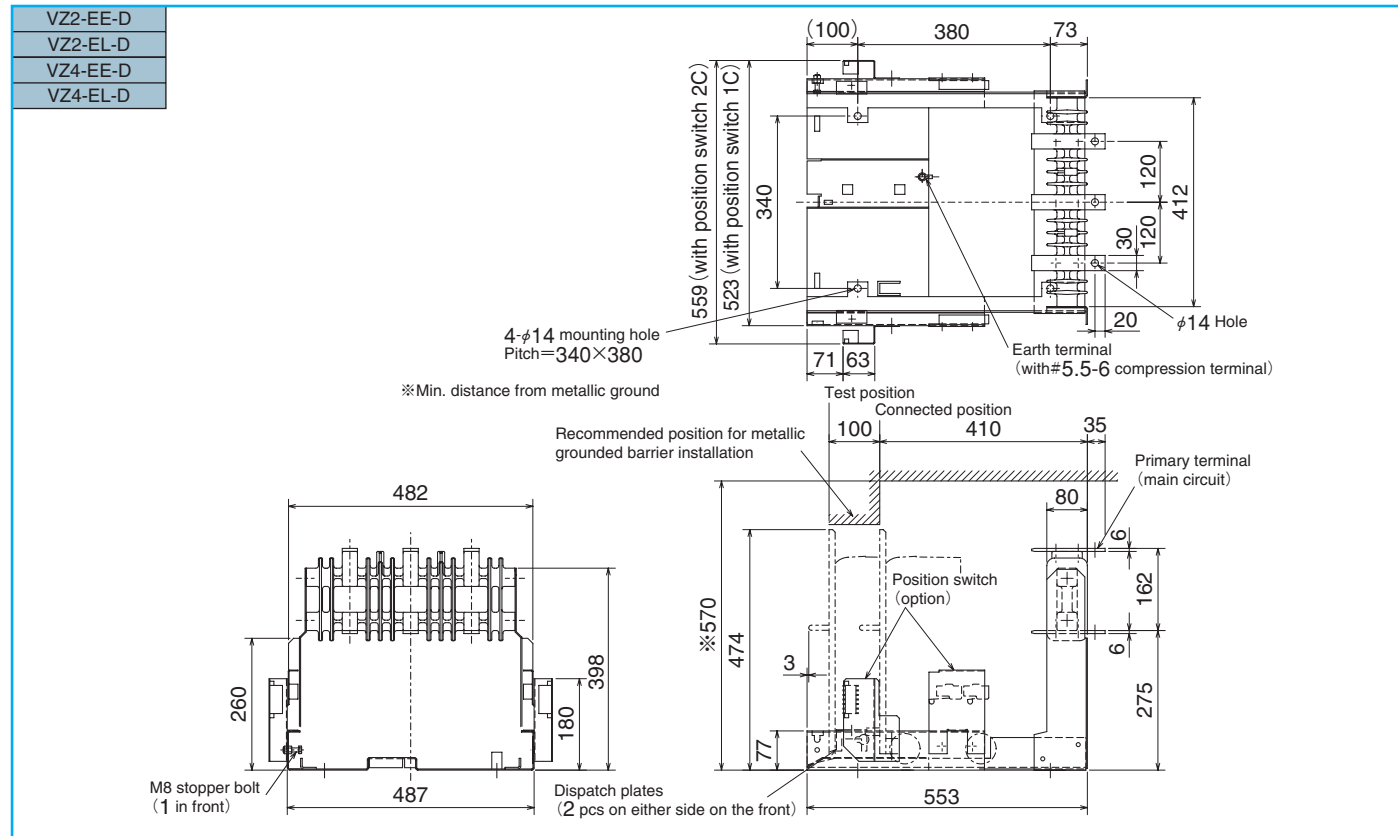


● Fig. 3.3

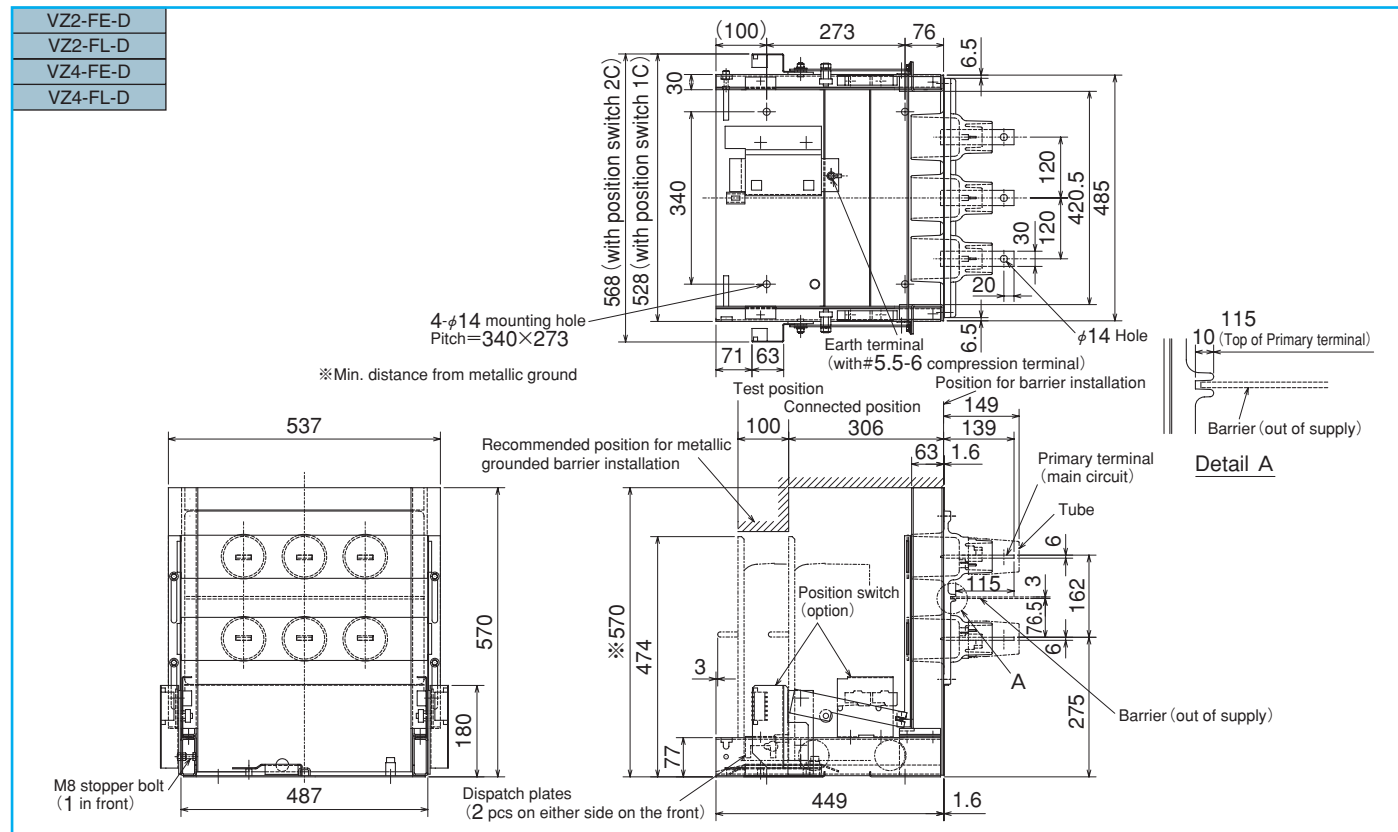


## ■ Cradle of Contactor

● Fig. 3.4

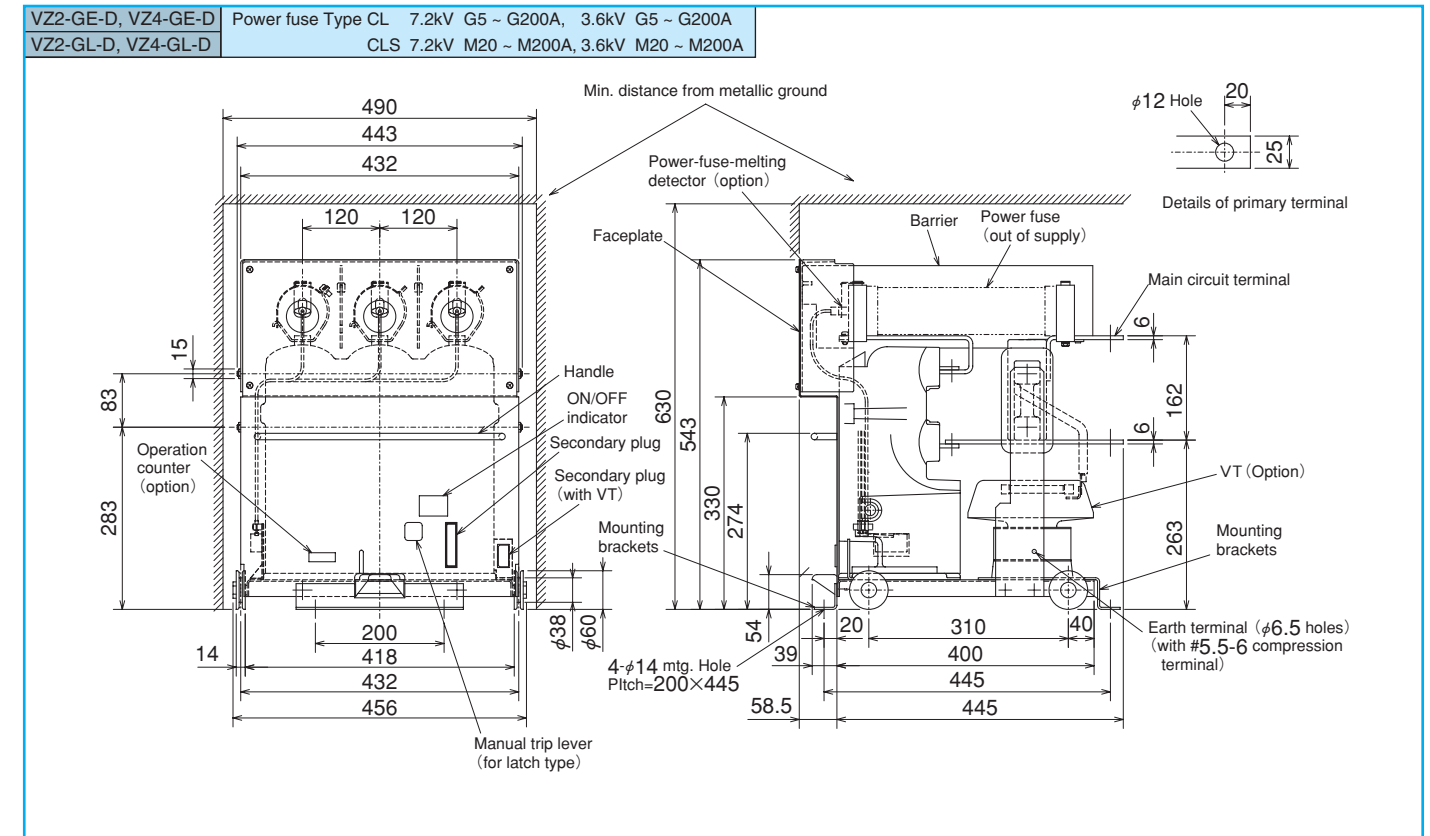


● Fig. 3.5

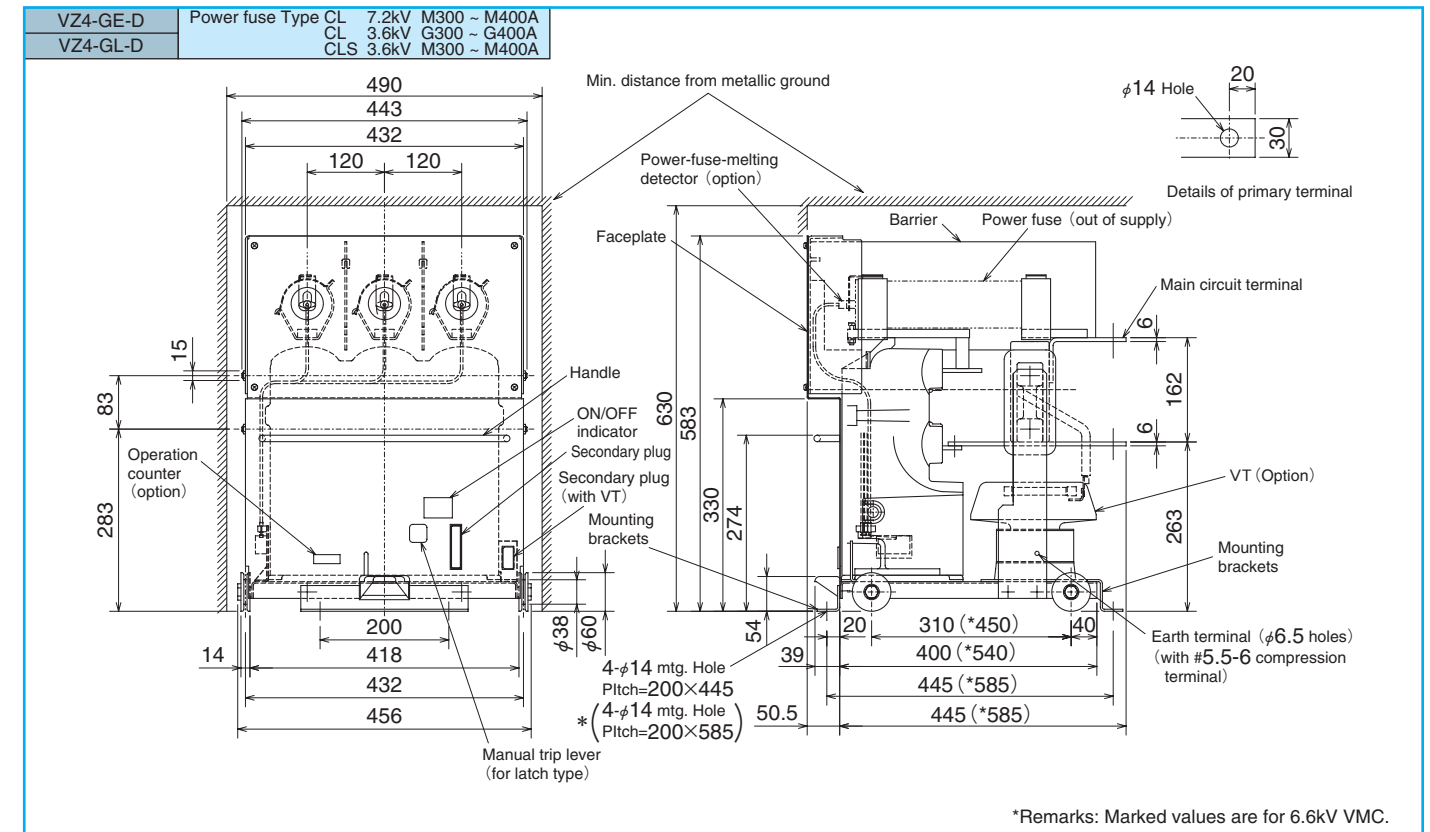


## ■ Fixed-type Combination Unit (Caster-fixed Type)

● Fig. 3.6

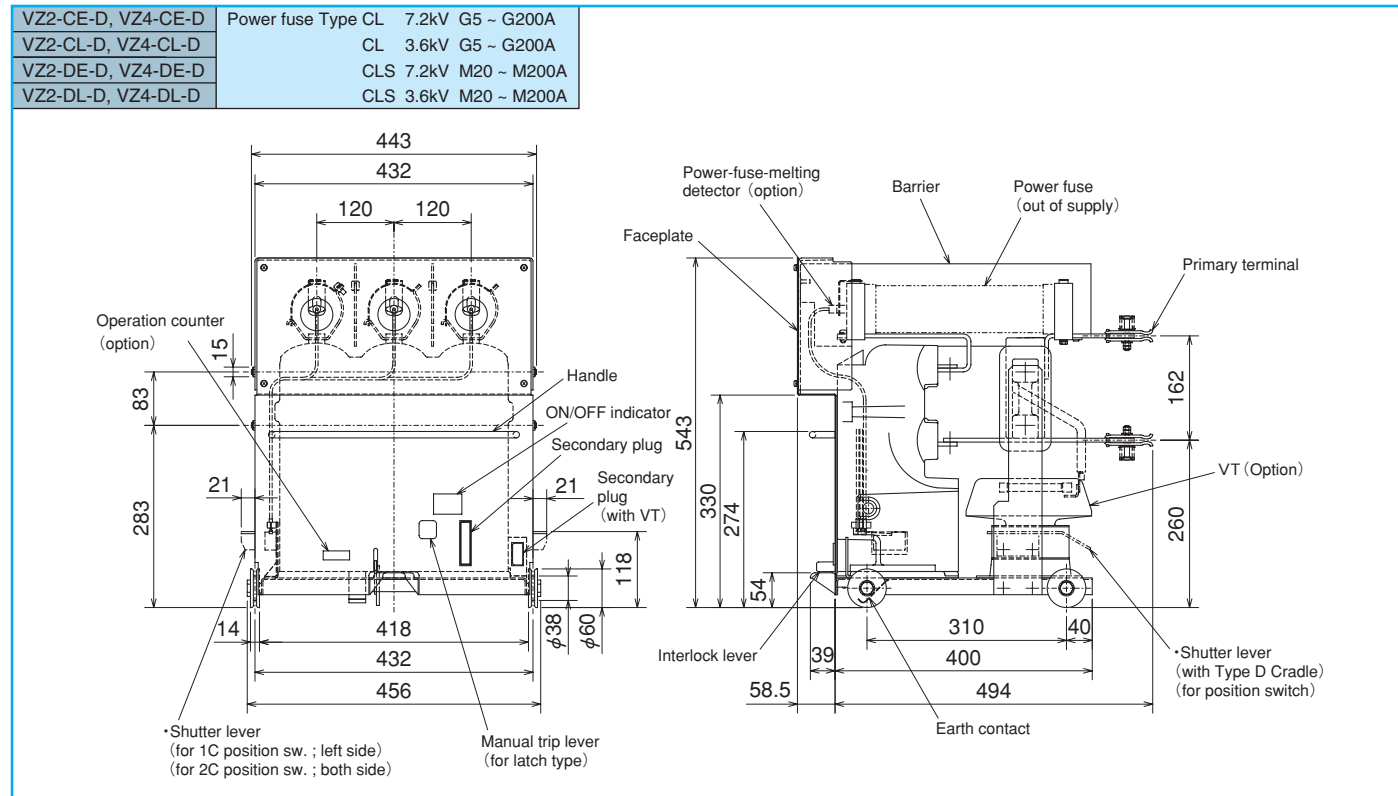


● Fig. 3.7



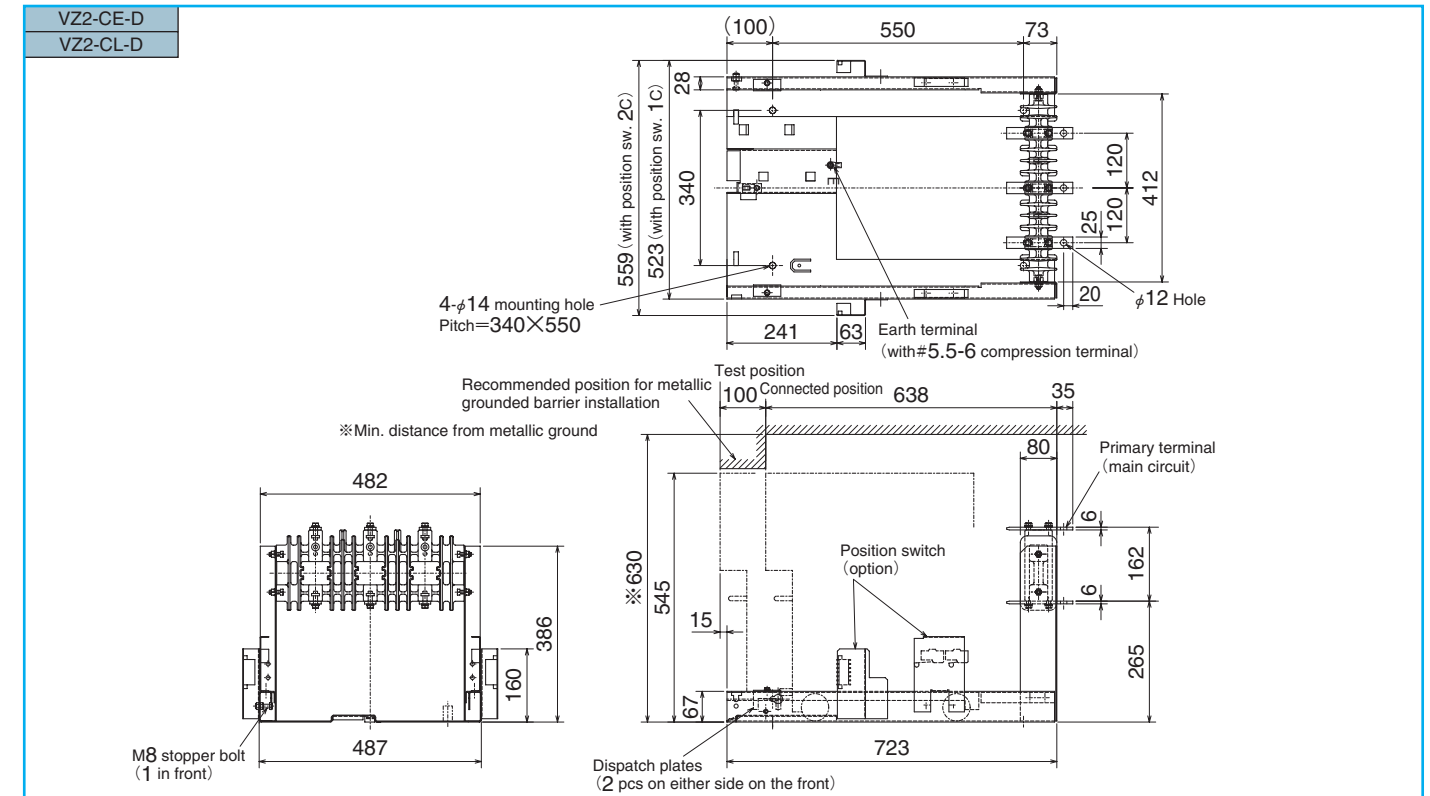
**Drawout-type Combination Unit (Standard, Bushing Type)**

● Fig. 3.8



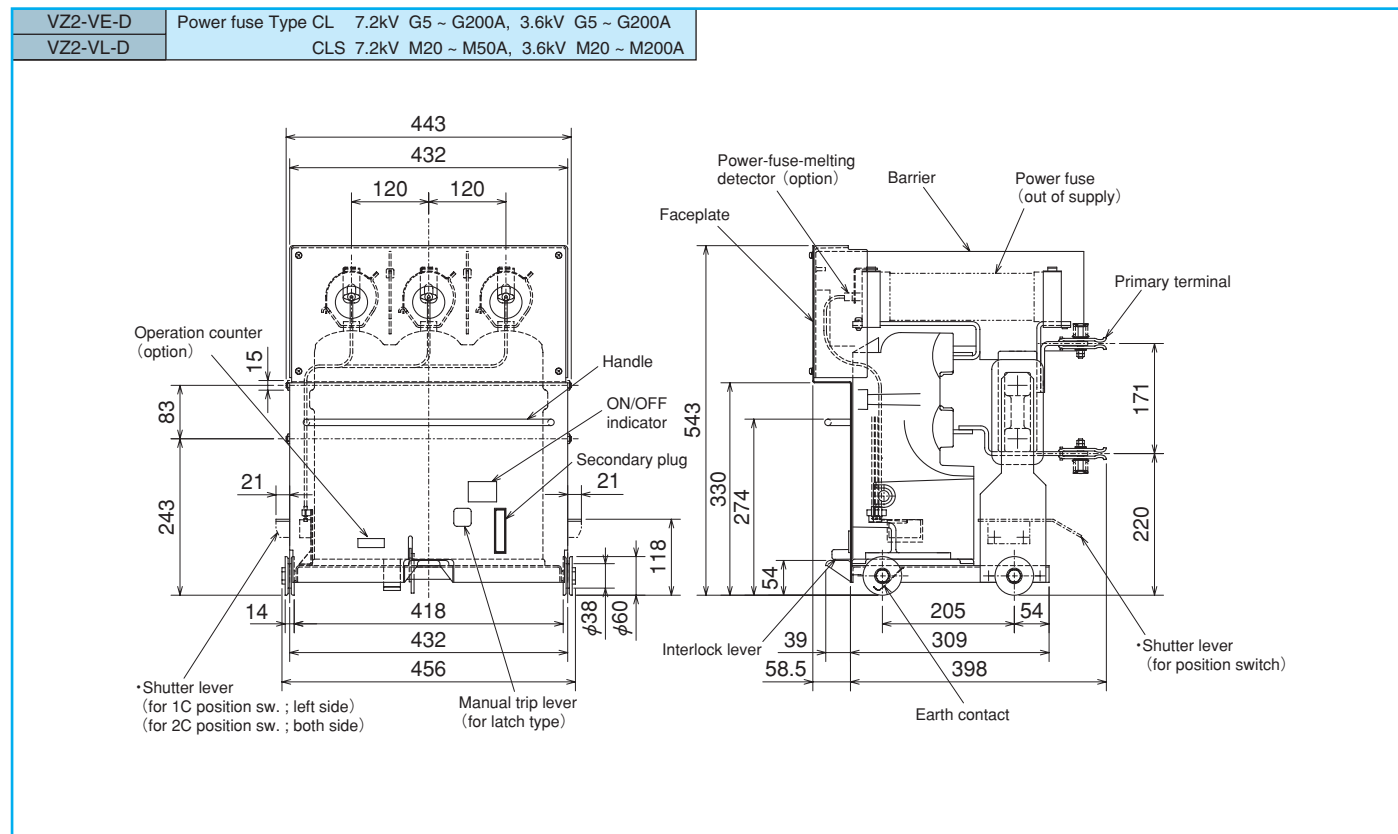
**Cradle of Combination Unit (Standard Type)**

● Fig. 3.10



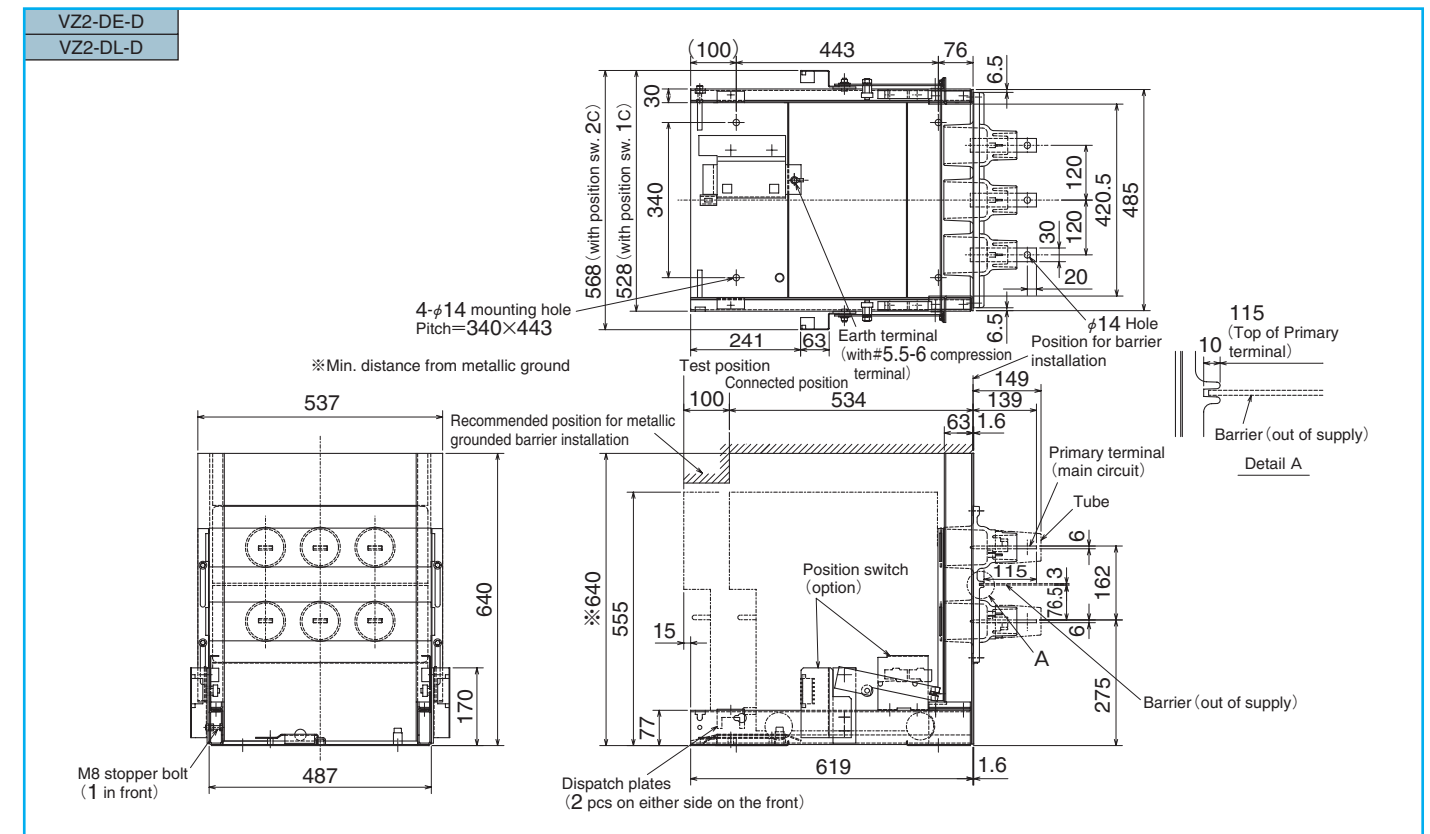
**Drawout-type Combination Unit (Slim Type)**

● Fig. 3.9



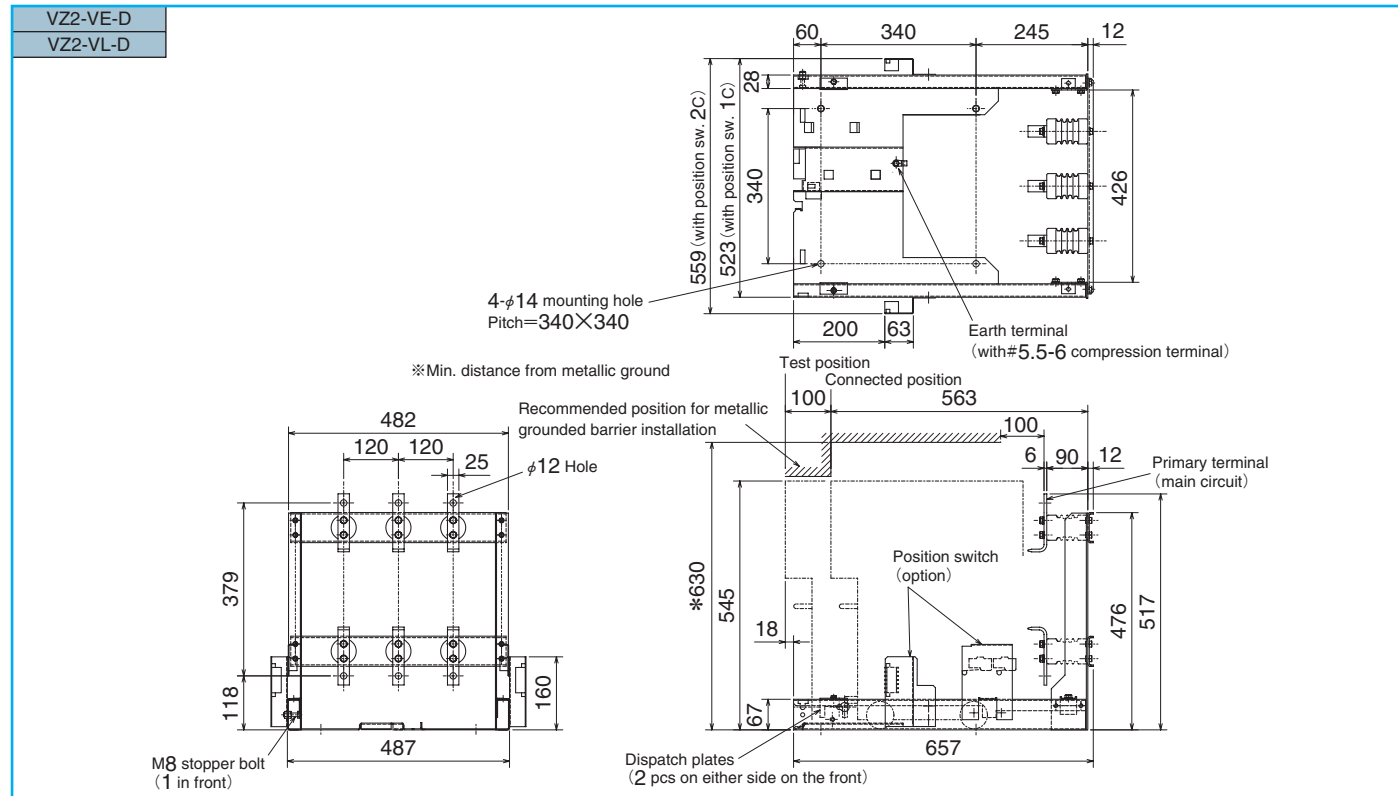
**Cradle of Combination Unit (Bushing Type)**

● Fig. 3.11



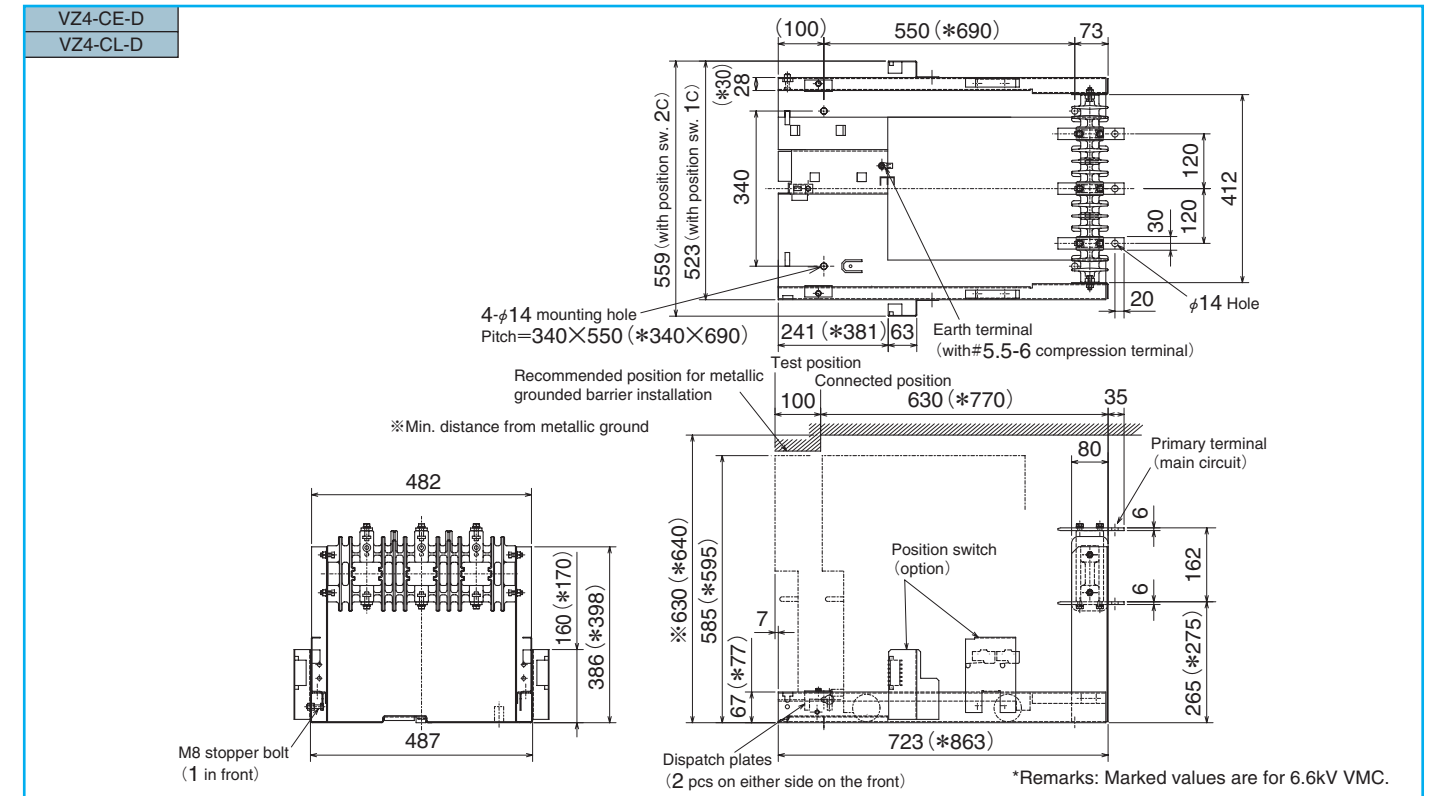
## ■ Cradle of Combination Unit (Slim Type)

● Fig. 3.12



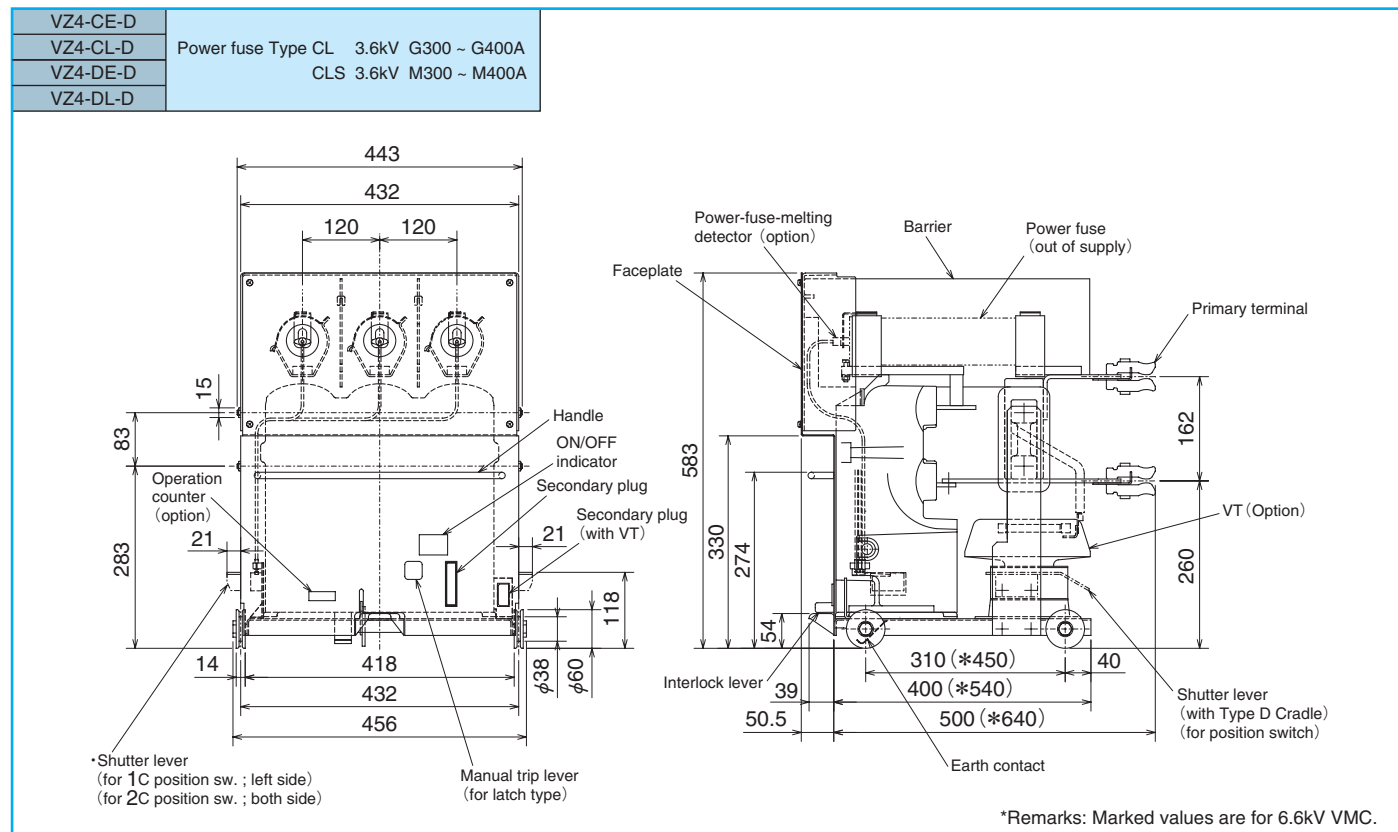
## ■ Cradle of Combination Unit (Standard Type)

● Fig. 3.14



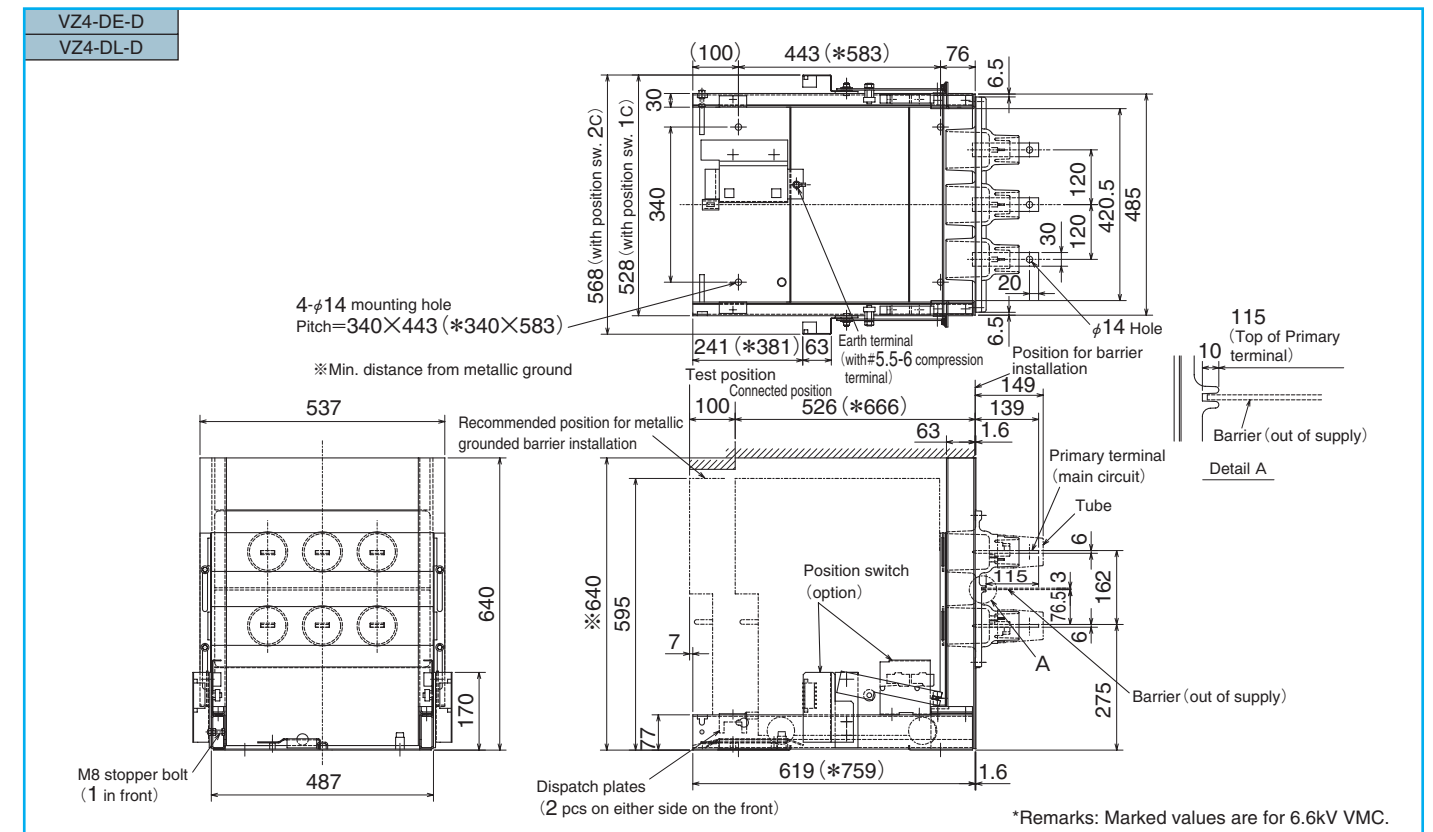
## ■ Drawout-type Combination Unit (Standard, Bushing Type)

● Fig. 3.13



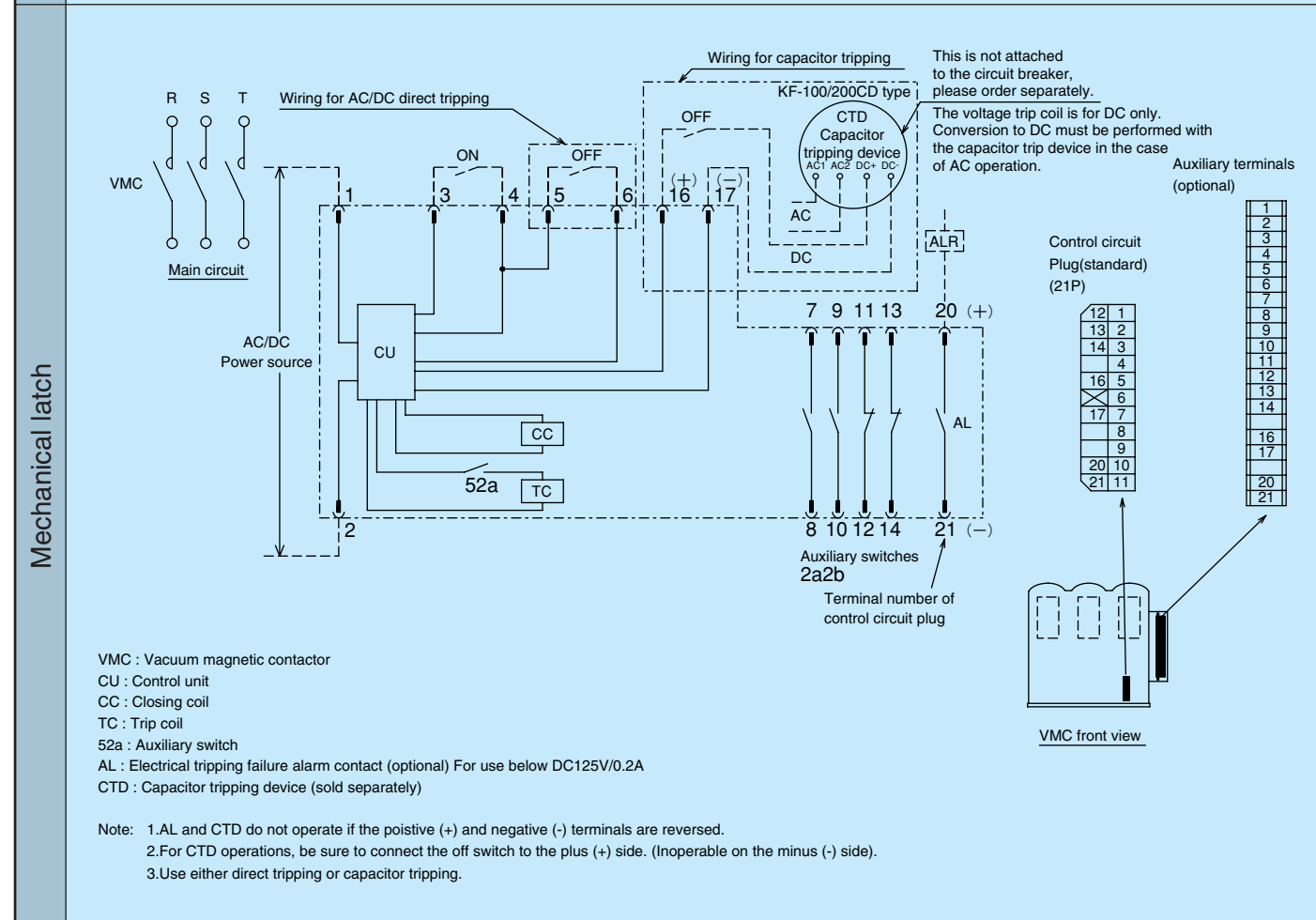
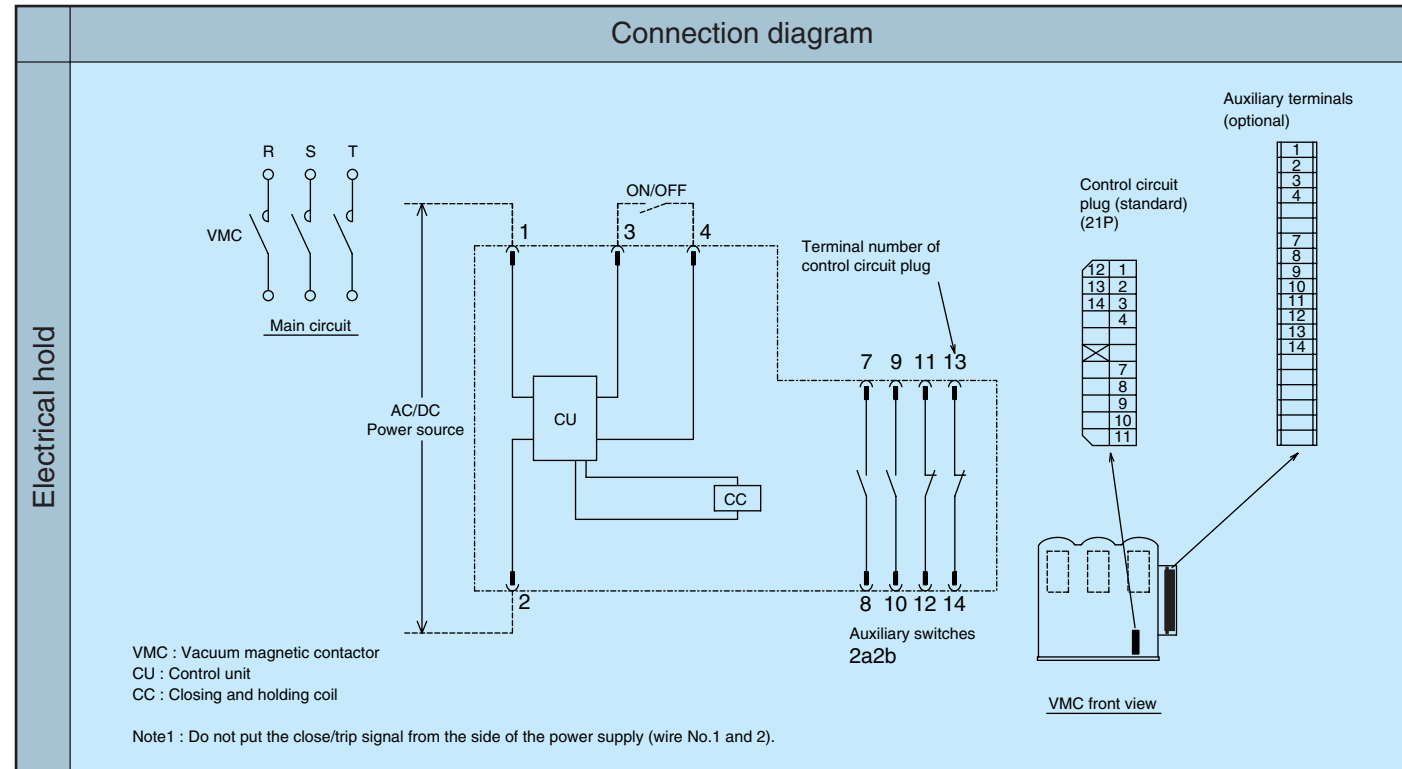
## ■ Cradle of Combination Unit (Bushing Type)

● Fig. 3.15



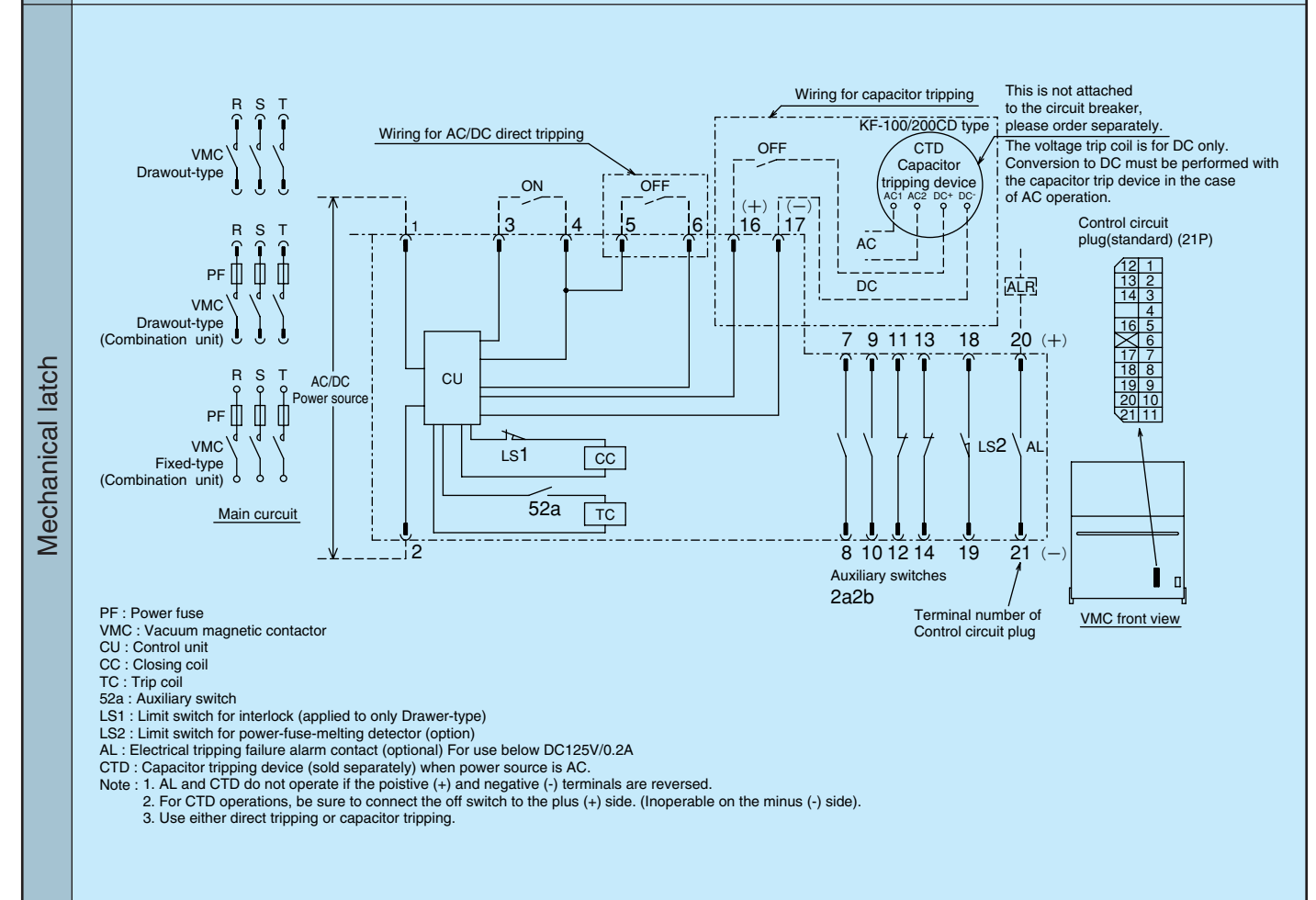
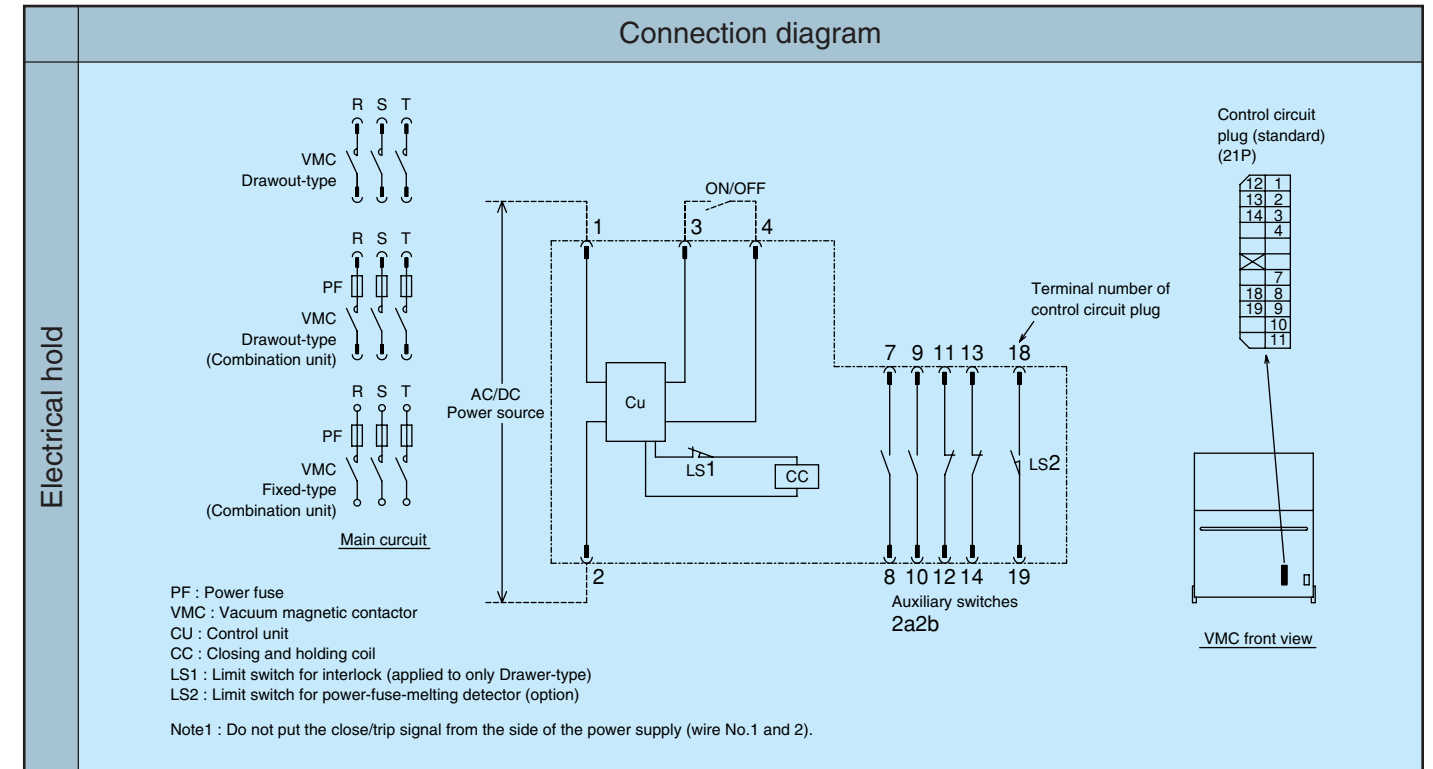
### Fixed-type Contactor

#### Fixed type control circuit



### Combination Unit

#### Standard combination unit control circuit





# 5 Standard Specifications and Attachments

Standard specifications of the VZ-D type vacuum contactors and combination units are shown below.

## Standard Specifications

Table 5.1 Standard equipment

Standard equipment	Type/mounting method		Contactor			Combination unit				Application
	P type	E type	F type	C type	D type	V type	G type			
Rating plate	○	○	○	○	○	○	○	○	IEC-470	
Auxiliary switch	○	○	○	○	○	○	○	○	Number of contactors 2a, 2b	
Grounding terminal	○	—	—	—	—	—	○	—	Crimped terminal for 5.5mm <sup>2</sup> , screw size M6	
Grounding contact	—	○	○	○	○	○	—	—	Automatic connection from test to connection positions	
Power fuse fastener	—	—	—	○	○	○	○	○	Three sizes are available depending on the fuse rating.	
Interlock	—	○	○	○	○	○	—	—	Electrical and mechanical double lock	
Shutter drive lever	—	—	○	—	○	—	—	—	One pair for left and right	
Fastener to secure the contactor to the cradle (Stopper bolt)	—	○	○	○	○	○	—	—	One screw fastening, position in front	
Contactor and cradle fastener for shipment (Dispatch plates)	—	○	○	○	○	○	—	—	Two screw fastening, positions in front	
Grounding terminal	—	○	○	○	○	○	—	—	Crimped terminal for 5.5mm <sup>2</sup> , screw size M6	
Shutter	—	—	○	—	○	—	—	—	Insulation board shutter	

Note: 1. — Not applicable.  
2. Power fuses are available as optional attachments.  
3. Contactor can be inserted and withdrawn only in OFF state.

## Ratings of Auxiliary Switch and Power-Fuse Switch

Table 5.2 Auxiliary switch

Rated insulation voltage (V)		660	
Operating current (A)	AC220V	1	
	DC110V	1	
Minimum operating current (A)	AC, DC24V	0.05	
Rated continuous current (A)		1	
Rated withstand voltage	—	AC	1mp
	Between T-E	2kV	7kV
	Between T-T	—	3kV

T : Terminal  
E : Earth

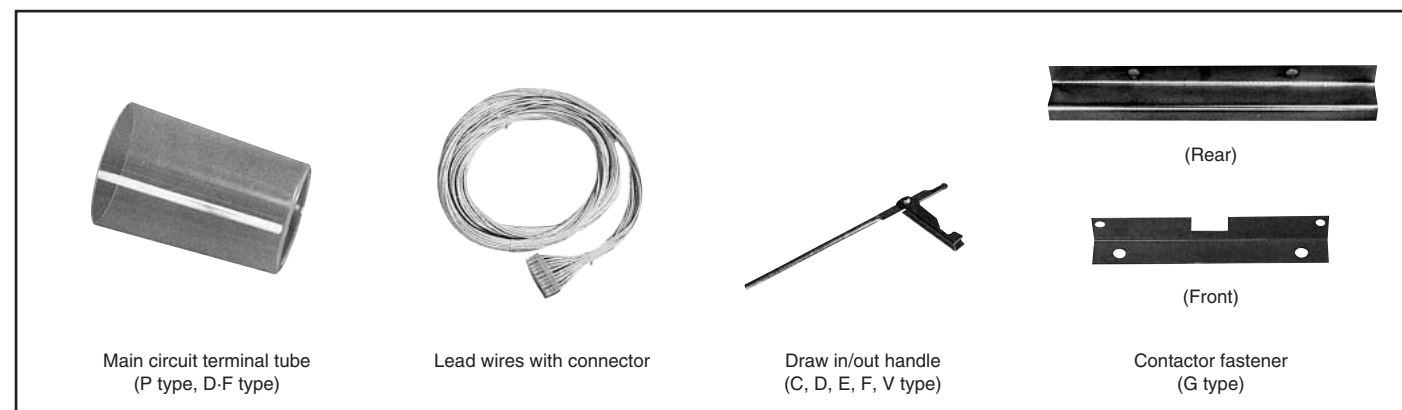
Table 5.3 Switch for power-fuse-melting detector (optional attachment)

Rated voltage (V)	Resistance load (A)	Inductance load (A)
AC 125V	15	15
DC 125V	0.5	0.05
Minimum operational current	A.C. D.C. 24V	0.02A

## Standard Attachments

Table 5.4 Standard attachments

Standard attachment	Type/mounting method		Contactor			Combination unit				Application
	P type	E type	F type	C type	D type	V type	G type			
Main-circuit terminal tube	○	—	○	—	○	—	—	—	6 pcs.	
Leadwires with connector	○	○	○	○	○	○	○	○	1.25 mm <sup>2</sup> , 1.5 m	
Power-fuse rating seal	—	—	—	○	○	○	○	○	1 piece	
Draw in/out handle	—	○	○	○	○	○	—	—	1 piece	
Contactor fastener	—	—	—	—	—	—	○	○	One pair for front and rear	



# 6 Optional Attachments

The optional attachments are shown in Table 6.1. If ordered, attachments will be mounted on the units prior to delivery.

Table 6.1 Optional attachments

Name	Contactor			Combination unit				Application
	P type	E type	F type	C type	D type	V type	G type	
Operation counter	○	○	○	○	○	○	○	6-digit mechanical type
Tripping failure alarm contact	○	○	○	○	○	○	○	1a contact (latch type only)
Power-fuse-melting defector	—	—	—	○	○	○	○	1a contact for 3-phases
Auxiliary terminal	○	—	—	—	—	—	—	
Transformer (VT)	—	—	—	○	○	—	○	Two 50 VAX2 or 100 VAX2 can be mounted.
Position switch	—	○	○	○	○	○	—	Two contacts can be attached.

## Instrumentation transformer (VT)

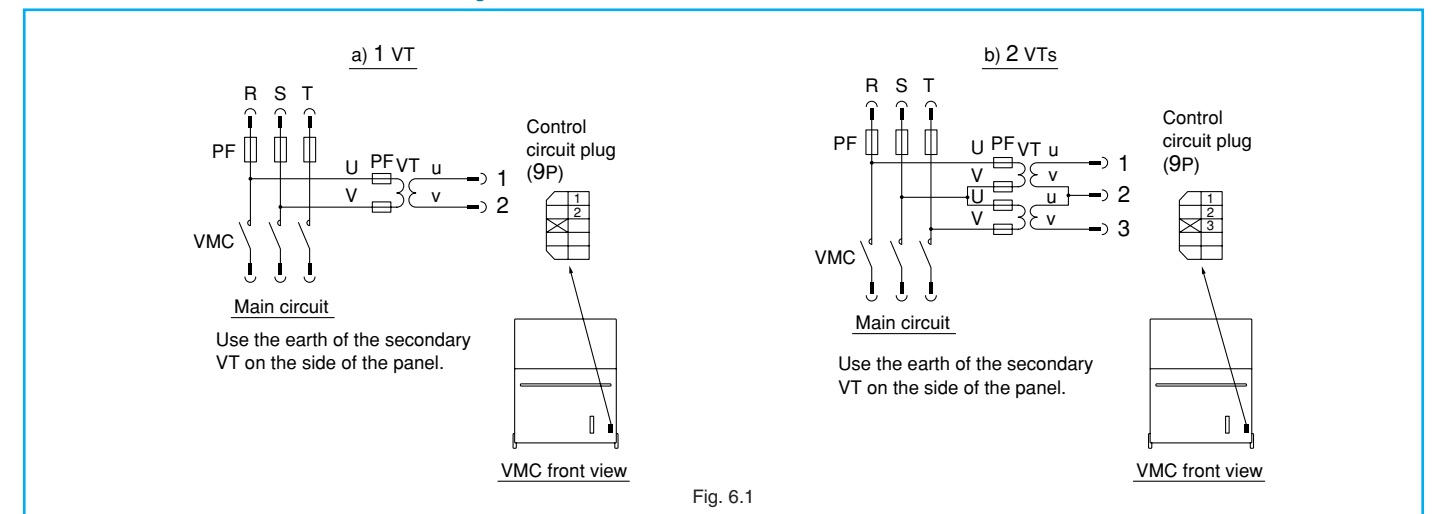
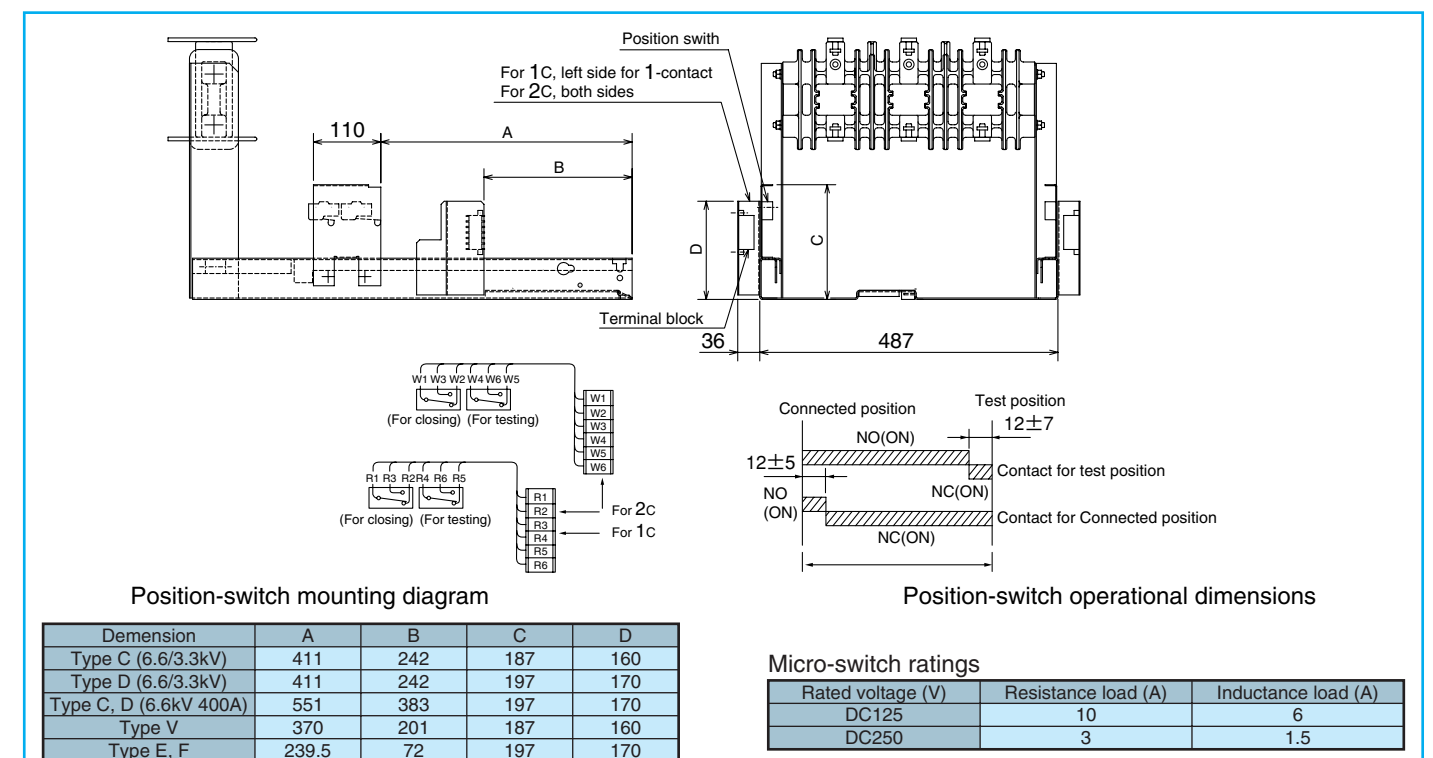


Fig. 6.1

## Position switch



Note: This diagram shows a Type C cradle, but the position-switch components and mounting dimensions, etc., are identical for Type V-D fixed panels.

Fig. 6.2

The short-circuit current for VZ-D type VMC<sup>\*1</sup> is 4 kA. However, this type of VMC can be used for circuits with short-circuit currents as high as 40 kA, when used in combination with a Mitsubishi power fuse. When selecting power fuses, make sure that the fuses chosen are not blown by inrush current such as when a motor starts, during transformer excitation or at the time of a capacitor inrush current. Tables 7.1 through 7.8 show the recommended current ratings of power fuses.

### When a Motor is Connected as a Load

Table 7.1 3 kV three-phase Induction Motor

Motor output (kW)	Max. applicable total load current (A)	Vacuum contactor rated working current (A)	Power fuse (CLS type) rated current (A)
35 ~ 75	20	200	M20
90 ~ 200	50		M50
220 ~ 400	100		M100
450 ~ 630	150		M150
710 ~ 750	200		M200
900 ~ 1250	300	400	M300
1500	400		M400

Table 7.2 6 kV three-phase Induction Motor

Motor output (kW)	Max. applicable total load current (A)	Vacuum contactor rated working current (A)	Power fuse (CLS type) rated current (A)
75 ~ 160	20	200	M20
185 ~ 400	50		M50
450 ~ 800	100		M100
900 ~ 1250	150		M150
1500	200		M200
2500	300	400	M300
900	400		M400

- The Mitsubishi high voltage current-limiting fuse CLS type (model: R) is the standard fuse for a motor.

### When a Transformer is Connected as a Load

Table 7.3 3 kV three-phase Transformer

Transformer capacity (kVA)	Transformer rated current (A)	Vacuum contactor rated current (A)	Power fuse (CL type) rated current (A)		
			Min.	Max.	
5	0.87	200	G5 (T1.5)	G5 (T1.5)	
10	1.75		G10 (T3)	G10 (T3)	
20	3.50		G20 (T7.5)	G20 (T7.5)	G30 (T15)
30	5.25			G30 (T15)	
50	8.75		G30 (T15)	G50 (T30)	G75 (T50)
75	13.1			G75 (T50)	
100	17.5		G40 (T20)	G100 (T75)	
150	26.2		G50 (T30)		
200	35.0		G60 (T40)	G200 (T150)	
300	52.5		G75 (T60)		
500	87.5		G150 (T100)	G200 (T150)	
750	131		G200 (T150)		
1000	175		*2 —	*2 —	
1500	262		400	G400 (T300)	G400 (T300)
2000	350			*3 —	*3 —

Table 7.4 6 kV three-phase Transformer

Transformer capacity (kVA)	Transformer rated current (A)	Vacuum contactor rated current (A)	Power fuse (CL type) rated current (A)	
			Min.	Max.
5	0.44	200	—	—
10	0.87		G5 (T1.5)	G5 (T1.5)
20	1.75			
30	2.62		G10 (T3)	G10 (T3)
50	4.37			
75	6.56		G20 (T7.5)	G40 (T20)
100	8.75			
150	13.1		G30 (T15)	G50 (T30)
200	17.5			
300	26.2		G40 (T20)	G75 (T50)
500	43.7			
750	65.6		G50 (T30)	G75 (T60)
1000	87.5			
1500	131		G75 (T50)	G100 (T75)
2000	175			
3000	262	400	G100 (T75)	G200 (T150)
4000	350		G150 (T100)	
			G200 (T150)	
			*2 —	*2 —
			*4 G400 (T300)	*4 G400 (T300)
			*3 —	*3 —

- The Mitsubishi high voltage current-limiting fuse CL type (Model: - and LB) is the standard fuse for a transformer.

Notes: \*1. VMC: Vacuum magnetic contactor

\*2. The CLS-R M200A power fuse is recommended for these operating conditions.

\*3. The CLS-R M400A power fuse is recommended for these operating conditions.

\*4. The CLS-R M300A is recommended for these operating conditions when a combination type fuse is required.

### When a Capacitor is Connected as a Load

Table 7.5 3 kV Capacitor (with no reactor)

Capacitor three-phase reactive power (kVar) 50/60 Hz	Capacitor rated current (A)	Vacuum contactor rated current (A)	Power fuse (CL type) rated current (A)		
			Min.	Max.	
10 / 12	1.75 / 2.10	200	G10 (C3)	G40 (C20)	
15 / 18	2.62 / 3.15				
20 / 24	3.50 / 4.20				
25 / 30	4.37 / 5.25		G20 (C7.5)	G50 (C30)	
30 / 36	5.25 / 6.30				
50	8.75				
75	13.1		G30 (C15)	G75 (C50)	G75 (C40)
100	17.5			G100 (C60)	

For a capacitor with 150 kVar or higher, a series reactor must be provided with the capacitor.

Table 7.7 6 kV Capacitor (with no reactor)

Capacitor three-phase reactive power (kVar) 50/60 Hz	Capacitor rated current (A)	Vacuum contactor rated current (A)	Power fuse (CL type) rated current (A)		
			Min.	Max.	
10 / 12	0.87 / 1.05	200	G5 (C1.5)	G40 (C20)	
15 / 18	1.31 / 1.57				
20 / 24	1.76 / 2.10				
25 / 30	2.19 / 2.62		G10 (C3)	G50 (C30)	
30 / 36	2.62 / 3.15				
50	4.37				
75	6.56		G20 (C7.5)	G75 (C50)	G75 (C40)
100	8.75				
150	13.1		G30 (C15)	G100 (C60)	
200	17.5				
250	21.9		G40 (C20)	—	

For a capacitor with 300 kVar or higher, a series reactor must be provided with the capacitor.

Table 7.6 3 kV Capacitor (with 6 to 13% reactor)

Capacitor three-phase reactive power (kVar) 50/60 Hz	Capacitor rated current (A)	Vacuum contactor rated current (A)	Power fuse (CL type) rated current (A)	
			Min.	Max.
10 / 12	1.75 / 2.10	200	G5 (C1.5)	G10 (C3)
15 / 18	2.62 / 3.15			
20 / 24	3.50 / 4.20			
25 / 30	4.37 / 5.25		G20 (C7.5)	G30 (C15)
30 / 36	5.25 / 6.30			
50	8.75			
75	13.1		G30 (C15)	G50 (C30)
100	17.5			
150	26.2		G50 (C30)	G60 (C40)
200	35.0			
250	43.7		G75 (C50)	G75 (C40)
300	52.5			
500	87.5		G100 (C60)	G150 (C75)
750	131			
1000	175		400	*5 —
1200	210	*8 —		*8 —

- The Mitsubishi high voltage current-limiting fuse CL type (Model: - and LB) is the standard fuse for a capacitor. However, if the circuit must be opened and closed frequently, the CLS type (Model: R) is recommended. Note also that the above current ratings are provided on the assumption that no other capacitors are connected in parallel with any of the above capacitors.

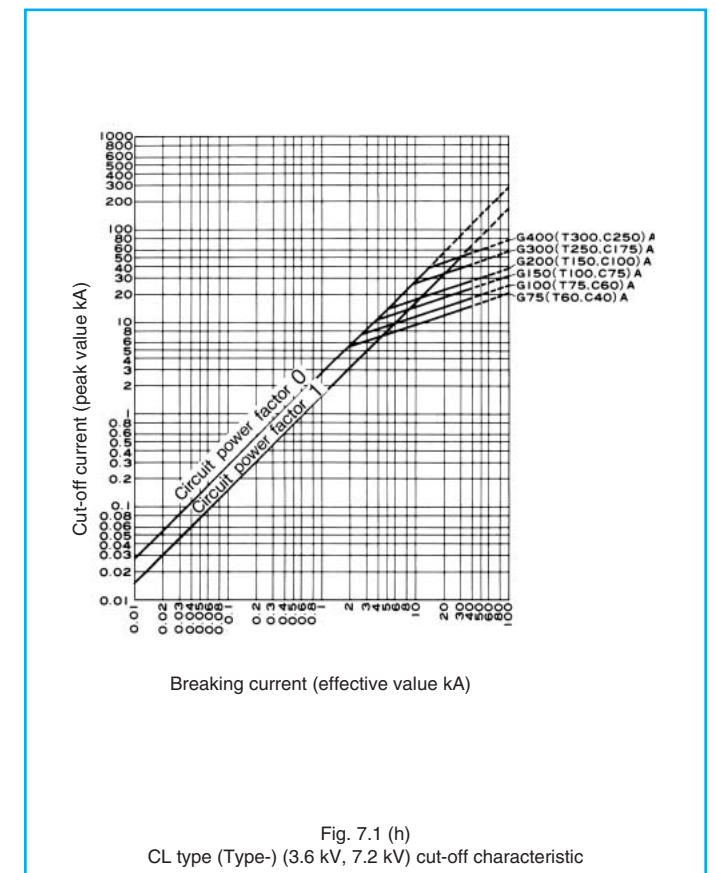
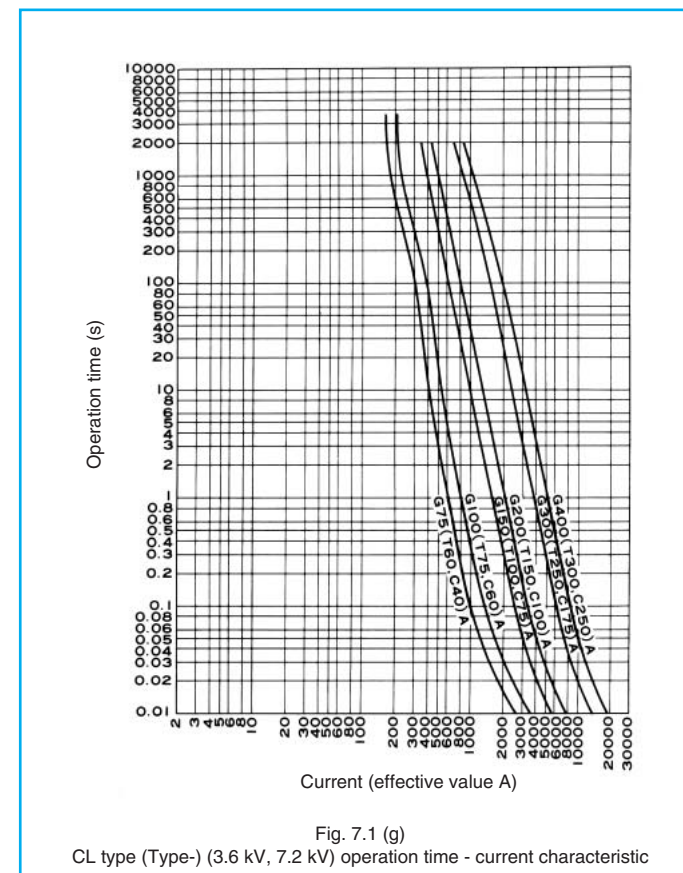
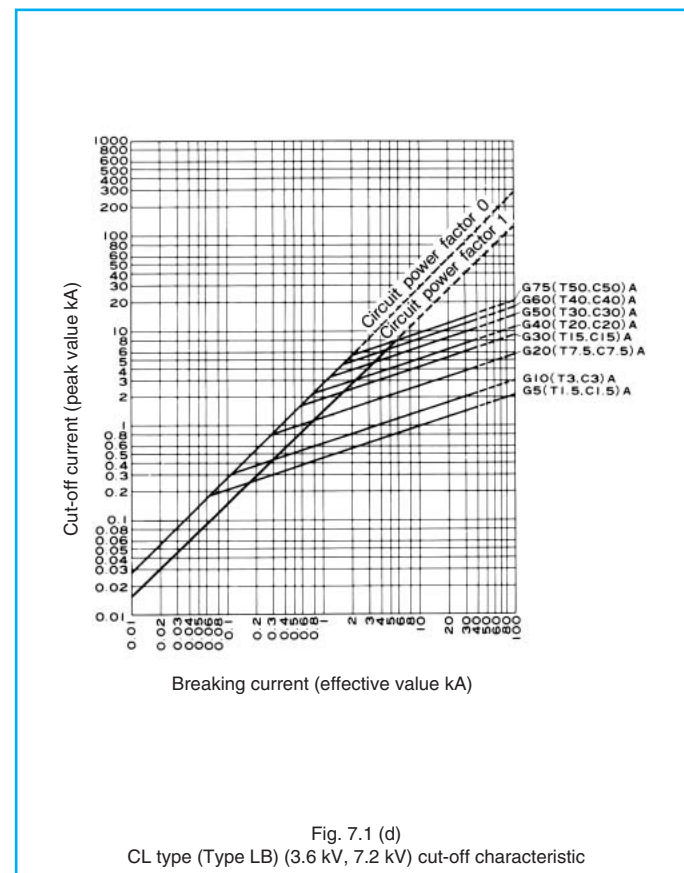
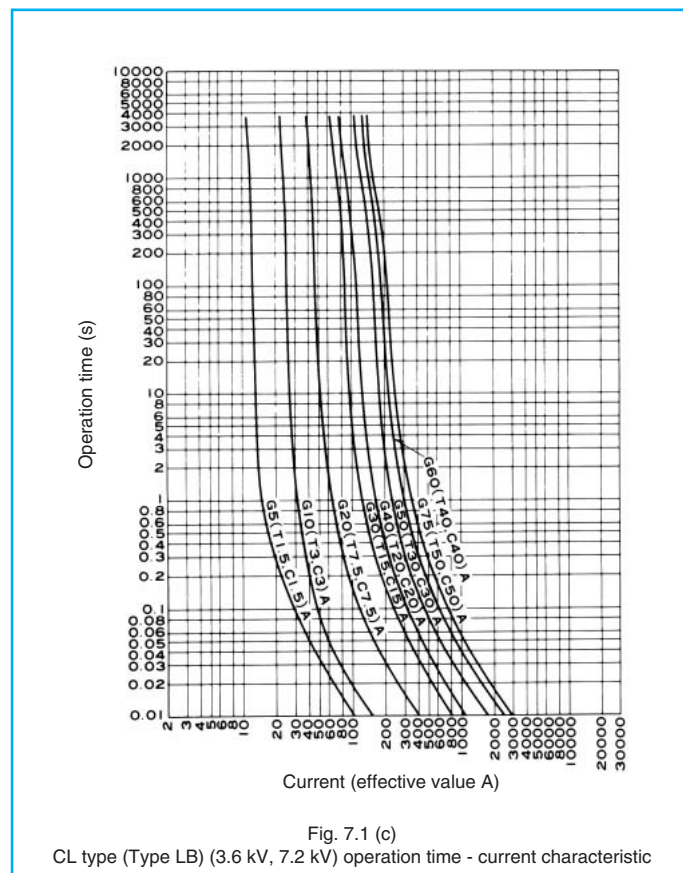
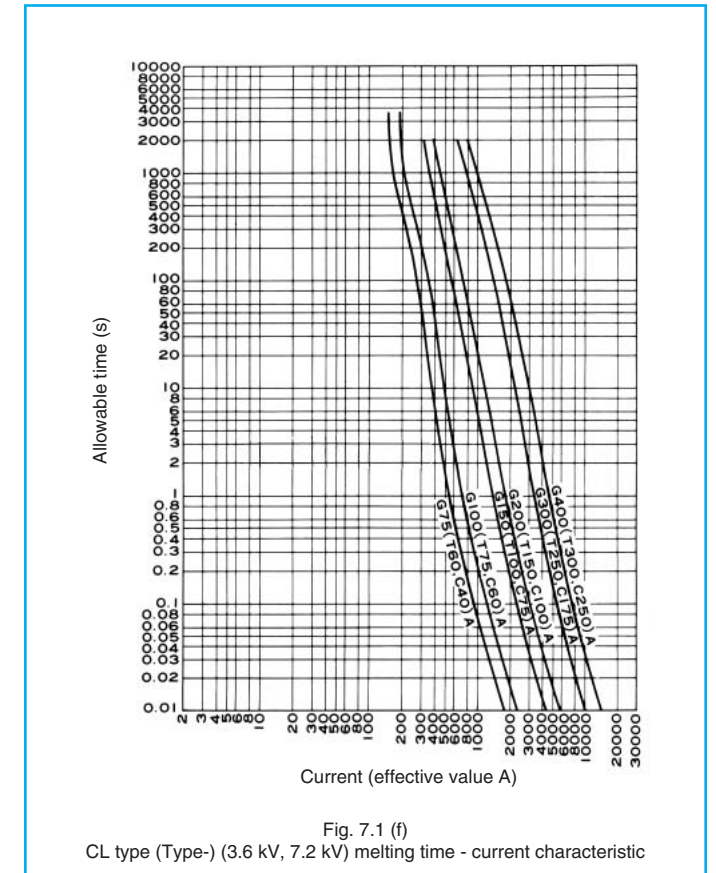
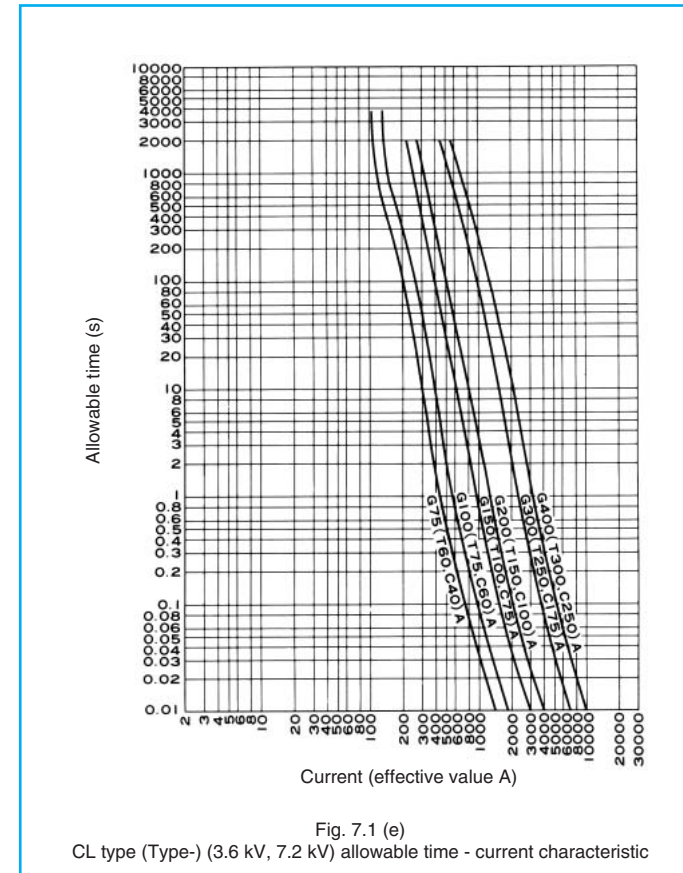
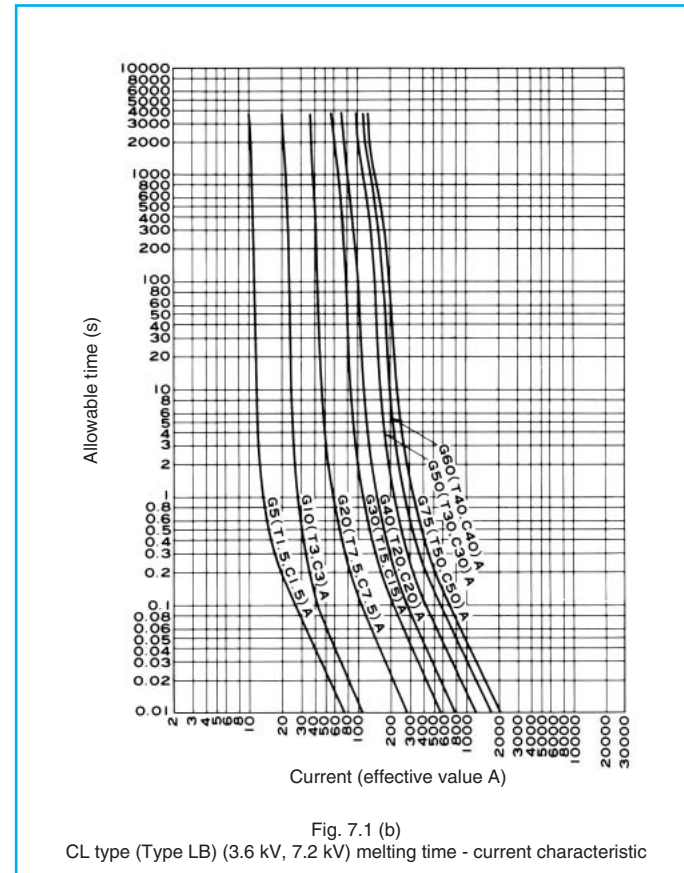
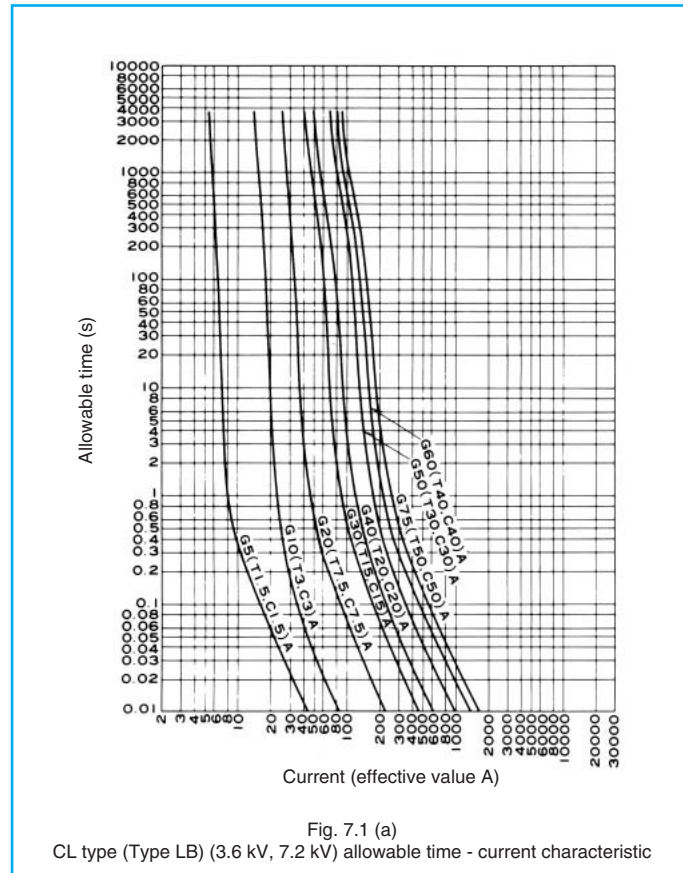
Notes: \*5. The CLS-R M200A power fuse is recommended for these operating conditions.

\*6. The CLS-R M200A power fuse is recommended for these operating conditions.

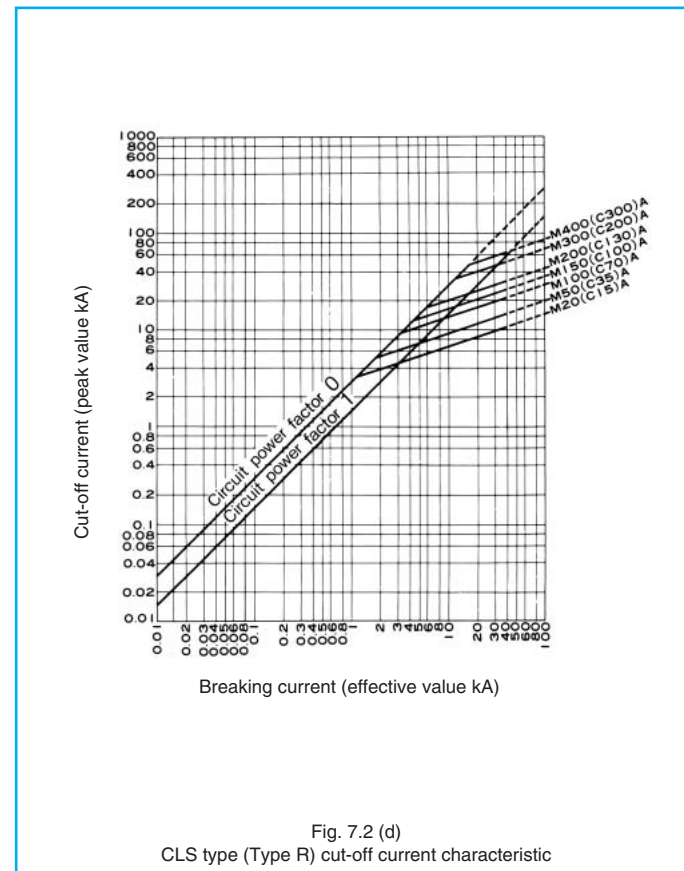
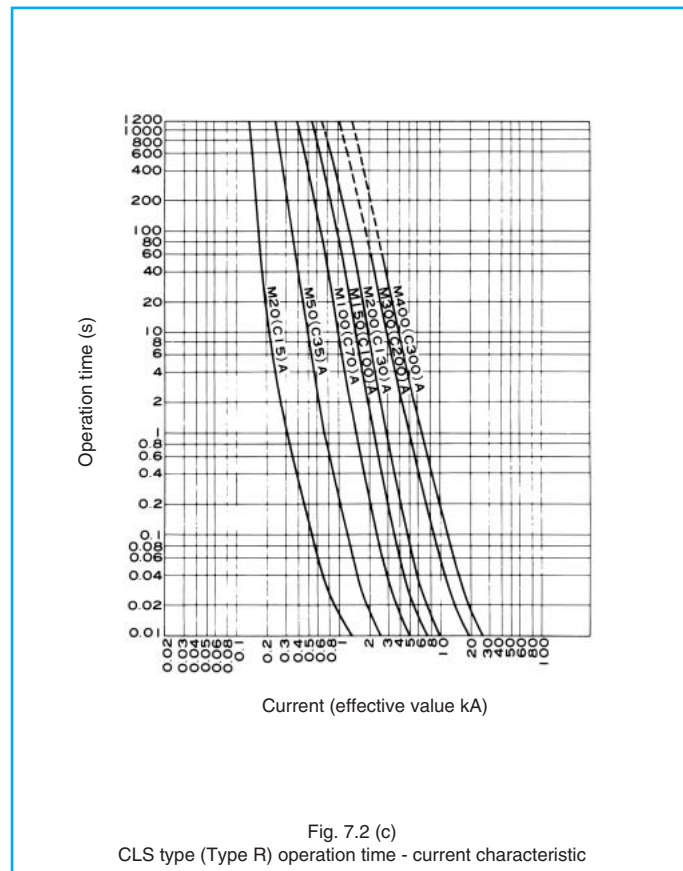
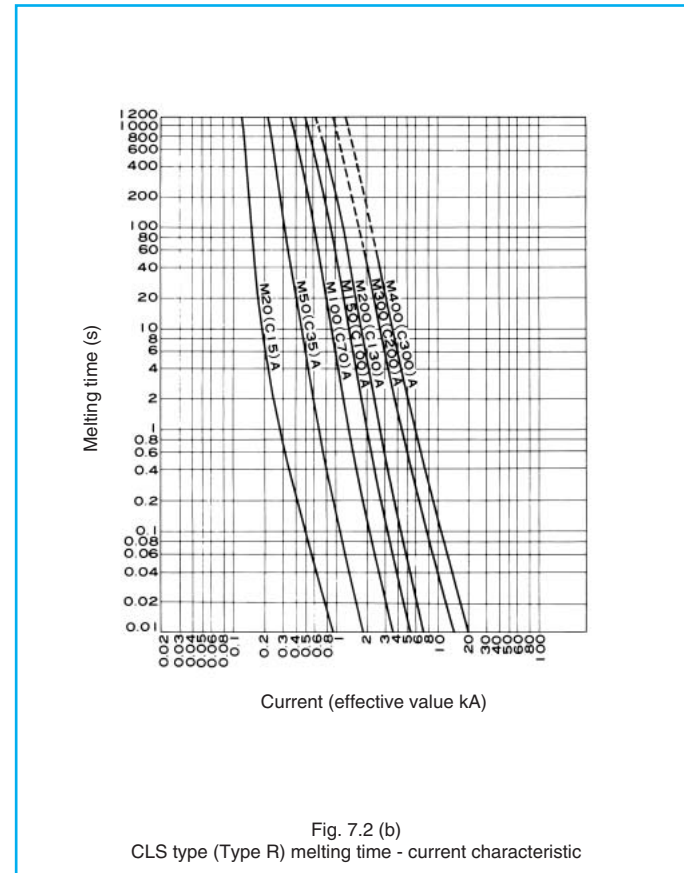
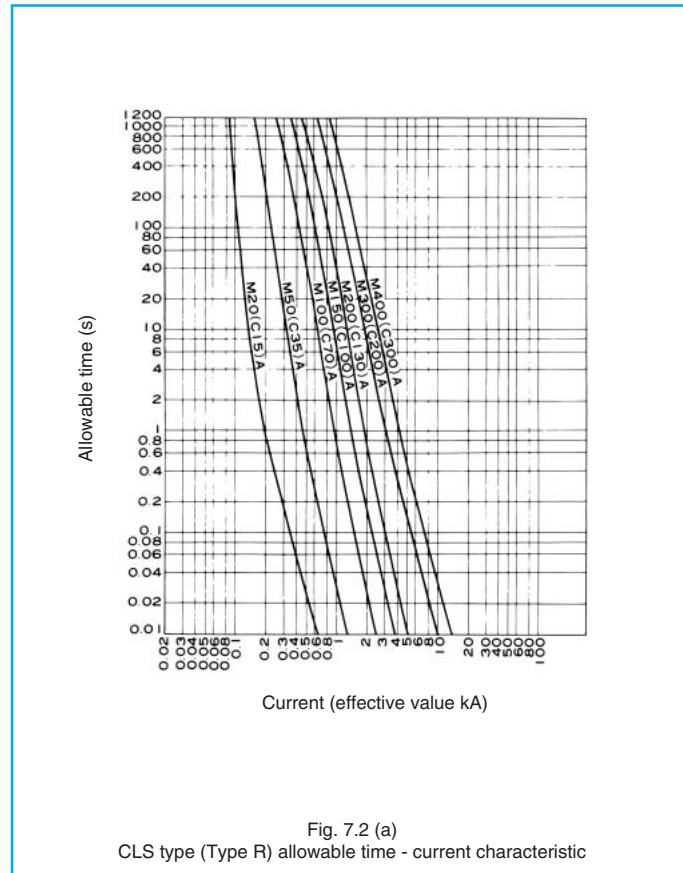
\*7. The CLS-R M300A is recommended for these operating conditions when a combination type fuse is required.

\*8. The CLS-R M400A power fuse is recommended for these operating conditions.

## CL type (Type-), CL type (Type LB) 3.6 kV, 7.2 kV Fuses



## CLS type fuse



Related devices are shown in Table 8.1. Since the devices are available as options, in addition ordering the vacuum contactor and combination unit, another order must be placed for any items required.

Table 8.1 Related devices

Name	Application
Capacitor-tripping device	This is a power unit to release VMC when the power supply is lost.
Testing lead wires	Extension lead wires used for testing outside the panel. Available in 2 m and 4 m.
CR suppressor (surge absorption condenser)	A surge protector at inching operation of the motor. Available in 3 kV and 6 kV.
Vacuum checker	This is a portable tester to judge the vacuum strength. Available in 100 V and 200 V.
Extension rail	The extension rail can be used as a simple drawout device.
Lifters (TypeF-2C)	Portable lifting devices for multitier layouts (in this case, extension rails are not required).

## Capacitor tripping power-supply device (KF type)

Fig. 8.1 Dimensions of CTD and device-mounting fixture

Table 8.2 Constant of element of CTD

Type name	Capacitor C	Resistance R1	Resistance R2	Resistance R3
KF-100CD	820 μF	10 W 300 Ω	10 W 100 Ω	0.5 W 240kΩ
KF-200CD/DD*	820 μF	10 W 300 Ω	10 W 100 Ω	0.5 W 240kΩ

\*KF-200DD: For Tripping failure alarm contact.

Table 8.3 Ratings of CTD

Item	KF-100CD	KF-200CD/DD
Rated voltage (V)	AC100 / 110	AC200 / 220
Rated frequency (Hz)	50 / 60 Hz	
Rated output voltage (V)	DC140 / 155 V	
Burden (VA)	1 VA or less	
Charged time constant (sec)	1	2.3
VMC voltage tripping device	DC100 / 110 V	

Fig. 8.2 Connection diagram of CTD

Fig. 8.3 Example of the device-mounting fixture

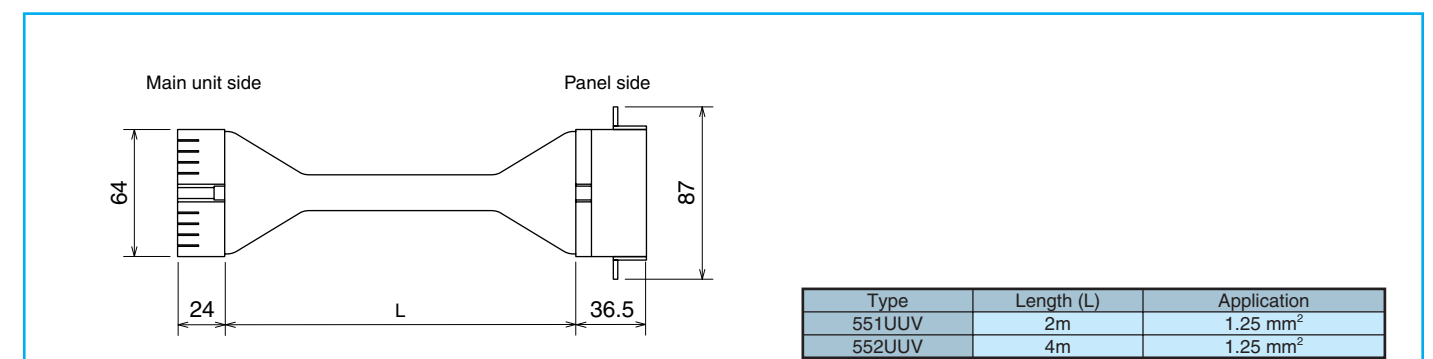
(Notes)

- The standard type of capacitor tripping power-supply device shall be a panel-buried type.
- No device-mounting fixture is included. The device-mounting fixture allows mounting of the device pointing left, right, up or down.

**Warning**

- The output voltage of the KF-200CD is DC140 / 155 V, and it can not open circuit breakers with tripping control voltage of DC200 / 220 V which may result in accidents.
- This device is specifically designed to trip circuit breakers. Do not use it for other purposes.
- One device is required per circuit breaker.

## Test Lead Wires



■ CR suppressor (surge absorbing capacitor), type CR

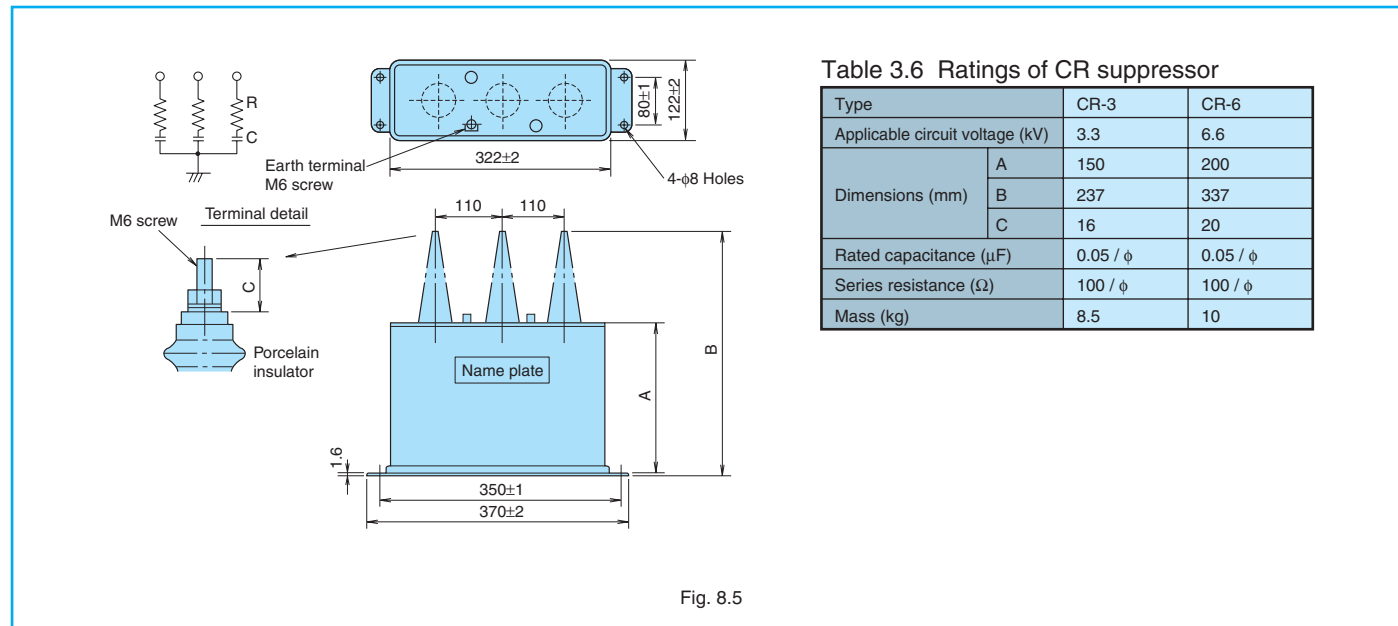


Fig. 8.5

● Handling instructions

(1) Caution about circuits that contain harmonics

Caution should be exercised when CR suppressors are applied to circuits that contain harmonics as is the case with general high-voltage capacitors. There are cases where multiorder harmonics may have flowed especially in circuits where current control is performed by means of thyristors. For use, the RMS value of the composite current containing harmonics should be the value in the following table (1.3 times the rated value) or less.

Type	CR-3	CR-6
Value of Allowable composite current containing harmonics	0.05 A RMS/phase	0.1 A RMS/phase

(2) Mounting direction

The mounting directions is vertical. Do not mount horizontally or use in an inverted position.

(3) Caution for periodic inspection

Make sure to ground when touching the high-voltage terminals of CR suppressors.

(4) Cautions for withstand voltage tests

- Perform withstand voltage tests after disconnecting wires.
- Pay attention to the voltage and applied time. There are cases where excessive current flows depending on the transformer capacity and withstand voltage tests cannot be performed. Generally, it is necessary to detach CR suppressors from circuits when withstand voltage test is performed in the condition that VCB has been inserted in a panel.

Allowable test voltage of CR suppressors

Rated test voltage	AC	Type		CR-3	CR-6
		Between T and T	1 min	6.6 kV	13.2 kV
		Between T and C		7.6 kV	14.2 kV
Between T and C	10 min	4.95 kV	9.9 kV		

T: Terminal C: Case

■ Vacuum Checker

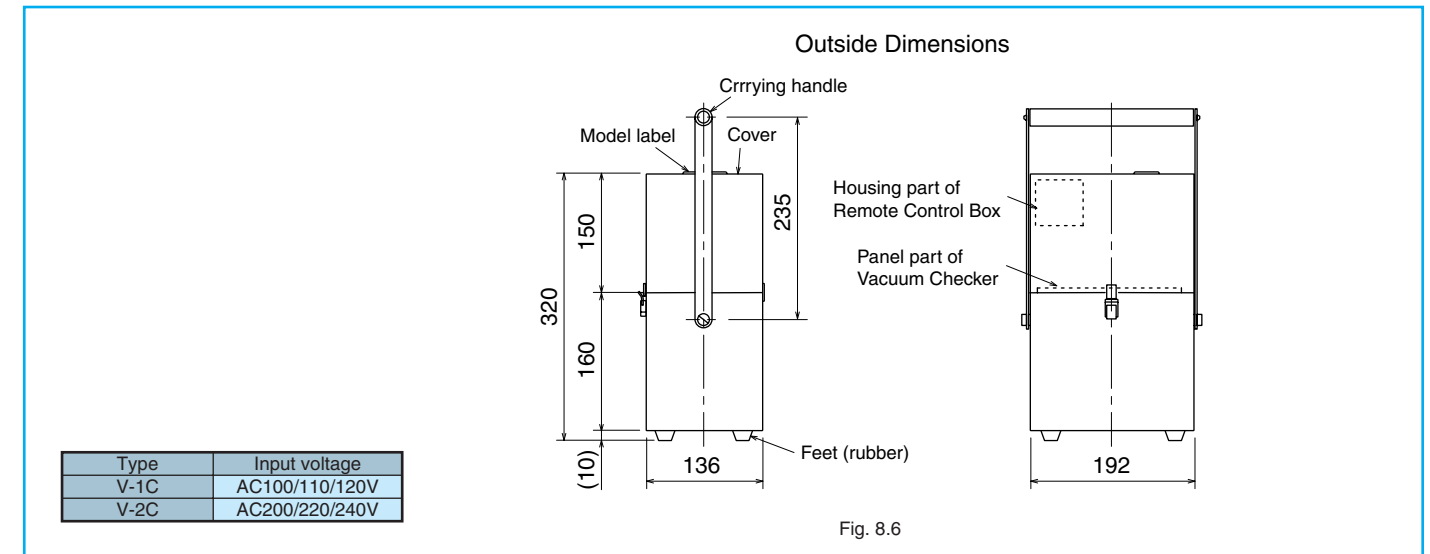


Fig. 8.6

■ Extension Rail

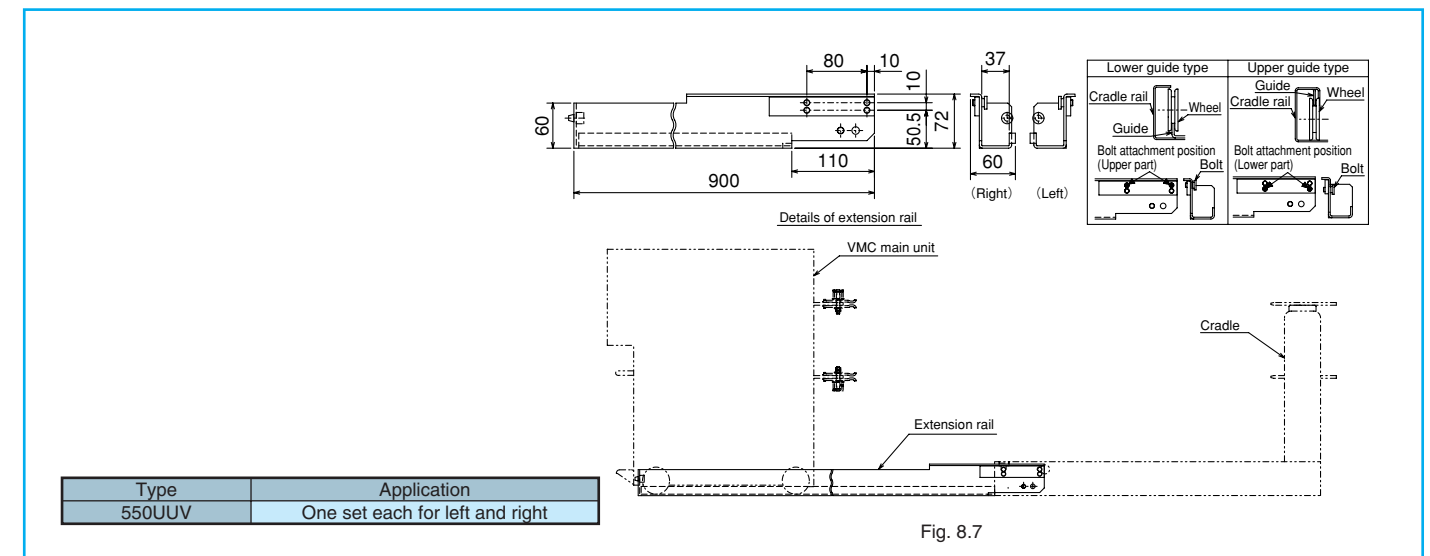


Fig. 8.7

■ Lifter

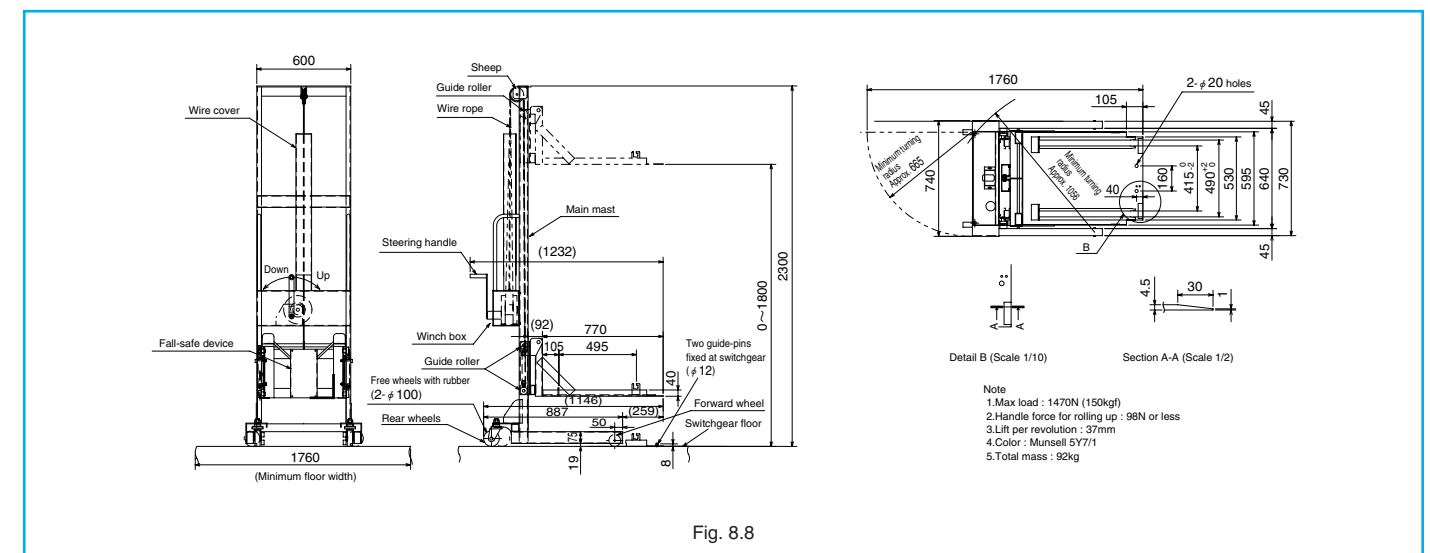


Fig. 8.8

### Electrical hold type

The VMC holds closed condition only while the operation coil is energized. Description of the operation circuit (Fig. 9.1) shows no-voltage condition when the VMC is open.

#### (1) Closing operation

- ① When ON/OFF command contact 52X is closed, Stability of contact operation is checked by the electronic control unit, then ON signal is given to the switching unit.
- ② When the switching unit is turned ON, current flows through the closing coil, the moving core is drawn by the operating coil, and the VMC is closed. Time measurement starts in the control unit at the moment when the VMC is closed.
- ③ After a certain time (300 ms), the coil current is reduced from closing current to holding current.

#### (2) Tripping operation

- ① Opening the ON/OFF contact 52X cuts off the holding current and opens the VMC. The self holding of the control unit is canceled at this moment.

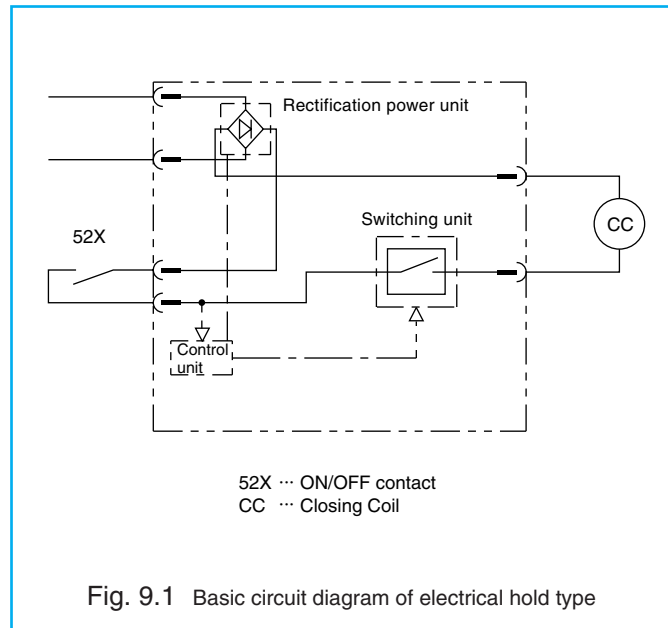


Fig. 9.1 Basic circuit diagram of electrical hold type

### Mechanical latch type

Coil current is cut off at the end of closing, and closed condition is held mechanically by the latch mechanism. Description of the operation circuit (Fig. 9.2) is at no-voltage condition when the VMC is open.

#### (1) Closing operation

- ① When the ON contact 52C is closed, the ON signal is sent to the switching unit.
- ② When the switching unit is turned on, current flows through the closing coil. The moving core is operated by the closing coil, then the VMC is closed. Time measurement starts in the control unit at the same time. At this closing operation, the latch holds the moving core. The auxiliary switch 52a is also closed by this operation.
- ③ After a certain time (300 ms), current supply to the closing coil (cc) is cut off by the control unit, although the ON contact 52C remains closed.

#### (2) Tripping operation

- ① When OFF contact 52T is closed under ON state of the VMC, current flows through the tripping coil and the latch is mechanically disengaged, and the VMC is OFF.
- ② When the VMC is OFF, the auxiliary switch 52a is opened at the same time, and current through the tripping coil is cut off.
- ③ While contact 52T is closed, supplying the next closing signal through 52C is not possible.

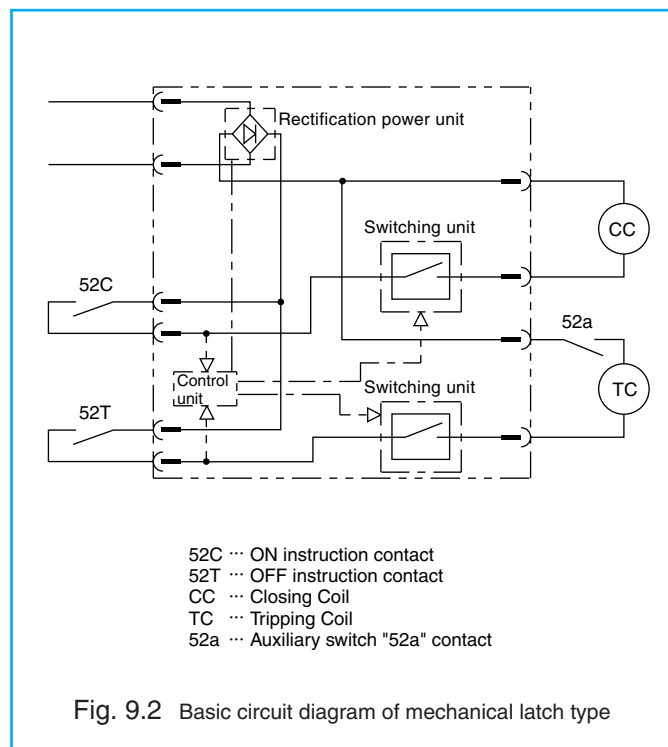


Fig. 9.2 Basic circuit diagram of mechanical latch type

### Operation Circuit

Mitsubishi's original electronic circuit is adopted for the control unit, and has the following features:

- ① Integrated AC/DC control power-sources.
- ② [OFF] command prior to [ON] command.
- ③ Even if tripping is not successful, the continuous tripping signal will actuate the alarm contact, and the tripping coil will not overheat (alarm contact is optional).

### Standard operating voltage

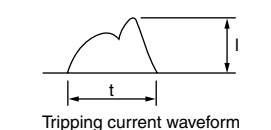
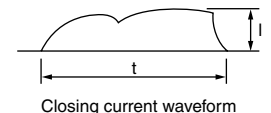
Operating system	Operating voltage (V)
Electrical hold type	AC: DC 100/110, 200/220
Mechanical latch type	AC: DC 100/110, 200/220

Note1: The allowable operating voltage range is 85% ~ 110% of the rated operational voltage for both AC and DC.

### Operating Current

Type	Operation system	Operation voltage (V)	Closing current		Tripping current		Holding current (A)
			I (A)	t (S)	I (A)	t (S)	
VZ2-□E-D	Electrical hold type	AC: DC100	4.8	0.3	-	-	0.07
VZ4-□E-D		AC: DC200	3.2	0.3	-	-	0.05
VZ2-□L-D	Mechanical latch type	AC: DC100	4.8	0.3	3.5	0.03	-
VZ4-□L-D		AC: DC200	3.2	0.3	3.3	0.03	-

\* Making current is the same for the continuously energized type and latch type.



### Cautions

Standard connection diagrams are shown on P12 - 13. In actual applications, pay attention to the following points.

#### (1) Continuous working current of auxiliary circuit

The auxiliary contact and fuse-blowout detection contact should be used with less than 1 A continuous working current.

#### (2) Making command time, tripping command time

Making and tripping command time should be longer than one second for latch type.

## Working Environment and Application

VZ-D vacuum contactors and combination units are to be used in the following conditions

Table 10.1

Table 10.1 Working environment

Standard conditions of use (JEM1167)
<ol style="list-style-type: none"> <li>1. Less than 1,000 m above sea level.</li> <li>2. The ambient temperature range is within -5°C and 40°C. However, average temperature for one day or 24 hours should not exceed 35°C.</li> <li>3. The relative humidity should be between 45% and 85%.</li> <li>4. The environment should be free of abnormal vibrations and shocks.</li> <li>5. The atmosphere should be free of excessive water vapor, oil vapor, smoke, dust, salt, and corrosive substances.</li> <li>6. When installed in an outdoor panel, there should be no dew condensation generated when the temperature or humidity changes.</li> </ol>

### ● Cautions on installation site and ambient atmosphere

If devices are mounted on an outdoor panel that may be exposed to dust or corrosive gases, be sure to protect from dust, corrosion, water, and dew condensation.

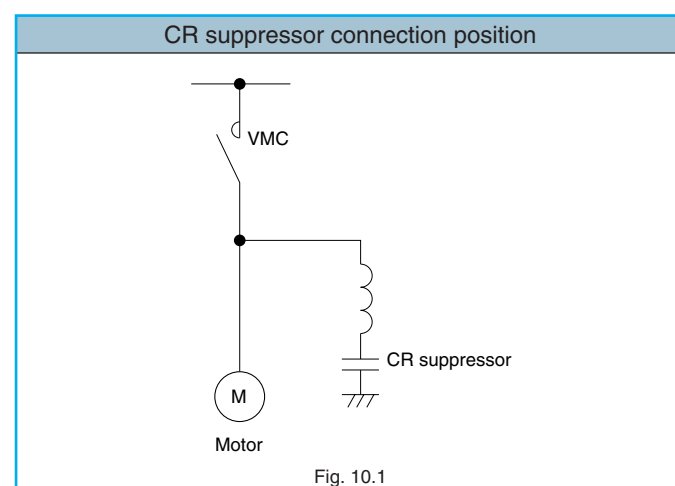
## Surge Protector Applications

### ● Use of low-surge vacuum valve

Since a low-surge vacuum valve is used for the VZ-D type VMC, it can be used with a low ON/OFF surge voltage without surge protection except in the following case.

### ● Surge protection

For inching operation of a motor or use with an aging motor, CR surge suppressor is recommended as shown in the following figure.



## Durability

VMC durability depends on the vacuum strength of the valve, electrical ON/OFF durability, mechanical ON/OFF durability, and other factors related to deterioration.

### ● Durability of vacuum strength

The breaking and insulation performance of our VMCs is ensured by the high vacuum strength of the vacuum valve. Before shipment from the factory, a 100% check is performed for the vacuum strength of valves to ensure the ability of long-term use.

The vacuum strength of vacuum valves can be easily tested during periodical inspections using the withstand voltage method. In addition, a portable vacuum checker is optionally available at your request. (See page 23)

### ● Electrical ON/OFF durability

The electrical ON/OFF durability of the vacuum valve is determined by the electrode consumption and load ON/OFF frequency. Since the electrode consumption of the VZ-D type VMC due to ordinary load ON/OFF is extremely small, it is possible to control the durability with the ON/OFF frequency.

In terms of electrical ON/OFF durability, 250,000 times is defined for the normal loads for motors and transformers, while 100,000 times is defined for capacitor loads.

### ● Mechanical ON/OFF durability

The mechanical ON/OFF frequency can be controlled by the 6-digit operation counter (optional) mounted on the VMC. The mechanical ON/OFF durability of vacuum valves is 250,000 times.

### ● Deterioration stress durability

Please note that VMCs will deteriorate even when used under normal conditions.

For correct use of VMC, daily and periodical maintenance is requested. Please follow the instruction manual for details on lubrication and cleaning.

### ● Recommended replacement time

To ensure that the VMCs function properly and continue highly reliable operation, replacement within 15 years from the staff of operations or within the above-mentioned ON/OFF durability frequency is recommended.

## Cautions for Application

### ● Application to capacitor circuit

#### (1) Cautions regarding inrush current

If the capacitor installed is rated higher than 300kVar (at 6.6kV) or 150kVar (at 3.3kV), install a 6% - 13% series reactor to protect against the effect of inrush current. If another capacitor circuit is used in parallel, be sure to install a series reactor.

#### (2) Capacitor recharging interval

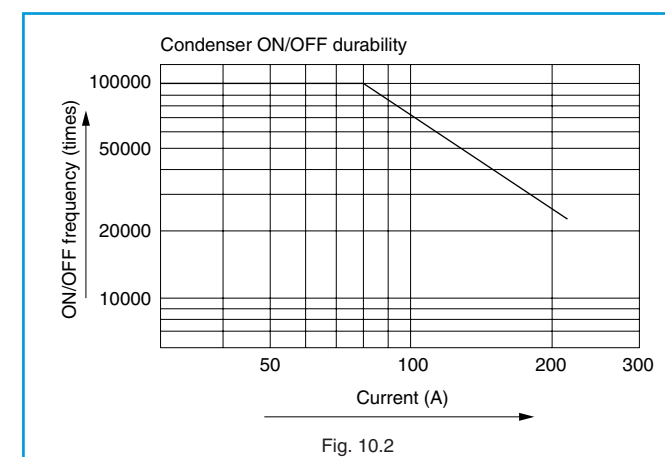
Recharging a capacitor that still maintains an electrical charge may generate excessive voltage. To avoid this, please allow sufficient time for the capacitor charge to dissipate.

#### (3) If there is a parallel capacitor circuit

The maximum application capacity should be reduced for use. For selection of a power fuse, refer to the power fuse catalogue.

#### (4) ON/OFF durability of capacitor

The standard for ON/OFF durability in terms of capacitor ON/OFF current is shown in the following chart. VMC needs to be used within the specified frequency and to carry out the maintenance according to the instruction manual.



Note: 1. The chart shows the values for 6% ~ 13% series reactor.  
2. The values indicated are without a parallel capacitor circuit.  
3. Use in a parallel capacitor circuit will result in a shorter life than capacitor circuit shown in the chart.

### ● Not applicable to circuits between different systems

Since the inter-electrode withstand voltage of the VMC is lower than that of the VCB, it cannot be used for a circuit in which a power company's commercial electricity and privately generated voltage are added across electrodes.

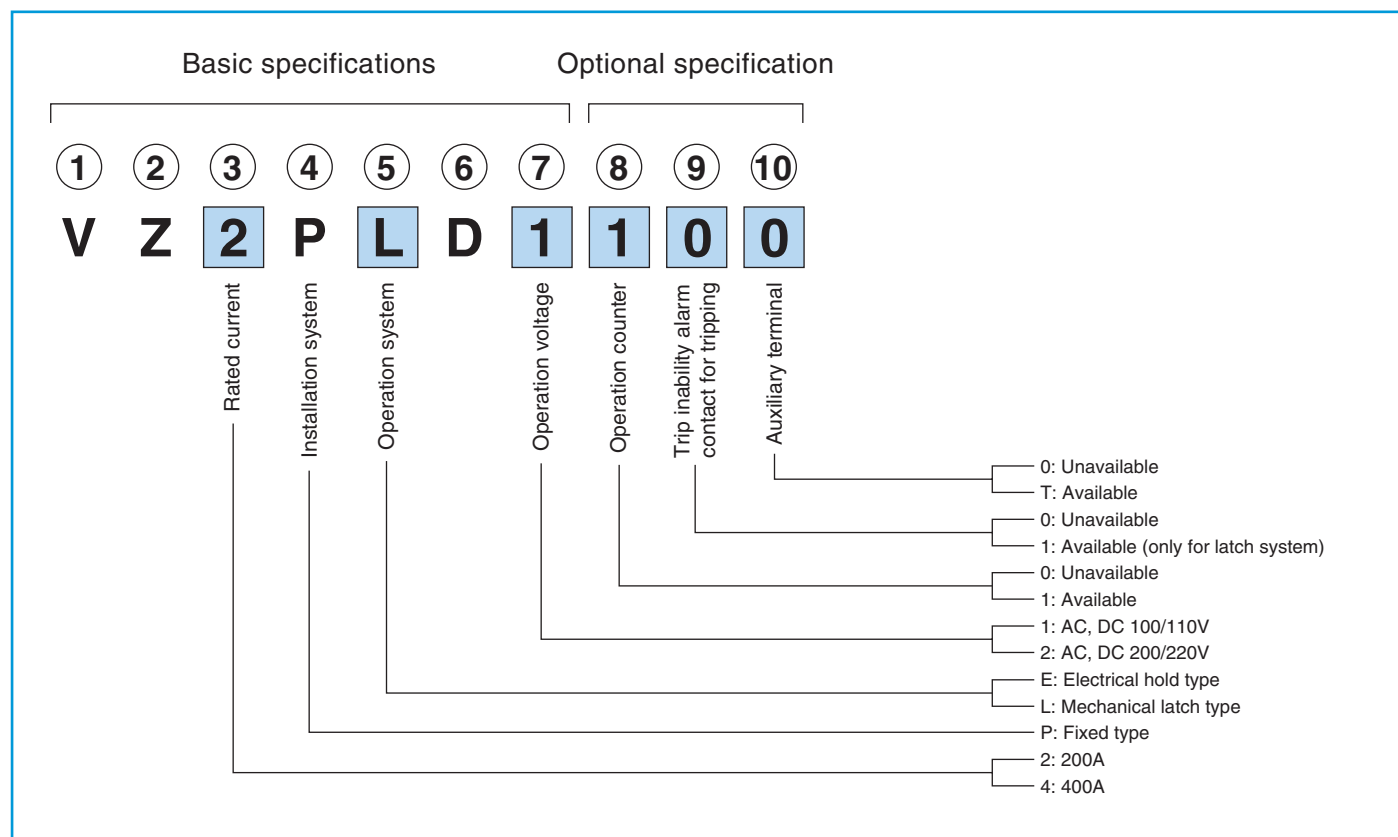
### ● Polarity of main circuit connection

For connection of combination units, connect the upper terminals to the power supply to secure a wider range of power-fuse protection. But as for the contactor which has no power fuse, power supply or load may be connected to either side of the contactor.

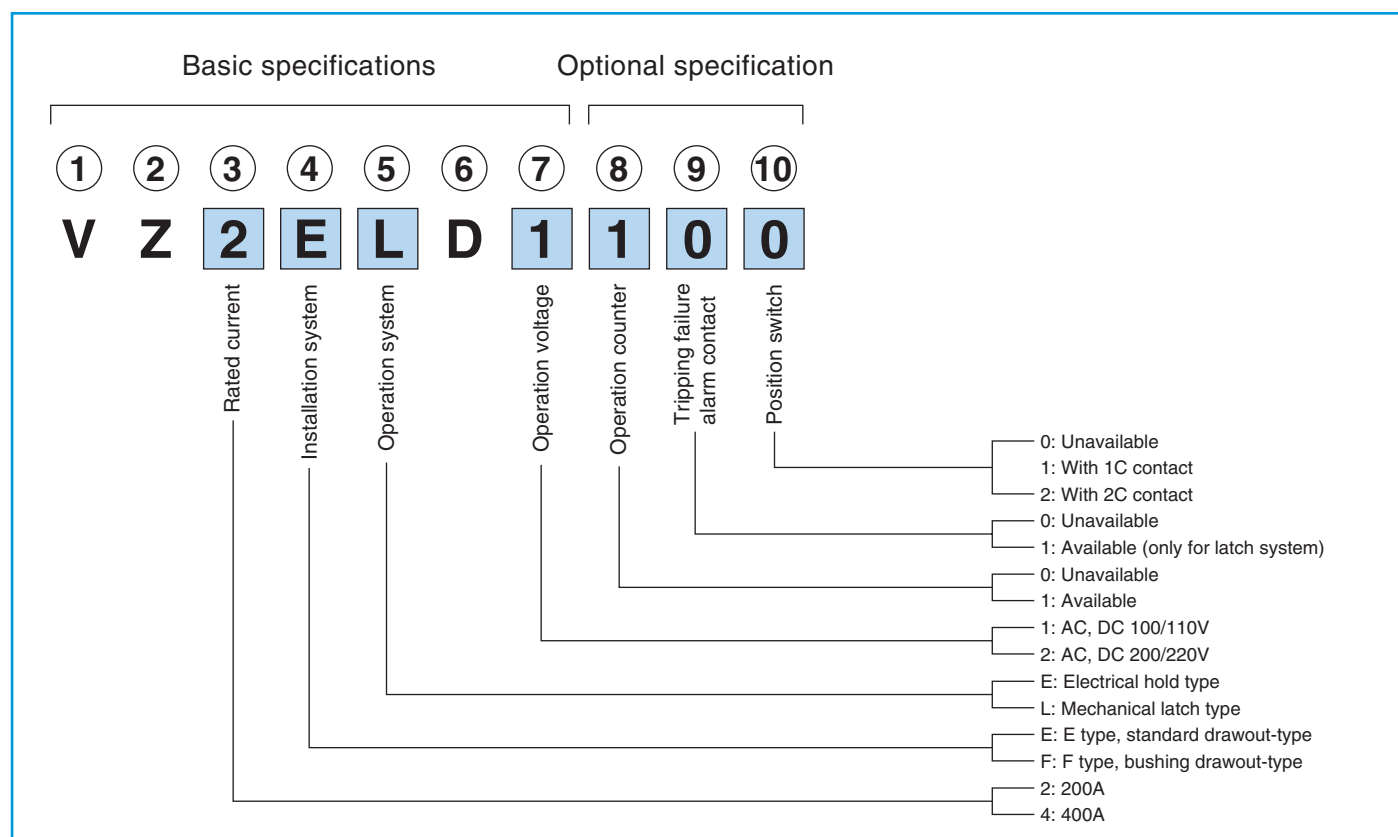
### ● Other special applications

Please contact a Mitsubishi Electric representative regarding use for other special applications.

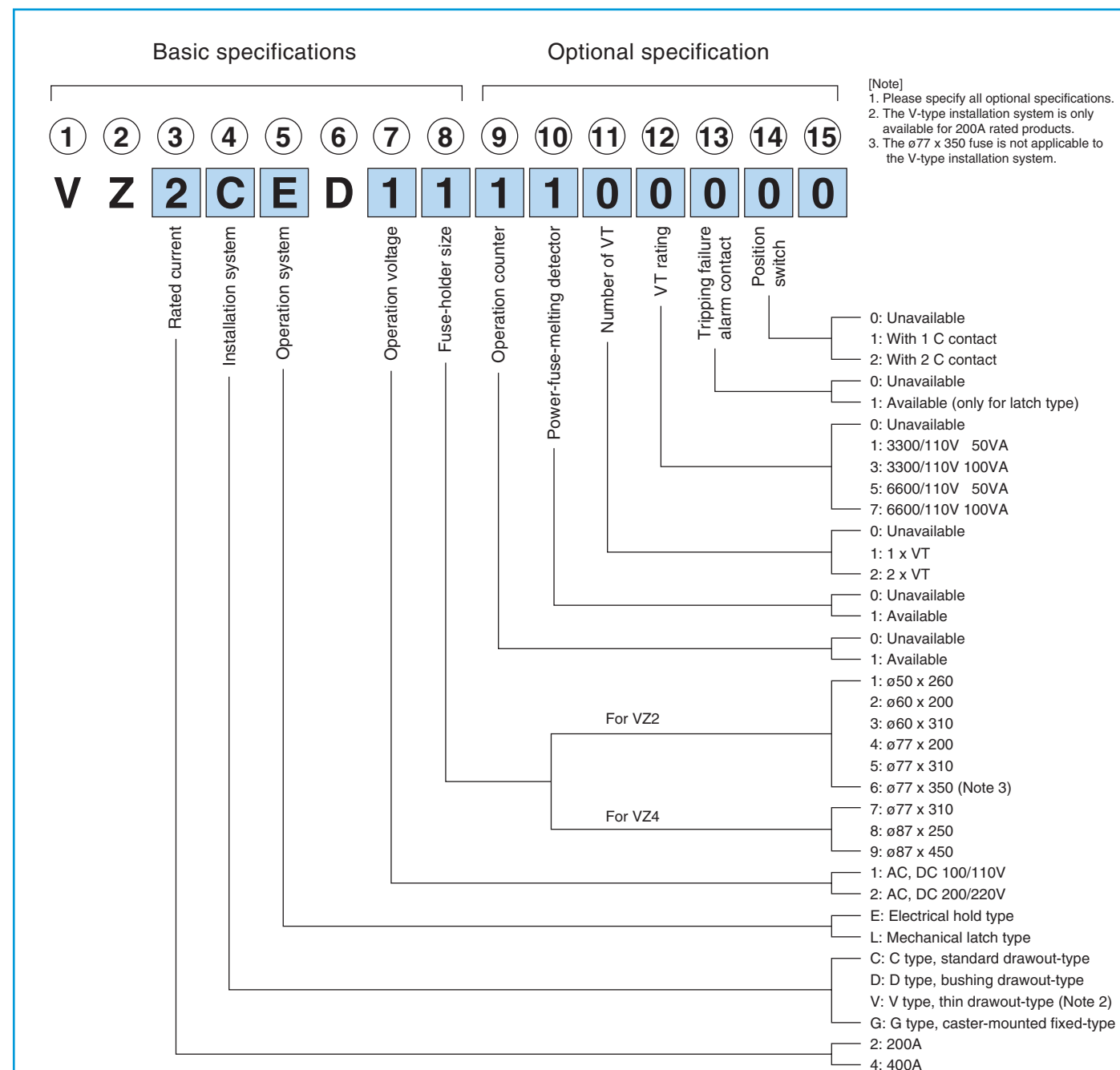
### Fixed-Type Vacuum Contactor



### Drawout-Type Vacuum Contactor



### Vacuum combination unit



#### Power-fuse sizes

Fuse holder size Code No.	Size		Applicable power-fuse type and rating		Fuse holder size Code No.	Size		Applicable power-fuse type and rating	
	Diameter (mm)	Length (mm)	Type	Rated voltage Rated current (G/M rating)		Diameter (mm)	Length (mm)	Type	Rated voltage Rated current (G/M rating)
1	50	260	CL-LB	3.6kV: G5 ~ G75	4	77	200	CLS-R	3.6kV: M150 ~ M200
				7.2kV: G5 ~ G75					5
2	60	200	CLS-R	3.6kV: M20 ~ M100	6	77	350	CLS-R	7.2kV: M100 ~ M200
				3.6kV: G75 ~ G200					7
3	60	310	CL-	7.2kV: G75 ~ G100	8	87	250	CLS-R	
				7.2kV: M20 ~ M50					9