Susol VCB
leads to Susol legend!

Susol
Super Solution

Vacuum Circuit Breakers

LS Industrial Systems
eng.lsis.biz

Susol VCB lead to Susol legend!



Susol VCB is full line-up new VCB which has the high interrupting capacity, large current(~50kA, ~4000A), and maximized compatibility with existing products through the dual phases and compact sized models.

Contents


Susol
LS

Susol VCB

Vacuum Circuit Breaker, VCB is installed in the medium voltage distribution lines to protect life and load equipment. In case of accidents such as over current, short circuit and ground fault current, VCB works by interrupting the circuit through the inner Vacuum Interrupter which is acted by signal from the outside separate relay.

LSIS' Super Solution, Susol VCB responds.

- customer needs for the breakers with high interrupting capacity and large current due to the integration and increase of the load capacity.
- worldwide trend of diversification in the medium voltage distribution lines.
- increase of the reliability for the temperature characteristics of circuit breakers.

Premium-type products to improve convenience and reliability of medium voltage switchgear configuration.

- full line-up modeling to the high interrupting capacity and large current.
- main structure with high reliability application.
- a variety of accessories and ability to maximize.

Suitable for use as the main circuit breaker to protect key installations in the places such as device industry, power plants, high-rise buildings, large ships.

▶ Strengthening of the high interrupting capacity and large current models and full line-up new VCB models to high/middle/low.

Voltage	Interrupting current	Rated current
7.2kV	8/12.5/20/25/31.5/40/50kA	400/630/1250/2000/3150/4000A
12/17.5kV	20/25/31.5/40/50kA	630/1250/2000/3150/4000A
24kV	12.5/25/31.5/40kA	630/1250/2000/2500/3150A
36kV	25/31.5/40kA	1250/2000/3150A
40.5kV	25/31.5kA	1250/2000/3150A

▶ Main circuit structure with high reliability.

- Maximizing the durability and reliability of the main circuit contactors (Stego Tulip contactor).
- Strong structure for the temperature rise (Natural cooling system).

▶ Convenience of switchgear configuration and a variety of accessories.

- CB compartment structure: Metal isolation structures to prevent the accident spread and ensure safety. And the convenience of switchgear building is extended by its module style.
- A variety of accessories: UVT, Locking Magnet, Plug Interlock, Key lock, Temperature Sensor, MOC, TOC, Earthing S/W.
- Maximizing compatibility with existing products through the dualistic deployment of phases and compact models.

※ Type testing is complete for all models according to latest standard, IEC62271-100 (2008) [M2, E2 (List1 or 3), C2].

Susol VCB Family

Susol VCB series are premium-type products featuring main structure with high reliability application and a variety of accessories and ability to maximize to be suitable for use as the main circuit breaker to protect key installations in the places such as device industry, power plants, high-rise buildings, large ships

7.2kV (VL-06)

- Rated short-time (for withstand current): 3sec.
- Rated operating sequence: O-0.3s-CO-15s-CO
- Type test level: M2, E2 (List1), C2
- Electrical and mechanical life: 30,000 operations
- 100% Compatibility
  - with existing fixed type breakers
  - with existing drawout type breakers
- Various cradle: E, F and G type
- A variety of control power
  - DC 24~30V, DC 48~60V, DC 110V, DC 125V, DC 220V
  - AC 48V, AC 100~130V, AC 220~250V
- A variety of accessories
  - Charge switch, UVT, Secondary trip Coil, Current trip coil, Trip Latch Checking S/W, Position S/W
  - Key-lock, Button lock, Button cover, Padlock, UVT, Time Delay Controller, Lifting hook, CTD
- TEST/SERVICE Automatic Position Indicator
- Standards and certification
  - IEC62271-100 (2008) [M2, C2, E2 (List1)]
  - Tested in enclosure
  - KERI type tested, V-check (KESCO) certification

Ur (kV)	Isc (kA)	Ir (A)
7.2	8	400
	12.5	630

Full line – up & Compact

Full line-up new VCB models to the high interrupting capacity and large current (~ 50kA, ~ 4000A) featuring maximization of compatibility with existing products through the dualistic deployment of phases and compact models

7.2/12/17.5kV (VL-06/12/17)

- Rated short-time (to withstand current): 3sec. 4sec*
- Rated operating sequence: O-0.3s-CO-15s-CO
- Type test level: M2, E2 (List3), C2
- Electrical and mechanical life: 30,000 operations
- Compatibility with existing Pro-MEC breakers
- Various cradle: E, F, G and H type
- CB Compartment for MCSG available
- A variety of control power
  - DC 24~30V, DC 48~60V, DC 110V, DC 125V, DC 220V
  - AC 48V, AC 100~130V, AC 220~250V
- A variety of accessories
  - VCB part: Charge switch, UVT, Secondary trip coil, Latch checking switch, Position switch, Locking magnet, Plug interlock, Key lock, Button cover, Button padlock, Padlock (H type Door interlock), MOC
  - Cradle part: MOC (Mechanical Operated Cell switch), TOC (Truck Operated Cell switch), Temperature sensor, Earthing switch & accessaries, Door, Door interlock, Door emergency button
  - Others: Racking in/out handle, UVT Time delay controller, CTD (Condensor Trip Device), Temperature module
- TEST/SERVICE Automatic Position Indicator
- Standards and certification
  - IEC62271-100 (2008) [M2, C2, E2 (List3)]
  - KEMA, KERI type tested, V-check (KESCO) certification

Note) * Please contact us

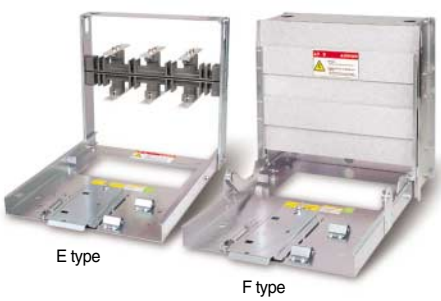
Ur (kV)	Isc (kA)	Ir (A)
7.2	20	630
		1250
		2000
	25	630
		1250
		2000
12	20	630
		1250
		2000
	25	630
		1250
		2000
17.5	20	630
		1250
		2000
	25	630
		1250
		2000

7.2/12/17.5/24/36/40.5kV (VH-06/12/17/24/36/40)

- Rated short-time (to withstand current): 3sec. 4sec*
- Rated operating sequence: O-0.3s-CO-3min-CO
- Type test level: M2, E2 (List3), C2
- Electrical and mechanical life: 20,000 operations
- Various cradle: K and H type
- CB Compartment for MCSG available
- A variety of control power
  - DC 48V, DC 110V, DC 125V, DC 220V
  - AC 48V, AC 110V, AC 220V
- A variety of accessories
  - VCB part: UVT, Secondary trip coil, Latch checking switch, Position switch, Locking magnet, Plug interlock, Key lock, Button cover, Button padlock, Padlock (H type Door interlock), MOC
  - Cradle part: MOC (Mechanical Operated Cell switch), TOC (Truck Operated Cell switch), Temperature sensor, Earthing switch & accessaries, Door, Door interlock, Door emergency button
  - Others: Racking in/out handle, Lifting hook, UVT Time delay controller, CTD (Condensor Trip Device), Temperature module
- Standards and certification
  - IEC62271-100 (2008) [M2, C2, E2 (List3)]
  - KEMA, KERI type tested, V-check (KESCO) certification

Note) * Please contact us

Ur (kV)	Isc (kA)	Ir (A)
7.2	50	1250
12		2000
17.5		2500
		3150
		4000
24	25	2500
	31.5	1250
		2000
		3150
	40	1250
		2000
		3150
36	25	1250
		2000
		3150
	31.5	1250
		2000
		3150
	40	1250
		2000
		3150
40.5	25	1250
		2000
		3150
	31.5	1250
		2000
		3150



E type

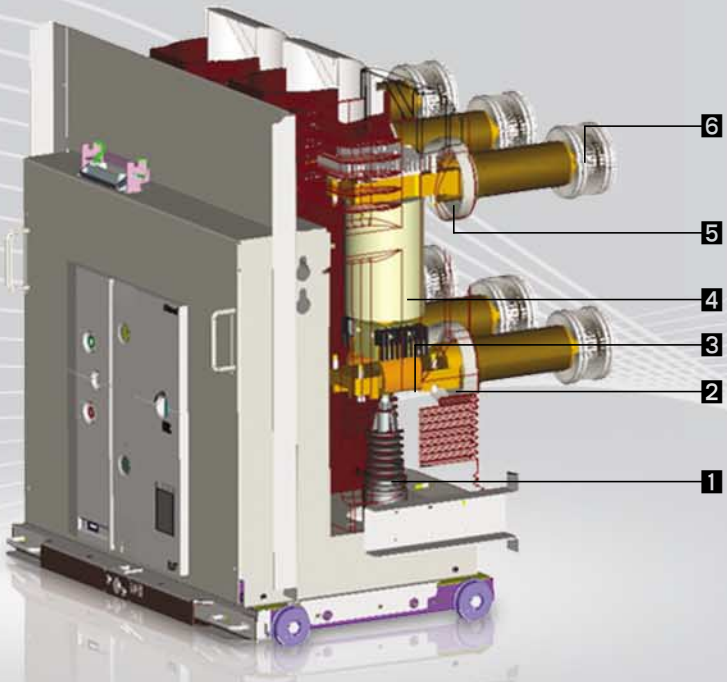
F type

H type

VCB Cradle type

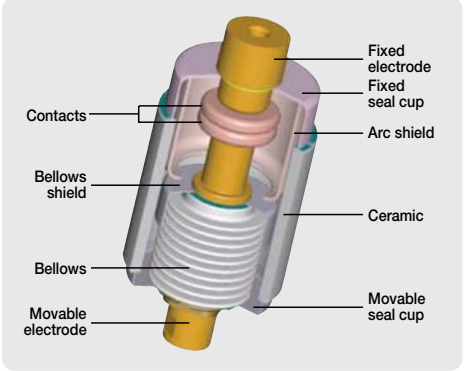
Main circuit structure with high reliability

Susol VCB



Breaker

1 Insulation rod
2 Lower terminal
3 Shunt
4 Vacuum interrupter
5 Upper terminal
6 Tulip contactor



Vacuum Interrupter, VI

The vacuum rate within the VI is very high (approximately $5x10^{-5}$ Torr) and the spacing between fixed contact and movable contact is about 6~20mm, depending on the voltage.

The contacts are in a structure that arc can easily be extinguished and the surfaces of the contacts are made of special alloy (copper-chromium) and the interior is completely sealed to prevent loss of vacuum.

Therefore the wearing of the contacts can be minimized in the event of short-circuit and the arc energy by overvoltage or switching can be reduced effectively.

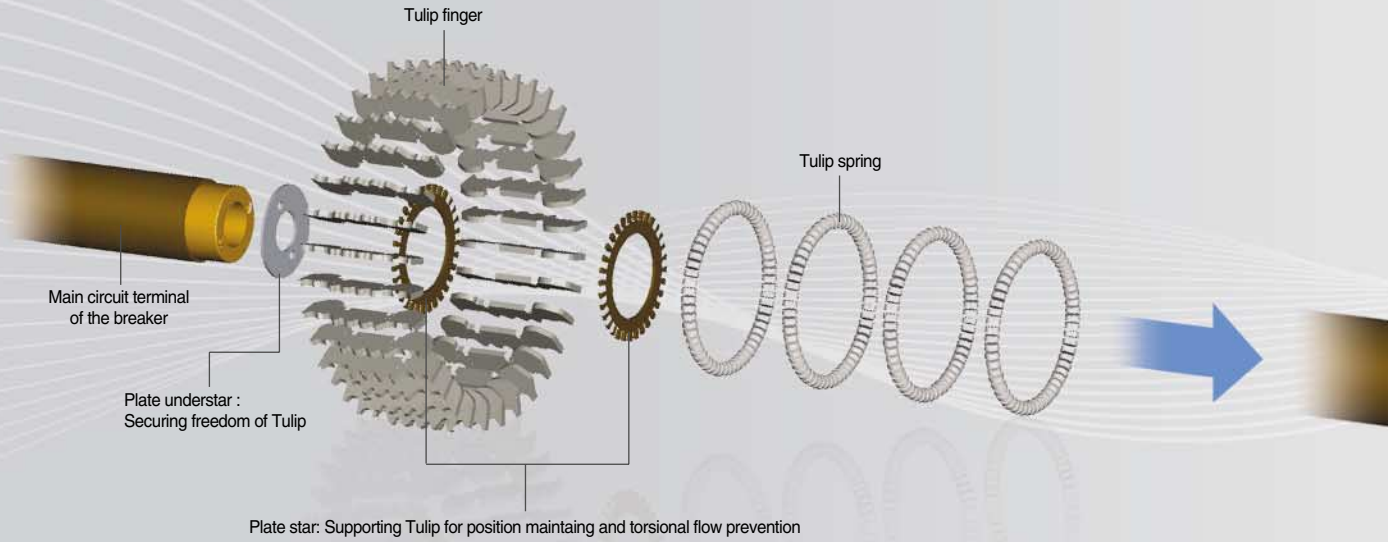
Convenience and Variety

- Maximizing the durability and reliability of the main circuit contactors (Stego Tulip contactor)
- Strong structure for the temperature rise (Natural cooling system)

Stego Tulip

Main circuit structure with high reliability

- Maximizing the durability and reliability of the main circuit contactors (Stego Tulip contactor)
- Strong structure for the temperature rise (Natural cooling system)



Structure of Stego Tulip Terminal

- Maintaining the connection between breaker and cradle for the optimum current path through securing freedom of Tulip.
- Increasing the heat dissipation area of the contactors and minimizing aging.

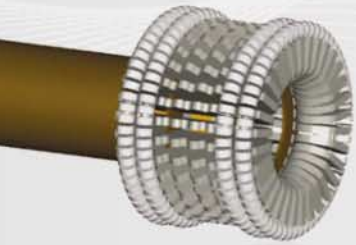
Major supply records

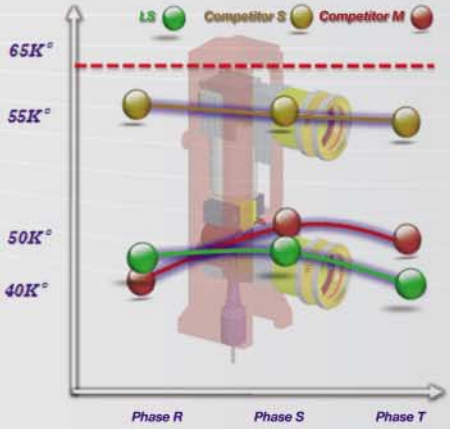
- S Electro-Mechanics, Busan plant: 12kV 40kA 4000A VCB
- P Combined cogeneration power plant: 7.2kV 50kA 4000A VCB
- K Petrochemical, Ulsan plant: 7.2kV 40kA 4000A VCB
- P Steel plant, Gwangyang: 7.2kV 50kA 4000A VCB
- P Steel plant, Pohang: 7.2kV 50kA 4000A VCB
- L Chem, Cheongju plant: 7.2kV 40kA 4000A VCB
- S Electronics, Tangjeong plant: 7.2kV 40kA 4000A VCB

6/12/17.5/24/36/40kV...

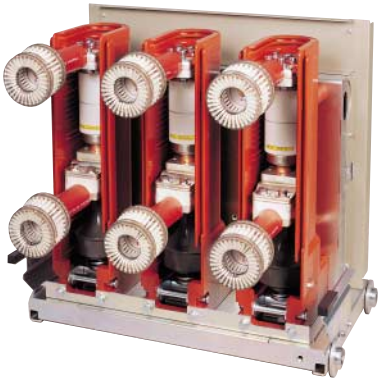
(VH-06/12/17/24/36/40)

- Drawout / natural cooling system
- Improved temperature characteristics and ensured high reliability





VL type Tulip contactor



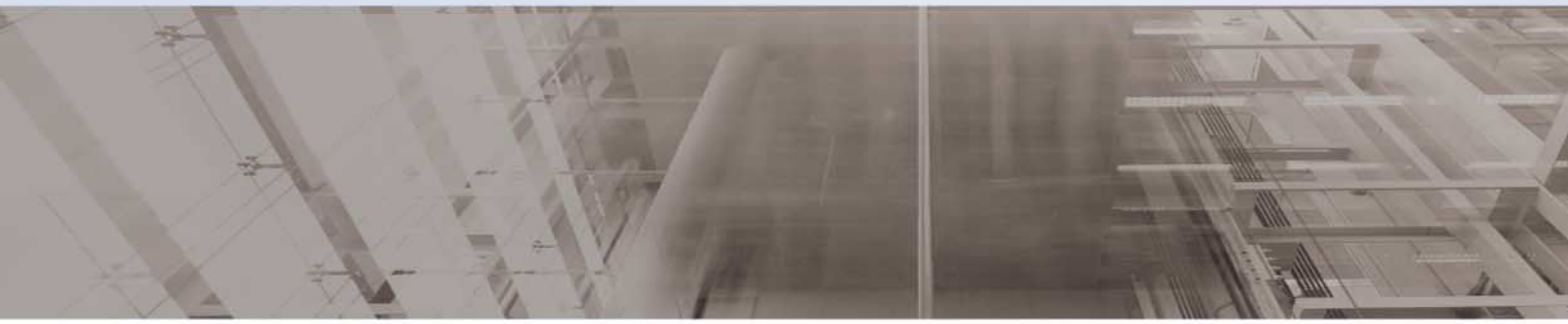
VH type Tulip contactor

36kV Tulip contactor

CB Compartment

Convenience in building switchgears

- CB compartment structure: H type cradle
- Metal isolation structure to prevent the accident spread and ensure safety
- Convenience of switchgear building



7.2/12/17.5/24/36/40.5kV 20/25/31.5/40/50kA

- Metal isolation structure to prevent the accident spread and ensure safety
- Convenience of operation by Truck
  - Drawable in the closed position of the switchgear door
  - Racking-in/out positions indicated mechanically
- Equipped with safety devices and accessories
  - Control power connected Interlock
  - Earthing S/W and interlock, MOC/TOC (ANSI)
- Convenience in building switchgears
  - Module assembly with CB compartment

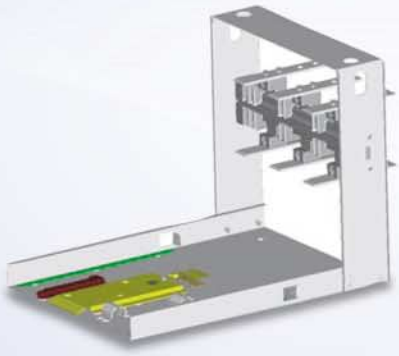
Accessories of CB compartment (H type cradle)

- MOC (Mechanism Operated Cell S/W)
- TOC (Truck Operated Cell S/W)
- Shutter Padlock
- Temperature Sensor
- Door Emergency ON/OFF Button
- Earthing switch & Accessaries
  - Key lock for Earthing S/W
  - Locking Magnet for Earthing S/W
  - Position S/W for Earthing S/W
- TM (Temperature Monitoring Unit)

Cradles

E, F, G and H type... Variety of the Cradles

E type



E type

- Economic style cradle with the basic structure
- No safety shutter and bushing
- For MESG
- Applies VL type VCB

E type

F type

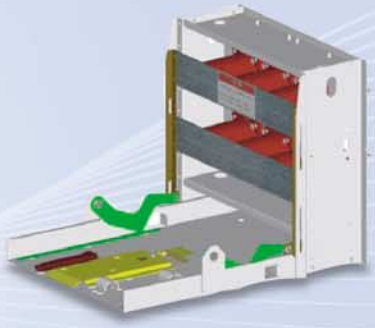
H type

F type

F type

- Safety shutter has been added to the cradle of type E
- No bushing
- For MESG
- Applies VL type VCB

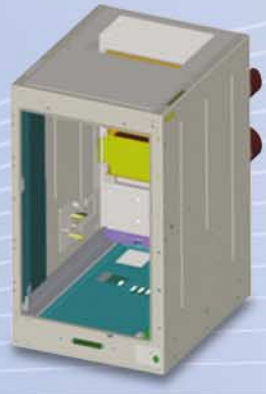
G type



G type

- Premium style cradle with safety shutter and bushings
- For MESG
- Applies VL type VCB

H type



H type

- Metal isolation structure to prevent the accident spread and ensure safety
- Convenience of operation by Truck
  - Drawable in the closed position of the switchgear door
  - Racking-in/out positions indicated mechanically
  - Control power connected Interlock
- Convenience in building switchgears
  - Module assembly with CB compartment
  - Assembly with CT/PT integrated compartment
- Applies VL/VH type VCB

VL type

VL type

VL, VH type

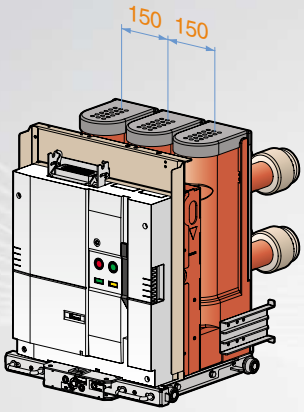
Convenience

Convenience in building switchgears

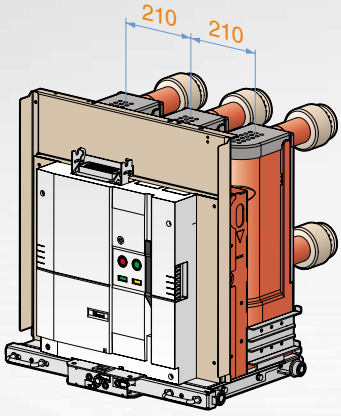
- Maximizing compatibility with existing products through the dualistic deployment of phases and compact models.

VCB rating

Ur (kV)	Isc (kA)	Ir (A)
12	20/25	630
		1250
17.5	20/25	630
		1250



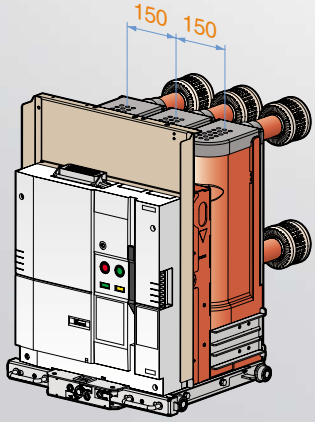
P150
(distance between phases: 150mm)



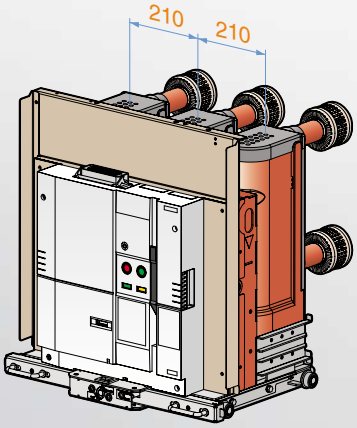
P210
(distance between phases: 210mm)

VCB rating

Ur (kV)	Isc (kA)	Ir (A)
12	20/25	2000
17.5	20/25	2000



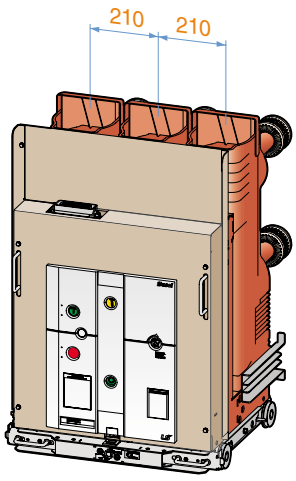
P150
(distance between phases: 150mm)



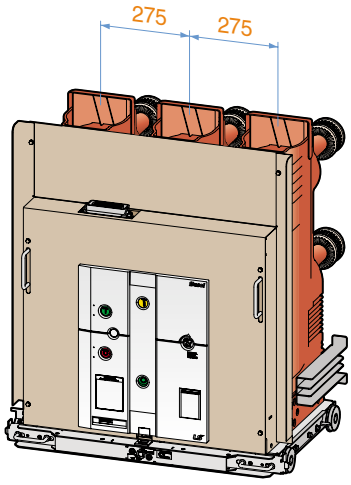
P210
(distance between phases: 210mm)

VCB rating

Ur (kV)	Isc (kA)	Ir (A)
24	31.5/40	2000
25.8	31.5/40	2000



P210
(distance between phases: 210mm)

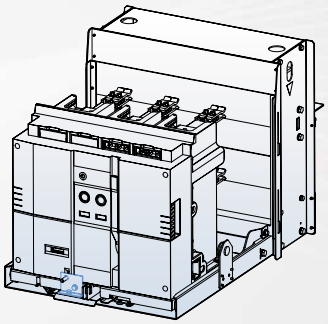


P275
(distance between phases: 275mm)

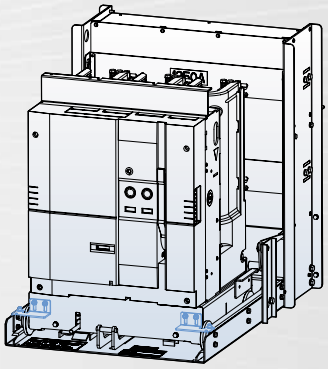
Function to locking a breaker during transport of a switchgear

- Fixed bracket must be dismantled first to rack in a breaker - interlocking system

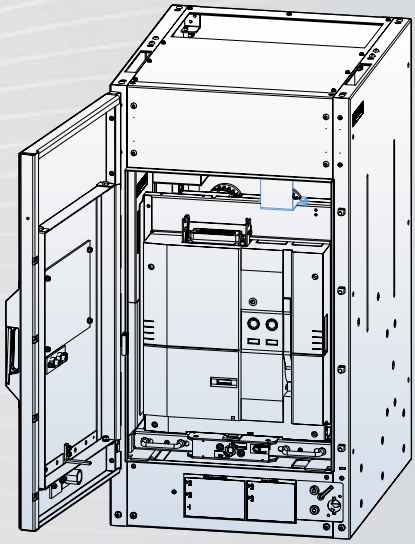
Fix braket easily visible from the front of the breaker



VL type VCB (VL-06)
(E/F/G type)



VL type VCB (VL-06/12/17)
(E/F/G type)

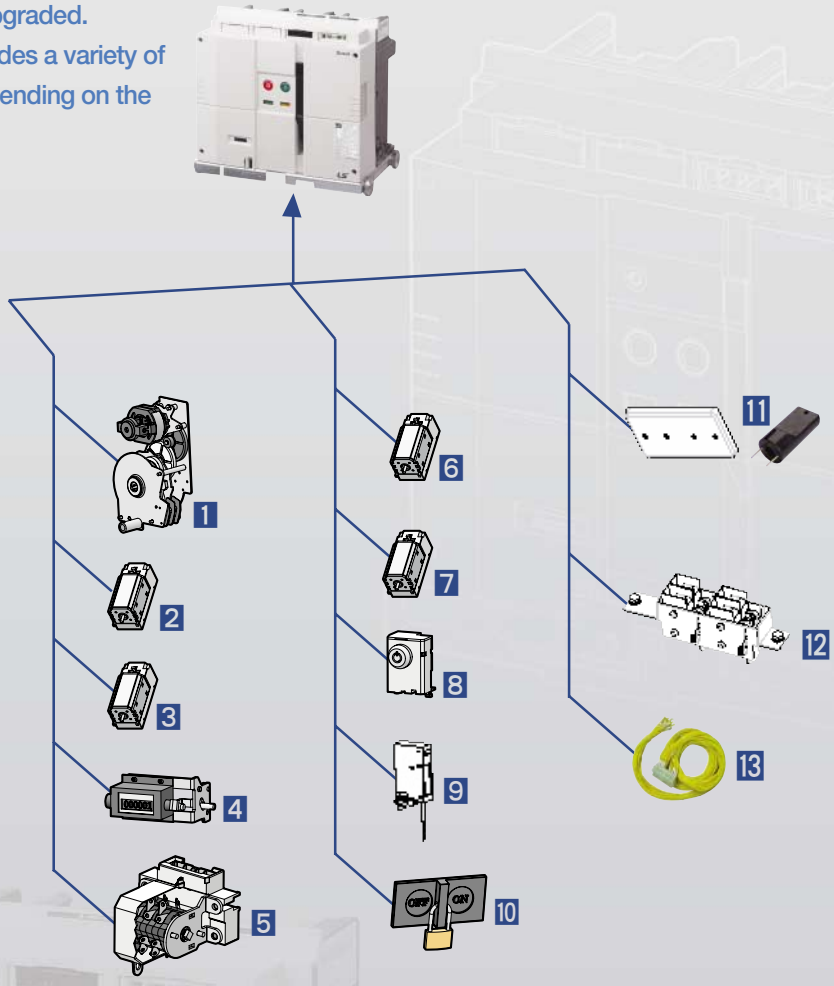


VL/VH type VCB
(H type CB compartment)

Accessories

A variety of accessories for VL-06

If accessories are attached to the breaker, the function of the breaker is upgraded. Susol VCB provides a variety of accessories depending on the purpose.



Breaker

1 Motor
2 Closing coil
3 Trip coil
4 Counter
5 Auxiliary contacts
6 UVT coil
7 Current trip coil
8 Key lock
9 Latch checking switch
10 Button padlock
11 Button cover
12 Position switch
13 Lead wire

A variety of accessories for VCL-06

If accessories are attached to the cradle, the function of the breaker is upgraded. Susol VCB provides a variety of accessories depending on the purpose.

Cradle

1 Handle for Racking-in and out
2 UVT time delay controller
3 Condenser trip device

Accessories

A variety of accessories for VL-06/12/17

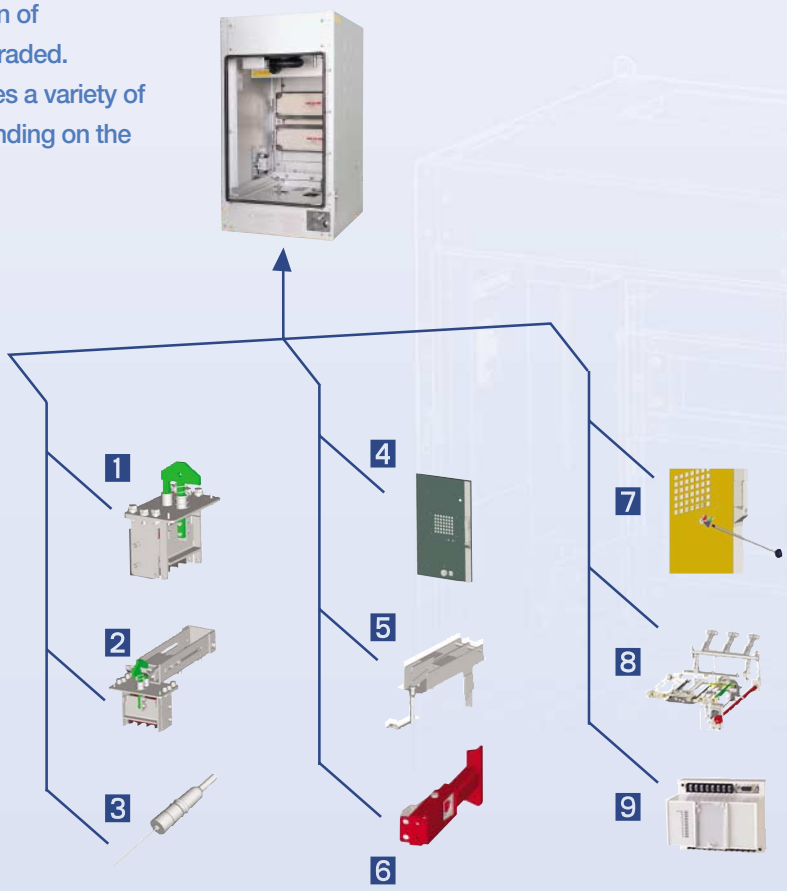
If accessories are attached to the breaker, the function of the breaker is upgraded. Susol VCB provides a variety of accessories depending on the purpose.

Breaker

1 Motor
2 Closing coil
3 Trip coil
4 Counter
5 Auxiliary contacts
6 UVT coil
7 Key lock
8 Latch checking switch
9 Button padlock
10 Button cover
11 Position switch
12 Handle for Racking-in/out
13 UVT time delay controller
14 Condenser trip device (CTD)
15 MOC
16 Padlock (H type Door Interlock)
17 Locking magnet
18 Plug Interlock

A variety of accessories for VL-06/12/17

If accessories are attached to the cradle, the function of the breaker is upgraded. Susol VCB provides a variety of accessories depending on the purpose.



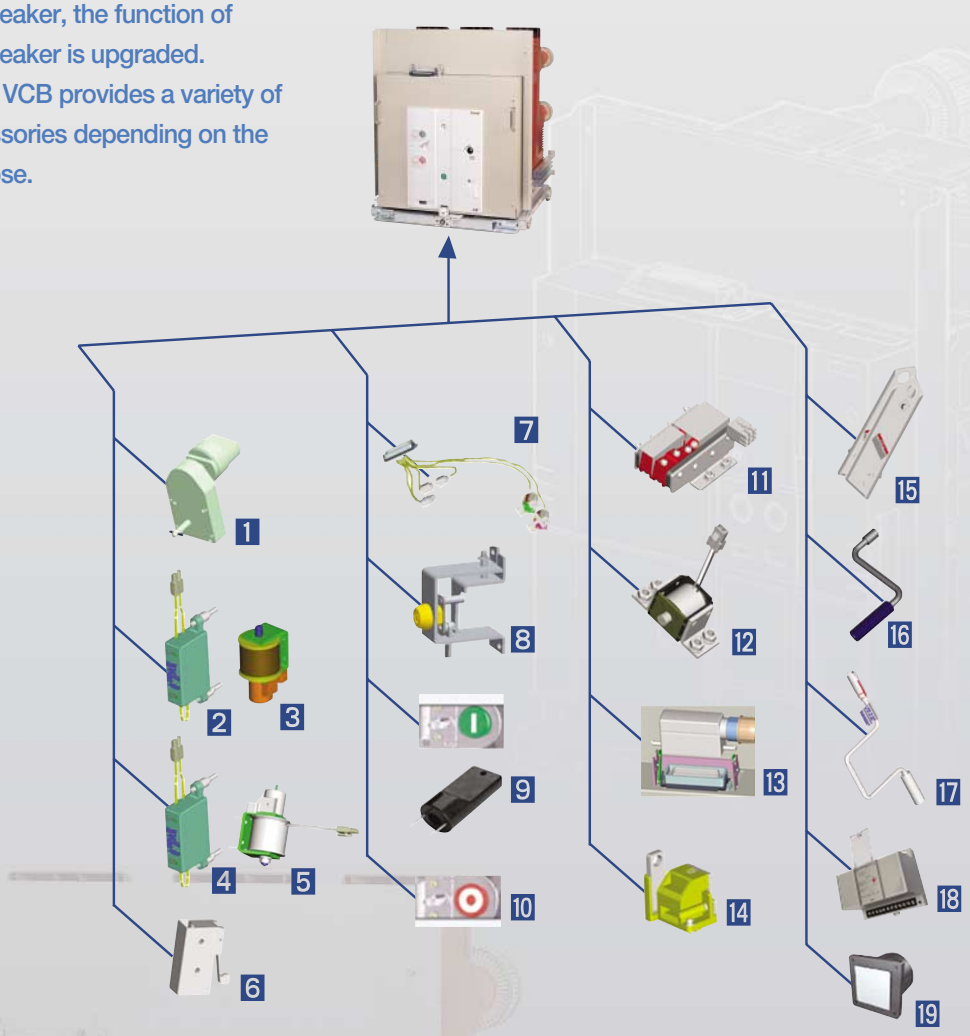
Cradle (H type)

1 TOC (Truck operated cell s/w)
2 MOC (Mechanical operated cell s/w)
3 Temperature sensor
4 Door
5 Door interlock
6 Shutter padlock
7 Emergency ON/OFF button
8 Earthing switch & Accessary
8-1 Key lock for Earthing switch
8-2 Locking Magnet for Earthing switch
8-3 Position s/w for Earthing switch
9 TM (Temperature monitoring unit)

Accessories

A variety of accessories for VH-06/12/17/24/36/40

If accessories are attached to the breaker, the function of the breaker is upgraded. Susol VCB provides a variety of accessories depending on the purpose.

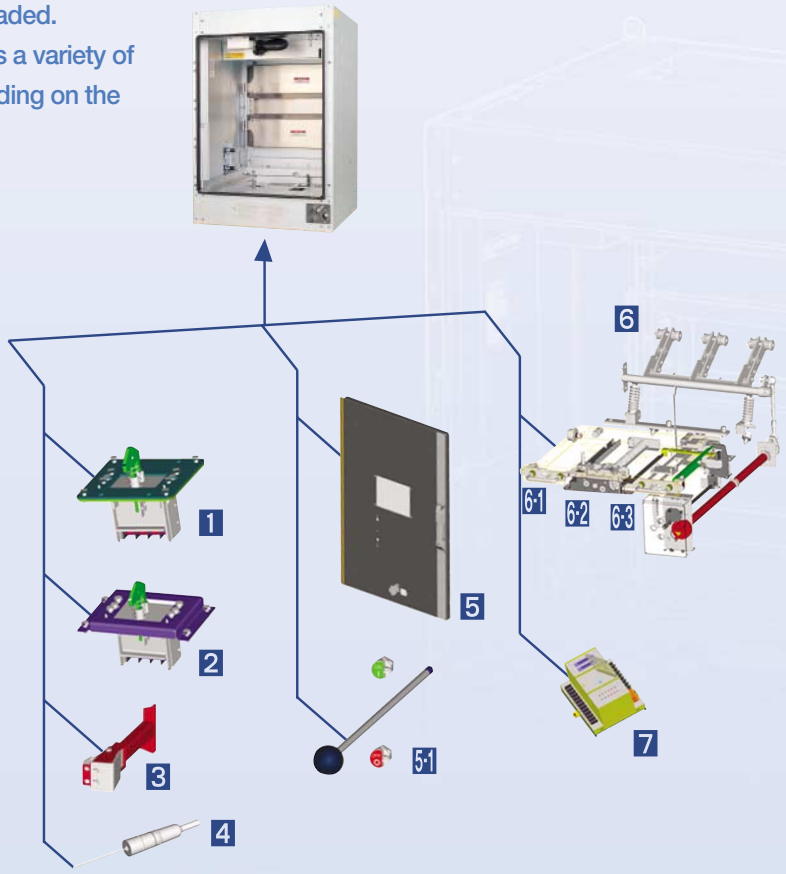


Breaker

1 Motor
2 AC/DC coil rectifier
3 Trip coil/Closing coil
Secondary trip coil
4 AC/DC UVT coil rectifier
5 UVT coil
6 Latch checking switch
7 Auxiliary contact wire
8 Key lock
9 Button cover/Push bar
10 Button padlock
11 Position switch
12 Locking magnet
13 Plug interlock
14 Door Interlock for withdrawable type
15 Lifting hook
16 Charge handle
17 Racking in/out handle
18 UVT Time delay controller
19 CTD (Condenser trip device)

A variety of accessories for VH-06/12/17/24/36/40

If accessories are attached to the cradle, the function of the breaker is upgraded. Susol VCB provides a variety of accessories depending on the purpose.



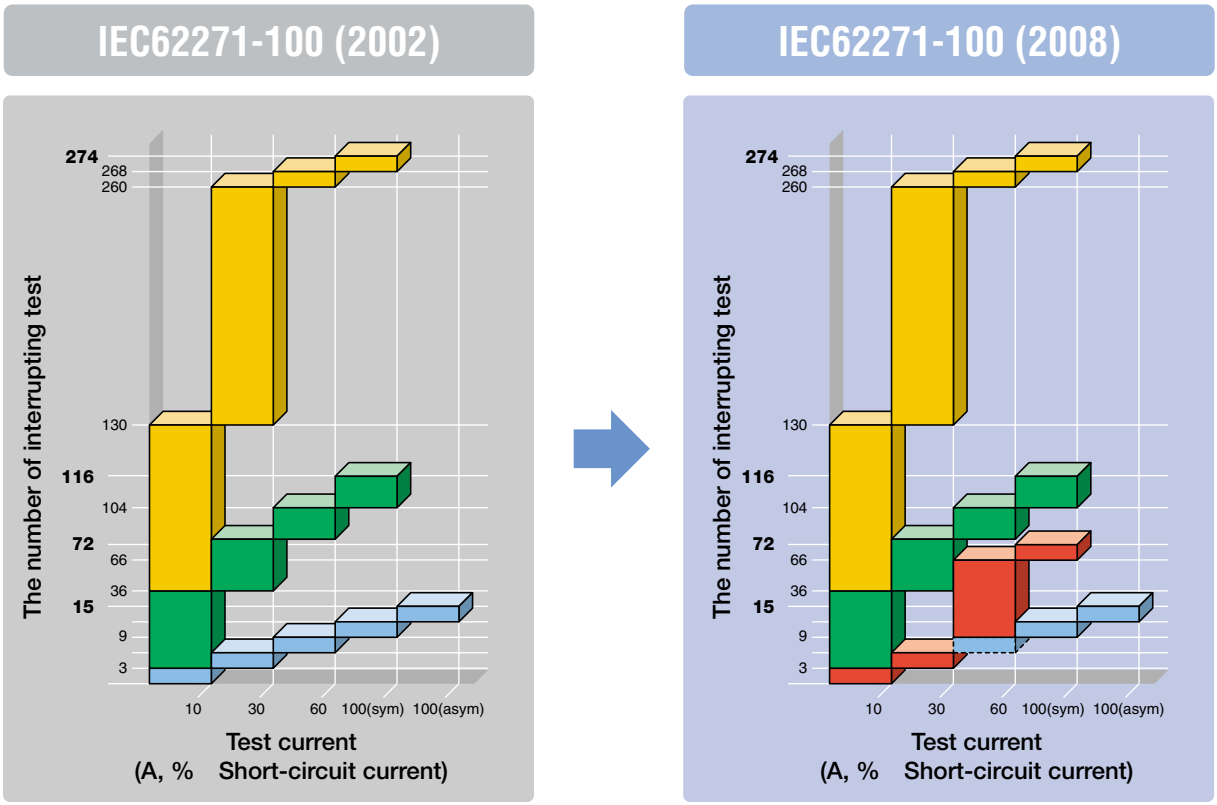
Cradle (H type)

1 MOC (Mechanism operated cell switch)
2 TOC (Truck operated cell switch)
3 Shutter padlock
4 Temperature sensor
5 Door
5-1 Emergency ON/OFF button
6 Earthing switch & Accessaries
6-1 Key lock for Earthing switch
6-2 Locking magnet for Earthing switch
6-3 Position switch for Earthing switch
7 TM (Temperature monitoring unit)

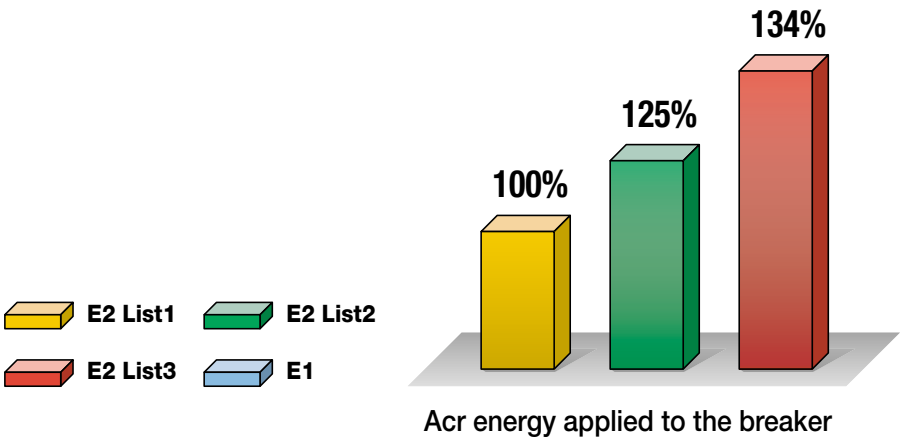
Standards and certifications

E2 (List 1 or List3)

E2 (List3) is first proposed in the IEC 62271-100(2008) to improve the efficiency of the interrupting test. According to it the number of interrupting test T60 is increased instead of fewer number of T10 and T30 compared to the existing List1. List3 compared with the List1 maintains the equivalent of the test but has severe test conditions because 34% higher arc energy applied to the breaker. List3 is applied to Susol VCB series.



Arc Energy: List 1 (100%) < List 2 (125%) < List 3 (134%)



Acr energy applied to the breaker

M2, C2

IEC standards to verify the relibilty of the product allows to select the quality level for the product to be tested according to its real performance and practical usage. The highest quality level of M2, C2 has been applied to Susol VCB.

M1 and M2: Test to determine the mechanical durability grade

2000 operation test		
Sequence	Control Voltage	Number of operations
C-O	85%	500
C-O	100%	500
C-O	110%	500
O-CO-C	100%	250

- Pre-test (characteristics, isolation, and temperature)
- Confirmative tests after the completion of 2000 operations (Characteristics, isolation, temperature)

- Pre-test (characteristics, isolation, and temperature)
- Confirmative tests after every 2000 operation
- Confirmative tests after the completion of 10,000 operations (Characteristics, isolation, temperature)

C1, C2: Capacitive current breaking test is to verify the probability of restriking and C2 class is secured for all Susol VCB.

"O" 24 operations
2 restrikes are allowed
during "CO" 24 operations

"O" 24 operations
Restrike is not allowed
during "CO" 24 operations

External structure of VCB

Susol

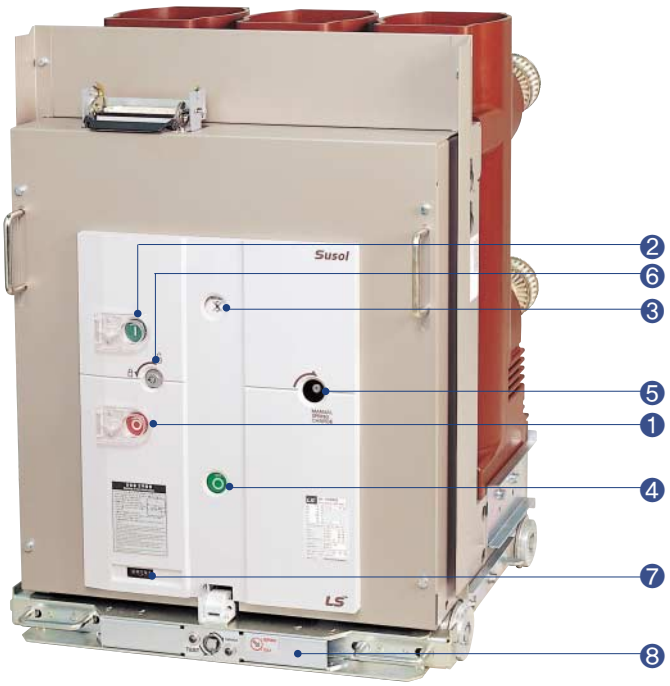
Breaker ... VL type

Name of each part

1. Push ON Button
2. Push OFF Button
3. Charge/Discharge Indicator
4. ON/OFF Indicator
5. Manual Charging Handle
6. Key Lock
7. Operation Counter
8. TEST/SERVICE Position Indicator

Back side

Breaker ... VH type



Name of each part

1. Push ON Button
2. Push OFF Button
3. Charge/Discharge Indicator
4. ON/OFF Indicator
5. Manual Charging Handle
6. Key Lock
7. Operation Counter
8. TEST/SERVICE Position Indicator

Back side

Basic functions

Manual operation

① Manual Charge

a) VL type: operate the charge handle 7-8 times as a fully stroke.
b) VH type: Insert the charge handle into the handle slot first. Rotate the handle clockwise 40 times more and then charge will be complete with a click sound.
- When the closing spring is charged fully "CHARGED" is displayed at the charge indicator.

② Manual closing

a) Pressing the ON button the breaker is closed.
b) With the closing of the breaker "ON" is displayed at Close/Trip indicator and “DISCHARGED” at the charge indicator.

③ Manual trip

a) Pressing the OFF button the breaker is opened.
b) “OFF”" is displayed at Close/Trip indicator.

Electric operation

① Electric charge

The breaker is remotely closing with charging of closing spring.
If the breaker trips the closing spring is automatically charged by gear motors.

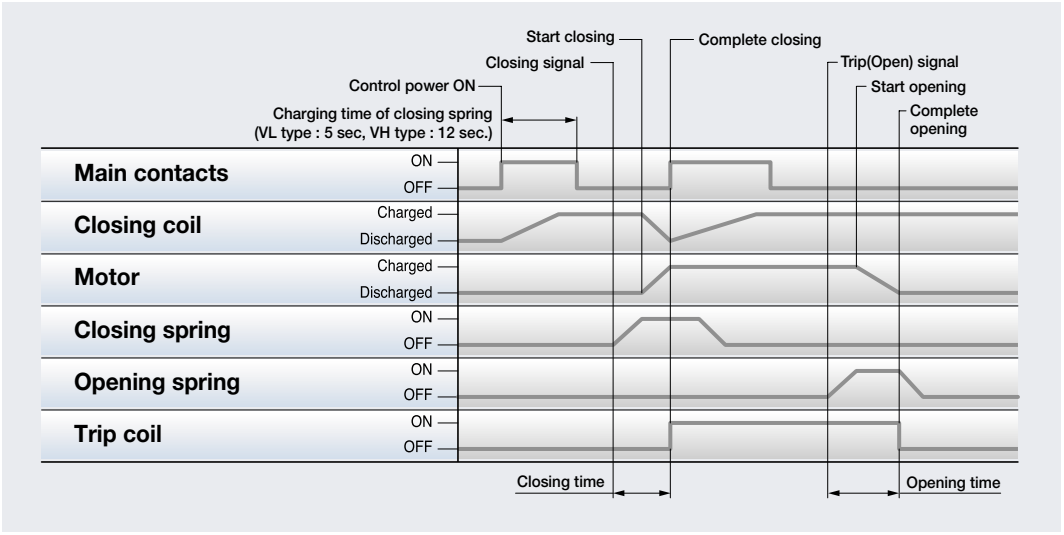
② Electric closing

Remote closing is operated by the closing coil.

③ Electric trip

Remote trip can be operated by the trip coil or UVT coil.

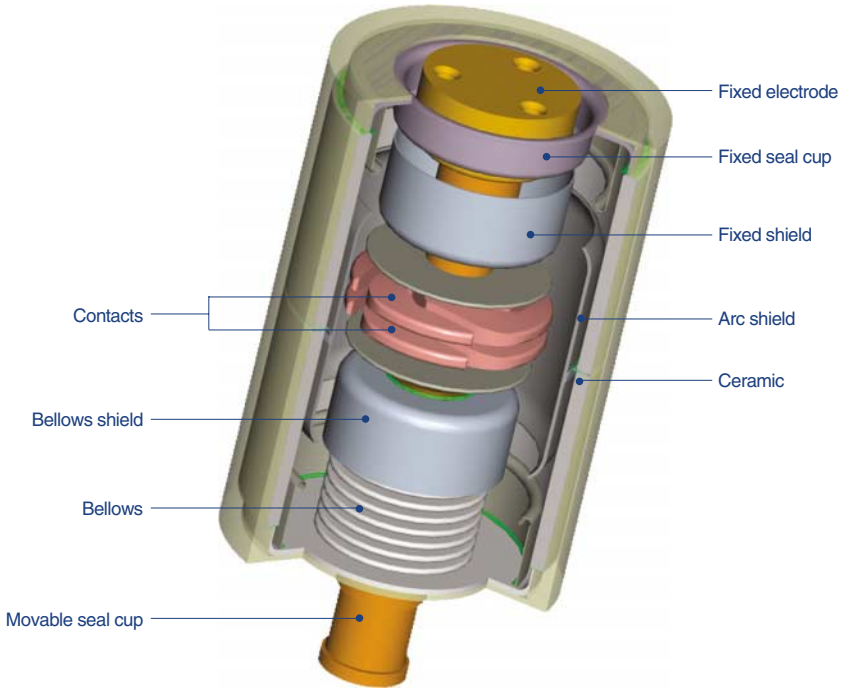
Main contacts are operated by the energy of the spring mechanism and closing spring is charged by the motor in the mechanism.
Breaker is closed by closing coil and tripped by trip coil.
These operations are repeated in VCB as shown in the below sequence chart.

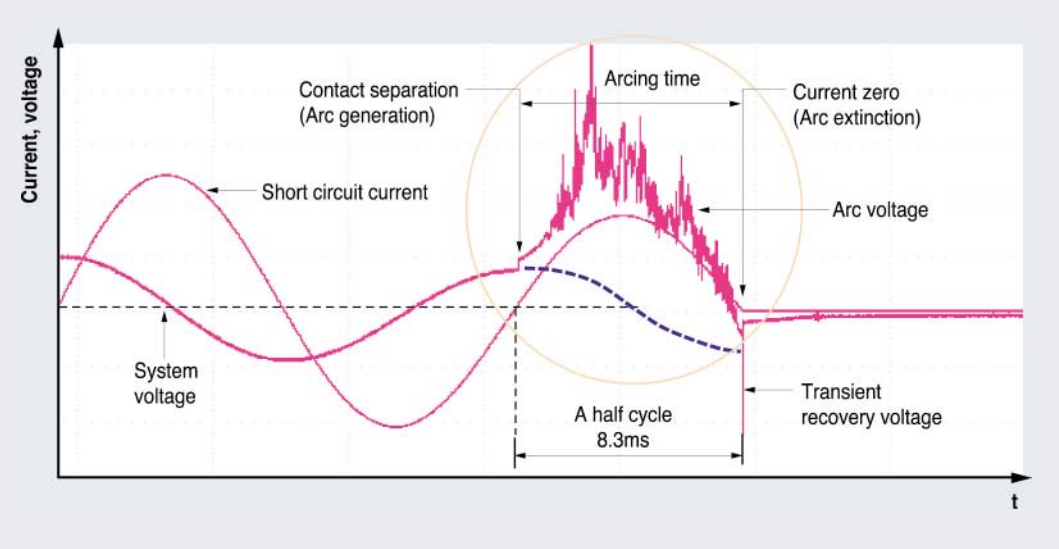


Sequence of the switching mechanism

The interruption of vacuum interrupters

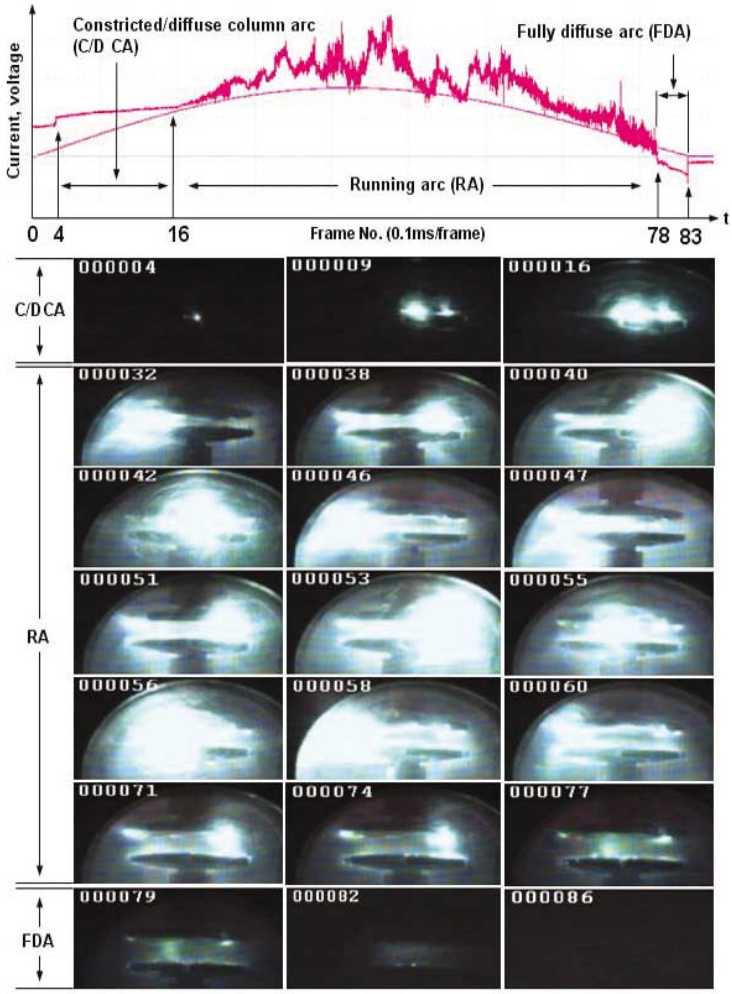
The interruption of VCB is carried out by the vacuum interrupters.
Interrupter contacts as a key part made of copper - chromium (CuCr) material with spiral shape have low contact wear characteristics and withstand voltage is excellent.
Spiral contacts make the arc generated between the surfaces of contacts rotated around the surface of contact by the induced magnetic field generated due to the spiral contact structure, which results in preventing local heating, thereby corruption and interrupting instantaneously.





An example of oscillogram obtained through the interrupting test using LC resonant circuit

The interruption of vacuum interrupters

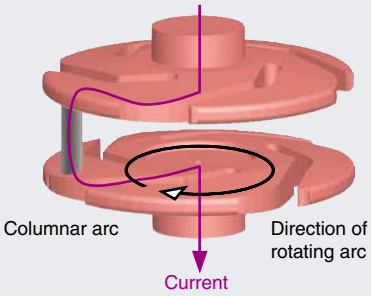


Arc voltage waveforms and arc image captured during arcing time

In case of using the flat contact any of the designs do not reflect on when contacts are opening the arc with high temperature is contracted and fixed in the center of the contacts,Which is called pinch effect.
To prevent the effect two kinds of contact shapes are designed.
One is Axial magnetic field which spreads the arc before its contraction, and the other is Radial magnetic field which permits the contraction of the arc but makes it rotated to disperse the energy.
Because contracted arc is shaped like a cylinder it is called Contracted arc or columnar arc.

Spiral contact structure (Radial magnetic field), using the force (F = j×B) generated by the interaction of the radial magnetic field caused by the current flowing through the arc between two contacts, disperse the arc energy evenly on the surface of contact by rotating the arc that is contracted by the pinch effect so as to minimize contact damage.
The images show arc behavior during the arcing time of about 8ms by shooting with high-speed camera capable of shooting 10,000 frames per sec. (0.1ms/frame) by focusing on parts of the arcing time on the above graph and simultaneously measured arc voltage also represented to show arc state by section.

Radial magnetic field type contact



Arc driving principle in the contacts of
Radial magnetic field

Susol VCB has been type tested and obtained certifications according to the latest IEC standard at international testing laboratory and can be installed and applied at the environment and conditions in accordance with the standard.

● **Standard**

- IEC 62271-1 (2007.10)
  High-voltage switchgear and controlgear - Part 1: Common specifications.
- IEC 62271-100 (2008.04)
  High-voltage switchgear and controlgear - Part 2: Alternating-current circuit breakers.

● **Test and certification**

- Test report (KERI)
- Test report (KEMA)

TEST REPORT 2009TS02564 1/47

CLASSIFICATION	Type Test
APPARATUS	Vacuum Circuit Breaker
DESIGNATION	VH-25□40D20
RATINGS	3 poles 25.8 kV 2 000 A 40 kA 60 Hz
APPLIED STANDARD	IEC 62271-100:2008-04
RECEIPT No.	TRD08S02808 (December 11, 2008)
APPLICANT	LS Industrial Systems Co., Ltd. Songjung-dong 1, Hungdeok-gu, Cheongju-si, 361-720, Korea
MANUFACTURER	LS Industrial Systems Co., Ltd. Songjung-dong 1, Hungdeok-gu, Cheongju-si, 361-720, Korea
DATE OF TESTS	June 30, 2008 – September 21, 2009
DATE OF ISSUE	December 14, 2009

The type tests have been carried out in accordance with IEC 62271-100:2008-0 applicant's specification.

The test results are presented in the records of tests with the performance of th apparatus and the observations made during the tests. The oscillograms are at hereto.

The obtained values and the general performances are considered to comply w requirements of the above standard for the performed type tests.

The test results apply only to the tested specific samples.
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No. OF PAGES INCORPORATED: records (47), photographs (4), circuit diagrams (4), oscillogram drawings & descriptions (5), attachments (0)

Prepared by Won , Ho-Sun

Verified by Park , Nam-O

Aproved by (Technical manager) Park, Sung-

Power Apparatus Testing & Evaluation D

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KERI Laboratories are accredited by KOLAS (Korea Laboratory Accreditation

KEMA

TYPE TEST CERTIFICATE OF CAPACITIVE SWITCHING PERFORMANCE:C04136-L

APPARATUS: A three-phase withdrawable vacuum circuit breaker in a test rig (cradle)

DESIGNATION: LVB-12 -25 /06 Serial No. 20040826001
LVB-12 -25 /12 Serial No. 20040826002
LVB-12 -25 /20 Serial No. 20040826003

Rated voltage: 12 kV Rated frequency: 50/60 Hz
Rated normal current: 630, 1250,2000A Rated Short Circuit Current: 25 kA

MANUFACTURER: LG Industrial Systems Co., Ltd., Hungduk-gu, Cheongju, Korea

CLIENT: LG Industrial Systems Co., Ltd., Hungduk-gu, Cheongju, Korea

TESTED BY: KEMA-Powertest, Inc., Chalfont, PA, USA

DATE(S) OF TESTS: Sept. 14-26, 2004

The apparatus, constructed in accordance with the description, drawings and photographs incorporated in this Certificate, has been subjected to the series of proving tests in accordance with IEC 62271-100: 2001, sub clause 6.111.

THE RESULTS ARE SHOWN IN THE RECORD OF PROVING TESTS AND THE OSCILLOGRAMS ATTACHED HERETO. THE VALUES OBTAINED AND THE GENERAL PERFORMANCE ARE CONSIDERED TO COMPLY WITH THE ABOVE STANDARD AND TO JUSTIFY THE RATINGS ASSIGNED BY THE MANUFACTURER AS LISTED ON PAGE 1.

This Certificate and Record of Proving Tests applies only to the specific piece of apparatus tested from the particular place of manufacture. The responsibility for conformity of any apparatus having the same designation with that tested rests with the manufacturer at the place of manufacture of that apparatus.

This Certificate consists of 80 pages in total.

Only reproduction of the complete Certificate, or reproductions of this page accompanied by the page(s) on which are stated the tests performed and the assigned rated characteristics of the apparatus tested, are permitted without permission from KEMA-Powertest.

KEMA-POWERTEST

M. F. Schacker

Date:

ACCREDITED

Form: COSCP.R2 Certificate Number: 0553-01 Rev.#0 12/15/2004

Types and ordering information

Susol

7.2kV (VL-06)

Breaker

VL — 06 P 08 A 04

Basic model name	
VL	Susol VCB

Rated voltage (kV)	
06	7.2

Version	
P	Fixed
E	E type drawout
F	F type drawout
G	G type drawout

Interrupting current (kA)	
08	8
13	12.5

Phase distance/Compatibility	
A	Standard
B	Compatible with existing breaker Note6)

Rated current (A)	
04	400
06	630

VL-06E08A04 — M1 C1 T1 SA1 U1 A 147

Motor control voltage	
M0	Without motor
M1	DC 110V
M2	DC 220V
M3	DC 125V
M4	DC 24V~30V
M5	DC 48V~60V
M6	AC 48V
M7	AC 100V~130V
M8	AC 200V~250V

Trip coil voltage	
T0	Without trip coil
T1	DC 110V
T2	DC 220V
T3	DC 125V
T4	DC 24V~30V
T5	DC 48V~60V
T6	AC 48V
T7	AC 100V~130V
T8	AC 200V~250V
T9	Current trip coil

UVT	
U0	Without UVT
U1	DC 110V
U2	DC 220V
U3	DC 125V
U4	DC 24V~30V
U5	DC 48V~60V
U6	AC 48V
U7	AC 100V~130V
U8	AC 200V~250V

Closing coil voltage	
C0	Without closing coil
C1	DC 110V
C2	DC 220V
C3	DC 125V
C4	DC 24V~30V
C5	DC 48V~60V
C6	AC 48V
C7	AC 100V~130V
C8	AC 200V~250V

Connector and wire		
SA1	Standard	A type connector, 2a2b
SA2		A type connector, 4a4b
SA3		A type connector, 6a6b
SA5	Flame retardant	A type connector, 2a2b
SA6		A type connector, 4a4b
SA7		A type connector, 6a6b

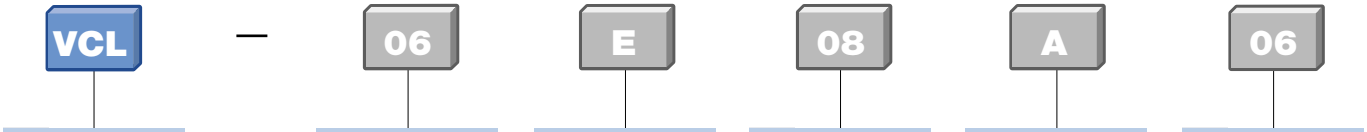
Optional	
LH	Lifting Hook
CTD1	Condenser Trip Device (AC 110V)
CTD2	Condenser Trip Device (AC 220V)
UDC1	UVT Time Delay Controller (AC/DC 110V)
UDC2	UVT Time Delay Controller (AC/DC 220V)
UDC3	UVT Time Delay Controller (AC/DC 48V)
CTU	Coil Test Unit
VC	Vacuum Checker

Other accessories Note)	
1	Secondary Trip coil
4	Position S/W (2a2a)
5	Position S/W (2a2b)
6	Latch checking S/W
7	Key lock
8	Button Padlock
9	Button cover
A	Lead wire
B	User Plug (Part)
O	Lead Wire special color (Blue)

Note) A is written only once in case of more than one.

Note)
1. If A2(UVT), A4 (Position S/W 2a2b) and A7(Keylock) are selected, A247 is the type name in the ordering.
2. A1(Secondary Trip Coil), A2(UVT) and A3(Current trip coil) can not be selected simultaneously.
3. A4(Position S/W 2a2a) and A5(Position S/W 2a2b) can not be selected simultaneously.
4. A8 (Button Padlock) and A9 (Button Cover) can not be selected simultaneously.
5. When A1 (Secondary Trip Coil), A2 (UVT) and A6 (Latch checking S/W) are selected the maximum available auxiliary contacts are 4a4b.
6. In case of using the existing old type cradle and replacing breaker only please order type B (Compatible with existing breaker). Compatibille busbars are required for fixed version.
7. If T9(CTC) is selected, in case of adding Secondary Trip coil, CTC is also added.

Cradle



Basic model name	
VCL	Susol VCB Cradle

Rated voltage (kV)	
06	7.2

Version	
E	E type drawout
F	F type drawout
G	G type drawout

Interrupting current (kA)	
08	8
13	12.5

Phase distance/Compatibility	
A	Standard
B	Compatible with existing breaker Note)

Rated current (A)	
04	400
06	630

Note) In case of replacing the existing old type VCB with Susol VCB please order type B for cradle and A for breaker.

Types and ordering information

Susol

7.2/12/17.5kV (VL-06/12/17)

Breaker

VL – 06 H 20 A 06

Basic model name	
VL	Susol VCB

Rated voltage (kV)	
06	7.2
12	12
17	17.5

Version	
P	Fixed
E	E type drawout (for MESG)
F	F type drawout (for MESG)
G	G type drawout (for MESG)
H	H type drawout (for MCSG)

Interrupting current (kA)	
20	20
25	25

Phase distance/Compatibility	
A	150mm
B	210mm
F	Compatible with existing breaker Note)

Rated current (A)	
06	630
13	1250
20	2000

Note) Types of phase distance
1. Only 150mm for 7.2kV VCB
2. In case of 12 and 17.5kV VCB
   - 150 and 210mm for H type
   - 150 and 210mm for 630/1250A of P type
   - 210mm available for E and F type
   - 630A and 1250A for F (compatible with existing breaker)

VL-06H20A06 – M1 C1 T1 SB1 U1 A 147

Motor control voltage	
M0	Without motor
M1	DC 110V
M2	DC 220V
M3	DC 125V
M4	DC 24V~30V
M5	DC 48V~60V
M6	AC 48V
M7	AC 100V~130V
M8	AC 200V~250V

Trip coil voltage	
T0	Without trip coil
T1	DC 110V
T2	DC 220V
T3	DC 125V
T4	DC 24V~30V
T5	DC 48V~60V
T6	AC 48V
T7	AC 100V~130V
T8	AC 200V~250V
T9	Current trip coil

UVT	
U0	Without UVT
U1	DC 110V
U2	DC 220V
U3	DC 125V
U4	DC 24V~30V
U5	DC 48V~60V
U6	AC 48V
U7	AC 100V~130V
U8	AC 200V~250V

Closing coil voltage	
C0	Without closing coil
C1	DC 110V
C2	DC 220V
C3	DC 125V
C4	DC 24V~30V
C5	DC 48V~60V
C6	AC 48V
C7	AC 100V~130V
C8	AC 200V~250V

Connector and wire		
SA2	Standard	A type connector, 4a4b
SA4		A type connector, 10a10b
SB2		B type connector, 4a4b
SB4		B type connector, 10a10b
SA6	Flame retardant	A type connector, 4a4b
SA8		A type connector, 10a10b
SB6		B type connector, 4a4b

Optional	
CTD1	Condenser Trip Device (AC 110V)
CTD2	Condenser Trip Device (AC 220V)
UDC1	UVT Time Delay Controller (AC/DC 110V)
UDC2	UVT Time Delay Controller (AC/DC 220V)
UDC3	UVT Time Delay Controller (AC/DC 48V)
CTU	Coil Test Unit
VC	Vacuum Checker

Other accessories Note)	
1	Secondary Trip coil
4	Position S/W (2a2a)
5	Position S/W (2a2b)
6	Latch checking S/W
7	Key lock
8	Button Padlock
9	Button Cover
B	User Plug (Part)
C	Plug Interlock
D	Padlock (H type Door Interlock)
E	MOC (Mechanical Operating Cell S/W)
F	Locking Magnet
O	Lead Wire special color (Blue)

Note) A is written only once in case of more than one.

Note)
1. If A2 (UVT), A4 (Position S/W 2a2b) and A7 (Keylock) are selected, A247 is the type name in the ordering.
2. A1 (Secondary Trip Coil) and A2 (UVT) can not be selected simultaneously.
3. A4 (Position S/W 2a2a) and A5 (Position S/W 2a2b) can not be selected simultaneously.
4. A8 (Button Padlock) and A9 (Button Cover) can not be selected simultaneously.
5. When A1 (Secondary Trip Coil) is selected the maximum available auxiliary contacts are 9a9b.
6. AC (Plug interlock),AD (H type Door interlock), AE (MOC) and AF (Locking magnet) are available only for H type.
7. In case of B-type connector the flame retardant wire is applicable to auxiliary contacts 4a4b, not to 10a10b.
8. A-type connector is applicable to P/E/F/G type and B-type connector to H type.
9. Lead wire special color (blue) is applicable to A-type connector.
10. In case of using position switch the available connectors are A type connector for P/E/F/G type and B type connector for H type.
11. Locking magnet can be applied only to H type VCB - breaker and cradle.
12. Locking magnet of H type breaker use the same control power supply as motor.
13. Flame retardant type blue wire is not available.
14. If T9(CTC) is selected, in case of adding Secondary Trip coil, CTC is also added.

Cradle

VCL – 06 H 20 A 06 A 147

Basic model name	
VCL	Susol VCB Cradle

Rated voltage (kV)	
06	7.2
12	12
17	17.5

Version	
E	E type drawout (for MESG)
F	F type drawout (for MESG)
G	G type drawout (for MESG)
H	H type drawout (for MCSG)

Rated short time current (kA)	
20	20
25	25

Phase distance/Compatibility	
A	150mm
B	210mm
F	Compatible with existing breaker Note)

Rated current (A)	
06	630
13	1250
20	2000

Other accessories (H type)	
1	ES (Earthing Switch) without option
2	ES with position S/W (2a2b)
4	ES with position S/W (6a6b)
5	ES with Key lock
6	ES with Locking magnet: DC 110V
7	ES with Locking magnet: DC 220V
8	ES with Locking magnet: DC 125V
9	ES with Locking magnet: DC 24V
A	ES with Locking magnet: DC 48V
B	ES with Locking magnet: AC 48V
C	ES with Locking magnet: AC 110V
D	ES with Locking magnet: AC 220V
E	Shutter padlock
F	TOC (Truck Operating Cell S/W)
G	MOC (Mechanical Operating Cell S/W)
H	Door
J	Door Interlock
K	Door Emergency Push Button
L	Temperature Monitoring Sensor
M	H type Lead wire 4a4b (Flame retardant wire)
N	H type Lead wire 10a10b (Flame retardant wire)
O	H type Lead wire 4a4b (Rated short time current)

Optional	
TM	Temperature Monitoring

Note) A is written only once in case of more than one.

Note) 1.These accessories for cradle and TM can be applied only to H type.
2. AJ and AK can not be selected without door (AH).
3. TM (Temperature Monitoring) should be used with AL (Temperature Sensor).
4. H type lead wire - one of AM, AN or AO is required for cradle in case of H type breaker.

Types and ordering information

Susol

7.2/12/17.5/24/36/40.5kV (VH-06/12/17/24/36/40)

Breaker

VH — 06 H 50 B 13

Basic model name	
VH	Susol VCB

Rated voltage (kV)	
06	7.2
12	12
17	17.5
20	24
25	25.8
36	36
40	40.5

Version	
P	Fixed
H	H type drawout (for MCSG)

Interrupting current (kA)	
25 Note)	25
32	31.5
40	40
50	50

Phase distance/Compatibility	
B	210mm
D	275mm
E	300mm

Rated current (A)	
13	1250A
20	2000A
25	2500A
32	3150A
40	4000A

*Phase distance is different by rating.
*Phase distance only E (300mm) for 36/40.5kV VCB

Note) only for 24/36kV

VH-06H50B32 — M1 C1 T1 SB2 U1 A 147

Motor control voltage	
M0	Without motor
M1	DC 110V
M2	DC 220V
M3	DC 125V
M5	DC 48V
M6	AC 48V
M7	AC 110V
M8	AC 220V

Trip coil voltage	
T0	Without trip coil
T1	DC110V
T2	DC220V
T3	DC125V
T5	DC48V
T6	AC 48V
T7	AC 110V
T8	AC 220V

UVT	
U0	Without UVT
U1	DC 110V
U2	DC 220V
U3	DC 125V
U5	DC 48V
U6	AC 48V
U7	AC 110V
U8	AC 220

Closing coil voltage	
C0	Without closing coil
C1	DC 110V
C2	DC 220V
C3	DC 125V
C5	DC 48V
C6	AC 48V
C7	AC 110V
C8	AC 220V

Connector and wire		
SB2	Standard	B type connector, 4a4b
SB4		B type connector, 10a10b
SB6	Flame retardant	B type connector, 4a4b

Optional	
LH	Lifting Hook
CTD	Condenser Trip Device
UDC	UVT Time Delay Controller
DH	VCB Draw-out Handle
CH	VCB Closing spring Charge Handle
CTU	Coil Test Unit
VC	Vacuum Checker

Other accessories Note)	
1	Secondary Trip coil
4	Position S/W (2a2a)
5	Position S/W (2a2b)
6	Latch checking S/W
7	Keylock
8	Button Padlock
9	Button cover
A	Lead Wire
B	User Plug(Part)
C	Plug Interlock
D	Padlock (H type Door Interlock)
E	MOC (Mechanical Operating Cell S/W)
F	Locking Magnet
P	Trip Coil Monitoring Contact
O	Lead Wire special color (Blue)

Note) A is written only once in case of more than one.

Note)
1. If A2 (UVT), A4 (Position S/W 2a2b) and A7 (Keylock) are selected, A247 is the type name in the ordering.
2. A1 (Secondary Trip Coil) and A2 (UVT) can not be selected simultaneously.
3. A4 (Position S/W 2a2a) and A5 (Position S/W 2a2b) can not be selected simultaneously.
4. A8 (Button Padlock) and A9 (Button Cover) can not be selected simultaneously.
5. AC (Plug interlock),AD (H type Door interlock), AE (MOC) and AF (Locking magnet) are available only for H type.
6. In case of B-type connector the flame retardant wire is applicable to auxiliary contacts 4a4b, not to 10a10b.
7. Locking magnet can be applied only to H type VCB - breaker and cradle.
8. Locking magnet of H type breaker use the same control power supply as motor.
8. A-type connector is applicable to P/E/F/G type and B-type connector to H type.
9. In case of selecting UVT A6 (Latch checking S/W) is not allowed. A6 (Latch checking S/W) is installed by default to make electrical interlock with UVT.
10. Lead wire is enclosed in the breaker in case of ordering fixed type or H type breaker without cradle, installed of cradle in case of ordering the breaker with cradle. If user plug is selected it will be enclosed in the breaker.

Cradle

VCL – 06 H 25 B 13 A 147

Basic model name	
VCL	Susol VCB Cradle

Rated voltage (kV)	
06	7.2
12	12
17	17.5
20	24
25	25.8
36	36
40	40.5

Version	
K	K type drawout
H	H type drawout (for MCSG)

Interrupting current (kA)	
25	25
32	31.5
40	40
50	50

Phase distance/Compatibility	
B	210mm
D	275mm
E	300mm
F	Rotated bushing type (210mm)

Rated current (A)	
13	1250A
20	2000A
25	2500A
32	3150A
40	4000A

Other accessories (H type)	
1	ES (Earthing Switch) without option
2	ES with Position S/W (2a2b)
4	ES with Position S/W (6a6b)
5	ES with Key lock
6	ES with Locking magnet: DC 110V
7	ES with Locking magnet: DC 220V
8	ES with Locking magnet: DC 125V
A	ES with Locking magnet: DC 48V
B	ES with Locking magnet: AC 48V
C	ES with Locking magnet: AC 110V
D	ES with Locking magnet: AC 220V
E	Shutter padlock
F	TOC (Truck Operating Cell S/W)
G	MOC (Mechanical Operating Cell S/W)
H	Door
J	Door Interlock
K	Door Emergency Push Button
L	Temperature Sensor
M	H type Lead wire 4a4b (Flame retardant wire)
N	H type Lead wire 10a10b (Flame retardant wire)
O	H type Lead wire 4a4b (Rated short time current)

Optional	
TM	Temperature Monitoring

Note) A is written only once in case of more than one.

Note) 1.These accessories for cradle and TM can be applied only to H type.
2. AJ and AK can not be selected without door (AH).
3. TM (Temperature Monitoring) should be used with AL (Temperature Sensor).
4. H type lead wire - one of AM, AN or AO is required for cradle in case of H type breaker.

Ratings - 7.2kV 8/12.5kA 400/600A

Susol

7.2kV (VL-06)

Item			VL-06□ 08□04	VL-06□13□ 06
Rated voltage		Ur (kV)	7.2	
Rated normal current		Ir (A)	400	630
Rated frequency		fr (Hz)	50/60	
Rated short-circuit current		Isc (kA)	8	12.5
Rated short-time withstand current		Ik/tk (kA/s)	8/3	12.5/3
Rated short-circuit breaking capacity		(MVA)	100	160
Rated short-circuit making current		Ip (kA)	2.5* Isc (50Hz)/2.6* Isc (60Hz)	
Rated breaking time		(cycle)	3	
Rated withstand voltage	Power frequency (1 min)	Ud (kV)	20	
	Impulse (1.2×50㎲)	Up (kV)	60	
Rated operating sequence			O-0.3s-CO-15s-CO	
Control voltage	Closing coil	(V)	AC/DC 100~130V, AC/DC 200~250V, DC 125V, DC 24~30V, DC 48~60V, AC 48V	
	Trip coil	(V)	AC/DC 100~130V, AC/DC 200~250V, DC 125V, DC 24~30V, DC 48~60V, AC 48V	
Auxiliary contacts			2a2b, 4a4b, 6a6b	
Rated opening time		(sec)	≤ 0.04	
No-load closing time		(sec)	≤ 0.06	
Type test class	Mechanical		M2	
	Electrical		E2 (List1)	
	Capacitive current switching		C2	
Lifetime *	Mechanical	(Operations)	30,000	
	Electrical	(Operations)	See graph, Page 117~118	
Installation version	Fixed		P type	
	Drawout		E, F, G type (for MESG)	
Phase distance		(mm)	130	
Weight	Breaker (E, F, G type)	(kg)	37	37
	Cradle (E, F, G type)	(kg)	18, 25, 32	19, 26, 33
Dimensions	Breaker (E, F, G type)		Page 80~81	
	Cradle (E, F, G type)		Page 81~82	
Standards			IEC 62271-100 (2008), KS C 4611, JEC 2300/JIS C 4603, V-check (KESCO)	

* Lifetime with maintenance.

Ratings - 7.2/12/17.5kV 20/25kA 630/1250/2000A

Susol

7.2/12/17.5kV (VL-06/12/17)

Item			VL-06□20/25□06/13/20			VL-12□ 20/25□06/13/20			VL-17□20/25□06/13/20		
Rated voltage		Ur (kV)	7.2			12			17.5		
Rated normal current		Ir (A)	630	1250	2000	630	1250	2000	630	1250	2000
Rated frequency		fr (Hz)	50/60								
Rated short-circuit current		Isc (kA)	20, 25								
Rated short-time withstand current		Ik/tk (kA/s)	20/3, 25/3								
Rated short-circuit breaking capacity		(MVA)	250/310			410/520			600/750		
Rated short-circuit making current		Ip (kA)	2.5* Isc (50Hz)/2.6* Isc (60Hz)								
Rated breaking time		(cycle)	3								
Rated withstand voltage	Power frequency (1 min)	Ud (kV)	20			28 (42)			38		
	Impulse (1.2×50㎲)	Up (kV)	60			75			95		
Rated operating sequence			O-0.3s-CO-15s-CO								
Control voltage	Closing coil	(V)	DC 24~30V, DC 48~60V, DC 110V, DC 125V, DC 220V, AC 48V, AC 100~130V, AC 220~250V								
	Trip coil	(V)	DC 24~30V, DC 48~60V, DC 110V, DC 125V, DC 220V, AC 48V, AC 100~130V, AC 220~250V								
Auxiliary contacts			4a4b, 10a10b								
Rated opening time		(sec)	≤ 0.04								
No-load closing time		(sec)	≤ 0.06								
Type test class	Mechanical		M2								
	Electrical		E2 (List3)								
	Capacitive current switching		C2								
Lifetime *	Mechanical	(Operations)	30,000								
	Electrical	(Operations)	See graph, Page 117~118								
Installation version **	Fixed		P type			P type					
	Drawout		E, F, G type (for MESG), H type (for MCSG)			E, F type (for MESG), H type (for MCSG)					
Phase distance ***		(mm)	150			150 (210)			150 (210)		
Weight	Breaker (E, F, G type)	(kg)	100	100	130	115 (120)	115 (120)	130 (140)	115 (120)	115 (120)	130 (140)
	Cradle (E, F, G type)	(kg)	170	170	180	170 (200)	170 (200)	180 (200)	170 (200)	170 (200)	180 (200)
Dimensions	Breaker (E, F, G type)		Page 83~85		Page 85~87	Page 87~91		Page 91~93	Page 87~91		Page 91~93
	Cradle (E, F, G type)		Page 100, 102		Page 101~102	Page 103~105		Page 106	Page 103~105		Page 106
	Cradle (H type)		Page 94		Page 95	Page 96~97		Page 98~99	Page 96~97		Page 98~99
Standards			IEC 62271-100 (2008), KERI/KEMA, V-check (KESCO)								

* Lifetime with maintenance.
** H type is a box type cradle with CB compartment style structure.
*** ( ) displays option of phase distance.

Ratings - 7.2/12/17.5kV 25/31.5/40/50kA 1250/2000/2500/3150/4000A

Susol

7.2/12/17.5kV (VH-06/12/17)

Item			VH-06□50□12/20/25/32/40					VH-12□50□12/20/25/32/40					VH-17□50□12/20/25/32			
Rated voltage		Ur (kV)	7.2					12					17.5			
Rated normal current		Ir (A)	1250	2000	2500	3150	4000	1250	2000	2500	3150	4000	1250	2000	2500	3150
Rated frequency		fr (Hz)	60													
Rated short-circuit current		Isc (kA)	50													
Rated short-time withstand current		Ik/tk (kA/s)	50/3													
Rated short-circuit breaking capacity		(MVA)	623					1039					1515			
Rated short-circuit making current		Ip (kA)	2.6 * Isc (60Hz)													
Rated breaking time		(cycle)	3													
Rated withstand voltage	Power frequency (1 min)	Ud (kV)	20					28					38			
	Impulse (1.2×50㎲)	Up (kV)	60					75					95			
Rated operating sequence			O-0.3s-CO-3min-CO													
Control voltage	Closing coil	(V)	DC 48V, DC 110V, DC 125V, DC 220V, AC 48V, AC 110V, AC 220V													
	Trip coil	(V)	DC 48V, DC 110V, DC 125V, DC 220V, AC 48V, AC 110V, AC 220V													
Auxiliary contacts			4a4b, 10a10b													
Rated opening time		(sec)	≤ 0.04													
No-load closing time		(sec)	≤ 0.06													
Type test class	Mechanical		M2													
	Electrical		E2 (List3)													
	Capacitive current switching		C2													
Lifetime *	Mechanical	(Operations)	20,000													
	Electrical	(Operations)	See graph, Page 117~118													
Installation version **	Fixed		P type				-	P type				-	P type			
	Drawout		H type (for MCSG)				K type	H type (for MCSG)				K type	H type (for MCSG)			
Phase distance		(mm)	210		275		275	210		275		275	210		275	
Weight	Breaker (H type)	(kg)	230		287	290	385	230		287	290	385	230		287	290
	Cradle (H, K type)	(kg)	175		320	320	315	175		320	320	315	175		320	320
Dimensions	Breaker (H type)		Page 107		Page 108		Page 109	Page 107		Page 109		Page 109	Page 107		Page 108	
	Cradle (H, K type)		Page 118		Page 119		Page 109	Page 118		Page 119		Page 109	Page 118		Page 119	
Standards			IEC 62271-100 (2008), KERI/KEMA, V-check (KESCO)													

* Lifetime with maintenance.
** K type is a 4000A exclusive cradle.

24kV (VH-20)

Item			VH-20□25□25	VH-20□32□12/20/32			VH-20□ 40□ 12/20/32		
Rated voltage		Ur (kV)	24/25.8						
Rated normal current		Ir (A)	2500	1250	2000	3150	1250	2000	3150
Rated frequency		fr (Hz)	60						
Rated short-circuit current		Isc (kA)	25	31.5			40		
Rated short-time withstand current		Ik/tk (kA/s)	25/3	31.5/3			40/3		
Rated short-circuit breaking capacity		(MVA)	1039/1117	1309/1407			1662/1787		
Rated short-circuit making current		Ip (kA)	2.6* Isc (60Hz)						
Rated breaking time		(cycle)	3						
Rated withstand voltage	Power frequency (1 min)	Ud (kV)	60 (65) Note1)						
	Impulse (1.2×50㎲)	Up (kV)	125						
Rated operating sequence			O-0.3s-CO-3min-CO						
Control voltage	Closing coil	(V)	DC 48V, DC 110V, DC 125V, DC 220V, AC 48V, AC 110V, AC 220V						
	Trip coil	(V)	DC 48V, DC 110V, DC 125V, DC 220V, AC 48V, AC 110V, AC 220V						
Auxiliary contacts			4a4b, 10a10b						
Rated opening time		(sec)	≤ 0.04						
No-load closing time		(sec)	≤ 0.06						
Type test class	Mechanical		M2						
	Electrical		E2 (List3)						
	Capacitive current switching		C2						
Lifetime *	Mechanical	(Operations)	20,000						
	Electrical	(Operations)	See graph, Page 117~118						
Installation version **	Fixed		P type						
	Drawout		H type (for MCSG)						
Phase distance ***		(mm)	275	210	210 (275)	275	210	210 (275)	275
Weight	Breaker (H type)	(kg)	295	256	256 (273)	318	256	256 (273)	318
	Cradle (H type)	(kg)	316	257	257 (284)	316	257	257 (284)	316
Dimensions	Breaker (H type)		Page 110	Page 111~112		Page 113	Page 111~112		Page 113
	Cradle (H type)		Page 123	Page 120~122		Page 123	Page 120~122		Page 123
Standards			IEC 62271-100 (2008), KERI/KEMA, V-check (KESCO)						

* Lifetime with maintenance.
** H type is a box type cradle with CB compartment style structure.
*** ( ) displays option of phase distance.
Note) 1. Contact us.

Ratings - 7.2/12/17.5kV 25/31.5/40/50kA 1250/2000/2500/3150/4000A

Susol

36kV (VH-36)

Item			VH-36□25□12/20/32			VH-36□32□12/20/32			VH-36□40□12/20/32		
Rated voltage		Ur (kV)	36								
Rated normal current		Ir (A)	1250	2000	3150	1250	2000	3150	1250	2000	3150
Rated frequency		fr (Hz)	50/60								
Rated short-circuit current		Isc (kA)	25			31.5			40		
Rated short-time withstand current		Ik/tk (kA/s)	25/3			31.5/3			40/3		
Rated short-circuit breaking capacity		(MVA)	1559			1964			2494		
Rated short-circuit making current		Ip (kA)	2.5* Isc (50Hz)/2.6* Isc (60Hz)								
Rated breaking time		(cycle)	3								
Rated withstand voltage	Power frequency (1 min)	Ud (kV)	70 (95) Note1)								
	Impulse (1.2×50㎲)	Up (kV)	170								
Rated operating sequence			O-0.3s-CO-3min-CO								
Control voltage	Closing coil	(V)	DC 48V, DC 110V, DC 125V, DC 220V, AC 48V, AC 110V, AC 220V								
	Trip coil	(V)	DC 48V, DC 110V, DC 125V, DC 220V, AC 48V, AC 110V, AC 220V								
Auxiliary contacts			4a4b, 10a10b								
Rated opening time		(sec)	≤ 0.04								
No-load closing time		(sec)	≤ 0.06								
Type test class	Mechanical		M2								
	Electrical		E2 (List3)								
	Capacitive current switching		C2								
Lifetime *	Mechanical	(Operations)	20,000								
	Electrical	(Operations)	See graph, Page 117~118								
Installation version **	Fixed		P type								
	Drawout		H type (for MCSG)								
Phase distance		(mm)	300								
Weight	Breaker (H type)	(kg)	400		490	400		490	400		490
	Cradle (H type)	(kg)	700		750	700		750	700		750
Dimensions	Breaker (H type)		Page 114		Page 115	Page 114		Page 115	Page 114		Page 115
	Cradle (H type)		Page 124		Page 125	Page 124		Page 125	Page 124		Page 125
Standards			IEC 62271-100 (2008), KERI/KEMA, V-check (KESCO)								

* Lifetime with maintenance.
** H type is a box type cradle with CB compartment style structure.
Note) 1. Contact us.

40.5kV (VH-40)

Item			VH-40□25□12/20/32			VH-40□32□12/20/32		
Rated voltage		Ur (kV)	40.5					
Rated normal current		Ir (A)	1250	2000	3150	1250	2000	3150
Rated frequency		fr (Hz)	50					
Rated short-circuit current		Isc (kA)	25			31.5		
Rated short-time withstand current		Ik/tk (kA/s)	25/4			31.5/4		
Rated short-circuit breaking capacity		(MVA)	1754			2210		
Rated short-circuit making current		Ip (kA)	2.5* Isc (50Hz)					
Rated breaking time		(cycle)	3					
Rated withstand voltage	Power frequency (1 min)	Ud (kV)	95					
	Impulse (1.2×50㎲)	Up (kV)	180					
Rated operating sequence			O-0.3s-CO-3min-CO					
Control voltage	Closing coil	(V)	DC 48V, DC 110V, DC 125V, DC 220V, AC 48V, AC 110V, AC 220V					
	Trip coil	(V)	DC 48V, DC 110V, DC 125V, DC 220V, AC 48V, AC 110V, AC 220V					
Auxiliary contacts			4a4b, 10a10b					
Rated opening time		(sec)	≤ 0.04					
No-load closing time		(sec)	≤ 0.06					
Type test class	Mechanical		M2					
	Electrical		20 Operations at 100% Isc					
	Capacitive current switching		C2					
Lifetime *	Mechanical	(Operations)	20,000					
	Electrical	(Operations)	See graph, Page 117~118					
Installation version **	Fixed		P type					
Phase distance		(mm)	300					
Weight	Breaker (H type)	(kg)	400		490	400		490
Dimensions	Breaker (H type)		Page 116		Page 117	Page 116		Page 117
Standards			GB1984					

* Lifetime with maintenance.
** H type is a box type cradle with CB compartment style structure.

Accessory

Susol

Mounting Position	Type	Accessory	Supplied as			Remarks	page
			VL: 7.2kV 8/12.5kA	VL: 20/25kA	VH		
Breaker (Internal)	M	Motor	●	●	●	Attached at the factory	46
	CC	Closing Coil	●	●	●	Attached at the factory	47
	TC	Trip Coil	●	●	●	Attached at the factory	48
	A1	Secondary Trip Coil	Option	Option	Option	Attached at the factory	49
	T9	Current Trip Coil	Option	-	-	Attached at the factory	50
	SA (SB)	Auxiliary Contact (2a2b)	●	-	-	Attached at the factory	51
		Auxiliary Contact (4a4b)	Option	●	●		51
		Auxiliary Contact (6a6b)	Option	-	-		51
		Auxiliary Contact (10a10b)	-	Option	Option		51
	U	Under Voltage Trip Coil	Option	Option	Option	Attached at the factory	52
	A4	Position Switch (2a2a)	Option	Option	Option	Attached at the factory	53
	A5	Position Switch (2a2b)	Option	Option	Option	Attached at the factory	53
	A6	Latch Checking Switch	Option	Option	Option	Attached at the factory	54
	C	Counter	●	●	●	Attached at the factory	54
	A7	Keylock	Option	Option	Option	Attached at the factory	55
	A8	Button Padlock	Option	Option	Option	Attached at the factory	56
	A9	Button cover	Option	Option	Option	Attached at the factory	57
	AA	Lead Wire: A/B type connector	Option	Option	Option	Attached at the factory	58
	AB	Plug/Terminal for Lead Wire	Option	Option	Option	Attached at the factory	59
	AC	Plug Interlock	-	Option	Option	Attached at the factory	59
	AD	Padlock (Type H Door Interlock)	-	Option	Option	Attached at the factory	59
	AE	MOC (Mechanical Operated Cell Switch	-	Option	Option	Attached at the factory	60
	AF	Locking Magnet	-	Option	Option	Attached at the factory	61
	AO	Lead Wire: A type connector (Special Color: Blue)	Option	Option	-	Attached at the factory	58
	AP	Trip Coil Monitoring Contact	●	●	Option	Attached at the factory	62
Breaker (External)	CTD1	Condenser Trip Device (AC 110V)	Option	Option	Option	-	64
	CTD2	Condenser Trip Device (AC 220V)	Option	Option	Option	-	64
	UDC 1	UVT Time Delay Controller (AD 110V)	Option	Option	Option	-	65
	UDC 2	UVT Time Delay Controller (AD 220V)	Option	Option	Option	-	65
	UDC 3	UVT Time Delay Controller (AD 48V)	Option	Option	Option	-	65
	CTU	Coil Test Unit	Option	Option	Option	-	63
	VC	Vacuum Checker	Option	Option	Option	-	66
	TM	Temperature Monitoring	-	Option	Option	-	67

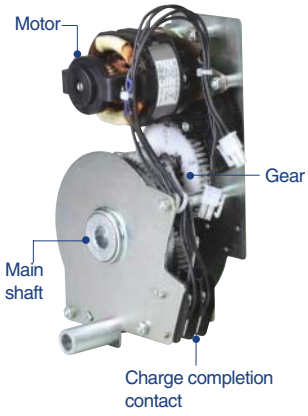
* ●: Basic Installation

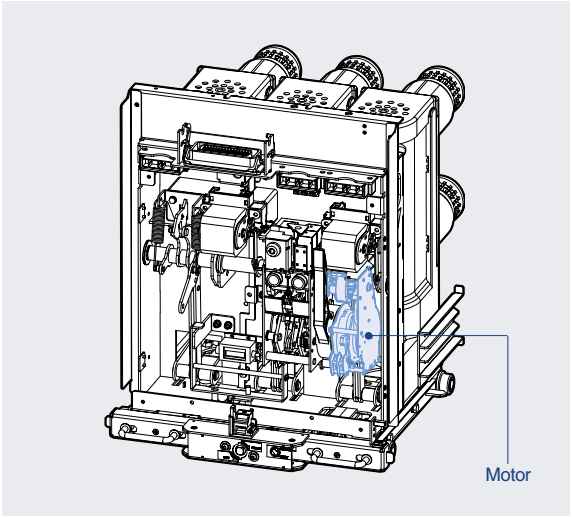
Mounting Position	Type	Accessory	Supplied as			Remarks	page
			VL: 7.2kV 8/12.5kA	VL : 20/25kA	VH		
Cradle	A1	ES (Earthing Switch) without Option	-	Option	Option	Attached at the factory	68
	A2	ES (Earthing Switch) with Position Switch (2a2b)	-	Option	Option	Attached at the factory	68
	A4	ES (Earthing Switch) with Position Switch (6a6b)	-	Option	Option	Attached at the factory	68
	A5	ES (Earthing Switch) with Keylock	-	Option	Option	Attached at the factory	69
	A6	ES (Earthing Switch) with Locking magnet: DC 110V	-	Option	Option	Attached at the factory	69
	A7	ES (Earthing Switch) with Locking magnet: DC 220V	-	Option	Option	Attached at the factory	69
	A8	ES (Earthing Switch) with Locking magnet: DC 125V	-	Option	Option	Attached at the factory	69
	A9	ES (Earthing Switch) with Locking magnet: DC 24V	-	Option	Option	Attached at the factory	69
	AA	ES (Earthing Switch) with Locking magnet: DC 48V	-	Option	Option	Attached at the factory	69
	AB	ES (Earthing Switch) with Locking magnet: AC 48V	-	Option	Option	Attached at the factory	69
	AC	ES (Earthing Switch) with Locking magnet: AC 110V	-	Option	Option	Attached at the factory	69
	AD	ES (Earthing Switch) with Locking magnet: AC 220V	-	Option	Option	Attached at the factory	69
	AE	Shutter padlock	-	Option	Option	Attached at the factory	70
	AF	TOC (Truck Operated Cell Switch)	-	Option	Option	Attached at the factory	70
	AG	MOC (Mechanical Operated Cell Switch)	-	Option	Option	Attached at the factory	71
	AH	Door	-	Option	Option	Attached at the factory	71
	AJ	Door Interlock	-	Option	Option	Attached at the factory	72
	AK	Door Emergency Push Button	-	Option	Option	Attached at the factory	72
	AL	Temperature Sensor	-	Option	Option	Attached at the factory	73
	AM	Type H Lead Wire 4a4b (Normal cable)	-	Option	Option	Attached at the factory	74
	AN	Type H Lead Wire 10a10b (Normal cable)	-	Option	Option	Attached at the factory	74
	AO	Type H Lead Wire 4a4b (Flame retardant cable)	-	Option	Option	Attached at the factory	74
		Door padlock	-	Option	Option	Attached at the factory	74

Motor: M

Installed inside of a breaker as standard

VL type





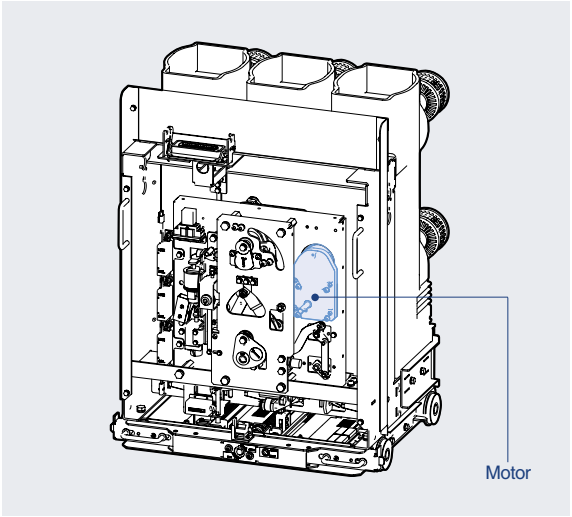
- Charge the closing spring of a circuit breaker by the external power source. When the charging is complete, control power of the motor will be "OFF" by the built-in Limit S/W. Without the external power source, charge manually.

  Operating voltage range (IEC 60947)
  85%~110%Vn

	VL type							
Input voltage (Vn)	DC 24~ 30V	DC 48~ 60V	DC 110V	DC 125V	DC 220V	AC 48V	AC 100~ 130	AC 200~ 250V
Load current (A)	5	3	1	1	0.5	3	1	0.5
Starting current (A)	5 times of load current							
Charge time	Less than 5 sec.							

Note) Rated operation and control voltage range, see page 50.

VH type



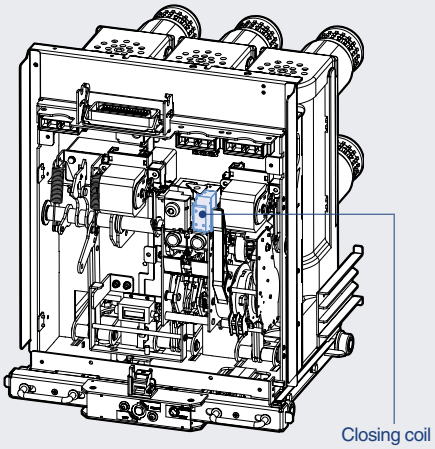
	VH Type						
Input voltage (Vn)	DC 48V	DC 110V	DC 125V	DC 220V	AC 48V	AC 110V	AC 220V
Load current (A)	6	3	3	2.6	6	3	2.6
Starting current (A)	30	20	20	17	30	20	17
Charge time	Less than 12 sec.						

Note) Rated operation and control voltage range, see page 50.

Closing Coil: C

Installed inside of a breaker as standard

VL type

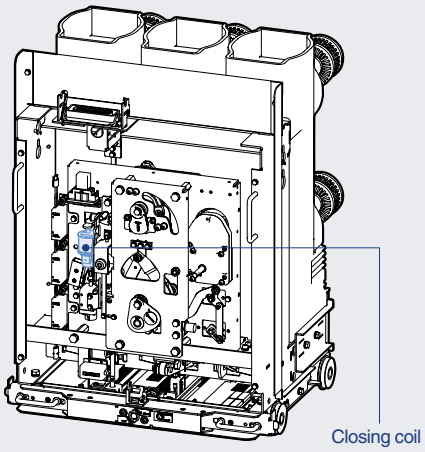


- It is a control device which closes a circuit breaker, when applying voltage continuously or instantaneously over 200ms to the coil control terminals.

	VL type							
Input voltage (Vn)	DC 24~ 30V	DC 48~ 60V	DC 110V	DC 125V	DC 220V	AC 48V	AC 100~ 130	AC 200~ 250V
Power consumption (inrush, W)	200							
Power consumption (steady, W)	5							

Note) Rated operation and control voltage range, see page 50.

VH type



- It is a control device which closes a circuit breaker, when applying voltage continuously about 45ms to the coil control terminals. Electrical pumping preventing circuit is built in.

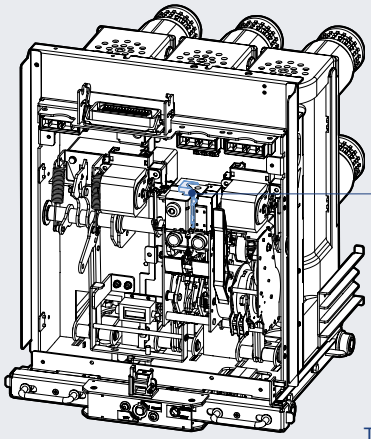
	VH Type						
Input voltage (Vn)	DC 48V	DC 110V	DC 125V	DC 220V	AC 48V	AC 110V	AC 220V
Rated current (A)	8	3	3	2.5	8	3	2.5

Note) Rated operation and control voltage range, see page 50.

Trip Coil: T

Installed inside of a breaker as standard

VL type

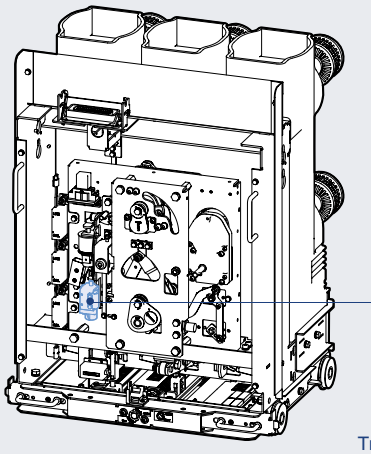


- It is a control device which trips a circuit breaker from remote place, when applying voltage continuously or instantaneously over 35ms to coil control terminals.
- When UVT coil is installed, its location is changed.

	VL type							
Input voltage (Vn)	DC 24~ 30V	DC 48~ 60V	DC 110V	DC 125V	DC 220V	AC 48V	AC 100~ 130	AC 200~ 250V
Power consumption (inrush, W)	200							
Power consumption (steady, W)	5							

Note) Rated operation and control voltage range, see page 50.

VH type



- It is a control device which trips a circuit breaker, when applying voltage continuously or instantaneously over 35ms to the coil control terminals.

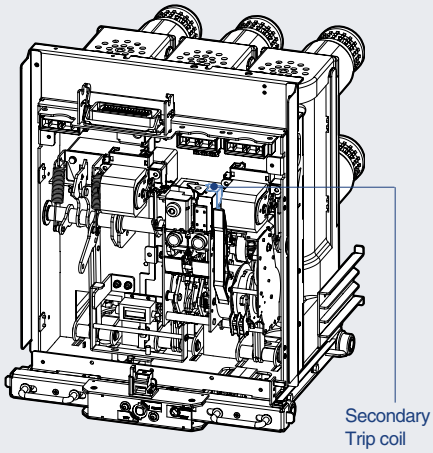
	VH Type						
Input voltage (Vn)	DC 48V	DC 110V	DC 125V	DC 220V	AC 48V	AC 110V	AC 220V
Rated current (A)	8	3	3	2.5	8	3	2.5

Note) Rated operation and control voltage range, see page 50.

Secondary Trip Coil: A1

Installed inside of a breaker as an option

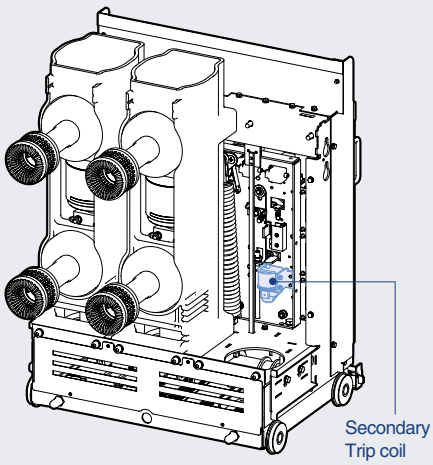
VL type



- It is a control device which trips a circuit breaker doubly from the outside. If the trip coil (T) fails, it can trip a circuit breaker safely.
- Trip coil: Install it at existing location.
- Secondary trip coil: Install it on the right side of the trip coil.
- It is not available with UVT coil when installing secondary trip coil.

	VL type							
Input voltage (Vn)	DC 24~ 30V	DC 48~ 60V	DC 110V	DC 125V	DC 220V	AC 48V	AC 100~ 130	AC 200~ 250V
Power consumption (inrush, W)	200							
Power consumption (steady, W)	5							

VH type



- It is a control device which trips a circuit breaker doubly from the outside. If the trip coil (T) fails, it can trip a circuit breaker safely.
- It is not available with UVT coil when installing secondary trip coil.

	VH Type						
Input voltage (Vn)	DC 48V	DC 110V	DC 125V	DC 220V	AC 48V	AC 110V	AC 220V
Rated current (A)	8	3	3	2.5	8	3	2.5

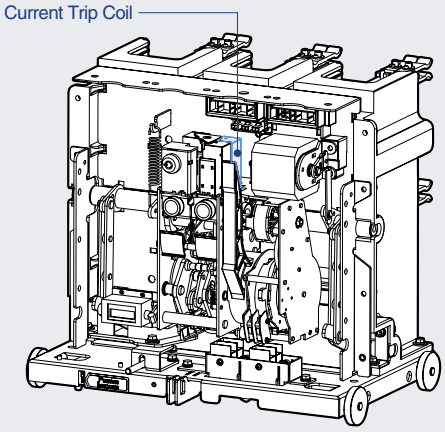
Rated operation and control voltage range

Item		Susol VCB			Remarks
		VL: 7.2kV 8/12.5kA	VL: 20/25kA	VH	
Motor	AC	85~110%	85~110%	85~110%	
	DC	75~110%	85~110%	85~110%	
Closing	AC	85~110%	85~110%	85~110%	
	DC	75~125%	85~110%	85~110%	
Trip	AC	60~125%	85~110%	85~110%	
	DC	60~125%	70~110%	70~110%	
Applied standards		IEC62271-100 (2008) KSC4611	IEC62271-100 (2008)	IEC62271-100 (2008)	

Current Trip Coil: T9

Installed inside of a breaker as an option

VL type

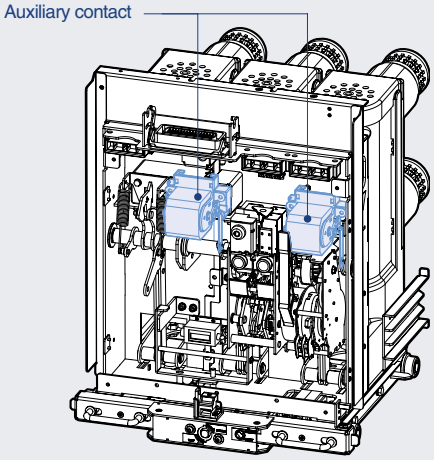


- This trip coil uses the output of the CT as its control power source and is used with over current relay in combination. Two current trip coils are supplied.
- Applies only to 7.2kV 8/12.5kA VCB.
- Coil burden is 90VA.
- Coil impedance (Z) is 10Ω or less. (Operating current is AC 3A)
- CT must be installed at load side. If it is installed at bus side there is the danger of malfunction or damage to CT.
- Don't disconnect the control power connector on main power is live condition at service position. Otherwise there is the danger of malfunction or damage to CT.

Auxiliary Contact: SA

Installed inside of a breaker as an option

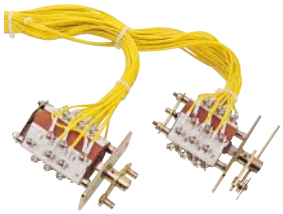
VL type

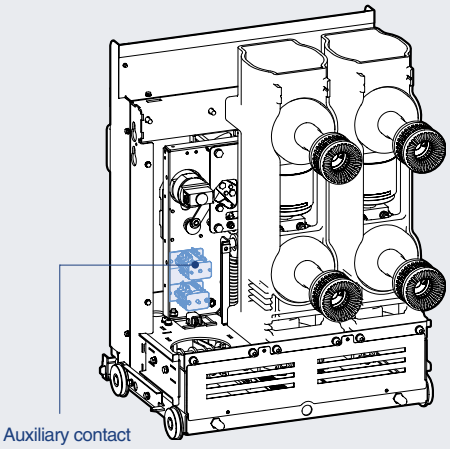


- It is a contact used to monitor ON/OFF status of a breaker from remote place.
- The auxiliary contacts supplied as standard configuration is 4a4b. 10a10b is also available on request.
- For 7.2kV 8/12.5kA VCB standard configuration is 2a2b. 4a4b and 6a6b are optional.

Item	VL: 7.2kV 8/12.5kA	VL: 20/25kA, VH
Standard	2a2b	4a4b
Optional	4a4b, 6a6b	10a10b

VH type





VL/VH Type					
Item			Resistive load (A)	Inductive load (A)	Remarks
Contact configuration	AC	250V	10	5	For all models
		125V	10	5	
	DC	250V	10	5	
		125V	10	5	
		30V	10	5	

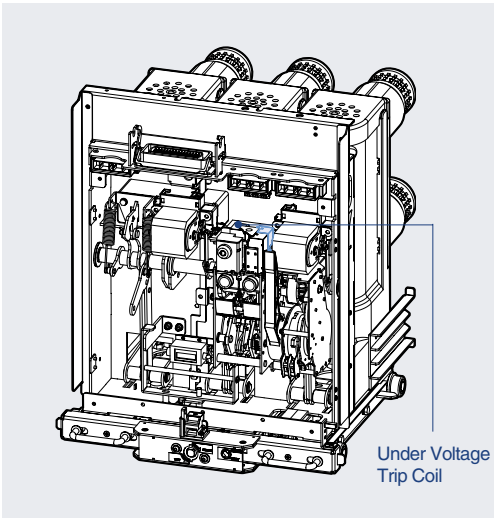
Under Voltage Trip Coil: U

Installed inside of a breaker as an option

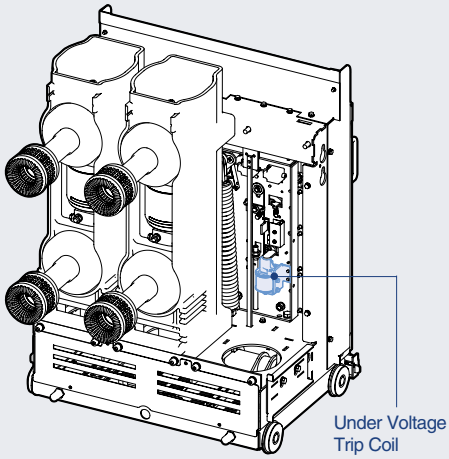
VL type

VH type

VL type



VH type



- It is installed inside of a breaker to trip when the main power or control power voltage drops below certain value. Instantaneous type is only available with UVT coil and Time delay type is available by connecting UVT coil and UVT time delay controller.
- The closing of a circuit breaker is impossible mechanically or electrically if control power is not supplied to UVT. To close the circuit breaker, 65~85% of rated voltage should be applied.
- UVT and secondary trip coil will not be selected together.

1. UVT rated voltage and characteristic
   - Operating voltage range: Pick up 0.65~0.85Vn, Drop out 0.4~0.6Vn
   - Operating voltage ranges based on the minimum value of each rated voltage (Vn)

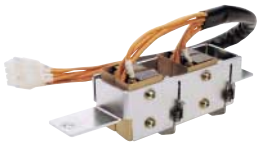
	VL type							
Input voltage (Vn)	DC 24~30V	DC 48~60V	DC 110V	DC 125V	DC 220V	AC 48V	AC 100~130	AC 200~250V
Power consumption (inrush, W)	200							
Power consumption (steady, W)	5							

	VH Type						
Input voltage (Vn)	DC 48V	DC 110V	DC 125V	DC 220V	AC 48V	AC 110V	AC 220V
Power consumption (inrush, W)	200						
Power consumption (steady, W)	5						

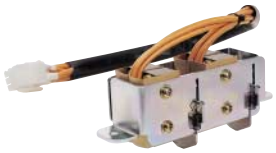
Position Switch: A4, A5

Installed inside of a breaker as an option

VL type - E/F/G Cradle

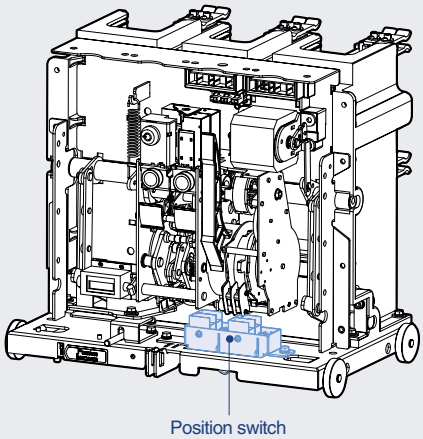


Small VCB (VL)

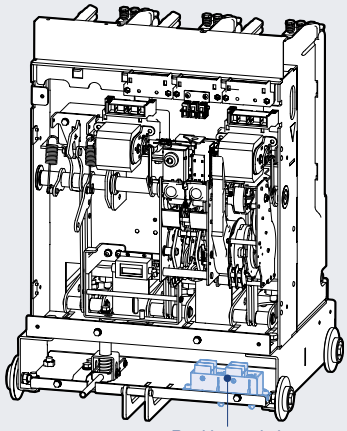


Medium VCB (VL)

VL: 7.2kV 8/12.5kA

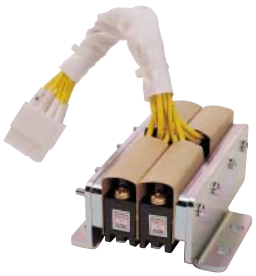


VL: 20/25kA



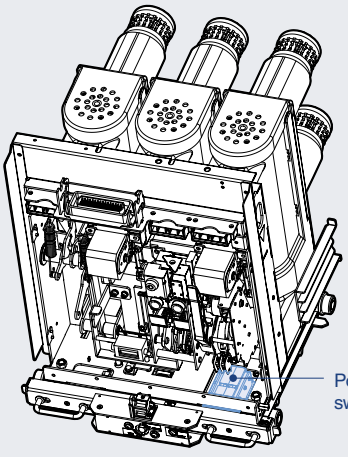
• This switch is used to indicate the breaker position (SERVICE, TEST), and contact configuration is 2a2a or 2a2b.

VL/VH type - H Cradle

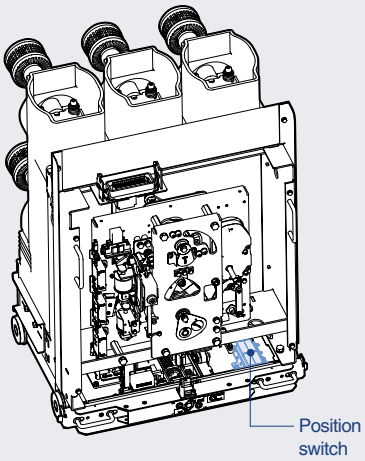


Large model (VH)

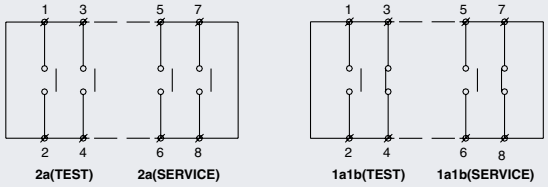
VL: 20/25kA



VH



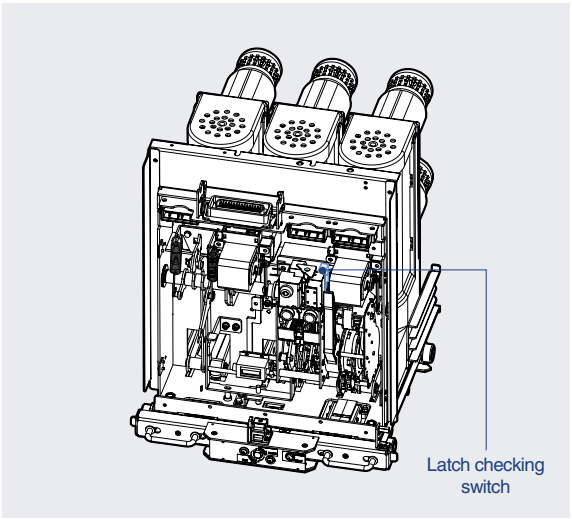
Contact configuration



Latch checking switch: A6

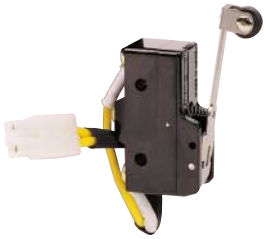
Installed inside of a breaker as an option

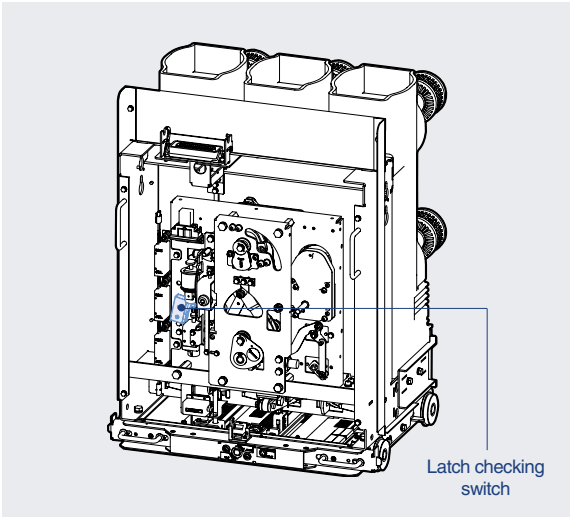
VL type



- This switch works in conjunction with the mechanism of the breaker. It checks if the breaker is ready to be closed.
- When the mechanism is OFF and the closing spring is at charged status the switch becomes "ON", which means the mechanism is ready to be closed.
- If the latch is not in a proper position the switch prevents the breaker from closing.
  In case of VL type, if it is connected in series with the closing coil, it is possible to prevent the breaker from closing electrically even though the closing signal happening when trip latch is in wrong position.

VH type





- In case of VH type it is connected internally in series with the closing coil.

Counter: C

Installed inside of a breaker as standard

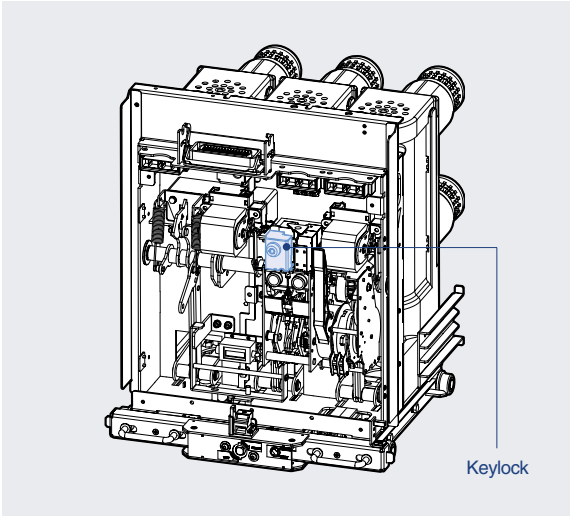
VL/VH type

- It displays the total number of ON/OFF operations of a breaker.

Keylock: A7

Installed inside of a breaker as an option

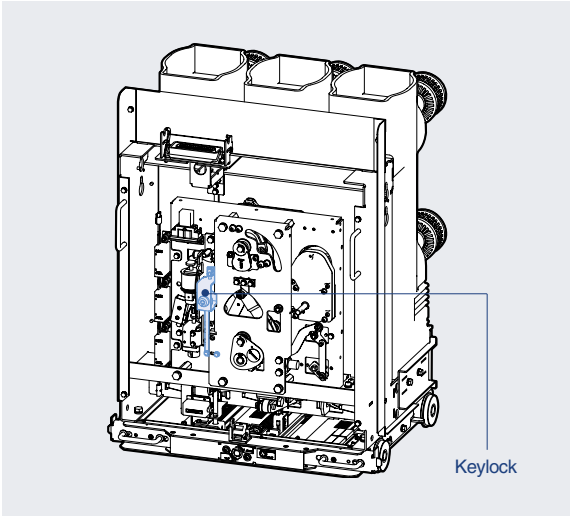
VL type



• The key is to unlock the locking device first to close the breaker electrically and mechanically.

*How to operate
- It is not possible to pull out the key in the unlocked position, possible only in locked status.
- Pushing "OFF" switch of a breaker turn the key counter-clockwise to the locked position and pull it out.
- It is not possible to close the breaker electrically and mechanically in the locked position.
- Insert the key and turn clockwise and then the breaker can be closed electrically and mechanically.

VH type

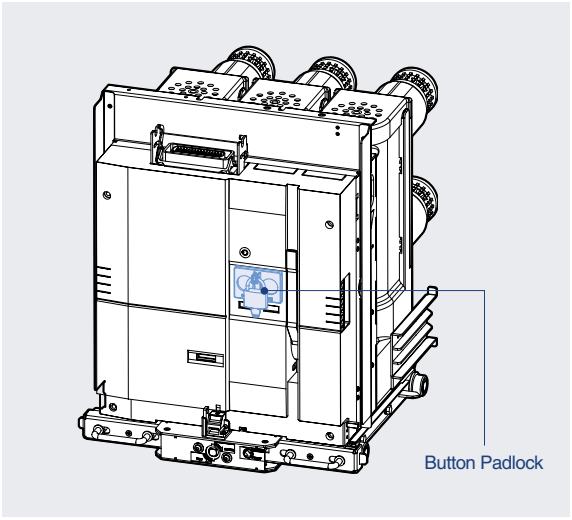


*How to operate
- It is not possible to pull out the key in the unlocked position, possible only in locked status.
- Trip the breaker first and then turn the key counter-clockwise to the locked position and pull it out.
- It is not possible to close the breaker electrically and mechanically in the locked position.

Button Padlock: A8

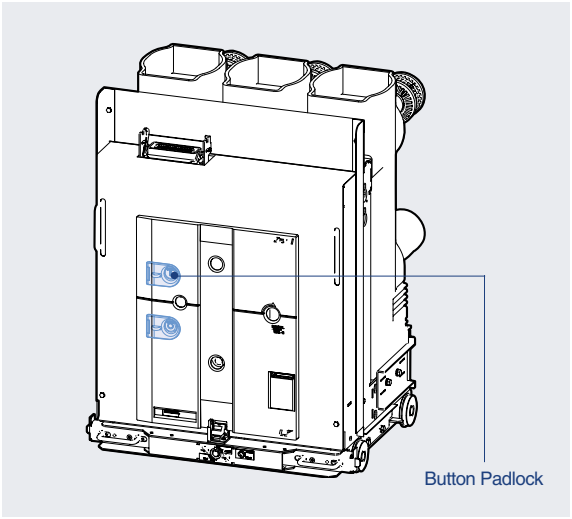
Installed outside of a breaker as an option

VL type



- It is to prevent manual operation of ON/OFF button due to user's wrong handling.
- It is not possible to handle ON/OFF operation under the "Button lock" status.

VH type

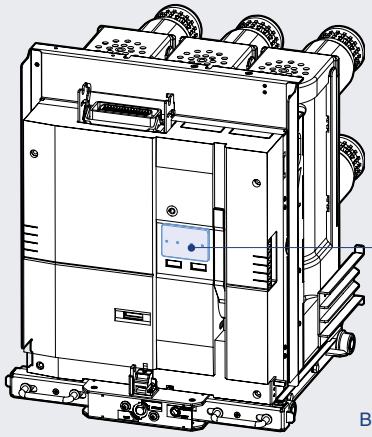


Button Cover: A9

Installed outside of a breaker as an option

VL type

Push Bar

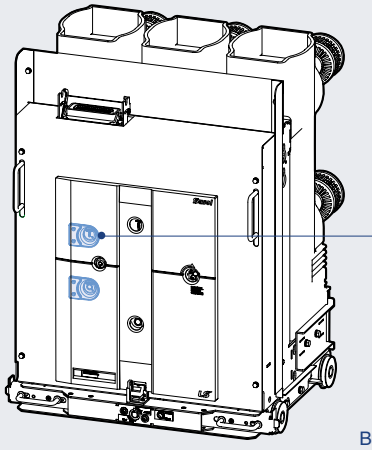


Button Cover

- It is a protection cover to prevent an accident due to unintended operation of ON/OFF button.
- Use the push-bar to operate the ON/OFF button.

VH type

Push Bar

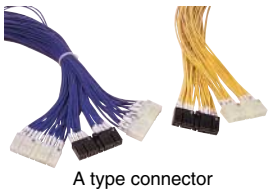


Button Cover

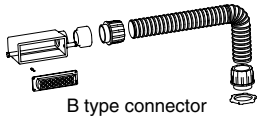
Lead wire : AA

Supplied separately from a breaker as an option

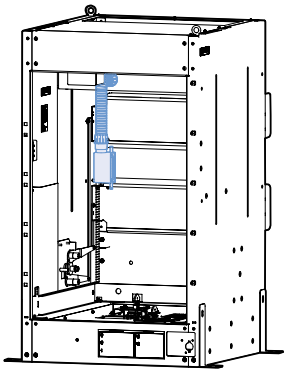
VL/VH type

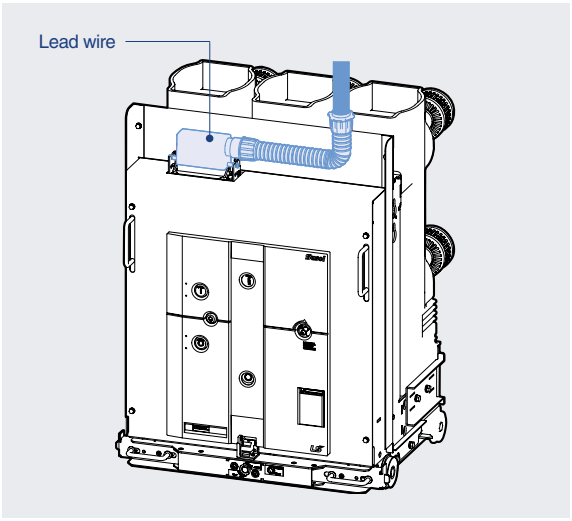


A type connector



B type connector





- It is to connect with the control circuit of a breaker from outside. (supply wire length: 2m)
- A type connector is supplied for P/E/F/G type of VL VCB.
- B type connector is supplied for P type of VH VCB.
- In case of H type breaker of VL and VH models the Lead wire is installed in the cradle when supplied.

Supply ways of Lead wires by VCB model

VCB model \ Cradle type		P	E	F	G	H
VL	Lead wire type	Lead wire of A type connector				Lead wire of B type connector
	Supply way	Enclosed in the breaker				Installed in the cradle
VH	Lead wire type	Lead wire of B type connector	-			Lead wire of B type connector
	Supply way	Installed in the breaker	-			Installed in the cradle

Plug/Terminal for lead wire

Supplied separately from a breaker as an option

VL/VH type

A type connector

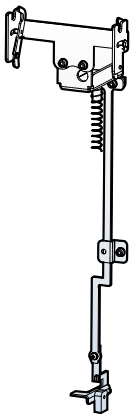
B type connector

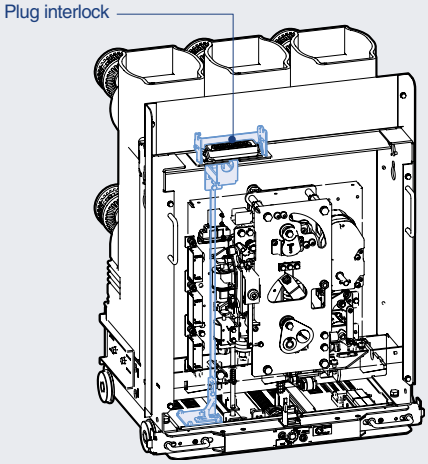
- It is connector to connect with the connector installed in the breaker. (supply connectors and terminal only for lead wire)
- Type of connector is depends on the type of connector installed in the breaker- A or B.

Plug interlock: AC

Installed inside of a breaker as an option

VL/VH type (7.2kV 20/25kA 630A~)



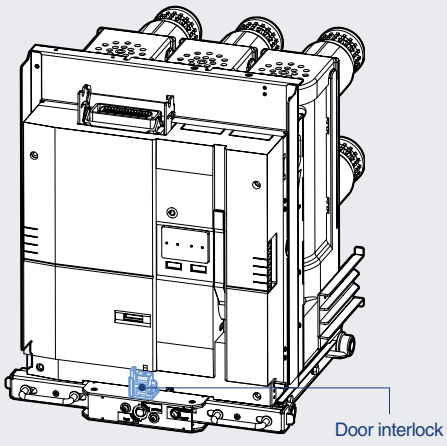


- It checks if the control power connector on the cradle (H type) is connected with the connecting terminal of the breaker before the proceeding of draw-in or out.
- It is not allowed to seperate the control power connector from the breaker in the position of draw-in /out or SERVICE, but TEST position.

Padlock/Door racking interlock: AD

Installed outside of a breaker as an option

VL/VH type (7.2kV 20/25kA 630A~)

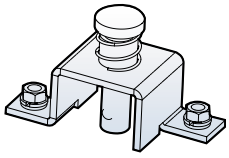


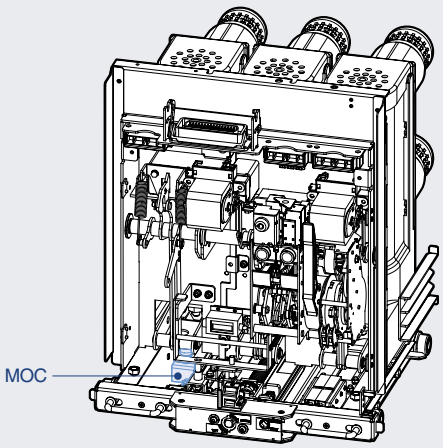
- With this door options for H type cradle draw-in/out is allowed only when the door is closed.
- If draw-in /out is necessary when the door is open, use the operation lever put in the slot of the breaker handle.
  Insert it into the hole in the bottom of door interlock.
- Padlock is also optional, which can lock to prevents the draw-in/out of the breaker in the position of TEST and SERVICE.

MOC drive device: AE

Installed inside of a breaker as an option

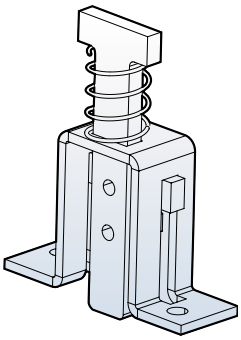
VL type (7.2kV 20/25kA 630A~)

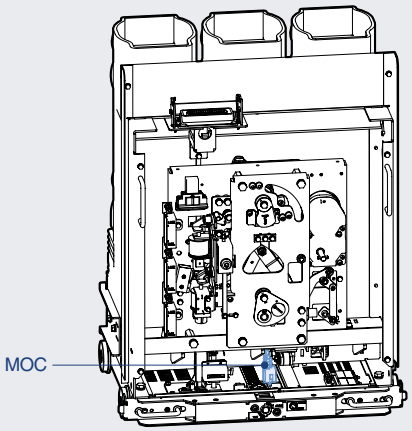




- It must be installed in the breaker to drive the MOC installed in H type cradle.
- MOC, Mechanically operated cell switch is the device to indicates the Closed/Trip status of VCB in 'SERVICE' position only.
- This MOC drive device in the breaker should be installed when MOC in the cradle is used.

VH type

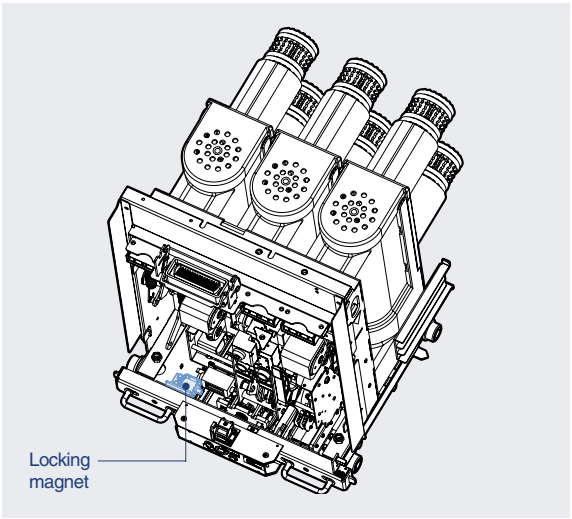




Locking magnet: AF

Installed inside of a breaker as an option

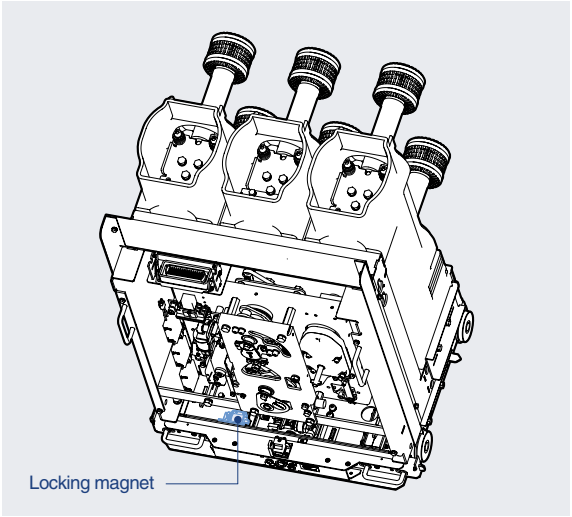
VL type



- It allows the drawing-in of the breaker in the TEST position under the condition that the control power connector on the cradle (H type) is connected with the connecting terminal of the breaker and the power is supplied.
- During the drawing-in or in the SERVICE position draw-in/out is allowed without supplying power.

* Control power rating is the same as that of a motor.

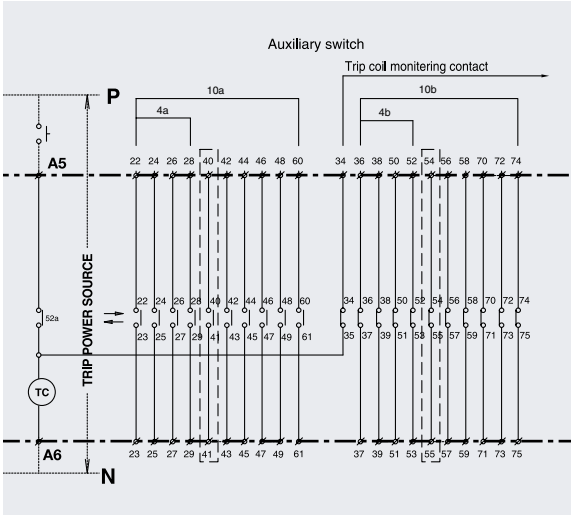
VH type



Trip coil monitoring contact: AP

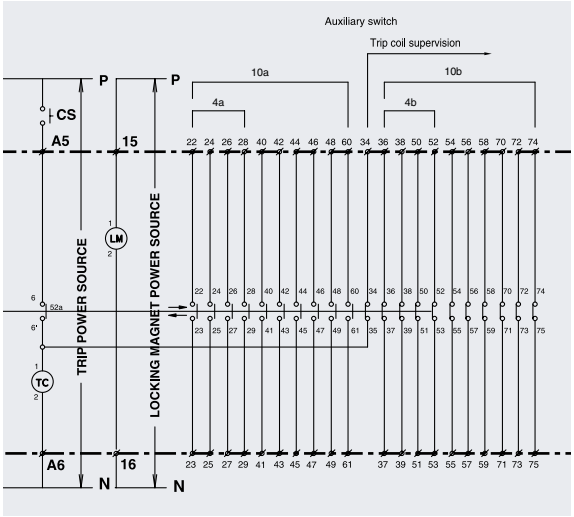
Installed inside of a breaker as an option

VL type



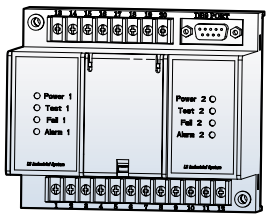
- Device for monitoring the functions of the trip coils.
- Supplied as standard for VL model and optional for VH model.
- To monitor the trip coils connect its terminals with the trip coil monitoring relay as shown on the circuit diagram.
  - If the trip coil is normal: closed-circuit consisting
  - If the trip coil is damaged: open circuit
  1) Terminals A5 and A6 monitor the trip coils in closed position of the breaker.
  2) Terminal A6 and aux. contact terminal 34 monitor the trip coils in trip position of the breaker.
- Coil Test Unit is opional, which enable monitoring the coils by connecting in parallel with the trip coil operation switch.

VH type



Coil Test Unit: CTU

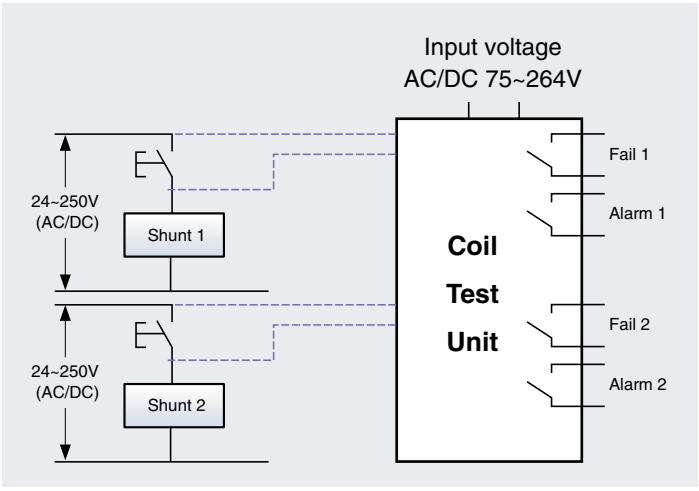
Installed outside of a breaker as an option

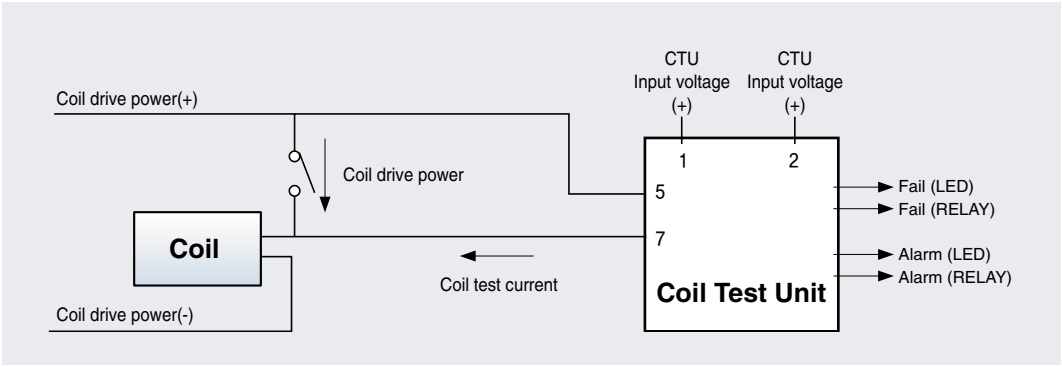


• When no current flows through the coil it gives the test current which does not cause the coil to operate to check whether the coil is disconnected or not.
- If the test current flows normally: coil normal
- If the test current does not flow through: coil disconnected

※ As it is connected in parallel with the control part of the coil the normal operation of the coil is not affected.
※ Monitoring of the running coils is not possible.
※ One test unit can monitor up to two coils.

1. Input voltage: AC/DC 75V~264V
2. Contact output
   1) 2×a contacts for Fail indication and 2×a contacts for Alarm
   2) 250Vac/10A Resistive, 30Vdc/10A Resistive
3. Disconnection test cycle is 12 seconds (Test LED blinks)
4. The default operation
   If Fail happens (coil disconnected), Fail LED turns on and the Fail contacts become short state.
   If Fail happens three times in series, Alarm LED turns on and the Alarm contacts become short state.
   In order to clear the Alarm status push up DIP switch on the front and then push down it (Off → On → Off)





Condenser trip device: CTD

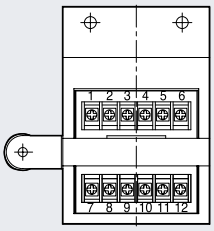
Installed outside of a breaker as an option

Ratings

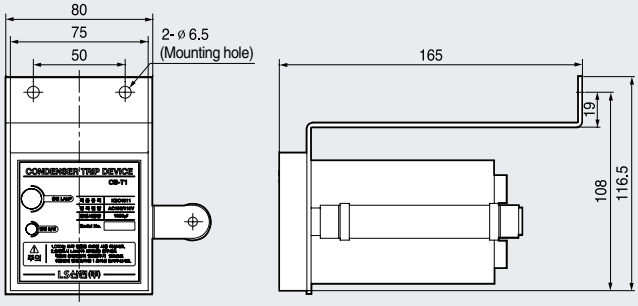
Ratings	Specification	
Model	CB - T1	CB - T2
Rated input voltage (V)	AC 100/110	AC 200/220
Frequency (Hz)	50/60	50/60
Rated charge voltage (V)	140/155	280/310
Charging time	Within 10sec.	Within 10sec.
Trip possible time	Within 30sec.	Within 30sec.
Range of Input voltage	85%~110%	85%~110%
Condenser capacity (μF)	1,000	560

- It gets a circuit breaker tripped electrically within regular time when control power supply is broken down and is used with Shunt coil, SHT. In case there is no DC power, It can be used as the rectifier which supplies DC power to a circuit breaker by rectifying AC power.
- Tripping within 30 seconds on the power failure is possible. However after that automatic trip circuit must be configured separately in the switchgear.

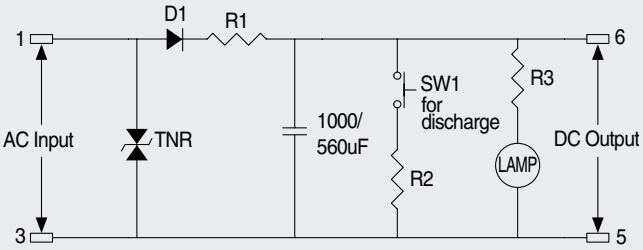
Terminal arrangement



External dimension



Circuit diagram



UVT Time delay: UDC

Installed outside of a breaker as an option

- UVT time delay, UDC is to delay the trip signal from UVT.
  Without UDC the breaker will be tripped instantaneously by the trip signal from UVT installed inside of the breaker even in the the momentary power failure.
- UDC can delay the trip time to avoid this unintended instantaneous trip in the event of such power failure.
- It can be installed on the cradle or inside of the switchgear.
- UDC provides output contacts for indication of trip status due to the UVT coil inside of the breaker.
  b contact is closed at normal state and a contact is closed at trip.

1. Characteristics

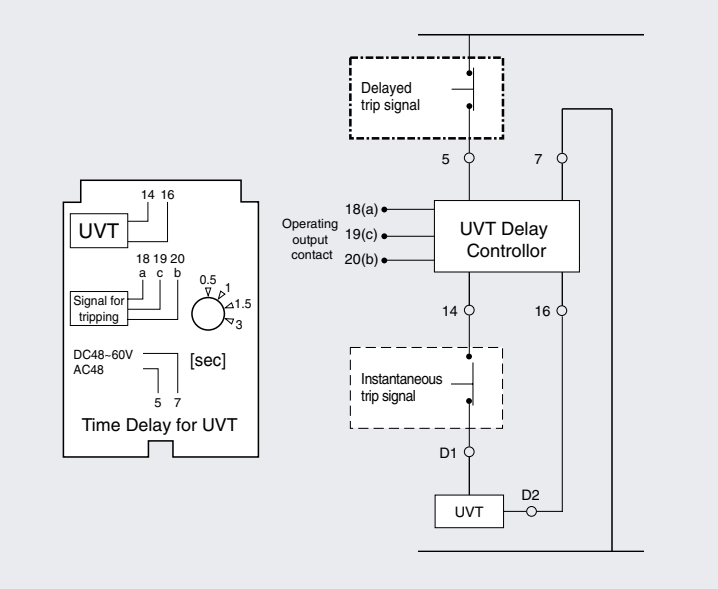
Rated voltage (Vn)		Opration voltage range (V)		Consumption (VA or W)		Time delay (ms)
DC (V)	AC (V)	Pick up	Drop out	Inrush	Steady - state	
48~60	48	0.65~0.85 Vn	0.4~0.65 Vn	200	5	0.5, 1, 1.5, 3
100~130	100~130					
200~250	200~250					

- Operating voltage ranges are based on the minimum value of each rated voltage (Vn)

2. Ratings of output contacts

Rated voltage (V)	Rated current (A), Resistive load	Max. switching voltage (A)	Max. switching current (A)
24V DC	12	110V DC 250V AC	15
120V AC	12		
250V AC	10		

3. Wiring diagram



Vacuum Checker: VC

Portable item, optional

VL/VH type

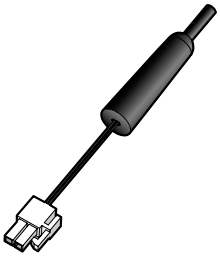
- It is a portable device to check the vacuum degree of the vacuum interrupter for stable operation of VCB.

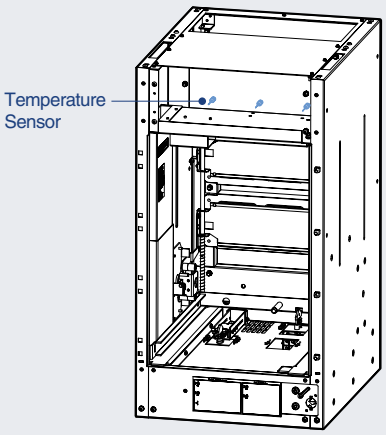
Model	VC 1030DC
Type	AC -DC Converter
Input voltage	AC 85~245V
Output voltage	DC 10~30kV
Weight	11kg
Environment	Humidity below 80%, -20℃~40℃
	Less than 1,000m above sea level
Standard accessories	High-voltage cable (2m): 1 set
	Power plug (1m): 1 ea
Handling	Portable

Temperature sensor and monitoring unit: TM

Installed outside of a breaker as an option

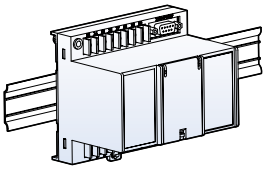
VL/VH type (7.2kV 20/25kA 630A~)

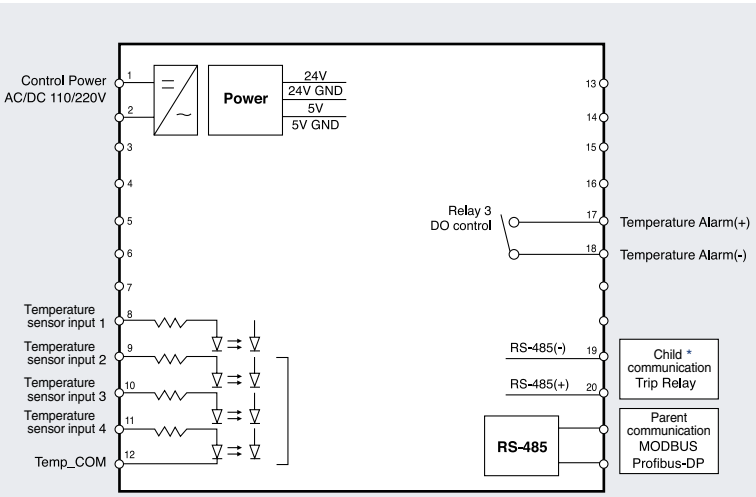




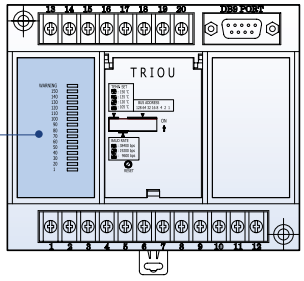
- Temperature Alarm Unit displays the input temperature detected through the temperature sensor installed in H-type cradle.
- Temperature sensor can be installed up to three (R, S, T phase).
- Temperature Alarm Unit converts the temperatures detected from the senser in the cradle and displays the maximum value and can transmit it throug communication.
- If the input temperature is above standard it may cause alarm.
  Temperature Alarm Unit supports Modbus/RS-485 communication and contact us Profibus-DP communication.

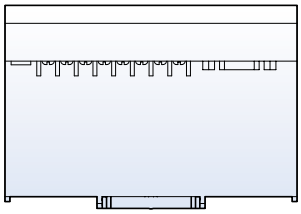
Temperature sensor and monitoring unit





LED temperature display (℃): 10 ~150℃,
Warning
Display maximum value of temperatures

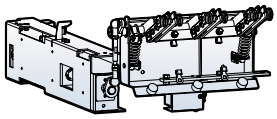


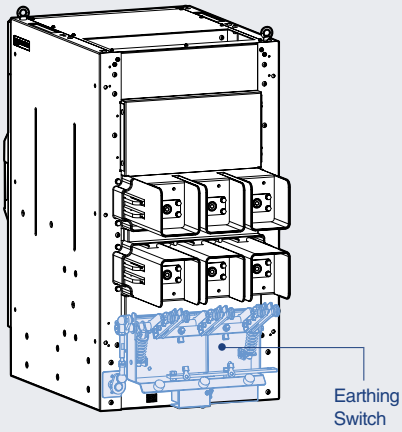


Earthing Switch: A1

Built-in a cradle as an option

VL/VH type (7.2kV 20/25kA 630A~)





- For the safety during the maintenance of switchgear in the position of TEST/Drawout discharge the charging current in the load side of a VCB with this earthing switch.
  It is available onlt for H type drawout breaker.

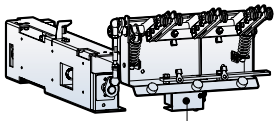
* Regarding the operations of earthing switch and related accessories see the instruction manual.
* Applicable Standards: IEC 62271-102

Position switch for Earthing Switch : A2, A4

Built-in a cradle as an option

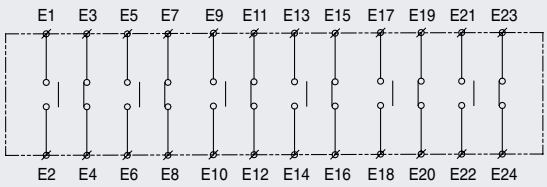
- In case of using earthing switch it can be added to indicate the ON / OFF status of the earthing switch.

** Contact configuration: 2a2b, 6a6b



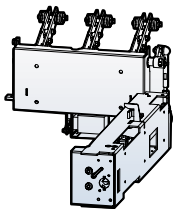
Position switch for E/S

Circuit diagram



Keylock for Earthing Switch: A5

Built-in a cradle as an option



- In case of using earthing switch it can be added for two types of interlocking.

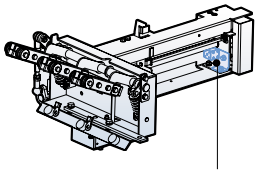
  1) Interlock to keep opening

  2) Interlock to keep earthing

Locking magnet for Earthing Switch : A6~AD

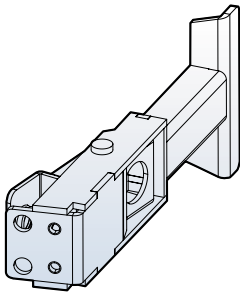
Built-in a cradle as an option

- In case of using earthing switch it can be added to prevent the earthing switch from opening or earthing before it is energized.
- Verify if the locking magnet is energized before opening or earthing the earthing switch.
- Control voltage
  - DC 24V / DC 48V / DC 110V / DC 125V / DC 220V
  - AC 48V / AC 110V / AC 220V

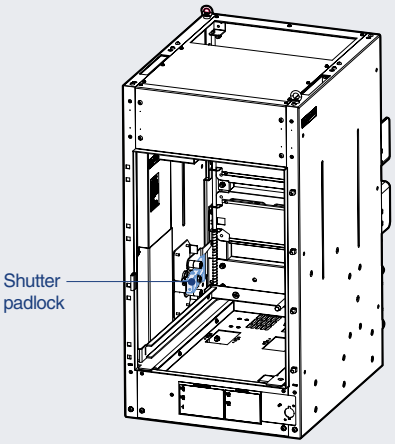


Shutter padlock: AE

Built-in a cradle as an option



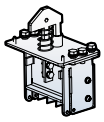
VL/VH type (7.2kV 20/25kA 630A~)



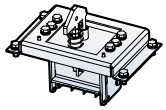
- It is the locking device to lock the primary and secondary shutter in closed state for safety while the breaker is drawn out for maintenance.
- When the breaker is drawn in, the shutter is automatically opened.
- There is a hole for padlock to lock the shutter.
- It can be applied only to H type cradle.

Truck operated cell switch (TOC: AF)

Built-in a cradle as an option

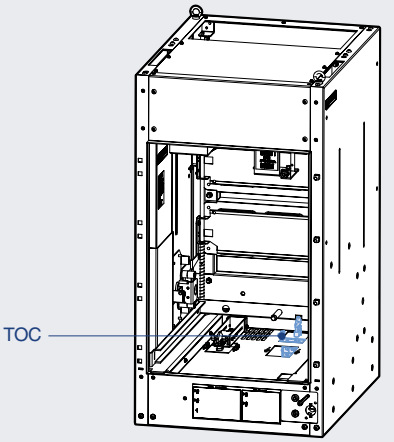


VL type



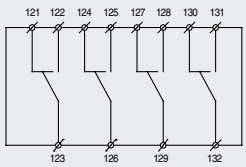
VH Type

VL/VH type (7.2kV 20/25kA 630A~)



- This auxiliary switch is used to indicate the 'SERVICE' position of VCB. It is installed in the bottom of a H type cradle and operated by the frame of a breaker.
- TOC is consisted of 4 cell switches with changeover contacts as below diagram.

Circuit diagram

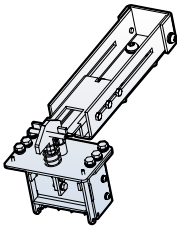


a Contact: 122-123, 125-126, 128-129, 131-132,
b Contact: 121-123, 124-126, 127-129, 130-132

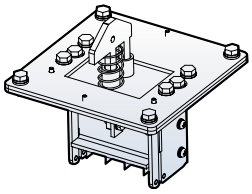
Mechanical Operated Cell Switch (MOC: AG)

Built-in a cradle as an option

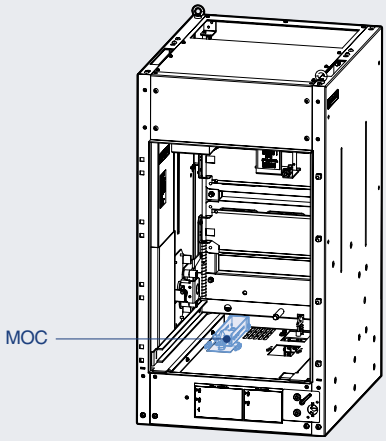
VL/VH type (7.2kV 20/25kA 630A~)



VL type

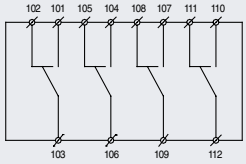


VH Type



- This auxiliary switch is used to indicate the Close/Trip of VCB. It is operated mechanically at the SERVICE position and installed in the bottom of a H type cradle and operated by the frame of a breaker.
- MOC is consisted of 4 cell switches with changeover contacts as below diagram.

Circuit diagram

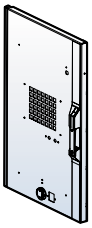


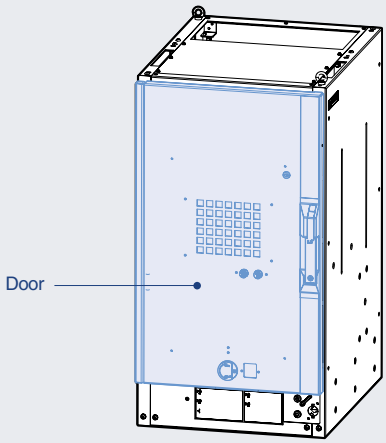
a Contact: 101-103, 104-106, 107-109, 110-112,
b Contact: 102-103, 105-106, 108-109, 111-112

Door: AH

Built-in a cradle as an option

VL/VH type (7.2kV 20/25kA 630A~)



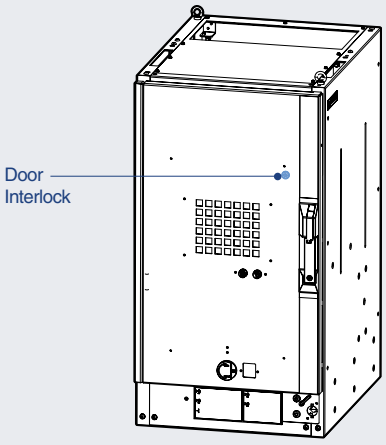


- It is outside door for H type cradle.
- Accessories are available for the door.

Door Interlock: AJ

Built-in a cradle as an option

VL/VH type (7.2kV 20/25kA 630A~)

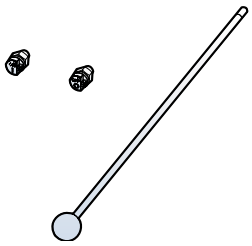


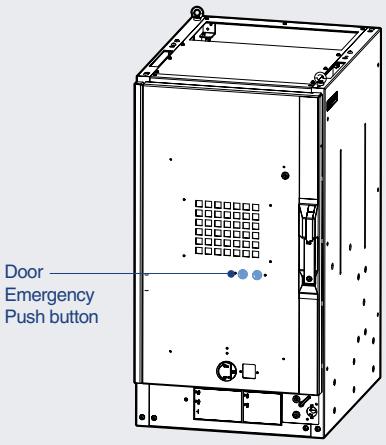
- When the Door is installed to H type cradle, this door interlock prevents opening it at SERVICE position.

Door Emergency Push button: AK

Built-in a cradle as an option

VL/VH type (7.2kV 20/25kA 630A~)

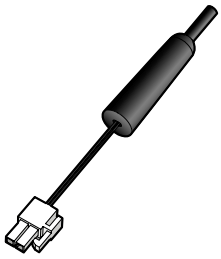




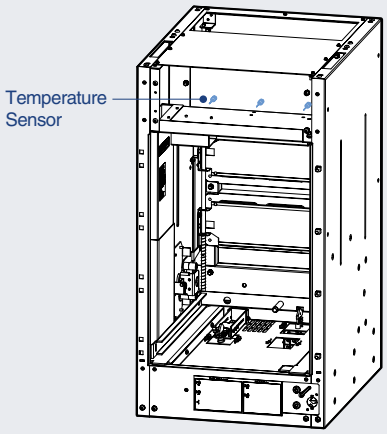
- It is used to enable the Close/Trip of the breaker manually from outside of the door installed to H type cradle during an emergency.
- Push the ON/OFF button by ON/OFF handle supplied seperately.

Temperature Sensor: AC

Built-in a cradle as an option



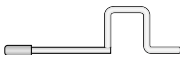
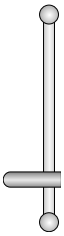
VL/VH type (7.2kV 20/25kA 630A~)



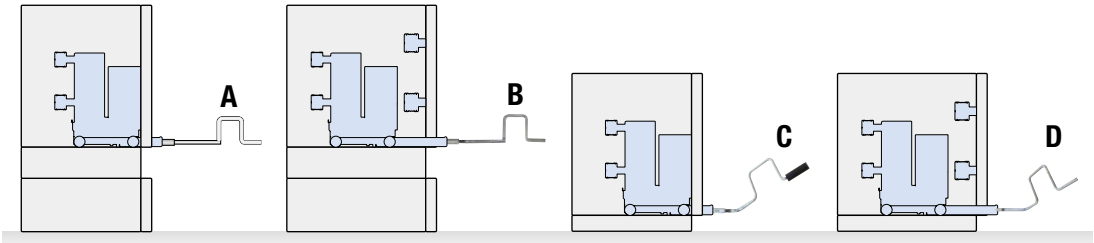
- This sensor is used to detect the temperature in H-type cradle combined with Temperature monitoring unit.
- It can be installed up to three (R, S, T phase).

Racking In/Out handle

Susol VCB is equipped with various handles depending on the intended use by types.

Type	Cradle		Racking in/out handle	Charging handle	Operating handle for earthing S/W
VL-06□08,13	E			Not required	-
	F				
	G				
VL-06□20,25	E			Not required	-
	F				
	G				
VL-06□20,25	H K	A		Not required	
		B			
VH-06,12,17, 24,35,36□		C			
		D			

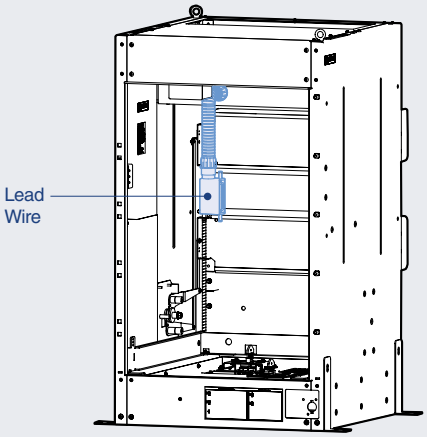
Racking in/out handle for H, K cradle



Type H Cradle Lead Wire: AM~AO

Built-in a cradle as an option

VL/VH type (7.2kV 20/25kA 630A~)

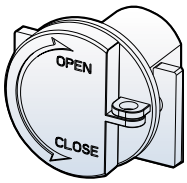


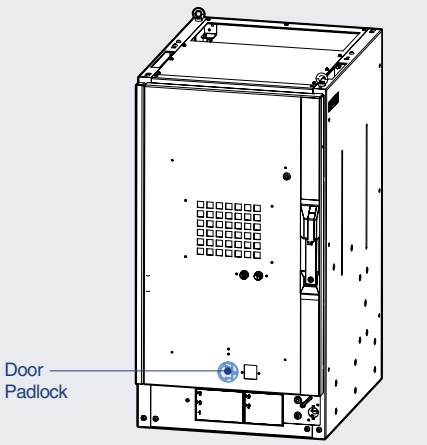
- In case of H type breaker of VL and VH models the Lead wire is installed in the cradle when supplied.
- 4a4b or 10a10b contacts are selectable according to the auxiliary contact of the breaker. Flame retardant cable is used for 4a4b.

Door Padlock

Built-in a cradle as an option

VL/VH type (7.2kV 20/25kA 630A~)



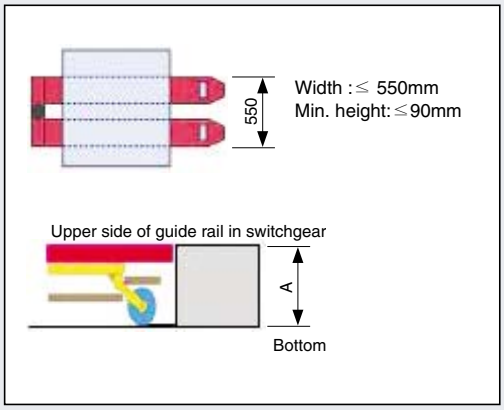


- It is supplied with a door for H type cradle as standard.
- It can be locked by seperate padlock to prevent entering the maunal handle.

Auxiliary guide frame

- Auxiliary guide frame is provided in order to move safely 36/40.5kV breaker into the switchgear.
- It can be used in combination with the hand pallet which meets the requirement shown below.

Applicable hand pallet



<Fig 1>

B

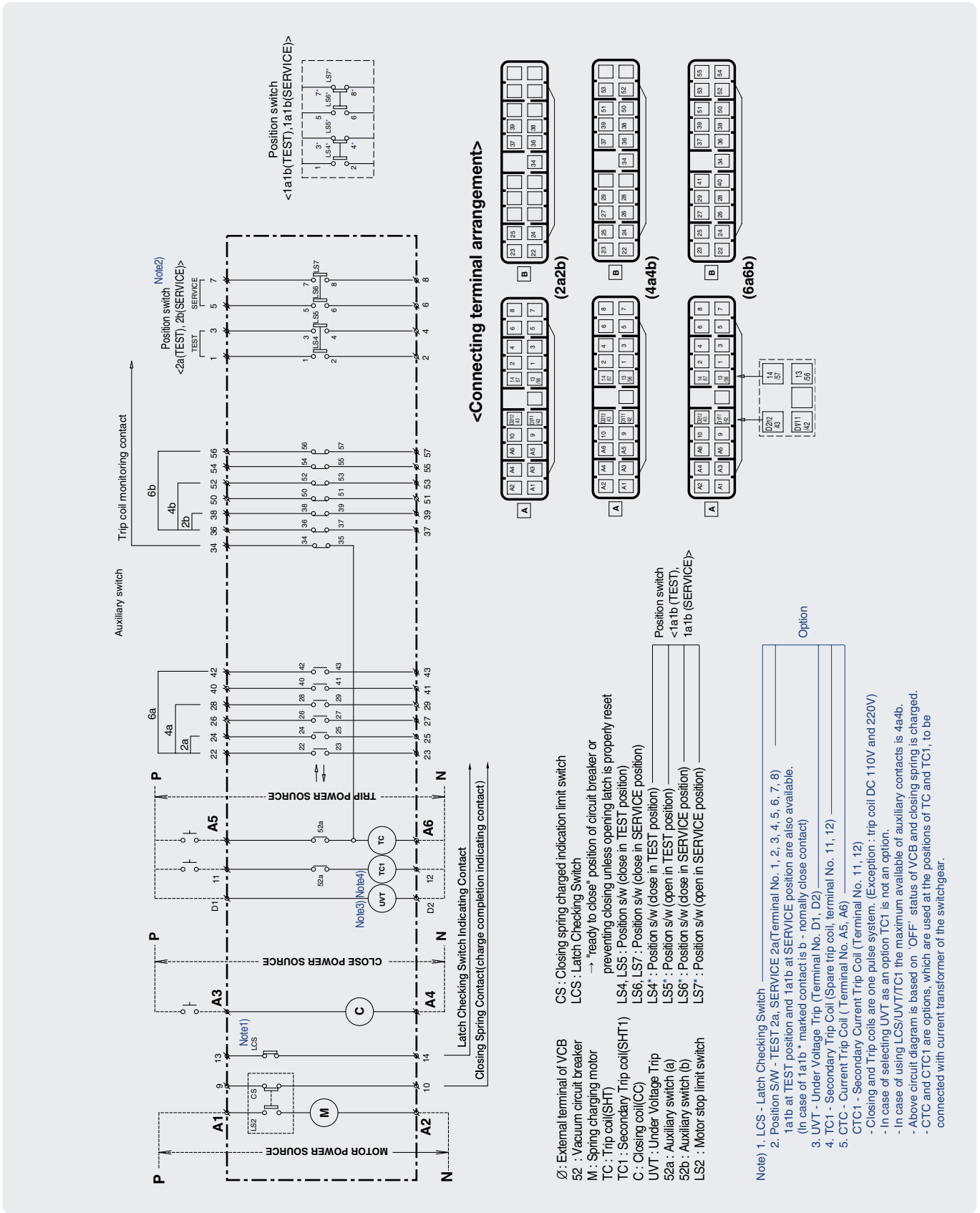
C

If dimension A in Fig. 1 is less than 120mm B type pallet can be used.
In case of more than 120mm C type must be applied.

Control circuit diagram - VL type (7.2kV 8/12.5kA 400/600A)

Susol

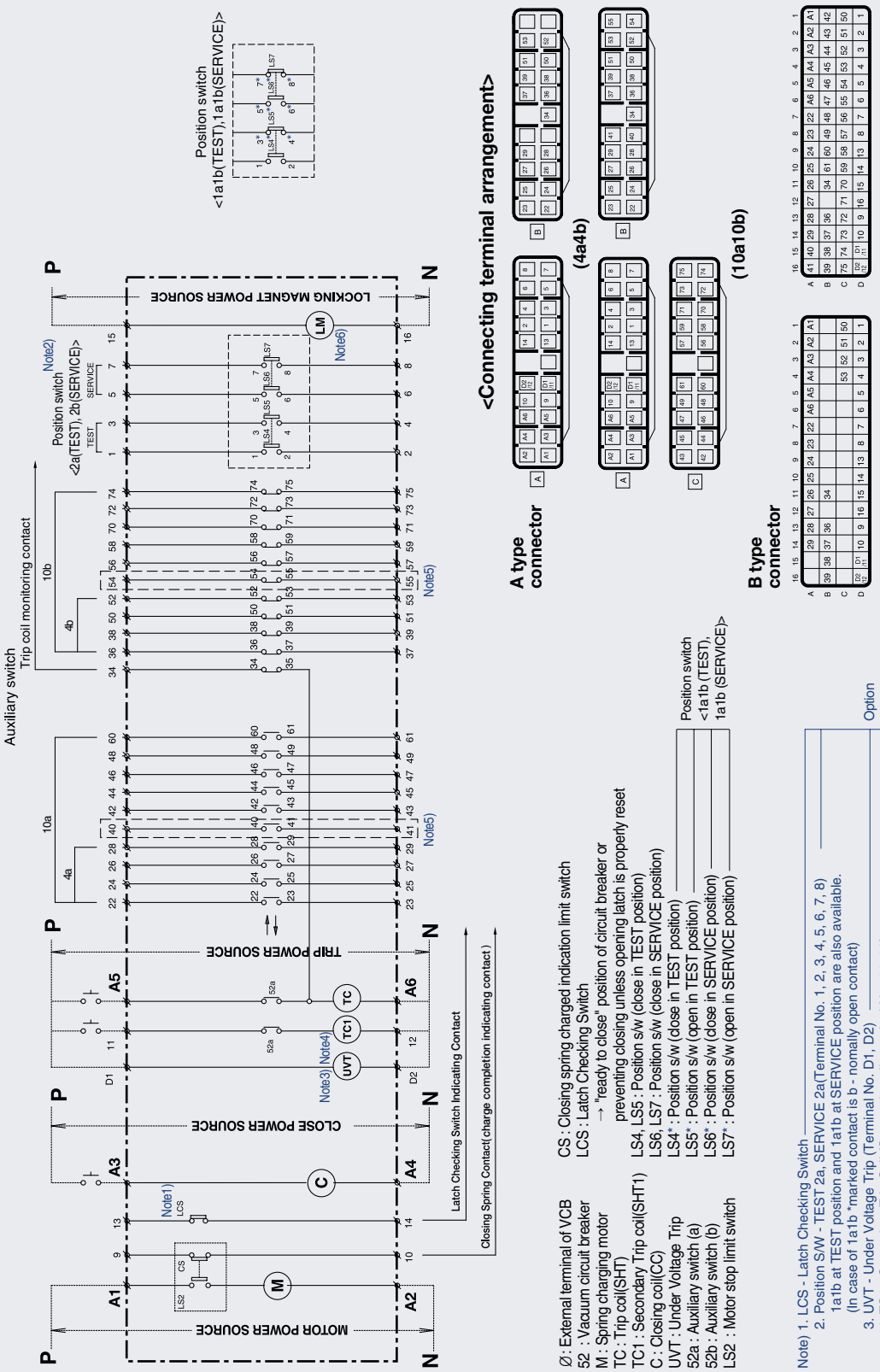
VL-06



Control circuit diagram - VL type (7.2/12/17.5kV 20/25kA)

Susol

VL-06/12/17



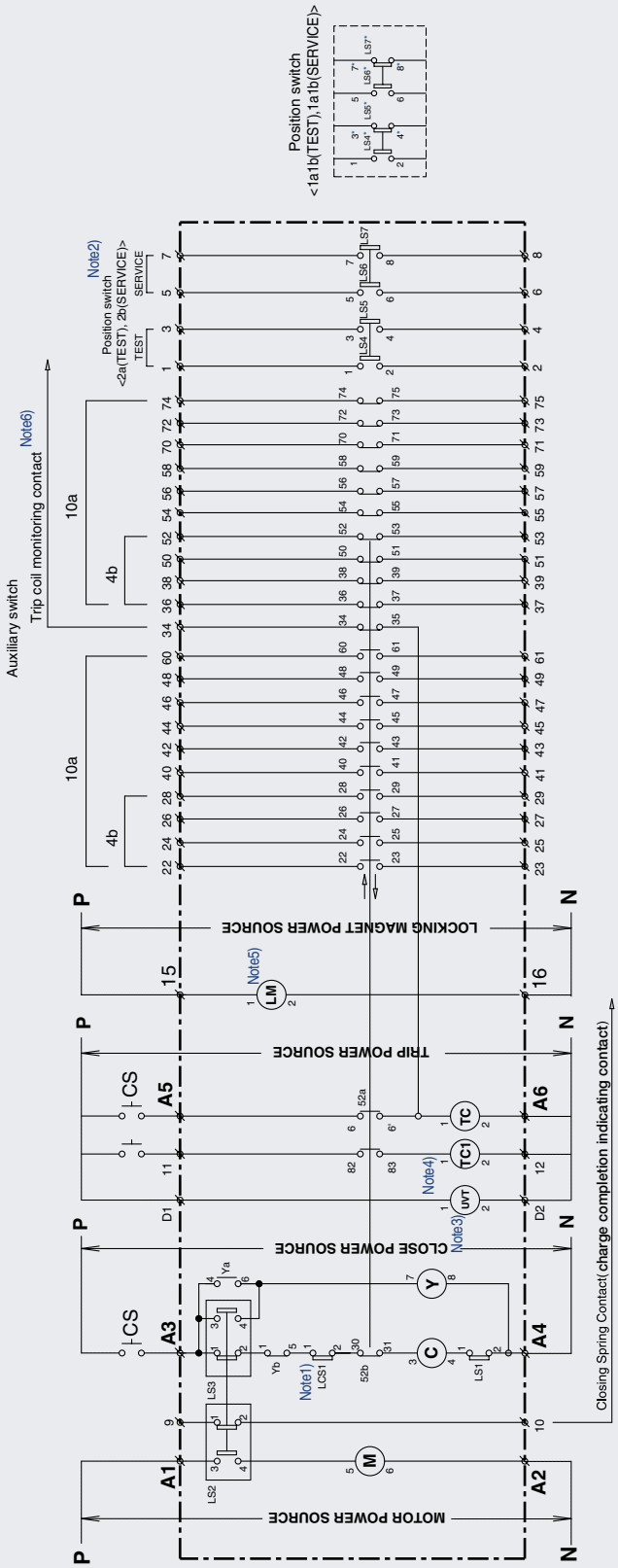
Note) 1. LCS - Latch Checking Switch
2. Position S/W - TEST 2a, SERVICE 2a(Terminal No. 1, 2, 3, 4, 5, 6, 7, 8)
1a1b at TEST position and 1a1b at SERVICE position are also available.
(In case of 1a1b 'marked contact is b - nomally open contact)
3. UVT - Under Voltage Trip (Terminal No. D1, D2)
4. TC1 - Secondary Trip Coil (Spare trip coil, terminal No. 11, 12)
If TC1 is selected, a contact(Terminal No. 40, 41) and b contact (Terminal No. 54, 55) are not available at aux. contacts 10a10b.
5. LM - Locking Magnet (Terminal No. 15, 16), only B type connector available
- Closing and Trip coils are one pulse system. (Exception : trip coil DC 110V and 220V)
- In case of selecting UVT as an option TC1 is not an option.
- Above circuit diagram is based on 'OFF' status of VCB and closing spring is charged.

Option

Control circuit diagram - VH type

Susol

VH-06/12/17/24/36/40



Ø : External terminal of VCB
52: Vacuum circuit breaker
M: Spring charging motor
TC: Trip coil
TC1: Secondary trip coil
C: Close coil
Y: Anti-pump relay
UVT: Under voltage trip
52a: Auxiliary switch (a)
52b: Auxiliary switch (b)
LS1: Close interlock limit switch (only withdrawable type)
LS2: Motor stop, close spring charged indication limit switch
LS3: Anti-close, anti-pumping limit switch
LCS1: Trip latch checking switch (preventing closing unless the trip latch is properly reset)
LS4, LS5: Position S/W (close in TEST position)
LS6, LS7: Position S/W (close in SERVICE position)
LS4* : Position s/w (close in TEST position) — Position switch <1a1b (TEST), 1a1b (SERVICE)>
LS5* : Position s/w (open in TEST position) — Position switch <1a1b (TEST), 1a1b (SERVICE)>
LS6* : Position s/w (close in SERVICE position) — Position switch <1a1b (TEST), 1a1b (SERVICE)>
LS7* : Position s/w (open in SERVICE position) — Position switch <1a1b (TEST), 1a1b (SERVICE)>
LM: Locking magnet (only withdrawable type)

<Connecting terminal arrangement>

(4a4b)

	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
A			29	28	27	26	25	24	23	22	A6	A5	A4	A3	A2	A1
B	39	38	37	36		34										
C													53	52	51	50
D	D2 /12	D1 /11	10	9	16	15			8	7	6	5	4	3	2	1

(10a10b)

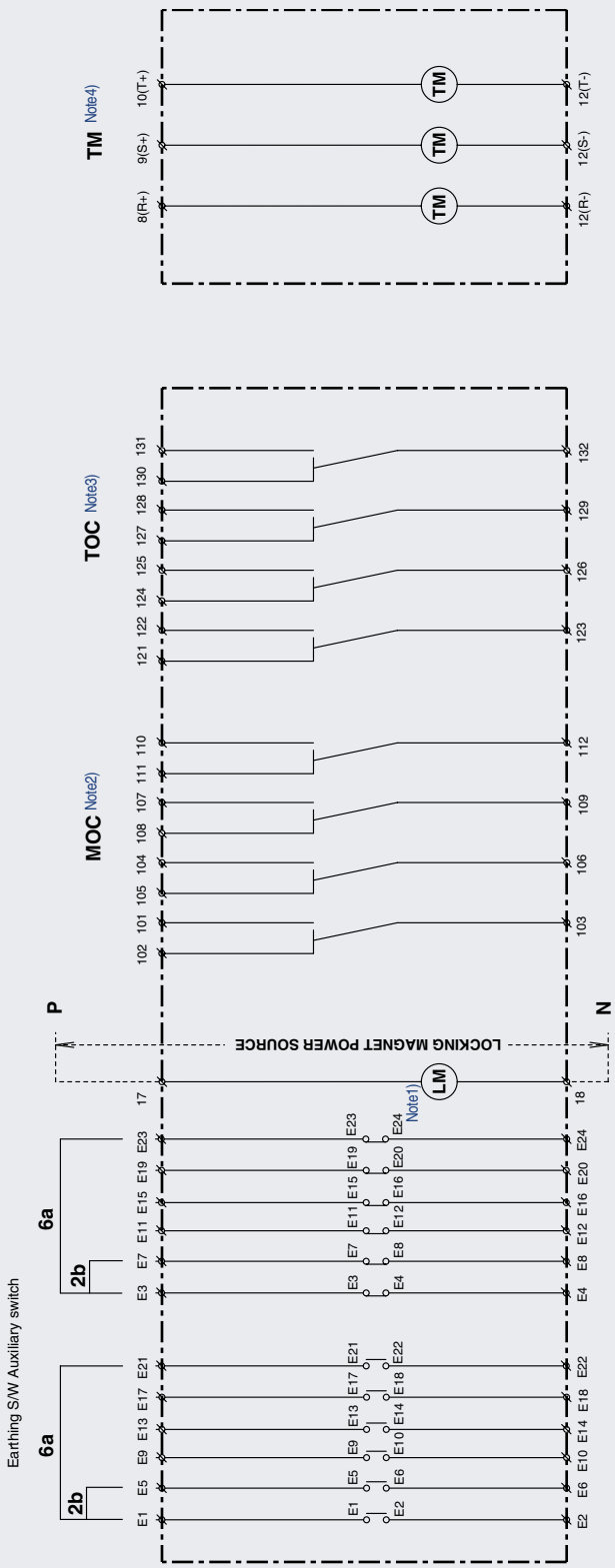
	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
A	41	40	29	28	27	26	25	24	23	22	A6	A5	A4	A3	A2	A1
B	39	38	37	36		34	61	60	49	48	47	46	45	44	43	42
C	75	74	73	72	71	70	59	58	57	56	55	54	53	52	51	50
D	D2 /12	D1 /11	10	9	16	15			8	7	6	5	4	3	2	1

Note) 1. LCS - Latch Checking Switch
2. Position S/W - TEST 2a, SERVICE 2a(Terminal No. 1, 2, 3, 4, 5, 6, 7, 8)
1a1b at TEST position and 1a1b at SERVICE position are also available.
(In case of 1a1b *marked contact is b - nomally open contact)
3. UVT - Under Voltage Trip (Terminal No. D1, D2) — Option
4. TC1 - Secondary Trip Coil (Spare trip coil, terminal No. 11, 12) — Option
5. LM - Locking Magnet (Terminal No. 15, 16) — Option
6. Trip coil monitoring contact — Option
- In case of fixed version LS1(Closing-interlock Limit Switch) is not applied (terminal No. 15, 16)
- In case of selecting UVT as an option TC1 is not an option (82 and 83 contacts are available in case of selecting TC1)
- Above circuit diagram is based on `OFF` status of VCB and closing spring is charged.

Control circuit diagram - VH type

Susol

Compartment



Ø: External terminals for auxiliary contacts and locking magnet
LM : Locking magnet for earthing swtich
MOC : Mechanism operated cell switch (for H type cradle)
TOC : Truck operated cell switch (for H type cradle)
TM : Temperature alarm (for H type cradle)

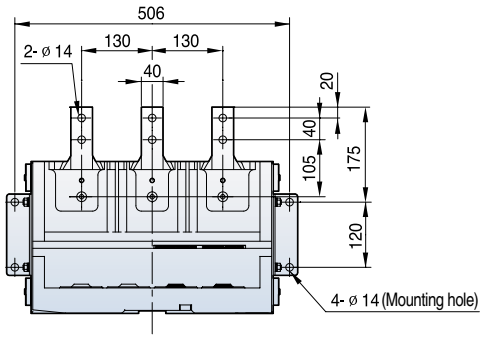
Note) 1. LM - If it is energized with the rated power the earthing switch can be closed or opened (for H type cradle)
2. MOC - This auxiliary switch is used to indicate the Close/Open of VCB (for H type cradle)
It is composed of 4 cell switches with 4 changeover contacts.
3. TOC - This auxiliary switch is used to indicate the 'SERVICE' position of VCB (for H type cradle)
It is composed of 4 cell switches with 4 changeover contacts.
4. TM - Temperature Alarm Unit displays the input temperature detected through the temperature sensor installed in H-type cradle. Temperature sensor can be installed in each phase and can be connected with the temperature module.

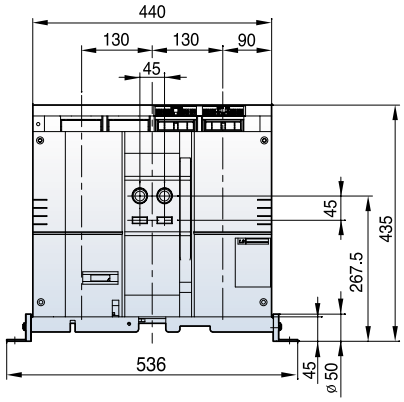
Option

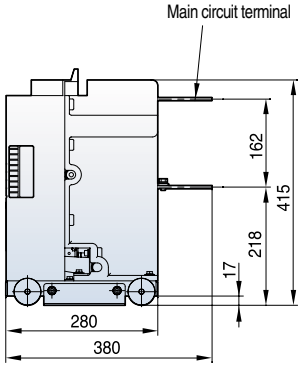
* Above circuit diagram is based on the status that the earthing S/W is Open and the breaker is at Test or between Test and Service position. MOC indicates the Open of the breaker. If the breaker is Closed from Service, the contacts configuration is displayed on the contrary.

7.2kV, 8/12.5kA, 400/630A

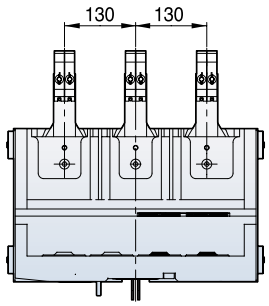
Fixed (P type)

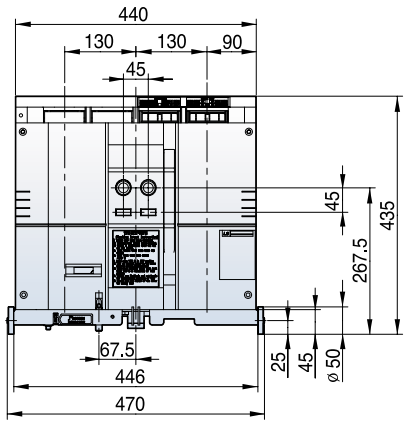


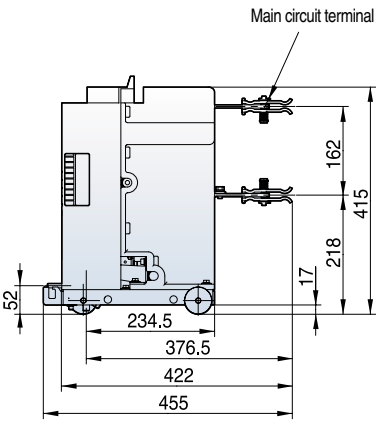




Withdrawable (Standard breaker E/F/G type)

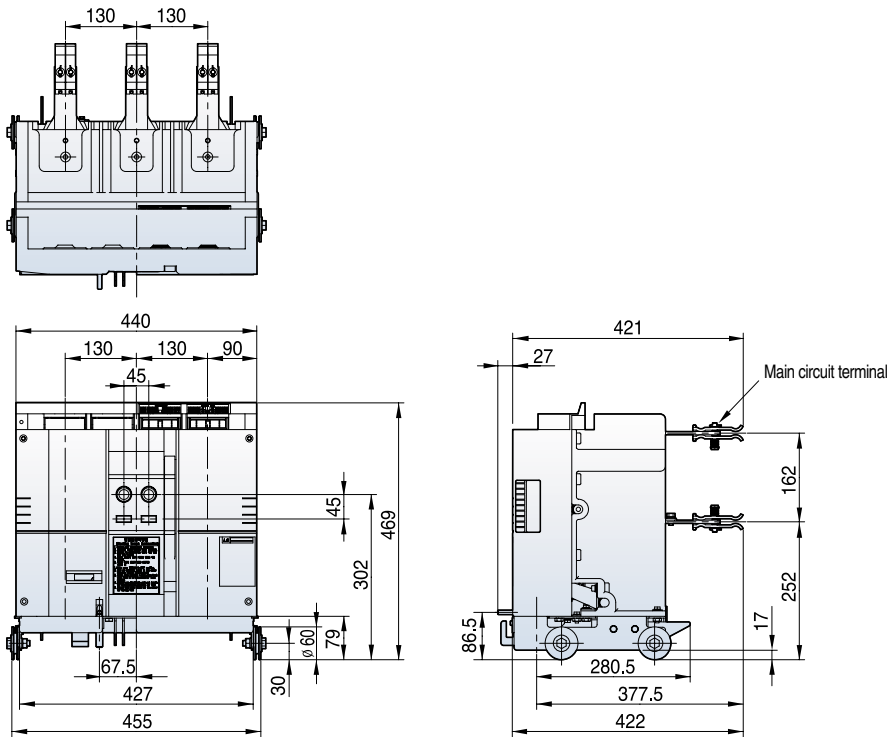




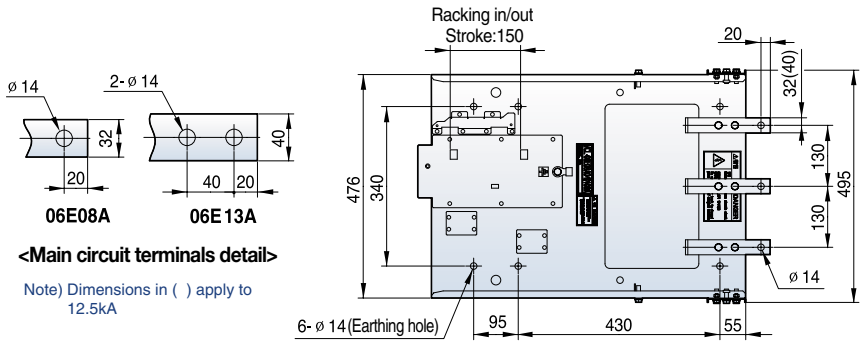


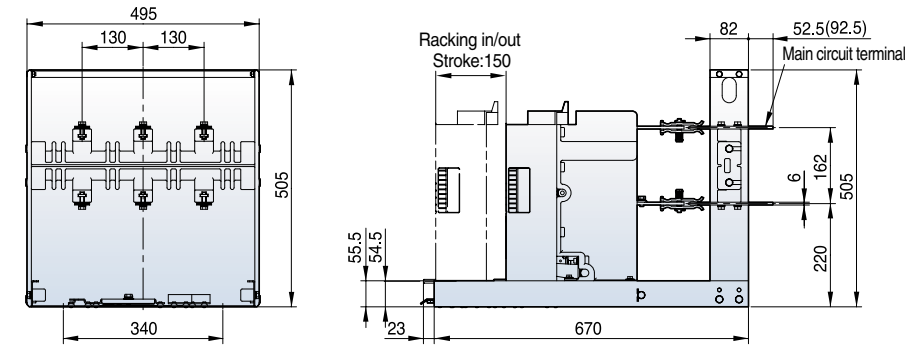
7.2kV, 8/12.5kA, 400/630A

Withdrawable (Compatible with existing breaker E/F/G type)



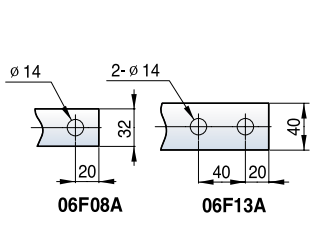
Withdrawable (E type cradle)



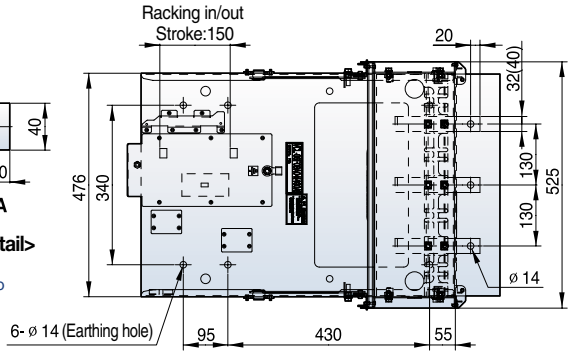


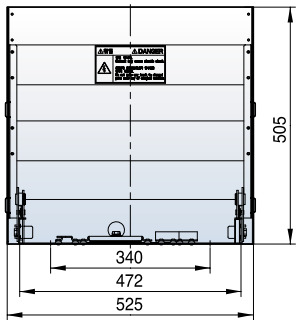
7.2kV, 8/12.5kA, 400/630A

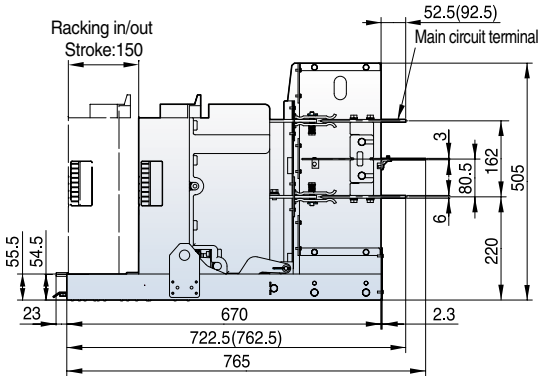
Withdrawable (F type cradle)



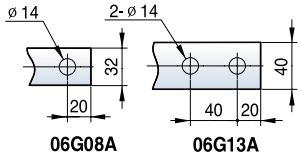
Note) Dimensions in ( ) apply to 12.5kA



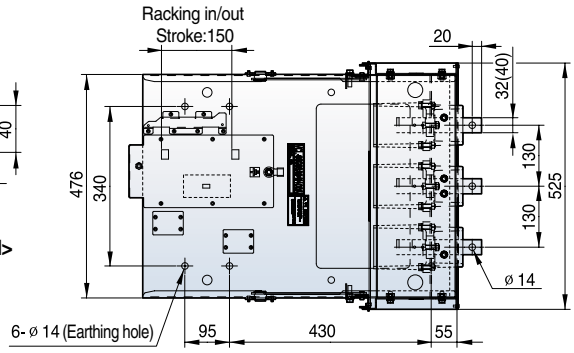


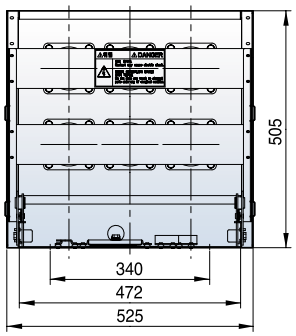


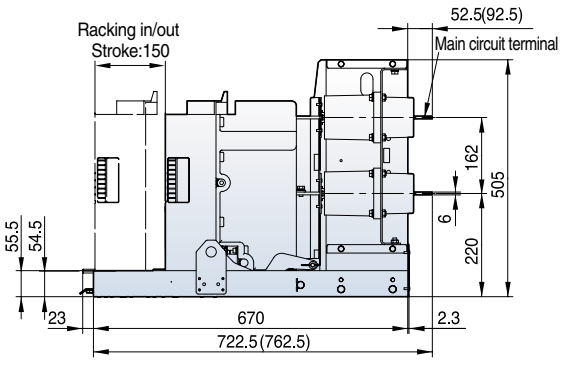
Withdrawable (G type cradle)



Note) Dimensions in ( ) apply to 12.5kA

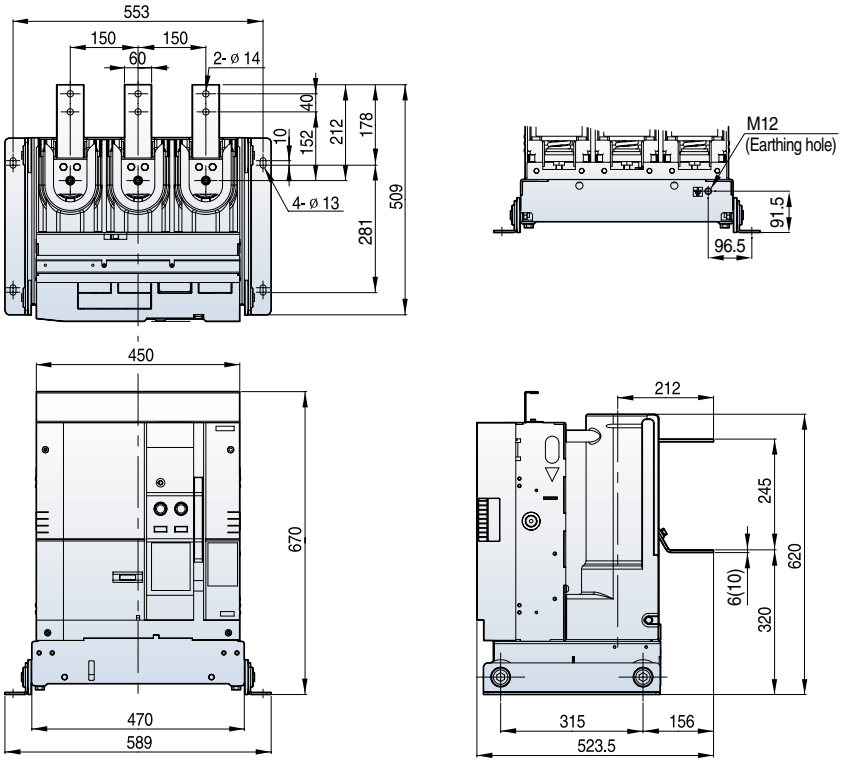






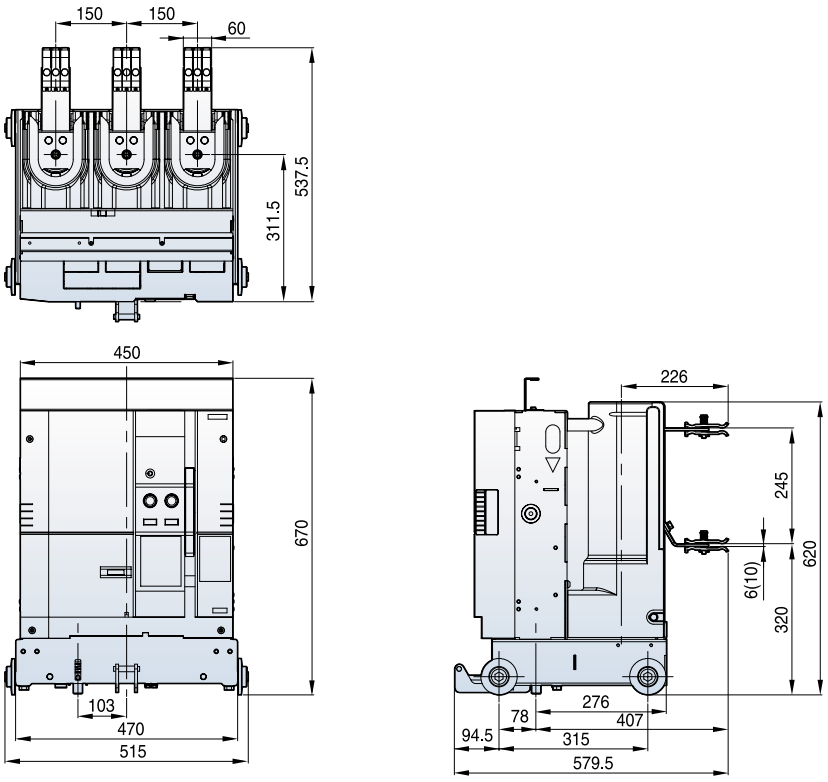
7.2kV, 20/25kA, 630/1250A

Fixed (P type, phase distance 150mm)



Note) Dimensions in ( ) apply to 1250A

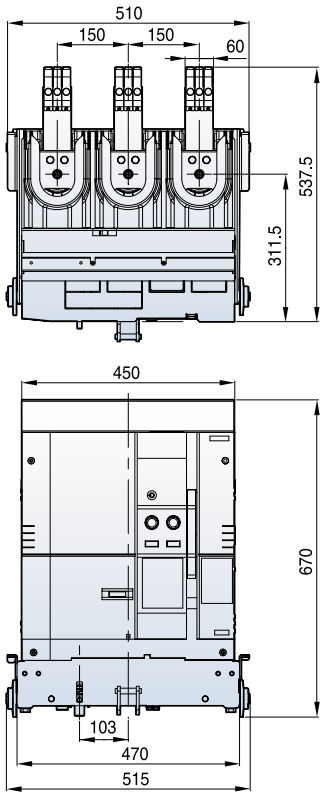
Withdrawable (E type unit, phase distance 150mm)

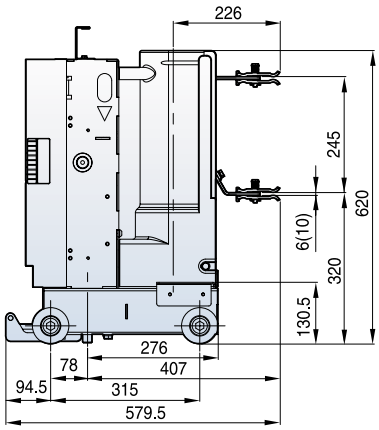


Note) Dimensions in ( ) apply to 1250A

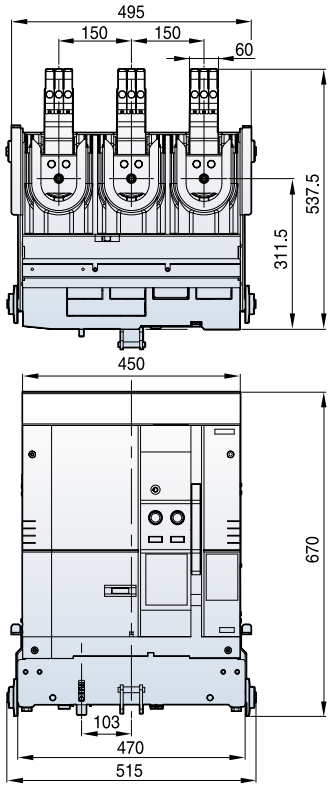
7.2kV, 20/25kA, 630/1250A

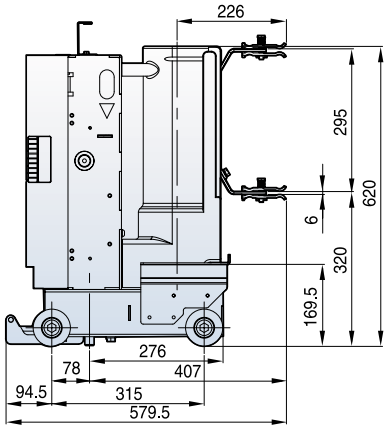
Withdrawable (F type unit, phase distance 150mm)





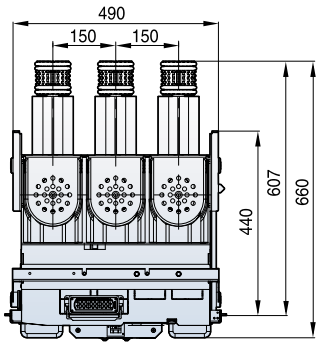
Withdrawable (G type unit, phase distance 150mm)

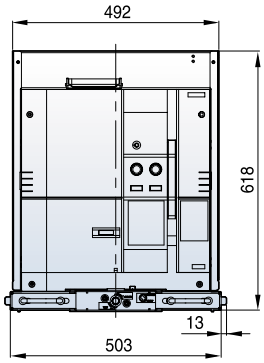


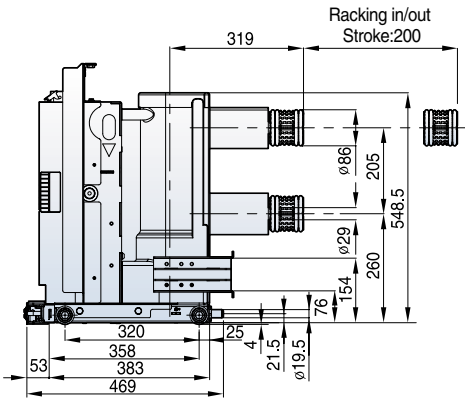


7.2kV, 20/25kA, 630/1250A

Withdrawable (H type unit, phase distance 150mm)

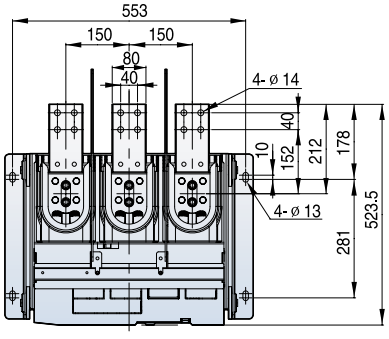


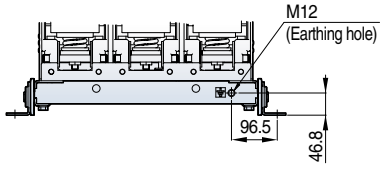


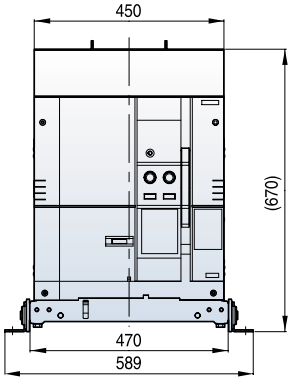


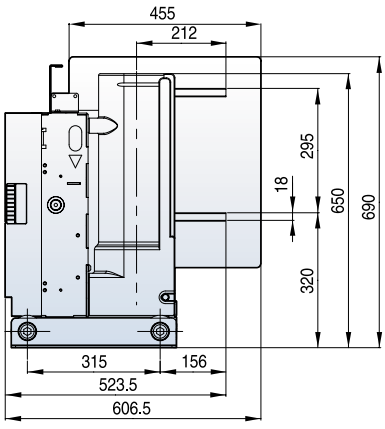
7.2kV, 20/25kA, 2000A

Fixed (P type, phase distance 150mm)



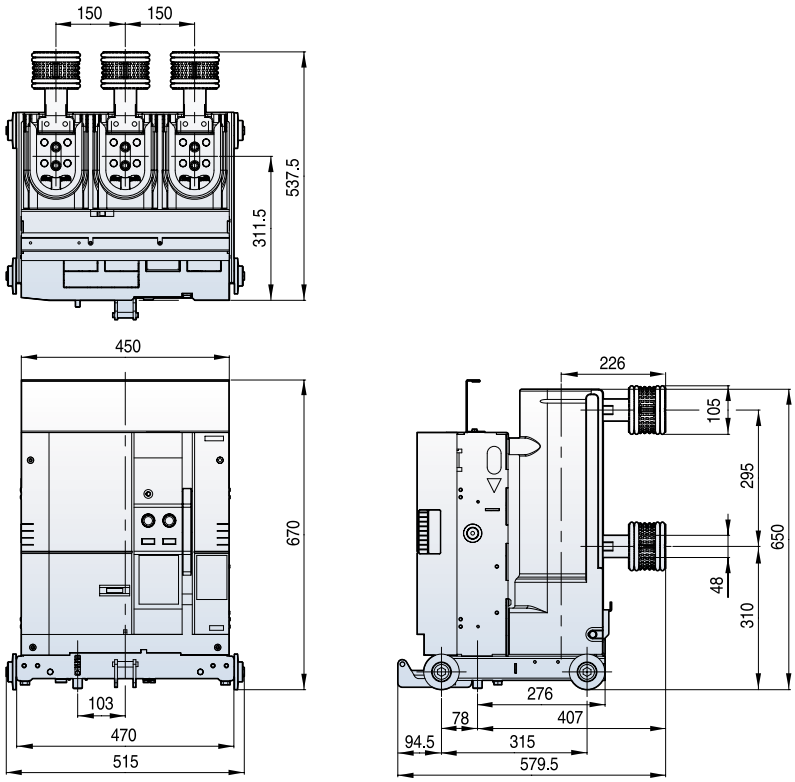




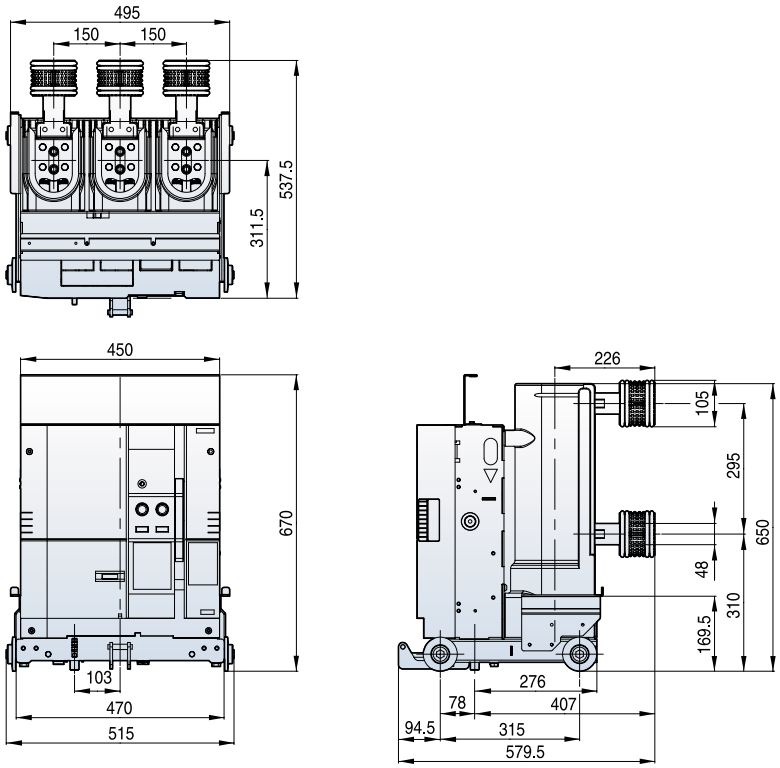


7.2kV, 20/25kA, 2000A

Withdrawable (E type unit, phase distance 150mm)

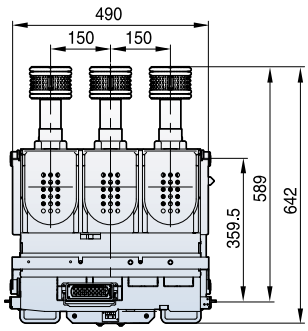


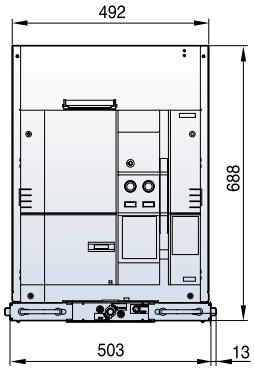
Withdrawable (F/G type unit, phase distance 150mm)

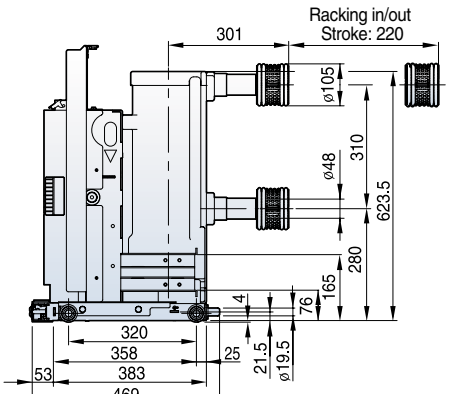


7.2kV, 20/25kA, 2000A

Withdrawable (H type unit, phase distance 150mm)

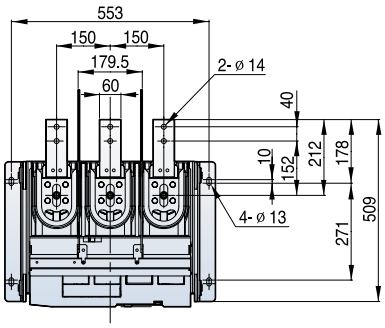


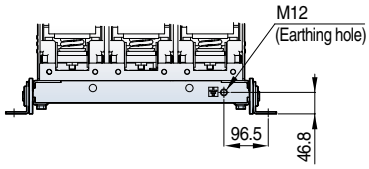


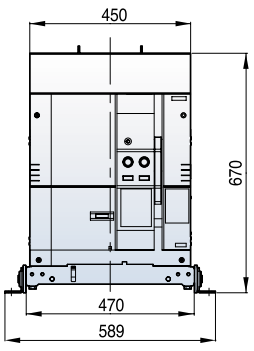


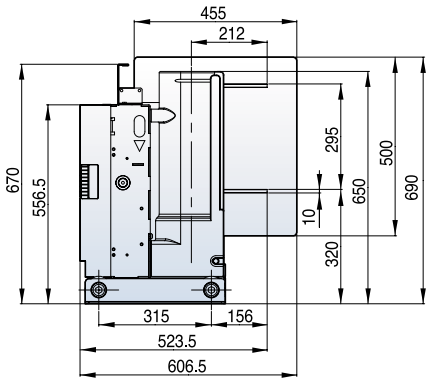
12/17.5kV, 20/25kA, 630/1250A

Fixed (P type, phase distance 150mm)



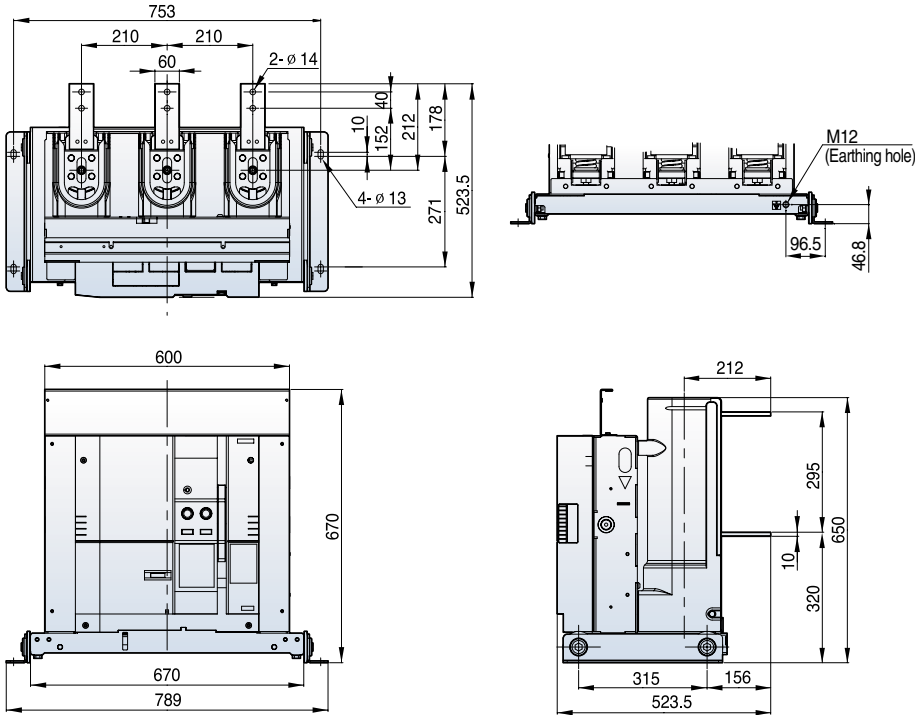




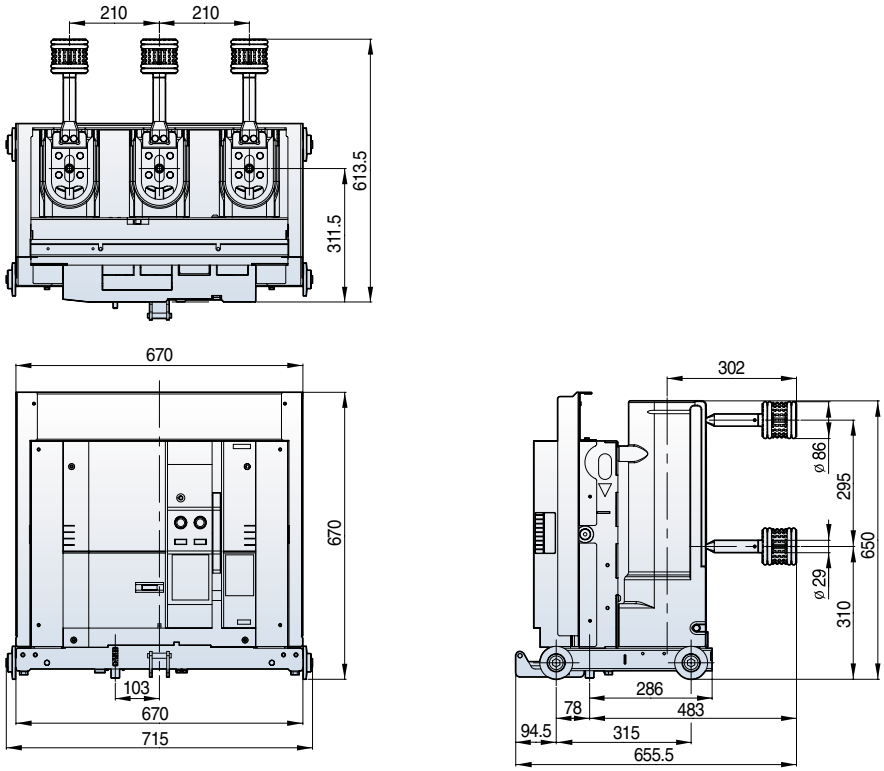


12/17.5kV, 20/25kA, 630/1250A

Fixed (P type, phase distance 210mm)

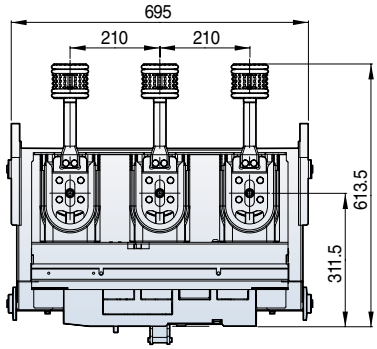


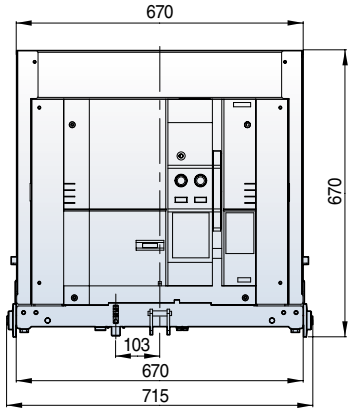
Withdrawable
(Compatible with existing E type unit, phase distance 210mm)

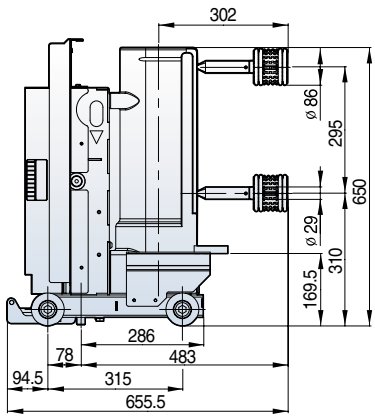


12/17.5kV, 20/25kA, 630/1250A

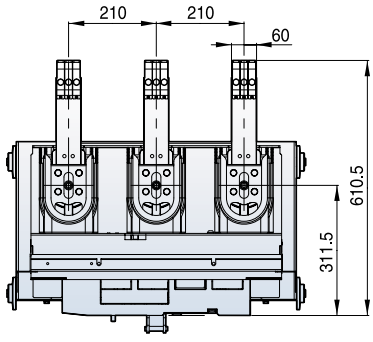
Withdrawable
(Compatible with existing F type unit, phase distance 210mm)

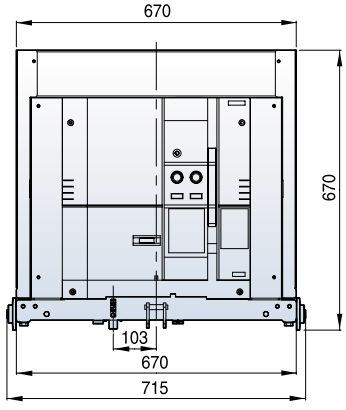


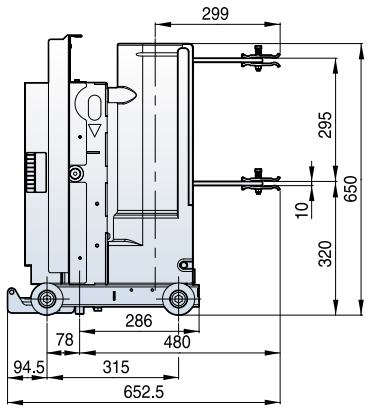




Withdrawable (E type unit, phase distance 210mm)

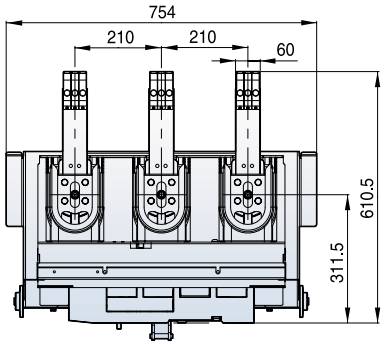


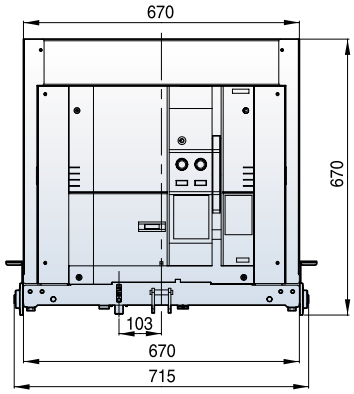


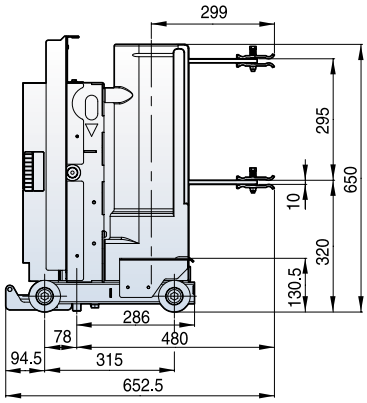


12/17.5kV, 20/25kA, 630/1250A

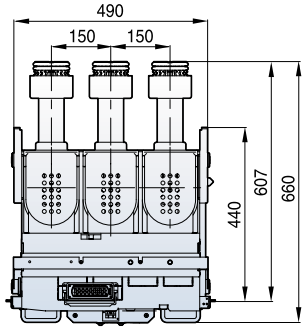
Withdrawable (F type unit, phase distance 210mm)

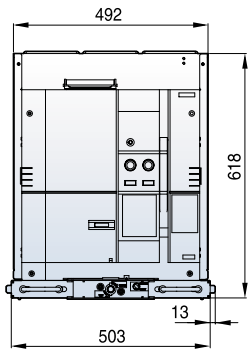


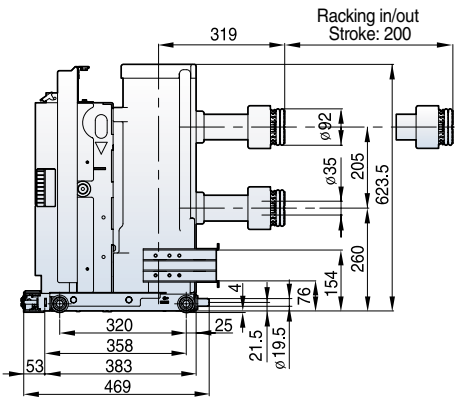




Withdrawable (H type unit, phase distance 150mm)

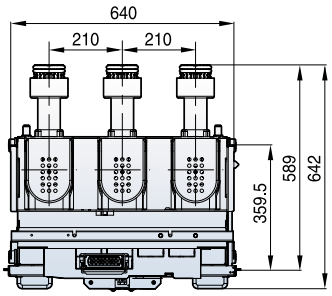


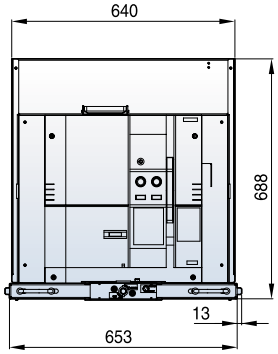


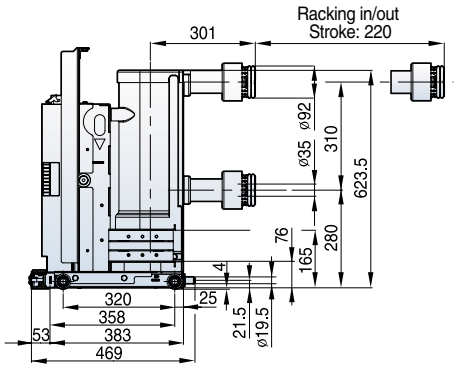


12/17.5kV, 20/25kA, 630/1250A

Withdrawable (H type unit, phase distance 210mm)

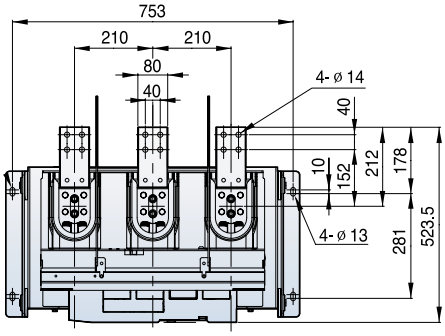


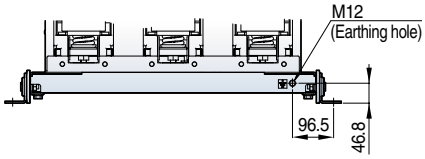


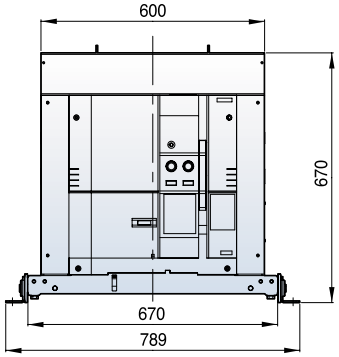


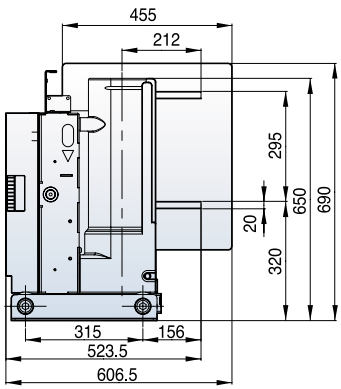
12/17.5kV, 20/25kA, 2000A

Fixed (P type, phase distance 210mm)



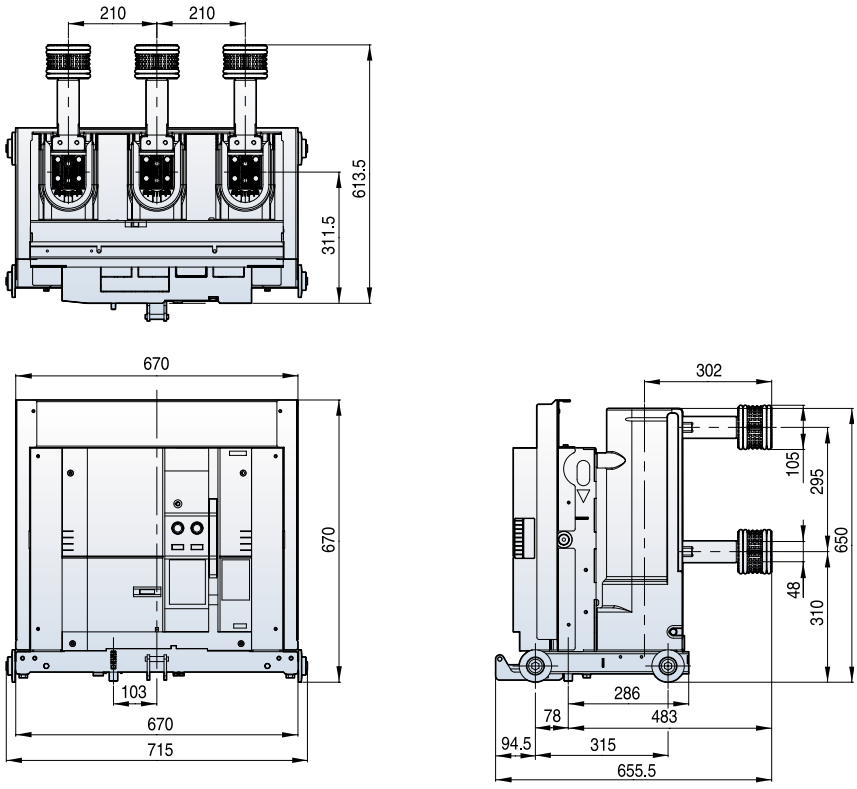




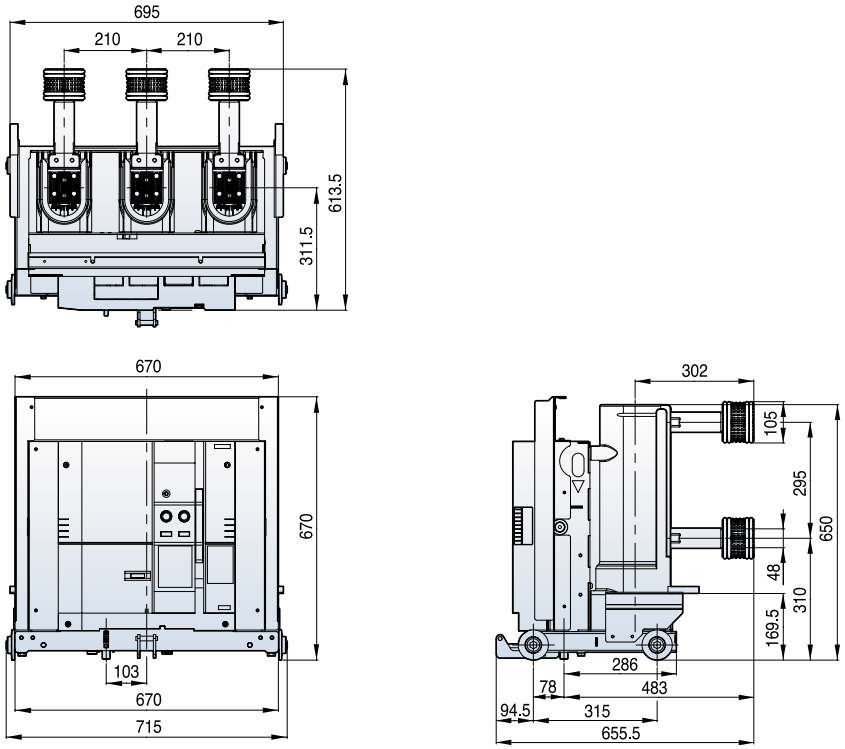


12/17.5kV, 20/25kA, 2000A

Withdrawable (E type unit, phase distance 210mm)

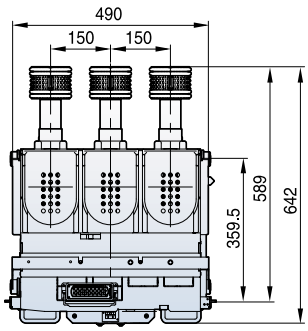


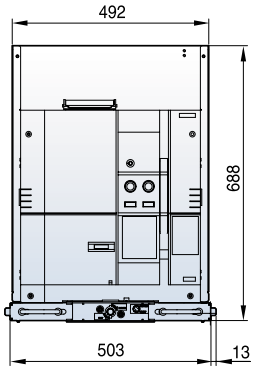
Withdrawable (F type unit, phase distance 210mm)

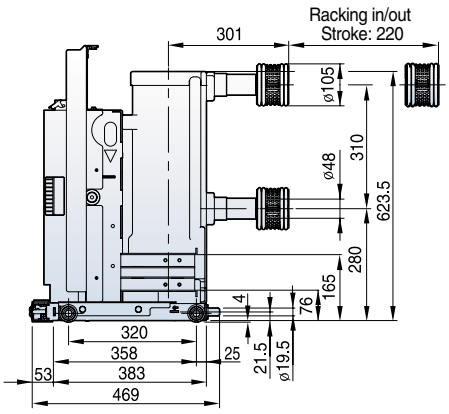


12/17.5kV, 20/25kA, 2000A

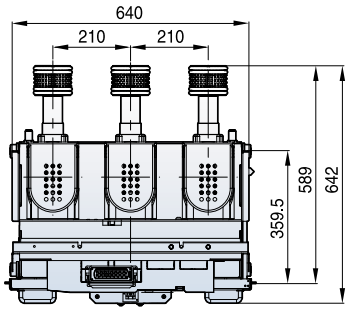
Withdrawable (H type unit, phase distance 150mm)

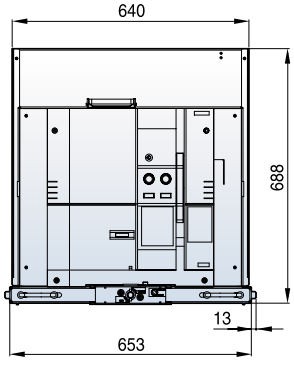


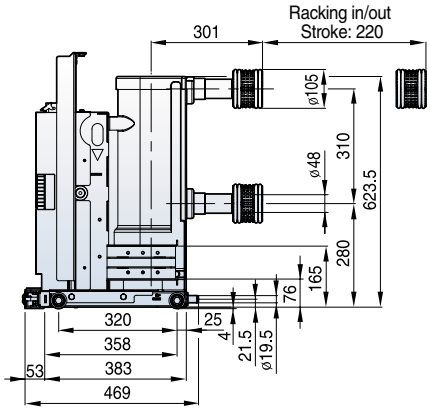




Withdrawable (H type unit, phase distance 210mm)

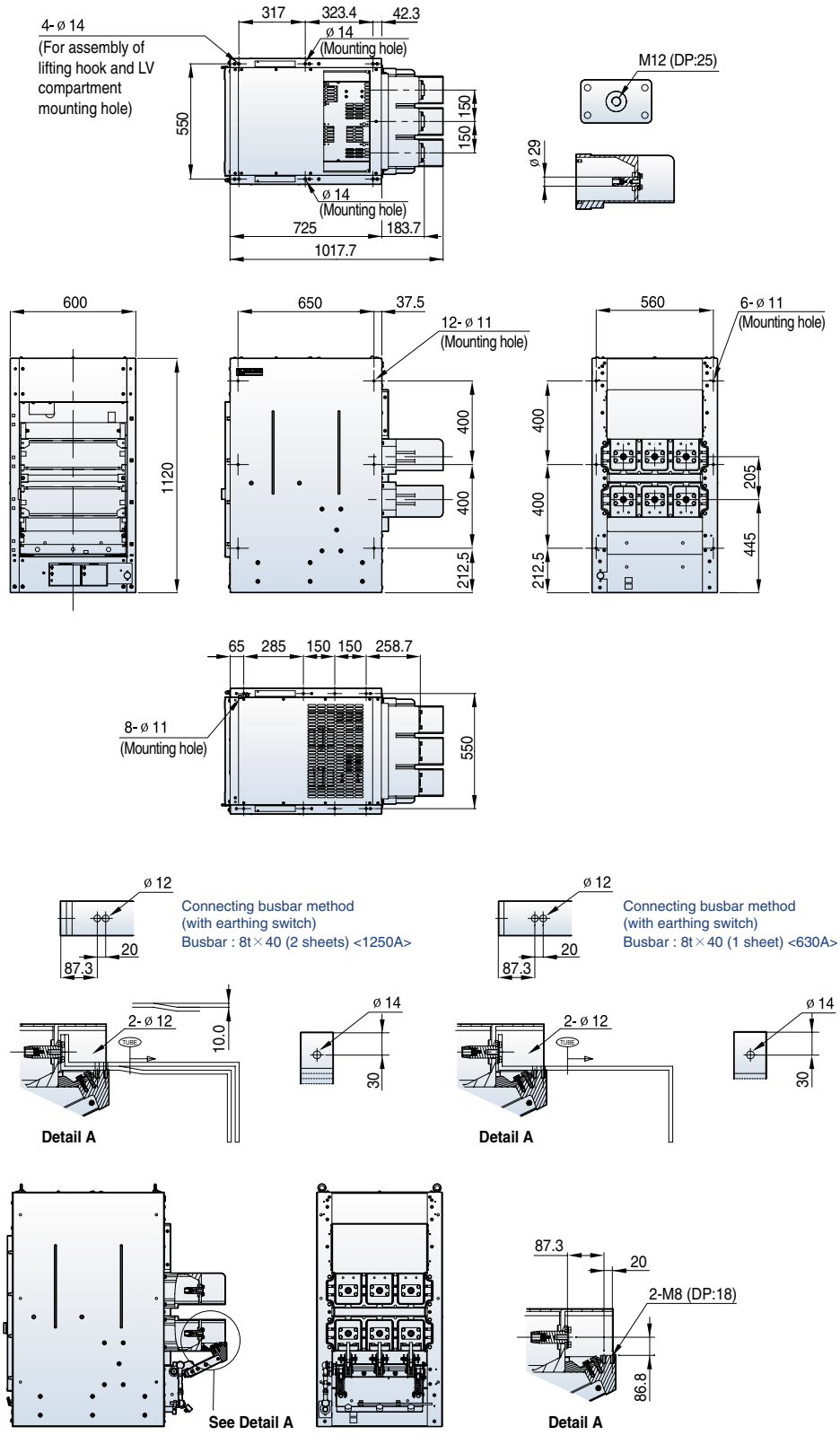






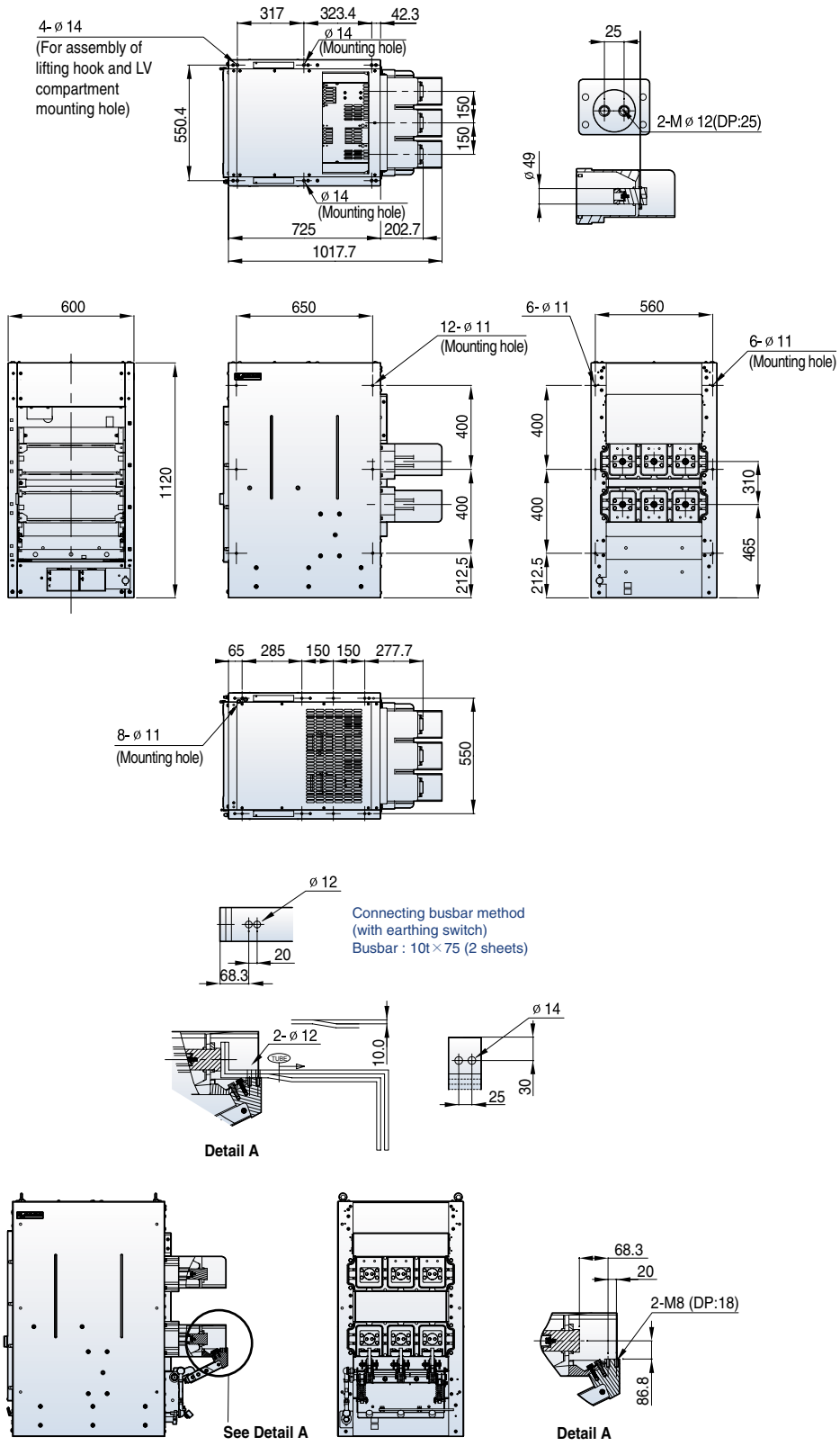
7.2kV, 20/25kA, 630/1250A

Withdrawable (H cradle, phase distance 150mm)



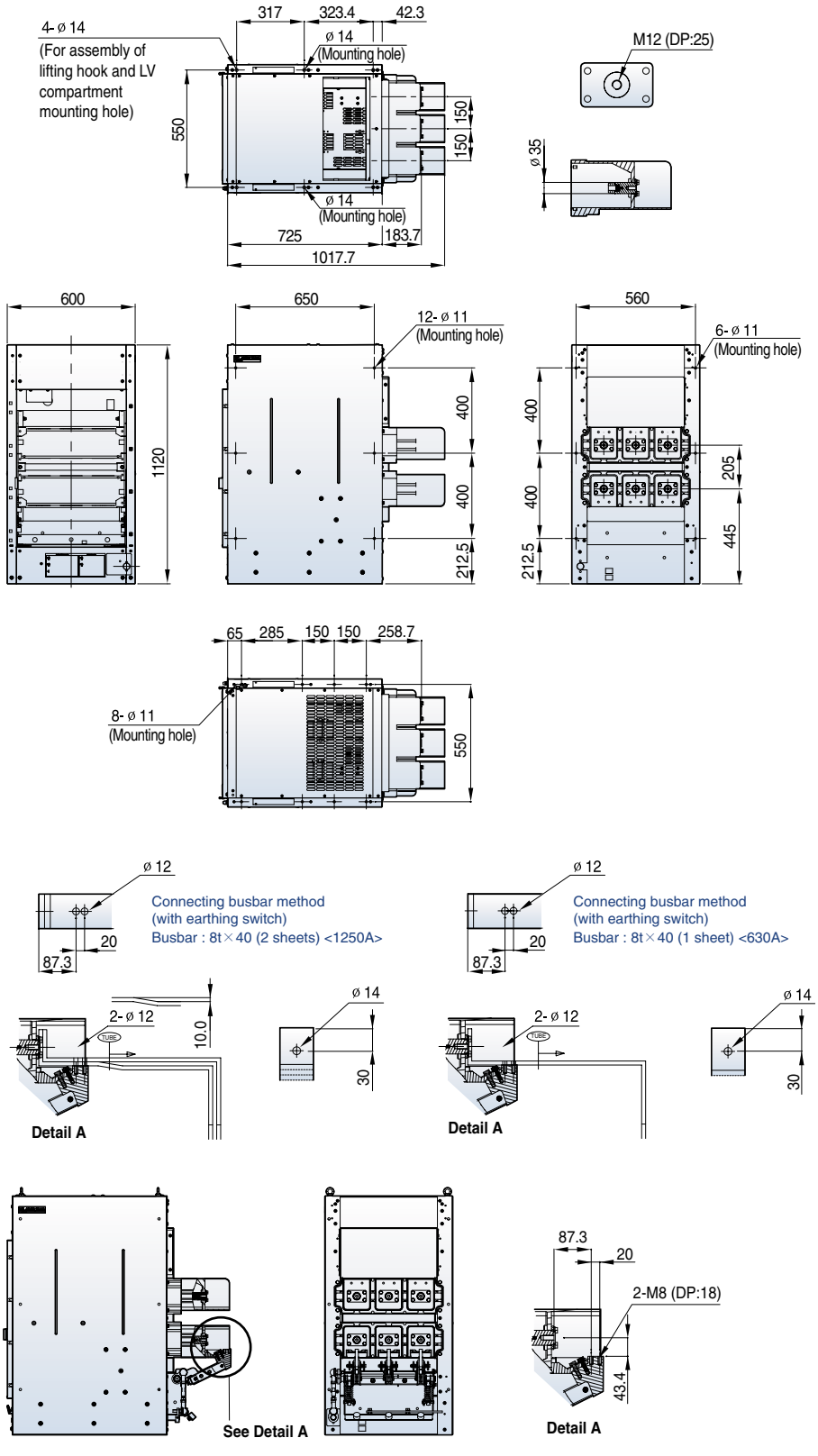
7.2/12kV, 20/25kA, 2000A

Withdrawable (H cradle, phase distance 150mm)



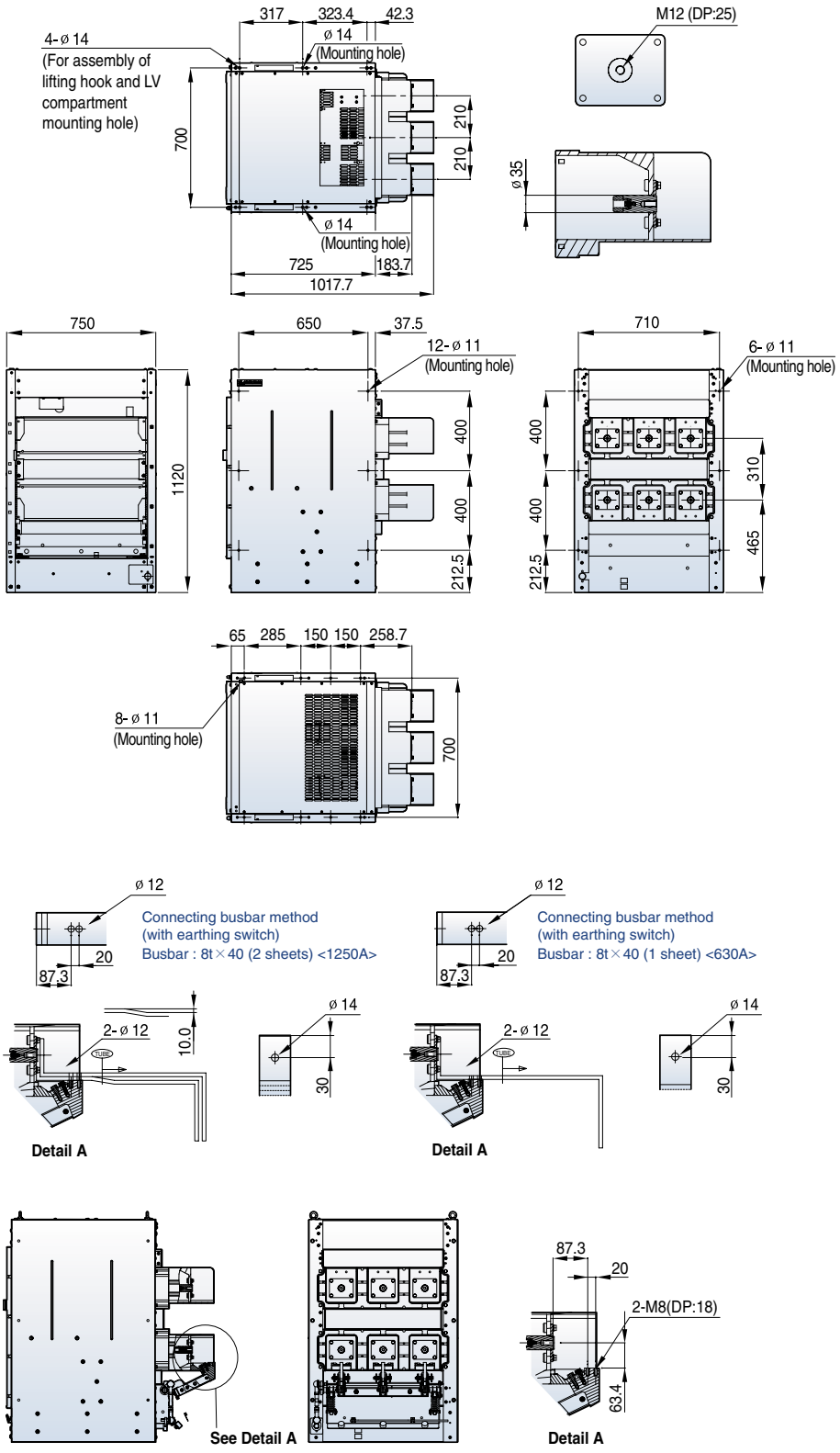
12/17.5kV, 20/25kA, 630/1250A

Withdrawable (H cradle, phase distance 150mm)



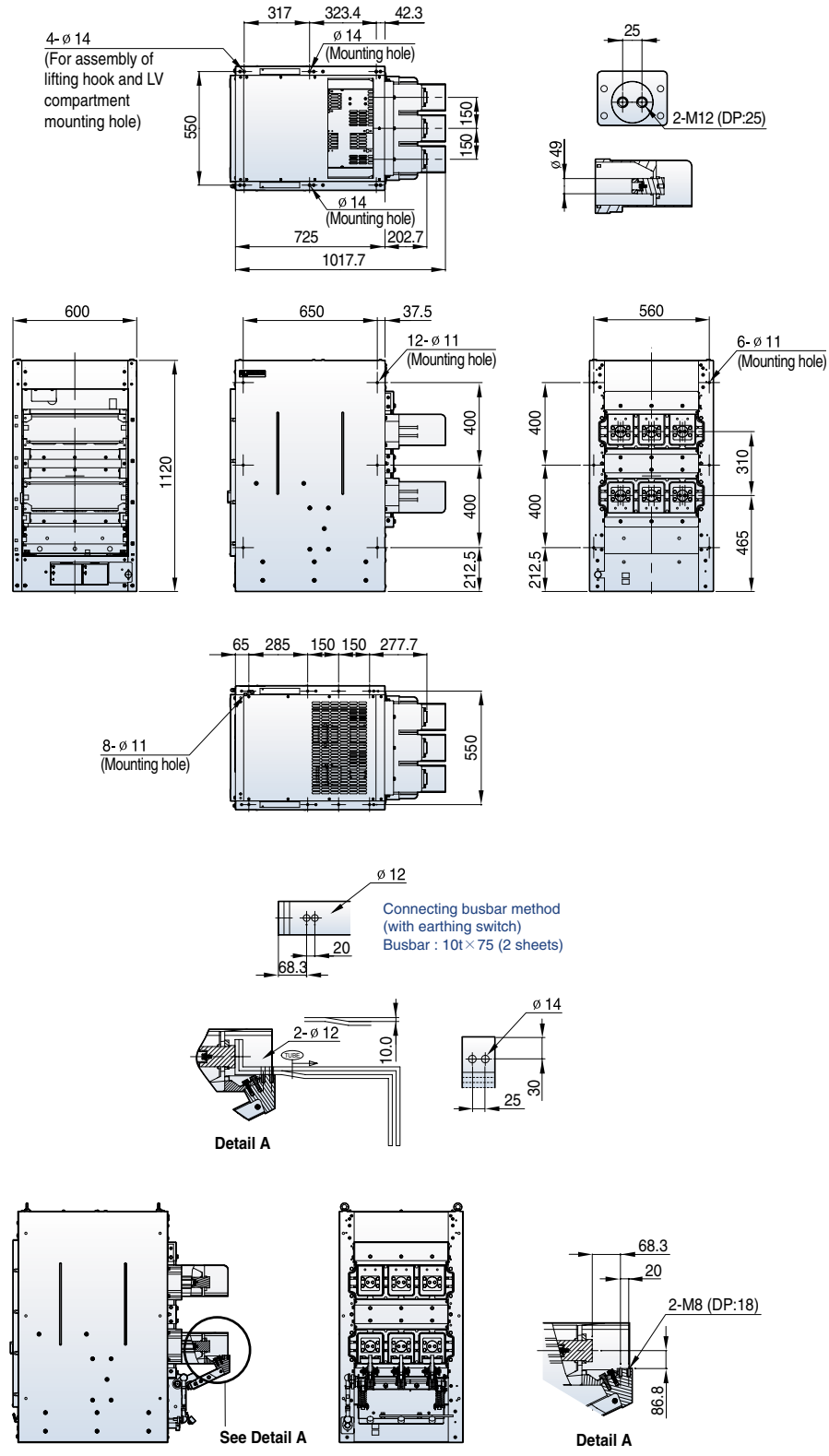
12/17.5kV, 20/25kA, 1250A

Withdrawable (H cradle, phase distance 210mm)



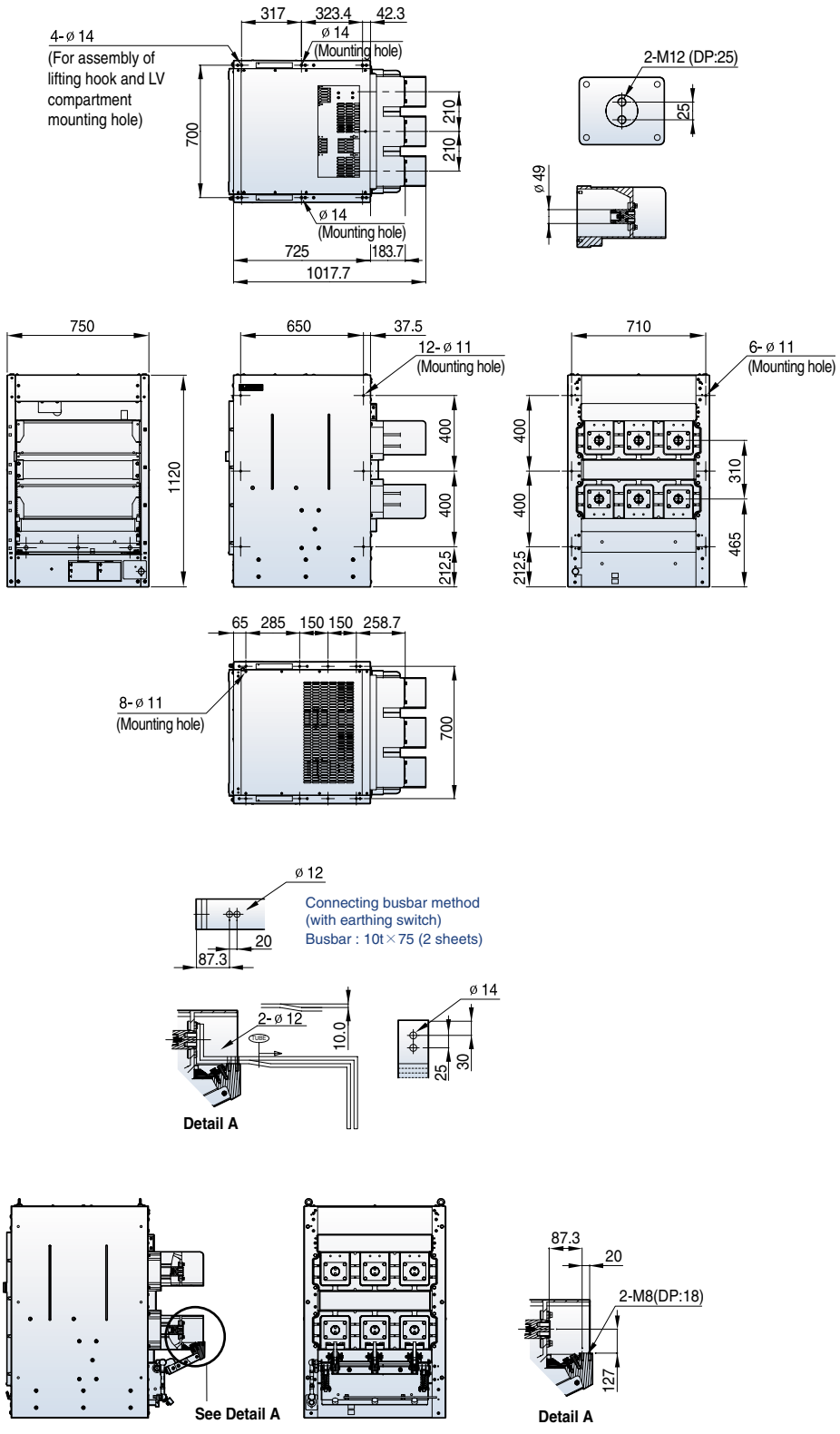
12/17.5kV, 20/25kA, 2000A

Withdrawable (H cradle, phase distance 150mm)



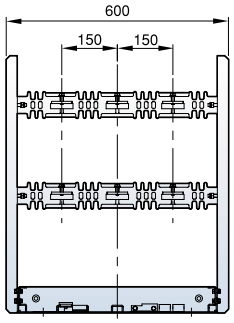
12/17.5kV, 20/25kA, 2000A

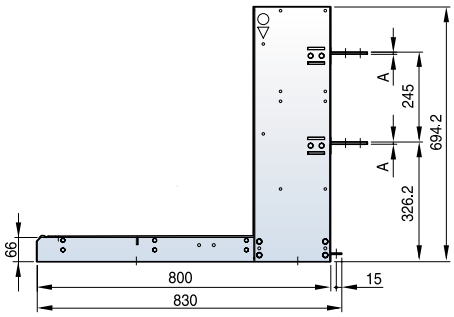
Withdrawable (H cradle, phase distance 210mm)

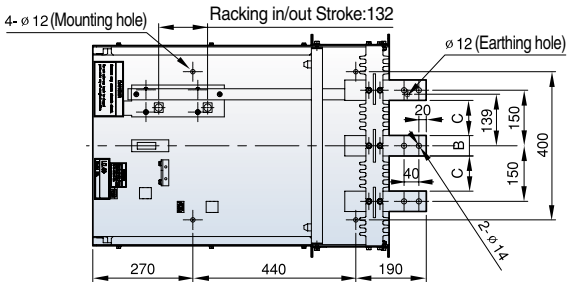


7.2kV, 20/25kA, 630/1250A

Withdrawable (E type cradle)

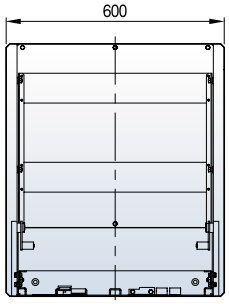


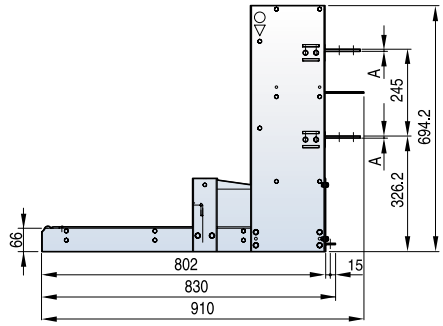


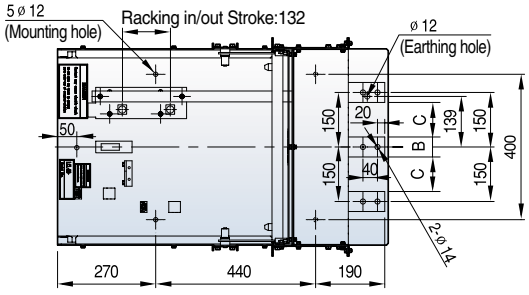


Rating	630A	1250A
A	6	10
B	55	60
C	95	90

Withdrawable (F type cradle)



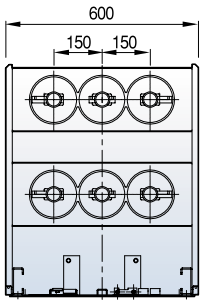


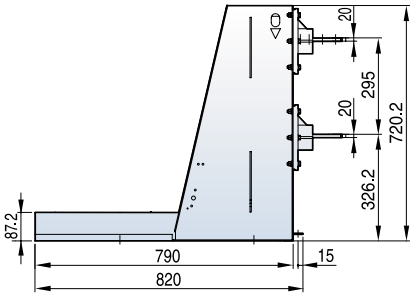


Rating	630A	1250A
A	6	10
B	55	60
C	95	90

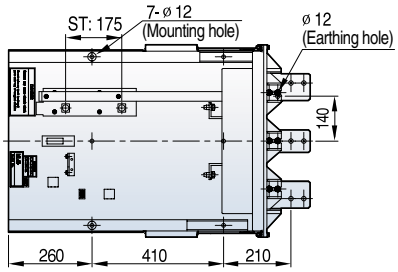
7.2kV, 20/25kA, 2000A

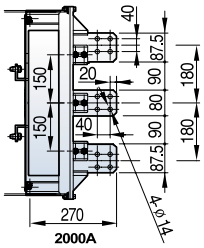
Withdrawable (E type cradle)





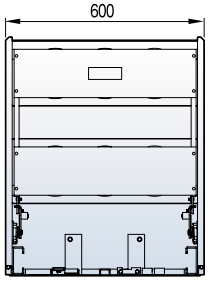
20/25kA 2000A E Type

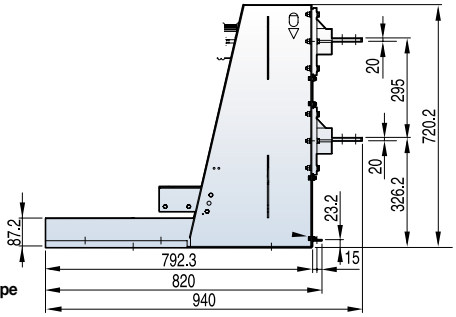




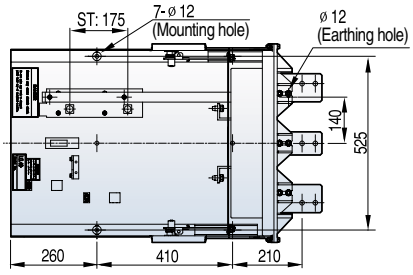
2000A

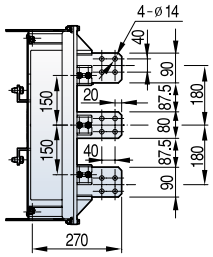
Withdrawable (F type cradle)





20/25kA 2000A F Type

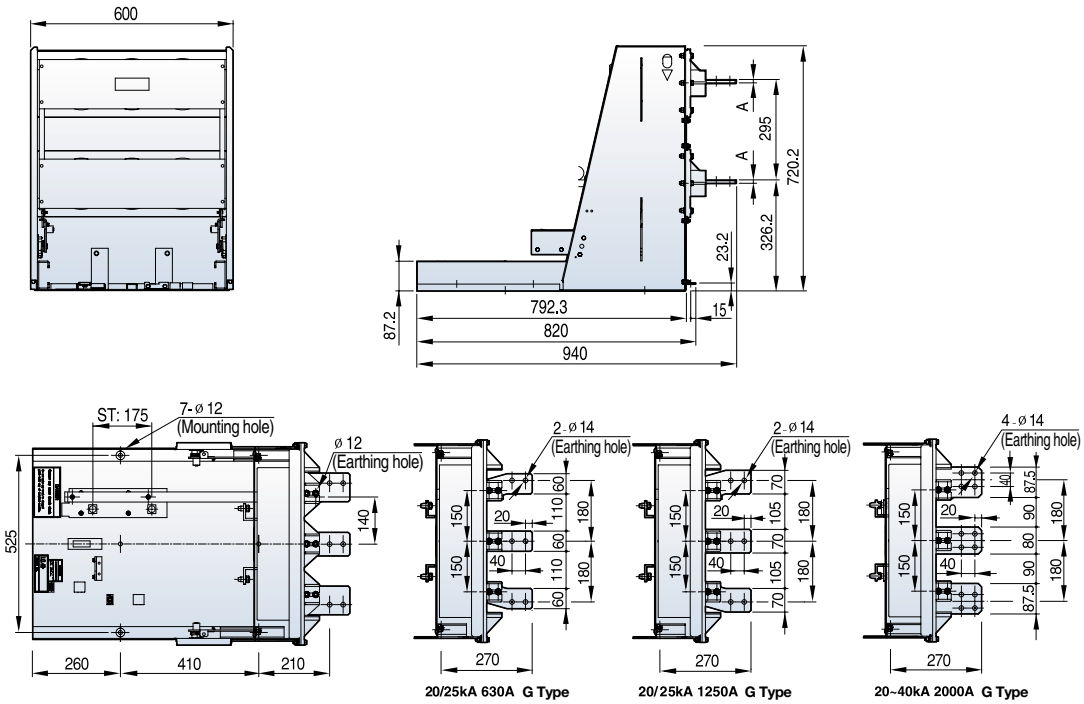




20, 25kA 2000A F Type

7.2kV, 20/25kA, 630/1250/2000A,

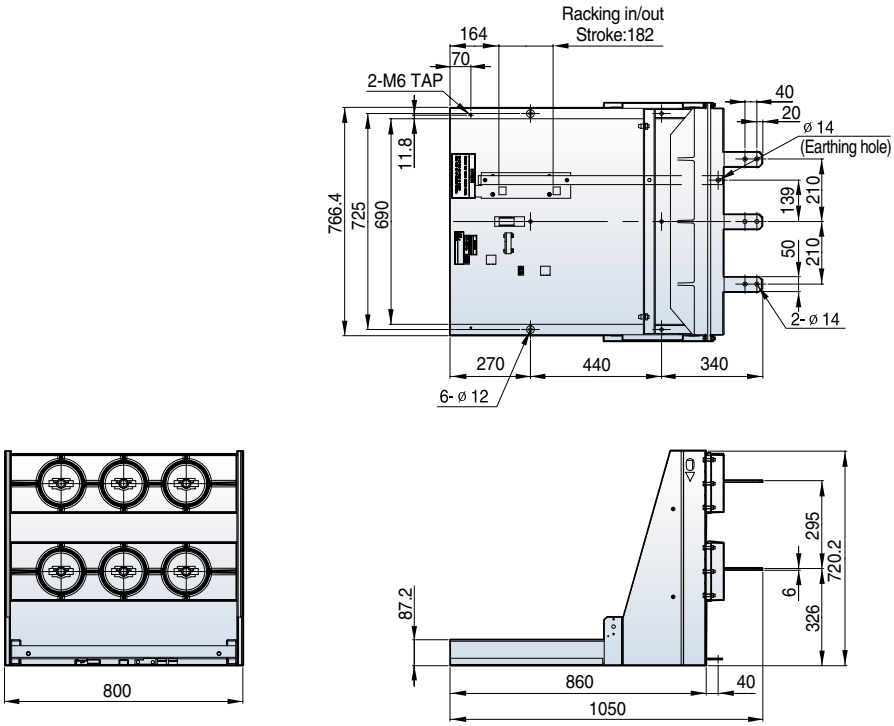
Withdrawable (G type cradle)



Rating	630A	1250A	2000A
A	6	10	20

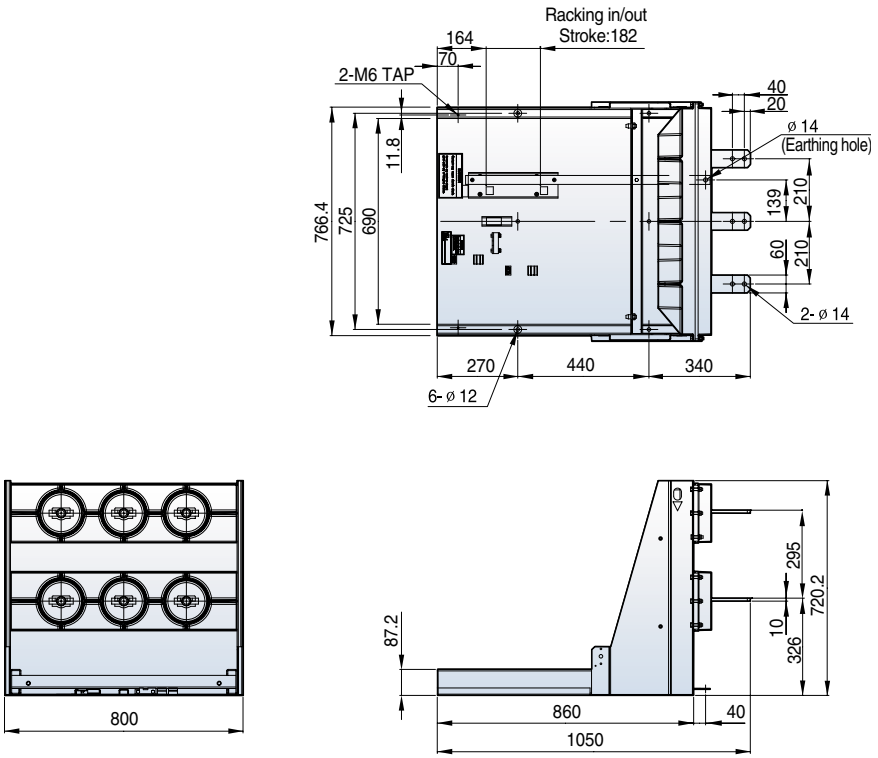
12/17.5kV, 20/25kA, 630A

Withdrawable (Compatible with existing E cradle, phase distance 210mm)



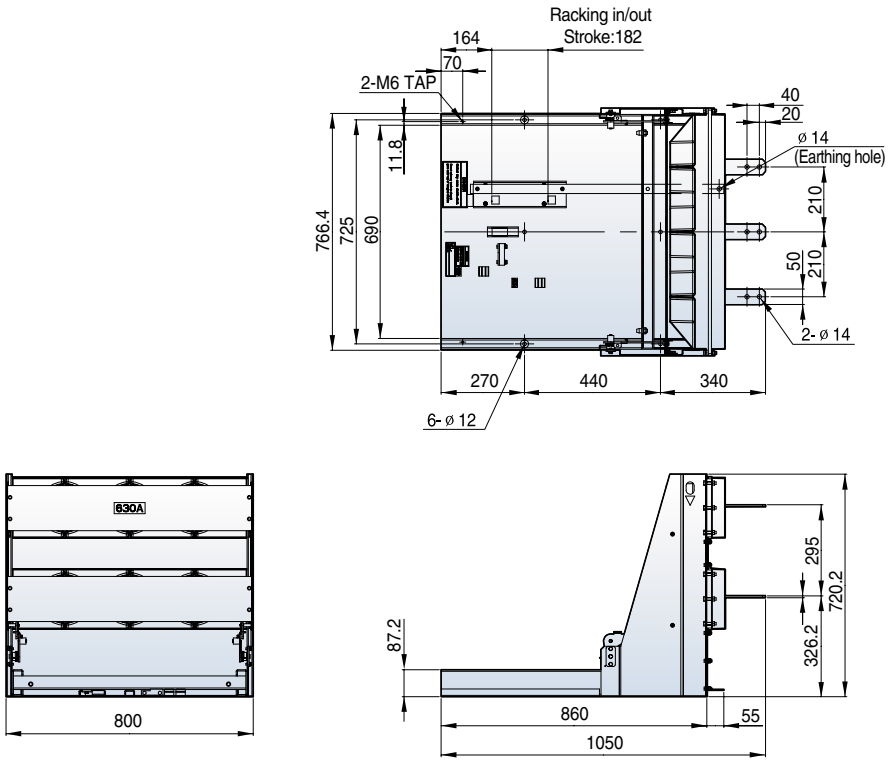
12/17.5kV, 20/25kA, 1250A

Withdrawable (Compatible with existing E cradle, phase distance 210mm)



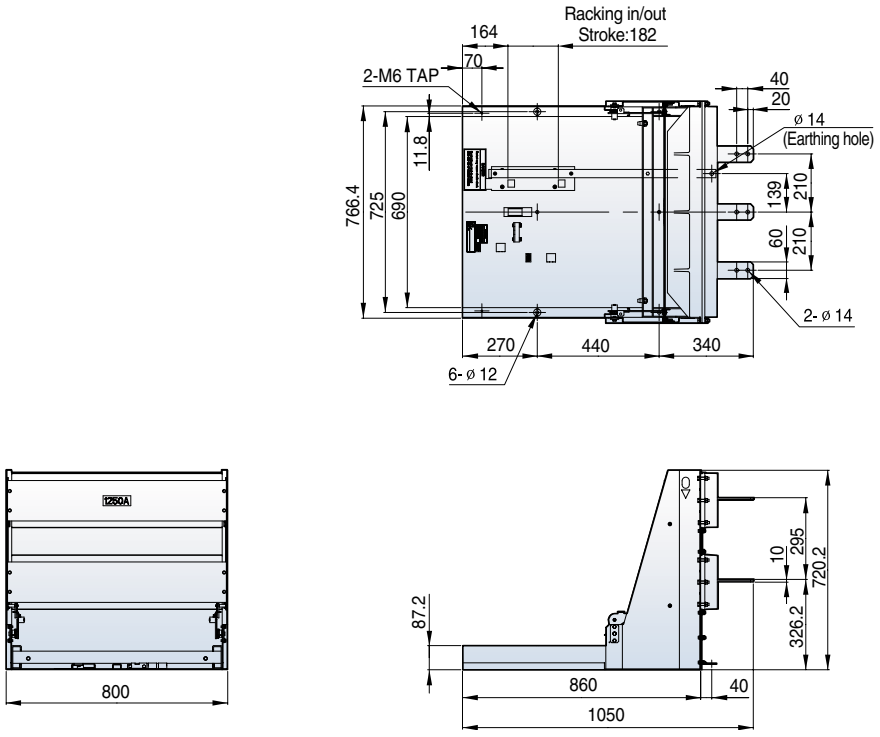
12/17.5kV, 20/25kA, 630A

Withdrawable (Compatible with existing F cradle, phase distance 210mm)



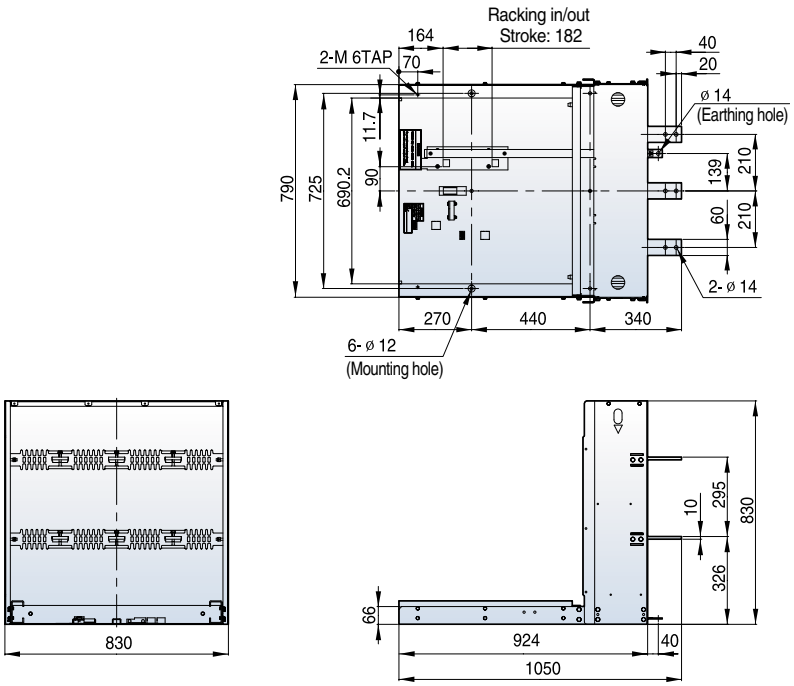
12/17.5kV, 20/25kA, 1250A

Withdrawable (Compatible with existing F cradle, phase distance 210mm)

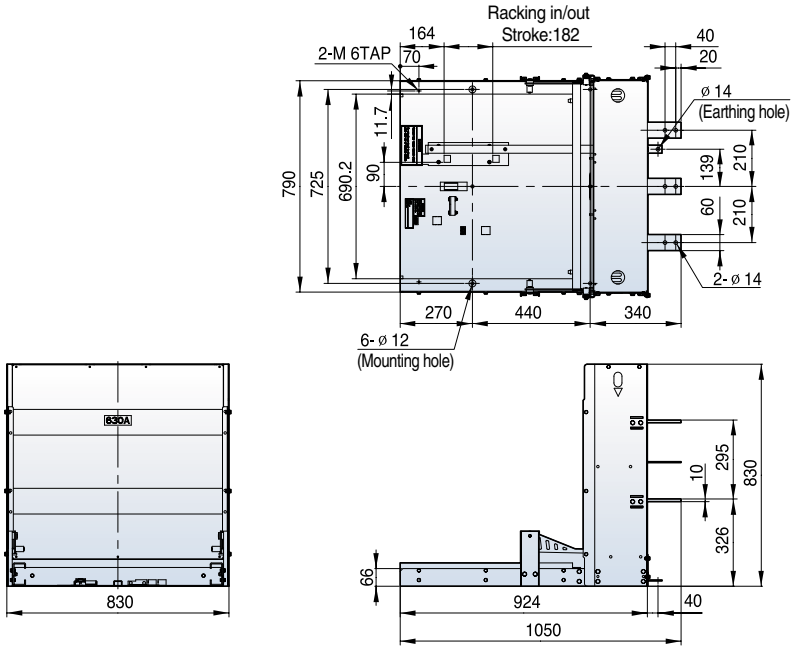


12/17.5kV, 20/25kA, 630/1250A

Withdrawable (E cradle, phase distance 210mm)

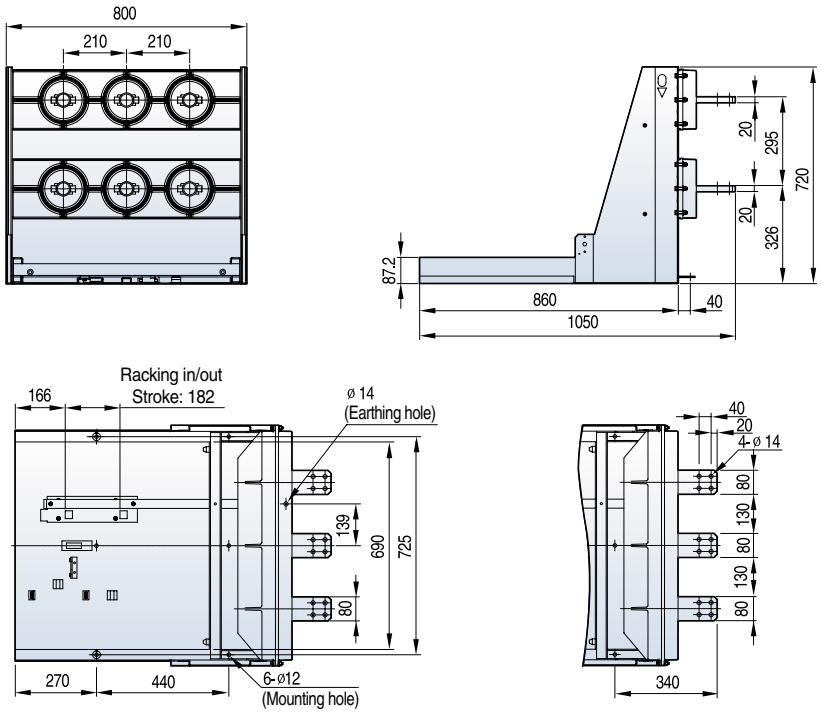


Withdrawable (F cradle, phase distance 210mm)

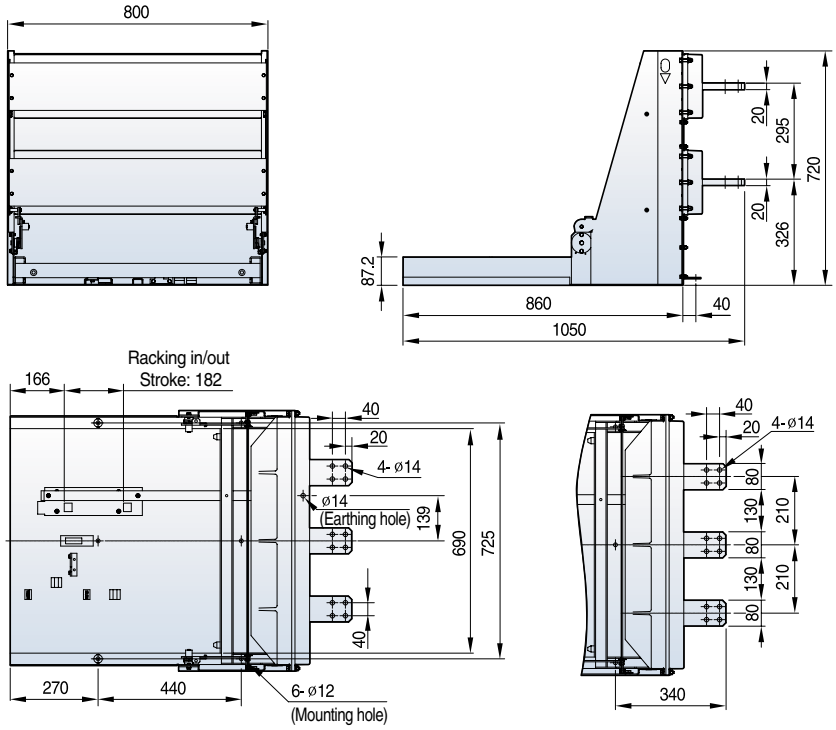


12/17.5kV, 20/25kA, 2000A

Withdrawable (E cradle, phase distance 210mm)

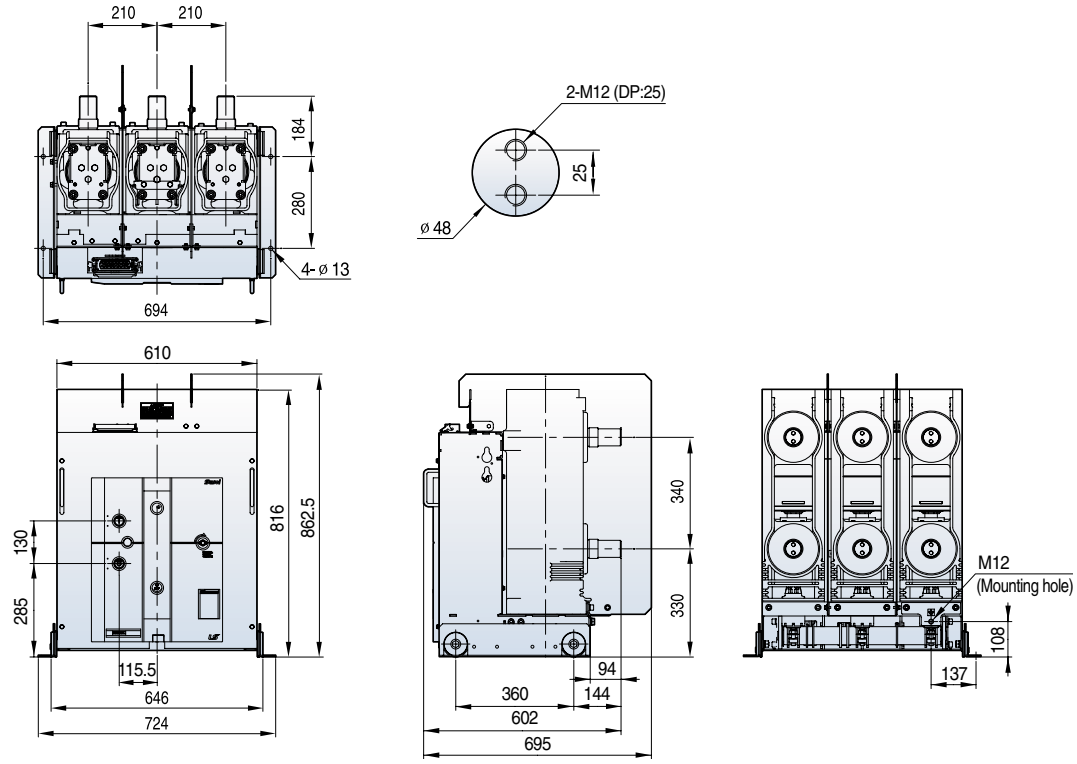


Withdrawable (F cradle, phase distance 210mm)

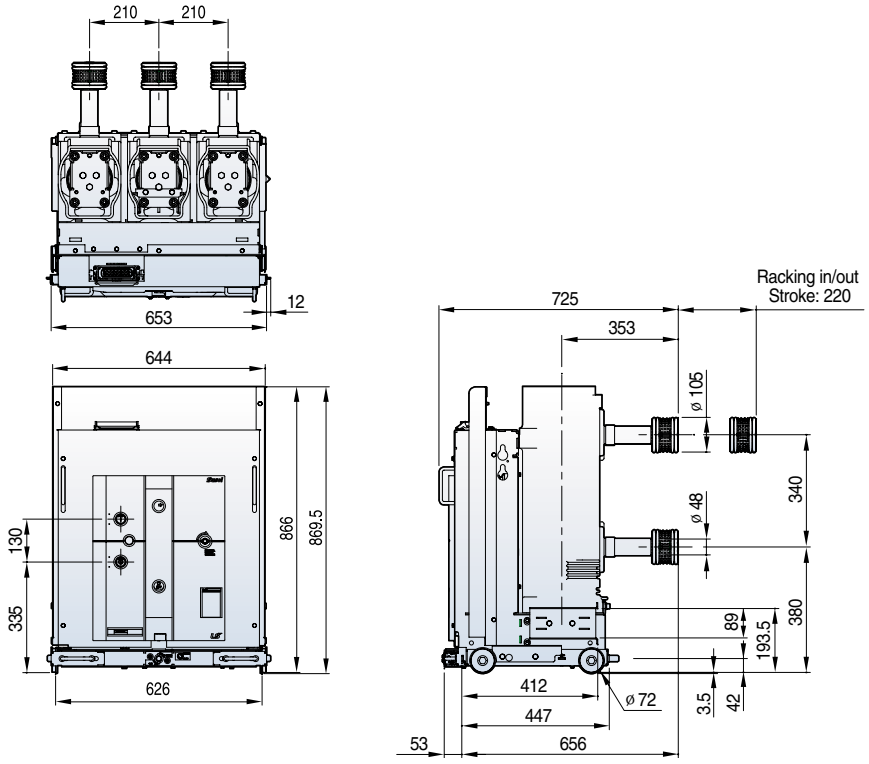


7.2/12/17.5kV, 50kA, 1250/2000A

Fixed (P type, phase distance 210mm)

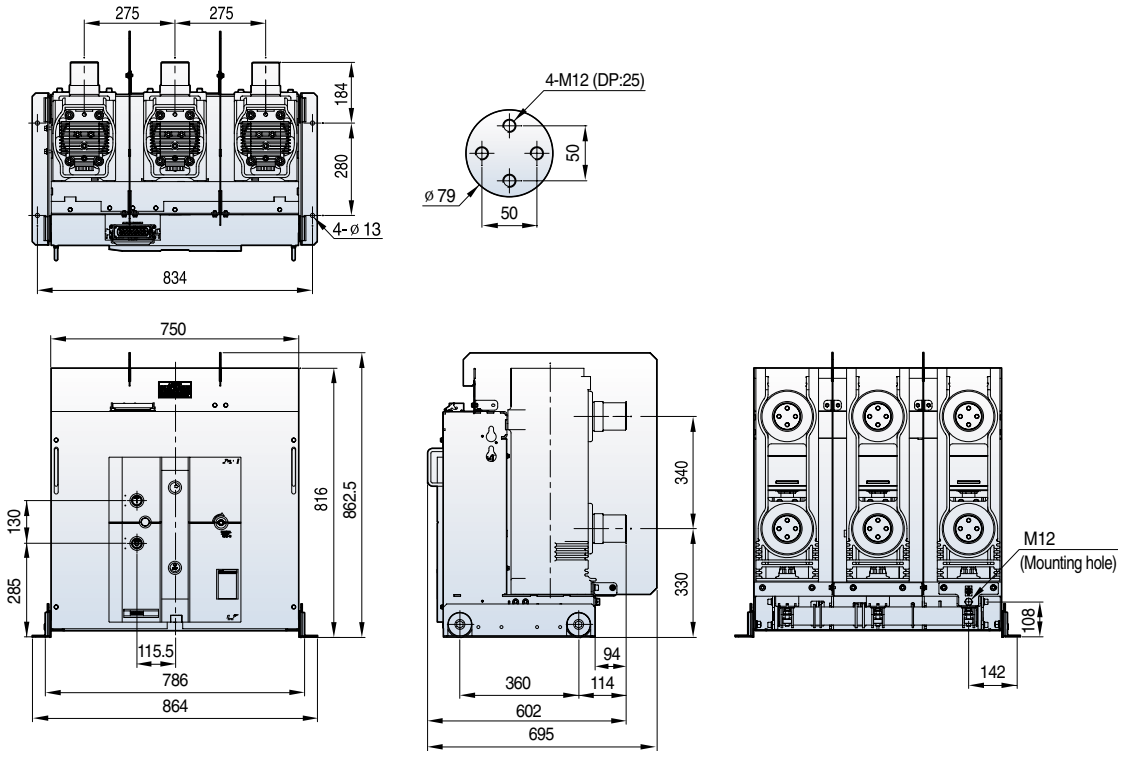


Withdrawable (H type unit, phase distance 210mm)

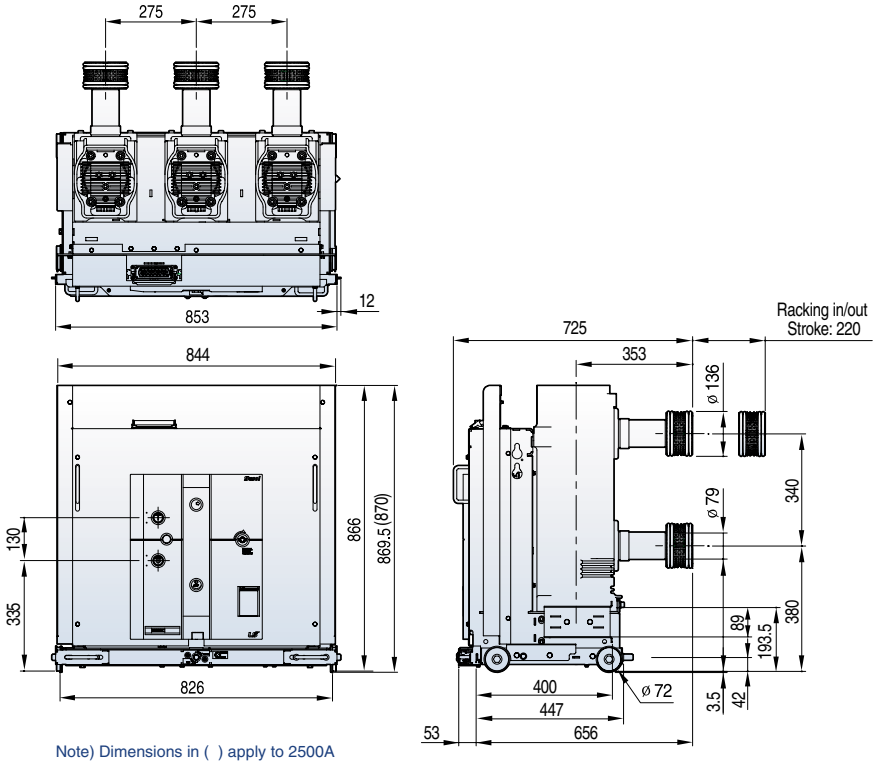


7.2/12/17.5kV, 50kA, 2500/3150A

Fixed (P type, phase distance 275mm)



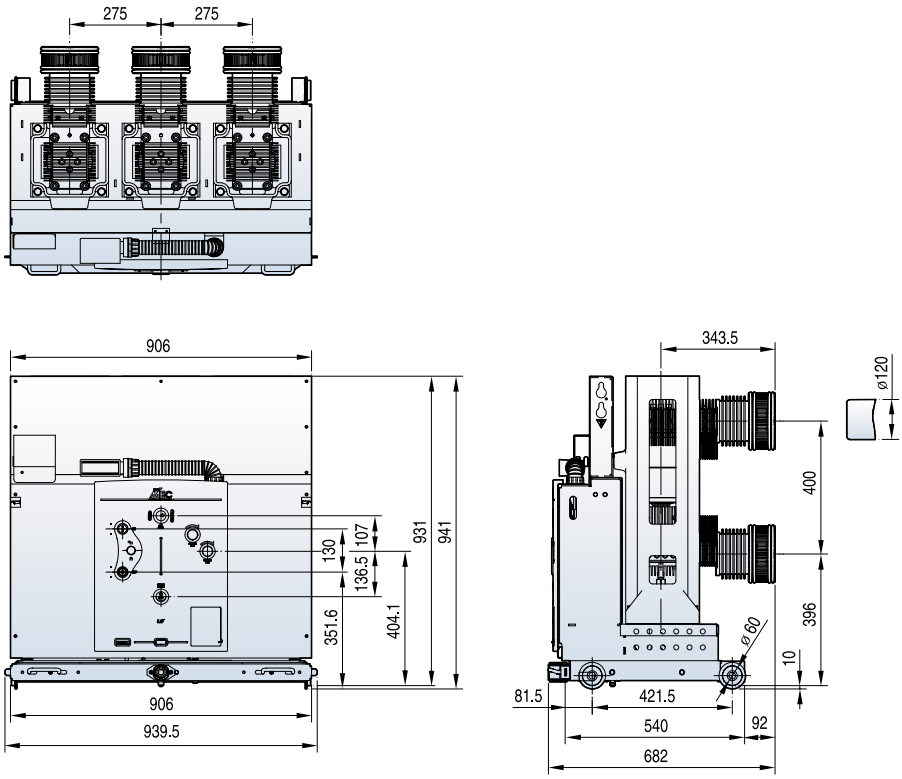
Withdrawable (H type unit, phase distance 275mm)



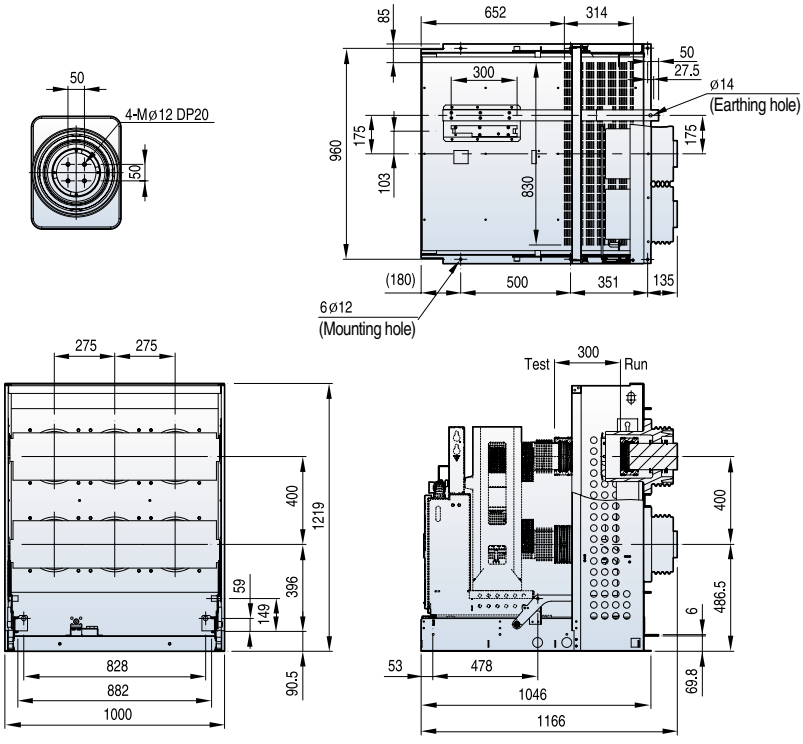
Note) Dimensions in ( ) apply to 2500A

7.2/12kV, 50kA, 4000A

Withdrawable (H type unit)

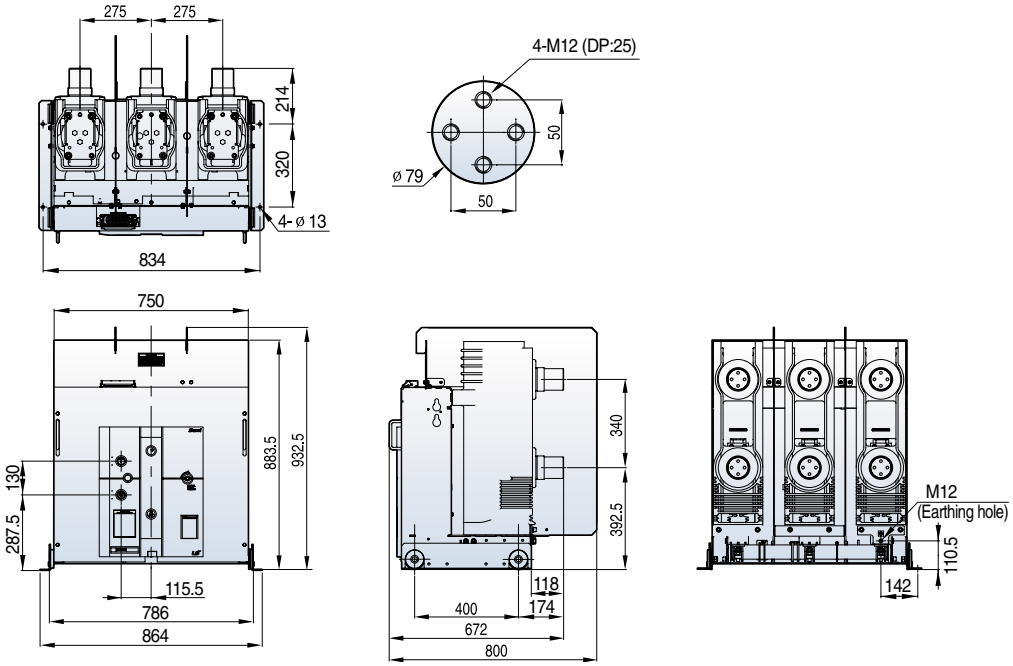


Withdrawable (K type cradle)

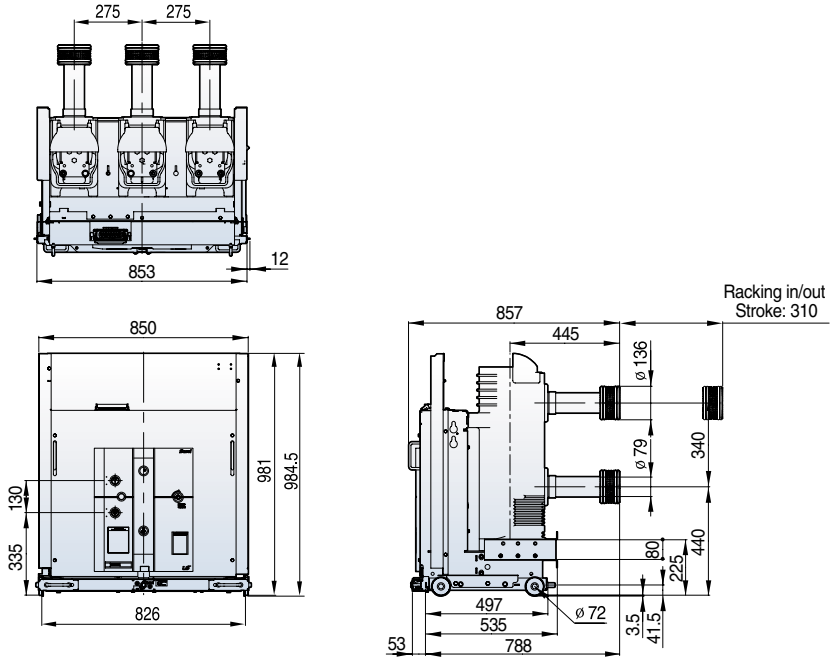


24kV, 25kA, 2500A

Fixed (P type, phase distance 275mm)

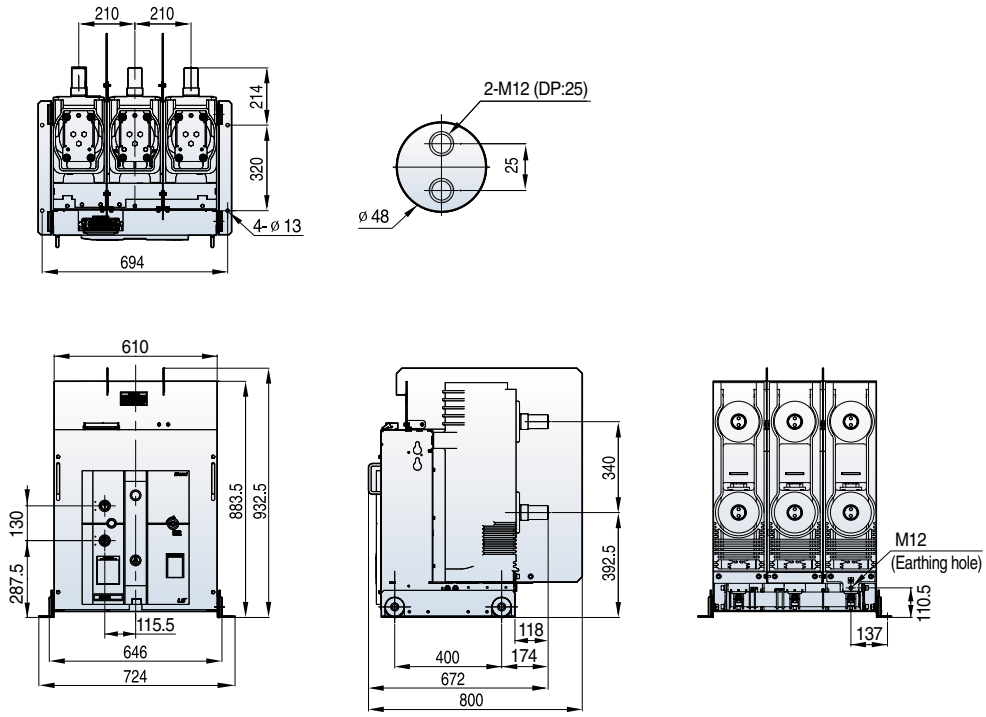


Withdrawable (H type unit, phase distance 275mm)

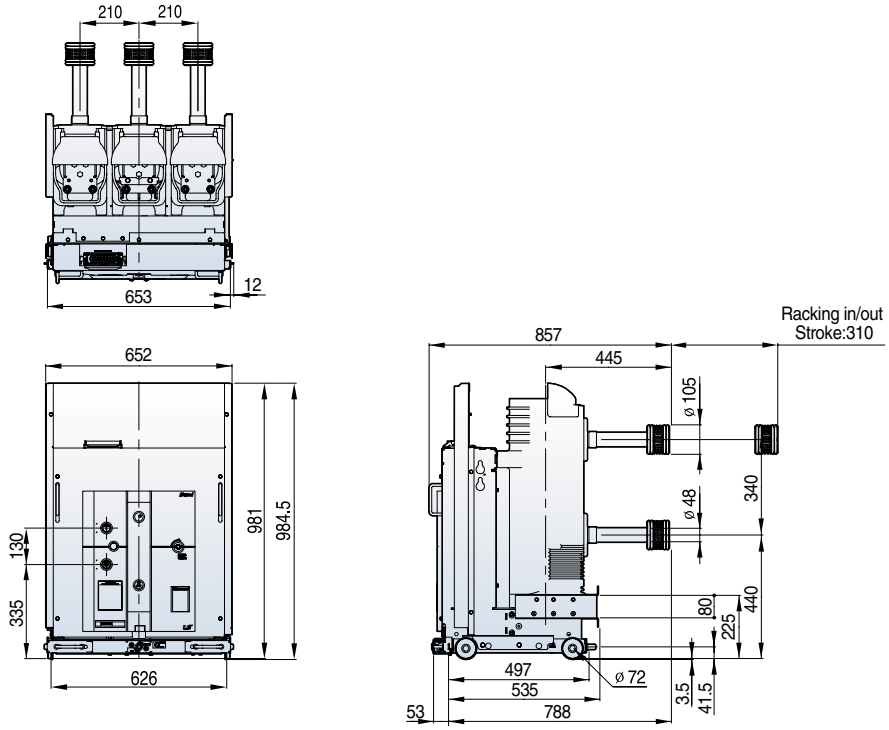


24kV, 31.5/40kA, 1250A

Fixed (P type, phase distance 210mm)

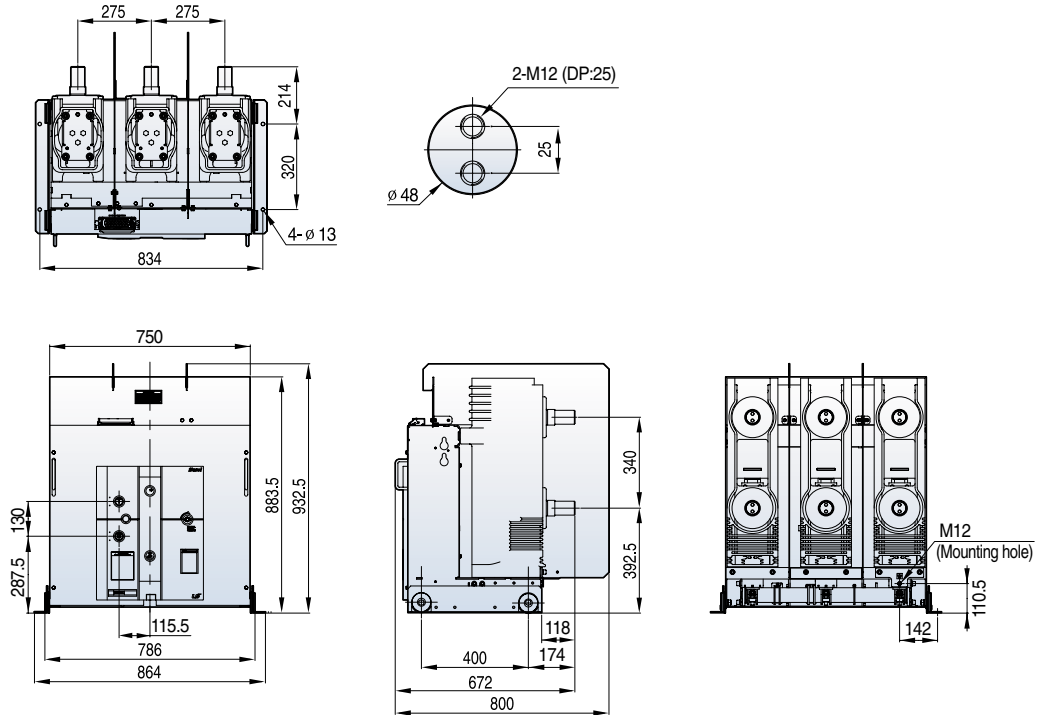


Withdrawable (H type unit, phase distance 210mm)

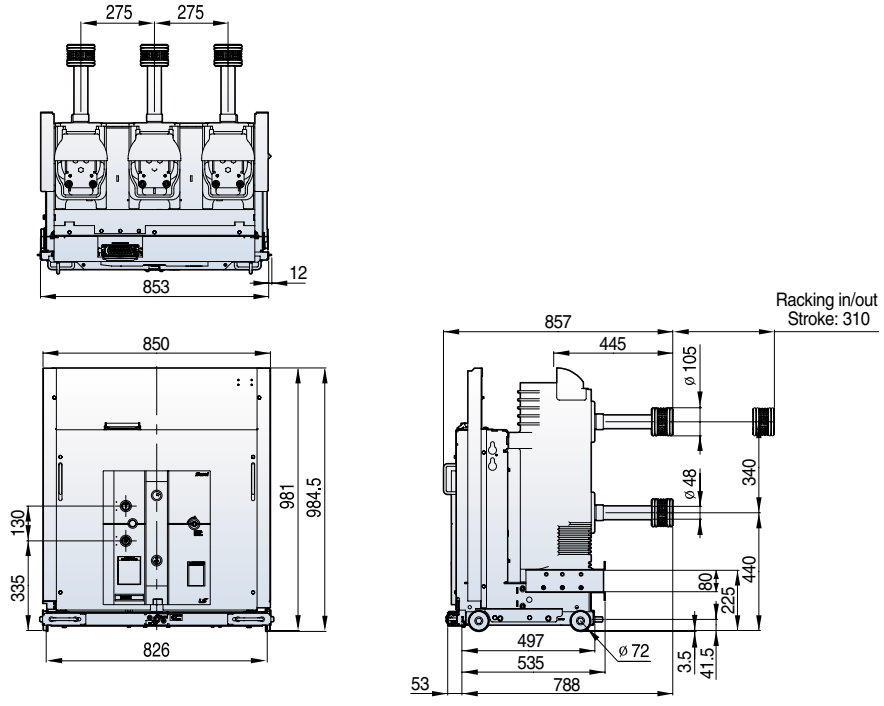


24kV, 31.5/40kA, 2000A

Fixed (P type, phase distance 275mm)

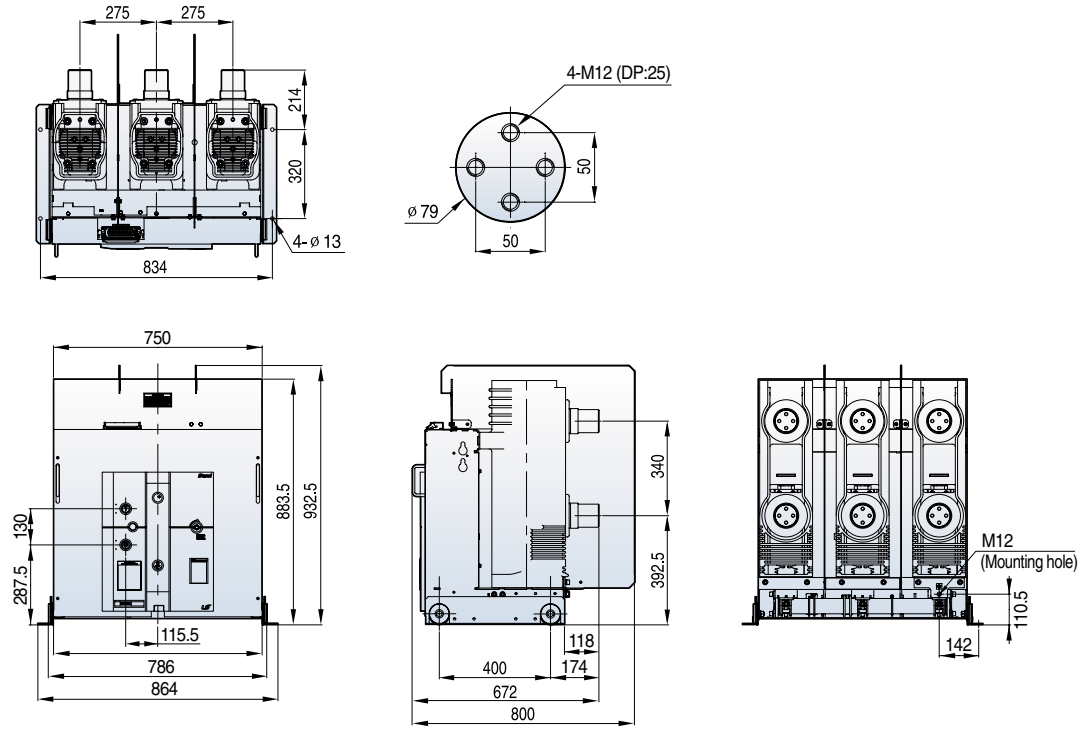


Withdrawable (H type unit, phase distance 275mm)

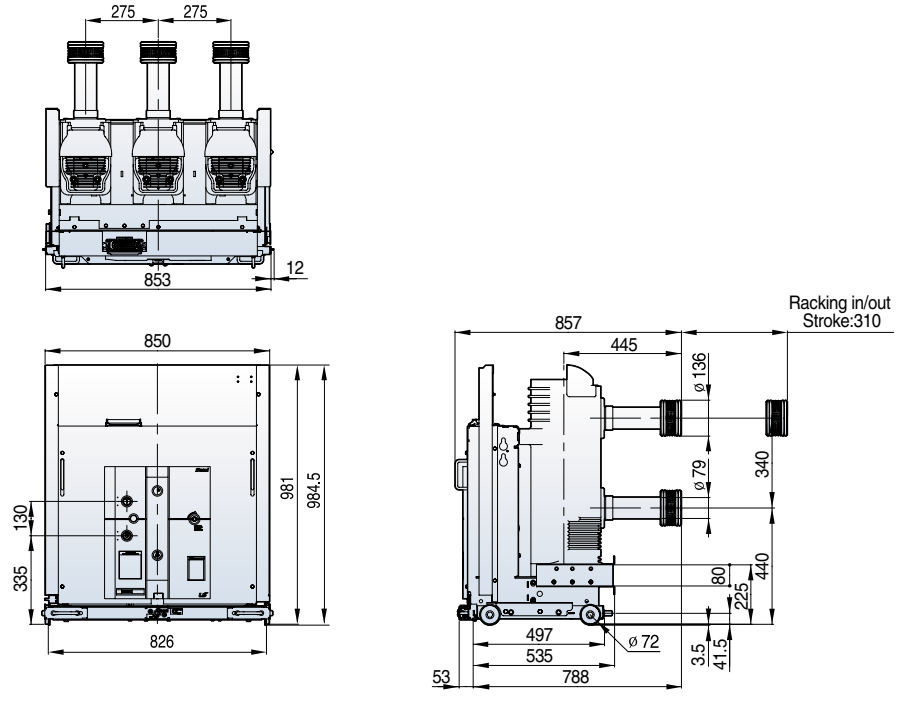


24kV, 31.5/40kA, 3150A

Fixed (P type)

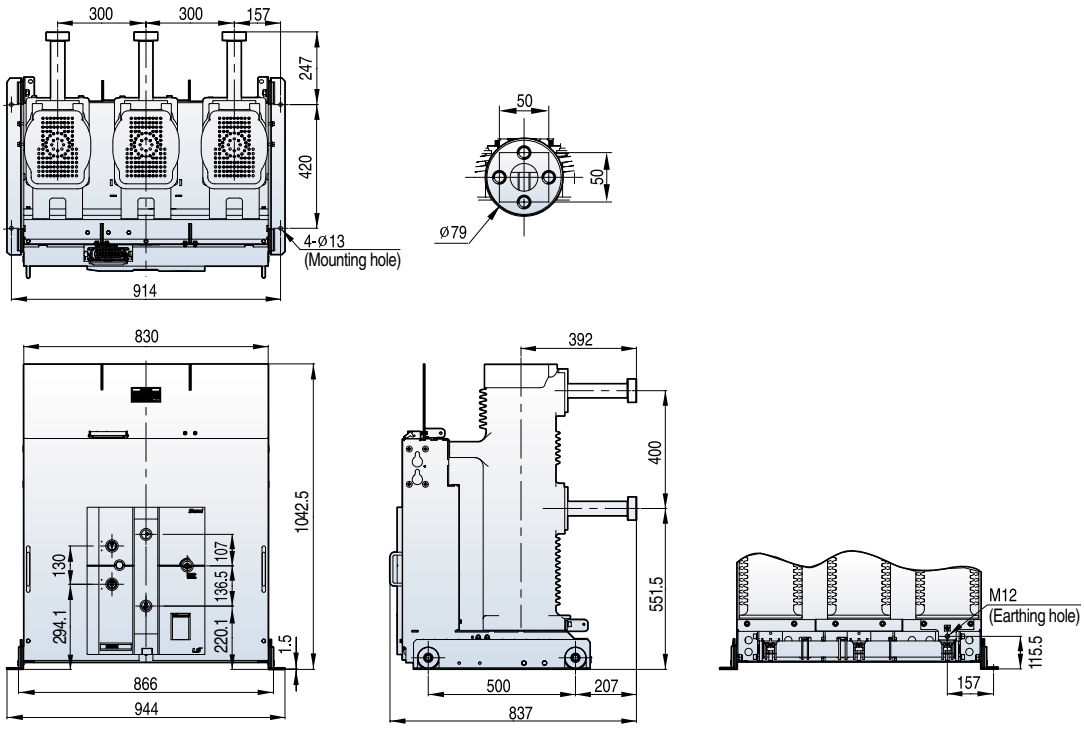


Withdrawable (H type unit)

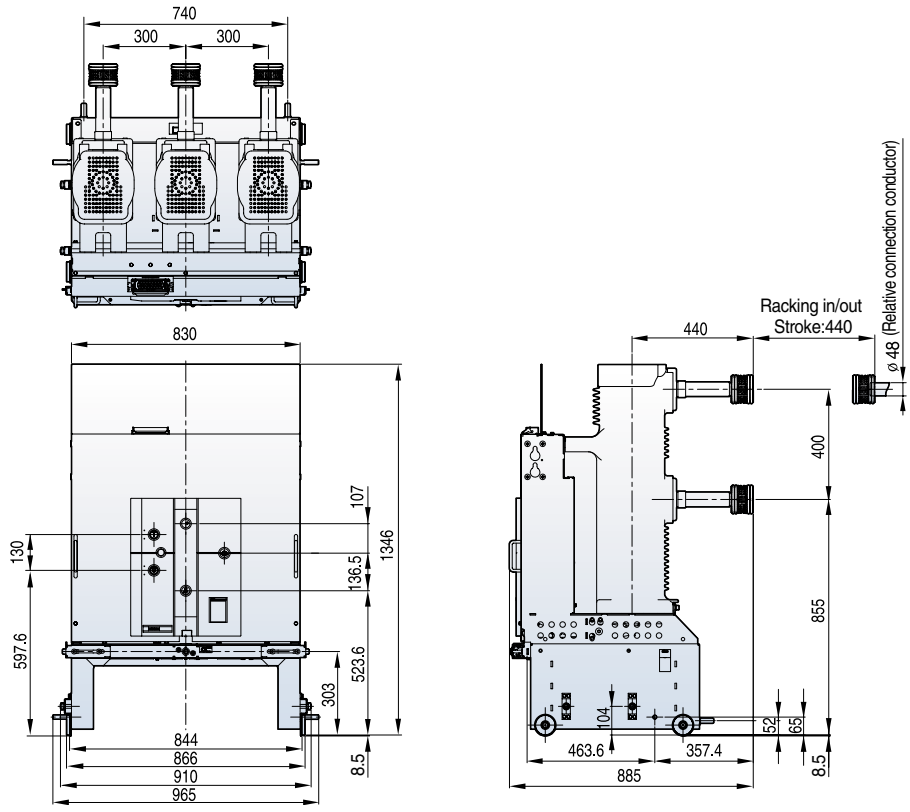


36kV, 25/31.5/40kA, 1250/2000A

Fixed (P type)

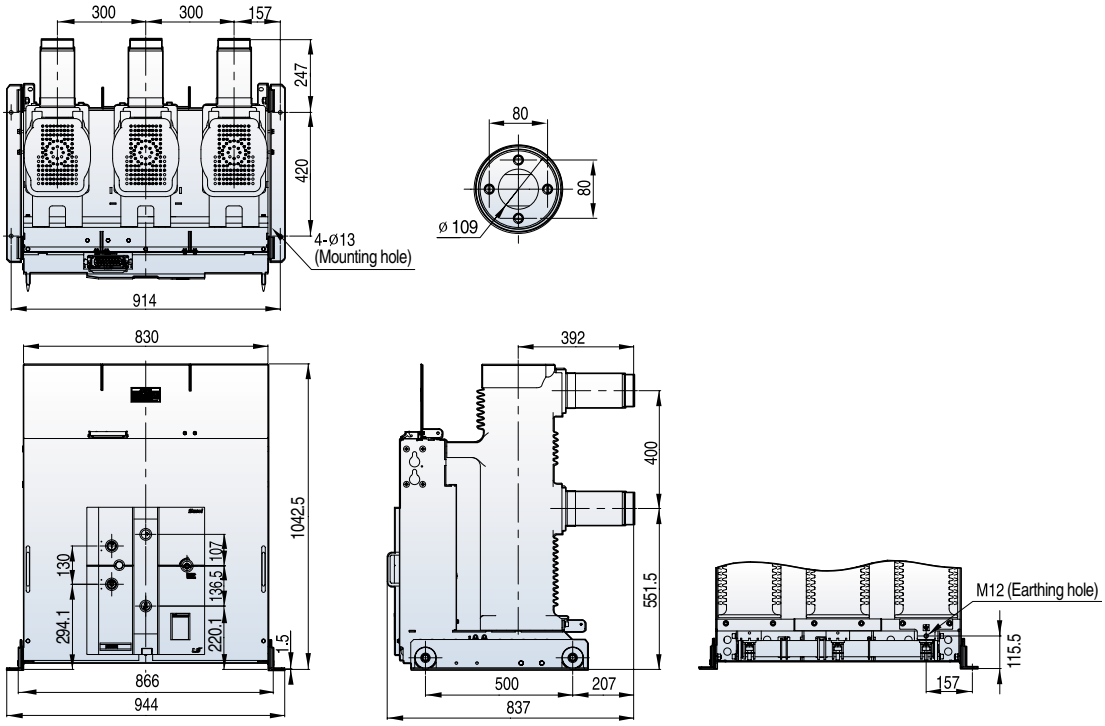


Withdrawable (H type unit)

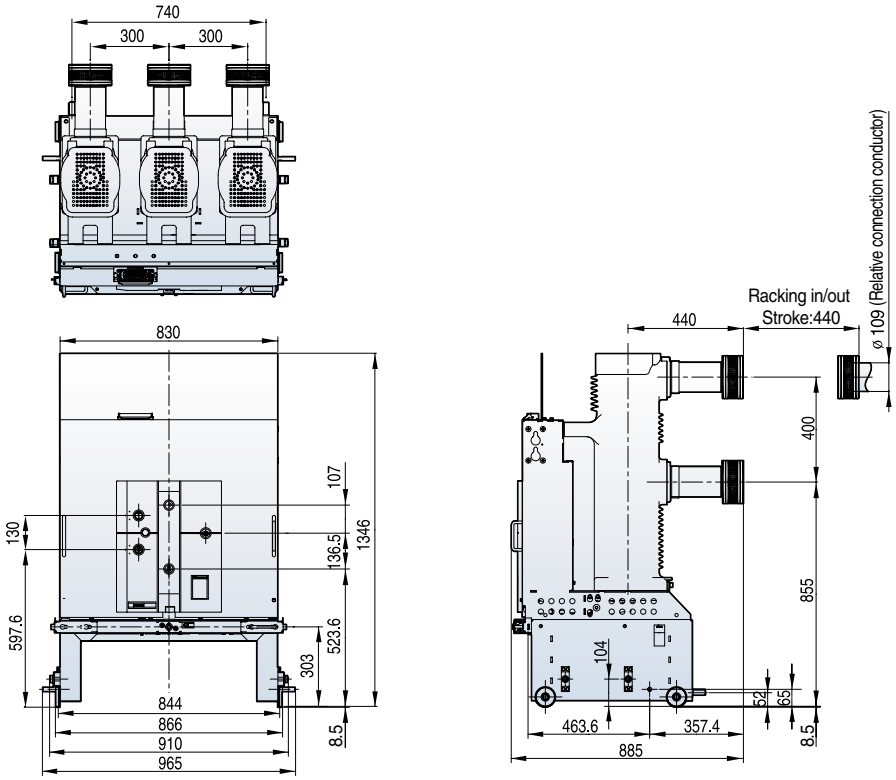


36kV, 25/31.5/40kA, 3150A

Fixed (P type)

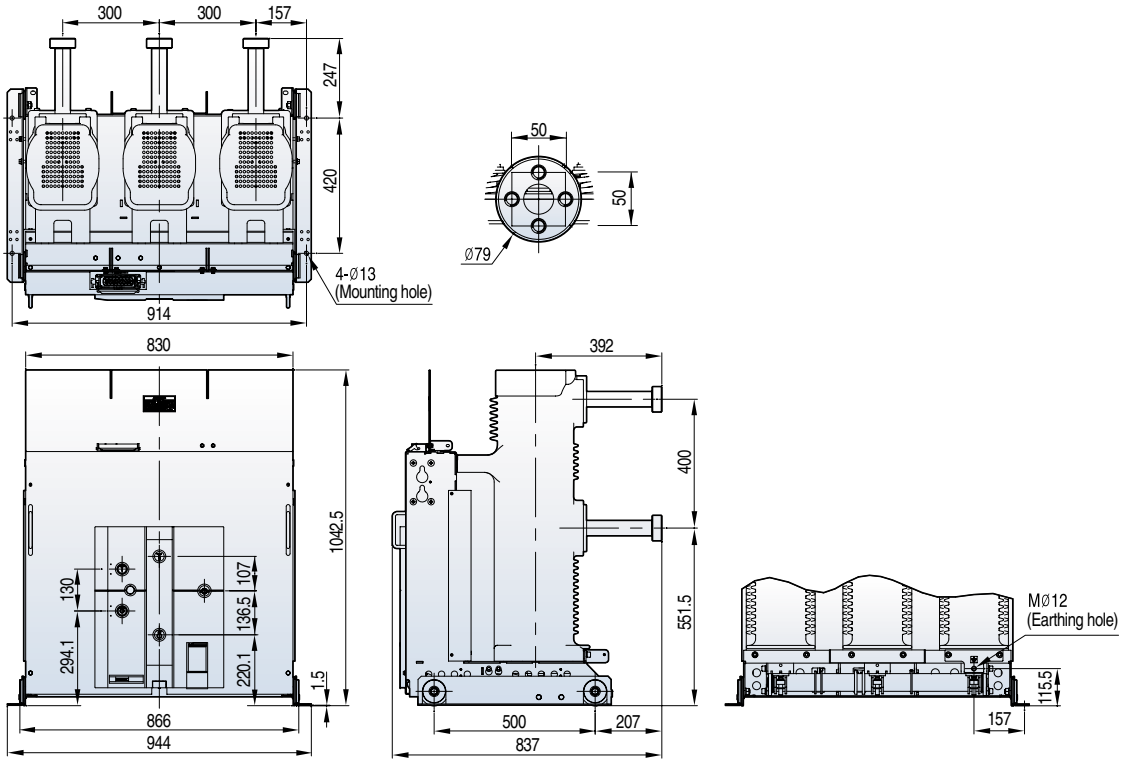


Withdrawable (H type unit)

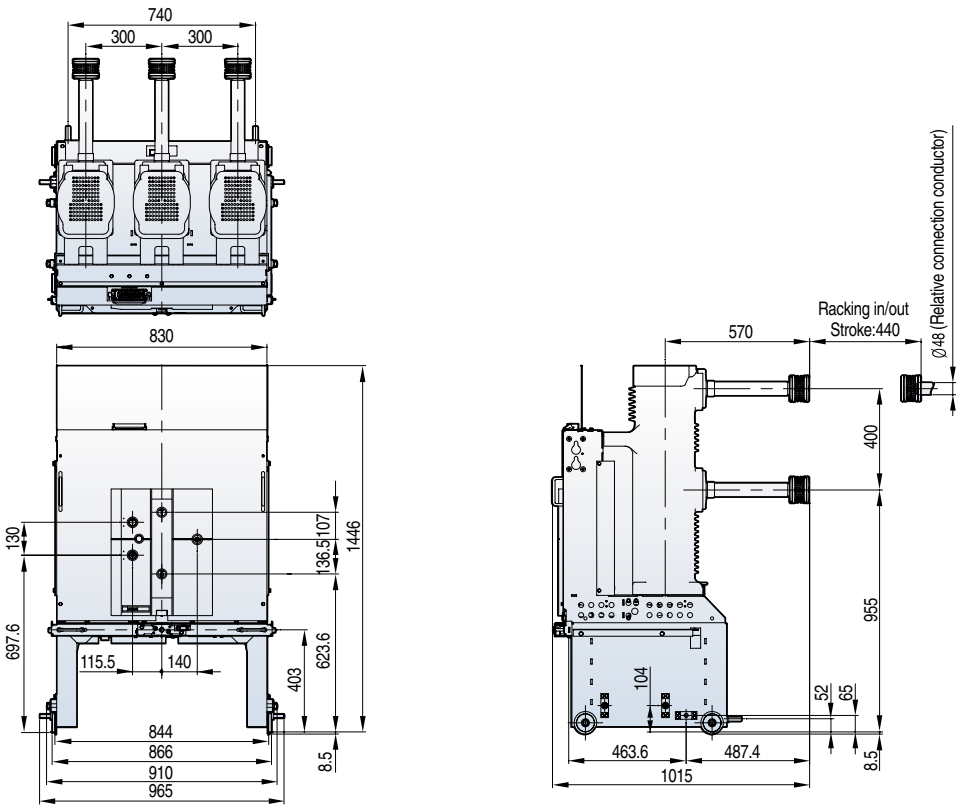


40.5kV, 25/31.5kA, 1250/2000A

Fixed (P type)

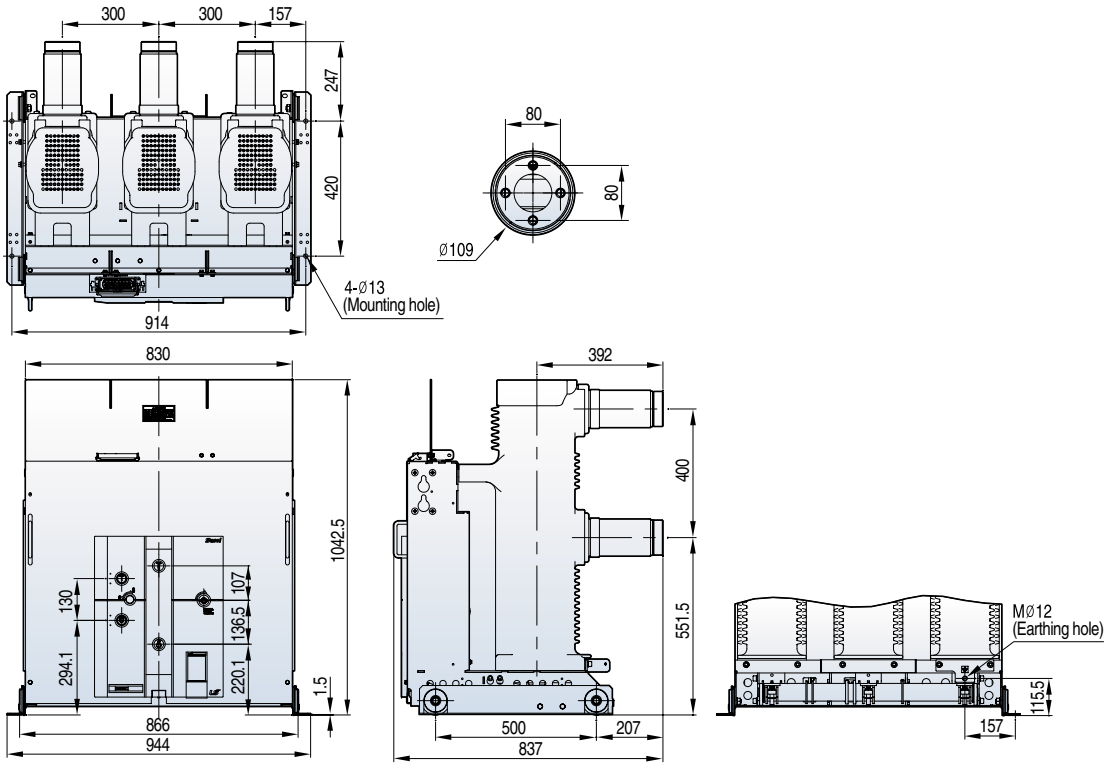


Withdrawable (H type unit)

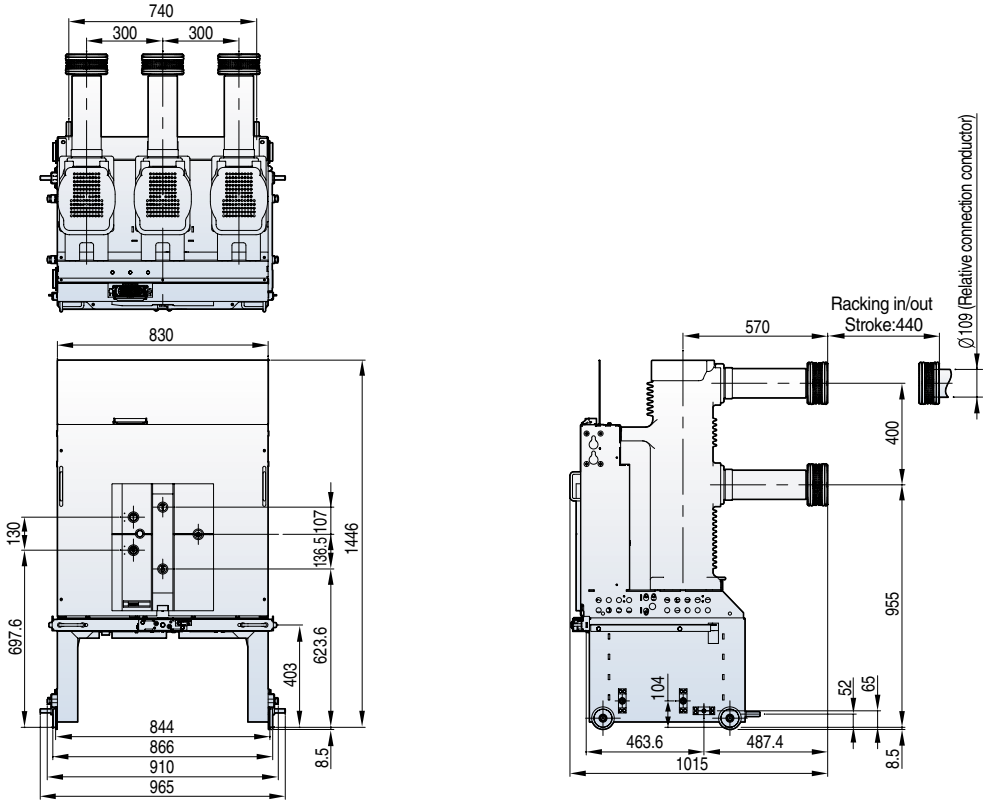


40.5kV, 25/31.5kA, 3150A

Fixed (P type)

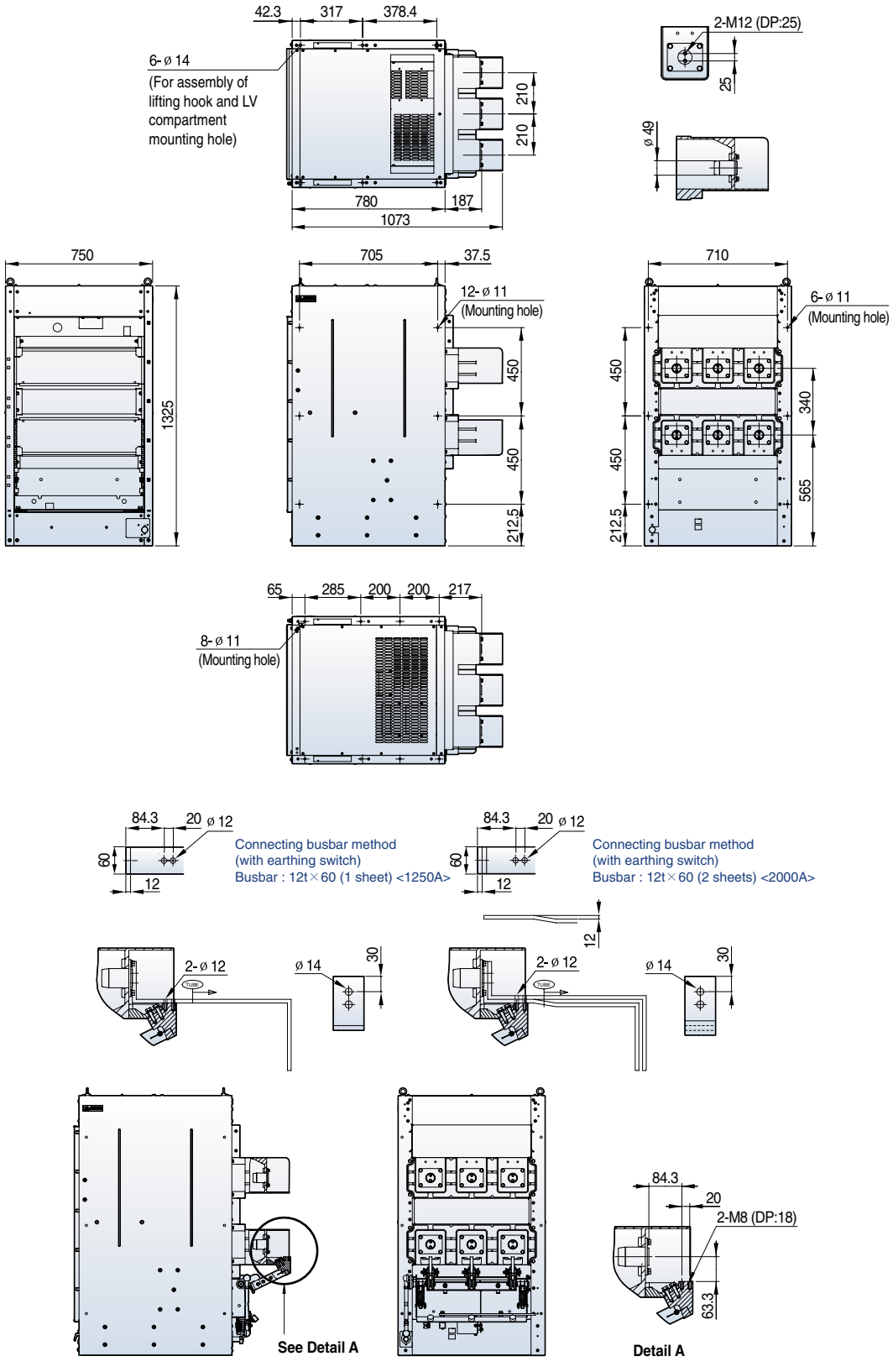


Withdrawable (H type unit)



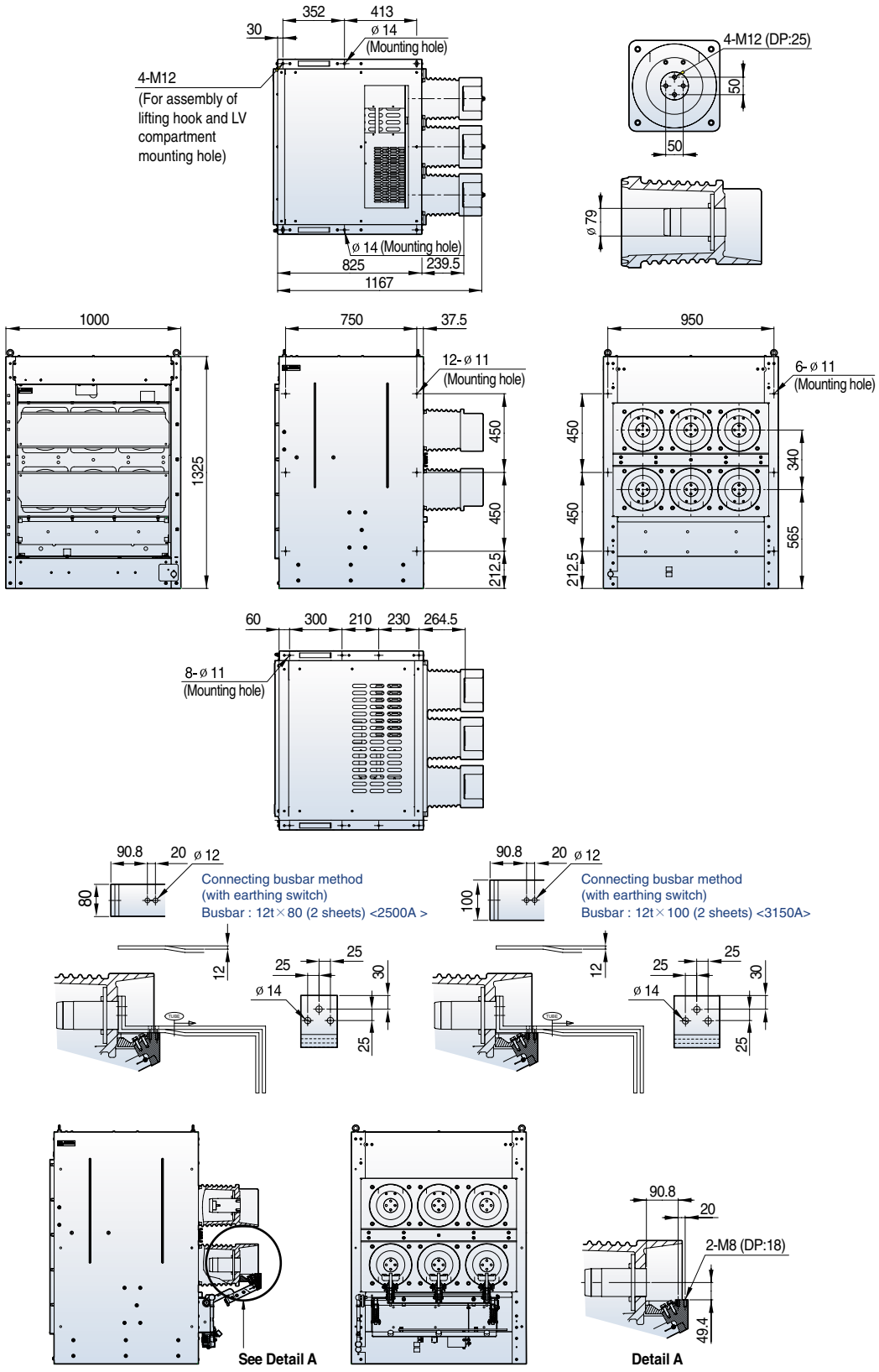
7.2/12/17.5kV, 50kA, 1250/2000A

Withdrawable (H cradle, phase distance 210mm)



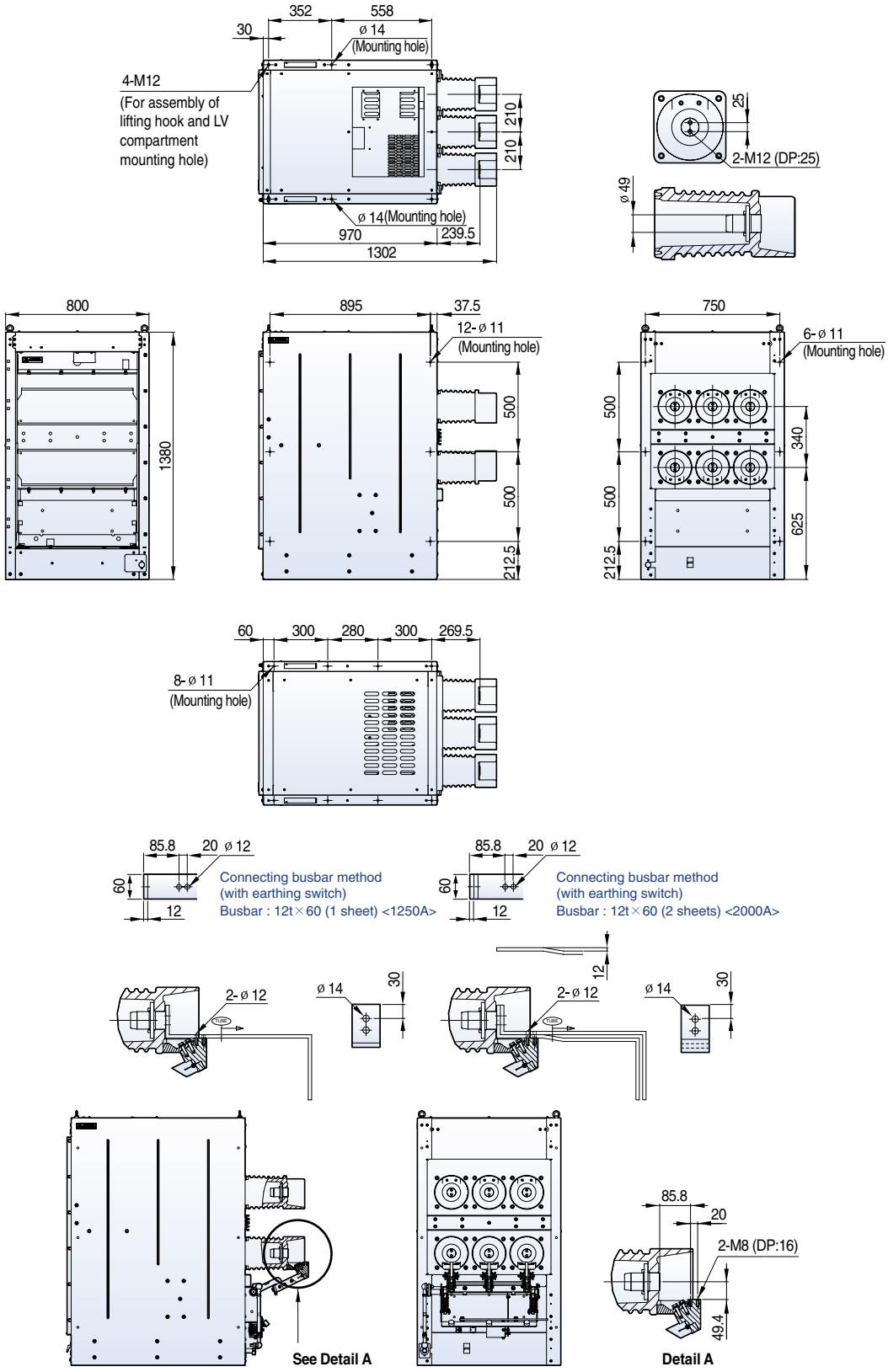
7.2/12/17.5kV, 50kA, 2500/3150A

Withdrawable (H cradle, phase distance 275mm)



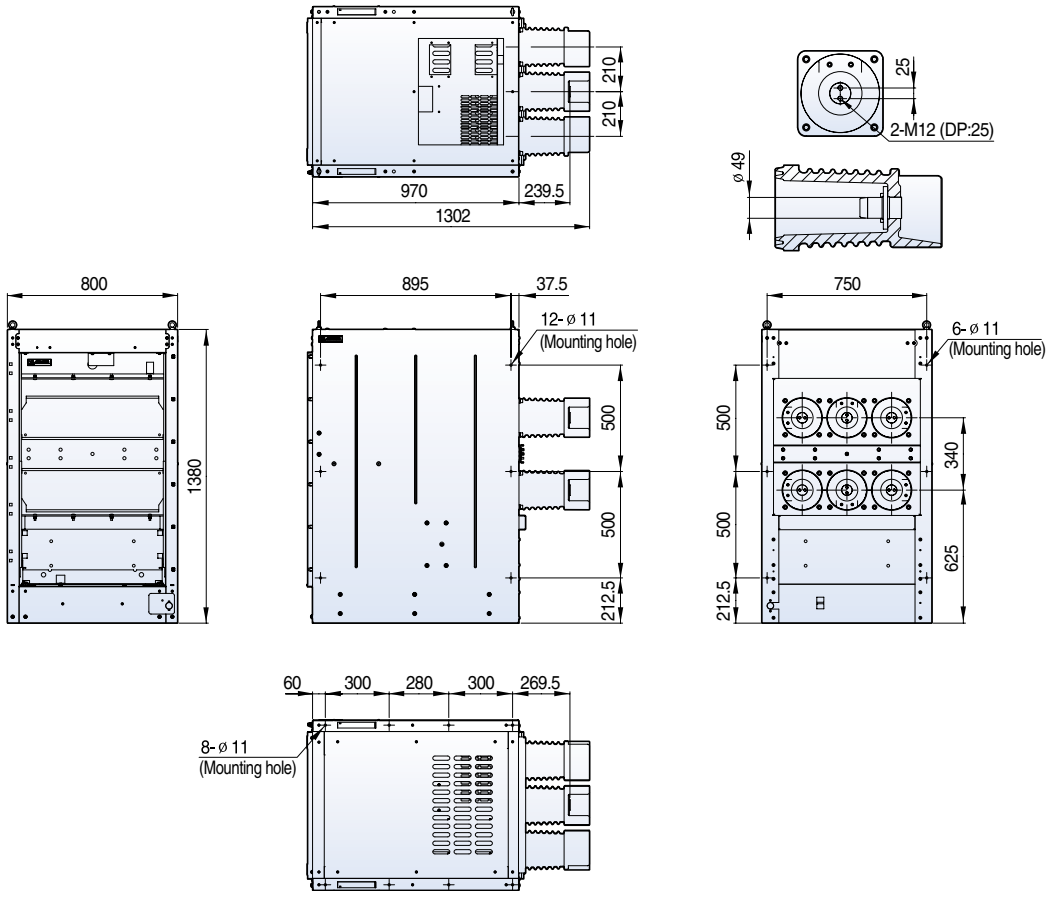
24kV, 31.5/40kA, 1250/2000A

Withdrawable (H cradle, phase distance 210mm)



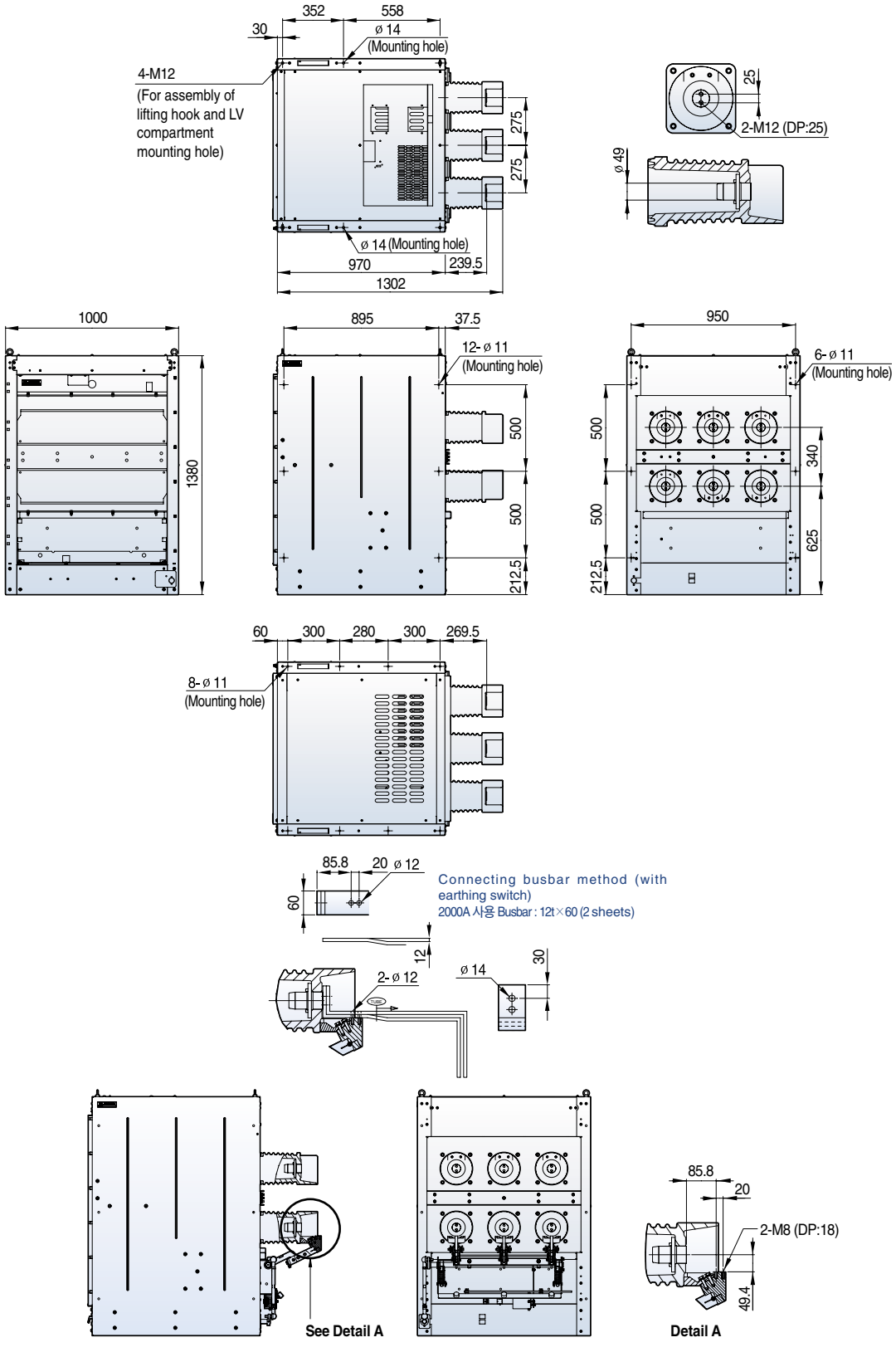
24kV, 31.5/40kA, 1250/2000A

Withdrawable (H cradle, Rotated bushing type, phase distance 210mm)



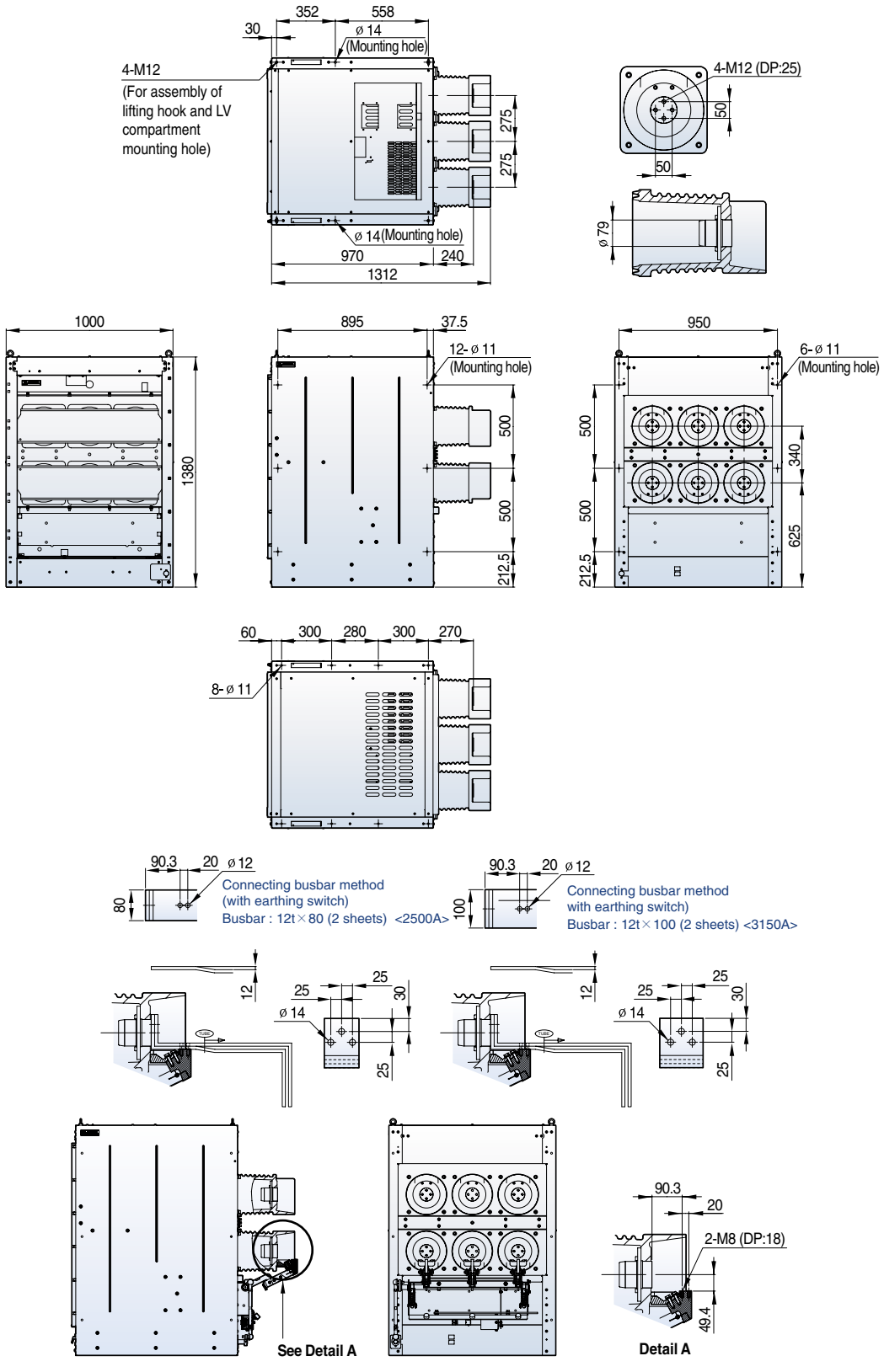
24kV, 31.5/40kA, 2000A

Withdrawable (H cradle, phase distance 275mm)



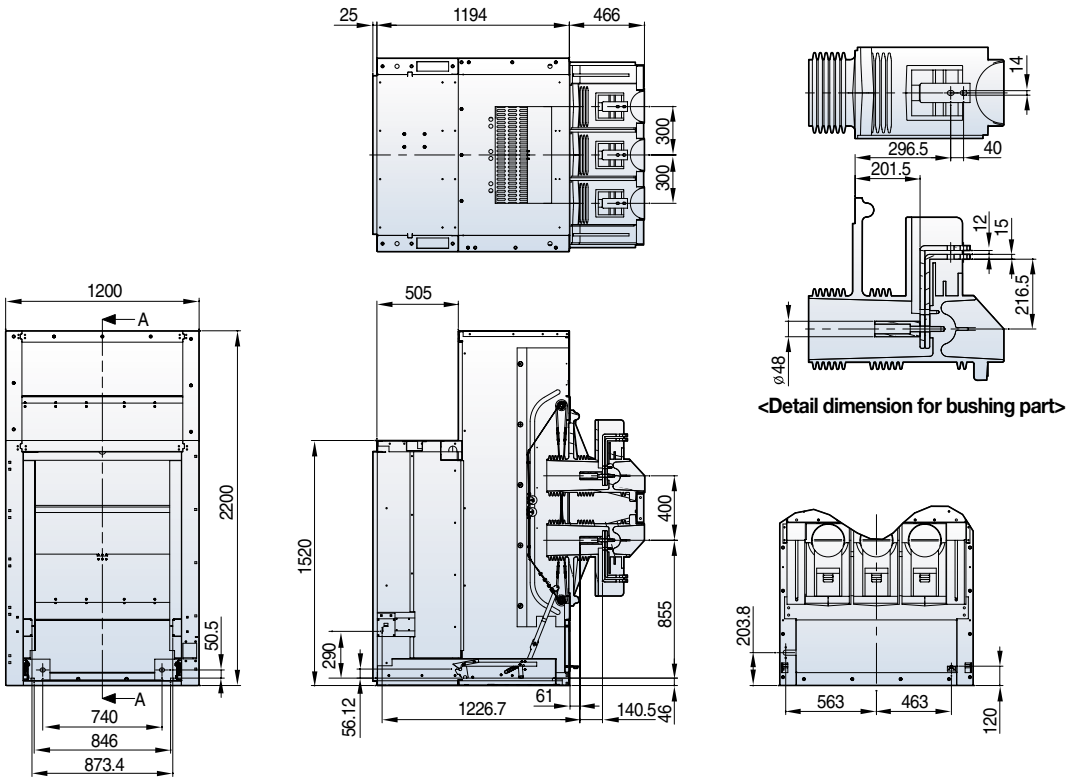
24kV, 25kA, 2500A, 31.5/40kA, 3150A

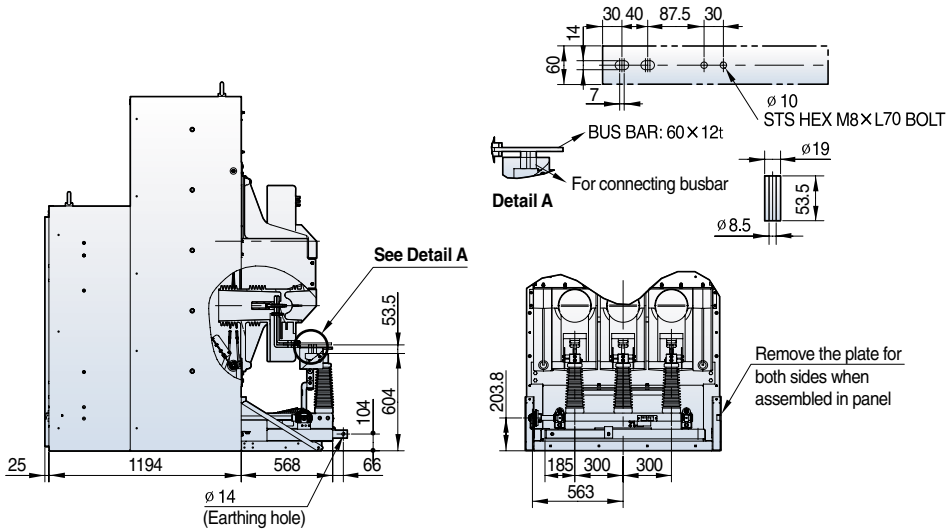
Withdrawable (H cradle, phase distance 275mm)



36kV, 25/31.5/40kA, 1250/2000A

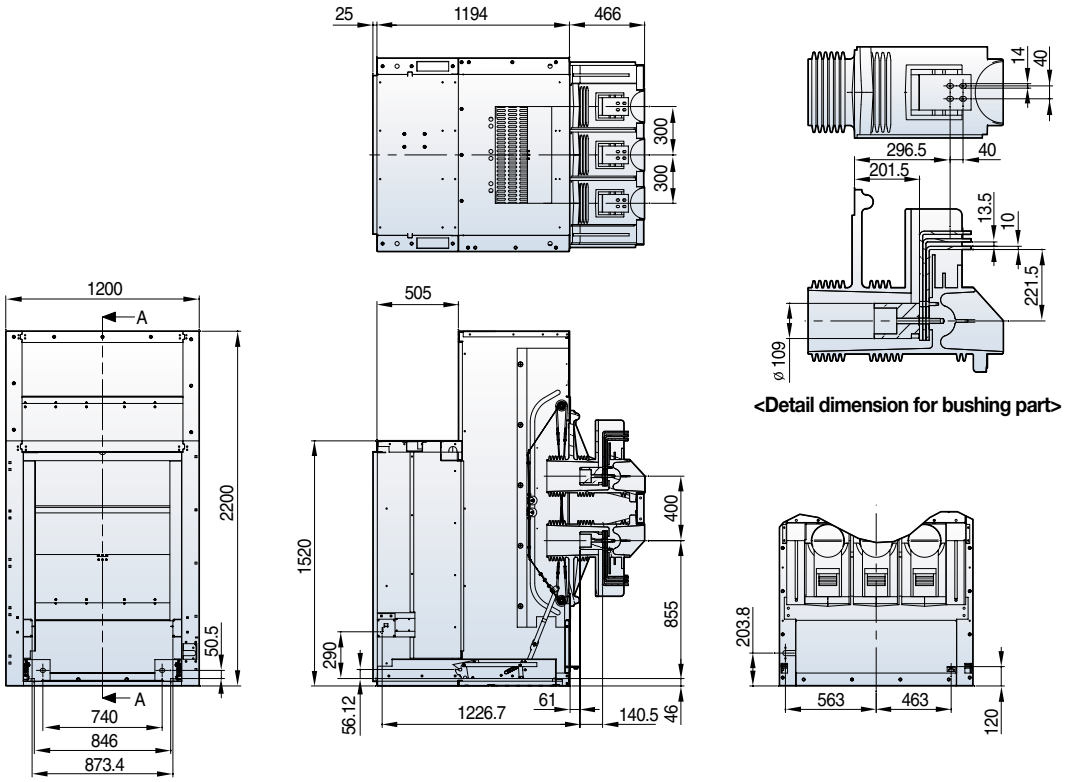
Withdrawable (H type cradle)

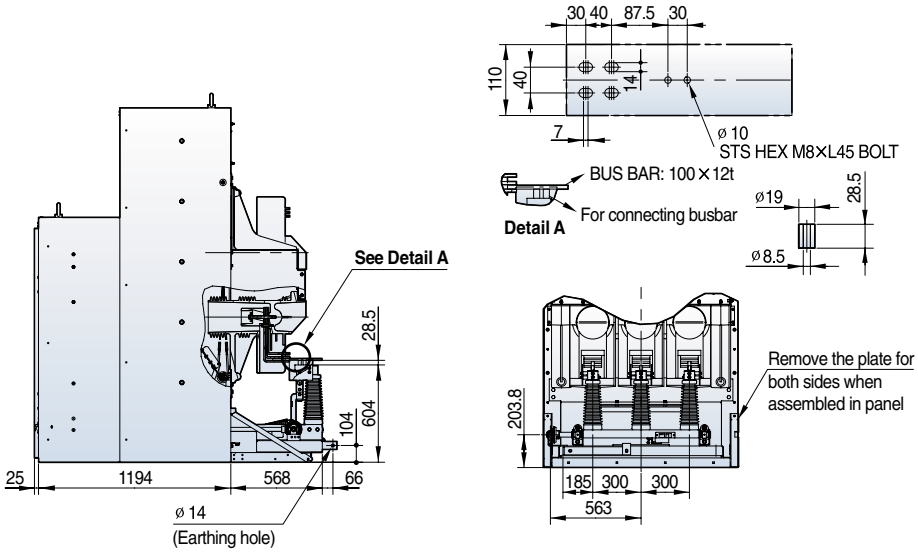




36kV, 25/31.5/40kA, 3150A

Withdrawable (H type cradle)





Side-Mount type VCB

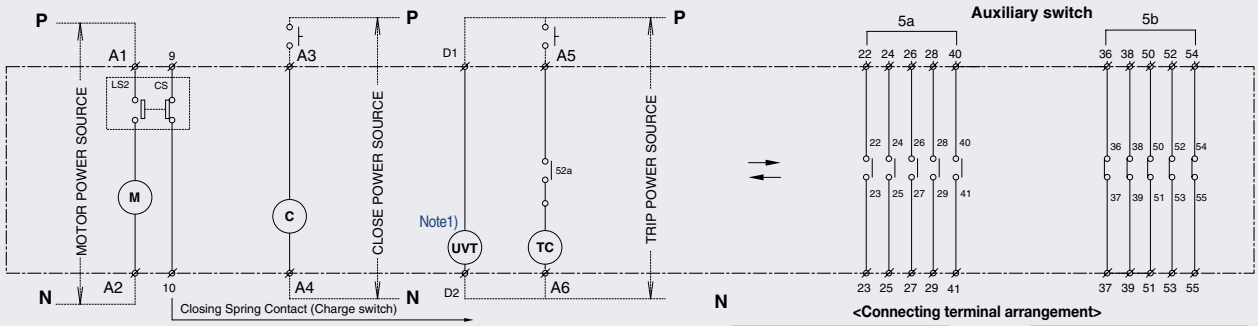
Susol

25.8kV 16kA 630A

Item			VL-25□ 16B 06
Rated voltage		Ur (kV)	25.8
Rated normal current		Ir (A)	630
Rated frequency		fr (Hz)	50/60
Rated short-circuit breaking current		Isc (kA)	16
Rated short-time withstand current (3 sec)		Ik (kA)	16
Rated short-circuit breaking capacity		(MVA)	665/715
Rated short-circuit making current		Ip (kA)	40/41.6
Rated breaking time		(cycle)	3
Rated withstand	Power frequency (1 min)	Ud (kV)	60
voltage	Impulse (1.2×50㎲)	Up (kV)	125
Rated operating sequence			O-0.3s-CO-3min-CO
Control voltage	Closing coil	(V)	DC 24~30V, DC 48~60V, DC 110V, DC 125V, DC 220V, AC 48V, AC 100~130V, AC 200~250V
	Trip coil	(V)	DC 24~30V, DC 48~60V, DC 110V, DC 125V, DC 220V, AC 48V, AC 100~130V, AC 200~250V
Auxiliary contact			5a5b
Rated opening time		(sec)	≤ 0.04
No-load closing time		(sec)	≤ 0.06
Type test class	Mechanical		M1
	Electrical		E1
	Capacitive current switching		C1
Lifetime *	Mechanical	(time)	2,000
	Electrical	(time)	2,000
Installation	Fixed	Right	R type
		Left	L type
Pole centre distance		(mm)	210
Weight	CB	(kg)	95
Standards			IEC 62271-100

* Lifetime with maintenance

Control circuit diagram



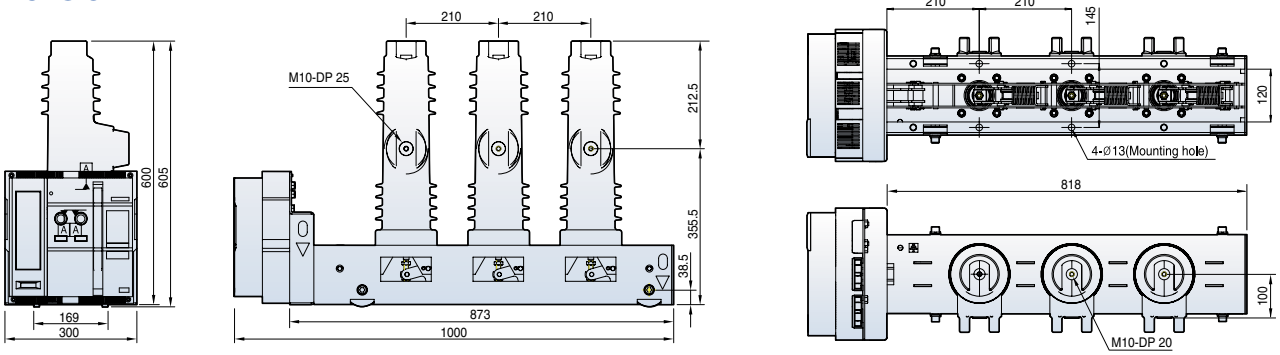
Ø : External terminal of VCB
52 : Vacuum circuit breaker
M : Spring charging motor
TC : Trip coil(SHT)

C : Closing coil(CC)
UVT : Under Voltage Trip
52a : Auxiliary switch (a)
52b : Auxiliary switch (b)

LS2 : Motor stop limit switch
CS : Closing spring charged indication limit switch

Note) 1. UVT : Under Voltage Trip (No. D1, D2) ——————— Option
* Closing and Trip coil : One Pulse type
* This circuit diagram is based on 'OFF' status of CB and Closing spring is charged.

Dimension



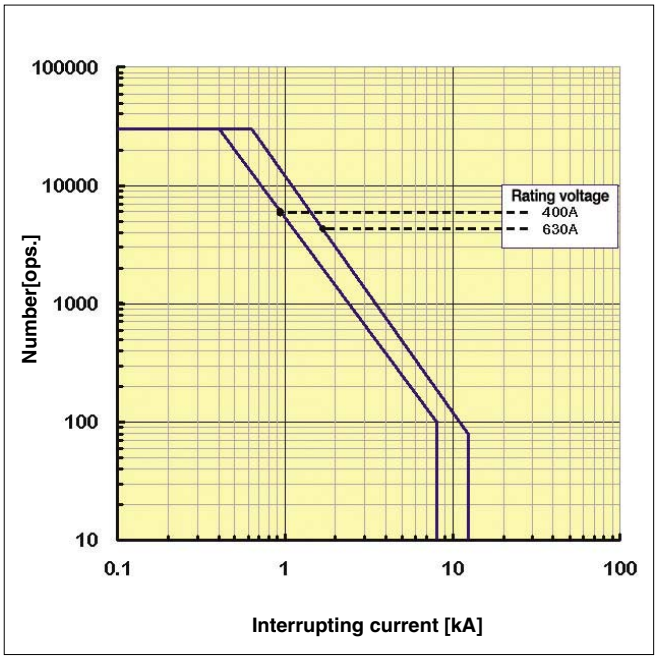
Ordering information

VL	—	25	R	16	B	06
Basic model name		Rated voltage (kV)	Installation type	Breaking	Phase distance/Compatibility	Rated current (A)
e-VCB		25 25.8	R On the right (Fixed type) L On the left (Fixed type)	16 16	B 210mm	06 680

VL-25□16B06	—	M1	C1	T1	SA5	U1	AAB
Motor control voltage		Closing coil voltage	Trip coil voltage	Aux. contact & wire ass'y		UVT	Other accessories

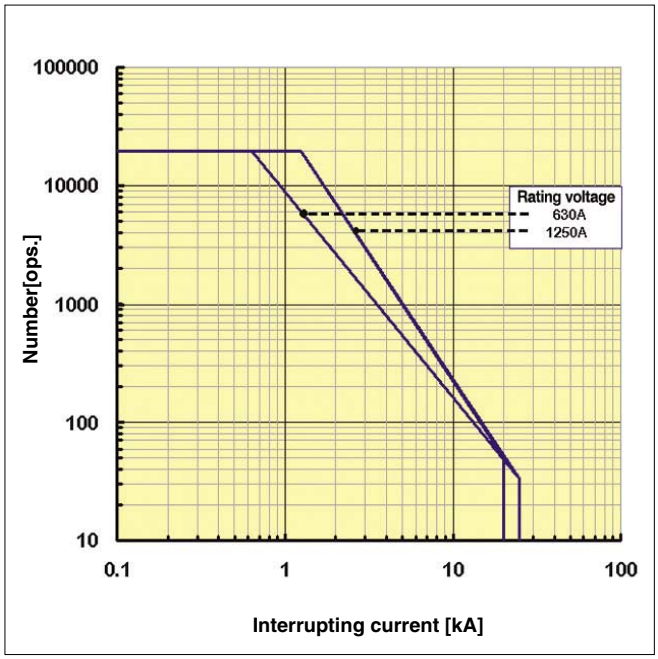
Motor control voltage		Closing coil voltage		Trip coil voltage		Aux. contact & wire ass'y		UVT		Other accessories	
M0	Without Motor	C0	Without Closing coil	T0	Without Trip coil	SA5	A type connector, 5a5b	U0	Without UVT	AA	Lead Wire
M1	DC 110V	C1	DC 110V	T1	DC 110V			U1	DC 110V	AB	User Plug(Part)
M2	DC 220V	C2	DC 220V	T2	DC 220V			U2	DC 220V		
M3	DC 125V	C3	DC 125V	T3	DC 125V			U3	DC 125V		
M4	DC 24V~30V	C4	DC 24V~30V	T4	DC 24V~30V			U4	DC 24V~30V		
M5	DC 48V~60V	C5	DC 48V~60V	T5	DC 48V~60V			U5	DC 48V~60V		
M6	AC 48V	C6	AC 48V	T6	AC 48V			U6	AC 48V		
M7	AC 100V~130V	C7	AC 100V~130V	T7	AC 100V~130V			U7	AC 100V~130V		
M8	AC 200V~250V	C8	AC 200V~250V	T8	AC 200V~250V			U8	AC 200V~250V		

Electrical endurance by interrupting current



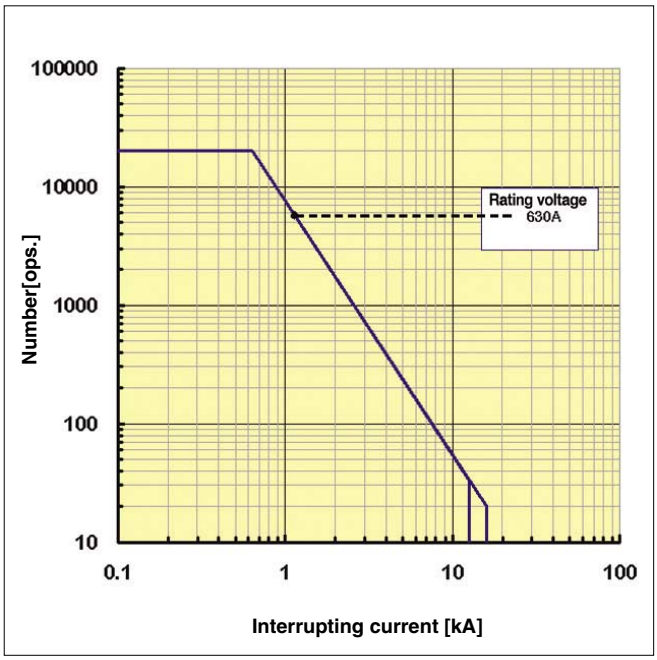
VI model LV2 at 7.2kV

- N : Operation numbers
- I : Interrupting current



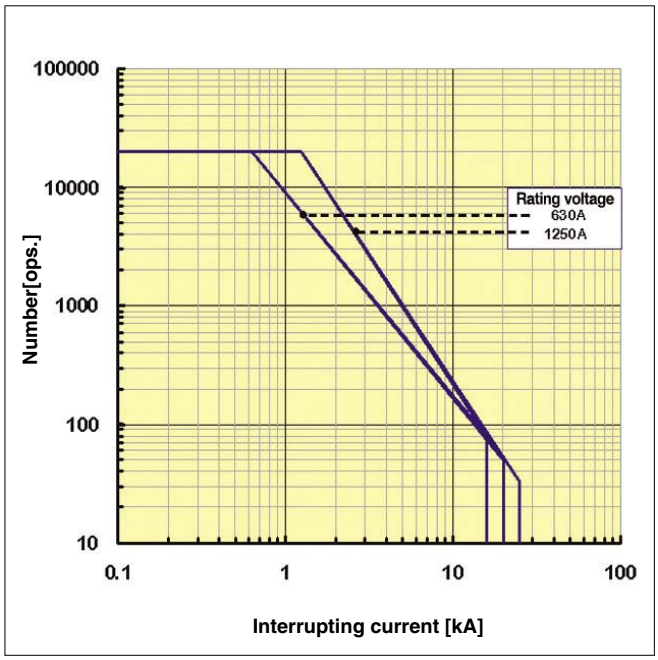
VI model LV3 at 7.2kV

- N : Operation numbers
- I : Interrupting current



VI model LV4 at 24kV

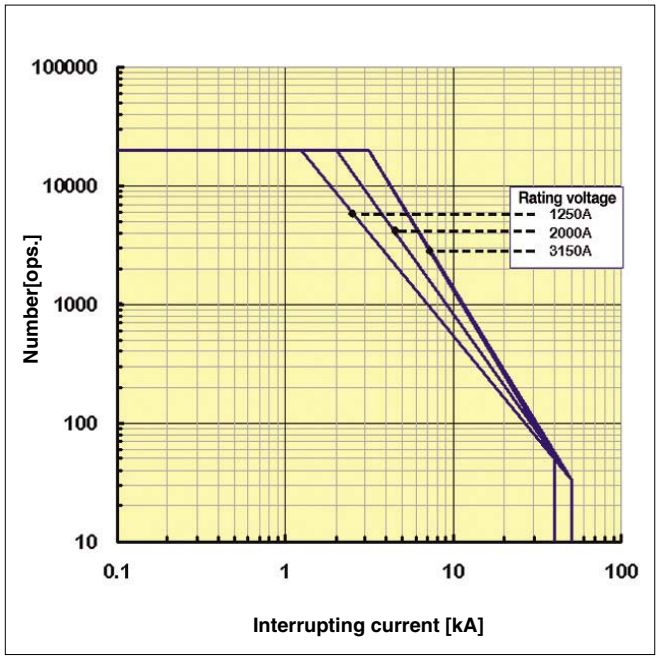
- N : Operation numbers
- I : Interrupting current



VI model LV5 at 17.5kV

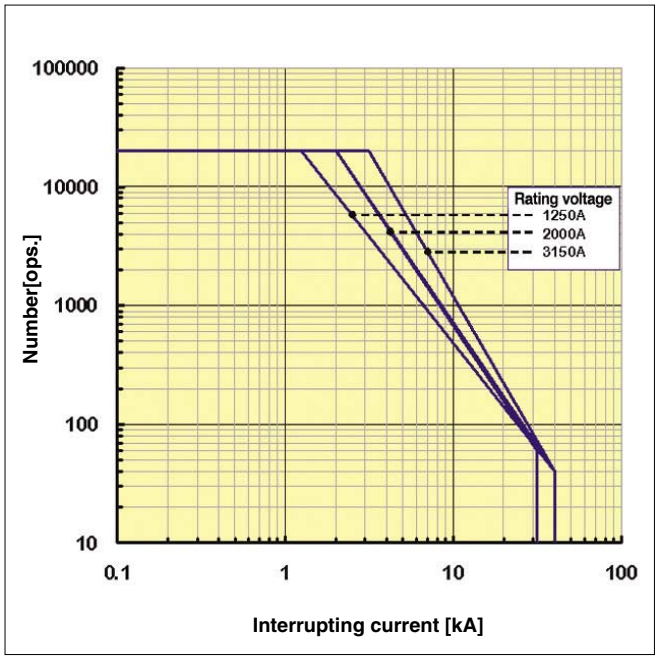
- N : Operation numbers
- I : Interrupting current

Electrical endurance by interrupting current



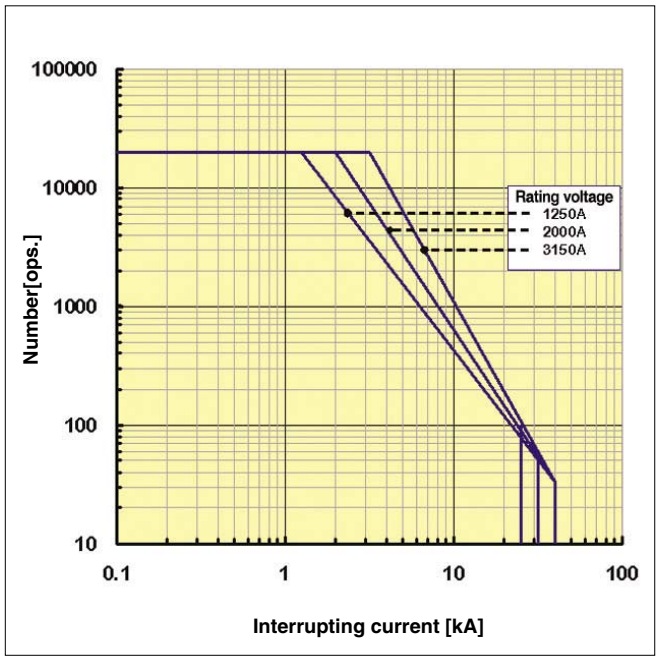
VI model LV8 at 17.5kV

- N : Operation numbers
- I : Interrupting current



VI model LV7-P1 at 24kV

- N : Operation numbers
- I : Interrupting current



VI model LV8 at 36kV

- N : Operation numbers
- I : Interrupting current

Note) 1. Above graphs represent the characteristics of the electrical life of LS Susol VCB.
2. Life characteristics of each model in each rating represents the LOG-LOG graphs.

Standard Use Environment for Susol VCB

The operation characteristic of Vacuum Circuit Breaker such as insulation and endurance is often influenced largely by external environment and thus should be applied appropriately with conditions of the place where it is used taken into consideration.

The following values are the limits have been set in accordance with IEC 62271-100 (IEC 62271-1)

Ambient Temperature

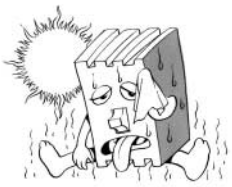
- maximum temperature: +40℃
- 24-hour average maximum temperature: +35℃
- minimum temperature: -5℃

Altitude

- 1000m or less above sea level

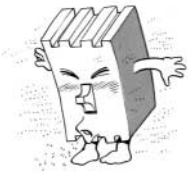
Relative Humidity

- 24 hours average value: 95% or less
- One month average: 90% or less



■ If a standard circuit breaker is used in high temperature exceeding 40℃, you are advised to use it according to the current corrected for each level of ambient temperature in catalog.

■ If used in conditions of high humidity, the dielectric strength or electric performance may be degraded.



■ It is highly recommended to use a dust cover or anti-humid agent if it is used in dusty and humid conditions.

■ Excessive vibration may cause a trip breaker such as connection fault or flaw on mechanical parts.

■ If it is left ON or OFF for a long time, it is recommended to switch load current on a regular basis.

■ It is recommend to put it in the sealed protection if corrosive gas is prevalent.

Special Use Environment

The circuit breaker is designed for use in standard use environment specified in Section 2. 1 of IEC62271-1. Concerning the special use environments as below the special use conditions are required to be considered, thus please contact us in advance.

- where altitude and ambient temperature are out of standard use environment.
- where a strong sea breeze blows
- when usually used in a humid place
- where a lot of steam or oil steam exists
- where explosive, flammable and other harmful gases might permeate the breaker
- In a dusty place
- where abnormal vibration or shock exists
- where a lot of ice and snow exist
- other special conditions

Withstand voltage compensation according to altitude

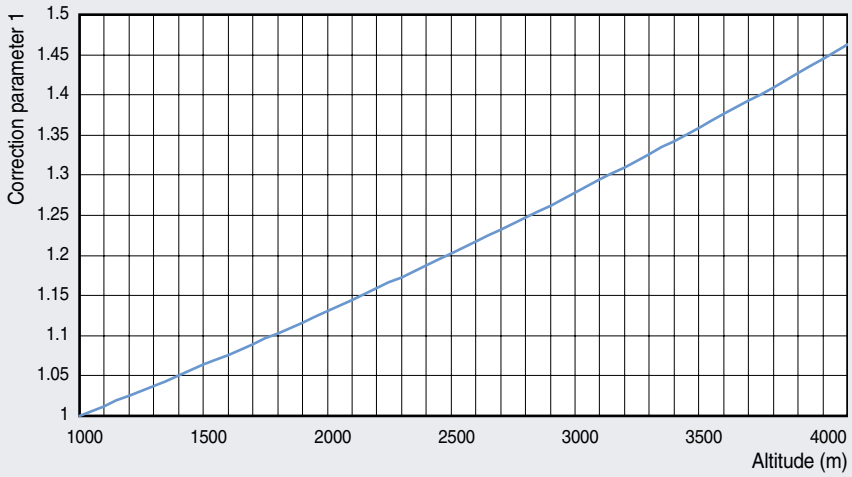
If the breaker is used in areas of sea level higher than 1000m the degradation of insulation performance should be taken into consideration.

Ud [kV/1min]	Ur[kV]	Up [kV/1.2 × 50㎲]
70	36	170
50(65)	24	125
38	17.5	95
28(42)	12	75(82)
20	7.2	60
Power Frequency Withstand Voltage		Impulse Withstand Voltage

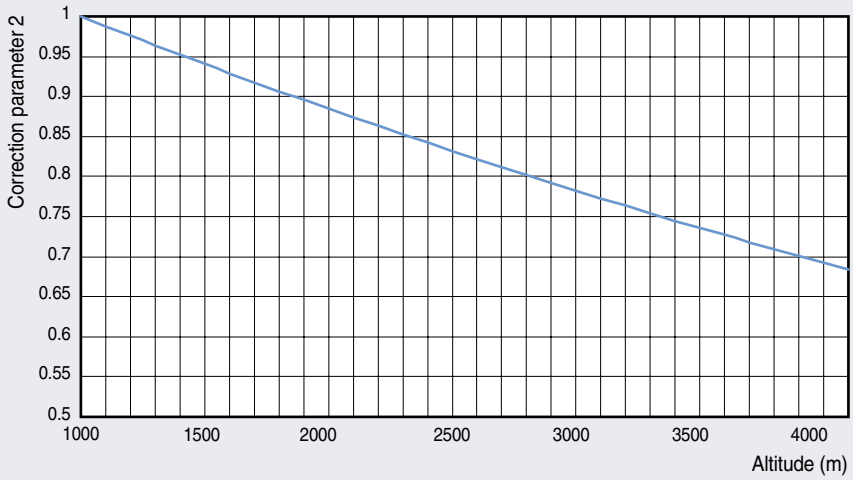
<Table 1> Criteria of withstand voltages by rated voltages specified in IEC62271-1

Special Use Environment

Withstand voltage compensation according to altitude



<Fig.1 > withstand voltage correction parameter 1 by altitude (based on a required withstand voltage)



<Fig.2 > withstand voltage correction parameter 2 by altitude (based on a applicable withstand voltage)

Ex) Selecting a breaker to be used in a place of 2500m above sea level with a rated voltage 7.2kV (correction parameter 1 applied)

- correction parameter at 2500m is 1.2
- criteria of withstand voltage by rated voltage:
  Power Frequency Withstand Voltage (Ud) = 20kV, Impulse Withstand Voltage (Up) = 60kV
- requirements withstand voltage criteria:
  Power Frequency Withstand Voltage (Ud) = 20×1.2 = 24kV, Impulse Withstand Voltage (Up) = 72kV
  Therefore rated voltage 12kV breaker shall apply to satisfy the required withstand voltage.

Ex) To apply a breaker with a rated voltage 12kV to the place of 2,500m above sea level (correction parameter 2 applied)

- correction parameter at 2500m is 0.825
- dielectric strength of VCB : Power Frequency Withstand Voltage (Ud) = 28×0.825 = 23.1kV,
  Impulse Withstand Voltage (Up) = 75×0.825 = 62kV/1.2×50 μs
  Therefore above breaker with rated voltage 12kV shall apply to rated voltage system 7.2kV at the altitude.

Rated current compensation in accordance with ambient temperature

When normal ambient temperature exceeds the temperature specified in the environment the following formula help to select the applicable current.

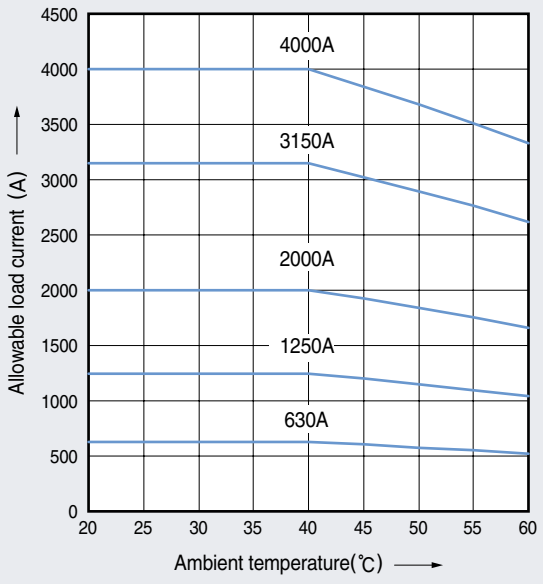
$$Ia = Ir\left(\left(\Theta max - \Theta a\right)/\Theta r\right)^{1/2}$$

Ia: allowable continuous current in the actual ambient temperature Θa
Ir: rated current at 40℃ ambient temperature
Θmax: acceptable overall temperature of the hottest spot
Θa: the actual ambient temperature expected at -30℃ and 60℃
Θr: allowable temperature in the hottest place at rated current

Ex) The calculation of the applicable load current value when a breaker with rated current 2000A is used at 55 ℃ ambient temperature
Ia = 2000×((105-55)/65)$^{1/2}$ = 2000×0.87 = 1754A

Rated current (A)	Ambient temperature (℃)								
	20	25	30	35	40	45	50	55	60
4000	4000	4000	4000	4000	4000	3843	3679	3508	3328
3150	3150	3150	3150	3150	3150	3026	2898	2763	2621
2000	2000	2000	2000	2000	2000	1922	1840	1754	1664
1250	1250	1250	1250	1250	1250	1201	1150	1096	1040
630	630	630	630	630	630	605	580	553	524

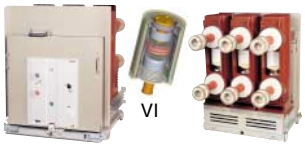
<Table 2> Allowable load current by ambient temperature



<Figure 3> Allowable load current by ambient temperature

Comparison of GCB & VCB

In the system of medium voltage lines VCB uses a vacuum which is an eco friendly medium for arc extinguishing.
It also offers excellent interrupting properties and ease of maintenance and has expanded the area to the scope of the GCB as the overlap increases.

Items	GCB	VCB	Comparison results	Remarks
Images		 VI		
Arc extinguish medium and characteristics	SF_6 gas - Greenhouse gas that causes global warming. - The toxic gas generated by chemical reactions due to arc energy. - 5kgf/㎟ high pressure required.	Vacuum - Green clean medium. - 5×10^{-5} Torr vacuum rate to maintain.	VCB is better than GCB	
Maintenance of the arc media	- Periodic check and supplement the gas pressure required. - Automatic locking if gas pressure falls below the certain value. ➔ In the event of an accident while the gas valve is locked trip is disable and the load equipment can not be protected.	- Available until the product life. - Always keep trip-first feature. ➔ When an accident occurs the trip-first feature functions to protect the equipment.	VCB is better than GCB	
Rated voltage range (kV)	3.6~550	3.6~36	GCB is better than VCB	VCB has been increasing rapidly in the medium voltage systems.
Applicable rate of transient recovery voltage (RRRV)	Low	High	VCB is better than GCB	IEC62271-100 Annex M applied/ Interrupting performance verified.
Development and trends	Decline - Company M discontinued producing GCB. - Company A manufactures VCB in medium voltage GCB production factory. - GCB Maker S started the production of VCB.	Increasing - Companies A and S have developed new VCBs. - Development trend that the voltage coverage of VCB expands. - VI increased coverage. (GIS, DAIS, SIS, etc.)	VCB is better than GCB	

Green Innovators of Innovation

Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact a qualified service technician when you need maintenance.
  Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

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Specifications in this catalog are subject to change without notice due to continuous product development and improvement.

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