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Metasol Meta Solution

VACUUM CIRCUIT BREAKERS

LS ELECTRIC

FEATURES

Metasol VCB series are premium-type products featuring main structure with compact size, simple structure, high reliability and a variety of accessories as main circuit breaker to protect key installations in the places such as device industry, power plants, high-rise buildings, large ships.

VCB is installed in the medium voltage distribution network 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 current with VI(Vacuum Interrupter) which is acted by signal from the outside separate relay.

Metasol Meta Solution

VACUUM CIRCUIT BREAKER

Contents

Metasol VCB

Merits of Metasol VCB

MVL series

7.2kV, 12kV, 17.5kV
16, 20, 25, 31.5kA
630, 1000, 1250A
IEC 62271-100 [M2, C2, E2(List3)]
Breaking time : 3 cycles

Compact, light and simple structure

- W550 CB Compartment.
- Less than 100kg for H type VCB
- Less than 60kg for P type VCB
- Compact full package size(W×H×D)
  - H type: 1000×960×700
  - P type: 710×665×540

Organized and flexible structure

- Basic module based series:
  Basic module < P type < B type < H type.
- Various options for withdrawal type.

Paper type package box except bottom part for H,B,P type

- Providing safety during unpacking with not fully wooden box which has many sharp nails.
- Saving unpacking time(Simple structure)
- Saving disposal cost [small volume(foldable paper box), light weight]
- Eco-friendly material relatively than wooden package box.

Compact but powerful performance

- High insulation level in spite of its compact size:
  Impulse withstand voltage up to 95kV.
  Power frequency voltage up to 42kV.
- Long duration time of short time withstand test: 4s
- W550 CB Compartment for the rating up to 17.5kV.

Convenience of switchgear configuration

- CB compartment structure
  - Metal isolation structures to prevent the accident spread and ensure safety.
  - Convenience of switchgear building extended by its module style.

A variety of accessories

- UVT, Locking Magnet, Plug Interlock, Keylock, Termperature Sensor, MOC, TOC, Earthing S/W and so on.

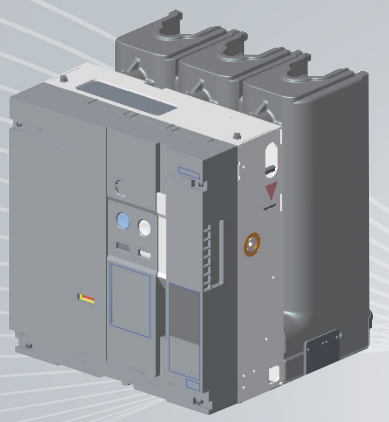
Main circuit structure with high reliability

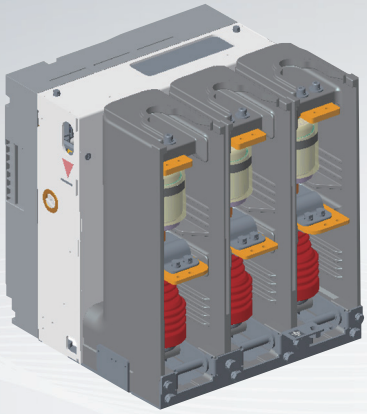
- Maximizing the durability and reliability of the main circuit contactors. (Stego Tulip contactor)
- Strong structure for the temperature rise. (Natural cooling system)

Merits of Metasol VCB

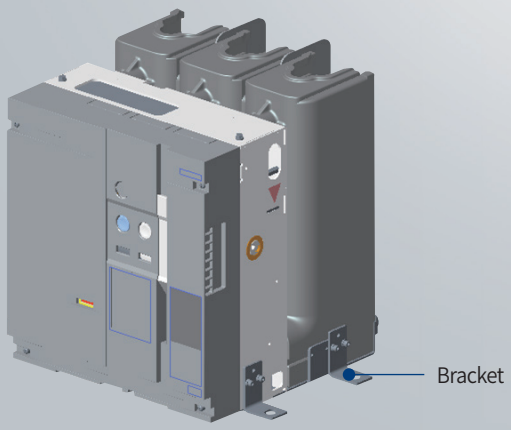
Organized and flexible structure

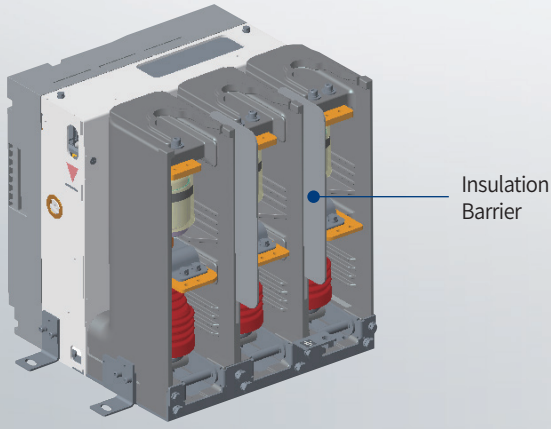
• Basic module of Metasol VCB



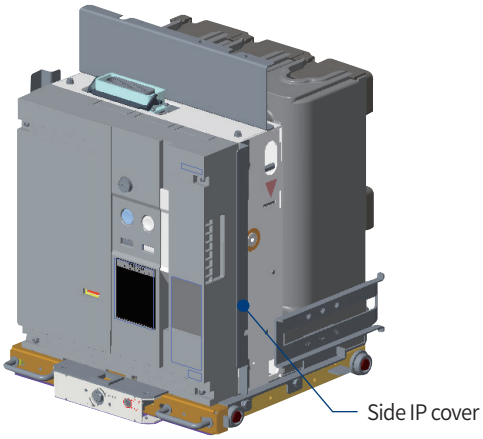


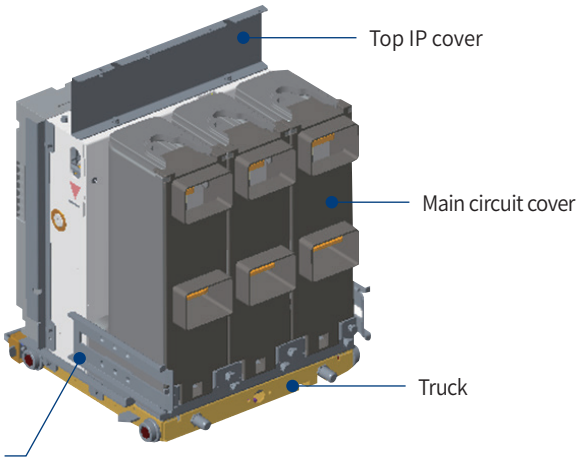
• P type(Fixed type): Basic module + Bracket + Insulation barrier



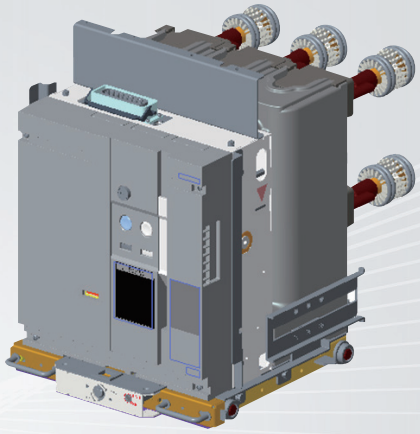


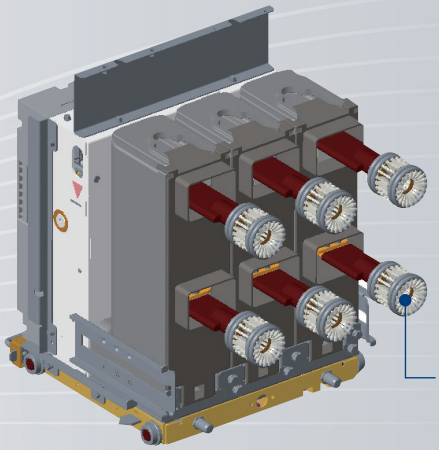
• B type(Box type: Basic module of H type Metasol VCB):
Basic module + Truck + Main circuit cover + IP cover(Top/Side) + Shutter guide

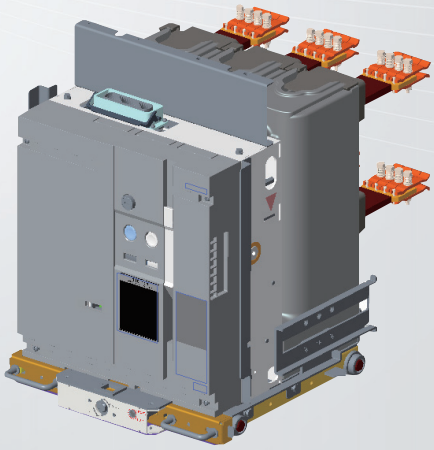


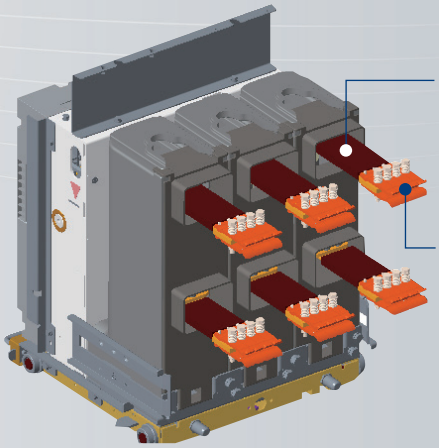


• H type: B type + Terminal(Clip/Tulip contact type)

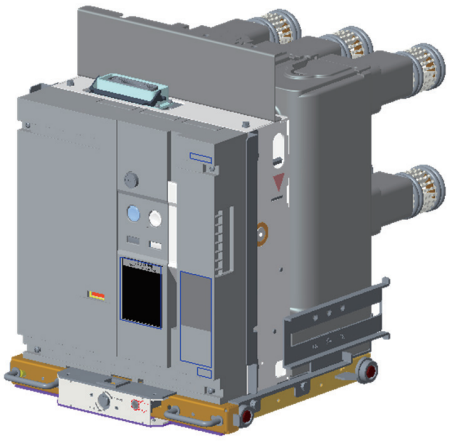


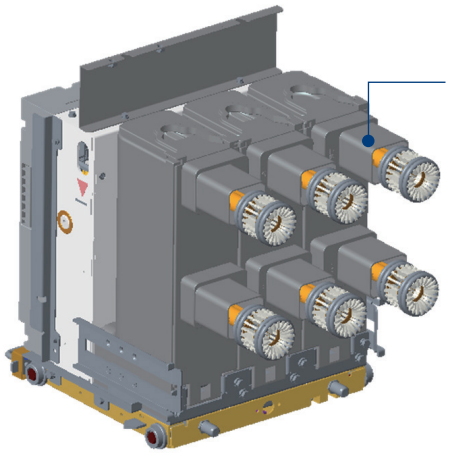






Compact but powerfaul performance





Using mold insulation tube instead of shrinkable insulation tube enable application of Metasol VCB to W550 CB compartment technically up to 17.5kV.

Merits of Metasol VCB

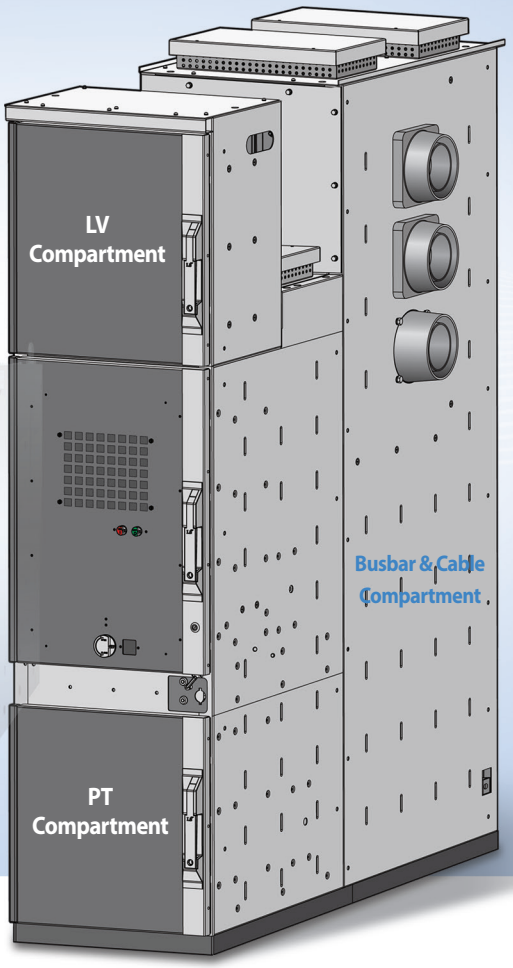
Convenience of switchgear configuration

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 extended by its module style.

Accessories of CB compartment (H type cradle)

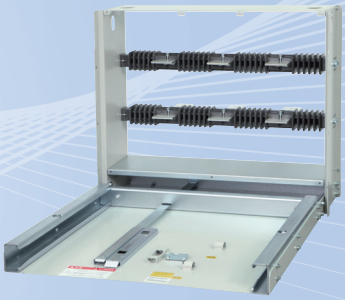
- MOC (Mechanism Operated Cell S/W)
- TOC (Truck Operated Cell S/W)
- Shutter Padlock
- Temperature Sensor
- Door Emergency ON/OFF Button
- Earthing switch & Accessories
  Key lock for Earthing S/W
  Locking Magnet for Earthing S/W
  Position S/W for Earthing S/W
- TM (Temperature Monitoring Unit)



H type

F type

E type



H type

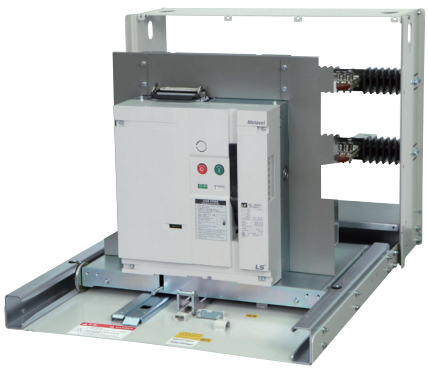
- Metal isolation structure to prevent the accident spread and ensure safety
- Convenience of operation by Truck
  - Drawable in the closed position of the switchgear door
  - Racking-in/out positions indicated mechanically
  - Control power connected Interlock
- Convenience in building switchgears
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

E type

- Economic style cradle with the basic structure
- No safety shutter and bushing
- For MESG

F type

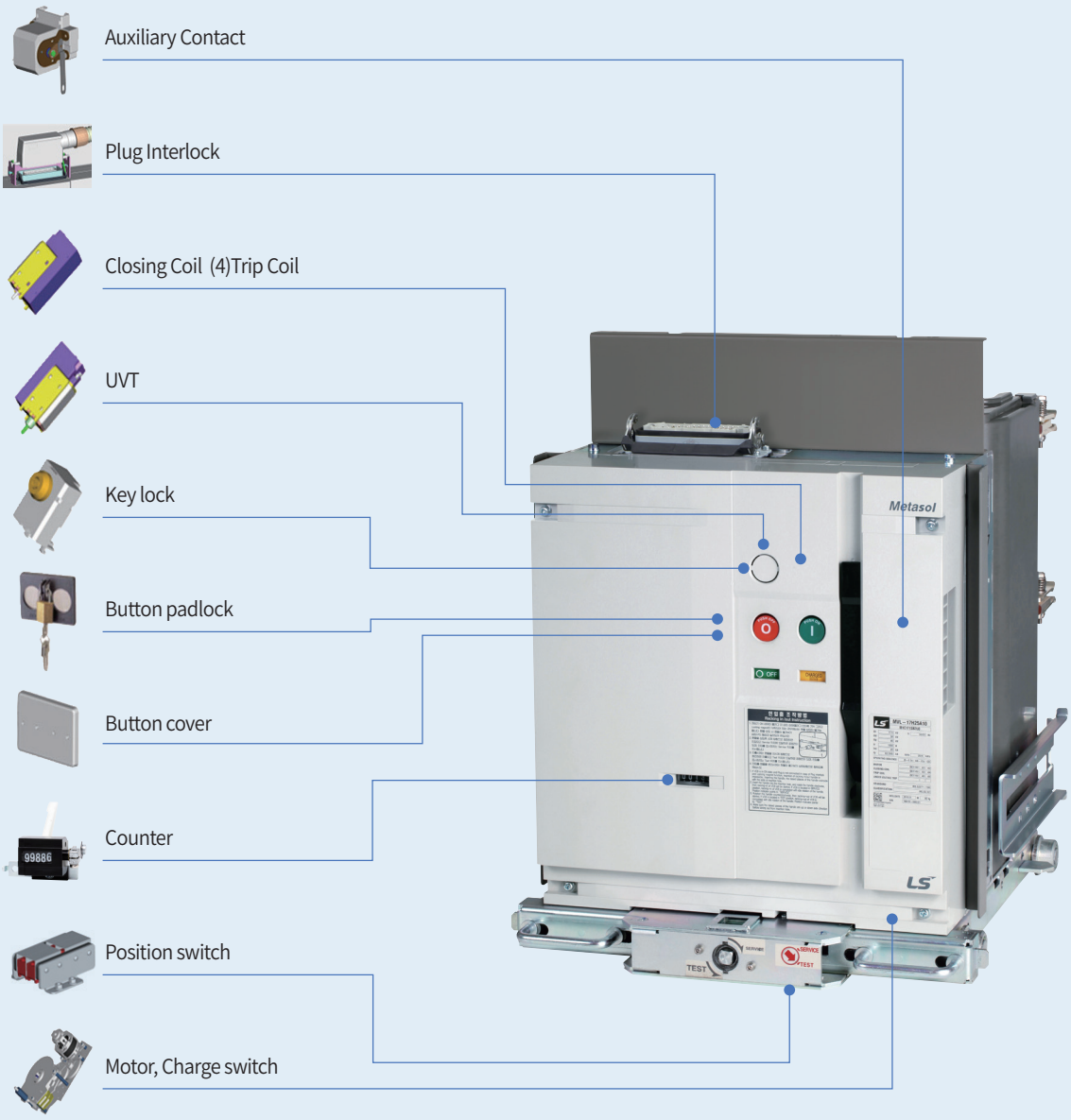
- Safety shutter added to the cradle of type E
- No bushing
- For MESG

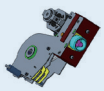


Merits of Metasol VCB

Variety of accessories

A variety of accessories for breaker



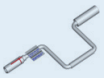

Manual charging geared ass'y


CTC


Padlock (H type)


MOC


Locking magnet


Racking handle

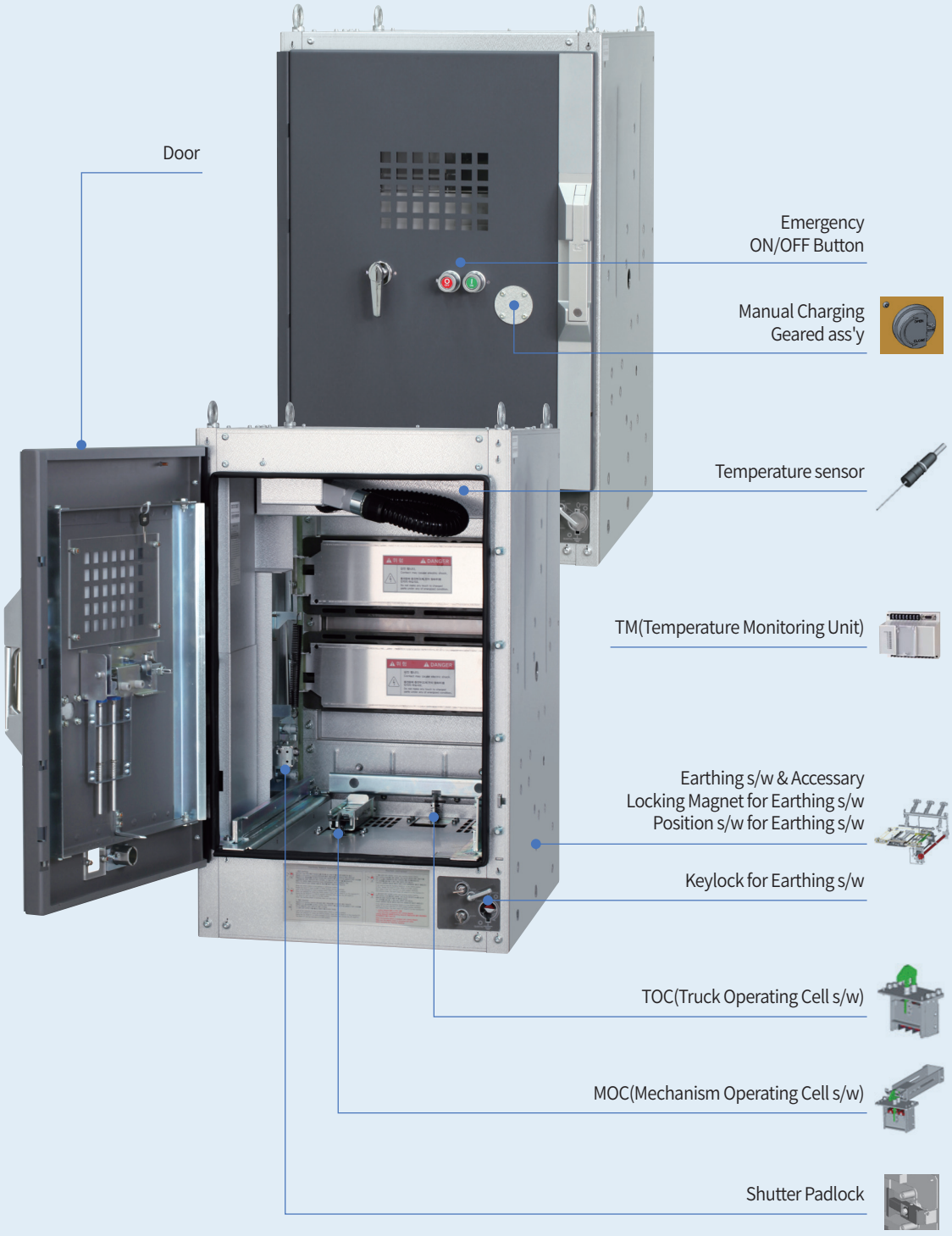

Manual charging handle


UVT time delay controller


CTD

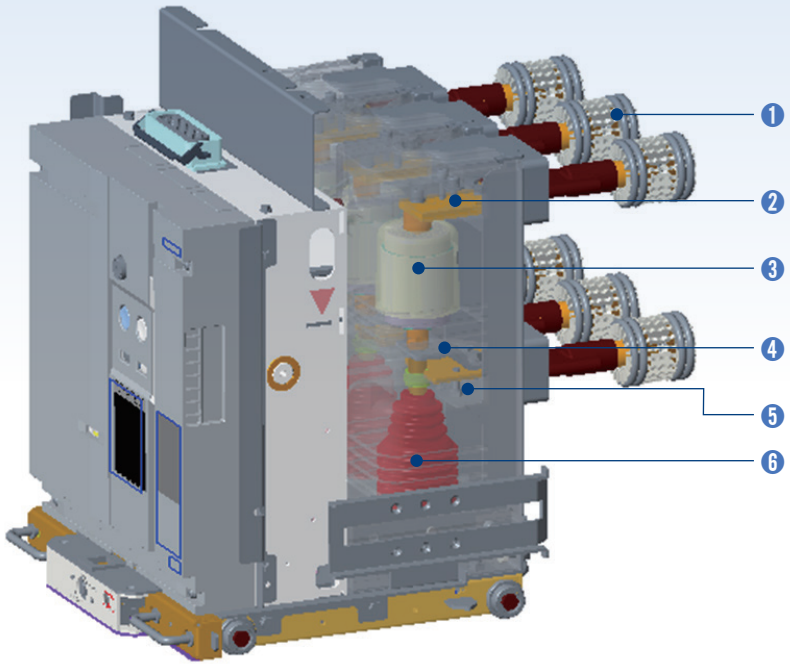
A variety of accessories for H Type cradle

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

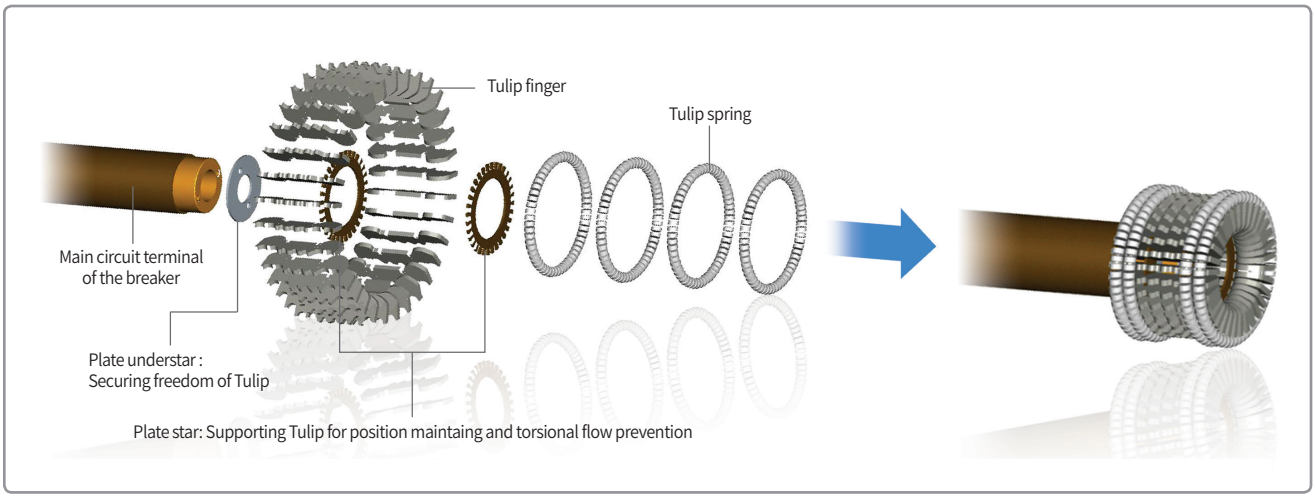


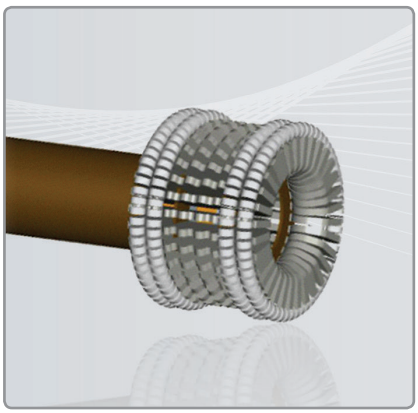
Merits of Metasol VCB

Main circuit structure with high reliability



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

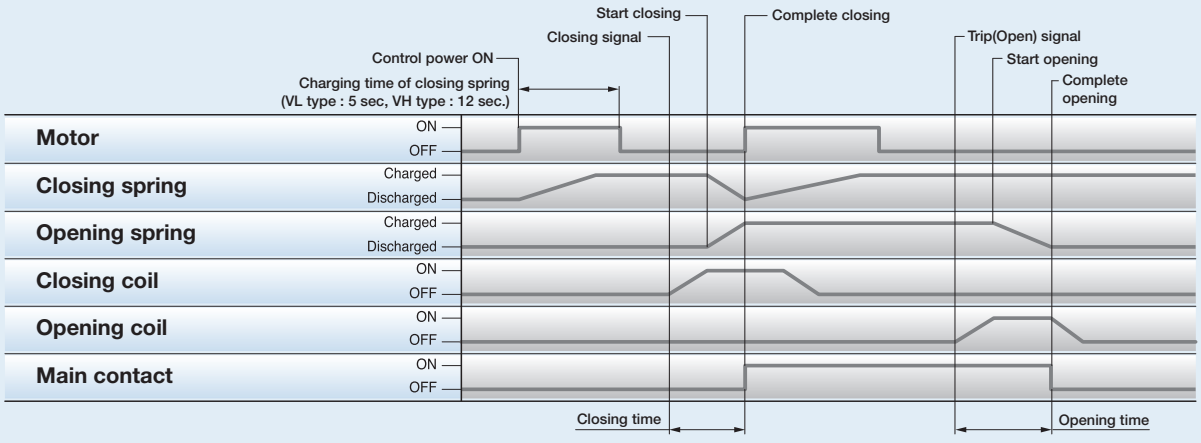




- Maximizing the durability and reliability of the main circuit contactors (Stego Tulip contactor)
- Strong structure for the temperature rise (Natural cooling system) Structure of Stego Tulip Terminal
- Maintaining the connection between breaker and cradle for the optimum current path through securing freedom of Tulip.
- Increasing the heat dissipation area of the contactors and minimizing aging.

Basic fuctions

❶ Push on button
❷ Push off button
❸ Charge/Discharge indicator
❹ On/Off indicator
❺ Manual charging handle
❻ Operation counter
❼ Racking screw (for H & B type)
❽ TEST/SERVICE Position indicator



Manual operation

❶ Manual Charge

Operate the charge handle 7-8 times as a fully stroke. When the closing spring is charged fully "CHARGED" is displayed at the charge indicator.

❷ 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.

❸ Manual trip

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

Electric operation

❶ Electric charge

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

❷ Electric closing

Remote closing is operated by the closing coil.

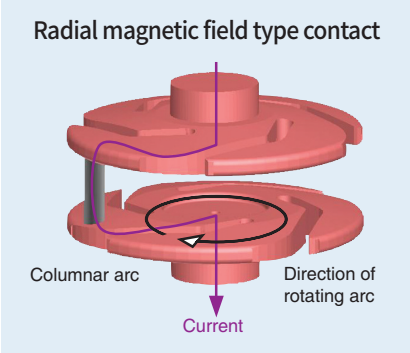
❸ Electric trip

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.

Interruption operation

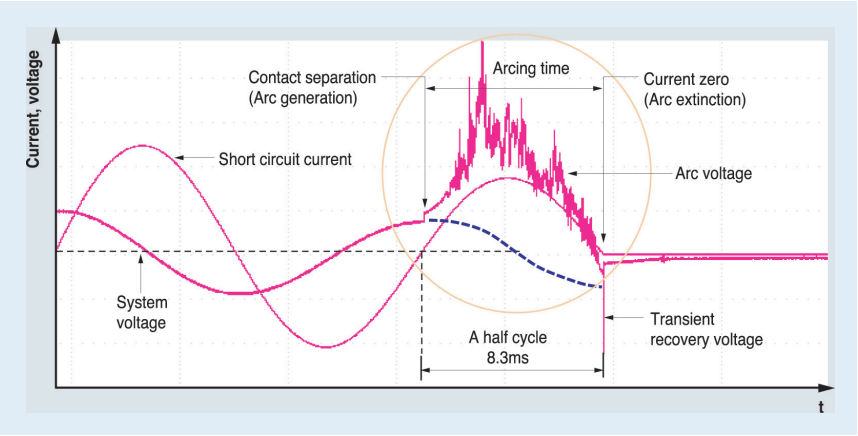
The interruption of vacuum interrupters



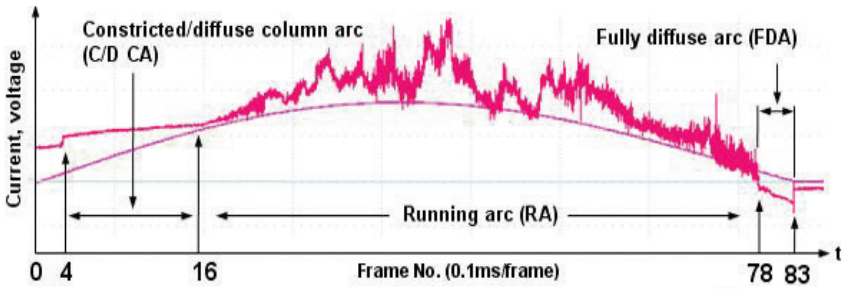
Arc driving principle in the contacts of Radial magnetic field

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.

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.

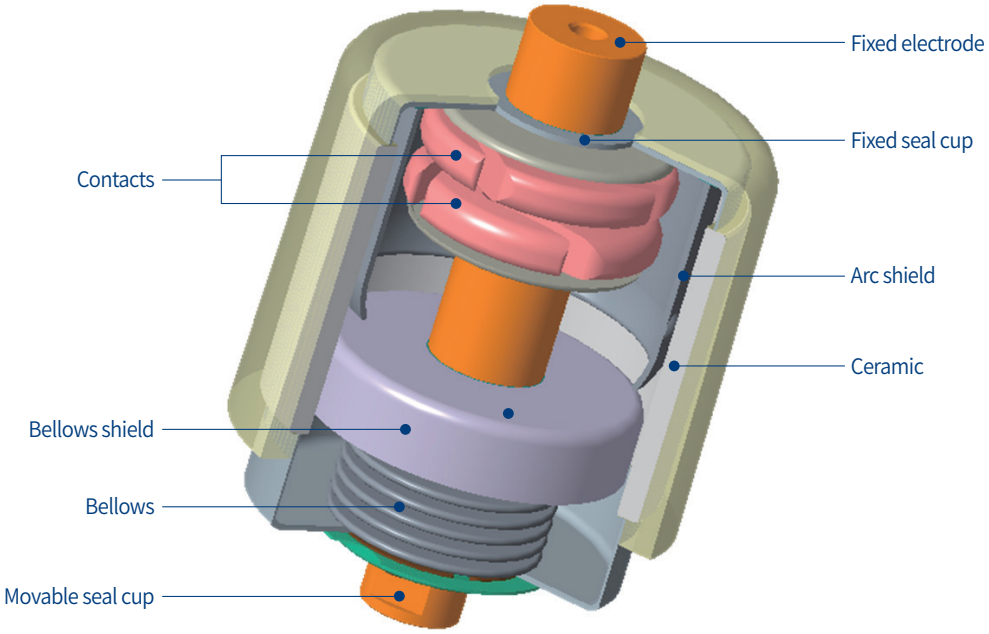


An example of oscillogram obtained through the interrupting test using LC resonant circuit



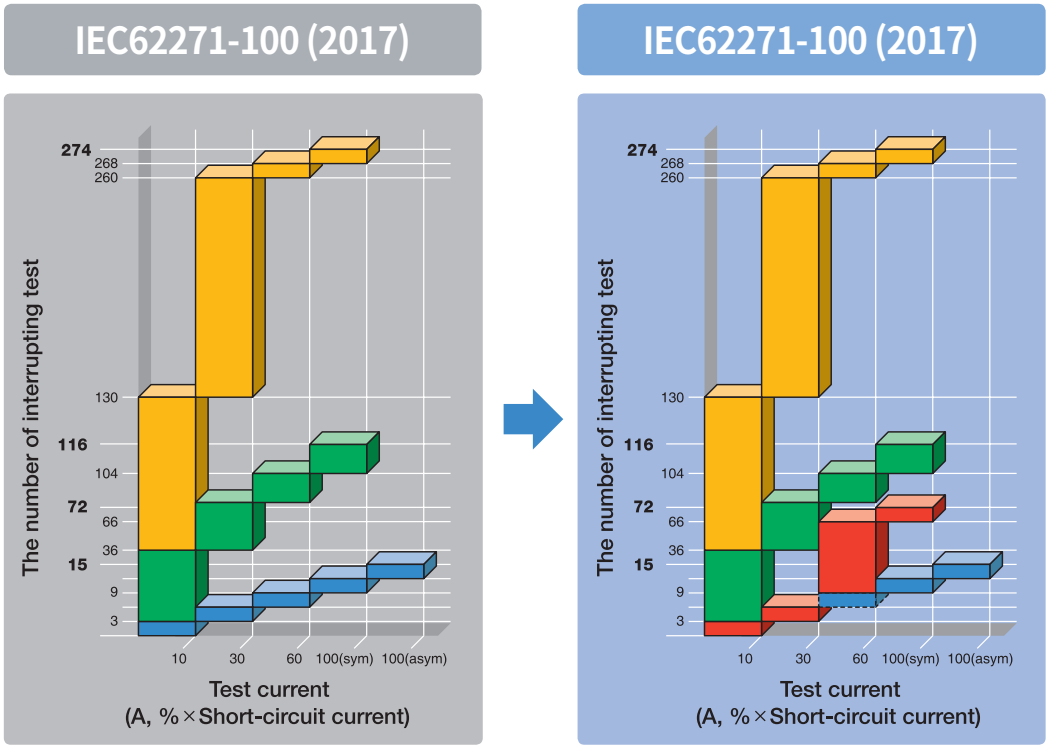
Vacuum interrupters

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.

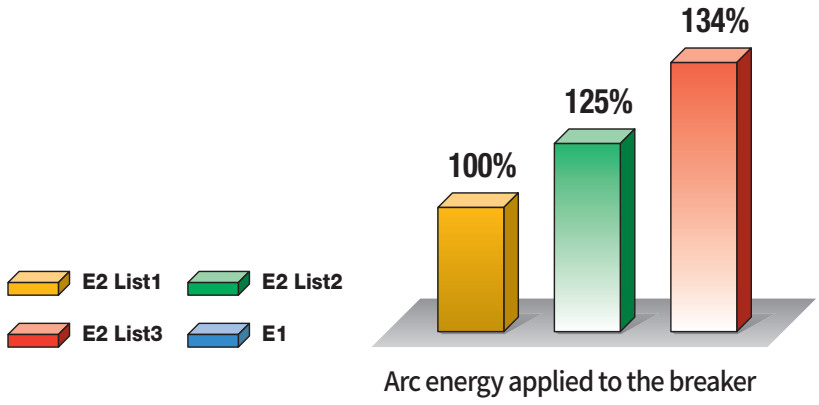


E2 (List 1 or List3)

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 Metasol VCB series.



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



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 Metasol 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 Metasol VCB.

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

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

Metasol VCB has obtained type test certificates 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 (2017.06)
    High-voltage switchgear and controlgear - Part 2: Alternating-current circuit breakers.
- **Test and certification**
  - Test report (KERI ~25kA)
  - Test report (KEMA 31.5kA)

Types and ordering information

Breaker order guide depending on the installation type

P/B type VCB

MVL	—	06	P	20	A	06
Basic model name		Rated voltage (kV)	Installation type	Interrupting current (kA)	Phase distance	Rated current (A)
MVL		06 7.2 12 12 17 17.5	P Fixed B Box type drawout (for MCSG)	16 16 1) 20 20 25 25 32 31.5	A 150 B 210	06 630 10 1000 1) 2) 13 1250

E/F type VCB

MVL	—	12	E	20	B	13
Basic model name		Rated voltage (kV)	Installation type	Interrupting current (kA)	Phase distance / Contactor	Rated current (A)
MVL		12 12	E E type drawout (for MESG) F F type drawout (for MESG)	20 20 25 25	B 210 / Clip Q 210 / Tulip	06 630 13 1250

H type VCB

MVL	—	17	H	25	P	13
Basic model name		Rated voltage (kV)	Installation type	Interrupting current (kA)	Phase distance / Contactor	Rated current (A)
MVL		06 7.2 12 12 17 17.5	H H type drawout (for MCSG)	16 16 1) 20 20 25 25 32 31.5	A 150 / Clip 2) P 150 / Tulip	06 630 10 1000 1) 2) 13 1250

MVL	—	12	H	25	T	10
Basic model name		Rated voltage (kV)	Installation type	Interrupting current (kA)	Phase distance / Contactor	Rated current (A)
MVL		12 12	H H type drawout (for MCSG)	20 20 25 25 32 31.5	T 150 / Tulip	06 630 10 1000 2) 13 1250

Note) Not applicable to 7.2kV and 31.5kA means we just don't have type test certificates for the ratings because there are no market needs for those ratings.

* Phase distance / contactor suffix 'T' means compatible H type with Susol compact VCB.

1) Not applicable to 7.2kV 2) Not applicable to 31.5kA

Up to 12kV P type
A type connector

17.5kV P type
B type connector

12kV E type(Clip contactor)
A type connector

12kV F type(Tulip contactor)
B type connector

M1

Motor control voltage	
M1	DC 110V
M2	DC 220V~250V
M3	DC 125V
M4	DC 24V~30V
M5	DC 48V~60V
M6	AC 48V
M7	AC 100V~130V
M8	AC 200V~250V

C1

Closing coil voltage	
C1	DC 110V
C2	DC 220V~250V
C3	DC 125V
C4	DC 24V~30V
C5	DC 48V~60V
C6	AC 48V
C7	AC 100V~130V
C8	AC 200V~250V

T1

Trip coil voltage	
T1	DC 110V
T2	DC 220V~250V
T3	DC 125V
T4	DC 24V~30V
T5	DC 48V~60V
T6	AC 48V
T7	AC 100V~130V
T8	AC 200V~250V

U1

UVT	
U1	DC 110V
U2	DC 220V~250V
U3	DC 125V
U4	DC 24V~30V
U5	DC 48V~60V
U6	AC 48V
U7	AC 100V~130V
U8	AC 200V~250V

SQ2

Connector and wire			Applicable VCB type		
			P	E/F	H/B
SA2	Standard	A type connector 4a4b	○	○	-
SA4		A type connector 10a10b	○	○	-
SQ2		B type connector 4a4b	○	○	○
SQ4		B type connector 10a10b	○	○	○
SA6	Flame retardant	A type connector 4a4b	○	○	-
SA8		A type connector 10a10b	○	○	-
SQ6		B type connector 4a4b	○	○	○
SQ8		B type connector 10a10b	○	○	-

A7B

Other accessories		Applicable VCB type		
		P	E/F	H/B
A1	Secondary trip coil	○	○	○
A2	Secondary trip coil with TCS contact	○	○	○
A3	Position S/W (Test : 1a1b, Service : 2b)	-	○	○
A4	Position S/W (Test : 2a, Service : 2a)	-	○	○
A5	Position S/W (Test : 1a1b, Service : 1a1b)	-	○	○
A7	Key lock (Individual key)	○	○	○
A8	Button padlock	○	○	○
A9	Button cover	○	○	○
AA	Lead wire	○	○	○
AB	User type plug (Part)	○	○	○
AC	Plug interlock	-	-	○
AD	Padlock (H type)	-	-	○
AE	MOC	-	-	○
AF	Locking magnet	-	-	○
AG	Keylock (Same key)	○	○	○
AH	Insulation tube	-	-	○
AI	Mecha shaft interlock lever	○	-	-
AV	CT operated coil 1A	○	○	○
AW	CT operated coil 5A	○	○	○
AZ	Manual(rotary) charge geared ass'y	-	-	○

Optional

Accessories	
CTD1	Condenser trip device (AC 110V)
CTD2	Condenser trip device (AC 220V)
UDC1	UVT time delay controller (ADC 110V)
UDC2	UVT time delay controller (ADC 220V)
UDC3	UVT time delay controller (ADC 48V)
CTU	Coil test unit
BA	Bushing ass'y
IC	Insulation cover

The control voltage of motor is the same with AF, AZ option

Note) 1. If A1(Secondary trip coil), A4(Position S/W 2a2a), A7(Keylock) are selected, A147 is the type name in the ordering.
2. Operation counter is equipped by default for all types of VCB.
3. Maximum auxiliary contacts by option
- A1: 9a10b - A2: 4a3b, 9a8b - AV, AW: 4a4b
4. Simultaneous application is not allowed for the options below.
- U1~U8, A1, A2, AV, AW - A3, A4, A5
- A8, A9 - AA, AB
5. A7[Keylock(Individual key)], A8(Button padlock), A9(Button cover), AG[Keylock(Same key)] VCB options can not be used with AK cradle option(door emergency push button).
6. A7[Keylock(Individual key)] and AG[Keylock(Same key)] an not be selected simultaneously.

Up to 17.5kV H/B type
[Representitive front view]
Only B type connetcor

B type rear view
(No contactor)

H type rear view
(Clip contactor for
up to 25kA 1000A)

H type rear view
(Clip contactor for
25kA 1250A)

H type rear view
(tulip contactor for
up to 31.5kA 1250A)

Types and ordering information

Cradle order guide depending on the installation type

H type Cradle

MVCL – 06 H 20 Aa 06 — A12

Basic model name
MVCL

Rated voltage (kV)	
06	7.2
12	12
17	17.5

Interrupting current (kA)	
16	16 1)
20	20
25	25
32	31.5

Rated current (A)	
06	630
10	1000 1) 2)
13	1250

Installation type	
H	H type drawout (for MCSG)

Phase distance / Contactor	
Aa	150 / Clip (W600)
Aq	150 / Clip (W550)
Pa	150 / Tulip (W600)
Pq	150 / Tulip (W550)

E/F type Cradle

MVCL – 12 E 20 B 06 — A12

Basic model name
MVCL

Rated voltage (kV)	
12	12

Interrupting current (kA)	
20	20
25	25

Rated current (A)	
06	630
13	1250

Installation type	
E	E type drawout (for MESG)
F	F type drawout (for MESG)

Phase distance / Contactor	
B	210 / Clip
Q	210 / Tulip

1) Not applicable to 7.2kV 2) Not applicable to 31.5kA

Other accessories		Applicable cradle H	Applicable cradle E/F
A1	ES(Standard earthing switch) without option	○	-
A2	ES with position S/W (2a2b)	○	-
A4	ES with position S/W (6a6b)	○	-
A5	Key lock for ES	○	-
A6	Locking magnet for ES: DC 110V	○	-
A7	Locking magnet for ES: DC 220V	○	-
A8	Locking magnet for ES: DC 125V	○	-
A9	Locking magnet for ES: DC 24V	○	-
AA	Locking magnet for ES: DC 48V	○	-
AB	Locking magnet for ES: AC 48V	○	-
AC	Locking magnet for ES: AC 110V	○	-
AD	Locking magnet for ES: AC 220V	○	-
AE	Shutter padlock	○	-
AF	TOC	○	-
AG	MOC	○	-
AH	Door	○	-
AJ	Door interlock	○	-
AK	Door emergency push button	○	-
AL	Temperature sensor	○	-
AM	H type lead wire 4a4b (Standard)	○	-
AN	H type lead wire 10a10b (Standard)	○	-
AO	H type lead wire 4a4b (Flame retardant)	○	-
AZ	Maunal charging	○	-
Other accessories			
TM	Temperature monitoring unit	○	-

Note) 1. It is not allowed to select AJ and AK options without door options(AH).
2. It is not allowed to select AK option if one of A7,A8 and A9 among VCB options is selected.
3. One of AM, AN and AO should be selected in case of H type VCB.
4. Keylock(A5) is equipped by default on earthing switch(A1, A2, A3).
5. AZ cradle option needs AZ VCB option.
6. Simultaneous application is not allowed for the options below.
- A1, A2, A4
- A6~A9, AA~AD
- AM~AO
7. Please contact us if you need IAC (Internal arc classification) of H type CB compartment.

E type Cradle

F type Cradle

H type Cradle

Earthing switch for H type cradle order guide in detail

MVES – 06 H 32 A 06 A12A

Basic model name
MVES

Rated voltage (kV)	
06	7.2
12	12
17	17.5

Installation type	
H	MCSG CB Compartment type

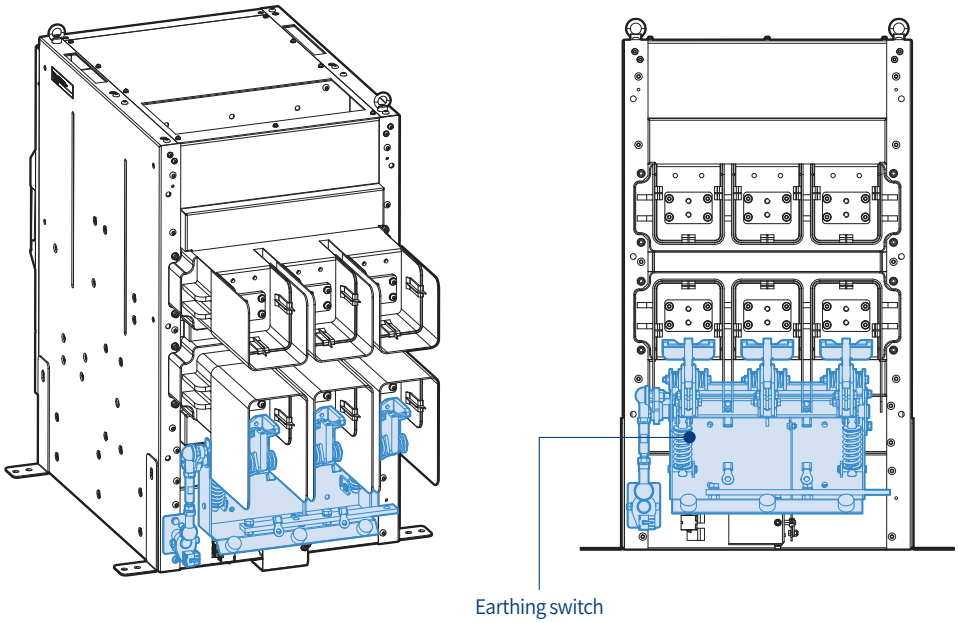
Short circuit current (kA)	
16	16
20	20
25	25
32	31.5

Phase distance	
A	150 (W600 cradle)
Q	150 (W550 cradle)

Rated current (A)	
06	630
10	1000
13	1250

Other accessories	
A1	ES(Standard earthing switch) without option
A2	ES with position S/W (2a2b)
A4	ES with position S/W (6a6b)
A5	Key lock for ES
A6	Locking magnet for ES: DC 110V
A7	Locking magnet for ES: DC 220V
A8	Locking magnet for ES: DC 125V
A9	Locking magnet for ES: DC 24V
AA	Locking magnet for ES: DC 48V
AB	Locking magnet for ES: AC 48V
AC	Locking magnet for ES: AC 110V
AD	Locking magnet for ES: AC 220V

Note) 1. Customers can refer to detailed specifications of earthing switch before purchasing earthing switch.
2. E0,M0 Class are available.
3. Refer to A2,A4 postion switch options in page 40.



Ratings

7.2kV breakers

Type			MVL-06□20,25□06,13		MVL-06□32□06,13	
Rated voltage, Ur		[kV]	7.2			
Rated normal current, Ir		[A]	630, 1250		630, 1250	
Rated frequency, fr		[Hz]	50 / 60			
Rated short-circuit current, Ik		[kA]	20, 25		31.5	
Rated short-circuit breaking capacity		[MVA]	250, 312		393	
Rated short-time withstand current, Ik/tk		[kA]	20/4 sec, 25/4sec		31.5/4 sec	
Rated short-circuit making current, Ip		[kA]	62.5(50Hz), 65(60Hz)		78.8(50Hz), 81.9(60Hz)	
Rated breaking time		[cycle]	3			
Rated withstand voltage	Power frequnecy (1 min), Ud	[kV]	20			
	Impulse (1.2×50μs), Up	[kV/1.2×50μs]	60			
TRV Growth rate		[kV/μs]	0.24			
TRV Maximum		[kV]	12.3			
Rated operating sequence			O-0.3s-CO-15s-CO			
Control voltage and current	Control voltage	[V]	DC24~30V	DC48~60V AC48V	AC/DC 100~130V	AC/DC 200~250V
	Control current for closing	[A]	≤ 8	≤ 4	≤ 2	≤ 1
	Control current for opening	[A]	≤ 8	≤ 4	≤ 4	≤ 2
	Motor current (steady / inrush)	[A]	≤ 5 / ≤ 25	≤ 3 / ≤ 15	≤ 2 / ≤ 10	≤ 1 / ≤ 5
Auxiliary contacts			4a4b, 10a10b			
Rated opening time		[s]	≤ 0.04			
Rated closing time at no load		[s]	≤ 0.06			
Motor charging time		[s]	≤ 5			
Phase distance	P	[mm]	150, 210			
	B, H	[mm]	150			
Weight	H	[kg]	83.5		91	
	Cradle (H-Type)	[kg]	150			
	P, B	[kg]	52		55	
Installation type			P, B, H			
Applicable standard			IEC 62271-100			

12kV breakers

Type			MVL-12□16,20,25□06,10,13		MVL-17□32□06,13	
Rated voltage, Ur		[kV]	12			
Rated normal current, Ir		[A]	630, 1000, 1250		630, 1250	
Rated frequency, fr		[Hz]	50 / 60			
Rated short-circuit current, Ik		[kA]	16, 20, 25		31.5	
Rated short-circuit breaking capacity		[MVA]	333, 416, 520		655	
Rated short-time withstand current, Ik/tk		[kA]	16/4sec, 20/4 sec, 25/4sec		31.5/4 sec	
Rated short-circuit making current, Ip		[kA]	62.5(50Hz), 65(60Hz)		78.8(50Hz), 81.9(60Hz)	
Rated breaking time		[cycle]	3			
Rated withstand voltage	Power frequnecy (1 min), Ud	[kV]	28			
	Impulse (1.2×50μs), Up	[kV/1.2×50μs]	75			
TRV Growth rate		[kV/μs]	0.34			
TRV Maximum		[kV]	20.6			
Rated operating sequence			O-0.3s-CO-15s-CO			
Control voltage and current	Control voltage	[V]	DC24~30V	DC48~60V AC48V	AC/DC 100~130V	AC/DC 200~250V
	Control current for closing	[A]	≤ 8	≤ 4	≤ 2	≤ 1
	Control current for opening	[A]	≤ 8	≤ 4	≤ 4	≤ 2
	Motor current (steady / inrush)	[A]	≤ 5 / ≤ 25	≤ 3 / ≤ 15	≤ 2 / ≤ 10	≤ 1 / ≤ 5
Auxiliary contacts			4a4b, 10a10b			
Rated opening time		[s]	≤ 0.04			
Rated closing time at no load		[s]	≤ 0.06			
Motor charging time		[s]	≤ 5			
Phase distance	P, B, H	[mm]	150		150	
	P, E, F	[mm]	210		210	
Weight	E, F, H	[kg]	83.5		91	
	Cradle (H-Type)	[kg]	150			
	P, B	[kg]	52		55	
Installation type			P, E/F, B, H			
Applicable standard			IEC 62271-100			

* E, F type VCB don't have 16kA and 1000A.

Ratings

17.5kV breakers

Type			MVL–17□16,20,25□06,10,13		MVL–17□32□06,13	
Rated voltage, Ur		[kV]	17.5			
Rated normal current, Ir		[A]	630, 1000, 1250		630, 1250	
Rated frequency, fr		[Hz]	50 / 60			
Rated short-circuit current, Ik		[kA]	16, 20, 25		31.5	
Rated short-circuit breaking capacity		[MVA]	485, 607, 758		955	
Rated short-time withstand current, Ik/tk		[kA]	16/4sec, 20/4 sec, 25/4sec		31.5/4 sec	
Rated short-circuit making current, Ip		[kA]	62.5(50Hz), 65(60Hz)		78.8(50Hz), 81.9(60Hz)	
Rated breaking time		[cycle]	3			
Rated withstand voltage	Power frequnecy (1 min), Ud	[kV]	38			
	Impulse (1.2×50μs), Up	[kV/1.2×50μs]	95			
TRV Growth rate		[kV/μs]	0.42			
TRV Maximum		[kV]	30.0			
Rated operating sequence			O-0.3s-CO-15s-CO			
Control voltage and current	Control voltage	[V]	DC24~30V	DC48~60V AC48V	AC/DC 100~130V	AC/DC 200~250V
	Control current for closing	[A]	≤ 8	≤ 4	≤ 2	≤ 1
	Control current for opening	[A]	≤ 8	≤ 4	≤ 4	≤ 2
	Motor current (steady / inrush)	[A]	≤ 5 / ≤ 25	≤ 3 / ≤ 15	≤ 2 / ≤ 10	≤ 1 / ≤ 5
Auxiliary contacts			4a4b, 10a10b			
Rated opening time		[s]	≤ 0.04			
Rated closing time at no load		[s]	≤ 0.06			
Motor charging time		[s]	≤ 5			
Phase distance	P	[mm]	150, 210			
	B, H	[mm]	150			
Weight	H	[kg]	83.5		91	
	Cradle (H-Type)	[kg]	150			
	P, B	[kg]	52		55	
Installation type			P, B, H			
Applicable standard			IEC 62271-100			

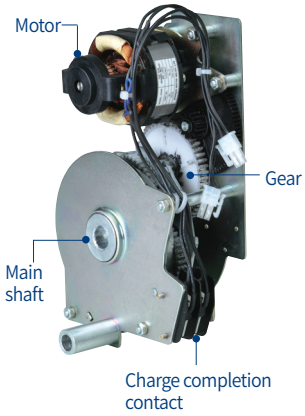
Accessories

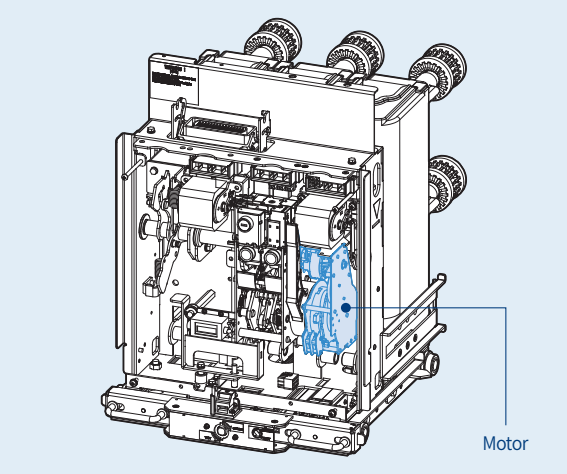
Type		Accessories	Mounting on	Supplied as		Page
				standard	Option	
Breaker (Internal)	M	Geared motor	●	●		26
	C	Closing coil	●	●		26
	T	Opening(Trip) coil	●	●		27
	SA	A type connector	●	●		27
	SQ	Q type connector	●	●		27
	U	UVT	●		●	28
	A1, A2	Additional opening(Trip) coil	●		●	28
	A3, A4, A5	Position S/W	●		●	29
	A7, AG	Keylock	●		●	29
	A8	Button padlock	●		●	30
	A9	Button cover	●		●	30
	AA	Lead wire			●	31
	AB	Plug/Terminal for lead wire			●	31
	AC	Plug interlock	●		●	32
	AD	Padlock	●		●	32
	AE	Mechanical operated cell switch	●		●	33
	AF	Locking magnet	●		●	33
	AH	Mold insulation tube	●		●	34
	AI	Main shaft intrlock lever	●		●	34
	AV, AW	CTC	●		●	35
	AZ	Manual charging geared motor ass'y	●		●	35
Breaker (External)	CTD1	Condenser Trip Device (AC 110V)			●	36
	CTD2	Condenser Trip Device (AC 220V)			●	36
	UDC1	UVT time delay controller (ADC 110V)			●	37
	UDC2	UVT time delay controller (ADC 220V)			●	37
	UDC3	UVT time delay controller (ADC 48V)			●	37
	CTU	Coil test unit			●	38
	TM	Temperature monitoring unit			●	46
	BA	Bushing ass'y			●	39
	IC	Insulation cover			●	40
Cradle	A1~A9, AA~AD	Earthing S/W & Accessory	●		●	41, 42
	AE	Shutter padlock	●		●	43
	AF	TOC	●		●	43
	AG	MOC	●		●	44
	AH	Door	●		●	44
	AJ	Door interlock	●		●	45
	AK	Door emergency push button	●		●	45
	AL	Temperature sensor	●		●	46
	AM~AO	Type H Cradle lead wire			●	47
	AZ	Manual charging option padlock	●		●	47
	etc.	Door padlock	●		●	47
	etc.	Drawout handle(E/F,H type)			●	48
	etc.	Earthing S/W handle(H type)			●	48

Accessories

Motor: M

Installed inside of a breaker as an option





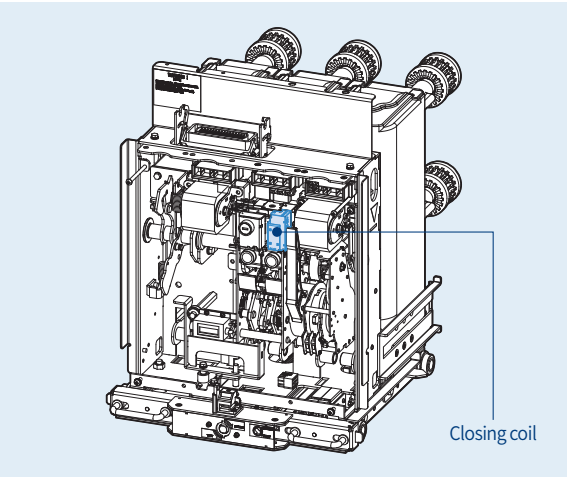
- Charge the closing spring of a circuit breaker by the external power source. When the charging is complete, control power of the motor will be "OFF" by the built-in Limit S/W. Without the external power source, charge manually.

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

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

Closing Coil: C

Installed inside of a breaker as an option

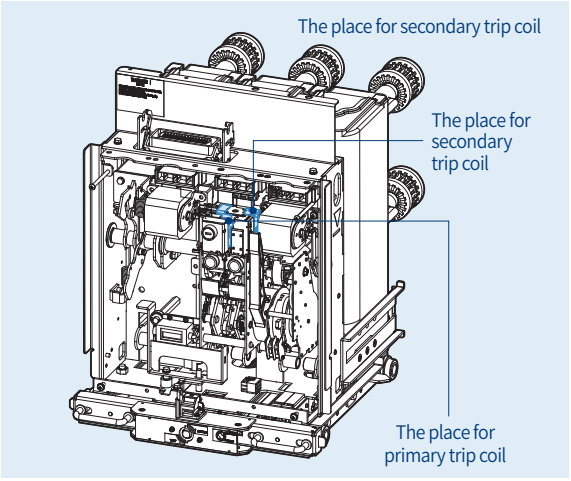


- It is a control device which closes a circuit breaker, when applying voltage continuously or instantaneously over 200ms to the coil control terminals.

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

Opening(Trip) Coil: T

Installed inside of a breaker as an option

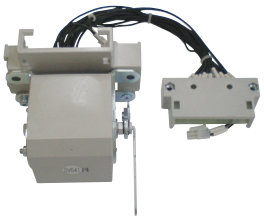


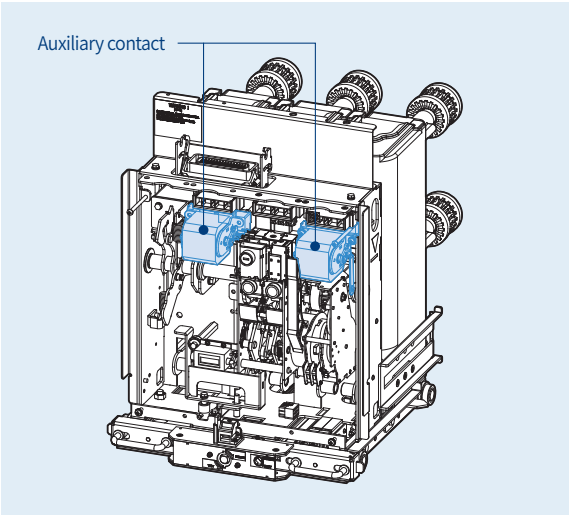
- It is a control device which trips a circuit breaker from remote place, when applying voltage continuously or instantaneously over 35ms to coil control terminals.
- The location of trip coil move to the place for secondary coil when UVT coil is installed.

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

Auxiliary Contact: SA, SQ

Installed inside of a breaker as an option





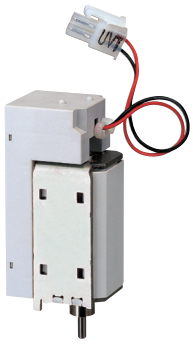
- It is a contact used to monitor ON/OFF status of a breaker from remote place.

* Order gudie
- 4a4b, 10a10 contacts are available.

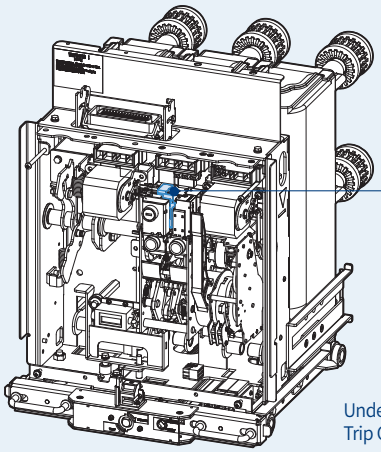
Accessories

Under Voltage Trip Coil: U

Installed inside of a breaker as an option



VL type



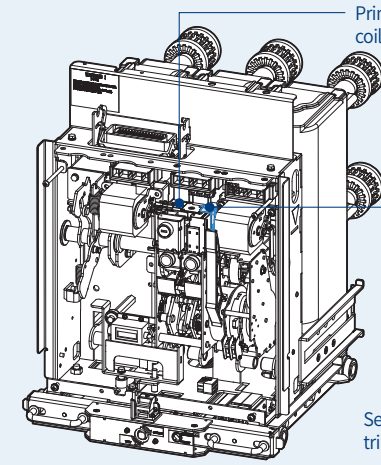
- It is installed inside of a breaker to trip when the main power or control power voltage drops below certain value.
  Instantaneous type is only available with UVT coil and Time delay type is available by connecting UVT coil and UVT time delay controller.
- The closing of a circuit breaker is impossible mechanically or electrically if control power is not supplied to UVT.
  To close the circuit breaker, 65~85% of rated voltage should be applied.
- The location of trip coil move to the place for secondary coil when UVT coil is installed.
- Refer to A1, A2 optons in page 28.

* Order gudie
- Simultaneous application of UVT and A1, A2, AV, AW is not allowed.

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)

Additional Opening(Trip) Coil: A1, A2

Installed inside of a breaker as an option



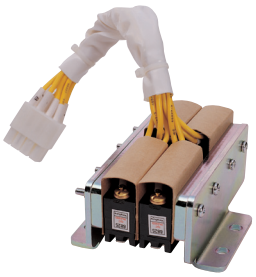
- It is a control device which trips a circuit breaker doubly from the outside. If the trip coil (T) fails, it can trip a circuit breaker safely.

* Order gudie
- Simultaneous application of A1, A2 and UVT (U1~U8), AV, AW is not allowed.

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

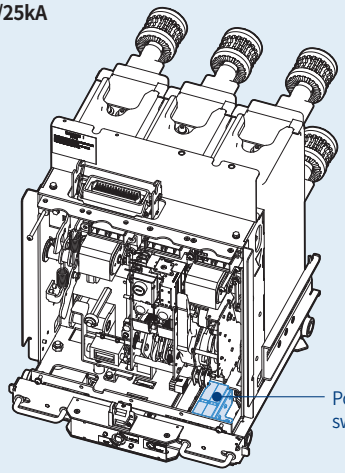
Position Switch: A3, A4, A5

Installed inside of a breaker as an option

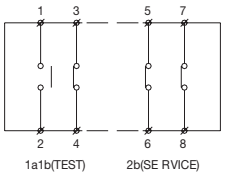


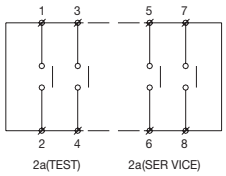
Large model

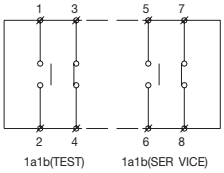
VL: 20/25kA



Contact configuration



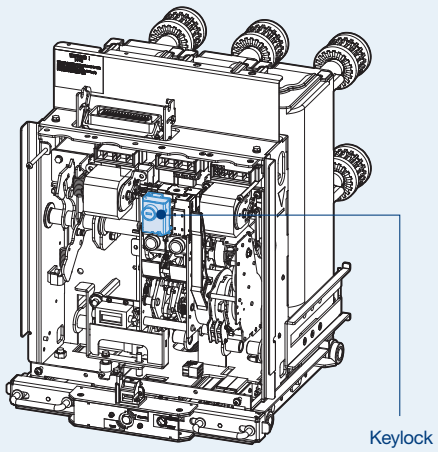




• This switch is used to indicate the breaker position (SERVICE, TEST), and contact configuration is 2a2a or 2a2b.

Keylock: A7, AG

Installed inside of a breaker as an option



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

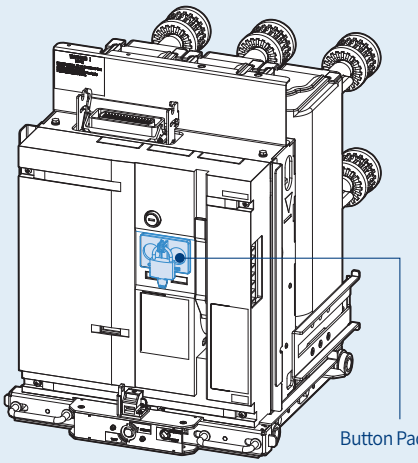
• How to operate
- It is not possible to pull out the key in the unlocked position, possible only in locked status.
- Pushing "OFF" switch of a breaker turn the key counter-clockwise to the locked position and pull it out.
- It is not possible to close the breaker electrically and mechanically in the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

* Order gudie
- This option can not used with AK cradle option (door emergency push button).
- Refer to AK cradle option in page 45.

Accessories

Button Padlock: A8

Installed outside of a breaker as an option

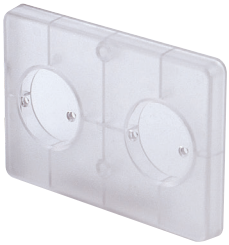


- It is to prevent manual operation of ON/OFF button due to user's wrong handling.
- It is not allowed to handle ON/OFF operation under the 'button lock' status.

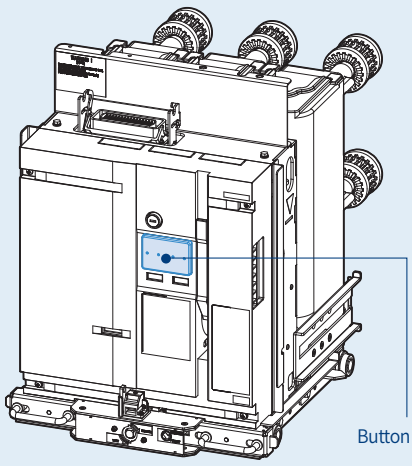
* Order gudie
  - Lock is optional.
  - Simultaneous application of A8 and A9 is not allowed.
  - This option can not be used with AK cradle option(door emergency push button).
  - Refer to AK cradle option in page 45.

Button Cover: A9

Installed outside of a breaker as an option



Push bar



- 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.

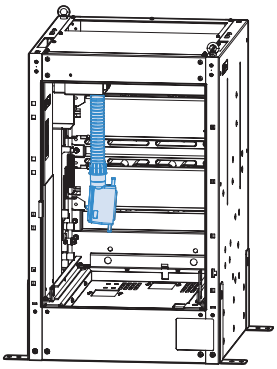
* Order gudie
  - Simultaneous application of A8 and A9 is not allowed.
  - This option can not be used with AK cradle option (door emergency push button).
  - Refer to AK cradle option in page 45.

Lead wire: AA

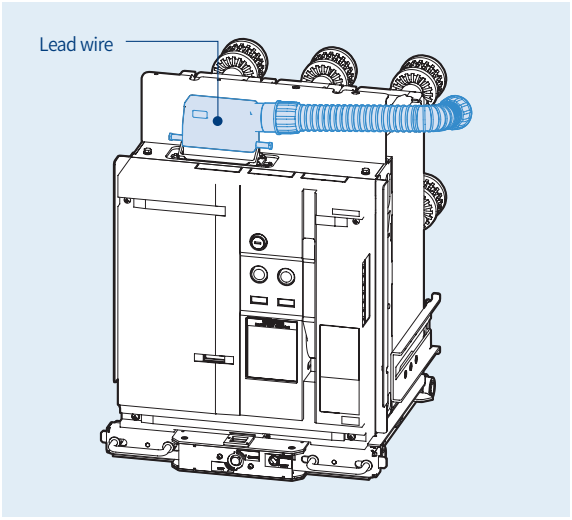
Supplied separately from a breaker as an option

A type connector

Q type connector



Installation of CB Compartment



- The wiring for connecting the control circuit of the circuit breaker from outside needs 2m of wire.

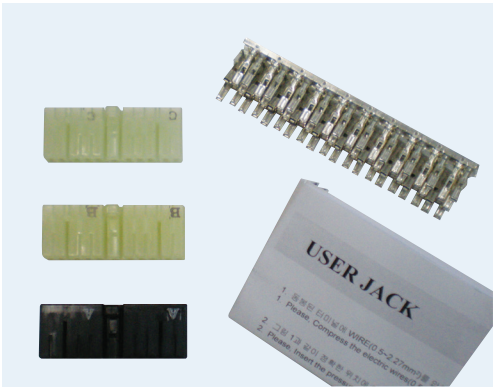
* Order gudie
- Both of A and Q type connector is applicable to P/E/F type VCB.
- Only Q type connector is applicable in case of H type VCB.
- Lead wire is option for only H type VCB.
- Lead wire is provided by default in case of H type cradle.
- Refer to AM~AO cradle options in page 47.

Supply ways of Lead wires by VCB model

Cradle	P	E	F	H
VCB	Purchase separately			Optional purchase or cradle shipment (optional)

Lead wire: AB

Supplied separately from a breaker as an option



A type connector

Q type connector

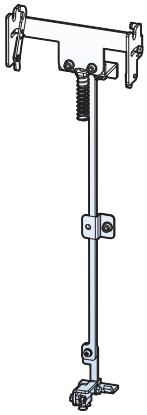
- These are male connectors to connect with a female connector in breaker depending on the connector type of breaker.
- These connectors consist of connectors and termina for lead wire.

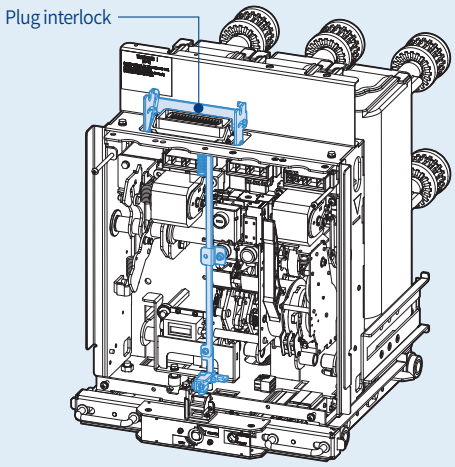
* Order gudie
- Q type connector can be applicable to H and Q type breakers.
- Both of A and Q type connector can be applicable to P, E and F type breakers.
- Refer to page 18 and 19.

Accessories

Plug interlock: AC

Installed inside of a breaker as an option

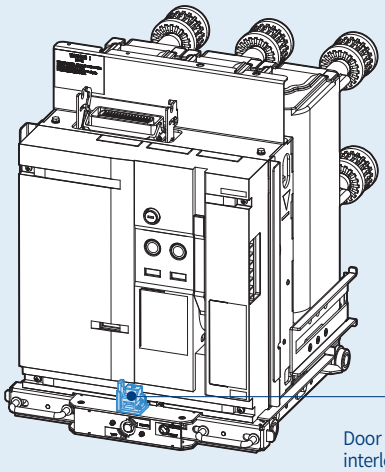




- It checks if the control power connector on the cradle (H type) is connected with the connecting terminal of the breaker before the proceeding of draw-in or out.
- It is not allowed to seperate the control power connector from the breaker in the position of draw-in /out or SERVICE, but TEST position.

Padlock/Door racking interlock: AD

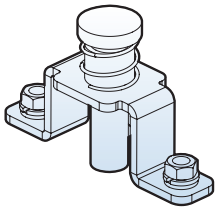
Installed outside of a breaker as an option

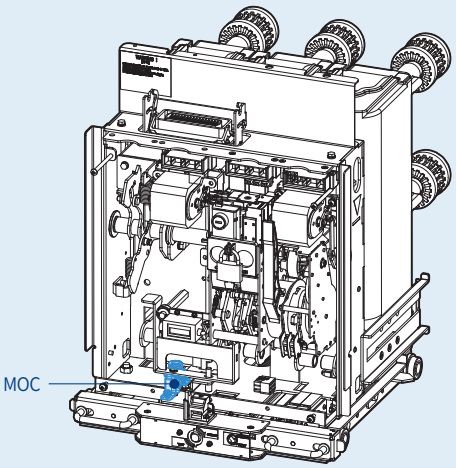


- With this door options for H type cradle draw- in/ out is allowed only when the door is closed.
- If draw-in /out is necessary when the door is open, use the operation lever put in the slot of the breaker handle. Insert it into the hole in the bottom of door interlock.
- Padlock is also optional, which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



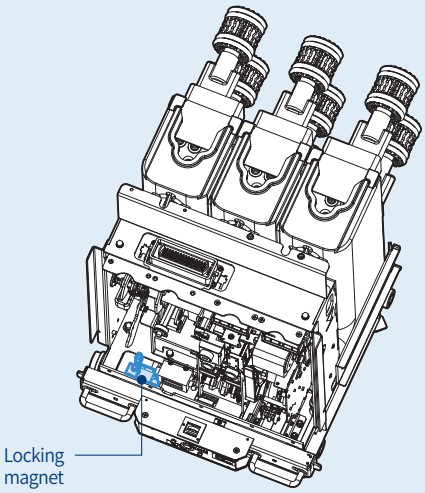


- MOC, Mechanically operated cell switch is the device to indicates the Closed/Trip status of VCB in 'SERVICE' position only.

* Order gudie
- MOC drive device(AE option) of breaker should be selected when MOC(AG option) is used in H type cradle.

Locking magnet: AF

Installed inside of a breaker as an option



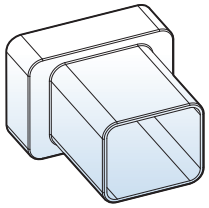
- It allows the withdrawing-in of the breaker in the TEST position under the condition that the control power connector on the cradle (H type)is connected with the connecting terminal of the breaker and the power is supplied.
- During the withdrawing-in or in the SERVICE position draw-in/out is allowed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

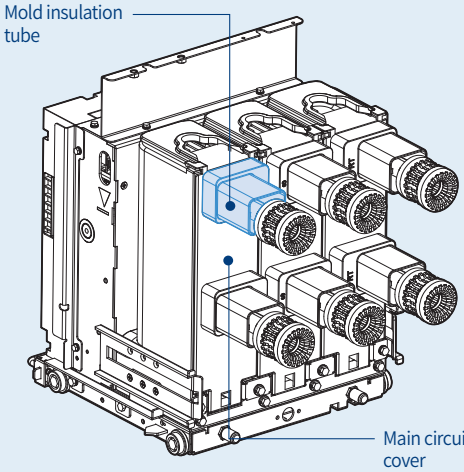
* Control power rating is the same as that of a motor.

Accessories

Mold insulation tube: AH

Installed inside of a breaker as an option

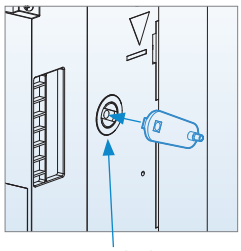


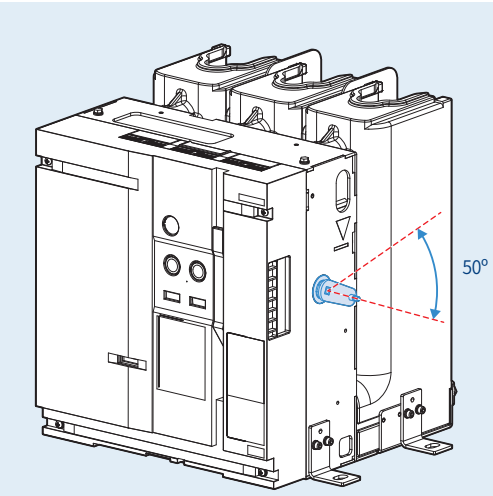


- Mold insulation tube enable Metasol VCB to be applied to W550 CB comparment for 17.5kV technically by assemble with main circuit cover. (Not easy seperation from main circuit cover but very easy assembly)
- There is no need to use any tools to assemble mold insulation tube.

Main shaft intrlock lever: AI

Installed inside of a breaker as an option

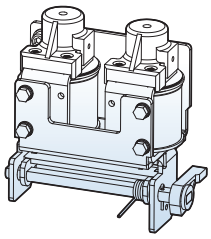


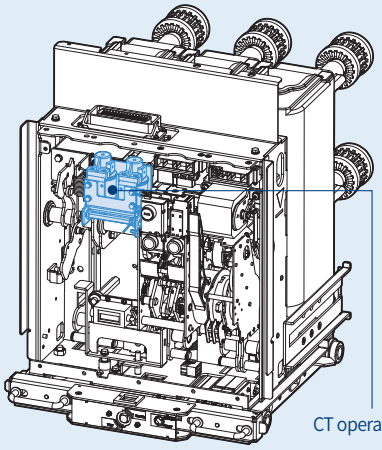


- 'AI' option is used exclusively for P type VCB and operated depending on shaft movement by VCB ON/OFF.
- The two mecha shaft interlock levers are attached to both sides of main shaft (right and left).
- This option can be used such as door interlock and so on depending on what function customer want to use this for.
- The direction of main shaft rotation on a right side basis.
  - Range: 50°
  - Close: counter clockwise
  - Open: Clockwise

CT operated coil: AV, AW

Installed inside of a breaker as an option



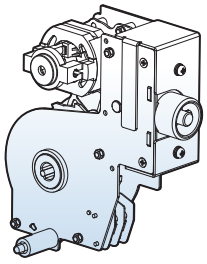


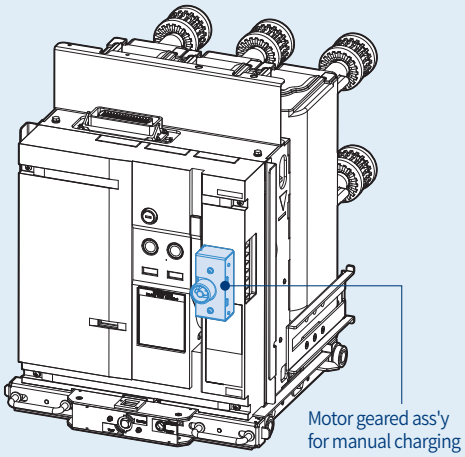
- This trip coil uses the output of the CT as its control power source and is used with over current relay in combination. Two current trip coils are supplied.
- It is a control device which closes a circuit breaker, when applying voltage continuously or instantaneously over 200ms to the coil control terminals.
- 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.

* CT is recommended to use 15VA 5P10 and more.
* Order gudie
  - Simultaneous application of AV, AW and A1, A2, UVT(U1~U8) is not allowed.

Manual Charging: AZ

Built-in a cradle as an option





- It is possible to do manual charging from outside of CB compartment with this option by using manual charging handle in service position of VCB and door closed state of CB compartment.

* Refer to 50page.

- Motor geared ass'y for manual charging has multi-function of auto-charging with control voltage and manual charging with manual charging handle.

* Order gudie
  - AZ VCB option should be coupled with AZ option of cradle.
  - Refer to AZ cradle options in page 47.

Condenser trip device: CTD

Installed outside of a breaker as an option

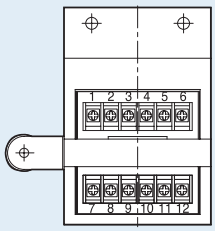
Ratings

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

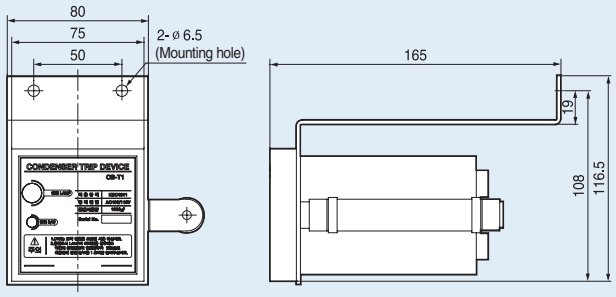
- It gets a circuit breaker tripped electrically within regular time when control power supply is broken down and is used with Shunt coil, SHT. In case there is no DC power, It can be used as the rectifier which supplies DC power to a circuit breaker by rectifying AC power.
- Tripping within 30 seconds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

* Order gudie
- 76113143001 for AC100/110
- 76113143002 for AC200/220

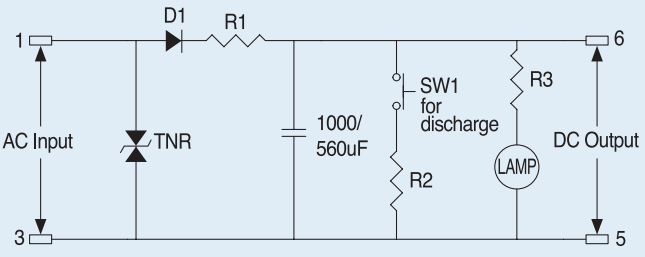
Terminal arrangement



External dimension

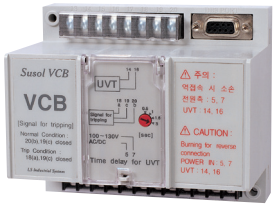


Circuit diagram



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.

* Order gudie
- 52773171281 for DC48/60V, AC48V
- 52773171282 for ADC100~130V
- 52773171283 for ADC200~250V

1. Characteristics

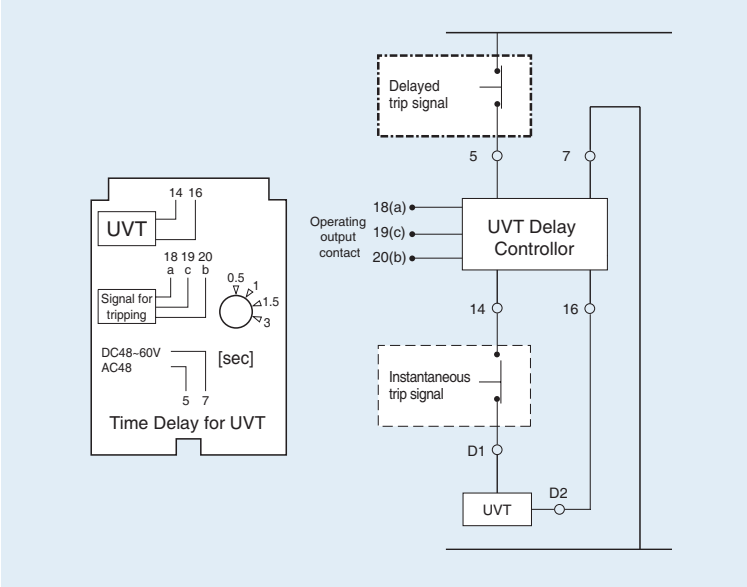
Rated voltage (Vn)		Opration voltage range (V)		Consumption (VA or W)		Time delay (ms)
DC (V)	AC (V)	Pick up	Drop out	Inrush	Steady - state	
48~60	48	0.65~0.85 Vn	0.4~0.65 Vn	200	≤ 5	0.5, 1, 1.5, 3
100~130	100~130					
200~250	200~250					

- 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		

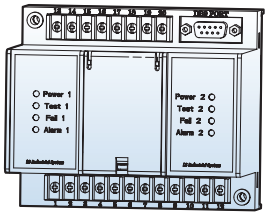
3. Wiring diagram



Accessories

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.

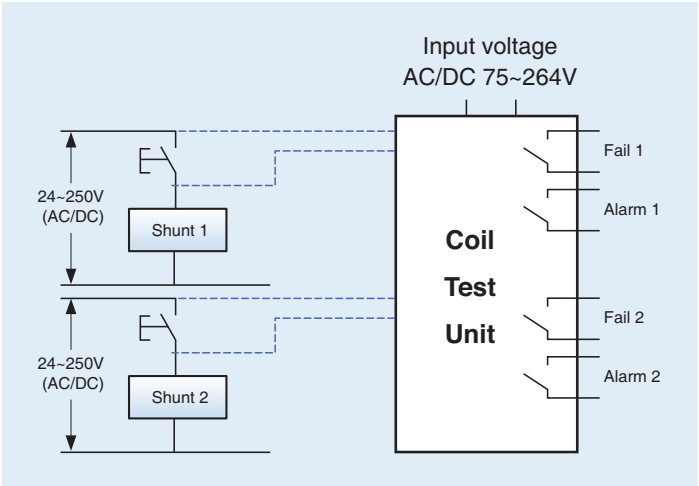
1. Input voltage: AC/DC 75V~264V

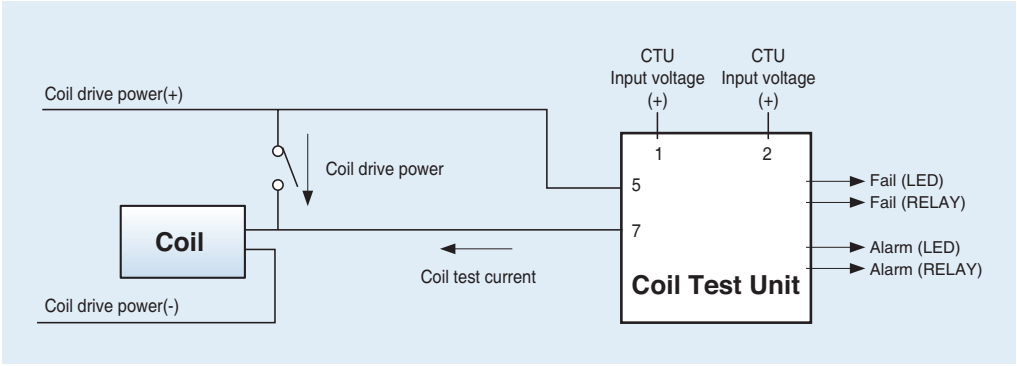
2. Contact output
   1) 2×a contacts for Fail indication and 2×a contacts for Alarm
   2) 250Vac/10A Resistive, 30Vdc/10A Resistive

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)

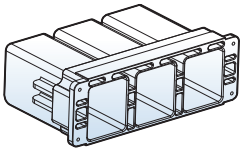
* Order gudie
  - 7387317122



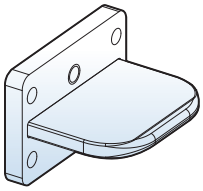


Bushing ass'y for Metasol VCB: BA

Built-in a cradle as an option

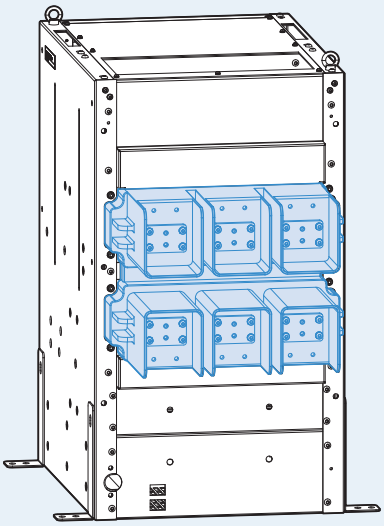


47623172703(only mold part)
Bushing ASS'Y, 150 ONE-BODY D35

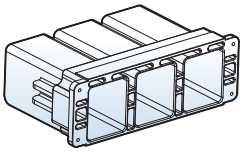


62673172809
TERMINAL ASS'Y, CLIP, MVCL

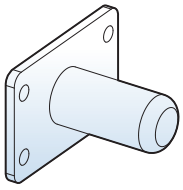
Tulip type (80573172801)



Bushing ass'y for tulip type Metasol VCB

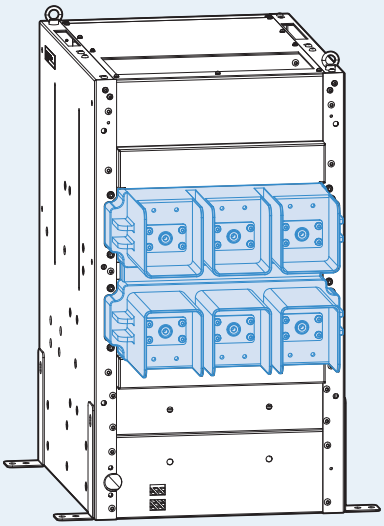


47623172703(only mold part)
Bushing ASS'Y, 150 ONE-BODY D35



62673172810
TERMINAL ASS'Y, TULIP, D29, CI, MVCL

Clip type(80573172802)



- Bushing ass'y can be provided for panel builders who want to use Metasol VCB.
- Bushing ass'y for Metasol VCB is assembly unit with bushing(1ea) and copper terminals(3ea).
- Bushing ass'y for Metasol VCB is provided in paper package box.
- The available order codes with paper box package accoding to terminal types are as below.
  - 80573172801(tulip type)
  - 80573172802(clip type)
- 47623172703(only mold part) can be ordered seperately for panel builders who can make copper terminals or who want to make copper terminals by themselves with 80573172983 code.

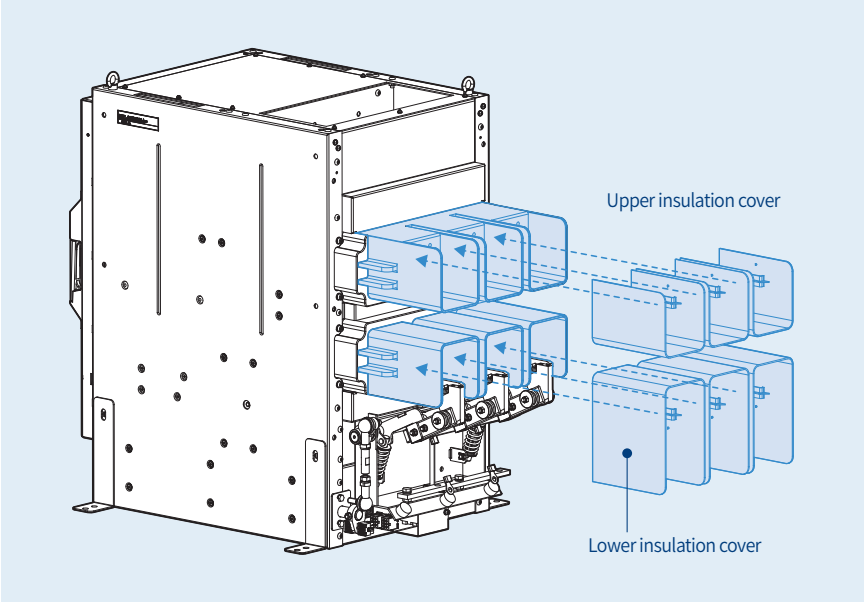
* It is impossible to provide only terminal ass'y for clip, tulip type(62673172809, 62673172810) seperately because there are difficulties providing them with package for various requesting number of terminal ass'y from customers.

* The pictures are in case of W550 H type cradle.

Accessories

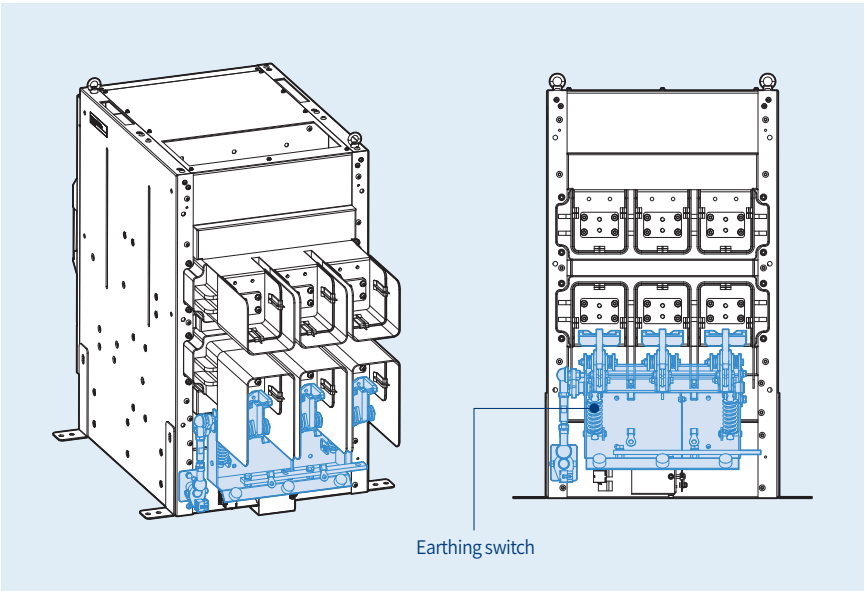
Insulation cover for Cradle bushing: IC

Built-in a cradle as an option



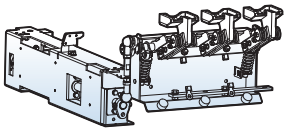
- Insulation cover for cradle bushing is used to complement insulation in bus compartment by extend air insulaton distance and creepage distance of bushing ass'y itself when building MCSG.
- Insulation cover can hold bushing tightly with 3 hands(not easily seperates from bushing).

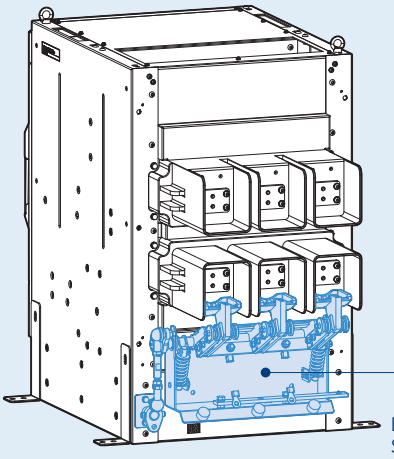
* The pictures are in case of W550 H type cradle.



Earthing Switch: A1

Built-in a cradle as an option





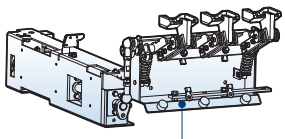
- For the safety during the maintenance of switchgear in the position of TEST/Drawout discharge the charging current in the load side of a VCB with this earthing switch. It is available onlt for H type drawout breaker.

* 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

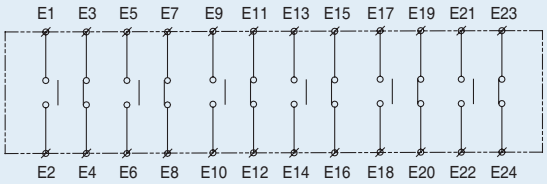


Position switch for E/S

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

** Contact configuration: 2a2b, 6a6b

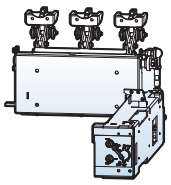
Circuit diagram

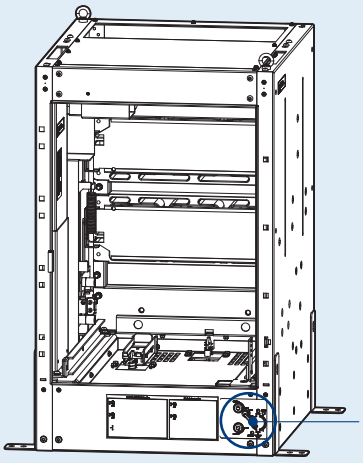


Accessories

Keylock for Earthing Switch: A5

Built-in a cradle as an option





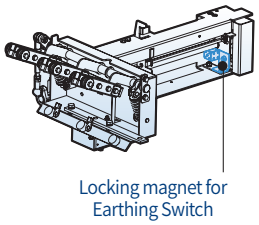
- In case of using earthing switch it can be added for two types of interlocking.

  1) Interlock to keep opening

  2) Interlock to keep earthing

Locking magnet for Earthing Switch : A6~AD

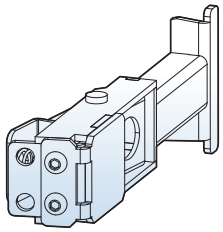
Built-in a cradle as an option

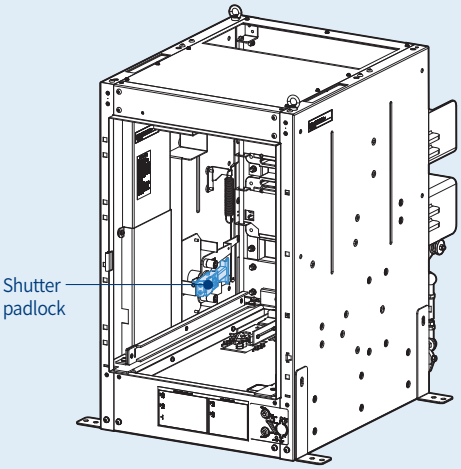


- In case of using earthing switch it can be added to prevent the earthing switch from opening or earthing before it is energized.
- Verify if the locking magnet is energized before opening or earthing the earthing switch.
- Control voltage
  - DC 24V / DC 48V / DC 110V / DC 125V / DC 220V
  - AC 48V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

Shutter padlock: AE

Built-in a cradle as an option

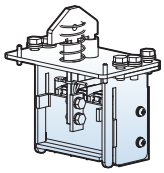


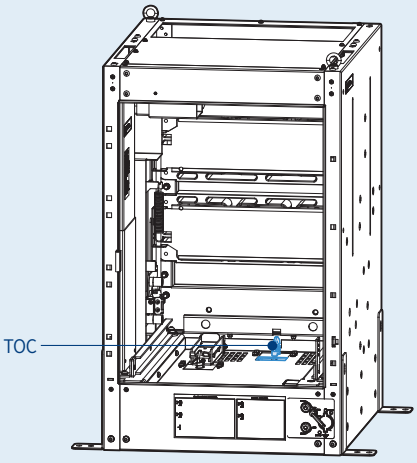


- It is the locking device to lock the primary and secondary shutter in closed state for safety while the breaker is drawn out for maintenance.
- When the breaker is drawn in, the shutter is automatically opened.
- There is a hole for padlock to lock the shutter.
- It can be applied only to H type cradle.

Truck operated cell switch (TOC: AF)

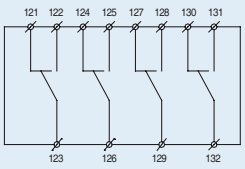
Built-in a cradle as an option





- 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 consists of 4 cell switches with changeover contacts as below diagram.

Circuit diagram

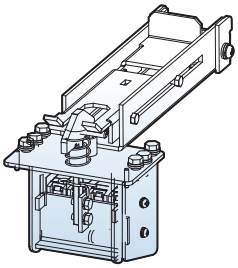


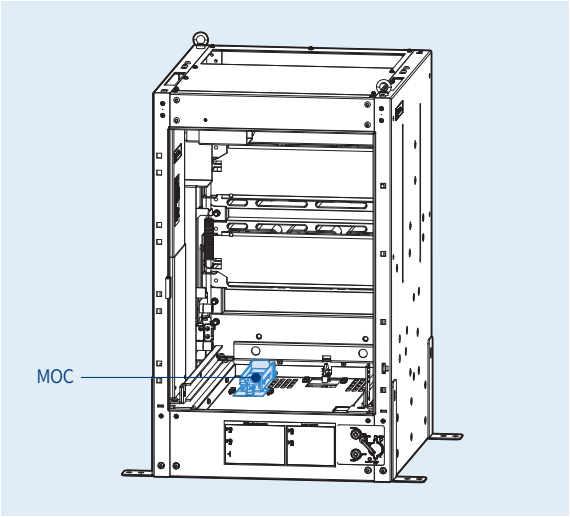
a Contact: 122-123, 125-126, 128-129, 131-132,
b Contact: 121-123, 124-126, 127-129, 130-132

Accessories

Mechanical Operated Cell Switch (MOC: AG)

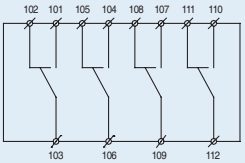
Built-in a cradle as an option





- 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.
- TOC consists of 4 cell switches with changeover contacts as below diagram.

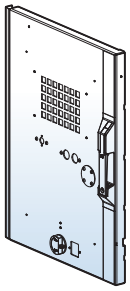
Circuit diagram

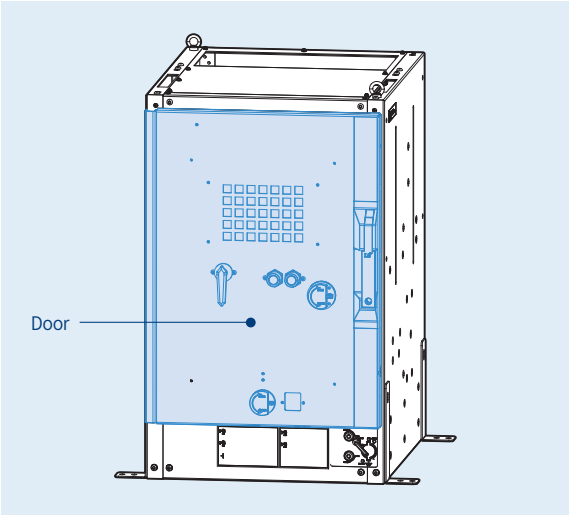


a Contact: 101-103, 104-106, 107-109, 110-112,
b Contact: 102-103, 105-106, 108-109, 111-112

Door: AH

Built-in a cradle as an option



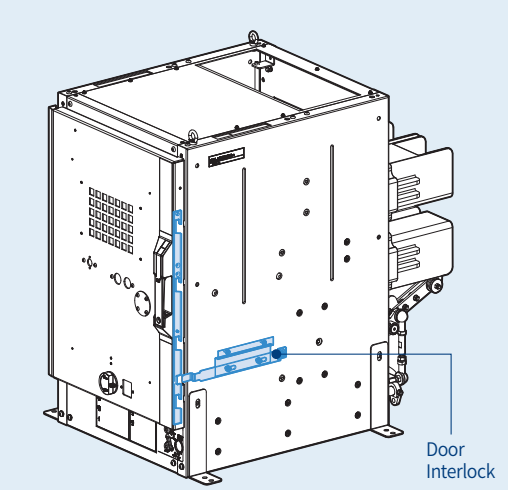


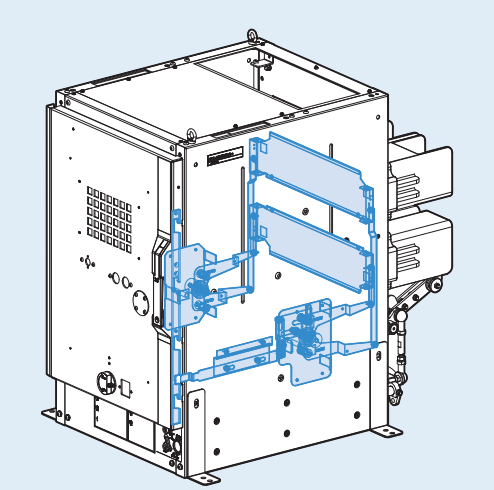
- It is outside door for H type cradle.

* Order gudie
- AZ option is sub option for AH opton(door) for H type cradle.

Door Interlock: AJ

Built-in a cradle as an option

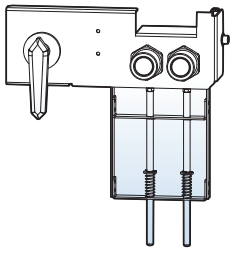


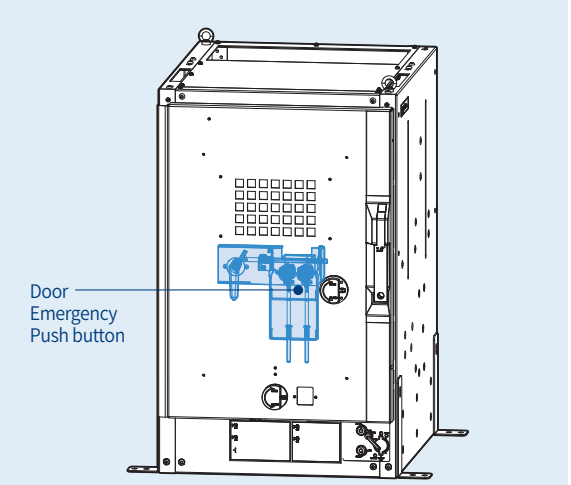


- Door interlock prevent the door from being opened in SERVICE position of VCB.
- Door interlock ass'y operates by means of shutter ass'y operation.

Door Emergency Push button: AK

Built-in a cradle as an option



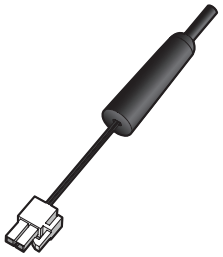


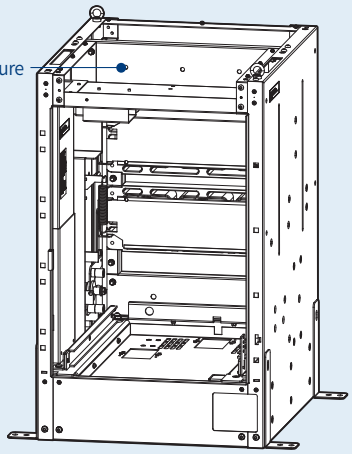
- It is used to enable the Close/Trip of the breaker manually from outside of the door installed to H type cradle during an emergency.
- Push the ON/OFF button by ON/OFF handle supplied seperately.

Accessories

Temperature sensor: AL
Temperature monitoring unit: TM

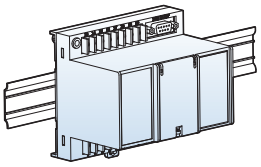
Installed outside of a breaker as an option

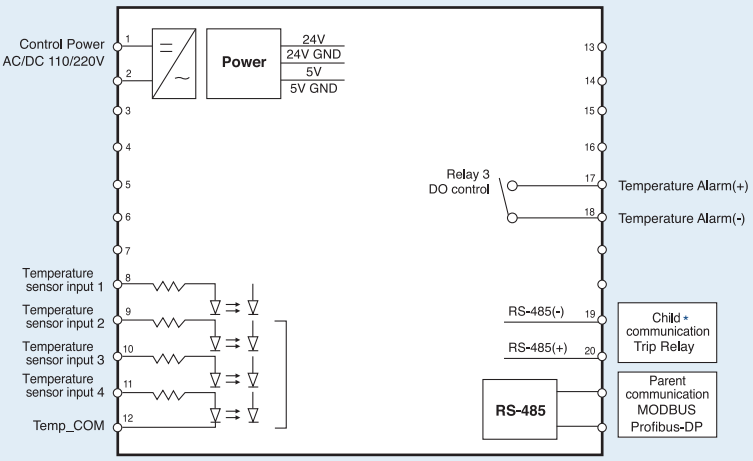




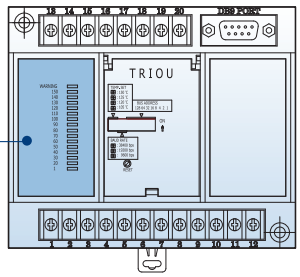
- This sensor is used to detect the temperature in H-type cradle combined with temperature monitoring
- Temperature Alarm Unit displays the input temperature detected through the temperature sensor installed in H-type cradle.
- Temperature sensor can be installed up to three (R, S, T phase).
- Temperature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

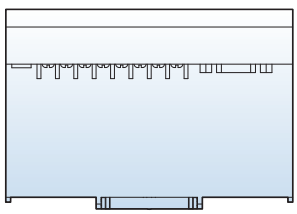
Temperature sensor and monitoring unit





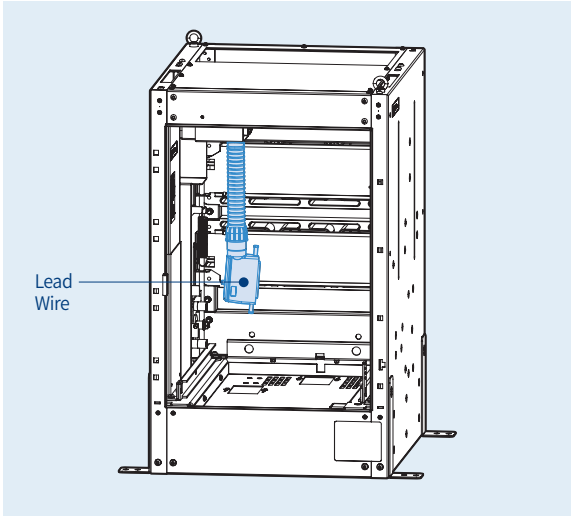
LED temperature display (°C): 10 ~150°C,
Warning
Display maximum value of temperatures





Type H Cradle Lead Wire: AM~AO

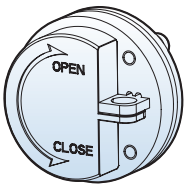
Built-in a cradle as an option

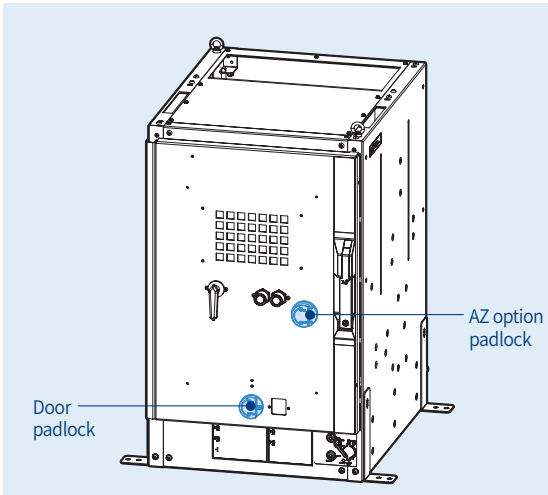


* Order gudie
  - Lead wire is provided by default in case of H type cradle.
  - 4a4b or 10a10b contacts are selectable depending on that of VCB.
  - Flame retardant cable is available for 4a4b B type connector.
  - Refer to page 20.

Manual charging option padlock: AZ and door padlock

Built-in a cradle as an option



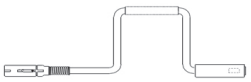
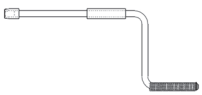


- Door padlock
  It is provided with the door for H type cradle by default and prevent inserting manual withdraw in/out handle by lockinng with key.
- Manual charging opton padlock: AZ
  It is provided with the door for H type cradle as option and prevent inserting manual charging handle by lockinng with key.

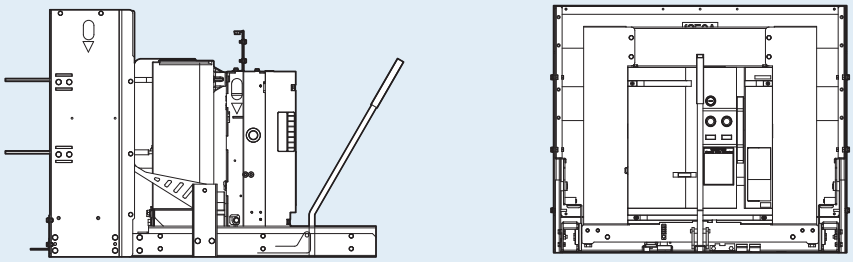
Racking In/Out handle

Metasol VCB offers various kinds of handles suitable for each type.

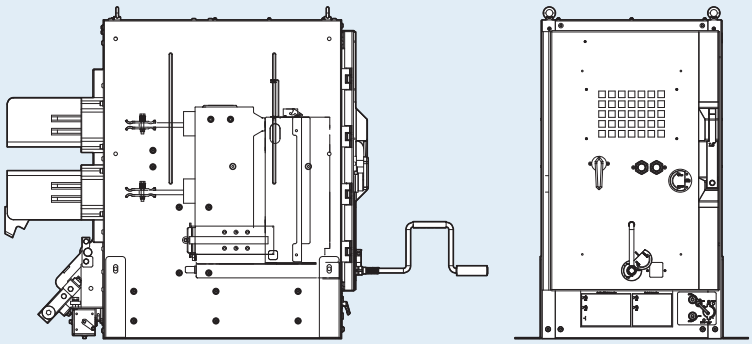
- Racking in/out handle is provided as basic part because it is an essential part for racking in/out of withdrawable type VCB.
- Manual charging handle is provided exclusively for the VCB with 'AZ' option.
- These hadles can be ordered seperately with the codes below.

Type	Cradle	Racking in/out handle	Charging handle
MVL-12□20,25	E F	55223172407 	Not required
MVL-06,12, 17□20,25	H	55223172480 	55213143005 

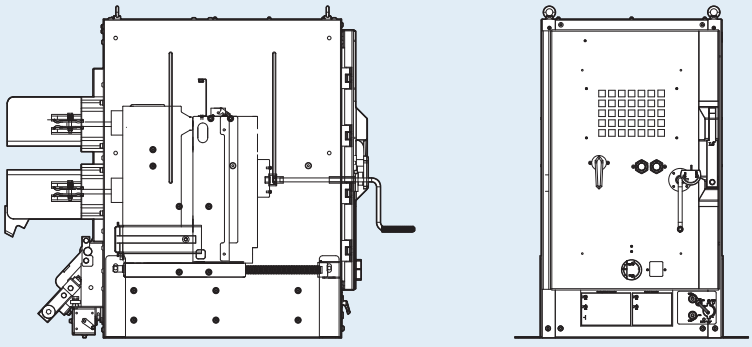
Racking in/out handle for E/F type cradle



Racking in/out handle for H type cradle



Manual charging handle for H type cradle

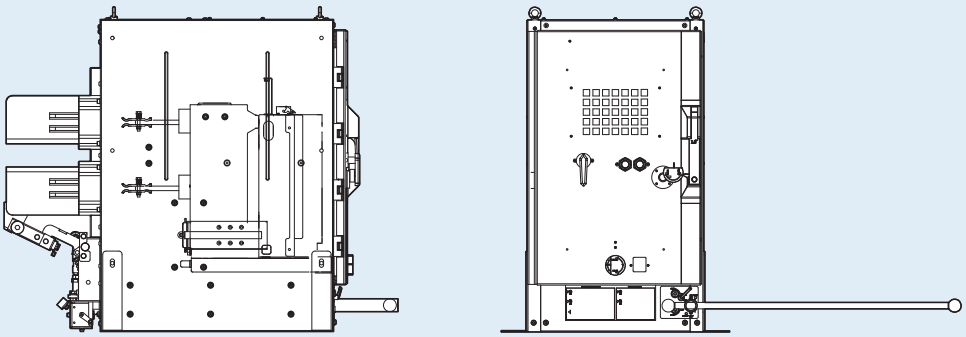


Operating handle for earthing S/W of H cradle

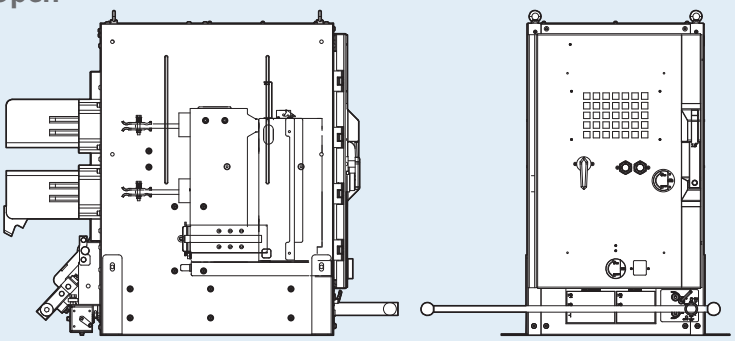
Type	Cradle	Operating handle for earthing S/W
MVL-06,12, 17□20,25	H	55223172701 

Warning: Earthing Swich should be operated only at test postion of VCB.

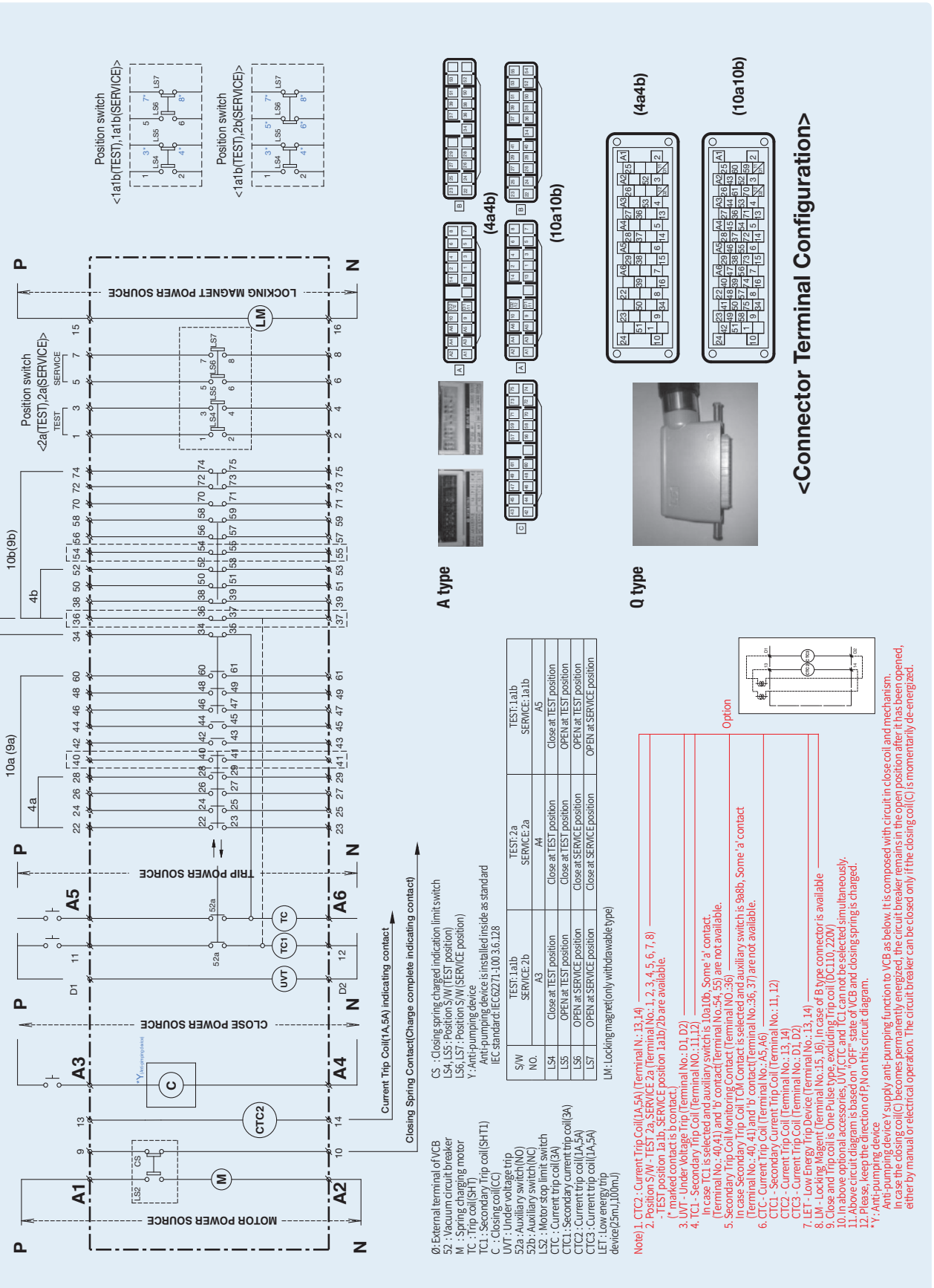
Close



Open



Control circuit diagram



Ø: External terminal of VCB
52 : Vacuum circuit breaker
M : Spring charging motor
TC : Trip coil(SHT)
TC1 : Secondary Trip coil(SHT1)
C : Closing coil(CC)
UVT : Under voltage trip
52a : Auxiliary switch(NO)
52b : Auxiliary switch(NC)
LS2 : Motor stop limit switch
CTC : Current trip coil(3A)
CTC1 : Secondary current trip coil(3A)
CTC2 : Current trip coil(1A,5A)
CTC3 : Current trip coil(1A,5A)
LET : Low energy trip device(25mJ,100mJ)

CS : Closing spring charged indication limit switch
LS4, LS5 : Position S/W (TEST position)
LS6, LS7 : Position S/W (SERVICE position)
Y : Anti-pumping device
Anti-pumping device is installed inside as standard
IEC standard: IEC 62271-100 3.6.128

S/W NO.	TEST:1a1b SERVICE:2b A3	TEST:2a SERVICE:2a A4	TEST:1a1b SERVICE:1a1b A5
LS4	Close at TEST position	Close at TEST position	Close at TEST position
LS5	OPEN at TEST position	Close at TEST position	OPEN at TEST position
LS6	OPEN at SERVICE position	Close at SERVICE position	OPEN at TEST position
LS7	OPEN at SERVICE position	Close at SERVICE position	OPEN at SERVICE position

LM : Locking magnet(only withdrawable type)

Note) 1. CTC2 : Current Trip Coil(1A,5A) [Terminal N.: 13,14)
2. Position S/W - TEST 2a,SERVICE 2a [Terminal No.: 1, 2, 3, 4, 5, 6, 7, 8)
- TEST position 1a1b,SERVICE position 1a1b/2b are available.
(* marked contact is b contact.)
3. UVT - Under Voltage Trip (Terminal No.: D1, D2)
4. TC1 - Secondary Trip Coil (Terminal NO.: 11,12)
In case TC1 is selected and auxiliary switch is 10a10b, Some 'a' contact.
(Terminal No.: 40,41) and 'b' contact(Terminal No.:54, 55) are not available.
5. Secondary Trip Coil Monitoring Contact (Terminal NO.:36)
In case Secondary Trip Coil TCM Contact is selected and auxiliary switch is 9a8b, Some 'a' contact
(Terminal No.: 40, 41) and 'b' contact(Terminal No.:36, 37) are not available.
6. CTC - Current Trip Coil (Terminal No.: A5, A6)
CTC1 - Secondary Current Trip Coil (Terminal No.: 11, 12)
CTC2 - Current Trip Coil (Terminal No.: 13, 14)
CTC3 - Current Trip Coil (Terminal No.: D1, D2)
7. LET - Low Energy Trip Device (Terminal No.: 13, 14)
8. LM - Locking Magent (Terminal No.:15, 16). In case of B type connector is available
9. Close and Trip coil is One Pulse type, excluding Trip coil (DC110, 220V)
10. In above optional accessories, UVT, CTC and TC1 can not be selected simultaneously.
11. Above circuit diagram is based on 'OFF' state of VCB and closing spring is charged.
12. Please, keep the direction of P, N on this circuit diagram.
*Y : Anti-pumping device
Anti-pumping device Y supply anti-pumping function to VCB as below. It is composed with circuit in close coil and mechanism.
In case the closing coil(C) becomes permanently energized, the circuit breaker remains in the open position after it has been opened, either by manual or electrical operation. The circuit breaker can be closed only if the closing coil(C) is momentarily de-energized.

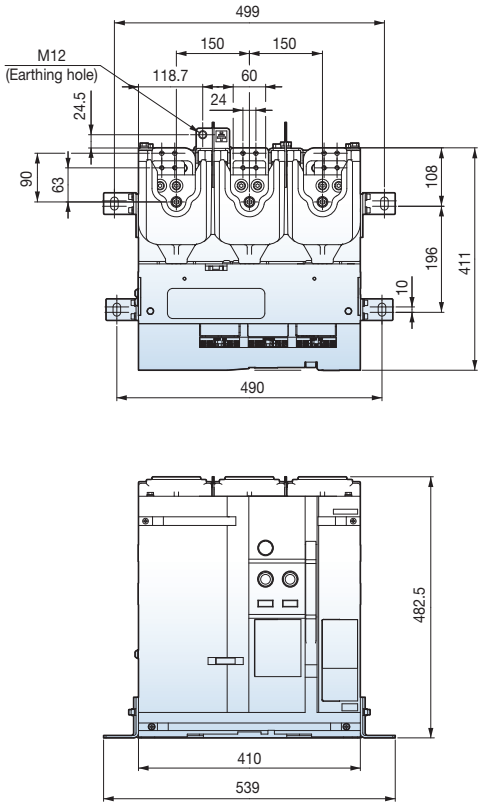
Option

Dimensions (VCB & Cradle)

P type (up to 12kV)

Phase-to-Phase distance: 150mm

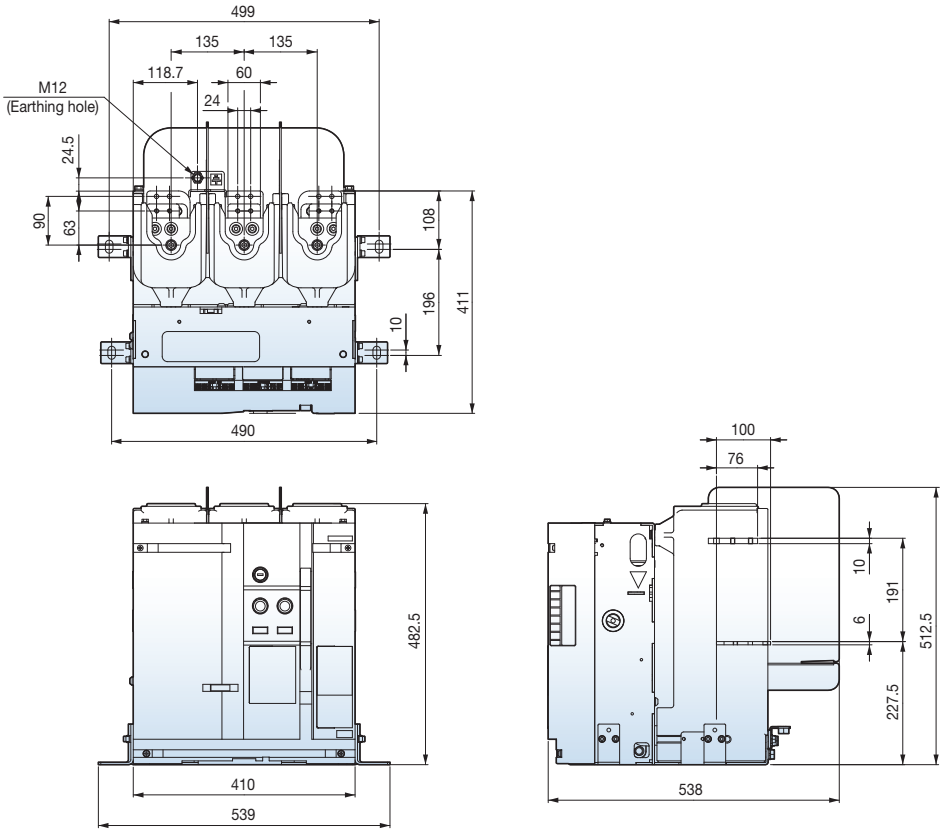
Rating	Type name
7.2kV 20kA 630A	06P20A06
7.2kV 20kA 1250A	06P20A13
7.2kV 25kA 630A	06P25A06
7.2kV 25kA 1250A	06P25A13
7.2kV 31.5kA 630A	06P32A06
7.2kV 31.5kA 1250A	06P32A13
12kV 16kA 630A	12P16A06
12kV 16kA 1000A	12P16A10
12kV 16kA 1250A	12P16A13
12kV 20kA 630A	12P20A06
12kV 20kA 1000A	12P20A10
12kV 20kA 1250A	12P20A13
12kV 25kA 630A	12P25A06
12kV 25kA 1000A	12P25A10
12kV 25kA 1250A	12P25A13
12kV 31.5kA 630A	12P32A06
12kV 31.5kA 1250A	12P32A13



P type (17.5kV)

Phase-to-Phase distance: 150mm

Rating	Type name
17.5kV 16kA 630A	17P16A06
17.5kV 16kA 1000A	17P16A10
17.5kV 16kA 1250A	17P16A13
17.5kV 20kA 630A	17P20A06
17.5kV 20kA 1000A	17P20A10
17.5kV 20kA 1250A	17P20A13
17.5kV 25kA 630A	17P25A06
17.5kV 25kA 1000A	17P25A10
17.5kV 25kA 1250A	17P25A13
17.5kV 31.5kA 630A	17P32A06
17.5kV 31.5kA 1250A	17P32A13

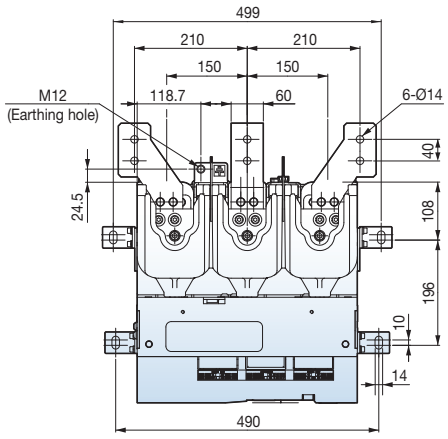


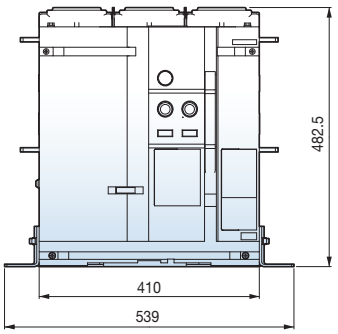
Dimensions (VCB & Cradle)

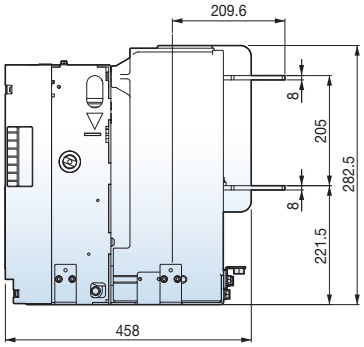
P type (up to 12kV)

Phase-to-Phase distance: 210mm

Rating	Type name
7.2kV 20kA 630A	06P20B06
7.2kV 20kA 1250A	06P20B13
7.2kV 25kA 630A	06P25B06
7.2kV 25kA 1250A	06P25B13
7.2kV 31.5kA 630A	06P32B06
7.2kV 31.5kA 1250A	06P32B13
12kV 16kA 630A	12P16B06
12kV 16kA 1000A	12P16B10
12kV 16kA 1250A	12P16B13
12kV 20kA 630A	12P20B06
12kV 20kA 1000A	12P20B10
12kV 20kA 1250A	12P20B13
12kV 25kA 630A	12P25B06
12kV 25kA 1000A	12P25B10
12kV 25kA 1250A	12P25B13
12kV 31.5kA 630A	12P32B06
12kV 31.5kA 1000A	12P32B10
12kV 31.5kA 1250A	12P32B13



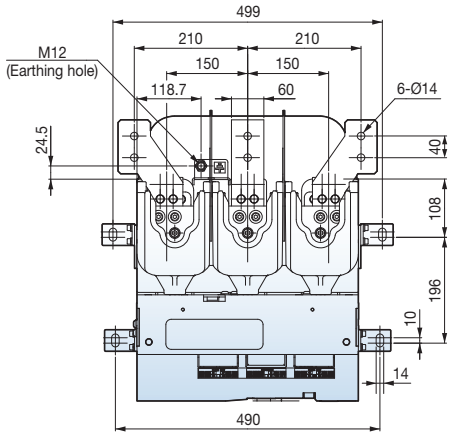


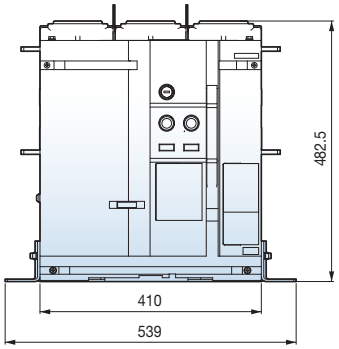


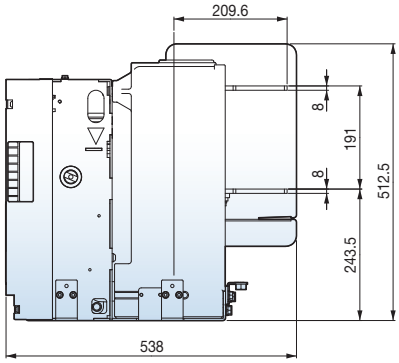
P type (17.5kV)

Phase-to-Phase distance: 210mm

Rating	Type name
17.5kV 16kA 630A	17P16B06
17.5kV 16kA 1000A	17P16B10
17.5kV 16kA 1250A	17P16B13
17.5kV 20kA 630A	17P20B06
17.5kV 20kA 1000A	17P20B10
17.5kV 20kA 1250A	17P20B13
17.5kV 25kA 630A	17P25B06
17.5kV 25kA 1000A	17P25B10
17.5kV 25kA 1250A	17P25B13
17.5kV 31.5kA 630A	17P32B06
17.5kV 31.5kA 1000A	17P32B10
17.5kV 31.5kA 1250A	17P32B13



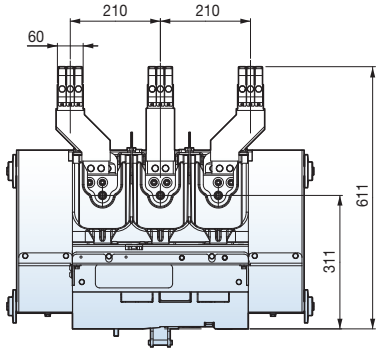


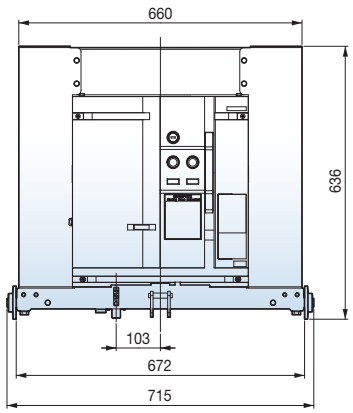


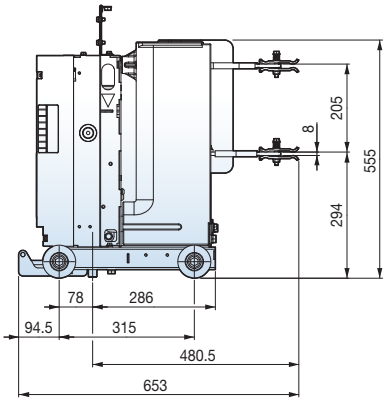
E type VCB & Cradle, Clip for 12kV 20/25kA 630A

Phase-to-Phase distance: 210mm
Racking In/Out stroke: 182mm

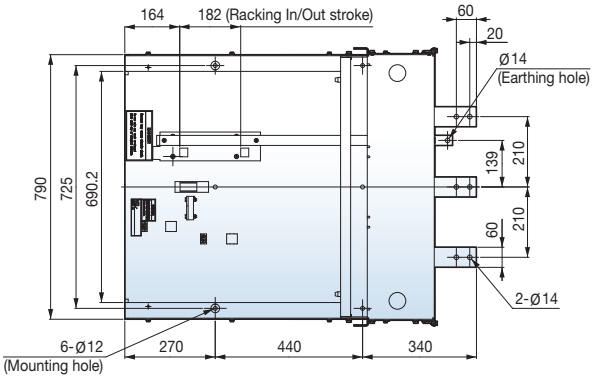
Rating	Type name
12kV 20kA 630A	12E20B06
12kV 25kA 630A	12E25B06

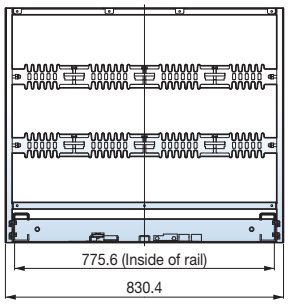


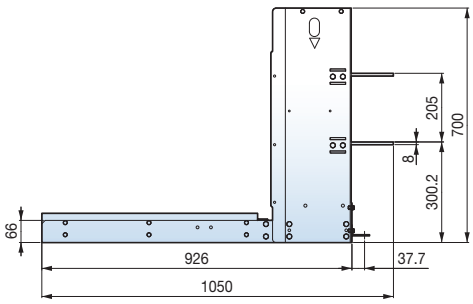




Rating	Type name
12kV 20kA 630A	12E20B06
12kV 25kA 630A	12E25B06





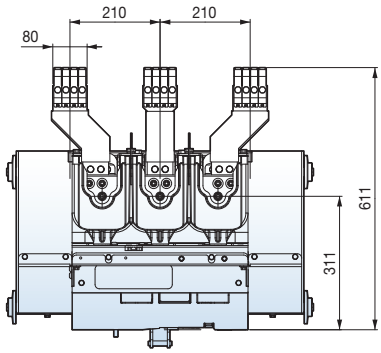


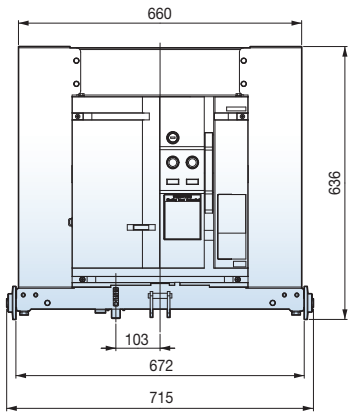
Dimensions (VCB & Cradle)

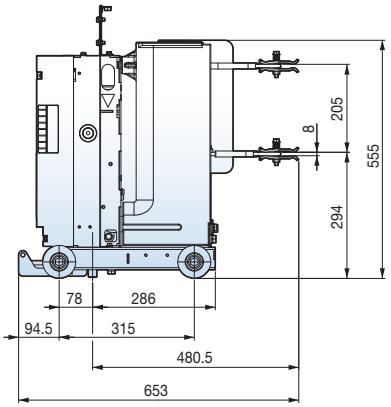
E type VCB & Cradle, Clip for 12kV 20/25kA 1250A

Phase-to-Phase distance: 210mm
Racking In/Out stroke: 182mm

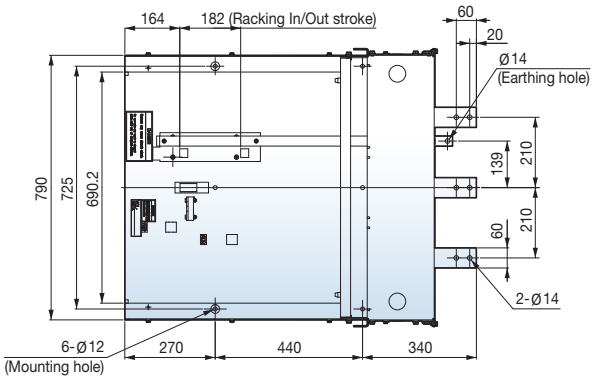
Rating	Type name
12kV 20kA 1250A	12E20B13
12kV 25kA 1250A	12E25B13

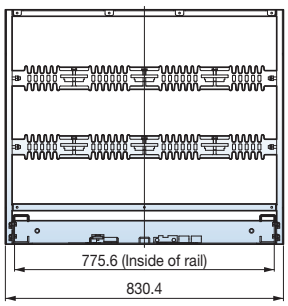


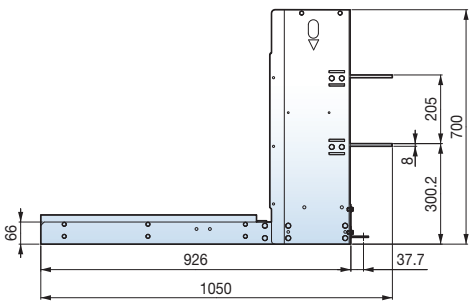




Rating	Type name
12kV 20kA 1250A	12E20B13
12kV 25kA 1250A	12E25B13



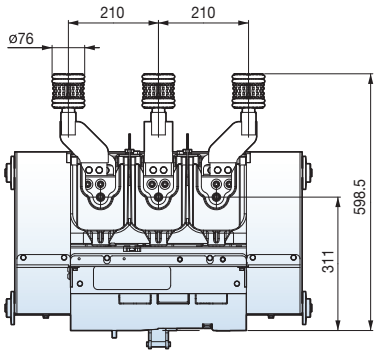


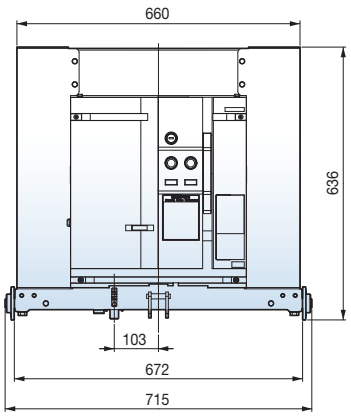


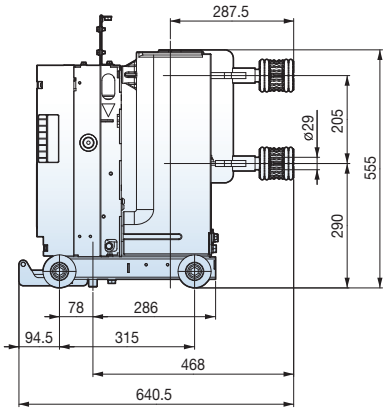
E type VCB & Cradle, Tulip for 12kV 20/25kA 630/1250A

Phase-to-Phase distance: 210mm
Racking In/Out stroke: 182mm

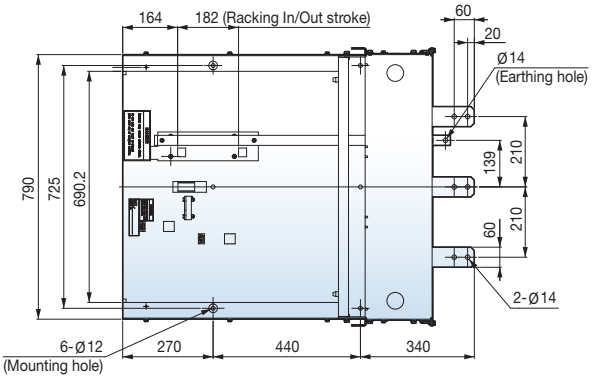
Rating	Type name
12kV 20kA 630A	12E20Q06
12kV 20kA 1250A	12E20Q13
12kV 25kA 630A	12E25Q06
12kV 25kA 1250A	12E25Q13

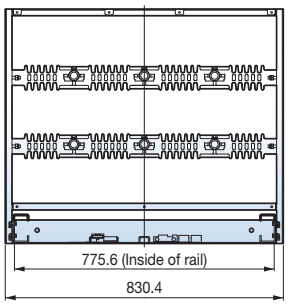


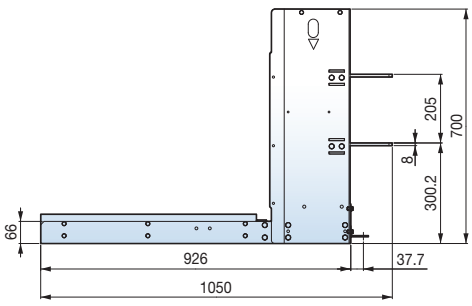




Rating	Type name
12kV 20kA 630A	12E20Q06
12kV 20kA 1250A	12E20Q13
12kV 25kA 630A	12E25Q06
12kV 25kA 1250A	12E25Q13





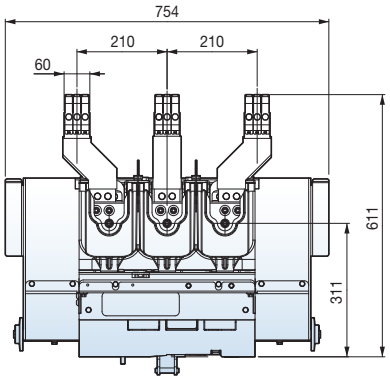


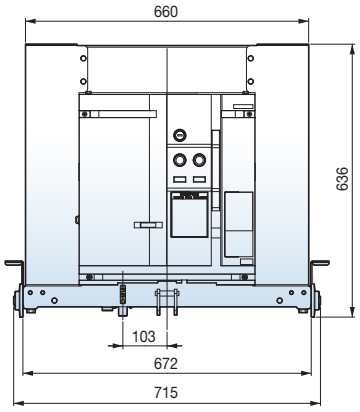
Dimensions (VCB & Cradle)

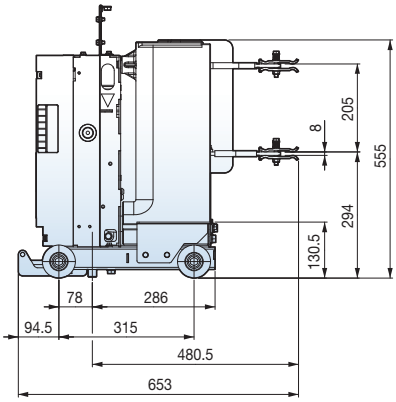
F type VCB & Cradle, Clip for 12kV 20/25kA 630A

Phase-to-Phase distance: 210mm
Racking In/Out stroke: 182mm

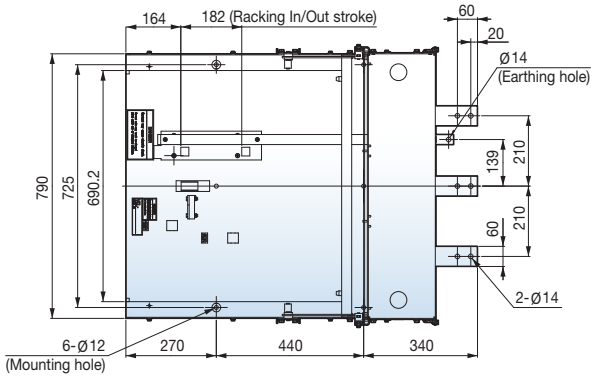
Rating	Type name
12kV 20kA 630A	12F20B06
12kV 25kA 630A	12F25B06

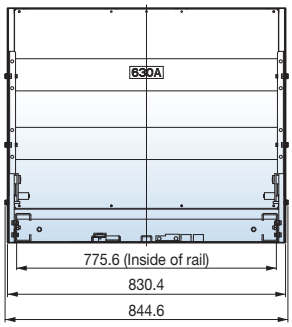


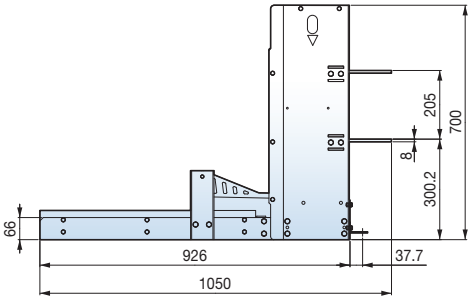




Rating	Type name
12kV 20kA 630A	12F20B06
12kV 25kA 630A	12F25B06



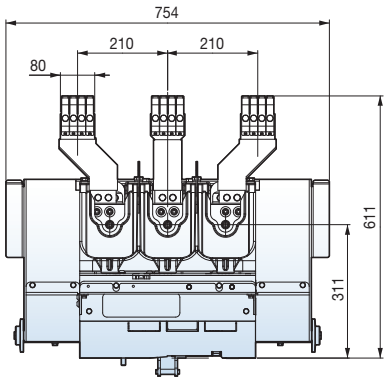


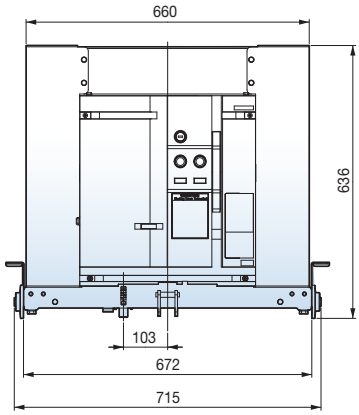


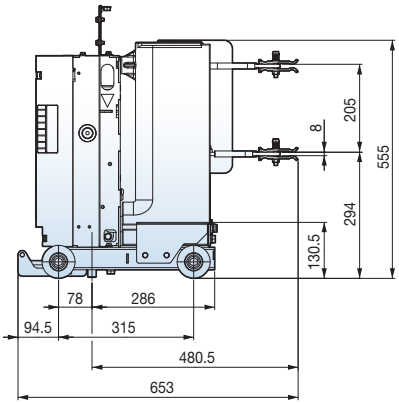
F type VCB & Cradle, Clip for 12kV 20/25kA 1250A

Phase-to-Phase distance: 210mm
Racking In/Out stroke: 182mm

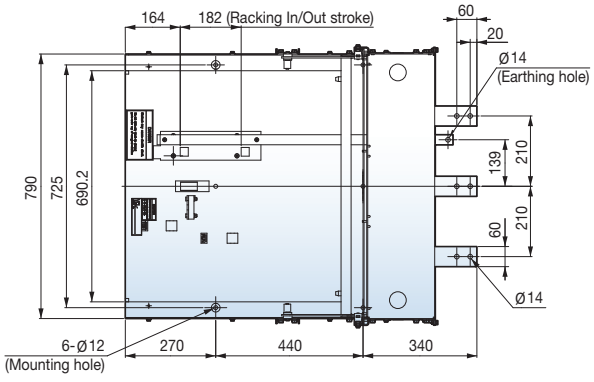
Rating	Type name
12kV 20kA 1250A	12F20B13
12kV 25kA 1250A	12F25B13

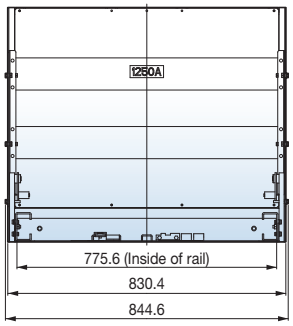


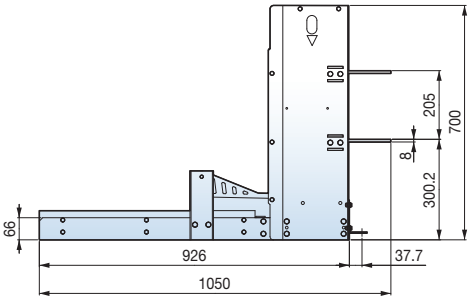




Rating	Type name
12kV 20kA 1250A	12F20B13
12kV 25kA 1250A	12F25B13





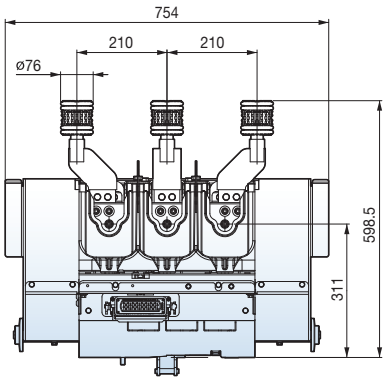


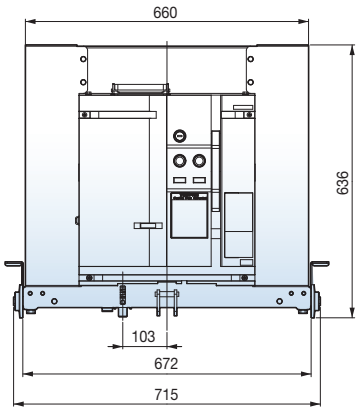
Dimensions (VCB & Cradle)

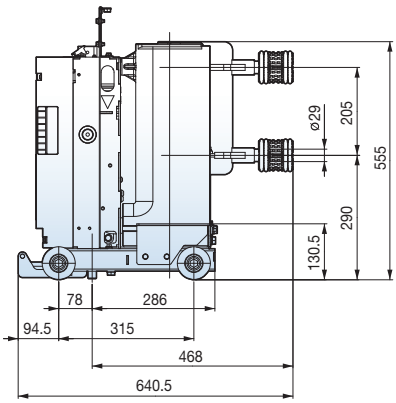
F type VCB & Cradle, Tulip for 12kV 20/25kA 630/1250A

Phase-to-Phase distance: 210mm
Racking In/Out stroke: 182mm

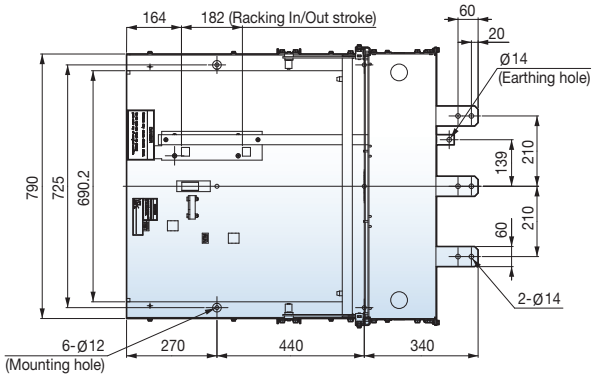
Rating	Type name
12kV 20kA 630A	12F20Q06
12kV 20kA 1250A	12F20Q13
12kV 25kA 630A	12F25Q06
12kV 25kA 1250A	12F25Q13

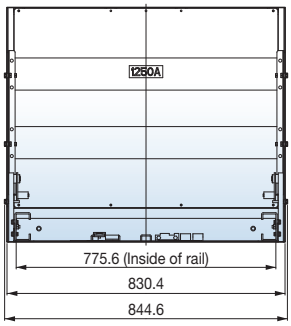


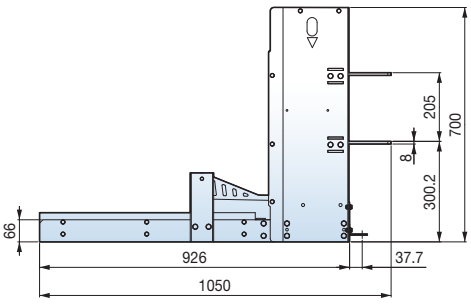




Rating	Type name
12kV 20kA 630A	12F20Q06
12kV 20kA 1250A	12F20Q13
12kV 25kA 630A	12F25Q06
12kV 25kA 1250A	12F25Q13



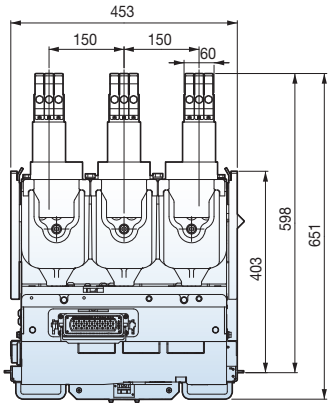


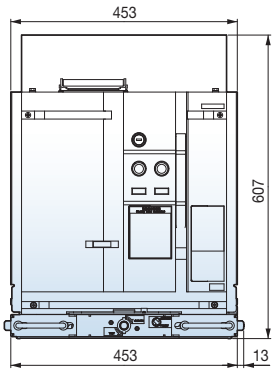


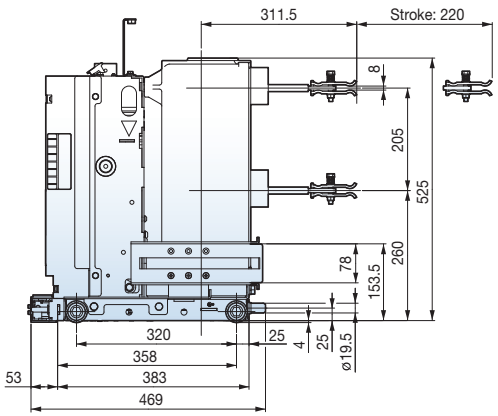
H type VCB, Clip

Phase-to-Phase distance: 150mm
Racking In/Out stroke: 220mm

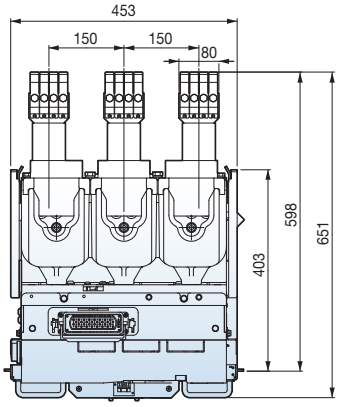
Rating	Type name
7.2kV 20kA 630A	06H20A06
7.2kV 25kA 630A	06H25A06
12kV 16kA 630A	12H16A06
12kV 16kA 1000A	12H16A10
12kV 20kA 630A	12H20A06
12kV 20kA 1000A	12H20A10
12kV 25kA 630A	12H25A06
12kV 25kA 1000A	12H25A10
17.5kV 16kA 630A	17H16A06
17.5kV 16kA 1000A	17H16A10
17.5kV 20kA 630A	17H20A06
17.5kV 20kA 1000A	17H20A10
17.5kV 25kA 630A	17H25A06
17.5kV 25kA 1000A	17H25A10

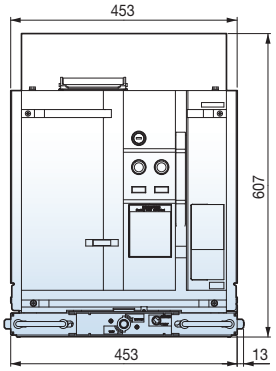


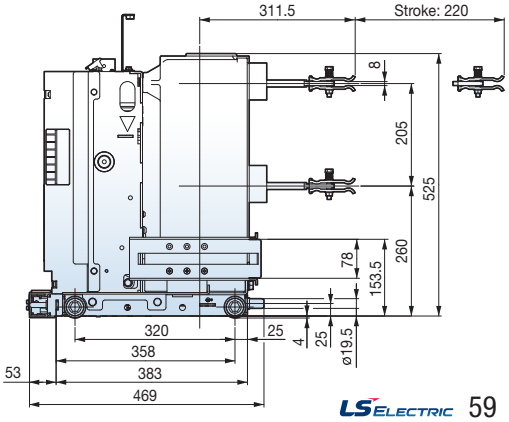




Rating	Type name
7.2kV 20kA 1250A	06H20A13
7.2kV 25kA 1250A	06H25A13
12kV 16kA 1250A	12H16A13
12kV 20kA 1250A	12H20A13
12kV 25kA 1250A	12H25A13
17.5kV 16kA 1250A	17H16A13
17.5kV 20kA 1250A	17H20A13
17.5kV 25kA 1250A	17H25A13







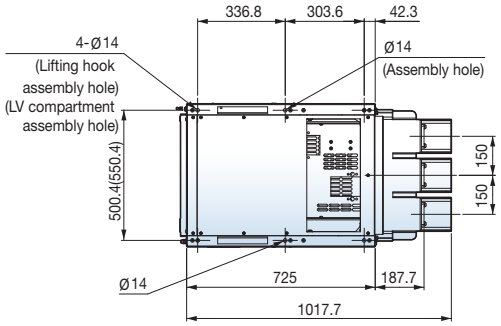
Dimensions (VCB & Cradle)

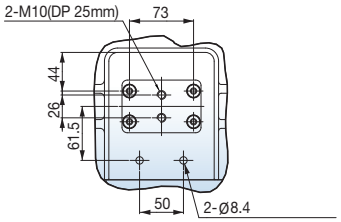
H type cradle, Clip, W: 550/600mm

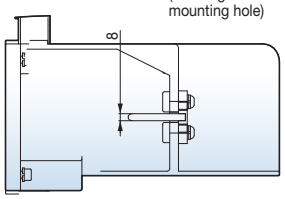
Phase-to-Phase distance: 150mm
Racking In/Out stroke: 220mm

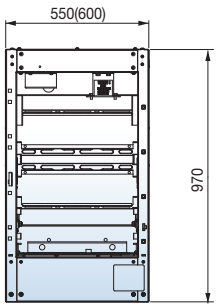
Rating	Type name
7.2kV 20kA 630A	06H20Aq06
7.2kV 20kA 1250A	06H20Aq13
7.2kV 25kA 630A	06H25Aq06
7.2kV 25kA 1250A	06H25Aq13
12kV 16kA 630A	12H16Aq06
12kV 16kA 1000A	12H16Aq10
12kV 16kA 1250A	12H16Aq13
12kV 20kA 630A	12H20Aq06
12kV 20kA 1000A	12H20Aq10
12kV 20kA 1250A	12H20Aq13
12kV 25kA 630A	12H25Aq06
12kV 25kA 1000A	12H25Aq10
12kV 25kA 1250A	12H25Aq13
17.5kV 16kA 630A	17H16Aq06
17.5kV 16kA 1000A	17H16Aq10
17.5kV 16kA 1250A	17H16Aq13
17.5kV 20kA 630A	17H20Aq06
17.5kV 20kA 1000A	17H20Aq10
17.5kV 20kA 1250A	17H20Aq13
17.5kV 25kA 630A	17H25Aq06
17.5kV 25kA 1000A	17H25Aq10
17.5kV 25kA 1250A	17H25Aq13

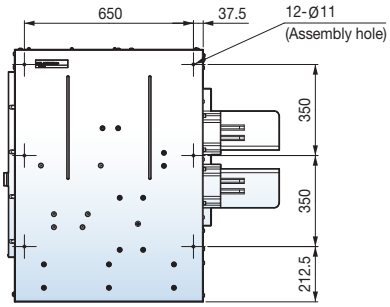
※ VCB needs AH option for 17.5kV with W550 cradle.
※ Racking In/Out stroke is 220mm.
※ The drawing is in case of W550 H type cradle. Most of dimessions are identical between W550 and W600 cradle except width-related dimenssions.
※ The width-related dimenssions for W600 cradle are in bracket.
※ Most of dimsions are identical between exept wiidh W550 and W600 H type Cradle.

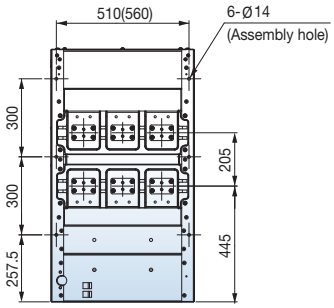


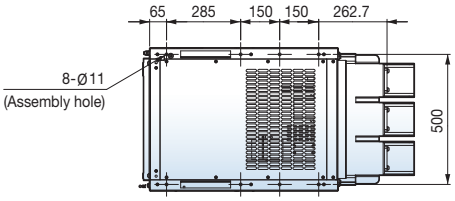


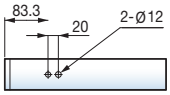


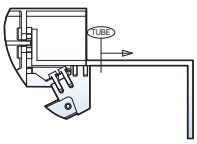


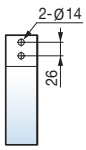




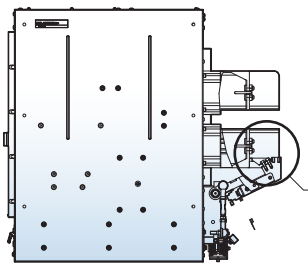


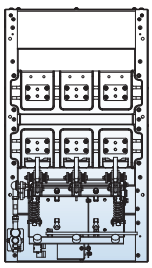


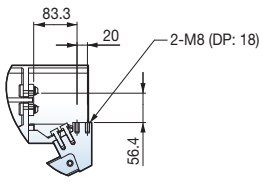




Busbar spec
630A: 40×10t
1000/1250A: 60×12t





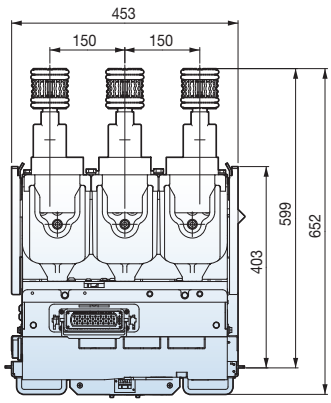


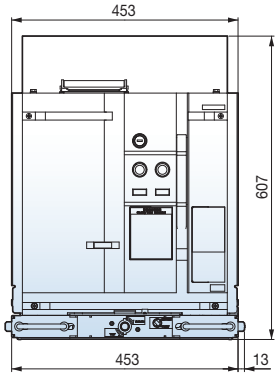
DETAIL A

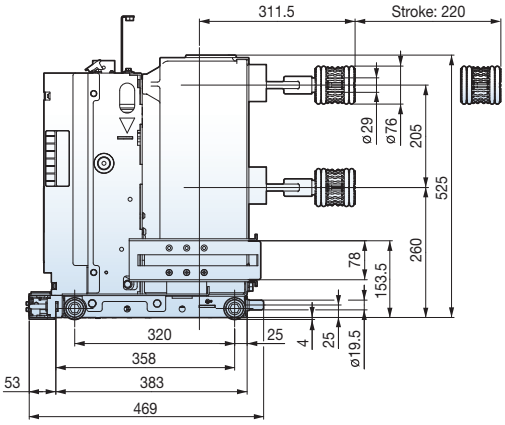
H type VCB, Tulip

Phase-to-Phase distance: 150mm
Racking In/Out stroke: 220mm

Rating	Type name
7.2kV 20kA 630A	06H20P06
7.2kV 20kA 1250A	06H20P13
7.2kV 25kA 630A	06H25P06
7.2kV 25kA 1250A	06H25P13
7.2kV 31.5kA 630A	06H32P06
7.2kV 31.5KA 1250A	06H32P13
12kV 16kA 630A	12H16P06
12kV 16kA 1000A	12H16P10
12kV 16kA 1250A	12H16P13
12kV 20kA 630A	12H20P06
12kV 20kA 1000A	12H20P10
12kV 20kA 1250A	12H20P13
12kV 25kA 630A	12H25P06
12kV 25kA 1000A	12H25P10
12kV 25kA 1250A	12H25P13
12kV 31.5kA 630A	12H32P06
12kV 31.5KA 1250A	12H32P13
17.5kV 16kA 630A	17H16P06
17.5kV 16kA 1000A	17H16P10
17.5kV 16kA 1250A	17H16P13
17.5kV 20kA 630A	17H20P06
17.5kV 20kA 1000A	17H20P10
17.5kV 20kA 1250A	17H20P13
17.5kV 25kA 630A	17H25P06
17.5kV 25kA 1000A	17H25P10
17.5kV 25kA 1250A	17H25P13
17.5kV 31.5kA 630A	17H32P06
17.5kV 31.5KA 1250A	17H32P13







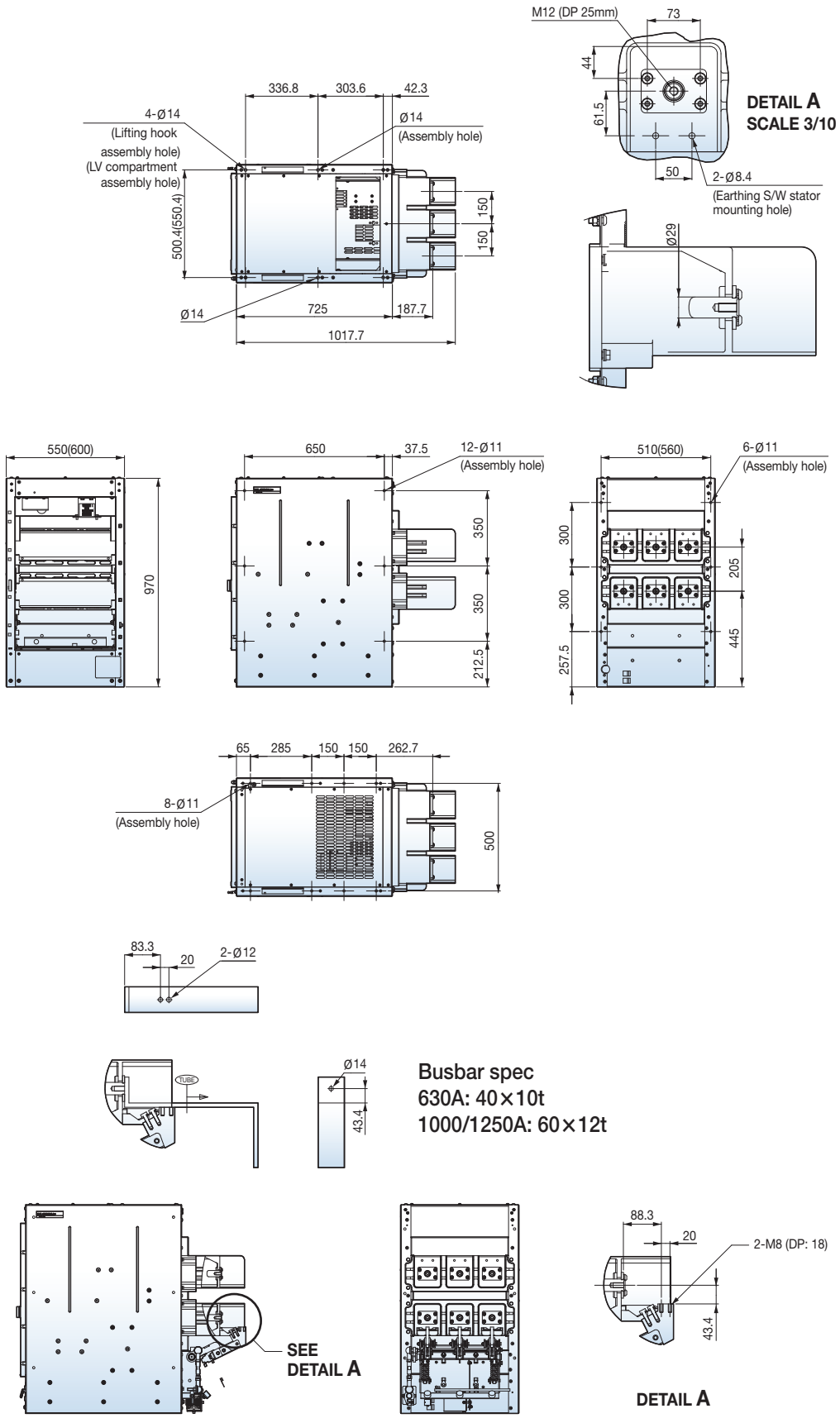
Dimensions (VCB & Cradle)

H type cradle, Tulip, W: 550/600mm

Phase-to-Phase distance: 150mm
Racking In/Out stroke: 220mm

Rating	Type name
7.2kV 20kA 630A	06H20Pq06
7.2kV 20kA 1250A	06H20Pq13
7.2kV 25kA 630A	06H25Pq06
7.2kV 25kA 1250A	06H25Pq13
7.2kV 31.5kA 630A	06H32Pq06
7.2kV 31.5kA 1250A	06H32Pq13
12kV 16kA 630A	12H16Pq06
12kV 16kA 1000A	12H16Pq10
12kV 16kA 1250A	12H16Pq13
12kV 20kA 630A	12H20Pq06
12kV 20kA 1000A	12H20Pq10
12kV 20kA 1250A	12H20Pq13
12kV 25kA 630A	12H25Pq06
12kV 25kA 1000A	12H25Pq10
12kV 25kA 1250A	12H25Pq13
12kV 31.5kA 630A	12H32Pq06
12kV 31.5kA 1250A	12H32Pq13
17.5kV 16kA 630A	17H16Pq06
17.5kV 16kA 1000A	17H16Pq10
17.5kV 16kA 1250A	17H16Pq13
17.5kV 20kA 630A	17H20Pq06
17.5kV 20kA 1000A	17H20Pq10
17.5kV 20kA 1250A	17H20Pq13
17.5kV 25kA 630A	17H25Pq06
17.5kV 25kA 1000A	17H25Pq10
17.5kV 25kA 1250A	17H25Pq13
17.5kV 31.5kA 630A	17H32Pq06
17.5kV 31.5kA 1250A	17H32Pq13

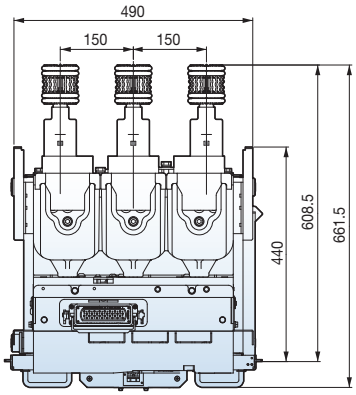
※ The dimensions are in case of W550 H type cradle.
※ Most of dimsions are identical between exept wiidh W550 and W600 H type cradle.
※ VCB needs AH option for 17.5kV with W550 H type cradle.

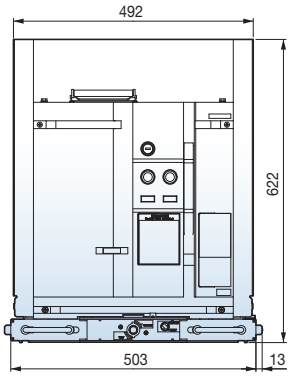


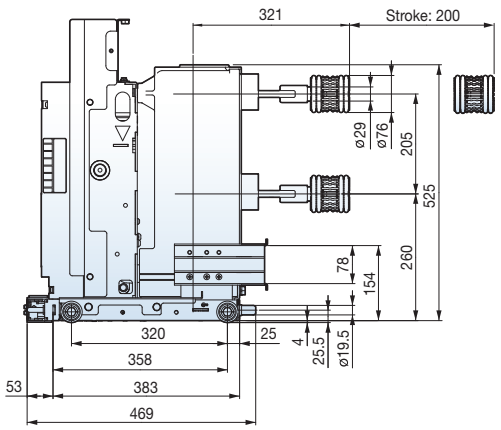
H compatible type VCB

Phase-to-Phase distance: 150mm
Racking In/Out stroke: 200mm

Rating	Type name
12kV 20kA 630A	12H20T06
12kV 20kA 1000A	12H20T10
12kV 20kA 1250A	12H20T13
12kV 25kA 630A	12H25T06
12kV 25kA 1000A	12H25T10
12kV 25kA 1250A	12H25T13
12kV 31.5kA 630A	12H32T06
12kV 31.5kA 1250A	12H32T13







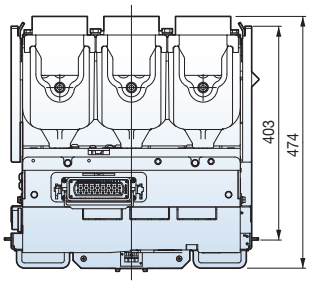
* Order guide
- There is no cradle for this H type VCB in Metasol Cradle series because this VCB is compatible with one of Susol VCBs. So Susol Cradle is available for this VCB(VCL-12H20/25C06/13)
- This VCB is also compatible with VD4/P VCB of ABB.

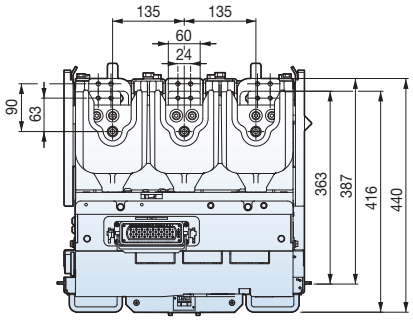
Dimensions (VCB & Cradle)

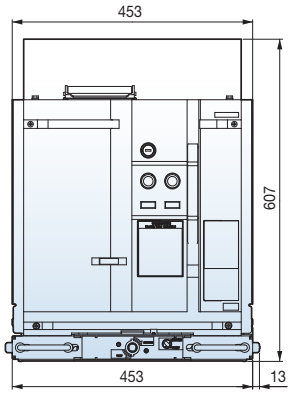
Box type VCB

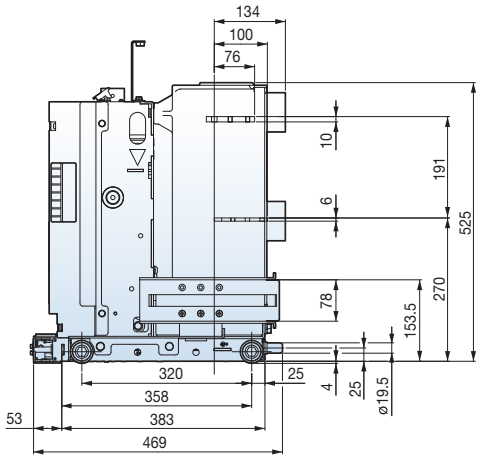
Phase-to-Phase distance: 150mm
Racking In/Out stroke: 220mm

Rating	Type name
7.2kV 20kA 630A	06B20A06
7.2kV 20kA 1250A	06B20A13
7.2kV 25kA 630A	06B25A06
7.2kV 25kA 1250A	06B25A13
7.2kV 31.5kA 630A	06B32A06
7.2kV 31.5kA 1250A	06B32A13
12kV 16kA 630A	12B16A06
12kV 16kA 1000A	12B16A10
12kV 16kA 1250A	12B16A13
12kV 20kA 630A	12B20A06
12kV 20kA 1000A	12B20A10
12kV 20kA 1250A	12B20A13
12kV 25kA 630A	12B25A06
12kV 25kA 1000A	12B25A10
12kV 25kA 1250A	12B25A13
12kV 31.5kA 630A	12B32A06
12kV 31.5kA 1250A	12B32A13
17.5kV 16kA 630A	17B16A06
17.5kV 16kA 1000A	17B16A10
17.5kV 16kA 1250A	17B16A13
17.5kV 20kA 630A	17B20A06
17.5kV 20kA 1000A	17B20A10
17.5kV 20kA 1250A	17B20A13
17.5kV 25kA 630A	17B25A06
17.5kV 25kA 1000A	17B25A10
17.5kV 25kA 1250A	17B25A13
17.5kV 31.5kA 630A	17B32A06
17.5kV 31.5kA 1250A	17B32A13



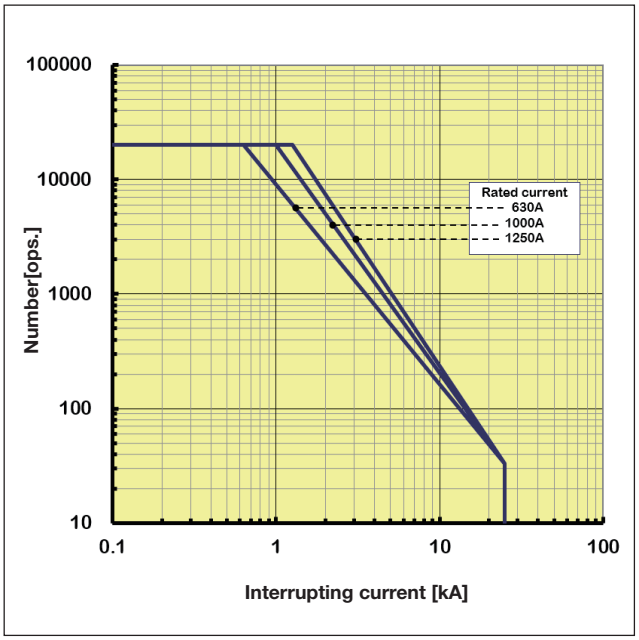






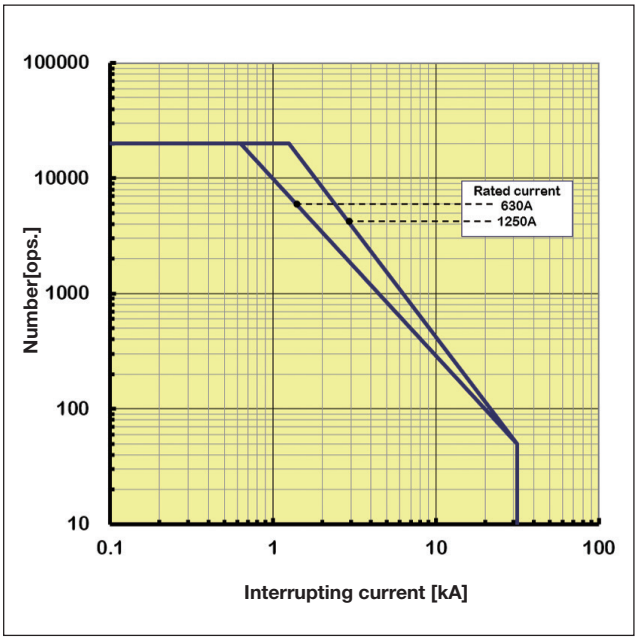
* Order guide
- Box type VCB is the VCB whose contactors are not defined.
- Box type VCB can be provided to the customers who can make their own terminals and contactors cheaper.
- Cradle is optional depending on what type of VCB contactors the customers want to use.
- Refer to bushing ass'y for Metasol VCB(BA) in page 39.

Electrical endurance by interrupting current



VI model LV3-P at 17.5kV 25kA

•N : Operation numbers
•I : Interrupting current



VI model LV12-P at 17.5kV 31.5kA

•N : Operation numbers
•I : Interrupting current

Standard Use Environment for Metasol VCB

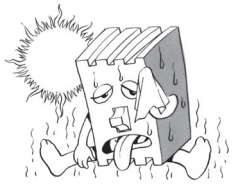
The operation characteristic of Vacuum Circuit Breaker such as insulation and endurance is often influenced largely by external environment and thus should be applied appropriately with conditions of the place where it is used taken into consideration.

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

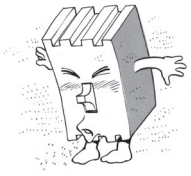
Ambient Temperature
- maximum temperature: +40°C
- 24-hour average maximum temperature: +35°C
- minimum temperature: -5°C

Altitude
- 1000m or less above sea level

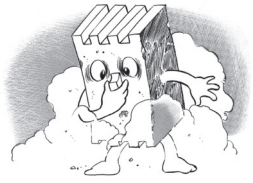
Relative Humidity
- 24 hours average value: 95% or less
- One month average: 90% or less



- If a standard circuit breaker is used in high temperature exceeding 40°C, 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.(-40°C)
- 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

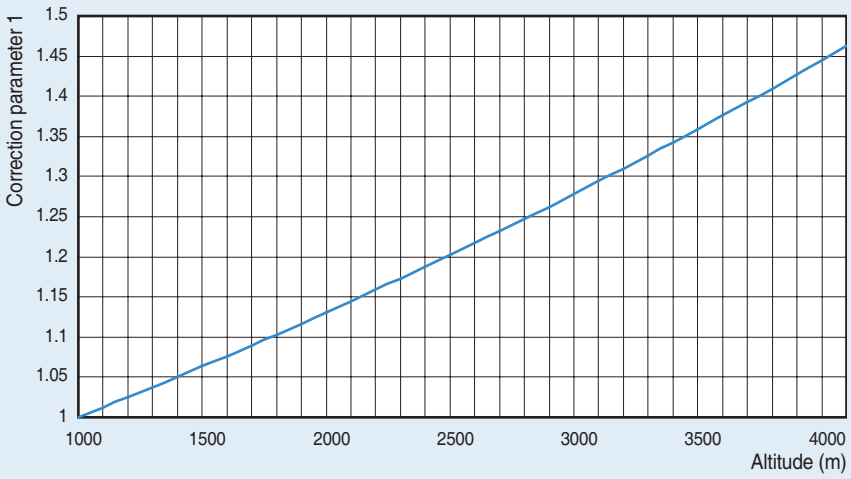
If the breaker is used in areas of sea level higher than 1000m the degradation of insulation performance should be taken into consideration.

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

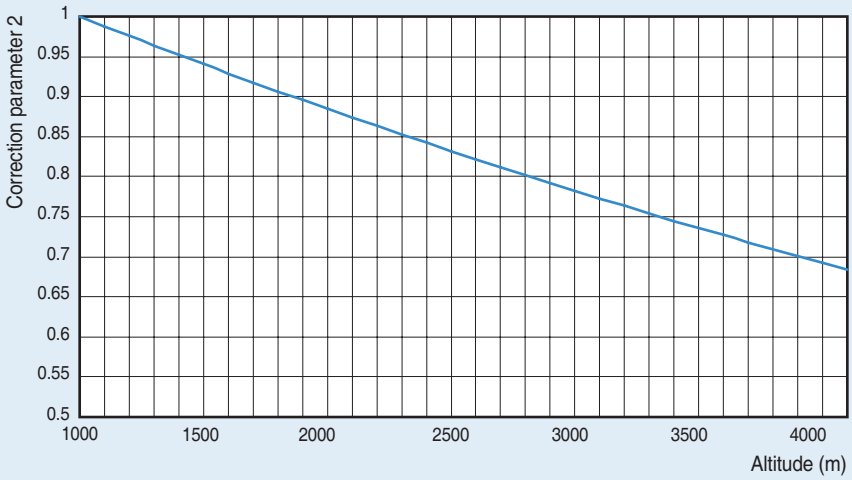
<Table 1> Criteria of withstand voltages by rated voltages specified in IEC62271-1

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.

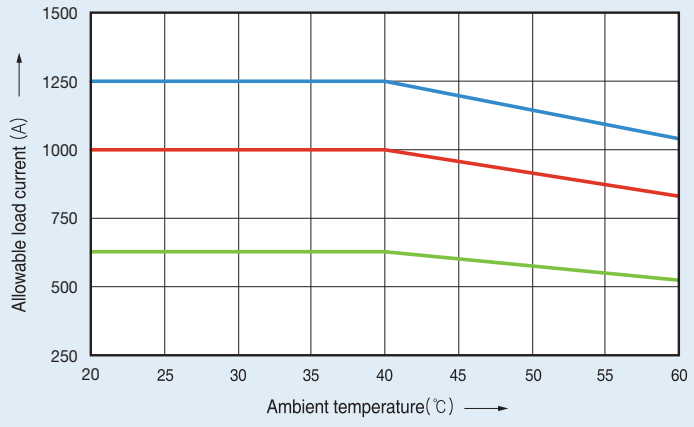
$$I_a = I_r \left((\Theta_{max} - \Theta_a) / \Theta_r \right)^{1/2}$$

I_a: allowable continuous current in the actual ambient temperature Θ_a
I_r: rated current at 40℃ ambient temperature
Θ_{max}: acceptable overall temperature of the hottest spot
Θ_a: the actual ambient temperature expected at -30℃ and 60℃
Θ_r: 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
$I_a = 2000 \times ((105-55)/65)^{1/2} = 2000 \times 0.87 = 1754A$

Rated current (A)	Ambient temperature (°C)								
	20	25	30	35	40	45	50	55	60
1250	1250	1250	1250	1250	1250	1201	1150	1096	1040
1000	1000	1000	1000	1000	1000	961	920	877	832
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

Memo

FUTURING SMART ENERGY

We open up a brighter future through
efficient and convenient energy solutions.

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 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.

- According to The WEEE Directive, please do not discard the device with your household waste.

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