

Installation, Operation and Maintenace Instruction

Vacuum Circuit Breaker



♠ Safety Intructions

- · Please read carefully this safety instructions before products are put into service.
- · This manual should be retained by those who in charge of maintenance and repair or ultimate users.
- · This instruction manual shall be kept within easy reach of



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Safety Precautions

▶ Please follow the safety precautions which is to prevent users from any possible electrical accidents or dangers in advance by using the product properly and safely.

Safety precaution is classified into three safety alert symbols, Danger, Caution, and Warning. The meanings are as follows:

⚠ Danger

Not following this instruction may result in serious injury or even sudden death

⚠ Warning

Not following this instruction may result in serious injury or even death

⚠ Caution

Not following this instruction may result in light injury or product damage

The meaning of each symbol in this manual and on your products is as follows.



This is the safety alert symbol which is to warn users of dangerous situation or to call attention to careful operation. Read and follow instructions carefully to avoid dangerous situation.



This symbol alerts the users to the presence of "dangerous voltage" which may result in an electric shock under specified conditions.

/ DANGER

Do not touch the electrically charged parts (Conductor and Terminal conducting parts) under energized conditions.

Otherwise, it may result in severe physical injury or even death by electric shock.

1

Safety Precautions

⚠ WARNING

1. Inspection and maintenance have to be performed by a qualified electrician.

Otherwise, there is the danger of malfunction, severe physical injury or electric shock.

- 2. When the circuit breaker is in service, don't open the front cover. Otherwise, there is the danger of severe physical injury or electric shock.
- **3. Do not contact the internal structure when front cover is opened.** Otherwise, there is the danger of malfunction, severe physical injury or electric shock.
- 4. When the circuit breaker is in service, don't rack out the circuit breaker.

Otherwise, there is the danger of severe physical injury or electric shock.

- 5. Inspection and maintenance have to be performed only after shutting off the electric power and discharging a charge current.

 Otherwise, there is the danger of severe physical injury or electric shock.
- **6. Please tighten the bolts and screw with specified torque.** Otherwise, there is the danger of over-heat or fire.
- 7. After performing installation, maintenance or inspection, remove some foreign objects like tools, wires or bolts.

Otherwise, there is the danger of short circuit or fire.

8. When performing a maintenance, make sure if VCB is tripped and it is maintained in TEST position.

Otherwise, there is the danger of electric shock.

- **9. Do not move a circuit breaker by holding main circuit terminals.** Otherwise, there is the danger of an electric accidents by temperature rise.
- 10. If transporting VCB which is installed at switchgear, it shall be in Test position.

If transporting VCB when it is in SERVICE position, the contact resistance of contacting parts gets higher and it may result in over-heat or damage.

Safety Precautions

!CAUTION

- Do not alter the control circuit at one's discretion.
 Otherwise, there is the danger of malfunction or damage to products.
- 2. The circuit breakers must be kept in dry condition and keep away from the water.

Otherwise, there is the danger of deterioration of insulation.

- 3. This product must be stored at the place with no corrosive gas. Otherwise, there is the danger of a product damage (discoloration, temperature rise or burns on contacts due to the increased contact resistance).
- 4. When storing VCB for a long period of time, put dust cover on them to prevent dust from entering.

Otherwise, it may result in electrical accidents during the operation since dielectric strength gets reduced.

Unpacking and Service Conditions

Unpacking

- When unpacking the package, take care to handle the circuit breaker, standard components and accessories.
- Certify that the instruction manual and a test report of final testing were packed inside each PVC envelop.
- If damage or breakage of products are founded, immediately notify LSIS' sales office or service representatives.
- 4. If damage or breakage of products by the carrier are founded, immediately file a claim with the carrier and notify the shipping company.



Service conditions(Indoor type)

Normal service condition
 Design to IEEE Std C37.09, IEEE Std C37.20, ANSI C37.54, ANSI C37.55
 following limits values:

Unpacking and Service Conditions

■ Ambient temperature

* Minimum : −5°C

■ Maximum site altitude : ≤ 1000 m above sea level.

■ Relative Humidity

* 24 hour average value : ≤ 95%* One month average value : ≤ 90%

2. Special service conditions

Special service conditions are to be agreed on by the manufacturer and user.

The manufacturer must be consulted in advance about each special service conditions using at the following cases or places:.

- Higher level of site altitude or ambient temperature exceeding the normal conditions
- At place much influence by sea wind.
- At a wet place with high humidity usually
- At places with much water or oil vapors
- At places with an explosive, flammable or noxious gas
- At places with much dust
- At places with abnormal vibration or impact
- At places with much ice and snow
- In case of using at other special conditions besides above cases

Transporting, Storage and Disposal

Transporting



 Do not move the circuit breaker by handling main circuit bus terminals.

Otherwise, there is the danger of electric accidents by temperature increasing.

2. Make sure to remove the lifting hook for centering weight before racking in circuit breaker into CB compartment of switchgear.

Otherwise, there is the danger of damage to products or short circuit.

Transporting, Storage and Disposal

- Please use hook and rope to lift or transport the circuit breaker.
 The hook should be put into the designated hole or position.
- 2. Before inserting circuit breaker into CB compartment of switchgear, please remove the lifting hooks.
- 3. When lifting the circuit breaker with a cradle, it should be raised at the SERVICE position.
- 4. When placing the circuit breaker on the ground, be careful not to drop or to impact the breaker.



Circuit Breaker (P-Type)



Circuit Breaker (H-Type)



Cradle

Transporting, Storage and Disposal

Storage



1. The circuit breakers must be stored in clean, dry, dust and condensation-free environment.

may cause a weakness of insulation.

2. The products must be stored at the place with no corrosive gas.

Otherwise, there is the danger of a product damage (discoloration, temperature rise or burns on contacts due to the increased contact resistance).

Disposal

⚠ CAUTION

1. When making a disposal, dispose it at a designated place with no affection to environment.

may cause an environmental pollution

- According to the ISO 14000, separate all of them as metallic or non-metallic material
 and dispose them at a designated place after dividing all of material as renewable
 materials and other materials which may cause an environmental pollution.
- 2. In case of being materials whatever you want to remake please contact us.
- 3. In case of special materials making noxious gas when destroying by fire, be sure to dispose them at an approved place

Installation

- 1. VCB life span and performance can be guaranteed when periodic visual inspection and maintenance are in place.
 - It shall be kept clean by removing the foreign objects around or inside switchgear.
 - Corrective action shall be taken in advance to limit any dust and high humidity since they may result in unexpected faults or accidents.
 - Switchgear door shall be well closed to prevent it from being invaded by rats or frogs which may cause the electrical incidents.
 - Sufficient effort shall be made to maintain it in a dry condition if it is installed in presence of high humidity or during the rainy season. Humidity is fatal to electricity.
 - Check if the wire is well coated and paint dose not come off from the panel.
 - The corrective action shall be taken if the installation place has a higher or lower temperature than specified operating range.
- 2. Any incident or damage resulting from customers neglect or mistake will void the warranty.

Warning

- 1. Installing VCB at outdoor switchgear
 - Extra care shall be taken to avoid condensation on the surface of VCB insulating materials by suitable ventilation or inner heating.
 - Use after performing Insulation resistance or dielectric strength test. (More than one time per quarter)

The reduced dielectric strength can be a major factor causing short-circuit.

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Installation

For safe and normal operation of circuit breaker installed in switchgear, a very careful and special installation should be followed.

- Handle with care when raising up by lift, etc. because circuit breaker lurches.
- Before inserting circuit breaker which have special lifting hooks for centering weight into CB compartment of switchgear remove lifting hooks.
- When installing a fixed type of circuit breaker into switchgear, fix the contactor with same torque value by passing through mounting holes (6-Ø14) after inserting spring washers into head of bolt without high pressure or alteration.
- Take care not to apply pressure or permanent tension by bus bars or others to main bus terminals.
- Keep the terminal of bushing horizontal and centered, otherwise the tulip/finger contacts of circuit breaker may result in over-heat and burns in use.
- Remove dust or other foreign substances.
- When bolting, follow the recommended torque value specified in Table 1.



When making bolts and screw assembling, follow the instruction with recommended torque values

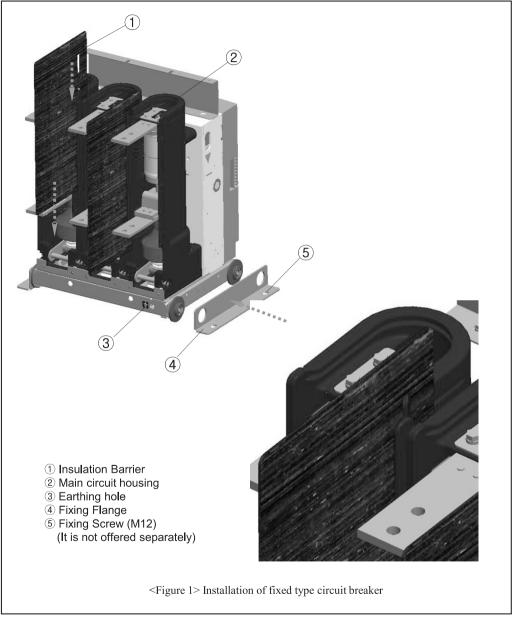
may result in over-heat or burns.

Do not alter the control circuit at one's discretion. may cause of malfunction or damage to products.

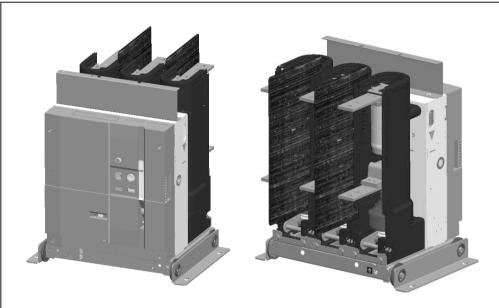
<Table 1> Torque value

Torque Size of bolt	Steel (kgf • cm)	Brass (kgf·cm)
М 3	7.3 (6.2 – 8.4)	4.3 (3.7 - 4.9)
M 3.5	11.2 (9.5 – 12.9)	6.6 (5.6 -7.6)
M 4	16.8 (14.2 - 19.3)	9.8 (8.4 - 11.3)
M 5	33.0 (28 – 37)	19.1 (16.2 – 22.0)
M 6	56.0 (48 - 65)	33.0 (28 – 38)
M 8	135 (115 – 156)	89 (68 – 91)
M 10	270 (230 – 310)	159 (135 – 182)
M 12	470 (410 - 540)	270 (230 – 310)

Installation: Fixed type circuit breaker (P-type)

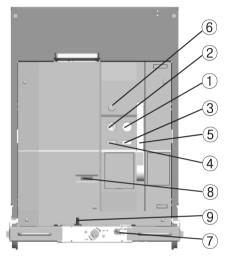


Installation: Fixed type circuit breaker (P-type)



- Installation of fixed type circuit breaker(P-type)
- 1. Installation guide
- 1) Install in each phase ① the insulation barrier (2 pieces) shown in Figure 1
 -Insulation Barrier ① is inserted the left/right side groove of housing ② of R and T Phase,
- 2) Fixed bracket (4) is basically offered in case of fixed type circuit breaker. The fixed bracket is firstly inserted in the wheel pointed out with the arrow. Then, the circuit breaker is installed in the switch gear using the mounting hole of the fixed bracket. (5): It is not offered separately M12 Bolt for connecting fixed bracket)
- 3) Earthing cable can be assembled at the hole 3 using M12
- Rating of fixed type circuit breaker that insulation barriers are basically offered
 - 1) 15kV 25/31.5kA 1200A (Pole distance 150mm, P-type)
- 2) 15kV 25/31.5kA 2000A (Pole distance 210mm, P-type)

1. Front View



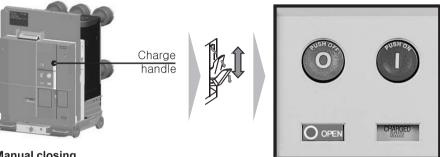
- 1) Push ON Button
- 2 Push OFF Button
- ③ Charge/Discharge Indicator
- 4 CLOSE/OPEN Indicator
- **5** Manual Charging Handle
- 6 Key Lock
- 7 TEST/SERVICE Position Indicator
- **8** Operation Counter
- 9 Locking Lever

<Figure 2> Front part of circuit breaker



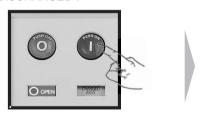
<Figure 3> Combination of circuit breaker and cradle

- 1.1 Operating method for operating mechanism
- 1) Manual operation
- 1 Manual charging
 - a) Charge the handle 5~ 6 times with full strokes.
- b) When the closing spring is completely charged, the charging indicator shows "CHARGED".



2 Manual closing

- a) Push ON button.
- b) The breaker will be closed.
- c) CLOSE/OPEN indicator shows "CLOSE" and the charging indicator shows "DISCHARGED".





3 Manual tripping

- a) Push the OFF button and breaker will be tripped.
- b) The CLOSE/OPEN indicator shows "OPEN".







2) Electrical operation

1 Electrical operation

Closing operation is done by charging the closing spring from remote control. If pushing OFF button, closing spring is automatically charged by a geared motor and a circuit breaker is closed by ON button.

② Electrical closing

Remote closing can be made by energizing the closing coil (CC).

Apply the rated voltage to A3+ and A4- of the control circuit terminals and close the circuit breaker.

- 3 Electrical opening
 - a) Remote opening can be made by energizing the trip coil (TC) or the under voltage trip (UVT) device.
 - b) In the case of TC, apply the rated voltage to A5+ and A6of control circuit terminals
 - c) In the case of UVT, remote opening is possible by connecting the switch in series to D1+ and D2- terminal where UVT or UVT controller gets connected.

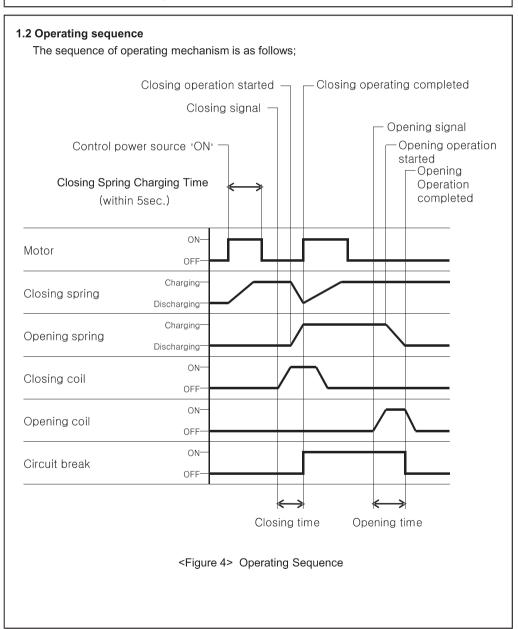


3) High-speed reclosing operation

This operating mechanism is available for the high-speed reclosing (O-0.3s-CO) operating duty by remote operation at the status that the main circuit is "CLOSE" and the closing spring is "CHARGED"

To perform the operating duty of multiple auto reclosing (O - 0.3s - CO - 3min - CO), the closing spring shall be charged automatically within 15sec. This circuit breaker is available for auto charging of closing spring within 5 sec.

Structure and operation



1.3 Operating frequency

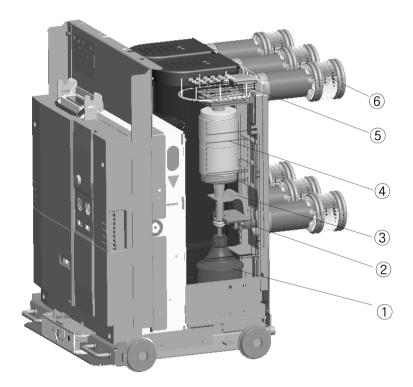
In order to keep the operating mechanism parts or components at the best service condition, please avoid any unnecessary operation and also attend the followings.

- Make a successive operation 10 operations with the minimum time interval (about 5sec.) required for charging the closing spring.
 (The 30 min. of time interval should be required at least after a successive operation)
- * Operate 20 times per an hour.
- * Operate 100 times per a day.

In case of requiring frequent switching operation or any severe operating duty under the dusty and polluted environment, it needs to be added the frequency of periodic inspection or maintenance.

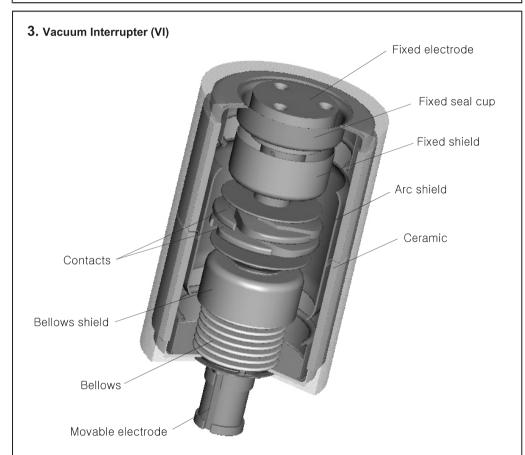
Structure and operation

2. Main Circuit



<Figure 5> Structure of main circuit parts

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



< Figure 6 > Structure of vacuum interrupter

■ The vacuum interrupters has a high dielectric strength with high vacuum integrity (approx. 5x10⁻⁵ Torr) and the gaps of between a stationary contact and moving moving contact are 6~20mm according to the rated voltage. Both contacts are designed to extinguish the arc easily and are made of special alloy in order to reduce the contact wearing by short circuit interruption and the overload, or arc energy when switching. The internal side is completely sealed to prevent the deterioration of vacuum integrity.

1. Racking-in/out operation

In order to make an operation of racking-in/out, insert the sliding plate of the withdrawal assembly (Figure 7) into the rectangular hole completely which is installed at side plate of cradle. (Disconnect position)

- **1.1 Racking-in operation (Disconnect Position** → **Test Position** → **Service Position)**
- 1) Rotate the locking lever count-clockwise.
- 2) Connect the wiring plug with the main body of circuit-breaker. (Test position)
- 3) Make sure that the CLOSE/OPEN indicator of the circuit breaker is at 'OPEN" state.
- 4) Insert the withdrawal operating handle into a screw for withdrawal(Fig.7/No.1)
- 5) Rotate the withdrawal operating handle about 20 times clockwise, then the circuit-breaker can be positioned at Service Position and it sounds successive crash sound cause by a result of run-idling of this screw.
- 6) If it appears any successive crash sounds, remove the withdrawal operating handle so that the circuit-breaker can not be inserted any more.
- 7) Check that the arrow of position indicator points out 'SERVICE'. (Service position)

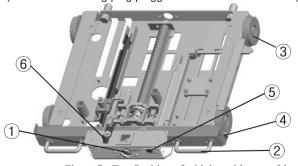
CAUTION

1. Do not position a circuit breaker on any position besides the Service Position and/or Test Position.

It may cause of malfunction or damage to products.

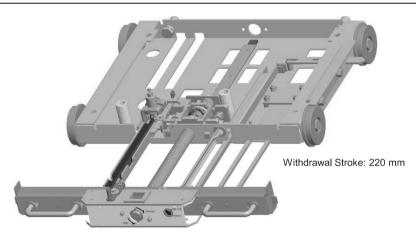
1.2 Racking-out operation (Service Position → Test Position → Disconnect Position)

- 1) Make sure that the CLOSE/OPEN indicator is at "OPEN" position.
- 2) Perform the same operation as manual insertion(Test Position→Service Position) in a opposite sequence .
- 3) Check that the arrow of position indicator points out 'TEST'.
- 4) Remove the wiring plug plugged into the circuit-breaker.(Disconnect position)



<Figure 7> Test Position of withdrawable assembly

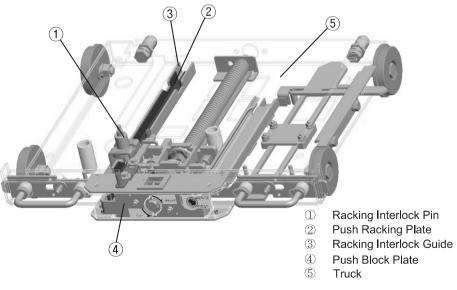
- 1) Screw for withdrawal
- 2 Handle
- ③ Wheels
- 4 Sliding plate
- ⑤ Position indicator
- 6 Locking lever



<Figure 8> Service Position of withdrawable assembly

1.3 Interlock for Racking-in/out of circuit breaker

1) Preventing Racking-in/out operation at the closing state of circuit breaker

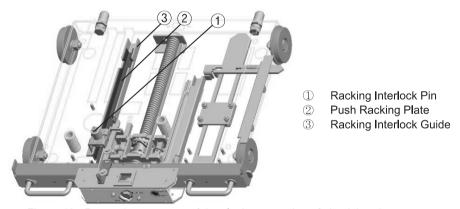


<Figure 9> Prevention structure of Racking-in/out operation at the closing state

Racking-in/out Operation

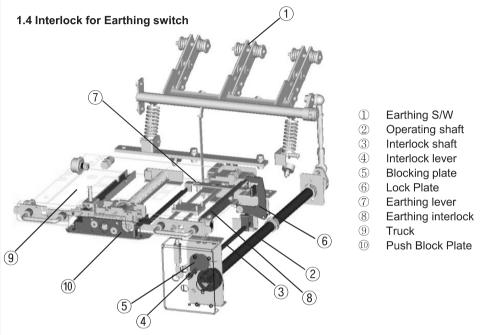
If the circuit breaker is closed, the mechanism of circuit breaker prevents Interlock Pin (Figure 9, No.1) from raising in up direction. At the same time, Racking Interlock Pin prevents the Push Racking Plate(No.2) and Racking Interlock Guide (No.3) from moving in forward/backward direction. Because the Push Racking Plate are connected to Push Block Plate(No.4), the Push Block Plate cannot be moved. The Push Block Plate prevents the racking-in/out handle from inserting at the insertion hole. Therefore, Racking-in/out operation at the closing state of circuit Breaker cannot be carried out because the insertion of the handle is impossible.

2) Preventing the closing operation of circuit breaker while Racking-in/out operation



<Figure 10> Prevention structure of the closing operation of circuit breaker while Racking-in/out operation

When the circuit breaker are at the other position except for TEST and SERVICE Position(while Racking-in/out operation), Racking Interlock Pin(Figure 10, No.1) is raised by Push Racking Plate(No. 2) and Racking Interlock Guide (No.3) in upward direction. Because the raised interlock pin push the OFF button of circuit breaker, the closing operation during Racking-in/out operation is mechanically prevented.

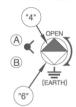


<Figure 11> Interlock structure for earthing switch and Racking-in/out

- 1) Prevention of Racking-in/out operation in the closing state of the earthing switch
 In order to close the earthing switch, the rotation of Interlock lever(Figure 11, No.4)
 in counter clockwise direction move Blocking plate(No.5). At that time, the insertion of the
 handle of earthing switch at the operating shaft(No. 2) can be possible.

 After the handle is inserted into the operating shaft, if the handle in clockwise direction is
 rotated for closing of earthing switch, the Pin assembled in the operating shaft prevent
 the Interlock lever(No. 4) from returning. In the rotated state of the interlock lever,
 Lock plate(No. 6) pushes Earthing lever(No. 7) assembled in Truck(No. 9). At that time,
 the pushed Earthing lever prevents the racking-in/out handle from inserting the insertion hole.
 Therefore, Racking-in/out operation at the closing state of earthing switch cannot be carried
 out because the insertion of the handle is impossible
- 2) Impossible of earthing switch's closing while Racking-in/out or at SERVICE position During Racking-in/out operation or at the SERVICE Position, the handle of earthing switch can not be inserted at the insertion hole because Interlock lever and Blocking plate close the insertion hole of the earthing switch handle

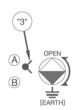
1.5 Instruction guide of Earthing switch and Keylocks



1) Earthing Switch

a. Earthing

When the VCB is either in the isolated or withdrawn position, rotate the lever("3") from CLOSE to OPEN position counter-clockwise. Look at the indicator("4") that is located either OPEN or EARTH position When the indicator("4") is the OPEN position, Insert the OP shaft("5") in the insertion("6"). Swing the OP shaft("5") to EARTH position clockwise then remove the OP shaft. The lever("3") can't be return to CLOSE position When the Earthing switch is Earthed. Must not rack VCB in



b. Opening

Look at the indicator("4") that is located either OPEN or EARTH position. When the indicator("4") is the EARTH position, Insert the OP shaft("5") in the insertion("6"). Swing the OP shaft("5") to OPEN position counterclockwise then remove the OP shaft. The lever("3") can be returned to CLOSE position.



2) Keylocks

a. LOCK with Earthing Switch OPEN

If you want to hold the Earthing switch is in the OPEN position, at first, rotate the lever("3") from OPEN to CLOSE position. Then rotate A-Key from UNLOCK to LOCK position clockwise and remove A-Key. You can't insert OP shaft("5") in the insertion("6")



b. LOCK with Earthing Switch EARTH

If you want to hold the Earthing switch is in the EARTH position, rotate B-Key from UNLOCK to LOCK position counter-clockwise and remove B-key. You can't insert OP shaft("5") in the insertion("6")



* Instruction of equipping with Locking Magnet

When the Earthing switch is equipped with Locking magnet, make sure the electric power is connected and active before operating the "OPENING" or "EARTHING"

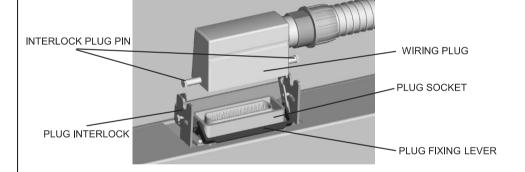
/ CAUTION

1.6 Notice of Racking -in/out operation according to accessories

- PLUG INTERLCOK Accessory
- Racking-in/out operation always can be available after connecting wiring plug of the cradle into the plug socket of the circuit breaker

(After Interlock plug pin is slided over at both side groove of Plug interlock and insert Interlock plug, raise the Plug fixing lever in upward direction, completely fix)

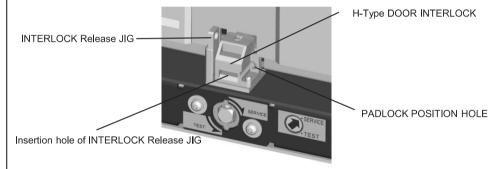
- During Racking in/out operation or at SERVICE position, the wiring plug cannot be separated. (The separation of the wiring plug is only possible at TEST position)



Racking-in/out Operation

■ DOOR INTERLOCK - Accessory

- In case the door accessory in cradle is assembled, the door interlock make Racking-in/out operation possible when the door is always closed.
- when the door is opened and in case that racking-in/out operation is needed, Interlock Release Jig assembled in side of H-type door interlock inserts into the insertion hole. Then Racking-in/out operation can be possible. When the JIG inserts into the insertion hole, any key can insert into the Padlock position hole at TEST or SERVICE position. At that time, the racking handle cannot be inserted
- * After the Release JIG inserts into the insertion hole, don't close the door, there can be a product damage



■ MOC - Accessory

- Before the operation and movement of circuit breaker, check that the bottom below circuit breaker or floor is flat. If there is the protruding point/thing at the bottom or floor, the closing of circuit breaker cannot be operated smoothly



Bottom below circuit breaker : good (O)



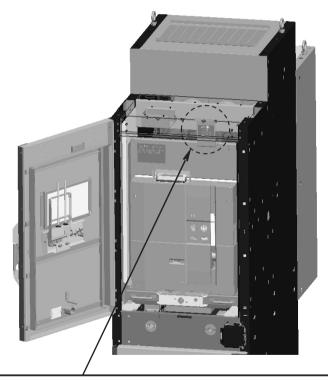
Bottom below circuit breaker: bad (X)

** In case of circuit breakers installed above accessories (Plug interlock, door interlock, MOC), the insertion of the racking handle cannot be impossible.
After check the kinds of accessories, operate Racking-in/out operation.
(if you try to operate Racking-in/out in abnormal, there can be a product damage)

2. Installation Guide of Fixed bracket

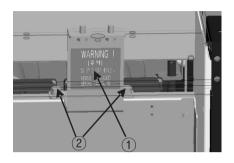
1) Cradle

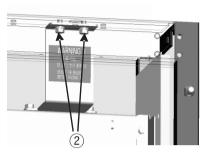
The bracket for fixing VCB at the test position is offered for safe transportation of the circuit breaker installed in the switchgear. Please use the following procedure.



*Bracket for fixing the circuit breaker (The bracket is used for preventing the floating/vibration of circuit breaker during the transportation. Before the installation of circuit breaker and Racking-in/out operation, always remove the bracket

<Figure 12> Fixed bracket assembled at TEST position





<Figure 13> Assembly of fixed bracket

- Assembling the fixed bracket
- ① Locate the VCB at the test position like Figure 12. (Check that the position indicator attached at the truck of circuit breaker points to TEST position)
- ② Mount the Fixed bracket(Figure 13, No.1) to fit the bolt holes shown in Figure 13 using the bolt(No. 2) enclosed with the fixed bracket.
- * If you want to move the VCB to SERVICE position, remove the bracket.

Accessory (Circuit breaker)

Under Voltage Trip device, UVT)

-UVT installed inside of the circuit breaker so as to trip the circuit breaker when the main/control voltage drops below the specified voltage.

UVT is instantaneous type. If you want to delay the time, please connect the UVT time-delay device independently

-The closing of a circuit breaker is impossible mechanically or electrically if control power not supplied to UVT. To close the circuit breaker, 85% of rated voltage should be applied to both terminals of UVT coil (D1, D2).

1. Rated voltage and characteristics of UVT

Rated vo	Itage(Vn)	Operating vol	tage range(V)	Power consumption(VA or W)		ge range(V) Power consumption(VA or W)		Trin
DC(V)	AC(V)	Pick up	Drop out	Inrush	Steady-state	Trip time(ms)		
24~30	-							
48~60	48	0.65~0.85Vn	0.44~0.6Vn	200	5	≤50ms		
100~130	100~130	0.05~0.05						
200~250	200~250							

2. Specification of using wire

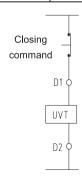
Refer to the below table regarding the length of wire when using trip coil with 24~30[V] or 48~60[V] of rate voltage as power consumption due to inrush current is about 200VA for coil operation. Coil can be non-operating in case of not corresponding with the wire specification listed below.

		Rated voltage(Vn)				
		DC 24~30(V)		DC/AC 48(V)		
Wire type		#14 AWG	#16 AWG	#14 AWG	#16 AWG	
		(2.08mm^2)	(1.31mm^2)	(2.08mm^2)	(1.31mm^2)	
Operating	100%	48.5m	30.5m	233.2m	143.9m	
Voltage	85%	13,4m	8.8	62,5m	39,3m	

3. External configuration and Wiring diagram







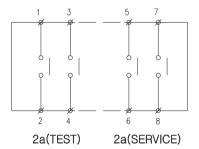
Wiring diagram

Accessory (Circuit breaker)

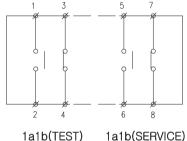
■ Position Switch

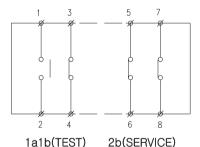
- Indicating the position (TEST or SERVICE) of VCB, by mechanically pressing the switch when VCB change the position
- Two kinds of switch structure is available.
 - 2a2a: 2a(TEST)+2a(SERVICE)
 - 2a2b: 1a1b(TEST)+1a1b(SERVICE)
 - 1a3b: 1a1b(TEST)+2b(SERVICE)

1. Wiring diagram









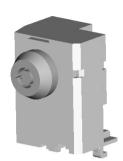
Accessory (Circuit breaker)

■ Key Lock

• When it is locked by a Key, the closing operation is not available without a Key

* Instruction

- KEY cannot be separated in UNLOCK position, and only separated in the LOCK position.
- After "OFF" button of circuit breaker is pushed, rotate a key counter-clockwise direction and separate a key. In LOCK position, the closing of a circuit breaker is impossible mechanically or electrically
- After inserting a key and rotating clockwise, the pushed "OFF" button returns in the original position.
 Then, the closing of a circuit breaker is possible mechanically or electrically



■ "ON","OFF" Button Cover

- To prevent the mis-operating, button cover protects 'ON' or 'OFF' button.
- It is available to operate by push bar.





■ "ON","OFF" Button Padlock

- To prevent the mis-operating, button padlock protects 'ON' or 'OFF' button.
- It is available to operate after release button padlock.



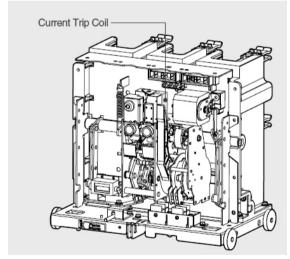
Accessory (Circuit breaker)

■ Current Trip Coil (3A)

- 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.
- 1. 3A: 10Ω or less, Operating current AC 3A
 - Coil burden is 90VA.
- 2. 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.



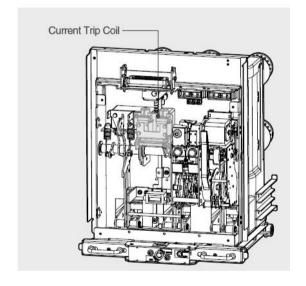


Accessory (Circuit breaker)

■ Current Trip Coil (1A, 5A)

- 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.
- 1. 1A: 160Ω or less, Operating current AC 1A 5A: 6Ω or less, Operating current is AC 5A
- 2. 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.





Accessory (Cradle)

■ Earthing Switch

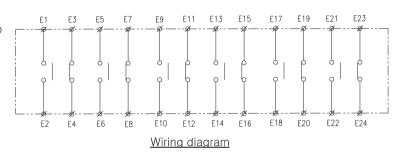
• For the safety during the maintenance of a VCB, discharge the charging current in the load side of a VCB with the earthing switch. The earthing switch is only available in H-Type Cradle.

■ Auxiliary switch of Earthing Switch

• Indicates the "EATHING" or "OPENING" status of the earthing switch.

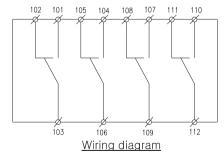
* Contacts

- 2a2b or 6a6b

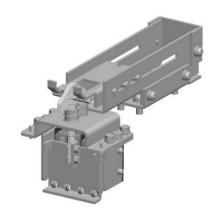


■ Mechanism Operated Cell Switch (MOC)

• MOC which indicates the "ON" or "OFF" condition of circuit breaker, but operated only when the circuit breaker is in "SERVICE" position.(installed in the bottom of a cradle) User's can use "a" or "b" contacts for various purposes. (for example, 4a, 4b, 2a2b,...)



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

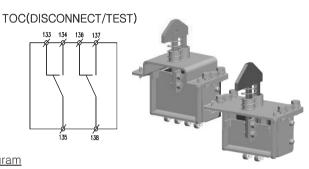


Accessory (Cradle)

Truck Operated Cell Switch (TOC)

• TOC which indicates the "SERVICE" state of circuit breaker and is operated by the movement of circuit breaker. (installed in the bottom of a cradle) User's can use "a" or "b" contacts for various purposes. (for example, 4a, 4b, 2a2b,...)

TOC(TEST/SERVICE)



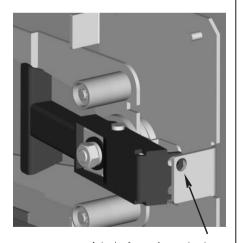
Wiring diagram

- "a" contact: 122-123.125-126.128-129.131-132.134-135.137-138 - "b" contact: 121-123.124-126.127-129.130-132.133-135.136-138

■ Shutter Padlock

- After removing VCB from the cradle, for the safety while maintenance works. shutter padlock enables the lock of shutters in closed position.
- While circuit breaker's racking-in operation. the cradle shutter automatically opened.
- To prevent the shutter opening, you can use a lock through a hole.

Please remove the lock before racking-in circuit breaker to the cradle.

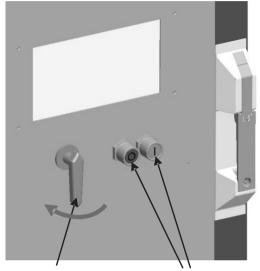


A hole for using a lock

Accessory (Cradle)

■ Door Emergency push button

• Keeping the door closed, the closing or opening of circuit breaker can be carried out by means of Door Emergency push button through the Operating Handle.



Operating Handle

Door Emergency push button

1. General caution



Do not touch the electrically charged parts (Conductor and Terminal conducting parts) under energized conditions.

Otherwise, it may result in severe physical injury or even death by electric shock.

! WARNING

1. Inspection and maintenance have to be performed by a qualified electrician.

Otherwise, there is the danger of malfunction, severe physical injury or electric shock.

- 2. When the circuit breaker is in service, don't open the front cover.
 - Otherwise, there is the danger of severe physical injury or electric shock.
- When the circuit breaker is in service, don't insert or withdraw the circuit breaker.
 - Otherwise, there is the danger of severe physical injury or electric shock.
- 4. Inspection and maintenance have to be performed only after shutting off the electric power and discharging a charge current.
 - Otherwise, there is the danger of severe physical injury or electric shock.
- 5. Please tighten the bolts and screw with specified torque.
 - Otherwise, there is the danger of over-heat or fire.
- After performing installation, maintenance or inspection, remove some foreign objects like tools, wires or bolts.
 - Otherwise, there is the danger of short circuit or fire.
- 7. When performing a maintenance, make sure if VCB is tripped and discharged, and it is maintained in test position.
 - Otherwise, there is the danger of electric shock.
- 8. Do not move a circuit breaker by holding main circuit terminals.
 - Otherwise, there is the danger of an electric accidents by temperature rise.

CAUTION

1. Do not alter the control circuit at one's discretion. may cause of malfunction or damage to products.

<Table 2> Period of maintenance and inspection

_	Maintenance and inspection interval			
Check Item	Normal condition	Abnormal condition (dusty and wet places)		
Usual inspection	6 months	1 month		
Periodic inspection	1~2 years after an installation. Once 3years after that	A periodic inspection		
Special inspection	If necessary	If necessary		

2. Routine inspection

Check Item		Check list	Method	Solution
Switching indica	ator	Verifying a normal operation	Visual	Investigating the cause and repair
Control circu	it	Verifying a connection of connectors	Visual	Investigating the cause and repair
Operating cour	iter	Verifying a time of operation	Visual	Check the contactor if exceeding 10,000 operations
Others		Verifying abnormal noise,smell	Visual	After disconnecting the main power, investigating and repair

Notice) The indicated numbers on operating counter is obtained from the ON-OFF operation performed during manufacturing and quality inspection process.

3. Periodic inspection <Table 4> Items of periodic inspection (1)

С	Check Item Check list		Method	Solution		
		Check abnormal assembling parts			Every	
Onou	ation and	Check parts to be lubricated	Verify a smooth	Clean and grease	periodic inspection,	
	pment parts	Check dust and foreign material	operation by	Replace if necessary	Every 5000 operations	
		Check whether C-Rings, spring pins and divider pins are wrinkled or missed				
C	Wiring Poor connection and/or loose wirings					
Control circuit	Closing, tripping device	Check component of Movable parts. Check a discoloration of coil	Visual	Retighten any loose parts Replace if necessary	Every periodic inspection	
	Aux. Switch	Check links and contacts				

Maintenance and Inspection

Check Item		Check list	Method	Solution	Frequency
Main circuit terminals		Check all connections Check the corrosion, discoloration	Visual	Check the torque, Replace if necessary	Every periodic inspection
Vacuum		Check the vacuum density	Vacuum integrity Testing method. Check the withstand test	Replace V.I. if necessary	Every periodic inspection,
Aux. Device	Switching Indicator	Check the normal operation	Visual	Check fixed bolts. Replace if necessary	Every 5000 operations
Insi	ılation	Main circuit: Over 500MΩ	1000V Megger	Clean it after finding the cause.	Every a periodic
	istance	Control circuit: Over $2M\Omega$	500V Megger	Replace if necessary	inspection
	Withstand woltage test Main circuit: 1.5 x R.Voltage for 10 min. Test and check with a withstand voltage tester Clean and replace if necessary		Every periodic inspection, every 5000 operations		
Opera Chara test	ating acteristics	Testing for trip/close Testing for trip-free Check the minimum of operating voltage	Perform the electrical testing after a manual operation test	Inspect and repair if finding a matter. Replace if necessary.	Every periodic inspection, Every 6 years
Contact Finger		Check the sectional traces of heat or discoloration. Check the damage of arc. Check the condition of applied grease on the contactor surface.	Visual (Use a microscope if necessary.)	Replace. Apply grease on contact surface. *Specification: HITALUBE280G	Every periodic inspection, Annually
Contact part Contact Spring		Check the sectional traces of heat or discoloration. Check the damage of arc. Check transformation or mechanical crack of a coil.	Visual (Use a microscope if necessary.)	Replace.	Every periodic inspection, Annually
	VCB & Cradle Terminal	Check the sectional traces of heat or discoloration. Check the damage of arc. Check the amount of eccentricity between terminals. - Clip type: within ±2mm - Tulip type: within ±3mm	Visual (Use a microscope if necessary.) Tightening force	Replace. Apply grease on contact part *Specification: HITALUBE280G	Every periodic inspection, Annually

Check Item	Check list	Method	Solution	Frequency
Contact resistance of main circuit	value - The variation resistance between phases must be less than 25%	The voltage drop method (DC 100A) -Measure with inserting the same size copper bar (make a jig for measuring if necessary)	 Dismantle the contactors Clean the discoloration, corrosion or heated parts of arc Clean the contactor surface after removing foreign substances Apply specified grease *Specification: HITALUBE280G 	Annually
Temperature rising	Check the temp. rising of contacted and connection parts *The max. available limit of temp. rising - Contacted part: 65K - Connected part: 75K (K: Temperature rise)	Visual Infrared camera	Carry out a close inspection	As occasion demands

Notice) Replacement of contactors

The replacement of contactors must be decided with a close inspection and carried out by LSIS service staff. Please follow below 1, 2, 3 when the contactors are replaced.

- 1. Apply specified grease after replacement. (specification: HITALUBE280G)
- Measure the contact resistance of main circuit with no-load mechanical operating test after replacement.The measured values should be compared with the measured values before replacement and they should be put on record.
- 3. If there are traces of arc when replacing contactors, the terminals should be replaced. In case that there aren't any traces, wipe clean on terminal surface.

< Table 5 > Items of periodic inspection (2)

	Item	Check list	Method	Solution
Common components of the contactor	Insulated frame	discoloration and	Visual Clean it, then measure the insulation resistance	Wipe it clearly with a dry cloth

4. Special inspection

Make a special inspection in case of situation as Table 6

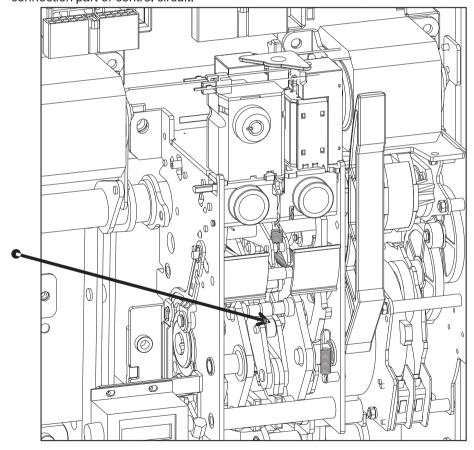
<Table 6> Special inspection

NO	Inspection item	Inspection method
1	When interrupting short-circuit(fault) current several times	Check wearing contacts of vacuum interrupter
2	In case of appearing a abnormal situation at service operation	Check defective parts

Maintenance and Inspection

5. Lubricant points for operating parts

When using a circuit breaker for a long period, lubricate its surface of operating and frictional parts with grease because its operating mechanism runs rapidly. The important parts are indicated with the mark of in the figure below. When lubricating, clean the points and check the condition of wear, and then lubricate them with the grease. Take care of not applying at the wiring connection part of control circuit.



<Figure 14> Opening state of main circuit

Rating

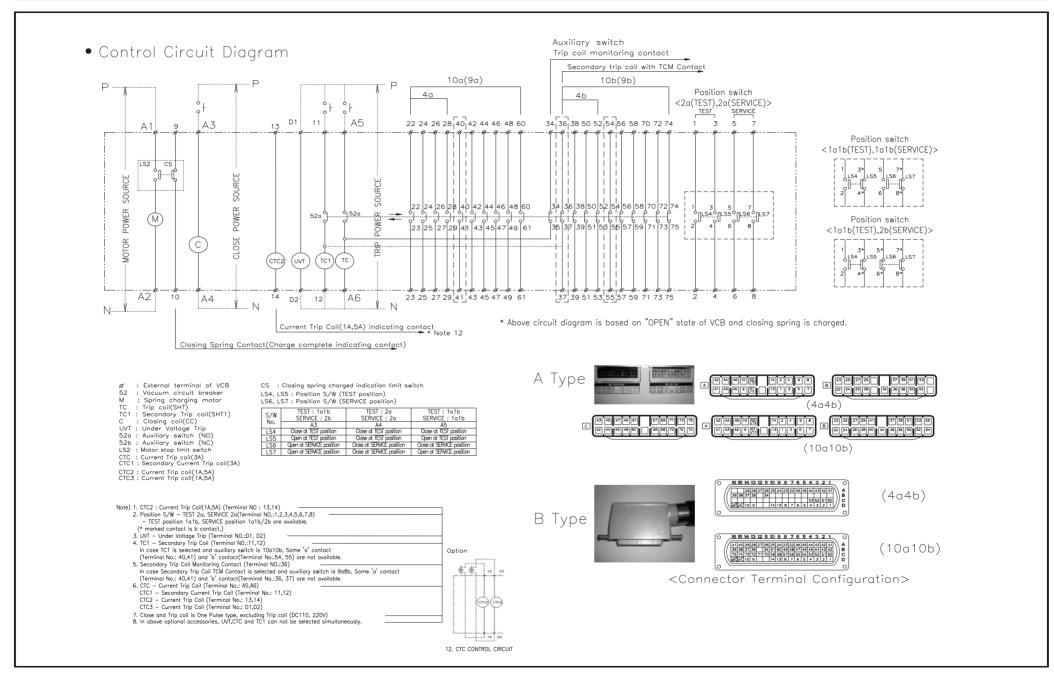
<table< th=""><th>7-1></th><th>Ratings</th><th>Table</th></table<>	7-1>	Ratings	Table
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Туре	VL–05□25A12	VL – 05□32A12	VL –15 □ 25A 12	VL-15□32A12		
Rated voltage (kV)	4.76			5		
Rated current (A)		12	200			
Rated frequency (Hz)		60				
Rated interrupting current (kA)	25	31.5	25	31.5		
Rated interrupting capacity (MVA)	207	260	650	820		
Rated short-time current (kA)	25/2sec	31.5/2sec	25/2sec	31.5/2sec		
Rated making current (kA)	65	81.9	65	81.9		
Rated interrupting time (cycle)		;	3			
Withstand Frequency (kV)	1	9	3	6		
Voltage Impulse (kV/1.2×50	6	0	9	5		
TRV increasing rate (kV/\mus)	0.	19	0.0	39		
TRV Max. Value (kV)	8.2		25.7			
Operating duty	O-0.3s-CO-3min-CO					
Control voltage (V)	DC24~30V	DC48~60V, AC 48V	AC/DC 100~130V	AC/DC 200~250V		
Current of motor operation (A)	≤ 8	≤ 4	≤ 2	≤ 1		
Control current for closing (A)	≤ 8	≤ 4	≤ 4	≤ 2		
Control current for opening (A)	- F/- OF	- 0/- 45	- 0/- 40	- 41- F		
(Steady Current/Inrush Current)	≤ 5/≤ 25	≤ 3/≤ 15	≤ 2/≤ 10	≤ 1/≤ 5		
Standard aux. contacts		4a4b,1	10a10b			
Rated opening time (s)		≤ 0	0.04			
No-load closing time (s)		≤ 0),06			
Motor Charging Time (s)		<u>≤</u>	5			
Pole distance (mm)	(mm) 150					
Weight(H, Circuit breaker) (kg)		115				
Weight(Cradle) (kg)	430					
Weight(P, Circuit breaker) (kg)	85					
Applicable standard	IEEE C37.09, IE	EEE C37.20.2, AI	NSI C37.54, ANSI	C37.55		

Rating

<table 7-2=""> Ratings Table</table>					
Туре	VL-05□25B20	VL-05□32B20	VL-15□25B20	VL-15□32B20	
Rated voltage (kV)	4.	76	1	5	
Rated current (A)		2000			
Rated frequency (Hz)		6	60		
Rated interrupting current (kA)	25	31.5	25	31.5	
Rated interrupting capacity (MVA)	207	260	650	820	
Rated short-time current (kA)	25/2sec	31.5/2sec	25/2sec	31.5/2sec	
Rated making current (kA)	65	81.9	65	81.9	
Rated interrupting time (cycle)) 3				
Withstand Frequency (kV)	1	9	3	6	
Voltage Impulse (kV/1.2×50#s)	6	0	g	95	
TRV increasing rate (kV/µs)	0.	19	0.	39	
TRV Max. Value (kV)	8	8.2 25.7			
Operating duty	O-0.3s-CO-3min-CO				
Control voltage (V)	DC24~30V	DC48~60V, AC 48V	AC/DC 100~130V	AC/DC 200~250V	
Current of motor operation (A)	≤ 8	≤ 4	≤ 2	≤ 1	
Control current for closing (A)	≤ 8	≤ 4	≤ 4	≤ 2	
Control current for opening (A) (Steady Current/Inrush Current)	≤ 5/≤ 25	≤ 3/≤ 15	≤ 2/≤ 10	≤ 1/≤ 5	
Standard aux. contacts		4a4b,1	l0a10b	•	
Rated opening time (s)		≤ 0	0.04		
No-load closing time (s)		≤ 0	.06		
Motor Charging Time (s)		≤	5		
Pole distance (mm)		2	10		
Weight(H, Circuit breaker) (kg)	140				
Weight(Cradle) (kg)	510				
Weight(P, Circuit breaker) (kg)		8	5		
Applicable standard	IEEE C37.09, I	EEE C37.20.2, A	ANSI C37.54, AN	SI C37.55	

Circuit Diagram



Warranty

Model Name		Buying Date	
Serial No.		Warranty Period	1years
	Name		
Customer Information	Address		
	Tel.		
	Name		
Sales Office (Distributor)	Address		
(= == == == == = = = = = = = = = = = =	Tel.		

- Product quality is strictly controlled and inspected.
- If he defective part is identified to have been properly used under the guarantee term, it will be repaired at our expense.
- The problems occur out of warranty term will be repaired at your expense.
- When applying for repair, please present this warranty.

■ In-Warranty Repair - Under Guarantee Term

■ Out-of-Warranty Repair

The guarantee will not be applied to any of the below listed conditions even if the term of guarantee is still valid,

- Defect caused by misusage or improper maintenance of customer
- Defect caused by improper repair or modification by unauthorized distributors or service center
- Damage caused by natural phenomenon such as earthquake, fire, flooding and lightning
- Claim guarantee without presented warranty form.



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79563172009

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

Vacuum Circuit Breaker 2014 09