Top 100
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Susol Super Solution

Vacuum Circuit Breakers

For generator application

LS ELECTRIC

KEMA Short circuit certification

DNV·GL

KEMA TYPE TEST CERTIFICATE OF SHORT-CIRCUIT PERFORMANCE

LSIS Co., Ltd,

Cheongju-City, South Korea

has successfully passed the type test sequence on a three-pole air-insulated

vacuum generator circuit-breaker

Type: VH-17□50□50
Rating: 17,5 kV – 5000 A – 50 kA – 60 Hz

The test object passed the specification of test duties of

IEC/IEEE 62271-37-013

subclauses 6.4 (Measurement of the resistance of circuits), 6.6 (STC), 6.103 (Test duties 1, 2), 6.104 (Load current breaking tests), 6.105 (Test duties 5, 6A) and 6.106 (Test duties OP1 and OP2).

The test results are recorded in Certificate No.

2300-16

This Certificate was issued on 15 November 2016.

DNV GL Netherlands B.V.

J.P. Pontenjne
Executive Vice President
KEMA Laboratories

KEMA Laboratories

Contents

17.5kV VCB for generator

17.5kV VCB for generator

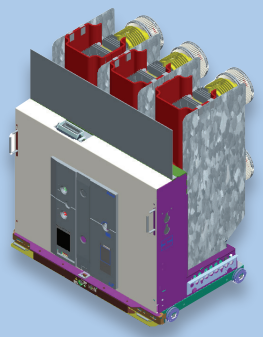
Features

- **Rating: 17.5kV 50kA 5000A(Fixed), 4000A(Withdrawable), 50/60Hz**
- **Maximum interrupting times: 5 cycle**
- **Rated short-time withstand current: 50kA/4sec**
- **Rated operating sequence: CO-30min-CO (Short circuit)**
  O-3min-CO-3min-CO (Load switching)
- **Short-circuit current**
  - **System-source fault: 50kA**
  - **Generator-source fault: 25kA**
- **Out-of-phase current switching capability: 25kA**
- **No-load mechanical endurance capability: 10,000 operations**
- **Control voltage**
  AC/DC 48V, AC/DC 110V, DC 125V, AC/DC 220V
- **Various accessories**
  - VCB part: UVT, Latch Checking S/W, Position S/W, Locking Magnet, Plug Interlock
  - Others: Draw-in/out handle, Lifting hook, UVT Time Delay Controller

Standards and Test

- **IEC/IEEE 62271-37-013(2015)_For generator circuit breaker**
- **KEMA Short circuit certification**

P Type (Fixed)

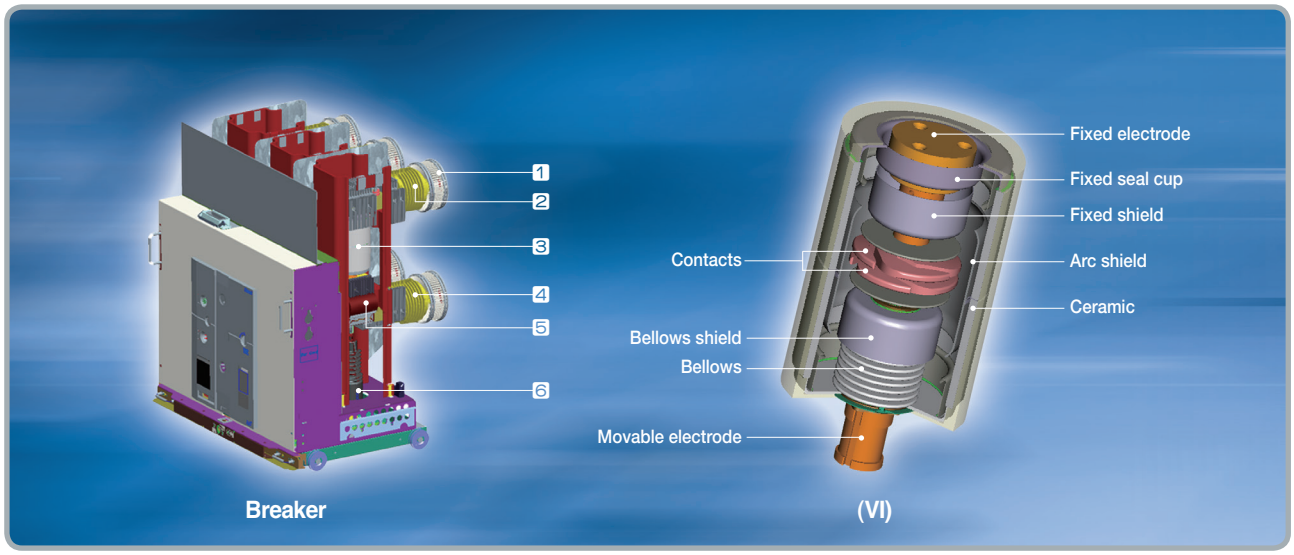


H Type (Withdrawable)

Rating

Type			VH-17P50D50	VH-17H50D40
Rated voltage		Ur (kV)	17.5	
Rated normal current		Ir (A)	5000A	4000A
Phase distance		(mm)	275	
Breaker weight		(kg)	385	395
Cradle (H Type) weight		(kg)	-	180
Rated frequency		fr (Hz)	50/60	
Rated short-circuit current		Ik (kA)	50	
Rated short-circuit breaking capacity		(MVA)	1520	
Rated short-time withstand current		Ik/tk (kA/s)	50kA/4s	
Rated short-circuit making current		Ip (kA)	137	
Maximum interrupting times		(cycle)	5	
Rated withstand voltage	Power frequency	Ud (kV)	50	
	Impulse	Up (kV/1.2×50㎲)	110	
Rated operating sequence	Short circuit current		CO-30min-CO	
	Load switching current		O-3min-CO-3min-CO	
Control voltage	Closing coil	(V)	DC 48, 110, 125, 220 AC 48, 110, 220	
	Trip coil	(V)	DC 48, 110, 125, 220 AC 48, 110, 220	
Auxiliary contacts			4a4b, 10a10b	
Rated opening time		(s)	≤ 0.04	
No-load closing time		(s)	≤ 0.06	
Motor operating current		(A)	≤ 5 (7:AC/DC48V)	
Closing control current		(A)	≤ 5 (7:AC/DC48V)	
Trip control current		(A)	≤ 5 (7:AC/DC48V)	
Motor charging time		(s)	≤ 12	
Generator-source-fault currents		(kA)	25	
Out-of-phase current switching capability		(kA)	25	
No. of mechanical endurance		(ops.)	10,000	
Installation type			P Type (Fixed)	H Type (Withdrawable)
Standards			IEC/IEEE 62271-37-013:2015	

Structure



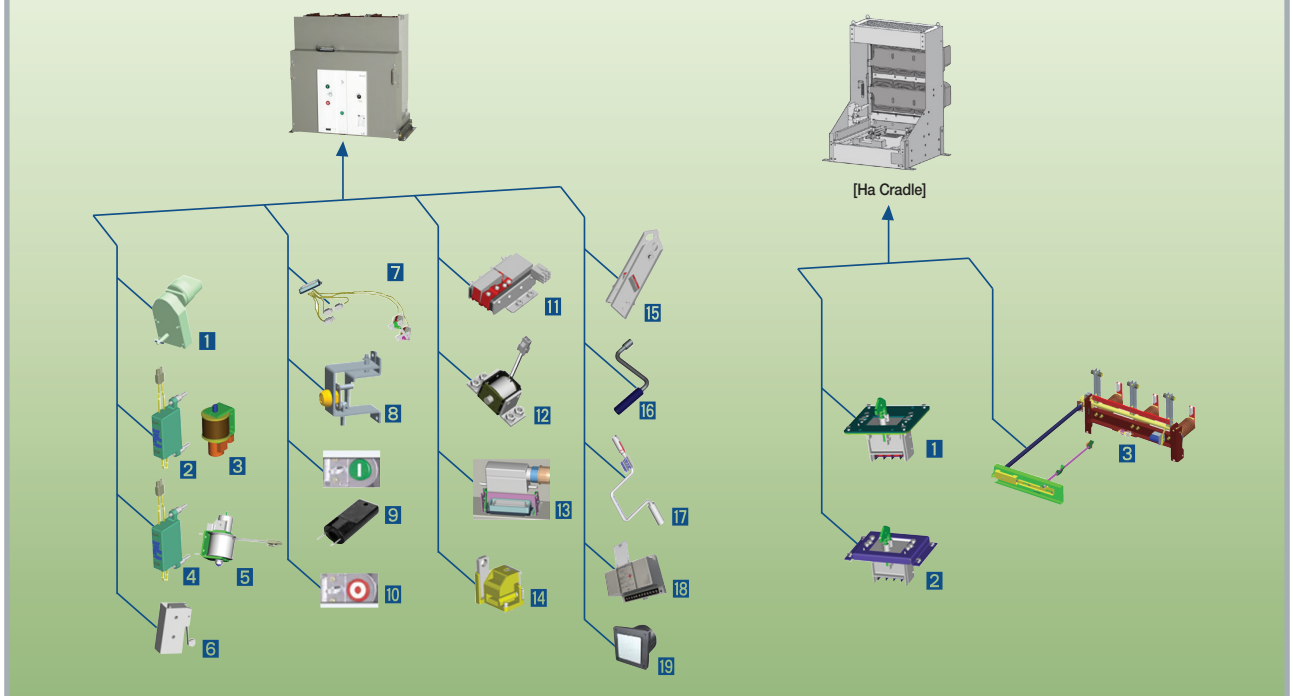
Breaker

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

Vacuum Interrupter, VI

The internal components of a typical Vacuum Interrupter are shown in the Fig.
LS Vacuum Interrupter consists of a ceramic insulator, two end plates, arc shield, bellows, a movable and fixed electrode, and contact set.
The ambient gas pressure within the evacuated tube is approximately 5x10-5 torr.

Accessories



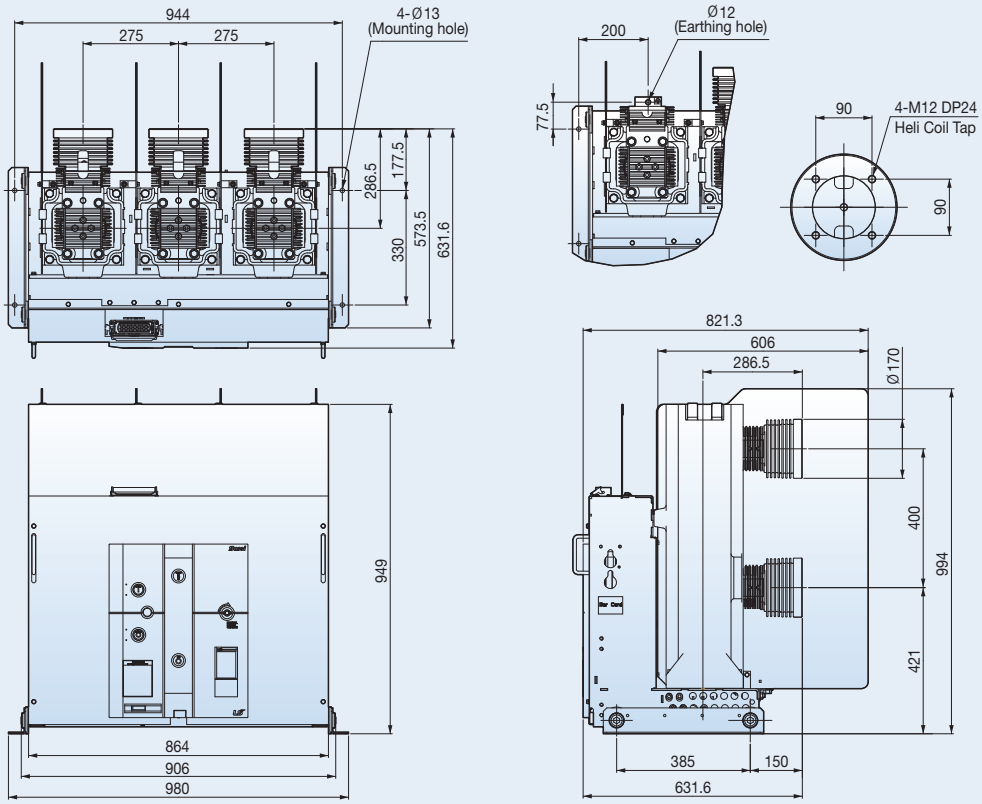
Breaker

1 Motor(M)
2 AC/DC Coil rectifier
3 Trip coil/Closing coil
Secondary trip coil
4 UVT rectifier
5 UVT
6 Latch checking S/W
7 Auxiliary contact wire
8 Keylock
9 Button cover/Push bar
10 Button padlock
11 Position S/W
12 Locking magnet
13 Plug interlock
14 Wireless Temp. monitoring sensor
15 Lifting hook
16 Charge handle
17 Handle for draw-in and out
18 UVT time delay controller
19 CTD

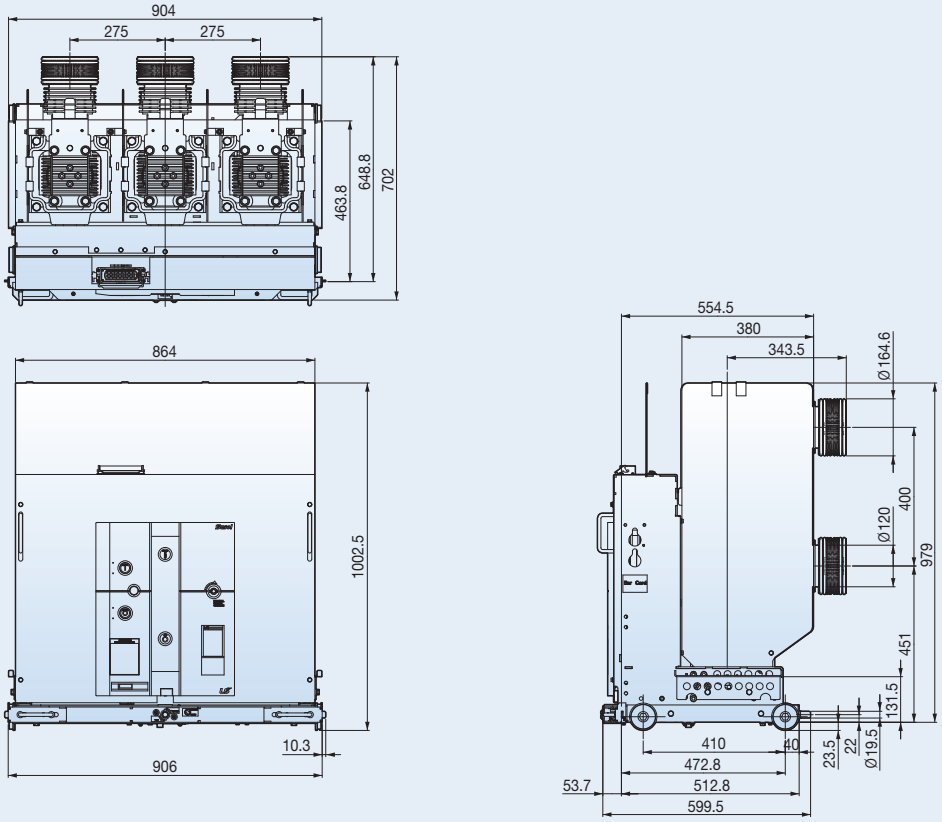
Cradle

1 MOC (Mechanism operating cell S/W)
2 TOC (Truck operating cell S/W)
3 Earthing S/W & Accessary

• 17.5kV 5000A P Type (Fixed)

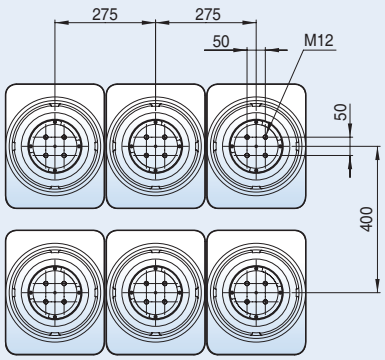


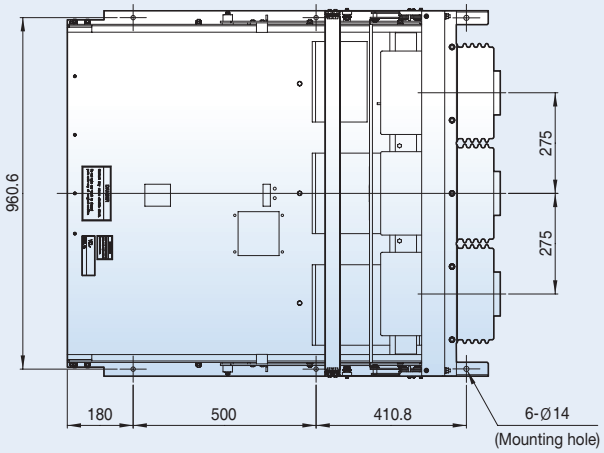
• 17.5kV 4000A H Type (Withdrawable)

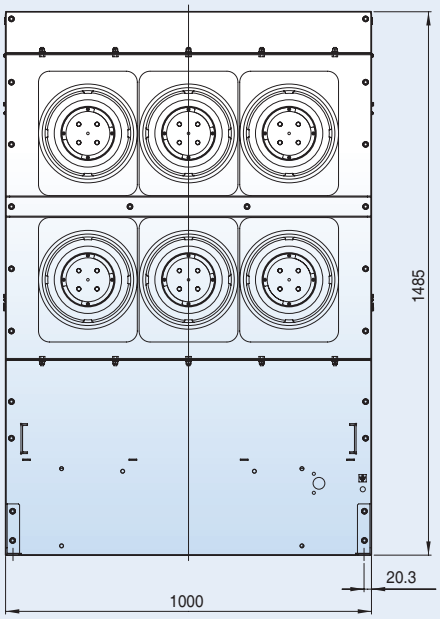


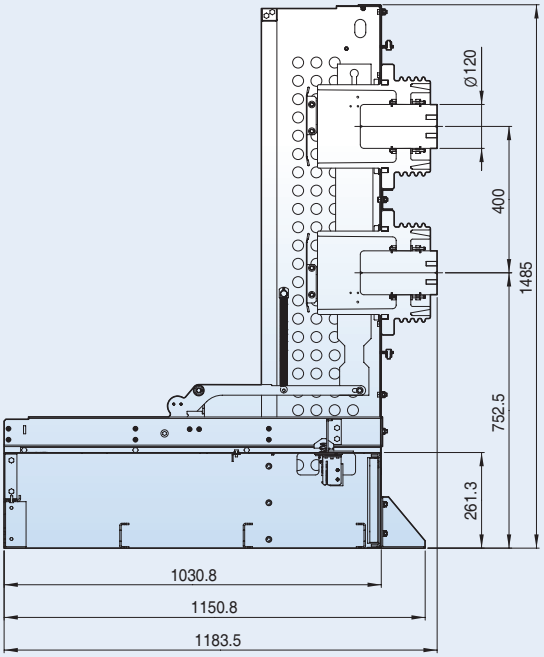
Dimensions

• **Ha Type VCB Cradle**

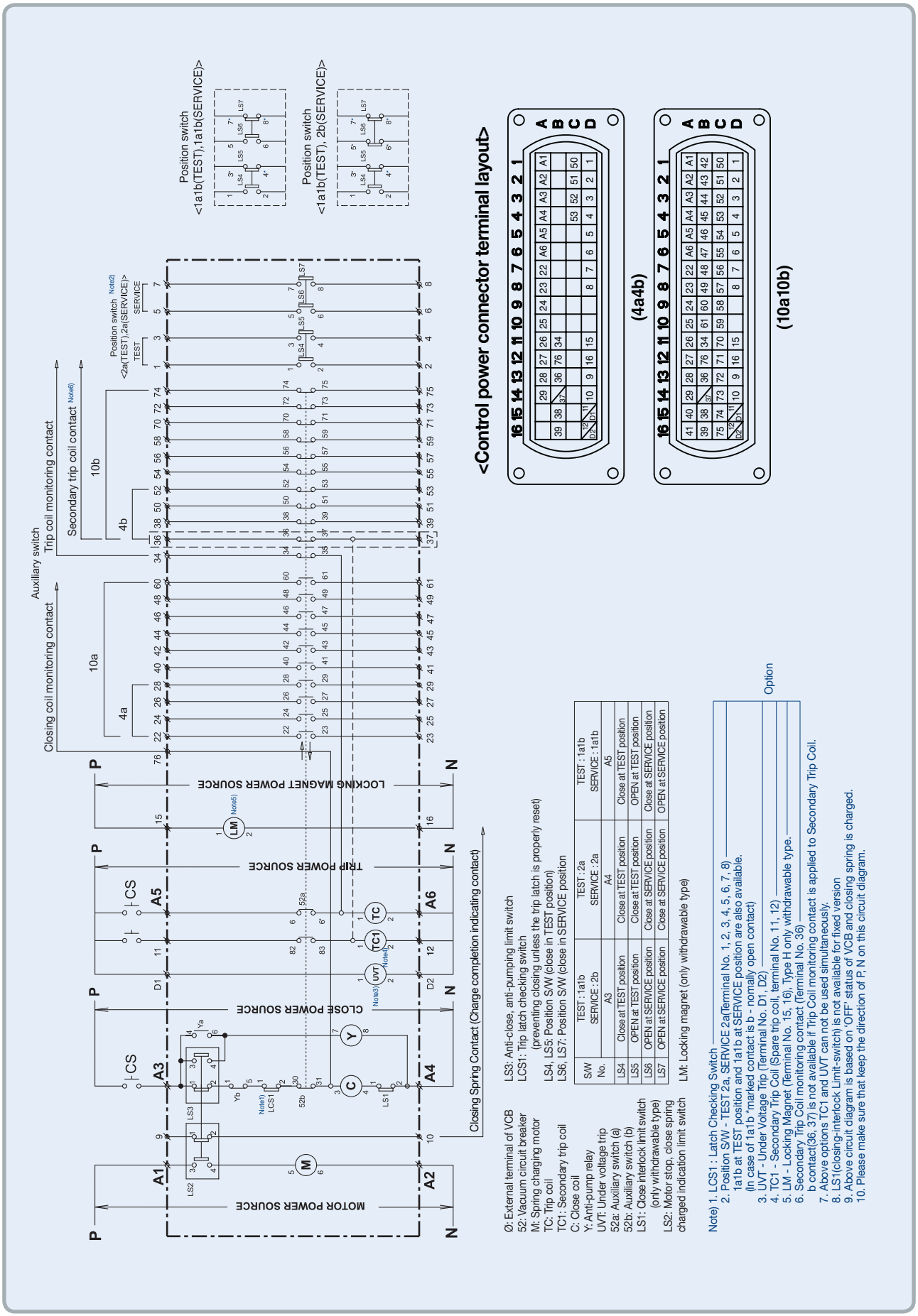








Control circuit diagram



Ø: External terminal of VCB
52: Vacuum circuit breaker
M: Spring charging motor
TC: Trip coil
TC1: Secondary trip coil
C: Close coil
Y: Anti-pump relay
UVT: Under voltage trip
52a: Auxiliary switch (a)
52b: Auxiliary switch (b)
LS1: Close interlock limit switch (only withdrawable type)
LS2: Motor stop, close spring charged indication limit switch

LS3: Anti-close, anti-pumping limit switch
LCS1: Trip latch checking switch (preventing closing unless the trip latch is properly reset)
LS4, LS5: Position S/W (close in TEST position)
LS6, LS7: Position S/W (close in SERVICE position

S/W No.	TEST : 1a1b SERVICE : 2b	TEST : 2a SERVICE : 2a	TEST : 1a1b SERVICE : 1a1b
	A3	A4	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	Close at SERVICE position
LS7	OPEN at SERVICE position	Close at SERVICE position	OPEN at SERVICE position

LM: Locking magnet (only withdrawable type)

Note) 1. LCS1 : Latch Checking Switch
2. Position S/W - TEST 2a, SERVICE 2a(Terminal No. 1, 2, 3, 4, 5, 6, 7, 8)
1a1b at TEST position and 1a1b at SERVICE position are also available.
(In case of 1a1b *marked contact is b - nomally open contact)
3. UVT - Under Voltage Trip (Terminal No. D1, D2)
4. TC1 - Secondary Trip Coil (Spare trip coil, terminal No. 11, 12)
5. LM - Locking Magnet (Terminal No. 15, 16), Type H only withdrawable type.
6. Secondary Trip Coil monitoring contact (Terminal No. 36)
b contact(36, 37) is not available if Trip Coil monitoring contact is applied to Secondary Trip Coil.
7. Above options TC1 and UVT can not be used simultaneously.
8. LS1(closing-interlock Limit-switch) is not available for fixed version
9. Above circuit diagram is based on 'OFF' status of VCB and closing spring is charged.
10. Please make sure that keep the direction of P, N on this circuit diagram.

Option

Ordering information

■ 17.5kV For generator (Breaker)

VH - 17 H 50 D 40

Basic del name	
VH	VH Mecha

Rated voltage (kV)	
17	17.5

Version	
P	Fixed
H	MCSG type withdrawable

Interrupting current (kA)	
50	50

Phase distance/Compatibility	
D	275

Rated current (A)	
40	4000
50	5000 (Fixed)

VH-17H50D40 - M1 C1 T1 SB2 U1 Note2) A12 Note1) GEN Optional

Motor control voltage	
M0	Motor none
M1	DC 110V
M2	DC 220V~250V
M3	DC 125V
M5	DC 48V
M6	AC 48V
M7	AC 110V
M8	AC 220V

Trip coil voltage	
T0	T.C none
T1	DC 110V
T2	DC 220V~250V
T3	DC 125V
T5	DC 48V
T6	AC 48V
T7	AC 110V
T8	AC 220V

UVT	
U0	UVT none
U1	DC 110V
U2	DC 220V~250V
U3	DC 125V
U5	DC 48V~60V
U6	AC 48V
U7	AC 110V
U8	AC 220V

Other accessories	
A1	Secondary Trip Coil Note2)
A2	Secondary Trip Coil with TCM Contact Note2)
A3	Position S/W (Test 1a1b, Service : 2b) Note6)
A4	Position S/W (Test : 2a, Service : 2a) Note6)
A5	Position S/W (Test 1a1b, Service : 1a1b) Note6)
A6	Latch Checking S/W Note5)
A7	Keylock (Individual key)
A8	Button Padlock Note4)
A9	Button cover Note4)
AA	Lead Wire
AB	User Plug (Part)
AC	Plug Interlock
AE	MOC Note5)
AF	Locking Magnet Note8)
AG	Keylock (Same key)
AX	Wireless Temperature Monitoring Sensor

Suffix	
GEN	VCB for generator

Closing coil voltage	
C0	C.C none
C1	DC 110V
C2	DC 220V~250V
C3	DC 125V
C5	DC 48V
C6	AC 48V
C7	AC 110V
C8	AC 220V

Connector and wire		
SB2	Standard	B type connector 4a4b
SB4		B type connector 10a10b
DO0		Dummy connector none
DB1		Dummy B type connector Note10)
SB6	Flame retardant	B type connector 4a4b Note7)

Other options	
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

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. A1~A2(Secondary Trip Coil) and U1~U8 (UVT) can not be selected simultaneously.
If A2 is selected, the number of auxiliary contacts decreases by 1a1b
3. A3(Posi tion S/W 1a3b), A4(Posi tion S/W 2a2a), A5(Position S/W 2a2b) can not be selected simultaneously.
4. A8 (Button Padlock) and A9 (Button Cover) can not be selected simultaneously.
5. In case of selecting UVT A6 (Latch checking S/W) is not allowed. A6
(Latch checking S/W) is installed by default to make electrical interlock with UVT.
6. A3(Position S/W 1a3b), A4(Position S/W 2a2a), A5(Position S/W 2a2b) can not be selected simultaneously.
7. In case of B-type connector the flame retardant wire is applicable to auxiliary contacts 4a4b, not to 10a10b.
8. Locking magnet of breaker use the same control power supply as motor.
9. In case of selecting Wireless-energy harvesting sell-power, The receiver module(USB type) is provided separately.The
installation program can be downloaded from LSIS Home Media.
10. When selecting VCB (DB1) for DUMMY, only Position S/W (A3 ~ A5), AB (User Plug) can be selected as an option.
11. A7[Keylock(Individual key)] and AG[Keylock(Same key)] an not be selected simultaneously.

■ 17.5kV For generator (Cradle)

VCL - 17 H 50 D 40 A12

Basic model name	
VCL	Susol VCB Cradle

Rated voltage (kV)	
17	17.5

Interrupting current (kA)	
50	50

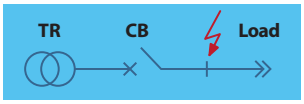
Rated current (A)	
40	4000

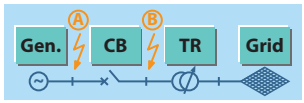
Other accessories	
A1	ES(Earthing Switch) without option
A3	ES(Earthing Switch) with Position S/W (4a4b)
A5	ES(Earthing Switch) with Keylock
AF	TOC
AG	MOC

Version	
Ha	MCSG Cradle type

Phase distance/Compatibility	
D	275

Comparison of distribution breaker and generator breaker





Item		Distribution VCB	Generator VCB	Remarks
Position		Between TR and normal load	Between generator and TR	
Protection		Protecting system from CB secondary accident	Protecting system from the accident at CB primary and secondary	Fault location A: System-source fault Fault location B: Generator-source fault
Power frequency withstand voltage		38kV @17.5kV	50kV @17.5kV	
Impulse withstand voltage		95kV @17.5kV	110kV @17.5kV	
Rated operating sequence		O-0.3s-CO-15s-CO	CO-30min-CO	
Making current		2.6Isc (60Hz), 2.5Isc (50Hz)	2.74Isc	Requires mechanical durability against high current peaks
System-source fault (Fault location A)	Isc	50kA	50kA	Require mechanical durability and breaking reliability due to high dc component
	%dc	(30~50%)	(65~80%)	
	RRRV Note1)	0.42kV/us	3.5kV/us	Requires very fast recovery voltage characteristics
Generator-source fault (Fault location B)	Iscg	Not required	Must demonstrate (0.5Isc)	Ability to withstand thermal stress due to long arc time
	%dc		(110~130%)	
	RRRV Note1)	0.42kV/us	1.6kV/us	
Out-of-phase	Ibr	Option (0.25Isc, preferred)	Option (0.5Isc, preferred)	Requires very fast recovery voltage characteristics
	RRRV Note1)	0.31kV/us	3.3kV/us	
Standards		IEC 62271-100	IEC/IEEE 62271-37-013(2015)	

Note1) RRRV (Rate of rise of recovery voltage): Indicates the slope of the transient recovery voltage.

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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2022. 12

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