Top 100
Global
Innovator
for 10 years

Up to 24kV

Compact AIS

Compact Air Insulated Switchgear

LS ELECTRIC

Up to 24kV

Compact Air Insulated Switchgear

Contents

Features

Reliability & Safety

- Type testing is complete for all models according to latest standard, IEC62271-200
- Internal arc proofed 21kA / 1s
- Earthing of both the whole switchboard structure and the metal division between the compartments
- Mechanical interlocks which assure the exact operation sequence
- Protection Classes: PI (insulating partition)
- Loss of service continuity classes: LSC2A (LSC1 for bus riser)
- IP3X protection degree on the external housing
- High voltage indication system in each cubicle

Optimization

- Reduced dimensions and weights
- Less space requirement for switchboard installation
- Easy integration in factory-built outdoor substations
- A solution adapted to cable connection
- Modular units containing fixed and withdrawable metal-enclosed switchgear, using vacuum

Simplicity

- Simplified switchboard busbar design
- Mimic diagram front of the switchboard by means of simple and functional devices

General characteristics

Electrical characteristics

Type		Rating				
Rated voltage		Ur		12	17.5	24
Rated frequency		fr	Hz	50/60		
Insulation level						
Power frequency withstand voltage	Insulation	Ud	1min (kV rms)	28	38	50
	Isolation	Ud	1min (kV rms)	32	45	60
Lightning impulse withstand voltage	Insulation	Ud	1.2/50µs (kV peak)	75	95	125
	Isolation	Ud	1.2/50µs (kV peak)	85	110	145
Breaking capacity						
Rated current		Ir	A	630		
Short-time withstand current		Ik/tk	kA/s	16kA/3s, 21kA/3s, 25kA/1s		
Making capacity (50Hz)		Ima	kA	40 / 50 / 54.6		
Internal arc classification		IAC	kA/1 s	21 (A-FLR): Option		

IEC standards

IEC 62271-1	High-voltage switchgear and controlgear Part 1: Common specifications
IEC 62271-100	High-voltage switchgear and controlgear Part 100: Alternating-current circuit-breakers
IEC 62271-102	High-voltage switchgear and controlgear Part 102: Alternating current disconnectors and earthing switches
IEC 62271-103	High-voltage switchgear and controlgear Part 103: Switches for rated voltages above 1kV up to and including 52kV
IEC 62271-105	High-voltage switchgear and controlgear Part 105: Alternating current switch-fuse combinations
IEC 62271-200	High-voltage switchgear and controlgear Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1kV and up to and including 52kV

Normal operating conditions

Ambient air pollution	No significant pollution by dust, smoke, corrosive and/or flammable gases, vapours or salt.
Ambient air temperature	Less than or equal to 40°C Less than or equal to 35°C on average over 24 hours Greater or equal to –5°C
Altitude	Less than or equal to 1000 m
Humidity	Average relative humidity over a 24 hour period, less than or equal to 95% (average relative humidity over a 1 month period, less than or equal to 90%)

Applications

Building

- Office building
- Hotel and resort
- Shopping mall
- Hospital
- University

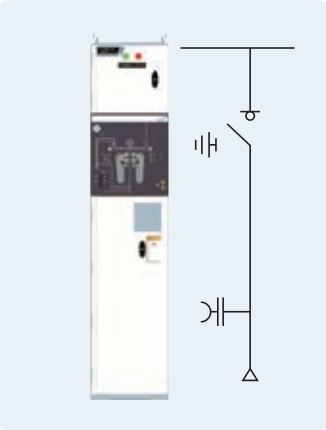
Industry

- Manufacturing industry
- Small size power plant
- Wind power plant

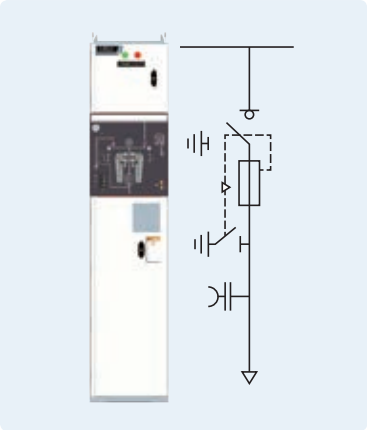
Utility/Public

- Secondary electricity distribution network
- MV/LV distribution transformer substation
- Airport

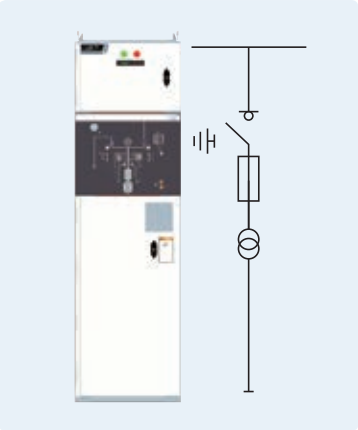
Units Functions



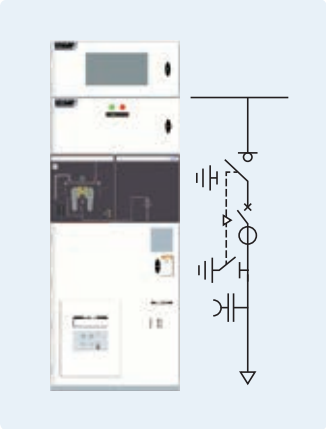
LU
Load break switch unit



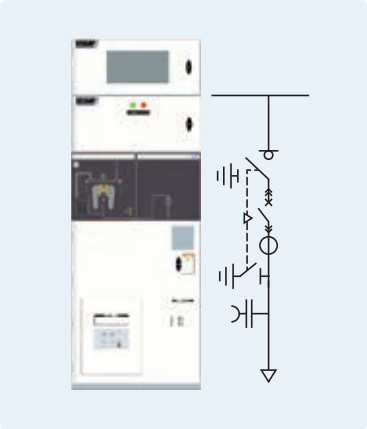
FU
Fuse switch combination unit



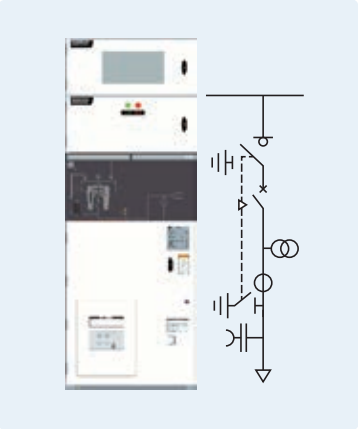
PU
Voltage transformers unit for mains with earthed neutral system



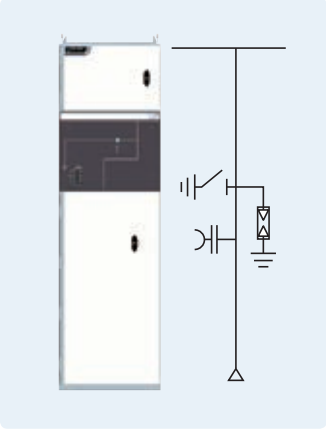
CU-A
Single-isolation, disconnectable circuit breaker unit



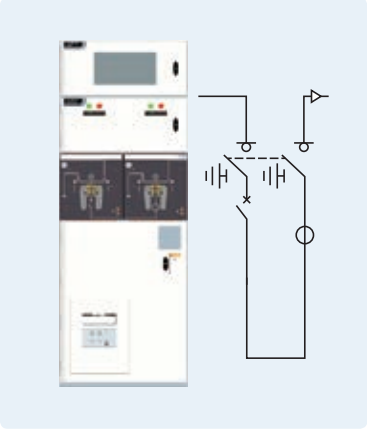
CU-W
Withdrawable single-isolation circuit breaker unit



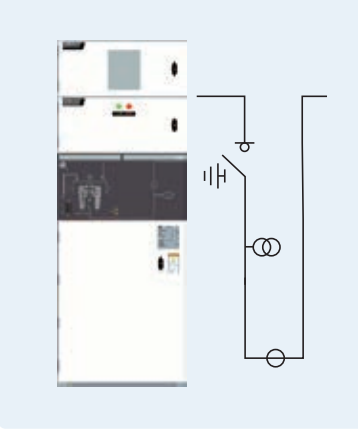
CU-AP
Single-isolation, disconnectable circuit breaker unit with PT



GAU
Incoming cable-connection unit with earthing



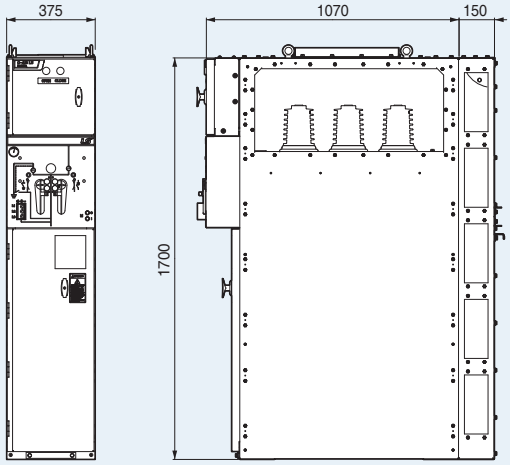
SU
Section unit with double-isolation, disconnectable circuit breaker right or left outgoing line



MU
Metering unit

LU – Load break switch unit

(Unit: mm)



- W×H×D(mm): 375×1,700×1,070
- Load break switch

Base unit

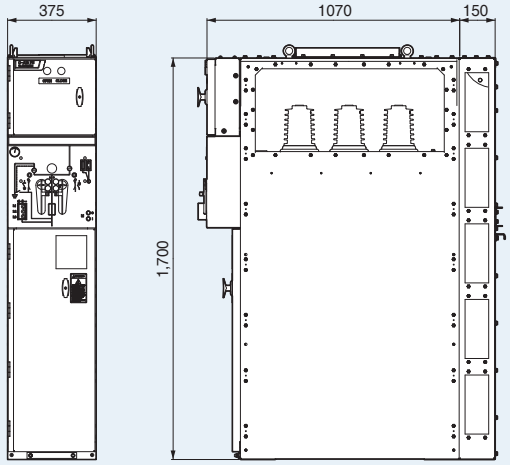
- 3-position load break switch rated 630A for load breaking and earthing
- Key interlock

Optional components

- Motor operation for load break switch
- Voltage detector
- Gas guage (Selection recommended)

FU – Fuse switch combination unit

(Unit: mm)



- W×H×D(mm): 375×1,700×1,070
- Fuse switch combination
- Power fuse
- External E/S

Base unit

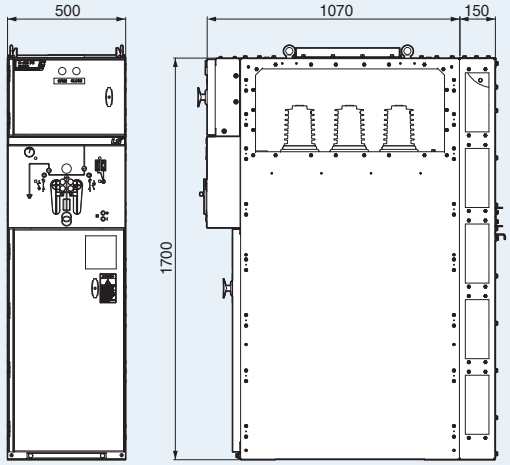
- 3-position fuse-switch combination with earthing switch
- Key interlock
- Power fuse: 63A

Optional components

- Motor operation for fuse-switch combination
- Voltage detector
- Gas guage (Selection recommended)

PU – Voltage transformer unit

(Unit: mm)



- W×H×D(mm): 500×1,700×1,070
- Fuse switch combination
- Power fuse
- Voltage transformer

Base unit

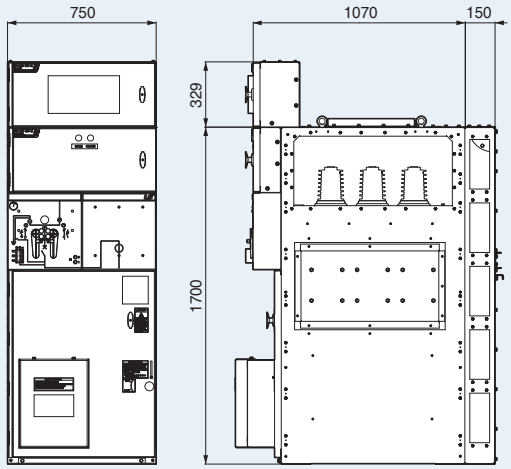
- 3-position fuse-switch combination with earthing switch
- Key interlock
- Power fuse: 1A

Optional components

- Motor operation for load break switch
- Voltage detector
- Gas guage (Selection recommended)
- Voltage transformer

CU-A/CU-W – Circuit breaker unit

(Unit: mm)



- W×H×D(mm): 750×1,700×1,070
- Load break switch
- Vacuum circuit breaker
- Current transformer
- External E/S

Base unit

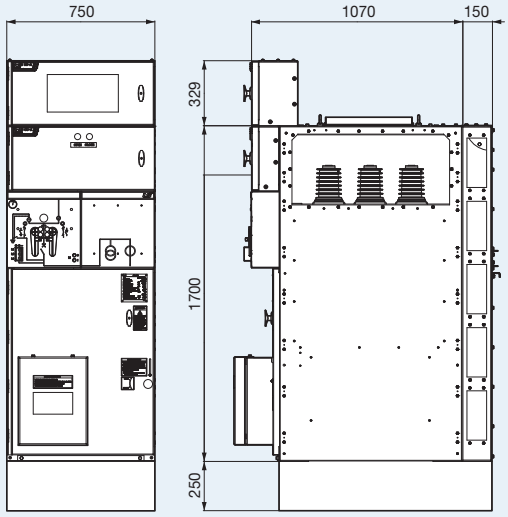
- 3cycle circuit breaker
- SM-VCB Auxiliary contacts: 4a4b
- 3-position load break switch rated 630A
- Key interlock

Optional components

- Motor operation for load break switch
- Voltage detector
- Gas guage (Selection recommended)
- Protective relay
- Current transformer

CU-AP - Circuit breaker unit with PT

(Unit: mm)



- W×H×D(mm): 750×1,700×1,070
- Load break switch
- Vacuum circuit breaker
- Current transformer
- Voltage transformer
- External E/S

Base unit

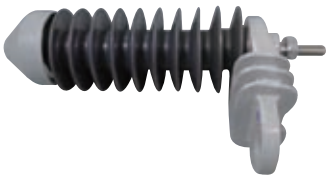
- 3cycle circuit breaker
- SM-VCB Auxiliary contacts: 4a4b
- 3-position load break switch rated 630A
- Key interlock

Optional components

- Motor operation for load break switch
- Voltage detector
- Gas guage (Selection recommended)
- Protective relay
- Block type CT is optional (Ring type CT is generally used)

* 250mm box is added when applying ring type CT.

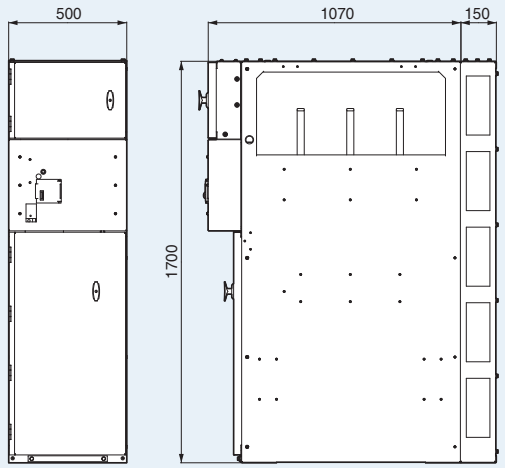
GAU – Incoming cable-connection unit



21kA E1 class E/S

21kA E0 class E/S

(Unit: mm)



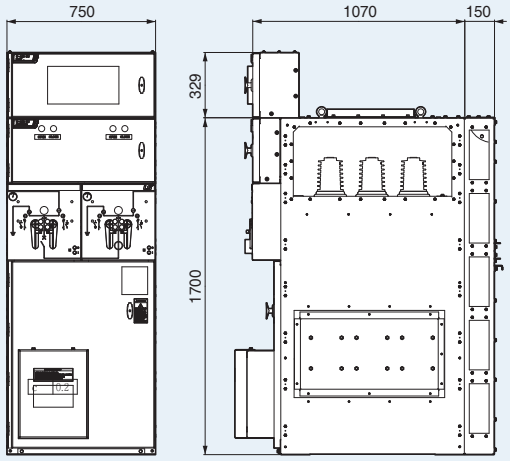
- W×H×D(mm): 500×1,700×1,070
- External E/S
- Lightning arrester

Optional components

- Voltage detector
- Lightning arrester

SU – Section unit

(Unit: mm)



- W×H×D(mm): 750×1,700×1,070
- Load break switch
- Vacuum circuit breaker
- Current transformer
- External E/S

Base unit

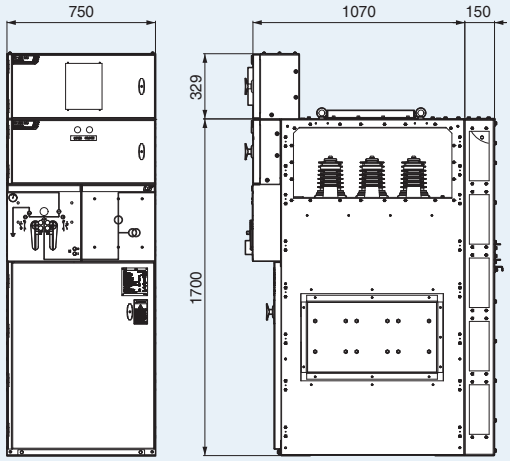
- 3cycle circuit breaker
- SM-VCB Auxiliary contacts: 4a4b
- 3-position load break switch rated 630A
- Key interlock

Optional components

- Motor operation for load break switch
- Voltage detector
- Gas guage (Selection recommended)
- Protective relay
- Current transformer

MU - Metering unit

(Unit: mm)



- W×H×D(mm): 750×1,700×1,070
- Load break switch
- Current transformer
- Voltage transformer

Base unit

- 3-position load break switch rated 630A
- Key interlock

Optional components

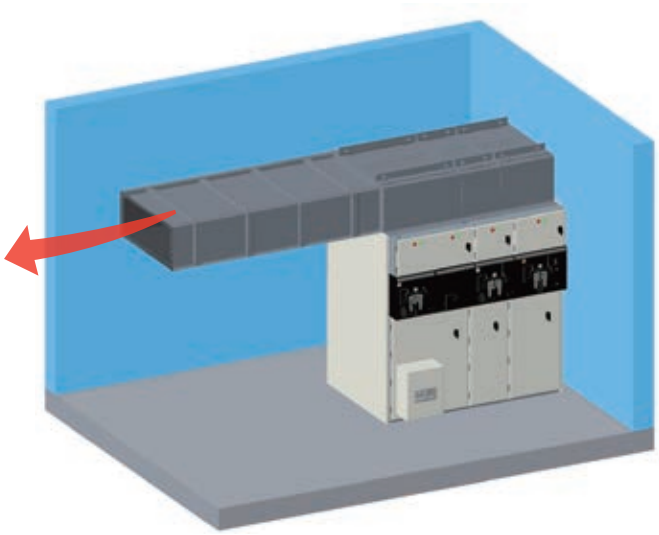
- Gas guage (Selection recommended)

Internal arc protection

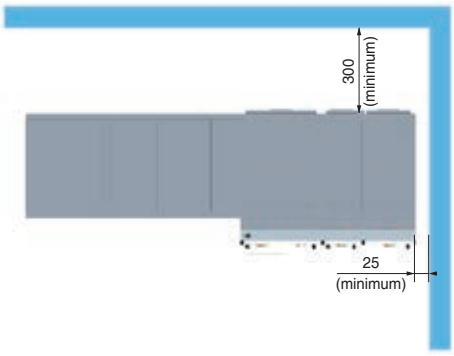
LS Compact AIS is designed to enhance user safety with internal arc structure so that an operator can be protected from effects of an internal arc fault. LS Compact AIS has passed internal arc tests in conformity with IEC 62271-200.

Layout examples

Example of installation of compact AIS

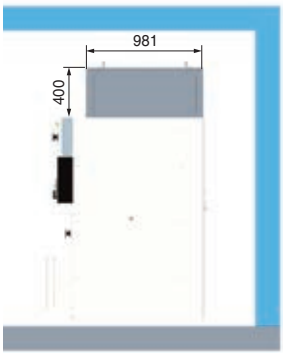


Top view



Front view

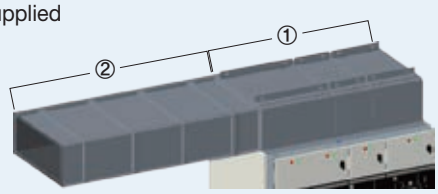
Side view



Features

Internal arc withstand

- Classified IAC: A-FLR (4-sides internal arc protection)
  - 21kA/1s
- Arc duct type
  - Arc duct is necessary on the top of the switchgear
    - ① supplied
    - ② not supplied



For user safety

- Compartment type enclosure
  - Metal division between the compartments
- safety devices
  - Voltage indication system
  - Mechanical interlocks for accurate operation sequence
- Technologies for safety
  - Structural design & analysis
    : Arc relief structure
  - Insulation design
    : Reliability of insulation materials
  - Electromagnetic field analysis

Considerations for high altitude installation

The installation at an altitude above 1,000m has an impact on the dielectric behavior of medium voltage air insulated switchgears. For this reason, some factors must be considered in operating medium voltage air insulated switchgears in high altitude conditions.

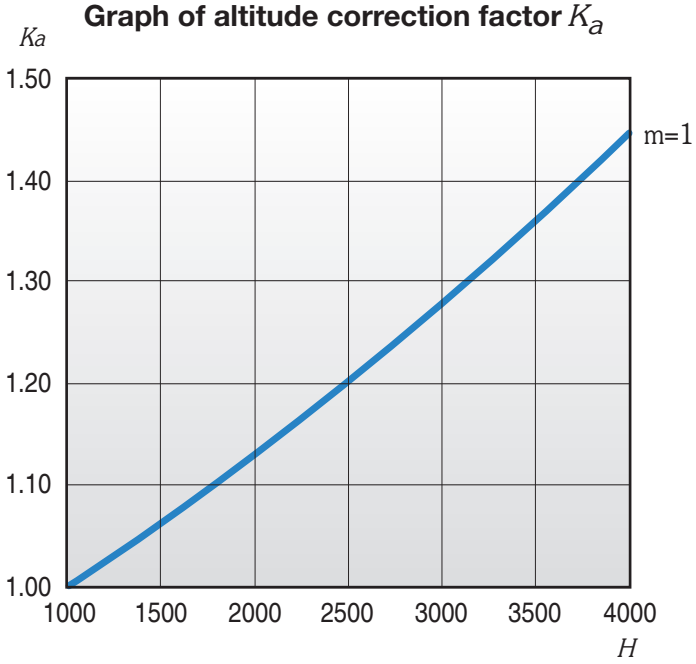
Altitude correction factors for insulation

As the altitude increases, the dielectric strength of insulation decreases due to the reduced air density. For installation at an altitude higher than 1,000m above sea level, the insulation withstand level of external insulation at the service location shall be determined by multiplying the rated insulation levels by a factor "Ka" in accordance with below formula. (IEC 62271-1 standards)

$$K_a = e^{m\,(H - 1000)/8150}$$

H = altitude in meters
m = 1 (for power-frequency, lightning impulse and phase-to-phase switching impulse voltages)

Graph of altitude correction factor K_a



Example

- Installation altitude: 4,000m
- Rated voltage: 12kV
- Power frequency withstand voltage: 28kV rms
- Lightning impulse withstand voltage: 75kV peak
- According to the above formular, Ka = 1.44

- Power frequency withstand voltage to be selected : 28 x 1.44 = 40.3kV rms
- Lightning impulse withstand voltage to be selected : 75 x 1.44 = 108kV peak

For installation at an altitude of 4,000m above sea level with 12kV rated voltage, C-AIS for a rated voltage 24kV with insulation levels at power frequency of 50kV rms and 125kV peak impulse withstand voltage should be selected.

Altitude correction factors for current

According to ANSI standard, for unusual conditions such as altitude, it is recommended the use of correction factors for the current and voltage as follows:

Altitude (m)	1,000	1,200	1,400	1,600	1,800	2,000	2,500	3,000	3,500	4,000
Altitude (ft)	3,280	3,940	4,600	5,250	5,900	6,560	8,200	9,840	11,500	13,125
ACF for current	1.00	0.996	0.992	0.988	0.984	0.980	0.970	0.960	0.950	0.940
ACF for voltage	1.00	0.98	0.96	0.94	0.92	0.90	0.85	0.80	0.75	0.70

Example

LS C-AIS with 630A of rated current in normal operating conditions has about 592A (630 x 0.940 = 592A) capability at 4,000m altitude. But it will have no problem in the majority of cases because switchgear is not often applied at the limits of its rated current capability for most applications.

Distortion of gas insulated electrical equipment

The atmospheric pressure decreases with an increase in altitude. In case of gas insulated electrical equipment such as LBS, the tank might be able to distorted due to the larger pressure difference between inside and outside of the tank at high altitude. So, for high altitude installation the equipment should be examined whether it works normally.

Example

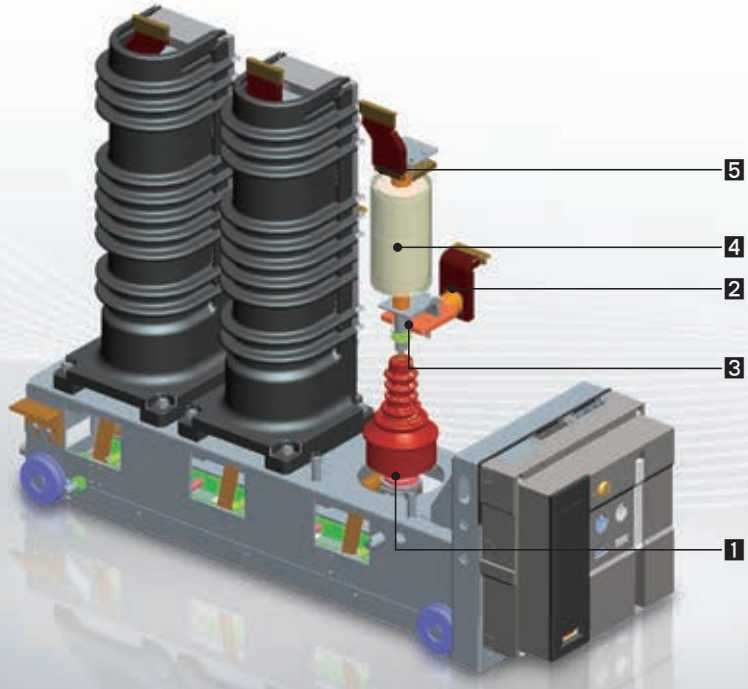
The absolute pressure of SF6 gas in LS LBS is 125kPa. As the altitude increases, higher pressure is caused to the tank by the decreasing atmospheric pressure. At 4,000m altitude, the pressure difference between the inside and outside of the tank is 2.67 times bigger than at 0 m.

Altitude above sea level (m)	0	1,000	2,000	3,000	4,000
Internal pressure of LBS: SF6 gas (kPa)	125	125	125	125	125
External pressure of LBS: Absolute atmospheric pressure (kPa)	101.33	89.87	79.50	70.11	61.64

LS has examined the normal operation and capability of LBS under the same pressure difference condition as at 4,000m altitude.

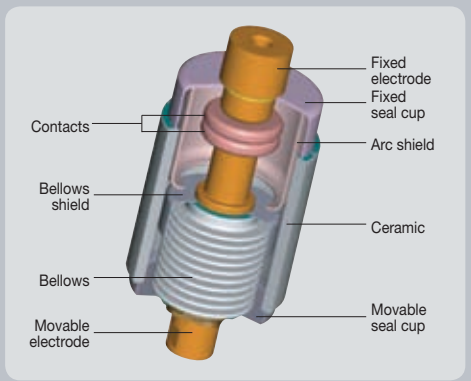
Main circuit structure with high reliability

SM VCB
(Side mount breaker)



Breaker

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



Vacuum Interrupter (VI)

The vacuum rate within the VI is very high (approximately 5x10^{-5} Torr) and the spacing between fixed contact and movable contact is about 6~20mm, depending on the voltage.
The contacts are in a structure that arc can easily be extinguished and the surfaces of the contacts are made of special alloy (copper-chromium) and the interior is completely sealed to prevent loss of vacuum.
Therefore the wearing of the contacts can be minimized in the event of short-circuit and the arc energy by overvoltage or switching can be reduced effectively.

Ratings



Insulation level			SVL-06□20,25□06,13		SVL-12□16, 20, 25□06,13		SVL-17□16, 20, 25□06,13		SVL-20□16, 20, 25□06,13		SVL-25□16, 20, 25□06,13	
Rated voltage		Ur (kV)	7.2		12		17.5		24		25.8	
Rated normal current		Ir (A)	630	1250	630	1250	630	1250	630	1250	630	1250
Phase distance		(mm)	210 (Fixed), 230 (Fixed/Withdrawable), 254 (Fixed)									
Weight (Fixed type)		(kg)	80, 90 (Phase distance 254 only)									
Weight (Withdrawable type)		(kg)	85									
Rated frequency		fr (Hz)	50/60									
Rated short-circuit current		Isc (kA)	20, 25		16, 20, 25							
Rated short-circuit breaking capacity		(MVA)	249, 312		333, 415, 520		485, 606, 758		665, 831, 1039		715, 894, 1117	
Rated short-time withstand current		Ik/tk(kA)	16/3 (4*), 20/3 (4*), 25/3 (4*)									
Rated short-circuit making current		Ip (kA)	2.5 Isc (50Hz)/2.6 Isc (60Hz)									
Rated breaking time		(cycle)	3									
Rated withstand voltage	Power frequency	Ud (kV)	20		28		38		50		60	
	Impulse	-	60		75		95		125		125	
Rated operating sequence			O-0.3s-CO-15s-CO									
Control voltage	Closing coil	(V)	DC 24~30V, DC 48~60V, DC 110V, DC 125V, DC 220V, AC 48V, AC 100~130V, AC 220~250V									
	Trip coil	(V)	DC 24~30V, DC 48~60V, DC 110V, DC 125V, DC 220V, AC 48V, AC 100~130V, AC 220~250V									
Auxiliary contacts			4a4b, 10a10b									
Rated opening time		(s)	≤ 0.04									
No-load closing time		(s)	≤ 0.07									
Type test class	Mechanical		M2									
	Electrical		E2 (List3)									
	Capacitive current switching		C2									
Type	Fixed type		R/L type									
	Withdrawable type		S/T type									
Standards			IEC62271-100									

Note) For C-AIS, only 230mm (phase to phase) right type SM VCB is available

Types and ordering information

SVL – 06 R 20 H 06

Basic model name	
SVL	SM VCB

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

Version	
R	Fixed type right
L	Fixed type left
S	Withdrawable type right
T	Withdrawable type left

Interrupting current (kA)	
16	16
20	20
25	25

* 7.2kV Model 20, 25kA only

Phase distance / Compatibility	
B	210mm
H	230mm
C	254mm

* 230 (Withdrawable type only)

Rated current (A)	
06	630A
13	1250A

SVL-06R20H06 – M1 C1 T1 SA2 U1 A 1 2 3...

Motor control voltage	
M0	-
M1	DC 110V
M2	DC 220V
M3	DC 125V
M4	DC 24V~30V
M5	DC 48V~60V
M6	AC 48V
M7	AC 100V~130V
M8	AC 200V~250V

Trip coil voltage	
T0	-
T1	DC 110V
T2	DC 220V
T3	DC 125V
T4	DC 24V~30V
T5	DC 48V~60V
T6	AC 48V
T7	AC 100V~130V
T8	AC 200V~250V

UVT	
U0	-
U1	DC 110V
U2	DC 220V
U3	DC 125V
U4	DC 24V~30V
U5	DC 48V~60V
U6	AC 48V
U7	AC 100V~130V
U8	AC 200V~250V

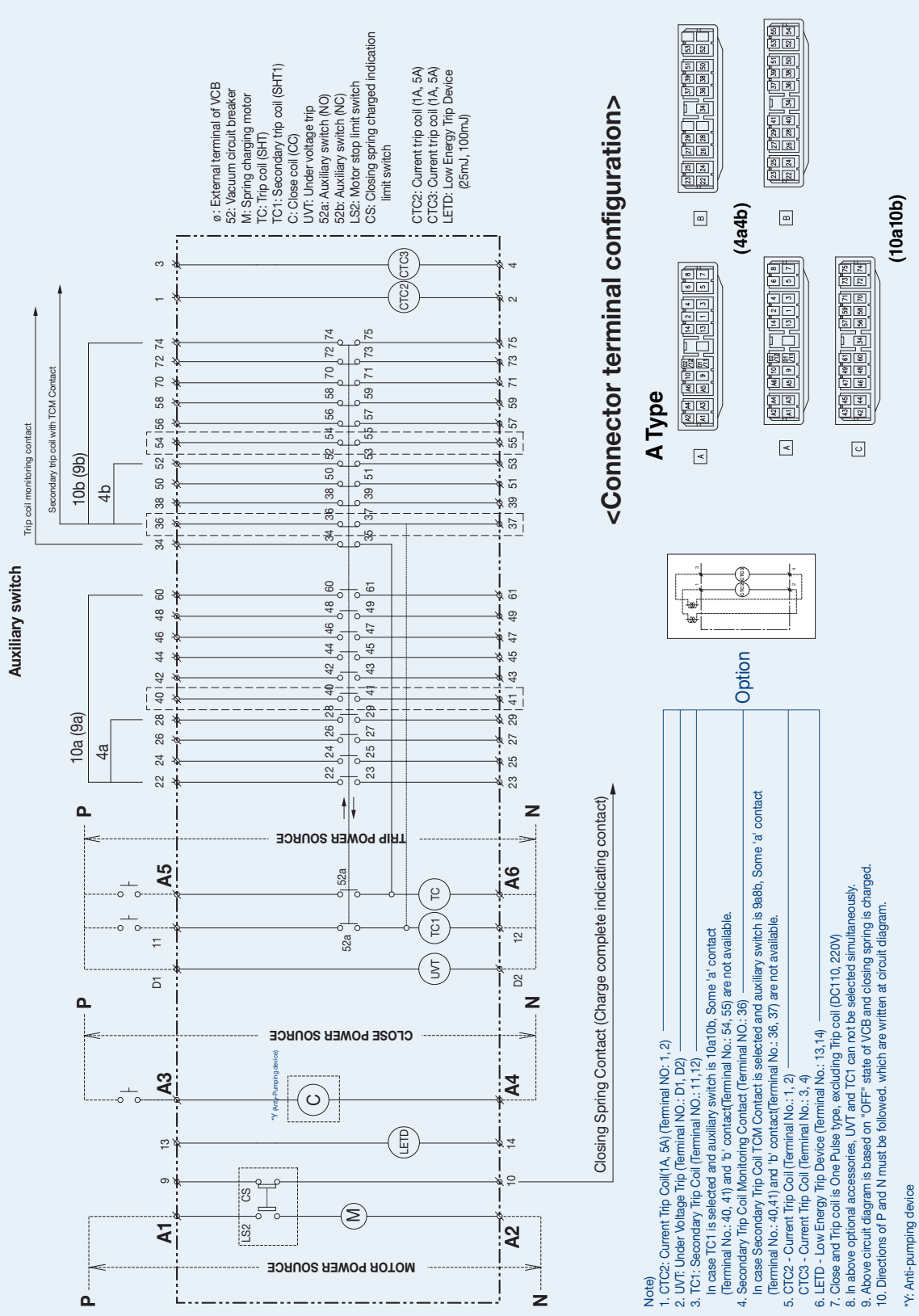
Closing coil voltage	
C0	-
C1	DC 110V
C2	DC 220V
C3	DC 125V
C4	DC 24V~30V
C5	DC 48V~60V
C6	AC 48V
C7	AC 100V~130V
C8	AC 200V~250V

Connector and wire		
SA2	Standard	A type connector, 4a4b
SA4	Standard	A type connector, 10a10b
SB6	Flame retardant	A type connector, 4a4b
SB8	Flame retardant	A type connector, 10a10b

Other accessories	
A1	Secondary trip coil
A2	Secondary trip coil with TCS contact
A3	-
A4	-
A5	-
A6	-
A7	Keylock
A8	Button padlock
A9	Button cover
AA	Lead wire
AB	User plug (Part)
AV	CT operated coil 1A
AW	CT operated coil 5A

Note)
1. If A1 (Secondary trip coil), A7 (Keylock), A8 (Button padlock) are selected, A148 is the type name in the ordering.
2. A1 (Secondary trip coil), U1~U8 (UVT) can not be selected simultaneously.
3. A8 (Button padlock) and A9 (Button cover) can not be selected simultaneously.
4. If A1 (Sencondary trip coil) is selected, Auxiliary contacts is max 9a9b
5. If A2 (Sencondary trip coil with TCS contact) are selected, Auxiliary contacts is max 4a3b, 9a8b
6. If AV (CTC 1A), AW (CTC 5A) are selected, Auxiliary contacts is max 4a4b
7. AV (CTC 1A), AW (CTC 5A), SA4 (10a10b), SA8 (10a10b) are only available on phase distance 254mm.

Control circuit diagram



<Connector terminal configuration>

A Type

(4a4b)

(10a10b)

Option

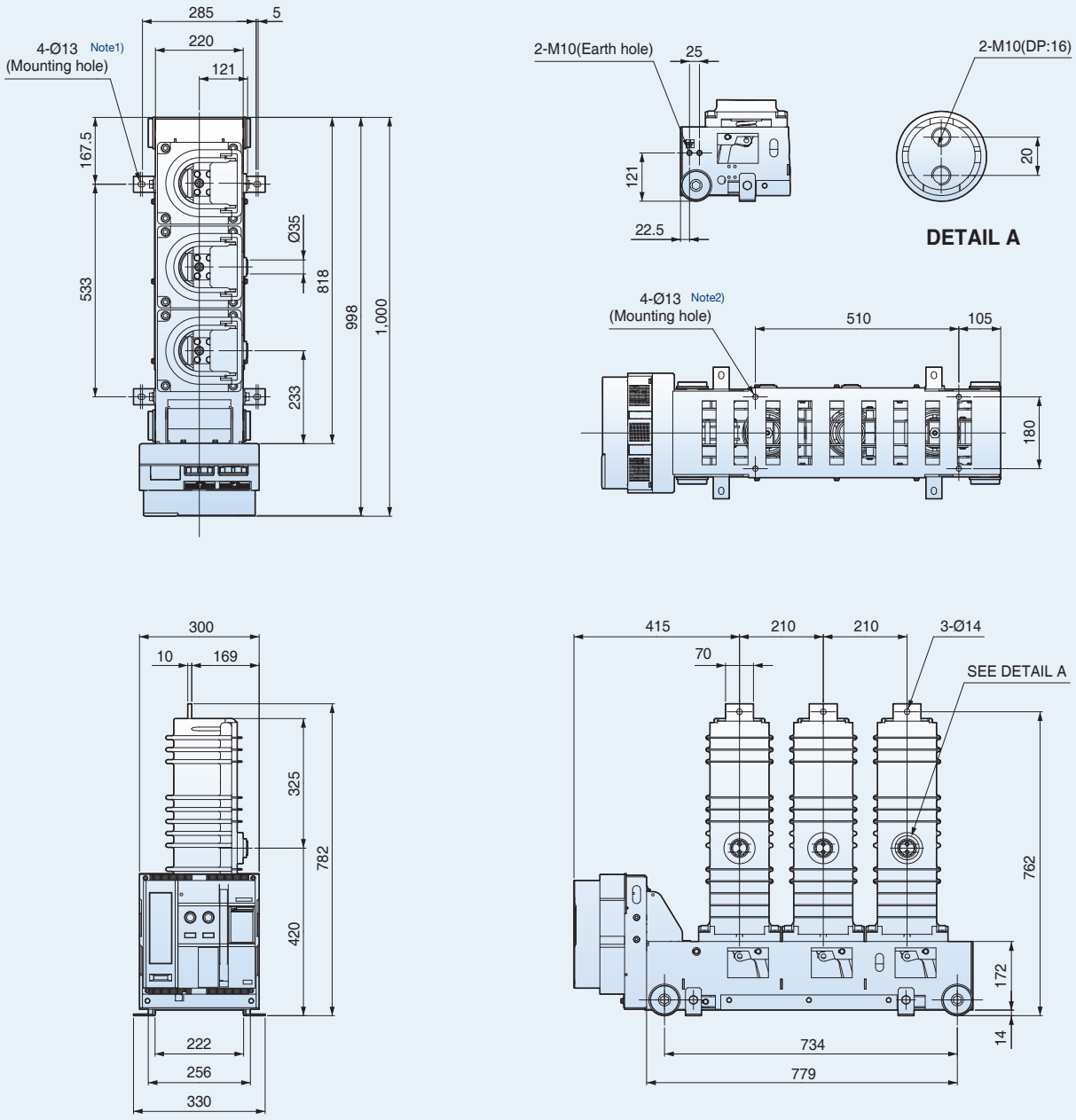
Note)
1. CTC2: Current Trip Coil(1A, 5A) (Terminal NO: 1, 2)
2. UVT: Under Voltage Trip (Terminal NO.: D1, D2)
3. TC1: Secondary Trip Coil (Terminal NO.: 11,12)
   In case TC1 is selected and auxiliary switch is 10a10b, Some 'a' contact (Terminal No.: 40, 41) and 'b' contact(Terminal No.: 54, 55) are not available.
4. 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.
5. CTC2 - Current Trip Coil (Terminal No.: 1, 2)
   CTC3 - Current Trip Coil (Terminal No.: 3, 4)
6. LETD - Low Energy Trip Device (Terminal No.: 13,14)
7. Close and Trip coil is One Pulse type, excluding Trip coil (DC110, 220V)
8. In above optional accessories, UVT and TC1 can not be selected simultaneously.
9. Above circuit diagram is based on "OFF" state of VCB and closing spring is charged.
10. Directions of P and N must be followed. which are written at 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.

※ Anti-pumping device (IEC62271-100 6.3.128)
: a device which prevents reclosing after a close-open operation as long as the device initiating closing is maintained in the position for closing Anti-pumping device is basically installed

24kV, 25kA, 1250A
Fixed (Right type, phase distance 210mm)

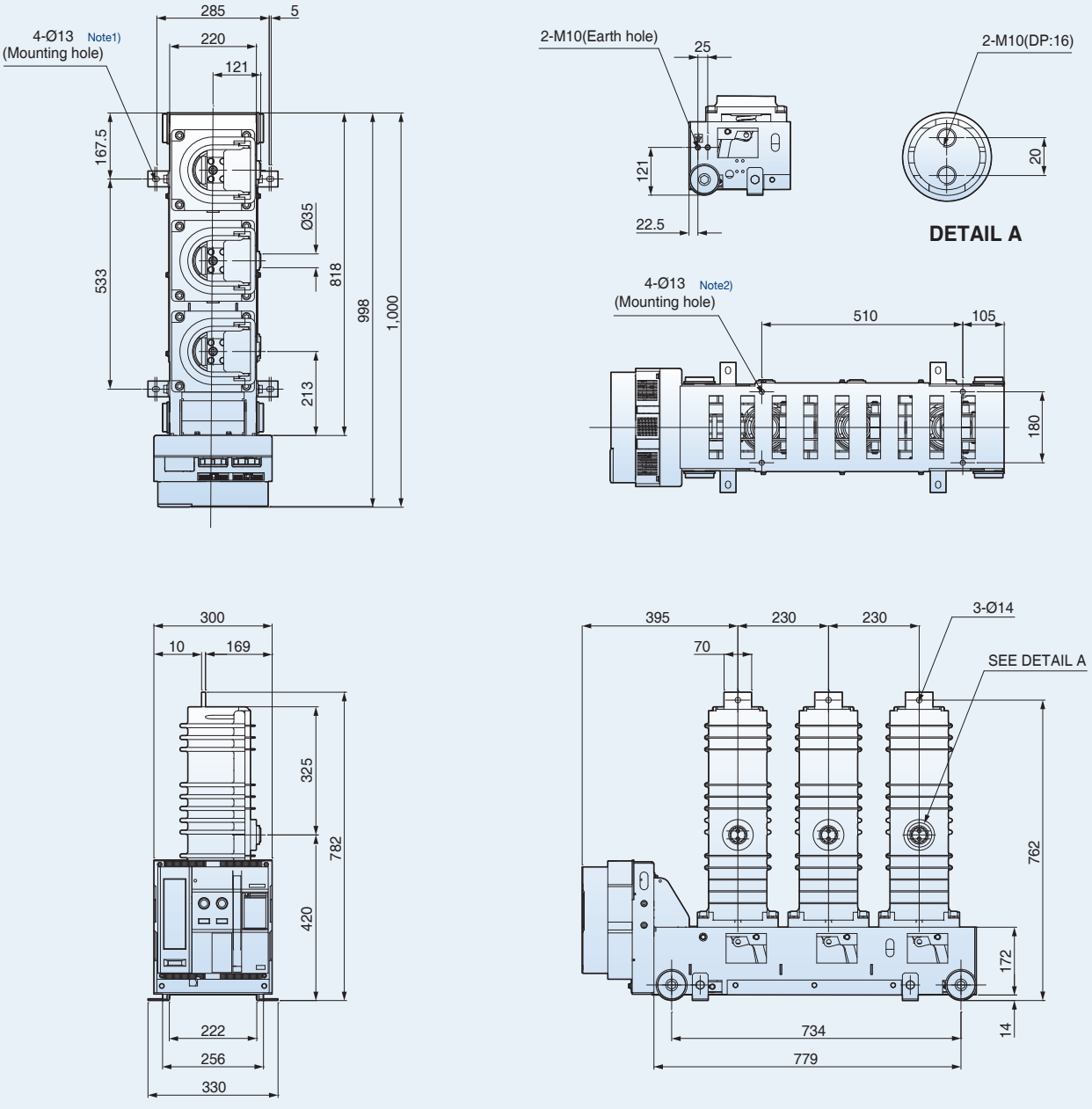
(Unit: mm)



Note)
1. Mounting hole 01 for compact AIS panel
2. Mounting hole 02 for using SM VCB only
3. If using mounting hole 02, four brackets attached to the frame for mounting hole 01 can be removed.

24kV, 25kA, 1250A
Fixed (Right type, phase distance 230mm)

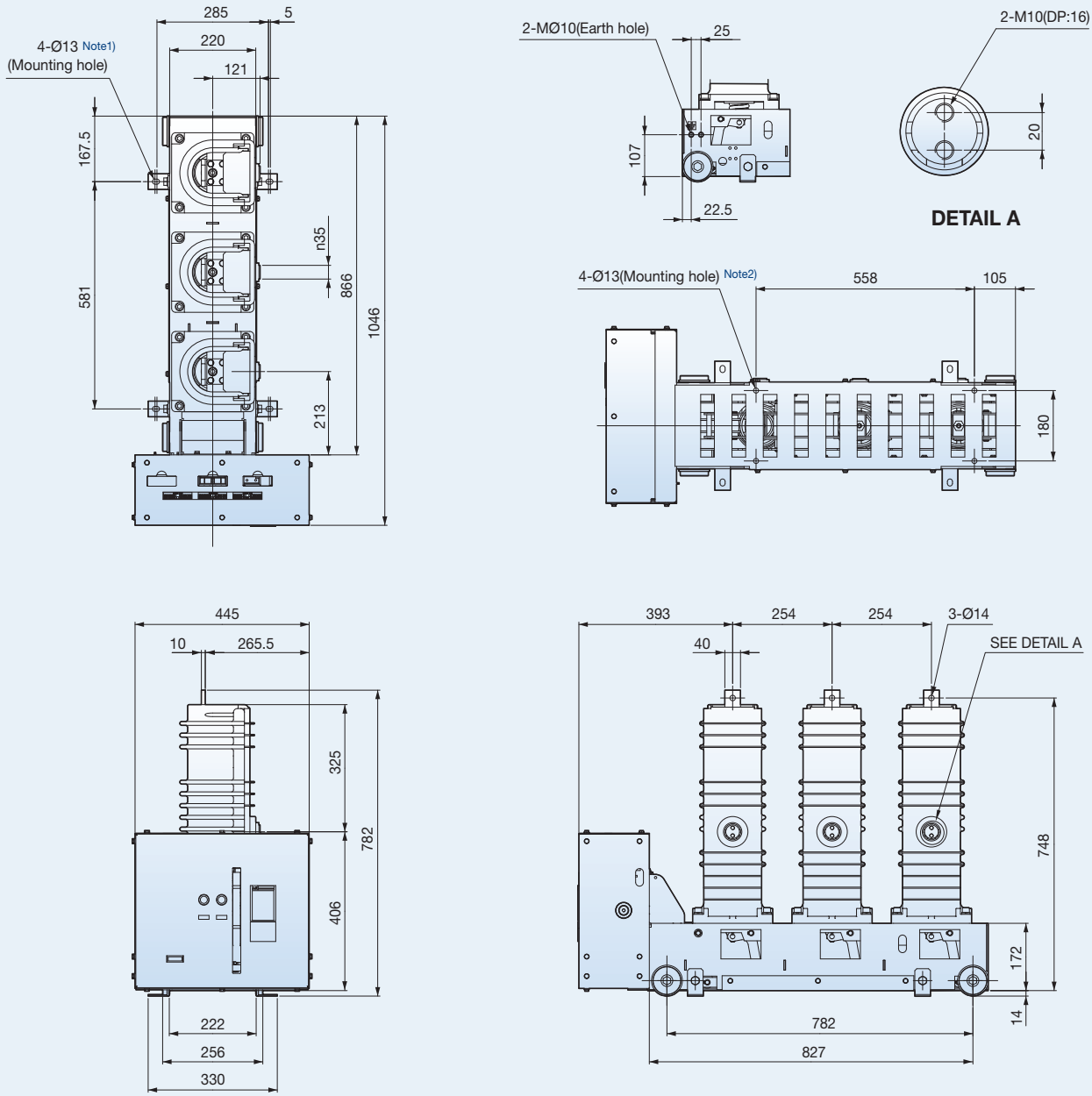
(Unit: mm)



Note)
1. Mounting hole 01 for compact AIS panel
2. Mounting hole 02 for using SM VCB only
3. If using mounting hole 02, four brackets attached to the frame for mounting hole 01 can be removed.

24kV, 25kA, 1250A
Fixed (Right type, phase distance 254mm)

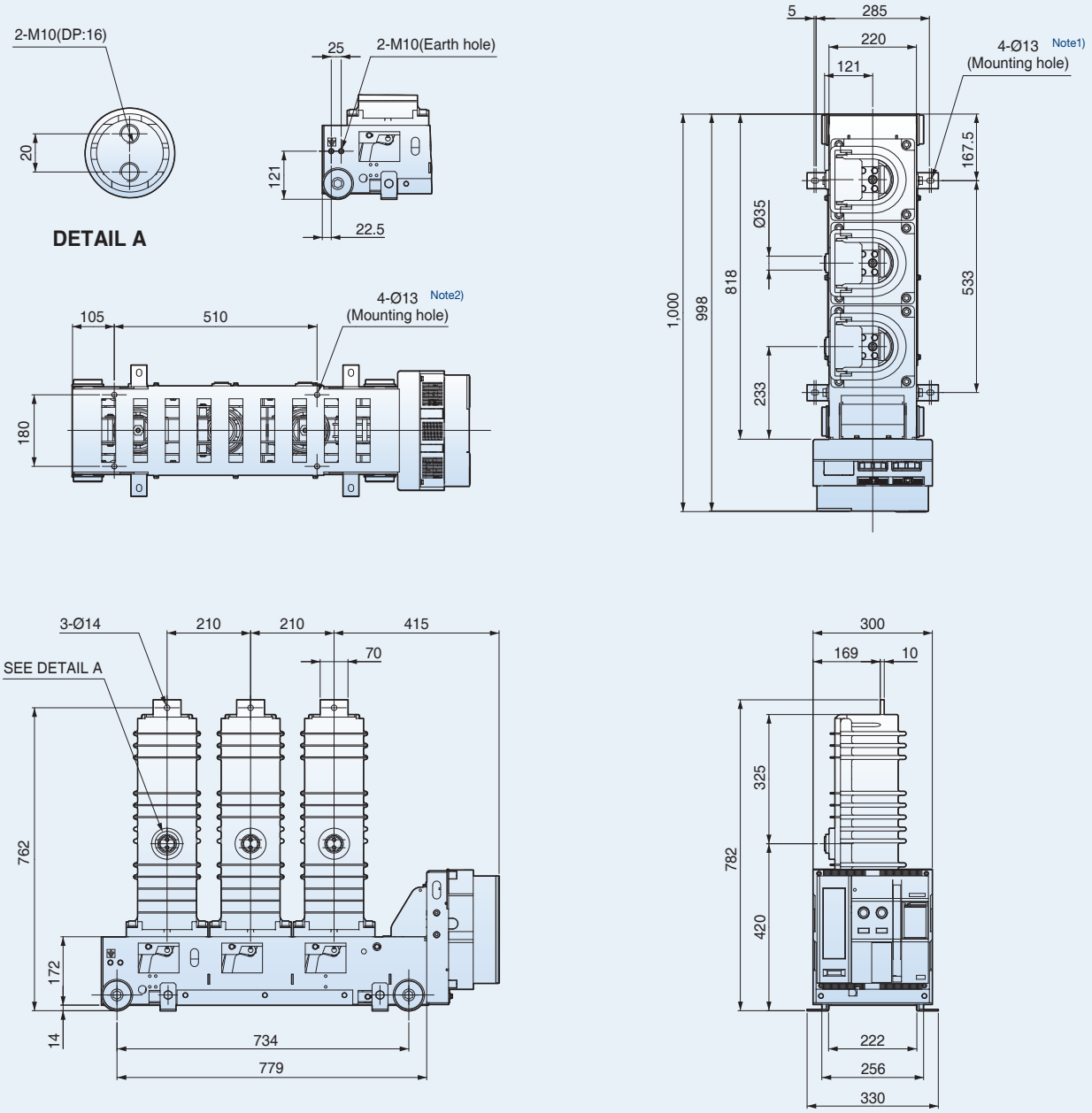
(Unit: mm)



Note)
1. Mounting hole 01 for compact AIS panel
2. Mounting hole 02 for using SM VCB only
3. If using mounting hole 02, four brackets attached to the frame for mounting hole 01 can be removed.

24kV, 25kA, 1250A
Fixed (Left type, phase distance 210mm)

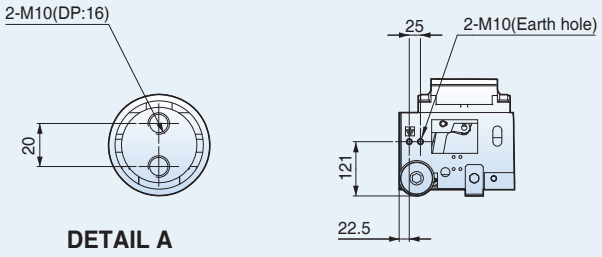
(Unit: mm)

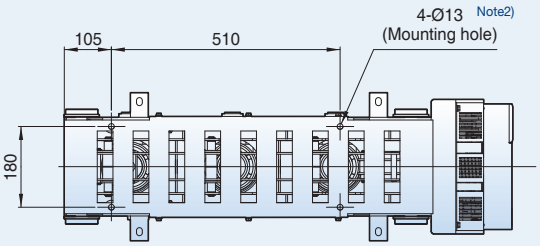


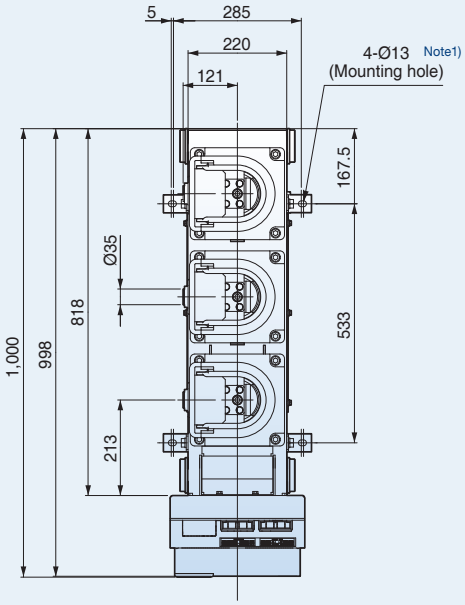
Note)
1. Mounting hole 01 for compact AIS panel
2. Mounting hole 02 for using SM VCB only
3. If using mounting Hole 02, four brackets attached to the frame for mounting hole 01 can be removed.

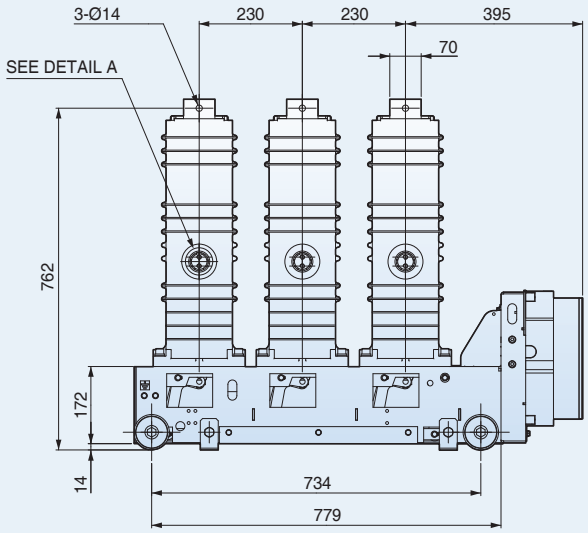
24kV, 25kA, 1250A
Fixed (Left type, phase distance 230mm)

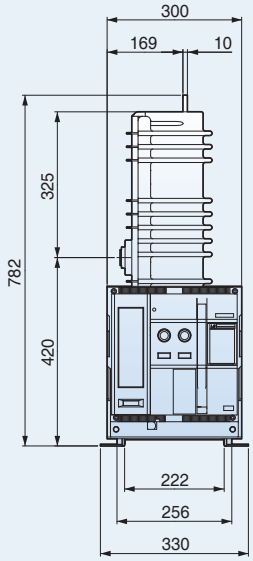
(Unit: mm)







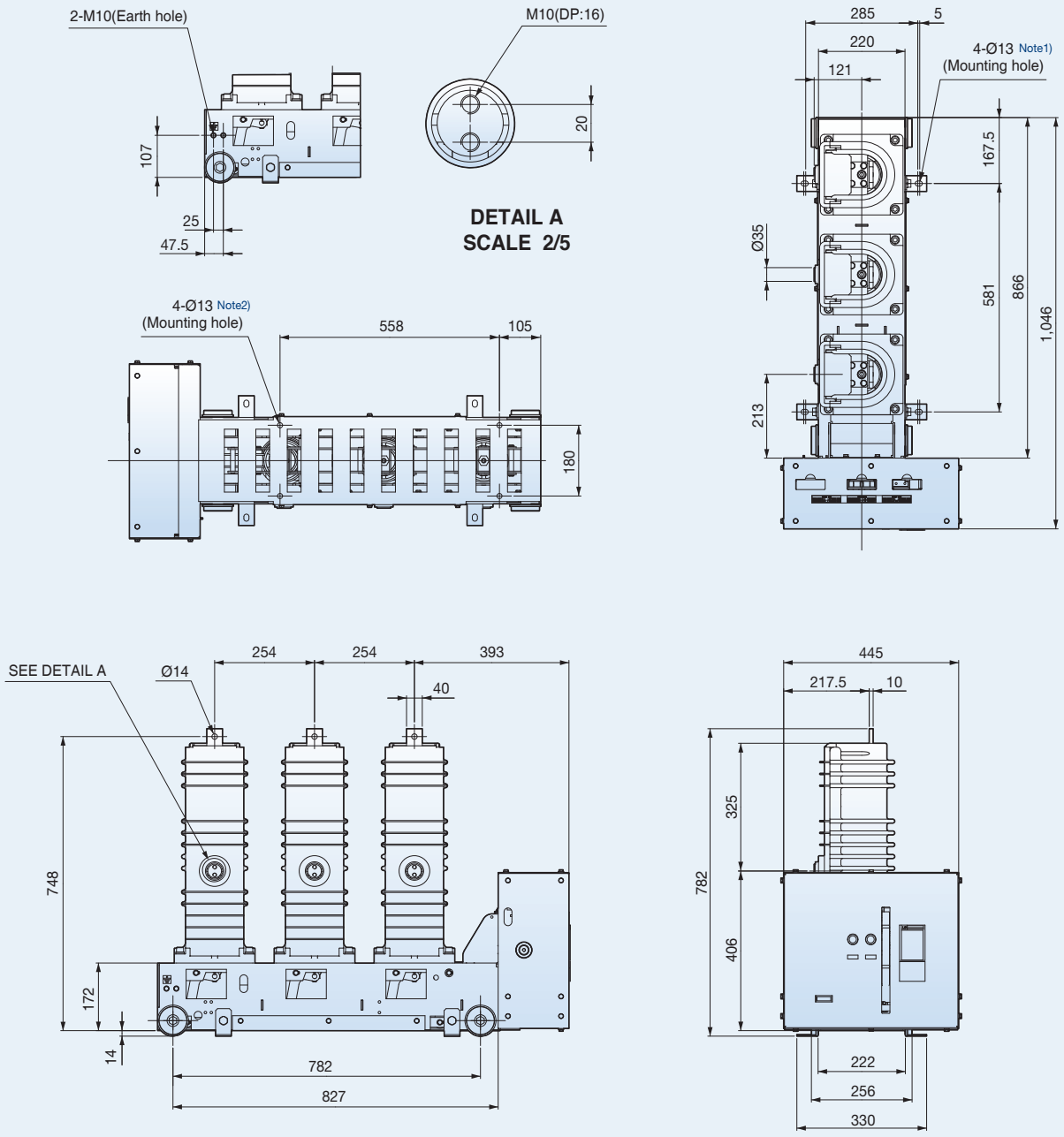




Note)
1. Mounting hole 01 for compact AIS panel
2. Mounting hole 02 for using SM VCB only
3. If using mounting hole 02, four brackets attached to the frame for mounting hole 01 can be removed.

24kV, 25kA, 1250A
Fixed (Left type, phase distance 254mm)

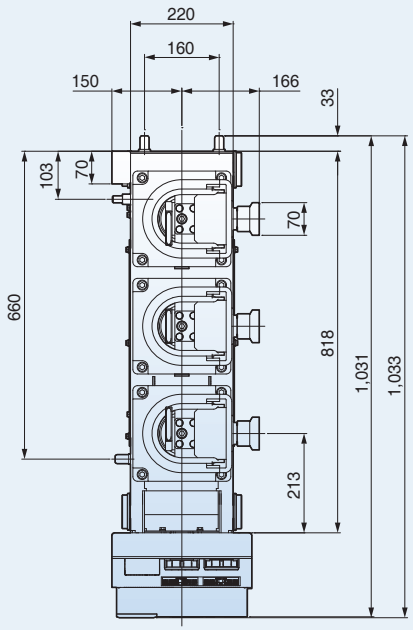
(Unit: mm)

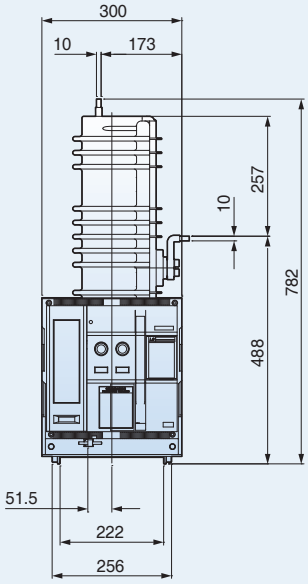


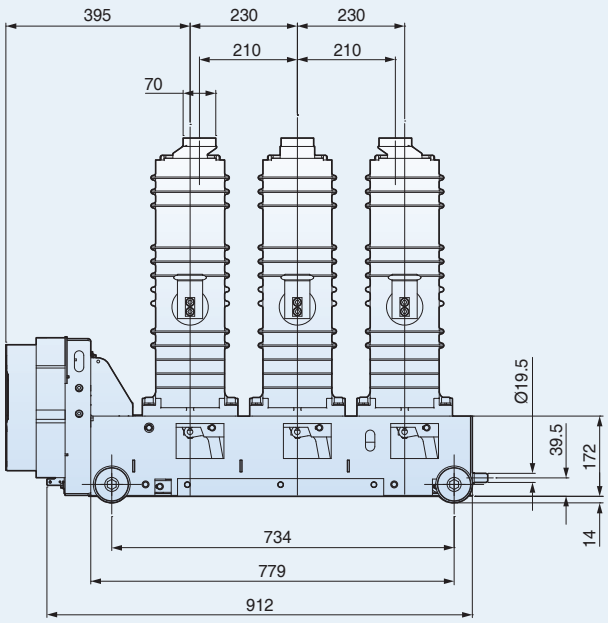
Note)
1. Mounting hole 01 for compact AIS panel
2. Mounting hole 02 for using SM VCB only
3. If using mounting hole 02, four brackets attached to the frame for mounting hole 01 can be removed.

24kV, 25kA, 1250A
Withdrawable (Right type, phase distance 230mm)

(Unit: mm)

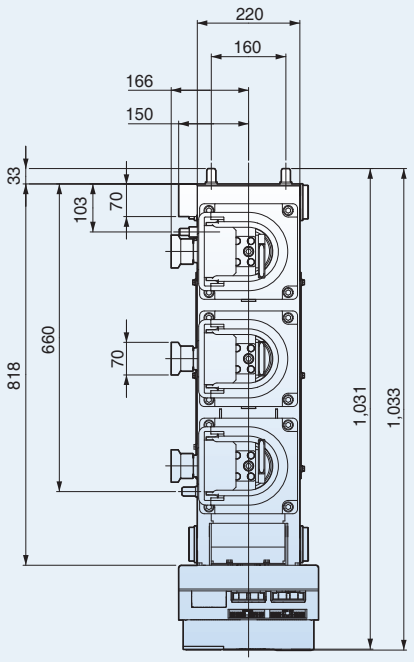


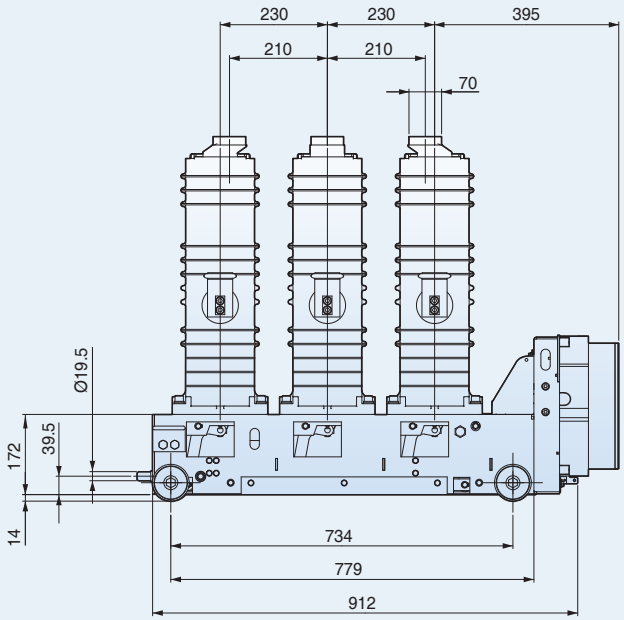


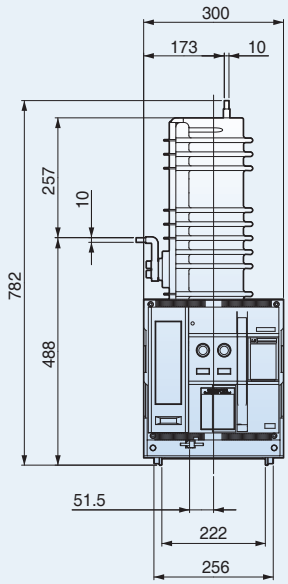


24kV, 25kA, 1250A
Withdrawable (Left type, phase distance 230mm)

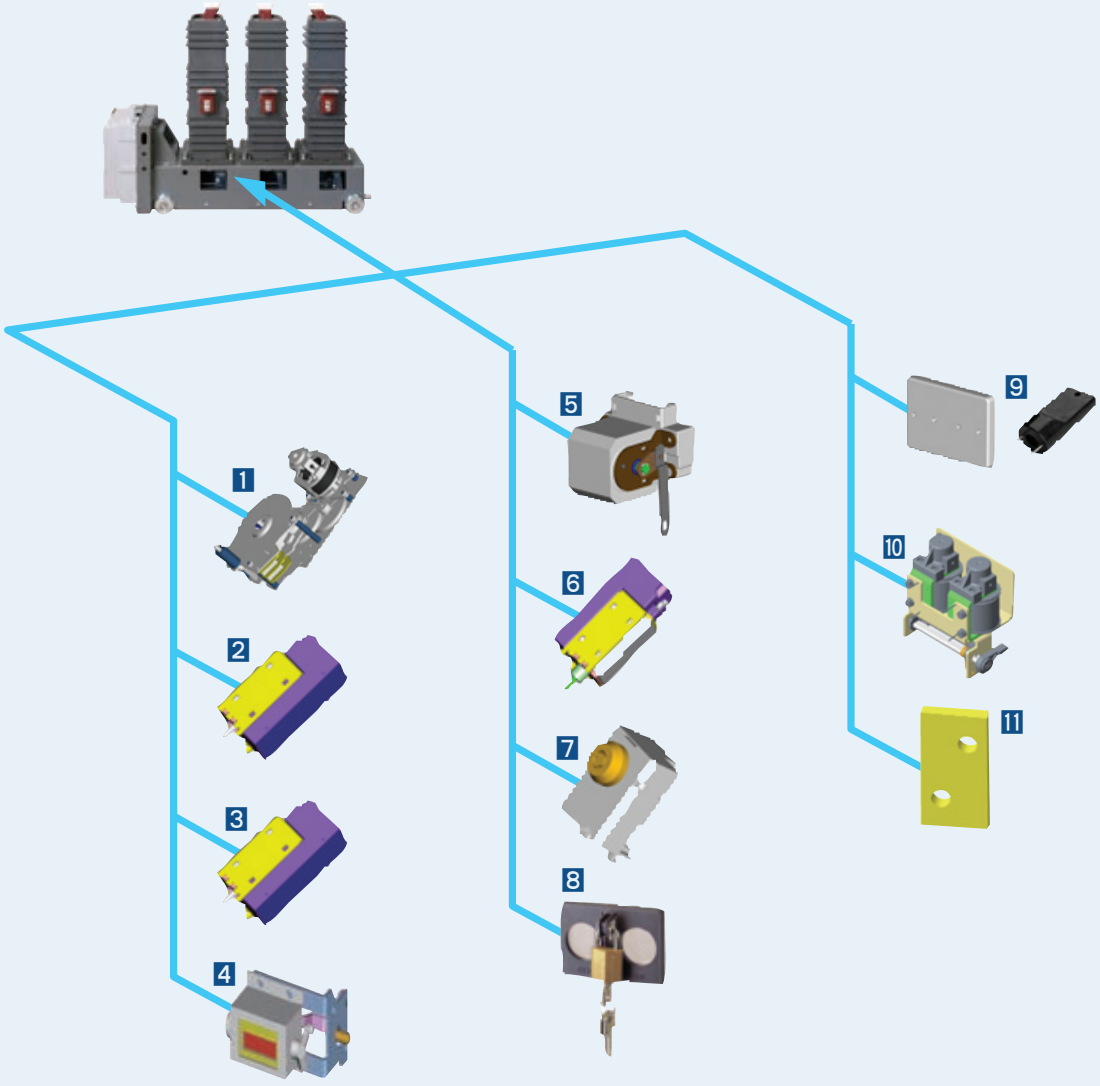
(Unit: mm)







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



Breaker

1 Motor
2 Closing coil
3 Trip coil
4 Counter
5 Auxiliary contacts
6 UVT coil
7 Keylock
8 Button padlock
9 Button cover
10 CTC (Current trip coil)
11 Changeable terminal

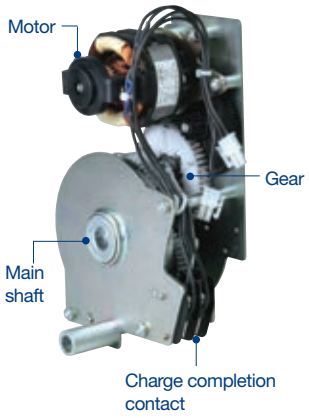
Motor / Closing / Trip

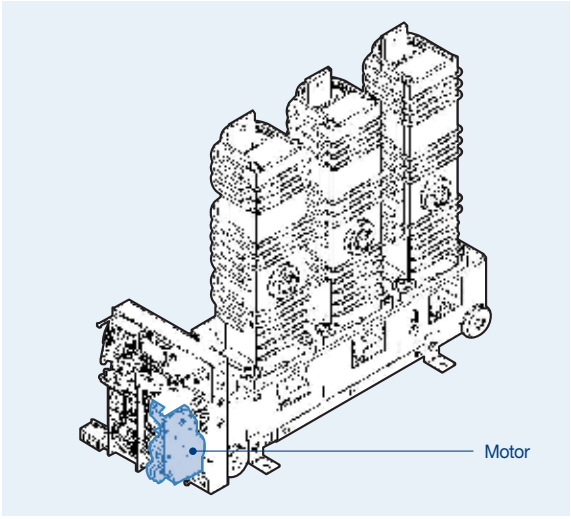
Rated operation and control voltage range

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

Motor: M

Standard





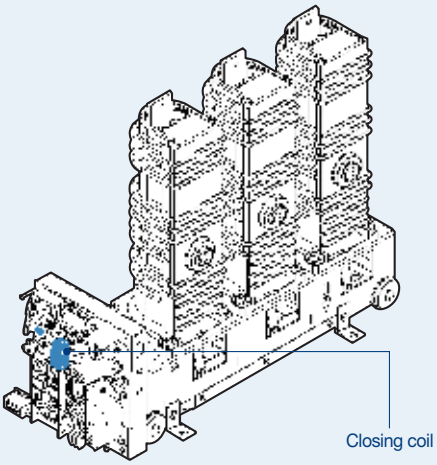
- Charge the closing spring of a circuit breaker by the external power source. When the charging is complete, control power of the motor will be "OFF" by the built-in Limit S/W. Without the external power source, charge manually.

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

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

Closing coil: C

Standard



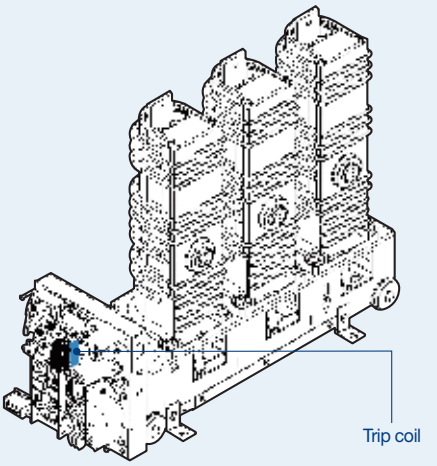
- It is a control device which closes a circuit breaker, when applying voltage continuously or instantaneously over 200ms to the coil control terminals.

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

Note) Rated operation and control voltage range, see page 25.

Trip coil: T

Standard



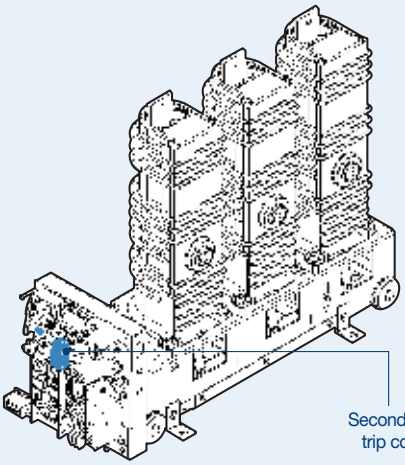
- It is a control device which trips a circuit breaker from remote place, when applying voltage continuously or instantaneously over 35ms to coil control terminals.
- When UVT coil is installed, its location is changed.

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

Note) Rated operation and control voltage range, see page 25.

Secondary trip coil: A1

Option

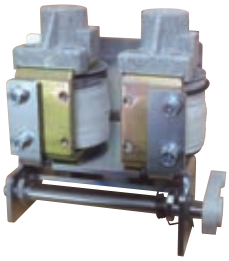


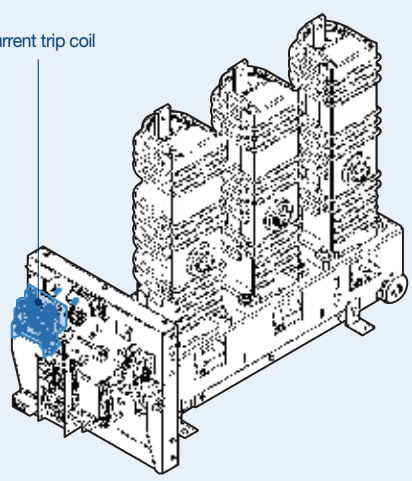
- It is a control device which trips a circuit breaker doubly from the outside. If the trip coil (T) fails, it can trip a circuit breaker safely.
- Trip coil: Install it at existing location.
- Secondary trip coil: Install it on the right side of the trip coil.
- It is not available with UVT coil when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

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

Current trip coil: AV, AW

Option



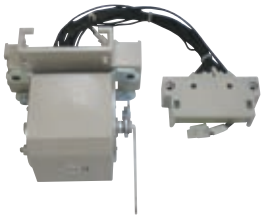


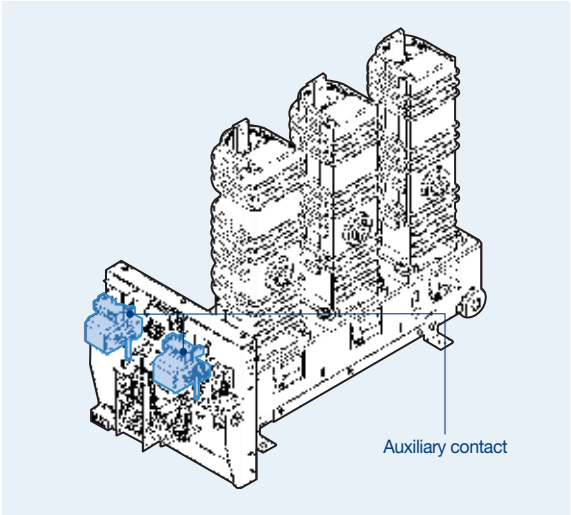
- This trip coil uses the output of the CT as its control power source and is used with over current relay in combination. Two current trip coils are supplied.
- Coil burden is 90VA.(T9)
- Coil impedance(Z) is like below
  - 3A: 10Ω or less, Operating current AC 3A (T9)
  - 1A: 160Ω or less, Operating current AC 1A (AV)
  - 5A: 6Ω or less, Operating current is AC 5A (AW)
- 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.

Auxiliary contact: SA

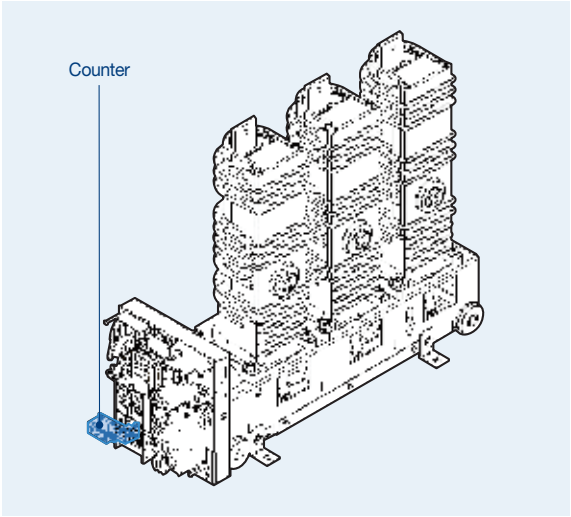
Option





Counter: C

Standard

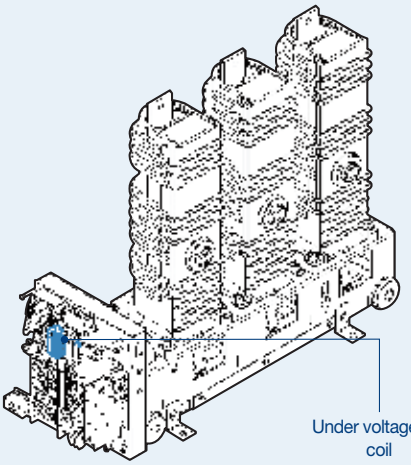


- It displays the total number of ON/OFF operations of a breaker.

Under voltage trip coil: U

Option

VL type



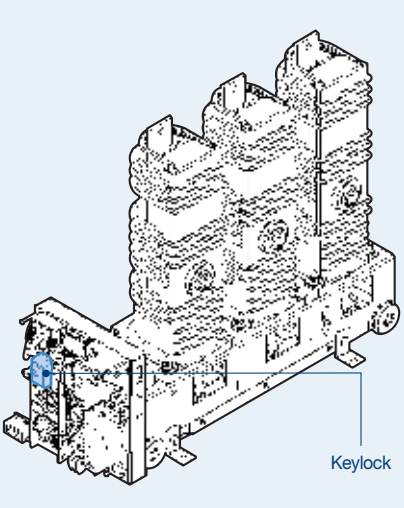
- It is installed inside of a breaker to trip when the main power or control power voltage drops below certain value.
  Instantaneous type is only available with UVT coil and Time delay type is available by connecting UVT coil and UVT time delay controller.
- The closing of a circuit breaker is impossible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

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

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

Keylock: A7

Option

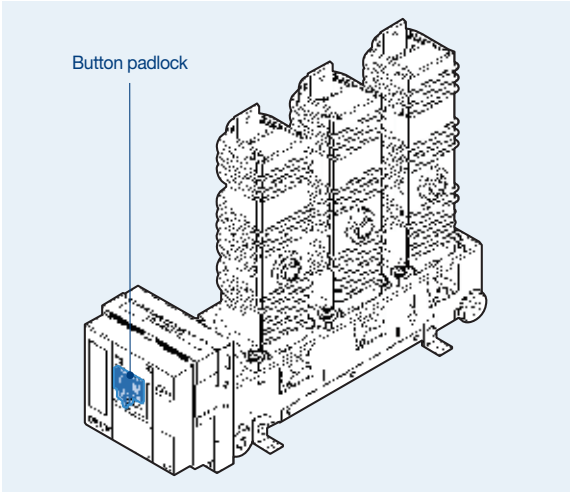


- The key is to unlock the locking device first to close the breaker electrically and mechanically.

*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.

Button padlock: A8

Option



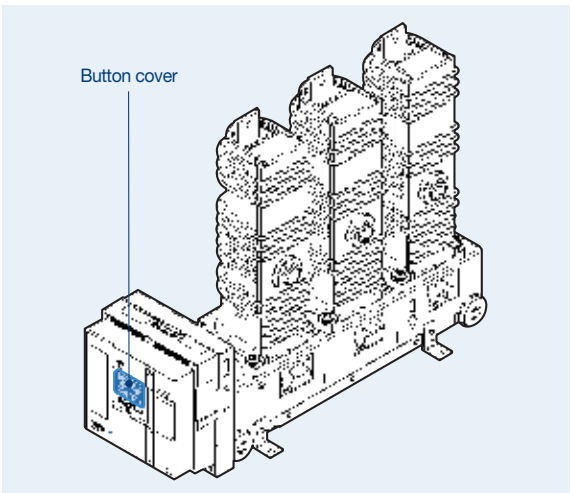
- It is to prevent manual operation of ON/OFF button due to user's wrong handling.
- It is not possible to handle ON/OFF operation under the "Button lock" status.

* Key lock is not supplied.

Button cover: A9

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.

Lead wire: AA

Option

A type connector

- It is the connect with the control circuit of a breaker from outside. (supply wire length: 2m)

Plug/terminal for lead wire: AB

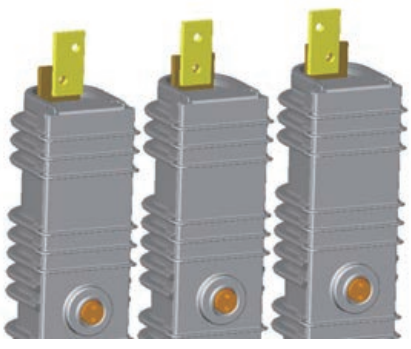
Option

A type connector

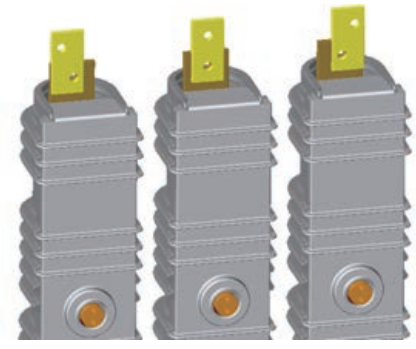
- It is connector to connect with the connector installed in the breaker. (supply connectors and terminal only for lead wire)

Changeable terminal (210 ↔ 230)

- It is an additional terminal attached to the upper terminal and is used to change the Phase distance 210↔230.
- The order can be proceeded with the termianl box code and 30 terminals are packed in one box.



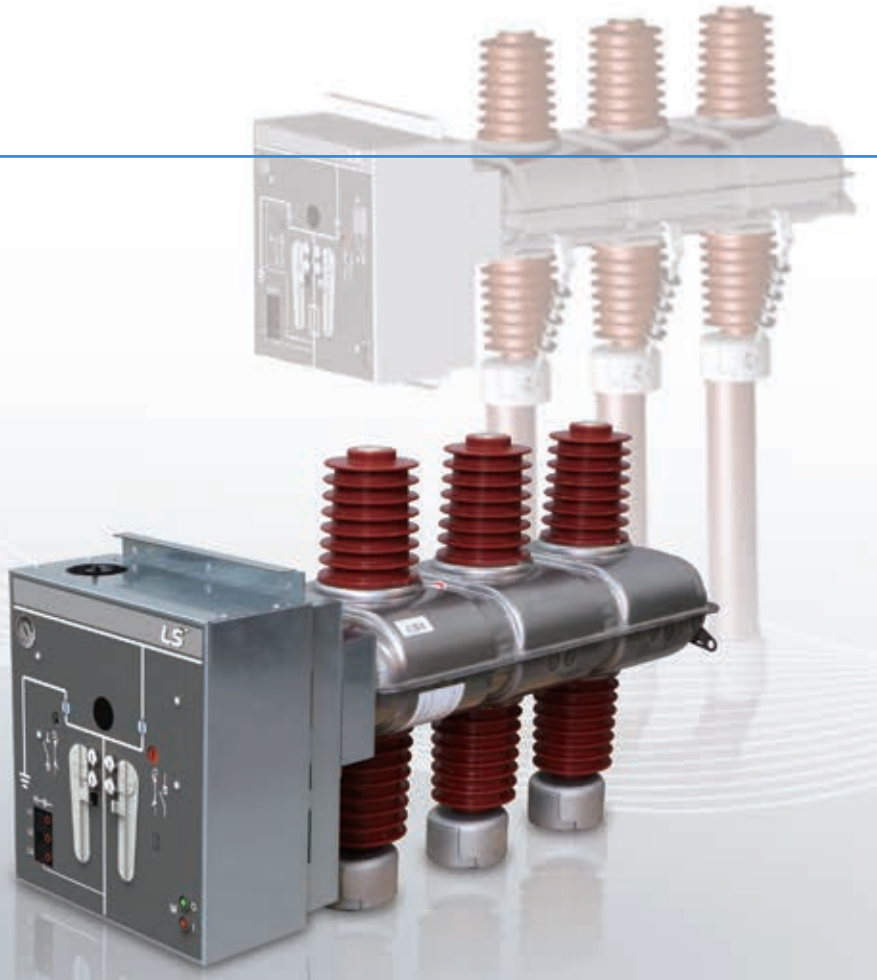
230 ➞ 210



210 ➞ 230

Switch with safety and convenience of maintenance cost

SM LBS
(Side mount LBS)



Insulation level			Indoor
Rated voltage		(kV)	12 / 17.5 / 24
Rated current	Cable switch, Busbar	(A)	630
	Circuit breaker	(A)	630 / 1250
Rated frequency		(Hz)	50 / 60
Rated short-time withstand current		(kA/3s)	21 (25kA/1s)
Power frequency withstand voltage	Between ground and phase	(kV/1min.)	28 / 38 / 50
	Between the open contact of the switch disconnector	(kV/1.2×50㎲)	32 / 45 / 60
Impulse withstand voltage	Between ground and phase	(kV/1min.)	75 / 95 / 125
	Between the open contact of the switch disconnector	(kV/1.2×50㎲)	85 / 110 / 145
Operation method	LBS Switch / Fuse		Manual / Motor (Option)
	ES		Manual
Motor operating voltage		(V)	AC/DC 110/230, DC 24, DC48
Insulation method			SF_6 Gas
Electrical durability	LBS		E3
	Internal ES		E1
Mechanical durability	LBS		M1
	Internal ES		M0
Standard			IEC 62271-1, 102, 103, 105

Types and ordering information

LS – AG – 24 – 21 – 06 – FU

Basic type	
LS	LS SM switch
LF	LS SM fuse combination switch

Installation	
AG	Air Gas

Rated voltage	
12	12kV
17	17.5kV
24	24kV

Rated short-time current	
16	16kA/3s
21	21kA/3s

Rated current	
06	630A

Frontal cover type	
FU	F-LBS FU
PU	F-LBS PU (EXT)
LU	LBS LU
CA	LBS CU-A
CW	LBS CU-W
SL	LBS SU-Left
SR	LBS SU-Right

– S – M – D – 23 – PG – VD – AMF – KM – T1 – BT

Operation method	
S	LS SM switch
F	LS SM fuse combination switch

Operation method	
H	Handle
M	Motor

Operation power	
D	DC
A	AC
X	None

Operation voltage	
02	24V
04	48V
11	110V
23	230V
XX	None

Gas gauge	
PG	Pressure gauge
PX	None

Voltage presence system	
VD	Voltage presence system
VX	None

Auxilary contact	
AMS	2NO+2NC for main
AES	2NO+2NC for E/S
AAS	2NO+2NC for main & E/S
AMF	2NO+2NC for main & 1NO+1NC blowing fuse condition
AEF	2NO+2NC for E/S & 1NO+1NC blowing fuse condition
AAF	2NO+2NC for main & E/S & 1NO+1NC blowing fuse condition
AFF	1NO+1NC blowing fuse condition
AXX	None

Key lock	
KM	Open & close for main
KE	Open & close for E/S
KA	Open & close for main, E/S
KX	None

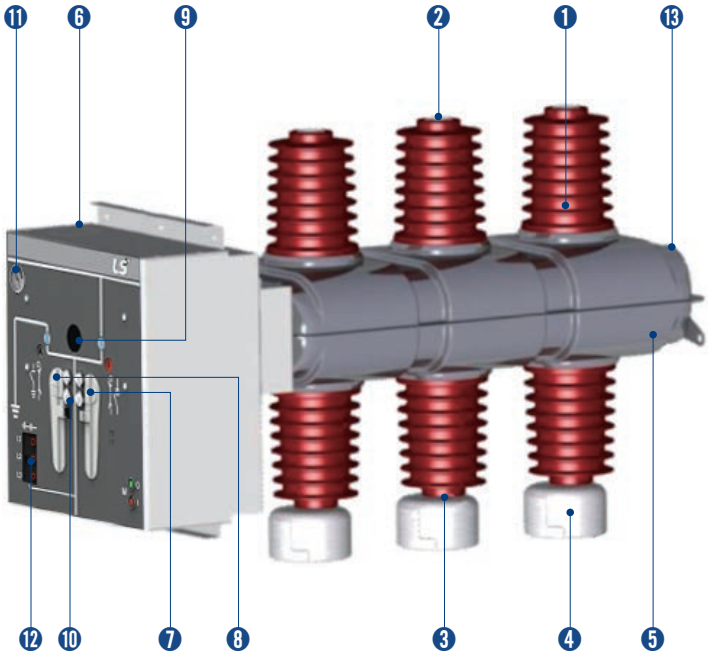
Trip coil	
T1	Trip coil 110 Vdc for fuse switch only
T2	Trip coil 24 Vdc for fuse switch only
TX	None

Opening push button	
BT	Opening push button for fuse switch only
BX	None

LS type 4Vdc-48Vdc

Characteristics of components

SF_6 disconnecting unit is equipped with switch disconnector and earthing switch fitted with separated and interlocked operating mechanism.

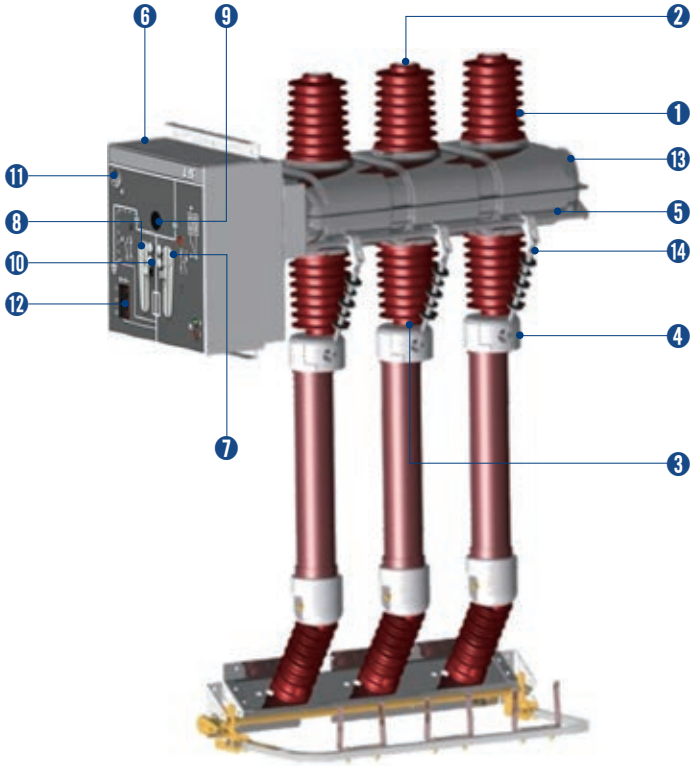


1. Insulator
2. Upper terminal
3. Lower terminal
4. Electrical field adapter only for 24kV
5. Stainless steel body
6. Operating mechanisms box
7. Switch-disconnector operating seat
8. Earthing-switch operating seat
9. Inspection window
10. Key interlock
11. Manometer
12. Voltage signalling lamp
13. Safety valve

LF type 4Vdc-48Vdc

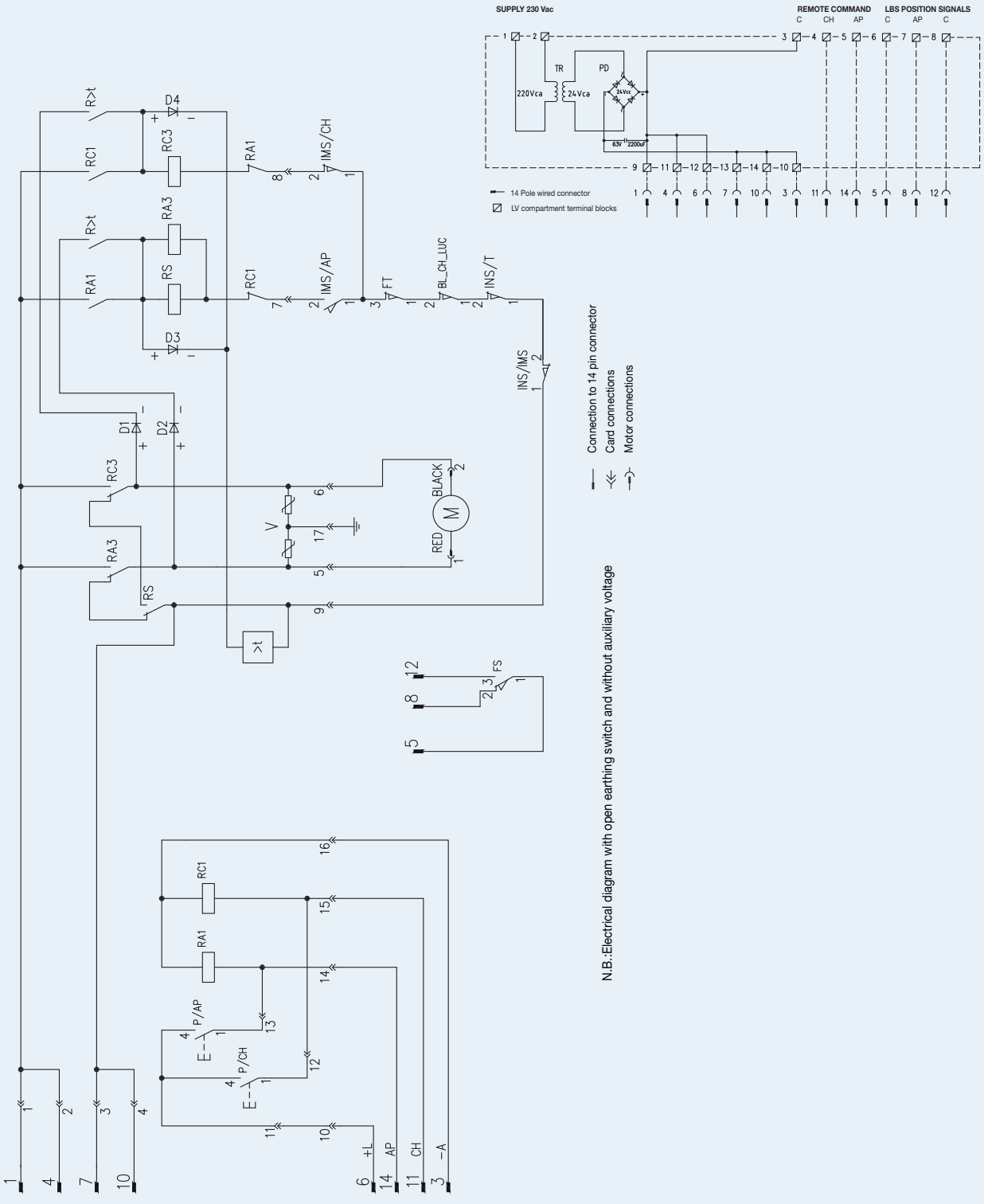
Characteristics of components

Structurally, F-LBS is similar to LBS switch disconnector but it is equipped with fuse-holder and downstream fuses air insulated earthing switch and release system activated by fuse striker and shunt-trip coil (optional).
F-LBS is equipped with switch-disconnector and earthing switch fitted with separated and inter locked operating mechanism.

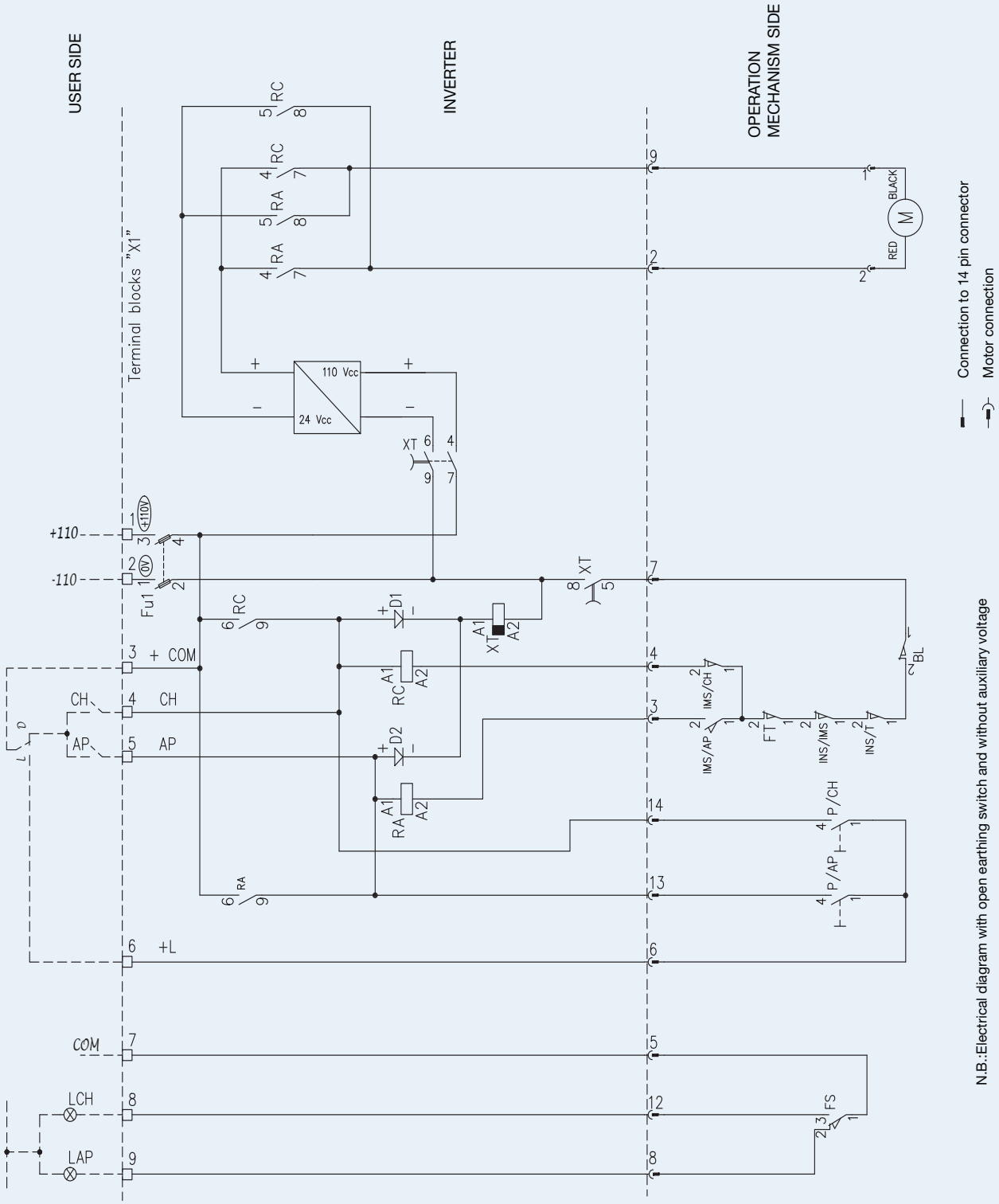


1. Insulator
2. Upper terminal
3. Lower terminal
4. Electrical field adapter only for 24kV
5. Stainless steel body
6. Operating mechanisms box
7. Switch-disconnector operating seat
8. Earthing-switch operating seat
9. Inspection window
10. Key interlock
11. Manometer
12. Voltage signalling lamp
13. Safety valve
14. Fuse striker link
15. External earthing switch
16. Fuse link

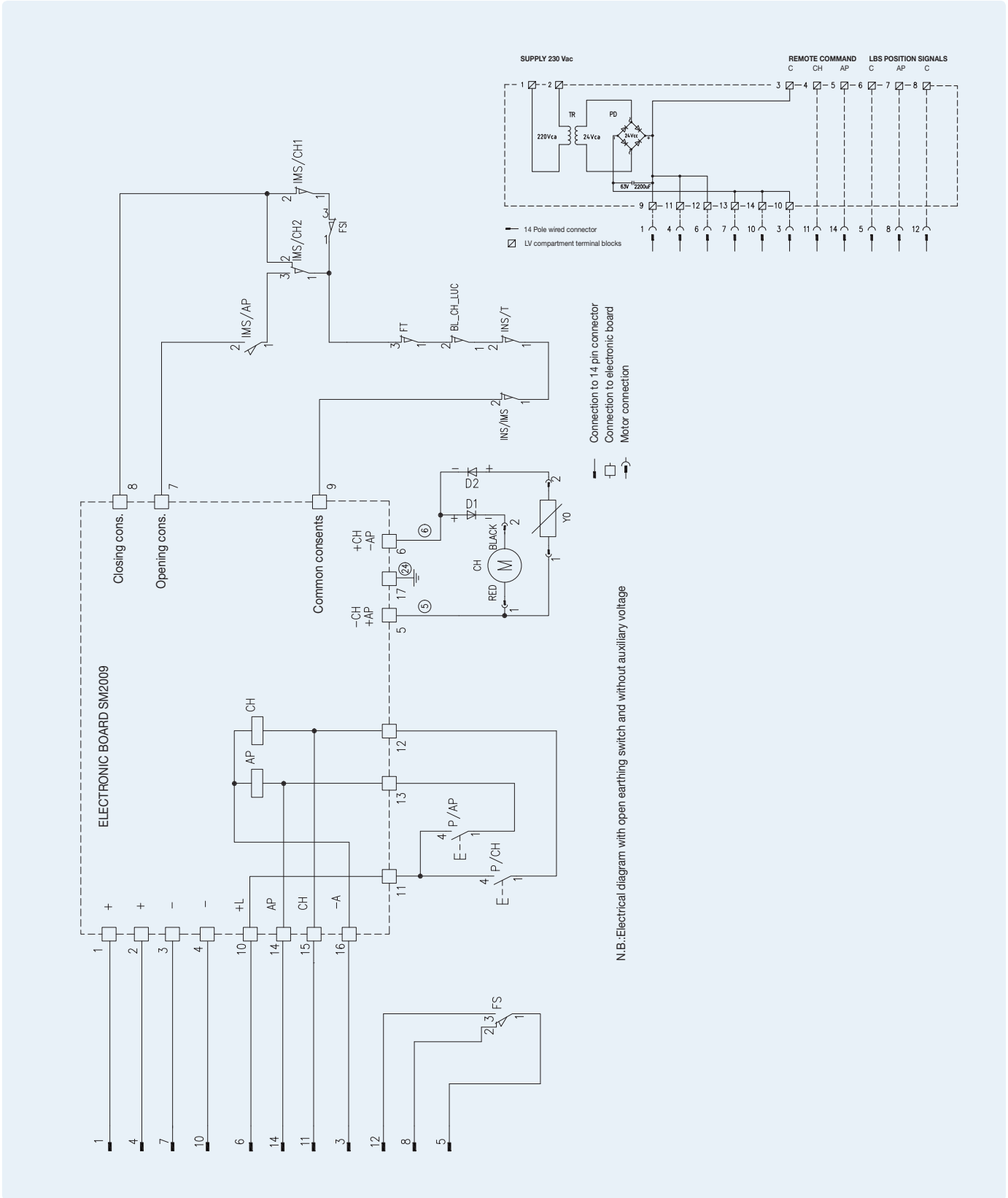
LS type 24Vdc-48Vdc



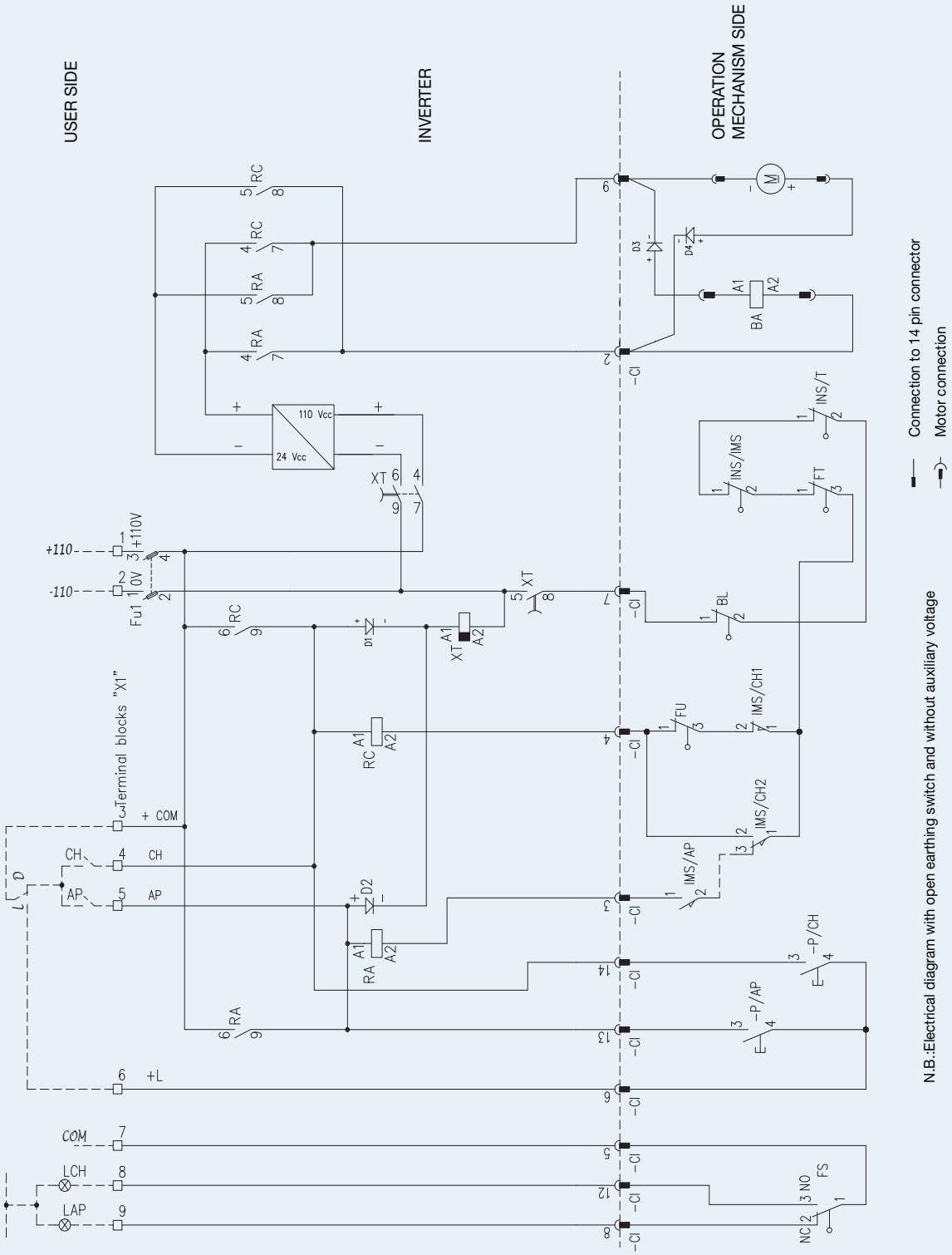
LS type 110Vdc



LF type 24Vdc-48Vdc

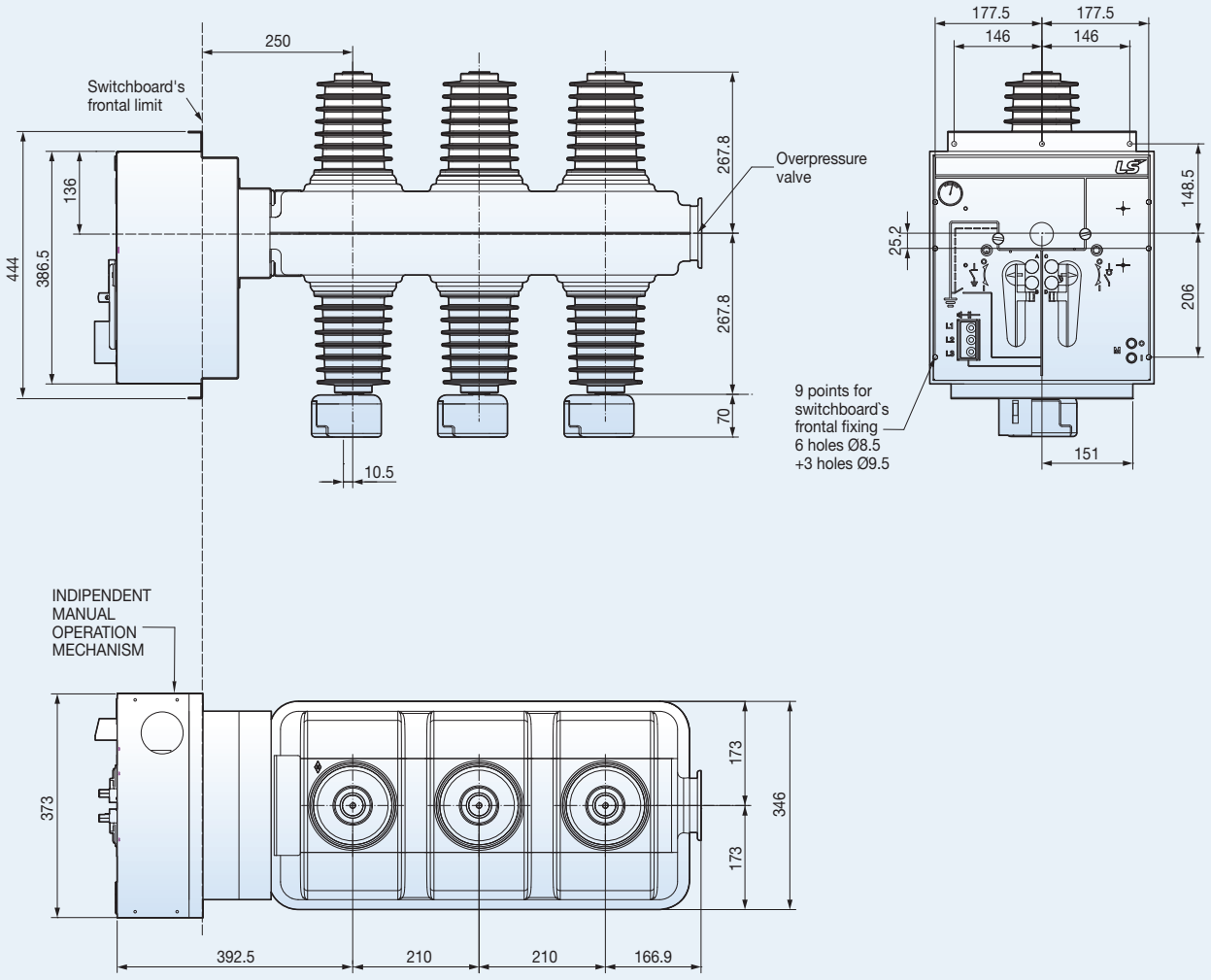


LF type 110Vdc



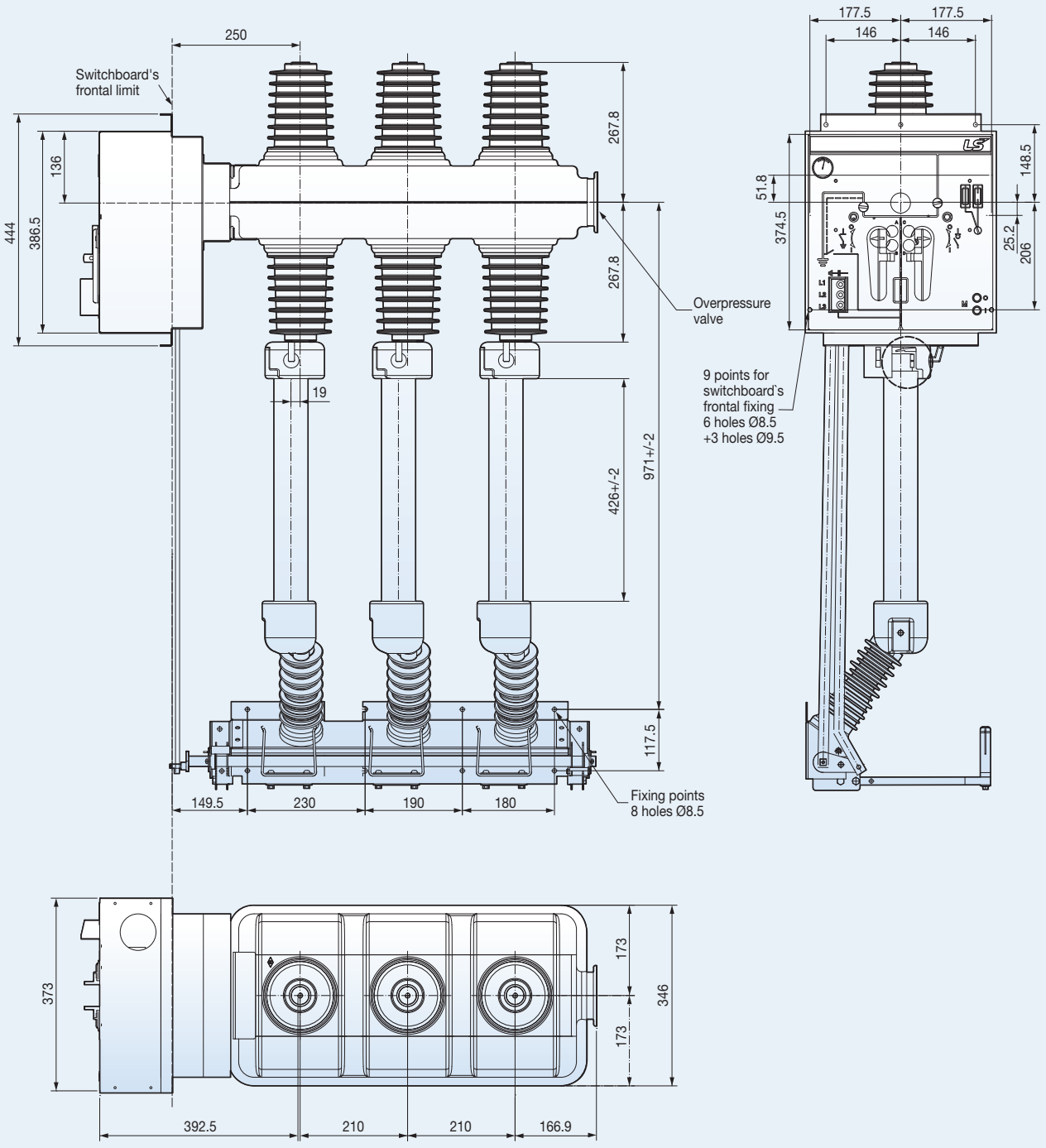
LS type 24kV, 21kA, 630A

(Unit: mm)



LF type 24kV, 21kA, 630A

(Unit: mm)



Options for Compact AIS

Current transformer (WS-261[W][R])

Section		Contents			
Highest voltage for equipment	kV	7.2	12	17.5	24
Rated power frequency withstand voltage (1min)	kV	20	28	38	50
Rated lighting impulse withstand voltage	kV	60	75	95	125
Rated frequency	Hz	50 or 60			
Rated primary current	A	30 to 600			
Rated continuous thermal current	X In	1.2			
Rated secondary current	A	5 or 1			
Rated short-time thermal current Ith (1sec)	max.kA	50			
Rated dynamic current Idyn (2.5×Ith)	max.kA	125			
Number of cores	max.	2			
Weight (approx.)	kg	48			
Applying Standards		IEC 61869-2, IEEE C57.13, KS C 1706, JEC 1201			
Model designation		WS-261			

Voltage transformer (PE-28N)

Techinical Data				
Highest voltage for equipment	kV	12	17.5	24
Rated power frequency withstand voltage (1min)	kV	28	38	50
Rated lighting impulse withstand voltage	kV	75	95	125
Rated frequency	Hz	50 or 60	50 or 60	50 or 60
Rated primary voltage	V	11000√3	13800√3	22000√3
Rated secondary voltage	V	110√3	110√3	110√3
Rated voltage factor/cont		1.9/8h	1.9/8h	1.9/8h
Rated burden	VA	50	50	50
Weight (approx.)	kg	38	38	38
Applying Standards		IEC 61869-3, IEEE C57.13, KS C 1706, JEC 1201		
Model designation		PE-28N		

Voltage detector (VDS)

Voltage detector is used to verify the presence (“Voltage Present”) and absence (“No Voltage Present”) condition in medium voltage switchgears, electrical equipment or of work places when working under voltage.

Power fuse (SIBA)

Fuse ratings for C-AIS units mainly depend on the following criteria.
1) Service voltage 2) Transformer rating 3) Fuse technology (maker)

Rated voltage	Article	Rated current	Length	Diameter
kV	-	A	mm	Mm
10/24	30 006 13	6,3 ~ 40	442	53
	30 014 13	50 ~ 63		67

XGIPAM

XGIPAM is the digital integrated protection & monitoring device solution for more convenient and reliable power protection and monitoring system through the easy interface, user friendly, high accuarcy and high reliability.

- Protection function - 50/51, 50/51N, 67G, 67N, 59, 27, 64, 47, 46, 49, 48/51LR, 79, 87T, 37, 66
- 8.4 inch large touch screen color TFT LCD
- System MIMIC diagram
- Modular design of H/W and S/W with flexibility
- Setting for the secondary rating of PT: 110 or 110 / √ 3
- Wave capture available
- Waveform recording for the state changes of equipment
- Dedicated PC manager program supported
- Supporting dual independent systems through two built-in communication ports
- 0.2% of the voltage and current measurement accuracy

GIPAM2000

GIPAM2000 is a digital integrated protection & monitoring device and monitoring device providing various protective elements and measurement elements for fault monitoring and protection and comprehensive monitoring of the distribution equipments.

- Protection function - 50/51, 50/51N, 67G, 67N, 59, 27, 64, 47, 46, 49, 48/51LR, 79, 87T
- Covering PLC (Programmable logic controller) functions
- 320×240 Graphic LCD & MIMIC diagram
- SOE (Sequence of event) function
- Recording event & fault functions
- Displaying harmonic spectrum, THD (Total harmonic distortion)
- Combination of the two elements of characteristic curve of the relay should be available
- Power and current demand should be measured

GIPAM10

GIPAM10 series provide accurate measurement and monitoring information necessary for efficient maintenance and post-fault analysis.

- Protection function - 50/51, 50/51N, 46, 79, 59, 27, 47P, 64, 67G, 67N
- Communication: Modbus
- Wave/fault/event recording
- DO latch function, trip DO and alarm DO setting
- Available to set up setting group up to 3 (GIPAM 10CU/10CR)
- Wave/fault/event recording

Order form

Compact AIS - LU (Load break switch unit)

Basic cubicle				
				Quantity
Rated voltage, Ur	12kV ☐	17.5kV ☐	24kV ☐	
Service voltage				(kV)
Short-circuit current, Isc				(kA)
Rated current, Ir				(A)
Internal arc withstand	None ☐	21kA/1s	A-FLR ☐	
Position in the switchboard	First on left ☐	Middle ☐	Last on right ☐	

Option				
Electrical driving motorization	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Auxiliary contacts 2NO+2NC main				
Auxiliary contacts 2NO+2NC E/S				
Key l ock	LBS Open ☐ LBS Close ☐		E/S Open ☐ E/S Close ☐	
Pressure gauge	None ☐	Presence ■		(Selection recommended)
Voltage detection system	None ☐	Presence ☐		
Control voltage (Including lamp)	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Low voltage control cabinet	Default only ☐	Add. top ☐		
Heater with thermostat	50W ☐	100W ☐		
Surge arrestor (Width 500)	12kV ☐	17.5kV ☐	24kV ☐	

Compact AIS - FU (Fuse switch combination unit)

Basic cubicle				
				Quantity
Rated voltage, Ur	12kV ☐	17.5kV ☐	24kV ☐	
Service voltage				(kV)
Short-circuit current, Isc				(kA)
Rated current, Ir	(up to 63A)			(A)
Internal arc withstand	None ☐	21kA/1s	A-FLR ☐	
Position in the switchboard	First on left ☐	Middle ☐	Last on right ☐	

Option				
Fuses				
Electrical driving motorization	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Auxiliary contacts 2NO+2NC main				
Auxiliary contacts 2NO+2NC E/S				
Blown fuse signalling contact				
Key lock	LBS Open ☐ LBS Close ☐		E/S Open ☐ E/S Close ☐	
Pressure gauge	None ☐	Presence ■		(Selection recommended)
Voltage detection system	None ☐	Presence ☐		
Control voltage (Including lamp)	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Low voltage control cabinet	Default only ☐	Add. top ☐		
Heater with thermostat	50W ☐	100W ☐		
Surge arrestor (Width 500)	12kV ☐	17.5kV ☐	24kV ☐	

Order form

Compact AIS - PU (Voltage transformer unit)

Basic cubicle				Quantity
Rated voltage, Ur	12kV ☐	17.5kV ☐	24kV ☐	
Service voltage				(kV)
Short-circuit current, Isc				(kA)
Rated current, Ir				(A)
Internal arc withstand	None ☐	21kA/1s	A-FLR ☐	
Position in the switchboard	First on left ☐	Middle ☐	Last on right ☐	
VT				See p.44

Option				
Fuses				(A)
Electrical driving motorization	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Auxiliary contacts 2NO+2NC main				
Auxiliary contacts 2NO+2NC E/S				
Blown fuse signalling contact				
Key lock	LBS Open ☐ LBS Close ☐		E/S Open ☐ E/S Close ☐	
Pressure gauge	None ☐	Presence ■		(Selection recommended)
Control voltage (Including lamp)	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Low voltage control cabinet	Default only ☐	Add. top ☐		
Heater with thermostat	50W ☐	100W ☐		

Compact AIS - CU-A/CU-W (Circuit breaker unit)

Basic cubicle				Quantity
Rated voltage, Ur	12kV ☐	17.5kV ☐	24kV ☐	
Service voltage				(kV)
Short-circuit current, Isc				(kA)
Rated current, Ir				(A)
Internal arc withstand	None ☐	21kA/1s	A-FLR ☐	
Position in the switchboard	First on left ☐	Middle ☐	Last on right ☐	
Vacuum ciruit breaker type	Fixed ☐	Withdrawable ☐		
CT				See p.44
Protection relay	Gipam 10 ☐	Gipam 2000 ☐	X-Gipam ☐	For others, discussion is needed.
Earthing switch at cable side	E0 ☐ Lock Coil ☐	E1 ☐ VD ☐	4a4b ■	(Short-circuit making capacity) (4a4b contact is default.)

Option				
Electrical driving motorization	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Auxiliary contacts 2NO+2NC main				☐
Auxiliary contacts 2NO+2NC E/S				☐
Key lock	LBS Open ☐ LBS Close ☐		E/S Open ☐ E/S Close ☐	
Pressure gauge	None ☐	Presence ■		(Selection recommended)
Voltage detection system	None ☐	Presence ☐		
Control voltage (Including lamp)	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Low voltage control cabinet	Default only ☐	Add. top ☐		
Heater with thermostat	50W ☐	100W ☐		

Order form

Compact AIS - CU-AP (Circuit breaker unit with PT)

Basic cubicle				Quantity
Rated voltage, Ur	12kV ☐	17.5kV ☐	24kV ☐	
Service voltage				(kV) ☐
Short-circuit current, Isc				(kA) ☐
Rated current, Ir				(A) ☐
Internal arc withstand	None ☐	21kA/1s	A-FLR ☐	
Position in the switchboard	First on left ☐	Middle ☐	Last on right ☐	
Vacuum ciruit breaker type	Fixed ☐			
CT				See p.44
VT				See p.44
Protection relay	Gipam 10 ☐	Gipam 2000 ☐	X-Gipam ☐	For others, discussion is needed.
Earthing switch at cable side	E0 ☐ Lock Coil ☐	E1 ☐ VD ☐	4a4b ■	(Short-circuit making capacity) (4a4b contact is default.)

Option				
Electrical driving motorization	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Auxiliary contacts 2NO+2NC main				☐
Auxiliary contacts 2NO+2NC E/S				☐
Key lock	LBS Open ☐ LBS Close ☐		E/S Open ☐ E/S Close ☐	
Pressure gauge	None ☐	Presence ■		(Selection recommended)
Voltage detection system	None ☐	Presence ☐		
Control voltage (Including lamp)	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Low voltage control cabinet	Default only ☐	Add. top ☐		
Heater with thermostat	50W ☐	100W ☐		
Block type CT	☐			250 mm box is added.

Compact AIS - GAU (Incoming cable-connection unit)

Basic cubicle				
				Quantity ☐
Rated voltage, Ur	12kV ☐	17.5kV ☐	24kV ☐	
Service voltage				(kV) ☐
Short-circuit current, Isc				(kA) ☐
Rated current, Ir				(A) ☐
Internal arc withstand	None ☐	21kA/1s	A-FLR ☐	
Position in the switchboard	First on left ☐	Middle ☐	Last on right ☐	
Earthing switch at cable side	E0 ☐ Lock Coil ☐	E1 ☐ VD ☐	4a4b ■	(Short-circuit making capacity) (4a4b contact is default.)

Option				
Voltage detection system	None ☐	Presence ☐		
Control voltage (Including lamp)	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Low voltage control cabinet	Default only ☐	Add. top ☐		
Heater with thermostat	50W ☐	100W ☐		
Surge arrestor	12kV ☐	17.5kV ☐	24kV ☐	

Order form

Compact AIS - SU (Section unit)

Basic cubicle				
				Quantity ☐
Rated voltage, Ur	12kV ☐	17.5kV ☐	24kV ☐	
Service voltage				(kV) ☐
Short-circuit current, Isc				(kA) ☐
Rated current, Ir				(A) ☐
Internal arc withstand	None ☐	21kA/1s	A-FLR ☐	
Position in the switchboard	First on left ☐	Middle ☐	Last on right ☐	
Vacuum ciruit breaker type	Fixed ☐			
CT				See p.44
Protection relay	Gipam 10 ☐	Gipam 2000 ☐	X-Gipam ☐	For others, discussion is needed.

Option				
Electrical driving motorization	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Auxiliary contacts 2NO+2NC main				☐
Auxiliary contacts 2NO+2NC E/S				☐
Key lock	LBS Open ☐ LBS Close ☐		E/S Open ☐ E/S Close ☐	
Pressure gauge	None ☐	Presence ■		(Selection recommended)
Voltage detection system	None ☐	Presence ☐		
Control voltage (Including lamp)	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Low voltage control cabinet	Default only ☐	Add. top ☐		
Heater with thermostat	50W ☐	100W ☐		

Compact AIS - MU (Metering unit)

Basic cubicle				Quantity
Rated voltage, Ur	12kV ☐	17.5kV ☐	24kV ☐	
Service voltage				(kV)
Short-circuit current, Isc				(kA)
Rated current, Ir				(A)
Internal arc withstand	None ☐	21kA/1s	A-FLR ☐	
Position in the switchboard	First on left ☐	Middle ☐	Last on right ☐	
CT				See p.44
VT				See p.44

Option				
Electrical driving motorization	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Auxiliary contacts 2NO+2NC main				
Auxiliary contacts 2NO+2NC E/S				
Key lock	LBS Open ☐ LBS Close ☐		E/S Open ☐ E/S Close ☐	
Pressure gauge	None ☐	Presence ☐		
Control voltage (Including lamp)	24 Vdc ☐ 48 Vdc ☐	110 Vdc ☐	110 Vac ☐ 220 Vac ☐	
Low voltage control cabinet	Default only ☐	Add. top ☐		
Heater with thermostat	50W ☐	100W ☐		

Certificates

ISO certification

ISO 9001

ISO 14001

OHSAS 18001

Test report (ASTA certi.)

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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