



Medium Voltage Products

SafeLink CB

SF<sub>6</sub> Insulated Secondary Distribution Compact Ring Main Unit

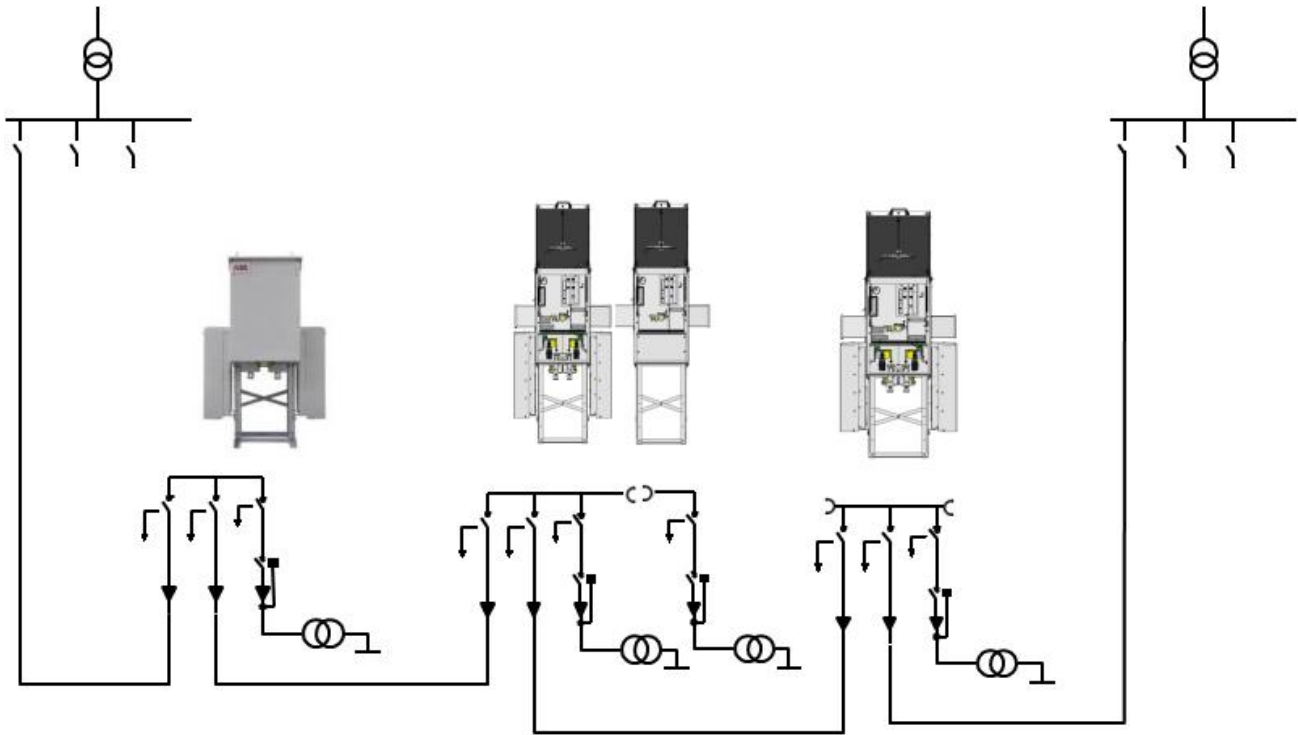
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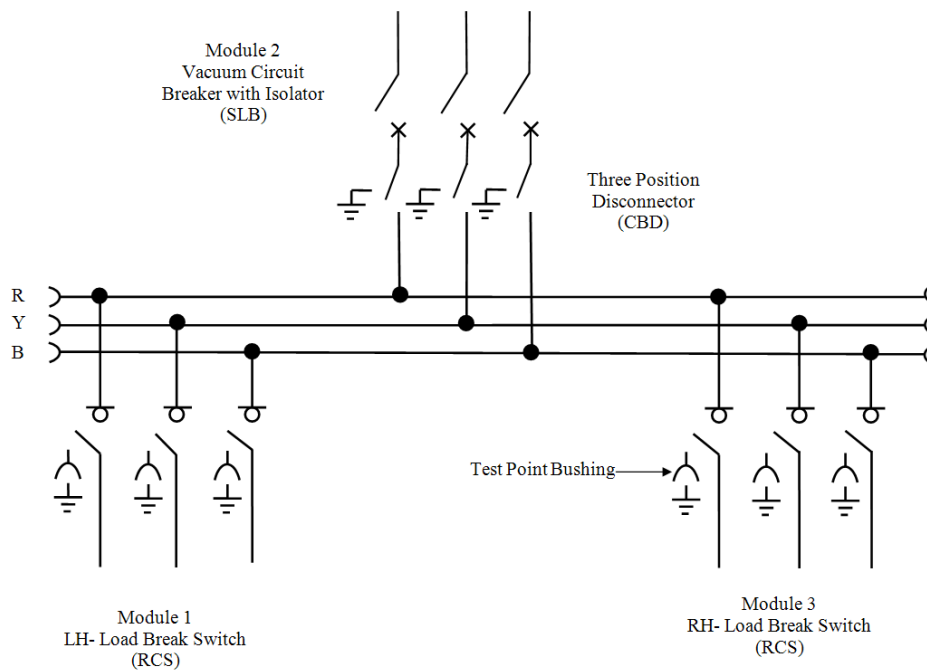


SafeLink CB for Secondary Distribution Network





SafeLink CB is a SF<sub>6</sub> insulated outdoor ring main unit for applications in 12 kV medium voltage distribution networks. SafeLink CB can be supplied with Ring Switch and/or Vacuum Circuit Breaker configurations of CVC, +CVC+, +C+ and +V+ with extensibility options. SafeLink CB offers a sealed stainless steel tank which contains all the live components and switching functions. The stainless steel tank is robotically welded and is sealed for life ensuring high level of personnel safety as well as maintenance free system.



'CVC', '+CVC+', '+C+' & '+V+' modules can be provided where,  
 C – Cable/Ring Switch  
 V – Vacuum Circuit Breaker (with Disconnecter on the busbar side)  
 '+' symbol represents extensibility option

The SafeLink CB unit offers a circuit-breaker with relay combination for protection of the transformer.

SafeLink CB is designed for use in the following applications:

- Small industries
- Wind power plants
- Hotels, shopping centers, office buildings, business centers etc.
- Light mining applications, airports
- Hospitals, tunnels and underground railways

**Evolution: - more functionality, compact dimensions.**

Secondary distribution switchgears have been subject to a significant development in recent 20 years. The traditional switching cells are substituted with complete switchgear systems. Specific functions such as grounding, disconnecting, cable connections, busbar extension, protection and switching have become integrated features in compact functional units. Compact switchgear systems fulfill customers MV application requirements. ABB has always taken an active part in this development. The most unique specialization is the development of the compact secondary switchgear. The numerous distribution substations requested a unified switching functionality that evolved into the Ring Main Unit concept. ABB's SafeLink CB is adapted to the needs in the utility distribution networks.

**Customer's involvement:**

The applied functionality in SafeLink CB is a result of input from customers all over the world. Key customers are continuously involved with ABB design staff to ensure optimised switchgear operation.

**Personnel – safety operation**

All products are designed and manufactured in compliance with ISO 9001, ISO 14001 and ISO 18001. The latest edition of relevant IEC standards will always apply to our continuous test programme. Safety is not only a specification and rating issue, but also a real life experience.

All units are factory routine tested according to international standards.

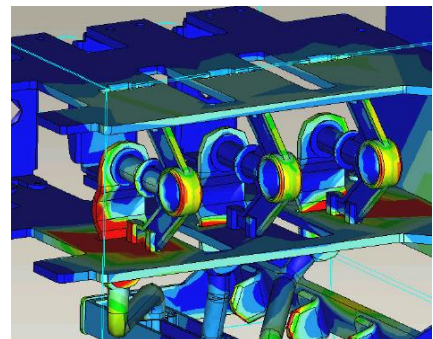
ABB takes this further to be an objective related to durability and repetitive manufacturing quality. Features for further enhancing personnel safety are available. "Integrated functionality" is a key objective to reduce the number of moving components, further reducing the risk of any mechanical defect.

**We are responsible for the environment**

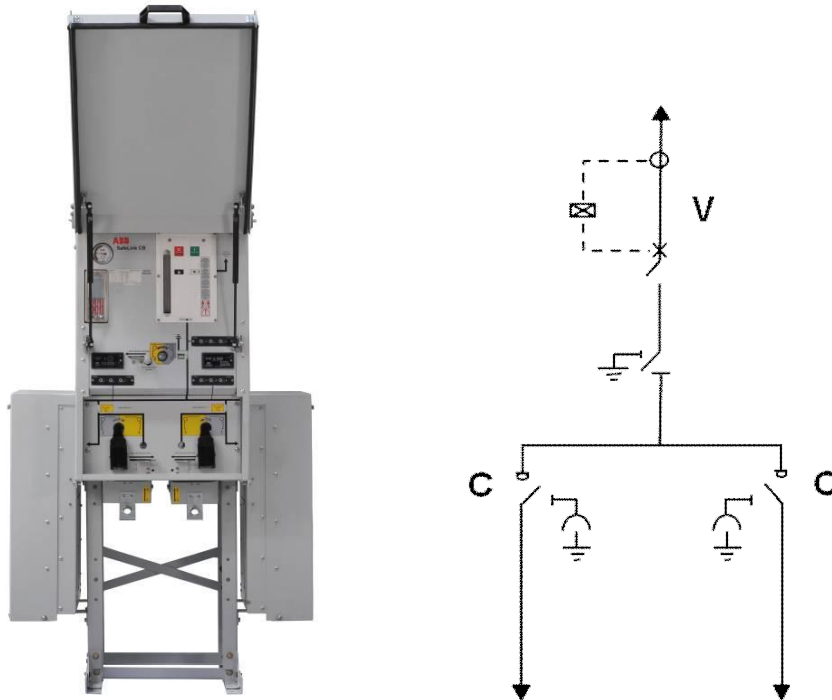
The location for manufacturing SafeLink CB is Nashik, India. Green policy assures focus on environmental factors in manufacturing as well as over the switchgear's life span. All products are manufactured in accordance with our ISO 14001 certification. Materials are carefully selected, to ensure reuse at end of life. Recycling capability is 95% (for details see chapter 10). To facilitate the recycling process we continuously work along with our partners to improve end of life handling.

**Modern - development and manufacturing**

Numerical simulations together with long experience ensure reliable and safe, compact and robust design. Dielectric simulations ensure that compactness does not influence the dielectric capability. The combination of design techniques; experience and the most modern production technology guarantee state of the art products and durability.



Standard Configuration CVC (Non Extensible)



- C Cable/Ring Switch module with test point facility (3 positions ON-OFF-EARTH)
- V Vacuum Circuit Breaker module for relay transformer protection (with manually operated Disconnecter).

SafeLink CB, can be also delivered as an extensible Ring Main Unit.

#### SafeLink CB is supplied with the following standard equipments

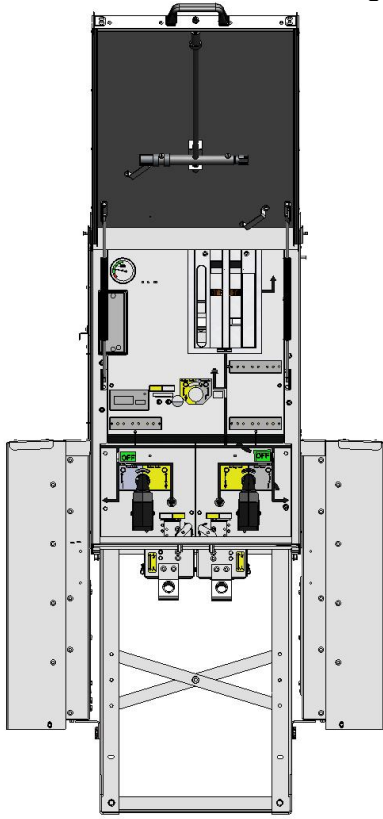
- Vacuum Circuit Breaker with Disconnecter
- Circuit breaker spring charged indication and indication for ON and OFF
- Two-position mechanism with auto-reclosing duty for Vacuum Circuit Breaker
- Relay Trip Coil
- Manually operated 3 position disconnecter
- 2 nos of three position Switch Disconnecter cum Earthing Switch
- Switch position indication for Load Break Switch, Earthing Switch and Disconnecter
- Single spring independent operated mechanism on 3 position Switch Disconnecter cum Earthing Switch
- Cable bushings 400 series bolted with integrated capacitive voltage indication provision
- Capacitive voltage indication
- Busbars, 630A
- Earthing bar
- Operating handle
- Lifting lugs for easy handling
- Manometer for SF<sub>6</sub> pressure
- All cable compartments fully interlocked with respective Earthing Switches
- External structure – painted
- Test Point facility for Ring Cable Switches
- Fully interlocked Test Point Box for both ring switches
- Facilities for padlocks on switching disconnecter, Earthing Switches and Disconnecter
- Arc proof cable compartments



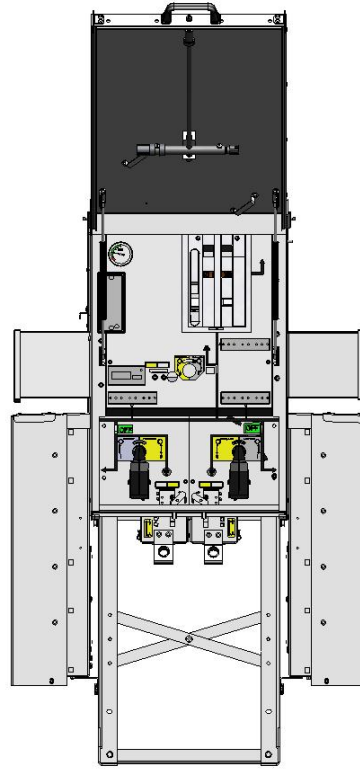
**Optional Features, Factory assembled or Retrofit**

- Signal (1NO) from internal pressure indicator wired to terminals (one each SF<sub>6</sub>-enclosure)
- Motorised operation
- Shunt opening and closing release/coil (for Vacuum Circuit Breaker)
- Additional shunt opening release/coil (for Vacuum Circuit Breaker)
- Aux. switch (2NO+3NC or 3NO+2NC) for Vacuum Circuit Breaker positions
- Aux. switch (2NO+2NC) for Switch Disconnect/Earthing Switch positions
- Aux. switch (2NO+2NC) for Disconnect/Earthing Switch positions
- Short circuit indicator and/or earth fault indicator for Switch Disconnectors
- Extensible bushings (630 A) on the sides for connection of external busbars
- Protective end box for extensible bushings
- External busbars for coupling 2 RMUs along with its covering box (for extensible version)

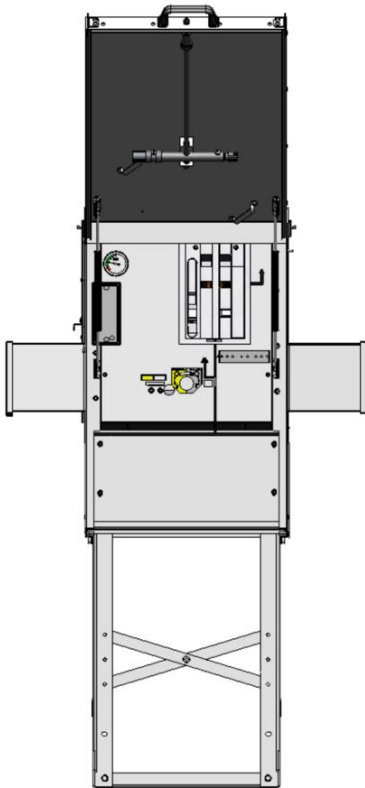
SafeLink CB is available in following configurations.



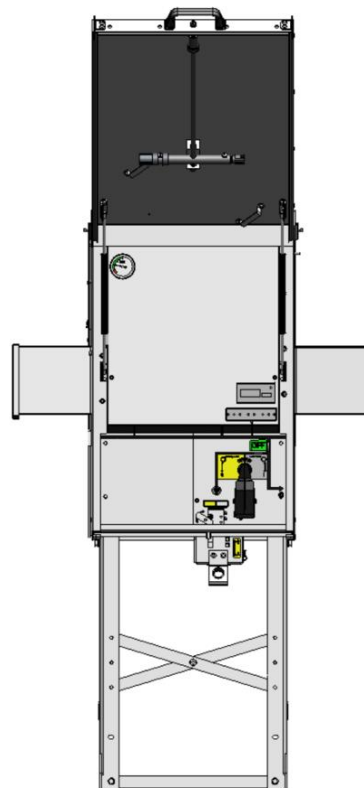
CVC Non Extensible



+CVC+ both side extensible



+V+ both side extensible



+C+ both side extensible



		C Module		V Module	
		Switch Disconnecter	Earthing Switch	Vacuum Circuit Breaker	Earthing Switch / Disconnecter
Rated Voltage	kV	12	12	12	12
Power frequency withstand voltage	kV	38	38	38	38
- across disconnecter	kV	45	45	45	45
Lightning impulse withstand voltage	kVp	95	95	95	95
- across isolating distance	kV	110	110	110	110
Rated normal current*	A	630	630	630	630
<i>Breaking capacities</i>					
- active load breaking current	A	630			
- closed loop breaking current	A	630			
- cable charging breaking current	A	25		25 (Class C2)	
- line charging breaking current	A	1		10 (Class C2)	
- earth fault breaking current	A	75			
- earth fault cable and line charging	A	43.5			
- short circuit breaking current	kA			21	
Making capacity	kA	52.5 (Class E2)	52.5 (Class E2)	52.5 (Class E2)	see <sup>1)</sup>
Short time current (3-sec)	kA	21	21	21	21
Mechanical Operations	Nos	M1 (1000 CO)	M0(1000 CO)	M1+3000	M0 (1000 CO)
Rated Operating Sequence	-			0-0.3sec-CO- 3min-CO	

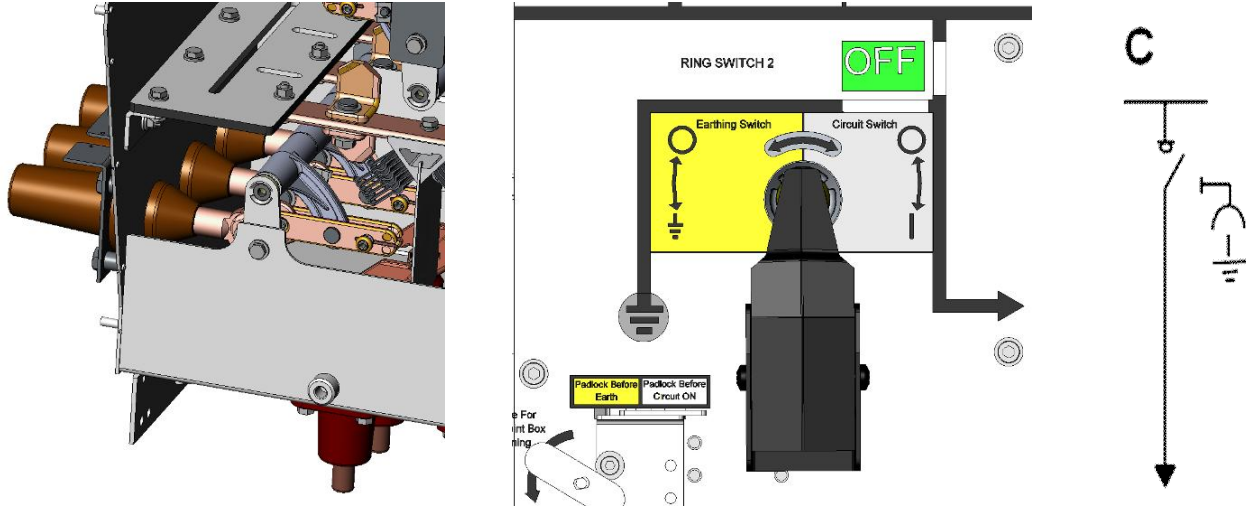
1) Disconnecter is manually operated; earthing operation is through Vacuum BKR, hence no making capacity assigned

Rated Filling Level for Insulation	0.02 MPa
Short Time Current (On Earthing Circuit)	21 kA 1 sec
Internal Arc Classification (IAC)	20 kA 1 sec for inside tank
Rated normal current for external busbar	630 A (for extensible version)

\*suitable derating shall be applied for ambient temperatures greater than 40°C

SafeLink CB is tested according to IEC standards IEC 62271-200, IEC 62271-1, IEC 62271-100, IEC 62271-102, IEC 60265-1 and IEC 60529

The Ring Cable Switch (C-Module) is a three position Switch Disconnecter and Earthing Switch using SF<sub>6</sub> gas as an arc quenching and insulating medium. The switch positions are Close – Open – Earthed. In the open position the switch satisfies the disconnecter requirements. C module is provided with test point bushings protruding on bottom side of the tank as standard.



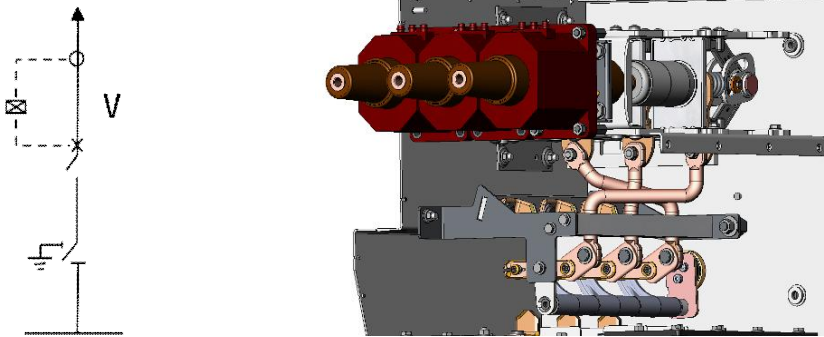
### Standard features

- Three position Load Break Switch with Disconnecter and Earthing Switch
- Single spring latched mechanism with common operating shaft for load break and earthing function
- Switch position indication for Load Break Switch and Earthing Switch
- Cable bushings horizontal on the sides, Interface C (400 series bolted) with integrated capacitor for voltage indication
- Busbars, 630A
- Bushings for cable testing (incl. earthing device test points)
- Arc Proof Cable Covers
- Interlocking
  - o Cable compartment on the sides interlocked with respective Earthing Switch
  - o Interlocking of Test Point bushing box with respective Earthing Switch
- VPIS (Voltage Presence Indicating System) with integrated indicator lamps
- Padlock for all three positions of ON-OFF-EARTH
- End box for extensible bushings (if present)

### Optional features (also available as retrofit)

- Extensible bushing for connection of external busbars on side (630 A)
- Signal (1NO) from internal pressure indicator wired to terminals (only one for each SF<sub>6</sub> tank)
- Motorised operation for Load Break Switch
- Aux. switch (2NO+2NC) for switch disconnecter/Earthing Switch positions
- Short circuit and/or earth fault indicator

The Vacuum Circuit Breaker (V-module) has vacuum bottles for short-circuit current interruption. A three position Disconnecter is connected in series with the circuit-breaker on the busbar side. The operation between Vacuum Circuit Breaker and Disconnecter as well as between Disconnecter and Earthing Switch are mechanically interlocked. The earthing of the T-off side cable is done through the vacuum interrupters.



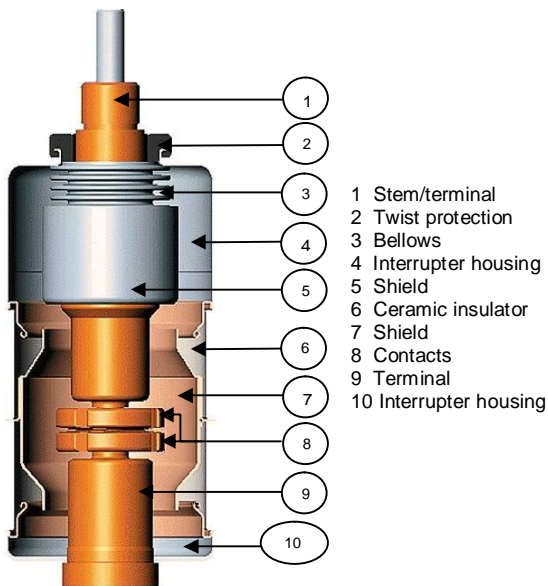
### Standard features

- 630 A Vacuum Circuit Breaker
- Two position EL2 trip free mechanism with auto-reclosing facility for Vacuum Circuit Breaker
- Mechanical signaling device for closing springs charged/ discharged
- Mechanical signaling device for circuit-breaker open/closed
- Lever for manually charging the closing spring of mechanism
- Closing pushbutton, opening pushbutton
- O-C-O operation possibility with closing spring in charged condition
- Manually operated three position Disconnecter with Earthing Switch in series
- Interlocking between Vacuum Circuit Breaker and Disconnecter
- Position indication for disconnecter and Earthing Switch
- Self powered electronic protection relay with ring core CTs on T-off side cable bushing
- Solenoid/trip coil (for relay tripping)
- Cable bushings with interface C (400 series bolted) with integrated capacitor for voltage indication
- Main busbar, 630A
- Arc proof cable compartment cover on the back side
- Cable compartment cover interlocked with Earthing Switch and Vacuum Circuit Breaker
- Manometer
- VPIS (Voltage Presence Indicating System) with integrated indicator lamps
- End box for extensible bushings (if present)

### Optional Features available as retrofit

- Extensible bushing for connection of external busbars on side (630 A)
- Signal (1NO) from internal pressure indicator wired to terminals (only one for each SF<sub>6</sub> tank)
- Spring charging geared motor with electrical signaling of spring charged
- Auxiliary switches
  - Vacuum Circuit Breaker position 3NO+2NC or 2NO+3NC
  - Disconnecter/Earthing position 2NO+2NC
- Shunt opening and closing release/coil
- Additional shunt opening release
- Operation counter for breaker ON-OFF operations
- Contact signaling closing spring charged/discharge
- Covering box for externally coupled busbars

The Vacuum Interrupter bottles are manufactured in world class ABB facility with main contacts in copper chromium material. Vacuum Interrupting technology offers advantage of high dielectric strength at short gap distances making it ideal for use in medium voltage products



Vacuum Interrupter



Clean Room for VI Production

The Vacuum Circuit Breaker does not require an interrupting and insulating medium. In fact, the interrupters do not contain ionisable material. In any case, on separation of the contacts an electric arc is generated made up exclusively of melted and vaporized contact material. The electric arc remains supported by the external energy until the current is cancelled in the vicinity of natural zero. At that instant, the rapid reduction in the load density carried and the rapid condensation of the metallic vapour, leads to extremely rapid recovery of the dielectric characteristics. The vacuum interrupter therefore recovers the insulating capacity and the capacity to withstand the transient recovery voltage, definitively extinguishing the arc. Since high dielectric strength can be reached in the vacuum, even with minimum distances, interruption of the circuit is also guaranteed when separation of the contacts takes place a few milliseconds before passage of the current through natural zero. The special geometry of the contacts and the material used, as well as the limited duration and low voltage of the arc, guarantee minimum contact wear and long life. Furthermore, the vacuum prevents their oxidation and contamination.

In a vacuum interrupter, the electric arc starts at the moment of contact separation and is maintained until zero current and can be influenced by magnetic fields.

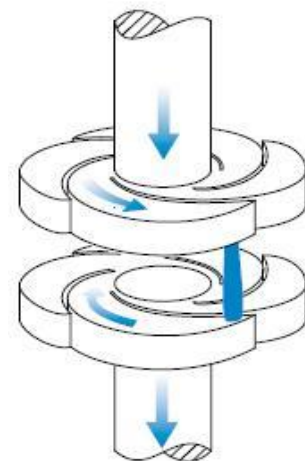
*Vacuum arc – diffuse or contracted*

Following contact separation, single melting points form over the entire surface of the cathode, producing metal vapours which support the arc. The diffuse vacuum arc is characterised by expansion over the contact surface and by an even distribution of thermal stress on the contact surfaces. At the rated current of the vacuum interrupter, the electric arc is always of the diffuse type. Contact erosion is very limited and the number of current interruptions very high.

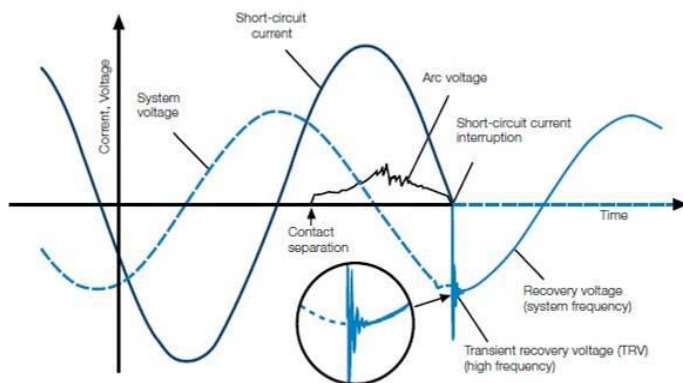
As the interrupted current value increases (above the rated value), the electric arc tends to be transformed from the diffuse into the contracted type, due to the Hall effect. Starting at the anode, the arc contracts and as the current rises further it tends to become sharply defined. Near the area involved there is an increase in temperature with consequent thermal stress on the contact. To prevent overheating and erosion of the contacts, the arc is kept rotating. With arc rotation it becomes similar to a moving conductor which the current passes through.

*The spiral geometry of ABB vacuum interrupter contacts*

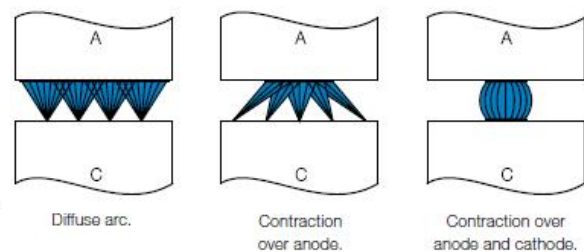
The special geometry of the spiral contacts generates a radial magnetic field in all areas of the arc column, concentrated over the contact circumferences. An electromagnetic force is self-generated and this acts tangentially, causing rapid arc rotation around the contact axis. This means the arc is forced to rotate and to involve a wider surface than that of a fixed contracted arc. Apart from minimising thermal stress on the contacts, all this makes contact erosion negligible and, above all, allows the interruption process to be controlled even with very high short-circuits. ABB vacuum interrupters are zero-current interrupters and are free of any re-striking. Rapid reduction in the current charge and rapid condensation of the metal vapours simultaneously with the zero current, allows maximum dielectric strength to be restored between the interrupter contacts within microseconds.



Radial magnetic field contact arrangement with rotating vacuum arc



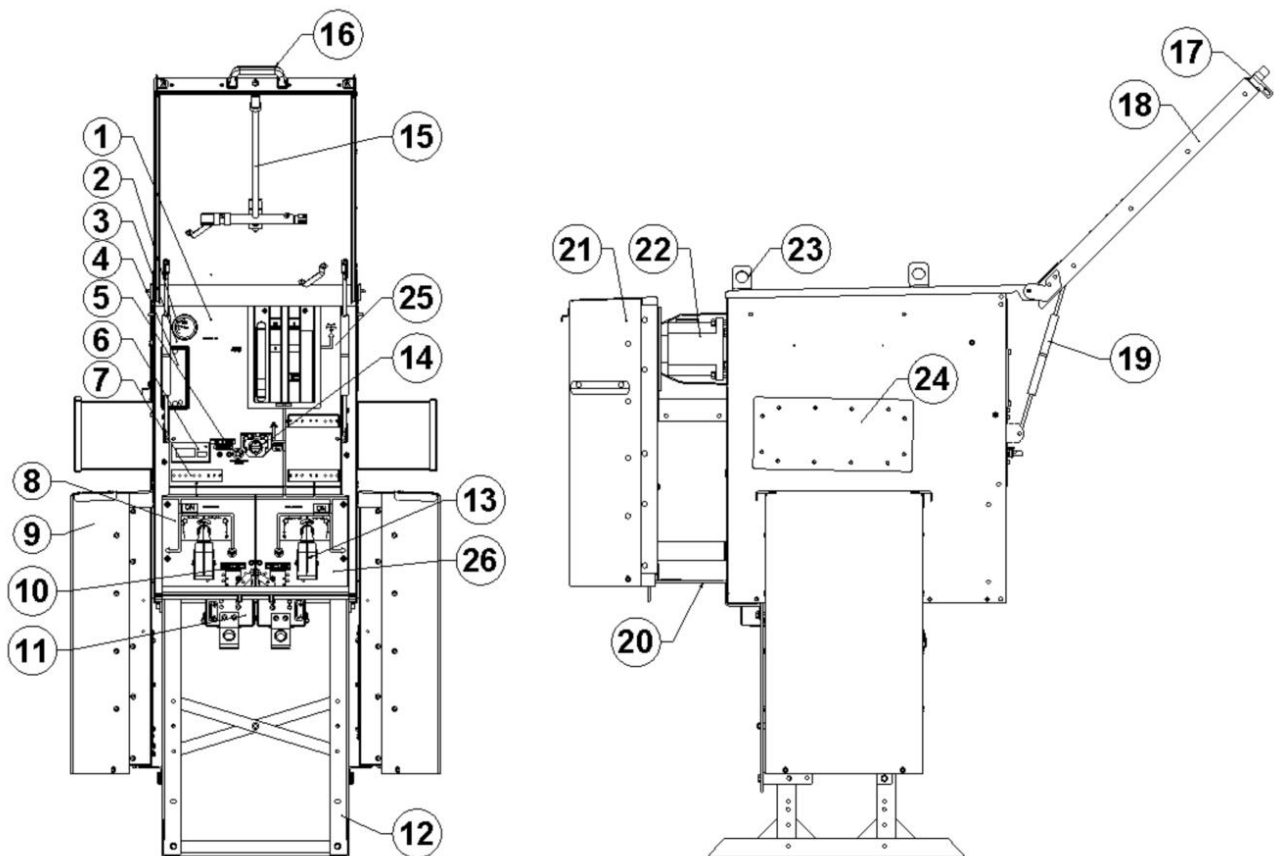
Development of current and voltage trends during a single phase vacuum interruption process



Schematic diagram of the transition from a diffuse arc to a contracted arc in a vacuum interrupter.



1. Rating Plate
2. Manometer
3. Front Upper Mimic
4. Relay
5. VCB Disconnecter Padlock
6. Fault Indicator
7. VPIS for Ring Switch RHS
8. Ring Switch RHS
9. Cable Box for Ring Switch RHS
10. Padlock for Ring Switch RHS
11. Test Point Box for Ring Switch RHS
12. Switchgear Stand
13. Earth & Circuit Slider for Ring Switch
14. VCB Disconnecter
15. Operating Handle
16. Door Handle
17. Padlocking for Switchgear Front Door
18. Switch Gear Front Door
19. Gas Spring for Switchgear Front Door
20. Switchgear Earthing
21. T-Off Cable Box (For Circuit Breaker)
22. Current Transformer (Directly mounted on Circuit Breaker Bushings)
23. Lifting Hook for Switchgear
24. End Box (For extensible version only)
25. 'V' module section
26. 'C' module section



+CVC+ Configuration (Extensible)



**Covers**

Upper and lower front mimic covers inside the front door have a thickness of 2 mm mild steel for displaying functions on the front side. The front mimic diagram shows the main circuit with the mechanical/position indicators for the switching devices and also spring charged condition for circuit breaker. Background color for these foils is light grey (RAL 7035). The upper and lower front mimics cover are removable.

The external structure is powder painted with color RAL 7035 as standard. The side sheets are of 2 mm mild steel. All cable compartment covers are removable. The Ring Cable Switches have separate cable compartments on the side whereas the T-off side circuit breaker module has the cable compartment on the back. In case of an arc fault inside the SF<sub>6</sub> tank, followed by an opening of the pressure relief in the rear-bottom of the tank, the gases are routed to the bottom but towards the back in between the space of T-off cable box and rear sheet of the unit.

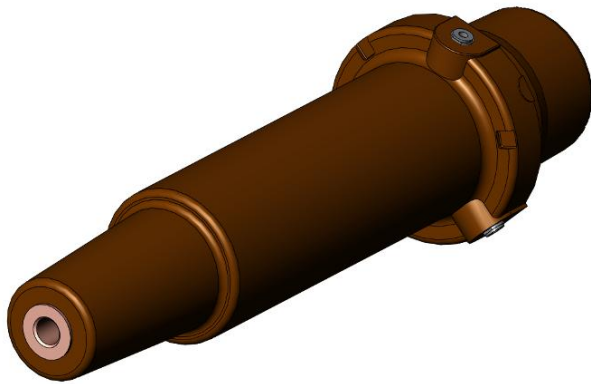
The connection of the HV-cables is made by cable bushings. The bushings are made of cast resin with molded-in conductors. In addition, an earthed screen is moulded in to control the electrical field and is also used as the main capacitor supplying the voltage indicating systems.

ABB also has experience with bushings for SF<sub>6</sub> switchgears since 1985 with high performance and quality. A very large number has been installed worldwide in distribution networks, power stations and industrial complexes. Used together with fully screened connectors it is an ideal solution for areas with humidity or condensation problems.

SafeLink CB has 2 types of cable bushings as shown below

- 1) For Ring Cable Switch
- 2) For T-off side Vacuum Circuit Breaker

The bushings are designed according to EN 50181 and are of type Interface C (400 series with M16 bolted contact, I<sub>n</sub>=630A).

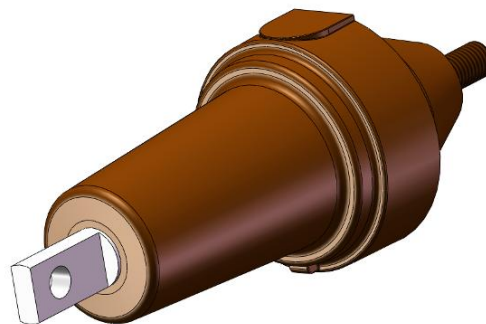


T-off cable bushing



Switch Cable Bushing

In addition to the above, in case of external busbar connection required between two extensible Ring Main Units, following type of bushings fitted on the side(s) is used. Connection is bolted type with sleeved busbars.



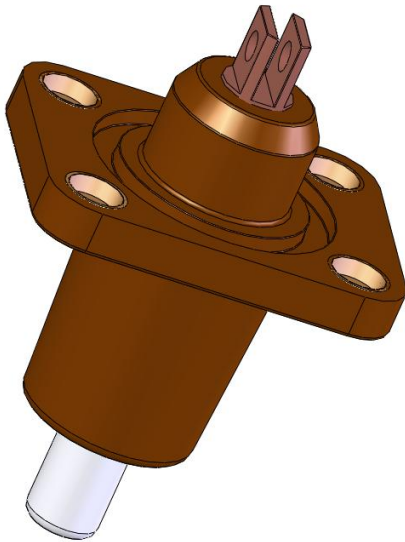
Extensible Connection Bushing

'C' modules of SafeLink CB are equipped with cable test bushings on the bottom side of the tank. Each set of test cable bushings have separate covering box which is interlocked with respective Earthing Switches to avoid access to the cable test compartment before Earthing Switch is in closed position.

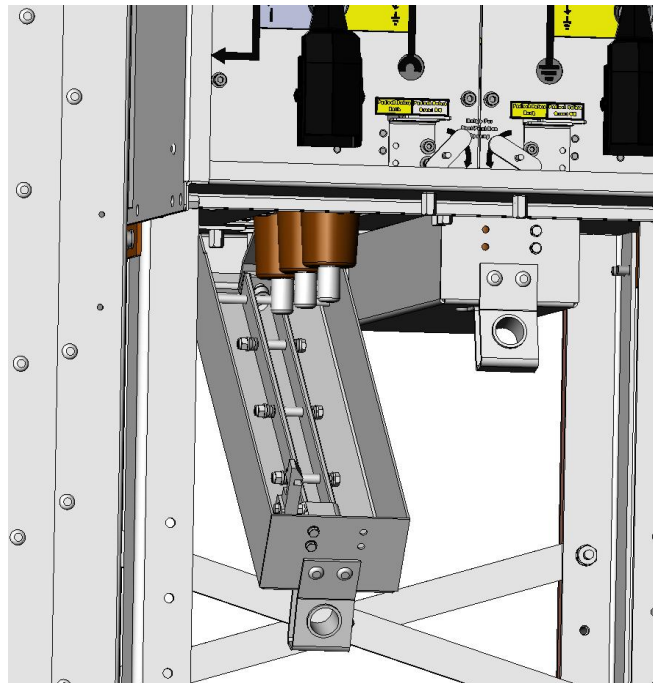
When these bushings are mounted, cable insulation test can easily be done according to the following procedure:

1. Close the Earthing Switch after having checked the voltage indicators
2. Remove the handle and bring the mimic selector switch to 'Blocked Position'
3. Open the Test Point Box which removes the common earthing bar
4. Install the injection device onto the access terminals and perform cable testing
5. After cable testing close the test point box.
6. Move the selector switch to 'Earth Open Position', insert the handle
7. Open the Earthing Switch

Please follow cable manufacturer instructions for cable testing purpose.



TP Bushing



TP Box Area in a CVC Unit

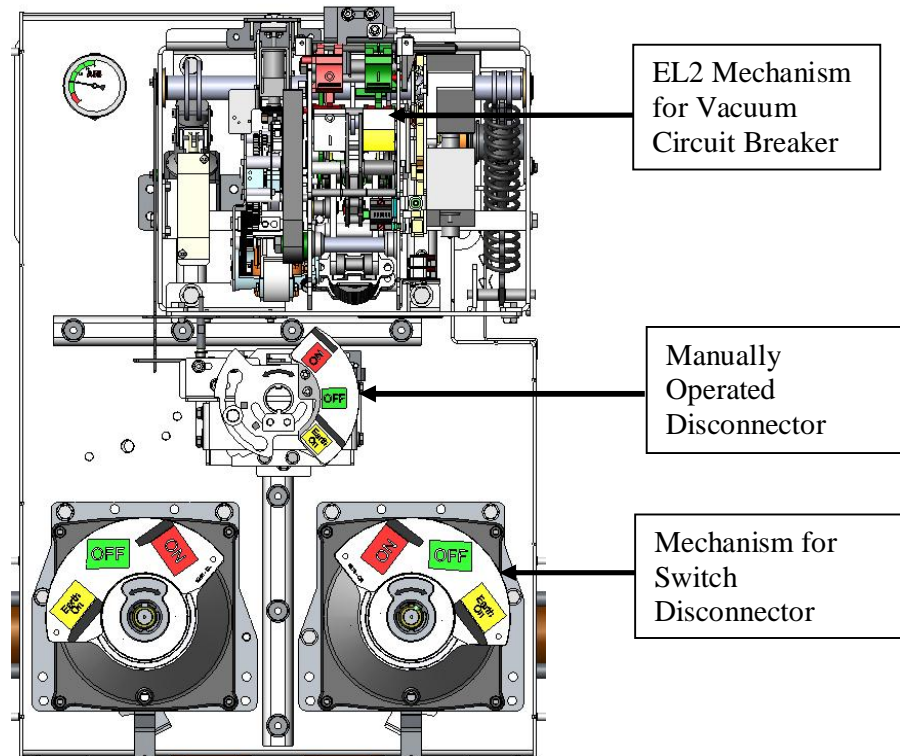
SafeLink CB is Gas insulated switchgear using SF<sub>6</sub> as an insulating and quenching medium. The complete switchgear is assembled and supported inside stainless steel welded tank. High precision and programmed ABB robots are used for the welding ensure high quality welded joints. Electrical and mechanical bushings penetrating the tank are clamped and sealed to the tank by high quality O rings. The mechanical bushings have in addition a rotating shaft which connects the shaft of the switch to the corresponding shaft of the mechanism. The rotating shaft is sealed by double set of gas seals.

All assembled Ring Main Units tanks have to pass through a stringent and pre-programmed leakage test before filling the equipment with SF<sub>6</sub>. Leakage test and gas filling are done inside a common chamber. The first step in the leakage test is to evacuate all air inside both SF<sub>6</sub> tank and vacuum chamber simultaneously. Helium gas is used for testing and monitoring the leaks if any in all the sealing and welding areas. Helium being inert and light gas can easily penetrate in extremely small pores of the weldments. Due to the characteristic of Helium this test will detect absolutely all possible leakages. Switchgear tank on a successful and leak free test is then filled with SF<sub>6</sub> gas after removal of Helium. The stainless steel tank on account of the construction, production process has a degree of protection of IP67.

Stainless steel tanks of SafeLink CB Ring Main Units are classified as sealed pressure system as defined in IEC and are sealed for life with an operating life time of 30 years. The leakage rate is less than 0.1% per year. This ensures adequate pressure of SF<sub>6</sub> gas for maintaining insulation and quenching levels for the required switching and breaking conditions throughout the specified operating life.



Automatic Gas filling and leakage testing station



Mechanism Compartment View

All operating mechanisms are situated outside the SF<sub>6</sub>-tank behind the front mimic covers with degree of protection of IP2X. This gives the opportunity of access to all operating mechanisms if retrofit or service should be required.

The speed of operation of these mechanisms is independent of the operator (except the manually operated three position disconnecter of the circuit breaker)

To prevent access to cable compartment before Earthing Switch is in closed position, all mechanisms are provided with mechanical interlocks which make it impossible to remove the cable compartment covers. It will then also be not possible to operate load break / disconnecter switch to open position before cable compartment cover is mounted properly.

Ring Switch and Disconnecter mechanisms are equipped with padlocking facility with suitable holes which when used will restrict the access to operate the mechanism. All operating mechanisms are equipped with mechanical position indicators for ON-OFF-EARTH conditions. In addition the circuit breaker mechanism also has indication to show spring charged/discharged condition. Operating handle is required only for the ring switch disconnecter and manually operated disconnecter. For ring switch mechanism there is anti-reflex system which prevents an immediate re-operation of the switch. All steel parts are electroplated with zinc and then chromotised.

**Cable Switch (C)**

The ring switch mechanism has one single operating shaft for the Load Break Switch and for the Earthing Switch function. Shaft is operated by single spring. When both Load Break Switch and Earthing Switch are in open position the switch satisfies the specifications of Disconnecter. Due to selector switch interlock inside the mechanism, it is impossible to operate the Load Break Switch when Earthing Switch is in earthed position or operate the Earthing Switch when the Load Break Switch is in closed position.



Ring Switch Mechanism

**Vacuum Circuit Breaker (V)**

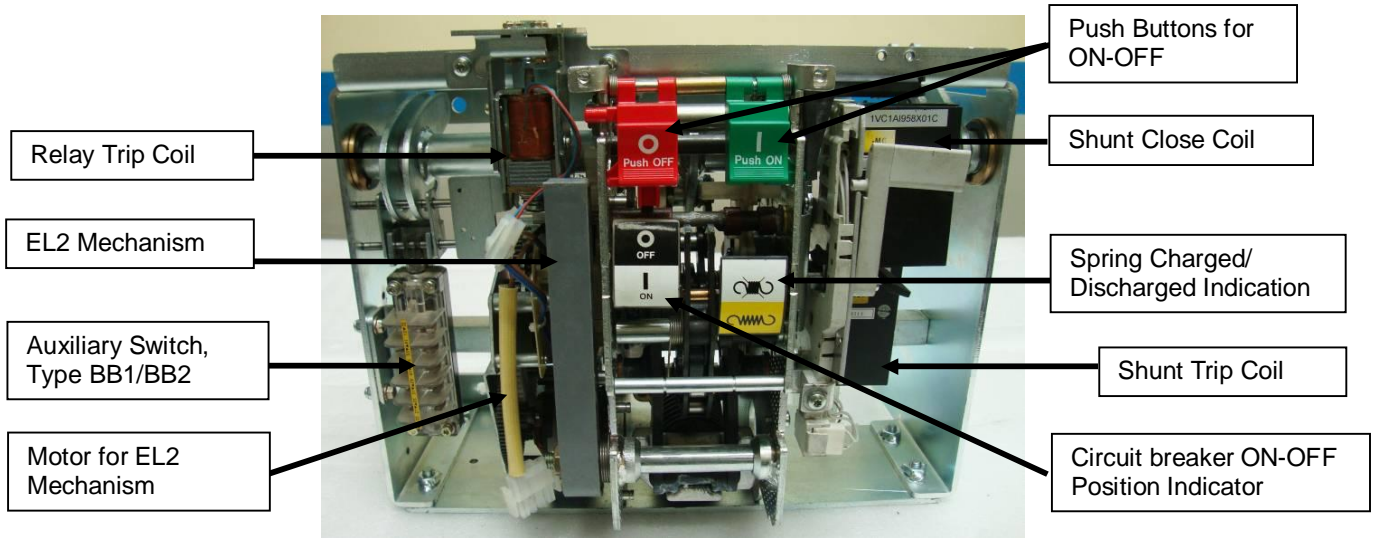
This module has two mechanisms; the upper one (EL2) is for Vacuum Circuit Breaker and the lower one is manually operated with single operating shaft for the three position Disconnecter.

The EL mechanism is provided with a lever for manually charging the closing spring. The Vacuum Circuit Breaker has the possibility of rapid auto-reclosing duty. By means for mechanical push buttons it is possible to close and open the circuit-breaker. The opening spring is always charged when the circuit-breaker is in closed position and will be ready to open immediately if the protection relay gives a trip signal. If the mechanism is recharged after closing, it is possible to perform Open - Close - Open sequence.

The EL mechanism is fitted with a mechanical anti-pumping device which prevents re-closing due to either electrical or mechanical commands. Should both the closing command and any one of the opening commands (local or remote) be active at the same time, there would be a continuous succession of opening and closing commands. The anti-pumping device avoids this situation, ensuring that each closing operation is only followed by an opening operation and that there is no other closing operation after this. To obtain a further closing operation, the closing command must be released and then re-launched. Furthermore, the anti-pumping device only allows circuit breaker closure if the following conditions are present at the same time:

- Operating mechanism spring fully charged
- Opening pushbutton and/or shunt opening release (-MO1/-MO2) not activated
- Circuit-breaker open.





Circuit Breaker Mechanism Frame

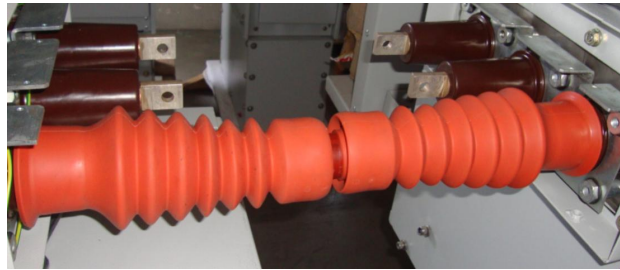
The lower mechanism is manually operated and is without any spring/latched action. It has 3 positions of OPEN, CLOSE and EARTH which can be padlocked after the pull for disconnecter knob is in the respective slot/position.

There is a mechanical interlock between these two mechanisms which prevents operating of the Disconnecter and/or Earthing Switch when the circuit-breaker is in closed position.

SafeLink CB can be provided with extensible bushings on side(s), for connection of external busbars on LHS and/or RHS side. The extensible bushing rated for 630 A has molded screen and is earthed to the switchgear body. A factory fitted end box is provided for covering extensible bushings. All extensible configurations of SafeLink CB will be always extensible on both sides.

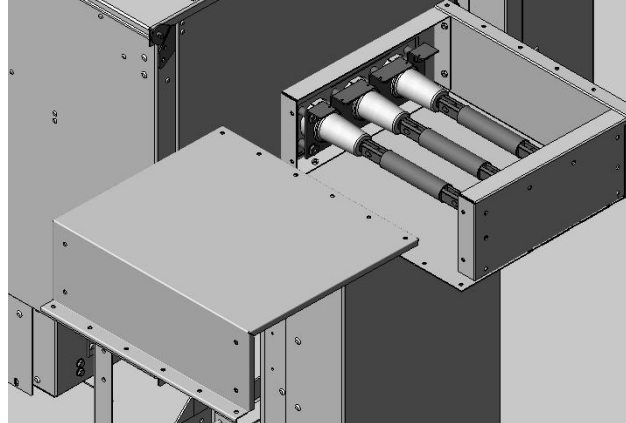
The length of the coupling busbar is of standard size irrespective of the configuration of extensible RMU's. For detailed coupling instruction between two extensible SafeLink CB RMU's separate instruction document 1VYN403090-067 is to be followed.

Sleeved busbar in coupled condition and with insulating boot/covering (RCAB) version is shown below.



Sleeved busbars in coupled condition with insulating boot

Covering box as shown below is used to protect the busbars in coupled condition during installation at site



Covering boxes to protect busbars in coupled condition

1) Motorised version for Ring Cable Switch

Closing and opening operations of mechanism for Ring Cable Switches can be performed with a motor operation.



Motorised version for C module

Operating cycle for motor operation is CO - 3 min (i.e. it may be operated with a frequency of up to one close and one open operation every third minute).

Motors and coils can easily be mounted to the mechanisms after delivery (retrofit). Test voltage for tables below is + 10/ - 15 % for motor operations and closing coils and +10/ -30% for trip coils and opening coils. The motor and coils can be retrofitted after delivery.

Auxiliaries like motor drives and auxiliary switches are located behind the lower mimic.

Characteristics	Specifications
Rated Voltages for Motor (Un)	24 VDC, 48 VDC, 60 VDC, 110 VDC, 220 VDC, 110 VAC, 230 VAC
Voltage variation	85-110% Un
Rated Power Consumption (max)	90 W, 90 VAC
Charging time	< 8 sec
Insulation voltage	2 kV 1 min (50 Hz)

2) Spring charging motor for Vacuum Circuit Breaker

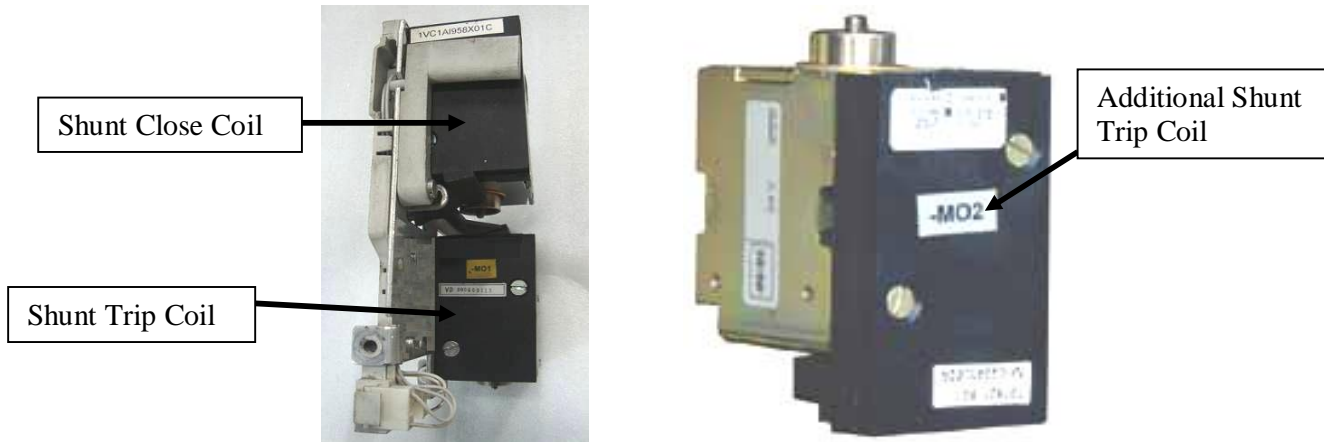
Charging of the closing spring of the EL2 mechanism for the Vacuum Circuit Breaker can be performed with a motor operation. Manually operated Disconnecter and Earthing Switch of the V-module does not have this possibility.



Motor for V module

This carries out automatic charging of the circuit-breaker operating mechanism closing spring. After circuit-breaker closing, the geared motor immediately recharges the closing springs. In the case of a power cut or during maintenance work, the closing spring can be charged manually in any case (by means of the crank handle incorporated in the operating mechanism).

Characteristics	Specifications
Rated Voltages for Motor (Un)	24 VDC, 48 VDC, 60 VDC, 110 VDC, 220 VDC, 110 VAC, 230 VAC
Voltage variation	85-110% Un
Inrush power (Ps)	600 W, 600 VAC
Rated power (Pn)	200 W, 200 VA
Charging time	< 10 sec
Inrush time	0.2 sec
Insulation voltage	2 kV 50 Hz for 1 min



1 Shunt opening release (-MO1)

This allows remote opening control of the circuit breaker. The release can operate both in direct and alternating current. This release is suitable for both instantaneous and permanent service. In the case of instantaneous service, the minimum current impulse time must be 100 ms.

2 Additional shunt opening release (-MO2)

Like the shunt opening release described above, this allows remote opening control of the circuit breaker and can be supplied by a circuit completely separate from the release (-MO1).

3 Shunt closing release (-MC)

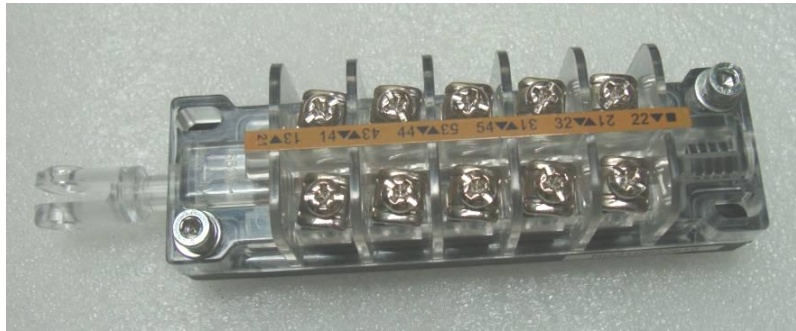
This allows remote closing control of the circuit breaker. The release can operate both in direct and alternating current. This release is suitable both for instantaneous and permanent service. In the case of instantaneous service, the minimum current impulse time must be 100 ms. Use of the permanently supplied release is recommended to carry out the electrical anti-pumping function.

Characteristics for MO1, MO2 and MC Coil/Releases

Characteristics	Specifications
Rated Voltages for Motor (Un)	24 VDC, 48 VDC, 60 VDC, 110 VDC, 220 VDC, 110 VAC, 230 VAC
Operating limits	70-110% Un
Inrush power (Ps) max	300 W, 300 VAC
Continuous Power (Pc)	5 W, 5 VA
#Closing time* (ms)	40-70
#Opening time (ms)	40-80
Inrush duration (ms) approx	100
Insulation voltage	2 kV 50 Hz for 1 min

\*for MC coil # in conjunction with circuit breaker

1) *Vacuum Circuit Breaker auxiliary contacts (-BB1,-BB2)*



Electrical signaling of circuit-breaker open/closed position can be provided with a group of 5 auxiliary contacts as standard. These are with combination of break contacts (signaling circuit-breaker open) and make contacts (signaling circuit-breaker closed) i.e. with options of BB1 (3NO+2NC) or BB2 (2NO+3NC).

2) *Switch Disconnecter/Circuit Breaker Disconnecter auxiliary contacts*



Switch disconnecter/Earthing Switch and circuit breaker disconnecter can be provided with 2NO+2NC for each of the positions

3) *Contact for signaling circuit breaker closing spring charged/ discharged (-BS2)*



This consists of a micro switch which allows remote signaling of the state of the circuit-breaker operating mechanism closing spring. The following signals are possible:

- Contact open: signaling spring charged
- Contact closed: signaling spring discharged.

The two signals must be used for circuits which have the same power supply voltage



1) VPIS



All modules are equipped with capacitive voltage indication type VPIS (Voltage Present Indicating System). This system has integrated LEDs. The LED starts to flicker when there is a system voltage between 10%-45% of line to ground voltage. By means of the sockets in VPIS it is possible to carry out phase balance check using suitable phase comparators.

2) Short Circuit and/or Earth Fault Indicators



Earth Fault Indicator



Earth Fault Indicator

Earth fault and/or short circuit indicators according to the DIN standards can be provided for both the Ring Cable Switches.

Shown above are panel mounted reading instruments. The reading instrument is equipped with a LED. The LED starts to blink, if the pre-adjusted operating current has been reached or exceeded. It can be reset manually or automatically after a certain defined delay. Test push button is provided and contact(s) for remote indication can be also provided. For different operating points/current settings, kindly check individual catalogues.

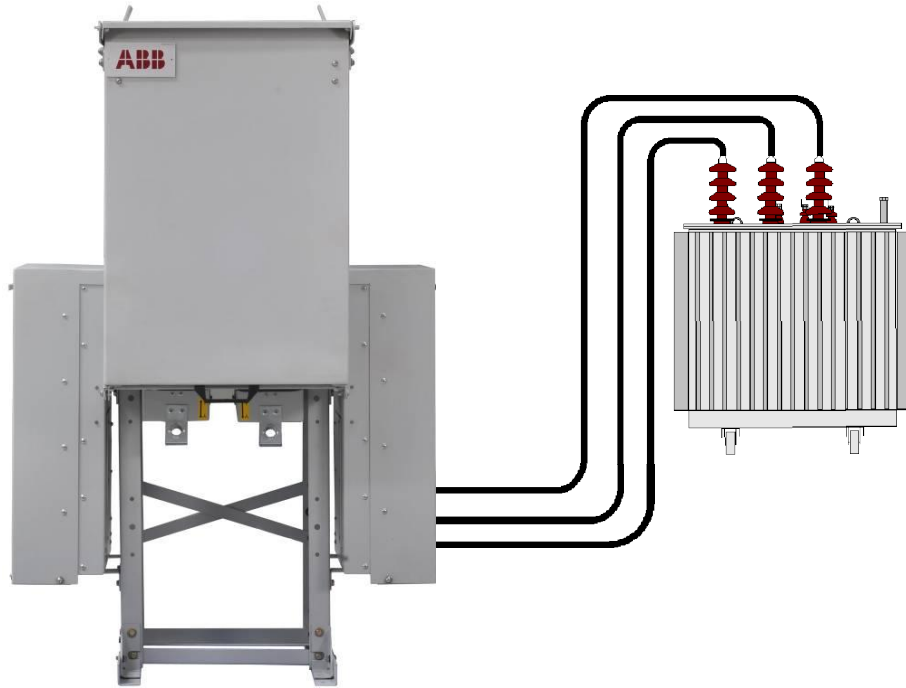


Sensors



Earth Fault and Short Circuit Indicator

Combined short circuit and earth fault can be also provided. The indicator set consists of one reading instrument, four sensors (one sensor on the 3 core cable and three for the individual 1 core cables) and four fibre optic cables. Earth fault and short circuit can be indicated via one LED each or short circuit via one LED for each core, one LED for earth fault. Besides this a remote indication for earth fault and short circuit via one relay contact can be also provided.



SafeLink CB offers a circuit-breaker in combination with relay for transformer protection which has better protection against low over-currents. Circuit-breaker with relay is always recommended for higher rated transformers. SafeLink CB is delivered with 630 A rated V-module. SafeLink CB has relay which is a self powered relay that utilizes the energy from the CTs under a fault situation, for energizing the trip coil. The CT's for the Vacuum Circuit Breaker are mounted on the T-off side cable bushings. The self powered relay can also be used for cable protection and more details on the different relays can be found in relay manufacturer's catalogue. Relay is mounted behind front door.



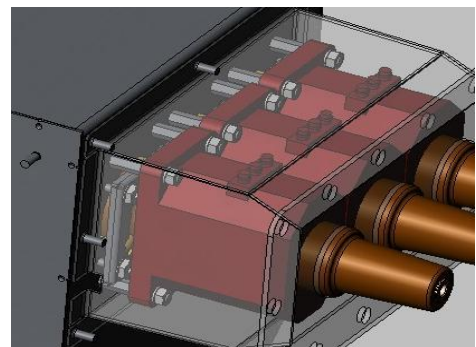
ABB REJ 603 Relay

*Typical for Vacuum Circuit Breaker protection:*

- Good protection against short-circuits
- Very good for protection of over currents
- Small fault currents are detected in an early stage

*Relay Characteristics*

- Economical
- Easy adjustment
- Perfect for large distribution transformers
- REJ603: ABB relay option with HMI
- Other relays with advanced over current and earth fault functions available

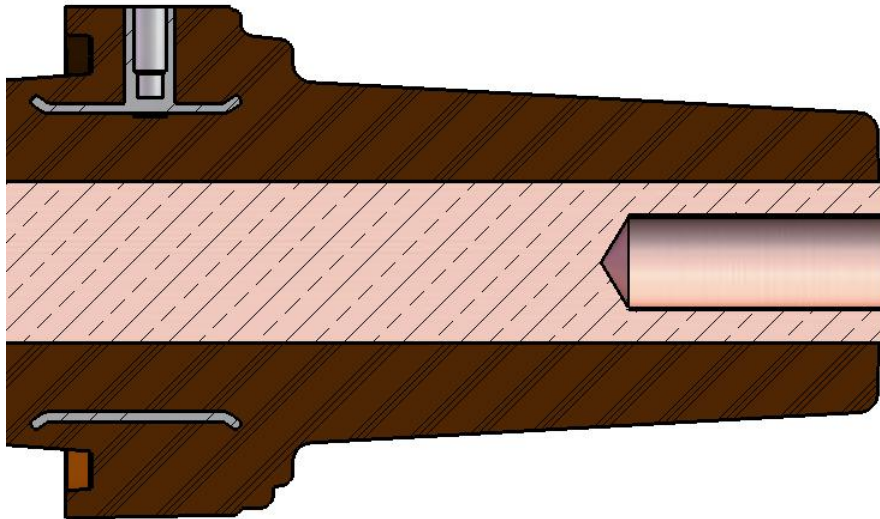


CT's mounted on T-off side bushings

SafeLink CB is equipped with cable bushings which comply with EN 50181 and IEC 60137 for termination of cables. The cable bushing has following external interface:

Interface C with M16 x 2 metric threads  
400 series,  $I_n = 630$  A  
Standard on C, V ( $I_n=630$ A)

All cable bushings are protected by cable compartment cover.



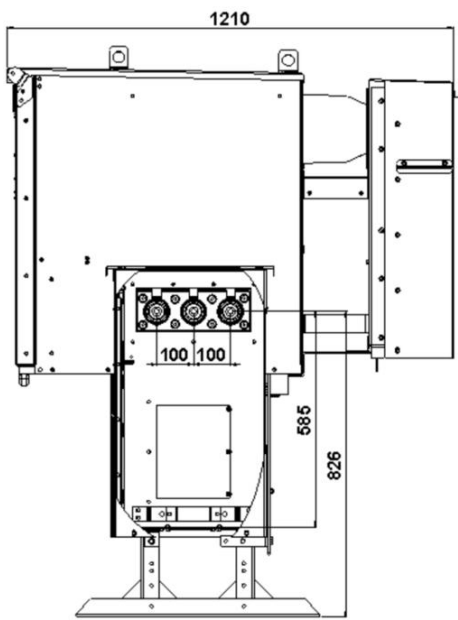
Cable Bushing Cross Section

*The installation instructions from the manufacturer of cable terminations must be followed. Be sure to lubricate the bushings thoroughly with the silicone grease supplied. Where cables are not connected, the Earthing Switch must be locked in closed position or the bushings must be fitted with dead end receptacles before the unit is energized.*

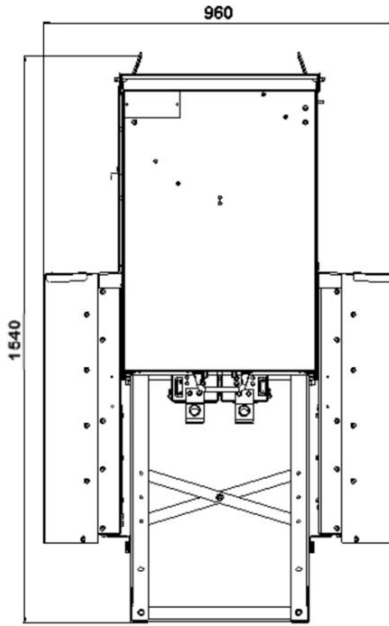
The following manufacturers of cable terminations are recommended:

- ABB Kabeldon
- Euromold/Elastimold
- Tyco/Raychem
- 3M

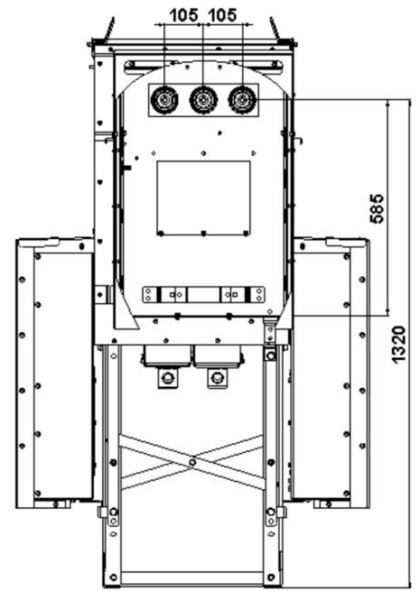
The cable bushings are situated on a height from the foundation level as per the details in next section.



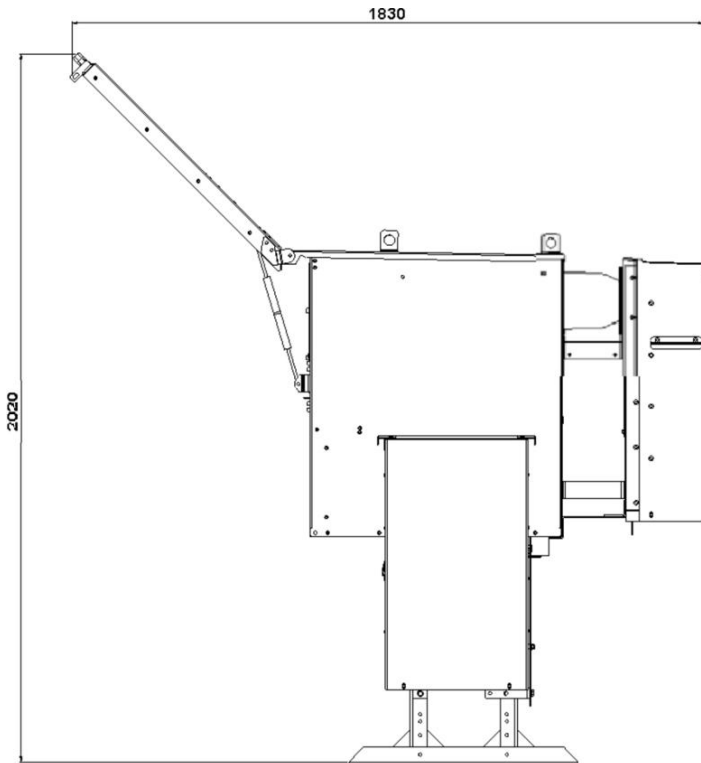
RHS View



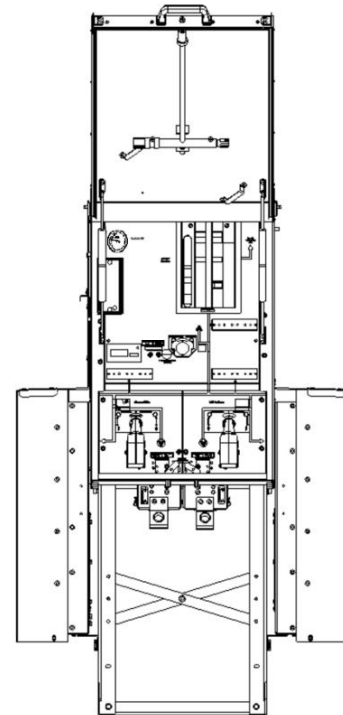
Front View



Back View

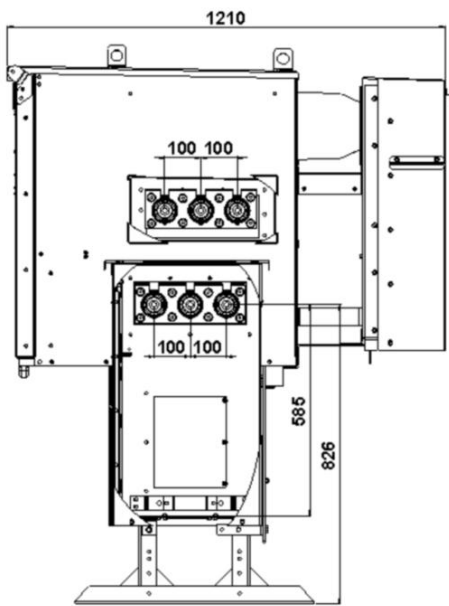


Side View with open door

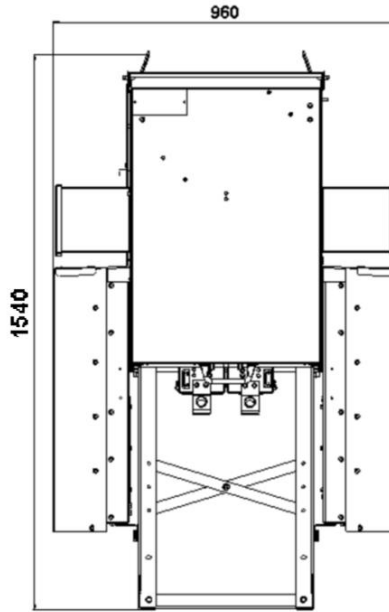


Front View with open door

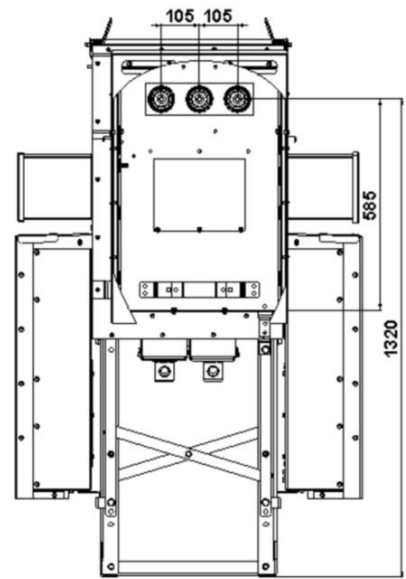
\* All dimensions are in mm



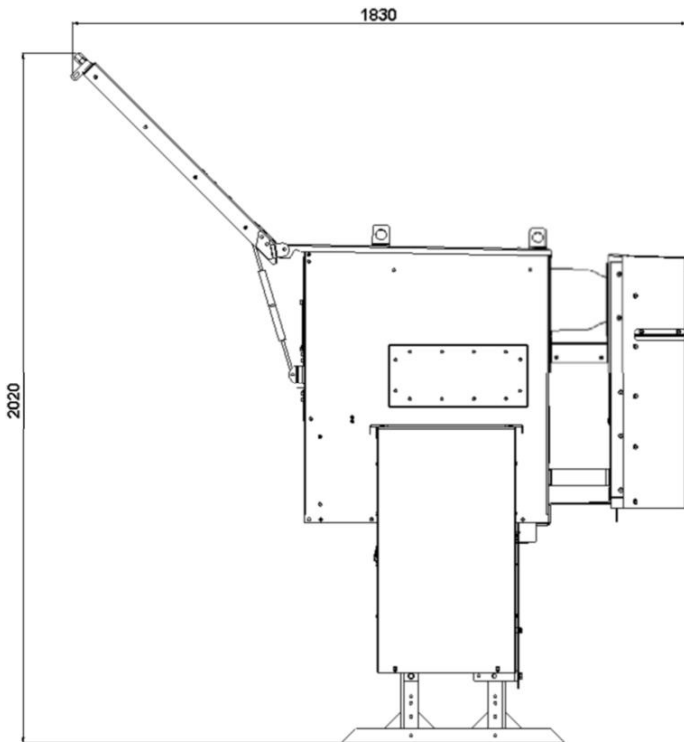
RHS View



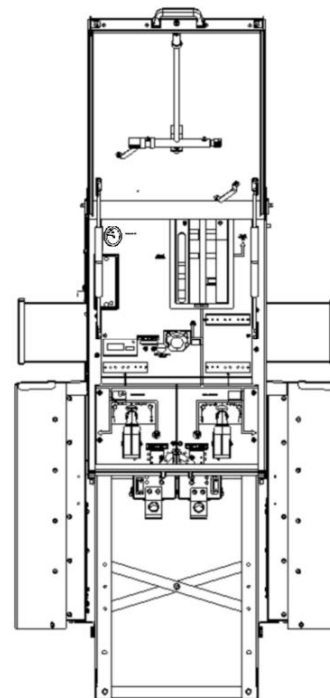
Front View



Back View

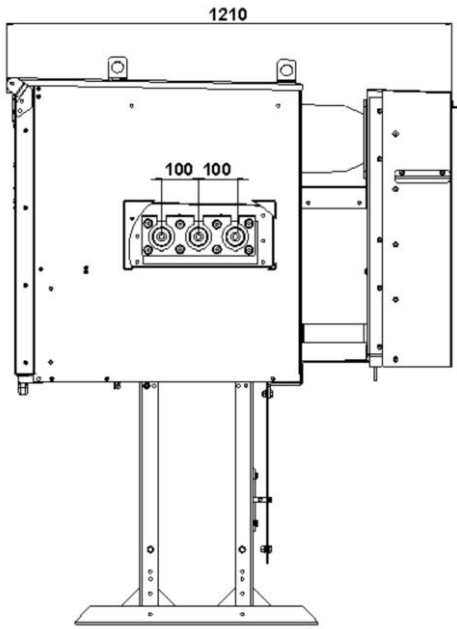


Side View with open door

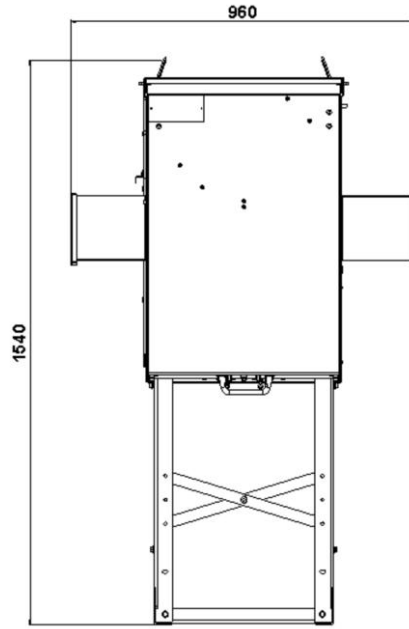


Front View with open door

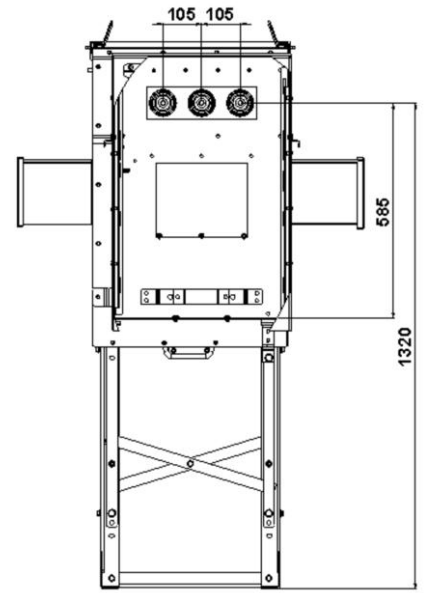
\* All dimensions are in mm



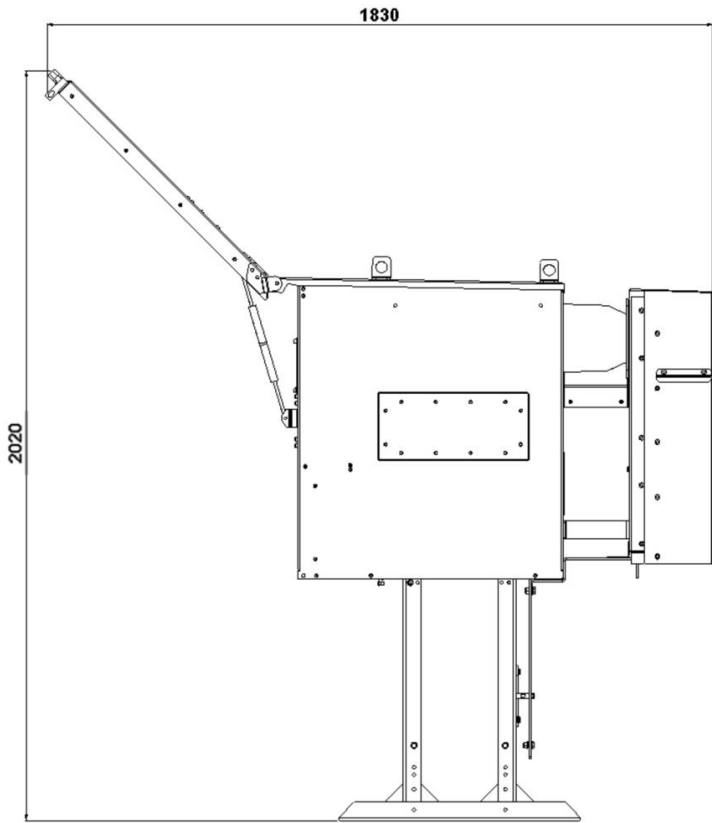
RHS View



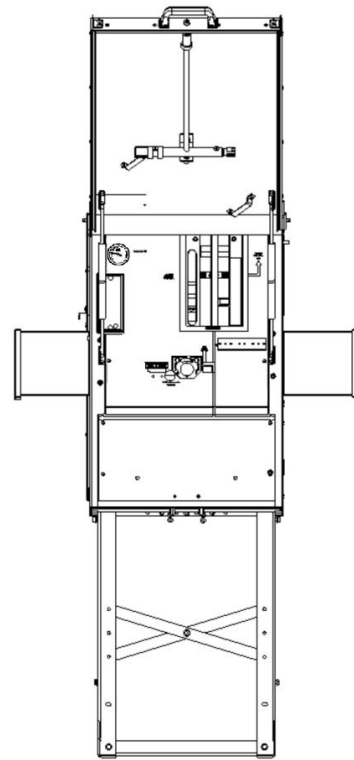
Front View



Back View



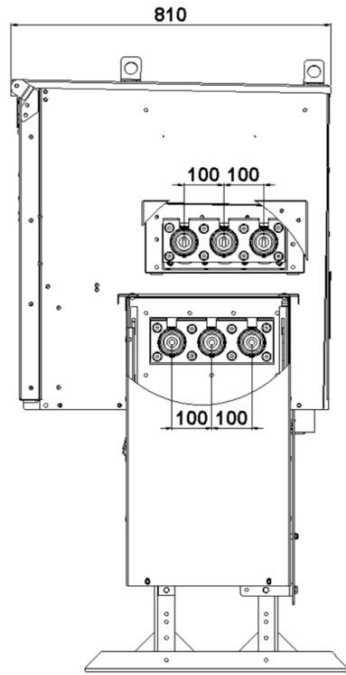
Side View with open door



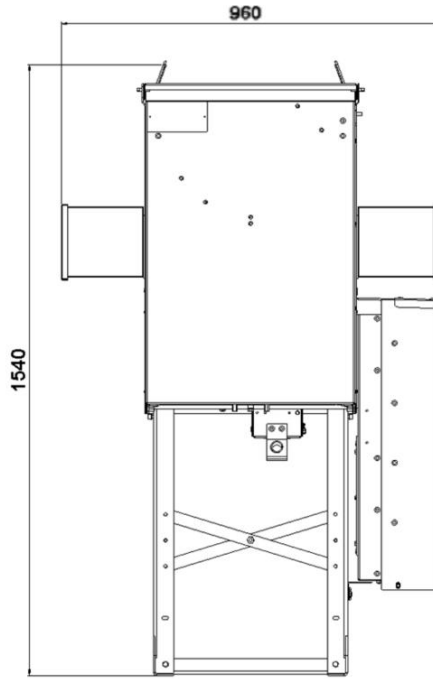
Front View with open door

\* All dimensions are in mm

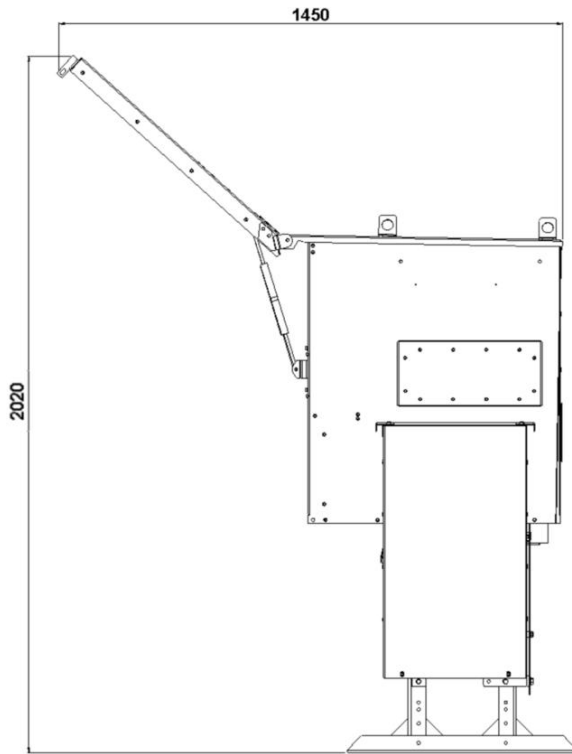




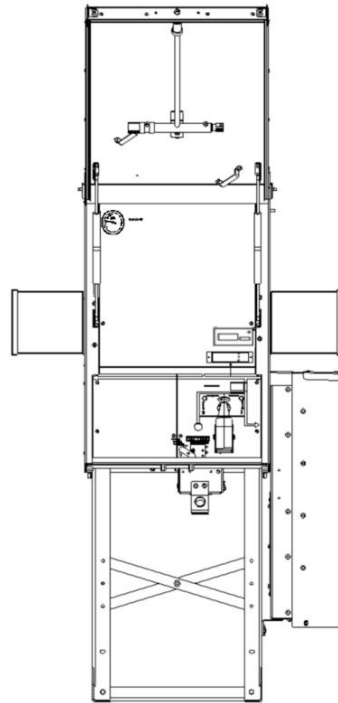
RHS View



Front View



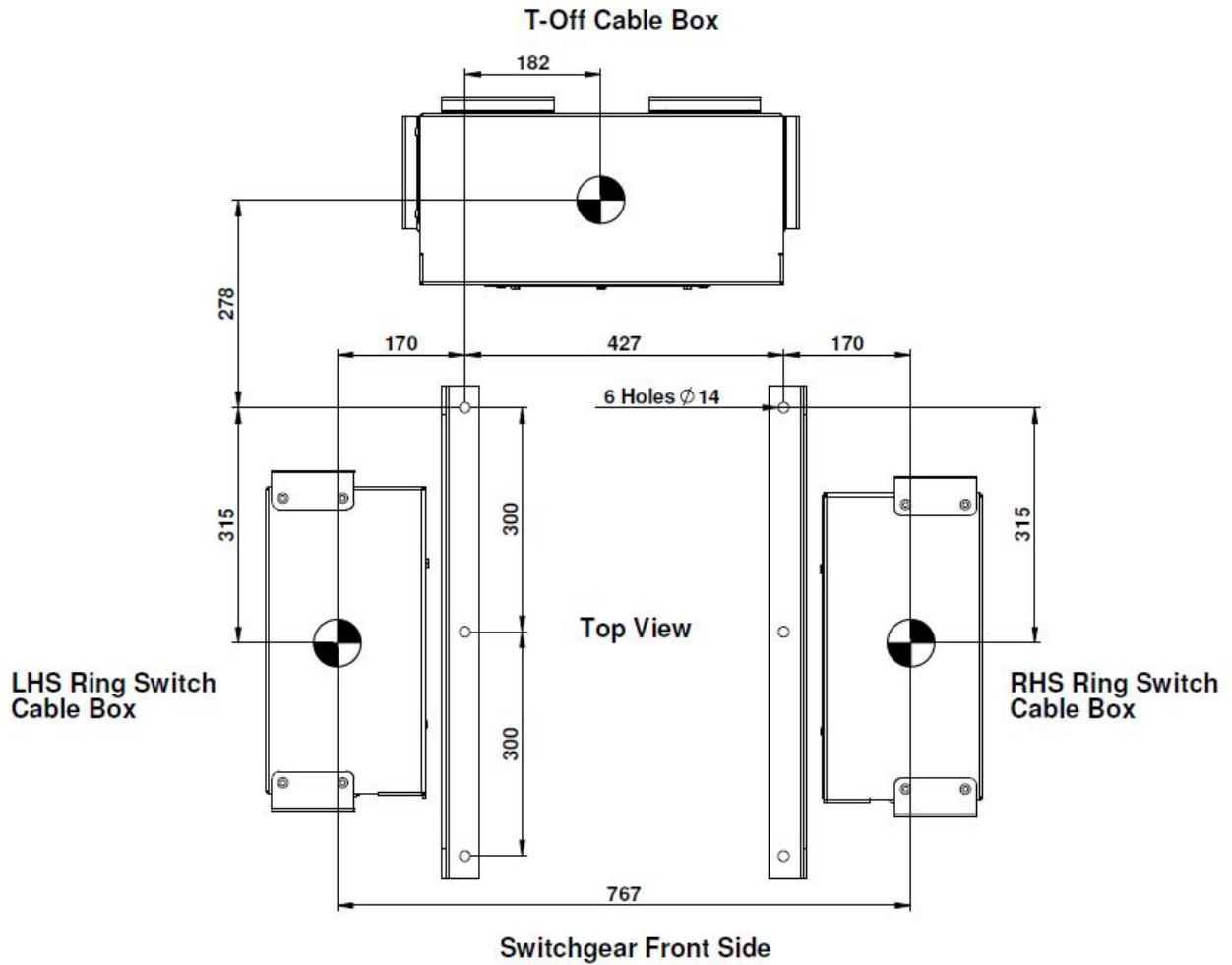
Side View with open door



Front View with open door

\* All dimensions are in mm

Following picture shows the footprint of SafeLink CB for foundation purpose considering a typical CVC configuration and its related cable entry positions<sup>1</sup>



Footprint as seen from bottom side of the unit

<sup>1</sup> Dimensions for T-off cable box to be considered for +V+ configuration and RHS Ring Switch Cable Box to be considered for +C+ configuration.

\* All dimensions are in mm. 6 holes of Dia. 14. are provided for foundation fixing purpose.

 Dowel Pin symbol indicates Cable Entry positions.

SafeLink CB is validated as per the following IEC standards

IEC 62271-1	High-voltage switchgear and controlgear Part 1: Common specification
IEC 62271-100	High-voltage switchgear and controlgear Part 100: High-voltage alternating-current circuit breakers
IEC 62271-102	High-voltage switchgear and controlgear Part 102: Alternating current disconnectors and Earthing Switches
IEC 62271-105	High-voltage switchgear and controlgear Part 105: Alternating current switch-fuse combination
IEC 62271-200	High-voltage switchgear and controlgear Part 200: A.C. metal enclosed switchgear and controlgear for rated voltages above 1kV and upto and including 52 kV
IEC 60265-1	High voltage switches- Part 1: Switches for rated voltage above 1 kV and less than 52 kV
IEC 60529	Degree of protection provided by enclosures (IP codes)

Normal ambient conditions

SafeLink CB is generally equipped for operation/service in normal indoor and outdoor conditions in accordance with IEC 62271-1. The following limitations apply:

Ambient temperature

Max. temperature	+40°C
Max. temperature (24-hour average)	+35°C
Min. temperature	- 25°C

Humidity

Max. average relative humidity measured over 24 hours 95%

Max. average relative humidity measured over 1 month 90%

Max height above sea level for installation without reducing gas pressure 1000 meters

Special conditions

In accordance with IEC 62271-1, the manufacturer and end-user must agree about special operating conditions which deviate from operation under normal conditions. The manufacturer/supplier must be consulted in advance if especially difficult operating conditions are involved. When electrical equipment is installed at more than 1000 meters above sea level, for example, the atmospheric pressure will be lower and the overpressure in the tank will have to be reduced.

1	Type of Ring Main Unit & Compact Switchgear	Metal enclosed switchgear and control gear according to IEC 62271-200
2	Number of poles	3
3	Pressure test on gas filled tank	1.728 bar abs (1 min withstand test)
4	Facility provided with pressure relief	Yes
5	Insulation gas	SF <sub>6</sub>
6	Nominal operating gas pressure	1.2 bar abs at 20°C
7	Minimum functional gas pressure	1.1 bar abs at 20°C
8	Gas leakage rate / annum	Less than 0.1%
9	Expected operating lifetime	30 years
10	Facilities provided for gas monitoring	Yes, temperature compensated manometer can be delivered
11	Material used in tank construction	Stainless steel sheet
12	Main Busbar	320 mm <sup>2</sup> Cu
13	Earth bar external	120 mm <sup>2</sup> Cu
14	Overall dimension of fully assembled RMU (Width x Height x Depth) CVC,+CVC+ & +V+ +C+	960 x 1540 x 1210 (mm) 960 x 1540 x 810 (mm)
15	Approximate weight of standalone standard units excluding additional equipments and transport pallets  CVC, +CVC+ +V+ +C+	325 kg 355 kg 275 kg 215 kg
16	Distance between adjacent side sheets for extensible RMU's in coupled condition	512 mm

1	Means of switch and disconnecter operation	separate handle
2	Means of circuit breaker operation	Inbuilt handle and push button
3	Rated operating sequence of circuit breaker	O - 0.3 sec - CO - 3 min - CO
4	Total opening time of circuit breaker	40-80 ms approx
5	Closing time of circuit breaker	40-70 ms approx
6	Mechanical operations of Switch	1000 CO
7	Mechanical operations of all Earthing Switches	1000 CO
8	Mechanical operations of disconnecter	1000 CO
9	Mechanical operations of circuit breaker	5000 CO
	<i>Load break switch</i>	
10	Rated operation on short circuit current (Class E2)	3
11	Rated operations mainly active load	100
	<i>Degree of protection</i>	
12	High voltage live parts, SF <sub>6</sub> tank	IP 67
13	Front mimic and mechanism cover	IP 2X
14	Protection class for external structure and cable box	IP 54
	<i>Colors</i>	
15	Front mimic	RAL 7035
16	External structure and cable covers	RAL 7035 (standard)
	<i>Cable compartment data</i>	
17	Phase to phase center distance (Ring Switch Side)	100 mm
18	Phase to phase center distance (T-off side)	105 mm
19	Phase to phase clearance (min)	75 mm
20	Phase to earth clearance	65 mm
21	Phase to earth over insulator surface (creepage)	110 mm
22	Type of cable termination adapters	Elbow or T-connector





#### Life Expectancy of Product/Environment Declaration:

The product is in compliance with the requirements denoted by IEC 62271-200. The design incorporates a life span under normal service conditions (IEC 62271-1 subclause 2.1). The switchgear is gas-tight and classified as sealed pressure system\*) with an expected operating life exceeding 30 years and a diffusion rate of less than 0.1 % per year (IEC 62271-1 subclause 5.15 and annex E). Referring to the filling pressure of 1.2 bar, the switchgear will maintain gas-tightness and a gas-pressure better than 1.1 bar\*) throughout its operating life.

\*) No topping up required during operating life at 20°C

#### End-of-life

ABB is committed to the protection of the environment and adhere to ISO 14001 standards. It is our obligation to facilitate end-of-life recycling for our products. There exist no explicit requirements for how to handle discarded switchgear at end-of-life. ABB's recycling service is according to IEC 61634 edition 1995 section 6: «End of life of SF6 filled equipment» and in particular 6.5.2.a: «Low decomposition»: «No special action is required; nonrecoverable parts can be disposed of normally according to local regulations.»

We also recommend ABB's website : <http://www.abb.com/sf6> .

The production processes are carried out in compliance with the standards for environmental protection in terms of reduction in energy consumption as well as in raw materials and production of waste materials. This is to allow maximum recycling at the end of the useful life cycle of the switchgear.

Raw Material	Weight	% of total weight -325 kg	Recycle	Environmental effects & recycle reuse processes
Iron	200.10	61.57	Yes	Separate, utilise in favour of new source (ore)
Stainless steel	50.26	15.46	Yes	Separate, utilise in favour of new source (ore)
Copper	31.83	9.79	Yes	Separate, utilise in favour of new source (ore)
Brass	2.28	0.70	Yes	Separate, utilise in favour of new source (ore)
Aluminium	2.27	0.70	Yes	Separate, utilise in favour of new source (ore)
Zinc	3.90	1.20		Separate, utilise in favour of new source (ore)
Silver	0.08	0.02		Electrolysis, utilise in favour of new source
Thermoplastic	3.50	1.08	Yes	Make granulate, re-use or apply as energy superior additive in refuse incineration
Epoxy incl. 60% quartz	13.15	4.05	Yes	Grind to powder and use as high grade energy additive in cement mill
Bakelite	3.06	0.94	Yes	Make granulate, re-use or apply as energy superior additive in refuse incineration
Rubber	0.51	0.16	Yes	High grade energy additive in refuse incineration
SF6 gas	0.80	0.25	Yes	ABB reclaims used SF6 gas.
Total for recycling	311.73	95.92		
Not specified*	13.27	4.08		Stickers, Film-foils, powder coating, screws, nuts, tiny components, grease.....
Total weight	325.00	100.00		
Packing foil	0.20		Yes	High grade energy additive in refuse incineration
Wooden pallet	20.00		Yes	Re-use or use as energy additive in refuse incineration

\*All the above figures are for CVC configuration (non-ext. version)  
 Not specified weight can vary based on the additional mountings and auxiliaries

ABB Limited operates a process of continuous product development. We therefore reserve the right to change designs, dimensions and data without prior notice.

**ABB**

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Power and productivity  
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