SafeLink CB is an extremely compact & robust gas insulated switchgear suitable for secondary distribution network, fitted with hermetically sealed SF6 gas tank, suitable for outdoor applications, ensuring best personnel safety as per latest IEC standards, compatible with SCADA integrated network.
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1. Safety

For your safety!
- Strictly follow these installation and operating instructions.
- Ensure that installation, operation and maintenance is only carried out by professional personnel.
- Comply fully with the standards in force (IEC or local), the conditions of the local power utility and the applicable safety at work regulations.
- Observe the relevant information in the manual for all actions involving the switchgear.
- Use PPEs when installing or operating switchgear.

Skilled personnel
All the installation, putting into service, running and maintenance operations must be carried out by skilled personnel with in-depth knowledge of the apparatus. When carrying out any maintenance work, the regulations in the country of installation must be strictly obeyed. Maintenance work must only be performed in a professional way by trained personnel familiar with the characteristics of the switchgear, in accordance with all the relevant IEC safety regulations and those of other technical authorities, and also respecting other overriding instructions. It is recommended that ABB service personnel be called in to perform the servicing and repair work.

Crucial information
Pay special attention to the information shown in the manual by the following attention symbol:

⚠️

After this symbol there are four different explanations indicating what types of injuries or damage can be caused should the recommended precautions not be followed:

- **DANGER** - identifies the most serious and immediate hazards which can cause serious personal injury or death
- **WARNING** - identifies hazards or unsafe practices which can result in serious personal injury or death
- **CAUTION** - identifies hazards or unsafe practices which can result in minor personal injury or product or property damage
- **NOTE** - identifies important procedures or requirements that, if not followed, can result in product or property damage

Warning
Make sure that the specified electrical ratings are not exceeded under switchgear operating conditions. Keep the manuals accessible to all personnel involved in installation, operation and maintenance. The user’s personnel are responsible for all matters regarding safety in the workplace and correct use of the switchgear.

Warning
Always follow the instructions in the manual and respect the rules of good engineering practice (GEP)! Hazardous voltages can cause serious injury or death! Disconnect the power and earth live parts before proceeding with any work on the switchgear. Follow the safety regulations in force in the place of installation.

Contact us
If you have any further questions about this manual, our field service team will be pleased to help.
2. General description

2.1 Product description

SafeLink CB is a SF6 insulated outdoor ring main unit for applications in 12 kV/13.8 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. The transformer is protected by vacuum circuit breaker module. The units are delivered from the factory completely tested and ready for installation. Routine tests are carried out on all units/modules before dispatch. No special tools are required for installing the equipment.

Vacuum circuit breaker in SafeLink CB is in compliance with IEC 62271-100.

With this unit the transformer will be protected by a vacuum circuit breaker combined with relays and current transformers. The standard relays are based on digital technology and do not require an external power supply.
2.2 Arrangement

1. Rating plate
2. Manometer
3. Front upper Mimic
4. Relay
5. VCB disconnector padlock
6. Fault indicator
7. VPIS for ring switch RHS
8. Ring switch RHS
9. Cable box for ring switch RHS
10. Test point box for ring switch RHS
11. Switchgear stand
12. Earth & circuit slider for ring switch
13. VCB disconnector
14. Operating handle
15. Door handle
16. Padlocking for switchgear front door
17. Switchgear front door
18. Gas spring for switchgear front door
19. Switchgear earthing
20. T-Off cable box (For VCB)
21. Current transformer
   (Directly mounted on VCB bushings)
22. Lifting hook for switchgear
23. End box (For extensible version only)
24. 'V' module section
25. 'C' module section
2.3 Dimensions

CVC Non Extensible
10kA 0.1s AFLR cable boxes & Vertical Front Door

* All dimensions are in mm
+CVC+ Both Sides Extensible
10kA 0.1s AFLR cable boxes & Vertical Front Door

* All dimensions are in mm
+V+ Both Sides Extensible
10kA 0.1s AFLR cable boxes & Vertical Front Door

* All dimensions are in mm
+C+ Both Sides Extensible
10kA 0.1s AFLR cable boxes & Vertical Front Door

*RHS view

Front view

Side view with open door

Front view with open door

* All dimensions are in mm
CVC Non Extensible
10kA 0.1s AFLR cable boxes & Horizontal Front Door

* All dimensions are in mm
+CVC+ Both Sides Extensible
10kA 0.1s AFLR cable boxes & Horizontal Front Door

* All dimensions are in mm
CVC Non Extensible
10kA 0.1s AFLR cable boxes & Horizontal Front Door

*RHS view

*Front view

*Back view

*Side view with open door

*Front view with open door

*All dimensions are in mm
CVC Non Extensible
21kA 1s AF cable boxes & Horizontal Front Door

*All dimensions are in mm*
+CVC+ Both Sides Extensible
21kA 1s AF cable boxes & Vertical Front Door

* All dimensions are in mm
+V+ Both Sides Extensible
21kA 1s AF cable boxes & Vertical Front Door

*R* All dimensions are in mm
+C+ Both Sides Extensible
21kA 1s AF cable boxes & Vertical Front Door

* All dimensions are in mm
3. Transport and handling

3.1 Transportation

The units delivered from the factory are ready for installation. Weight for standard SafeLink CB type +CVC+ is approximately 355 kg (without additional equipment and transport related material). SafeLink CB unit is fitted with 4 lifting lugs with hole dia. of 30 mm on top side as per the details shown in the dimensional section, but can also be moved on pallets with a forklift truck.

Caution

The units are top heavy so please handle with care. Proper belting must be used while transporting on forklifts to avoid toppling of the unit.

Note

Use all 4 lifting hooks while lifting. Included angle between slings as shown above should be always less than 90°.
3.2 By receiving – inspection

Upon receiving the SafeLink CB unit, please check that the delivered equipment has not been damaged during transport. If any such damage has occurred, a claim must be submitted to the carrier immediately wherever applicable.

After unpacking, the following must be checked:
1. Check whether the received product is as per requirements provided
2. Operating handle – 1 piece should be included, normally fixed on inner side of the front door
3. Check that the pointer on the SF₆ pressure indicator is in the green area/zone
4. Carry out a functional test on the mechanisms and interlocks

During/Prior to commissioning following tests can be carried out as per practice (if required)
1. Insulation resistance/Megger testing
2. CT/Trip coil testing for circuit breaker operation based on relay settings
3. Contact resistance measurement test
4. Verification of wiring & tightness
5. High voltage test

Any faults or omissions must be reported immediately to the supplier/concerned agency.

3.3 Storage

It is strongly recommended that the ring main unit is stored under cover in a dry and well-ventilated area until it is installed and put into operation. Further to this it is also recommended to store ring main unit on factory assembled pallet to avoid damage to base frame. Units that are stored for a long time should be protected against dust and debris.
### 4. Technical data

<table>
<thead>
<tr>
<th></th>
<th>C Module</th>
<th>V Module</th>
<th>Earthing switch</th>
<th>Vacuum circuit breaker</th>
<th>Earthing switch</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C Module</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>V Module</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated voltage</td>
<td>kV</td>
<td>12/13.8</td>
<td>12/13.8</td>
<td>12/13.8</td>
<td>12/13.8</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>Hz</td>
<td>50/60</td>
<td>50/60</td>
<td>50/60</td>
<td>50/60</td>
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<tr>
<td>Power frequency withstand voltage</td>
<td>kVrms</td>
<td>38</td>
<td>38</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>- across disconnector</td>
<td>kVrms</td>
<td>45</td>
<td>45</td>
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</tr>
<tr>
<td>Lightning impulse withstand voltage</td>
<td>kVp</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>- across isolating distance</td>
<td>kVp</td>
<td>110</td>
<td>110</td>
<td>110</td>
<td>110</td>
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<td>Rated normal current*</td>
<td>A</td>
<td>630</td>
<td>630</td>
<td>630</td>
<td>630</td>
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<tr>
<td>Breaking capacities</td>
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<td></td>
</tr>
<tr>
<td>- active load breaking current</td>
<td>A</td>
<td>630</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- closed loop breaking current</td>
<td>A</td>
<td>630</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- cable charging breaking current</td>
<td>A</td>
<td>25</td>
<td></td>
<td>25 (Class C2)</td>
<td></td>
</tr>
<tr>
<td>- line charging breaking current</td>
<td>A</td>
<td>1</td>
<td></td>
<td>10 (Class C2)</td>
<td></td>
</tr>
<tr>
<td>- earth fault breaking current</td>
<td>A</td>
<td>75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- earth fault cable and line charging</td>
<td>A</td>
<td>43.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- short circuit breaking current</td>
<td>kA</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Making capacity</td>
<td>kAp</td>
<td>52.5/54.6</td>
<td>52.5/54.6</td>
<td>52.5/54.6</td>
<td>52.5/54.6</td>
</tr>
<tr>
<td>Short time current (3-sec)</td>
<td>kA</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Short time current (1-sec)</td>
<td>kA</td>
<td>21 (Earthing circuit)</td>
<td>21 (Earthing circuit)</td>
<td>21 (Earthing circuit)</td>
<td>21 (Earthing circuit)</td>
</tr>
<tr>
<td>Rated filling level for insulation</td>
<td>0.02 MPa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal arc classification</td>
<td>AFLR 10kA 0.1s / AF 21kA 1s</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical &amp; mechanical classes</td>
<td>E3, C2, M1</td>
<td>E2, M0</td>
<td>E2, C2, S1, M1+3000, M2 (Optional)</td>
<td>E2, M0</td>
<td></td>
</tr>
<tr>
<td>Rated operating sequence</td>
<td>-</td>
<td></td>
<td></td>
<td>0-0.3 sec-CO-3 min-CO</td>
<td></td>
</tr>
<tr>
<td><strong>V Module</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated filling level for insulation</td>
<td>0.02 MPa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short time current (on earthing circuit)</td>
<td>21 kA 1 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal arc classification (IAC)</td>
<td>10 kA 0.1 Sec / 21 kA 1 sec**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated normal current for external busbar</td>
<td>630 A (for extensible version)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Earthing operation is through vacuum circuit breaker, hence no making capacity assigned

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

**optional against request
5. Installation

5.1 Foundation details

The floor must be well leveled and the unit must be fixed by means of anchor bolts wherever possible in accordance with the dimensional drawing. Holes provided in the base channel are suitable for M10 hardware. Minimum distance of 300 mm has to be maintained between the walls (if any on the back and lateral sides) and the outer faces of cable boxes.

The below foundation/footprint details are applicable for all configurations except +C+ & coupled SafeLink CB involving +C+. 

<table>
<thead>
<tr>
<th>Description</th>
<th>10 kA IAC cable box</th>
<th>21 kA IAC cable box</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>312 mm</td>
<td>312 mm</td>
</tr>
<tr>
<td>B</td>
<td>178 mm</td>
<td>178 mm</td>
</tr>
<tr>
<td>C</td>
<td>278 mm</td>
<td>290 mm</td>
</tr>
<tr>
<td>D</td>
<td>182 mm</td>
<td>182 mm</td>
</tr>
</tbody>
</table>

Dowel pin symbol indicates cable entry positions.
Flatness of concrete plinth area covering 600x800 mm should be within ±2 mm. This area only considers switchgear foundation. Concrete plinth height of minimum 200 mm is recommended.

- Wherever it is not possible to have proper leveling, use channel, ISMC-75 as per IS-2062/1999.

- Alternatively unit can be directly bolted to the concrete foundation with suitable M10 Fischer bolts (6 Nos.)

**Note!** Always use all 6 Nos. of holes for foundation purpose.
5.2 Door Opening/Closing

Front door of the RMU opens towards the top side as shown below. After certain degree of opening, the gas spring will make the door to open by itself. Similarly while closing the door, after certain degree, the door will pull in on account of snap action resulting from the gas springs. The door can be locked as shown below.

SafeLink CB also have a version of front door opening in horizontal way. There is a provision for locking the door open position as shown. To close front door just lift the pin and close the door. Three point lock on front door with locking possibility is there.

Caution

Care should be taken while opening/closing front door due spring back/pull in action.
5.3 Front Mimic opening/closing

Top and bottom front mimic covers can be removed as per the following procedure:

Opening of Top Front Mimic
1. It is recommended that circuit breaker is ON and disconnector is in Earth condition
2. Remove 2 Nos. of M5 screws on EL2 mechanism cover
3. Remove right side gas spring mounted on side sheet by removing M8 hexagonal nut
4. EL2 mechanism cover can now be removed by suitably pulling manual charging lever of EL2 mechanism and top mimic can be removed by unscrewing M6 screws

Caution
Care should be taken while working with EL2 mechanism in charged condition.

Opening of Bottom Front Mimic (LH/RH)
1. It is recommended that respective ring switch is in Earth condition and rotary selector is in middle position i.e. handle access blocked
2. Take out rotary selector by unscrewing 2 numbers of M5 screws and then M4x30 grub screw
3. Remove 3 Nos. of M6 button head socket screws
4. Respective bottom mimic can be removed now
6. Internal arc classification

SafeLink CB is available for a wide range of installations and applications in order to secure the highest safety for operators. Switchgears are designed and type tested for internal arc classification according to the following configurations.

**Internal arc classification – 10kA 0.1s**
With this configuration, for any internal arc inside SF6 gas tank, hot gases and pressure are evacuated towards switchgear top. For internal arc inside cable compartment, hot gases and pressure are evacuated towards switchgear bottom.
In this setup, the switchgear can be installed as free standing.

**Basic parameters of setup:**
IAC AFLR 10kA 0.1s (for cable compartment)
IAC AFL 21kA 1s (for SF6 gas tank)
Switchgear needs to be installed and fixed to the floor in accordance with “SafeLink CB installation and operating instructions”

**Internal arc classification – 21kA 1s**
With this configuration, for any internal arc inside SF6 gas tank, hot gases and pressure are evacuated towards switchgear top. For internal arc inside cable compartment, hot gases and pressure are evacuated towards switchgear bottom. In this setup the switchgear can be installed as free standing.

**Basic parameters of setup:**
IAC AF 21kA 1s (for cable compartment)
IAC AFL 21kA 1s (for SF6 gas tank)
Switchgear needs to be installed and fixed to the floor in accordance with “SafeLink CB installation and operating instructions”
7. Cable compartment

7.1 Removal of cable box covers

7.1.1 Switch disconnector cable box

Ring switch side cable box covers can be opened with the help of lifting flaps only when the respective earth switch is closed position and handle access to the mechanism is prohibited as shown below. For basic switch operation, please see section 5.2 and 5.3.

Loosen the 4 Nos. of Allen M8 screws provided on all the cable box sides as shown below.
7.1.2 Vacuum circuit breaker cable box

The T-off side cable box can be removed only when the disconnector is in earthed condition and the circuit breaker is in closed position. Earthing operation for the T-off side cable will be as per the following sequence (starting with normal working condition of the switchgear i.e. circuit breaker closed and disconnector – closed):

1. First open/trip the circuit breaker
2. Move the disconnector to open position
3. Move the disconnector to earth position
4. Close the circuit breaker

Loosen 4 Nos. of M8 screws provided on the cable box sides (in similar manner explained above).

**Warning**

Kindly ensure that none of the cables connected are live because of upstream or remote connection before doing any operation or earthing of cables.

When the T-off side cable box is removed, manual trip/open operation of the push button lever of the EL2 mechanism (for circuit breaker) is restricted.

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Disconnector Earthed & BKR ON

---

Removal of T-off side cable box
7.2 Cable termination

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, In = 630 A
  - Standard on C, V (In=630A)

All cable bushings are protected by cable compartment cover.

The following manufacturers of cable terminations are recommended:

- Nkt
- Euromold/Nexans
- Tyco/Raychem
- 3M

Either the cable termination shall be screened touch proof cable terminations with Elbow connector or insulated terminal protectors.

The cable bushings are situated on a height from the foundation level as per the details provided in “Dimensions”.

Below is the basic representative cable termination for 12kV SafeLink CB from cable box gland plate to bushing center.

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.
Following pictures shows the tightening torque and fasteners to be used for the bushing terminations. Cable size of maximum 300 sq. mm can be used.

**Warning**

Proper tightening torque of 50 N-m should be given to ensure good connection/contact of cable lug to bushing copper face.

**For cable lug hole size = 16.2 mm**

- RMU cable bushing
- Copper contact surface
- Silver plated copper washer
- Cable lug
- M 16 cup washer
- M 16x30 MS hex bolt

**Warning**

M16/M10 reducer stud should be inserted properly inside the bushing, such that lug touches the bushing copper face properly. Tightening torque of 30 N-m should be also properly ensured.

**For cable lug hole size < 16.2mm**

- RMU cable bushing
- Copper contact surface
- Reducer stud
- Cable lug
- M10 cup washer
- M10 MS hex nut
Following pictures show cable bushing and cable box related dimensions and an illustration of 3-core cable termination.

![Cable Box Dimensions](image)

3-core termination

* T-off Cable Box dimensions.

External earthing bar shall be provided close to the gland entry position for each cable compartment for the purpose of cable earthing.

![Phase Positions/Sequence](image)

Warning

Before/while doing installation and cabling related work, following points to be used as check points to avoid equipment damage and serious personnel injury.

Important check points

- Before starting cabling work, RMU frame/body is earthed
- Cable bushings epoxy surfaces thoroughly lubricated with the silicone grease (supplied) before inserting insulating boots
- 1 Cable lug suitable to 25 mm diameter copper rod of cable bushings
- Cable lug directly in contact with cable bushing copper face and no sharp edges on the cable lug
- 3 Termination joints properly tightened with torques (by calibrated tool) as per instructions on page 24
- 3 Installation instructions and procedure suggested by cable manufacturer strictly followed and all possible compatibility issues between insulating components checked
- Assembly and installation of stress control tubes done properly
- Where cable not connected, earthing switch locked in closed position or the bushings fitted with dead end receptacles before the unit is energized
- All cable phase connections match with phase positions/sequence as per page 25.
- Proper cable clamping with supplied cable clamps to avoid any load on bushing and gland area sealed properly to avoid dust/verm entry
- All 3 cables in 3 core terminations cut and adjusted properly so that cable lug hole and M16 copper hole of cable bushing is concentric
- In case of a cable length mismatch, no tool or crooked method employed by which cable bushing are stressed
- Dust or other particles accumulated because of improper storage or site conditions thoroughly cleaned and all cable boxes clean from inside
- Cable earthing done to the earthing strip provided close to respective cable boxes.

1 Failure to do this can result in prolonged heat generation at the particular cable joint and subsequently failure of cable insulation and resulting in a flashover phenomenon.

2 It is recommended to have cable terminations kits and boots/elbows from the same manufacturer so as to avoid compatibility issues. Due to incorrect size and mismatch of insulating components long term dielectric withstand cannot be guaranteed.

3 This is to ensure stress free connection and to avoid entry of dust/small creatures into the cable compartment, which may severely reduce dielectric performance.

Screened/touchproof separable connectors for cable size upto 300 sq. mm. can be used in SafeLink CB as optional.
Available options

- NKT SOC 630
- Euromold/Nexans 430-TB 630 A

**ABB Kabledon SOC 630**
1. Insulating plug
2. Bolt
3. Cable lug
4. Inner conductive layer
5. Insulating layer
6. Outer conductive layer
7. Adapter
8. Earth connection
9. Designed for polymeric insulated cables
10. Capacitive test point (optional)

**Euromold 430-TB 630 A**
1. Type C - 630 A interface as described by CENELEC EN 50180 and 50181
2. Clamping screw
3. Conductive EPDM insert
4. Insulating EPDM layer moulded between the insert and the jacket
5. Conductive EPDM jacket
6. Conductive rubber cap
7. Basic insulating plug
8. Conductor connector
9. Cable reducer
10. Earthing lead
7.3 Cable testing

Cable testing and locating cable faults are performed in three ways

Option 1: Directly on the test point bushing if they are fitted on the unit.

Option 2: Cable connector dismounted from the switchgear.

Caution

Cable testing must be carried out in accordance with the cable manufacturer’s recommended practice.

Danger

Remember that the cable has two ends. Both ends of the cable need to be isolated. This is typically done by opening the switch disconnectors of SafeLink CB switchgears connected to the cable. The free end of the tested cable needs to be secured against accidental access.

7.3.1 Procedure of cable testing with TP bushing

Each ring switch has test point facility. The test point bushings are situated on the bottom side of tank. Each TP bushing set has a separate covering box which is interlocked with the respective earth switch. The test point covers/boxes can be opened or closed with the one end of the operating handle as shown on page 34. The test point box is interlocked with the respective ring switch mechanism. It can be opened only when the ring switch is in earthed condition and the handle access is blocked.
Test Point Box Opening/Closing

1) Insert handle in the TP box handle socket. Simultaneously pull the TP lever knob towards out as shown by the arrow.
2) Pull down the handle as per the direction shown to open the T.P. box.
3) To close push the handle upwards as per the direction shown.
4) Ensure that the lock rod is properly located in the hole provided in locker.

**Warning**

Cable testing should be carried out in accordance with the cable manufacturer's recommended practice.

**Caution**

While closing the TP box, please ensure that it is fully closed upwards until there is a latching/click sound as this is important for correct operation of the interlocks and free movement of the TP lever knob before the opening operation.
7.3.2 Procedure of Cable Testing without TP bushing but with cable disconnected from the switchgear

1. Open switch disconnector.
2. Check voltage status.
3. If voltage is not present, close the earthing switch.
4. Open cable compartment cover.
5. Remove cable connector from the switchgear.
6. Connect test rod or test lead to cable connector.
7. Perform the test respecting maximum test voltage levels as detailed in instructions from cable supplier and cable connector supplier.

When the cables are disconnected at both ends, the cable testing is independent from the switchgear. Procedures and test values are determined by the cable, cable terminations and test equipment. Test procedure and methods must follow recommendations and limitations related to the cable, cable terminations and test equipment.

8. Disconnect test equipment.
9. Refit cable connector to switchgear.
10. Refit cable compartment cover.

Maximum cable test voltages when testing the cables with test point bushing or without test point bushing (cables connected or disconnected)

<table>
<thead>
<tr>
<th>Rated voltage of the switchgear</th>
<th>Ur (kV rms)</th>
<th>12kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power frequency cable test voltage</td>
<td>Uct(ac) (kV rms)</td>
<td>12kV</td>
</tr>
<tr>
<td>DC cable test voltage</td>
<td>Uct(dc) (kV peak)</td>
<td>24kV</td>
</tr>
<tr>
<td>Time</td>
<td>minutes</td>
<td>15 minutes</td>
</tr>
</tbody>
</table>

Following steps should be followed for coupling two RMUs at site. For detailed instructions please refer separate instruction document 1VYN403090-067

Remove end box and end box cover which are mounted on the RMUs.
8. Current transformers & relays

A self powered protection relay is installed in SafeLink CB unit vacuum circuit breaker module. The current transformers are mounted on the T-off side cable bushings (as standard) as shown below. The cables from the protection relay to the current transformers are routed within inside of the structure to the front side mimic.

The protection CTs and the wiring shall be factory fitted inside the CT box on the T-off side. It is hence required that during the ordering/specification stage the ratio/ratings of the CT is correct and checked as per the distribution transformer rated current and for the adjustment range of the protection relay.

The T-off side cable bushings have molded screen integrated which is earthed via the VPIS unit to the tank body.

SafeLink CB can be supplied with self powered overcurrent and/or earth fault advanced relays. There is no need for external auxiliary voltage for functioning of the relay.

---

**Caution**

- For correct functioning, the current transformers should be properly connected and protection relay should be properly adjusted. (See respective relay manuals for further details)
- It is also recommended to short CT secondary in case not used for long time

---

T-off side bushing with CT Arrangement
9. Extension of Switchgear

Following steps should be followed for coupling two RMUs at site. For detailed instructions please refer separate instruction document 1VYN403090-067 & 1VYN403090-097.

1. Remove end box and end box cover which are mounted on the RMUs.

2. Mount the provided coupling trays and coupling frames. A distance of 512 mm should be maintained as shown in the picture with the help of upper and lower coupling frames.
3. Mount the coupling busbar on one side of the extensible bushing in loose condition. Insert both the silicon rubber boots and tighten the coupling busbar on both ends. Apply silicon grease on bushing surface and black mastic along with insulation tape on busbar bolted connection. Slide boots on one phase set of extensible bushings and repeat the procedure for other two phases.

4. Mount the top and bottom covering boxes with M6 hardware provided and with serrated washers on two specified locations for earthing.

5. Mount earthing strip between two RMU’s at the bottom end of the rear side.

6. RMUs in completely coupled conditio
10. Pressure indicator

10.1 Gas pressure

SafeLink CB contains SF6 gas with a nominal pressure of 1.2 bar at 20˚C. The stainless steel tank enclosure is sealed for life and is fitted with a temperature compensated pressure indicator.

The indicator can be easily screwed or unscrewed without disturbing the SF6 pressure inside. Tighten the nut of the manometer with a torque of 45 N-m.

A temperature compensated device that emits an electrical signal to indicate low pressure (below 1.1 bar) can be supplied on request.

**Warning**

RMU should not be put into operation when the needle is in the red zone.
10.2 Refilling of SF6 gas

Potential risk! Operators must be trained and qualified for SF6 gas handling.

Following equipment is needed:
SF6 gas bottle with manometer and reduction valve, bottle for recovery of SF6 / air mixture, adapter and pressure measuring device.

Follow the below procedure for refilling the SF6 gas
1. Open the front door, remove the front top mimic cover and unscrew manometer
2. Screw the manometer nut to the valve with the torque of 45 N-m
3. Before connecting the hose from the gas bottle to the adapter, the air in the hose must be removed by running SF6 gas through the hose. The SF6 gas must be recovered.
4. When gas is flowing into the RMU/switchgear, the manometer on the gas bottle has to be observed. When it shows 0.2 bar at ambient temperature 20° Celsius (1.2 bar absolute) the gas filling must be stopped. See table below for filling pressure indications.
5. Remove the filling hose and connect a pressure device to check the pressure inside the RMU/switchgear.
6. When the correct pressure of 0.2 bar (1.2 bar absolute) is obtained, remove the adapter and screw in the manometer to the RMU with a tightening torque of 45 Nm as shown above on page 31. Observe that the sealing between the manometer and the valve is smooth and clean.

---

Gas Filling Chart
11. Operation of switchgear

11.1 Operating conditions

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 metres

Special conditions
In accordance with IEC 62271-1, the manufacturer and enduser 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 metres above sea level, for example, the atmospheric pressure will be lower and the overpressure in the tank will have to be reduced.

Airfreight
Units / modules transported by airfreight are delivered with reduced overpressure. For re-filling, please see procedure for re-filling of SF6 gas.

11.2 Warning & precautions

<table>
<thead>
<tr>
<th>Danger</th>
<th>Do not walk on the top of switchgear units!</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Switchgear operations must be carried out</td>
</tr>
<tr>
<td></td>
<td>with the doors closed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Warning</th>
<th>Operations and any type of work must</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>be carried out by trained and specialized</td>
</tr>
<tr>
<td></td>
<td>personnel who are familiar with SafeLink CB</td>
</tr>
<tr>
<td></td>
<td>and follow all the safety regulations</td>
</tr>
<tr>
<td></td>
<td>in accordance with the IEC Standards and</td>
</tr>
<tr>
<td></td>
<td>other regulations in force, as well as any</td>
</tr>
<tr>
<td></td>
<td>local work regulations and instructions.</td>
</tr>
</tbody>
</table>

Note: The tools required for installation and maintenance of the switchgear are specified in the tool list in chapter 20.6.
11.3 Putting into service

Before connection to the medium voltage network

The following work must be carried out in preparation for putting into service

- Check the general condition of the switchgear for any damage or defects
- Visually inspect the switching devices, cable bushings, insulating parts, etc
- Check the paintwork for any damage and, where necessary, paint over scratches to avoid corrosion
- Remove all residues of materials, foreign objects and tools from the switchgear
- If necessary, clean the switchgear and remove any traces of greasy or sticky dirt
- Correctly remount all covers etc. removed during assembly and testing procedures
- Switch the auxiliary and control voltage on
- Carry out testing operations on switching devices either manually or using electrical control, simultaneously observing the relative position indicators
- Check the mechanical and electrical interlocks for effectiveness, without using force
- Check the SF6 gas pressure of the tank. It needs to be at green level before operating the switchgear
- Instruct local operators regarding the basic features for correct use of the switchgear
- Confirm switchgear is earthed firmly at two points
- If switchgear is supplied with battery & charger, battery requires charging time of 8 hours and RMU motorised operation shall be performed only after complete battery is charged

Other checkpoints
Depending on the allocation of responsibilities, it may also be necessary to check the following equipment in the vicinity of the switchgear

- Power cables
- Auxiliary cables
- Auxiliary power source
- Remote control system
- Complete earthing system
- Switchgear installation room equipment
- Switchgear installation room characteristics
- Pressure resistance in the case of an arc fault
- Ventilation
- Temperature
- Humidity

11.4 Start-up

Instructions

- Comply with all relevant safety regulations
- Ensure that the switch disconnectors, circuit breakers or fuse switches in the configuration are in the OPEN position
- Energize the power supply feeders
- Connect the switchgear step by step, observing the signals and indicators
- Where necessary, check that the conductors are in phase when there are several incoming feeder cables and switchgear sections
- Carry out all measurements and check that all functions that depend on the medium voltage power supply are connected
- Check there are no irregularities of any kind
12. Operations

Warning

Read this before attempting to open any cover or operate any switch. Failure to do so may damage the equipment or other property or cause personal injury and invalidate any warranties (if applicable)

- Ensure that SF6 pressure indicated is in green zone before operating
- Make sure that front mimic covers of the RMU are intact and correctly mounted if removed

All switch disconnectors, earthing switches and disconnector can be operated with the operating handle provided as shown below. The test point box opening can be also done with one of the end of the operating handle. The vacuum circuit breaker has an integrated lever for the charging of the springs and push buttons for operation.

Internal mechanical interlocking between the following prevents incorrect operations:
- Switch disconnector and the associated earthing switches
- Circuit breaker and associated disconnector/earthing switch

All positions of ring switch disconnector, earthing switches and disconnector can be padlocked.

All mechanisms are designed and manufactured in such a way that all three phases are operated simultaneously. In case of 3 position ring switch mechanisms, the speed of operation is independent of the operator action and an anti-reflex system, prevents an immediate re-operation of switches.
12.1 Rotary selector functions and positions

Insertion of the operating handle is controlled by a ‘Rotary Selector’, which has one of the three possible states. The rotary selector is connected directly to one of the interlocking parts of the mechanism by which it is not possible to switch directly from ON to EARTH and vice versa. The selector has following three positions.

1. Handle access BLOCKED and switch is pad lockable in all states
2. Switching between OFF & ON possible
3. Switching between OFF & EARTH possible
   - The switch side cable boxes (Left hand side and right hand side) can be removed only when the associated switch is in ‘Earth ON’ position, the operating handle is removed and the ‘rotary selector’ in the middle, BLOCKED, position
   - The T-off side cable box can be opened only when the disconnector is in ‘Earth ON’ condition and circuit breaker is in closed position
   - For details please see following sections:
12.2 Switch disconnector mechanism (RHS) operations

Operation of ‘Rotary Selector’
(as per sequence mentioned in numbers)

To rotate to left side

To restore initial position

RHS mechanism initial (OFF) position
Switch disconnector mechanism (RHS) operations

OFF to EARTH
- Rotate ‘Rotary Selector’ to the LEFT
- Insert operating handle
- Rotate operating handle ANTI-CLOCKWISE
- Check mimic cover and switch position indicators as shown

EARTH to OFF
- Ensure that ‘Rotary Selector’ to be on LEFT
- Insert operating handle
- Rotate operating handle CLOCKWISE
- Check mimic cover and switch position indicators as shown

OFF to ON
- Rotate ‘Rotary Selector’ to the RIGHT
- Insert operating handle
- Rotate operating handle CLOCKWISE
- Check mimic cover and switch position indicators as shown

ON to OFF
- Ensure that ‘Rotary Selector’ to be on RIGHT
- Insert operating handle
- Rotate operating handle ANTI-CLOCKWISE
- Check mimic cover and switch position indicators as shown
12.3 Switch disconnector mechanism (LHS) operations

Operation of ‘Rotary Selector’
(as per sequence mentioned in numbers)

1. To rotate to left side
2. To rotate to right side
3. To restore initial position

LHS Mechanism Initial (OFF) Position

Open

Padlock
Switch disconnector mechanism (LHS) operations

**OFF to EARTH**
- Rotate ‘Rotary Selector’ to the RIGHT
- Insert operating handle
- Rotate operating handle CLOCKWISE
- Check mimic cover and switch position as shown

**EARTH to OFF**
- Ensure that ‘Rotary Selector’ to be on RIGHT
- Insert operating handle
- Rotate operating handle ANTI-CLOCKWISE
- Check mimic cover and switch position indicator as shown

**OFF to ON**
- Rotate ‘Rotary Selector’ to the LEFT
- Insert operating handle
- Rotate operating handle ANTI-CLOCKWISE
- Check mimic cover and switch position indicator as shown

**ON to OFF**
- Ensure that ‘Rotary Selector’ to be on LEFT
- Insert operating handle
- Rotate operating handle CLOCKWISE
- Check mimic cover and switch position indicator as shown
12.4 Vacuum circuit breaker operations

Close: Push green (ON) button  
Open: Push red (OFF) button

Before operating of the Vacuum circuit breaker, check that the closing spring is charged. If the spring is not charged, it can be charged by means of the charging lever. The spring is fully charged when the indicator turns to spring charged symbol (after about 10 operations required to fully charge the spring).

Note: If the VCB is equipped with motor operation (optional) it is not necessary to charge the spring by hand. The motor starts charging the closing spring automatically after each closing operation and the supply gets cut-off automatically after the spring is fully charged.
12.5 Disconnector operations

Note: Disconnector operation is interlocked with the vacuum circuit breaker and can be operated only when the circuit breaker is in OFF condition. The disconnector is manually operated i.e. there is no spring energy operation. The operation of the disconnector can be achieved through one end of the operating handle provided.

Caution

- Ensure full engagement of handle with disconnector mechanism socket, for all operations.
- Before removing the handle, check that selector puller knob is guided back in its position.
- Ensure padlock pin is in place before any disconnector operation.

OFF to EARTH

- Remove padlock pin. Slide padlock to LEFT.
- Insert padlock pin.
- Insert operating handle.
- Pull knob for disconnector operation outside.
- Rotate handle Anti-clockwise.
- After some degrees of rotation of handle, release knob.
- Spring loaded knob will guide itself back in EARTH position.
- Check mimic cover and switch position as shown.

EARTH to OFF

- Padlock has to be on LEFT.
- Insert operating handle.
- Pull knob for Disconnector Operation.
- Rotate handle CLOCKWISE.
- After some degrees of rotation of handle release knob.
- Spring loaded knob will guide itself back in OFF position.
- Check mimic cover and switch position as shown.
OFF to ON

- Remove padlock pin. Slide padlock to RIGHT
- Insert padlock pin
- Insert operating handle
- Pull knob for disconnector operation outside
- Rotate handle Clockwise
- After some degrees of rotation of handle release knob
- Spring loaded knob will guide itself back in ON position
- Check mimic cover and switch position as shown

ON to OFF

- Padlock has to be on RIGHT
- Insert operating handle
- Pull knob for disconnector operation
- Rotate handle Anti-Clockwise
- After some degrees of rotation of handle, release knob
- Spring loaded knob will guide itself back in OFF position
- Check mimic cover and switch position indicator as shown

12.6 Padlocking options

Ring switches can be padlocked on the rotary selector and circuit breaker disconnector can be padlocked in any position. Only padlocking provision is provided as standard, actual locks are optional.
13. Accessories

13.1 Motorised operations

13.1.1 Motorised version for ring cable switch

Optionally, closing and opening operations of mechanism for switch disconnector can also be performed with motorized operations.

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 bottom mimic.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltages for motor (Un)</td>
<td>24 VDC, 48 VDC, 60 VDC, 110 VDC, 220 VDC, 110 VAC, 230 VAC</td>
</tr>
<tr>
<td>Voltage variation</td>
<td>85-110% Un</td>
</tr>
<tr>
<td>Rated power consumption (max)</td>
<td>90 W, 90 VAC</td>
</tr>
<tr>
<td>Charging time</td>
<td>&lt; 8 sec</td>
</tr>
<tr>
<td>Insulation voltage</td>
<td>2 kV 1 min (50 Hz)</td>
</tr>
</tbody>
</table>
13.1.2 Motorised version for vacuum circuit breaker

Charging of the closing spring of the EL2 mechanism for the vacuum circuit breaker can be performed with motorised operation. However, disconnector & earthing switch of V module shall be still manually operated considering safety aspects.

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).

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.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltages for motor (Un)</td>
<td>24 VDC, 48 VDC, 60 VDC, 110 VDC, 220 VDC, 110 VAC, 230 VAC</td>
</tr>
<tr>
<td>Voltage variation</td>
<td>85-110% Un</td>
</tr>
<tr>
<td>Inrush power (Ps)</td>
<td>600 W, 600 VAC</td>
</tr>
<tr>
<td>Rated power (Pn)</td>
<td>200 W, 200 VA</td>
</tr>
<tr>
<td>Charging time</td>
<td>&lt; 10 sec</td>
</tr>
<tr>
<td>Inrush time</td>
<td>0.2 sec</td>
</tr>
<tr>
<td>Insulation voltage</td>
<td>2 kV 50 Hz for 1 min</td>
</tr>
</tbody>
</table>
13.2 Shunt releases

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.

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.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltages for motor (Un)</td>
<td>24 VDC, 48 VDC, 60 VDC, 110 VDC, 220 VDC, 110 VAC, 230 VAC</td>
</tr>
<tr>
<td>Operating limits</td>
<td>70-110% Un</td>
</tr>
<tr>
<td>Inrush power (Ps) max</td>
<td>300 W, 300 VAC</td>
</tr>
<tr>
<td>Continuous power (Pc)</td>
<td>5 W, 5 VA</td>
</tr>
<tr>
<td>#Closing time* (ms) (with VCB)</td>
<td>40-70</td>
</tr>
<tr>
<td>#Opening time (ms) (with VCB)</td>
<td>40-80</td>
</tr>
<tr>
<td>Inrush duration (ms) approx</td>
<td>100</td>
</tr>
<tr>
<td>Insulation voltage</td>
<td>2 kV 50 Hz for 1 min</td>
</tr>
</tbody>
</table>
13.3 Auxiliary/Signal Contacts

13.3.1 Vacuum circuit breaker auxiliary contacts (-BB1,-BB2)
Electrical signaling of vacuum 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. 3NO+2NC. Optionally, 2nd set of such signaling contacts can be provided with 3NO+2NC. These auxiliary/signaling contacts are true contacts of auxiliary switch directly coupled to EL2 spring mechanism, which gives true indication of vacuum circuit breaker ON/OFF indication.

13.3.2 Switch disconnector/Circuit breaker Disconnector auxiliary contacts
Switch disconnector, Earthing switch and disconnector can be provided with 1NO+1NC auxiliary contacts. In case of switch disconnector & disconnector, 2Nos. switch i.e., 2NO+2NC, but for earthing switch, only 1NO+1NC is possible.

13.3.3 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

13.4 Capacitive voltage indicators
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.
VPIS are available for:
System voltage range 3 - 3.6 kV
System voltage range 9 - 15 kV

Optionally, these voltage indicators can be supplied with SCADA contact of 1NO+1NC which will provide signal to SCADA on voltage present or not present.
13.5 Short circuit and/or Earth fault indicators

Earth fault and/or short circuit indicators according to the IEC 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 of different manufacturers.

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/standard copper 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.
13.6 Manometer & Pressure indicators

SafeLink CB are sealed systems designed and tested according to IEC 62271-200 as maintenance free switchgear for lifetime (30 years). The switchgear does not require any gas handling. ABB applies state-of-the-art technology for gas tightness providing the equipment with an expected leakage rate lower than 0.1 % per annum, referring to the filling pressure of 1.2 bar*. The switchgear will maintain gas tightness and a gas pressure better than 1.15 bar* throughout its designed lifespan. This pressure value is still within a good margin. From the pressure used during type testing, which is 1.2 bar*.

* at 20°C.

For increasing the safety under operation of the switchgear, manometers may be used for each tank. In case of need of remote indication, manometers can be equipped with signalling contacts. Detailed descriptions of manometer functions are described in the table on next page.

Altitude

Maximum height above sea level for installation without reducing gas pressure is 1000 meters. For installation above 1000 meters, please contact ABB for instructions.

Pressure indicating manometer is supplied as standard on all SafeLink CB Ring Main Units. As an option remote indication provision can also be provided with micro switch(s). This gas density monitor requirement with integrated switch must be specified with order.

13.7 Counters

Optionally, for all switch disconnectors & vacuum circuit breakers, mechanical operational counters are provided which will be visible from front mimic of respective switching devices. These mechanical counters are directly mechanically coupled to the respective mechanisms and hence gives the true count of number of operations performed in these switch disconnectors & vacuum circuit breakers.
14. Service and maintenance

14.1 General warning and cautions

Preparing the switchgear for safe assembly

• For each case, set safe working conditions with the utility safety officer.
• Make sure that national safety regulations are followed.
• Make sure there is no voltage in the busbars and cable terminals and that the risk of reconnection is eliminated in all units. Any remote control must also be prevented.
• Make sure that auxiliary circuits are also disconnected from all possible power supply sources (including instrument transformers)

Tools required
Tool list as specified under chapter 14.6,
Consumables/Miscellaneous items are as below:
• Vacuum cleaner
• Cleaning cloths
• Mild alkaline cleaning agent
• Do not use trichloroethane, carbon carbotetrachloride or any kind of alcohol, etc. for cleaning
• Clean water
• Silicone liquid
• In special cases, insulating surfaces can be covered with a thin layer of silicone liquid such as DC200/100CS or similar
• Instruction manuals
• Test equipment

14.2 Maintenance instructions

Maintenance serves for preserving trouble-free operation and achieving the longest possible working life of the switchgear.

It comprises the following closely related activities
• Inspection: Determination of the actual conditions
• Servicing: Measures to preserve the specified conditions
• Repairs: Measures to restore the specified conditions

The time intervals for maintenance work to be carried out always depend on the operating conditions of the switchgear and, above all on the mode of operation, the number of rated and short circuit current switching operations, ambient temperature, pollution, etc. The maintenance intervals and measures to be taken that are given in table below are recommended for SafeLink CB under normal service conditions.

Three year intervals are recommended for all maintenance measures in more demanding conditions (such as areas with high pollution levels).

The operation of all protection relays should be checked in accordance with the manufacturer’s instructions & respective manuals. All components in the SF6 tank are maintenance free for the declared life expectancy of the product. The tank is made of stainless steel.

14.3 Maintenance intervals

We recommend carrying out the maintenance work at the following intervals:

<table>
<thead>
<tr>
<th></th>
<th>Section</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspection</td>
<td>14.4</td>
<td>5 years</td>
</tr>
<tr>
<td>Service</td>
<td>14.5</td>
<td>As required²</td>
</tr>
<tr>
<td>Repairs</td>
<td>14.6</td>
<td>As required³</td>
</tr>
</tbody>
</table>

²Under more demanding service conditions, we recommend shortening this interval appropriately.

³According to the results of the inspection.

Other services may be required, as when max number of operations is reached, please contact ABB to order inspection.

Note

Under abnormal operating conditions (including adverse climatic conditions) and/or particular environmental conditions (among which, heavy pollution and aggressive atmosphere), inspection at shorter intervals may be necessary.
14.4 Inspection

General aspects
Where necessary, the working area must be isolated and secured against accidental re-connection before inspection, in accordance with the “Safety Regulations” specified by IEC standards and corresponding national standards. The switchgear condition must be monitored by regular inspections. Under normal operating conditions, inspections should be carried out once every fifth year by suitably trained personnel.

Instructions
Carry out the following inspections
- Visually check for dirt, corrosion and moisture.
- Check for traces of discharges on insulating material parts.
- If there are test points:
  - Visually check the contact points and surrounding earthed surfaces.
  - If there are signs of pollution or dust, please clean the area.
  - Check the operating pressure of the gas insulated switching devices where possible. Follow gas chapter for further instructions.
  - Check condition and life time of installed accessories and auxiliary devices; change if necessary according to component data sheet, specifically batteries.
  - If corrosion is observed on mechanisms, motors or other accessories please contact ABB to evaluate if anything needs to be replaced.
  - Check that there are no visible signs of, or damage from, partial discharges.
  - There should not be any visible signs of overheated connections, specifically near bushings and cable lug joints.
  - All components should perform perfectly and any faulty components must be replaced.
  - Firmness and adequate earthing of the RMU with proper earthing resistance.
  - All the entry points are sealed properly
  - Firmness of the bushing & cable joints using torque wrench of suitable rating.
  - Cables are clamped properly and load of the cable should not be transferred to bushings.

14.5 Servicing

If the need for servicing measures is established during the course of an inspection, proceed as follows
- Clean all parts (e.g. motors and mechanisms) with a vacuum cleaner and visually inspect them. Clean the surfaces in general including lightly settled dry dust deposits with a soft dry cloth.
- Perform a closing/opening operation on all switch disconnectors and circuit breakers, disconnectors and earthing switches.
- Connect the auxiliary control voltage, but ensure that no remote signals can activate the components. Perform one electrical operation sequence on all motor operated devices and tripping mechanisms.
- For maintenance of gas pressure, follow gas chapter for further instructions.
- Completely remove all rust from damaged paint work areas on steel sheet and other steel parts by mechanical means, e.g. with a wire brush, and apply appropriate anti-corrosion treatment.

14.6 Repairs

Note: If the switchgear is damaged, contact ABB to evaluate necessary repairs. Some advanced repairs/operations should be carried out only by ABB service personnel. Carry out repair work immediately after a defect has been discovered.

Caution
Follow the maintenance instructions in the manuals for the relative components.
## 14.7 Tool list

### Note

The following list of tools does NOT cover tools needed for HV or LV cable work/handling or testing. The tools listed below are needed for installation and regular maintenance work as described in chapter 14.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Tool description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Allen Key Set-BM-ABB4D00596</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Screw Driver-BM-ABB4D01031 -200mm</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Soft Faced Nylon Hammer-BM-ABB4D01193-40mm</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Adjustable Spanner-BM-ABB4D01060-26mm Jaw capacity</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Bit M4 -T20</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Bit M5 -T25</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Bit M6-T30</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Bit Socket</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Bit Socket Ratchet</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>1/2 Ratchet</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Open ended Spanner range 6-7 mm</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Open ended Spanner range 7-8 mm</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Open ended Spanner range 10-11 mm</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Open ended Spanner range 12-13 mm</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Open ended Spanner range 16-17 mm</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>Open ended Spanner range 18-19 mm</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>Combination Plier</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>Nose Plier</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>T type Allen key 2.5</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>T type Allen key 3 mm</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>T type Allen key 4 mm</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>T type Allen key 5 mm</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>T type Allen key 6 mm</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>1/2 Socket 10 mm-</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td>1/2 Socket 13 mm</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>1/2 Socket 16 mm</td>
<td>1</td>
</tr>
<tr>
<td>27</td>
<td>1/2 Socket 17 mm</td>
<td>1</td>
</tr>
<tr>
<td>28</td>
<td>1/2 Socket 19 mm</td>
<td>1</td>
</tr>
<tr>
<td>29</td>
<td>1/2 Extension Rod- length 200 mm</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td>Big size Screw driver</td>
<td>1</td>
</tr>
<tr>
<td>31</td>
<td>Wiring Connector screw driver</td>
<td>1</td>
</tr>
<tr>
<td>32</td>
<td>Wire Stripper</td>
<td>1</td>
</tr>
<tr>
<td>33</td>
<td>RYB Lug Crimper tool</td>
<td>1</td>
</tr>
<tr>
<td>34</td>
<td>13 Tapque</td>
<td>1</td>
</tr>
<tr>
<td>35</td>
<td>1/2 Allen socket M4</td>
<td>1</td>
</tr>
<tr>
<td>36</td>
<td>1/2 Allen socket M5</td>
<td>1</td>
</tr>
<tr>
<td>37</td>
<td>1/2 Allen socket M6</td>
<td>1</td>
</tr>
<tr>
<td>38</td>
<td>1/2 Allen socket M8</td>
<td>1</td>
</tr>
<tr>
<td>39</td>
<td>Ring Type Spanner : 16-17 mm</td>
<td>1</td>
</tr>
<tr>
<td>40</td>
<td>Ring Type Spanner : 18-19 mm</td>
<td>1</td>
</tr>
<tr>
<td>41</td>
<td>Ring Type Spanner : 12-13 mm</td>
<td>1</td>
</tr>
</tbody>
</table>
15. Environmental certification

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 adher to ISO 14001 standards. It is our obligation to facilitate end-of-life recycling for our products. There exists 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.»
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.

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

*All the above figures are for CVC configuration (NE)
Not specified weight can vary based on the additional mountings and auxiliaries
Additional Information
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Accordingly, the reader of this document acknowledge and agree that values of dimensions and weight provided herein are neither final nor binding and that the result of their use is neither feasible nor accurate nor error free.