

SafeLink

SF₆ Insulated Ring Main Unit

Installation and Operating Instructions





SafeLink

SF₆ Insulated Ring Main Unit

Installation and Operating Instructions

Product Overview

ABB's type-tested SafeLink ring main unit (RMU) is an SF₆ insulated RMU utilising the latest developments in switchgear technology to provide a very compact switchgear solution. SafeLink is a completely sealed system with a stainless steel tank containing all live parts and switching functions. A hermetically sealed tank separated from the outside environment ensures a high level of reliability as well as personal safety and a virtually maintenance free system.

SafeLink is manufactured according to the latest environmental and quality standards. The ABB assembly plant is certified according to ISO9001 (Quality) and ISO14001 (Environmental). SafeLink equipment conforms to all applicable IEC standards.

This manual provides detailed information on the handling, installation, commissioning and operation of SafeLink.

The range of SafeLink products and the specifications of the equipment are subject to change without notice as product features and benefits are added.

For more information, or to discuss SafeLink operation, please contact your local ABB office or the ABB factory in New Zealand:

ABB Ltd
Power Technology Products Division
133 Central Park Drive
PO Box 83-203
Auckland 8
New Zealand

Ph: +64 9 837 1234
Fax: +64 9 837 2950



SafeLink

SF₆ Insulated Ring Main Unit
Installation and Operating Instructions

Contents

1	GENERAL DESCRIPTION	1
1.1	SAFELINK FEATURES	2
1.1.1	CFC, CCC,CF, DF, DC	3
1.1.2	CFCC, CCCC, CFC D	4
1.1.3	CFCF	5
1.1.4	Outdoor Enclosure	6
2	TECHNICAL DATA	7
2.1	OPERATING CONDITIONS	7
2.2	ELECTRICAL DATA	7
2.3	RATING LABEL	8
2.4	STANDARD COMPLIANCE	8
3	TRANSPORT & HANDLING	9
3.1	STORAGE	9
3.2	TRANSPORTING	9
3.3	INSPECTION OF UNIT	9
3.4	DIMENSIONS & WEIGHTS	9
4	INSTALLATION	10
4.1	FOUNDATIONS	10
4.2	MAIN CABLE BOXES	11
4.3	CABLE CONNECTION	11
4.3.1	Steps for Cable Connection	11
4.3.2	Cable termination boots	11
4.4	OUTDOOR ENCLOSURE	12
5	OPERATION	13
5.1	GAS DENSITY GAUGE	13
5.2	GENERAL SWITCH OPERATION	14
5.3	SWITCH-FUSE RESET	15
5.4	FUSE REPLACEMENT	15
5.5	FUSE TYPES AND REPLACEMENT	17
5.5.1	Fuse Tables	17
5.6	CABLE BOX	18
5.7	CABLE TESTING	18
6	MAINTENANCE	19
6.1	ENVIRONMENTAL	19
6.2	MAINTENANCE	19
6.3	GAS SAMPLING AND FILLING	19
6.4	ENVIRONMENTAL CERTIFICATION	20
6.4.1	Life Expectancy Of Product	20
6.4.2	Recycling Capability	20
6.4.3	End-Of-Life	20
7	ACCESSORIES	21
7.1	HORSTMANN EKA-3	21
7.2	HORSTMANN ALPHA/E AND ALPHA/M	21
7.3	VOLTAGE INDICATOR	21
7.4	PHASE BALANCE TESTER	21
7.5	AUXILIARY SWITCH	22
7.6	MOTOR OPERATOR	22
7.7	GAS DENSITY MONITOR	22
7.8	SHUNT TRIP	23
7.9	CABLE CLAMP RAIL	23
7.10	BOTTOM COVER/GLAND PLATES	23
7.11	EMERGENCY TRIP	23
7.12	GAS FILLING/SAMPLING ADAPTOR KIT	24
7.13	EXTENDED HEIGHT PLINTH	24
7.14	LIFTING FRAME	24

1 General Description

This manual provides details needed to install and operate the SafeLink ring main unit. The SafeLink unit is certified for use on distribution systems operating at up to 12kV. SafeLink is available in several configurations based on ring and fuse-protected switches: e.g. CFC, CCC, CFCC, CFCF; where *C* denotes a load break switch and *F* a switch-fuse combination. The switch-fuse combination has three-phase tripping and when the switch is earthed, both ends of the fuses are connected to earth.

SafeLink units can be supplied with direct busbar connections (D) in place of load break switches to allow SafeLink units to be joined with an external cable connection. For example, units configured as CFCD and DFC, when joined, will give three ring switches and two switch-fuse combinations.

Each switch is in the form of a three-position switch giving *on*, *off* and *earthed* conditions with respect to the connected cable. The status of each switch is indicated by the symbol visible in the round hole towards the top of the mimic panel and confirmed by the mimic diagram. Active flags in the diagram match the circuit condition with black confirming open switches and white indicating switches that are closed. Access to the cable box and fuse compartment is interlocked with the switch status.

The operating handle is designed to give a delay between switching operations. Insertion of the operating handle is controlled by a rotary selector, which has one of three possible states:

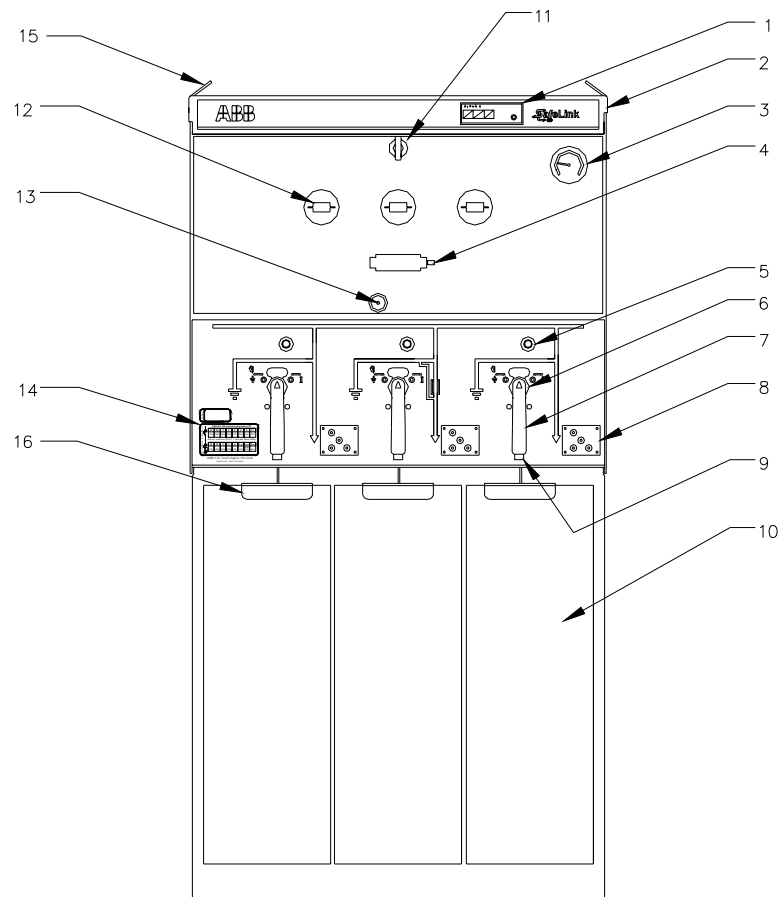
1. Handle access blocked.
2. Switching between *off* and *on* and switch-fuse *reset* possible.
3. Switching between *off* and *earth* possible.

The selector handle can be padlocked in any of these three positions.

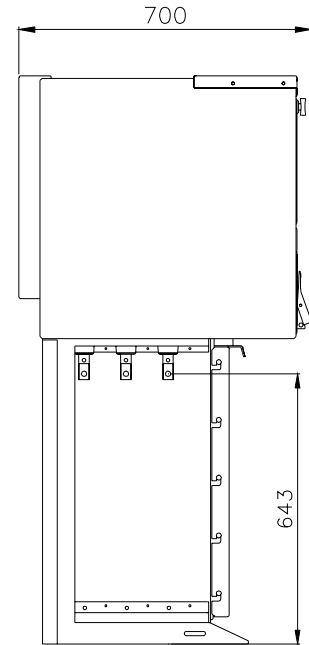


1.1 SafeLink Features

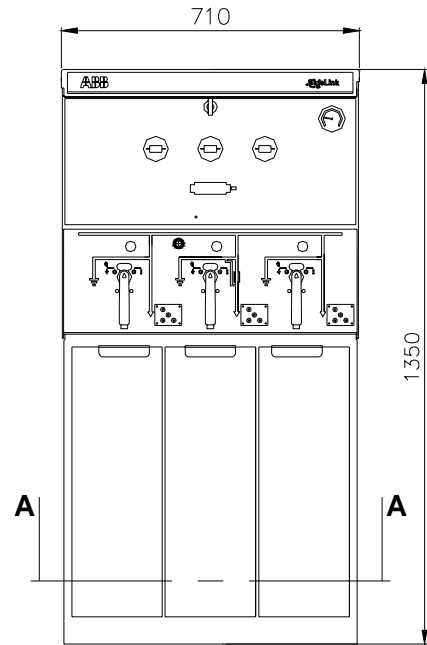
1	Short circuit indicator (optional)
2	Lift up lid
3	Gas density indicator
4	Fuse blown indicator
5	Switch position symbol
6	Switch handle socket
7	Switch mode selector (on/off, blocked, off/earth)
8	Capacitive voltage indicator
9	Padlocking device
10	Interlocked cable compartment door
11	Interlocked fuse access door catch
12	Fuses contained behind door
13	Emergency trip (optional)
14	Rating plate, serial number
15	Lifting lugs
16	Cable-door handle includes door padlock facility



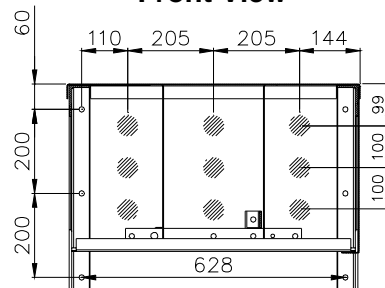
1.1.1 CFC, CCC, CF, DF, DC



**Left Hand View
(end panel removed)**

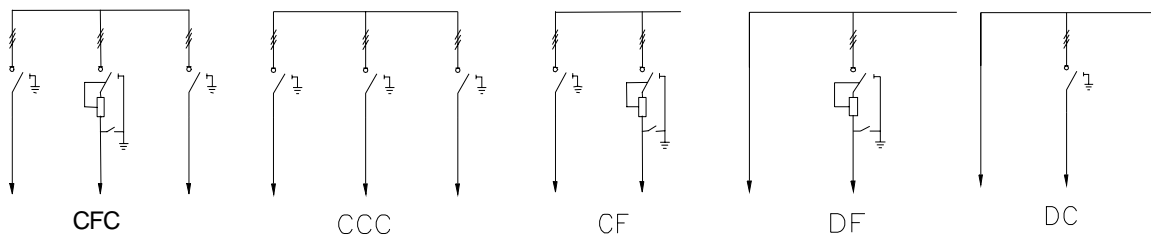


Front View



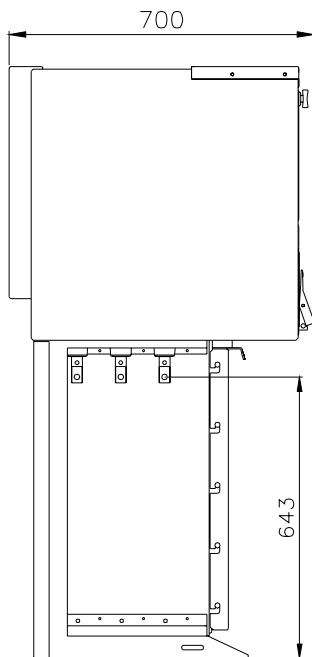
**Foundation Plan
(section AA)**

Single line diagrams

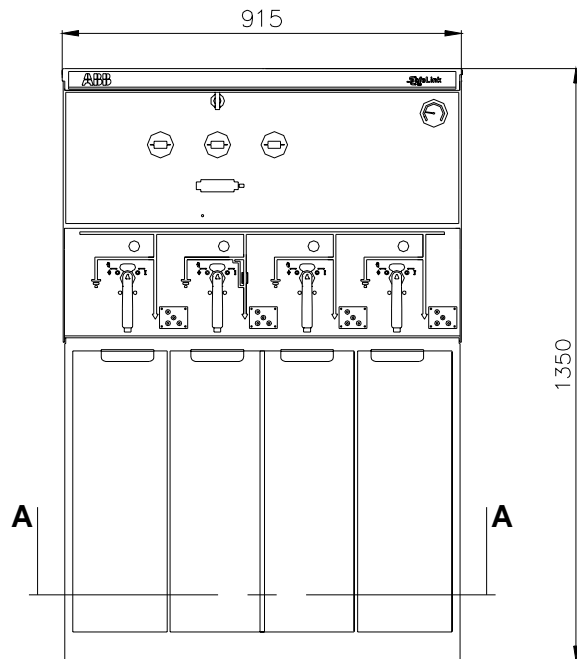


Mass: 250 kg

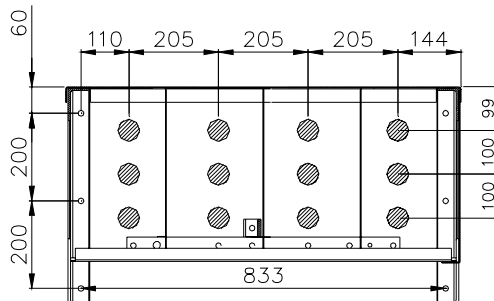
1.1.2 CFCC, CCCC, CFCD



**Left Hand View
(end panel removed)**

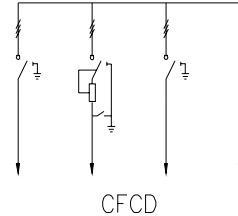
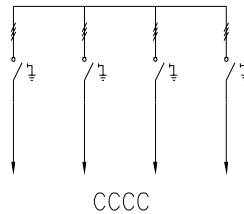
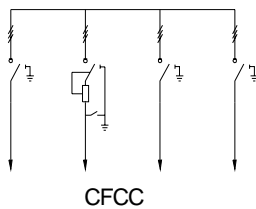


Front View



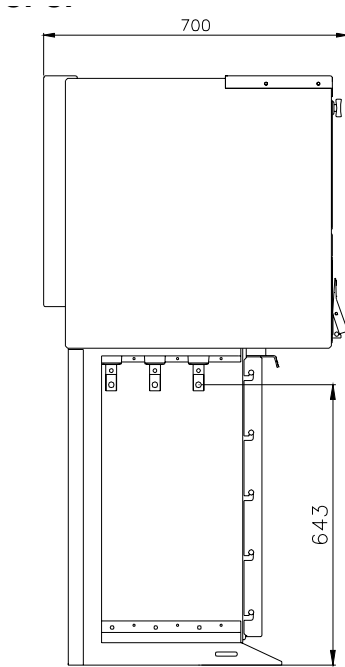
**Foundation Plan
(section AA)**

Single line diagrams

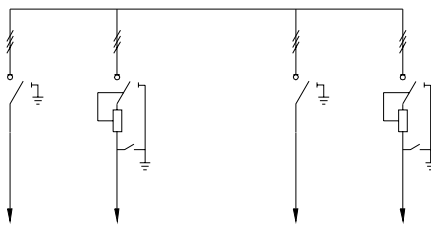


Mass: 270 kg

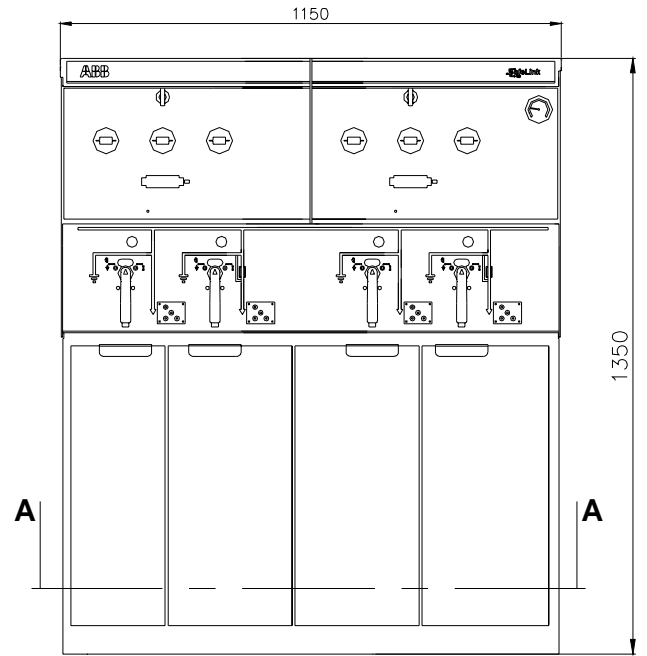
1.1.3 CFCF



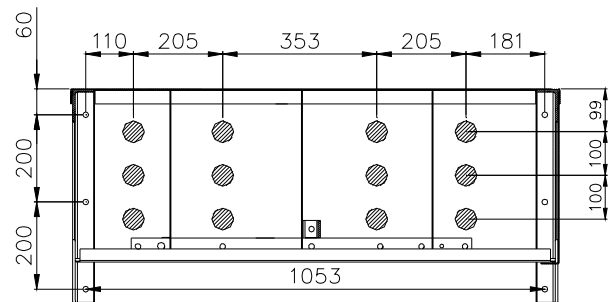
**Left Hand View
(end panel removed)**



Single Line Diagram



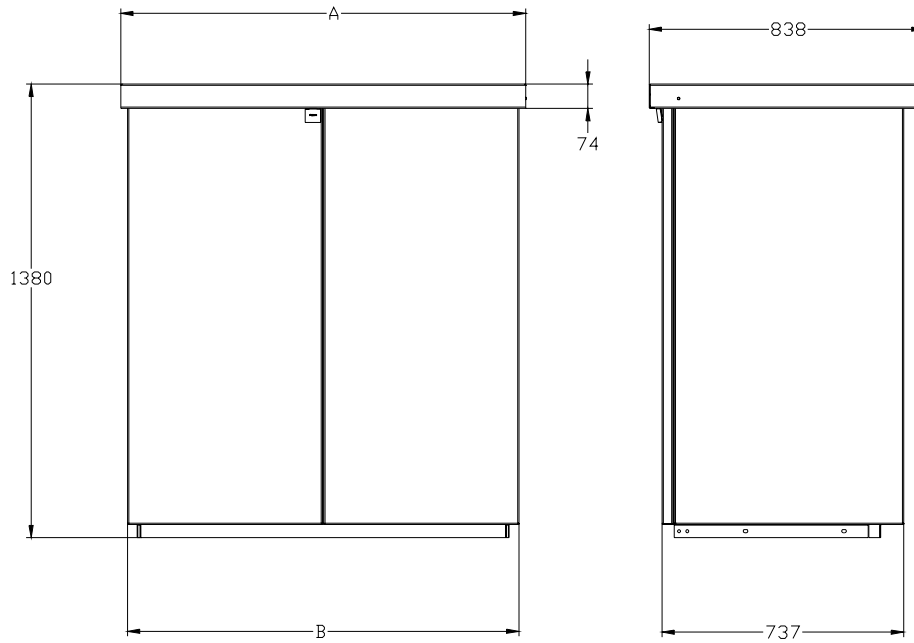
Front View



**Foundation Plan
(section AA)**

Mass: 350 kg

1.1.4 Outdoor Enclosure



	CFC, CCC CF,DF, DC	CFCC, CCCC CFCD	CFCF
Dim "A"	810	1015	1235
Dim "B"	770	975	1195

2 Technical Data

2.1 Operating Conditions

Normal Ambient Temperature:	-25°C to +40°C
Altitude:	Up to 1000m above sea level
Installation:	Indoor or outdoor with an enclosure
Standard indoor RMU	IP43
Mounted in Outdoor Enclosure	IP55W

Insulating Gas

Type:	SF ₆ (IEC 60376)
Filling Pressure @ 20°C:	1.2bar abs
Quantity:	1kg approximately (CFC)
Minimum Operating Pressure:	1.1bar abs

2.2 Electrical Data

General Ratings @ 1.1bar abs SF₆ Pressure

Rated Voltage:	12kV
Lightning impulse Voltage:	95/110kV BIL (optional 75/85kV BIL)
Withstand Voltage:	28/32kV for 1 minute (42kV on request)
Frequency:	50Hz
Rated Current:	630A
Withstand Current:	20kA rms
Withstand Current Duration:	3sec
Internal Arc fault withstand:	20kA
Recommended Maximum Cable Size:	300mm ² 3-core cable 500mm ² single-core cable

Load Break Switch (E3, M2 rating to IEC 60265-1:1998)

Rated Current:	630A
Short Circuit Making Current:	50kA peak

Switch-Fuse

Rated Current:	200A
Prospective Fault Withstand:	20kA rms

Bushings

Series 400 (DIN 47632) with adapted in-line bolted connection	
Rated Current:	630A

Fuses

DIN 43625	
Maximum. Barrel Length:	292mm
Maximum. Diameter:	87mm
Maximum. Fuse current rating	160A

Refer to Section 5.5.1 on page 17 for the fuse selection chart.

2.3 Rating Label

The rating label is integrated into the main mimic panel. This panel is UV stabilized, weather resistant polycarbonate. The label information satisfies the requirements of IEC 60298 and includes RMU configuration. The rating label includes a bar-coded serial No., which matches a similar label used to identify each tank throughout its production.



2.4 Standard Compliance

SafeLink has been tested to (and passed) the following standard tests in an ASTA accredited laboratory:

- IEC 60298 (1990-12)
A.C. metal-enclosed switchgear and controlgear for rated voltages above 1kV and up to and including 52kV.
- IEC 60265-1 (1998-01)
High-voltage switches - Part 1: Switches for rated voltages above 1kV and less than 52kV.
- IEC 60420 (1990-10)
High-voltage alternating current switch-fuse combinations.
- IEC 60129 (1984-01)
Alternating current disconnectors and earthing switches.
- IEC 60694 (1996-05)
Common specifications for high-voltage switchgear and controlgear standards.
- IEC 60137 (1995-12)
Insulating bushings for alternating voltages above 1000V.
- IEC 60529 (1989-11)
Degrees of protection provided by enclosures (IP Code).

3 Transport & Handling

3.1 Storage

SafeLink units must be stored under cover in a dry and well-ventilated area.

3.2 Transporting

SafeLink units are shipped from the factory filled with SF₆ gas and ready for installation. All units have passed routine tests before leaving the factory.

The switchgear is filled with SF₆ gas to a pressure of 0.2 bar above atmosphere at 20°C. Bolts, nuts, connections etc associated with sealing must not be adjusted.

The units are supplied packed on a wooden pallet or concrete pad to allow fork hoist movement. Lifting eyes are also provided for lifting the RMU only. (They are not to be used for lifting units pre-fitted with concrete pads)
. Where the unit is to be fitted with an outdoor enclosure, the enclosure can be supplied as a flat-pack and fitted to the SafeLink following installation. (see section 4.4)

Lifting frames are available where SafeLink RMU's are transported to site pre-fitted to concrete plinth and/or with outdoor enclosure. This allows direct positioning of the unit by crane or hiab truck.

3.3 Inspection of Unit

On receipt of the unit, it should be checked for any visible signs of damage. Damage to paintwork, etc should be made good as soon as possible. Check that the gas density gauge is in the green area.

If there are any problems with your SafeLink unit please contact your ABB agent.

3.4 Dimensions & Weights

SafeLink with ABB stand:

Configuration	CFC, CCC,CF, DF, DC	CFCC, CCCC, CFCD	CFCF
Height:*	1350mm	1350mm	1350mm
Width:	720mm	915mm	1150mm
Depth:	700mm	700mm	700mm
Weight:	250kg	270kg	350kg

* Note that extended height plinths are available to increase standard height to 1650mm

Optional outdoor enclosure:

Configuration	CFC, CCC,CF, DF, DC	CFCC, CCCC, CFCD	CFCF
Width:	810mm	1015mm	1235mm
Height:	1380mm	1380mm	1380mm
Depth:	838mm	838mm	838mm
Weight:	94kg	106kg	122kg

Optional concrete mounting pad:

Configuration	CFC,CCC,CF, DF, DC	CFCC, CCCC, CFCD	CFCF
Width:	940mm	1155mm	1375mm
Height:	150mm	150mm	150mm
Depth:	855mm	855mm	855mm
Weight:	210kg	260kg	325kg

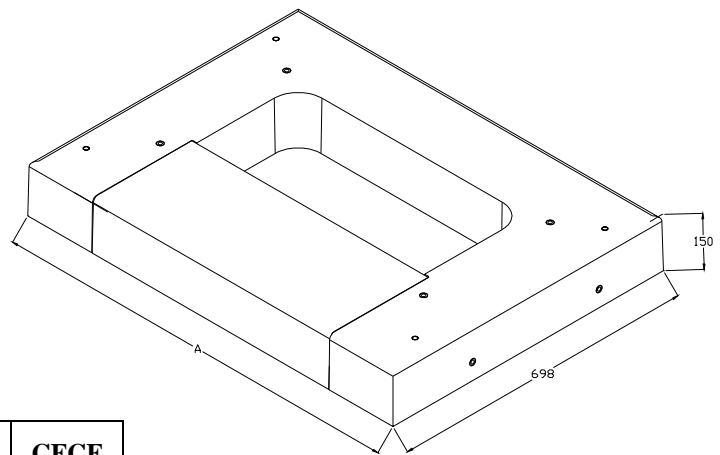
4 Installation

4.1 Foundations

The equipment shall be mounted on a concrete base designed to support the equipment weight of the switchgear and for the outdoor enclosure if used. The base pad shall be mounted on a prepared and compacted base. The concrete base should be smooth and must be installed such that it is level.

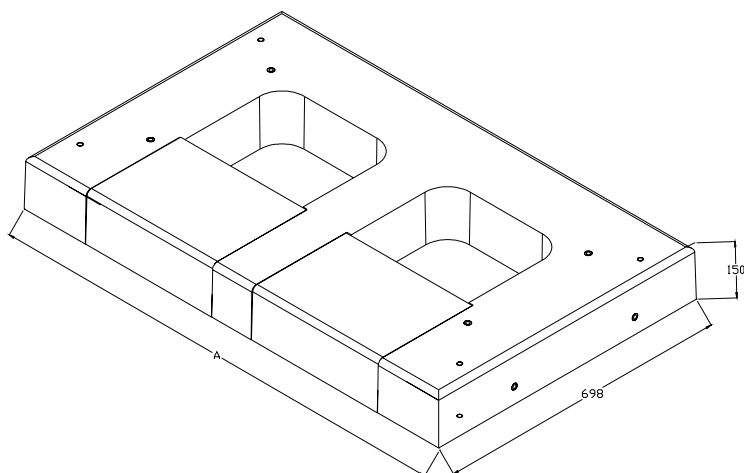
The units are fastened to the concrete base by four M10 bolts. Ensure that there is free air movement around the stand and prevent build up of material (vegetation, bark, etc.) around the base of the stand.

ABB is able to supply a suitable concrete base as an optional item. The concrete pads have a removable step to improve access for laying cables. The pad is designed for seismic load and is suitable for seismic loads up to 1g



Type 1

	CFC, CCC, CF,DF, DC	CFCC, CCCC, CFCD	CFCF
Type	1	1	2
Dim"A"	940	1155	1375
kg	210	260	325



Type 2

4.2 Main Cable Boxes

The cable box compartment covers can be removed individually, while the side plates can also be removed for installation and commissioning. This allows all of the bushings to be exposed to give maximum cable termination room.

Options available include gland plates, cable support clamps, and their associated brackets.

4.3 Cable Connection

The maximum cable recommended is 300mm² 3-core or 500mm² for single-core cables. The bushings for each switch are arranged front to rear. The cable should be prepared for jointing with L1 to the rear.

The cable-bushing stem has a 25mm wide pad and lugs should be fitted using high tensile M12 bolts tightened to a maximum of 72Nm.(max bolt length recommended M12 x 35mm)

Unused switches should be appropriately terminated with a blank termination.

4.3.1 Steps for Cable Connection

1. Ensure that the switch is in the earth position to allow the front cover to be removed. Each cable box is separated from the others so that work can be carried out within a single cable box if needed. When the extreme left and right switches are earthed the outside cable box plates can be removed.
2. Where the centre switch and one of the outside switches are turned to the earth position (for example during commissioning) the side plate between the two cable boxes can be removed to give more working space.



(a)



(b)

*Steps to install cabling. (a) Bolting lugs to the cable bushings;
(b) Left hand cable termination completed.*

4.3.2 Cable termination boots

The following cable termination boots have been type tested with SafeLink for a voltage impulse level of 95kV BIL in accordance with IEC 60694-1996.

Manufacturer	Termination insulating boot type	Cable size
ABB Kabeldon	KAP 300	XLPE – 300 mm ² max Paper insulated – 240 mm ² max
ABB	ABB - SLB	XLPE 16 - 300 mm ²
Raychem	RCAB-4120	XLPE 35 - 400 mm ²
3M Electrical Products	92-EE615-1 (cold shrink)	XLPE 50 – 300 mm ²

The SafeLink product is not designed to have heat shrink termination boots. The manufacturers installation instructions are supplied with each kit and must be followed. For special situations (i.e. earth screen terminations) please seek further advice from your local ABB agent.

4.4 Outdoor Enclosure

The outdoor enclosure to suit the SafeLink attaches to the ring main unit. It is padlockable and no special tools are required for its installation—only an M8 socket and 4mm allen key are needed. Once installed all critical fixings are hidden. For access to the SafeLink unit, the top lifts up, and the door is hinged.

The enclosure can be supplied in a flat-pack form for retrofitting or fully assembled. Full instructions for assembly and mounting are supplied with each enclosure.



Dimensions and weights are detailed in section 3.4 on page 9.

5 Operation

The following sections describe the operating procedure for SafeLink. There are no parts within the SafeLink unit that require user attention other than the fuses and the gas density gauge.

Equipment suffering faults or damage must be returned to your supplier for servicing.

Ensure the gauge reads in the green area before switching.

5.1 Gas Density Gauge

During operation, the gas density of the SafeLink unit should be in the green region. The gas pressure has been factory set to 1.2bar absolute (at 20°C). Each switch is filled with approximately 1kg of SF₆ gas.

The gas density gauge differs from a simple pressure indicator in that it is temperature compensated

The accuracy of the gas density gauge varies slightly with temperature; it is $\pm 1\%$ at +20°C (i.e. ± 20 mbar) and $\pm 2.5\%$ (i.e. ± 50 mbar) at the working limits of the gauge - 20°C/+60°C.

All units are tested for gas tightness during production to ensure any gas leakage rate is less than 0.1% per annum (maximum 3×10^{-6} mbar/s using helium).

In rare circumstances, the SafeLink unit may need to be topped up with SF₆ gas (for instance to replace gas removed for sampling purposes). Gas filling is through a valve at the front of the unit. See section 6.3 on page 19 for further details.



5.2 General Switch Operation

All switches (ring and fuse) have the same basic operating procedure. Select the operation desired with the rotary selector. The spring-loaded selector must engage with the location hole in the panel. Symbols to the right (Red) and left (Green) of the handle hole indicate the operations possible in the respective positions.

Access for the operating handle is controlled by a rotary selector that has one of three possible states:

1. Handle access blocked; no switching possible.
2. Switch able to operate from *off* to *on* (and vice versa) Red zone
3. Switch able to operate from *earth* to *off* (and vice versa). Green zone

The selector can be padlocked in any of these three positions.

From *off* status, selection of either *earth* or *main* switch operation is possible. From *on* status, *earth* switch operation is not possible (the switch must first be returned to *off*). Likewise, from *earthed* status the *main* switch operation is not possible.

After selecting the desired operation insert the handle and rotate in the direction indicated by the symbols. For instance, to switch from *off* to *on* the handle is rotated clockwise. About 60° rotation is required for switch operation; internal stops provide limits to the movement. The operating handle has been designed to give a delay between operations either clockwise or anti-clockwise.



Front of SafeLink unit showing the mimic diagram and switches in (from left to right) the off, on, and earth positions.

The status of each switch is indicated by an active mimic diagram that changes to reflect the state of the switch. Black lines show that a switch is open, while white lines show the switch is closed. In addition, the status of each switch is indicated by a symbol (O, I or \perp) for *off*, *on* and *earth* respectively.

Interlocks are provided to ensure that operators can perform switching operations only in the correct sequence; and to ensure that access to cable terminations and other high voltage areas are prevented when voltage is present.

Only when the switch has been earthed and the selector returned to the blocked position can the associated cable box cover be removed. Once the cover is removed, the interlock prevents the switch being closed until the cover is replaced. While the covers are removed, the switch can only be moved from *earth* to *off*, this allows for cable testing to be carried out. See Section 5.7 on page 18 for further details.

5.3 Switch-Fuse Reset

The operation of the switch-fuse is identical to the ring switch except when a fuse has blown. In which case, the striker initiates the automatic opening of the switch. This is indicated by the symbol "O" appearing on the mimic and the word "RESET" being shown above the handle hole. In addition to this, the fuse blown indication on the front of the SafeLink will show.

The arrow on the handle socket will indicate that the handle must be rotated anti-clockwise to reset the mechanism (the only possible action).

It is important to rotate the handle fully until the stop is felt, to reset the switch correctly.

5.4 Fuse Replacement

1. When a fuse is blown, there is indication via the striker mimic on the fuse door. This indicator is BLACK when all fuses are healthy and the door is closed and turns RED if there is a blown fuse



Front of SafeLink fuse door The red fuse blown indicator is displayed.

2. To gain access to the fuse compartment the switch must be in the earth position and the selector in the *blocked* position before the door can be opened. The door catch will not fully rotate and release the door unless these conditions are met. This ensures that the internal earthing of both ends of the fuse is in place before access is available.



Front of SafeLink unit showing the mimic diagram for the switch-fuse following a fuse blow event. Note the word 'RESET' and the red fuse blown indicator are displayed.

Rotate the fuse access door catch anti-clockwise to open.

3. Once the door is opened, the fuse canisters are visible. The blown fuse(s) will be indicated by the canister(s) with the extended white plastic pin(s). All three fuses should be replaced as a set.



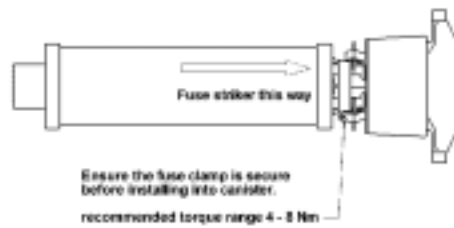
Fuse door open and fuse canisters available.

- with the fuse door open, the roof section can be hinged up to allow improved access to the fuse handles. Pull the red handle on the front of the canister fully downwards. This will allow the fuse assembly to be removed.



Central fuse assembly and fuse being withdrawn.

- Release the fuse from the fuse assembly with a screwdriver.
- Fit the new fuse into fuse assembly and tighten clamp. Do not overtighten the clamp screw. Make sure that the striker is in the direction of the fuse sealing cap. Carefully refit the fuse and fuse assembly into the canister. The cap must be clean of grease or dirt.
- When the fuse door is closed ensure that nothing obstructs the fuse striker mechanism slots. If these slots are blocked, fuse tripping may not operate.



Fuse door cover showing position of striker mechanism slots.



SafeLink

SF₆ Insulated Ring Main Unit
Installation and Operating Instructions

5.5 Fuse Types and Replacement

The fuses used must comply with IEC 60282-1:1994 (*High-voltage fuses - Part 1: Current-limiting fuses*) having medium striker energy of $1J \pm \frac{1}{2}J$. It is important that care is taken with the fuse alignment when installing small diameter fuses (ie less than 87mm). The fuse canister is completely sealed to IP65. Fuse links must have a barrel length of 292mm and dimensional compliance to DIN 43625

To replace a fuse, undertake the steps outlined in Section 5.3.1 on page 15. This section also details the switch-fuse reset procedure. Note that the switch will not remain in the closed position if a blown fuse is present.

Auxiliary switches are available to give an additional indication of the fuse trip status.

Avoid dirt on the rubber plug; do not apply grease. The fuse canister and tripping mechanism must be kept clean and dry.

Discard and replace all three fuses when any fuse has operated (refer to IEC 60282-1 & IEC 60420).

5.5.1 Fuse Tables

100% 630A	Transformer rating (kVA)													
	50	100	125	160	200	250	315	400	500	630	800	1000	1250	1500
Un (kV)	Fuse Link rating In (A)													
3.3	25	40	40	50	50	63	100	100	125	160				
6.6	16	25	25	25	40	40	50	50	63	80	100	125	160	
10	10	16	16	25	25	25	40	40	50	50	80	80	160	
11	6	16	16	25	25	25	25	40	50	50	63	80	125	160
12	6	16	16	16	25	25	25	40	40	50	63	80	125	160

The table is based on using fuse types ABB CEF (alt. SIBA)

Fuse barrel length = 292mm

Normal operating conditions with no transformer overload

Ambient temperature $-25\text{ }^{\circ}\text{C} + 40\text{ }^{\circ}\text{C}$

130% 630A	Transformer rating (kVA)													
	50	100	125	160	200	250	315	400	500	630	800	1000	1250	1500
Un (kV)	Fuse Link rating In (A)													
3.3	25	40	40	50	50	80	100	125	160					
6.6	16	25	25	25	40	40	50	50	80	100	125	160		
10	10	16	16	25	25	25	40	40	50	80	80	125		
11	6	16	16	25	25	25	25	40	50	63	80	100	160	*160
12	6	16	16	16	25	25	25	40	40	63	63	80	125	*160

The table is based on using fuse types ABB CEF (alt. SIBA)

Fuse barrel length = 292mm

Normal operating conditions with 30% transformer overload

Ambient temperature $-25\text{ }^{\circ}\text{C} + 40\text{ }^{\circ}\text{C}$

* *Maximum continuous overload 120%*

5.6 Cable Box

The cable box has been designed to ensure that arc faults are contained. This is achieved using a double skin design on the side and front panels.

To gain access to the cable box the respective switch must first be in the *earth* position and the selector switch in the blocked position. This allows the cable box cover to be lifted off. This action also engages an interlock to prevent the switch being closed while the cover is removed.

When refitting the cable box covers ensure that the cover is pushed fully down onto the locating pins.

5.7 Cable Testing

Cable testing first requires that the cable box cover be removed as described above. The switch can be taken out of the *earth* position to the *off* position. To allow test connections to be made to the cable, the termination boots must be slid down to reveal the test points on the bushing stems above the terminations.

Once the cable box cover is removed, the switch cannot be turned to the *on* position. The switch must be returned to the *earth* position before the cover is refitted. The cover catch locks automatically once the switch is taken out of the *earth* position.

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

It is important that the terminations be done in the manner outlined in section 4.3 on page 11

6 Maintenance

6.1 Environmental

The SafeLink switching enclosure is a gas-tight welded stainless steel compartment able to withstand a harsh environment. However, it is important that the base of the SafeLink installation be kept free of vegetation or other material to prevent corrosion of the stand and/or enclosure.

6.2 Maintenance

All components within the SF₆ insulated tank are maintenance free for the life expectancy of the unit. The tank is made of stainless steel.

Scratches or other damage to panels must be repaired.

Mechanical parts located outside the sealed tank are surface treated or made of corrosion resistant materials. Moving parts are lubricated, as necessary during manufacture, for the unit's life expectancy.

Units installed in extreme conditions will require inspection depending on the nature of the environment.

Where an outdoor enclosure is used, this should be checked periodically for scratches or corrosion and the base of the stand must be kept clear of vegetation and well ventilated.

6.3 Gas Sampling and Filling

The gas density gauge on the front of the SafeLink shows the density of SF₆ gas in the unit. All units are tested to ensure that any leakage rate is so low as to give a thirty-year service life. During switching, the arc formed will cause the gas to dissociate. Once the arc is extinguished the SF₆ reforms. A molecular sieve is fitted inside the switching enclosure to absorb any remaining decomposition products.

When samples are required these are taken through the *Dilo* fitting of the gas density gauge on the front of the unit in the fuse compartment. Therefore, the fused switch must be switched to the *earth* position and the selector placed in the blocked position. The sample must be taken with the sampling kit available from ABB. This will ensure that any gas escaping during the sampling process is minimised.

Gas is added through the same connection used to take samples. The ABB filling adaptor allows the pressure inside the switch to be monitored during filling. Full details are included with the filling adaptor.

6.4 Environmental Certification

Environmental Declaration For SafeLink Sf₆ Insulated Ring Main Unit

6.4.1 Life Expectancy Of Product

The product complies with the requirements denoted by IEC 60298. The designed life span under indoor service condition exceeds 30 years (IEC 60298 annex GG).

The switchgear is gas-tight with an expected diffusion rate of less than 0.1% per annum. Referring to the reference-pressure of 1.2 bar, the switchgear will maintain gas-tightness and a gas-pressure better than 1.1 bar* throughout its designed life span. (* at 20°C)

6.4.2 Recycling Capability

Raw Material	Amount (kg)	% of total weight –	Recycle	Environmental effects & recycle/reuse processes
Iron	120.10	49.28%	Yes	Separate and (re)melt
Stainless Steel	66.39	27.24%	Yes	Separate and (re)melt
Copper	26.44	10.85%	Yes	Separate and (re)melt
Zinc	5.63	2.31%	Yes	Separate and (re)melt
Brass	1.80	0.74%	Yes	Separate and (re)melt
Silver	0.08	0.03%	Yes	Separate and (re)melt
Thermoplastic	3.25	1.33%	Yes	Separate and make pellets or burn for energy
Rubber	1.53	0.63%	Yes	Burn for energy
SF ₆ gas	1.00	0.41%	Yes	ABB reclaims used SF ₆ gas
Total for recycling	226.22	92.82%		
Epoxy	17.49	7.11%		Returns 60% silicon ash if burned for energy
Epoxy Resin Fibre	0.17	0.07%		Landfill
Total Weight **	243.70			
Wood (packing)	15.50		Yes	Reuse or burn for energy

** All figures were collected from first generation CFC 3-way ring main unit

6.4.3 End-Of-Life

ABB Switchgear Division is committed to the protection of the environment and adheres to ISO 14001 standards. It is our obligation to facilitate end-of-life recycling for our products.

There are no explicit requirements for how to handle discarded switchgears at end-of-life. ABB's recycling service is according to IEC 1634 edition 1995 section 6: {*End of life SF₆ filled equipment*} and in particular 6.5.2.a: {*Low decomposition*}: No special action is required; non-recoverable parts can be disposed of normally according to local regulations.

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

ABB Ltd. Power Technology Division in Auckland can arrange to reclaim SF₆ gas from discarded switchgears.

7 Accessories

	<h3>7.1 Horstmann EKA-3</h3> <p>Earth Fault and Short Circuit Indicator</p> <ul style="list-style-type: none"> • Indicating unit with earth fault sensitivity 40A, 80A and 160A • Large CT for earth fault 3 phases split core diameter 50 to 90mm • Two small CT's for short circuit indication split core diameter 20 to 50mm • Standard short circuit indication set at 450A • Reset after approx 14 hours • SCADA relay collective wipe contact • 240 Vac required
	<h3>7.2 Horstmann Alpha/E and Alpha/M</h3> <p>Short-circuit indicator</p> <ul style="list-style-type: none"> • Consists of the indicator and three CT's that are fixed above the cable bushings, no cable CT's • Trip current selectable 400A, 600A, 800A, 1000A • Auto-reset selectable 2 hr or 4 hr or manual • Remote signalling wiping contact. • Test function • Self powered with lithium cell
	<h3>7.3 Voltage Indicator</h3> <p>This plug-in device monitors the voltage on the cable bushings. Each cable bushing has a built in capacitive screen, which is wired to 4mm plugs on the front panel. Each switch has a plug-set to accept the display module. This gives an indication 1,2 and/or 3 related to the live phases.</p>
	<h3>7.4 Phase Balance Tester</h3> <p>Before closing a new incoming feeder or ring current to a live SafeLink ring main unit, check phase rotation and balance with the Phase Balance Tester.</p> <p>There is also facility to check the function of the Voltage Indicator and the Phase Balance Tester itself.</p>



7.5 Auxiliary Switch

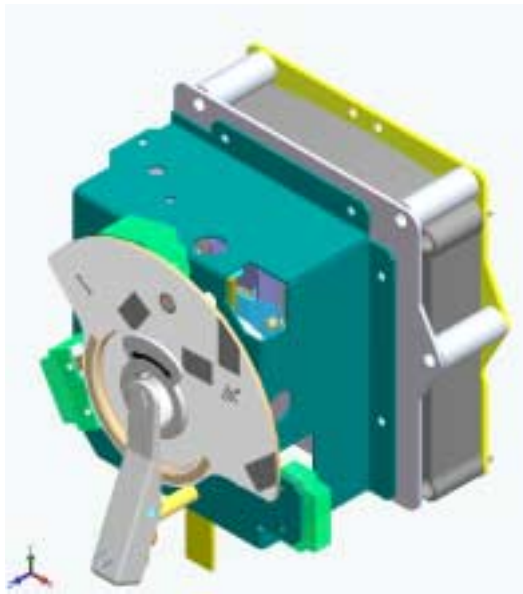
Snap action double-break switch with forced contact opening and self-cleaning contacts.

1 x Normally Open contact and 1 x Normally Closed contact per block.

It is possible to fit two blocks per Main switch and two blocks per Earth switch including the switch-fuse module. One block can also be fitted to indicate fuse blown.

Ratings:

I _{th}	10A
Vac	380
Vdc	450
V withstand	2500V



7.6 Motor Operator

- Available to be fitted to any main ring switch
- Fitted behind mimic panel
- Available in 24Vdc and 230Vac, other voltages on request
- Manual override is standard
- Plug-in control box that houses battery and remotes can be supplied to fit within the outdoor enclosure space.



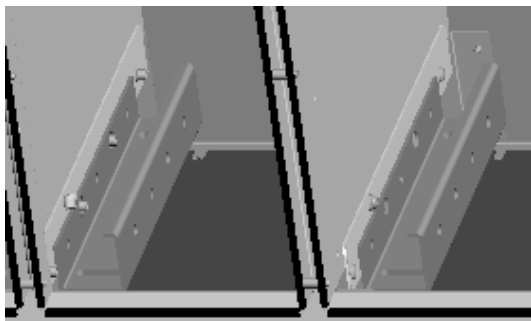
7.7 Gas Density Monitor

Pressure indicator is supplied as standard on all SafeLink Ring Main Units. Remote indication can also be provided as an option providing 1 or 2 micro switches 5A / 250 Vac, 50 Hz. The gas density monitor must be specified with order.



7.8 Shunt Trip

- Available in 24Vdc and 230Vac, other voltages on request
- The shunt trip can be retrofitted to any SafeLink RMU.



7.9 Cable Clamp Rail

- Adjustable for cable size
- Suitable for Unistrut K series clamps or equivalent. (Not included)
- Durable 3mm Hot Dip Galvanised construction



7.10 Bottom Cover/Gland Plates



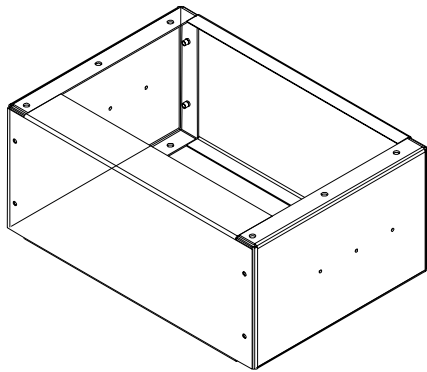
7.11 Emergency Trip

Available to be fitted to the switch-fuse transformer feed.



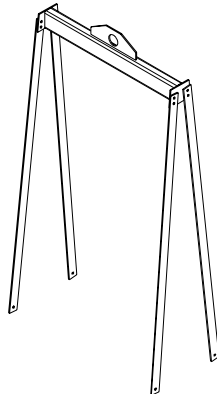
7.12 Gas Filling/Sampling Adaptor Kit

- Allows access to gas enclosure via the density gauge shut-off connecting valve (DILO)
- Fitted with 1/4 NPT nipple for connection to bottle regulator set (not supplied)
- See instruction sheets for connection and procedure details



7.13 Extended Height Plinth

- Extends the height by 300mm
- Fits to the base of a SafeLink RMU
- Available in three sizes to suit width of the RMU



7.14 Lifting Frame

- Suitable for lifting SafeLink RMU's fitted to standard concrete plinths.

Text and illustrations are not binding.
The right to make alterations is reserved.