

1VDD005976 GB

SafeRing / SafePlus 12/24kV Installation and operating instructions



CONTENTS

Contents

1.	General description	3
1.1	Table of locations	4
1.2	Dimensional drawings	5
2.	Transport and handling	6
2.1	By receiving Inspection	6
2.2	Storage	6
3.	Technical data	7
3.1	Electrical data	7
3.2	Fuse table for modules	9
4.	Installation	10
4.1	Cable compartment	11
4.2	Cable connection	12
4.3	Current transformers for relay protection	13
4.4	Gas pressure	14
5.	Operation	15
5.1	Operating conditions	15
5.2	Operation	16
5.3	Installation and replacement of fuses	18
6.	Additional equipment	20
6.1	Low-voltage connections auxiliary contacts	20
6.2	Remote control and monitoring unit	20
6.3	Capacitive voltage indicator	20
6.4	Short circuit indicator	20
6.5	Motor operation	21
6.6	Cable testing	21
6.7	External busbar	22
6.8	Arc-suppressor	22
6.9	Pressure indicator	22
6.10	Base frame	22
6.11	Ronis key interlock	22
6.12	Top entry box for low voltage cables	22
6.13	Low voltage compartment	22
7.	Maintenance	22
7.1	Control and monitoring the gas	22
7.2	Environmental certification	23



SafeRing 3-way unit CCV

1. GENERAL DESCRIPTION

SafeRing is a SF6-insulated ring main unit and SafePlus is a compact switchgear for applications in medium voltage distribution networks. SafeRing can be supplied as a 2, 3 or 4-way standard configurations with additional equipment according to customer specification.

Available configurations:

DeF, CCF, CCC, CCCF, CCFF, DeV, CCV, CCCC, CCCV, CCVV.

SafePlus has a unique flexibility due to its extendibility and the possible combination of fully modular and semi-modular configurations.

Available modules:

Be - SL - Sv - M - C - De - D - F - V.

SafeRing and SafePlus offer a sealed stainless steel tank which contains all the live components and switching functions. The transformer is protected either by a switch fuse combination or a vacuum circuit-breaker.

The units / modules are delivered from the factory ready for installation.

Routine tests are carried out on all units/ modules before dispatch.

No special tools are required for installing the equipment.

Available modules are :

C - Cable switch

F - Switch fuse disconnecter

D - Direct cable connection

De -Direct cable connection with earthing

V - Vacuum circuit breaker

SL -Busbar sectionalizer, load break switch

Busrise needed when SL on right side of SF6 tank

Sv -Busbar sectionalizer, vacuum circuit breaker

Sv always together with busrise (total width=650 mm)

Be - Busbar earthing

M - Metering cubicle

SafeRing / SafePlus with switch fuse combination in compliance with IEC 62271-105.

With this unit the transformer will be protected by current-limiting HV fuses in combination with a load break switch.

The load break switch is equipped with a stored spring energy mechanism which can be tripped by the fuse striker pin

SafeRing / SafePlus with vacuum circuit-breaker in compliance with IEC62271-100

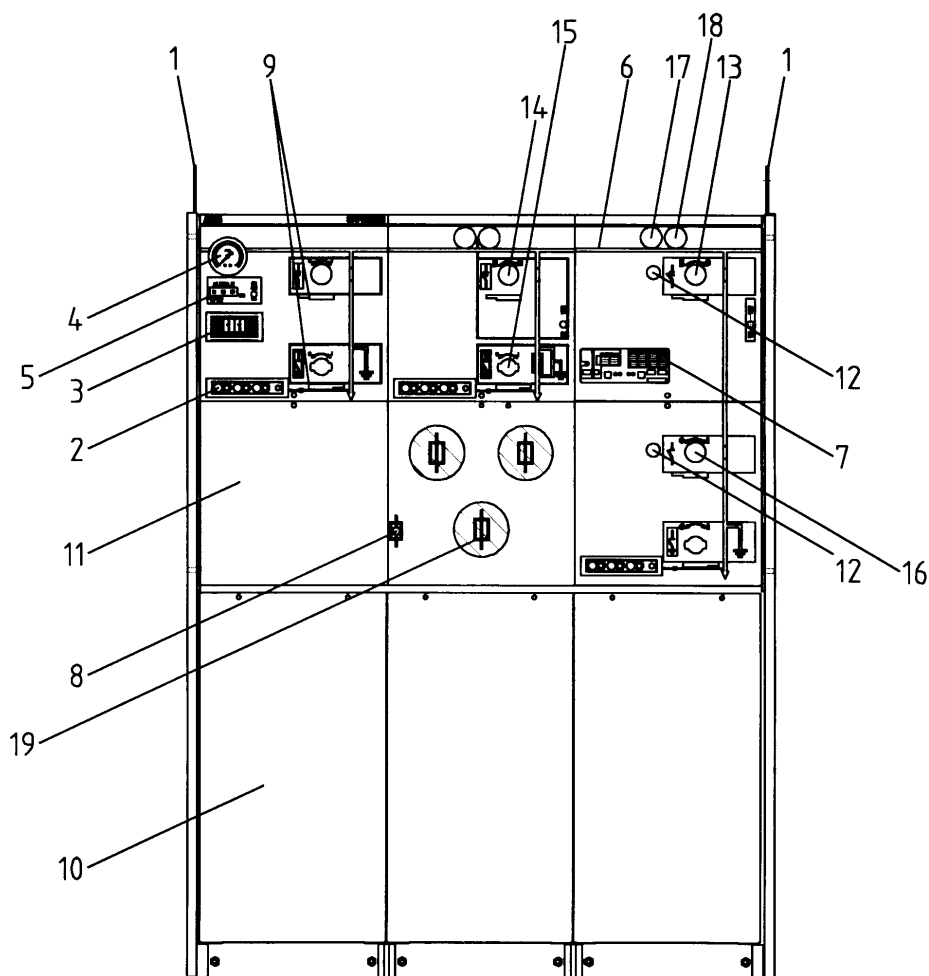
With this unit the transformer will be protected by a vacuum circuit breaker combined with relays and current transformers.

The standard relays are based on digital technology and do not require an external power supply.

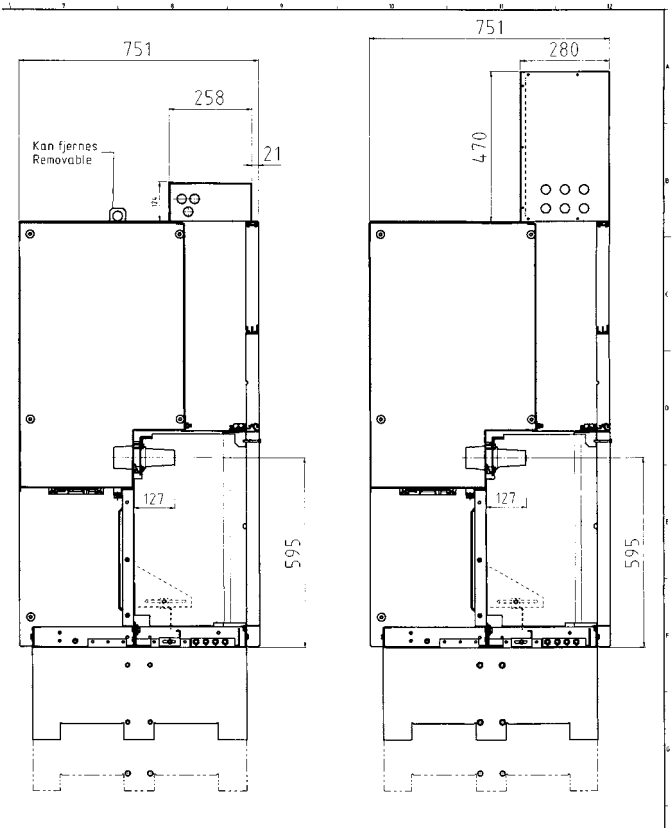
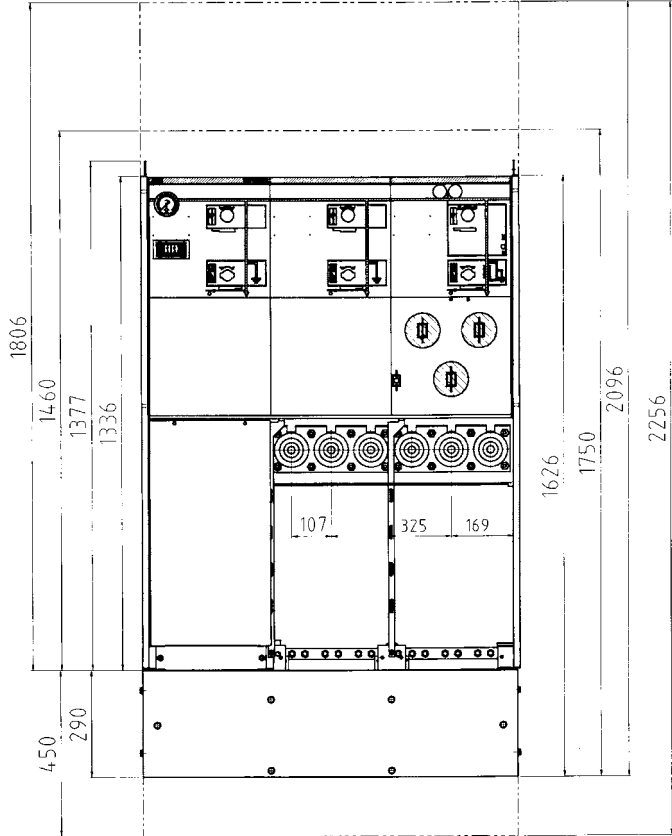
Further information can be found in the product catalogue for SafeRing and SafePlus, 1VDD006104 GB.

1.1 TABLE OF LOCATIONS

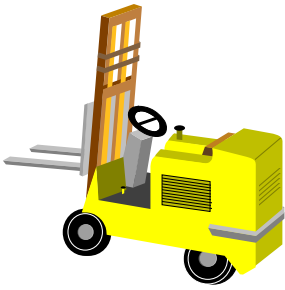
1. Lifting lugs
2. Capacitive voltage indication (additional equipment)
3. Short circuit indicator (additional equipment)
4. Pressure indicator (additional equipment)
5. Legend plate with serial number
6. Mimic diagram
7. Relay protection
8. Blown fuse indicator
9. Padlock device
10. Cable compartment
11. Test bushings (additional equipment)
12. Ronis key interlock (additional equipment)
13. Circuit breaker
14. Fuse switch disconnecter
15. Earthing switch
16. Isolator
17. Circuit breaker open/ emergency stop
18. Circuit breaker close
19. Fuses



1.2 DIMENSIONAL DRAWINGS



Unit	mm
1-way	371
2-way	696
3-way	1021
4-way	1346
5-way	1671



2. TRANSPORT AND HANDLING

The units are delivered from the factory ready for installation.

Weight table for standard SafeRing

2-way DeF / DeV	300 kg
3-way CCF / CCV	450 kg
4-way CCCF / CCCV	600 kg
4-way CCFF / CCVV	600 kg
3-way CCC	450 kg
4-way CCCC	600 kg

SafePlus

Standard 1-way	150 kg
2-, 3 and 4-way as for SafeRing	
5-way approx.	750 kg
M-metering cubicle approx.	250 kg

The weights are without additional equipment.

SafeRing / SafePlus is fitted with lifting lugs, but can also be moved on pallets with a forklift truck.



2.1 BY RECEIVING INSPECTION

Upon receiving the SafeRing / SafePlus 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.

After unpacking, the following must be checked:

1. Operating handle – 1 piece should be included, normally fixed on right hand side .
2. Check that the pointer on the pressure indicator is in the green area.
3. Carry out a function test on the mechanical parts.

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

2.2 STORAGE

SafeRing / SafePlus must be stored under cover in a dry and well ventilated area until it is installed and put into operation.

3. TECHNICAL DATA

3.1 ELECTRICAL DATA

SafeRing		C-module		F-module		V-module	
		Switch disconnecter	Earthing switch	Switch-fuse disconnecter	Downstream earthing switch	Vacuum circuit-breaker	Earthing switch/disconnector
Rated voltage	kV	12/15/17,5/24	12/15/17,5/24	12/17,5/24	12/17,5/24	12/15/17,5/24	12/15/17,5/24
Power freq. withstand voltage	kV	28/38/38/50	28/38/38/50	28/38/50	28/38/50	28/38/38/50	28/38/38/50
Impulse withstand voltage	kV	95/95/95/125	95/95/95/125	95/95/125	95/95/125	95/95/95/125	95/95/95/125
Rated normal current	A	630/630/630/630		see ¹⁾		200/200/200/200	
Breaking capacities:							
- active load	A	630/630/630/630					
- closed loop	A	630/630/630/630					
- off load cable charging	A	135/135/135/135					
- off load transformer				20/20/20			
- earth fault	A	200/150/150/150					
- earth fault cable charging	A	115/87/87/87					
- short-circuit breaking current	kA			see ²⁾		16/16/16/16	
Making capacity	kA	52,5/52,5/40/40	52,5/52,5/40/40	see ²⁾	12,5/12,5/12,5	40/40/40/40	40/40/40/40
Short time current 0,5 sec. ³⁾						16/16/16/16	
Short time current 1 sec. ⁴⁾	kA				5/5/5		
Short time current 3 sec. ⁵⁾	kA	21/21/16/16	21/21/16/16			21/21/16/16	21/21/16/16

¹⁾ Depending on the current rating of the fuse-link

²⁾ Limited by high voltage fuse-links

³⁾ Maximum rating for bushings Interface A (200 series plug-in)

⁴⁾ Maximum rating for bushings Interface B (400 series plug-in)

⁵⁾ Maximum rating for bushings Interface C (400 series bolted)

SafeRing is tested according to IEC Publications IEC 60265, IEC 60694 and IEC 62271, parts 100, 102, 105, 200

SafePlus		C-module		F-module		V-module ⁶⁾	
		Switch disconnecter	Earthing switch	Switch-fuse disconnecter	Downstream earthing switch	Vacuum circuit-breaker	Earthing switch/disconnector
Rated voltage	kV	12/15/17,5/24	12/15/17,5/24	12/17,5/24	12/17,5/24	12/15/17,5/24	12/15/17,5/24
Power freq. withstand voltage	kV	28/38/38/50	28/38/38/50	28/38/50	28/38/50	28/38/38/50	28/38/38/50
Impulse withstand voltage	kV	95/95/95/125	95/95/95/125	95/95/125	95/95/125	95/95/95/125	95/95/95/125
Rated normal current	A	630/630/630/630		see ¹⁾		200/200/200/200	
Breaking capacities:							
- active load	A	630/630/630/630					
- closed loop	A	630/630/630/630					
- off load cable charging	A	135/135/135/135					
- off load transformer				20/20/20			
- earth fault	A	200/150/150/150					
- earth fault cable charging	A	115/87/87/87					
- short-circuit breaking current	kA			see ²⁾		16/16/16/16	
Making capacity	kA	62,5/52,5/40/40	62,5/52,5/40/40	see ²⁾	12,5/12,5/12,5	52,5/52,5/40/40	52,5/52,5/40/40
Short time current 0,5 sec. ³⁾						16/16/16/16	
Short time current 1 sec.	kA	25/-/-/- ⁵⁾	25/-/-/- ⁵⁾		5/5/5	16/16/16/16 ⁴⁾	
Short time current 3 sec.	kA	21/21/21/21	21/21/21/21			21/21/16/16	21/21/16/16

¹⁾ Depending on the current rating of the fuse-link

²⁾ Limited by high voltage fuse-links

³⁾ Maximum rating for bushings Interface A (200 series plug-in) with rated current 200A

⁴⁾ Maximum rating for bushings Interface B (400 series plug-in)

⁵⁾ Maximum rating for bushings Interface C (400 series bolted)

⁶⁾ Data for V-module 12kV/25kA, 24kV/20kA, see next page

SafePlus is tested according to IEC Publications IEC 60265, IEC 60694 and IEC 62271, parts 100, 102, 105, 200

Technical data Vacuum circuit-breaker 24kV/20kA		
Rated voltage	kV	24
Power frequency withstand voltage	kV	50
Impulse withstand voltage	kV	125
Rated normal current	A	630
Breaking capacities:		
- short-circuit breaking current	kA	20
Making capacity	kA	50
Short time current 1 sec. ¹⁾	kA	21
Short time current 3 sec.	kA	21
Number of mechanical operations	2000 close / open manual	
Earthing switch downstream		
Rated voltage	kV	24
Power frequency withstand voltage	kV	50
Impulse withstand voltage	kV	125
Making capacity	kA	50
Short time current 1 sec.	A	21
Number of mechanical operations	1000 close / open manual	

¹⁾ Maximum rating for bushings Interface B (400 series plug-in): 16kA

3.2 FUSE TABLE FOR MODULES

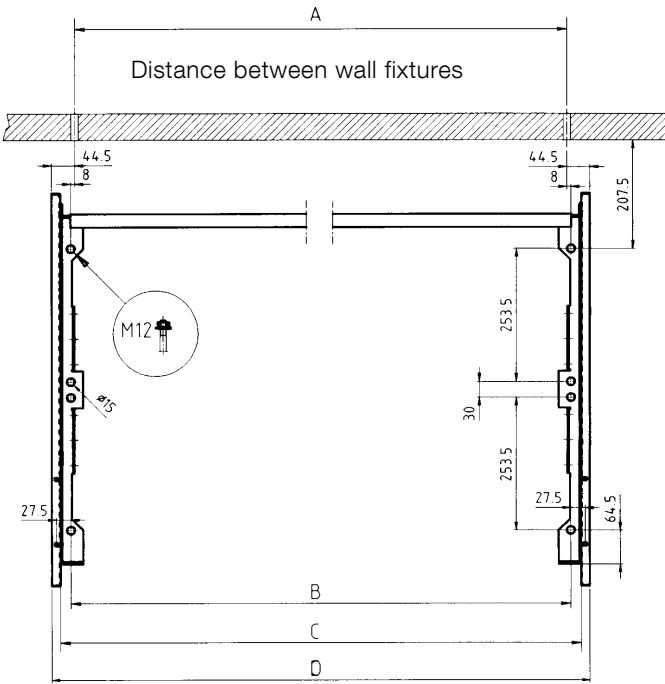
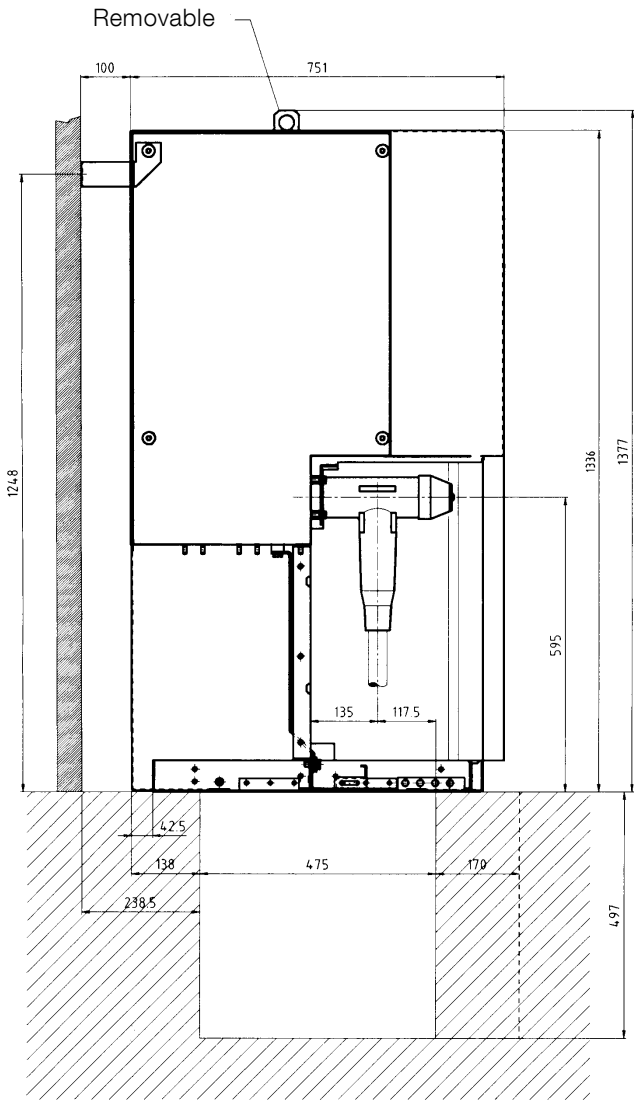
100%	Transformer rating (kVA)																CEF
U _N (kV)	25	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	
3	16	25	25	40	40	50	50	80	100	125	160	160					7,2 kV
3,3	16	25	25	40	40	50	50	63	80	100	125	160					
4,15	10	16	25	25	40	40	50	50	63	80	100	125	160				
5	10	16	25	25	25	40	40	50	50	63	80	100	160	160			
5,5	6	16	16	25	25	25	40	50	50	63	80	100	125	160			
6	6	16	16	25	25	25	40	40	50	50	80	100	125	160	160		
6,6	6	16	16	25	25	25	40	40	50	50	63	80	100	125	160		12 kV
10	6	10	10	16	16	25	25	25	40	40	50	50	80	80	125	125	
11	6	6	10	16	16	25	25	25	25	40	50	50	63	80	100	125	
12	6	6	10	16	16	16	25	25	25	40	40	50	63	80	100	125	17,5 kV
13,8	6	6	10	10	16	16	25	25	25	25	40	50	50	63	80	100	
15	6	6	10	10	16	16	16	25	25	25	40	40	50	63	80	100	
17,5	6	6	6	10	10	16	16	16	25	25	25	40	50	50	63	80	24 kV
20	6	6	6	10	10	16	16	16	25	25	25	40	40	50	63	63	
22	6	6	6	6	10	10	16	16	16	25	25	25	40	50	50	63	
24	6	6	6	6	10	10	16	16	16	25	25	25	40	40	50	63	

120%	Transformer rating (kVA)																CEF
U _N (kV)	25	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	
3	16	25	25	40	40	50	63	80	100	125	160	160					7,2 kV
3,3	16	25	25	40	40	50	63	80	80	100	125	160					
4,15	10	16	25	25	40	40	50	63	80	80	100	125	160				
5	10	16	25	25	25	40	40	50	63	80	80	100	160	160			
5,5	6	16	16	25	25	25	40	50	50	80	80	100	125	160			
6	6	16	16	25	25	25	40	40	50	63	80	100	125	160	160		
6,6	6	16	16	25	25	25	40	40	50	63	80	80	100	125	160		12 kV
10	6	10	10	16	16	25	25	25	40	40	50	50	80	80	125	125	
11	6	6	10	16	16	25	25	25	25	40	50	50	63	80	100	125	
12	6	6	10	16	16	16	25	25	25	40	40	50	63	80	100	125	17,5 kV
13,8	6	6	10	10	16	16	25	25	25	25	40	50	50	63	80	100	
15	6	6	10	10	16	16	16	25	25	25	40	40	50	63	80	100	
17,5	6	6	6	10	10	16	16	16	25	25	25	40	50	50	63	80	24 kV
20	6	6	6	10	10	16	16	16	25	25	25	40	40	50	63	63	
22	6	6	6	6	10	10	16	16	16	25	25	25	40	50	50	63	
24	6	6	6	6	10	10	16	16	16	25	25	25	40	40	50	63	

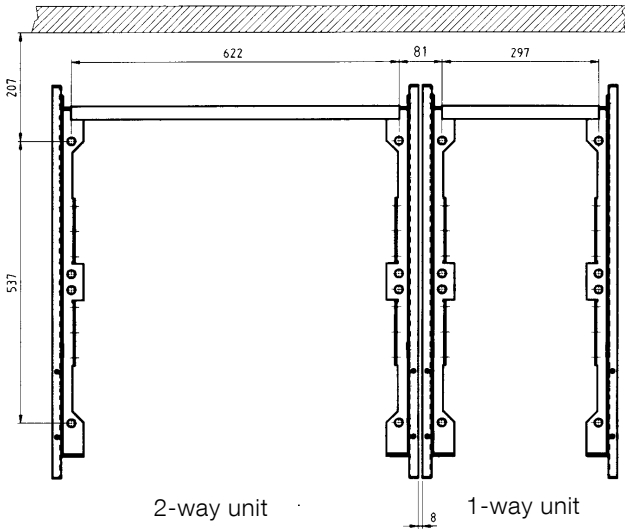
- Both tables above are based on using ABB CEF high-voltage current-limiting back-up fuse-links
- Normal operating conditions with no overload of transformer (table 1) and with 20% overload of transformer (table 2)
- Ambient air temperature -25°C to +40°C

4. INSTALLATION

The floor must be well leveled and the unit must be fixed by means of anchor bolts in accordance with the dimensional drawing for the number of modules or units as appropriate.



Distance between units when external extension is used



When installing Ring Main Unit or Compact Switchgear with Internal Arc Classification AFL, the following must be considered:

- Unit must be equipped with arc proof cable covers.
- Distance from floor to roof must be minimum 2400 mm
- Distance from back of unit to wall must be 100 mm.
- Distance from side wall of unit to wall should preferably be 20 mm.
- Protection cover(s) with height 650 mm must be mounted on the side(s) of the unit when distance exceeds 20 mm.
- If unit is freestanding (i.e. distance from back of unit to wall exceeds 100 mm), the area behind the unit must be restricted and not accessible.
- Minimum dimensions of cable trench are 230 x 355 mm.

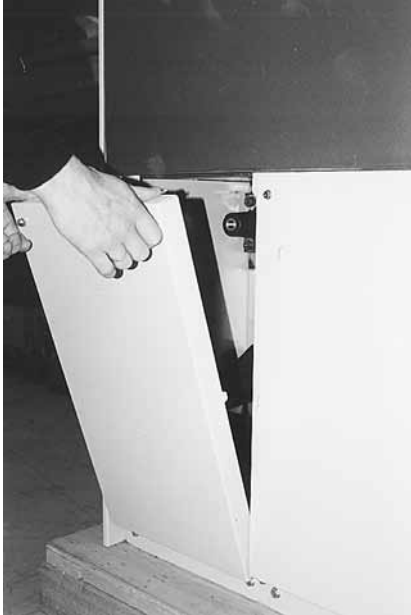
Unit	A	B	C	D
1-way	271	297	336	371
2-way	696	622	661	696
3-way	1021	947	986	1021
4-way	1346	1272	1313	1346
5-way	1581	1597	1636	1671

4.1 CABLE COMPARTMENT

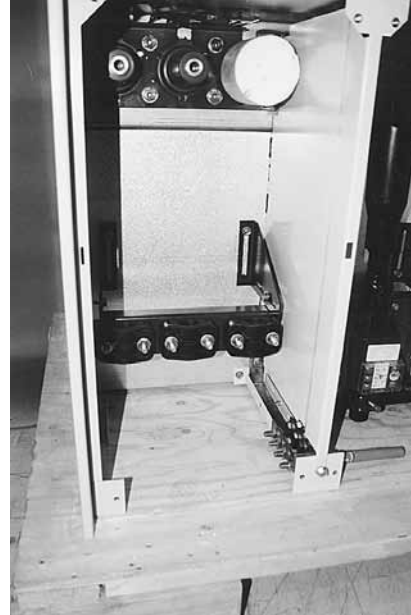
Removal of cable cover:

NB!

The cable cover can be supplied with interlocking to earthing switches. When interlocking is fitted, the cable cabinet can only be accessed when the earthing switch is in the closed position.



1. Loosen the screws on the cable cover, pull out and lift cover off.



3. Front section removed.



2. Removal of front section.



4. The panel can be removed by unscrewing A and B.

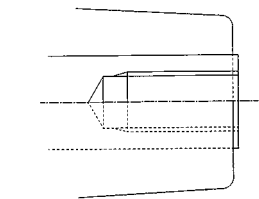
4.2 CABLE CONNECTION

SafeRing/SafePlus is equipped with external bushings which comply with DIN47636T1 & T2/EDF HN 525-61 for termination of cables.

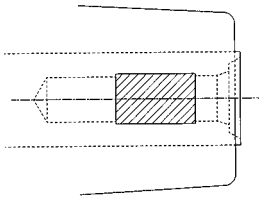
All bushings are situated in the same height from the floor and are protected by the cable cover.

SafeRing / SafePlus can be supplied with the following bushings for the various type of cubicles:

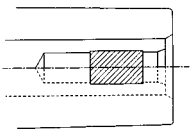
Bushings	Type of module		
	C	F	V
200 series plug-in		X	X
400 series plug-in	X	X	X
400 series bolted	X	X	X
600 series bolted	X		



400 series bolted
600 series bolted



400 series plug-in



200 series plug-in

Cable adapters

The following types are recommended:

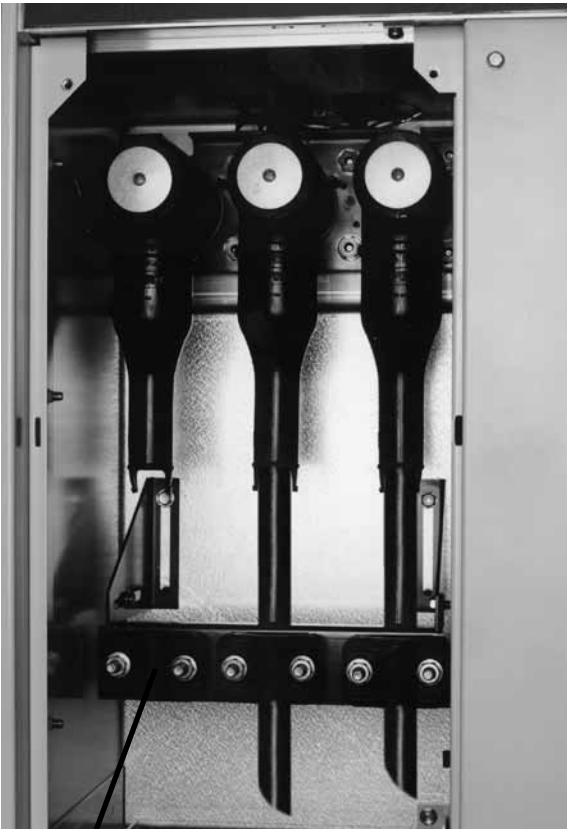
- ABB Kabeldon
- ABB Kabel und Draht
- Elastimold
- Raychem
- Cooper
- 3M

Please see supplier documentation for details.

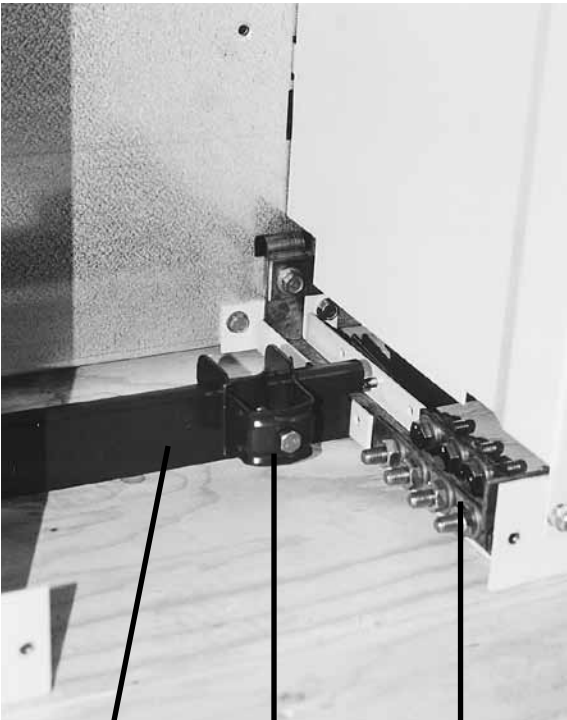
The manufacturer's installation instructions must be followed. Be sure to lubricate the bushings thoroughly with the silicone supplied.

NB!

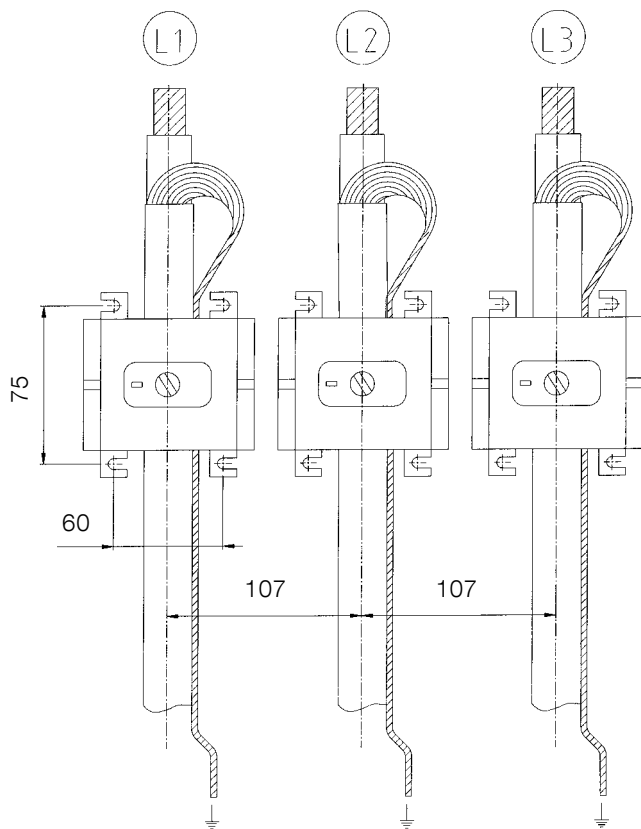
Where cables are not connected, the earthing switch must be locked in closed position or the bushings must be fitted with deadend recepticals before the unit is put into operation.



Adjustable cable support beam (additional equipment).



Cable support beam
Cable clamp(additional equipment).
Earthing bar



Installing current transformers. The cable shielding is led back through the centre hole and earthed

4.3 RELAY AND CURRENT TRANSFORMERS

A protection relay is installed in each vacuum circuit-breaker module. The cables from the protection relay to the current transformers are installed from the factory, and end up in the cable compartment, ready for connection to the three current transformers supplied.

Before installation:

- Check that the three current transformers have been delivered and that they are all of the same type.
- Check that the current transformers are of the correct type, with the correctly rated transformer ratio, for the distribution transformer's rated current and for the adjustment range on the protection relay (see protection relay manual).

Each current transformer must be mounted onto its high voltage cable before the cable termination is fitted.

The earth shield on the cable must be led back through the centre hole in the current transformer (see figure on left) and earthed on the earthing bar in the cable compartment. A mounting plate for the current transformers is fitted in the cable compartment.

After the current transformers have been installed in the unit, the cables from the protection relay are connected. Consult the manual supplied with the protection relay for a description of the connections.

SafeRing / SafePlus with vacuum circuit-breakers are prepared for self-powered OCEF protection relay ABB type REJ 603.

Relays with auxiliary voltage

SafePlus can be delivered with advanced protection relays:

- REF610 (integrated LV-compartment with hinged door)
- REF615 (high LV-compartment with hinged door)
- REF630 (high LV-compartment with hinged door)
- REF541 (high LV-compartment with hinged door)
- REF542+ (high LV-compartment with hinged door)

Separate manuals with examples of settings have been prepared for each of these protection relays.

4.4 GAS PRESSURE

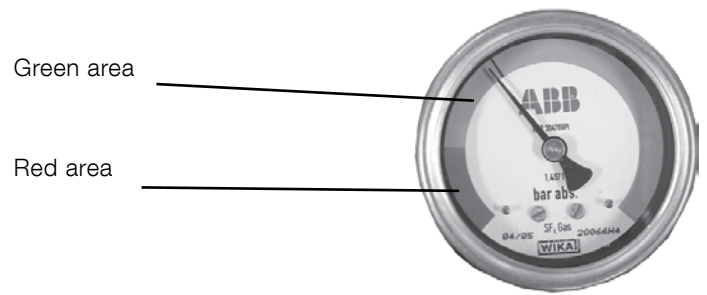
SafeRing / SafePlus contain SF₆ gas with a nominal pressure of 1,4 bar at 20° C.

SafeRing / SafePlus are «sealed for life» and is fitted with a temperature-compensated pressure indicator.

Pointer in green area - unit has correct pressure.

Pointer in red area - pressure is too low.

A temperature-compensated device emitting an electrical signal to indicate low gas pressure can be supplied on request

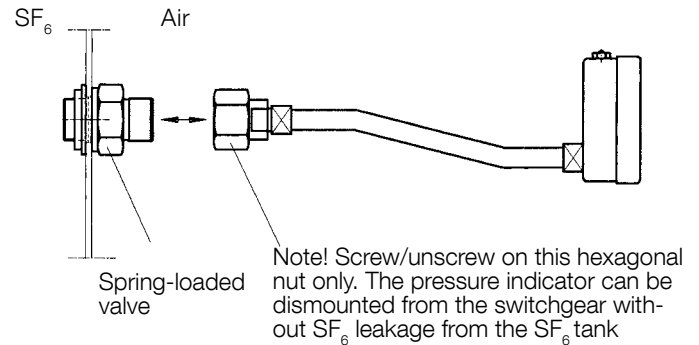


Topping up of SF₆ gas in SafeRing/SafePlus

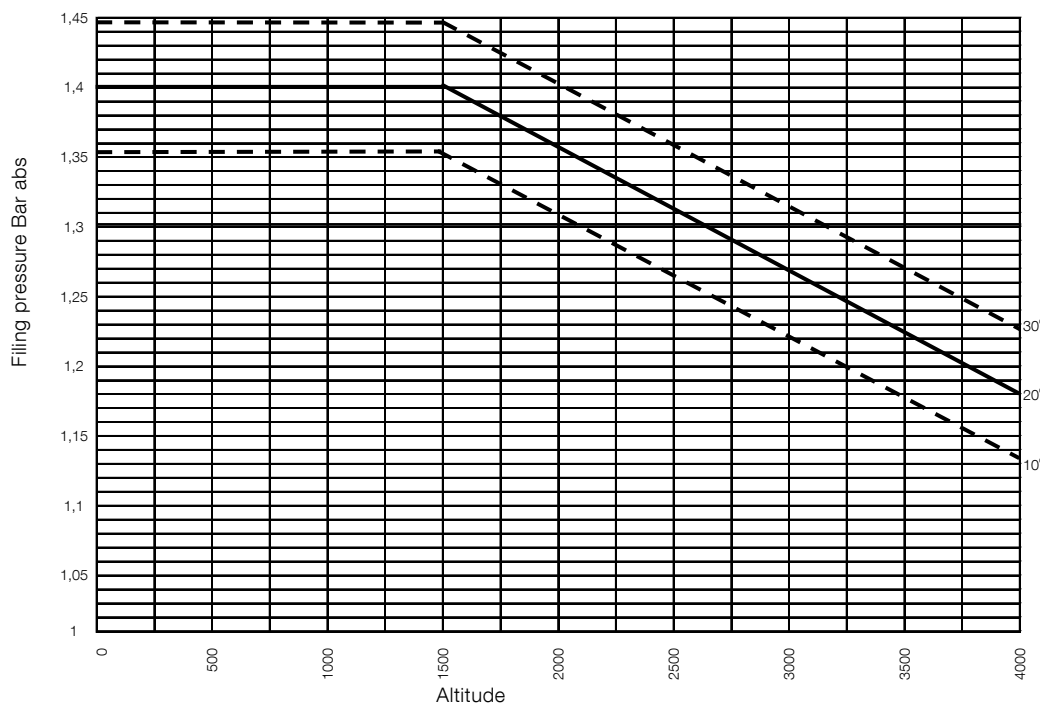
Potential risk!

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. It is important that the pressure measuring device shows absolute pressure. If you have a pressure measuring device showing over-pressure, please contact ABB for instructions (NHP 408025).



1. Remove the front cover and unscrew the pressure indicator by unscrewing the hexagon nut as shown on the figure at the right.
2. Screw the adapter to the valve. The tightening torque is max 45 Nm.
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 0,4 bar at ambient temperature 20° Celsius, (1,4 bar absolute) the gas filling must be stopped. See table for filling pressure below.
5. Remove the filling hose and connect the pressure device to check the pressure inside the RMU/switchgear.
6. When the correct pressure of 0,4 bar (1,4 bar absolute) is obtained, remove the adapter, check that the sealing between the pressure indicator and the valve is smooth and clean, and screw the pressure indicator to the RMU/switchgear with tightening torque max 45 Nm as shown above.



SF ₆ -gas temp	Absolute filling pressure
°C	mbar
0	1305
5	1328
10	1352
15	1376
20	1400
25	1424
30	1448
35	1472
40	1496

5. OPERATION

5.1 OPERATING CONDITIONS

Normal ambient conditions

SafeRing / SafePlus is generally equipped for operation/ service in normal indoor 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%

Altitude

Max height above sea level for installation without reducing gas pressure is 1500 metres. In the interval from 1500 to 2500 meters, gas pressure has to be reduced according to figure on previous page. For installation above 2500 meters, please contact ABB for instructions.

Special conditions

In accordance with IEC 62271-1, the manufacturer and end-user must agree about special operating conditions which deviate from operation under normal conditions.

The manufacturer/supplier must be consulted in advance if especially difficult operating conditions are involved. When SafeRing/SafePlus is installed more than 1500 metres above sea level, the atmospheric pressure will be lower and the overpressure inside the tank will have to be reduced.

Airfreight

Units / modules transported by airfreight are delivered with reduced overpressure. For topping up, please see procedure for topping up of SF₆ gas.

Application of the X-ray regulations

One of the physical properties of vacuum insulation is the possibility of X-ray emissions when the contact gap is open. The specified type test performed by the Physikalisch-Technische Bundesanstalt (PTB) in Brunswick demonstrates that the local dosage output of 1 µSv/h at a distance of 10 cm from the touchable surface is not exceeded.

The results are as follows:

- The use of the vacuum interrupters at rated operation voltage is completely safe.
- The above requirement is also fulfilled on application of the rated power frequency withstand voltage specified for the switching device by DIN VDE 0670 and IEC 60056 or a DC voltage of 48 or 70 kV during cable tests.
- Higher voltages than the rated power frequency withstand voltage specified in DIN VDE or IEC standards or the DC test voltage should not be applied!
- Fulfillment of the above requirement with the vacuum interrupter in the open position is dependent on maintenance of the specified distance between the contacts (which is automatically ensured with correct mechanism function and force transmission).



Switch disconnector:

Close: Turn the operating handle clockwise.

Open: Turn the operating handle anti-clockwise.



Earthing switch:

Close: Turn the operating handle clockwise.

Open: Turn the operating handle anti-clockwise.



Switch fuse disconnector:

Close: Turn the operating handle clockwise to charge the close/open spring. Then push the green button. (A)

Open: Push the red button. (B)

In circuit breaker configurations, the transformer circuit breaker can be tripped by the protection relay, while in switch fuse configurations fuse switch disconnector can be triggered by the fuse striker pin if an over current or short-circuit occurs.

5.2 OPERATION

All switches can be operated with the included operating handle.

Internal mechanical interlocking between the switch disconnector/isolator and the associated earthing switches prevents incorrect operation.

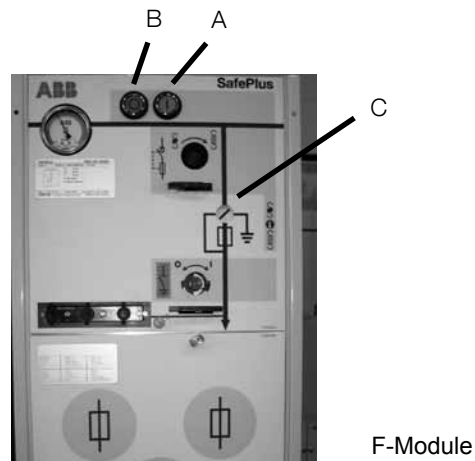
The isolator in the V-Module can only be opened after the circuit breaker is opened. Then the circuit breaker can be closed for testing purpose.

The operation of the switch disconnector/circuit breaker and earthing switches can be further interlocked by means of a padlock.

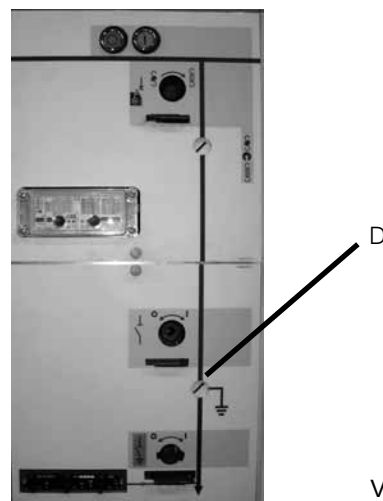
The earthing switches are operated by a snap action mechanism, which ensures fast closing. The earthing switch is closed by turning the operating handle clockwise. Turning the operating handle anti-clockwise opens the switch.

For closing the switch fuse disconnector / circuit breaker the spring mechanism must be charged. Turning the operating handle clockwise does this. Then the green "on" button must be pressed to close the switch/breaker.

An anti-reflex system, standard on all operating handles, prevents the immediate re-operation of switches.



F-Module



V-Module

Mechanical position indicators:

C: Switch fuse disconnector and Earthing switch both open

D: Isolator and Earthing switch both open

OPERATION OF VACUUM CIRCUIT-BREAKER - 24kV/20kA



Push button - VCB (OFF)

Push button - VCB (ON)

Indication -
spring charged /(discharged)

VCB position indicator

Counter - closing and opening
operations

Spring-charging lever



Before operating of the VCB, check that the 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 charged spring (yellow symbol, about 10 operations needed 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 spring automatically as soon as the auxiliary voltage is switched on.



Close: Push green (ON) button

Open: Push red (OFF) button

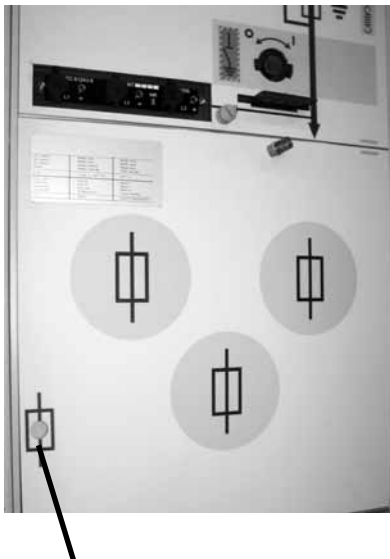
Note: the downstream disconnecter is mechanically interlocked with the VCB.

Operation of the downstream disconnecter and earthing switch, see previous page.

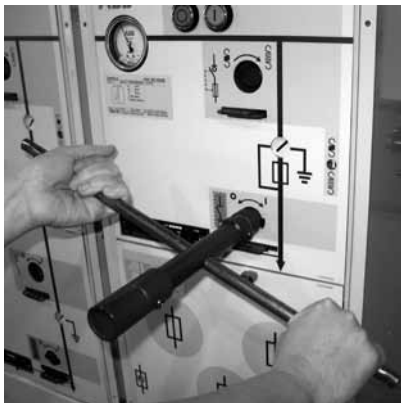
5.3 INSTALLATION AND REPLACEMENT OF FUSE-LINKS

A red indicator below the fuse symbol on the lower front panel indicates that at least one fuse-link has blown. Fuse links are replaced as shown in the sequence of illustrations. Switch-fuse configurations are supplied without fuse-links installed.

When installing fuse-linkss for the first time, follow the sequence of illustrations 1-9.



1. Blown fuse indicator.



2. Close earthing switch by turning operating handle clockwise.



3. Unscrew fuse cover.

4. Tilt out the fusepanel to gain access to fuse canisters.



5. Applying the operating handle and turning anti-clockwise opens the fuse canisters.



6. Pull out the fuse handle. The fuses are firmly fixed in the fuse cover.



7. Fix the fuses to the fuse cover using the contact screw

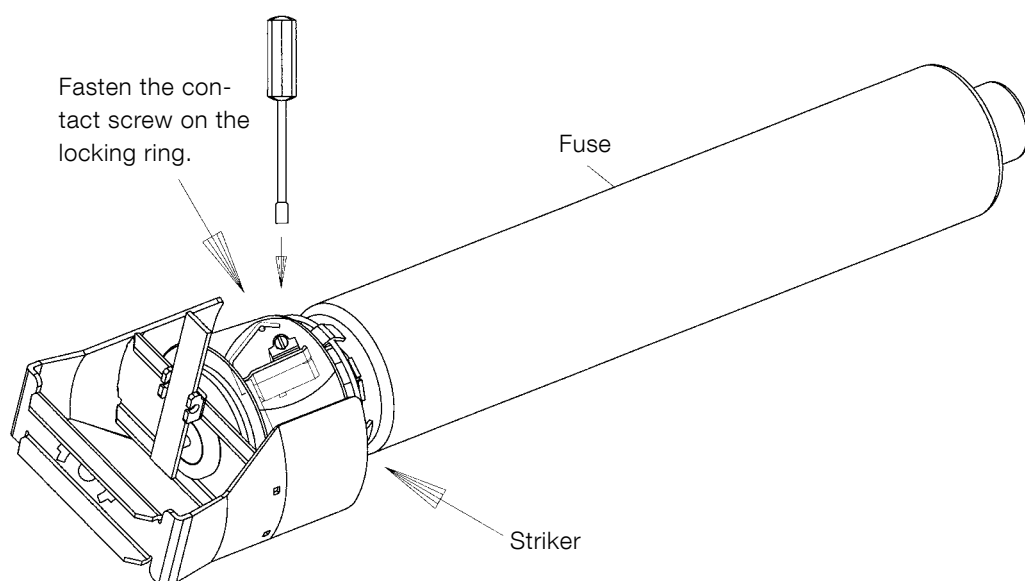
- The striker must point out from the fuse canister for the fuse to function properly.



8. Turn the handle on the fuse cover clockwise to lock and seal the fuse canister.
Use the operating handle.

9. Close the fuse panel.

The switches are ready for operation.





6. ADDITIONAL EQUIPMENT

6.1 LOW-VOLTAGE CONNECTIONS

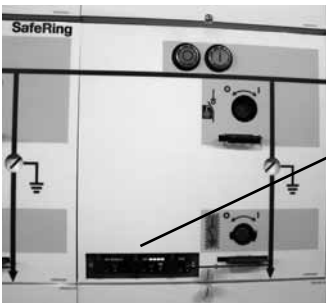
Auxiliary contacts (2NO+2NC) can be supplied to indicate switch positions on all switches/breakers. Access to the low-voltage connections is gained by removing the top front panel. A shunt trip coil (AC or DC) can be fitted on the transformer switch/breaker.

6.2 REMOTE CONTROL AND MONITORING UNIT

SafeRing can be equipped with an integrated remote control and monitoring unit (see picture left).

This unit is preengineered and can be delivered and installed as a retrofit solution or complete from factory.

SafePlus can have the same equipment but need an additional low voltage compartment on top of the switchgear.



Capacitive voltage indicator type HR



Phase balance check



VIM 1



VIM 3

Voltage indicators



6.4 SHORT CIRCUIT INDICATOR

Several types can be supplied:

Horstman SIGMA

Horstman SIGMA f+E 3

Horstman ALPHA-E

Horstman ComPass A

Horstman ComPass B

6.5 MOTOR OPERATION

Cable switches, vacuum circuit-breakers and earthing switches are operated by mechanisms located behind the front panel. The mechanisms for all the switches and breakers are operated manually with the operating level (standard), or are fitted with motor operation (additional equipment). The earthing switch can only be operated manually and is fitted with mechanisms to achieve fault making capabilities.

Motor operation can be easily retrofitted.

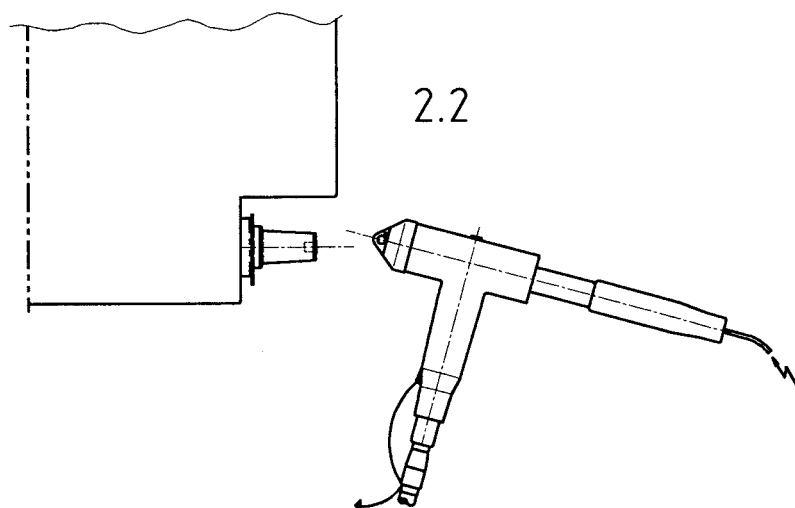
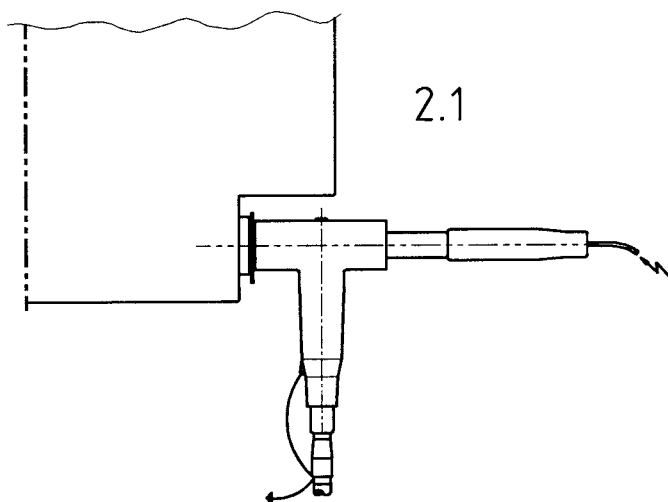
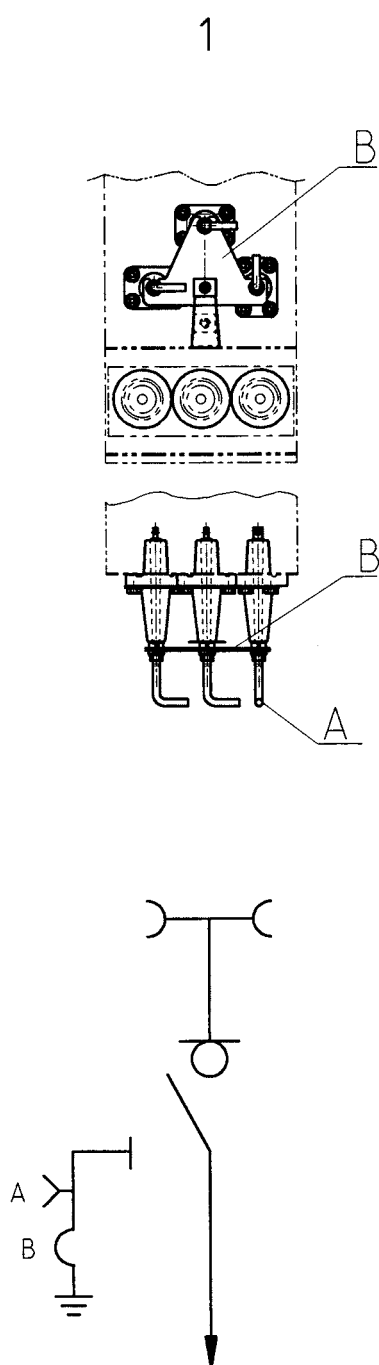
6.6 CABLE TESTING

Voltage testing and locating cable faults can be performed in two ways:

1. Directly at the testing points (A) if they are fitted on the unit. Proceed as follows: engage the earthing switch. Connect the testing equipment on top of the testing points which hold the earth bar (B). Remove the earth bar and perform the test. Refit the earth strip before the testing equipment is disconnected.
2. Directly at the cable connectors which are designed for testing the voltage of the cable. Follow the supplier's instructions.

2.1. Cable connector connected

2.2. Cable connector dismantled



6.7 EXTERNAL BUSBAR

SafeRing and SafePlus can be equipped with an external busbar. See separate instruction manual NOPOWSP 6006 GB.

6.8 ARC-SUPPRESSOR

An arc-suppressor can be fitted on all cable modules for SafeRing and C, D, De and V-modules on SafePlus. They must be ordered together with the unit and cannot be retrofitted.

The tripped of an arc-suppressor is indicated by means of an electric contact in the SF₆ tank, wired to the terminal strip behind the top front panel. (This requires aux. voltage supply.)

6.9 PRESSURE INDICATOR

SafeRing / SafePlus is always supplied with a pressure indicator in the form of a manometer. Additionally it is possible to fit device for an electric signal if the pressure is low. This requires aux. voltage supply.

6.10 BASE FRAME

SafeRing/SafePlus can be installed on a separate base frame, designed for cable entry from both sides or from the back. Two different heights 290 mm and 450 mm.

Note: Standard base frame is available as non arc proof version only.

6.11 RONIS KEY INTERLOCK

SafeRing / SafePlus can be supplied with a RONIS, EL 11 AP key interlocking system for breakers, switches and earthing switches

6.12 TOP ENTRY BOX FOR LOW VOLTAGE CABLES

SafeRing/SafePlus can be supplied with top entry box for low voltage cables.

6.13 LOW VOLTAGE COMPARTMENT

SafePlus can be supplied with low voltage compartment for protection relays, metering and other secondary equipment.

7. MAINTENANCE

All components in the SF₆ tank are maintenance-free for the declared life expectancy of the product. The tank is made of stainless steel.

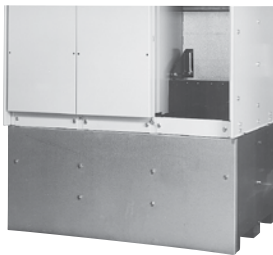
If the panels sustain any scratches or damage, these must be repaired with paint to prevent corrosion.

Mechanical parts are positioned outside the tank and behind the front panel. This enables easy access and replacement if required.

Mechanical parts are surface-treated to prevent corrosion. Moving parts are lubricated at the factory for the product's life expectancy. In extreme conditions (dust, sand and pollution), inspection and maintenance will be imperative, and in some cases replacements will be necessary. Check that the lubricant is not washed or wiped away from the mechanical moving parts.

7.1 CONTROL AND MONITORING THE GAS

SafeRing / SafePlus is a pressure-sealed system that normally does not require special inspections. However the gas pressure on the manometer should always be checked prior to operation.



7.2 ENVIRONMENTAL CERTIFICATION

1. LIFE EXPECTANCY OF PRODUCT

The product is developed in compliance with the requirements denoted by IEC 298. The design incorporates a life span under indoor service conditions exceeding 30 years (IEC 298 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 1.4 bar, the switchgear will maintain gas-tightness and a gas-pressure better than 1.3 bar* throughout its designed life span.

*) at 20°C.

RECYCLING CAPABILITY

Raw Material	Weight (kg)	% of total weight	Recycle	Environmental effects & recycle/reuse processes
Iron	132,80	42,53	Yes	Separate, utilise in favour of new source (ore)
Stainless steel	83,20	24,93	Yes	Separate, utilise in favour of new source (ore)
Copper	43,98	14,09	Yes	Separate, utilise in favour of new source (ore)
Brass	2,30	0,74	Yes	Separate, utilise in favour of new source (ore)
Aluminium	8,55	2,74	Yes	Separate, utilise in favour of new source (ore)
Zinc	3,90	1,25	Yes	Separate, utilise in favour of new source (ore)
Silver	0,075	0,024	Yes	Electrolysis, utilise in favour of new source
Thermoplastic	5,07	1,63	Yes	Make granulate, re-use or apply as energy superior additive in refuse incineration
Epoxy incl. 60% quartz	26,75	8,35	Yes	Grind to powder and use as high-grade energy additive in cement mill
Rubber	1,35	0,42	Yes	High-grade energy additive in refuse incineration
Dielectric oil	0,21	0,066	Yes	Reclaim or use as high-grade energy additive in refuse incineration
SF ₆ gas	3,24	1,04	Yes	ABB AS in Skien reclaims used SF ₆ gas
Total recycleables	311,42	97,81		
Unspecified*	9,00		No	*Stickers, film foils, powder coating, screws, nuts, grease....
Total weight **	320	100		
Packing foil	0,20		Yes	High-grade energy additive in refuse incineration
Wooden pallet	21,50		Yes	Re-use or use as energy additive in refuse incineration

**) All figures are collected from CCF 3-way unit with fuse canisters

3. END-OF-LIFE

ABB AS, Power Products Division, is committed to the protection of the environment and adhere to ISO 14001 standards. It is our obligation to facilitate end-of-life recycling for our products.

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

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

ABB AS, Power Products Division in Skien is equipped to reclaim SF₆ gas from discarded switchgears.

Contact us

For more information please contact:

ABB AS

Power Products Division

P.O. Box 108, Sentrum

N-3701 Skien, Norway

Phone: +47 35 58 20 00

Fax: +47 35 52 41 08

www.abb.com

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

©Copyright 2012 ABB

All rights reserved

1VDD005976 GB Ed. February 2013