

SF6 insulated Ring Main Units and Compact Switchgear - SafeRing and SafePlus

Instruction for Installation, Operating and Maintenance



ABB

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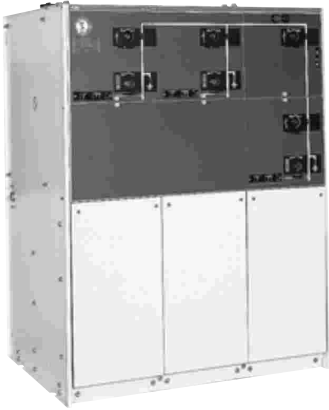
Ensure compliance of local legal and safety norms



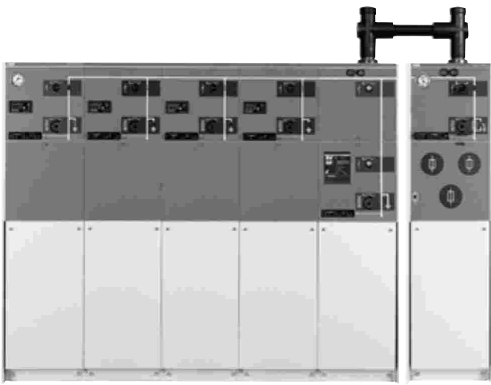
We recommend that installation and commissioning should be carried out by qualified and authorised personnel.



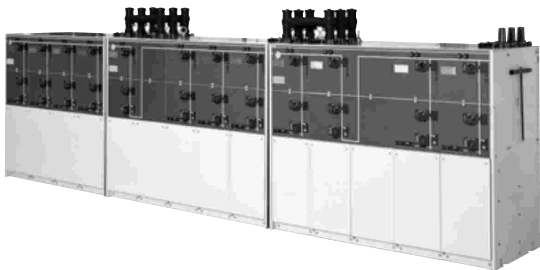
Check that the personnel operating the apparatus have this instruction manual with them.



SafeRing 3 - way unit CCV



SafePlus 5 + 1 module with external busbar



SafePlus 14 modules

1. GENERAL DESCRIPTION

SafeRing / SafePlus with vacuum circuit-breaker in compliance with IEC 60056. 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 auxiliary power supply. 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. DF, CCF, CCC, CCCC, CCFF, DV, CCV, CCCC, CCCV, CCVV.

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

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

SafeRing and SafePlus offers 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)
- M - Metering cubicle

SafeRing / SafePlus with switch fuse combination in compliance with IEC 60420.

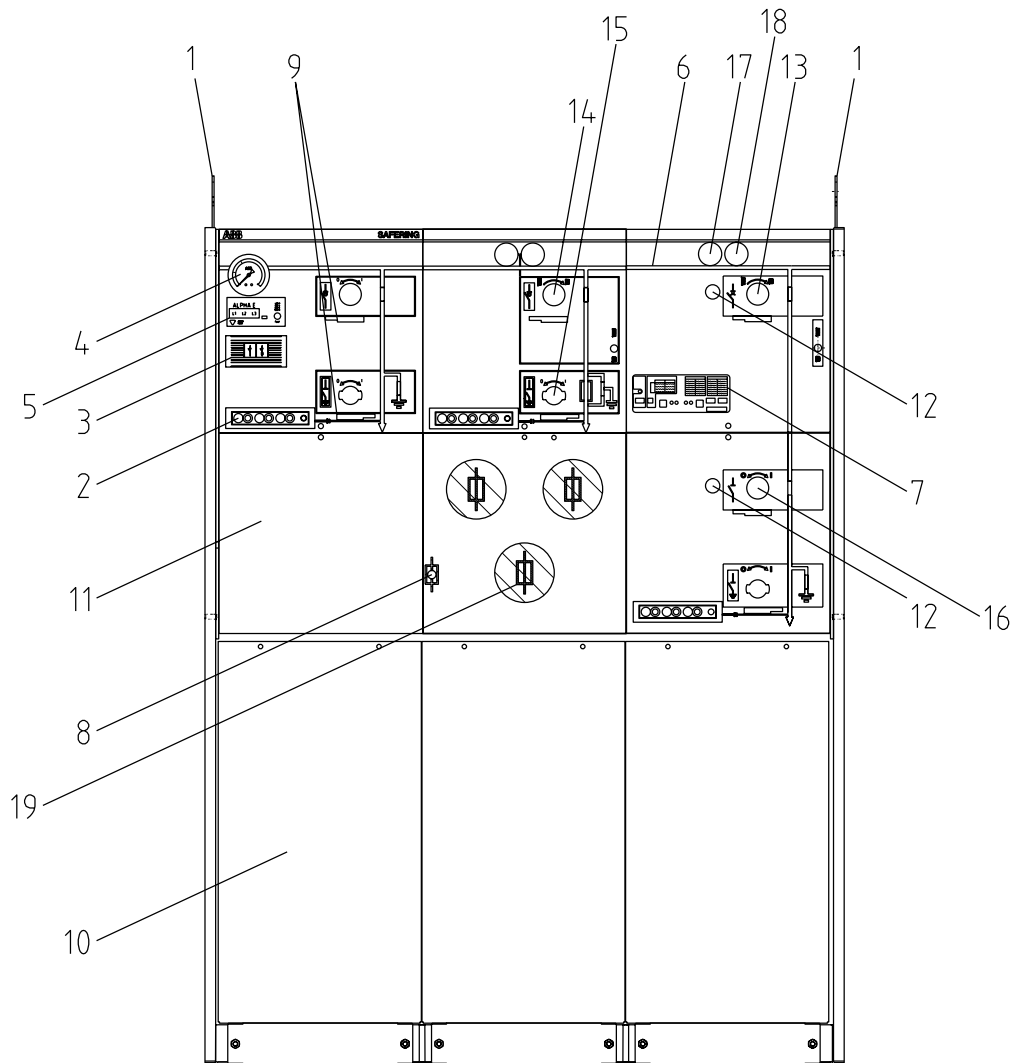
With this unit the transformer will be protected by current-limiting HV fuses in combination with a load break switch. The load break switch is equipped with a stored spring energy mechanism which can be tripped by the fuse striker pin.

SafeRing / SafePlus with vacuum circuit-breaker in compliance with IEC 60056

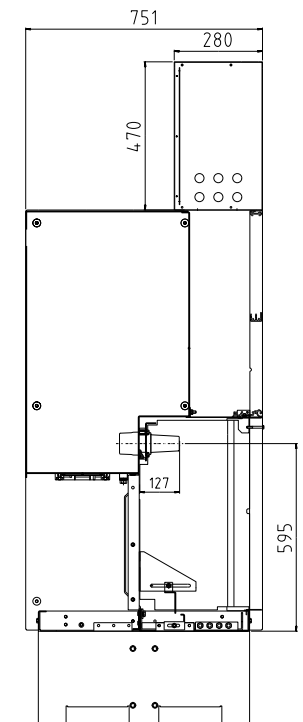
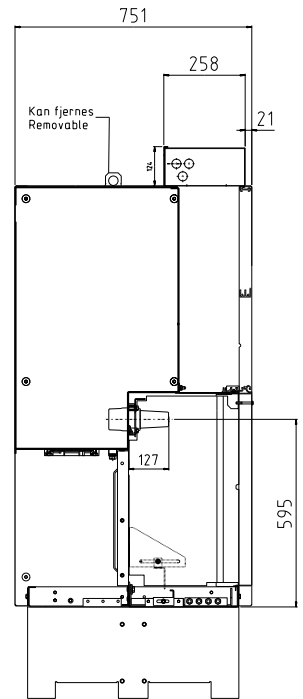
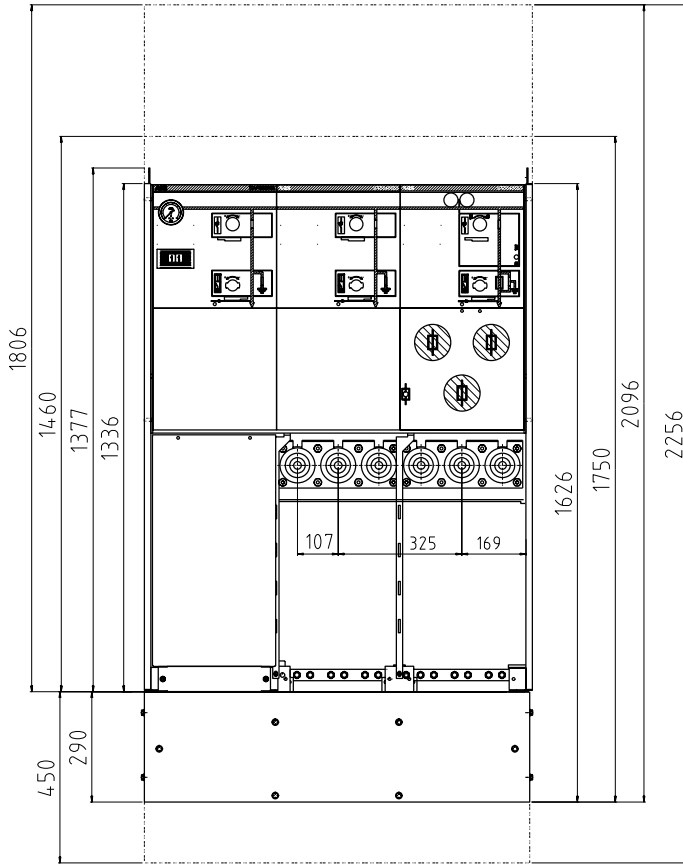
With this unit the transformer will be protected by a vacuum circuit breaker combined with relays and current transformers. The standard relays are based on digital technology and do not require an external power supply.

1.1 TABLE OF LOCATIONS

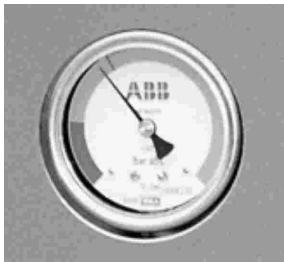
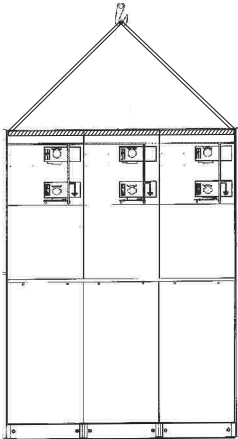
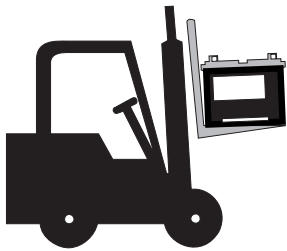
- 1. Lifting Hooks
- 2. Capacitive voltage indication (additional equipment)
- 3. Short circuit indicator (additional equipment)
- 4. Pressure indicator (additional equipment)
- 5. Legend plate with serial number
- 6. Mimic diagram
- 7. Relay protection
- 8. Blown fuse indicator
- 9. Padlock device
-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



1.2 DIMENSIONAL DRAWINGS



Unit	A
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 DV	252 kg	2-way DF	260 kg
3-way CCV	313 kg	3-way CCF	320 kg
4-way CCCV	403 kg	4-way CCCF	410 kg
4-way CCVV	411 kg	4-way CCFF	430 kg
3-way CCC	300 kg		
4-way CCCC	390 kg		

SafePlus	
Standard 1-way	130 kg
2-3 and 4-way as for SafeRing	
5-way approx. between	480-600 kg
M-metering cubicle approx.	250 kg

The weights is without additional equipment

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

2.1 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.
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.

SafeRing		RMU IEC 60298	
Type :	Serial No. :		
IEC60129,60265		Ur	kV
	Up	kV	Up
	fr	Hz	fr
	Ir	A	Ir
	IK	kA	IK
	tK	s	tK
	n		Oper.Seq. : C-0
		IEC60056,60129	
Psw = 1,4 x10 ⁵ Pa		Year :	TC : -25°C TO +40°C Indoor
Made by ABB			

NHP 407789

3. TECHNICAL DATA

3.1 ELECTRICAL DATA

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

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

¹) 38 kV on request ²) Depending on the current rating of the fuse ³) Limited by High Voltage fuse links

SafeRing RMU/SafePlus CSG is tested according to IEC publications IEC 60056, IEC 60129, IEC 60265, IEC 60298, IEC 60420 and IEC 60694

3.2 FUSE TABLE FOR MODULES

100%	Transformer rating (kVA):																CEF	
UN (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			
10	6	10	10	16	16	25	25	25	40	40	50	50	80	80	125	125	12 kV	
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		
13,8	6	6	10	10	16	16	25	25	25	25	40	50	50	63	80	100	17,5 kV	
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		
20	6	6	6	10	10	16	16	16	25	25	25	40	40	50	63	63	24 kV	
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		

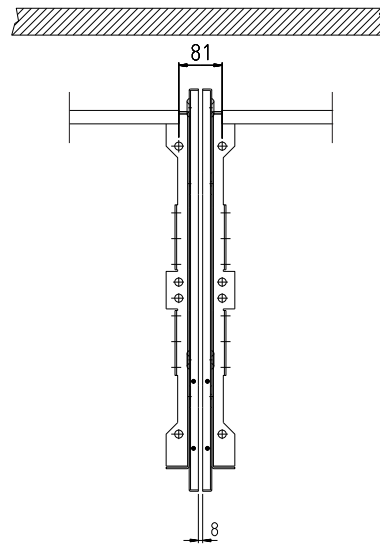
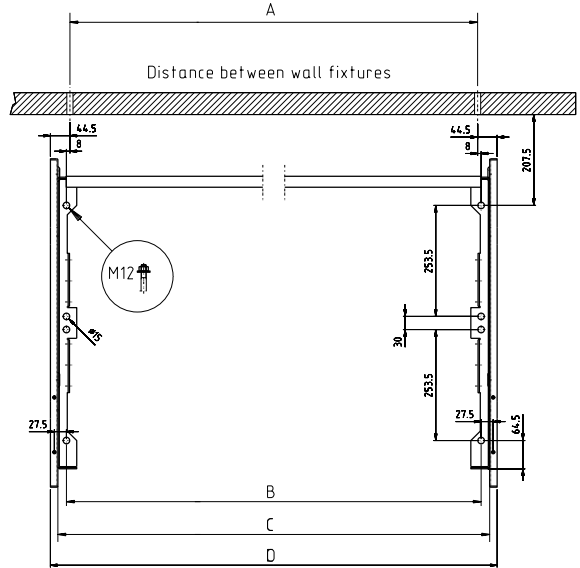
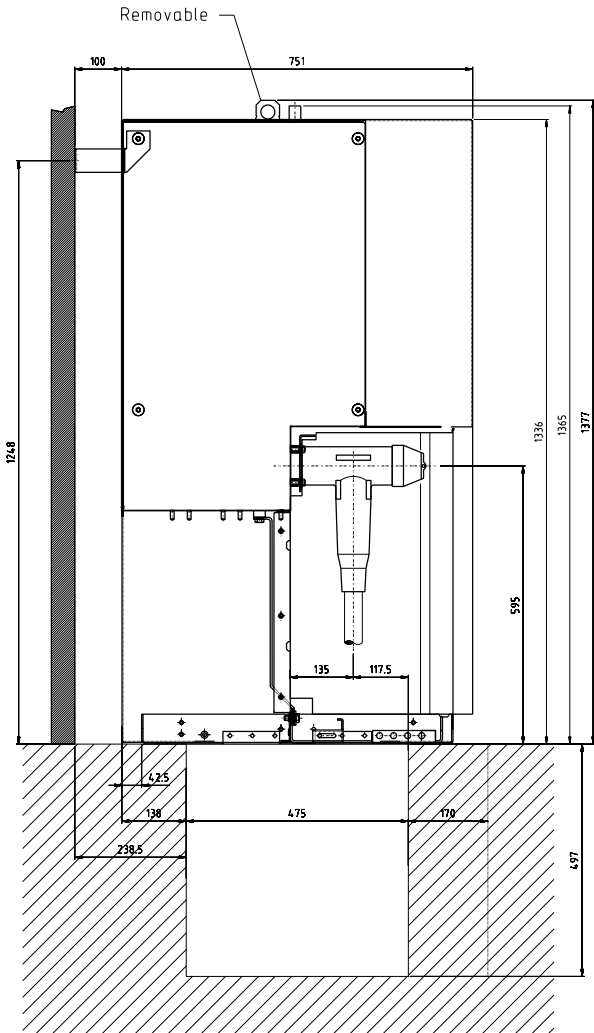
The table is based on using fuses type ABB CEF
 Normal operating conditions with no overload
 Ambient temperature -25 °C + 40 °C

120%	Transformer rating (kVA):																CEF
UN (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						7,2 kV
3,3	16	25	25	40	40	50	63	80	80	100	125						
4,15	10	16	25	25	40	40	50	63	80	80	100	125					
5	10	16	25	25	25	40	40	50	63	80	80	125	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			
6,6	6	16	16	25	25	25	40	40	50	63	80	80	100	125			
10	6	10	10	16	16	25	25	25	40	40	50	63	80	80	125	125	12 kV
11	6	6	10	16	16	25	25	25	25	40	50	50	80	80	100	125	
12	6	6	10	16	16	16	25	25	25	40	40	50	63	80	100	125	
13,8	6	6	10	10	16	16	25	25	25	25	40	50	50	80	80	100	17,5 kV
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	
20	6	6	6	10	10	16	16	16	25	25	25	40	40	50	63	63	24 kV
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	

The table is based on using fuses type ABB CEF
 Normal operating conditions with 20% overload
 Ambient temperature -25°C + 40 °C

4. INSTALLATION

The base must be flat and fitted with anchor bolts in accordance with the dimensional drawing for the number of modules or units as appropriate.



Unit	A	B	C	D
1-way	371	297	336	371
2-way	696	622	663	696
3-way	1021	947	988	1021
4-way	1346	1272	1313	1346
5-way	1671	1597	1636	1671

4.1 CABLE COMPARTMENT

Opening of cable door :

NB!

The cable door are 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. For opening the door, press the lever at the bottom and pull the door.

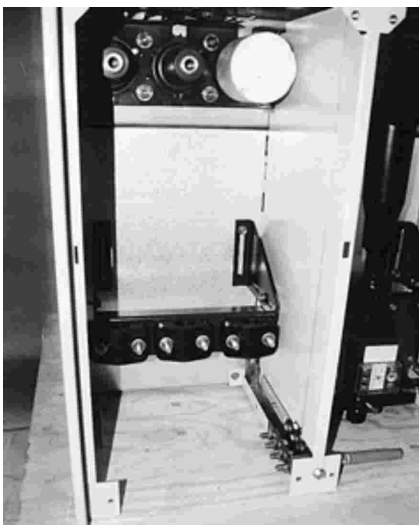


Interlocking Lever

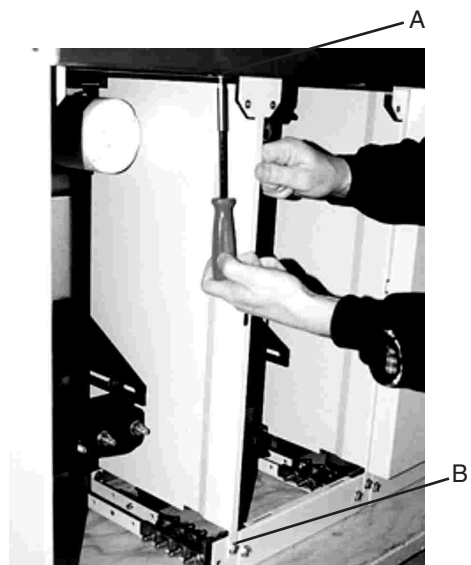
1. Press the interlocking lever up to open the door.



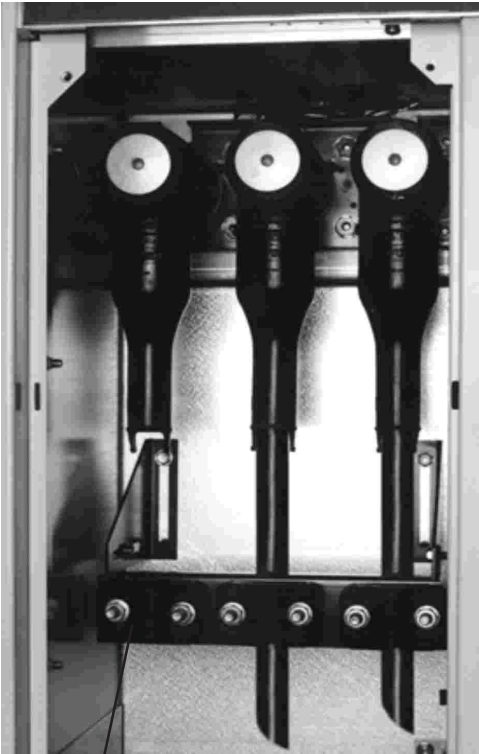
2. Removal of front section.



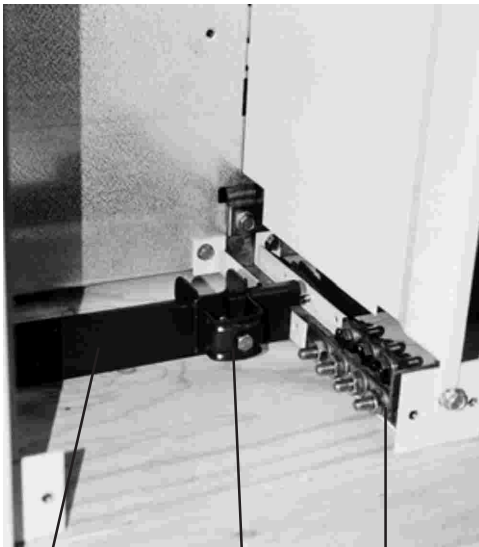
3. Front section removed.



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



Adjustable cable support beam (additional equipment).
(Single core cable termination)



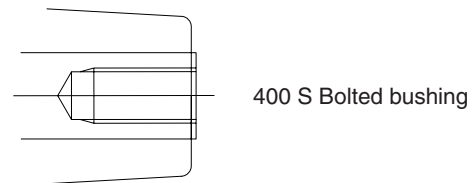
Cable support beam
Cable clamp
Earthing bar

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 is supplied with 400 series bolted type bushing



400 S Bolted bushing



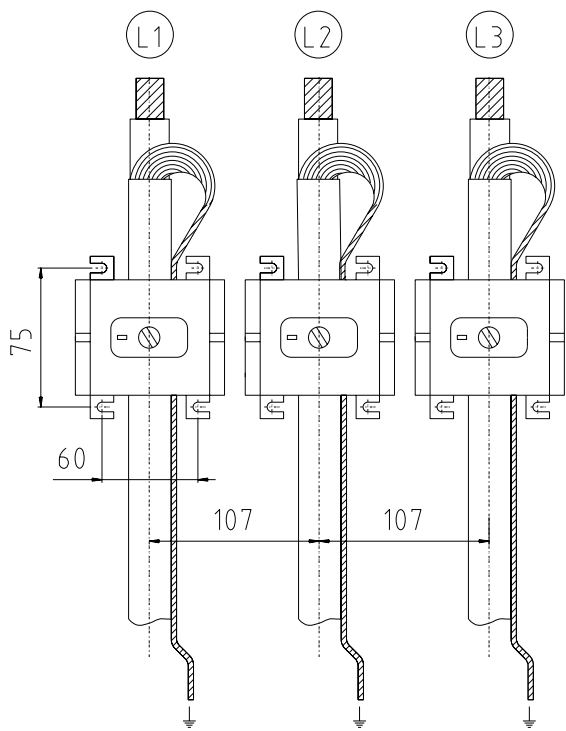
3 core cable termination with CT mounted.

For cable termination kits please refer supplier documentation for details.

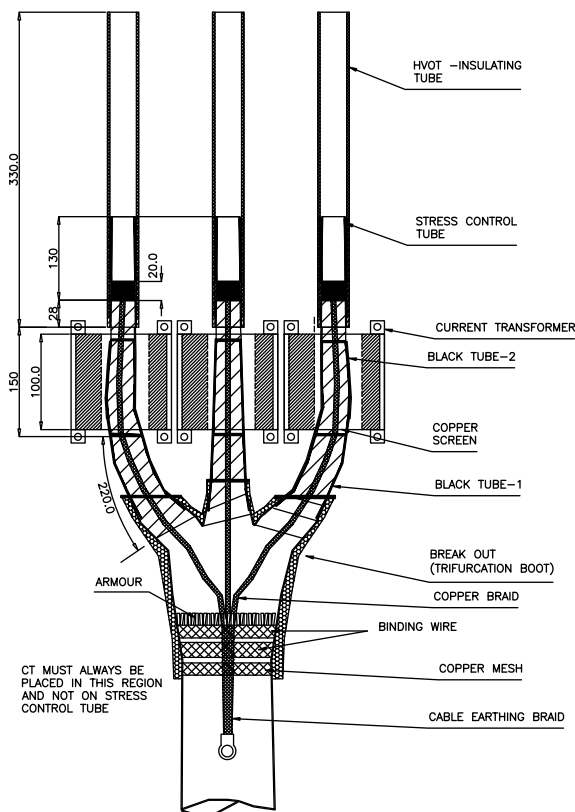
The manufacturer installation instructions must be followed. Be sure to lubricate the bushings thoroughly with the silicone supplied.

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.



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



CTS with 3 core cable.

4.3 CURRENT TRANSFORMERS FOR RELAY PROTECTION

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

A protection relay is installed in each vacuum circuit breaker module. The cables from the protection relay to the current transformers are placed 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 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. Refer the manual supplied with the protection relay for a description of the connections.

SafeRing with vacuum circuit breakers are suitable for three different types of protection relays: SACE PR521/ 512, SEG WIC/WIP. All these types are designed so that there is no need for external auxiliary voltage for correct functioning.

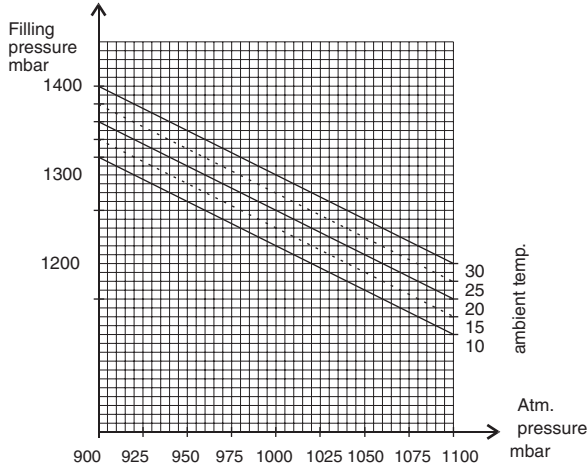
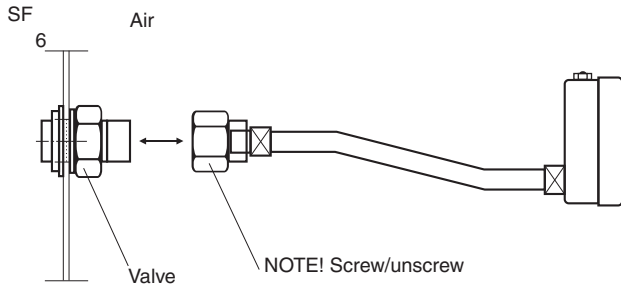
Separate manuals have been supplied for each of these protection relay, with examples of adjustments.

SACE PR 521/ 512

This relay offers advanced protection with facilities for constant-time, normal inverse, very inverse and extremely inverse characteristics as well as simple earth fault protection in accordance with IEC 60255-3.

It is essential for correct functioning that the current transformers are properly connected and that the protection relay is properly adjusted.

SafePlus can be delivered with advanced protection relays. As option SPAJ140 can be delivered and also other ABB relays like REJ and REF54 can be fitted. This will require additional low voltage compartment. See separate documentation for these relays.



NHP 408025

Refilling of SF₆ gas in SafeRing/SafePlus

Following equipment is needed gas bottle with manometer and reduction valve adapter pressure measuring device

1. Remove front cover and unscrew manometer as shown.
2. Screw (tightening the torque.45 Nm) the adapter to the valve.
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.
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, (14 bar absolute) the gas filling must be stopped. See table for filling pressure above.
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 (14 bar absolute) is obtained, remove the adapter and screw with tightening torque 45 Nm the manometer to the RMU/switchgear as shown above. Observe that the sealing between the manometer and the valve is smooth and clean.

4.4 GAS PRESSURE

SafeRing / SafePlus contains SF₆ gas with a nominal pressure of **1.4** bar at 20° C.

SafeRing / SafePlus is 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

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 60694.

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	1,000 metres

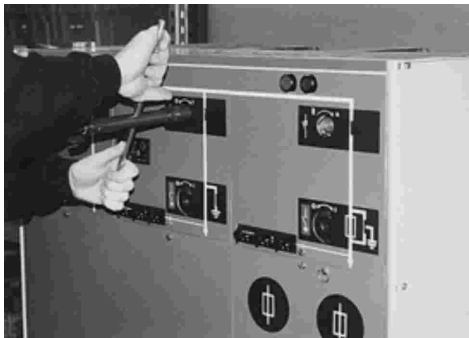
Special conditions

In accordance with IEC 60694, the manufacturer and end-user must agree about special operating conditions which deviate from operation under normal conditions. The manufacturer/supplier must be consulted in advance if especially difficult operating conditions are involved. When electrical equipment is installed at more than 1,000 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 delivered with reduced overpressure - see procedure for refilling.

5.2 OPERATION



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.



Fuse switch 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.

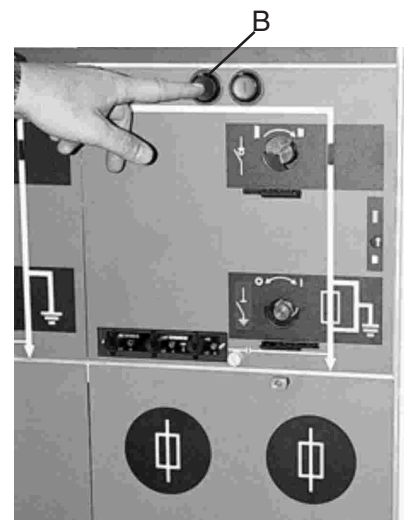
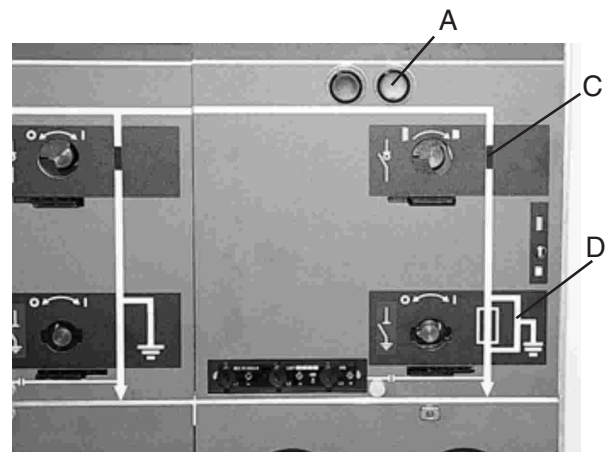
All switches can be operated with the included operating handle.

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

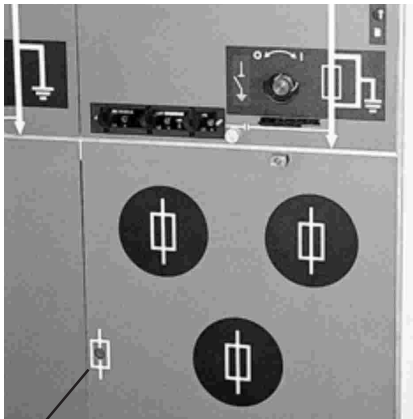


Mechanical position indicators:

C: Transformer breaker open D: Earthing switch closed

5.3 INSTALLATION AND REPLACEMENT OF FUSES

A red indicator below the fuse symbol on the lower front panel indicates a fuse trip. Fuses are replaced as shown in the sequence of illustrations. Switch fuse configurations are supplied without fuses installed. When installing fuses for the first time, follow the sequence of illustrations 1-9.



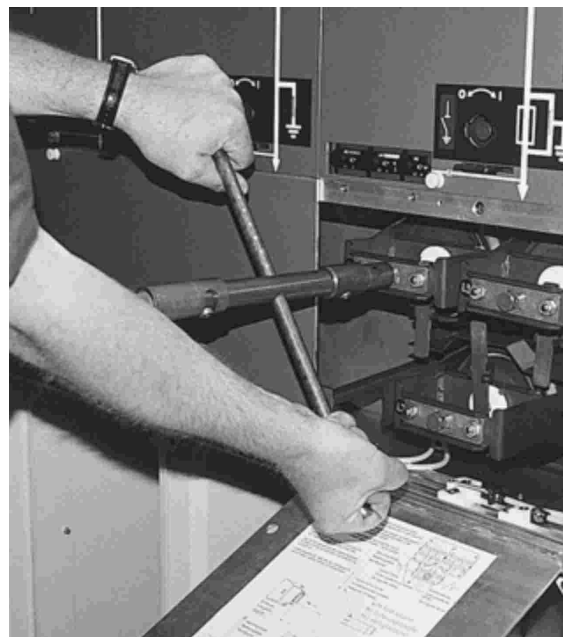
1. Fuse trip indicator.



3. Unscrew fuse cover.
4. Tilt out the fusepanel to gain access to fuse canisters.



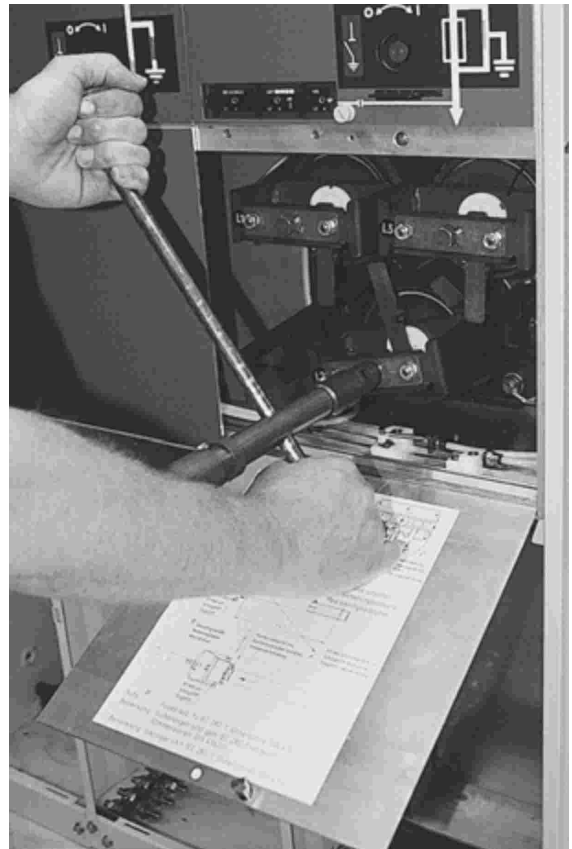
2. Close earthing switch by turning operating handle clockwise.



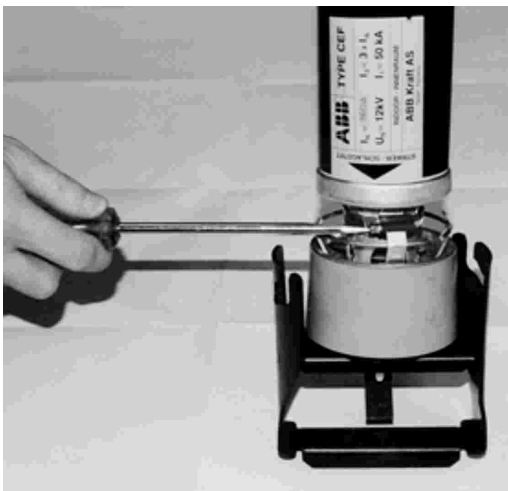
5. Applying the operating handle and turning anti-clockwise opens the fuse canisters.



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

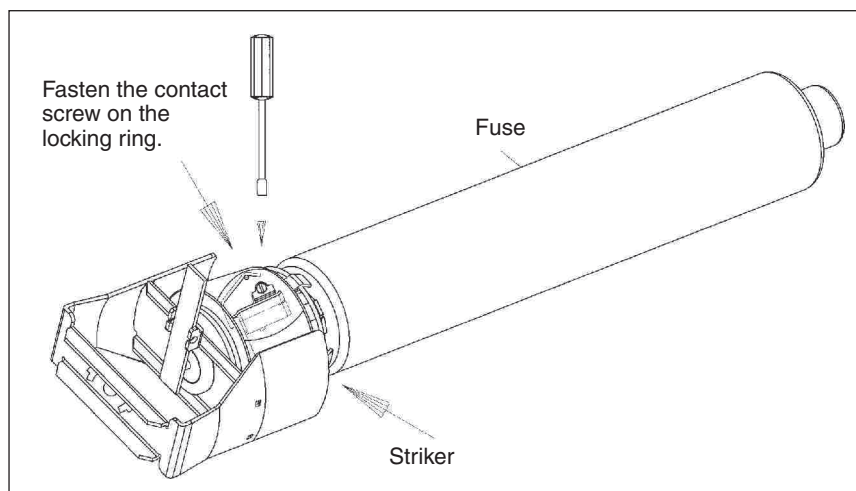


8. Turn the handle on the fuse cover clockwise to close and seal the fuse canister. Use the operating handle.



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.

9. Close the fuse panel.
The switches are ready for operation.



5.4 RELAYS

SafeRing / SafePlus with vacuum circuit breakers are suitable for following different types of protection relays: SACE PR521/512 and SEG WIC/WIP. All these types are designed so that there is no need for external auxiliary voltage for correct functioning.

Separate manuals are available for each of these protection relay, with examples of adjustments.

SafePlus can be delivered with advanced protection relays. As option SPAJ140 can be delivered and also other ABB relays like REJ and REF can be fitted. This will require additional low voltage compartment.

Refer separate documentation for these relays.



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 obtained 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.

6.2 CAPACITIVE VOLTAGE INDICATION

Capacitive voltage indication system.

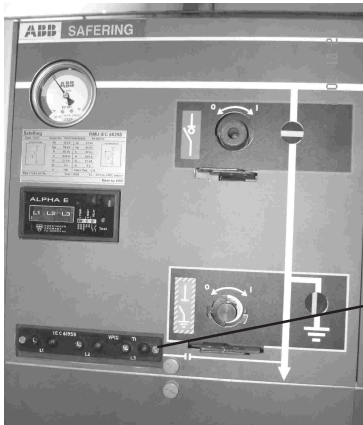


Wim 1

Plugin type
Voltage indicator



Wim 3



Voltage presence indication system
(VPIS)



Phase balance check



6.3 SHORT CIRCUIT INDICATOR

Three types can be supplied:
Horstman ALPHA-M
Horstman ALPHA-E
Horstman GAMMA

6.4 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.

6.5 CABLE TESTING

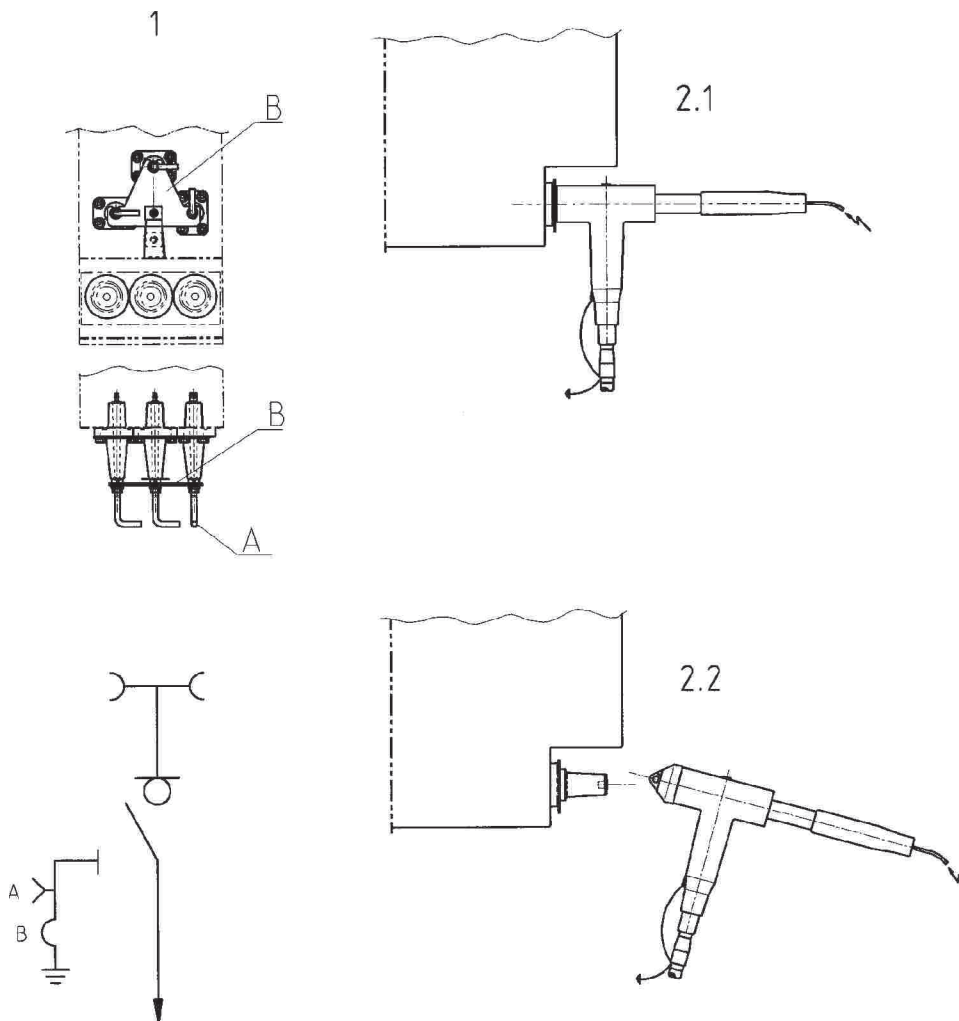
Voltage testing and locating cable faults can be performed in two ways:

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 suppliers instructions.

2.1. Cable connector connected

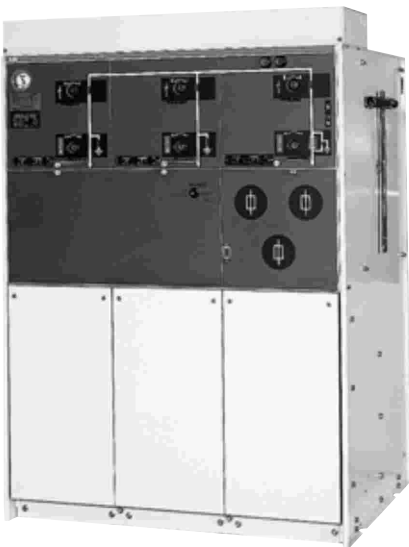
2.2. Cable connector disconnected



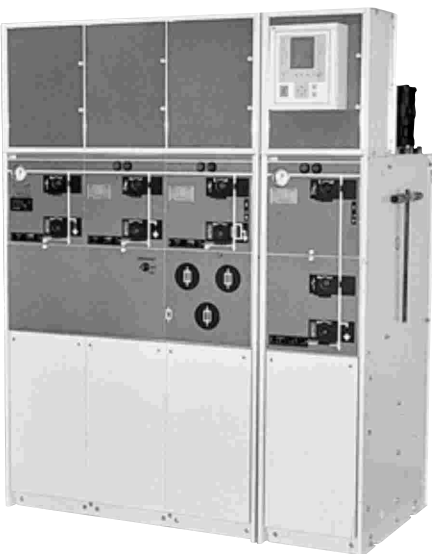
NHP 304708



Base frame



Top entry box low voltage cables



SafePlus with Low voltage compartment

6.6 EXTERNAL BUSBAR

SafeRing and SafePlus can be equipped with an external busbar.

6.7 PRESSURE INDICATOR

SafeRing / SafePlus is always supplied with a pressure indicator in the form of a manometer.

6.8 BASE FRAME

SafeRing/ SafePlus can be installed on a separate base frame. The base frame is designed for cable entry from both sides or from the back.

Two different heights 290 mm and 450 mm.

6.9 TOP ENTRY BOX FOR LOW VOLTAGE CABLES

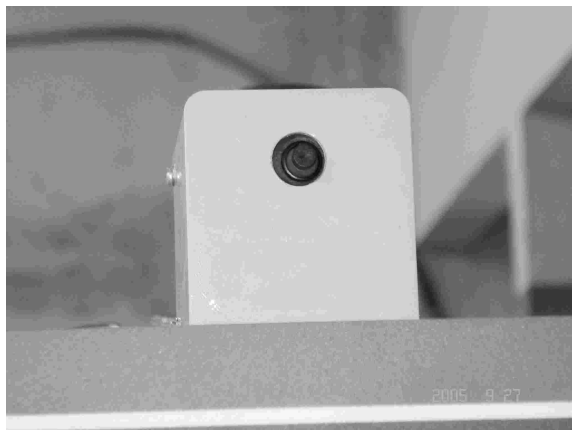
SafeRing/SafePlus can be supplied with top entry box for low voltage cables.

6.10 LOW VOLTAGE COMPARTMENT

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

6.11 FLAG INDICATOR

SafeRing/SafePlus can be supplied with flag indicator for breaker with protection relay type WIC of AVK SEG make.



7. Maintenance

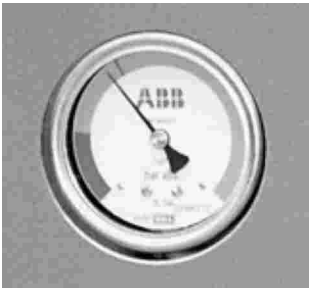
All components in the SF₆ tank are maintenance-free for the declared life expectancy of the product. The tank is made of stainless steel.

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 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.

2.RECYCLING CAPABILITY

Raw Material	Amount	% of total weight 320kg	Re-cycle	Environmental effects & recycle/reuse processes
Iron	132,80 kg	42,53%	Yes	Separate, utilise in favour of new source (ore)
Stainless steel	83,20 kg	24,93%	Yes	Separate, utilise in favour of new source (ore)
Copper	43,98 kg	14,09%	Yes	Separate, utilise in favour of new source (ore)
Brass	2,30 kg	0,74%	Yes	Separate, utilise in favour of new source (ore)
Aluminium	8,55 kg	2,74%	Yes	Separate, utilise in favour of new source (ore)
Zinc	3,90 kg	1,25%	Yes	Separate, utilise in favour of new source (ore)
Silver	0,075 kg	0,024	Yes	Electrolysis, utilise in favour of new source
Thermoplastic	5,07 kg	1,63%	Yes	Make granulate, re-use or apply as energy superior additive in refuse incineration
Epoxy incl. 60% quartz	26,75 kg	8,35 %	Yes	Grind to powder and use as high-grade energy additive in cement mill
Rubber	1,35 kg	0,42 %	Yes	High-grade energy additive in refuse incineration
Dielectric oil	0,21 kg	0,066 %	Yes	Reclaim or use as High-grade energy additive in refuse incineration
SF ₆ gas	3,24 kg	1,04%	Yes	ABB reclaims used SF ₆ gas.
Total for recycling	311,44kg	97,25 %		
Not specified *	9,00 kg			*Stickers, Film-foils, powder coating, screws, nuts, tiny components, grease É.
Total weight **	320,00 kg	100 %		
Packing foil	0,2 kg		Yes	High-grade energy additive in refuse incineration
Wooden pallet	21,5 kg		Yes	Re-use or use as energy additive in refuse incineration

***)All figures are collected from CCF 3-way unit with arc suppresser.

3.END-OF-LIFE

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

There exist no explicit requirements for how to handle discarded 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> .



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