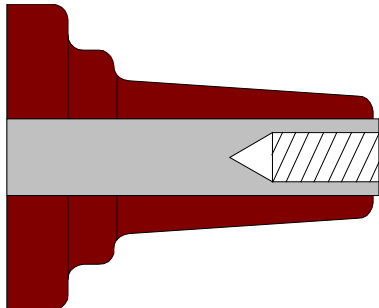


## 6.9 Cable termination



Interface C  
(Bolted type 400 series)

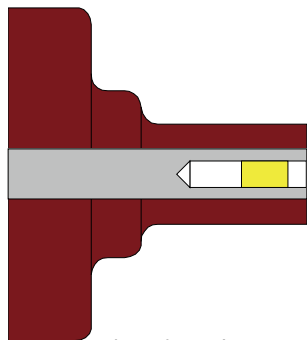
SafeRing/SafePlus are equipped with cable bushings which comply with Cenelec EN 50181\*), EDF HN 52-S-61 and IEC 60137 for termination of cables.

The following cable bushings are available:

### Interface C with M16 x 2 metric threads

400 series,  $I_n = 630$  A

Standard on C, V ( $I_n=630$ A), D and De modules; and for top extension



Interface A  
(Plug-in type 200 series)

### Interface A with plug

200 series,  $I_n = 200$  A

Standard on F and V modules ( $I_n = 200$  A)

The yellow area indicates the silver coated contact spring.

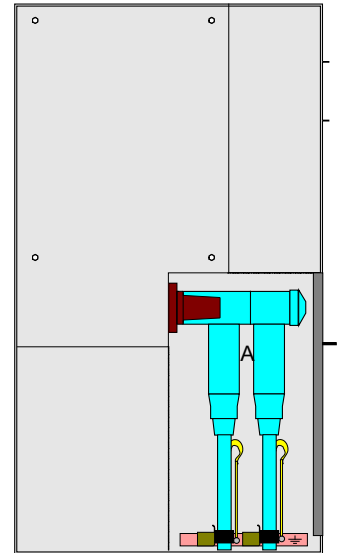
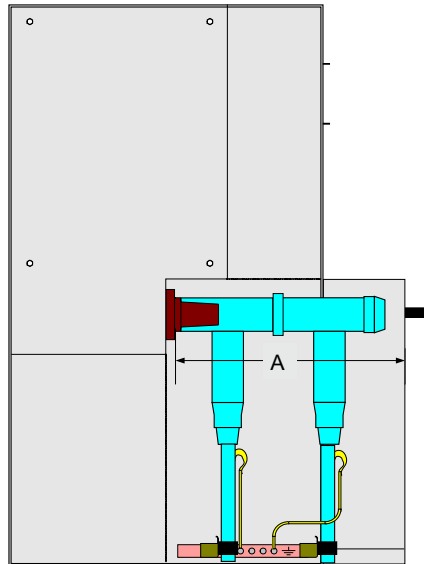
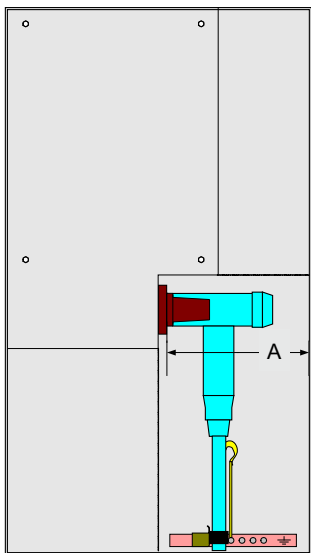
The installation instructions from the manufacturer of cable terminations must be followed. Be sure to lubricate the bushings thoroughly with the silicone supplied.

Where cables are not connected, the earthing switch must be locked in closed position or the bushings must be fitted with dead end receptacles before the unit is energized.

## 6.9 Cable termination

All bushings are situated in the same height from the floor and are protected by cable compartment cover. The three draw-

ings below show typical arrangements with cable connectors for single and double cables.



Arc proof cable compartment with double set of cables. Cable terminations from nkt cables or Elastimold.

The table below shows the net distance A in millimeter from cable bushing flange to the inner part of cable compartment cover.

	Interface A (200 series plug-in)	Interface B (400 series plug-in)	Interface C (400 series bolted)	Interface D (600 series bolted)
Standard	400	361	360	369
With window	392	354	353	362
Arc proof	377	338	337	346
Double cables	595	556	555	564

The following manufacturers of cable terminations are recommended:

- ABB Kabeldon
- Südkabel
- Euromold/Elastimold
- nkt cables
- Tyco Electronics
- Prysmian
- 3M

## 6.9 Cable termination



a



b



c



d

### Kabeldon Screened Separable Connector from ABB

#### Benefits:

- No special tools
- Prefabricated for simple and safe installation
- Minimal cable stripping
- Active pressure
- Complete kits

#### Use:

Designed for XLPE-insulated 1- or 3-core cables with Al or Cu conductors for 12-24 kV.

Supplied in kits of three.

Fits standard bushings type outer cone in accordance with Cenelec EN 50180 and EN 50181.

#### Design:

The connector hood is made of rubber in three layers: inner conductive layer, insulating layer and outer conductive layer.

The connector meets the requirements for being touch-proof.

The 250 A connectors is equipped with a metallic part for capacitive voltage check.

Supplied complete with adapter for cable, screw cable lug and connection to the bushing.

#### Different accessories is also available like:

- Screen separation kit for 3-core cables
- Earthing kits for different type of cable screens
- Adaptor kits for small cables
- Capacitive test points for the 400 and 630 A series
- Parallell coupling of kits
- Equipment for safe-for-work

Designation	XLPE/EPR Ø mm <sup>2</sup>	Conductor cross section mm <sup>2</sup>	Rating	Bushing type	Picture type
SOC 250 TP	12.5 – 25.8	25 – 95	250 A	Plug-in Ø 7.9	a
SOC 400 – 1	15.0 – 26.8	50 – 120	400 A	Plug-in Ø 14	b
SOC 400 – 2	21.4 – 34.9	150 – 300	400 A	Plug-in Ø 14	b
SOC 630 – 1	15.0 – 26.8	50 – 120	630 A	Bolt M16	c
SOC 630 – 2	21.4 – 34.9	150 – 300	630 A	Bolt M16	c
SOC 630 – 3	31.5 – 42	400	630 A	Bolt M16	d
SOC 630 – 4	31.5 – 42	500	630 A	Bolt M16	d
SOC 630 – 5	40 – 46	630	630 A	Bolt M16	d

## 6.9 Cable termination

12 kV: Separable connectors interface A with earthing shield,  $I_r = 250A$

Manufacturer	Designation	Conductor [mm <sup>2</sup> ]	XLPE / EPR Ø [mm]
3M	93-EE 605-2/-95	25-95	12.2-25.0
3M	92-EE 615-2/120	120	19.8-22.8
3M	92-EE 615-2/150	150	21.3-24.3
ABB	SOC 250 TP	25-95	12.9-25.8
Euromold	158LR/G	16-70	12.6-18.7
Euromold	158LR	70-95	18.4-26.4
nkt cables	EASW 10/250	25-95	12.7-19.2
nkt cables	CE 12-250	95-120	16.9-25.0
Prysmian	FMCE-250	16-95	10.0-21.3
Südkabel	SEW 12	25-150	12.2-25.0
Tyco Electronics	RSES	16-120	13.5-33.5

For dynamic and thermal short-circuit currents, please compare the values expected in your network with the rated values of the connectors from the different suppliers

12 kV: Separable connectors interface C,  $I_r = 630A$

Manufacturer	Designation	Conductor [mm <sup>2</sup> ]	XLPE / EPR Ø [mm]	Earthing shield Yes/No	Additional equipment for dual cable arrangement	Surge Arrester with	Cable compartment with							
							Single cable + surge arrester				Dual cables			
							Standard Distance A = 360 mm	with window Distance A = 353 mm	Arc proof Distance A = 337 mm	Double cables Distance A = 555 mm	Standard Distance A = 360 mm	with window Distance A = 353 mm	Arc proof Distance A = 337 mm	Double cables Distance A = 555 mm
3M	93-EE 705-6/-95	50-95	15.0-23.5	Y	KU 23.1+93-EE 705-6/-95	MUT 23								
3M	93-EE 705-6/240	120-240	21.8-32.6	Y	93-EE 718-6/150-240	MUT 23								
ABB	KAP 300U	25-300	Flexible	N	None	None								
ABB	KAP 630	50-300	Flexible	N	KAP 630 P	KAP 630-S	X	X	X	X	X	X	X	X
ABB	SOC 630-1	50-120	15.0-26.8	Y	PC 630+SOC 630-1	Yes <sup>1)</sup>	X	X	X	X	X	X	X	X
ABB	SOC 630-1	50-120	15.0-26.8	Y	PC 630+SOC 630-1	Yes <sup>2)</sup>	X	X	X	X	X	X	X	X
ABB	SOC 630-2	150-300	21.4-34.9	Y	PC 630+SOC 630-2	Yes <sup>1)</sup>	X	X	X	X	X	X	X	X
ABB	SOC 630-2	150-300	21.4-34.9	Y	PC 630+SOC 630-2	Yes <sup>2)</sup>	X	X	X	X	X	X	X	X
Euromold	400TB/G	25-300	12.0-37.5	Y	400CP-SC+400TB/G	400PB-XSA				X				X
Euromold	400LB	25-300	12.0-37.5	Y	400CP-SC+400TB/G	400PB-XSA	X			X				X
Euromold	430TB-630	25-300	12.0-37.5	Y	300PB-630	300PB-10SA	X	X	X	X	X	X	X	X
Euromold	440TB/G	185-630	23.5-56.0	Y	440CP+ 440TB/G	400PB-XSA				X				X
nkt cables	CB 12-630	25-300	12.7-34.6	Y	CC 12-630	CSA 12	X	X	X	X	X	X	X	X
nkt cables	AB 12-630	25-300	12.7-34.6	N	AC 12-630	ASA 12	X	X	X	X	X	X	X	X
nkt cables	CB 24-630 (1250)	400-630	34.0-45.6	Y	CC 24-630 (1250) or CC 12-630	CSA 12	X	X	X	X	X	X	X	X
Prysmian	FMCTs-400	70-300	18.5-30.4	Y	FMPCs-400-12+FMCTs-400	Yes <sup>2)</sup>				X				X
Prysmian	FMCTs-400/1250	70-630	18.5-42.0	Y	FMPCs-400-12+FMCTs-400/1250	Yes <sup>2)</sup>				X				X
Südkabel	SET 12	50-300	15.0-32.6	Y	SEHDK 13.1	MUT 23	X	X	X	X	X	X	X	X
Südkabel	SET 12	50-300	15.0-32.6	Y	KU23.2/23+SET 12	MUT 23	X	X	X	X				X
Südkabel	SEHDT 13	400-500	31.6-36.4	Y	None	KU33 + MUT 33				X				
Tyco Electronics	RSTI-L	25-300	12.7-34.6	Y	RSTI-CC-L	RSTI-SA	X	X	X	X	X	X	X	X
Tyco Electronics	RICS	25-300	Flexible	N	None	RDA	X	X	X	X				
Tyco Electronics	RSTI-36Lxx	400-630	28.9-45.6	Y	RSTI-66CP-M16+RSTI-36Lxx	None				X				X

1) Combination with surge arrester possible with Euromold 156SA with Kabeldon parallel connector PC 630/250

2) Combination with surge arrester possible with Euromold 400PB-XSA

For dynamic and thermal short-circuit currents, please compare the values expected in your network with the rated values of the connectors from the different suppliers

## 6.9 Cable termination

### 24 kV: Separable connectors interface A with earthing shield, I<sub>r</sub> = 250A

Manufacturer	Designation	Conductor [mm <sup>2</sup> ]	XLPE / EPR Ø [mm]
3M	93-EE 605-2/-95	25-95	12.2-25.0
3M	93-EE 615-2/120	120	24.0-27.0
3M	93-EE 615-2/150	150	25.5-28.5
ABB	SOC 250 TP	25-95	12.9-25.8
Euromold	K158LR/G	16-25	12.6-18.7
Euromold	K158LR	25-95	18.4-26.4
nkt cables	EASW 20/250	25-95	17.0-25.0
nkt cables	CE 24-250	25-120	16.9-25.0
Prysmian	FMCE-250	35-95	18.6-26.0
Südkabel	SEW 24	25-95	17.3-25.0
Tyco Electronics	RSES	16-120	13.5-33.5

Separable connectors without earthing shield are not recommended.

For dynamic and thermal short-circuit currents, please compare the values expected in your network with the rated values of the connectors from the different suppliers

### 24 kV: Separable connectors interface C with earthing shield, I<sub>r</sub> = 630A

Manufacturer	Designation	Conductor [mm <sup>2</sup> ]	XLPE / EPR Ø [mm]	Additional equipment for dual cable arrangement	Surge Arrester with	Cable compartment with							
						Single cable + surge arrester				Dual cables			
						Standard Distance A = 360 mm	with window Distance A = 353 mm	Arc proof Distance A = 337 mm	Double cables Distance A = 655 mm	Standard Distance A = 360 mm	with window Distance A = 353 mm	Arc proof Distance A = 337 mm	Double cables Distance A = 655 mm
3M	93-EE 705-6/-95	50-95	15.0-23.5	KU 23.1+93-EE 705-6/-95	MUT 23	X	X	X	X				X
3M	93-EE 705-6/-240	95-240	21.8-32.6	93-EE 718-6/150-240	MUT 23	X	X	X	X	X	X	X	X
ABB	SOC 630-1	50-120	15.0-26.8	PC 630+SOC 630-1	Yes <sup>1)</sup>	X	X		X	X	X		X
ABB	SOC 630-1	50-120	15.0-26.8	PC 630+SOC 630-1	Yes <sup>2)</sup>	X	X	X	X	X	X		X
ABB	SOC 630-2	150-300	21.4-34.9	PC 630+SOC 630-2	Yes <sup>1)</sup>	X	X		X	X	X		X
ABB	SOC 630-2	150-300	21.4-34.9	PC 630+SOC 630-2	Yes <sup>2)</sup>	X	X	X	X	X	X		X
Euromold	K400TB/G	25-300	12.0-37.5	K400CP-SC+K400TB/G	400PB-XSA				X				X
Euromold	K400LB	25-300	12.0-37.5	K400CP-SC+K400TB/G	400PB-XSA	X			X				X
Euromold	K430TB-630	25-300	12.0-37.5	K300PB-630	300PB-10SA	X	X	X	X	X	X	X	X
Euromold	K440TB/G	185-630	23.5-56.0	K440CP+ K440TB/G	400PB-XSA				X				X
nkt cables	CB 24-630	25-300	12.7-34.6	CC 24-630	CSA 24	X	X	X	X	X	X	X	X
nkt cables	CB 24-630 (1250)	400-630	34.0-45.6	CC 24-630 (1250) or CC 24-630	CSA 24	X	X	X	X	X	X	X	X
Prysmian	FMCTs-400	35-300	18.5-35.3	FMPCs-400-24+FMCTs-400	Yes <sup>2)</sup>				X				X
Prysmian	FMCTs-400/1250	35-630	18.5-47.1	FMPCs-400-24+FMCTs-400/1250	Yes <sup>2)</sup>				X				X
Südkabel	SET 24	25-240	15.0-32.6	SEHDK 23.1	MUT 23	X	X	X	X	X	X	X	X
Südkabel	SET 24	25-240	15.0-32.6	KU23.2/23+SET 24	MUT 23	X	X	X	X				X
Südkabel	SEHDT 23.1	300	31.9-34.6	KU23.2/23+SEHDT 23.1	MUT 23	X	X	X	X				X
Südkabel	SEHDT 23	300-500	31.9-40.6	None	KU33 + MUT 33				X				
Tyco Electronics	RSTI-L	25-300	12.7-34.6	RSTI-CC-L	RSTI-SA	X	X	X	X	X	X	X	X
Tyco Electronics	RSTI-56Lxx	400-630	34.0-45.6	RSTI-66CP-M16+RSTI-56Lxx	None				X				X

1) Combination with surge arrester possible with Euromold 156SA with Kabeldon parallel connector PC 630/250

2) Combination with surge arrester possible with Euromold 400PB-XSA

Separable connectors without earthing shield are not recommended.

For dynamic and thermal short-circuit currents, please compare the values expected in your network with the rated values of the connectors from the different suppliers

## 6.10 Capacitive voltage detection / indication



HR-module (VDS)



VPIS

Capacitive voltage indicating system

SafeRing / SafePlus can be supplied with two different types of capacitive voltage indication systems:

### 1. Voltage Detection System, type HR

SafeRing / SafePlus can be delivered with a voltage Detection System, (VDS) acc. to IEC 61243-5.

Portable voltage indicators, type VIM-1 and VIM-3 can be connected to the coupling system interface, see below for details. The VDS solution is designed and tested for reliable operation in heavily polluted and humid environments.

### 2. Voltage Presence Indicating System

SafeRing/SafePlus are normally delivered with a voltage Presence Indicating System (VPIS) acc. to IEC 61958.

The coupling system has integrated voltage indicators (LEDs). The VPIS solution is the recommended choice for normal indoor operating conditions.

### Coupling system

VDS or VPIS are situated on the front of the switchgear, one for each functional unit.

The voltage condition for each cable terminal is shown by separable (VDS) or integrated (VPIS) voltage indicators. Identification of the phases is achieved by labels on the front of the coupling system / voltage indicator.

### Phase balance check

The coupling systems of both solutions VDS and VPIS have connection points for phase balance checking.

If the VDS coupling systems have permanently connected indicators (VIM-3), these must be removed before phase balance checking can be done.

Phase balance checking should be done with a recommended phase comparator, type PCM, (for details see below). PCM can be used for phase balance checking between identical coupling systems (VDS or VPIS).

Particular care should be taken when phase balance checking is done between different coupling systems.

In this case a universal Phase Comparator (VPC acc. to IEC 61243-5) is recommended.

## 6.10 Capacitive voltage detection / indication



PCM



VIM-3



VIM-1

### FF1 type PCM

The PCM-FF1 comparator indicates phasebalance /unbalance between two cubicles. To be used in capacitive Coupling systems, acc.to IEC 61243-5 and/or IEC 61958.

Special features:

No external power supply required.

Voltage indication by flashing LED.

Fully insulated system (IP 68) with cast resin.

Function test 230 V AC or test-equipment

“MAXTEST - S”

Technical data:

Rated frequency 50 / 60 Hz

Length of test lead 1,4 m

Operating temperature -25 -+55 °C

Dimensions, w x h x d

(excl. connectors) 43 x 22 x 20 mm

Enclosure protection IP 68

Weight 40 g

### Voltage indicators VIM 1 and VIM 3 for HR-module

The voltage indicators VIM 1 and VIM 3 are used with capacitive outlets based on HR-system, to indicate high voltage in a switchgear. VIM 1 and VIM 3 fulfil the test requirements of IEC 61243-5. The indicators can be delivered in two versions:

VIM 1 for voltage indication in one phase at a time, mobile unit.

VIM 3 for voltage indication in three phases, prepared for permanent mounting in the switchgear.

Special features:

No external power supply required

Voltage indication by red flashing LED's.

Fully insulated system (IP 68) with cast resin and safety pin.

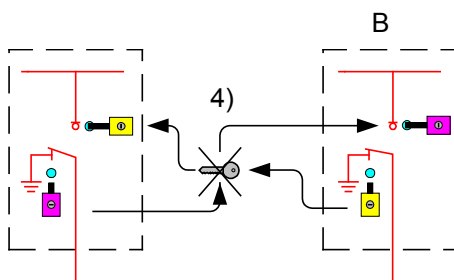
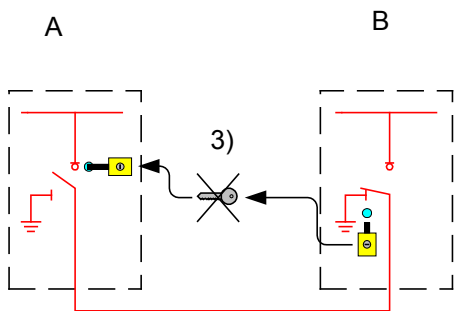
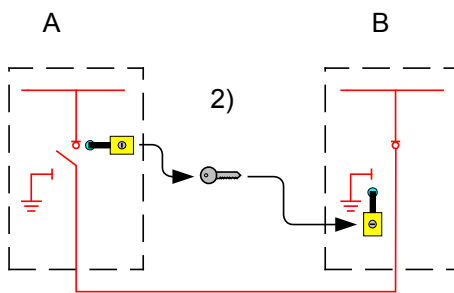
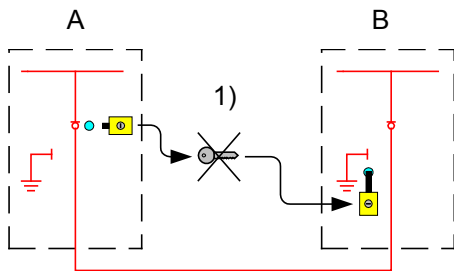
Function test: e.g. test equipment

“ MAXTEST - S”

Technical data VIM 1 and VIM 3	
Rated frequency	50 / 60 Hz
Threshold voltage U	70 – 90 V
Threshold current I	1,62 – 2,5 µA
Capacity to coupling system	74 – 88 pF
Input impedance of indicator	36 – 43,2 MΩ
Operating temperature	-25 - +55 °C
Enclosure protection	IP 68
Dimensions VIM 1, W x H x D (excl. connectors)	43 x 22 x 30 mm
Dimensions VIM 3, W x H x D (excl. connectors)	144 x 28 x 30 mm
Weight VIM 1	40 g
Weight VIM 3	110 g

## 6.11 Short-circuit indicator

Except for fuse-switch and vacuum breaker, all load break switches, earthing switches and disconnectors may be equipped with Ronis key interlock type EL11AP for one key or EL22 for 2 keys.



Another example for use of Ronis key interlocks is to prevent access to the distribution transformer before the primary side of the transformer is connected to earth. This can be solved

Ronis key interlocks can be used as follows: Two switchgear A and B are connected to each other by cables. The purpose of interlocks is to prevent closing of the earthing switch unless the load break switch in the other switchgear is locked in open position.

1) One Ronis key interlock will be mounted close to the operating shaft of the load break switch in switchgear A. An identical Ronis key interlock will be mounted close to the operating shaft of the earthing switch in switchgear B. As long as the load break switch in switchgear A is in closed position, it will be impossible to remove or operate the key in the key interlock.

2) First you have to operate this load break switch in switchgear A to open position. Then it will be possible to operate this key interlock and turn the key which extends the locking bolt. This will prevent the access to the operating shaft of this load break switch. Then withdraw the key and insert it into the identical key interlock on the earthing switch of switchgear B.

3) When the key is inserted, you will be able to operate the key interlock and turn the key which will withdraw the extended locking bolt. Then there will be access to operate this earthing switch to closed position. As long as this earthing switch is in closed position, the key will be captured and make it impossible to close the load break switch in switchgear A.

4) If the load break switch in switchgear B and earthing switch in switchgear A are equipped with another identical Ronis key interlock which has a different key combination than described above, it will be impossible to make an earth connection of an incoming energized cable from neither switchgear A nor B.

by means of two identical Ronis key interlocks; one mounted on the earthing switch for the distribution transformer feeder and the other one on the door in front of the transformer.



## 7. Remote control



Equipped with RTU (remote termination unit), the SafeRing & SafePlus series switchgear can implement intelligent application. Connecting all the IRMUs by a communication network, it enable to monitor and control the switchgear remotely, locate and isolate fault automatically as well as the system recovery. This will dramatically reduce the affected area and duration of blackout, and realize the high reliability and excellent power quality.

The SafeRing & SafePlus series switchgear units works with ABB's IDS distribution grid automation systems featuring standard-based open architecture and consisting of substations and automation terminal modules. The automation terminals employs a distributed modular design, and feature high reliability. Meanwhile, the compact form factor allows for easy installation in a compact switchgear unit.

The automation system of IDS is available in two configurations, IDS-MMI and IDS-DAS.

The remote termination unit (RTU) of IDS is also available in two configurations, IDS-F86 and IDS-A814 are two kinds of IDS.

### Integrated Control and Monitor Unit (ICMU)

The Safe series switchgear units may implement intelligent upgrading through the built-in IDS terminal modules (F86 and A814).

The RTU of IDS can be mounted in the RTU bay of Safe or in the low voltage cabinet on top of the Safe switchgear unit. Every RTU module includes a RS232 interface and a RS485 interface photoelectrically isolated to each other. The RS232 interface is provided for field testing and RS485 for remote communication. MODBUS or IEC60870-5-101 (DL/T634-1997) protocol may be leveraged in the communication with any remote site.

## 7. Remote control



### IDS-F86

#### Standard feature set:

- Design for three-way switch unit
- MSP430F1612 hardware platform: high velocity, low work consumption, rich resource
- 16 binary input, 1500 VDC of isolation voltage
- 8 analog input, including 4 current values (5AAC), 4 voltage values (1\*24VDC, 3\*100VAC/220VAC)
- 6 binary output (remote control, for up to 3 switching actions), C-form relay, 250VAC8A/30VDC8A
- 1\*RS485 interface for remote communication up to 1,200m
- 4 alternative baudrates: 9,600bps, 4,800bps, 1,200 bps and 600bps
- CAN main line communication with Hilon B stipulation velocity rate is 10, 20, 50, 100, 250, 500k bps
- 64 SOEs
- Operating temperature: -25~+70°C
- Operating voltage: 24VDC±20%, 5W

#### Optional:

- Energy counters
- 4 telemetry counters (digit adjustable)
- BCD code analyzer
- Double telemetry

## 7. Remote control



### Intelligent substation IDS-DTU51

#### Standard functions:

- Designed for 5-way switchboard;
- Directly view and operate on interface plate;
- TMS320F2812 hardware platform, dual CPU system, quick response;
- Can be used for the power system of single bus with a sectional switch;
- 26 digital inputs, single remote signaling, isolation voltage 1500 VDC;
- Analog input: 3\*5 currents (5AAC, 1AAC optional), 6 AC voltages (3\*100VAC, 220VAC optional), class 0.5;
- 2 DC voltage inputs, 10-36, class 1.0;
- Each pair of 2 current and voltage inputs co-work to implement electricity vector calculation with precision being up to class 1.0;
- 13 digital outputs (time remain adjustable), C-type contact, 250VAC8A, 30VDC8A;
- 1 RS485 COM port for remote communication within a range of up to 1200m;
- 5 optional communication rates: 1200, 4800, 9600, 19200, 38400 bps
- Integrated CAN bus interface, Hilon B Protocol, rates: 10, 20, 50, 100, 250, 500k bps;
- Front RS232 interface for local debugging;
- 80 SOE sequential event records, 20 local SOEs;
- Temperature range: -15°C +70°C ;
- Two optional operation power supplies: 24VDC±20%, 12W; or 85\_265V AC/DC,15VA.

#### Expanded function:

- 5 digital pulse counts, 65535 each;
- 4 remote signal shifting techniques: 65535 each;
- Relay output hold-up time adjustable: 0.2-99 s;
- Analogue limit alarm functionality.

### Intelligent substation IDS-MMI

#### Features:

- PC104 busbar architecture
- 100MHz, 32-bit CPU
- VxWORKS real-time embedded OS
- Software and hardware watchdog
- 2\*RS232 interfaces for communication with upper-level management system
- Implementing two communication plates for terminal communication, optional function combinations:

## 7. Remote control

Com- bination	Com- bination 1	Com- bination 2	Com- bination 3	Com- bination 4	Com- bination 5	Com- bination 6
Slot1	4 RS485s	1 Profi- bus DP	2CANs	4RS485s	4RS485s	1Profi- bus DP
Slot2	4RS485s	1Profi- bus DP	2CANs	1Profi- bus DP	2CANs	2CANs

- Communication protocol: DL/T451-91, IEC60870-5-101, MODBUS, SPA, IEC60870-5-104, Hilon B
- Real-time multi-task processing
- BIT at power-on
- Automatic fault location, isolation, and restructuring of 2 typical single rings
- 6.4-inch color LCD hard connected to PC
- LCD automatic/manual turn-on/off
- Keypad, mouse, floppy disk drive, etc.
- 5 alternative baudrates: 9,600bps, 4,800bps, 1,200 bps , 19,200 and 38,400bps
- Nonvolatile SOE
- Operating temperature: 0~+55°C
- Operating voltage: 24VDC±20%, 25W (excluding monitor)Intelligent substation IDS-MMI

### Optional:

- LCD featuring wide temperature range: 50W, -25~+70°C
- No LCD: -25~+70°C
- SNMP trap (RTU cooperation needed)
- Other communication protocols
- 2\*MMIs cascading
- Automation of 2 additional rings
- Inter-MMI ring control

### Multi-function Substation IDS-DAS

#### Features:

- Standard industry processor
- Windows 2000 OS
- Software and hardware watchdog
- 2\*RS232 interfaces for communication with upper-level management system
- 12\*RS485 interfaces for communication with lower-level management system
- Communication protocols: DL/T451-91, IEC60870-5-101, MODBUS, SPA, IEC60870-5-104, Hilon B
- Real-time multi-task processing
- Automatic fault location, isolation, restructuring of 8 typical single rings
- 4 alternative baudrates: 9,600bps, 4,800bps, 1,200 bps and 600bps
- Nonvolatile SOE
- Operating temperature: 0~+40°C
- Operating voltage: 220VAC±10%, 200W

#### Optional:

- NMP trap (RTU cooperation needed)
- Other communication protocols
- Cascading of two substations

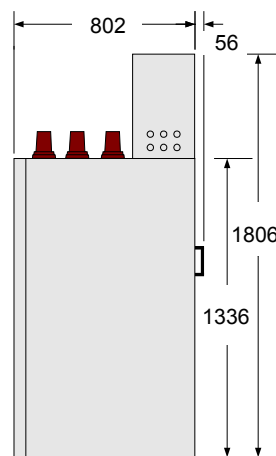
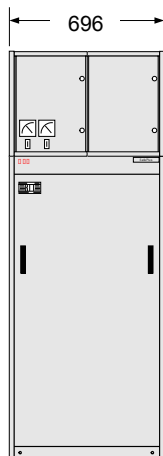
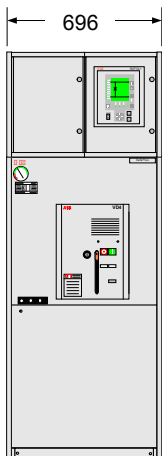
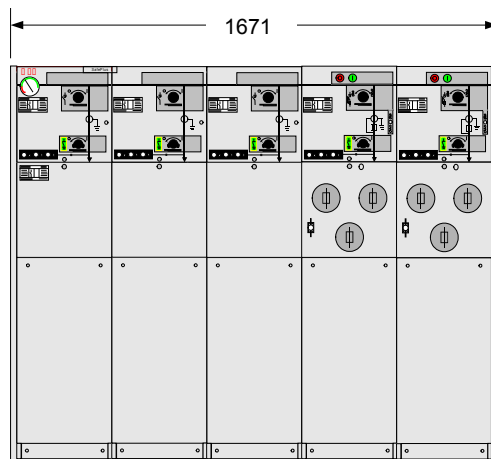
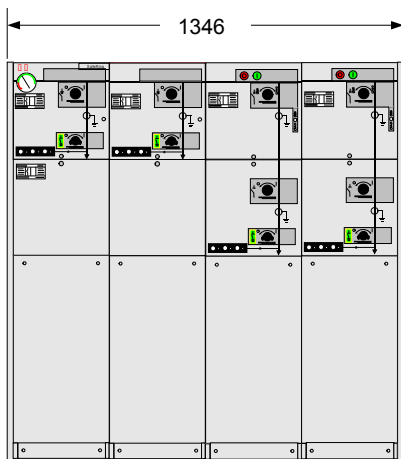
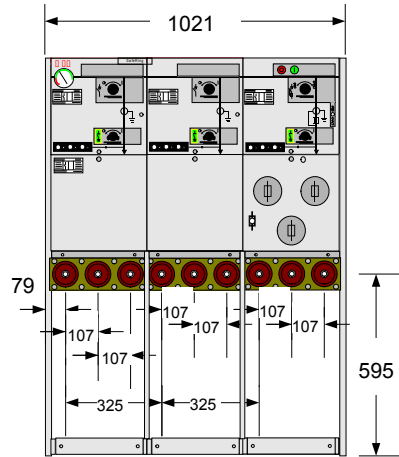
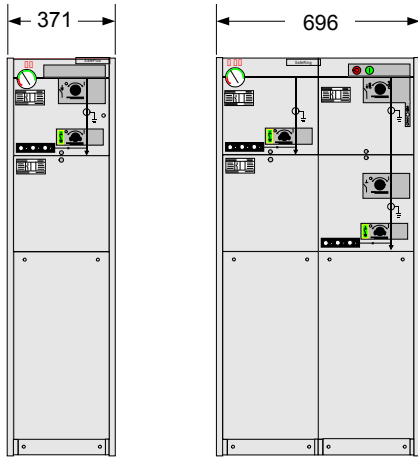
#### Other automation terminal module

IDS-A814,IDS-S/B8,IDS-C6/V6.

For more functions please refer to IDS Monitoring System catalogue published by ABB High Voltage Swithgear Co.,Ltd.,Beijing.

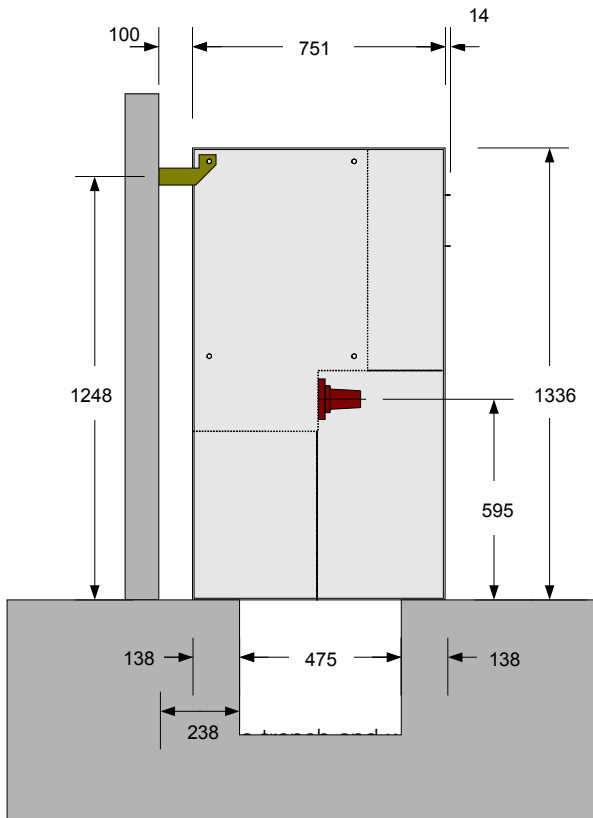
# 8. Dimensions

## 8.1 Standard units

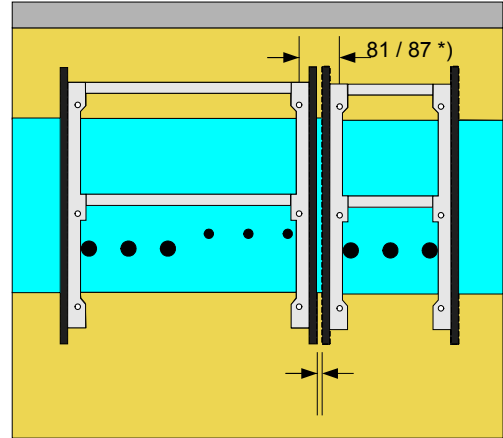


Metering module M, front view and side view right

## 8.2 Floor and wall fixing including cable entry



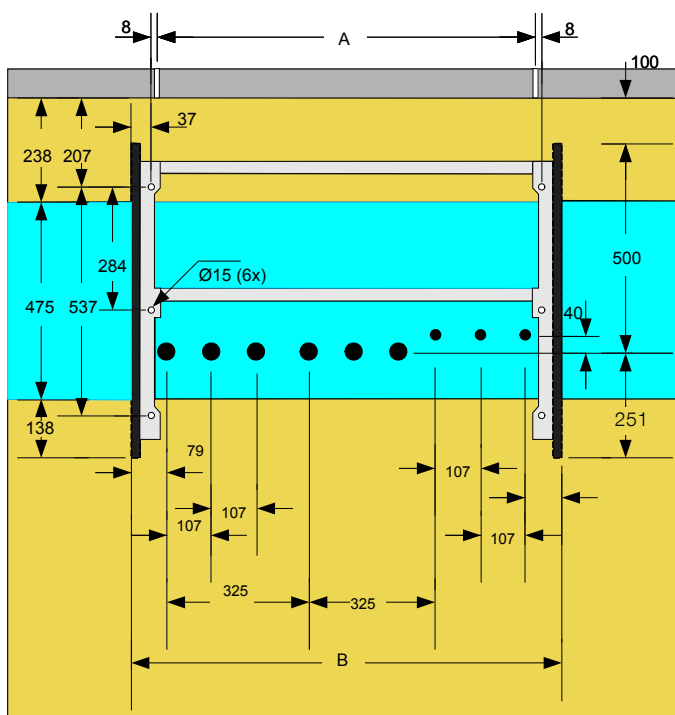
Cable trench and wall fixing



Distance between two units which are connected to each other by means of external busbars

● Indicates cable entry

\*) Top extension - 8 mm / 81 mm  
Side extension - 14 mm / 87 mm



Floor and wall fixing including cable entry

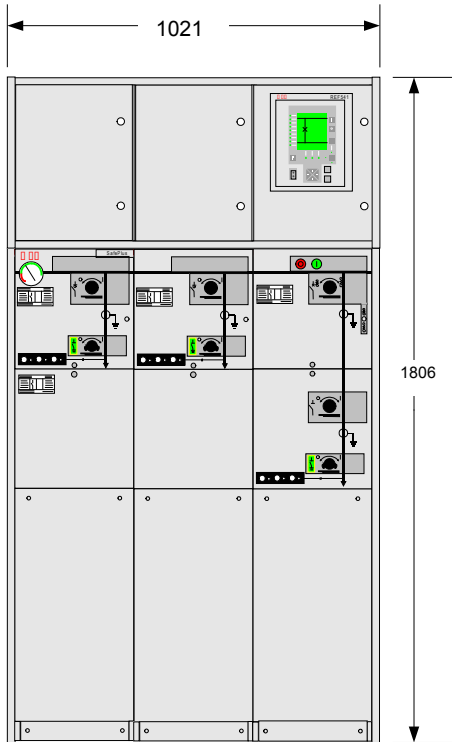
Unit	A	B
1-way	281	371
2-way	606	696
3-way	931	1021
4-way	1256	1346
5-way	1581	1671

3-way unit with cable bushings Interface C (400 series bolted) for module 1 and 2 and cable bushings Interface A (200 series plug-in) for module 3.

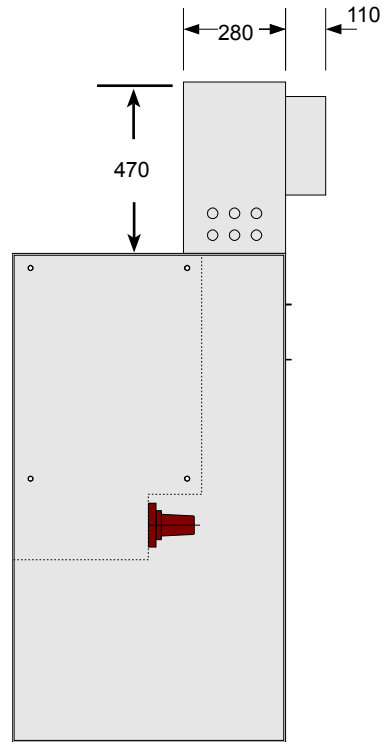
● Indicates cable entry

## 8.3 Low voltage compartment with relay

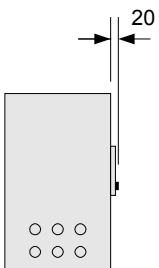
### Low voltage compartment with relay



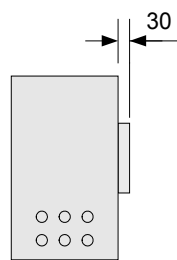
Low voltage compartment with REF 541



Low voltage compartment with REF 541



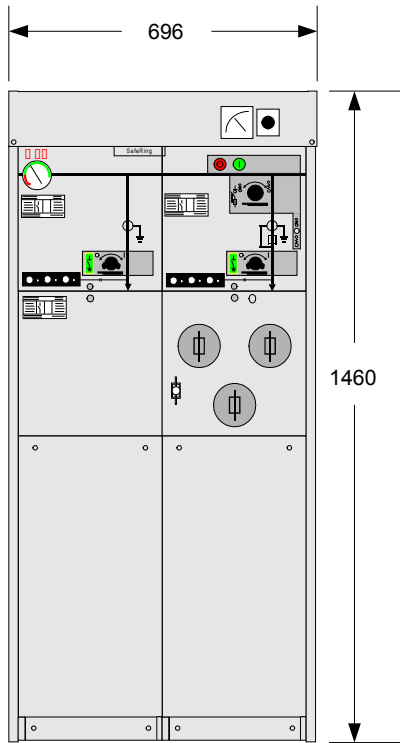
Low voltage compartment with REF 542plus



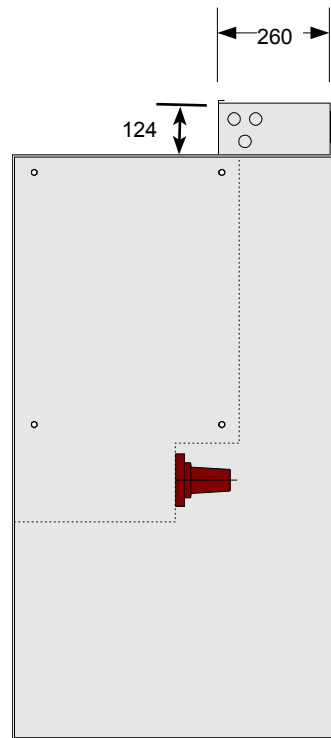
Low voltage compartment with REF 610

## 8.4 Floor and wall fixing including cable entry

### Top entry box



Top entry box with ammeter and position switch

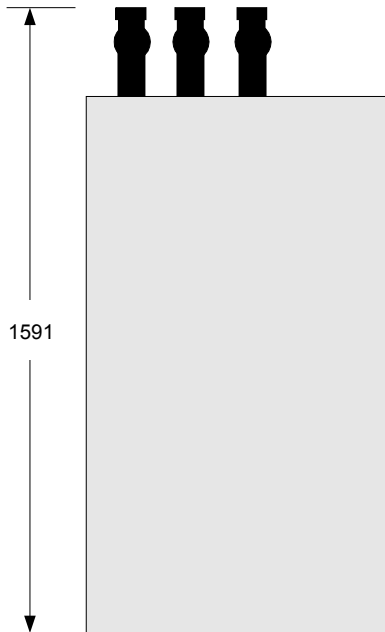


Top entry box - side view

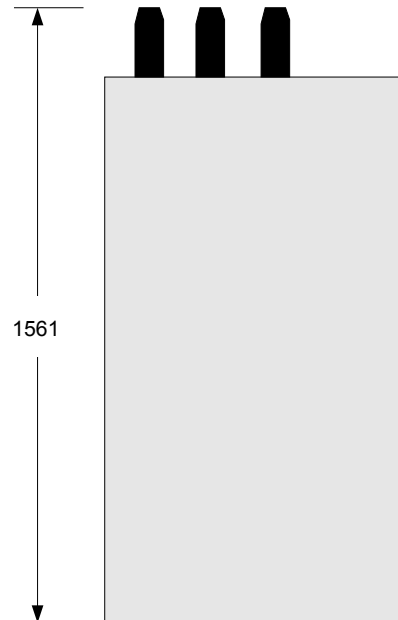


## 8.5 Low voltage compartment with relay

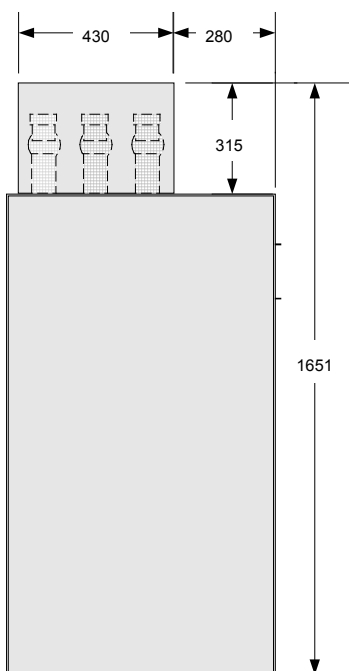
External busbars



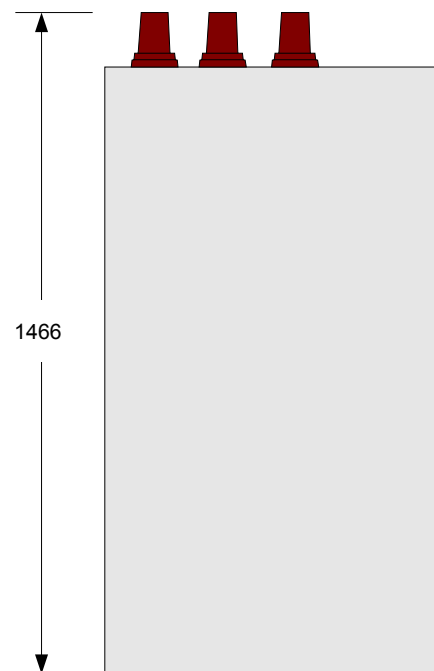
External busbars



Prepared for future extension with  
dead end receptacles



Busbar cover

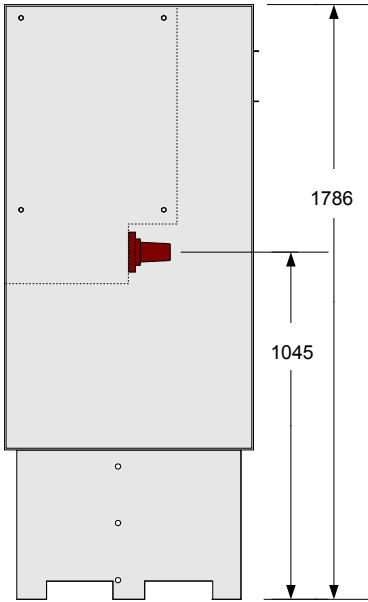


Product catalogue | Dimensions

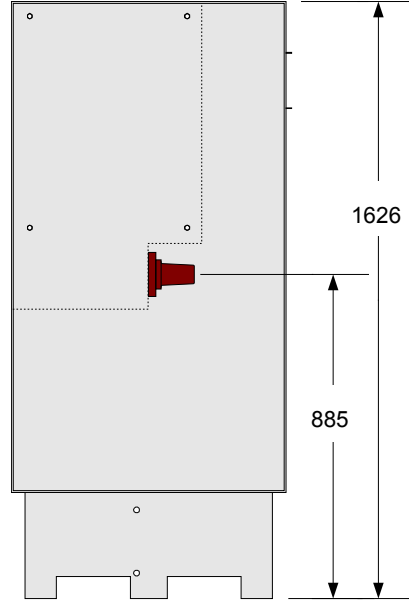
## 8.6 Base frames

## 8.7 Special cable compartment covers

### Base frames

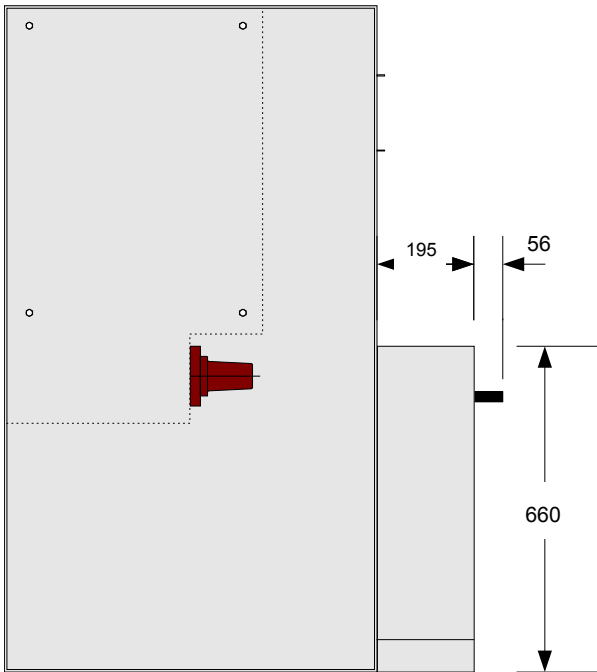


Base frame, height 450 mm

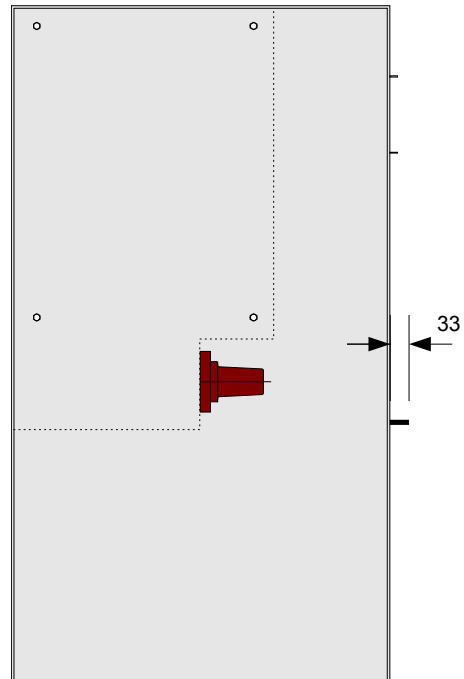


Base frame, height 290 mm

### Special cable compartment covers



Cable compartment cover for parallel cables



Arc proof cable compartment cover

# 9. Low voltage compartment with relay

## 9.1 Codes and standards

### Codes and standards

SafeRing and SafePlus are manufactured and tested in accordance with the latest version of:

IEC 60694	Common specifications for high-voltage switchgear and controlgear standards
IEC 62271-100	High-voltage switchgear and controlgear - Part 100: High-voltage alternating-current circuit-breakers
IEC 62271-102	High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches
IEC 62271-105	High-voltage switchgear and controlgear - Part 105: Alternating current switch-fuse combinations
IEC 62271-200	High-voltage switchgear and controlgear - Part 200: A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
IEC 60265-1	High-voltage switches- Part 1: Switches for rated voltages above 1 kV and less than 52 kV
IEC 60529	Degrees of protection provided by enclosures (IP code)

## 9.2 SafeRing, electrical data

### SafeRing - Ring Main Unit, electrical data

Electrical data and service conditions							
1	Rated voltage	$U_r$	kV	12	15	17,5	24
2	Rated power frequency withstand voltage	$U_d$	kV	28	38	38	50
	- across disconnecter		kV	32	45	45	60
3	Rated lightning impulse withstand voltage	$U_p$	kV	95	95	95	125
	- across disconnecter		kV	110	110	110	145
4	Rated frequency	$f_r$	Hz	50/60	50/60	50/60	50/60
5	Rated normal current (busbars)	$I_r$	A	630	630	630	630
6	Rated normal current (cable switch)	$I_r$	A	630	630	630	630
7	Rated normal current (switch-fuse-disconnector)	$I_r$	A	200 <sup>1)</sup>	200 <sup>1)</sup>	200 <sup>1)</sup>	200 <sup>1)</sup>
8	Rated normal current (vacuum circuit-breaker)	$I_r$	A	200	200	200	200
9	Rated short-time withstand current	$I_k$	kA	21 <sup>3)</sup>	21 <sup>3)</sup>	16 <sup>3)</sup>	16 <sup>3)</sup>
10	Rated duration of short-circuit	$t_k$	s	3	3	3	3
11	Rated peak withstand current	$I_p$	kA	52,5	52,5	40	40
	<i>Making and breaking capacities C-module:</i>						
12	Rated mainly active load breaking current	$I_1$	A	630	630	630	630
13	Number of operations for mainly active load breaking	n		100	100	100	100
14	Rated distribution line closed-loop breaking current	$I_{2a}$	A	630	630	630	630
15	Rated no-load transformer breaking current	$I_3$	A	20	20	20	20
16	Rated single capacitor bank breaking current	$I_{4c}$	A	135	135	135	135
17	Rated earth fault breaking current	$I_{6a}$	A	200	150	150	150
18	Rated cable- and line-charging breaking current under earth fault conditions	$I_{6b}$	A	115	87	87	87
19	Rated short-circuit making current	$I_{ma}$	kA	52,5	52,5	40	40
	<i>Making and breaking capacities F-module:</i>						
20	Rated mainly active load breaking current	$I_1$	A	200	200	200	200
21	Number of operations for mainly active load breaking	n		100	100	100	100
22	Rated no-load transformer breaking current	$I_3$	A	20	20	20	20
23	Rated making capacity <sup>2)</sup>	$I_{sc}$	kA	21	21	16	16
24	Rated making capacity (downstream earthing switch)	$I_{ma}$	kA	12,5	12,5	12,5	12,5
25	Rated short-time current (downstream earthing switch)	$I_k$	kA	5	5	5	5
26	Rated duration of short-circuit	$t_k$	s	1	1	1	1
	<i>Making and breaking capacities V-module:</i>						
27	Rated mainly active load breaking current	$I_1$	A	200	200	200	200
28	Rated short-circuit breaking current	$I_{sc}$	kA	16	16	16	16
29	Rated cable-charging breaking current	$I_c$	A	31,5	31,5	31,5	31,5
30	Rated short-time current (earthing switch)	$I_k$	kA	16	16	16	16
31	Rated short-circuit making current (earthing switch)	$I_{ma}$	kA	40	40	40	40
32	Rated filling level for insulation	$P_{re}$	MPa	0,04	0,04	0,04	0,04
	Service conditions for indoor equipment according to IEC 60694						
	Ambient temperature <sup>4)</sup>						
33	Maximum value		°C	+40	+40	+40	+40
34	Maximum value of 24 hours mean		°C	+35	+35	+35	+35
35	Minimum value		°C	-25	-25	-25	-25
36	Altitude for installation above sea level <sup>5)</sup>		m	1500	1500	1500	1500
37	Relative humidity			max 95%	max 95%	max 95%	max 95%

1) T-off fuse module: depending on the current rating of the fuse

2) T-off fuse module: limited by high voltage fuse-links

3) Valid with Interface C bushings (400 series bolted type) only

4) Derating allows for higher maximum temperature

5) For installation above 1500 m, reduced gas pressure is required

## 9.3 SafePlus, electrical data

### SafePlus - Compact Switchgear, electrical data

Electrical data and service conditions							
1	Rated voltage	Ur	kV	12	15	17,5	24
2	Rated power frequency withstand voltage	Ud	kV	28	38	38	50
	- across disconnector		kV	32	45	45	60
3	Rated lightning impulse withstand voltage	Up	kV	95	95	95	125
	- across disconnector		kV	110	110	110	145
4	Rated frequency	fr	Hz	50/60	50/60	50/60	50/60
5	Rated normal current (busbars)	Ir	A	630	630	630	630
6	Rated normal current (external busbars)	Ir	A	1250	1250	1250	1250
7	Rated normal current (cable switch)	Ir	A	630	630	630	630
8	Rated normal current (switch-fuse-disconnector)	Ir	A	200 1)	200 1)	200 1)	200 1)
9	Rated normal current (vacuum circuit-breaker)	Ir	A	200 / 630	200 / 630	200 / 630	200 / 630
10	Rated short-time withstand current	Ik	kA	25 / 21 3)	21 3)	21 3)	21 3)
11	Rated duration of short-circuit	tk	s	1 / 3	3	3	3
12	Rated peak withstand current	Ip	kA	62,5 / 52,5	52,5	52,5	52,5
	Making and breaking capacities C-module:						
13	Rated mainly active load breaking current	I1	A	630	630	630	630
14	Number of operations for mainly active load breaking	n		100	100	100	100
15	Rated distribution line closed-loop breaking current	I2a	A	630	630	630	630
16	Rated no-load transformer breaking current	I3	A	20	20	20	20
17	Rated single capacitor bank breaking current	I4c	A	135	135	135	135
18	Rated earth fault breaking current	I6a	A	200	150	150	150
19	Rated cable- and line-charging breaking current under earth fault conditions	I6b	A	115	87	87	87
20	Rated short-circuit making current	I <sub>ma</sub>	kA	62,5	52,5	50	50
	Making and breaking capacities F-module:						
21	Rated mainly active load breaking current	I1	A	200	200	200	200
22	Number of operations for mainly active load breaking	n		100	100	100	100
23	Rated no-load transformer breaking current	I3	A	20	20	20	20
24	Rated making capacity 2)	I <sub>sc</sub>	kA	25	21	20	20
25	Rated making capacity (downstream earthing switch)	I <sub>ma</sub>	kA	12,5	12,5	12,5	12,5
26	Rated short-time current (downstream earthing switch)	Ik	kA	5	5	5	5
27	Rated duration of short-circuit	tk	s	1	1	1	1
	Making and breaking capacities V-module:						
28	Rated mainly active load breaking current	I1	A	200 / 630	200 / 630	200 / 630	200 / 630
29	Rated short-circuit breaking current	I <sub>sc</sub>	kA	21	21	16	16
30	Rated cable-charging breaking current	Ic	A	31,5	31,5	31,5	31,5
31	Rated short-time current (earthing switch)	Ik	kA	21	21	16	16
32	Rated short-circuit making current (earthing switch)	I <sub>ma</sub>	kA	52,5	52,5	40	40
33	Rated filling level for insulation	Pre	MPa	0,04	0,04	0,04	0,04
	Service conditions for indoor equipment according to IEC 60694						
	Ambient temperature 4)						
34	Maximum value		°C	+40	+40	+40	+40
35	Maximum value of 24 hours mean		°C	+35	+35	+35	+35
36	Minimum value		°C	-25	-25	-25	-25
37	Altitude for installation above sea level 5)		m	1500	1500	1500	1500
38	Relative humidity			max 95%	max 95%	max 95%	max 95%

1) T-off fuse module: depending on the current rating of the fuse

2) T-off fuse module: limited by high voltage fuse-links

3) Valid with Interface C bushings (400 series bolted type) only

4) Derating allows for higher maximum temperature

5) For installation above 1500 m, reduced gas pressure is required

## 9.4 SafeRing and SafePlus, general data

### General data, enclosure and dimensions

1	Type of ring main unit (RMU) and compact switchgear (CSG)	Metal-enclosed switchgear and controlgear according to IEC 62271-200		
2	Number of phases	3		
3	Type-tested RMU and CSG	Yes		
4	Pressure test on equipment tank or containers	2.64 bar abs		
5	Facility provided with pressure relief	Yes		
6	Insulating gas	SF <sub>6</sub>		
7	Nominal operating gas pressure	1.4 bar abs 20°C		
8	Gas leakage rate / annum	0,1%		
9	Expected operating lifetime	30 years		
10	Facilities provided for gas monitoring	Yes, temperature compensated manometer can be delivered		
11	Material used in tank construction	Stainless steel sheet, 3 mm		
12	Busbars	240 mm <sup>2</sup> Cu		
13	Earth bar (external)	120 mm <sup>2</sup> Cu		
14	Earth bar bolt dimension	M10		
	Overall dimensions of the fully assembled RMU	Height	Depth	Width
		mm	mm	mm
15	2-way unit	1336	765	696
16	3-way unit	1336	765	1021
17	4-way unit	1336	765	1346
	CSG (2, 3 and 4 way units as RMU) with additional height for optional low voltage compartment (470 mm)			
18	1-way unit	1336	765	371
19	5-way unit	1336	765	1671
20	Distance between units when external extension is used	8 mm		
21	Distance between units when side extension is used	14 mm		

## 9.5 SafeRing and SafePlus, general data

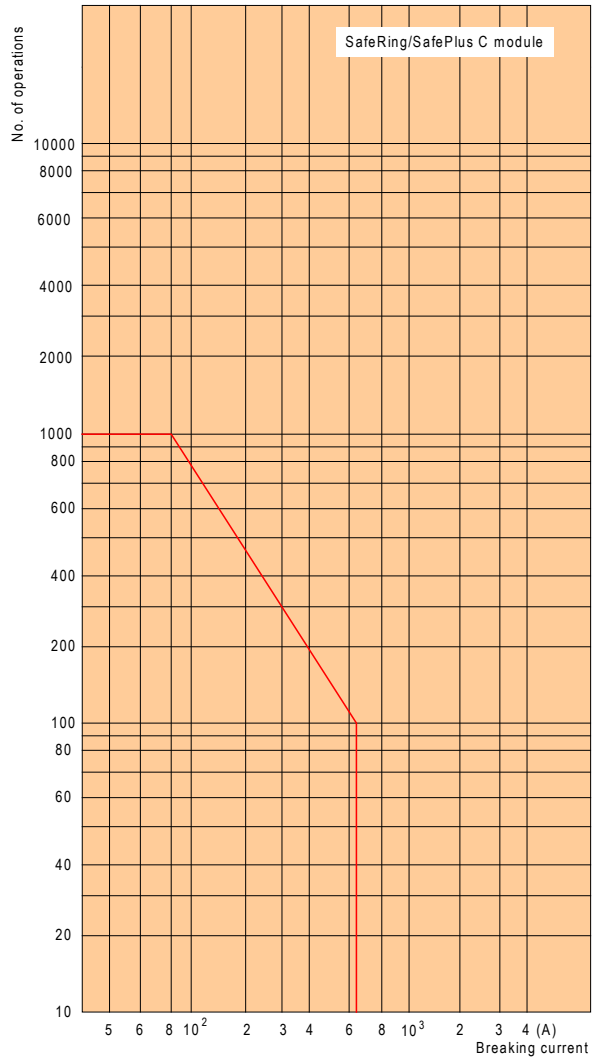
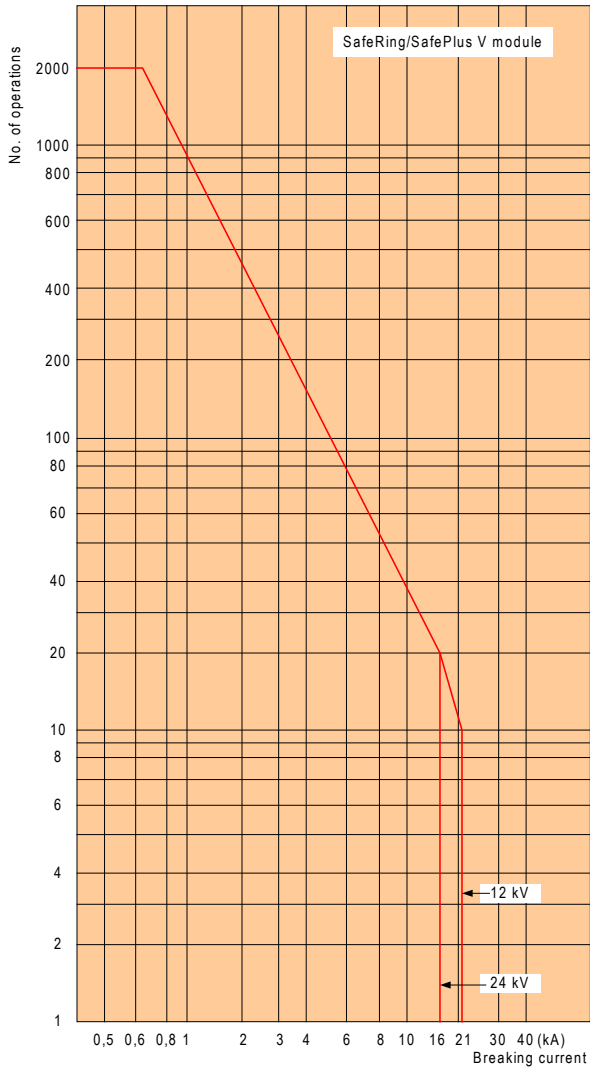
### Operations, degree of protection and colours

1	Means of switch operation	separate handle
2	Means of fuse switch/circuit-breaker operation	separate handle and push buttons
3	Rated operating sequence of circuit-breaker (V-module)	O – 3 min – CO – 3 min – CO
4	Rated operating sequence of circuit-breaker (CB-module)	O – 0,3 s – CO – 3 min – CO
5	Total opening time of circuit-breaker	approx. 75 ms
6	Closing time of circuit-breaker	approx. 40 – 60 ms
7	Mechanical operations of switch	1000 CO
8	Mechanical operations of earthing switch	1000 CO
9	Mechanical operations of circuit-breaker (V-module)	2000 CO
10	Mechanical operations of circuit-breaker (CB-module)	30000 CO
11	Principle switch-disconnector and earthing switch	3 position combined switch-disconnector and earthing switch
	Load break switch:	
12	Rated operations on short circuit current (class E3)	5
13	Rated operations mainly active load (class E3)	100
	Degree of protection:	
14	High voltage live parts, SF <sub>6</sub> tank	IP 67
15	Front cover mechanism	IP 2XC
16	Cable covers	IP 3X
17	Protection class of fuse compartment	IP 67
	Colours:	
18	Front covers	RAL 7035
19	Side and cable covers	RAL 7035

### Fuses, cable compartment

1	Standard fuse-link length	442 mm. Shorter fuse-links can be used with fuse adapter
2	Standard dimensions	According to DIN 43625
3	Maximum size 12kV	125 A
4	Maximum size 24kV	63 A
	Cable box for heat shrinkable termination:	
5	Phase to phase clearance	107 mm
6	Phase to earth clearance	54,5 mm
7	Phase to earth over insulator surface (creepage)	120 mm
8	Type of cable termination adapters	Elbow or T-connector

## 9.6 Weight table



### Weight table

The units are delivered from the factory ready for installation

#### Maximum weights for standard SafeRing:

2-way DV	300 kg	2-way DF	300 kg
3-way CCV	450 kg	3-way CCF	450 kg
4-way CCCV	600 kg	4-way CCCF	600 kg
3-way CCC	450 kg	4-way CCFF	600 kg
4-way CCCC	600 kg	5-way CCCCCF	700 kg
		6-way CCCCCC	750 kg

#### SafePlus

Standard 1-way	150 kg
2-, 3- and 4-way	as for SafeRing
5-way	750 kg
M – metering module	250 kg



# 10. Environment

## Environmental Declaration

### Life expectancy of product

The product is in compliance with the requirements denoted by IEC 62271-200. The design incorporates a life span under normal "indoor service conditions" (IEC 60694 subclause 2.1.1). The switchgear is gas-tight and classified as sealed pressure system\*) with an expected operating life exceeding 30 years and a diffusion rate of less than 0.1 % per year (IEC 60694 subclause 5.15 and annex E). Referring to the filling pressure of 1.4 bar, the switchgear will maintain gas-tightness and a gas-pressure better than 1.35 bar\*\*) throughout its operating life.

\*) No topping up required during operating life

\*\*) at 20°C

### Recycling capability

Raw material	Weight	% of total weight -320kg	Recycle	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, reuse of 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 coil	0,21 kg	0,066%	Yes	Reclaim or use as high-grade energy additive in refuse incineration
SF <sub>6</sub> gas	3,24 kg	1,04%	Yes	ABB AS in Skien is equipped to reclaim used SF <sub>6</sub> gas
Total for recycling	311,44 kg	97,25%		
Not specified*	9,00 kg			*Stickers, film-foils, powder coating, screws, nuts, tiny components, grease...
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	Reuse or use as energy additive in refuse incineration

\*\*) All figures are collected from CCF 3-way unit with arc suppressor

### End-of-life

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

There exist no explicit requirements for how to handle discarded switchgear at end-of-life. ABB's recycling service is according to IEC 61634 edition 1995 section 6: «End of life of SF<sub>6</sub> 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 AS, Power Products Division in Skien is equipped to reclaim SF<sub>6</sub> gas from discarded switchgear.

# Contact us

**ABB High Voltage Switchgear Co. Ltd., Beijing**

No 12 Jingyuan Street  
Beijing Economic-Technological Development Area  
Beijing, 100176, P. R. China  
Tel : +8610 67818000  
Fax: +8610 67818001

[www.abb.com.cn](http://www.abb.com.cn)

Information given in this publication is generally applicable to equipment described. Changes may be made in future without notice.

Document ID 1YVA000022 - Rev.B, en 2010-08