Medium voltage products

UniSec
Air-insulated medium voltage secondary distribution switchgear

Power and productivity
for a better world™

Index

UniSec – A superior switchgear range

UniSec is the result of ABB's quest for continuous innovation, following a vision to meet ever-changing market needs. It provides long-term technical solutions for a world of applications. Safety and reliability, user-friendly specifications and installation, and sustainability have been the driving forces in its development.

Ultimately convenient

Wherever your business is, UniSec always provides the most direct route to solving your technical and market challenges.

Always the optimum solution for different needs

UniSec brings the most versatile switchgear to the market, with a very broad portfolio of functional units.
Fewer parts, all standardized and modularized, require less service training and fewer competences.
Comfortable access for cable connection; simple solutions for panel connectivity; easily removable circuit-breakers.
The design enables customization, even at the later project stages, and easy modifications, fast replacement and upgrading of main accessories.
UniSec brings you state-of-the-art control, monitoring and protection technology. From low-end self-powered protection relays to high-end configurable terminals, available for all applications.

Absolutely trustworthy

When people's lives are on the line, they need to know that safety and reliability are always UniSec's main concern.

Reliable and Safe

Reliability and service continuity are assured.
UniSec's long life-cycle is assured by extensive product testing and an unrivalled global service network.
The metallic partitions between busbars and cable compartments is a further safety and service continuity feature.
Personnel safety is paramount. Safety features protect your investment.
The UniSec range is fully designed and type tested according to the IEC standard no. 62271-200, and has a high internal arc withstand capability rating.
Optional arc-protection solutions integrated in protection relays limit the negative effects of the internal arc.

Genuinely adaptable

Any place, anywhere, with ABB's global experience and knowledge, UniSec will always have the answer for local challenges and conditions.

Knowledge of the local markets served by a global footprint

ABB operates in around 100 countries. That helps us understands local markets and regulatory regimes. Wherever you operate, we not only apply the relevant standards and specifications but also deliver localized drawings, documentation, training and eLearning packages.
Because identical UniSec switchgear and components are produced and shipped in all parts of the world from regional factories, delivery times are optimized, quality is assured and supply is guaranteed.

Committed all the way

Backed by ABB's global presence, financial strength and sustainable approach to long-term development, UniSec is here to make a difference.

A sustainable solution from a long-term player in the global marketplace

ABB's global presence, philosophy of continuous development and financial strength mean you can rely on our long-term commitment to making UniSec the leading brand in secondary distribution air-insulated switchgear.
It combines high quality, state-of-the-art technology with minimal environmental impact.
Support includes UniSec tools, services, product configurator, eLearning, personalized training and product documentation.

1. General characteristics

Switchgear electrical characteristics

Rated voltage	kV	12	17.5	24
Test voltage (50-60 Hz x 1 min)	kV	28	38	50
Impulse withstand voltage	kV	75	95	125
Rated frequency	Hz	50-60	50-60	50-60
Rated main busbar current	A	630/800/1250	630/800/1250	630
Rated current of apparatus				
– VD4-HD4 removable circuit-breaker	A	630/800	630/800	630
– GSec gas switch-disconnector	A	630/800	630/800	630
– Vmax withdrawable circuit-breaker	A	630/1250	630/1250	–
– VSC/P vacuum contactor	A	400	–	–
Rated short-time withstand current	kA (3s)	16/21/25 (1) (2)	16/21/25 (2)	16/21
Peak current	kA	40/52.5/63	40/52.5/63	40/52.5
Internal arc withstand current (IAC AFLR) (4)	kA (1s)	12.5/16/21/25 (3)	12.5/16/21/25 (3)	12.5/16/21

(1) 25 kA 2s. (2) 25 kA, 3 s for withdrawable circuit-breaker (3) for unit with withdrawable circuit-breaker (4) if no internal arc requested

Designed for all applications

UniSec is the new ABB air-insulated switchgear, LSC2A-PM and LSC2B-PM classified design for panels with withdrawable circuit-breaker, in accordance with loss of service continuity definitions and complying with the IEC 62271-200 Standards.

UniSec offers the following features:

- Air insulation of all live parts
- SF_6 switch-disconnector
- Removable and withdrawable circuit-breakers
- Vacuum contactor
- LSC2A service continuity classification
- Withdrawable circuit-breaker and contactor class LSC2B service continuity classification
- Complete range of functional units and accessories
- Large selection of state-of-the-art protection relays, integrated on removable circuit-breakers or separately mounted for protection, control and measurement functions.

Reference Standards

- IEC 62271-200
- EN 62271-200, in particular with reference to the classifications introduced by the standards, UniSec switchgear is defined as follows:
  - classification of service continuity: LSC2A and LSC2B
  - classification of the partitions: PM (Metallic Partitions).


VD4/R-SEC


HD4/R-SEC


Vmax/W


VSC/P

Available versions

- Internal arc fault tested in accordance with IEC 62271-200
- Arc proof according to IEC 62271-200 Standards in the IAC AFLR arc proof version on three sides (front, lateral, rear) 12.5 kA, 16 kA and 21 kA.

Available apparatus

- GSec type gas switch-disconnector
- VD4/R-SEC removable vacuum circuit-breakers
- HD4/R-SEC removable SF_6 gas circuit-breakers
- Vmax withdrawable circuit-breaker
- VSC/P vacuum contactor.

Normal service conditions

- Range of ambient temperature: –5 °C ... +40 °C
- Maximum relative humidity without condensation: 95 %
- Minimum relative humidity without condensation: 5 %
- Altitude: <1000 m above the sea level(*).

Degrees of protection

- For IP 3X enclosure
- For IP 2X partition between compartments
- For IP 3X mechanical operating equipment.

(*) For higher altitudes, contact ABB.

Surface treatment

UniSec units are made of pre-galvanized sheet. The doors of the front panels and the switch-disconnector cover are painted grey RAL 7035 with gloss finish.

Fields of application

- Medium voltage secondary power distribution
- Transformer substations
- Control and protection of feeders and power transformers
- Infrastructures
- Airports
- Hospitals and shopping centres
- Industries.

Technical documentation

For in-depth information about technical and application aspects of the apparatus used in UniSec switchgear, please request the following publications:

– VD4 circuit-breaker	1VCP000263
– HD4 circuit-breaker	1VCP000028
– Vmax circuit-breaker	1VCP000408
– VSC/P contactor	1VCP000165
– Current transformers	1VLC000501
– Voltage transformers	1VLC000572
– REF601	1MDS07202
– REF610	1MRS756029
– REF615	1MRS756379

1. General characteristics

Design concept
Each unit is constructed entirely using pre-galvanized metal sheets. Each unit consists of several compartments, which are described in the following paragraphs.

Compartments
Each unit consists of several power compartments: cable compartment [8], busbar compartment [4] and apparatus compartment.
The compartments are metallically segregated from each other by means of the switch-disconnector or by means of shutters [10] in the case of withdrawable circuit-breakers.
The units can be fitted with an auxiliary circuit compartment [7], where all the instruments and cabling are housed.
Arc-proof switchgear is normally provided with a duct for evacuation of the gases produced by an arc. All the units are accessible from the front and the maintenance and service operations can therefore also be carried out with the switchgear mounted against the wall.

Main busbars
The busbar compartment contains the main busbar system connected to the fixed upper contacts of the switch-disconnector. The main busbars are made of electrolytic copper up to 1250 A. The system consists of flat busbars.
The busbar compartment is placed along the whole length of the switchgear.
Each unit has holes for fixing to the floor and is provided with bottom closure fitted with openings for medium voltage cable passage.

All the units fitted with a door have a mechanical interlock which only allows door opening under safe conditions.
There is a metal wiring duct in each unit to segregate the low voltage circuits from the medium voltage circuits.

Earthing busbar
The earthing busbar is made of electrolytic copper.
It runs lengthwise right round the switchgear, thereby providing maximum personnel and plant safety.

Switch-disconnector
The switch-disconnector compartment contains a GSec type of 3-position SF_6-insulated switch-disconnector.
The contacts of the switch-disconnector are housed in an enclosure made of two materials: the top part is a moulded resin case to guarantee the insulation level; the bottom part is made of stainless steel to guarantee metallic partitions and earthing between the busbar compartment and the cable compartment.
This metallic partition (classification PM - Metallic Partitions according to the IEC 62271-200 Standard) guarantees maximum safety for personnel in the case of intervention in the cable compartment even with the busbar energized, for example to replace the fuses or to check the cables.

Earthing switch
Each incoming/outgoing unit can be fitted with an earthing switch to earth the cables (except for the DRC unit).

Cable compartment

The switch-disconnector compartment creates a metal partition between the cable and busbar compartment. It can contain different apparatus according to the specific unit.

Terminals

The cable compartment contains the terminals for connection of the power cables to the lower fixed isolating contacts of the apparatus. The terminals are made of electrolytic copper and have flat busbars for the whole range of currents.

Auxiliary circuit compartment

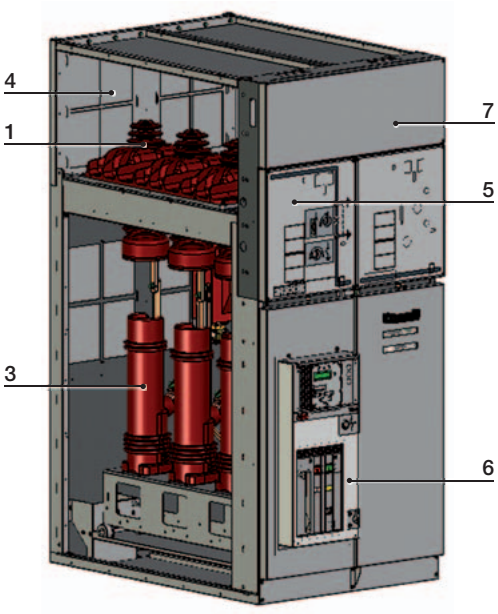
The auxiliary circuit compartment is available in either the basic or enlarged version depending on the required application. The enlarged version is normally used for protection relays. The protection relays, secondary wiring and terminal boxes are installed in this compartment.

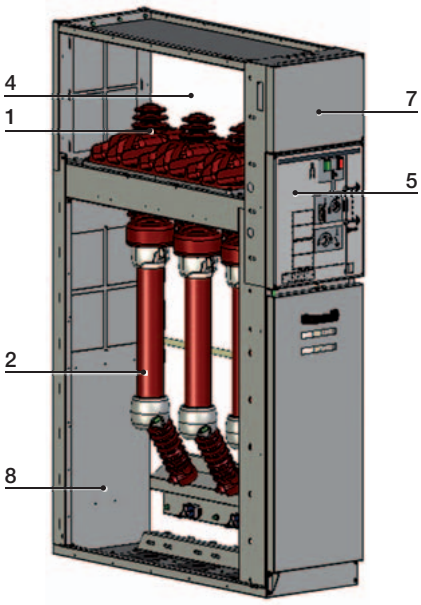
Mechanism compartment

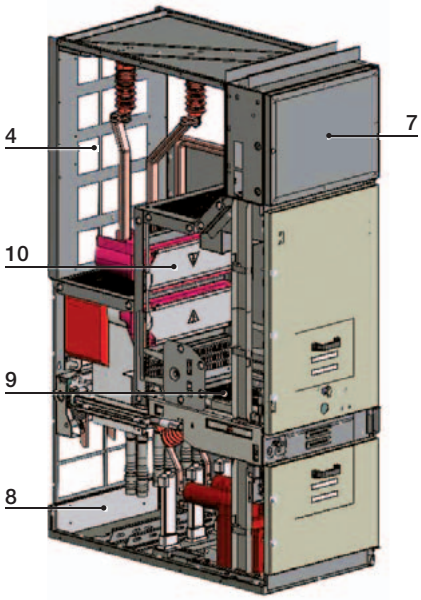
This compartment contains the operating mechanism of the switch-disconnector and earthing switch, the mechanical interlocks and the position indicators. The auxiliary contacts, trip coils and voltage indicators are also mounted in this compartment.

Cables

Single-pole or three-pole cables up to a maximum of two per phase can be used, depending on the rated voltage, the unit dimensions and the cross section of the cables.
The three-pole cables must be branched under the floor so that they can be mounted on each phase.
The switchgear can be mounted against the wall in the station as the cables are easily accessible from the front.







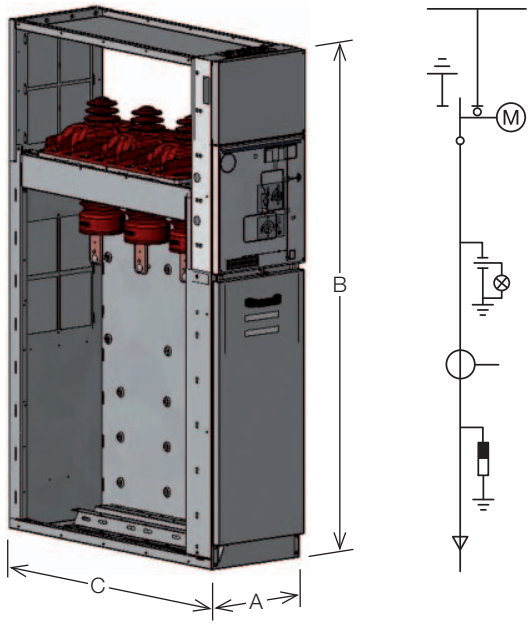
1 - Switch-disconnector
2 - Fuses
3 - Circuit-breaker
4 - Busbar compartment
5 - Mechanism compartment
6 - Actuator of the circuit-breaker
7 - Auxiliary circuit compartment
8 - Cable compartment
9 - Apparatus compartment
10 - Metallic shutters

2. Typical units

List of available units

Code	Description	Width				
		190 mm	375 mm	500 mm	600 mm	750 mm
SDC	Unit with switch-disconnector		•	•		•
SDS	Unit with switch-disconnector – isolation		•	•		
SDM	Isolating unit with measurement with switch-disconnector					•
SFC	Disconnector unit with fuses		•	•		
SFS	Disconnector unit with fuses – isolation		•	•		
SBC	Circuit-breaker unit with disconnector					•
SBS	Circuit-breaker unit with disconnector – isolation					•
WBC	Unit with withdrawable circuit-breaker				•	
WBS	Unit with withdrawable circuit-breaker – isolation				•	
SBR	Reversed circuit-breaker unit					•
SFV	Disconnector unit with fuses – measurement			•		
DRC	Riser unit		•	•		
DRS	Riser unit – measurement		•	•		
RLC/RRC	Lateral, left and right-hand cable riser (only for SBR unit)	•				

SDC – Unit with switch-disconnector



Units available in the 375 mm, 500 mm and 750 mm widths. The switch-disconnector unit with cable is mainly used as an incoming, ring or branch unit. The basic unit is equipped with a 3-position switch-disconnector. The 3-position switch-disconnector can be in one of three positions: “closed”, “open” or “earthed”, therefore preventing incorrect operations. Access to the cable compartment is possible in the “earthed” position.
Inspection of cable connections and fault indicators, when used, is easily carried out through the front-door window.

Panel dimensions	Weight
mm A x B x C (*)	**kg**
375 x 1700 x 1070	140 (1)
500 x 1700 x 1070	160 (1)
750 x 1700 x 1070	185 (1)

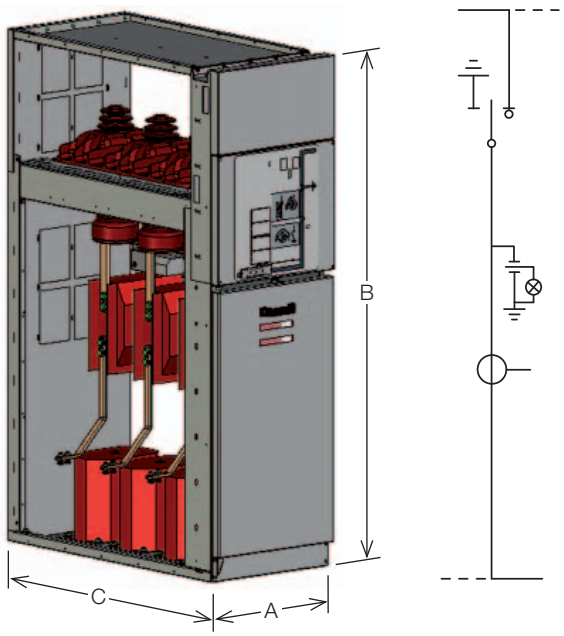
Un	Ir	Ik
kV	**A**	**kA**
12	630/800	25 (2 s)
17.5	630/800	21 (3 s)
24	630	21 (3 s)

(*) Basic panel dimensions (No IAC)
(1) Without CT

Reference	Standard equipment	Main accessories
GSec Switch-disconnector	3-position switch-disconnector	4 change-over contacts signalling closed - earthed indication
	Mechanical operating mechanism with position indicators	Digital or conventional manometer with optional alarm contacts
	Integrated voltage indicator	Geared motor operating mechanism
Unit	Busbar compartment closure	DIN or ring core current transformer (except 375 mm panels)
	Integrated basic auxiliary circuit compartment	Accessories for internal arc classification
	Mechanical interlocks	Wiring duct for auxiliary cable passage
	Busbars	Anti-condensation heater
	Cable compartment closure	Internal lighting
	Cable terminals	Apparatus earthing busbar
	Support for cable connections	Key interlocks
	Bushing earthing bar	Short-circuit indicator
		Padlocks
		Surge arresters
		Enlarged auxiliary circuit compartment
		Voltage transformers (750 mm units)
		Terminals for parallel cables (excepted 375 mm panels)
		Terminals for parallel cables (750 mm units)

2. Typical units

SDS – Unit with switch-disconnector – isolation



Units available in the 375 mm and 500 mm widths.
The switch-disconnector unit for isolation is used together with the riser unit. The standard version is equipped with a 3-position switch-disconnector for isolating the busbars. The earthing system is always provided integrated as standard.
The 500 mm wide units can be equipped with CTs and VTs (VTs only when the lower busbar exit is on the left).

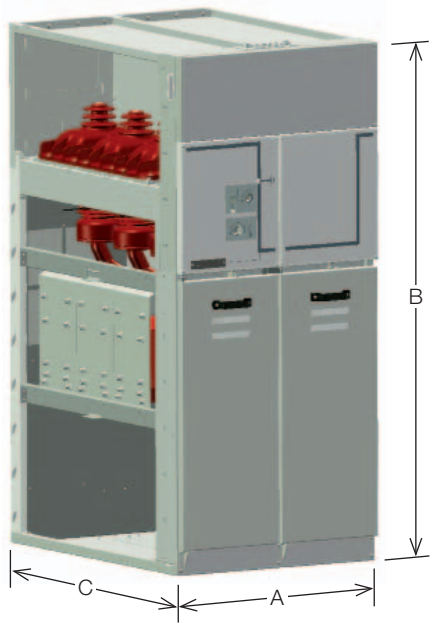
Panel dimensions	Weight
mm A x B x C (*)	**kg**
375 x 1700 x 1070	145 (1)
500 x 1700 x 1070	165 (1)

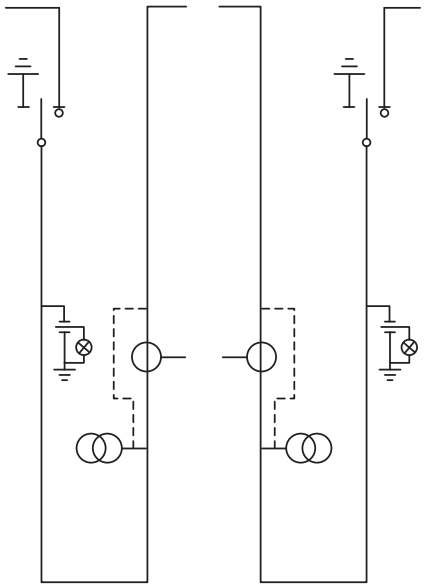
(*) Basic panel dimensions (No IAC)
(1) Without CT or VT

Un	Ir	Ik
kV	**A**	**kA**
12	630/800	25 (2 s)
17.5	630/800	21 (3 s)
24	630	21 (3 s)

Reference	Standard equipment	Main accessories
GSec Switch-disconnector	3-position switch-disconnector	4 change-over contacts for closed - earthed indication
	Mechanical operating mechanism with position indicators	Digital or conventional manometer with optional alarm contacts
	Integrated voltage indicator	Geared motor operator
Unit	Busbar compartment closure	DIN current transformer (except 375 mm panels)
	Integrated basic auxiliary circuit compartment	DIN voltage transformer (for 500 mm panel with left-hand lower busbar exit)
	Mechanical interlocks	Accessories for internal arc classification
	Busbars	Wiring duct for auxiliary cable passage
	Bottom cover	Anti-condensation heater
	Bushing earthing bar	Internal lighting
		Key interlocks
		Padlocks
		Enlarged auxiliary circuit compartment

SDM – Isolating unit with measurement with switch-disconnector





Insulator on left

Insulator on right

Unit available in the 750 mm width.
The isolating unit with measurement with switch-disconnector carries out the measurement and isolation functions in a single unit and can be used instead of the SDS + DRS units to take up less space.
The standard version uses a three-position switch-disconnector and allows isolation of the main busbars and relative earthing (always available).
The 750 mm wide units can be equipped with DIN current and voltage transformers. The voltage transformers, which are optional can be connected on either the supply or load sides of the current transformers.

Panel dimensions	Weight
mm A x B x C (*)	**kg**
750 x 1700 x 1070	185 (1)

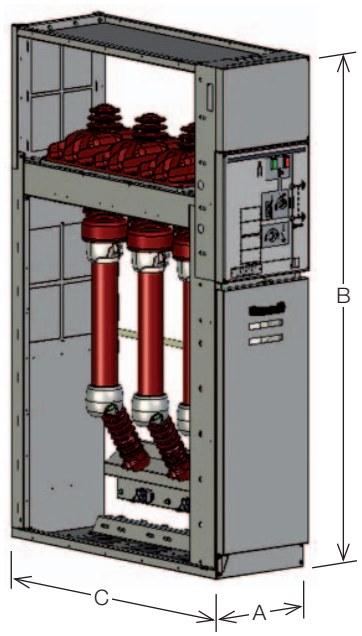
(*) Basic panel dimensions (No IAC)
(1) Without CT or VT

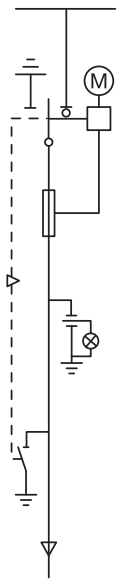
Un	Ir	Ik
kV	**A**	**kA**
12	630/800	25 (2 s)
17.5	630/800	21 (3 s)
24	630	21 (3 s)

Reference	Standard equipment	Main accessories
GSec Switch-disconnector	3-position switch-disconnector	4 change-over contacts for closed - earthed indication
	Mechanical operating mechanism with position indicators	Digital or conventional manometer with optional alarm contacts
	Integrated voltage indicator	Geared motor operator
Unit	Busbar compartment closure	Current transformer to DIN standards
	Integrated basic auxiliary circuit compartment	Voltage transformer to DIN standards
	Mechanical interlocks	Accessories for internal arc classification
	Busbars and insulators	Wiring duct for auxiliary cable passage
	Bottom cover	Anti-condensation heater
	Bushing earthing bar	Internal lighting
		Earthing busbar for apparatus
		Enlarged auxiliary circuit compartment
		Surge arresters
		Cable terminals

2. Typical units

SFC – Disconnector unit with fuses





Units available in the 375 mm and 500 mm widths.
The fused SFC type of switch-disconnector unit is mainly used for transformer protection. The unit is equipped with a 3-position switch-disconnector and with an earthing switch. To earth the fuses, the integrated earthing switch acts on the on the supply side, whereas a separate earthing switch acts on the load side of the fuses. A double-spring operating mechanism is used with automatic fuse tripping. Access to the cable compartment is possible in the “earthed” position. Inspection of the cable connections and fault indicators, when used, is easily carried out through the front door window.

Panel dimensions	Weight
mm A x B x C (*)	**kg**
375 x 1700 x 1070	145 (1)
500 x 1700 x 1070	165 (1)

(*) Basic panel dimensions (No IAC)
(1) Without fuses

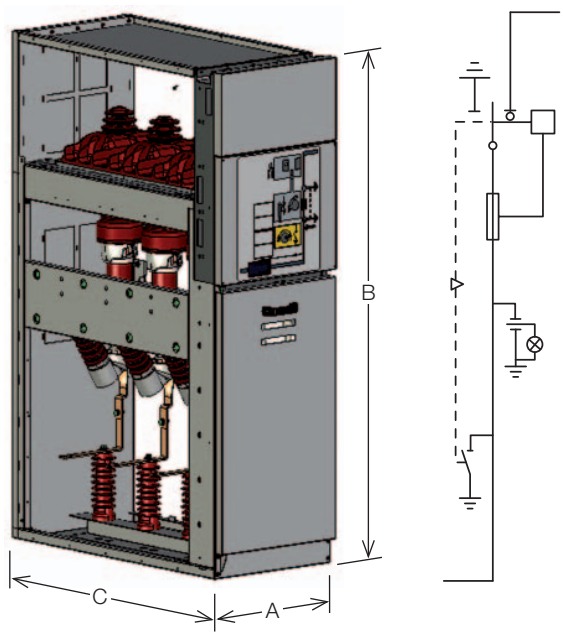
Un	Ir	Ik	IkAp (*)	Fuses
kV	**A**	**kA**	**kAp**	**A**
12	630/800	25 (2 s)	5	125
17.5	630/800	21 (3 s)	5	80
24	630	21 (3 s)	5	80

(*) Making capacity EF 230

Reference	Standard equipment	Main accessories
GSec Switch-disconnector	3-position switch-disconnector	4 change-over contacts for closed - earthed indication
	Mechanical operating mechanism with position indicators	Digital or conventional manometer with optional alarm contacts
	Integrated voltage indicator	Geared motor operator
		Shunt opening release
		Shunt closing release
		1 contact for indicating fuse blown
Unit	Busbar compartment closure	Accessories for internal arc classification
	Integrated basic auxiliary circuit compartment	Wiring duct for auxiliary cable passage
	Mechanical interlocks	Anti-condensation heater
	Release indicator for fuse blown	Internal lighting
	Busbars	DIN Standard fuses (1)
	Lower earthing switch on load side of fuses (EF 230)	Key interlock
	Base for fuses	Padlocks
	Cable terminals	Enlarged auxiliary circuit compartment
	Cable connection support	
	Bushing earthing bar	

(1) DIN Fuses: 292 and 442 mm at 12-17.5 kV
442 mm at 24 kV

SFS – Disconnector unit with fuses – isolation



Units available in the 375 mm and 500 mm widths.
The SFS type unit is used when an disconnector unit with fuse protection is needed. For fuse earthing, the integrated earthing switch acts on the supply side, whereas a separate earthing switch acts on the load side of the fuses.
A double-spring operating mechanism is used with automatic fuse blowing. Access to the cable compartment is only possible in the “earthed” position. Connection on the left of the lower busbars is possible.

Panel dimensions	Weight
mm A x B x C (*)	**kg**
375 x 1700 x 1070	155 (1)
500 x 1700 x 1070	170 (1)

(*) Basic panel dimensions (No IAC)
(1) Without fuses

Un	Ir	Ik	IkAp(*)	Fuses
kV	**A**	**kA**	**kAp**	**A**
12	630/800	25 (2 s)	5	125
17.5	630/800	21 (3 s)	5	80
24	630	21 (3 s)	5	80

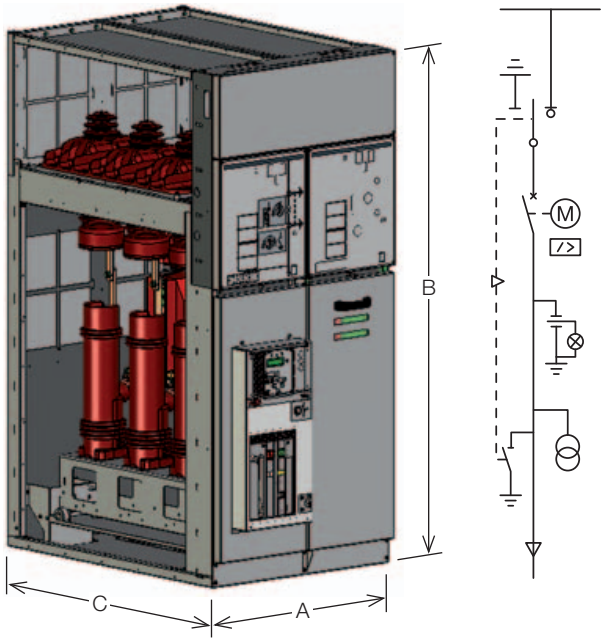
(*) Making capacity EF 230

Reference	Standard equipment	Main accessories
GSec Switch-disconnector	3-position switch-disconnector	4 change-over contacts for closed - earthed indication
	Mechanical operating mechanism with position indicators	Digital or conventional manometer with optional alarm contacts
	Integrated voltage indicator	Geared motor operator
		Shunt opening release
		Shunt closing release
		1 contact for indicating fuse blown
Unit	Busbar compartment closure	Accessories for internal arc classification
	Integrated basic auxiliary circuit compartment	Wiring duct for auxiliary cable passage
	Release indicator for fuse blown	Anti-condensation heater
	Busbars	Internal lighting
	Lower earthing switch on load side of fuses (EF 230)	DIN Standard fuses (1)
	Bottom cover	Enlarged auxiliary circuit compartment
	Base for fuses	
	Bushing earthing bar	

(1) DIN Fuses: 292 and 442 mm at 12-17.5 kV
442 mm at 24 kV

2. Typical units

SBC – Circuit-breaker unit with disconnector



Unit available in the 750 mm width.
The SBC type unit is made for control and protection of distribution lines, networks, motors, transformers, capacitor banks, etc. The unit can be equipped with a vacuum or SF_6 gas circuit-breaker. The circuit-breaker is mounted on a rail and fixed to the busbars. A 3-position switch-disconnector fitted with an earthing switch is provided for the isolating operations, mounted between the circuit-breaker and the busbars.
The door is mechanically interlocked with the switch-disconnector earthing position to ensure personnel safety. The unit is designed to be equipped with CTs and VTs (dimensions to DIN standards, see main components). Alternatively, a circuit-breaker with integrated current sensor and relay is available.

Panel dimensions	Weight
mm A x B x C (*)	**kg**
750 x 1700 x 1070	335 (1)

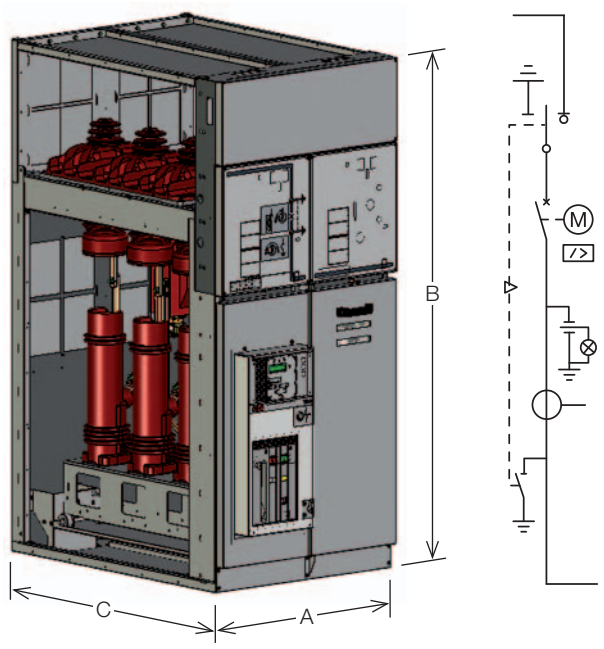
(*) Basic panel dimensions (No IAC)
(1) Without CT or VT

Un	Ir	Ik	IkAp(*)
kV	**A**	**kA**	**kAp**
12	630/800	25 (2 s)	63
17.5	630/800	21 (3 s)	52.5
24	630	21 (3 s)	52.5

(*) Making capacity ES 230

Reference	Standard equipment	Main accessories
GSec Switch-disconnector	3-position switch-disconnector	4 change-over contacts for closed – earthed indication
	Mechanical operating mechanism with position indicator	Digital or conventional manometer with optional alarm contacts
	Integrated voltage indicator	Geared motor operator
VD4 - HD4 Circuit-breaker	Opening device with mechanical signalling and opening and closing pushbuttons	Motor operator
	Removable vacuum or gas circuit-breaker	REF601 relay and on-board current sensors
Unit	Busbar compartment closure	Current transformer to DIN standards
	Integrated basic auxiliary circuit compartment	Voltage transformer to DIN standards
	Mechanical interlocks	Accessories for internal arc classification
	Busbars	Wiring duct for auxiliary cable passage
	Cable compartment closure	Anti-condensation heater
	Cable terminals	Internal lighting
	Cable connection supports	Wide range of protection relays
	Earthing switch on the cables (ES 230)	Key interlocks
	Bushing earthing busbar	Padlock
		Surge arresters
		Terminals for parallel cables
		Enlarged auxiliary circuit compartment

SBS – Circuit-breaker unit with disconnector – isolation



Unit available in the 750 mm width.
The switch-disconnector unit with circuit-breaker for isolation is used together with the riser unit. The standard units are equipped with a 3-position switch-disconnector in series with a circuit-breaker for isolating the busbar. The unit is equipped with a vacuum or SF_6 gas circuit-breaker. The circuit-breaker is mounted on a rail and fixed to the busbars. The switch-disconnector earthing system is always integrated.
The door is mechanically interlocked with the switch-disconnector earthed position to ensure personnel safety.
The unit is designed to be equipped with CTs (DIN Standard dimensions). Alternatively, a circuit-breaker with integrated current sensor and relay is available.

Panel dimensions	Weight
mm A x B x C (*)	**kg**
750 x 1700 x 1070	355 (1)

(*) Basic panel dimensions (No IAC)
(1) Without CT

Un	Ir	Ik	IkAp(*)
kV	**A**	**kA**	**kAp**
12	630/800	25 (2 s)	63
17.5	630/800	21 (3 s)	52.5
24	630	21 (3 s)	52.5

(*) Making capacity ES 230

Reference	Standard equipment	Main accessories
GSec Switch-disconnector	3-position switch-disconnector	4 change-over contacts for closed – earthed indication
	Mechanical operating mechanism with position indicator	Digital or conventional manometer with optional alarm contacts
	Integrated voltage indicator	Geared motor operator
VD4 - HD4 Circuit-breaker	Opening device with mechanical signalling and opening and closing pushbuttons	Motor operator
	Removable vacuum or gas circuit-breaker	REF601 relay and on-board current sensors
Unit	Busbar compartment closure	Current transformer to DIN standards
	Integrated basic auxiliary circuit compartment	Accessories for internal arc classification
	Mechanical interlocks	Wiring duct for auxiliary cable passage
	Busbars	Anti-condensation heater
	Earthing switch on the cables (ES 230)	Internal lighting
	Bottom closure	Wide range of protection relays
	Bushing earthing busbar	Key interlocks
		Padlock
		Enlarged auxiliary circuit compartment

2. Typical units

WBC / WBS – Unit with withdrawable circuit-breaker

The units with withdrawable circuit-breaker are suitable for secondary distribution applications where high performances are required and they guarantee:

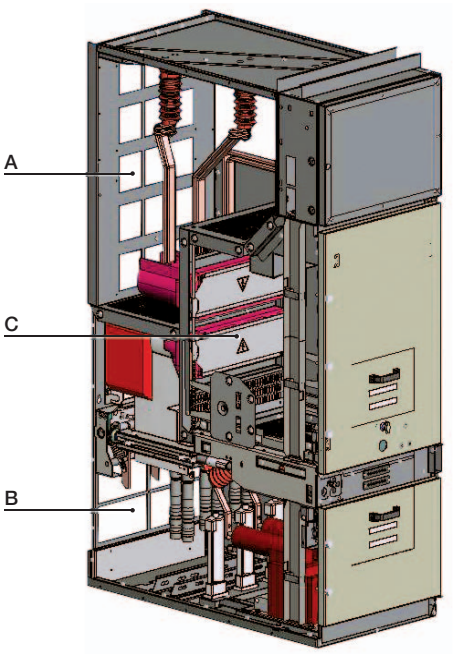
- service continuity
- safety
- high electrical characteristics.

Service continuity

The units with withdrawable circuit-breaker are classified according to IEC 62271-200 Standards.

LSC2B Classification

Busbar compartment [A], feeder [B] and apparatus [C] segregated physically and electrically.
This category defines the possibility of accessing the circuit-breaker compartment with the busbars and cables live.



PM partitions (Partition made of Metallic material)

The busbar, feeder and apparatus compartments are segregated from each other by continuous metallic partitions and/or metallic shutters.

Earthing switch

The earthing switch is fitted with short-circuit making capacity. The incoming/outgoing units are equipped with an earthing device to earth the cables. In the bus-tie unit, the earthing switch has the function of earthing a section of the main busbars.

Control of the earthing switch is carried out from the front of the switchgear with manual operation.
The position of the earthing switch can be seen from the front of the unit through an inspection window in the feeder compartment door.

Monoblocs and shutters

The three-pole monoblocs are located in the apparatus compartment. The fixed contacts for connection of the circuit-breaker to the busbar and cable compartment are housed inside the monoblocs.
The shutters are of the metallic type and are activated automatically during movement of the circuit-breaker from the withdrawn position to the connected position and vice versa.

Cables

Single-pole or three-pole cables can be used up to a maximum cross section of 630 mm^2.
The cables are accessible from the front of the compartments as well, so the switchgear can be places right against the wall.

Gas exhaust duct

The units with withdrawable circuit-breakers can be equipped, like all the other units, with:

- gas exhaust duct positioned above the switchgear. The gas exhaust duct runs the whole length of the switchgear. With this solution, the hot gases and incandescent particles produced by any internal arcs are normally evacuated out of the room;
- absorbent gas filters positioned on the rear of each unit. With this solution, the hot gases and incandescent particles produced by any internal arcs are discharged into the room.

Safety

Like all the UniSec units, the units with withdrawable circuit-breakers are fitted with the interlocks and accessories needed to ensure the highest level of safety and reliability for the plant and for the operators.

Interlocks

There are two types of safety interlocks in the unit:

- standard, foreseen by the standards and therefore necessary to guarantee the sequence of operations;
- locks provided on request. The presence of these must be envisaged according to the plant service and maintenance procedures.

Interlocking units for the LSC2B-PM units

Standard safety interlocks (compulsory)

Type		Description	Condition
1	A	Apparatus racking-in/out	Apparatus in the "open" position
	B	Closing of the apparatus	Truck in determinate position
2	A	Racking-in of the apparatus	Multi-contact apparatus plug connected
	B	Removal of the apparatus multi-contact plug	Truck in test position
3	A	Closing of the earthing switch	Truck in test position
	B	Racking-in of the apparatus	Earthing switch in the "open" position
4	A	Opening of the apparatus compartment door	Truck in test position
	B	Apparatus racking-in	Apparatus compartment door closed
5	A	Opening of the feeder compartment door	Earthing switch in the "closed" position
	B	Opening of the earthing switch	feeder compartment door closed

Keys

The use of key interlocks is of great importance in making interlocking logics between units of the same switchgear or with other medium and/or low voltage switchgear.
The logics are made by means of distributors or by ringing the keys themselves.

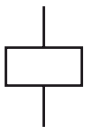
Keys (on request)

1	Lock on apparatus racking-in	Can only be removed if the truck is in the withdrawn position
2	Lock on earthing switch closing	Can only be removed if the earthing switch is open
3	Lock on switch-disconnector opening	Can only be removed if the earthing switch is closed
4	Insertion of the apparatus racking-in/out lever	Can always be removed
5	Insertion of the earthing switch operating lever	Can always be removed

Padlocks

1	Insertion of the apparatus racking-in/out lever
2	Shutter opening and closing

Locking magnet (on request)



1	Apparatus racking-in/out
2	Earthing switch opening and closing
3	Apparatus compartment door opening

Accessory devices

Shutter Fail-safe	The device locks the shutters when the apparatus is removed from the compartment. The operator cannot open the shutters manually. The shutters can only be activated by the apparatus truck or by the service trucks.
Apparatus compatibility matrix - switchgear unit	The multi-contact apparatus plug and relative switchgear unit socket are fitted with a mechanical matrix, which makes apparatus racking-in impossible in a switchgear unit with inappropriate rated current.
Circuit-breaker mechanical operating mechanism	The apparatus compartment is fitted with a mechanical devices which makes it possible to operate closing and/or opening of the circuit-breakers directly by means of the front control pushbuttons, keeping the door closed. The commands can be given with the circuit-breakers in the service and withdrawn position.

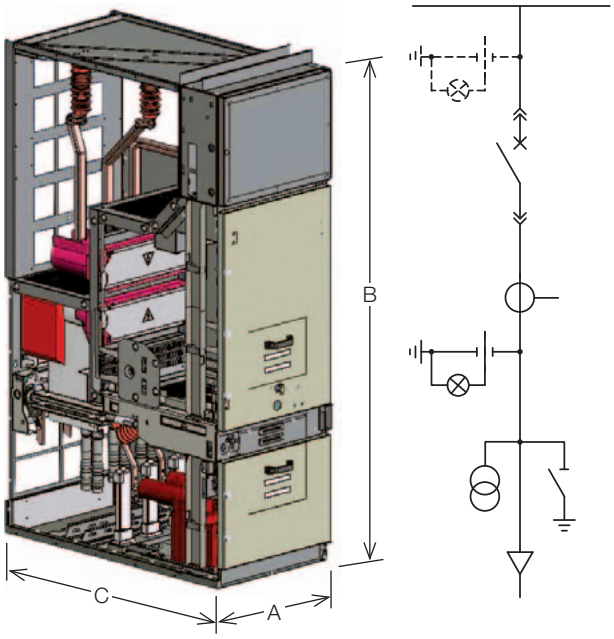
2. Typical units

High electrical characteristics

The design of the unit with withdrawable circuit-breaker allows high electrical performances. Increasingly innovative components together with a consolidated solution have made it possible to obtain switchgear with high performances.

– Short-circuit current up to 25 kA for 3 s
– Internal arc withstand capability on the 4 sides (front, lateral and rear) 25 kA for 1 s in the following two applications:
  - with absorbent gas filters (gases inside the room)
  - with gas duct (gases outside the room).

WBC – Unit with withdrawable circuit-breaker LSC2B-PM



Panel dimensions	Weight
mm A x B x C (*)	**kg**
600 x 2000 x 1200	600 (1)

(*) Basic panel dimensions (No IAC)

(1) Without CT or VT

Un	Ir	Ik	IkAp(*)
kV	**A**	**kA**	**kAp**
12	630/1250	25 (3 s)	63
17.5	630/1250	25 (3 s)	63

(*) Making capacity ES

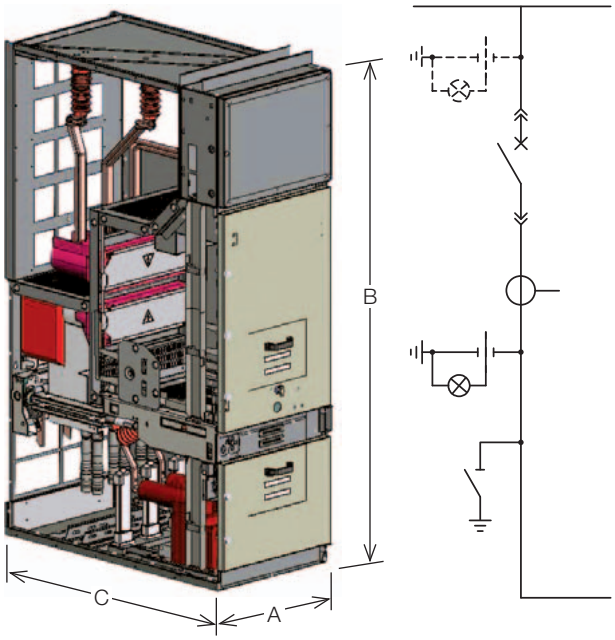
Unit available in the 600 mm width.
The WBC unit, with withdrawable circuit-breaker or contactor, is used for control and protection of plants such as airports, railways, underground railways and industries, where service continuity, high safety levels and high electrical characteristics are major requirements.
The unit is classified LSC2B-PM and is made up of three compartments, busbars, cables and apparatus, segregated from each other by means of metallic shutters. This category gives the unit maximum service continuity since it is possible to access the apparatus compartment while keeping the other compartments and/or functional units energized.
The unit can be fitted with a withdrawable Vmax series vacuum circuit-breaker or with a VSC/P series vacuum contactor, provided with support and handling truck. The truck has a system of wheels which allows circuit-breaker handling inside the compartment.
The apparatus racking-in/out, putting into service, maintenance and service operations take place directly from the front.
It is possible to fit the unit with an earthing switch on the cable side with full making capacity.
A large compartment for the auxiliary circuits and installation of the protection relays are integrated in the unit itself.
The unit is fitted with safety interlocks, padlocks, key and magnet interlocks between the door, the earthing switch and the truck to guarantee maximum personnel safety.
The unit allows installation of current and voltage transformers (dimensions to DIN standards – see Main Components paragraph). Alternatively, it is possible to install current and current/voltage sensors.

Reference	Standard equipment	Main accessories
Vmax Circuit-breaker	Opening device with mechanical signalling and opening and closing pushbuttons	Motor operator
	Withdrawable circuit-breaker or vacuum contactor	
Unit	Busbar compartment closure	Current transformer to DIN standards
	Integrated basic auxiliary circuit compartment	Voltage transformer to DIN standards with or without fuses (*)
	Mechanical interlocks	Accessories for internal arc classification
	Busbars and insulators	Wiring duct for auxiliary cable passage
	Cable terminals	Apparatus and/or cable compartment anti-condensation heater
	Cable connection support	Apparatus and/or cable compartment internal lighting
	Bushing earthing busbar	Wide range of protection relays
	Metallic shutters	Mechanical interlocks
	Earthing switch on cable side	Key interlocks
	Voltage indicator lamp on cable side	Locking magnets
		Voltage indicators on busbar side
		Surge arresters
		Cable connection up to 630 mm^2
		Mechanical "on-off" pushbuttons on the circuit-breaker door
		5NO + 5NC auxiliary contacts on the earthing switch

(*) IEC 60282-1 type fuses

2. Typical units

WBS – Unit with withdrawable circuit-breaker – isolation – LSC2B-PM



Panel dimensions	Weight
mm A x B x C (*)	**kg**
600 x 2000 x 1200	600 (1)

(*) Basic panel dimensions (No IAC) (1) Without CT or VT

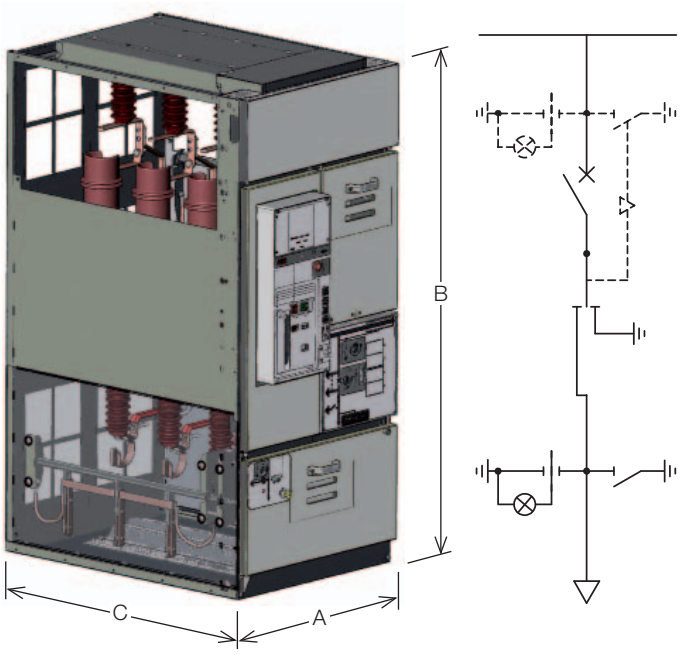
Un	Ir	Ik	IkAp(*)
kV	**A**	**kA**	**kAp**
12	630/1250	25 (3 s)	63
17.5	630/1250	25 (3 s)	63

(*) Making capacity EWB

Unit available in the 600 mm width.
The WBS unit for isolation, with withdrawable circuit-breaker or contactor, is used together with the DRS 2000 mm riser unit.
The unit is classified LSC2B-PM. It is made up of three compartments, busbars, isolating busbars and apparatus, segregated from each other by means of metallic shutters. This category gives the unit maximum service continuity since it is possible to access the apparatus compartment while keeping the other compartments and/or functional units energized.
The unit can be fitted with a withdrawable Vmax series vacuum circuit-breaker or with a VSC/P series vacuum contactor, provided with support and handling truck. The truck has a system of wheels which allows circuit-breaker handling inside the compartment.
The apparatus racking-in/out, putting into service, maintenance and service operations take place directly from the front.
It is possible to fit the unit with an earthing switch on the cable side with full making capacity.
A large compartment for the auxiliary circuits and installation of the protection relays are integrated in the unit itself.
The unit is fitted with safety interlocks, padlocks, key and magnet interlocks between the door, the earthing switch and the truck to guarantee maximum personnel safety.
The unit allows installation of current transformers (dimensions to DIN standards – see Main Components paragraph). Alternatively, it is possible to install current and current/voltage sensors.

Reference	Standard equipment	Main accessories
Vmax Circuit-breaker	Opening device with mechanical signalling and opening and closing pushbuttons	Motor operator
	Withdrawable circuit-breaker or vacuum contactor	
Unit	Busbar compartment closure	Current transformer to DIN standards
	Integrated basic auxiliary circuit compartment	Accessories for internal arc classification
	Mechanical interlocks	Wiring duct for auxiliary cable passage
	Busbars and insulators	Busbar and/or isolation compartment anti-condensation heater
	Cable terminals	Busbar and/or isolation compartment internal lighting
	Bushing earthing busbar	Wide range of protection relays
	Metallic shutters	Mechanical interlocks
	Earthing switch on cable side	Key interlocks
	Voltage indicator lamp on cable side	Locking magnets
		Voltage indicators on top busbar side
		Mechanical "on-off" pushbuttons on the circuit-breaker door
		5NO+5NC earthing switch auxiliary contacts

SBR – Reversed circuit-breaker unit



Unit available in the 750 mm width.
The switch-disconnector unit, reversed in relation to the circuit-breaker, can be used together with the 190 mm direct cable riser unit. The SBR unit allows opening and earthing of the switch-disconnector while leaving the cable compartment in service.
The standard units are equipped with a 3-position switch-disconnector in series with a circuit-breaker.
The unit is equipped with a vacuum or SF_6 gas circuit-breaker.
The cable compartment is mechanically key interlocked; the circuit-breaker compartment is key interlocked with the switch-disconnector. The circuit-breaker door is mechanically interlocked with the earthed position of the switch-disconnectors to ensure personnel safety.
The unit is designed to be equipped with CT, combisensors and toroidal sensors.
Alternatively, a circuit-breaker with integrated current sensor and relay is available.

Panel dimensions	Weight
mm A x B x C (*)	**kg**
750 x 1700 x 1070	335 (1)

(*) Basic panel dimensions (No IAC)
(1) Without CT

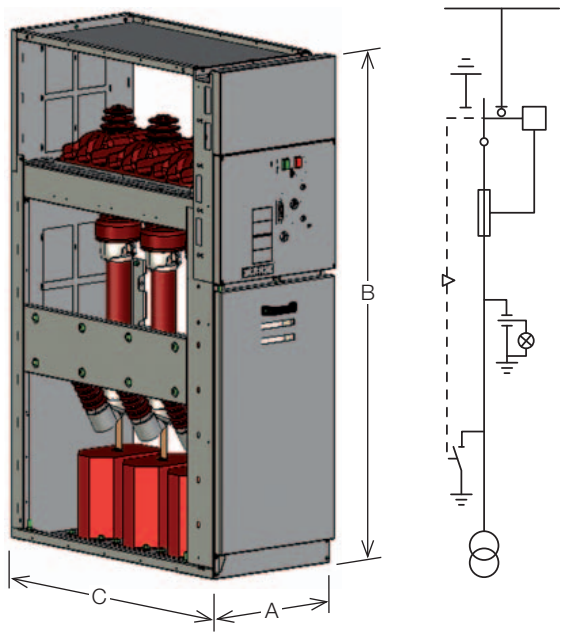
Un	Ir	Ik	IkAp(*)	IkAp(**)
kV	**A**	**kA**	**kAp**	**kAp**
12	630	16 (1 s)	40	5
17.5	630	16 (1 s)	40	5
24	630	16 (1 s)	40	5

(*) Making capacity ESBR230-U
(**) Making capacity ESBR230-L

Reference	Standard equipment	Main accessories
GSec Switch-disconnector	3-position switch-disconnector	4 change-over contacts for signalling closed and earthed positions
	Mechanical operating mechanism with position indicators	Digital or conventional manometer with optional alarm contacts
	Integrated voltage indicator	
VD4 - HD4 Circuit-breaker	Opening device with mechanical signalling and opening and closing pushbuttons	Motor operator
	Removable vacuum or gas circuit-breaker	REF601 relay and on-board circuit-breaker sensors
Unit	Integrated basic auxiliary circuit compartment	Current transformers to DIN Standards or Combisensors installed in the busbar compartment
	Mechanical interlocks	Ring core current transformers installed in the base of the compartment
	Busbars and insulators	Earthing switch in the ESBR230-U busbar compartment
	Busbar compartment closure	Accessories for internal arc classification
	Earthing switch on ESBR230-L cables	Wiring duct for auxiliary cable passage
	Bushing earthing busbar	Anti-condensation heater
		Internal lighting
		Voltage indicator on busbar side
		Mechanical interlocks
		Key interlocks
		Wide range of protection relays
		Enlarged auxiliary circuit compartment

2. Typical units

SFV – Disconnector unit with fuses – measurement



Unit available in the 500 mm width.
The SFV type of circuit-breaker-fuse combination is primarily used for voltage measurement.
The unit is equipped with a 3-position switch-disconnector and an earthing switch. For fuse earthing, the integrated earthing switch acts on the supply side, while a separate earthing switch acts on the load side of the fuses.
A double-spring operating mechanism with automatic fuse blowing is used.
The voltage transformers are located in the bottom part of the unit to provide the measurement function.

Panel dimensions	Weight
mm A x B x C (*)	**kg**
500 x 1700 x 1070	165 (1)

(*) Basic panel dimensions (No IAC)
(1) Without VT and fuses

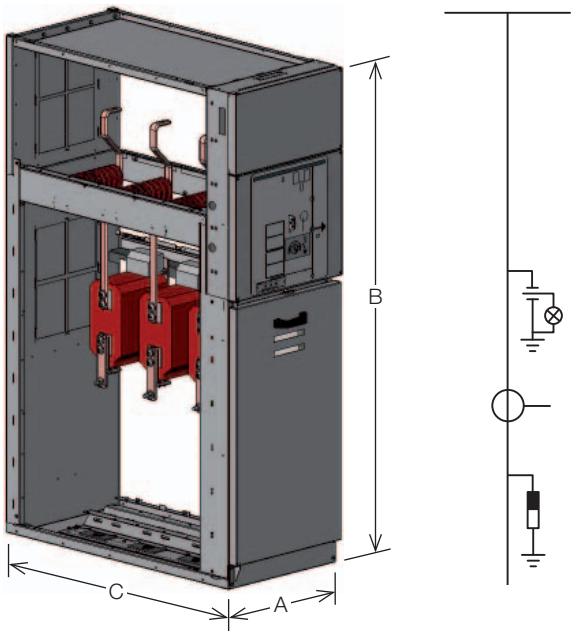
Un	Ir	Ik	IkAp(*)	Fuses
kV	**A**	**kA**	**kAp**	**A**
12	630/800	25 (2 s)	5	125
17.5	630/800	21 (3 s)	5	80
24	630	21 (3 s)	5	80

(*) Making capacity EF 230

Reference	Standard equipment	Main accessories
GSec Switch-disconnector	3-position switch-disconnector	4 change-over contacts for signalling closed - earthed
	Mechanical operating mechanism with position indicators	Digital or conventional manometer with optional alarm contacts
	Integrated voltage indicator	Shunt opening release
		Shunt closing release
		1 changeover switch signalling fuse blown
Unit	Busbar compartment closure	Accessories for internal arc classification
	Integrated basic auxiliary circuit compartment	Wiring duct for auxiliary cable passage
	Mechanical interlocks	Anti-condensation heater
	Release system for fuse blown	Internal lighting
	Busbars	Key interlock
	Lower earthing switch on load side of the fuses (EF 230)	Padlock
	Fuse supports	DIN fuses (1)
	Voltage transformer to DIN Standards	Enlarged auxiliary circuit compartment
	Bottom closure	
	Bushing earthing busbar	

(1) DIN Fuses: 292 and 442 mm at 12-17.5 kV
442 mm at 24 kV

DRC – Riser unit



Unit available in the 375 mm and 500 mm widths.
To connect cables directly to the busbars, a direct riser unit is available. The lower front door is fixed and can only be opened with a tool.
The door has a window for inspection.

Panel dimensions	Weight
mm A x B x C (*)	**kg**
375 x 1700 x 1070	120
500 x 1700 x 1070	135 (1)

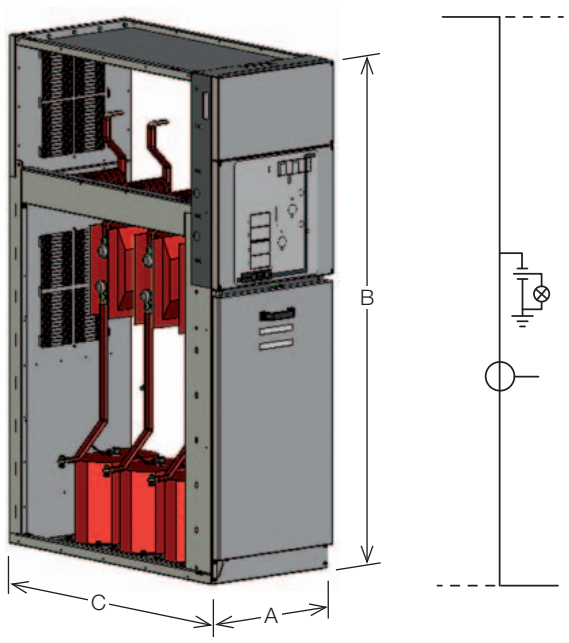
(*) Basic panel dimensions (No IAC)
(1) Without CT

Un	Ir	Ik
kV	**A**	**kA**
12	630/800	25 (2 s)
17.5	630/800	21 (3 s)
24	630	21 (3 s)

Reference	Standard equipment	Main accessories
Unit	Busbar compartment closure	Accessories for internal arc classification
	Integrated basic auxiliary circuit compartment	Wiring duct for auxiliary cable passage
	Busbars and insulators	Current transformers to DIN Standards (except 375 mm panels)
	Cable compartment closure	Anti-condensation heater
	Cable terminals	Internal lighting
	Cable connection support	Surge arresters
	Integrated voltage indicator	Enlarged auxiliary circuit compartment
	Bushing earthing busbar	Terminals for parallel cables (except 375 mm)

2. Typical units

DRS – Riser unit – measurement



Units available in the 375 mm and 500 mm widths.
The direct riser unit for isolation, type DRS, connects the busbar to the bottom of an isolating unit with circuit-breaker or switch-disconnector.
The 500 mm wide unit can be used as a measurement unit and can hold 3 CTs and 3 VTs (the VTs are only possible when the lower busbar exit is on the left).
The bottom front door is fixed to the unit and has to be opened with a tool. The door has a window for inspection.
DRS with 2000 mm height can be coupled to the WBS panel.

Panel dimensions	Weight
mm A x B x C (*)	**kg**
375 x 1700 x 1070	120 (1)
500 x 1700 x 1070 (2)	135 (1)

(*) Basic panel dimensions (No IAC)
(1) Without CT and VT
(2) 500 x 2000 x 1200 DRS for WBS without IAC

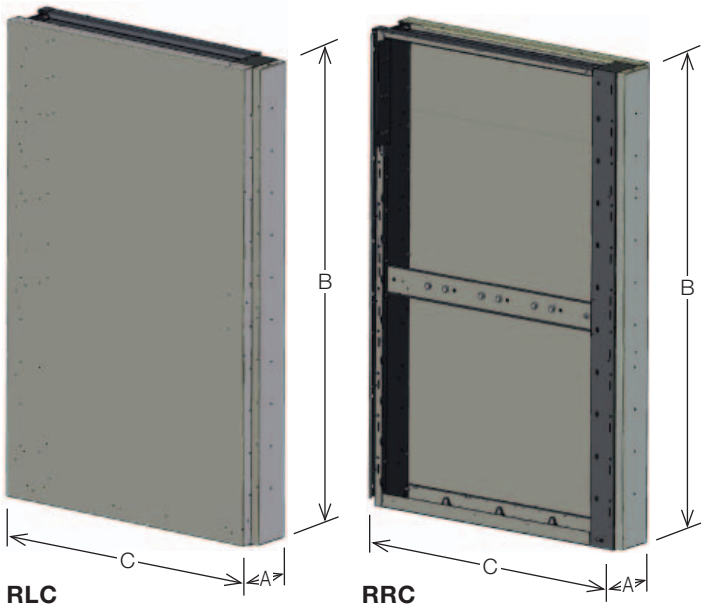
Un	Ir	Ik
kV	**A**	**kA**
12	630/800	25 (2 s) (1)
17.5	630/800	21 (3 s) (1)
24	630	21 (3 s)

(1) 25kA, 3s DRS 2000 mm for WBS

Reference	Standard equipment	Main accessories
Unit	Busbar compartment closure	Accessories for internal arc classification
	Integrated basic auxiliary circuit compartment	Wiring duct for auxiliary cable passage
	Busbars and insulators (only for DRS for WBS)	Current transformers to DIN Standards (except 375 mm panels)
	Compartment for busbars for riser	Voltage transformers to DIN Standards (except 375 mm panels) (1)
	Integrated voltage indicator device	Anti-condensation heater
	Bottom closure	Internal lighting
	Bushing earthing busbar	Enlarged auxiliary circuit compartment

(1) Only VT with left side exit

RLC/RRC – Lateral, left and right-hand cable riser (only for SBR unit)



RLC **RRC**

Unit available in the 190 mm width.

Panel dimensions	Weight
mm A x B x C	**kg**
190 x 1700 x 1070	80

Un	Ir	Ik
kV	**A**	**kA**
12	630	16 (1 s)
17.5	800	16 (1 s)
24	630	16 (1 s)

2. Typical units

Weights

Estimated weights of basic units

1700 mm high basic units with 630 A main busbars and without CT‘s VT‘s or fuses.

Width (mm)	Type of unit (kg)												
	SDC [1]	SDS [1]	SDM	SFC [2]	SFS [2]	SBC [1]	SBS [1]	WBC	WBS	SBR [1]	SFV [2]	DRC [1]	DRS [1]
375	140	145	–	145	155	–	–	–	–	–	–	120	120
500	160	165	–	165	170	–	–	–	–	–	165	135	135/160 [*]
600	–	–	–	–	–	–	–	600	600	–	–	–	–
750	185	–	185	–	–	335	355	–	–	335	–	–	–

[1] No CTs or VTs
[2] Without fuse
[*] DRS 2000 mm for WBS

Width (mm)	Type of unit (kg)	
	RLC	RRC
190	80	80
750	–	–

Estimated weight of components

Current transformers	
12/17.5 kV	22 kg
24 kV	33 kg

Voltage transformers	
12/17.5 kV	20 kg
24 kV	35 kg

Apparatus	
VD4/R	90 kg
HD4/R	105 kg
Vmax	98 kg
VSC/P	52 kg [*]

[*] Excluding the fuses

Fuses	
3 fuses	19 kg

Gas exhaust ducts (1700 mm high)	
Width 375	14 kg
Width 500	17 kg
Width 750	30 kg

Gas exhaust ducts (2000 mm high)	
Width 500	25 kg
Width 600	38 kg

3. Main components

Removable vacuum circuit-breaker

The VD4/R-SEC vacuum circuit-breaker has been specially designed for UniSec switchgear. The circuit-breaker capacity is sufficient for any conditions arising from operation of the apparatus as well as from system components under normal service and fault conditions.
Vacuum circuit-breakers have particular advantages for use in power systems where frequent operations with normal operating currents are required. VD4 vacuum circuit-breakers are equipped with a stored-energy spring operating mechanism suitable for the normal operating sequence, and also for the auto-reclosing sequence (O-0.3s-CO-15s-CO). They have high operating reliability and long life.
The circuit-breaker poles include vacuum interrupters installed in tubular epoxy resin insulators.

Breaking technique

The current-breaking process in a vacuum circuit-breaker differs from all other circuit-breakers, which use an oil or gas arc quenching medium. After separation of the current-carrying contacts, the contact material has to generate the charge carriers required to pass the current through the natural zero vacuum by itself. For normal currents up to about 10 kA this effect is described as a “diffuse vacuum arc”. Without special measures, contraction of the diffuse vacuum arc occurs at higher levels, resulting in overheating and general erosion of the contacts.
These effects are avoided by magnetically forced movement of the plasma arc due to the spiral geometry of the contacts. Since high dielectric strength can be reached in the vacuum, even with minimum distances, interruption of the circuit is also guaranteed when separation of the contacts takes place a few milliseconds before passage of the current through natural zero.

The special geometry of the contacts and the material used, as well as the limited duration and low voltage of the arc, guarantee minimum contact wear and long life. Furthermore, the vacuum prevents their oxidation and contamination.

Standard equipment

1 Closing pushbutton
2 Opening pushbutton
3 Operation counter
4 Mechanical indicators for circuit-breaker opening/closing
5 Manual spring charging crank lever
6 Mechanical indicator of the charged/discharged state of the closing springs
7 **Kit 1**: set of five open/closed auxiliary contacts.
Un = 24…250 V AC-DC
8 **Kit 2**: shunt opening release (M01). Allow remote opening of the apparatus.

Characteristics	
Un	24 - 30 - 48 - 60 - 110 - 125 - 132 - 220 - 250 V–
Un	48 - 60 - 110 - 120 - 127 - 220...240 V~ 50 Hz
Un	110 - 120 - 127 - 220 - 240 V~ 60 Hz
Operating limits	70...110 % Un
Inrush power (Ps)	DC 200 W; AC = 200 VA
Inrush time	about 100 ms
Inrush upkeep time (Pc)	DC = 5 W; AC = 5 VA
Opening time	40...60 ms
Insulation voltage	2000 V 50 Hz (for 1 min)

9 **Kit 3**: key lock in open position with different or identical keys.

VD4/L-SEC – VD4/R-SEC technical data				
Rated voltage		**12 kV**	**17.5 kV**	**24 kV**
Rated frequency	[Hz]	50/60	50/60	50/60
Rated impulse withstand voltage	[kV]	75	95	125
Rated test voltage at power frequency	[kV]	28	38	50
Rated current	[A]	630/800	630/800	630
Breaking capacity	[kA]	12/16/20/25[1]	12/16/21	12/16/21
Making capacity	[kA]	30/40/50/63	30/40/50	30/40/50
Short-circuit duration	[s]	3	3	3
Pole centre distance	[mm]	230	230	230

[1] 25 kA - 2s

3. Main components

Vacuum circuit-breaker accessories

Spring charging motor operator (MS)
This device automatically changes the operating mechanism springs after the closing operation.

Characteristics	
Un	24...30 - 48...60 - 110...130 - 220...250 V–
Un	100 ...130 - 220...250 V~ 50/60 Hz
Operating limits	85-110 % Un
Inrush power (Ps)	DC = 600 W; AC = 600 VA
Rated power (Pn)	DC = 200 W; AC = 200 VA
Inrush time	0.2 s
Charging time	6-7 s
Insulation voltage	2000 V 50 Hz (for 1 min)

Additional shunt opening release (M02)
This is an electromechanical device which, following energization of an electromagnet, activates the operating mechanism lever making the circuit-breaker open.

Characteristics	
Un	24 - 30 - 48 - 60 - 110 - 125 - 132 - 220 - 250 V–
Un	48 - 60 - 110 - 120 - 127 - 220...240 V~ 50 Hz
Un	110 - 120 - 127 - 220 - 240 V~ 60 Hz
Operating limits	70…110 % Un
Inrush power (Ps)	DC 200 W; AC = 200 VA
Inrush time	about 100 ms
Inrush upkeep time (Pc)	DC = 5 W; AC = 5 VA
Opening time	40...60 ms
Insulation voltage	2000 V 50 Hz (for 1 min)

Shunt closing release (MC)
This is an electromechanical device which, following energization of an electromagnet, activates the operating mechanism lever making the circuit-breaker close.

Characteristics	
Un	24 - 30 - 48 - 60 - 110 - 125 - 132 - 220 - 250 V–
Un	48 - 60 - 110 - 120...127 - 220...240 V~ 50 Hz
Un	110 - 120 - 127 - 220 - 240 V~ 60 Hz
Operating limits	70...110 % Un
Inrush power (Ps)	DC 200 W; AC = 200 VA
Inrush time	about 100 ms
Inrush upkeep time (Pc)	DC = 5 W; AC = 5 VA
Closing time	40...80 ms
Insulation voltage	2000 V 50 Hz (for 1 min)

Undervoltage release (MU)
This release opens the circuit-breaker when there is a sharp reduction or cut in the power supply voltage.

Characteristics	
Un	24 - 30 - 48 - 60 - 110 - 125 - 220 - 250 V–
Un	48 - 60 - 110 - 120 - 127 - 220...240 V~ 50 Hz
Un	110 - 120...127 - 220...240 V~ 60 Hz
Operating limits	– circuit-breaker opening: 35-70 % Un
	– circuit-breaker closing: 85-110 % Un
Inrush power (Ps)	DC 200 W; AC = 200 VA
Inrush time	about 100 ms
Inrush upkeep time (Pc)	DC = 5 W; AC = 5 VA
Opening time	60...80 ms
Insulation voltage	2000 V 50 Hz (for 1 min)

Removable gas circuit-breaker

HD4/R-SEC SF_6 medium voltage circuit-breakers have been specifically designed for installation in UniSec units, and are equipped with right-hand lateral operating mechanism. They use SF_6 gas to extinguish the electric arc and as the insulating means. They are constructed using the separate pole technique.
The operating mechanism is the ESH type with stored energy and free release, with closing and opening independent of operator action. Remote control is possible by adding electrical accessories. Construction is compact, sturdy and of limited weight. The HD4/R-SEC circuit-breakers are systems with sealed-for-life pressure (IEC 60271-1 Standards).

Breaking technique

SF_6 is an inert gas with excellent insulating properties. Thanks to its special thermal and chemical stability, SF_6 maintains its characteristics for a long time, ensuring a high level of reliability for the circuit-breakers.
The blasting and cooling effect of SF_6 and the special shape of the contacts, gradually quenches the electric arc and rapidly restores the dielectric properties, without re-ignition. This process results in very low overvoltage values and short arc duration. These characteristics make HD4/R-SEC circuit-breaker ideal for MV distribution substations.

Standard equipment

1 Closing pushbutton
2 Opening pushbutton
3 Operation counter
4 Mechanical indicators for circuit-breaker opening/closing
5 Manual spring charging crank lever
6 Mechanical indicator for closing springs charged/discharged
7 **Kit 1**: set of five open/closed auxiliary contacts.
Un = 24…250 V AC-DC
8 **Kit 2**: shunt opening release (M01). Allows remote opening of the apparatus.

Electrical characteristic	
Inrush power	125 VA/W
Voltages available	24-30-48-60-110-125-132-220-250 V–
	48-110-120-127-220-230-240 V 50 Hz
	110-120-127-220-230-240 V 60 Hz

9 **Kit 3**: key lock in open position with different or identical keys.

Two-level pressure switch

– **First level - intervention for low pressure**: the indication is given when the gas pressure drops from 380 kPa absolute to an absolute value of 310 kPa.
– **Second level - intervention for insufficient pressure**: the indication is given when the gas pressure drops to below the 280 kPa absolute value.

The pressure switch must be requested at the time of ordering because it must be mounted and tested in the factory.

Circuit-breaker locking device with signalling lamps for insufficient SF_6 gas pressure

This device can only be supplied for circuit-breakers provided with a pressure switch.
The locking circuit is an optional application and can only be installed by ABB.
The following configurations are available:
A - Circuit for automatic circuit-breaker opening with three signalling lamps.
B - Circuit for locking the circuit-breaker in the position it is found in, with three signalling lamps.

HD4/R-SEC technical data				
Rated voltage		**12 kV**	**17.5 kV**	**24 kV**
Rated frequency	[Hz]	50/60	50/60	50/60
Rated impulse withstand voltage	[kV]	75	95	125
Rated test voltage at power frequency	[kV]	28	38	50
Rated current	[A]	630/800	630/800	630
Breaking capacity	[kA]	12/16/20/25(1)	12/16/21	12/16/21
Making capacity	[kA]	30/40/50/63	30/40/50	30/40/50
Rated short-circuit duration	[s]	3	3	3
Pole centre distances	[mm]	230	230	230

(1) 25 kA - 2s

3. Main components

Gas circuit-breaker accessories

Spring charging motor operator (MS)
This device automatically changes the operating mechanism springs after the closing operation.

Electrical characteristics	
Inrush power	1500 VA / W
Continuous power	400 VA / W
Charging time	from 7 to 10 s.
Voltages available	24-30-48-60-110-125-220 V–
	24-30-48-60-110-120-127-220-230-240 V 50 Hz
	110-120-127-220-230-240 V 60 Hz

Additional shunt opening release (M02)
This is an electromechanical device which, following energization of an electromagnet, activates the operating mechanism lever making the circuit-breaker open.

Electrical characteristics	
Inrush power	125 VA / W
Voltages available	24-30-48-60-110-125-132-220-250 V–
	48-110-120-127-220-230-240 V 50 Hz
	110-120-127-220-230-240 V 60 Hz

Shunt closing release (MC)
This is an electromechanical device which, following energization of an electromagnet, activates the operating mechanism release lever making the circuit-breaker close.

Electrical characteristics	
Inrush power	250 VA / W
Continuous power	5 VA / W
Voltages available	24-30-48-60-110-125-132-220-250 V–
	24-30-48-60-110-120-127-220-230-240 V 50 Hz
	110-120-127-220-230-240 V 60 Hz

Undervoltage release (MU)
This release opens the circuit-breaker when there is a sharp reduction or cut in the power supply voltage.

Electrical characteristics	
Inrush power	250 VA / W
Continuous power	5 VA / W
Voltages available	24-30-48-60-110-125-132-220-250 V–
	24-48-60-110-120-127-220-230-240 V 50 Hz
	110-120-127-220-230-240 V 60 Hz

Vmax circuit-breaker

General information

The Vmax medium voltage circuit-breakers consist of an insulating monobloc in which three vacuum interrupters are housed. The monobloc and operating mechanism are fixed onto a frame. The vacuum interrupters, one per pole, house the contacts and make up the interruption chamber.

Insulating monobloc

The Vmax circuit-breaker structure consists of a single insulating monobloc, where the three vacuum interrupters are housed. The monobloc and mechanical stored energy operating mechanism are fixed onto a solid metallic frame. The structure is very compact and guarantees solidity and sturdiness.
The reduced contact run and the limited mass, limit the energy required for the operations, ensuring extremely low wear of the system which needs little maintenance.
The vacuum interrupters of the Vmax medium voltage circuit-breakers are the same as those used in other types of circuit-breakers (VD4, VM1, etc.). They have the characteristic of breaking the current, generating overvoltages of negligible value, and restoring the dielectric properties very rapidly.

Operating mechanism

The Vmax series is fitted with a stored energy operating mechanism of simple concept and use, derived from the same mechanical operating mechanism as the VD4 series.
The operating mechanism has free release and guarantees opening and closing operations independent of the operator.
The operating mechanism spring system can be recharged both manually and by means of a geared motor.

Apparatus opening and closing can be carried out by means of pushbuttons located on the front of the operating mechanism or by means of the electrical releases (closing, opening and undervoltage).
The circuit-breakers are always fitted with an anti-pumping device to eliminate the possibility of repeated opening and closing sequences following simultaneous and maintained opening and closing commands (local and/or remote).

Truck

The poles and operating mechanism are fixed onto a metallic support and handling truck. The truck has a system of wheels which allows the circuit-breaker racking-in and out operations inside the switchgear compartment, with the door closed.
The truck allows efficient circuit-breaker earthing by means of the metal structure of the switchgear.

Apparatus-operator interface

The front part of the circuit-breaker is the apparatus interface towards the operator. It is fitted with the following accessories:

- opening pushbutton
- closing pushbutton
- operation counter
- indicator of the circuit-breaker open and closed state
- indicator of the operating mechanism springs charged and discharged state
- device for manually charging the operating mechanism springs
- selector for exclusion of the undervoltage release (optional).

Electric characteristics

Rated voltage		**12 kV**	**17.5 kV**
Rated frequency	[Hz]	50/60	50/60
Rated impulse withstand voltage	[kV]	75	95
Rated test voltage at power frequency	[kV]	28	38
Rated current	[A]	630/1250	630/1250
Breaking capacity	[kA]	16/20/25	16/20/25
Making capacity	[kA]	40/50/63	40/50/63
Short-circuit time	[s]	3	3
Pole centre distance	[mm]	150	150

3. Main components

Vmax circuit-breaker accessories

Shunt opening release (M01)
This device allows remote opening control of the apparatus.
Its electrical characteristics and operation are indicated in table 1.

Motor operator for spring charging (MS)
This device automatically charges the operating mechanism springs after the closing operation.
Its electrical characteristics and operation are indicated in table 1.

Shunt closing release (MC)
This release is an electromechanical device which, following energization o fan electromagnet, activates the operating mechanism lever making the circuit-breaker close.
Its electrical characteristics and operation are indicated in table 1.

Additional shunt opening release (M02)
This is an electromechanical device which, following energization of an electromagnet, activates the operating mechanism lever making the circuit-breaker open.
Its electrical characteristics and operation are indicated in table 1.

Undervoltage release (MU)
This release opens the circuit-breaker when there is a sharp reduction or cut in the power supply voltage.
Its electrical characteristics and operation are indicated in table 1.

Electrical characteristics		
Un		24 - 30 - 48 - 60 - 110 - 132 - 220 - 250 V DC-AC (50-60 Hz)
Operating limits	MO1-MO2-MC	65...120 % Un
	MU	35...85 % Un
	RL1	85...110 % Un
Operating time	MO1-MO2	33,5...60 ms
	MC	45...80 ms
	MU	60...60 ms
Power on inrush (Ps)		< 150 W
Inrush duration		150 ms
Upkeep power (Pc)		3 W
Insulation voltage		2000 V 50-60 Hz (for 1 min)

Table 1

Vacuum contactor

The medium voltage V-Contact VSC contactors are apparatus suitable for operating in alternating current and are normally used to control users requiring a high number of hourly operations. They are suitable for controlling and protecting motors, transformers and power factor correction banks. When fitted with suitable fuses, they can be used in circuits with fault levels up to 1000 MVA.
The electrical life of the V-Contact VSC contactor is defined as category AC3 with 100,000 operations (closing/opening) and 400 A interrupted current.

V-Contact VSC contactor

These contactors consist of a resin monobloc containing the following components:
- vacuum interrupters
- moving parts
- magnetic actuator
- multivoltage feeder
- accessories and auxiliary contacts.

The V-Contact contactors are available in the following versions:
- VSC 7/P for voltages up to 7.2 kV
- VSC 12/P for voltages up to 12 kV.

Both these versions are available with an operating mechanism with electrical or mechanical latching.

Operating mechanism

Given the presence of the magnetic actuator, the V-Contact VSC contactors require a negligible amount of auxiliary power in all the configurations (15 W on inrush - 5 W continuous).

The V-Contact VSC contactor is available in three different configurations:
- SCO (Single Command Operated). The contactor closes when auxiliary voltage is supplied to the multivoltage feeder input, whereas it opens when auxiliary voltage is cut off
- DCO (Double Command Operated). The contactor closes when auxiliary voltage is supplied to the closing input of the multivoltage feeder, whereas it opens when voltage is supplied to the opening input. The anti-pumping function is always
- On request, the DCO configuration is also available with a delayed undervoltage function. This function allows automatic contactor opening when the level of auxiliary voltage drops below the levels defined by the IEC Standards.
  Opening can be delayed from 0 to 5 seconds (setting defined by the customer by means of a dip-switch).

Fuses

The contactor is fitted with medium voltage fuses for protection of the users.
Coordination between the contactor, fuses and protection unit is guaranteed in compliance with the IEC 60470 Standards for class C apparatus.
The fuseholder frame is normally prepared for installation of three fuses with average dimensions and striker, according to the following Standards:
- DIN 43625
- BS 2692.

The following fuses can be used:
- DIN type with 192, 292 and 442 mm length
- BS type with 235, 305, 410, 453 and 553 mm length.

Electrical characteristics

		VSC7/P	VSC12/P
Rated voltage	[kV]	7.2	12
Rated insulation voltage	[kV]	7.2	12
Rated test voltage at power frequency	[kV] 1 min	20	28
Rated impulse withstand voltage	[kV]	60	75
Rated frequency	[Hz]	50/60	50/60
Rated short-time withstand current	[kA] (1)	...50	...50
Peak current	[kA]	...125	...125
Internal arc withstand current (2)	[kA] 1 s	...50	...50
Maximum contactor rated current	[A]	400	400

(1) Limited by the fuses.
(2) The internal arc withstand values are guaranteed in the compartments on the supply side of the fuses (busbars and apparatus) by the structure of the switchgear and in the compartment on the load side (feeder) by the limiting properties of the fuses.

3. Main components

The fuseholder frames are fitted with an automatic opening device even in the case of only a single fuse blowing.
This device does not allow contactor closing when even a single fuse is missing.
The ABB range of fuses for transformer protection is called CEF, while the one for motor and capacitor banks is CMF.

Standards

IEC 60470 for the contactor
IEC 60282-1 for the fuses.

Maximum performances of the contactor with fuses

		3.6 kV	7.2 kV	12 kV
Motors	kW	1500	3000	5000
Transformers	kVA	2000	4000	5000
Capacitor banks	kVAR	1500	3000	4800 (1)

(1) It is advisable to use the surge arresters.

Maximum fuse load current

Feeder	Transformers		Motors		Capacitor banks	
Rated voltage	Fuse	Maximum load	Fuse	Maximum load	Fuse	Maximum load
3.6 kV	200 A	160 A	315 A	250 A	450 A	360 A
7.2 kV	200 A	160 A	315 A	250 A	355 A	285 A
12 kV	200 A	160 A	200 A	160 A	200 A	160 A

GSec gas switch-disconnectors

GSec is an SF_6-insulated 3-position switch-disconnector.
The contacts of the switch-disconnectors are housed in an enclosure made of two materials: the top part is a moulded resin housing to guarantee the insulation level; the bottom part is made of stainless steel to guarantee metallic segregation and earthing between the busbar compartment and the cable compartment.
This guarantees maximum personnel safety in the case of trips in the line compartment even with the main busbars supplied with power, for example to replace one or more fuses or to check the cables.
The switch-disconnector can be used in combination with fuses, for example for protection of transformers.

Actuator

The GSec actuator can be accessed directly from the front and allows easy plug and play installation and replacement of accessories. The GSec actuator has separate lever couplings for the isolation and earthing operations.
The GSec uses two different types of actuators:
– type 1 with single spring for closing and opening operations. It can be operated by a lever and by a motor;
– type 2 with double springs for closing and opening operations. It can be operated by pushbuttons (spring charging with the lever) or shunt opening and closing releases.

In case of emergency, both actuators can be operated manually by means of an operating lever (type 1) or pushbuttons (type 2), even if equipped with a motor operator:
– 24 V DC - 60 V AC/DC – Low voltage version (for 48-60 V AC/DC type 2 operating mechanisms)
– 110 - 220 V AC/DC – High voltage version.

Type 1 actuator - With independent control on exceeding dead centre

This control allows rapid manual or motor-operated closing and opening of the switch-disconnector with operating speed independent of the operator. Closing or opening takes place by charging the above-mentioned spring (manually or using the motor operator) until dead centre is exceeded. This control also carries out rapid manual closing of the earthing switch with operating speed independent of the operator.

Type 2 actuator - Stored energy device with independent control

This control allows rapid manual closing of the switch-disconnector with operation independent of the operator, obtained by means of a spring charged until it exceeds dead centre.
The operation cycle takes place with the following sequence:
– opening and closing spring charging by means of a lever or a motor operator;
– switch-disconnector closing by means of a pushbutton or a shunt closing release;
– switch-disconnector opening by means of a pushbutton or a shunt opening release or by means of a release system
– activated by the fuse striker in the case of even a single fuse blowing without spring re-charging.

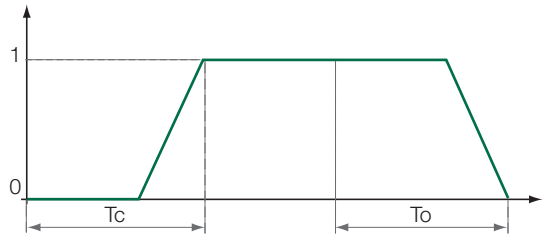
The type 2 actuator also carries out rapid manual closing of the earthing switch with operating speed independent of the operator.

Unit	Actuators	
	Type 1	Type 2
SDC, SDS	•	–
SFC, SFS	–	•
SDM	•	–
SBC, SBS	•	–
SBR	•	–
DRC, DRS	–	–
SFV	–	•

3. Main components

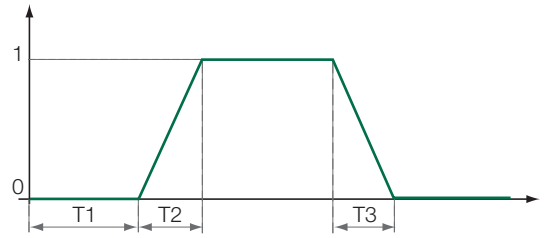
GSec actuator tripping times

Single spring motor operating mechanism or manual control (without coils)



Tc (motorized closing time, including spring charging and closing) < 5 sec
To (motorized opening time, including spring charging and opening) < 5 sec
Tc/To (manual) = depending on the operator for the spring charging phase
0 = disconnector in “open” position
1 = disconnector in “closed” position

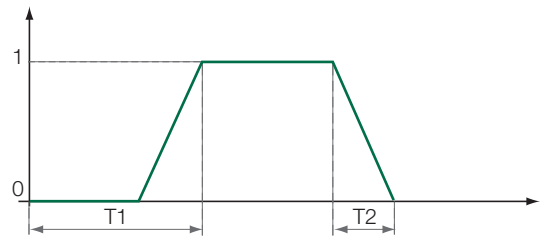
Manual double spring operating mechanism (with or without coils)



T1 (spring charging) = depending on the operator
T2 (closing) = 0.3 sec
T3 (opening) = 0.3 sec
0 = disconnector in “open” position
1 = disconnector in “closed” position

The opening/closing operations can be carried out by means of pushbuttons or coils (if remote control is used).

Double spring motor operator (coils always included)



T1 (spring charging + closing) < 7 sec
T2 (opening) = 0.3 sec
0 = disconnector in “open” position
1 = disconnector in “closed” position

GSec motor operating device (MOD)

The MOD (Motor Operating Device) is the GSec switch-disconnector device which controls the spring charging motor and opening and closing coils (the opening and closing coils are only present in the type 2 actuator).
The MOD is an electronic device which includes protection and diagnostic functions, improving reliability, availability and overall safety of the system.
The MOD includes a local panel interface (HMI), binary inputs and outputs for remote operations and overcurrent protection functions for the motor and the coils.
The diagnostic functions are available locally by means of the local HMI panel interface, or remotely by means of the binary inputs and outputs.
The MOD carries out the opening and closing operations of the switch-disconnector while earthing only takes place manually.

Local interface (HMI)

The GSec switch-disconnector can be operated locally by means of two pushbuttons available on the local HMI interface.
A third pushbutton allows the possibility to change from local to remote control, indicating this by means of two LEDs (L or R). When the MOD is in local mode, the binary control inputs are disabled.
The remaining LEDs allow the Ready, Alarm and Communication information to be seen. The Comm LED is reserved for future applications.

Binary inputs

The binary inputs include the opening and closing commands. The trip threshold is set to 85% of the rated voltage. The minimum impulse time required for the command to be carried out is 300 ms.
Different settings can be made available on request. For further information, please contact ABB.
Both the opening and closing inputs provide feedback on the state of the diagnostics and protection functions.
It is possible to have a TCS (Trip Circuit Supervision) device connected to one of these binary inputs, which generates an alarm in the case of a fault in the GSec switch-disconnector.

Binary outputs

The binary outputs indicate the state of the GSec and the diagnostic information.
In particular, when the READY contact is normally closed, it indicates that the GSec is working correctly and can be operated.
The indications of the state of the GSec are only displayed if the MOD is supplied with power.

Diagnostics

The diagnostics continually check the conditions of the disconnector mechanical operating mechanism, the safety conditions, motor, coils, binary inputs and the quality of the auxiliary power supply.

Fault conditions are displayed by the local interface (HMI) by means of two LEDs. A code of the LED indications is provided to help the operator identify the fault.
No operation can be carried out on the disconnector in the case of a fault.

Protection function

The spring-charging motor and coils are protected against overcurrents, against temperatures which are too high and short-circuit.
These events are signalled through the local interface (HMI) by the READY output and by the binary inputs.

Electrical characteristics of the GSec switch-disconnector

Rated voltage	**kV**	**12**	**17.5**	**24**
Withstand voltage (50–60 Hz/1 min)	kV	28	38	50
Impulse withstand voltage	kV	75	95	125
Rated frequency	Hz	50-60	50-60	50-60
Rated current (40 °C)	A	630/800	630/800	630
Rated short-time withstand current (2 s)	kA	25	21	21
Rated short-time making capacity (peak current)	kA	63	52.5	52.5
Breaking capacity				
- Active load	A	630/800	630/800	630
- No-load transformers	A	... 16	... 16	... 16
- No-load cables/lines	A	... 50	... 50	... 50
- Ring circuits	A	630/800	630/800	630
- Line electrical resistance [1]	class	E3	E3	E3
- Earth electrical resistance [1]	class	E2	E2	E2
- Line mechanical resistance [2]	class	M2 [4]	M2 [4]	M2 [4]
- Earth mechanical resistance [3]	class	M0	M0	M0

[1] Up to 5 closing operations
[2] Up to 5000 operations
[3] Up to 1000 operations
[4] M1 up to 1000 operations for Type 2 actuator

3. Main components

GSec gas switch-disconnectors accessories

Accessories

1 Key locks
These allow the apparatus to be locked in the “open” or “closed” position. Up to a maximum of four key locks can be combined. There are three types of keys available: standard type, RONIS and PROFALUX.

2 Padlocks
These allow the apparatus to be locked in the “open” or “closed” position. Up to a maximum of three padlocks can be combined per line and/or earth.

3 Auxiliary contacts
These contacts indicate the position of the apparatus.
4 change-over contacts for the line position and 4 changeover contacts for the earth position are available.
Contact characteristics:
– change-over contacts for normally “open” and normally “closed” positions
– 250 V AC, 16 A
– 250 V DC, 0.3 A.

4 Shunt opening release (only for type 2 actuator)
This is an electromechanical device which, following energization of an electromagnet, activates remote opening of the line switch-disconnector.
Power supply voltages:
– 24 V DC, 48 - 60 V AC/DC - low voltage version
– 110 - 220 V AC/DC - high voltage version
– 200 W (DC), 200 VA (AC) power on inrush.

5 Shunt closing release (only for type 2 actuator)
This is an electromechanical device which, following energization of an electromagnet, activates remote closing of the line switch-disconnector.
Power supply voltages:
– 24 V DC, 48 - 60 V AC/DC - low voltage version
– 110 - 220 V AC/DC - high voltage version
– 200 W (DC), 200 VA (AC) power on inrush.

6 Motor operator
The motor operator carries out automatic charging of the type 1 and 2 actuator closing and opening springs. After switch-disconnector closing, the motor operator immediately recharges the springs. In the case of a power cut or during maintenance work, the closing springs can in any case be charged manually (by means of the lever).

Power supply voltages:

Un		DC					AC	
Voltage (V)		24(*)	48	60	110	220	110	230
Actuator type 1	Opening Power (W) (VA)	160			200		200	
	Closing Power (W) (VA)	160			200		200	
Actuator type 2	Opening Power (W) (VA)	220			440		440	
	Closing Power (W) (VA)	220			440		440	

(*) Only for type 1 Actuator

7 VDS and VPIS voltage indicators
The UniSec panels can be fitted with two different types of VDS and VPIS voltage indicators.
VDS: device based on the HR system complying with the IEC 61243-5 Standard. The VDS consists of a fixed device with capacitive sockets installed on the switchgear and a moveable one on which the luminous indicators are installed, which visually show the presence or absence of voltage and phase concordance.
VPIS: device complying with the IEC 61958 Standard. The VPIS consists of a fixed device installed on the switchgear with capacitive sockets and luminous indicators which give the operators the state of voltage of the main switchgear circuit. The devices can be combined with the crosspiece with capacitive indicators or Din type CT.

8 Contact signalling fuse blown
When a fuse blows, special kinematics activate a signalling contact.

9 Temperature-compensated pressure switch(1)
The pressure switch allows monitoring of the gas pressure and provides an alarm signalling the presence of low pressure. The device provides the following indications:
– correct operating pressure (ok)
– low pressure (low): indication of the minimum gas level for which operation of the disconnector is guaranteed
– insufficient pressure (very low): the disconnector cannot be operated.

10 Manometer (1)
The manometer displays the gas pressure.

(1) Specify this request at the time of ordering.

ABB CEF fuses for transformer protection (IEC 60282-1/DIN 43625)

Three fuses (one fuse for each phase) for transformer protection can be connected in series with the switch-disconnector.
Selection of the fuse according to the voltage and power of the transformer must be made in conformity with the data indicated in the table.

Transformer protection and fuse selection

When the disconnectors are used to control transformer protection, a special type of current-limiting fuses are used which guarantee selectivity with other protection devices and can take the high transformer connection currents without deterioration.
In this case, the protection against overcurrents on the medium voltage side of the transformer is not indispensable since this task is taken on by the protection provided on the low voltage side. The protection on the medium voltage side can be entrusted just to the fuse, which must be selected taking into account the no-load connection current, which can take on values of or greater than 10 times the rated current according to the power of the transformer and to the type of punched sheets used (hot rolled sheet or sheet with orientated crystals).
The maximum connection current occurs when circuit-breaker closing takes place in correspondence with voltage passage through zero.
Another outcome to be guaranteed is protection against faults of the low voltage winding and of the connection tract of this to the circuit-breaker placed on the secondary winding, avoiding the use of fuses with rated current which is too high, in order to ensure rapid tripping even under these fault conditions.

A rapid check of the short-circuit currents at the transformer secondary terminals and on the supply side of the circuit-breaker on the secondary when placed at a significant distance, allows the trip time to be checked on the fuse melting curve.
The usage table given below takes the required conditions into account, i.e. sufficiently high rated current to avoid untimely fuse blowing during the no-load connection stage and, in any case, of a value which guarantees protection of the machine against faults on the low voltage side.

Selection of fuses for transformer protection

Transformer rated voltage [kV]	Transformer power [kVA]																Fuse rated voltage [kV]
	25	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	
	CEF Fuse In [A]																
3	16	25	25	40	40	50	63	80	100	125	–	–	–	–	–	–	3.6/7.2
5	10	16	25	25	25	40	40	50	63	80	100	125	–	–	–	–	
6	6	16	16	25	25	25	40	40	50	63	80	100	125	–	–	–	
10	6	10	16	16	16	20	20	25	31.5	40	50	63	80	100	125	–	12
12	6	6	10	16	16	16	20	20	25	40	40	50	63	80	100	125	
15	6	6	10	10	16	16	16	20	20	25	40	40	50	63	80	80	17.5
20	6	6	6	10	10	16	16	16	20	20	25	31.5	40	50	63	80	24
24	6	6	6	6	10	10	16	16	16	20	20	25	40	40	50	63	

3. Main components

Transformers and sensors

Conventional instrument transformers

Conventional instrument transformer technology is well known and extensively used in various applications. The design is appropriate for providing protection of measurement systems against overcurrents, overvoltages or any other faulty conditions in the network that need to be analyzed and further processed. The current and voltage transformers for UniSec switchgear comply with the IEC 60044-2 and IEC 60044-1 standards. The dimensions are in accordance with the DIN 42600 standard.

Voltage transformer

Current transformer

Current and voltage sensors

The functionality of sensors is similar to that of conventional instrument transformers, but based on a higher level of standardization. The sensor technology is also based on a reduced environmental impact as well as improved safety and reliability of the application. Numerous applications for combination with various different protection relays are available.

Current sensors

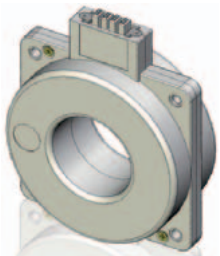
Combined current and voltage sensors

Combisensors combine a current sensor (Rogowski coil) with a voltage sensor (resistive divider).
Their characteristics and dimensions comply with the IEC and DIN Standards.

Combined current and voltage sensors

Low voltage ring transformers with insulation

Application of low voltage ring type transformers is possible as an alternative to conventional transformers, especially in applications with purely functional requirements.



Low-voltage ring current transformer with insulation

4. Mechanical interlocks

UniSec switchgear is fitted with all the interlocks and accessories needed to guarantee a high level of safety and reliability both for the installation and operators.

Interlocks

Safety interlocks can either be those provided as standard or special versions available on request.
The former are required by the standards and are therefore necessary to guarantee the correct operation sequence. The latter can be supplied on request and their integration must be considered during the installation and maintenance stage. Their presence guarantees the highest level of reliability even in the case of an accidental error and allows what ABB defines as an “error-free” system of interlocks.

Key interlocks

The use of key interlocks is very important in realising the interlocking logics between units of the same switchgear, or of other medium, low and high voltage switchgear. The logics are realised by means of distribution lines or by ringing the key interlocks.
The earthing switch closing and opening operations can be locked by means of key interlocks, which can only be removed with the earthing switch in an opposed position to the lock to be made.
The key lock can also be applied to the earthing switch of busbar applications.

Padlocks

The apparatus and cable compartment doors can be locked in the closed position by means of padlocks.
The switchgear is preset for use of padlocks with a 4 to 8 mm diameter.

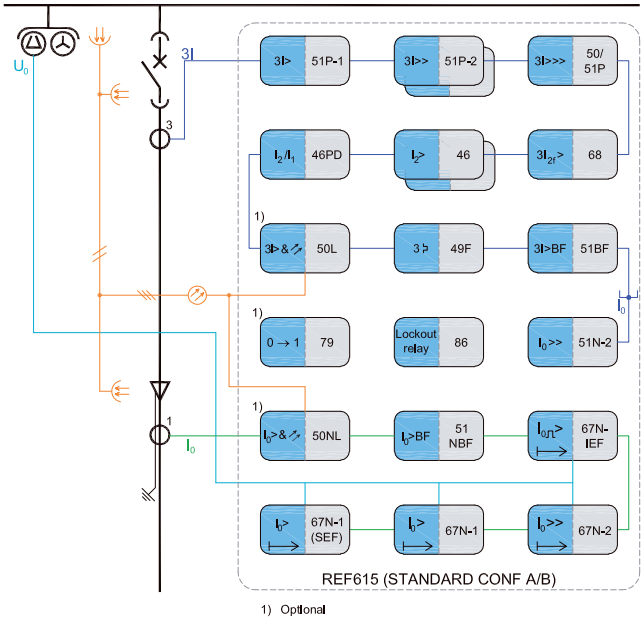
5. Protection and automation devices

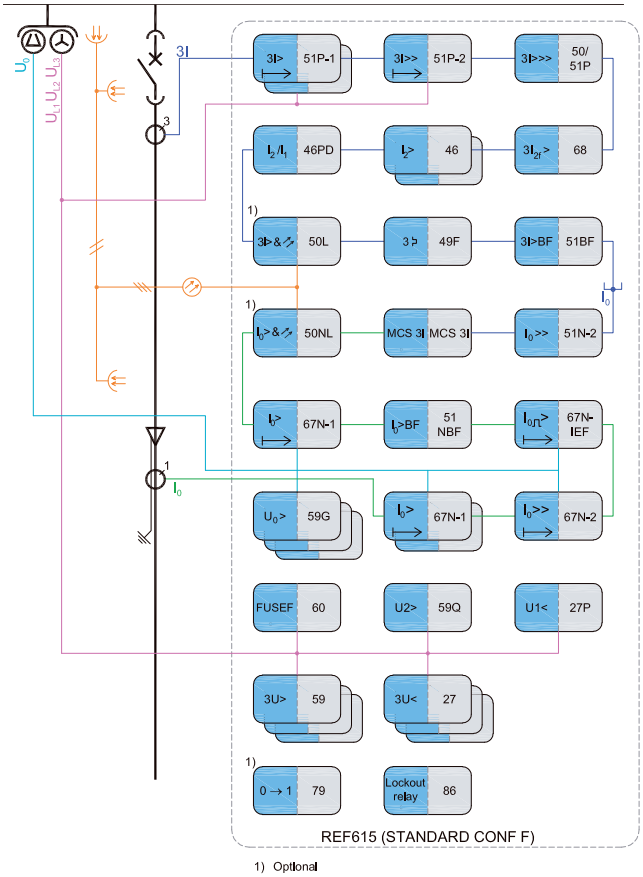
Distribution protection and control

In medium voltage networks, distribution automation means protection, control, measurement and supervision of utility substations and industrial electrical plants. The purpose of distribution automation is to improve safety, reliability and performance of the power distribution process.
The main purpose of a relay protection system is to recognize any abnormal states in the electrical system or anomalous operation of the system components. Based on the information gathered, the protection system will initiate corrective actions to restore the system to its normal operating state.
The protection relay does not prevent network faults from occurring, but is only activated when there is an anomaly in the electrical system. However, careful selection of protection functions and methods improves the performance and reliability of the protection system, thus minimizing the effects of network faults and preventing the fault in question from spreading to healthy parts of the network.
The modern and IEC 61850 compliant intelligent electronic devices (IEDs) allow efficient use of the most sophisticated protection schemes in secondary distribution as well.

Feeder Protection in secondary distribution

The feeder protection applications can be roughly divided into two categories, namely standard (1) applications using basic current based protection, and high requirement (2) applications use a protection based on current and voltage, as well as various combinations between the two.
The selected protection scheme has to fulfil the specific application requirements regarding sensitivity, selectivity and operating speed. The protection requirements are mainly determined by the physical structure of the network. In most cases the above requirements can be fulfilled with non-directional/directional overcurrent relays.
The purpose of the overvoltage and undervoltage protection system is to monitor the voltage level of the network. If the voltage level deviates from the target value by more than the permitted margin for a pre-established period of time, the voltage protection system limits the duration of the anomaly and the consequences thereof.
Our range IEDs has been selected so that they meet all feeder protection requirements in secondary distribution applications, from the simplest to the more complex.





By combining the respective functional locks in A and B standard configurations, REF615 can be used in a wide range of secondary distribution applications. The F standard configuration, fitted with additional protection functions, is also available.

Recommended distribution protection and control products

ABB offers a complete series of protection and control products ranging from the simplest self-powered protection devices to advanced protection, monitoring and control solutions. The modern protection and control IEDs comply with the requirements of the new international IEC 61850 standard on substation communication and distribution automation.

REF601

REF601 is a digital feeder protection relay, designed for protection and control of both utility and industrial power systems in distribution networks. The relay provides basic short-circuit, overcurrent and earth fault protection in networks with directly earthed neutral, earthed by means of a resistance and isolated. The phase currents are measured with current sensors according to the Rogowski coil principle and the earth fault current can be internally calculated or measured using conventional current transformers.

ABB offers two sensors:
- KECA (Rogowski coil type) mounted around the MV cables
- KEVCR mounted on board the circuit-breaker.

The REF601 relay can be mounted on-board the VD4/R-Sec and HD4/R-Sec circuit-breaker or in the auxiliary circuits compartment.
Furthermore, two types of relay are available:
- REF601 according to IEC Standards
- REF601 according to the CEI 0-16 Standard for the Italian market.

Auxiliary supply voltage:
24…240 V AC/DC

⚠ WARNING!

The REF601 relay cannot be applied for protection of systems characterised by the presence of high harmonic currents. In particular, for the feeders which supply:
- electronic converters, speed regulators
- active or passive power factor correction systems
- heating and induction welding systems
- arc furnaces.

Also in the case where the load is not supplied directly but through a power transformer.
Should the REF601 relay be applied under these conditions, ABB declines any responsibility for any possible malfunctioning.
For further information, contact ABB.

RE- 610 Series

The 610 series includes IEDs for feeder protection, motor protection and general system voltage monitoring. The plug-in design of the 610 series facilitates switchgear commissioning and enables fast and safe insertion and withdrawal of the IED plug-in units.

5. Protection and automation devices

The digital protection IEDs of the 610 series support a wide range of communication protocols, among which IEC 61850, IEC 60870-5-103, Modbus and Profibus.

- REF610 is a protection relay mainly designed for protection of incoming and outgoing feeders in MV distribution substations. REF610 can also be used as back-up protection for motors, transformers and generators, in industrial as well as in utility applications. The integrated protection functions, including three-threshold overcurrent protection and a two-threshold, non-directional earth-fault protection make the REF610 relay a valid protection system against overcurrent and earth faults.
- REM610 is an IED for protection, measurement and monitoring of medium-large sized asynchronous LV motors and small-medium sized asynchronous HV motors in the manufacturing and process industry. REM610 is also used for protection of cabled feeders and distribution transformers, which benefits from thermal overload protection as well as phase overcurrent, earth-fault and phase unbalance protection.
- REU610 is designed for distribution substation busbar overvoltage and undervoltage protection, feeder and power transformer overvoltage protection, motor undervoltage protection and capacitor bank protection and monitoring. In isolated neutral electrical systems, it is also used for non-discriminative earth fault protection based on residual voltage measurement.

Auxiliary power supply voltage:
High: 110 - 240 V AC
110 - 250 V DC
Low: 24 - 60 V DC

RE- 615 Series

Fitted with the latest protection technology and complying with the IEC 61850 Standard in force for substation communication, the ABB 615 series of protection and control IEDs are the ideal choice for protection and control of distribution substations. Stringent implementation of the IEC 61850 substation communication standard in the 615 series IEDs covers both vertical and horizontal communication, including GOOSE messaging and parameter setting according to IEC 61850-8-1.

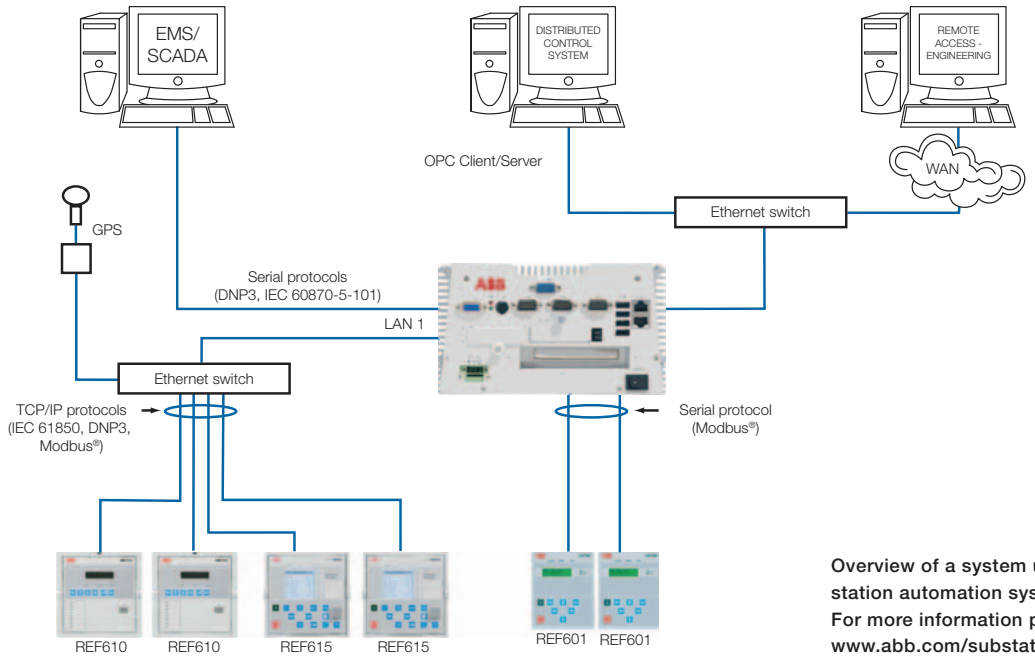
- REF615 guarantees general protection of overhead lines, cable feeders and busbar systems of distribution substations. It fits both isolated neutral networks and networks with resistance or impedance earthed neutral.
- REM615 is a dedicated IED for motor protection and control, perfectly aligned for protection, control, measurement and monitoring of asynchronous motors in the manufacturing and process industry.
- RET615 is a dedicated IED for protection and control of power transformers, unit and step-up transformers, including power generator-transformer blocks in utility and industry power distribution systems.
- RED615 is a residual current feeder IED which, in particular, can be used for applications requiring highly selective feeder protection (unit protection).
  RED615 maintains selectivity even in cases where the fault current magnitude varies and can be fed from several sources. This normally occurs in closed circuit, ring and meshed networks.
- REU615 is an IED available in two predefined configurations named A and B, destined for two of the most common applications.
  The A configuration is preset for the protections based on voltage and frequency for applications in industrial and utility electrical system, including the networks of distributed generation of power.
  The B configuration is preset for the automatic voltage regulation functions of transformers fitted with on-load tap-changer.
  The A and B configurations also allow circuit-breaker control with measurement and supervision functions.

In addition to protection, all 615 series IEDs offer the functionality needed for local and remote control of a circuit-breaker.

Auxiliary power supply voltage:
High: 100 - 110 - 120 - 220 - 240 V 50/60 Hz
46 - 60 - 115 - 220 - 250 V DC
Low: 24 - 30 - 48 - 60 V DC

COM600 automation system

COM600, the station automation device, includes a communication gateway, an automation platform and a user interface for industrial and utility distribution substations. The gateway functionality provides seamless IEC 61850 connectivity between the substation IEDs and the control and management systems at network level. The automation platform with its logic processor makes COM600 a flexible implementation platform for automation tasks at substation level. As a user interface, the COM600 system incorporates functionalities based on web technology, ensuring access to substation devices and processes via a human-machine interface (HMI) based on the web browser.
COM600 is only available on request.



Overview of a system using the COM600 station automation system.
For more information please visit www.abb.com/substationautomation

5. Protection and automation devices

Options for electric arc protection

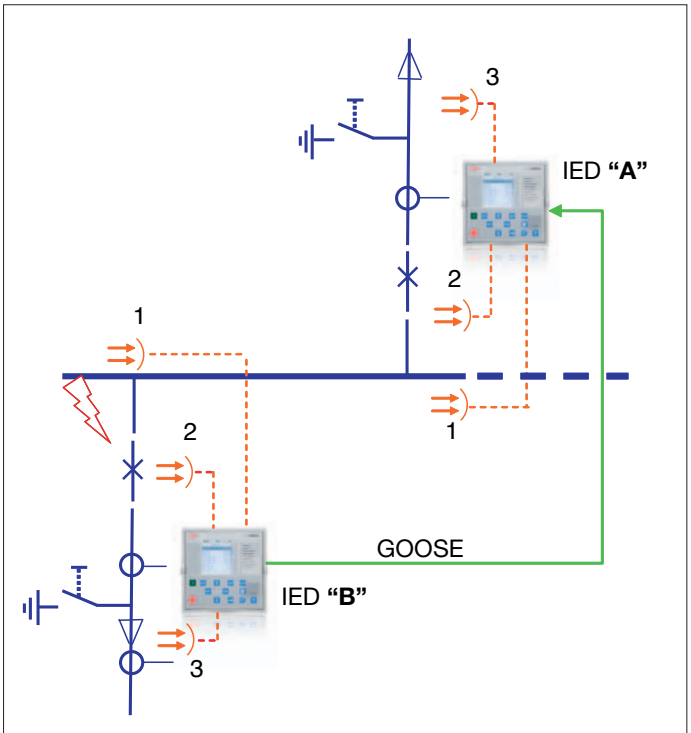
Time is critical when it comes to detecting and minimizing the effects of an electric arc. An arc fault lasting 500 ms may cause severe damage to the installation. If the arc lasts less than 100 ms the damage is often smaller, but if the arc is extinguished in less than 35 ms its effect is almost unnoticeable.
An adequate electric arc protection system protects against arc faults, minimising the arc time and preventing excessive heat and damage. It minimizes material damage, increases personnel safety and allows power distribution to be smoothly and safely restored.

High-speed GOOSE busbar protection

Traditional interlocking-based protection schemes that use conventional hard-wired blocking signal paths between the switchgear compartments are generally not fast enough to ensure safe fault clearance times of arc faults to prevent damage. By means of IEC 61850 based GOOSE communication, the traditional interlocking scheme can be speeded up considerably.
Implementation of the IEC 61850 Standard in REF615 includes fast peer-to-peer communication over the substation bus. Using GOOSE communication, the REF615 IEDs of the incoming and outgoing feeders of a substation co-operate to form a stable, reliable and high-speed busbar protection system.
When using GOOSE communication, the traditional relay-to-relay hard-wiring transmission in the switchgear is replaced by a station-wide Ethernet LAN (Local Area Network). By using GOOSE messaging an operational speed gain of about 30% can be achieved in comparison with the operating speed of the classic, interlocking-based busbar protection schemes. The speed advantage is entirely due to the speed and reliability of the GOOSE service.
The efficient GOOSE-based busbar protection is obtained simply by configuring the IEDs, and operational availability of the protection is ensured by continuous monitoring of the protection IEDs and their GOOSE messaging over the station bus. Any transmission interruptions and errors will immediately be detected and corrective measures can be taken. Apart from a standard Ethernet LAN, no separate hard-wiring is needed for horizontal communication between the switchgear compartments.

Selective busbar protection with electric arc sensors

The cable terminations are the most fault-prone components of MV switchgear. Busbar protection systems based on current measurement are generally not sensitive enough to detect faults occurring in the cable terminations and may even cause the entire busbar system to be de-energized, even though tripping of the feeder concerned would clear the fault.
Protection systems based on electric arc detection selectively trip the relevant feeder circuit-breaker, leaving the busbar system intact.
By installing electric arc sensors to monitor each unit of the switchgear, the speed can be further increased. At the same time, new technology offers greater protection operational reliability and flexibility. Thanks to REF615, the total fault clearance time can be reduced to 10 ms plus the circuit-breaker contact travel time.
As an option, each REF615 feeder protection and control IED can be provided with three electric arc sensors, one for each compartment of the switchgear unit. The busbar electric arc protection is based on detection of an arcing fault on the busbar system. The IED which detects the electric arc transmits a GOOSE message or uses the traditional hard-wired communication paths to transfer the message to the other IEDs.
The IEDs of the units supplying the fault current to the busbar system also receive the electric arc fault message and trip the relative circuit-breakers as fast as possible. Typically, when there is an arc fault, the electric arc protection clears the fault about twice as fast as the busbar protection system based on peer-to-peer messaging between IEDs.



Protection against electric arc using REF615 and GOOSE

Selection table for IEDs in their various applications

Relay	REF601	REF610	REU610	REM610	REF615[2]	RED615	REM615	RET615	REU615
Application									
Feeder application	x	x	x		x	x			
Motor application				x			x		
Feeder residual current protection						x			
Transformer application								x	
Voltage and frequency protection									x [5]
Automatic voltage regulation									x [6]
Electric arc protection for feeder unit		x			x		x	x	
Communication Protocols									
IEC 60870-5-103		x	x	x	x	x	x	x	x
IEC 61850-8-1		x [1]	x [1]	x [1]	x	x	x	x	x
DNP 3.0		x			x	x	x	x	x
SPA		x	x	x					
LON		x [1]	x [1]	x [1]					
Modbus	x				x	x	x	x	x
Profibus		x [1]	x [1]	x [1]					
Additional functions									
Disturbance recording		x	x	x	x	x	x	x	x
Withdrawable release mechanics		x	x	x	x	x	x	x	x
Status monitoring		x	x	x	x	x	x	x	x
Local control	x				x	x	x	x	x
Remote control	x				x	x	x	x	x
Remote access (communication)	x	x	x	x	x	x	x	x	x
Communication	x	x	x	x	x	x	x	x	x
Local HMI [3]	x	x	x	x	x	x	x	x	x
Web browser-based HMI					x	x	x	x	x
Auto-reclosing		3 operations			5 operations	5 operations			
RTD [4] inputs				6					6 [6]

[1] With interface adapter
[2] With A, B and F standard configurations
[3] HMI - Human Machine Interface
[4] RTD - Resistive Temperature Detector
[5] With A standard configuration
[6] With B standard configuration

6. IEC classification

The IEC 62271-200 Standard has introduced some new aspects regarding definitions and classifications of MV switchgear.
One of the most significant changes introduced by this Standard is elimination of classification of switchgear into metal-enclosed, divided into compartments and with units.
Switchgear classification has been revised taking the user's point of view into account, in particular for some aspects such as switchgear operation and maintenance, according to the requirements and expectations of good substation management, from installation to disposal. In this context, "loss of service continuity" has been chosen as a fundamental criterion for the user.

According to the updated standards, UniSec switchgear can be defined as follows:

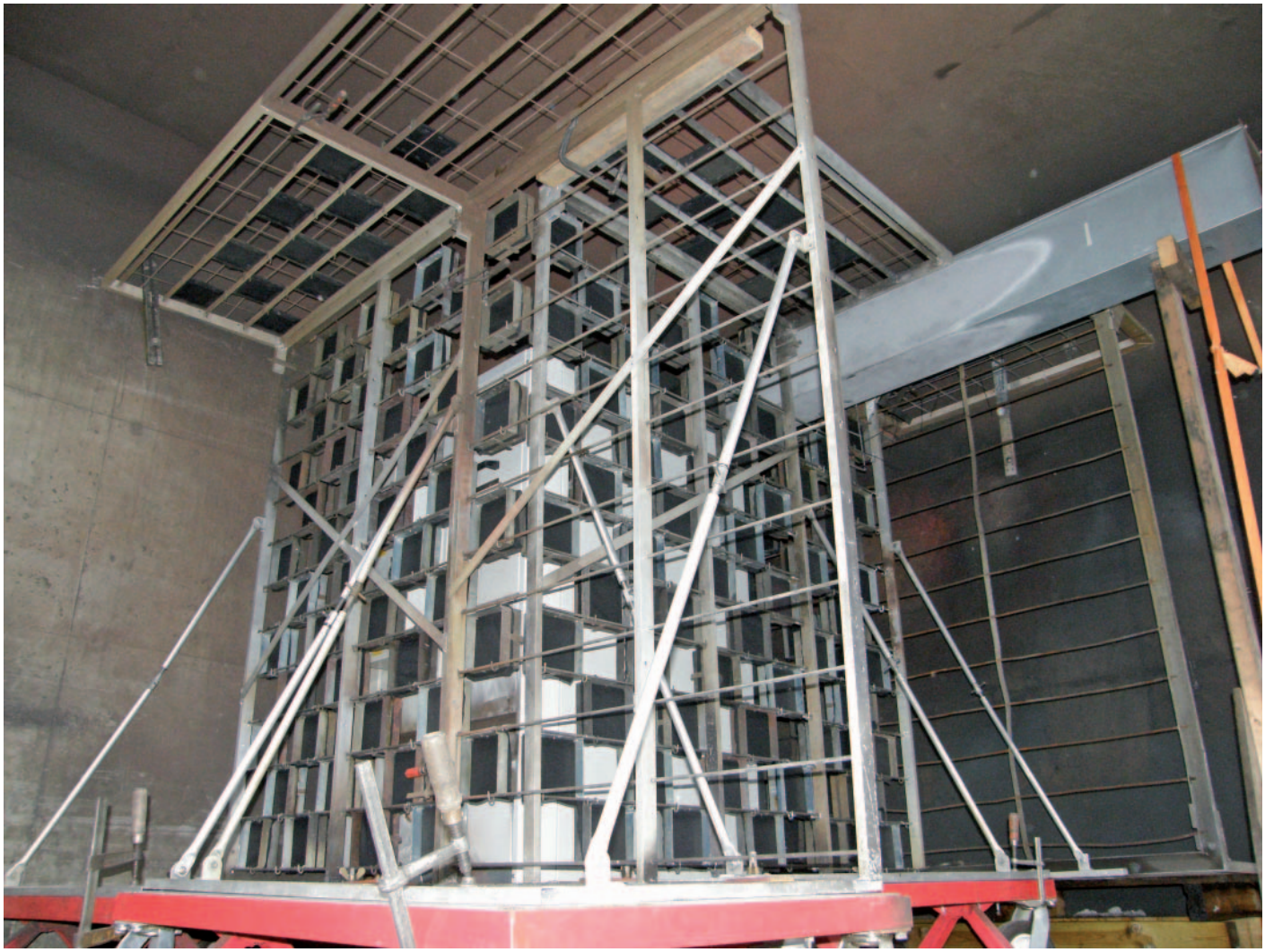
1. Compartment with access controlled by an interlock, containing high-voltage parts, designed to be opened for normal operation and/or normal maintenance, where access is controlled by integral configuration of the switchgear and controlgear.
2. Compartment with procedure-based access, containing high-voltage parts, designed to be opened for normal operation and/or normal maintenance, where access is controlled by a suitable procedure associated with a lock.
3. Service continuity class
   The busbar and cable compartments are physically and electrically partitioned. This category defines the possibility of opening a main circuit compartment whilst keeping other compartments and/or functional units energised.
4. Partition class
   Controlgear with continuous metal partitions, intended to be earthed, between the compartment with free access and the main circuit live parts.
   The metal partitions or metal parts of these must be connected to the earthing point of the functional unit.

7. Internal arc withstand capacity

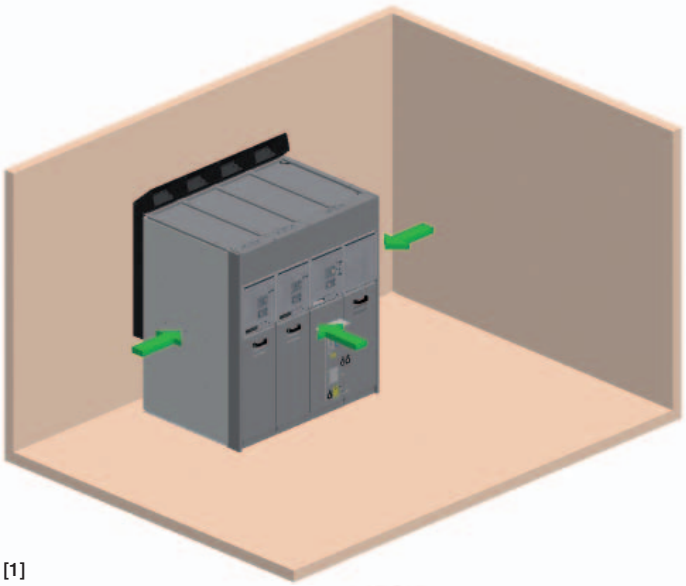
Internal arc faults are extremely rare occurrences, but can still occur due to human errors, malfunctions of apparatus, insulation ageing or other exceptional reasons. In designing the UniSec switchgear, special attention was paid to personnel safety during internal arc situations. The switchgear units have extremely high mechanical resistance, being able to withstand pressure and thermal effects caused by even the highest internal arc currents. The switchgear design also notably reduces the probability of an internal arc occurring in the first place.
UniSec switchgear undergone the internal arc test according to the IEC 62271-200 Standard, Annex A.
The internal arc withstand tests are better classified in this new standard compared to the previous one.

The test verifies the effectiveness of the switchgear protection in protecting people against internal arcs, evaluating the dynamic pressure effects and the thermal effects. UniSec fulfils all the 5 acceptance criteria set by the standard. The internal arc withstand tests have been performed in the busbar and cable compartments, as well as in the switch-disconnector enclosure.
UniSec offers various Internal Arc Classified (IAC) solutions. All solutions are class A (authorized personnel only) and are accessible from different sides (F for front, L for lateral and R for rear).
UniSec switchgear is available, on request, in standard version (no IAC).
UniSec classifications:
- IAC AFLR 12.5 kA 1 s
- IAC AFLR 16 kA 1 s
- IAC AFLR 21 kA 1 s
- IAC AFLR 25 kA 1 s
- No IAC.

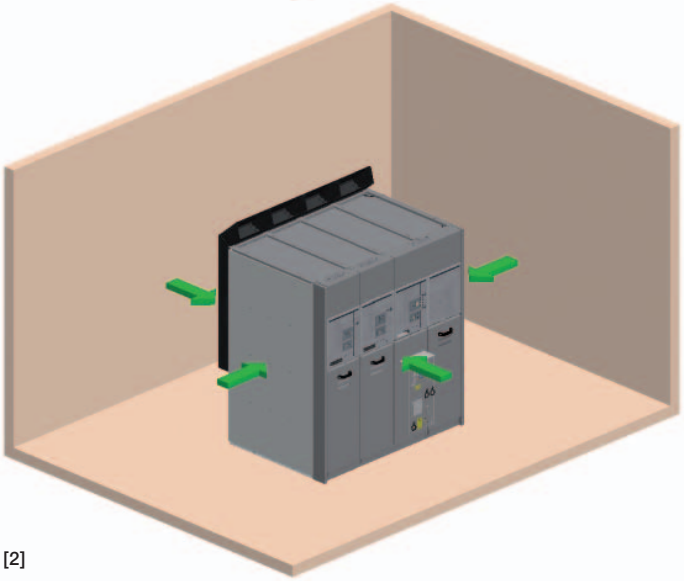
Setup for an internal arc withstand test



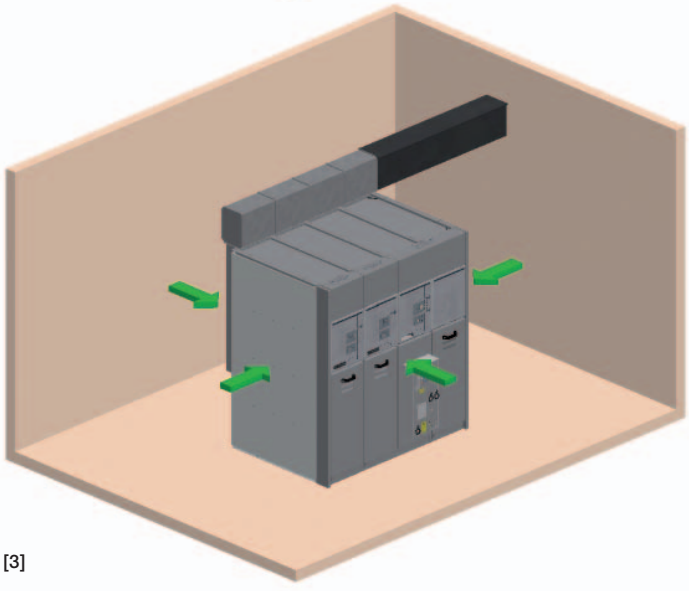
7. Internal arc withstand capacity



[1]



[2]



[3]

IAC AFLR 12,5 kA, AFLR 16 kA 1 s and AFLR 25 kA 1 s [1]

In this solution the switchgear can be positioned against the wall [1] or in the middle of the switchgear room [2]. Internal arc protection is guaranteed on 4 sides. The gases produced by the arc are released into the switchgear room. An efficient structure for absorbing the gases produced by the arc ensures that they are cooled down significantly before entering the switchgear room, guaranteeing internal arc withstand up to a fault current of 16 kA and 25 kA[1]. The absorbers are pre-mounted behind each switchgear unit, so no extra work needs to be done at the installation site.

IAC AFLR 21 kA 1 s and AFLR 25 kA 1 s [1]

In this solution [3], the switchgear can be positioned against the wall or in the centre of the switchgear room. Internal arc protection is guaranteed on 4 sides up to a fault current of 21 kA and 25 kA[1]. The personnel inside the switchgear room are completely safe, since special gas exhaust ducts are used to channel the arc gases safely to an external area. The pressure effects on the switchgear are also minimal. This solution provides the highest possible internal arc withstand level.
The switchgear is fitted with a 1-metre long extension duct between the switchgear and wall, for outlet of gases from the installation room. On request, a duct with an extension up to a maximum length of 2 metres can be supplied.

Strong mechanical resistance together with suitable arc gas exhaust devices provide a good level of safety against internal arcs. However, it is possible to increase safety even further by using active protection methods to quickly extinguish the arcs.
The electric arc protection system with integrated sensor monitoring offers extremely rapid and selective zone-based busbar protection.
REF615 feeder protection relay also offers an optional arc fault protection function. More information about the active protection methods is available in chapter 5 (Protection devices).

[1] Only for units with withdrawable circuit-breaker.

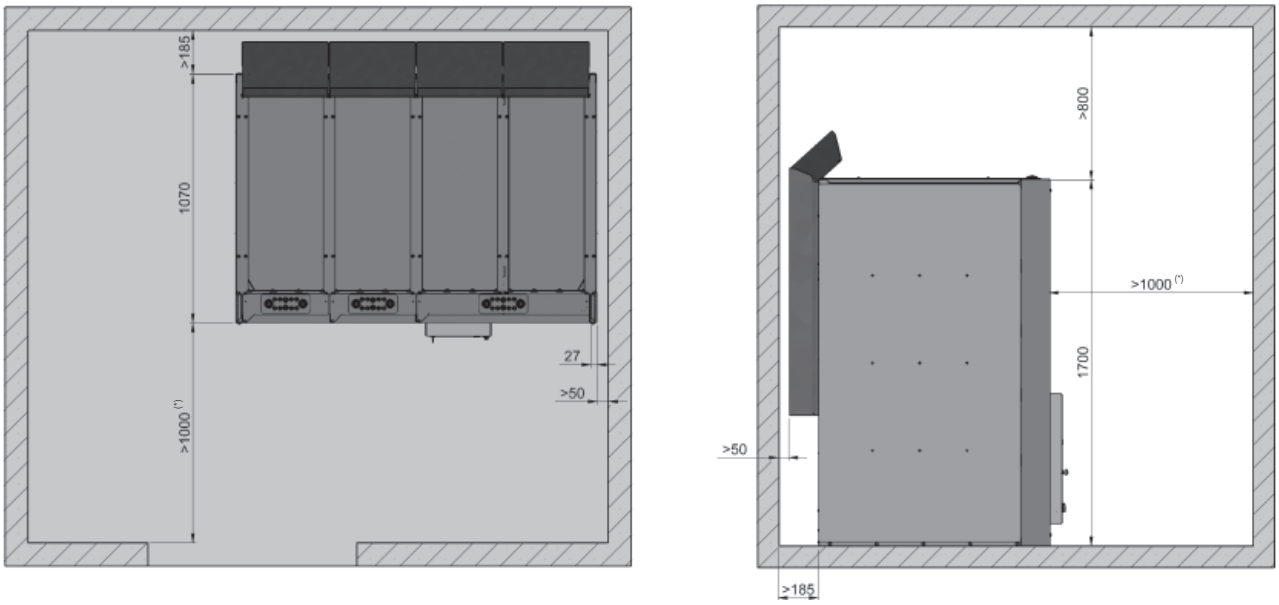
8. Installation information

Installation room

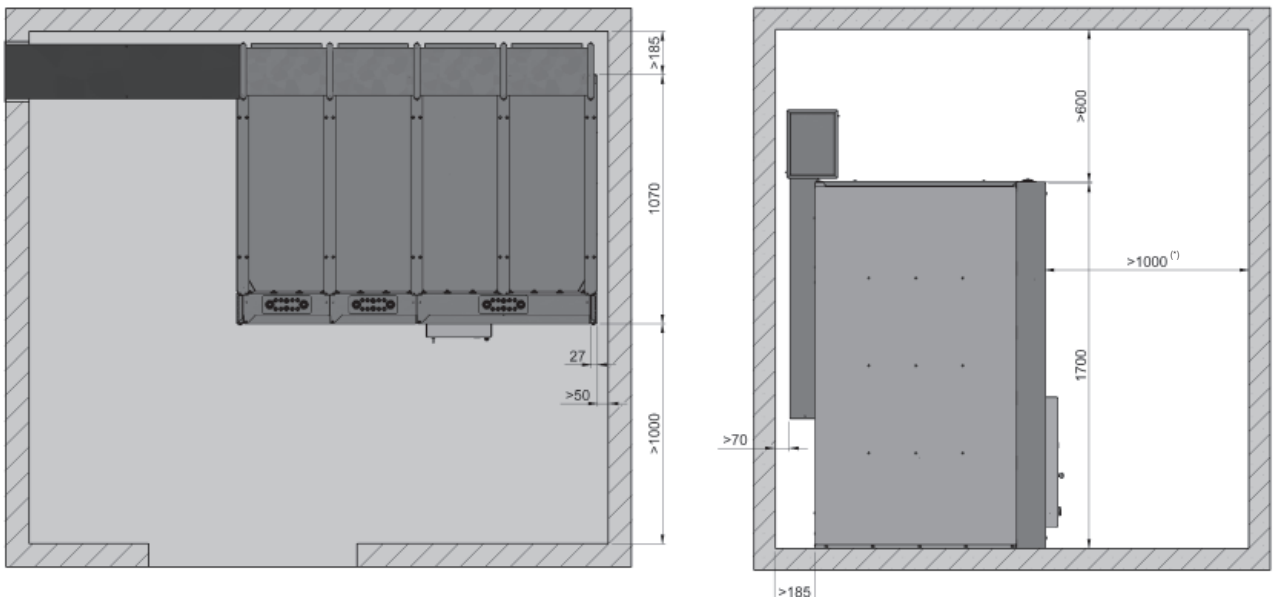
The installation room must be prepared according to the switchgear dimensions and version. Observance of the distances indicated guarantees correct and safe operation of the apparatus. For installation conditions other than those indicated, please consult ABB.

Note
When gas exhaust ducts or gas absorbers are used, there should be a minimum space of 185 mm between the rear of the switchgear and the switchgear room wall.

Room layout



Minimum distances to the switchgear room walls with arc gas absorbers. Class AFLR

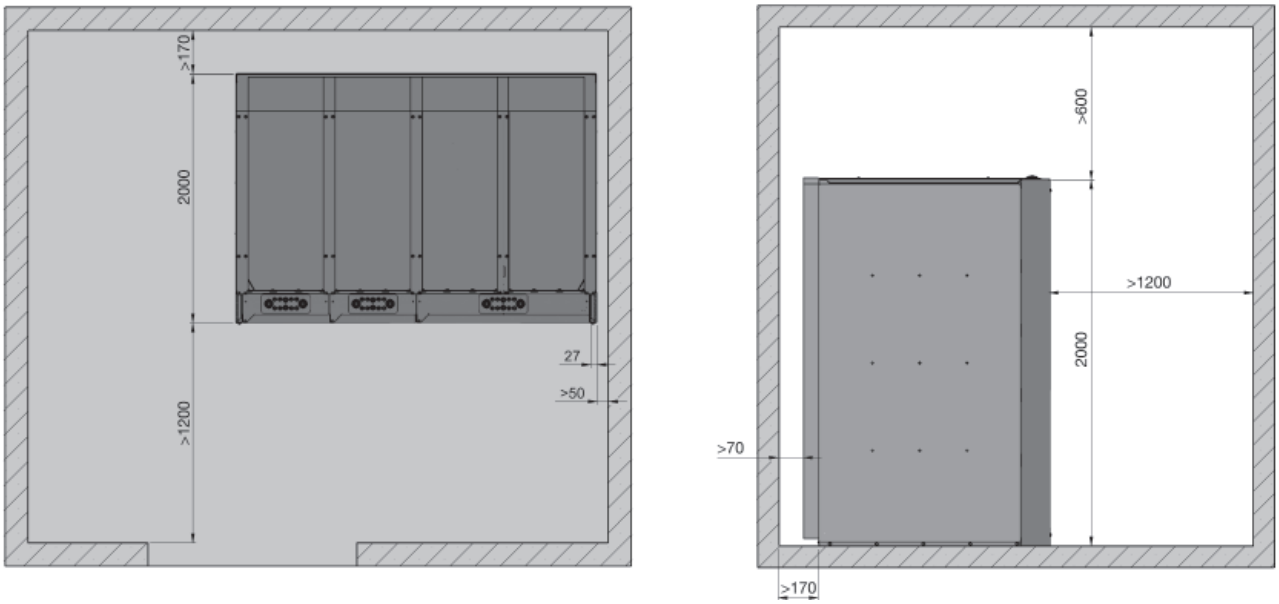


Minimum distances to the switchgear room walls with gas exhaust ducts. Class AFLR

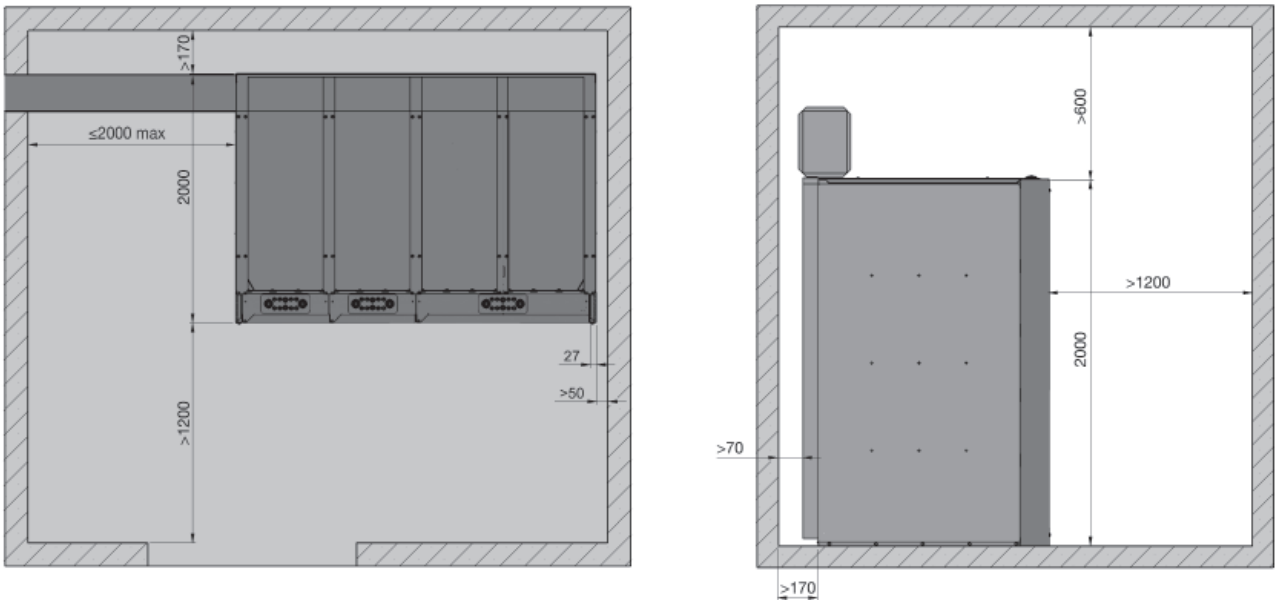
(5) >1200 mm for panels with removable circuit-breaker

8. Installation information

Room layout for unit with withdrawable circuit-breaker



Minimum distances to the switchgear room walls with gas absorbers. Class ALFR.

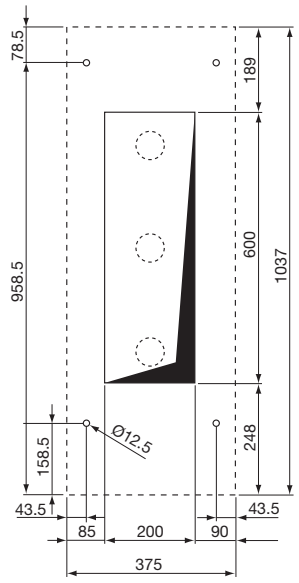


Minimum distances to the switchgear room walls with gas exhaust ducts. Class AFLR.

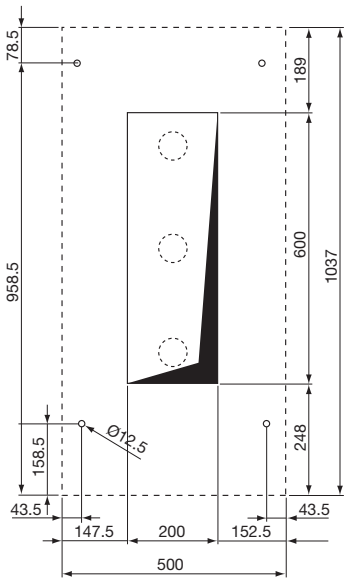
Cable passage and fixing points of the units

The following figures show the positions and sizes of the cable passage holes underneath the different units. These holes must be made before installation of the switchgear. The figures also show the switchgear fixing points.

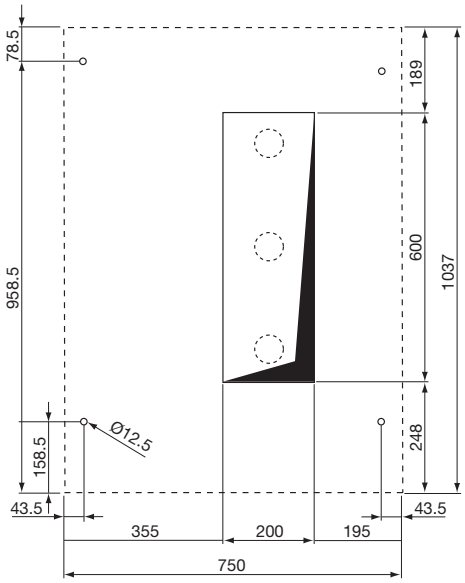
There is one fixing point in each corner of the unit (4 per unit). Units without cable entry have dimensions and fixing points according to the width of the unit. 10 mm anchoring bolts can be used for fixing.



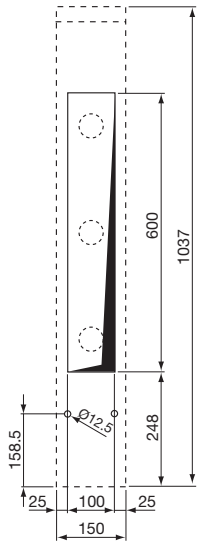
375 mm wide units



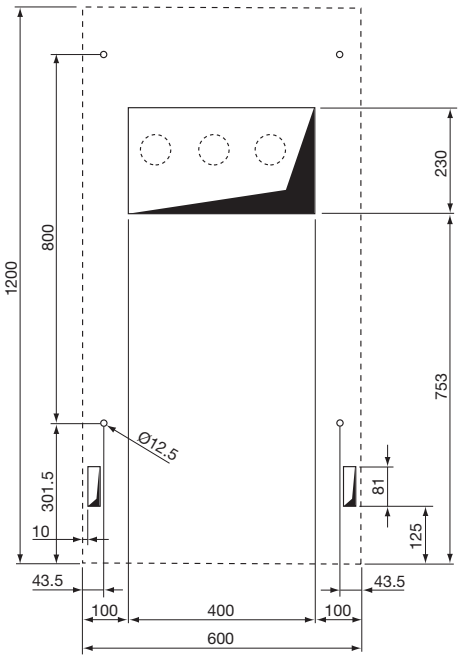
500 mm wide units



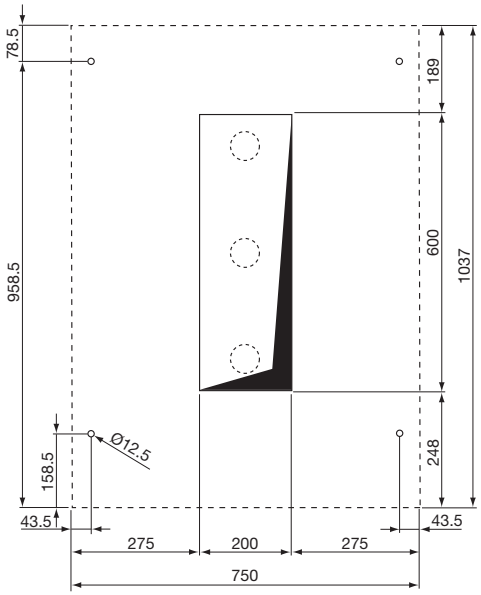
750 mm wide units



190 mm width for RLC/RRC units (only for SBR)



600 mm width for units with withdrawable circuit-breaker

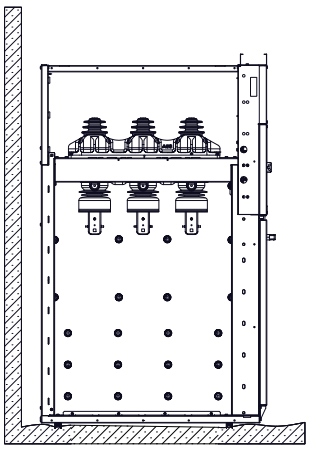


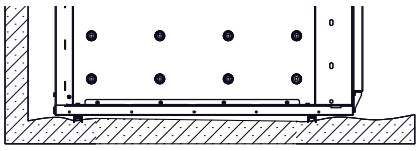
750 mm width for SBR unit

8. Installation information

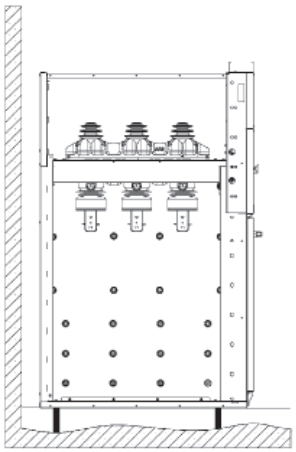
Foundations

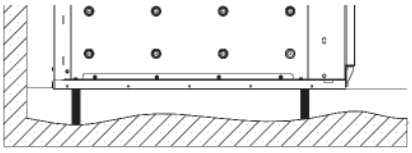
The switchgear must be erected on a foundation that fulfils the requirement of 2x1000 levelness in relation to the length of the switchgear. Since it is difficult to make a concrete foundation that fulfils this levelness requirement, suitable adjustments are made using a metal frame or by installing steel plates under the corners of the units.
The load capacity of the floor and foundation must also be sufficient.



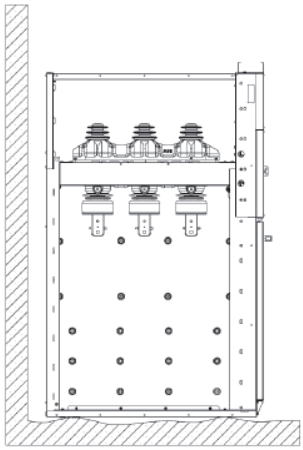


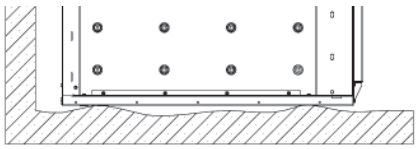
Switchgear erected on the metal frame





Switchgear erected on the raised floor





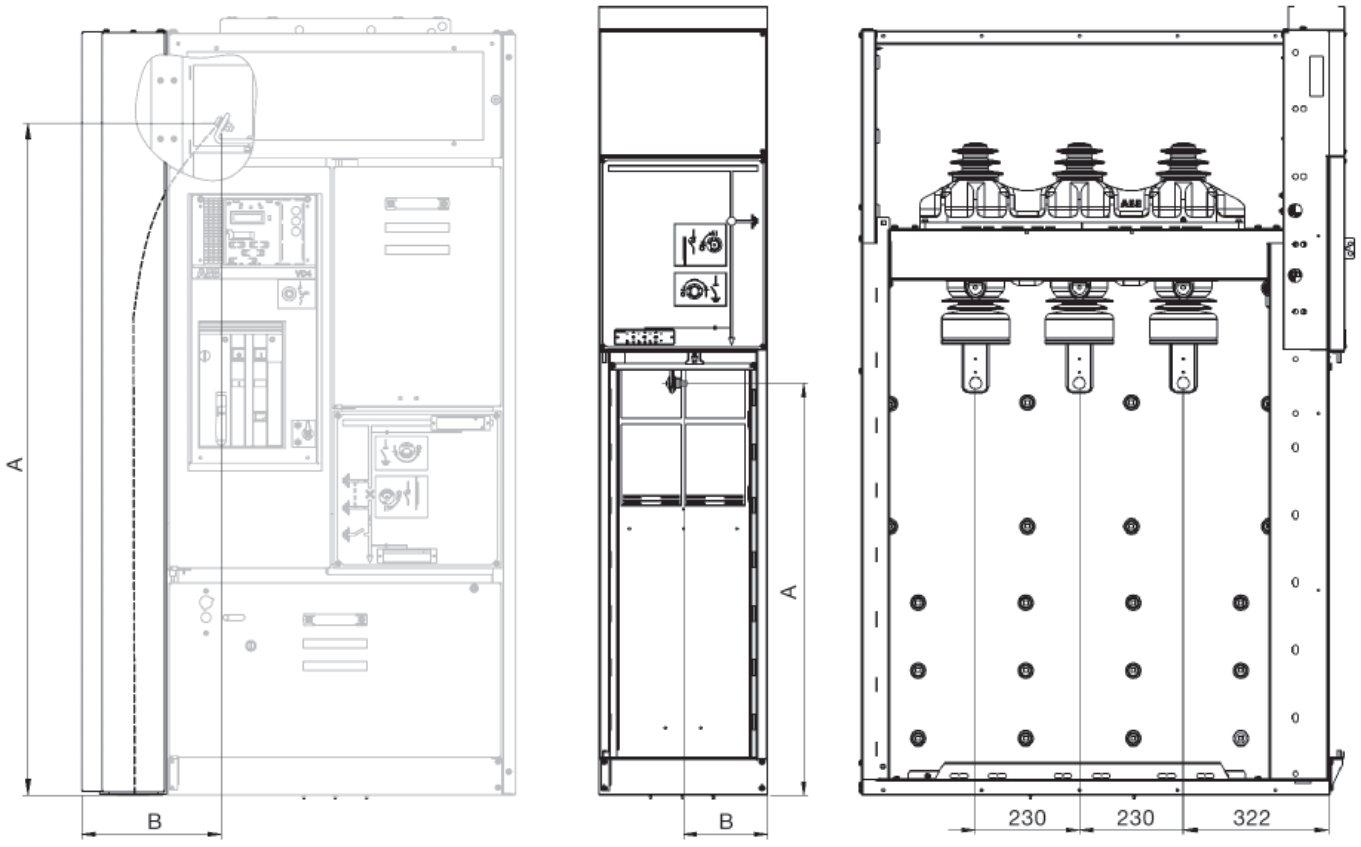
Switchgear installed on the concrete floor

If the switchgear consists of only a few cubicles, and there are no heavy units included, it can be installed on a concrete floor.

Medium voltage cable positions and lengths

The lengths of the medium voltage cables used (distance between the cable connection point and the floor) depend on the units and accessories.

The following figures and table show the cable lengths and locations for the various units.



RLC unit

Medium voltage cable lengths and locations

	Details	190 mm width		375 mm width		500 mm width		600 mm width		750 mm width	
		A (mm)	B (mm)	A (mm)	B (mm)	A (mm)	B (mm)	A (mm)	B (mm)	A (mm)	B (mm)
SDC	Basic	–	–	915	210	915	275	–	–	–	–
SDC	With CT	–	–	–	–	525	275	–	–	525	275
SDM	Basic	–	–	–	–	–	–	–	–	525[1]	275[1]
SFC	292 mm fuse	–	–	600	200	600	230	–	–	–	–
SFC	442 mm fuse	–	–	450	200	450	230	–	–	–	–
SBC	Basic	–	–	–	–	–	–	–	–	500	310
WBC	Basic or with CT	–	–	–	–	–	–	600	150[2]	–	–
DRC	Basic	–	–	500	165	500	230	–	–	–	–
DRC	With CT	–	–	–	–	530	275	–	–	–	–
SBR	Basic	–	–	–	–	–	–	–	–	400	390
RLC/RRC	Basic	1495	310	–	–	–	–	–	–	–	–

[1] With optional cable terminal
[2] Distance between the side wall of the panel and the first cable connection

8. Installation information

Cable terminations

- Cold application
- Can be used in restricted spaces
- No special tools needed
- Prefabricated for easy and safe installation
- Minimal cable stripping
- Active pressure
- Few components
- Long life

General aspects

The power cables used for the switchgear need suitable terminations. The power cable has an aluminium or copper conductor, insulation made of polymeric material, an extruded insulating sheath, metal braiding, armour (optional) and an outer polymeric sheath.
To ensure a safe and reliable current carrying capacity, it is necessary to provide a good mechanical connection between the cable conductor and the busbar. For this purpose, ABB offers mechanical cable terminals specially designed to fit the cable conductor by being screwed on. It is also essential to guide the electric field produced by the cable correctly. For this reason, ABB supplies terminations made of cold-applied rubber, which ensure an active pressure around the cable. Furthermore, if the cable is designed with a metal sheath without copper, special earthing kits must be used for correct management of any fault currents.
Any cable armour must guarantee the same earth potential as the sheath, so it might be necessary to use additional connection material, which is also part of the ABB offer.
Detailed information can be found in the separate technical documentation regarding ABB cable accessories.

Standards

Meets the requirements of CENELEC HD 629.1 S1.

Applications and characteristics

Depending on the cable structure, it is necessary to use the right type of cable accessories.
When a single-core cable screened only with a copper sheath is used, it is sufficient to use a cable terminal and a termination suitable for the actual dimensions of the cable. If a three-core cable is used, or a cable screened with copper tape or with an aluminium sheet or a cable with armouring, extra material must be added.
Correct preparation of the cable is just as important as using the right type of material. ABB also offers a wide range of optimal cable preparation tools for this purpose.

Recommended products

The ABB SOT type pre-moulded cable terminations can be used on any polymeric cable, irrespective of the structure or conductor dimensions.
Just a few variants of terminations fit a wide range of cable sizes. For 12/17.5/24 kV values, only four types of terminations are required to cover cable dimensions up to 800 mm^2.
The ABB range of products also includes extra material, such as earthing kits, support gaskets for 3-core cables and screening material for cable armouring. Please contact ABB in your area for further information.

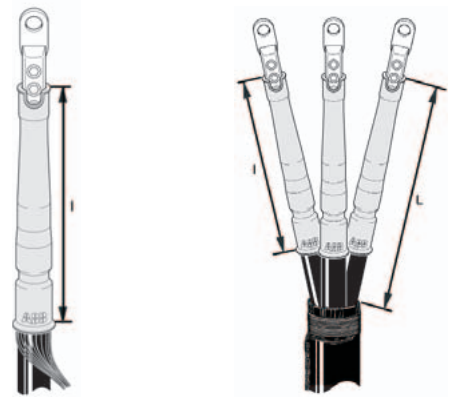
Kebeldon SOT type cable terminations with bimetal SKSB type cable terminal

Kits complete with screw cable terminal

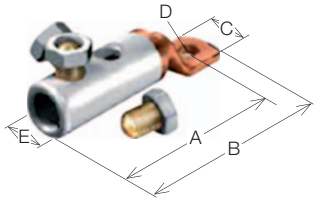
Cable termination, including bimetal screw cable terminal for Al and Cu conductors.
The cable terminal is equipped with shear-off bolts.

Designation	Weight	Designation	Weight	XLPE-Ø	Conduction (12 kV)	Conduction (24 kV)
Indoor termination 3-core / 3 x single-core	kg/kit	Indoor termination single-phase kit	kg/kit	mm	mm²	mm²
SOT 241 A-3	0.60	SOT 241 A	0.20	11-15	10-35	10
SOT 241-3	0.60	SOT 241	0.19	15-28	50-185	25-120
SOT 242-3	0.70	SOT 242	0.23	24-39	240-500	150-300
SOT 242 B-3	0.90	SOT 242 B	0.30	38-54	630	–

Designation	Weight	Designation	Weight	Conduction (12 kV)	Conduction (24 kV)
Indoor termination 1-core / 1 x single-core	kg/kit	3-core / 3 x single-core for indoors	kg/kit	mm²	mm²
SOT 241A S1	0.35	SOT 241A-3 S1	1.05	16-35	16
SOT 241 S1	0.34	SOT 241-3 S1	1.02	50-70	25-70
SOT 241 S2	0.44	SOT 241-3 S2	1.32	95-150	95-120
SOT 241 S3	0.59	SOT 241-3 S3	1.50	185	–
SOT 242 S2	0.48	SOT 242-3 S2	1.44	–	150
SOT 242 S3	0.63	SOT 242-3 S3	1.89	240	185-240
SOT 242 S4	0.98	SOT 242-3 S4	2.94	300-400	300
SOT 242B S5	1.78	SOT 242B-3 S5	5.25	500-630	–



Designation	I	L
	mm	
SOT 241/242/242 B	235	min 300

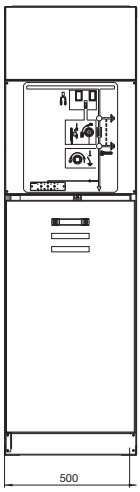


Designation	Al or Cu conductor			Tightening torque	Dimensions					Weight kg/item
	sector shaped	round	max Ø		A	B	C	D (Ø)	E (Ø)	
	mm²	mm²	mm		mm					
SKSB 70-12	25-70	16-70	11	15*	90	103	25	13	21.5	0.15
SKSB 150-12	95	95-150	16	20*	103	118	30	13	27	0.25
SKSB 240-12	120-185	185-240	20	30*	125	140	30	13	33.5	0.40
SKSB 400-16	240	300-400	25.5	40*	166	185	37	17	41.5	0.75
SKSB 630-16	–	500-630	33	45*	201	227	55	17	49	1.45

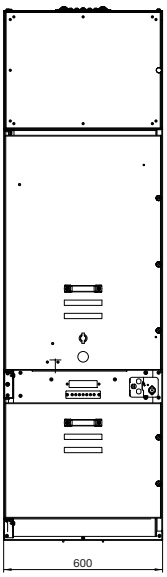
9. Dimensional drawings

Front view

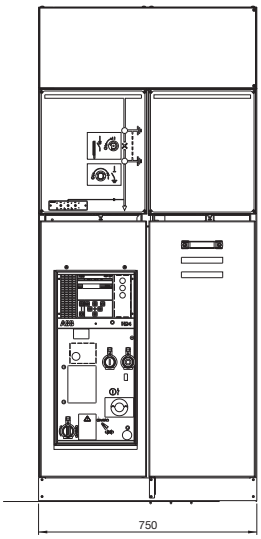
SDC
SDS
SFC
SFS
DRC
DRS



SDC
SDS
SFC
SFS
SFV
DRC
DRS

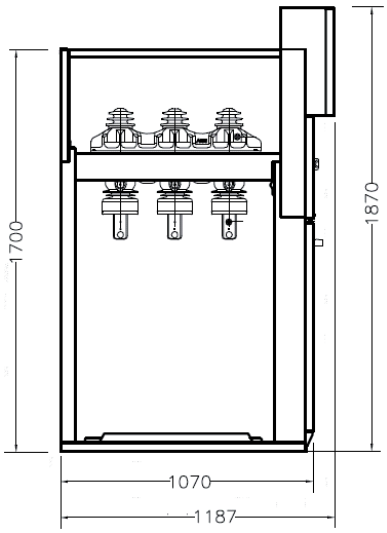


WBC
WBS

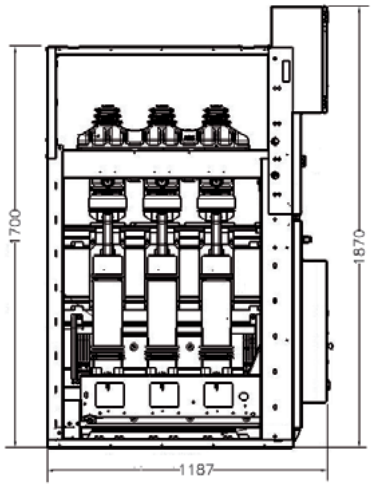


SBC
SBS
SBR

Lateral view (no IAC)

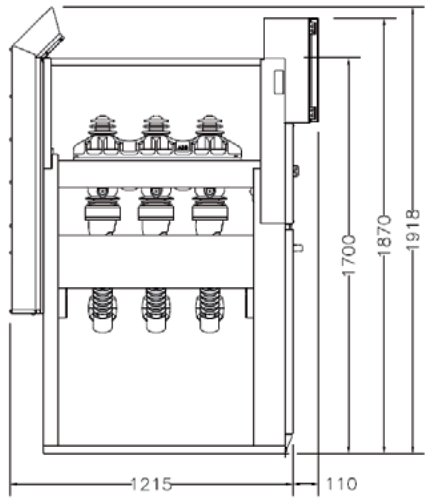


SDC
SDS
SDM
SFC
SFS
SFV
DRC
DRS

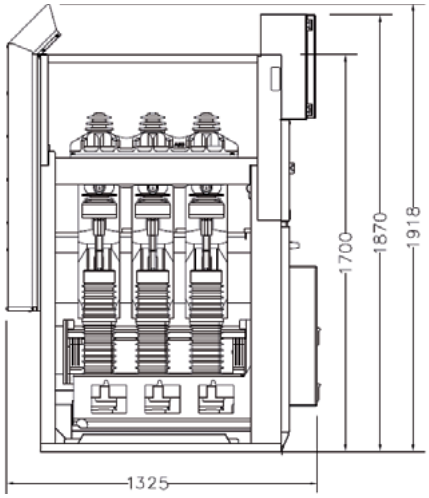


SBC
SBS
SBR

Lateral view IAC 16 kA, with filters

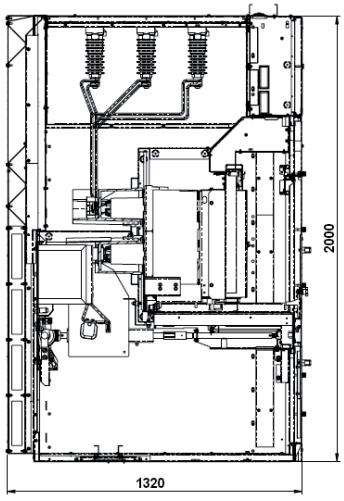


SDC
SDS
SDM
SFC
SFS
SFV
DRC
DRS



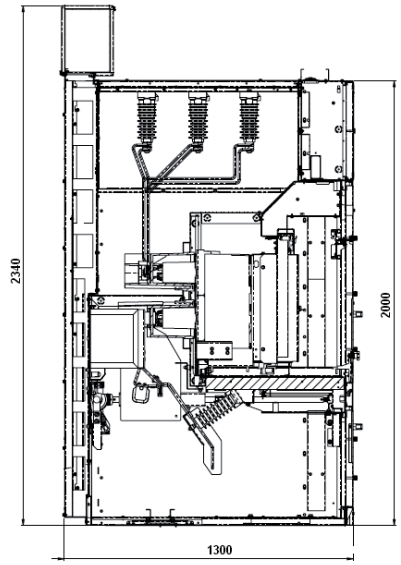
SBC
SBS
SBR

Lateral view for panels with withdrawable circuit-breaker, IAC 25 kA, 1 sec with filters



WBC
WBS

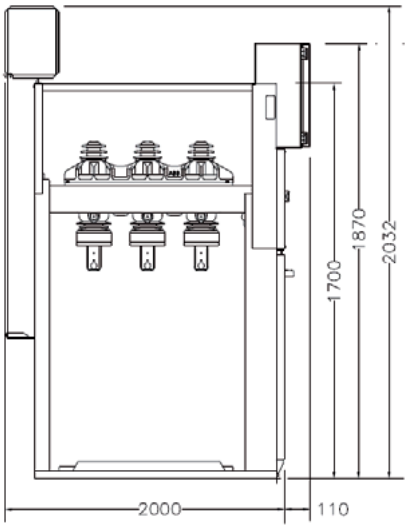
Lateral view for panels with withdrawable circuit-breaker, IAC 25 kA, 1 sec with duct



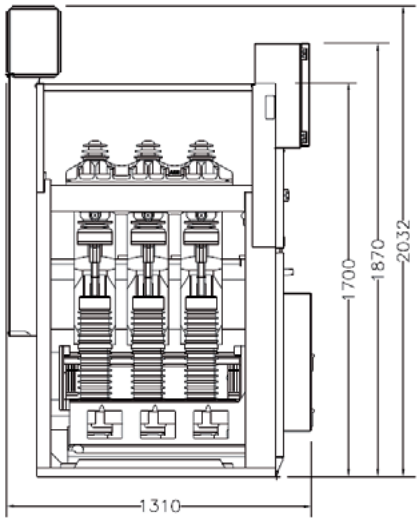
WBC
WBS

9. Dimensional drawings

Lateral view IAC 21 kA, with duct



SDC
SDS
SDM
SFC
SFS
SFV
DRC
DRS



SBC
SBS
SBR

10. Configuration software

UniSec Pro

UniSec Pro has been developed to be a tender and switchgear design tool. It also helps design offices to design and plan projects. A designer version is also available. Please contact your local ABB representative.

- Projects are stored online, enabling statistics and follow-up.
- Online site for projects, feedback, news, installation files, etc.

11. Recycling

ABB's present and future operations and processes will always comply with environmental standards and legislation. ABB strives to develop and provide products and services with reduced harmful environmental impacts that are safe in use and can be recycled, reused or disposed of safely. This includes the products and services bought from ABB's suppliers and subcontractors. In our research and development we aim for innovative and environmentally sound technologies, systems and products.

To support our customers and protect the environment during maintenance and at the end of service life of their switchgear, ABB offers a complete service program aimed at eliminating any release of SF_6 into the atmosphere.

UniSec units are produced in compliance with the requirements of international standards for the quality management system and environmental management system.

ABB is committed to protection of the environment and adheres to ISO 14001 standards. The product is developed in compliance with the requirements denoted by IEC 62271-200.

The following table gives the materials used in the SDC 375 mm unit.

Recycling capability

Material	Recyclable	kg	%
Steel	Yes	106.5	69
Stainless steel	Yes	5.5	3.5
Copper	Yes	14	9
Brass	Yes	<0.5	<0.5
Aluminium	Yes	4	3
Zinc	Yes	1.5	1
Plastics	Yes	4.6	3
SF_6	Yes	<0.5	<0.5
Total recyclables		**132**	**87**
Rubber	No	<1	<0.5
Epoxy	No	18.5	12
Total non-recyclables		**19**	**13**

Recycling of SF_6 gas

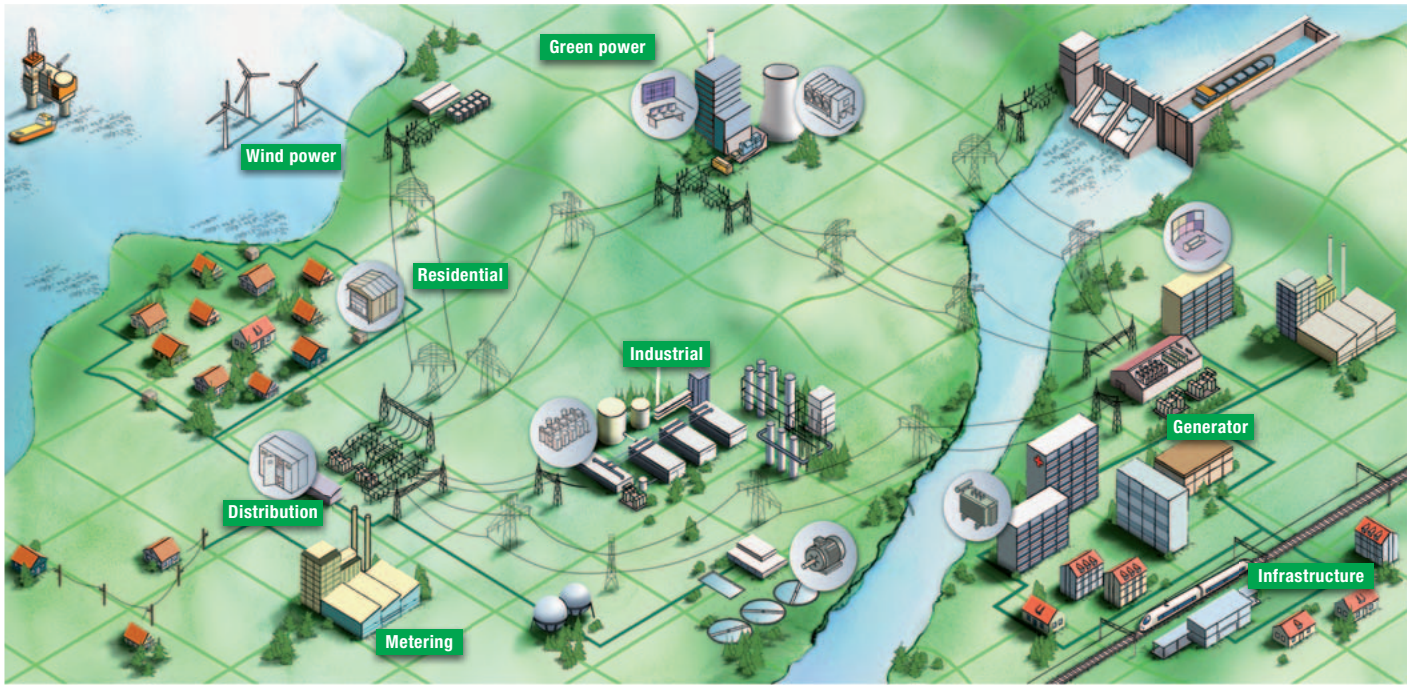
It is ABB's obligation to facilitate end-of-life recycling for our products. In the EU and EEA, the F-Gas Regulation must be followed.

SF_6 is a fluorinated greenhouse gas and care must be taken not to cause emission of SF_6 and at end-of-life the greenhouse gas must be recovered.

We also advise customers to always consult ABB's website http://www.abb.com/sf6 website.

12. Applications

Use of Unisec switchgear



UniSec switchgear is used in medium voltage secondary power distribution. In particular, it can be used for transformer substations, for control and protection of feeders and power transformers, for infrastructure, airports, hospitals, shopping centres, industries, etc.
UniSec is the ABB solution for a fully automated power distribution network. Supported by sensor technology and the latest in protection relays, it meets even the most demanding requirements in different applications.
UniSec offers a wide range of panels, making it possible to identify the most cost-efficient solution for all applications by combining the available panel types.

Safety
- Integrated voltage indicator
- Interlocking devices
- Gas gauge or pressure indicator
- Inspection windows
- Gas exhaust ducts

Smart integration
- Compact size
- Modular design with components for various applications
- Easy installation and easy to extend

Economy
- Long lifecycle
- High mechanical endurance
- Low maintenance costs
- Low environmental impact
- Virtually maintenance-free

Reliability
- Each panel is stringently tested
- Robust construction
- Extremely durable and reliable operating mechanism
- Local ABB support with global focus on reliability and quality

12. Applications

Residential

Customer needs
Residential areas get their power from a local transformer substation.
- The transformer substation is required to be safe, compact in size and with low environmental impact
- Continuity of service and stable supply are important design factors for the equipment to be installed.

Transformer substation solutions
A transformer substation is the most common UniSec solution for ring networks, residential areas, buildings and small industry.
Modular and flexible design provides simple and easy installation. Key factors in this case are:
- Easy to extend
- Very compact units
- Wide portfolio of protection, control and monitoring solutions.

Distribution

Customer needs
The distribution network refers to switching substations feeding, protecting, monitoring and controlling for example residential areas, industrial sites and large buildings. Priorities here are:

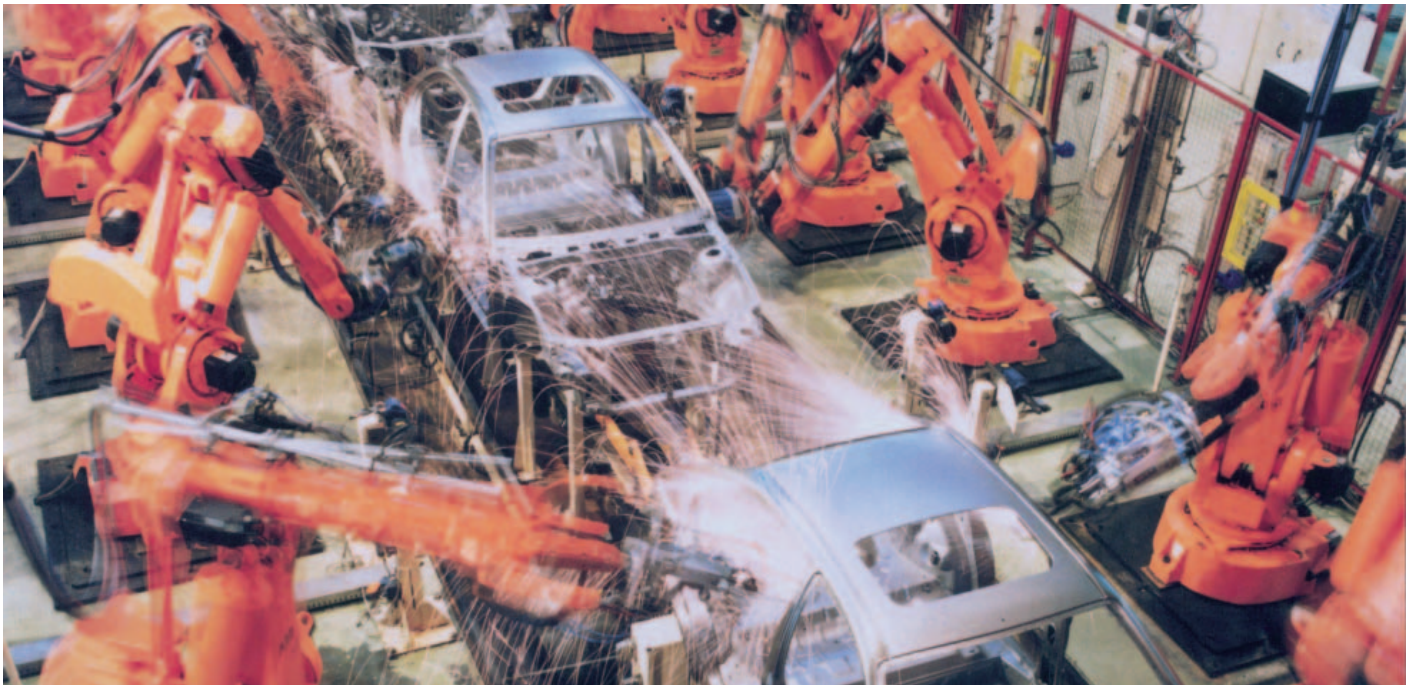
- Continuity of service and reliability
- Safety
- Life cycle cost
- Easy integration in existing networks and systems.

- **Safety** - Switchgear designed and tested according to IEC and internal arc proofing.
- **Life cycle cost** - Standardized and modularized solutions, reduced training and maintenance requirements, fewe spare parts and easy operation and fast replacements of components with reduced resources dedicated to the plant.
- **Easy integration** - Compliance with local requirements.

Light substation solutions
UniSec solutions for distribution include:

- **Service continuity**
  Removable and withdrawable circuit-breaker solutions meeting the highest demands on personnel safety and reliability. LSC2A and LSC2B and the latest generation of protection, monitoring and control solutions are available.

12. Applications



Industrial

Customer needs
Industrial customers require a stable and non-fluctuating power supply without outages. UniSec specifically meets the following customer requirements:
- A reliable solution
- A wide range of functional units that are easy to upgrade
- Safe and easy for operators.

Industrial switchgear solutions
UniSec offers industrial customers:
- A proven design
- A wide portfolio that enables the configuration of a solution that is the best fit for the required application
- Easy to operate and to maintain.

Other applications

Infrastructures
Installation reliability is a key factor in guaranteeing performance and safety.

Metering
Due to demand of deregulation and liberalization of the electricity market, UniSec has standard solutions for measurement applications.

Generators
Typical generator applications are emergency power supplies such as hospitals, airports, shopping centres, back-up power for greenhouses where reliability is absolutely crucial.

Contact us

Your sales contact: www.abb.com/contacts
More product information: www.abb.com/productguide

1VFM200003 – Rev. G, en – 2011.07 (Product catalogue) (mt)

Power and productivity
for a better world™