Medium voltage products

UniMix
Medium voltage air-insulated switchgear

Power and productivity
for a better world™

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1. General characteristics

General

UniMix medium voltage switchgear for indoor use is constructed by placing standardised units side by side in a coordinated way.
Construction and testing are carried out entirely in the factory.
UniMix switchgear is preset for the following apparatus:

- VD4 type vacuum circuit-breakers
- HD4 type gas circuit-breakers
- SHS2 type switch-disconnectors and isolators in gas.

Versions available

UniMix switchgear is available in the following versions:

- standard(*)
- arc proof according to the IEC 62271-200 Standards in the following two versions:
  - arc proof on the four sides: IAC AFLR
  - arc proof only on the front: IAC AF(**) (up to 12.5 kA for 1s).

Fields of application

UniMix switchgear is used in medium voltage secondary power distribution.
In particular, it can be used for transformer substations and for control and protection of feeders and power transformers.

Compliance with Standards

UniMix switchgear complies with the following Standards:

- IEC 62271-200
- EN 62271-200.

In particular, with reference to the new classifications introduced by the standards, UniMix switchgear is defined as follows:

- classification of service continuity: LSC2A
- classification of the partitions: PM (Partitions Metallic) for units with switch-disconnector
- classification of arc proofing (on request): IAC AFLR (or simplified version IAC AF).

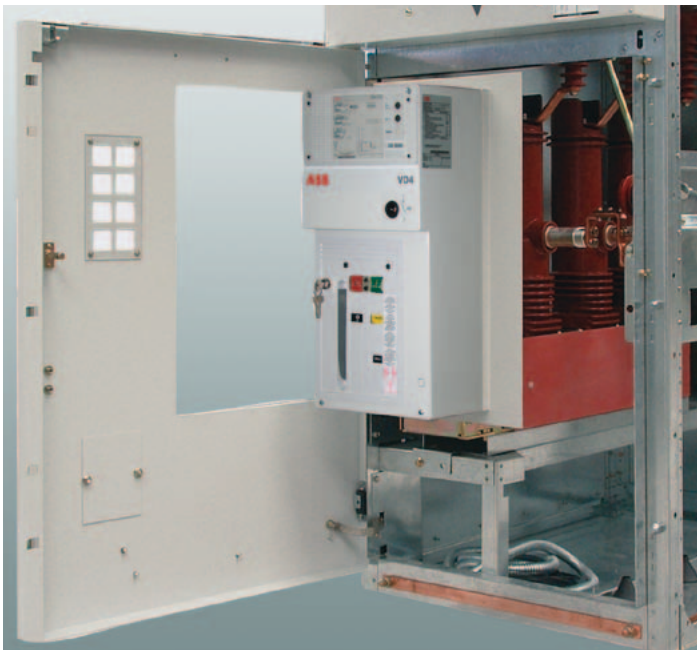
Normal service conditions

The rated service characteristics are guaranteed under the following limit conditions:

– Minimum ambient temperature	– 5 °C
– Maximum ambient temperature	+ 40 °C
– Maximum relative humidity without condensation	95%
– Altitude	≤ 1.000 m s.l.m.

N.B. For operation under other conditions, please consult us.

(*) No IAC version: WARNING! Do not enter the switchgear room during service.
(**) WARNING! Do not access the side part or rear of the switchgear when in service.



1. General characteristics

Protection against internal arc

UniMix switchgear in the arc proof version guarantees maximum personnel safety even when an internal arc takes place inside the unit.
The switchgear is built to resist the overpressures caused by the internal arc and special ducts convey the gases produced by the arc towards the outside of the switchgear.

Main characteristics

UniMix switchgear is characterised by:

- personnel safety is guaranteed by:
  - metallic segregation and earthing between the compartments guaranteed by the stainless steel housing of the switch-disconnector/isolator (PM Partitions Metallic classification)
  - live parts of the switch-disconnector insulated in gas and therefore not affected by the external environment
  - insulating parts with large exhaust escape routes to guarantee insulation even in rooms with a high degree of pollution
  - earthing of both the structure and components
- possibility of wall mounting
- segregation between the busbar, switch-disconnector and feeder compartment
- possibility of constructing many different solutions and simple extension of switchgear already installed
- easily accessible apparatus controls.

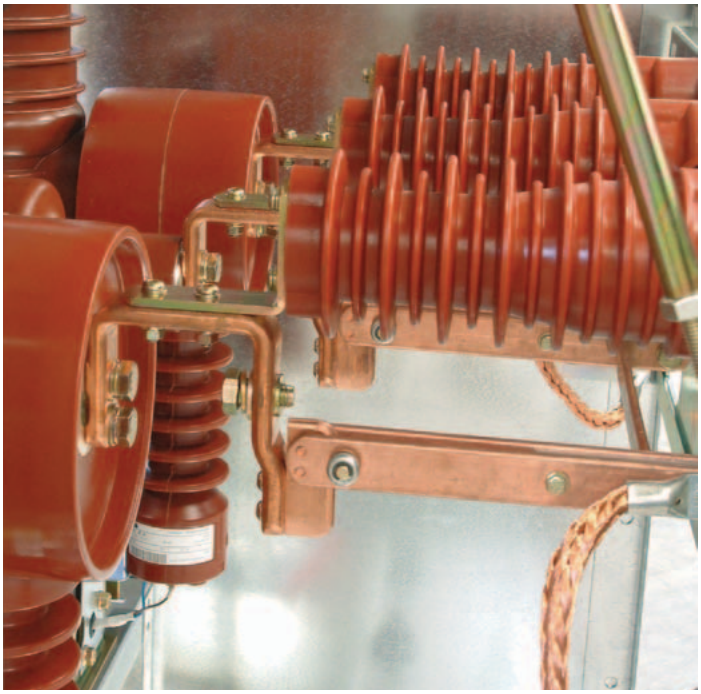
On request, the UniMix switchgear can be fitted with a REF542*plus* microprocessor unit.
This unit combines all the protection, control, measurement, etc. functions usually entrusted to several devices in a single piece of apparatus.
The REF542*plus* unit also makes it possible to dialogue with the installation control and automation systems, allowing plant data acquisition and processing.

Surface treatment

The UniMix units are made of pre-galvanized sheet. The doors of the front panels are painted grey RAL 7035. The surface appearance is semi-gloss.
On request, the sides are available painted RAL 7035.

Degrees of protection

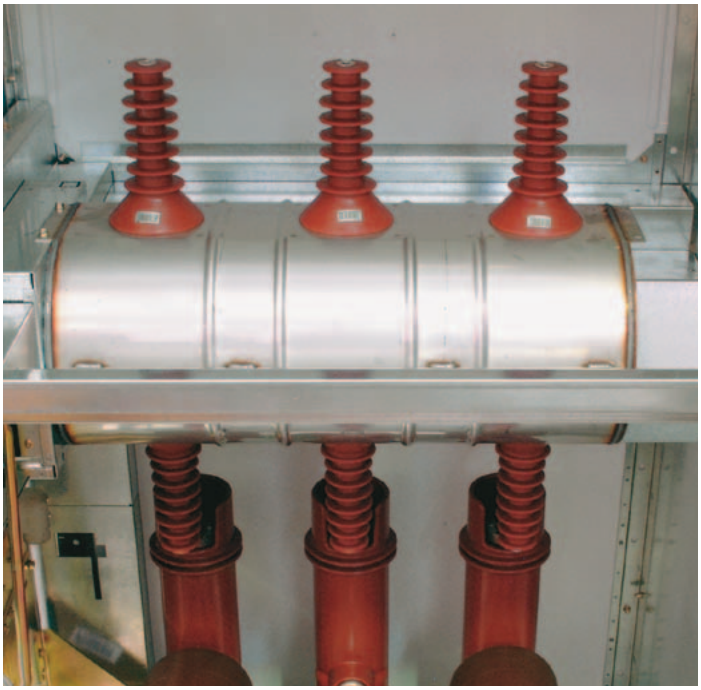
- IP2X inside the switchgear
- IP3X on the external housing (operation seats excluded)
- IP2XC on operation seats.



Technical documentation

To obtain in-depth information about technical and application aspects of the apparatus used in UniMix switchgear, please ask for the following publications:

- VD4/R circuit-breakers Cat. 1VCP000037
- HD4/R circuit-breakers Cat. 1VCP000028
- VD4/US circuit-breakers Cat. 1VCP000002
- HD4/US circuit-breakers Cat. 1VCP000004
- SHS2 switching and isolation apparatus Cat. 1VCP000046
- PR512 protection device Cat. 1VCP000055
- REF542*plus* unit Cat. 1VTA100001



1. General characteristics

Electrical characteristics of the switchgear

Rated voltage	kV	12	17.5	24
Test 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 main busbar current[1]	A		400/630/800/1250	
Rated normal current[1]				
• circuit-breakers	A	630 -1250	630 -1250	630 -1250
• switch-disconnectors	A	400/630	400/630	400/630
• isolators	A	400/630	400/630	400/630
Rated short-time withstand current	kA (1s)		12.5 - 16 - 20 - 25	
	kA (3s)		12.5 - 16 - 20	
Peak current	kA		31.5 - 40 -50 - 63	
Internal arc withstand current				
Unit width				
• 500 - 750 mm	kA x 0.5 s		12.5 - 16 - 20	
• 500 - 750 mm	kA x 1 s		12.5 - 16	
• 375 mm	kA x 0.5 s		12.5 - 16	
• 375 mm	kA x 1 s		12.5 - 16[2]	

[1] The values indicated are valid for a maximum ambient temperature of 40°C. For higher temperatures, please contact us.
[2] Only for intermediate units.

Apparatus to adapt to the CEI 0-16 Standard

To comply with the new dictates of the CEI 0-16 edition II, July 2008 Standard, the new REF601 series of protection relays and the REF542*plus* protection unit are available.

Quality Assurance system

Complies with ISO 9001 Standards, certified by an independent organisation.

Environmental Management System

Complies with ISO 14001 Standards, certified by an independent organisation.

Health and Safety Management System

Complies with OHSAS 18001 Standards, certified by an independent organisation.

Test laboratory

Complies with UNI CEI EN ISO/IEC 17025 Standards, certified by an independent organisation.

2. Typical units

Compartments

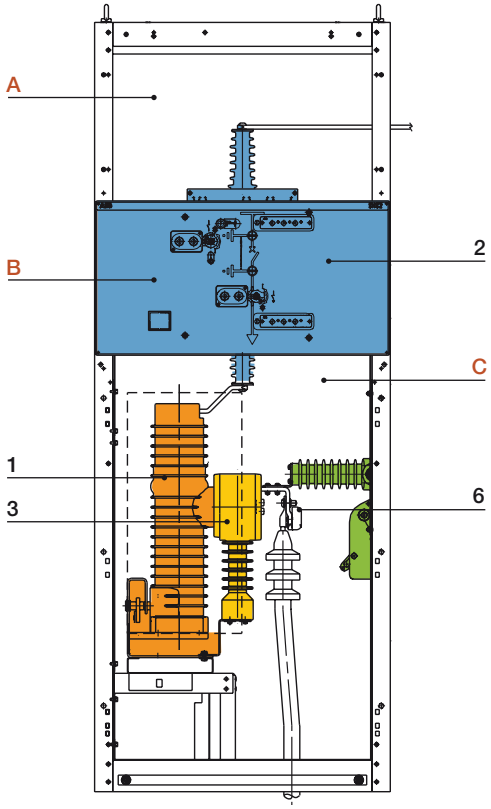
The structure of each unit is made entirely using pre-galvanized metal sheets.
Each unit consists of several compartments with metal segregations between them.
Each unit is preset with special holes for fixing to the floor and is provided with back closure fitted with special openings for medium voltage cable passage.
All the units fitted with a door have a mechanical interlock which only allows door opening under safe conditions.
If the low voltage compartment (control auxiliaries) is not provided, the busbar compartment can be reached from the roof and also from the front as well, by dismantling the special metallic cover.
There is a special metal wiring duct in each unit to segregate the low voltage circuits from the medium voltage circuits.
A box for incoming cables from above - only for standard versions up to 630 A - can e requested to complete the basic product.

Busbar compartment (A)

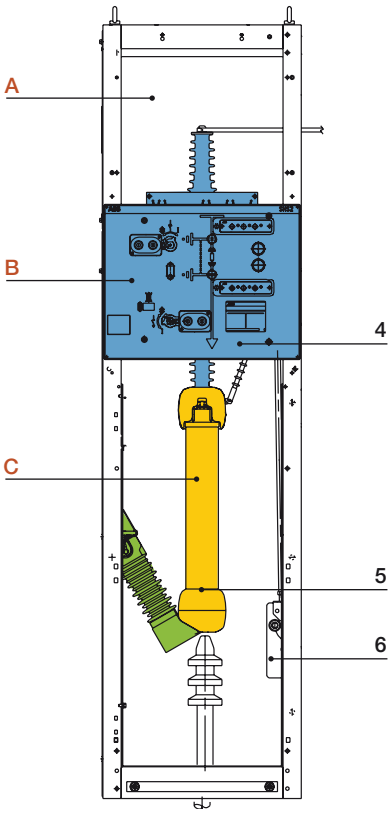
This contains the main busbar system. The busbars, made of electrolytic copper, are fixed to the terminals of the insulation isolator or of the switch-disconnector. Insulation is guaranteed in air.
Three busbar current transformers or, alternatively, three busbar voltage transformers, can be applied in the busbar compartment of 500 mm wide units.
In the former case, with the CTs, the switchgear must be made up of at least three panels, and in the latter case, with the VTs, by at least two panels.

Isolator switch-disconnector compartment (B)

This contains the live parts of the isolator or switch-disconnector and is metallically segregated from the busbar compartment and from the feed compartment by means of the stainless steel housing of the isolator or switch-disconnector itself.



Circuit-breaker unit with side operating mechanism



Unit with switch-disconnector and fuses

A	Busbar compartment
B	Isolator, switch-disconnector compartment
C	Feeder compartment
1	Circuit-breaker
2	Isolator
3	Current sensors
4	Switch-disconnector
5	Fuses
6	Earthing switch

2. Typical units

This metallic segregation (classification PM - Partition Metallic according to the IEC 62271-200 Standard) guarantees maximum safety for personnel in the case of intervention in the feeder compartment even with the busbars supplied with power, for example to replace one or more of the fuses or to check the cables.

Feeder compartment (C)

This is normally metallically segregated from the busbar compartment by means of an insulation isolator or by a switch-disconnector.
It can contain different pieces of apparatus according to the typical unit.

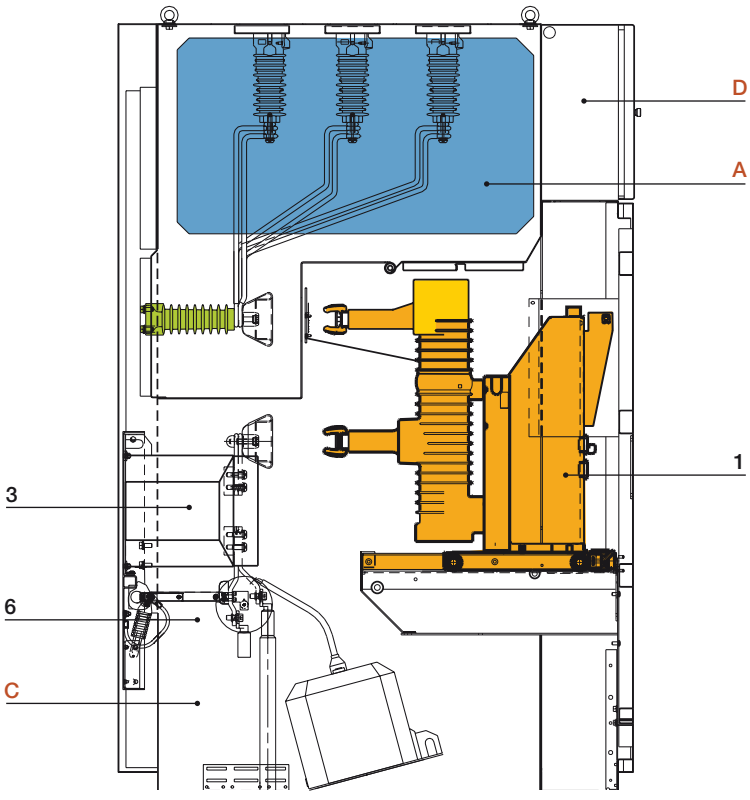
Auxiliary circuits (D)

An instrument compartment containing all the low voltage apparatus normally used can be installed in front of the busbar compartment.

For example:
- terminal boxes, wiring ducts and cables to connect the auxiliary circuits of the unit;
- auxiliary accessories of the circuit-breaker and unit (measuring instruments, protection relays, control and signalling devices, fuses, auxiliary circuit protection circuit-breakers, etc.).

Depending on the quantity of apparatus to be housed in it, the instrument compartment can be selected from two different solutions:
- 235 mm depth
- 350 mm depth.

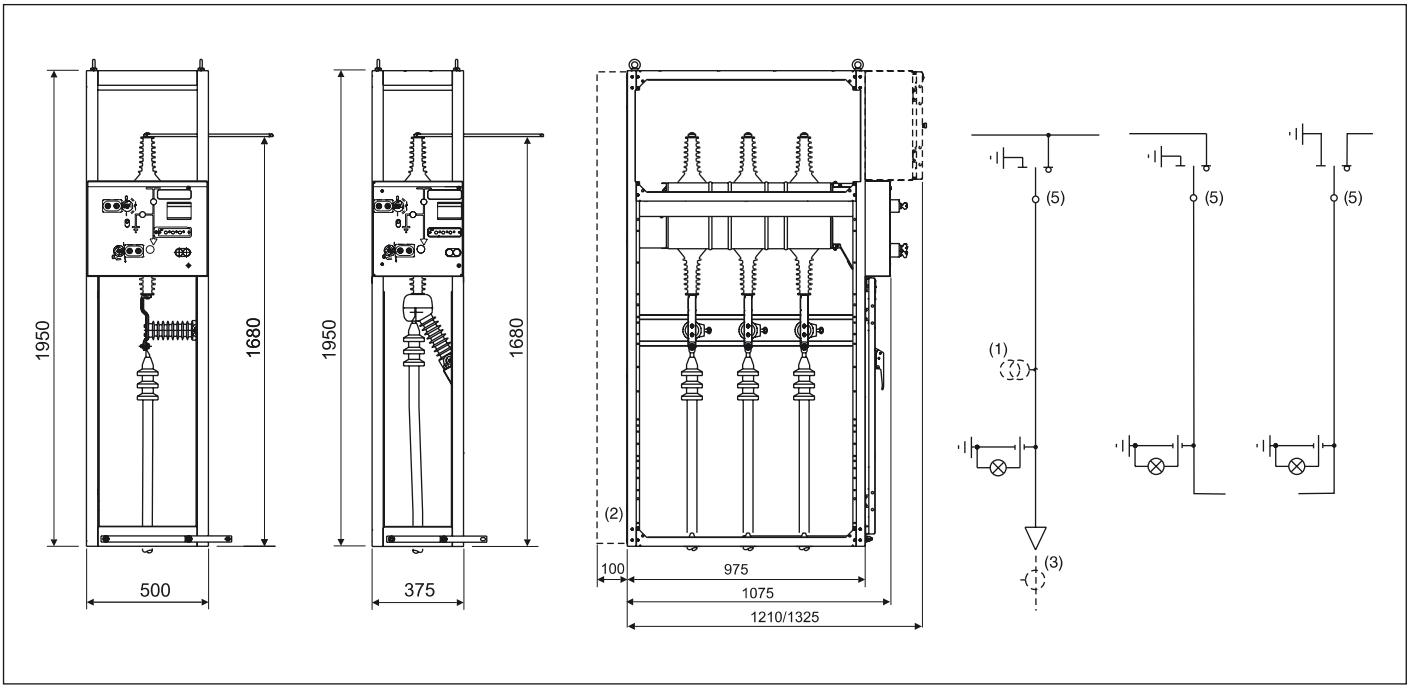
Cable passage for inter-panel connections is made by means of special holes provided in the walls of the instrument compartment itself.
On request, to complete the basic product, a top wiring duct for incoming auxiliary cables from the top.



Incoming/outgoing circuit-breaker unit with front operating mechanism

A	Busbar compartment
C	Feeder compartment
D	Auxiliary circuit compartment
1	Circuit-breaker
3	Current transformers
6	Earthing switch

P3 - Unit with switch-disconnector



Switch-disconnector(*) (5)

	Unit
SHS2/T1 - SHS2/T1M - SHS2/T2 - SHS2/T2M	500 mm
SHS2/T1/N - SHS2/T1M/N - SHS2/T2/N - SHS2/T2M/N	375 mm

(*) For a detailed description, please see the relative technical catalogue.

Types available (375 mm and 500 mm)

Ur	Ir	Ik
12-17.5-24 kV	400 A	12.5 kA
12-17.5-24 kV	400 A	16 kA
12-17.5-24 kV	400 A	20 kA
12-17.5-24 kV	400 A	25 kA
12-17.5-24 kV	630 A	16 kA
12-17.5-24 kV	630 A	20 kA
12-17.5-24 kV	630 A	25 kA

CT and VT configuration table

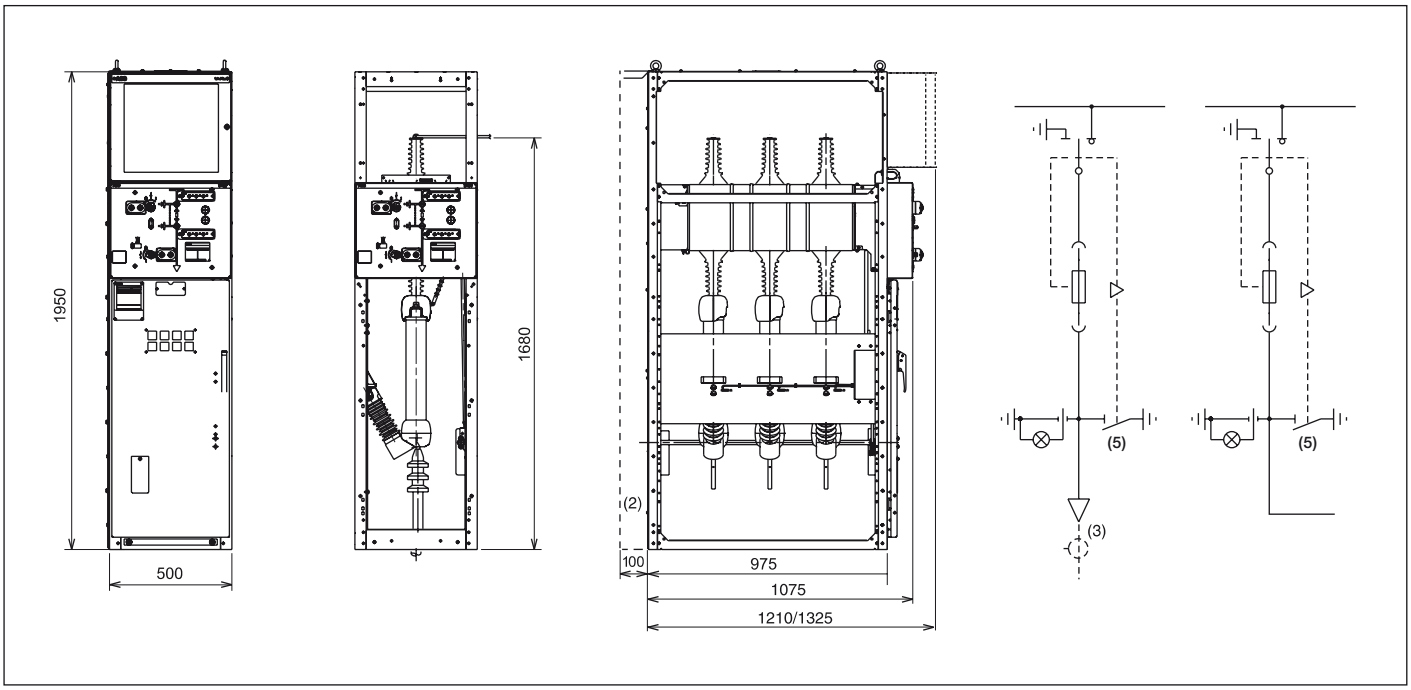
	Standard			Arc proof			Unit
Toroidal CTs(3)	■	■	■	■	■	■	500 mm
DIN VT	■	■	■	■	■	■	
DIN busbar CT(6)		■(4)			■(4)		
DIN busbar VT(6)			■			■	
Toroidal CTs		■			■		375 mm

Note

(1) See CT and VT configuration table.
(2) Ducting for gas exhaust. Only provided for unit with arc proofing on the four sides.
(3) Application of toroidal phase CTs on the medium voltage cables is made with a special support on the back of the panel.
(4) Interchangeable with DIN Combisensor.
(5) Class E1 for earthing switch.
(6) Not possible when the unit is either the first or the last one.

2. Typical units

P2 - Unit with switch-disconnector and fuses



Switch-disconnector(*)

	Unit
SHS2/T2F - SHS2/T2FM	500 mm
SHS2/T2F/N - SHS2/T2FM/N	375 mm

(*) For a detailed description, please see the relative technical catalogue.

CT and VT configuration table

	Standard				Arc proof				Unit
Toroidal CTs(3)	■	■			■	■			500 mm
DIN VT(7)			■	■			■	■	
DIN busbar CT(6)	■(4)		■		■(4)		■		
DIN busbar VT(6)		■		■		■		■	
Toroidal CTs	■				■				375 mm

Types available (375 mm and 500 mm)

Ur	Ir	Ik	IkAp(5)
12-17.5-24 kV	400 A	12.5 kA	2.5 kA
12-17.5-24 kV	400 A	16 kA	2.5 kA
12-17.5-24 kV	400 A	20 kA	2.5 kA
12-17.5-24 kV	400 A	25 kA	2.5 kA
12-17.5-24 kV	630 A	16 kA	2.5 kA
12-17.5-24 kV	630 A	20 kA	2.5 kA
12-17.5-24 kV	630 A	25 kA	2.5 kA

Note

(1) –

(2) Ducting for gas exhaust. Only provided for unit with arc proofing on the four sides.

(3) Application of toroidal phase CTs on the medium voltage cables is made with a special support on the back of the panel.

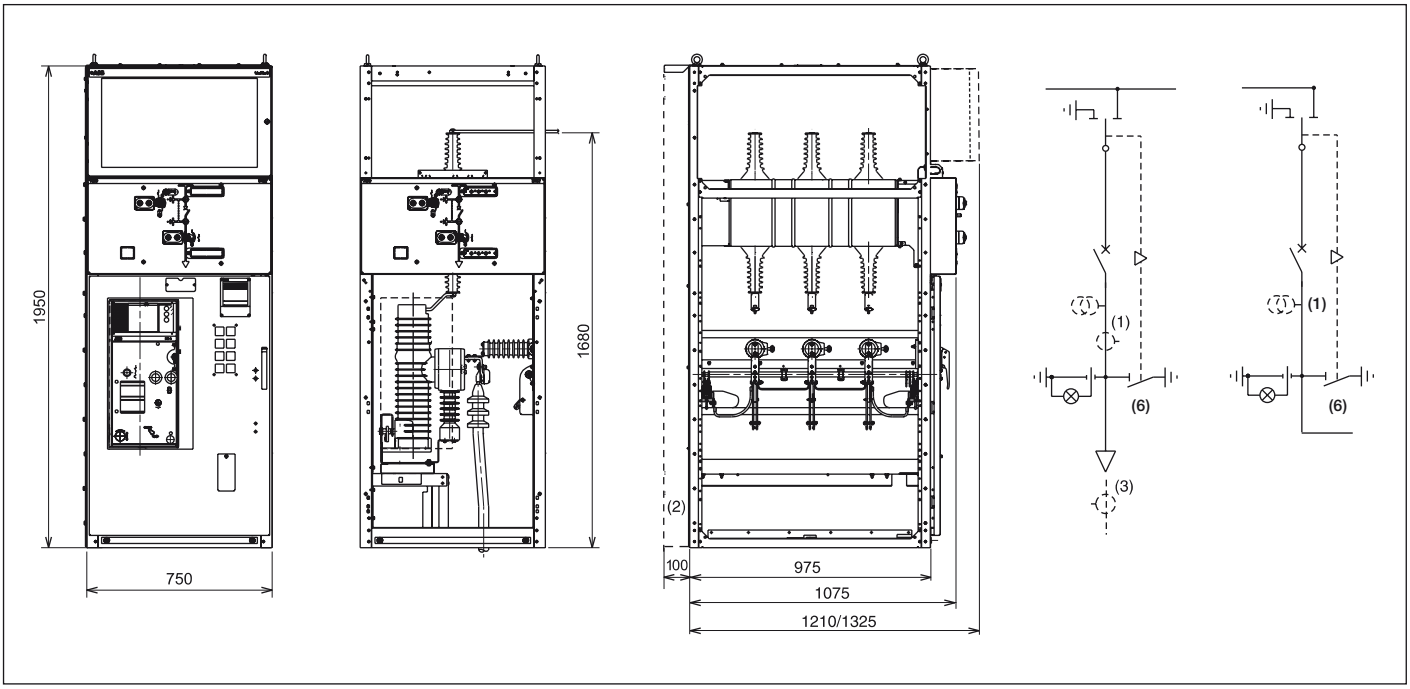
(4) Interchangeable with DIN Combisensor.

(5) Withstand current for class E1 earthing switch.

(6) Not possible when the unit is either the first or the last one.

(7) DIN VT positioned on the base plate for bus tie unit.

P1F - Unit with fixed circuit-breaker with right-hand side operating mechanism



Isolator(*)

SHS2/IB

(*) For a detailed description, please see the relative technical catalogue.

Types available

Ur	Ir	Ik	IkAp
12-17.5-24 kV	400 A	12.5 kA	31.5 kA
12-17.5-24 kV	400 A	16 kA	40 kA
12-17.5-24 kV	400 A	20 kA	50 kA
12-17.5-24 kV	400 A	25 kA	63 kA
12-17.5-24 kV	630 A	16 kA	40 kA
12-17.5-24 kV	630 A	20 kA	50 kA
12-17.5-24 kV	630 A	25 kA	63 kA

Circuit-breaker(*)

VD4/UniMix F - VD4/UniMix R(7)

HD4/UniMix F - HD4/UniMix R(7)

(*) For a detailed description, please see the relative technical catalogue.

Types available

Ur	Ir	Ik
12 kV	... 630 A	... 25 kA
17.5-24 kV	... 630 A	... 20 kA (*)

(*) Tested in switchgear at 25 kA x 1 s, 20 kA x 3 s.

CT and VT configuration table

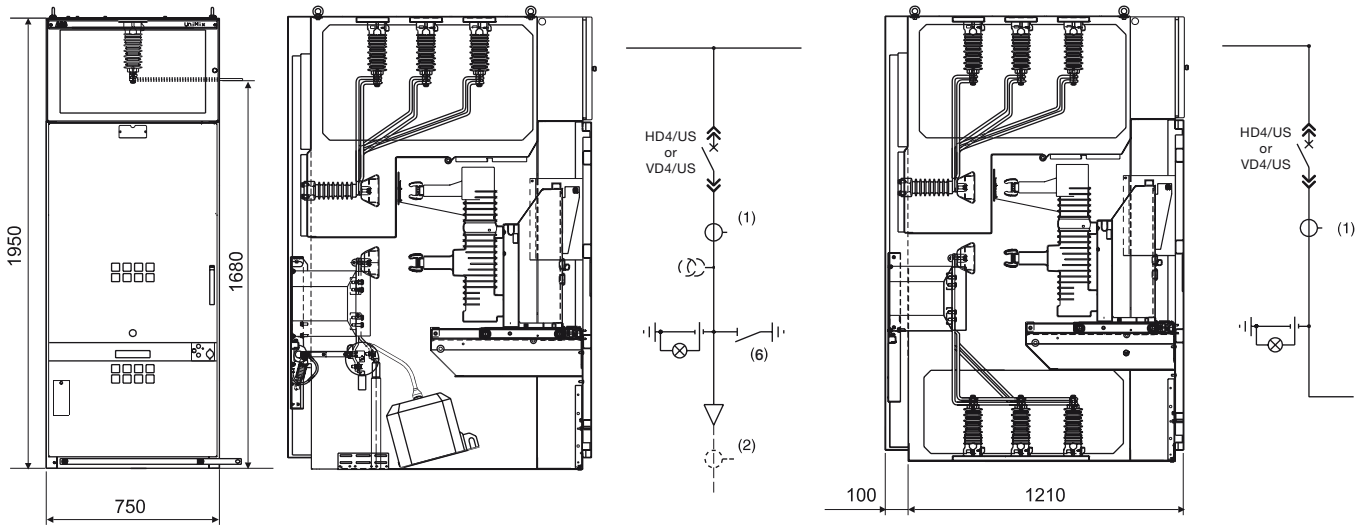
	Standard			Arc proof			Unit
Toroidal CTs(3)	■	■	■	■		■	750 mm
DIN VT	■			■			
DIN CT		■(4)			■(4)		
On-board circuit-breaker current sensors			■			■	

Notes

(1) See CT and VT configuration table.
(2) Ducting for gas exhaust. Only provided for unit with arc proofing on the four sides.
(3) Application of toroidal phase CTs on the medium voltage cables is made with a special support on the back of the panel.
(4) Interchangeable with DIN Combisensor.
(5) DIN VTs or current sensors on-board the circuit-breaker can be installed for the bus tie unit.
(6) Class E1 for earthing switch.
(7) With wheel kit and connector.

2. Typical units

P1E - Unit with withdrawable circuit-breaker with front operating mechanism[5]



Incoming/outgoing unit

Bus-tie unit

Circuit-breaker[*]

VD4/US - HD4/US

[*] For a detailed description, please see the VD4 - HD4 technical catalogue.

Types available

Ur	Ir	Ik	IkAp
12-17.5-24 kV	400 A	12.5 kA	31.5 kA
12-17.5-24 kV	400 A	16 kA	40 kA
12-17.5-24 kV	400 A	20 kA	50 kA
12-17.5-24 kV	400 A	25 kA	63 kA
12-17.5-24 kV	630 A	12.5 kA	31.5 kA
12-17.5-24 kV	630 A	16 kA	40 kA
12-17.5-24 kV	630 A	20 kA	50 kA
12-17.5-24 kV	630 A	25 kA	63 kA
12-17.5-24 kV	1250 A	12.5 kA	31.5 kA
12-17.5-24 kV	1250 A	16 kA	40 kA
12-17.5-24 kV	1250 A	20 kA	50 kA
12-17.5-24 kV	1250 A	25 kA	63 kA

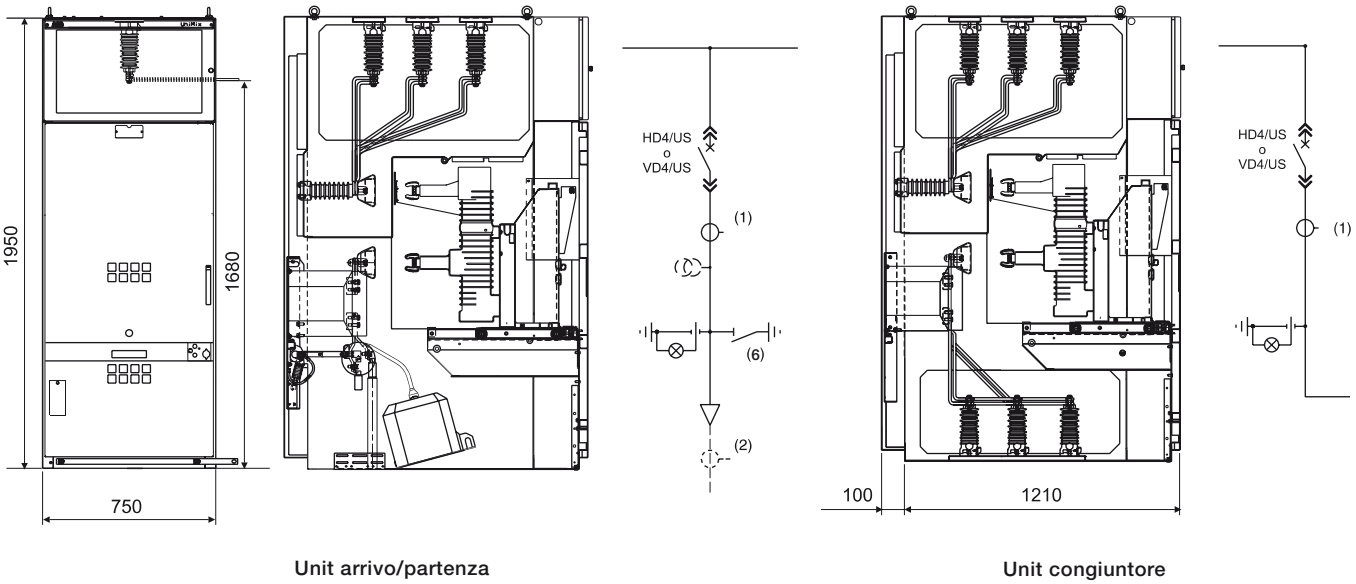
CT and VT configuration table

	Standard	Arc proof	Unit
Toroidal CTs[2]	■	■	750 mm
DIN VT	■	■	
DIN CT	■[3]	■[3]	

Notes

[1] See CT and VT configuration table.
[2] Application of toroidal phase CTs on the medium voltage cables is made with a special support on the back of the panel.
[3] Interchangeable with DIN Combisensor.
[4] For the bus-tie unit, it is not possible to install DIN VT.
[5] Arc proof version 20 kA x 0.5 s on the four sides, not available.
[6] Class E1 for earthing switch.

WCB, WSB - Unit with withdrawable circuit-breaker with front operating mechanism[5] - LSC2B/PI[7]



Unit arrivo/partenza

Unit congiuntore

Circuit-breaker[*]

VD4/US - HD4/US

[*] For a detailed description, please see the relative technical catalogue.

Types available

Ur	Ir	Ik	IkAp
12-17.5-24 kV	400 A	12.5 kA	31.5 kA
12-17.5-24 kV	400 A	16 kA	40 kA
12-17.5-24 kV	400 A	20 kA	50 kA
12-17.5-24 kV	400 A	25 kA	63 kA
12-17.5-24 kV	630 A	12.5 kA	31.5 kA
12-17.5-24 kV	630 A	16 kA	40 kA
12-17.5-24 kV	630 A	20 kA	50 kA
12-17.5-24 kV	630 A	25 kA	63 kA
12-17.5-24 kV	1250 A	12.5 kA	31.5 kA
12-17.5-24 kV	1250 A	16 kA	40 kA
12-17.5-24 kV	1250 A	20 kA	50 kA
12-17.5-24 kV	1250 A	25 kA	63 kA

CT and VT configuration table

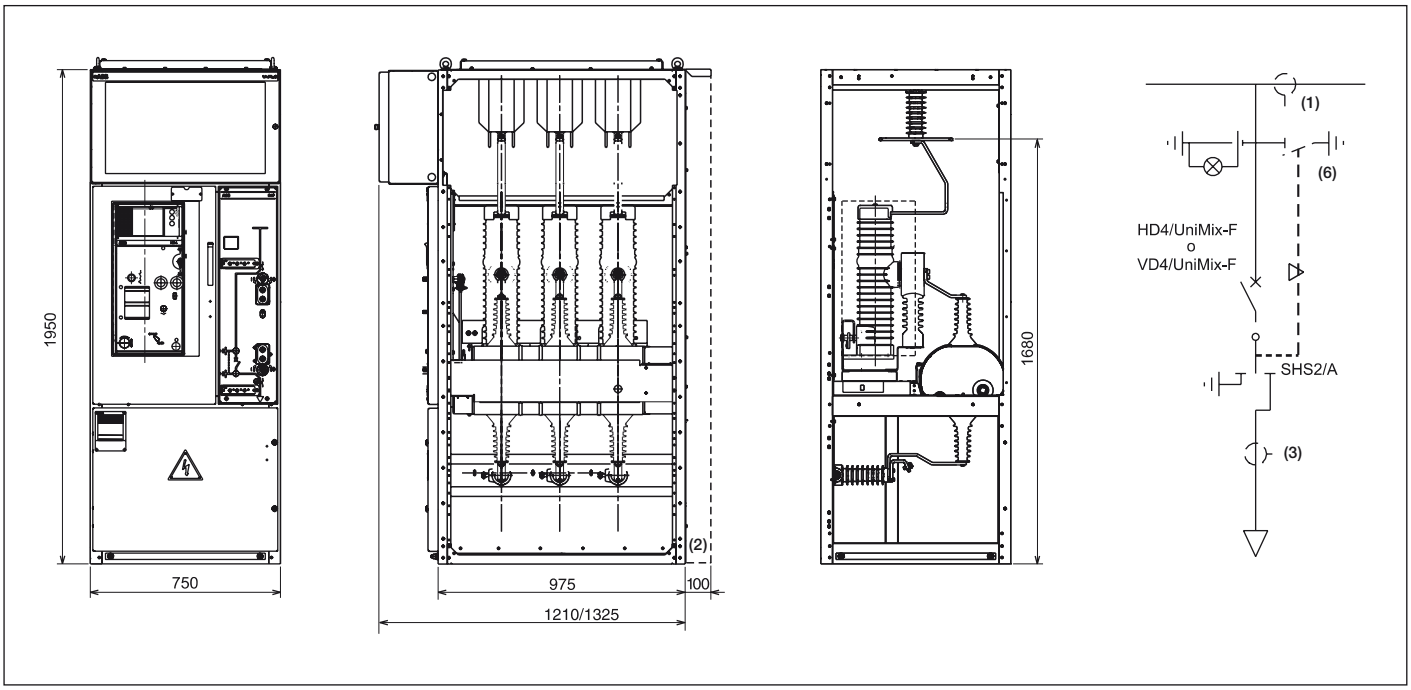
	Standard	Arc proof	Unit
Toroidal CTs[2]	■	■	750 mm
DIN busbar VT	■	■	
DIN busbar CT	■[3]	■[3]	

Notes

[1] See CT and VT configuration table.
[2] Application of toroidal phase CTs on the medium voltage cables is made with a special support on the back of the panel.
[3] Interchangeable with DIN Combisensor.
[4] For the bus-tie unit, it is not possible to install DIN VT.
[5] Arc proof version 20 kA x 0.5 s on the four sides, not available.
[6] Class E1 for earthing switch.
[7] LSC2B (Loss of Service Continuity): possibility of accessing the circuit-breaker compartment during ordinary maintenance without putting the following out of service:
1. the cable compartment
2. the busbars and adjacent functional units.
PI (Partition made of Insulating material), mechanical and electrical segregation of the cable compartment, busbar compartment and circuit-breaker compartment by means of insulating shutters.

2. Typical units

P1A - Incoming circuit-breaker unit upside-down(5)



Isolator(*)

SHS2/A

(*) For a detailed description, please see the relative technical catalogue.

Types available

Ur	Ir	Ik
12-17.5-24 kV	400 A	12.5 kA
12-17.5-24 kV	400 A	16 kA
12-17.5-24 kV	630 A	16 kA

Circuit-breaker(*)

VD4/UniMix F - VD4/UniMix R(7)
HD4/UniMix F - HD4/UniMix R(7)

(*) For a detailed description, please see the relative technical catalogue.

Types available

Ur	Ir	Ik
12 kV	... 630 A	... 25 kA
17.5-24 kV	... 630 A	... 20 kA

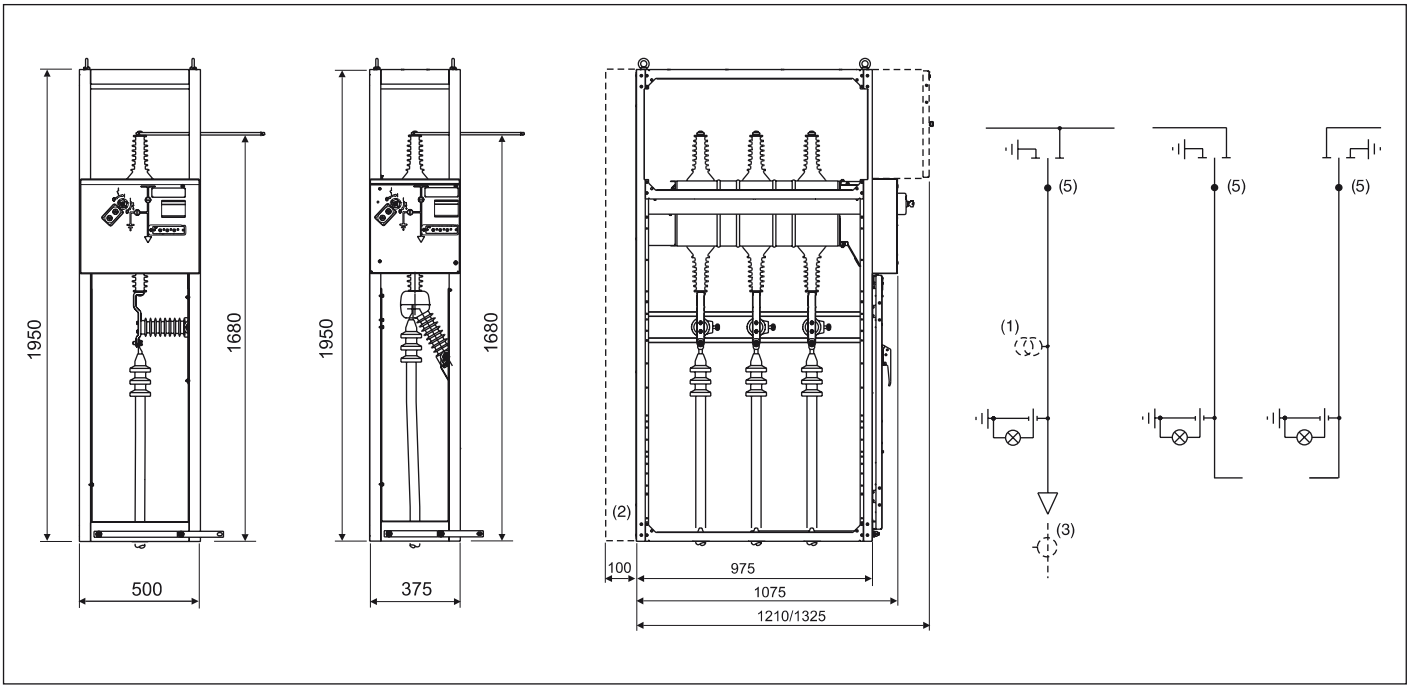
CT and VT configuration table

	Standard		Arc proof		Unit
Toroidal CTs(3)	■	■	■	■	750 mm
DIN busbar CT	■(4)		■(4)		
On-board circuit-breaker current sensors		■		■	

Notes

(1) See CT and VT configuration table.
(2) Ducting for gas exhaust. Only provided for unit with arc proofing on the four sides.
(3) Application of toroidal phase CTs on the medium voltage cables is made with a special support on the back of the panel.
(4) Interchangeable with DIN Combisensor.
(5) Arc proof version on the front, not available.
(6) Class E0 for earthing switch.
(7) With wheel kit and connector.

ASR - Unit with isolator



Isolator(*) (5)

	Unit
SHS2/I	500 mm
SHS2/I/N	375 mm

(*) For a detailed description, please see the relative technical catalogue.

Types available (375 mm and 500 mm)

Ur	Ir	Ik
12-17.5-24 kV	400 A	12.5 kA
12-17.5-24 kV	400 A	16 kA
12-17.5-24 kV	400 A	20 kA
12-17.5-24 kV	400 A	25 kA
12-17.5-24 kV	630 A	16 kA
12-17.5-24 kV	630 A	20 kA
12-17.5-24 kV	630 A	25 kA

CT and VT configuration table

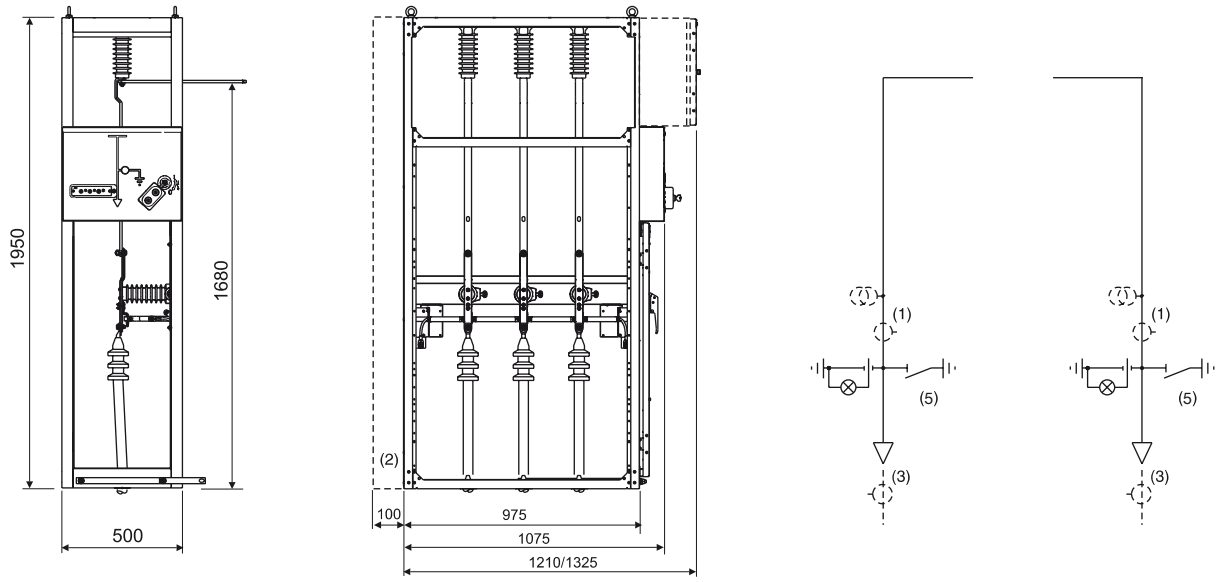
	Standard			Arc proof			Unit
Toroidal CTs(3)	■	■	■	■	■	■	500 mm
DIN VT	■	■	■	■	■	■	500 mm
DIN busbar CT(6)			■(4)			■(4)	500 mm
DIN busbar VT(6)		■			■		500 mm
Toroidal CTs(3)		■			■		375 mm

Notes

(1) See CT and VT configuration table.
(2) Ducting for gas exhaust. Only provided for unit with arc proofing on the four sides.
(3) Application of toroidal phase CTs on the medium voltage cables is made with a special support on the back of the panel.
(4) Interchangeable with DIN Combisensor.
(5) Class E0 for earthing switch.
(6) Not possible when the unit is either the first or the last one.

2. Typical units

A - Unit with earthing switch



Earthing switch(*)(5)

SHS2/ES

(*) For a detailed description, please see the relative technical catalogue.

Types available (500 mm)

Ur	Ir	Ik
12-17.5-24 kV	400 A	12.5 kA
12-17.5-24 kV	400 A	16 kA
12-17.5-24 kV	630 A	16 kA
12-17.5-24 kV	630 A	20 kA
12-17.5-24 kV	630 A	25 kA
12-17.5-24 kV	800/1250 A	20 kA
12-17.5-24 kV	800/1250 A	25 kA

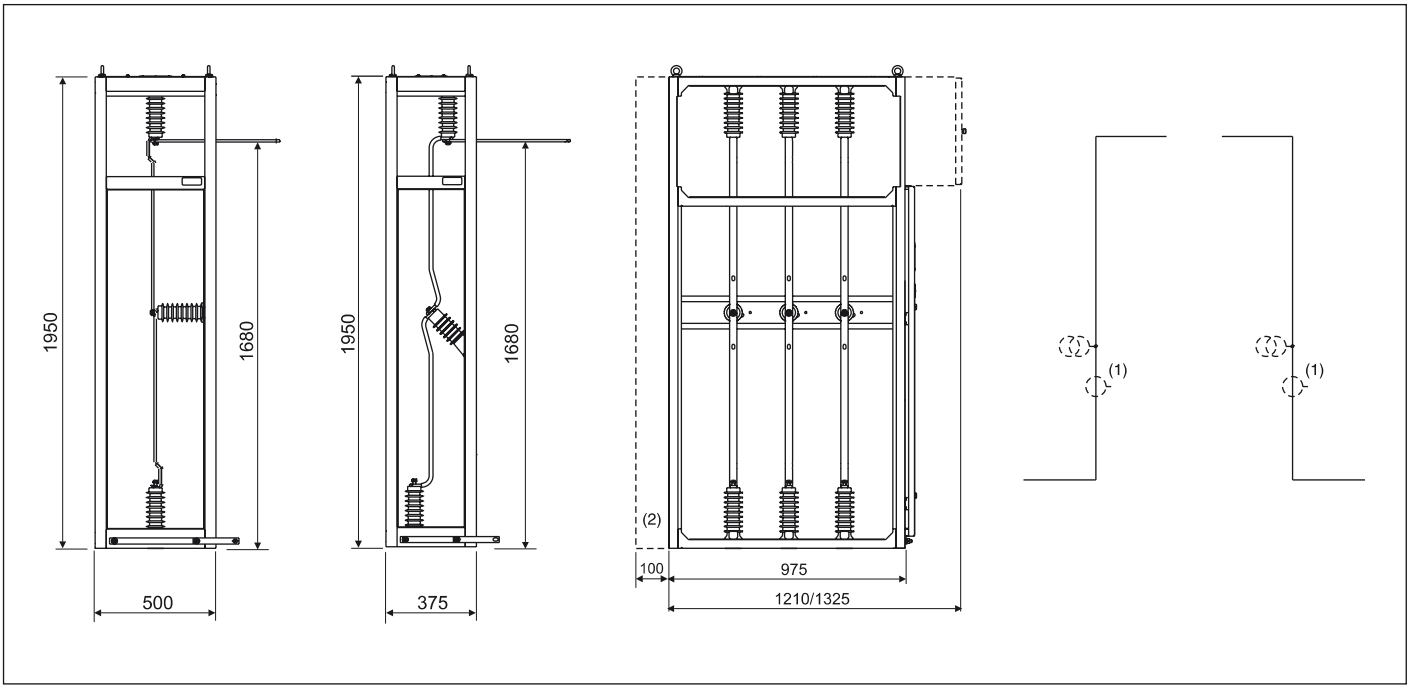
CT and VT configuration table

	Standard		Arc proof		Unit
Toroidal CTs(3)	■	■	■	■	500 mm
DIN VT	■	■	■	■	
DIN CT		■(4)		■(4)	

Notes

(1) See CT and VT configuration table.
(2) Ducting for gas exhaust. Only provided for unit with arc proofing on the four sides.
(3) Application of toroidal phase CTs on the medium voltage cables is made with a special support on the back of the panel.
(4) Interchangeable with DIN Combisensor.
(5) Class E1 for earthing switch.

R - Riser unit



Types available (375 mm and 500 mm)

Ur	Ir	Ik
12-17.5-24 kV	400 A	12.5 kA
12-17.5-24 kV	400 A	16 kA
12-17.5-24 kV	400 A	20 kA
12-17.5-24 kV	400 A	25 kA
12-17.5-24 kV	630 A	16 kA
12-17.5-24 kV	630 A	20 kA
12-17.5-24 kV	630 A	25 kA
12-17.5-24 kV	800-1250 A(*)	20 kA
12-17.5-24 kV	800-1250 A(*)	25 kA

(*) Only for units 500 mm wide.

CT and VT configuration table

	Standard	Arc proof	Unit
Toroidal CTs	–	–	500 mm
DIN VT	■	■	
DIN CT	■	■	

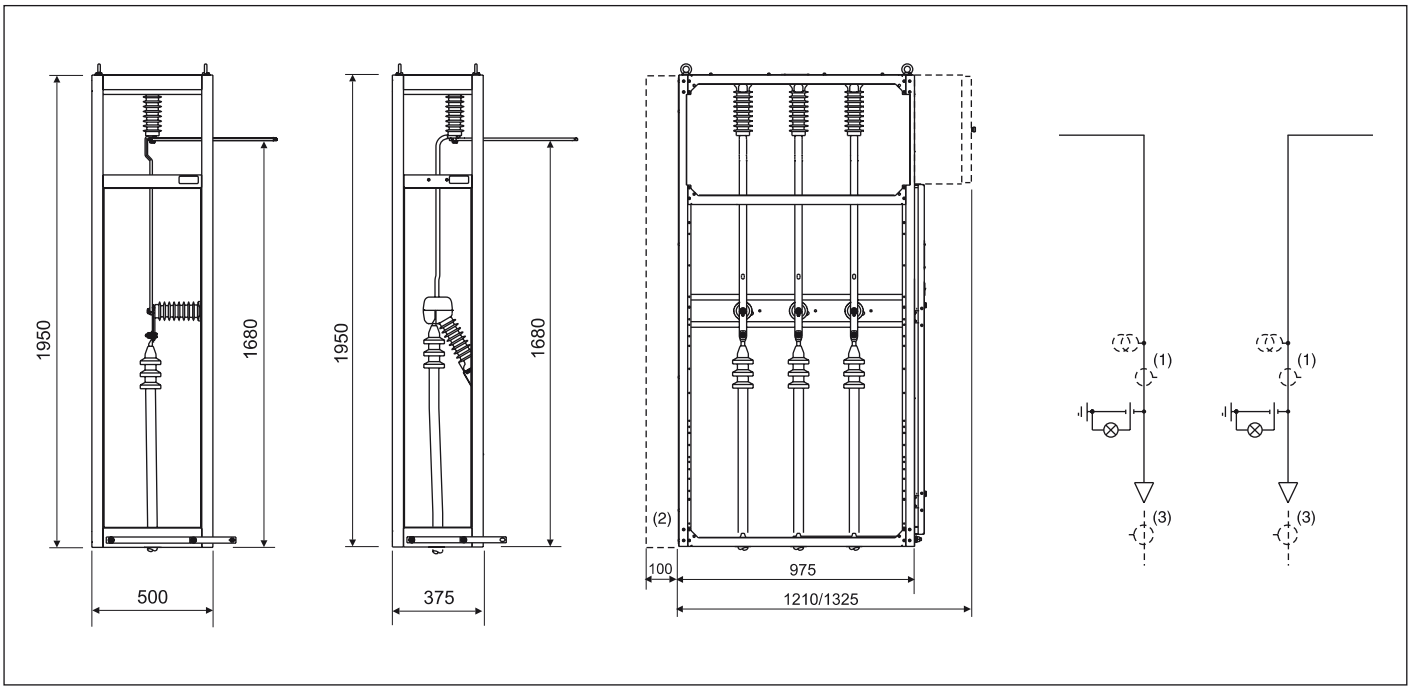
Notes

(1) See CT and VT configuration table.

(2) Ducting for gas exhaust. Only provided for unit with arc proofing on the four sides.

2. Typical units

Rac - Incoming cable unit



Types available (375 mm and 500 mm)

Ur	Ir	Ik
12-17.5-24 kV	400 A	12.5 kA
12-17.5-24 kV	400 A	16 kA
12-17.5-24 kV	400 A	20 kA
12-17.5-24 kV	400 A	25 kA
12-17.5-24 kV	630 A	16 kA
12-17.5-24 kV	630 A	20 kA
12-17.5-24 kV	630 A	25 kA
12-17.5-24 kV	800/1250 A(*)	20 kA
12-17.5-24 kV	800/1250 A(*)	25 kA

(*) Only for units 500 mm wide.

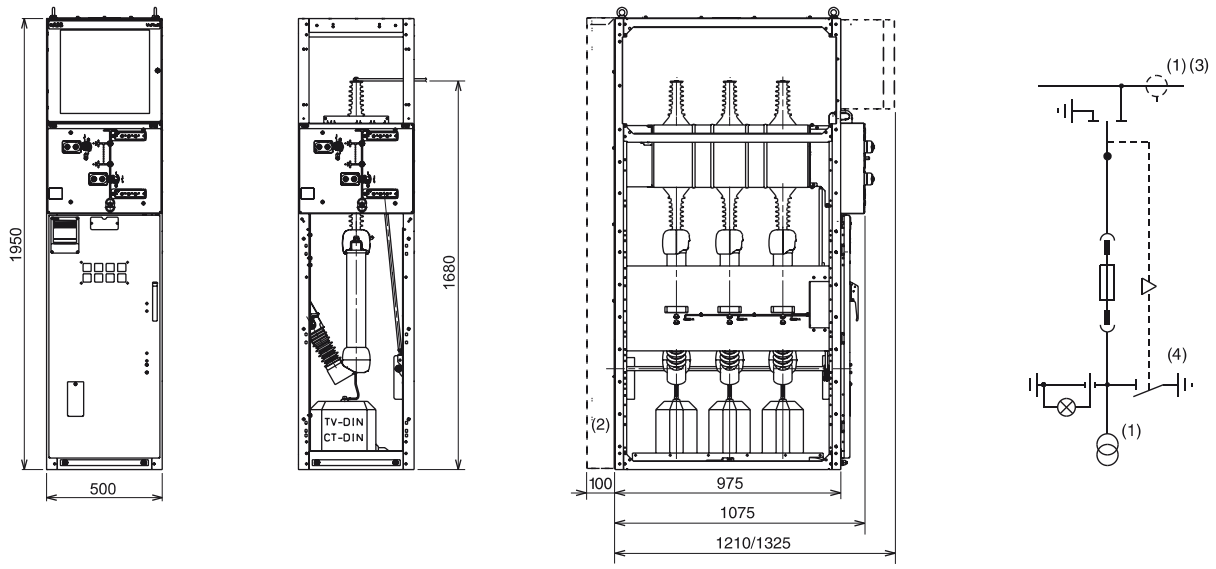
CT and VT configuration table

	Standard	Arc proof	Unit
Toroidal CTs[3]	■	■	500 mm
DIN VT	■	■	
DIN CT	■[4]	■[4]	
Toroidal CTs[3]	■	■	375 mm

Notes

[1] See CT and VT configuration table.
[2] Ducting for gas exhaust. Only provided for unit with arc proofing on the four sides.
[3] Application of toroidal phase CTs on the medium voltage cables is made with a special support on the back of the panel.
[4] Interchangeable with DIN Combisensor.

M - Measurement unit



Typical earthing switch(*)

SHS2/IF

(*) For a detailed description, please see the relative technical catalogue.

CT and VT configuration table

	Standard	Arc proof	Unit
DIN VT	■	■	500 mm
DIN busbar CT	■(3) (5)	■(3) (5)	

Types available

Ur	Ir	Ik
12-17.5-24 kV	400 A	12.5 kA
12-17.5-24 kV	400 A	16 kA
12-17.5-24 kV	400 A	20 kA
12-17.5-24 kV	400 A	25 kA
12-17.5-24 kV	630 A	16 kA
12-17.5-24 kV	630 A	20 kA
12-17.5-24 kV	630 A	25 kA

Notes

(1) See CT and VT configuration table.
(2) Ducting for gas exhaust. Only provided for unit with arc proofing on the four sides.
(3) Interchangeable with DIN Combisensor.
(4) Withstand current for class E1 earthing switch.
(5) Not possible when the unit is either the first or the last one.

2. Typical units

TR - Transformer box unit

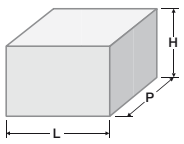
The transformer box unit is only available in the standard version: The transformer box is made of RAL 7035 painted sheet, is supplied in an assembly kit and can be fitted with internal lighting. For transformer boxes of different sizes, please contact us.

Selection of the transformer box units

After having defined the type of transformer box unit according to the total transformer losses, it is necessary to check that the transformer box unit dimensions are sufficient to ensure adequate insulation distances.

Types available

Unit	W [mm]	D [mm]	H [mm]
TR1	1600	1150	1950
TR2	2000	1150	1950
TR3	2000	1300	2250
TR4	2200	1500	2250
TR5	2200	1800	2250



Maximum operating temperature of transformer	T [°C]
No-load losses	Wo [W]
Load losses	Wcc [W]
Load factor	a
Rated current	In [A]
Total losses	Ptot. = Wo + a2 x Wcc

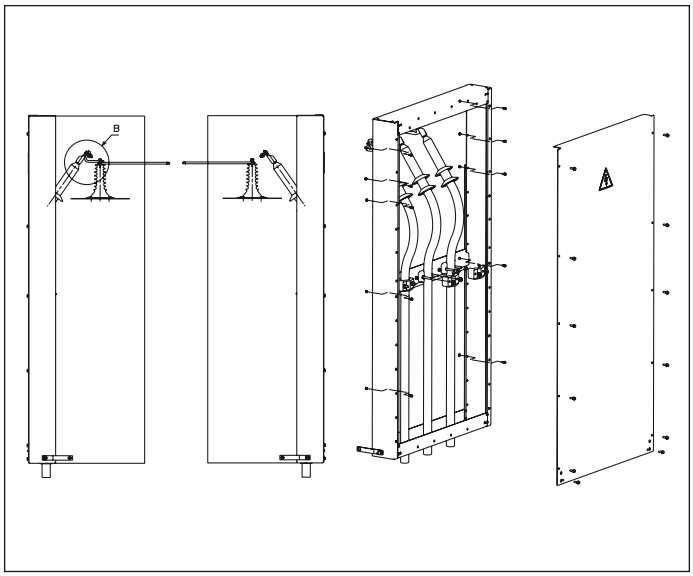
Type of box	Total losses [W]		
	T=100 °C	T=120 °C	T=140 °C
TR1	5,000	6,000	7,000
TR2	6,000	7,500	8,500
TR3	7,500	9,000	10,500
TR4	8,500	10,000	11,500
TR5	9,000	10,500	12,500

CL - Lateral cable riser unit

The lateral cable riser unit is available both in the standard version and in the arc proof version.

Types available

Unit	W [mm]	D [mm]	H [mm]
Left lateral cable riser	150	975	1950
Right lateral cable riser	150	975	1950



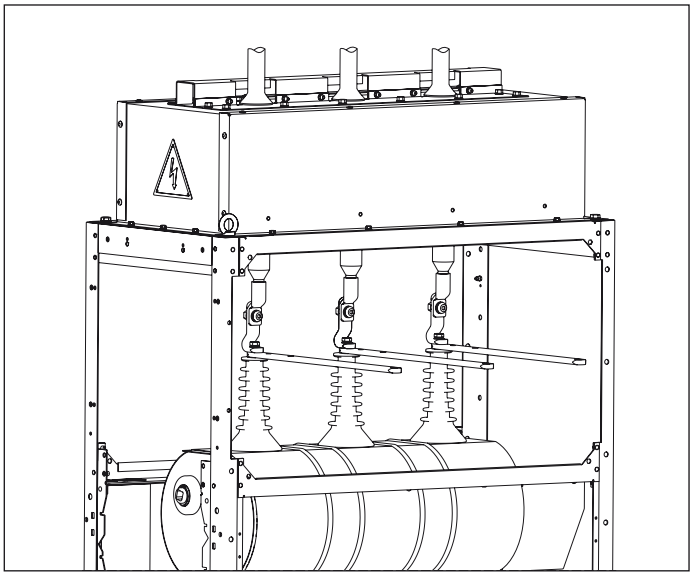
AC - Unit for incoming cables from above

The unit for incoming cables from above is available both in the standard version and in the arc proof version.

Types available

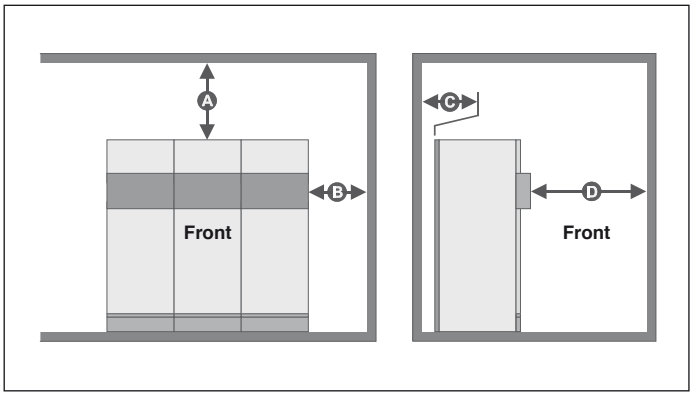
Unit	W [mm]	D [mm]	H [mm]
AC1 (1)	375	975	300
AC2	500	975	300
AC3	750	975	300

(1) Version unavailable for end panels with 24 kV insulation voltage



Installation room

The installation room must be prepared according to the switchgear dimensions and version.
Observance of the distances indicated guarantees correct operation of the apparatus.
For installation conditions other than those indicated, please consult us.
Arc proofing is guaranteed in the versions with access on all four sides and with access limited just to the front of the switchgear (in this case up to 12.5 kA for 1s).



Switchgear version	A [mm]	B [mm]	C [mm]	D [mm]
Standard	≥ 50 (3)	≥ 100 (3)	≥ 50	≥ 1550 (1)
Arc proof	≥ 600 (2)(3)	≥ 100 (3)	≥ 50	≥ 1550 (1)
Internal arc on the front	≥ 600	≥ 100	≥ 100	≥ 1550 (1)

(1) For P1F, P1/A and P1/E units, D = 1200 mm.
(2) For lower values, please consult us.
(3) When the units are complete with low voltage compartments (control auxiliaries) and the rear sheets are against the wall, distances A and B must be large enough to allow a person to pass through to carry out main busbar assembly.

Indicative weight of typical units (without instrument transformers)

Typical Unit	Weight [kg]		Weight [kg]		Weight [kg]	
Width	375 [mm]		500 [mm]		750 [mm]	
Version	Basic	A.P.	Basic	A.P.	Basic	A.P.
A	–	–	160	200	–	–
P2	190	230	205	245	–	–
P3	170	215	185	230	–	–
ASR	150	200	175	215	–	–
M	–	–	290	335	–	–
R	130	160	125	165	–	–
Rac	120	170	135	190	–	–
P1F	–	–	–	–	370	425
P1E	–	–	–	–	500	530
WCB	–	–	–	–	580	630
WSB	–	–	–	–	580	650
P1A	–	–	–	–	370	425

2. Typical units

Foundations

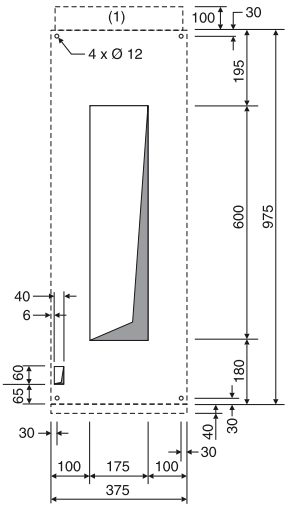
The switchgear is prepared for connection from below of both the medium voltage circuit and the auxiliary circuits.
Before installation of the switchgear, special passage holes must be made underneath each unit.
The general drawings of the foundations are given on the following pages.

Fixing to the floor

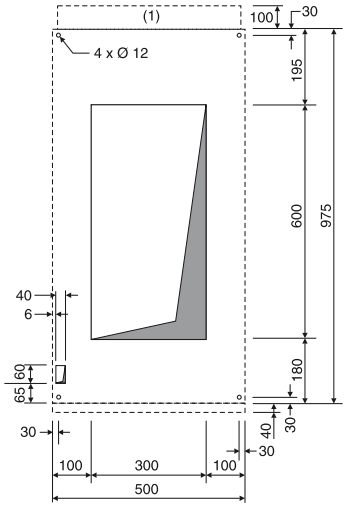
The switchgear can be fixed directly to the floor using expansion anchoring bolts in the fixing holes.
The fixing surface must be horizontal and perfectly level. The maximum acceptable planarity tolerance is 2 x 1000.

Slab drilling for fixing switchgear

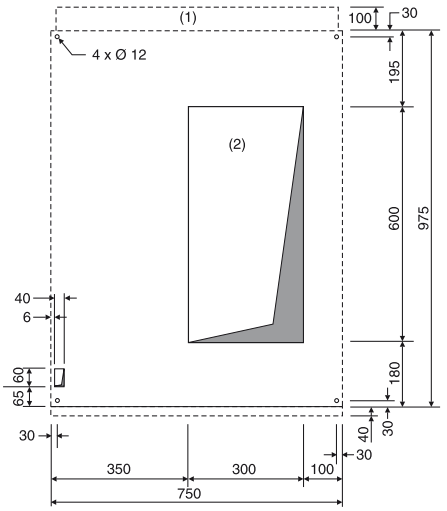
Width:	375 mm
Type:	P2 - P3 - ASR - A - Rac



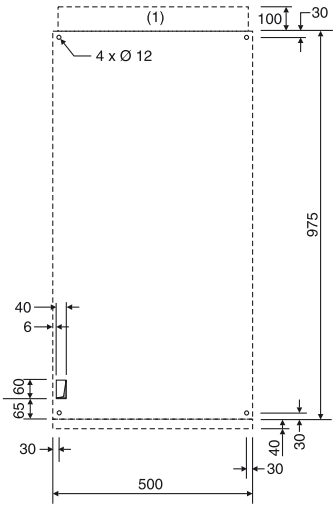
Width:	500 mm
Type:	P2 - P3 - ASR - A - Rac



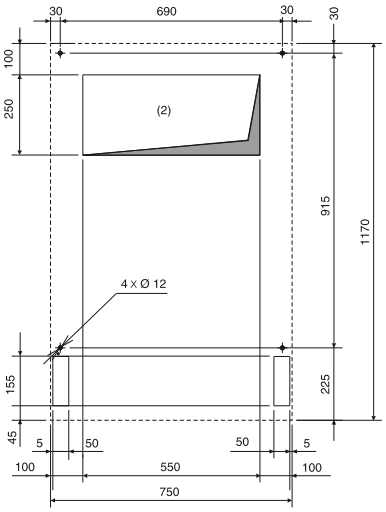
Width:	750 mm
Type:	P1F - P1A



Width:	500 mm
Type:	R - M



Width:	750 mm
Type:	P1E - WCB - WSB

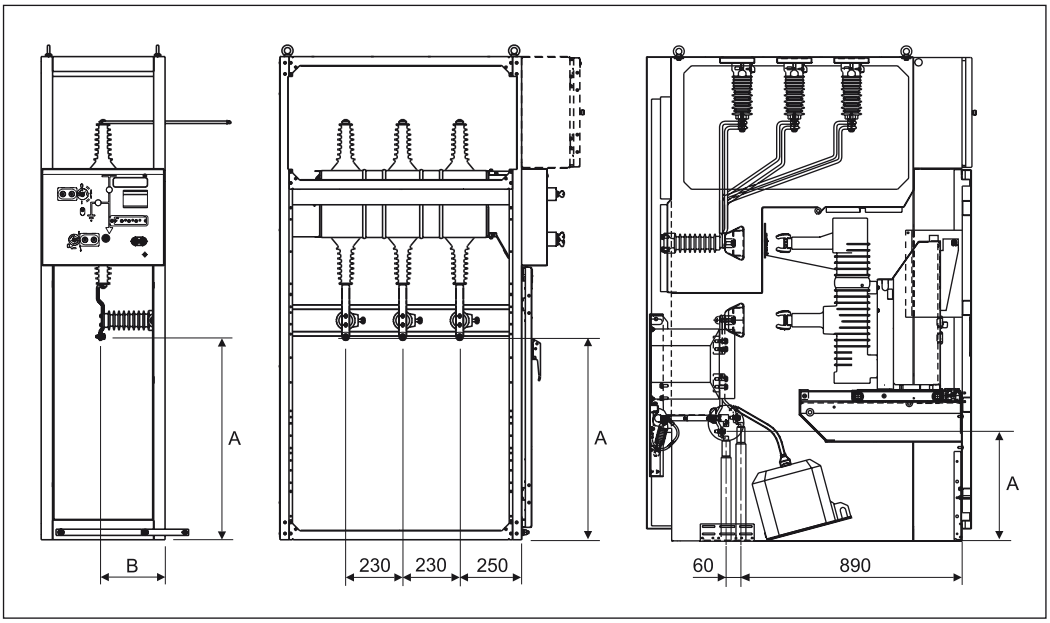


Connection of medium voltage cables

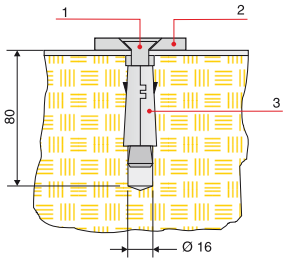
The UniMix panels are prepared for connection of single-core medium voltage cables with solid extruded elastomer insulation (type G7 or XLPE).

The cable cross-section depends on the panel current:
- 95 mm² for the P2 units (with fuses)
- 300 mm² up to 630 A
- 2 x 400 mm² up to 1250 A.

The distance of the cable connection point from the floor depends on the type of panel and is summarised in the following table.



Detail for fixing switchgear with expansion anchoring bolts



1 Screw
2 Plate
3 Anchoring bolt

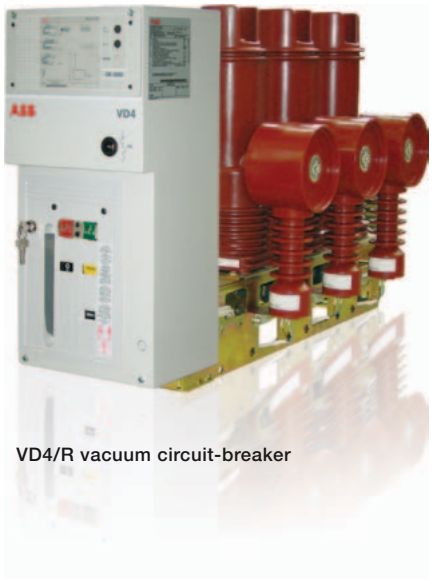
Unit	Description	Width 375 mm		Width 500 mm		Width 750 mm	
		A [mm]	B [mm]	A [mm]	B [mm]	A [mm]	B [mm]
Rac	Without CT and VT	960	187.5	875	250	–	–
	With DIN CT	–	–	540	250	–	–
	With DIN CT and VT	–	–	540	250	–	–
A	Without CT and VT	908	187.5	732	250	–	–
	With DIN CT	–	–	530	250	–	–
	With DIN CT and VT	–	–	530	250	–	–
P3	Without VT	960	187.5	820	250	–	–
	With DIN VT	–	–	530	250	–	–
P2		455	187.5	455	250	–	–
ASR	Without VT	960	187.5	820	250	–	–
	With DIN VT	–	–	530	250	–	–
P1F	With DIN CT	–	–	–	–	530	250
	With current sensors	–	–	–	–	732	250
	With DIN VT	–	–	–	–	530	250
P1E	With / Without DIN VT	–	–	–	–	440 - 495	–
WCB	With / Without DIN VT	–	–	–	–	440 - 495	–
WSB	With / Without DIN VT	–	–	–	–	440 - 495	–
P1A		–	–	–	–	385	250

3. Main components

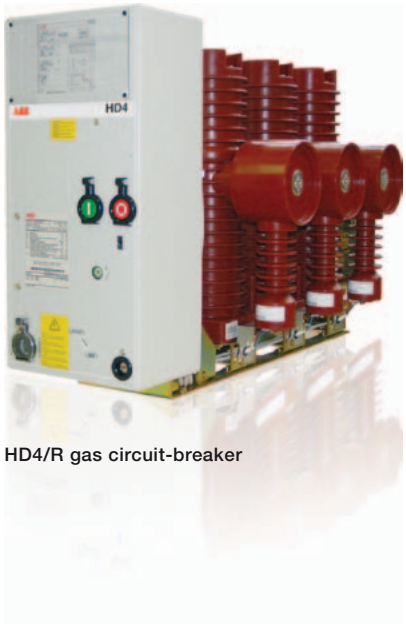
VD4/UniMix-F and HD4/UniMix-F circuit-breakers

VD4/UniMix-F, VD4/UniMix-R type vacuum or gas-insulated HD4/UniMix-F, HD4/UniMix-R type circuit-breakers are used in the P1/F and P1/A type units.
Racking-out of the circuit-breakers can only take place under safe conditions, i.e. with insulation isolator open and earthing switch closed.
The interruption system of these circuit-breakers requires limited energy for operation.
The VD4 and HD4 series circuit-breakers are particularly suitable for transformer protection and control, for protection of distribution lines, for motor switching and protection, etc.
The VD4/UniMix-F, VD4/UniMix-R and HD4/UniMix-F, HD4/UniMix-R circuit-breakers can be fitted with current sensors for power supply of the protection device installed on-board the circuit-breaker:

- PR521 (self-supplied)
- REF601 (with auxiliary power supply) conforming to the CEI 0-16 Standard.



VD4/R vacuum circuit-breaker



HD4/R gas circuit-breaker

Performances

		VD4/UniMix-F 12 HD4/UniMix-F 12	VD4/UniMix-F 17 HD4/UniMix-F 17	VD4/UniMix-F 24 HD4/UniMix-F 24
Rated and insulation voltage	kV	12	17.5	24
Withstand voltage	kV (50 Hz)	28	38	50
Impulse withstand voltage	kV	75	95	125
Rated frequency	Hz	50-60	50-60	50-60
Rated current	A (40 °C)	630	630	630
Breaking capacity	kA	12.5	12.5	12.5
		16	16	16
		20	20	20
		25	25(2)	–
Rated short-time withstand current (3 s)	kA	12.5	12.5	12.5
		16	16	16
		20	20	20(1)
		25	25(2)	–
Making capacity	kAp	31.5	31.5	31.5
		40	40	40
		50	50	50
		63	63(2)	–
Operation sequence	VD4/R	O-0.3min-CO-3min-CO/O-0.3s-CO-3min-CO		
	HD4/R	O-0.3min-CO-3min-CO/O-0.3s-CO-15s-CO		
Opening time	ms	45	45	45
Arc duration	ms	10-15	10-15	10-15
Total interruption time	ms	55-60	55-60	55-60
Closing time	ms	80	80	80
SF6 rated pressure (only HD4)	kPa	380	380	380
Technical catalogue	VD4/R	1VCP000263	1VCP000263	1VCP000263
	HD4/R	1VCP000028	1VCP000028	1VCP000028

VD4/US and HD4/US circuit-breakers

Vacuum VD4/US or gas-insulated HD4/US type circuit-breakers are used in the P1/E, WCB and WBS type unit. Racking-out of the circuit-breakers from the unit can only take place under safe conditions, i.e. with the shutter and earthing switch closed.
The interruption system of these circuit-breakers requires limited energy for operation.
The VD4 and HD4 series circuit-breakers are particularly suitable for transformer protection and control, for protection of distribution lines, for motor switching and protection, etc.
The VD4/US and HD4/US circuit-breakers for Unimix can be fitted with the accessories and the interlocks of the VD4 and HD4 series of circuit-breakers with front operating mechanism.

Performances

		VD4/US		HD4/US	
Rated and insulation voltage	kV	24		24	
Withstand voltage	kV (50 Hz)	50		50	
Impulse withstand voltage	kV	125		125	
Rated frequency	Hz	50-60		50-60	
Rated current	A (40 °C)	630	1250	630	1250
Breaking capacity	kA	16	16	16	16
		20	20	20	20
		25	25	25	25
Rated short-time withstand current (3 s)	kA	16	16	16	16
		20	20	20	20
		25	25	25	25
Making capacity	kAp	40	40	40	40
		50	50	50	50
		63	63	63	63
Operation sequence	VD4/US	O-0.3s-CO-3min-CO			
	HD4/US	O-0.3s-CO-15s-CO			
Opening time	ms	40 ... 60		45	
Arc duration	ms	10 ... 15		10-15	
Total interruption time	ms	50 ... 75		55-60	
Closing time	ms	60 ... 80		80	
SF6 rated pressure	kPa	–		380	
Technical catalogue	VD4	1VCP000002		–	
	HD4	–		1VCP000004	

3. Main components

Switch-disconnectors

SHS2 series switch-disconnectors are used in the P2 and P3 units.
The SHS2 series of switch-disconnectors have three positions with insulation in SF6 gas and a stainless steel housing.
Installation of this type of apparatus carries out metallic segregation and earthing between the busbar compartment and the feeder compartment of the unit guaranteeing maximum personnel safety in the case of interventions in the feeder compartment even with the main busbars supplied with power, for example to replace one or more fuses or to check the cables.
The operating mechanism can be accessed directly from the front and allows installation/replacement of accessories.
They are available with a manual operating mechanism or motor operator with operation independent of the operator (SHS2/T1) and with manual operating mechanism or motor operator with stored energy (SHS2/T2).
The SHS2/T2 with motor operator can be supplied with a shunt opening release for remote control (on request).
The switch-disconnector can be used in combination with fuses, for example for protection of transformers.
For further indications, please see technical catalogue 1VCP000046.

Performances of the switch-disconnectors

		SHS2
Rated voltage	kV	24
Withstand voltage (50-60 Hz/1 min) towards earth and between phases	kV	50
Impulse withstand voltage towards earth and between phases	kV	125
Rated frequency	Hz	50-60
Rated normal current (40 °C)	A	400/630
Rated short-time withstand current (1 s)	kA	12.5
		16
		20
		25
Rated short-circuit making capacity (peak current)	kA	31.5
		40
		50
		63
Breaking capacity		
• Mainly active load	A	400/630
• No-load transformers	A	4 ... 16
• No-load cables/feeders	A	50/25
• Ring circuits	A	400/630

Operating mechanism and accessories

Switch-disconnector	SHS2/T1N SHS2/T1	SHS2/T1MN SHS2/T1M	SHS2/T2FN SHS2/T2F	SHS2/T2N SHS2/T2	SHS2/T2FMN SHS2/T2FM	SHS2/T2MN SHS2/T2M
Operating mechanism	T1	T1M	T2	T2	T2	T2
UniMix Unit	P3	P3	P2	P3	P2	P3
Motorisation						
24 V DC	–	■	–	–	–	–
48 V AC/DC	–	■	–	–	■	■
110 V AC/DC	–	■	–	–	■	■
220 V AC/DC	–	■	–	–	■	■
Shunt opening release						
24 V AC/DC	–	–	■	■	–	–
48 V AC/DC	–	–	■	■	■	■
110 V AC/DC	–	–	■	■	■	■
220 V AC/DC	–	–	■	■	■	■

Isolators

SHS2 series isolators are used in the M, ASR, P1/F and P1/A units. The SHS2 series of isolators have three positions with insulation in SF6 gas and a stainless steel housing. Installation of this type of apparatus carries out segregation between the busbar compartment and the circuit-breaker/feeder compartment of the unit.
The operating mechanism can be accessed directly from the front and allows installation/replacement of accessories.
The SHS2 isolators are used:
– in combination with fuses, for protection of instrument transformers
– in combination with VD4/UniMix-F, VD4/UniMix-R or HD4/UniMix-F, HD4/UniMix-R series of circuit-breakers.

Performances of the isolators

		SHS2
Rated voltage	kV	24
Withstand voltage (50-60 Hz/1 min) towards earth and between phases	kV	50
Impulse withstand voltage towards earth and between phases	kV	125
Rated frequency	Hz	50-60
Rated normal current (40°C)	A	400
		630
Rated short-time withstand current (1 s)	kA	12.5
		16
		20
		25

Operating mechanism

Isolator	SHS2/IF	SHS2/I	SHS2/IB	SHS2/ES	SHS2/A
Operating mechanism	T3	T3	T3	T4	V1
UniMix Unit	M	ASR	P1/F	A	P1/A

Earthing switches

The A, P1/F, P1/E, WCB, WBS, P1/A, P2, M units can be fitted with an earthing switch. The operating device of the earthing switch is normally placed on the front of the switchgear. Operation of the earthing switch takes place from the front and is interlocked mechanically with any line-side isolator and with the feeder compartment door.

Main busbars

The busbars are made of flat bare electrolytic copper and are sized to withstand the thermal and electrodynamic stresses caused by the short-circuit currents. The busbars pass from one unit to the adjacent one without any partitions being interposed, so as to make a continuous duct.

Voltage transformers

The voltage transformers are of the type insulated in resin and are used to supply power to measuring instruments and protections.
They comply with the IEC 60044-2 Standards.
The dimensions are in accordance with the DIN 42600 standard.

Current transformers

The following applications are possible.

- **CTs on board the circuit-breaker**

These are placed on-board the VD4/UniMix-F, VD4/UniMix-R or HD4/UniMix-F, HD4/UniMix-R series of circuit-breakers, and are always combined exclusively with the PR521 protection device mounted on-board the circuit-breaker.

- **Current sensors on board the circuit-breaker**

These are placed on-board the VD4/UniMix-F, VD4/UniMix-R or HD4/UniMix-F, HD4/UniMix-R series of circuit-breakers and are always combined exclusively with the REF601 protection mounted on-board the circuit-breaker.
When the relay is glued onto the LV compartment, the following current sensors are available for mounting on a medium voltage:
- Keca 250_B1 type for REF601
- Keca 80_A1 type (Rogowski coils) for REF542*plus*.
They are installed on the bottom of the compartment in a special supporting structure.
The REF542*plus* unit is installed in the low voltage compartment.

- **External earth fault toroid**

The PR521 protection device can be used with any external toroid to detect the earth fault current, as long as it has the following characteristics:
– Primary rated current any
– Rated secondary current 1 A
– Performance 1 VA
– Precision class, ultimate precision factor Cl. 3 or better
The use of an external toroid to detect the earth fault current is recommended when very low values of the 51N threshold are to be set (less than 0.45 times the rated current - In - of the current sensors).

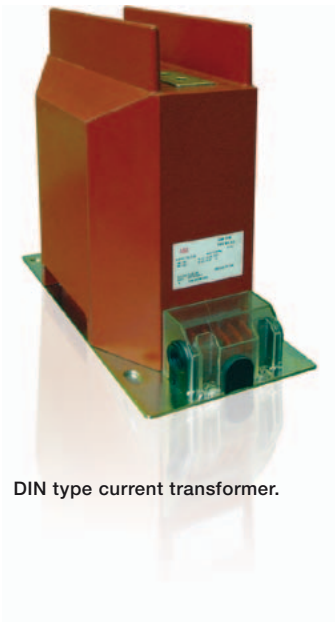
3. Main components

- **Toroidal transformers**

Application of toroidal phase transformers is possible in all the switchgear units to supply the measuring instruments and protections with power.
The toroidal transformers can be installed on the back of the compartment on a special supporting structure.

- **Transformers on-board the switchgear**

These are of the type insulated in resin and are used to supply power to measuring instruments and protections.
They comply with the IEC 60044-1 Standards.
Their dimensions are in accordance with the DIN 42600 standard.



DIN type current transformer.

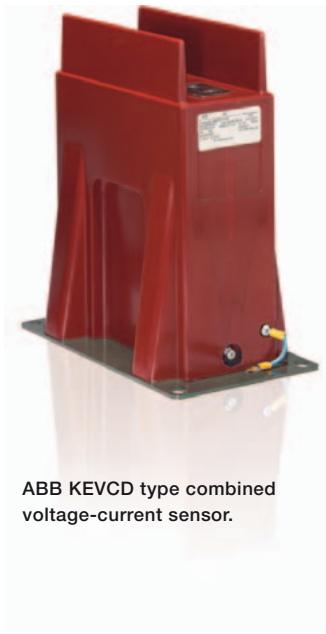


ABB KEVCD type combined voltage-current sensor.

Combined current/voltage sensors

The introduction of digital technologies into electrical measuring and protection instruments has considerably modified the performances required of transformers.
The analogue input levels of the instruments have been notably reduced when compared with those of traditional systems.
For this reason, ABB has introduced a new range of sensors which best covers the characteristics of the new generations of instruments and in particular of the REF542*plus* unit.
UniMix switchgear can be equipped with ABB KEVCD Block Type sensors.
The current sensors comply with the IEC 60044-8 Standards, whereas the voltage sensors comply with the IEC 60044-7 Standards. The dimensions are in accordance with the DIN 42600 standard.
Both the current and voltage sensors or just the current sensor can be integrated simultaneously in the same resin body.
The voltage divider for connection to the voltage signalling lamps is also inserted.
The measurement assembly consisting of the sensors and REF542*plus* unit offers Cl. 1 precision.

REF542*plus* unit

The REF542*plus* unit carries out integration of all the secondary functions relative to a switchgear unit in a single module fitted with watchdog.
Thanks to the flexibility of its software, the unit is able to satisfy a vast range of installation requirements.
The high functionality of the REF542*plus* unit is supported by a simple and easy-to-use user interface.
Thanks to the use of the REF542*plus* unit, each medium voltage UniMix panel becomes an integrated and independent unit able to carry out all the required functions.

REF542*plus* unit

Main characteristics:

- integration of all the functions in a single instrument: protection, measurement, switching, signalling, interlocking, automation and communication;
- a single interface between switchgear and operator for all the installation panels: feeder, transformer, motor, generator, power factor correction banks, bus-tie and measurement units;
- a single type of spare parts and accessories: a single hardware unit;
- reduced maintenance: drastic reduction in preventive maintenance, great limitation of the faults caused by tampering and errors;
- simple modification and adaptation of the functions: by means of the unit configuration software, even with the switchgear in service.

The possibility of connecting the switchgear directly to the installation management system fully implements the concept of an integrated installation and at the highest levels.

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