

UniSafe

Technical Guide



ABB

SUMMARY

UniSafe Switchboards

Description	1/1	1
Typical conventional units	2/1	2
Typical units for marine applications	3/1	3
Busbar applications	4/1	4
General characteristics	5/1	5
Apparatus	6/1	6
Measuring instruments	7/1	7
Accessories	8/1	8
Data	9/1	9

UniMotor Switchboards

Description	10/1	10
Typical units	11/1	11
V-Contact type vacuum contactors	12/1	12
Data	13/1	13

DESCRIPTION

1.1	Compartments	1/2
1.2	Components of the structure	1/3
1.2.1	Pre-galvanised sheet-steel	1/3
1.2.2	Painted sheet-steel	1/4
1.2.3	Copper	1/5
1.2.4	Insulating materials	1/7
1.3	General electrical characteristics	1/8
1.3.1	Earthing switch electrical characteristics	1/8
1.4	Technical data	1/9
1.5	Main dimensions and apparatus	1/11

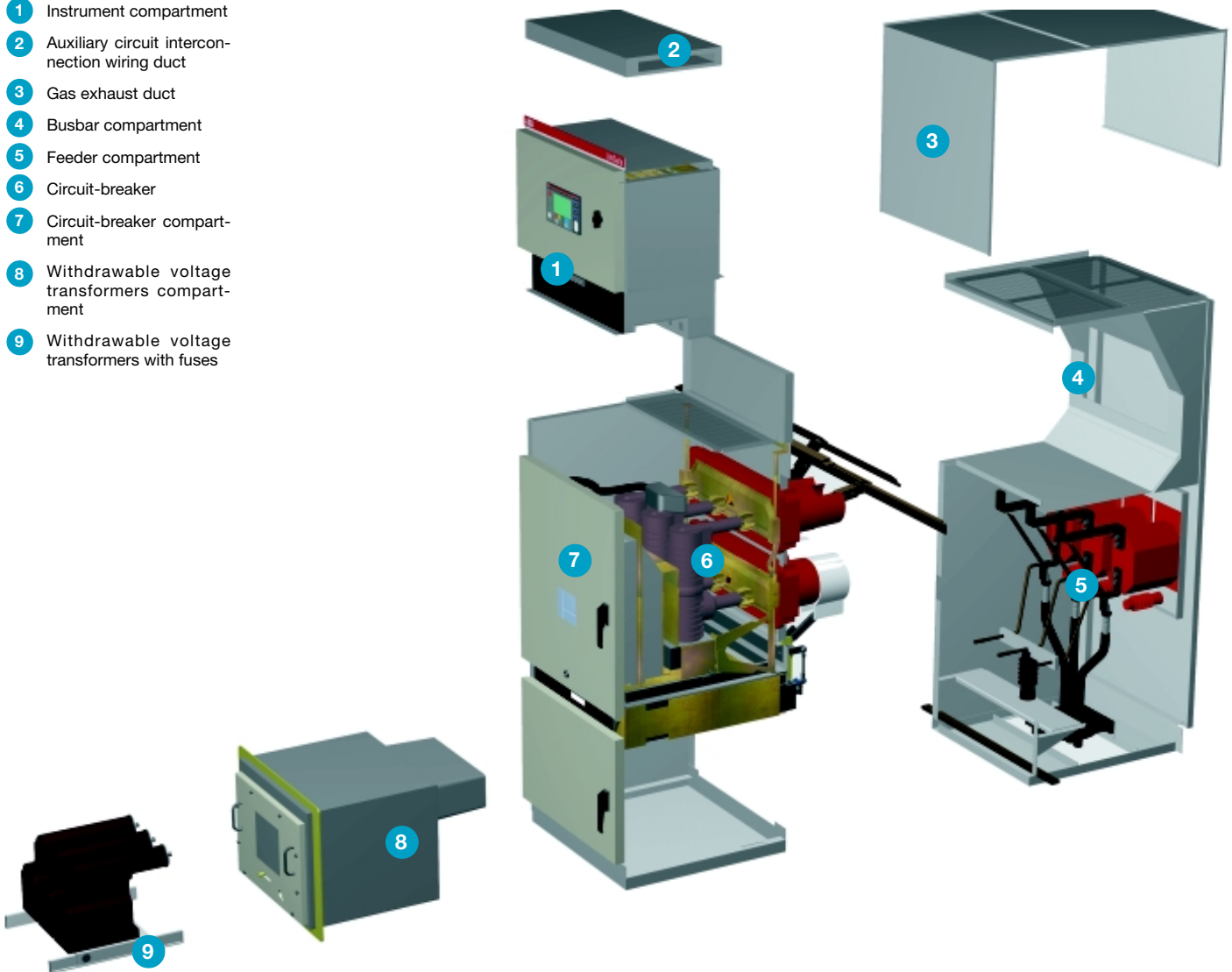
DESCRIPTION

1.1 Compartments

The typical units of the UniSafe switchboard consist of up to a maximum of seven compartments segregated from each other by means of metal partitions (incoming/outgoing unit with measurements shown in the figure).

For details of the other units, please see chapter 2.

- 1 Instrument compartment
- 2 Auxiliary circuit interconnection wiring duct
- 3 Gas exhaust duct
- 4 Busbar compartment
- 5 Feeder compartment
- 6 Circuit-breaker
- 7 Circuit-breaker compartment
- 8 Withdrawable voltage transformers compartment
- 9 Withdrawable voltage transformers with fuses



1.2 Components of the structure

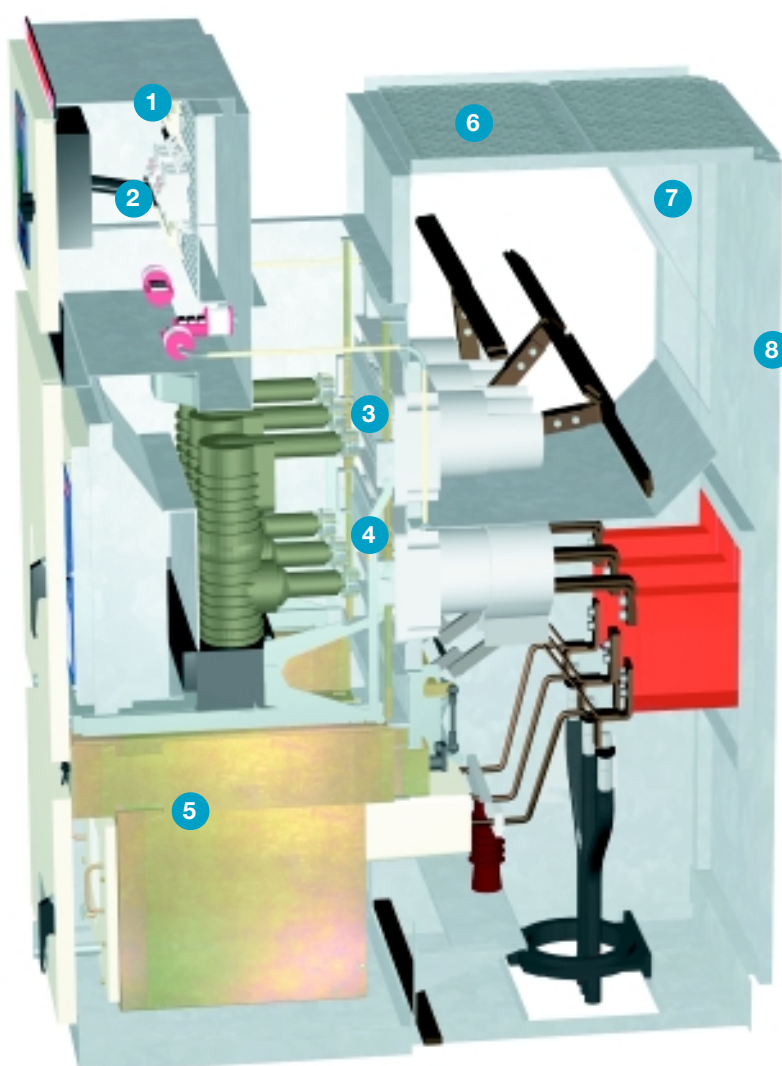
1.2.1 Pre-galvanised steel-sheet

Type: UNI EN 10142 Fe P02G

Thickness: 2 mm (some details 0.8 or 1.5 mm)

Weight (average): 310...350 Kg

Use: supporting structure, compartments, segregations, shutters, auxiliary circuit wiring duct, gas exhaust duct, gas exhaust flap, auxiliary instrument support, end panels (also available painted on request).



- 1 Wiring duct
- 2 Instrument support
- 3 Top shutter
- 4 Bottom shutter
- 5 Compartments (e.g. VT)
- 6 Gas exhaust flap
- 7 Segregations
- 8 Closing panels

DESCRIPTION

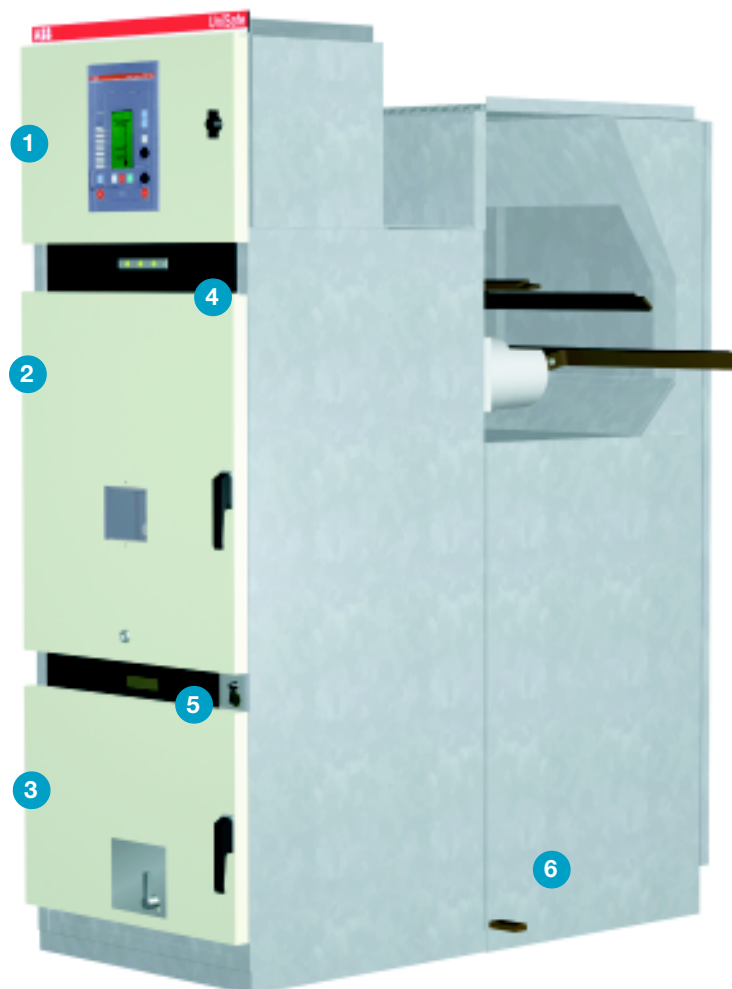
1.2.2 Painted sheet-steel

Type: UNI EN 10130 Fe P01
 Standard colour: RAL7035 (doors and end panels)
 Standard colour: RAL7012 (horizontal bands)
 Thickness: 3 mm for the doors – 2 mm for the other components
 Weight: 52...60 Kg
 Use: auxiliary compartment doors, circuit-breaker and feeder, end panels (also available painted on request).

1.2.2.1 Weight of the paint used

12-17.5 kV	Kg
600 mm wide units	0.3
750 mm wide units	0.4
1000 mm wide units	0.5
1550 mm deep end panels	0.8
2000 mm deep end panels	1
24 kV	Kg
750 mm wide units	0.4
1000 mm wide units	0.5
1900 mm deep end panels	1
2300 mm deep end panels	1.2

- 1 Auxiliary instrument compartment door
- 2 Circuit-breaker compartment door
- 3 Feeder compartment door
- 4 Horizontal band
- 5 Horizontal band
- 6 End panels (closing panels of the right-hand and left-hand units of the switchboard. They can either be galvanised or painted)



1.2.3 Copper

Type: UNI EN 5649 Cu ETP⁽¹⁾

12-17.5 kV				
Rated current (A)	Cross-section of main busbars (mm)	Cross-section of top branches (mm)	Cross-section of bottom branches (mm)	Cross-section of earthing busbar (mm)
–	–	–	–	1x40x10
630	–	1x40x10	1x40x10	–
1250	2x40x10	2x40x10	2x40x10	–
1600	3x60x10	3x50x10	3x60x10	–
2000	4x60x10	4x50x10	4x60x10	–
2500	4x60x10	4x60x10	4x60x10	–

24 kV				
Rated current (A)	Cross-section of main busbars (mm)	Cross-section of top branches (mm)	Cross-section of bottom branches (mm)	Cross-section of earthing busbar (mm)
–	–	–	–	1x40x10
630	–	1x40x10	1x40x10	–
1250	2x40x10	2x40x10	2x40x10	–
1600	3x50x10	3x50x10	2x80x10	–
2000	4x50x10	4x50x10	3x80x10	–

Weight: 52...150 Kg

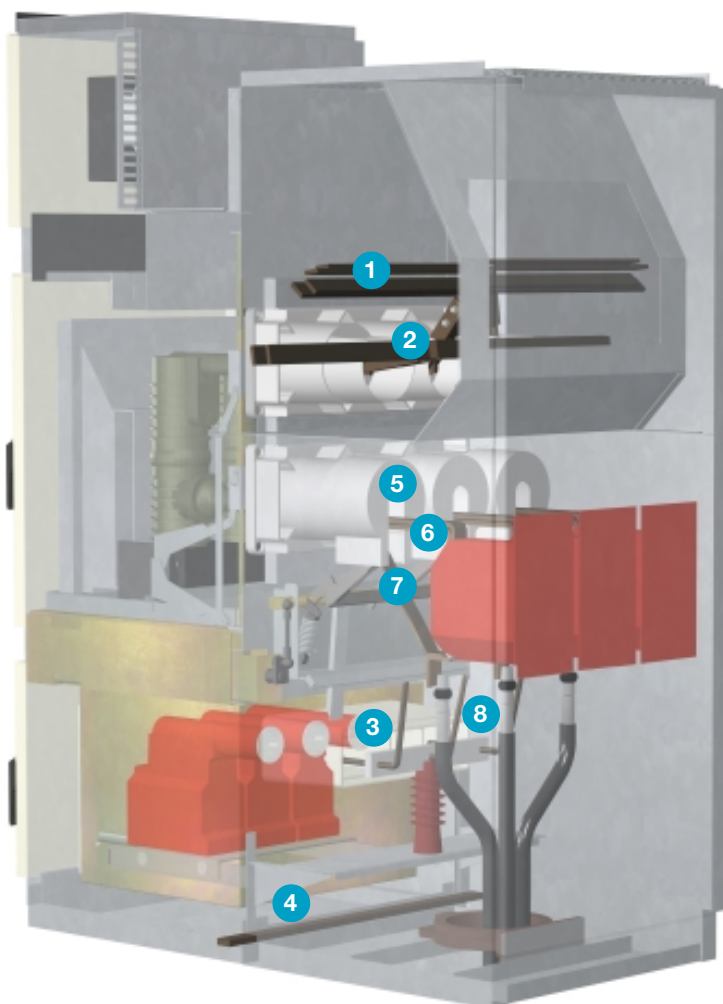
Use: main busbars, top and bottom branches, branches for CT and VT, cable connections, monoblock fixed contacts, earthing switch fixed contacts, earthing busbar.

⁽¹⁾ Silver-plated copper is used for the main busbar system.

The branches are made of bare copper.

On request, the main busbar system and the branches can be supplied with insulating covering.

DESCRIPTION



- 1 Main busbars
- 2 Top branches
- 3 VT branches
- 4 Earthing busbar
- 5 Monoblock fixed contacts
- 6 Bottom branches
- 7 Earthing switch fixed contacts
- 8 Cable connections

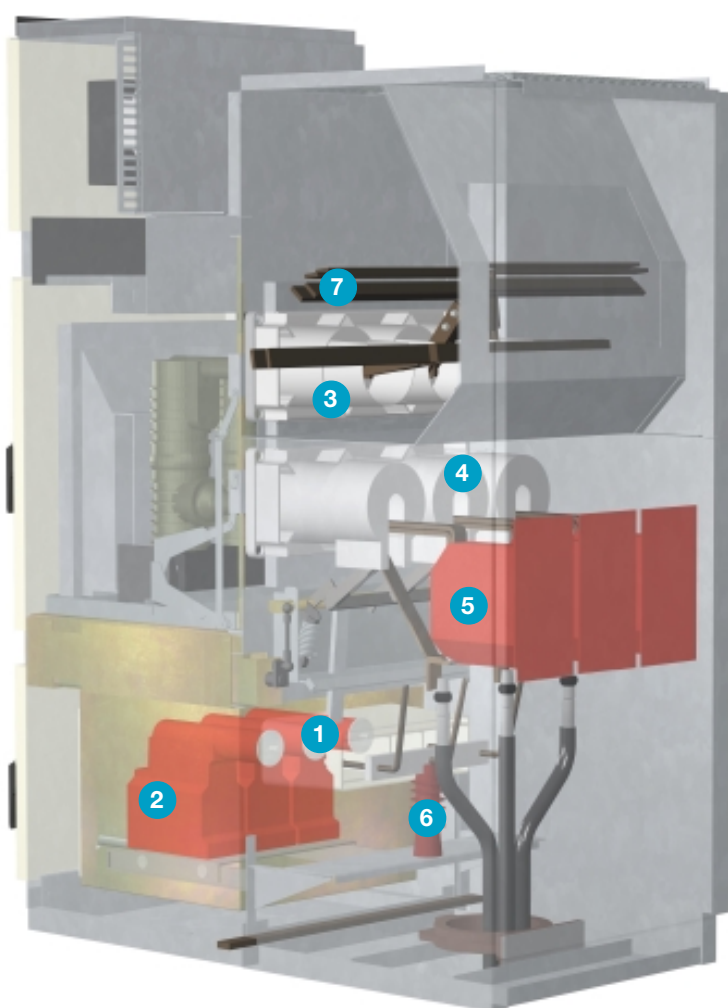
1.2.4 Insulating materials

Type: Polyester glass
 Weight (average): 30...40 Kg
 Use: circuit-breaker compartment monoblocks and withdrawable VTs compartment.

Type: Epoxy resin
 Weight: see chap. 7
 Use: CTs, VTs, sensors, insulators (in variable quantities, see single units - chap. 2 and 3).

Type: Epoxy resin
 Weight (average): 2 Kg
 Use: insulating covering of busbars and branches (when requested).

Type: Polycarbonate
 Weight: 0.1 Kg
 Use: Inspection window.



- 1 Withdrawable VTs compartment monoblock
- 2 VTs
- 3 Top monoblock
- 4 Bottom monoblock
- 5 CTs
- 6 Insulator
- 7 Busbar insulating covering

DESCRIPTION

1.3 General electrical characteristics

Switchboard		12 kV	17.5 kV	24 kV
Rated voltage	kV	12	17.5	24
Rated insulation voltage	kV	12	17.5	24
Rated power frequency withstand voltage	kV (1 min)	28 ^(*)	38	50
Rated lightning impulse withstand voltage	kV	75	95	125
Rated short-time withstand current	kA (3s)	31.5	31.5	25
Peak current	kA	80	80	63
Internal arc withstand current	kA (1s)	31.5	31.5	25
Branch connectors rated currents	A	1250	1250	1250
		1600	1600	1600
		2000	2000	2000
		2500	2500	–
Main busbars rated currents	A	630	630	630
		1250	1250	1250
		1600	1600	1600
		2000	2000	2000
		2500	2500	–

(*) Also available at 42 kV (1 min).

1.3.1 Earthing switch electrical characteristics

Earthing switch with making capacity		12 kV	17.5 kV	24 kV
Rated short-time withstand current	kA (3s)	25	25	25
	kA (1s)	31.5	31.5	–
Making capacity	kAp	80	80	63

1.4 Technical data

12 kV		Units width							
		600 mm		750 mm				1000 mm	
HD4		630 A	1250 A	630 A	1250 A	1600 A	2000 A	2500 A	
VD4		630 A	1250 A	630 A	1250 A	1600 A			2000 A 2500 A
V-Contact		400 A							
NALF				630 A					
IF	Incoming feeder	■ ■ ■	■ ■	■ ■	■ ■	■ ■	■	■	■ ■
IFM	Incoming feeder with measurement			■ ■	■ ■	■ ■	■	■	■ ■
R	Rise		■		■	■	■	■	
RM	Rise with measurement				■	■	■	■	
M	Measurement	■		■					
BT	Bus tie		■ ■		■ ■	■ ■	■	■	■ ■
BTM	Bus tie with measurement				■ ■	■ ■	■	■	■ ■
IFD	Incoming feeder direct				■			■	
IFDM	Incoming feeder direct with measurement				■			■	
DF	Disconnecter feeder			■					
IFC	Incoming feeder with capacitors	■ ■ ■		■ ■					

17.5 kV		Units width							
		600 mm		750 mm				1000 mm	
HD4		630 A	1250 A	630 A	1250 A	1600 A	2000 A	2500 A	
VD4		630 A	1250 A	630 A	1250 A	1600 A			2000 A 2500 A
NALF				630 A					
IF	Incoming feeder	■ ■	■ ■	■ ■	■ ■	■ ■	■	■	■ ■
IFM	Incoming feeder with measurement			■ ■	■ ■	■ ■	■	■	■ ■
R	Rise				■	■	■	■	
RM	Rise with measurement				■	■	■	■	
M	Measurement			■					
BT	Bus tie		■ ■		■ ■	■ ■	■	■	■ ■
BTM	Bus tie with measurement				■ ■	■ ■	■	■	■ ■
IFD	Incoming feeder direct				■			■	
IFDM	Incoming feeder direct with measurement				■			■	
DF	Disconnecter feeder			■					
IFC	Incoming feeder with capacitors	■ ■		■ ■					

DESCRIPTION

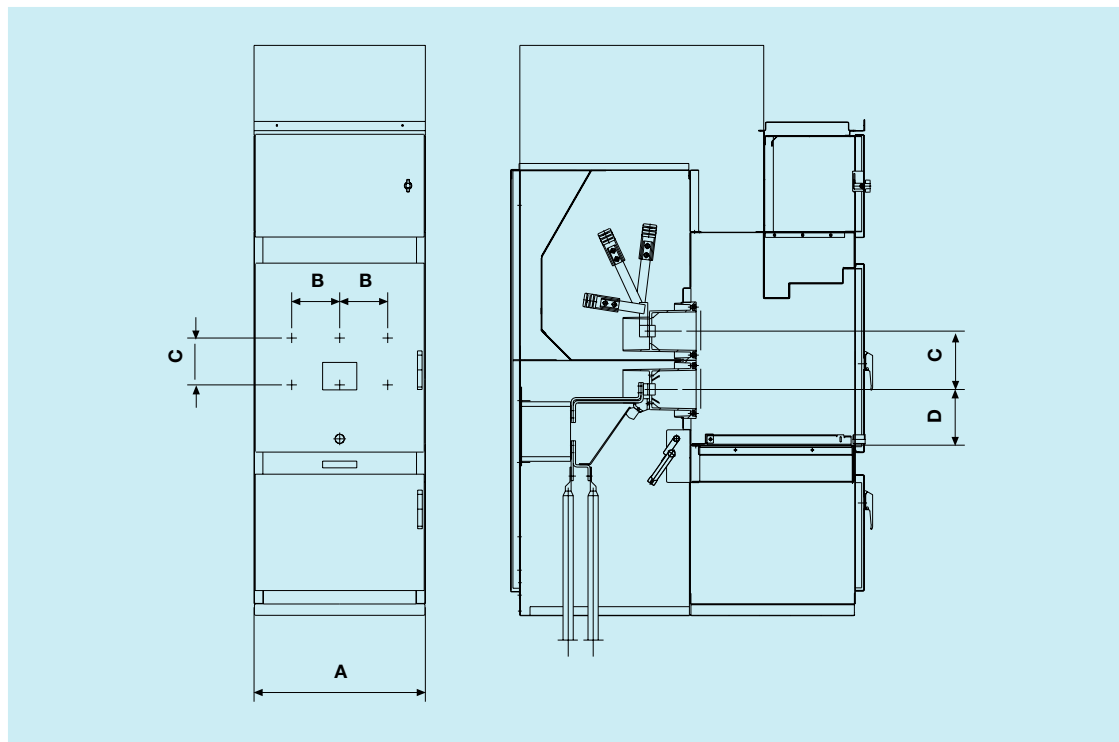
24 kV		Units width					
		750 mm		1000 mm			
		630 A	1250 A	630 A	1250 A	1600 A	2000 A
HD4		630 A	1250 A			1600 A	2000 A
VD4		630 A	1250 A			1600 A	2000 A
NALF				630 A			
IF	Incoming feeder	■ ■	■ ■	■	■	■ ■	■ ■
IFM	Incoming feeder with measurement	■ ■	■ ■	■	■	■ ■	■ ■
R	Rise			■		■	■
RM	Riser with measurement			■		■	■
M	Measurement		■		■		
BT	Bus tie		■ ■		■	■ ■	■ ■
BTM	Bus tie with measurement		■ ■		■	■ ■	■ ■
IFD	Incoming feeder direct			■		■	■
IFDM	Incoming feeder direct with measurement			■		■	■
DF	Disconnecter feeder				■		
IFC	Incoming feeder with capacitors	■ ■		■			

12 kV marine		Units width							
		600 mm		750 mm				1000 mm	
		630 A	1250 A	630 A	1250 A	1600 A	2000 A	2500 A	
HD4		630 A	1250 A	630 A	1250 A	1600 A	2000 A	2500 A	
VD4		630 A	1250 A	630 A	1250 A	1600 A			2000 A 2500 A
V-Contact		400 A							
IF	Incoming feeder	■ ■ ■	■ ■			■ ■	■	■	■ ■
IFM	Incoming feeder with measurement					■ ■	■	■	■ ■
R	Rise		■			■	■	■	
RE	Rise earthing-transformer		■						
RM	Rise with measurement					■	■	■	
M	Measurement	■		■					
ME	Measurement earthing-transformer	■							
BT	Bus tie		■ ■			■ ■	■	■	■ ■
BTM	Bus tie with measurement					■ ■	■	■	■ ■

Busbar applications		Current transformers	Voltage transformers	Earthing switch	Incoming duct
IF	Incoming feeder ⁽¹⁾	■	■	■	■
IFM	Incoming feeder with measurement	■	■	■	■

⁽¹⁾ 750 and 1000 mm wide units only.

1.5 Main dimensions and apparatus



UniSafe 12/17.5 kV				
A	B	C	D	Apparatus
600	150	205	264	HD4 630-1250A / VD4 630-1250A / V-Contact 400A
750	210	310	284	HD4 630-2500A / VD4 630-1600A
1000	275	310	284	VD4 2000-2500A

UniSafe 24 kV				
A	B	C	D	Apparatus
750	210	310	329	HD4 630-1250A / VD4 630-1250A
1000	275	380	349	HD4 630-1250A
1000	275	380	349	HD4 1600-2000A / VD4 1600-2000A

TYPICAL CONVENTIONAL UNITS

2.1	Incoming-outgoing unit (IF)	2/2
2.1.1	Bottom cable entry	2/2
2.1.2	Bottom cable entry - deep version	2/3
2.1.3	Top cable entry	2/4
2.1.4	Top busbar entry	2/5
2.2	Incoming-outgoing unit with measurement (IFM)	2/6
2.2.1	Bottom cable entry	2/6
2.2.2	Bottom cable entry - deep version	2/7
2.2.3	Top cable entry	2/8
2.2.4	Top busbar entry	2/9
2.3	Bus tie (BT)	2/10
2.3.1	Conventional	2/10
2.3.2	Deep version	2/11
2.4	Bus tie with measurement (BTM)	2/12
2.5	Bus rise (R)	2/13
2.5.1	Conventional	2/13
2.5.2	Deep version	2/14
2.6	Bus rise with measurement (RM)	2/15
2.7	Incoming-outgoing unit direct (IFD)	2/16
2.8	Incoming-outgoing unit direct with measurement (IFDM)	2/17
2.9	Incoming unit with capacitors (IFC)	2/18
2.9.1	Conventional	2/18
2.9.2	Deep version	2/19
2.10	Measurement unit (M)	2/20
2.11	Disconnecter feeder (DF)	2/21

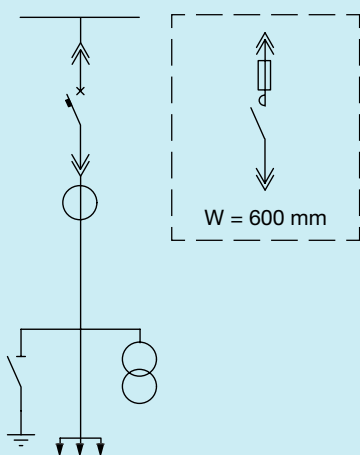
TYPICAL CONVENTIONAL UNITS

General notes

Each medium size current transformer can be replaced by an ABB KEVCD sensor. The earthing switch is not a compulsory switchboard accessory.

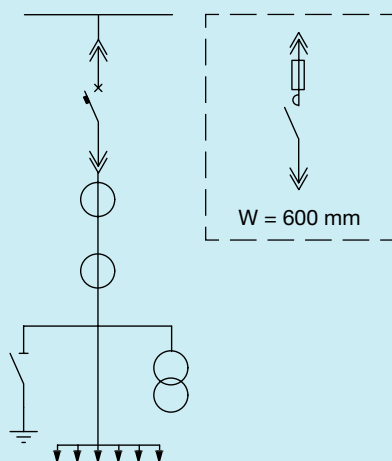
2.1 Incoming-outgoing unit (IF)

2.1.1 Bottom cable entry



		12-17.5 kV			24 kV		
Width	mm	600	750	1000	750	1000	1000
Height	mm	2160	2160	2160	2160	2160	2160
Height with gas exhaust duct	mm	2495	2495	2495	2600	2600	2600
Depth	mm	1550	1550	1550	1900	1900	1900
Rated current	A						
630		■	■		■	■	
1250		■	■		■	■	
1600			■				■
2000			■	■			■
2500			■	■			
Earthing switch		■	■	■	■	■	■
Number of cable connections	nr.	2	2	2	2	2	2
Number of CTs per phase (alternative combinations)							
1 medium size		■	■	■	■	■	■
1 long size		■	■	■	■	■	■
2 medium size							
1 medium and 1 long size							
Number of VTs per phase (alternative combinations)							
1 fixed		■	■	■	■	■	■
2 fixed							
1 fixed with fuses		■					
1 withdrawable with fuses							
1 fixed and 1 withdrawable with fuses							

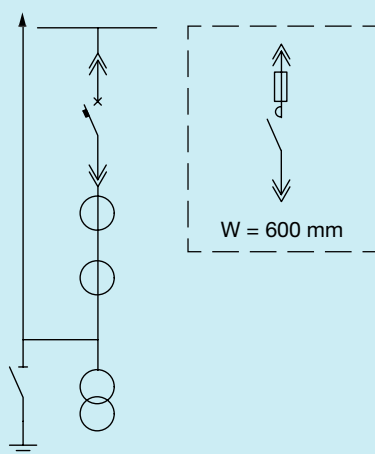
2.1.2 Bottom cable entry - deep version



		12-17.5 kV			24 kV		
Width	mm	600	750	1000	750	1000	1000
Height	mm	2160	2160	2160	2160	2160	2160
Height with gas exhaust duct	mm	2495	2495	2495	2600	2600	2600
Depth	mm	2000	2000	2000	2300	2300	2300
Rated current	A						
630		■	■		■	■	
1250			■				
1600			■				■
2000			■	■			■
2500			■	■			
Earthing switch		■	■	■	■	■	■
Number of cable connections	nr.	4	6	6	6	6	6
Number of CTs per phase (alternative combinations)							
1 medium size		■	■	■	■	■	■
1 long size		■	■	■	■	■	■
2 medium size		■	■	■	■	■	■
1 medium and 1 long size		■	■	■	■	■	■
Number of VTs per phase (alternative combinations)							
1 fixed		■	■	■	■	■	■
2 fixed			■	■	■	■	■
1 fixed with fuses		■					
1 withdrawable with fuses							
1 fixed and 1 withdrawable with fuses							

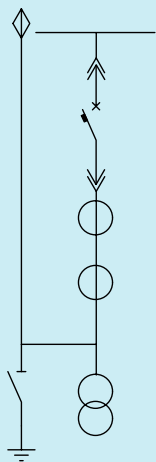
TYPICAL CONVENTIONAL UNITS

2.1.3 Top cable entry



		12-17.5 kV			24 kV		
Width	mm	600	750	1000	750	1000	1000
Height	mm	2700	2700	2700	2850	2850	2850
Height with gas exhaust duct	mm	2700	2700	2700	2850	2850	2850
Depth	mm	2235	2235	2235	2645	2645	2645
Rated current	A						
630		■	■		■	■	
1250			■				■
1600			■				■
2000			■	■			■
2500			■	■			■
Earthing switch		■	■	■	■	■	■
Number of cable connections	nr.	4	4	4	4	4	4
Number of CTs per phase (alternative combinations)							
1 medium size		■	■	■	■	■	■
1 long size		■	■	■	■	■	■
2 medium size		■	■	■	■	■	■
1 medium and 1 long size		■	■	■	■	■	■
Number of VTs per phase (alternative combinations)							
1 fixed		■	■	■	■	■	■
2 fixed			■	■	■	■	■
1 fixed with fuses		■					
1 withdrawable with fuses							
1 fixed and 1 withdrawable with fuses							

2.1.4 Top busbar entry

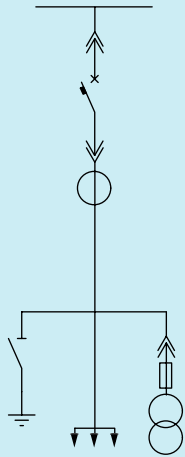


		12-17.5 kV			24 kV		
Width	mm	600	750	1000	750	1000	1000
Height	mm	2160	2160	2160	2160	2160	2160
Height with gas exhaust duct	mm	2495	2495	2495	2600	2600	2600
Depth	mm	2000	2000	2000	2300	2300	2300
Rated current	A						
630		■	■		■	■	
1250			■				
1600			■				■
2000			■	■			■
2500			■	■			
Earthing switch		■	■	■	■	■	■
Number of cable connections		–	–	–	–	–	–
Number of CTs per phase (alternative combinations)							
1 medium size		■	■	■	■	■	■
1 long size		■	■	■	■	■	■
2 medium size		■	■	■	■	■	■
1 medium and 1 long size		■	■	■	■	■	■
Number of VTs per phase (alternative combinations)							
1 fixed		■	■	■	■	■	■
2 fixed			■	■	■	■	■
1 fixed with fuses		■					
1 withdrawable with fuses							
1 fixed and 1 withdrawable with fuses							

TYPICAL CONVENTIONAL UNITS

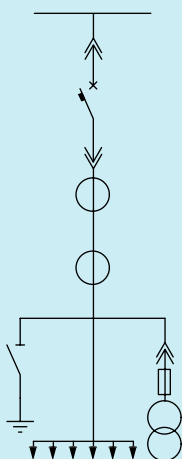
2.2 Incoming-outgoing unit with measurement (IFM)

2.2.1 Bottom cable entry



		12-17.5 kV			24 kV		
Width	mm		750	1000	750	1000	1000
Height	mm		2160	2160	2160	2160	2160
Height with gas exhaust duct	mm		2495	2495	2600	2600	2600
Depth	mm		1550	1550	1900	1900	1900
Rated current	A						
630			■		■	■	
1250			■		■	■	
1600			■				■
2000			■	■			■
2500			■	■			
Earthing switch			■	■	■	■	■
Number of cable connections	nr.		2	2	2	2	2
Number of CTs per phase (alternative combinations)							
1 medium size			■	■	■	■	■
1 long size			■	■	■	■	■
2 medium size							
1 medium and 1 long size							
Number of VTs per phase (alternative combinations)							
1 fixed							
2 fixed							
1 fixed with fuses							
1 withdrawable with fuses			■	■	■	■	■
1 fixed and 1 withdrawable with fuses							

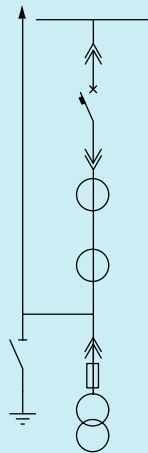
2.2.2 Bottom cable entry - deep version



		12-17.5 kV			24 kV		
Width	mm		750	1000	750	1000	1000
Height	mm		2160	2160	2160	2160	2160
Height with gas exhaust duct	mm		2495	2495	2600	2600	2600
Depth	mm		2000	2000	2300	2300	2300
Rated current	A						
630							
1250			■		■	■	
1600			■				■
2000			■	■			■
2500			■	■			
Earthing switch			■	■	■	■	■
Number of cable connections	nr.		6	6	6	6	6
Number of CTs per phase (alternative combinations)							
1 medium size			■	■	■	■	■
1 long size			■	■	■	■	■
2 medium size			■	■	■	■	■
1 medium and 1 long size			■	■	■	■	■
Number of VTs per phase (alternative combinations)							
1 fixed							
2 fixed							
1 fixed with fuses							
1 withdrawable with fuses			■	■	■	■	■
1 fixed and 1 withdrawable with fuses			■	■	■	■	■

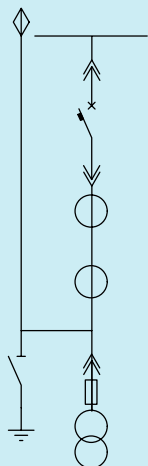
TYPICAL CONVENTIONAL UNITS

2.2.3 Top cable entry



		12-17.5 kV			24 kV		
Width	mm		750	1000	750	1000	1000
Height	mm		2700	2700	2850	2850	2850
Height with gas exhaust duct	mm		2700	2700	2850	2850	2850
Depth	mm		2235	2235	2645	2645	2645
Rated current	A						
630			■		■	■	
1250			■				■
1600			■	■			■
2000			■	■			■
2500			■	■			
Earthing switch			■	■	■	■	■
Number of cable connections	nr.		4	4	4	4	4
Number of CTs per phase (alternative combinations)							
1 medium size			■	■	■	■	■
1 long size			■	■	■	■	■
2 medium size			■	■	■	■	■
1 medium and 1 long size			■	■	■	■	■
Number of VTs per phase (alternative combinations)							
1 fixed							
2 fixed							
1 fixed with fuses			■	■	■	■	■
1 withdrawable with fuses			■	■	■	■	■
1 fixed and 1 withdrawable with fuses			■	■	■	■	■

2.2.4 Top busbar entry

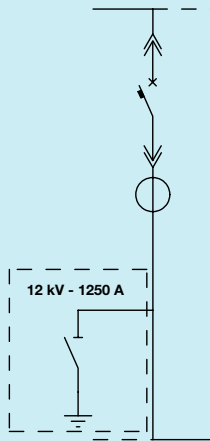


		12-17.5 kV			24 kV		
Width	mm		750	1000	750	1000	1000
Height	mm		2160	2160	2160	2160	2160
Height with gas exhaust duct	mm		2495	2495	2600	2600	2600
Depth	mm		2000	2000	2300	2300	2300
Rated current	A						
630							
1250			■		■	■	
1600			■				■
2000			■	■			■
2500			■	■			
Earthing switch			■	■	■	■	■
Number of cable connections			–	–	–	–	–
Number of CTs per phase (alternative combinations)							
1 medium size			■	■	■	■	■
1 long size			■	■	■	■	■
2 medium size			■	■	■	■	■
1 medium and 1 long size			■	■	■	■	■
Number of VTs per phase (alternative combinations)							
1 fixed							
2 fixed							
1 fixed with fuses							
1 withdrawable with fuses			■	■	■	■	■
1 fixed and 1 withdrawable with fuses			■	■	■	■	■

TYPICAL CONVENTIONAL UNITS

2.3 Bus tie (BT)

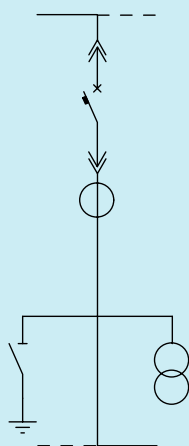
2.3.1 Conventional



		12-17.5 kV			24 kV		
Width	mm	600	750	1000	750	1000	1000
Height	mm	2160	2160	2160	2160	2160	2160
Height with gas exhaust duct	mm	2495	2495	2495	2600	2600	2600
Depth	mm	1550	1550	1550	1900	1900	1900
Rated current	A						
630		■	■		■	■	
1250			■				■
1600			■				■
2000			■	■			■
2500			■	■			
Earthing switch		(1)	(1)	—	—	—	—
Number of cable connections		—	—	—	—	—	—
Number of CTs per phase (alternative combinations)							
1 medium size		■	■	■	■	■	■
1 long size		■	■	■	■	■	■
2 medium size							
1 medium and 1 long size							
Number of VTs per phase (alternative combinations)							
1 fixed							
2 fixed							
1 fixed with fuses							
1 withdrawable with fuses							
1 fixed and 1 withdrawable with fuses							

(1) Only 12 kV and 1250 A.

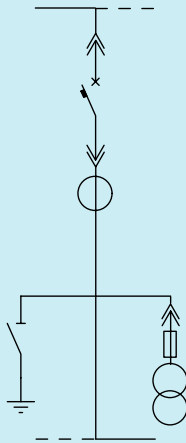
2.3.2 Deep version



		12-17.5 kV			24 kV		
Width	mm	600	750	1000	750	1000	1000
Height	mm	2160	2160	2160	2160	2160	2160
Height with gas exhaust duct	mm	2495	2495	2495	2600	2600	2600
Depth	mm	2000	2000	2000	2300	2300	2300
Rated current	A						
630		■	■		■	■	
1250			■				
1600			■	■			■
2000			■	■			■
2500			■	■			
Earthing switch		■	■	■	■	■	■
Number of cable connections		—	—	—	—	—	—
Number of CTs per phase (alternative combinations)							
1 medium size		■	■	■	■	■	■
1 long size		■	■	■	■	■	■
2 medium size							
1 medium and 1 long size							
Number of VTs per phase (alternative combinations)							
1 fixed		■	■	■	■	■	■
2 fixed							
1 fixed with fuses							
1 withdrawable with fuses							
1 fixed and 1 withdrawable with fuses							

TYPICAL CONVENTIONAL UNITS

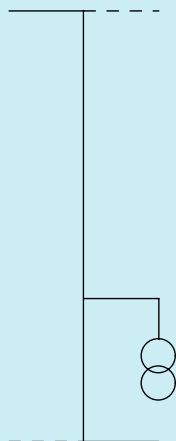
2.4 Bus tie with measurement (BTM)



		12-17.5 kV			24 kV		
Width	mm		750	1000	750	1000	1000
Height	mm		2160	2160	2160	2160	2160
Height with gas exhaust duct	mm		2495	2495	2600	2600	2600
Depth	mm		2000	2000	2300	2300	2300
Rated current	A						
630			■		■	■	
1250			■				■
1600			■	■			■
2000			■	■			■
2500			■	■			■
Earthing switch			■	■	■	■	■
Number of cable connections			–	–	–	–	–
Number of CTs per phase (alternative combinations)							
1 medium size			■	■	■	■	■
1 long size			■	■	■	■	■
2 medium size							
1 medium and 1 long size							
Number of VTs per phase (alternative combinations)							
1 fixed							
2 fixed							
1 fixed with fuses			■	■	■	■	■
1 withdrawable with fuses							
1 fixed and 1 withdrawable with fuses							

2.5 Bus rise (R)

2.5.1 Conventional

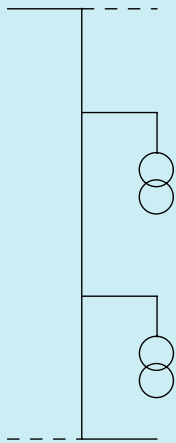


		12-17.5 kV			24 kV		
Width	mm	600 ⁽²⁾	750		750	1000	1000
Height	mm	2160	2160		2160	2160	2160
Height with gas exhaust duct	mm	2495	2495		2600	2600	2600
Depth	mm	1550	1550		1900	1900	1900
Rated current	A						
630							
1250		■	■		■	■	
1600			■				■
2000			■				■
2500			■				
Earthing switch		–	–		–	–	–
Number of cable connections		–	–		–	–	–
Number of CTs per phase (alternative combinations)							
1 medium size							
1 long size							
2 medium size							
1 medium and 1 long size							
Number of VTs per phase (alternative combinations)							
1 fixed							
2 fixed							
1 fixed with fuses							
1 withdrawable with fuses							
1 fixed and 1 withdrawable with fuses							

⁽²⁾ Only 12 kV.

TYPICAL CONVENTIONAL UNITS

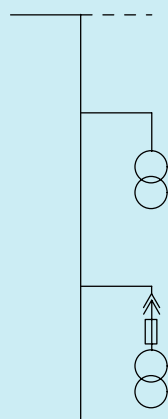
2.5.2 Deep version



		12-17.5 kV			24 kV		
Width	mm	600 ⁽³⁾	750		750	1000	1000
Height	mm	2160	2160		2160	2160	2160
Height with gas exhaust duct	mm	2495	2495		2600	2600	2600
Depth	mm	2000	2000		2300	2300	2300
Rated current	A						
630		■	■		■	■	
1250			■				
1600			■				■
2000			■				■
2500			■				
Earthing switch		–	–		–	–	–
Number of cable connections		–	–		–	–	–
Number of CTs per phase (alternative combinations)							
1 medium size							
1 long size							
2 medium size							
1 medium and 1 long size							
Number of VTs per phase (alternative combinations)							
1 fixed		■	■		■	■	■
2 fixed			■		■	■	■
1 fixed with fuses							
1 withdrawable with fuses							
1 fixed and 1 withdrawable with fuses							

⁽³⁾ Only 12 kV.

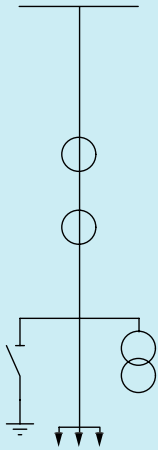
2.6 Bus rise with measurement (RM)



		12-17.5 kV			24 kV		
Width	mm		750		750	1000	1000
Height	mm		2160		2160	2160	2160
Height with gas exhaust duct	mm		2495		2600	2600	2600
Depth	mm		2000		2300	2300	2300
Rated current	A						
630							
1250			■		■	■	
1600			■				■
2000			■				■
2500			■				
Earthing switch			-		-	-	-
Number of cable connections			-		-	-	-
Number of CTs per phase (alternative combinations)							
1 medium size							
1 long size							
2 medium size							
1 medium and 1 long size							
Number of VTs per phase (alternative combinations)							
1 fixed							
2 fixed							
1 fixed with fuses							
1 withdrawable with fuses			■		■	■	■
1 fixed and 1 withdrawable with fuses			■		■	■	■

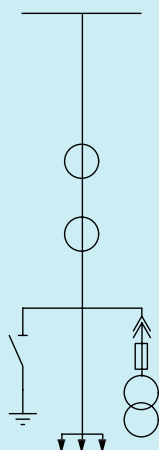
TYPICAL CONVENTIONAL UNITS

2.7 Incoming-outgoing unit direct (IFD)



		12-17.5 kV			24 kV		
Width	mm		750		750	1000	1000
Height	mm		2160		2160	2160	2160
Height with gas exhaust duct	mm		2495		2600	2600	2600
Depth	mm		1550			1900	1900
Rated current	A						
630			■		■	■	
1250							
1600							
2000							■
2500			■				
Earthing switch			■		■	■	■
Number of cable connections	nr.		2		2	2	2
Number of CTs per phase (alternative combinations)							
1 medium size			■		■	■	■
1 long size			■		■	■	■
2 medium size			■		■	■	■
1 medium and 1 long size			■		■	■	■
Number of VTs per phase (alternative combinations)							
1 fixed			■		■	■	■
2 fixed							
1 fixed with fuses							
1 withdrawable with fuses							
1 fixed and 1 withdrawable with fuses							

2.8 Incoming-outgoing unit direct with measurement (IFDM)

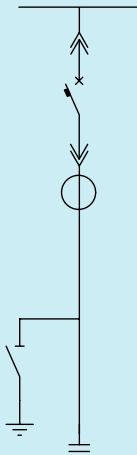


		12-17.5 kV			24 kV		
Width	mm		750		750	1000	1000
Height	mm		2160		2160	2160	2160
Height with gas exhaust duct	mm		2495		2600	2600	2600
Depth	mm		1550		1900	1900	1900
Rated current	A						
630			■		■	■	
1250							
1600							
2000							■
2500			■				
Earthing switch			■		■	■	■
Number of cable connections	nr.		2		2	2	2
Number of CTs per phase (alternative combinations)							
1 medium size			■		■	■	■
1 long size			■		■	■	■
2 medium size			■		■	■	■
1 medium and 1 long size			■		■	■	■
Number of VTs per phase (alternative combinations)							
1 fixed							
2 fixed							
1 fixed with fuses							
1 withdrawable with fuses			■		■	■	■
1 fixed and 1 withdrawable with fuses							

TYPICAL CONVENTIONAL UNITS

2.9 Incoming unit with capacitors (IFC)

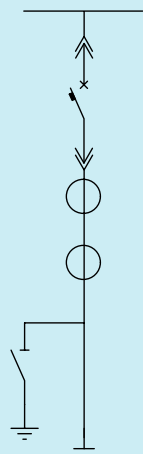
2.9.1 Conventional



		12-17.5 kV			24 kV		
Width	mm	600	750		750	1000	
Height	mm	2160	2160		2160	2160	
Height with gas exhaust duct	mm	2495	2495		2600	2600	
Depth	mm	1550	1550		1900	1900	
Rated current	A						
630		■	■		■	■	
1250							
1600							
2000							
2500							
Earthing switch		■	■		■	■	
Number of cable connections		–	–		–	–	
Number of CTs per phase (alternative combinations) ⁽⁴⁾							
1 medium size		■	■		■	■	
1 long size		■	■		■	■	
2 medium size							
1 medium and 1 long size							
Number of VTs per phase (alternative combinations)							
1 fixed							
2 fixed							
1 fixed with fuses							
1 withdrawable with fuses							
1 fixed and 1 withdrawable with fuses							

⁽⁴⁾ The characteristics and number of CTs can be different from the ones described according to the type of capacitors used, the installed power and the use of damping reactances and surge arresters.

2.9.2 Deep version

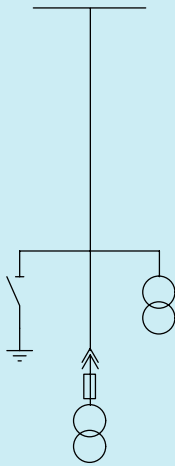


		12-17.5 kV			24 kV		
Width	mm	600	750		750	1000	
Height	mm	2160	2160		2160	2160	
Height with gas exhaust duct	mm	2495	2495		2600	2600	
Depth	mm	2000	2000		2300	2300	
Rated current	A						
630		■	■		■	■	
1250							
1600							
2000							
2500							
Earthing switch		■	■		■	■	
Number of cable connections		–	–		–	–	
Number of CTs per phase (alternative combinations) ⁽⁵⁾							
1 medium size		■	■		■	■	
1 long size		■	■		■	■	
2 medium size		■	■		■	■	
1 medium and 1 long size		■	■		■	■	
Number of VTs per phase (alternative combinations)							
1 fixed							
2 fixed							
1 fixed with fuses							
1 withdrawable with fuses							
1 fixed and 1 withdrawable with fuses							

⁽⁵⁾ The characteristics and number of CTs can be different from the ones described according to the type of capacitors used, the installed power and the use of damping reactances and surge arresters.

TYPICAL CONVENTIONAL UNITS

2.10 Measurement unit (M)



		12-17.5 kV			24 kV		
Width	mm	600	750		750	1000	
Height	mm	2160	2160		2160	2160	
Height with gas exhaust duct	mm	2495	2495		2600	2600	
Depth	mm	1550	1550		1900	1900	
Rated current	A						
630							
1250							
1600							
2000							
2500							
Earthing switch		■	■		■	■	
Number of cable connections		–	–		–	–	
Number of CTs per phase (alternative combinations)							
1 medium size							
1 long size							
2 medium size							
1 medium and 1 long size							
Number of VTs per phase (alternative combinations)							
1 fixed		■	■		■	■	
2 fixed			■				
1 fixed with fuses		■					
1 withdrawable with fuses			■		■	■	
2 withdrawable with fuses			■				
1 fixed and 1 withdrawable with fuses			■				
2 fixed and 1 withdrawable with fuses			■				
1 fixed and 2 withdrawable with fuses			■				
2 fixed and 2 withdrawable with fuses			■				

2.11 Disconnecter feeder (DF)



		12-17.5 kV			24 kV		
Width	mm		750		1000		
Height	mm		2160		2160		
Height with gas exhaust duct	mm		2495		2600		
Depth	mm		1550		1900		
Rated current	A						
630			■ ⁽⁶⁾			■ ⁽⁶⁾	
1250							
1600							
2000							
2500							
Earthing switch			■			■	
Number of cable connections	nr.		2			2	
Number of CTs per phase (alternative combinations) ⁽⁷⁾							
1 medium size							
1 long size							
2 medium size							
1 medium and 1 long size							
Number of VTs per phase (alternative combinations)							
1 fixed							
2 fixed							
1 fixed with fuses							
1 withdrawable with fuses							
1 fixed and 1 withdrawable with fuses							

⁽⁶⁾ The rated current depends on the fuses used.

⁽⁷⁾ The DF unit foresees the use of low voltage toroidal CTs applied to the power cables.

TYPICAL UNITS FOR MARINE APPLICATIONS

3.1	Incoming-outgoing unit (IF) – Top cable entry	3/2
3.2	Incoming-outgoing unit with measurement (IFM) – Top cable entry	3/3
3.3	Rise earthing transformer (RE)	3/4
3.3.1	Conventional	3/4
3.3.2	Deep version	3/5
3.4	Measurement earthing transformer (ME)	3/6

TYPICAL UNITS FOR MARINE APPLICATIONS

General notes

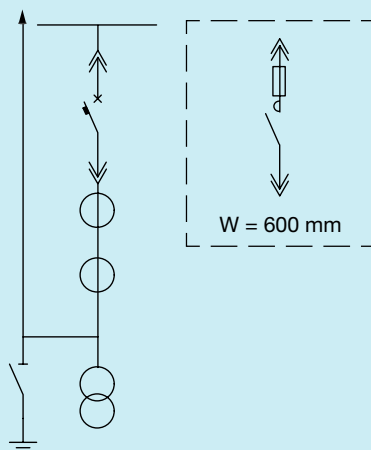
This chapter only describes typical units dedicated to marine applications with special characteristics, different from those of conventional units.

The "12 kV marine" units shown on page 1/10 and not given in this chapter, have the same characteristics as conventional units.

Each medium size current transformer can be replaced by an ABB KEVCD sensor.

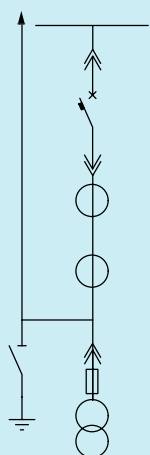
The earthing switch is not a compulsory switchboard accessory.

3.1 Incoming-outgoing unit (IF) – Top cable entry



		12 kV		
Width	mm	600	750	1000
Height	mm	2160	2160	2160
Height with gas exhaust duct	mm	2495	2495	2495
Depth	mm	2000	2000	2000
Rated current	A			
630		■	■	
1250			■	
1600			■	
2000			■	■
2500			■	■
Earthing switch		■	■	■
Number of cable connections	nr.	4	4	4
Number of CTs per phase (alternative combinations)				
1 medium size		■	■	■
1 long size		■	■	■
2 medium size		■	■	■
1 medium and 1 long size		■	■	■
Number of VTs per phase (alternative combinations)				
1 fixed		■	■	■
2 fixed			■	■
1 fixed with fuse		■		
1 withdrawable with fuses				
1 fixed and 1 withdrawable with fuses				

3.2 Incoming-outgoing unit with measurement (IFM) – Top cable entry



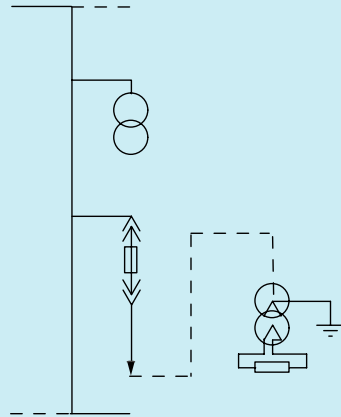
12 kV

Width	mm		750	1000
Height	mm		2160	2160
Height with gas exhaust duct	mm		2495	2495
Depth	mm		2000	2000
Rated current	A			
630			■	
1250			■	
1600			■	
2000			■	■
2500			■	■
Earthing switch			■	■
Number of cable connections	nr.		4	4
Number of CTs per phase (alternative combinations)				
1 medium size			■	■
1 long size			■	■
2 medium size			■	■
1 medium and 1 long size			■	■
Number of VTs per phase (alternative combinations)				
1 fixed				
2 fixed				
1 fixed with fuses				
1 withdrawable with fuses			■	■
1 fixed and 1 withdrawable with fuses			■	■

TYPICAL UNITS FOR MARINE APPLICATIONS

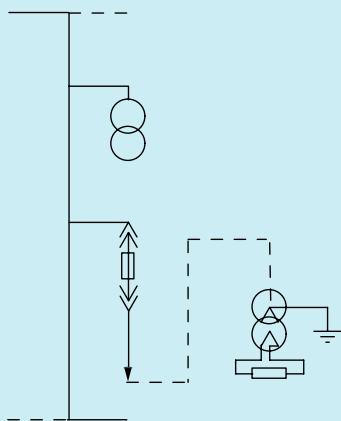
3.3 Rise earthing transformer (RE)

3.3.1 Conventional



		12 kV		
Width	mm	600		
Height	mm	2160		
Height with gas exhaust duct	mm	2495		
Depth	mm	1550		
Rated current	A			
630		■		
1250				
1600				
2000				
2500				
Earthing switch		—		
Number of cable connections		—		
Number of CTs per phase (alternative combinations)				
1 medium size				
1 long size				
2 medium size				
1 medium and 1 long size				
Number of VTs per phase (alternative combinations)				
1 fixed		■		
2 fixed				
1 fixed with fuses				
1 withdrawable with fuses				
1 fixed and 1 withdrawable with fuses				

3.3.2 Deep version

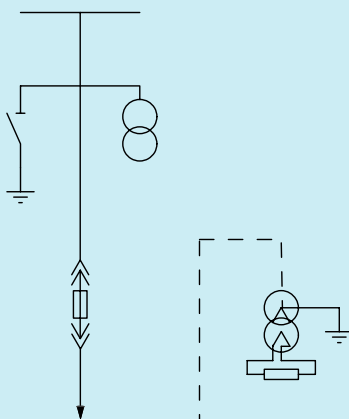


12 kV

Width	mm	600		
Height	mm	2160		
Height with gas exhaust duct	mm	2495		
Depth	mm	2000		
Rated current	A			
630		■		
1250				
1600				
2000				
2500				
Earthing switch		–		
Number of cable connections		–		
Number of CTs per phase (alternative combinations)				
1 medium size				
1 long size				
2 medium size				
1 medium and 1 long size				
Number of VTs per phase (alternative combinations)				
1 fixed		■		
2 fixed				
1 fixed with fuses				
1 withdrawable with fuses				
1 fixed and 1 withdrawable with fuses				

TYPICAL UNITS FOR MARINE APPLICATIONS

3.4 Measurement earthing transformer (ME)



		12 kV		
Width	mm	600		
Height	mm	2160		
Height with gas exhaust duct	mm	2495		
Depth	mm	1550		
Rated current	A			
630				
1250				
1600				
2000				
2500				
Earthing switch		■		
Number of cable connections		–		
Number of CTs per phase (alternative combinations)				
1 medium size				
1 long size				
2 medium size				
1 medium and 1 long size				
Number of VTs per phase (alternative combinations)		■		
1 fixed				
2 fixed				
1 fixed with fuses				
1 withdrawable with fuses				
1 fixed and 1 withdrawable with fuses				

BUSBAR APPLICATIONS

4.1	Current transformers	4/2
4.2	Voltage transformers	4/2
4.3	Incoming duct	4/2
4.4	Earthing switch	4/2

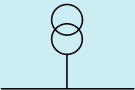
BUSBAR APPLICATIONS

4.1 Current transformers



Width	mm	12-17.5 kV			24 kV		
		600	750	1000	750	1000	1000
Busbars rated current	A						
1250			■		■	■	
1600			■				■
2000			■	■			■
2500			■	■			

4.2 Voltage transformers



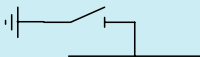
Width	mm	12-17.5 kV			24 kV		
		600	750	1000	750	1000	1000
Busbars rated current	A						
1250			■		■	■	
1600			■				■
2000			■	■			■
2500			■	■			

4.3 Incoming duct



Width	mm	12-17.5 kV			24 kV		
		600	750	1000	750	1000	1000
Busbars rated current	A						
1250			■		■	■	
1600							
2000							■
2500			■	■			

4.4 Earthing switch



Width	mm	12-17.5 kV			24 kV		
		600	750	1000	750	1000	1000
Busbars rated current	A						
1250			■		■	■	
1600			■				■
2000			■	■			■
2500			■	■			

GENERAL CHARACTERISTICS

5.1	IEC reference Standards	5/2
5.2	Operating conditions	5/2
5.3	Level of insulation	5/3
5.3.1	Reference Standards	5/3
5.3.2	Rated degrees of insulation	5/3
5.3.3	Example of calculation	5/4
5.4	Degrees of protection	5/5
5.4.1	Reference Standards	5/5
5.4.2	Identification table	5/5
5.4.3	Degrees of protection	5/6
5.5	Internal arc withstanding	5/6
5.5.1	Reference Standards	5/6
5.5.2	Switchboard characteristics	5/6
5.5.3	Methods for evacuating the gases	5/7

GENERAL CHARACTERISTICS

5.1 IEC reference Standards

Switchboard	60298
Switchboard and apparatus	60694
IEC 60298 Standard references of the tests the switchboard has been subjected to:	
– dielectric	6.1
– temperature	6.2
– impedance measurement	6.4
– rated short-time withstand current of the main circuits	6.5.101
– rated short-time withstand current of the earthing circuits	6.5.102
– removable mechanical parts	6.102.1
– mechanical interlocks	6.102.2
– degree of protection	6.103
– internal arc	6.108
Circuit-breakers	60056
Contactors	60470
Fuses	60282-1
Switch-disconnectors	60265-1 e 60420
SF6 gas	60376
Earthing switch	60129
Level of insulation (Co-ordination guide)	60071
Level of insulation (Values)	60694 Table 1a
Internal arc	60298 appendix AA, class A accessibility, criteria 1 to 6
Degrees of protection	60529
Current transformers	60044-1
Voltage transformers	60044-2
Current sensors	60044-8 (CDV)
Voltage sensors	60044-7

5.2 Operating conditions

The switchboard rated characteristics are guaranteed under the following ambient conditions:

- minimum ambient temperature - 5 °C
- maximum ambient temperature + 40 °C
- maximum relative humidity 95 %
- maximum altitude 1000 m s.l.m.
- presence of normal, non-corrosive and unpolluted atmosphere.

The switchboard must also be installed in ambients with the following characteristics:

- inside masonry or prefabricated structures;
- suitable for containing electrical apparatus;
- closed and not accessible to the public;
- only utilisable by personnel in charge of the electrical installation.

5.3 Level of insulation

5.3.1 Reference Standards

IEC 60694.

5.3.2 Rated degrees of insulation

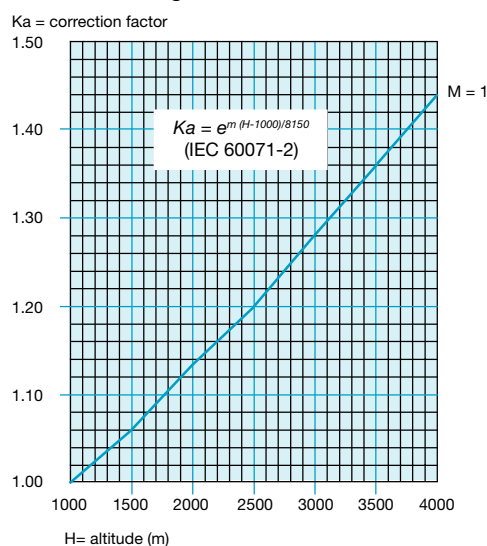
Rated and insulation voltage kV	Test voltage at industrial frequency		Impulse withstand voltage	
	For the insulation distance kV	For the phase-phase and phase-earth distance kV	For the insulation distance kV	For the phase-phase and phase-earth distance kV
3.6	12	10	46	40
7.2	23	20	70	60
12	32	28	85	75
17.5	45	38	110	95
24	60	50	145	125
36	80	70	190	170

The rated values are guaranteed at sea level and under normal atmospheric conditions (IEC 60071-2, pressure 1013 h Pa, temperature 20 °C, relative humidity 11 g/m³).

The degree of air insulation decreases progressively as the altitude increases; however, the rated values are guaranteed up to 1000 metres above sea level.

Above an altitude of 1000 m, a correction factor must be introduced which allows the required insulation levels to be guaranteed.

The graph below shows the correction factors according to the altitude.



Voltage test at industrial frequency (installation altitude) = > Test voltage at industrial frequency (according to IEC 60694) x Ka

Impulse withstand voltage (installation altitude) = > Impulse withstand voltage (according to IEC 60694) x Ka

GENERAL CHARACTERISTICS

5.3.3 Example of calculation

Rated insulation voltage of the switchboard	12 kV
Test voltage at industrial frequency	28 kV
Impulse withstand voltage	75 kV
Altitude of the switchboard installation site	2000 metres
Correction factor (Ka)	1.13
Test voltage at industrial frequency (altitude of installation)	28x1.13
Impulse withstand voltage (altitude of installation)	75x1.13
Test voltage at industrial frequency	31.6 kV
Impulse withstand voltage	84.7 kV

The levels of insulation required are therefore guaranteed by the 17.5 kV (38 kV and 95 kV) switchboard.

5.4 Degrees of protection

5.4.1 Reference Standards

IEC 60529.

5.4.2 Identification table

IP	Protection against foreign bodies	Protection against water
0	No protection	No protection
1	 Foreign bodies with diameter 50 mm or more	 Vertical rain
2	 Foreign bodies with diameter 12 mm or more	 Rain at 15°
3	 Foreign bodies with diameter 2.5 mm or more	 Rain at 60°
4	 Foreign bodies with diameter 1 mm or more	 Spray from all directions
5	 Deposit of dust	 Jets from all directions
6	 Entry of dust	 Flood
7	–	 Immersion of limited duration
8	–	 Immersion of indefinite duration

5.4.3 Degrees of protection

UniSafe switchboards are usually supplied with the following standard degrees of protection:

- External housing IP4X
- Inside the compartments IP2X

On request, the external housing can be supplied with other degrees of protection up to IP53 maximum.

GENERAL CHARACTERISTICS

5.5 Internal arc withstanding

5.5.1 Reference Standards

IEC 60298 appendix AA, class A accessibility, criteria 1 to 6.

Meaning of the criteria of the IEC 60298 Standard for carrying out the internal arc withstand tests:

Criteria	Description
1	The switchboard doors must remain closed and there must be no opening of the covering sheets
2	No part of the switchboard which is a possible source of danger for personnel must become detached
3	No drilling holes on the external housing of the switchboard must be made in the parts accessible to personnel
4	The vertical fabric indicators on the outside of the switchboard must not catch fire
5	The horizontal fabric indicators on the outside of the switchboard must not catch fire
6	All the switchboard earthing connections must remain efficient

5.5.2 Switchboard characteristics

The UniSafe switchboard satisfies all the criteria from 1 to 6 for guaranteeing safety of the personnel in charge of the installation in the case of an internal arc.
The criteria apply to the external switchboard housing.

5.5.3 Methods for evacuating the gases

Standard solution

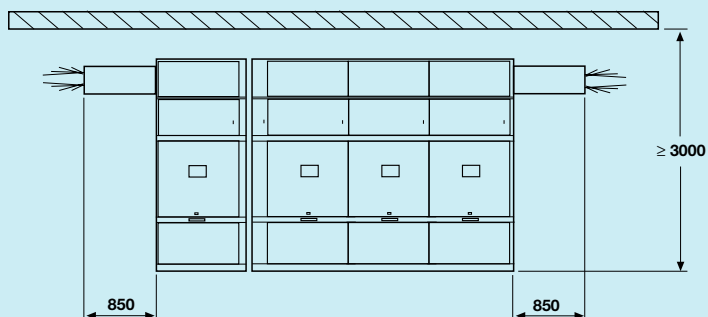
With metal-clad apparatus the probability of an internal arc occurring is very low because it is designed and constructed to prevent these faults.

The UniSafe switchboard, in the arc-proof version, does, in any case, guarantee maximum personnel safety even under those conditions.

In fact, it is able to resist the overpressures caused by the arc and is fitted with exhaust ducts to channel the gases generated and therefore prevent damage to the operators and equipment.

The standard solution foreseen for the arc-proof version of the UniSafe switchboard consists of a collection and exhaust duct for the gases, placed in the upper part of the switchboard, suitably extended at the two ends as shown in the diagram below.

Standard solution



Minimum room height: 3 metres.
Degree of protection up to IP53.

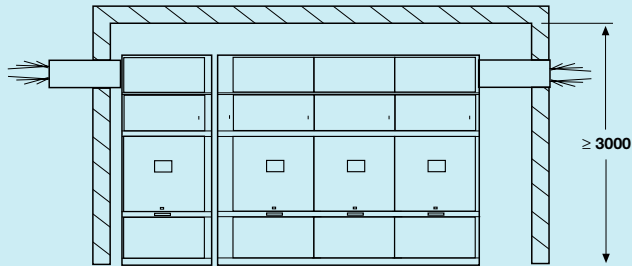
If the ends of the duct direct the exhaust gases towards areas of the installation room accessible to personnel and/or destined for positioning other apparatus/plants, or towards walls of the room which might make the gas rebound on outlet, the ends of the duct must be extended until they discharge the gases into non-hazardous areas. The extensions must consist of a duct made of metal material (able to resist a minimum pressure of 60 kPa) with a cross-section at least the same as the output cross-section of the extensions already applied to the switchboard, with bends (when strictly necessary) with the widest possible radius and suitably supported.

The best solution for preventing gases being deposited and overpressures inside the installation room is to extend the duct to the outside (either laterally or upwards). In this case, great care must be taken regarding access of people into the gas exit area and the gas exhaust mouths located outside must be protected to prevent any water, dust, animals or other foreign bodies from entering.

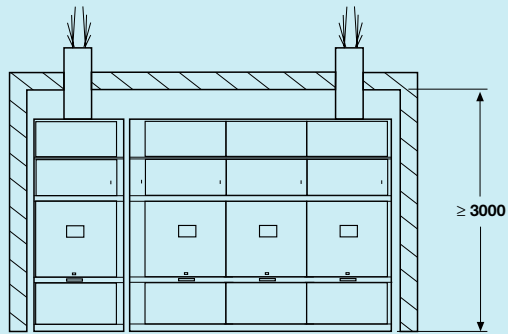
GENERAL CHARACTERISTICS

The following drawings illustrate some construction examples.

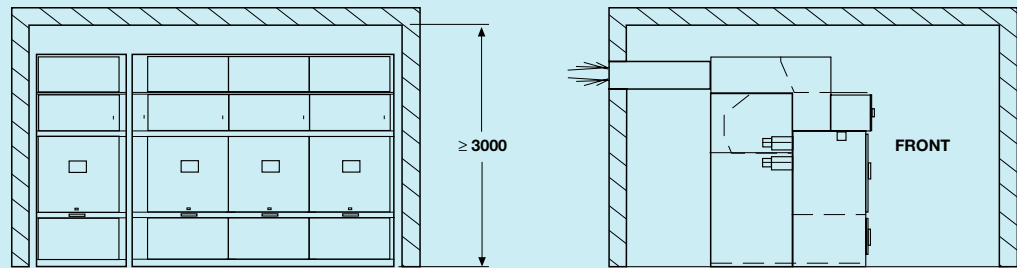
Example 1



Example 2

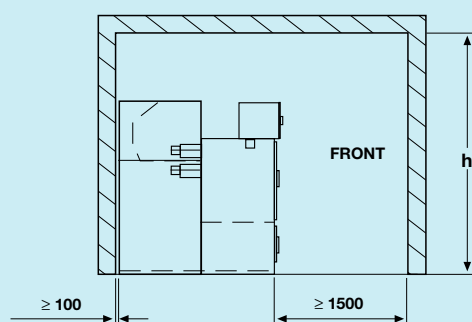


Example 3



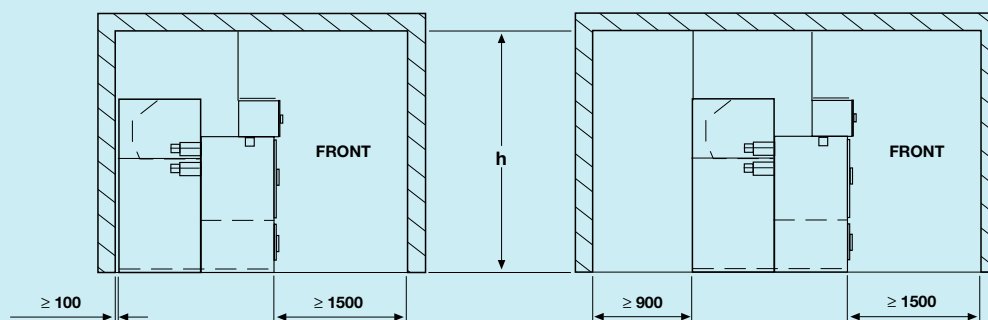
Should the dimensions and location of the installation room not allow one of the solutions defined previously to be used, one of the following alternative solutions can be used:

Solution A



Unit without gas exhaust duct.
Degree of protection up to IP40.

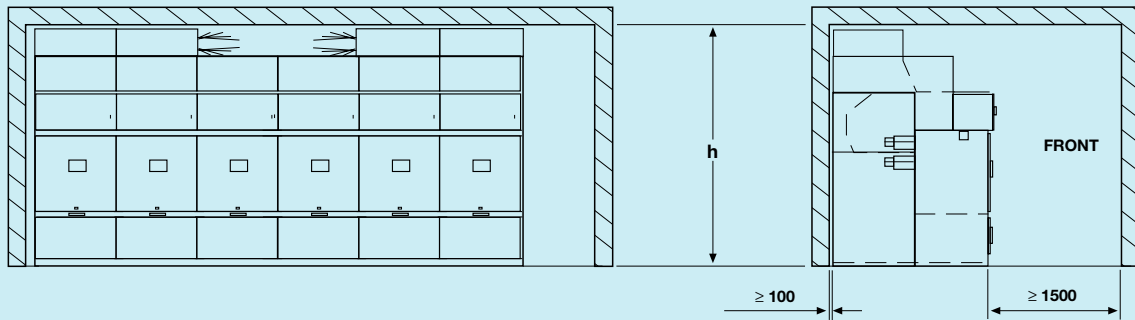
Solution B



Unit without gas exhaust duct, but with front and rear curtain walls (if not placed against the wall). The duct is extended laterally according to the criteria indicated in the "Standard solution".
Degree of protection up to IP41.

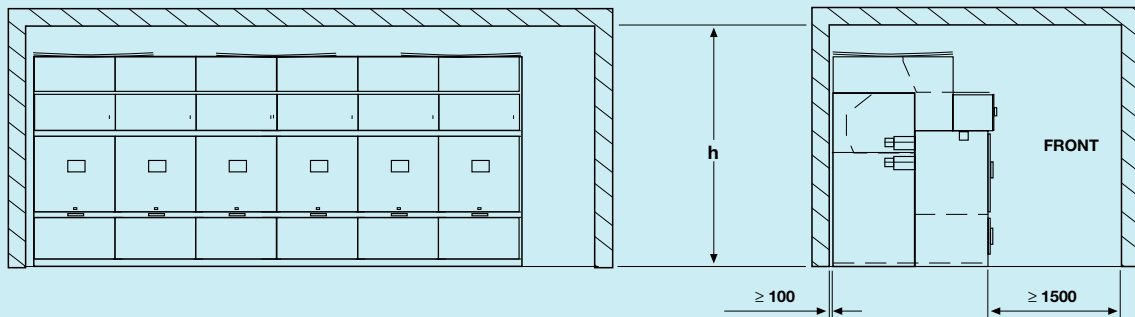
GENERAL CHARACTERISTICS

Solution C



Unit with gas exhaust duct bent over the two end panels at the top on each side.
Solution possible with a minimum of 5 units.
Degree of protection up to IP53.

Solution D



Unit with gas exhaust duct fitted with upper outlets.
Solution possible with a minimum of 3 units.
Degree of protection up to IP43.

The alternative solutions **must be** selected in accordance with the table below.

I (kA)	16		20		25		31.5	
T (s)	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
$2.4 \leq h \leq 2.6$	B	B	B	B	B	B	B	B
$2.6 < h \leq 3$	B-D	D	B-D	D	D	D	D	D
$3 < h \leq 3.5$	B-D	C-D	C-D	C-D	C-D	C-D	C-D	C-D
$3.5 < h \leq 4$	A-C-D	C-D	A-C-D	C-D	C-D	C-D	C-D	C-D
$h > 4$	A-C-D	C-D	A-C-D	C-D	A-C-D	C-D	C-D	C-D

I : internal arc short-circuit current

T : internal arc duration

h : room height (in metres)

Use of the FAST RECOVERY system limits internal arc duration to 0.1 s.

APPARATUS

6.1	HD4 type SF6 circuit-breakers	6/2
6.1.1	Identification table and weights	6/2
6.1.2	Value of the rated currents	6/4
6.2	VD4 type vacuum circuit-breakers	6/5
6.2.1	Identification table and weights	6/5
6.2.2	Value of the rated currents	6/7
6.3	V-Contact type vacuum contactors	6/8
6.3.1	Identification table and weights	6/8
6.3.2	Value of the rated currents	6/8
6.4	NALF fuse switch disconnectors	6/9
6.4.1	Identification table and weights	6/9
6.4.2	Value of the rated currents	6/9

APPARATUS

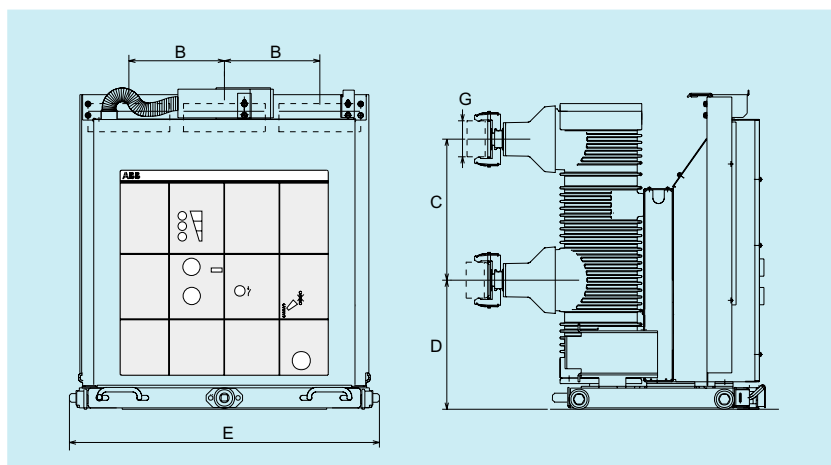
6.1 HD4 type SF6 circuit-breakers

6.1.1 Identification table and weights

Rated voltage kV	Rated breaking capacity kA	Rated Current A						Circuit-breakers (see drawing below)	Weights Kg
		A=600 B=150 C=205 D=264 E=532 F=200 G=ø35	A=750 B=210 C=310 D=284 E=682 F=200 G=ø35	A=750 B=210 C=310 D=284 E=682 F=200 G=ø79	A=750 B=210 C=310 D=284 E=682 F=200 G=130x24	A=1000 B=275 C=310 D=284 E=882 F=200 G=ø79	A=1000 B=275 C=310 D=284 E=882 F=200 G=ø109		
12	16	630						HD4/W 12.06.16 p150	120
		1250						HD4/W 12.12.16 p150	120
			630					HD4/W 12.06.16 p210	125
			1250					HD4/W 12.12.16 p210	125
				1600				HD4/W 12.16.16 p210	177
				2000				HD4/W 12.20.16 p210	177
					2500			HD4/W 12.25.16 p210	177
	25	630						HD4/W 12.06.25 p150	120
		1250						HD4/W 12.12.25 p150	120
			630					HD4/W 12.06.25 p210	125
			1250					HD4/W 12.12.25 p210	125
				1600				HD4/W 12.16.25 p210	177
				2000				HD4/W 12.20.25 p210	177
					2500			HD4/W 12.25.25 p210	177
	31.5	630						HD4/W 12.06.32 p150	120
		1250						HD4/W 12.12.32 p150	120
			630					HD4/W 12.06.32 p210	125
			1250					HD4/W 12.12.32 p210	125
				1600				HD4/W 12.16.32 p210	177
				2000				HD4/W 12.20.32 p210	177
					2500			HD4/W 12.25.32 p210	177

Caption

A = Unit width
 B = Pole centre distance
 C = Top and bottom terminals distance
 D = Height of bottom terminal
 E = Circuit-breaker width
 F = Circuit-breaker isolating run
 G = Size of the isolating contacts.



Rated voltage	Rated breaking capacity	Rated Current A						Circuit-breakers (see drawing on page 6/2)	Weights Kg
kV	kA	A=600 B=150 C=205 D=264 E=532 F=200 G=ø35	A=750 B=210 C=310 D=284 E=682 F=200 G=ø35	A=750 B=210 C=310 D=284 E=682 F=200 G=ø79	A=750 B=210 C=310 D=284 E=682 F=200 G=130x24	A=1000 B=275 C=310 D=284 E=882 F=200 G=ø79	A=1000 B=275 C=310 D=284 E=882 F=200 G=ø109		
17.5	16	630						HD4/W 17.06.16 p150	120
		1250						HD4/W 17.12.16 p150	120
			630					HD4/W 17.06.16 p210	125
			1250					HD4/W 17.12.16 p210	125
				1600				HD4/W 17.16.16 p210	177
				2000				HD4/W 17.20.16 p210	177
					2500			HD4/W 17.25.16 p210	177
	25	630						HD4/W 17.06.25 p150	120
		1250						HD4/W 17.12.25 p150	120
			630					HD4/W 17.06.25 p210	125
			1250					HD4/W 17.12.25 p210	125
				1600				HD4/W 17.16.25 p210	177
				2000				HD4/W 17.20.25 p210	177
					2500			HD4/W 17.25.25 p210	177
	31.5	630						HD4/W 17.06.32 p150	120
		1250						HD4/W 17.12.32 p150	120
			630					HD4/W 17.06.32 p210	125
			1250					HD4/W 17.12.32 p210	125
				1600				HD4/W 17.16.32 p210	177
				2000				HD4/W 17.20.32 p210	177
					2500			HD4/W 17.25.32 p210	177

Caption

A = Unit width
 B = Pole centre distance
 C = Top and bottom terminals distance
 D = Height of bottom terminal
 E = Circuit-breaker width
 F = Circuit-breaker isolating run
 G = Size of the isolating contacts.

APPARATUS

Caption

A = Unit width
B = Pole centre distance
C = Top and bottom terminals distance
D = Height of bottom terminal
E = Circuit-breaker width
F = Circuit-breaker isolating run
G = Size of the isolating contacts.

Rated voltage	Rated breaking capacity	Rated current			Circuit-breakers (see drawing on page 6/2)	Weights Kg
kV	kA	A=750 B=210 C=310 D=329 E=682 F=300 G=ø35	A=1000 B=275 C=380 D=349 E=882 F=300 G=ø35	A=1000 B=275 C=380 D=349 E=882 F=300 G=ø79		
24	16	630			HD4/W 24.06.16 p210	125
		1250			HD4/W 24.12.16 p210	125
			630		HD4/W 24.06.16 p275	130
			1250		HD4/W 24.12.16 p275	130
				1600	HD4/W 24.16.16 p275	177
				2000	HD4/W 24.20.16 p275	177
	20	630			HD4/W 24.06.20 p210	125
		1250			HD4/W 24.12.20 p210	125
			630		HD4/W 24.06.20 p275	130
			1250		HD4/W 24.12.20 p275	130
				1600	HD4/W 24.16.20 p275	177
				2000	HD4/W 24.20.20 p275	177
	25	630			HD4/W 24.06.25 p210	125
		1250			HD4/W 24.12.25 p210	125
			630		HD4/W 24.06.25 p275	130
			1250		HD4/W 24.12.25 p275	130
				1600	HD4/W 24.16.25 p275	177
				2000	HD4/W 24.20.25 p275	177

6.1.2 Value of the rated currents

Value of the rated currents according to the degree of protection of the external switchboard housing and ambient temperature.

Ambient temperature °C	IP4X					IP5X				
	630	1250	1600	2000	2500	630	1250	1600	2000	2500
40	630	1250	1600	2000	2500	440	880	1120	1400	1750
45	630	1200	1530	1910	2390	420	840	1070	1340	1670
50	600	1140	1460	1820	2280	400	800	1020	1280	1590
55	570	1080	1380	1730	2160	380	760	970	1210	1510
60	540	1020	1300	1630	2040	360	710	910	1140	1430
65	480	870	1110	1390	1740	310	610	780	980	1220

6.2 VD4 type vacuum circuit-breakers

6.2.1 Identification table and weights

Rated voltage	Rated breaking capacity	Rated current						Circuit-breakers (see drawing on page 6/2)	Weights Kg
kV	kA	A=600 B=150 C=205 D=264 E=532 F=200 G=ø35	A=750 B=210 C=310 D=284 E=682 F=200 G=ø35	A=750 B=210 C=310 D=284 E=682 F=200 G=ø79	A=750 B=210 C=310 D=284 E=682 F=200 G=130x24	A=1000 B=275 C=310 D=284 E=882 F=200 G=ø79	A=1000 B=275 C=310 D=284 E=882 F=200 G=ø109		
12	16	630						VD4E 12.06.16 ZC p150	100
		1250						VD4 12.12.16 ZC p150	125
			630					VD4E 12.06.16 W p210	105
			1250					VD4 12.12.16 W p210	130
				1600				VD4 12.16.20 ZC p210	195
						2000		VD4 12.20.20 ZC p275	200
							2500	VD4 12.25.20 ZC p275	210
		630						VD4E 12.06.25 ZC p150	100
		1250						VD4 12.12.25 ZC p150	125
			630					VD4E 12.06.25 W p210	105
			1250					VD4 12.12.25 W p210	130
				1600				VD4 12.16.25 ZC p210	195
	25	630						VD4 12.20.25 ZC p275	200
		1250						VD4 12.25.25 ZC p275	210
			630					VD4 12.06.31 ZC p150	125
			1250					VD4 12.12.31 ZC p150	125
				1600				VD4 12.06.31 W p210	130
						2000		VD4 12.12.31 W p210	130
							2500	VD4 12.16.31 ZC p210	195
								VD4 12.20.31 ZC p275	200
								VD4 12.25.31 ZC p275	210
		630						VD4 12.06.31 ZC p150	125
		1250						VD4 12.12.31 ZC p150	125
			630					VD4 12.06.31 W p210	130
			1250					VD4 12.12.31 W p210	130
	31.5			1600				VD4 12.16.31 ZC p210	195
						2000		VD4 12.20.31 ZC p275	200
							2500	VD4 12.25.31 ZC p275	210

Caption

A = Unit width
 B = Pole centre distance
 C = Top and bottom terminals distance
 D = Height of bottom terminal
 E = Circuit-breaker width
 F = Circuit-breaker isolating run
 G = Size of the isolating contacts.

APPARATUS

Rated voltage	Rated breaking capacity	Rated current						Circuit-breakers (see drawing on page 6/2)	Weights Kg
kV	kA	A=600 B=150 C=205 D=264 E=532 F=200 G=ø35	A=750 B=210 C=310 D=284 E=682 F=200 G=ø35	A=750 B=210 C=310 D=284 E=682 F=200 G=ø79	A=750 B=210 C=310 D=284 E=682 F=200 G=130x24	A=1000 B=275 C=310 D=284 E=882 F=200 G=ø79	A=1000 B=275 C=310 D=284 E=882 F=200 G=ø109		
17.5	16	630						VD4E 17.06.16 ZC p150	100
		1250						VD4 17.12.16 ZC p150	125
			630					VD4E 17.06.16 W p210	105
			1250					VD4 17.12.16 W p210	130
				1600				VD4 17.16.20 ZC p210	195
						2000		VD4 17.20.20 ZC p275	200
							2500	VD4 17.25.20 ZC p275	210
	25	630						VD4 17.06.25 ZC p150	125
		1250						VD4 17.12.25 ZC p150	125
			630					VD4 17.06.25 W p210	130
			1250					VD4 17.12.25 W p210	130
				1600				VD4 17.16.25 ZC p210	195
						2000		VD4 17.20.25 ZC p275	200
							2500	VD4 17.25.25 ZC p275	210
	31.5	630						-	-
		1250						-	-
			630					-	-
			1250					-	-
				1600				VD4 17.16.31 ZC p210	195
						2000		VD4 17.20.31 ZC p275	200
							2500	VD4 17.25.31 ZC p275	210

Caption

A = Unit width
 B = Pole centre distance
 C = Top and bottom terminals distance
 D = Height of bottom terminal
 E = Circuit-breaker width
 F = Circuit-breaker isolating run
 G = Size of the isolating contacts.

Rated voltage	Rated breaking capacity	Rated current			Circuit-breakers (see drawing on page 6/2)	Weights Kg
kV	kA	A=750 B=210 C=310 D=329 E=682 F=300 G=ø35	A=1000 B=275 C=380 D=349 E=882 F=300 G=ø35	A=1000 B=275 C=380 D=349 E=882 F=300 G=ø79		
24	16	630			VD4E 24.06.16 ZC p210	110
		1250			VD4 24.12.16 ZC p210	125
			630		–	–
			1250		–	–
				1600	VD4 24.16.16 ZC p275	210
				2000	VD4 24.20.16 ZC p275	210
	20	630			VD4 24.06.20 ZC p210	115
		1250			VD4 24.12.20 ZC p210	125
			630		–	–
			1250		–	–
				1600	VD4 24.16.20 ZC p275	210
				2000	VD4 24.20.20 ZC p275	210
	25	630			VD4 24.06.25 ZC p210	115
		1250			VD4 24.12.25 ZC p210	125
			630		–	–
			1250		–	–
				1600	VD4 24.16.25 ZC p275	210
				2000	VD4 24.20.25 ZC p275	210

Caption

A = Unit width
 B = Pole centre distance
 C = Top and bottom terminals distance
 D = Height of bottom terminal
 E = Circuit-breaker width
 F = Circuit-breaker isolating run
 G = Size of the isolating contacts.

6.2.2 Value of the rated currents

Value of the rated currents according to the degree of protection of the external switchboard housing and ambient temperature.

Ambient temperature °C	IP4X					IP5X				
	630	1250	1600	2000	2500	630	1250	1600	2000	2500
40	630	1250	1600	2000	2500	440	880	1120	1400	1750
45	630	1200	1530	1910	2390	420	840	1070	1340	1670
50	600	1140	1460	1820	2280	400	800	1020	1280	1590
55	570	1080	1380	1730	2160	380	760	970	1210	1510
60	540	1020	1300	1630	2040	360	710	910	1140	1430
65	480	870	1110	1390	1740	310	610	780	980	1220

APPARATUS

6.3 V-Contact type vacuum contactors

6.3.1 Identification table and weights

Rated voltage	Rated breaking capacity	Rated current ⁽³⁾	Contactors	Weights Kg
kV	kA ⁽¹⁾	A=600 B=150 C=205 D=264 E=532 F=200 G=ø35		
7.2	16	400	V7/W	55 ⁽²⁾
	25			
	31.5			
12	16	400	V12/W	55 ⁽²⁾
	25			
	31.5			

Caption

A = Unit width
 B = Pole centre distance
 C = Top and bottom terminals distance
 D = Height of bottom terminal
 E = Circuit-breaker width
 F = Circuit-breaker isolating run
 G = Size of the isolating contacts.

⁽¹⁾ Guaranteed by using suitable fuses.

⁽²⁾ The weight of the fuses must be added (the largest size weighs 5.5. kg each).

⁽³⁾ Rated service current in category AC4. For the largest fuse size which can be used with the contactor, at the different service voltages and the type of load to be protected, refer to the technical catalogue of the V-Contact contactor.

6.3.2 Value of the rated currents

Value of the rated currents according to the degree of protection of the external switchboard housing and ambient temperature (without fuses).

Ambient temperature °C	IP4X 400	IP5X 400
40	400	280
45	380	270
50	360	260
55	350	240
60	330	230
65	280	200

6.4 NALF fuse switch disconnectors

6.4.1 Identification table and weight

Rated voltage	Rated breaking capacity	Rated current ⁽³⁾		Switch-disconnector	Weights Kg
kV	kA ⁽¹⁾	A=750 B=170	A=1000 B=275		
12	16	630		NALF 17-6A170R	44 ⁽²⁾
	25				
	31.5				
17.5	16	630		NALF 17-6A170R	44 ⁽²⁾
	25				
	31.5				
24	16	630		NALF 24-6A275R	53 ⁽²⁾
	20				
	25				

⁽¹⁾ Guaranteed by using suitable fuses.

⁽²⁾ The weight of the fuses must be added (the largest size weighs 5.5. kg each).

⁽³⁾ The rated current depends on the fuse used.

6.4.2 Value of the rated currents

Value of the rated currents according to the degree of protection of the external switchboard housing and ambient temperature (without fuses).

Ambient temperature °C	IP4X 630	IP5X 630
40	630	440
45	600	420
50	570	400
55	540	380
60	510	360
65	440	310

Caption

A = Unit width

B = Pole centre distance.

MEASURING INSTRUMENTS

7.1	Current transformers	7/2
7.1.1	Reference Standards	7/2
7.1.2	Dimensions	7/3
7.1.3	Weights	7/5
7.1.4	Classes	7/5
7.1.5	Types	7/6
7.2	Voltage transformers	7/6
7.2.1	Reference Standards	7/6
7.2.2	Dimensions	7/7
7.2.3	Weights	7/11
7.2.4	Classes	7/11
7.2.5	Types	7/11
7.3	Sensors	7/12
7.3.1	Current sensor	7/12
7.3.2	Voltage sensor	7/12
7.3.3	Capacitive divider	7/13
7.3.4	Reference Standards	7/13
7.3.5	Dimensions	7/14
7.3.6	Types and weights	7/18

MEASURING INSTRUMENTS

7.1 Current transformers

The primary current of the transformer must be selected from among the standard values closest to the measurement to be made (e.g. current to be measured = 1120 A - primary current of the transformer 1250 A).

The secondary current of the transformer is normally 1 or 5A and is a function of the instruments it is to be connected to and the distance between the transformer and the instruments themselves: 5A is used for distances under 10 metres, whereas 1A for higher ones. The losses due to connection wire resistance are 25 times higher at 5A than at 1A.

The VA power of the transformer must be calculated by summing the connection wire losses with the absorption of the connected instruments.

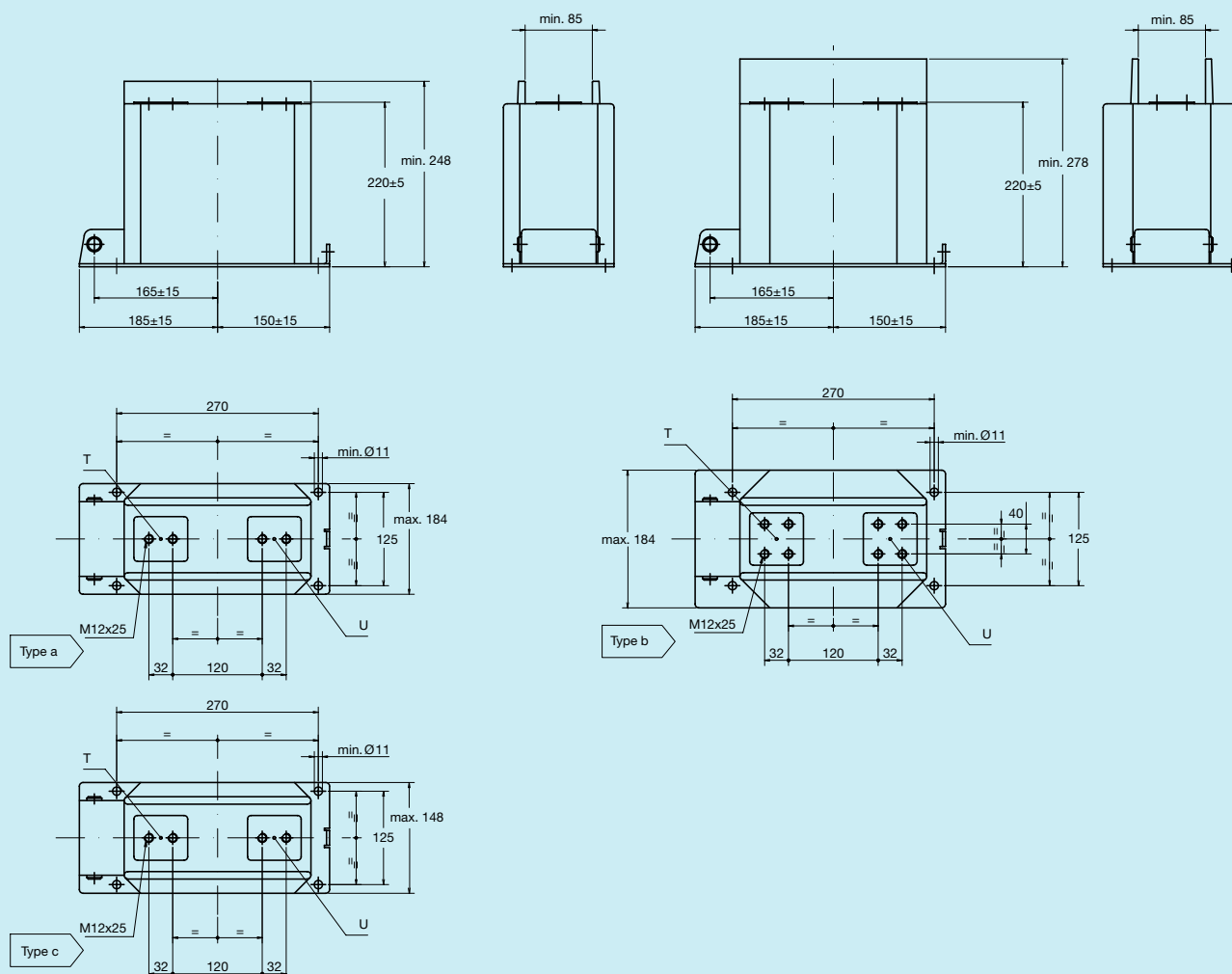
Caution! Never leave the secondary circuit of the transformer open with the primary terminals energised. High voltages could be produced in the secondary circuit causing damage to people or to the transformer itself.

7.1.1 Reference Standards

Electrical characteristics	60044-1
Dimensions	DIN 42600 Narrow type Medium and Long size

7.1.2 Dimensions

12-17.5 kV

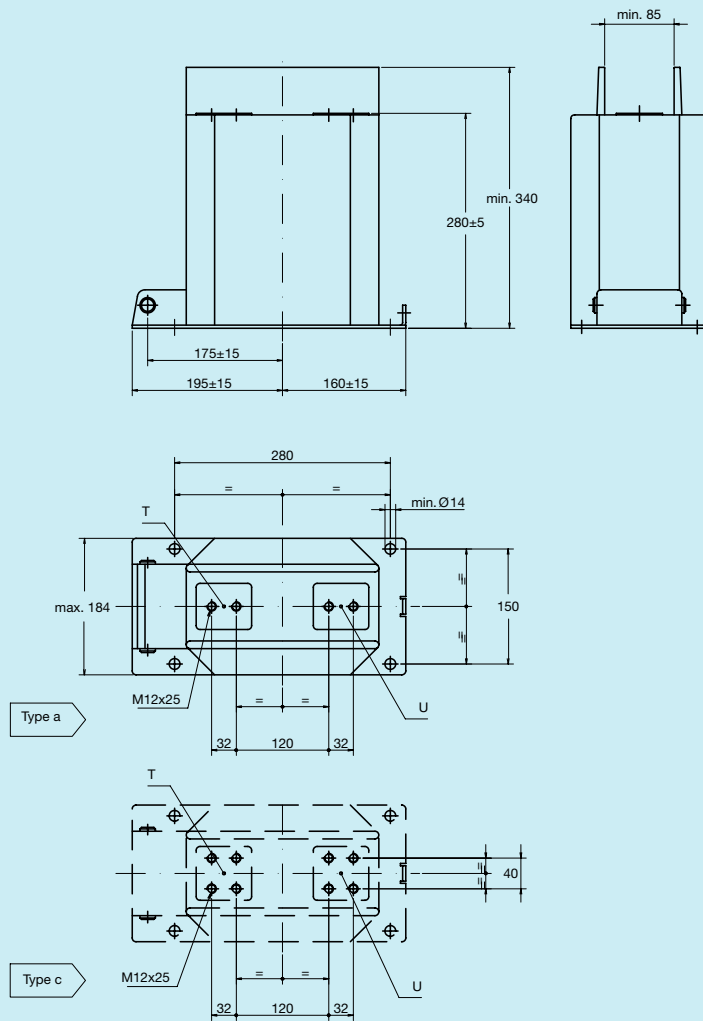


Type	Switchboard	Current
a		$I_n \leq 1250$ A
b	750/1000 mm	$I_n > 1250$ A
c	600 mm	$I_n \leq 2500$ A

Version	Connection coding	
	T	U
1	P1	P2
2	P2	P1
3	K	L
4	L	K

MEASURING INSTRUMENTS

24 kV



Type	Switchboard	Current
a	750/1000 mm	$I_n \leq 1250$ A
b		$I_n > 1250$ A
		$I_n \leq 2000$ A

Version	Connection coding	
	T	U
1	P1	P2
2	P2	P1
3	K	L
4	L	K

7.1.3 Weights

Rated voltage kV	Rated current A	Type	Weight Kg
12-17.5	1250	Medium size	20
		Long size	31
	2500	Medium size	26
		Long size	37
24	1250	Medium size	29
		Long size	42
	2500	Medium size	33
		Long size	46

7.1.4 Classes

IEC 60044-1.

Class	Error					Phase displacement			
	0.05 In	0.2 In	0.5 In	In	1.2 In	0.05 In	0.2 In	In	1.2 In
0.2	±0.75%	±0.35%	–	±0.2%	±0.2%	±30'	±15'	±10'	±10'
0.5	±1.5%	±0.75%	–	±0.5%	±0.5%	±90'	±45'	±30'	±30'
1	±3%	±1.5%	–	±1%	±1%	±180'	±90'	±60'	±60'
3	–	–	±3%	–	±3%	–	–	–	–

Class	Error					Phase displacement			
	0.05 In	0.2 In	0.5 In	In	1.2 In	0.05 In	0.2 In	In	1.2 In
0.2s	±0.75%	±0.35%	±0.2%	±0.2%	±0.2%	±30'	±15'	±10'	±10'
0.5s	±1.5%	±0.75%	±0.5%	±0.5%	±0.5%	±90'	±45'	±30'	±30'

Class	Error	Phase displacement	Composite error
	In	In	At rated accuracy limit current
5P	±1%	±60'	±5%
10P	±3%	–	±10%

MEASURING INSTRUMENTS

7.1.5 Tipologie

Some types of transformers which can be applied to UniSafe switchboards are listed.

Manufacturer: ABB Transmit (Finland)
Name: KOFD

Manufacturer: ABB EJF (Czech Republic)
Name: TPU

Manufacturer: Wattsud (Italy)
Name: IWR __ W

7.2 Voltage transformers

The primary voltage of the transformer must be selected from among the standard values closest to the measurement to be made (e.g. voltage to be measured = 19 kV - primary voltage of the transformer 20 kV).

The secondary voltage of the transformer is normally 100 V or 110 V and is a function of the instruments to be supplied.

The VA power of the transformer must be calculated by summing the connection wire losses with the absorption of the connected instruments.

The voltage factor is determined by the maximum service voltage, by the type of neutral and by the earthing condition of the primary circuit of the transformer. For phase-phase type transformers, the factor is $1.2 \times U_n$ continuous; for phase-neutral type transformers, it is as follows:

- $1.5 \times U_n$ for 30 s in installations with an effectively earthed neutral system;
- $1.9 \times U_n$ for 30 s in installations with a non-effectively earthed neutral system, with instantaneous earthfault tripping;
- $1.9 \times U_n$ for 8 hours in installations with an isolated or compensated neutral system, without instantaneous earthfault tripping.

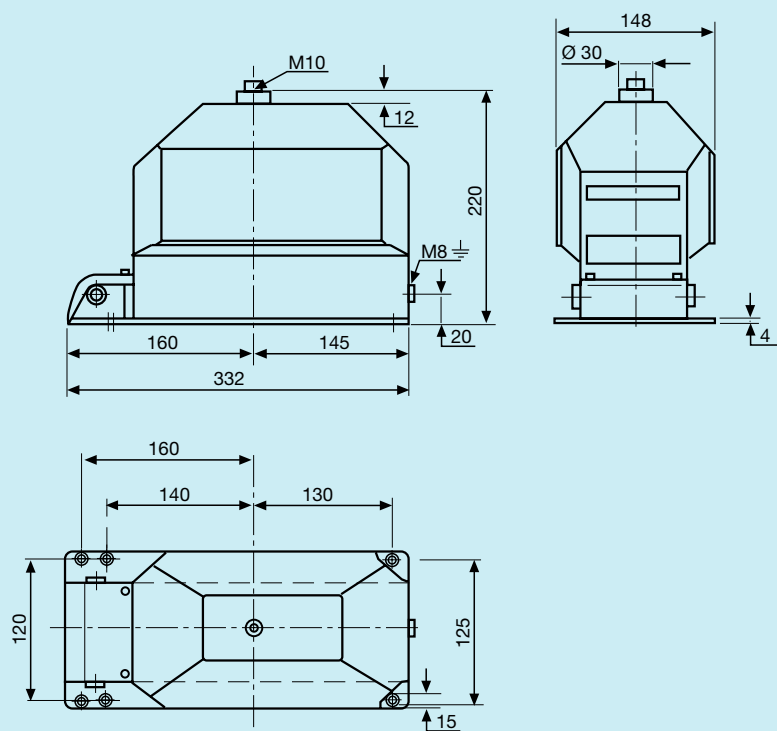
Caution! Never short-circuit the secondary of the transformer with the primary circuit energised to avoid it being damaged within a few seconds.

7.2.1 Reference Standards

Electrical characteristics	60044-2
Dimensions	DIN 42600 Narrow type (in fixed version and fixed with fuses) Dedicated (see Chapter 2) (in withdrawable version with fuses)

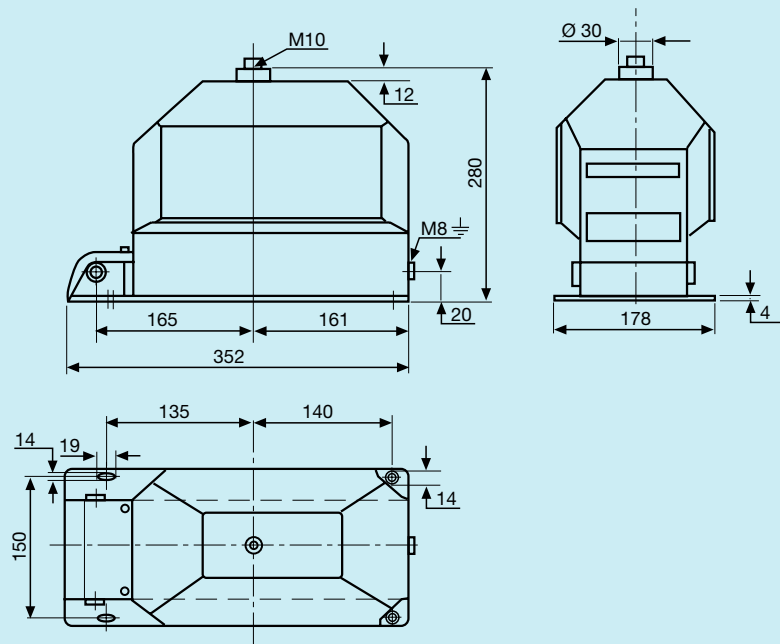
7.2.2 Dimensions

12-17.5 kV

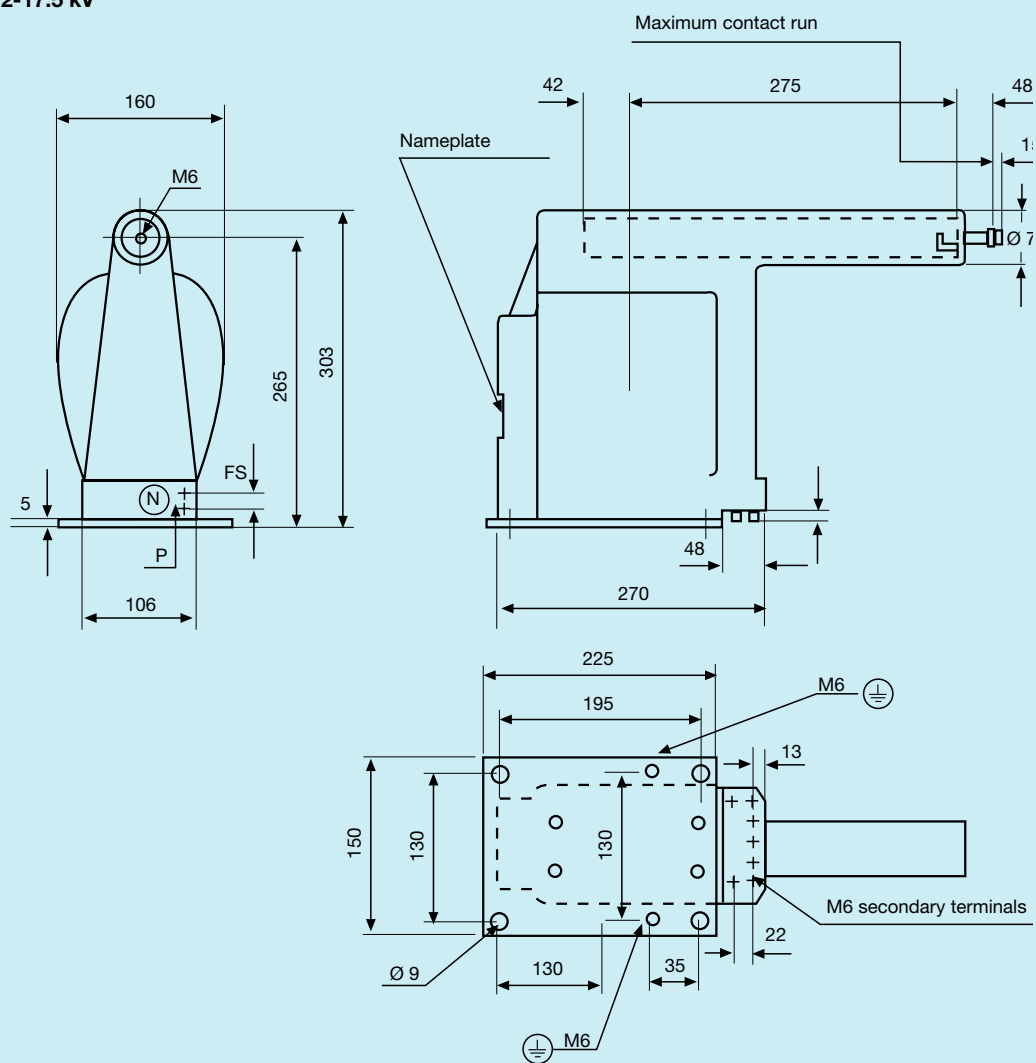


MEASURING INSTRUMENTS

24 kV



12-17.5 kV

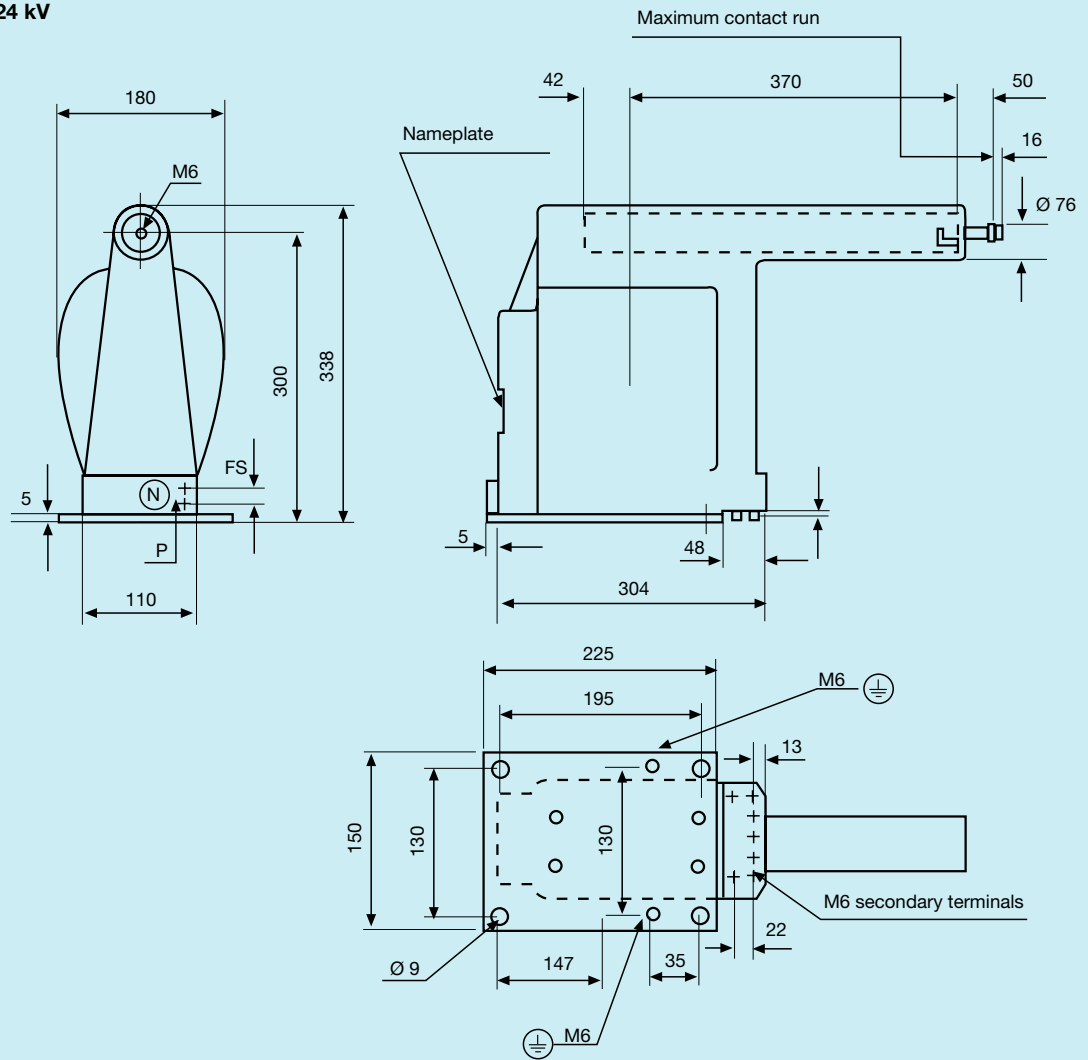


Fuse length = 220 mm

Type	P	FS
EPR 10F	—	—
EPR 10FS	M8x15	25

MEASURING INSTRUMENTS

24 kV



Fuse length = 340 mm

Type	P	FS
EPR 20F	-	-
EPR 20FS	M8x15	25

7.2.3 Weights

Average weight of fixed transformers	
12-17.5 kV	22 Kg
24 kV	30 Kg

Average weights of withdrawable transformers with fuses	
12-17.5 kV	25 Kg
24 kV	33 Kg

7.2.4 Classes

IEC 60044-2.

Class	Error	Phase displacement
	0.8...1.2 Un	0.8...1.2 Un
0.2	±0.2%	±10'
0.5	±0.5%	±20'
1	±1%	±40'
3	±3%	—

Class	Error	Phase displacement
	0.05...voltage factor x Un	0.05...voltage factor x Un
3P	±3%	±120'
6P	±6%	±240'

7.2.5 Types

Some types of transformers which can be applied to UniSafe switchboards are listed.

Fixed version and fixed with fuses:

Manufacturer: ABB Transmit (Finland)
Name: KRED A1

Manufacturer: ABB EJF (Czech Republic)
Name: TJC

Manufacturer: Wattsud (Italy)
Name: EPR __ W

Withdrawable version with fuses:

Manufacturer: Wattsud (Italy)
Name: EPR __ F

MEASURING INSTRUMENTS

7.3 Sensors

Sensors: ABB KEVCD Combi Sensor, Block type.
Manufacturer: ABB Transmit (Finland).

The sensors are available in two versions:
– sensors for current measurement;
– combined sensors for current and voltage measurements.

7.3.1 Current sensor

Type	Rated current (1)	Measuring range (2)
KEVCD_A_	80 A	40...160 A
	240 A	120...480 A
	640 A	320...1280 A
KEVCD_B_	1600 A	800...3200 A

The KEVCD_A_ sensor is used for rated continuous currents up to 1280 A.

Installation is carried out as follows:

- partialisation of the sensor by means of mobile bridges (1);
- setting the rated current in the REF unit software within the measuring range (2).

The KEVCD_B_ sensor is used for currents above the previous ones up to 3200 A.

Installation is carried out by setting the rated current in the REF unit software within the measuring range (2).

The voltage at the secondary circuit is 0.150 V (50 Hz) or 0.180 V (60 Hz).

The precision class for the whole measurement system (sensor+REF) is C11.

7.3.2 Voltage sensor

Type	Rated primary voltage	Rated secondary voltage
KEVCD 12_	10 kV / $\sqrt{3}$	1.0 V / $\sqrt{3}$
KEVCD 17.5_	15 kV / $\sqrt{3}$	1.5 V / $\sqrt{3}$
KEVCD 24_	20 kV / $\sqrt{3}$	2.0 V / $\sqrt{3}$

The KEVCD sensor is used for rated voltages up to 24 kV.

Installation is carried out by setting the rated voltage in the REF unit software.

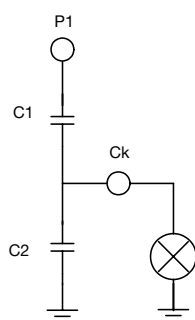
Division ratio: 10000 / 1

Precision class: 1/3P

7.3.3 Capacitive divider

The KEVCD sensor always includes the capacitive divider for connection to the voltage indicator lamp.

C1 ...20 pF
C2 ...25 pF

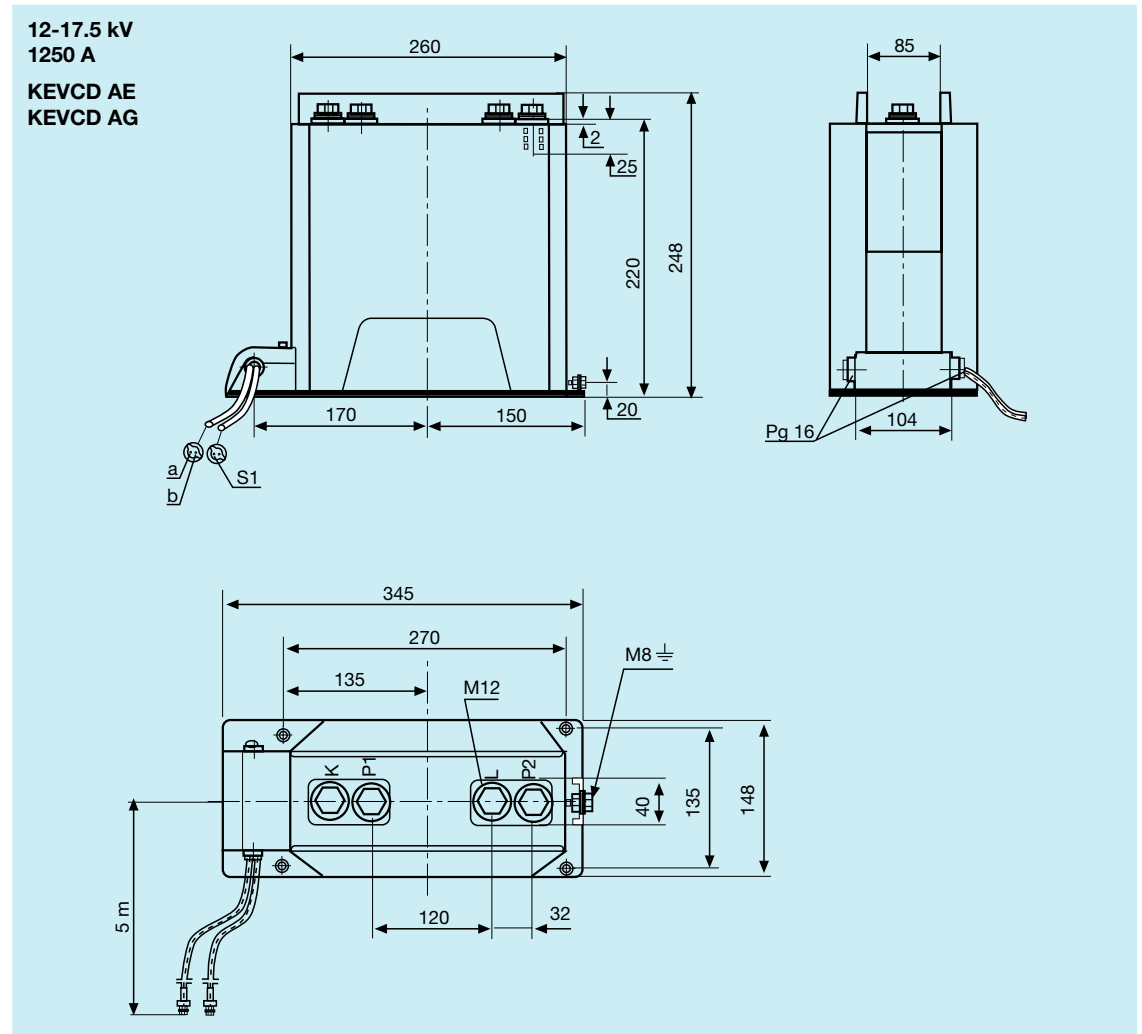


7.3.4 Reference Standards

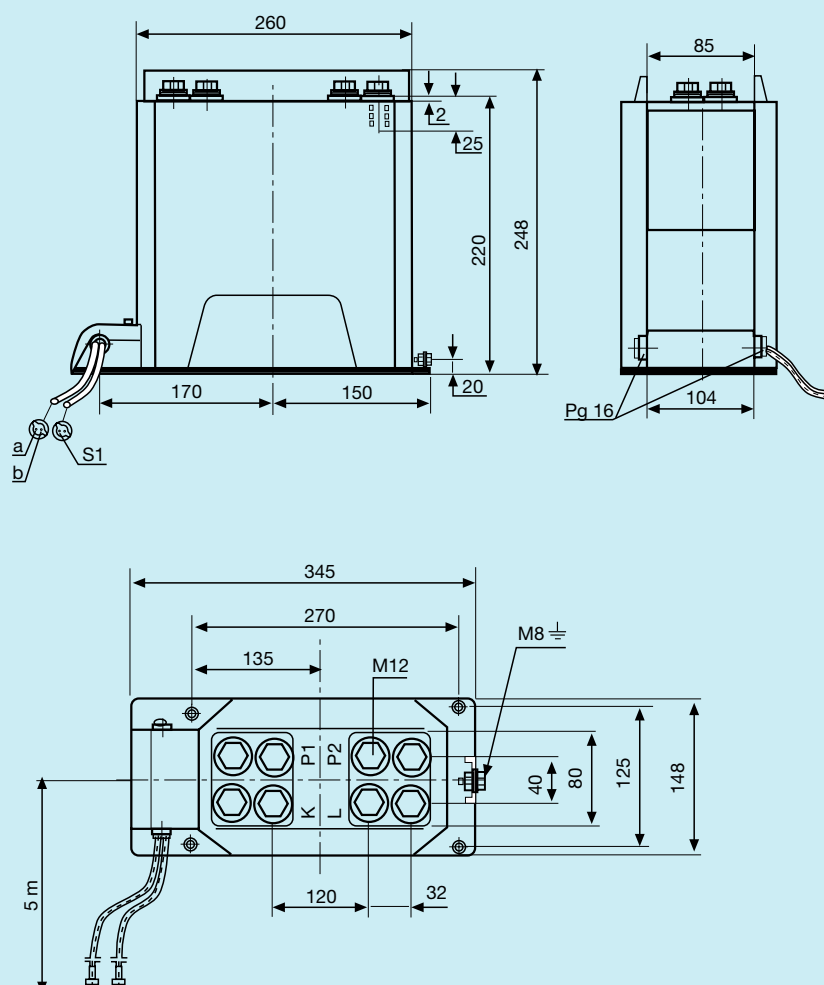
Electrical characteristics	60044-2
Currents sensors	IEC 60044-8 (CVD)
Voltage sensors	IEC 60044-7
Dimensions	DIN 42600 Narrow type, Medium size

MEASURING INSTRUMENTS

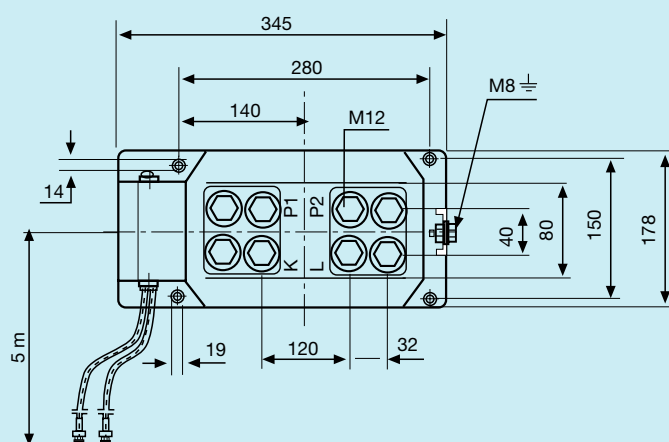
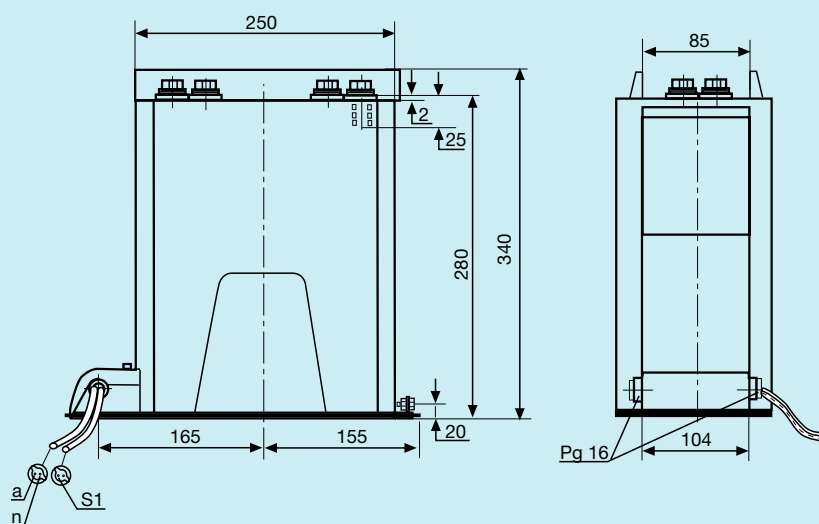
7.3.5 Dimensions



12-17.5 kV
2500 A
KEVCD BE
KEVCD BG



24 kV
2500 A
KEVCD BE
KEVCD BG



MEASURING INSTRUMENTS

7.3.6 Types and weights

Type	Sensors	Voltage kV	Current A	Weight Kg
KEVCD 12 AE 2	Current and voltage	12	1250	18
KEVCD 17.5 AE 2	Current and voltage	17.5	1250	18
KEVCD 24 AE 2	Current and voltage	24	1250	21
KEVCD 12 AG 2	Current	12	1250	18
KEVCD 17.5 AG 2	Current	17.5	1250	18
KEVCD 24 AG 2	Current	24	1250	21
KEVCD 12 BE 2	Current and voltage	12	2500	23
KEVCD 17.5 BE 2	Current and voltage	17.5	2500	23
KEVCD 24 BE 2	Current and voltage	24	2500	26
KEVCD 12 BG 2	Current	12	2500	23
KEVCD 17.5 BG 2	Current	17.5	2500	23
KEVCD 24 BG 2	Current	24	2500	26

ACCESSORIES

8.1 Cables

8/2

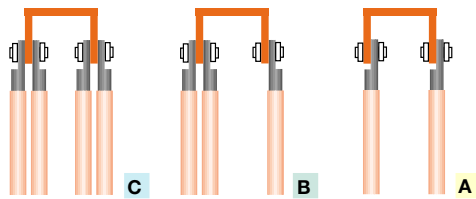
ACCESSORIES

8.1 Cables

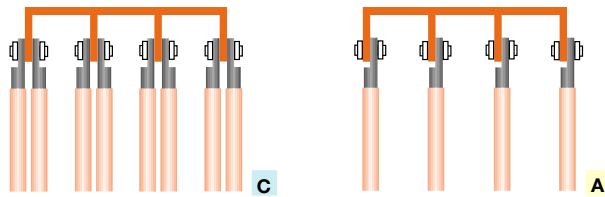
The UniSafe switchboard can be connected with cables with copper or aluminium conductors. The cables can be of the single-core, three-core and three-core armored type. Cable terminals are normally used for screw connection.

As an example, the tables below give the maximum external diameter of the XLPE cable (DIN 0273) and the solutions for connecting the cables to the switchboard.

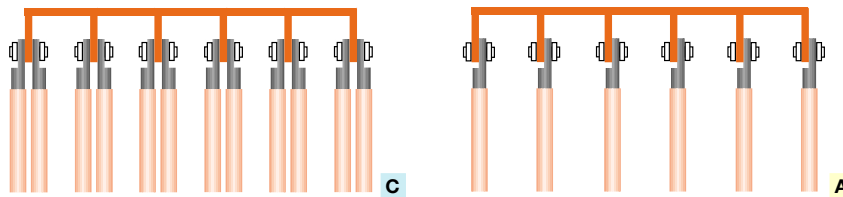
Unit with 2 cable connections per phase



Unit with 4 cable connections per phase



Unit with 6 cable connections per phase



- (1) Solution C covers the A and B ranges of application. Solution B covers the A ranges of application.
- (2) The solutions shown in the figures refer to one phase.
- (3) The application range limits are also valid for different diameters than the ones shown.

Single-core					
Nominal cross-section mm ²	3.6 kV	7.2 kV	12 kV	17.5 kV	24 kV
10	14.0	16.5	19.7	–	–
16	15.0	17.5	21.1	23.4	–
25	16.7	18.8	22.4	24.7	27.8
35	17.6	20.1	23.3	25.6	27.7
50	18.9	21.4	24.6	26.9	29.0
70	21.1	23.6	26.4	28.7	31.0
95	23.1	25.2	28.0	30.3	33.1
120	24.7	26.8	29.6	32.6	34.6
150	26.1	28.1	31.2	33.9	36.0
185	27.8	29.9	33.4	35.7	37.8
240	30.2	32.6	35.8	38.1	40.2
300	32.8	35.3	38.5	40.8	42.9
400	35.6	37.7	40.9	43.6	45.7
500	39.6	41.7	44.9	47.2	49.7
630	43.9	46.0	49.4	52.1	54.2

Three-core					
Nominal cross-section mm ²	3.6 kV	7.2 kV	12 kV	17.5 kV	24 kV
10	25.6	30.3	36.5	–	–
16	27.7	32.4	39.2	44.6	–
25	30.7	35.3	42.0	47.4	54.5
35	33.1	37.4	44.5	49.8	54.7
50	35.6	40.7	47.2	52.9	57.4
70	40.0	44.5	51.4	56.7	62.0
95	43.6	48.5	55.4	60.7	65.9
120	47.4	52.3	58.7	64.4	69.3
150	50.3	55.2	62.5	67.7	72.6
185	54.5	59.4	66.6	71.9	76.8
240	60.1	65.3	72.2	77.5	82.0
300	65.7	70.6	78.4	83.3	88.7
400	71.4	76.3	84.5	89.9	–
500	80.9	86.2	92.7	–	–
630	–	–	–	–	–

ACCESSORIES

Three-core armored					
Nominal cross-section mm ²	3.6 kV	7.2 kV	12 kV	17.5 kV	24 kV
10	28.2	32.7	40.3	–	–
16	30.3	35.2	42.4	48.1	–
25	33.1	38.4	45.6	51.3	58.5
35	35.6	40.5	48.0	53.4	58.3
50	38.7	43.1	51.1	56.5	61.8
70	42.5	47.4	55.3	60.7	65.6
95	46.5	51.4	58.9	64.7	69.5
120	50.3	55.2	63.1	68.4	73.7
150	53.6	58.5	66.0	71.7	76.6
185	57.8	62.7	70.2	75.9	80.8
240	63.4	68.7	76.1	81.5	86.6
300	68.7	74.0	82.4	87.9	92.8
400	75.2	80.1	88.3	93.6	–
500	84.3	89.4	96.4	–	–
630	–	–	–	–	–

DATA

9.1	Weight	9/2
9.2	Cable connection height	9/3
9.3	Thermal dissipation	9/4

DATA

9.1 Weight

Rated voltage kV	Unit width mm	Unit depth mm	
		1550	2000
12	600	400...450 kg	500...550 kg
	750	450...500 kg	570...620 kg
	1000	550...600 kg	700...750 kg

Rated voltage kV	Unit width mm	Unit depth mm	
		1550	2000
17.5	600	400...450 kg	500...550 kg
	750	450...500 kg	570...620 kg
	1000	550...600 kg	700...750 kg

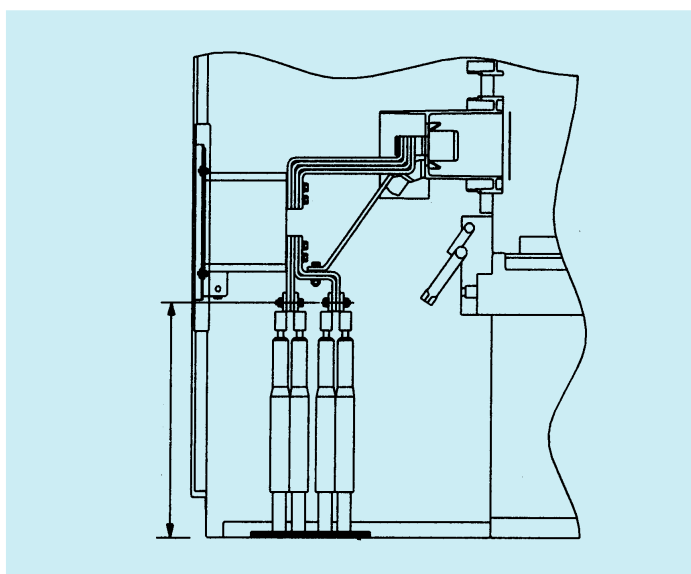
Rated voltage kV	Unit width mm	Unit depth mm	
		1900	2300
24	750	500...550 kg	580...630 kg
	1000	600...650 kg	700...750 kg

N.B. The weights indicated do not include the apparatus (circuit-breakers, contactors, switch disconnectors), the transformers and/or measuring sensors and the auxiliary apparatus.

9.2 Cable connection height

Rated voltage kV	Panel width mm	Panel depth mm	CT for phase no.	Cable connection distance mm	
12-17.5	600	1550	1	650	
	750			630	
	1000			630	
	600	2000	1	680	
	750			700	
	1000			700	
	600	2000	2	490	680 ^(*)
	750			500	700 ^(*)
	1000			500	700 ^(*)
24	750	1900	1	650	
	1000			630	
	750	2300	1	670	
	1000			670	
	750	2300	2	415	
	1000			415	

^(*) Only 12 kV marine version.



DATA

9.3 Thermal dissipation

Average thermal dissipation valid for all the units used at the rated current.

Rated current		630 A	1250 A	1600 A	2000 A	2500 A
Unit with circuit-breaker	[W]	200	610	590	840	1190
Unit without circuit-breaker	[W]	–	30	50	80	130
Unit with measurements	[W]	120	–	–	–	–

The auxiliary apparatus are excluded.

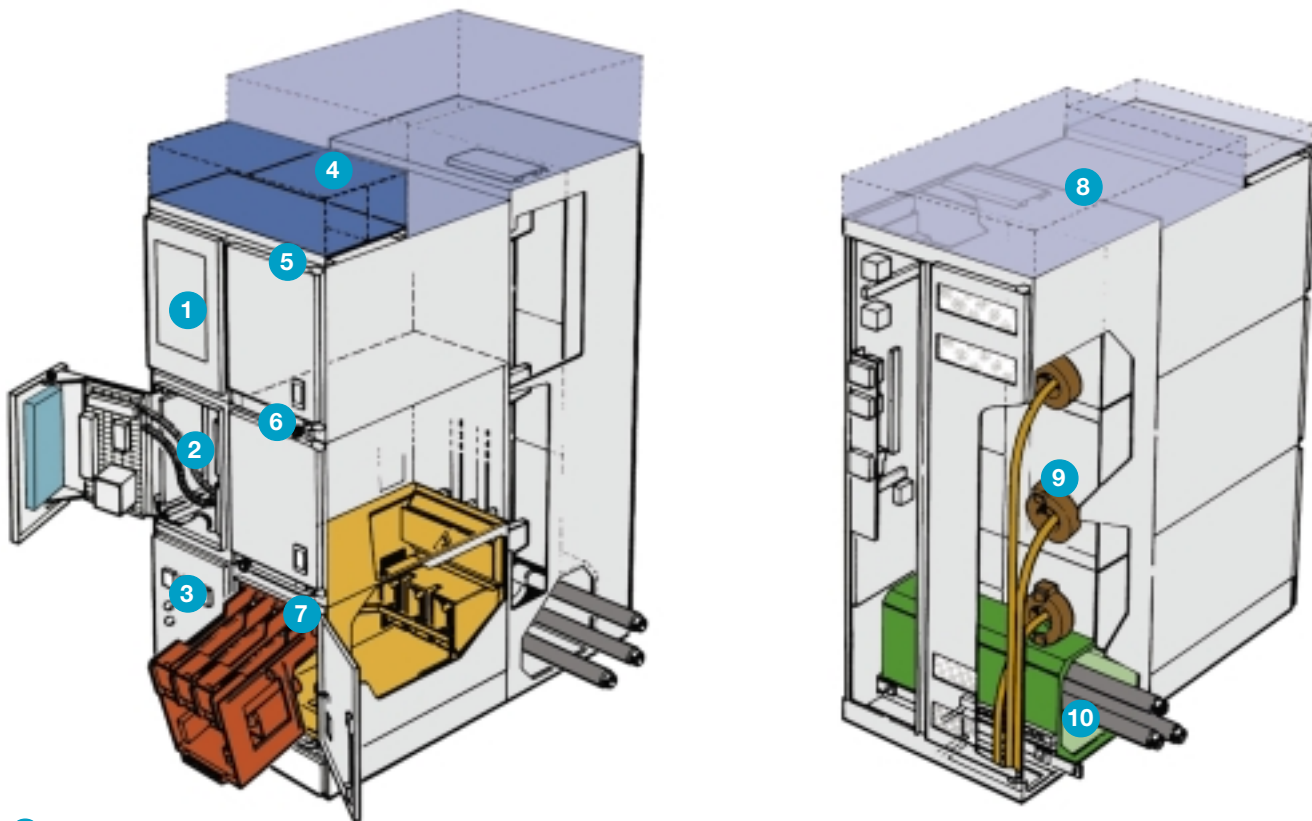
DESCRIPTION

10.1	Compartments	10/2
10.2	Components of the structure	10/3
10.2.1	Pre-galvanised sheet-steel	10/3
10.2.2	Painted sheet-steel	10/4
10.2.3	Copper	10/5
10.2.4	Insulating materials	10/6
10.3	General electrical characteristics	10/7

DESCRIPTION

10.1 Compartments

The typical units of the UniMotor switchboard consist of up to a maximum of ten compartments segregated from each other by metal partitions (unit consisting of three outgoing feeders shown in the figure). For the details of the other units, please see chapter 11.



- 1 Instrument compartment no. 3
- 2 Instrument compartment no. 2
- 3 Instrument compartment no. 1
- 4 Auxiliary circuit interconnection wiring duct
- 5 Contactor compartment no. 3
- 6 Contactor compartment no. 2
- 7 Contactor compartment no. 1
- 8 Gas exhaust duct
- 9 Feeder compartment
- 10 Busbar compartment

10.2 Components of the structure

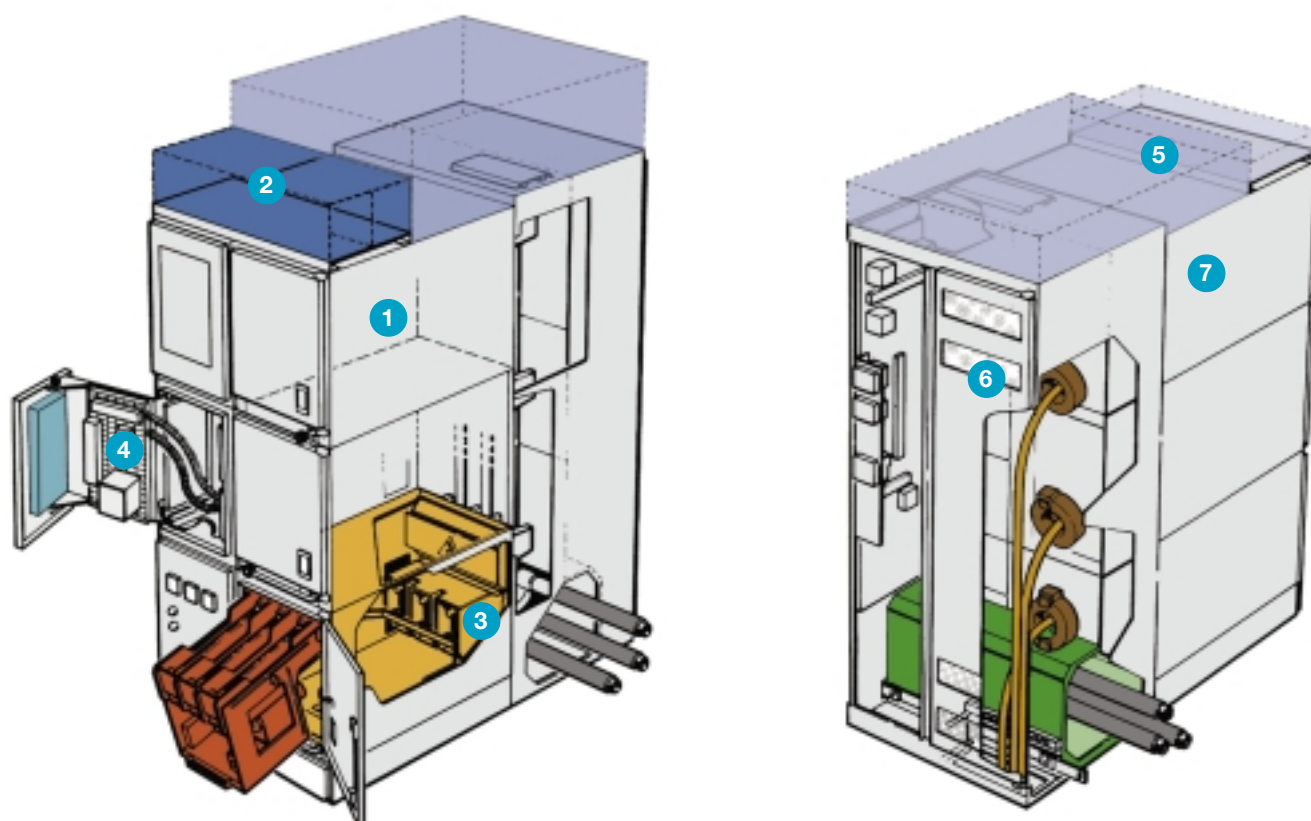
10.2.1 Pre-galvanised sheet-steel

Type: UNI EN 10142 Fe P02G

Thickness: 2 mm

Weight (average): 655...752 Kg

Use: supporting structure, compartments, segregations, shutters, auxiliary circuit wiring ducts, gas exhaust duct, gas exhaust flap, auxiliary instrument support, end panels (also available painted on request).

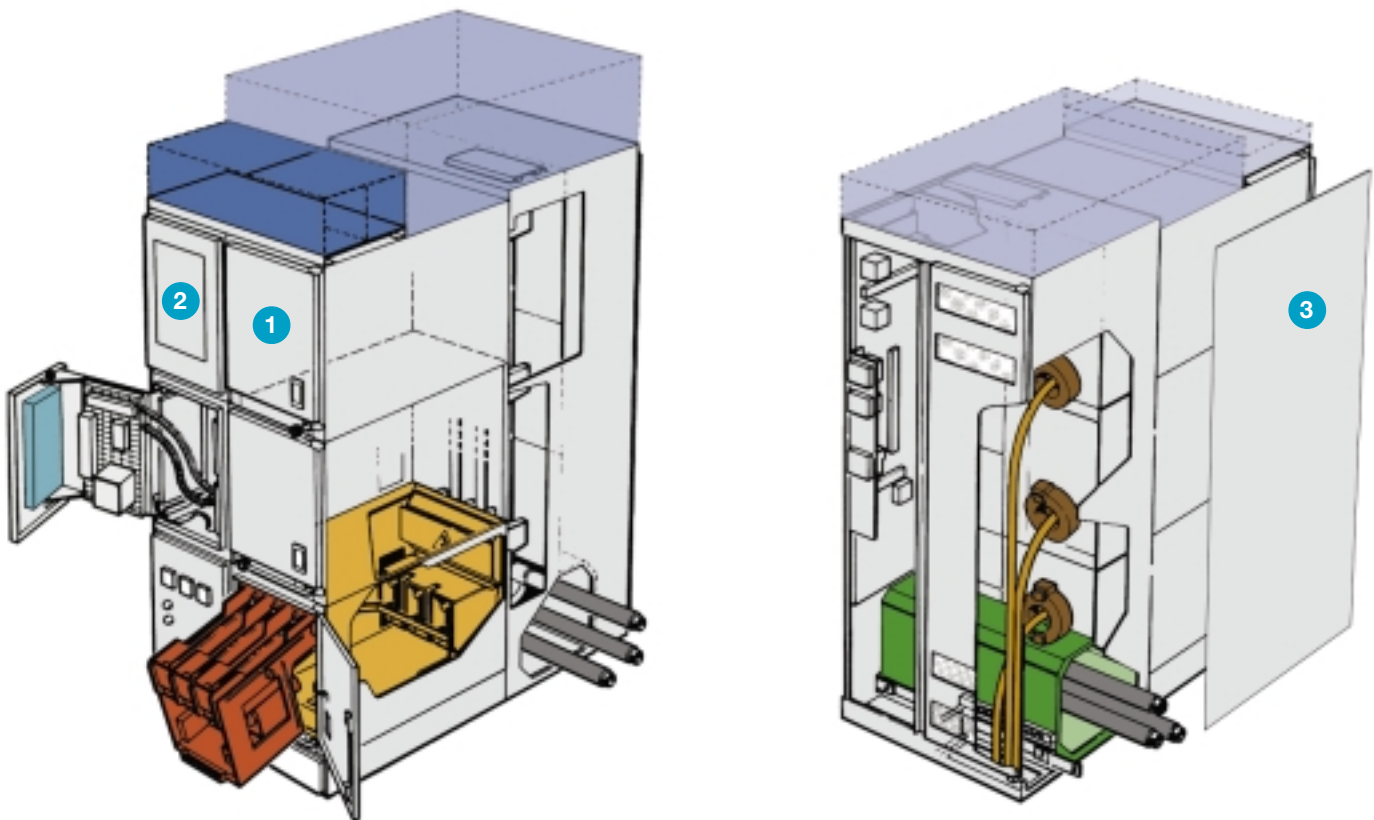


- 1 Compartments
- 2 Auxiliary circuit interconnection wiring duct
- 3 Shutters
- 4 Instrument support
- 5 Gas exhaust flap
- 6 Segregations
- 7 Supporting structure

DESCRIPTION

10.2.2 Painted sheet-steel

Type: UNI EN 10130 Fe P01
Standard colour: RAL7035 (doors and end panels)
Standard colour: RAL7012 (horizontal bands)
Thickness: 2.5 mm for the doors – 2 mm for the other components
Weight: 112...129 Kg
Use: auxiliary compartment, contactor and feeder doors, end panels (also available painted on request).



- 1 Contactor compartment door
- 2 Auxiliary instrument compartment door
- 3 End panels (closing panels of the right-hand and left-hand units of the switchboard. These can either be galvanised or painted)

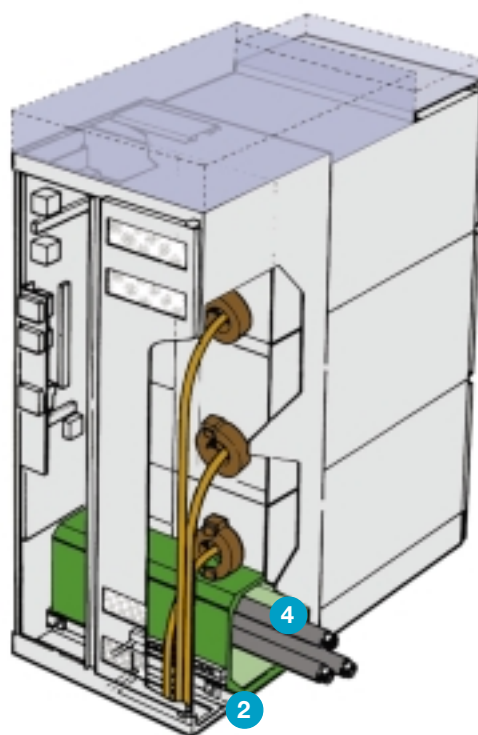
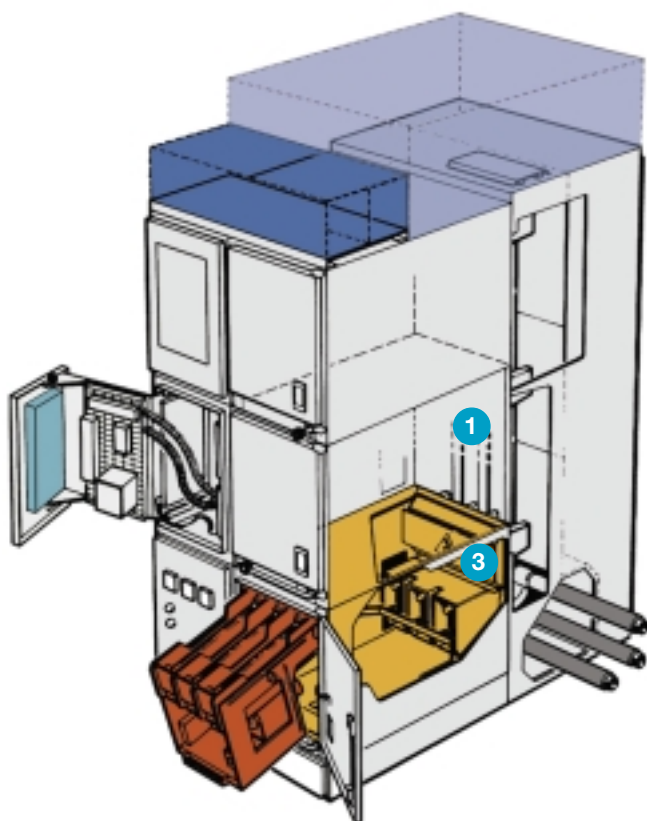
10.2.3 Copper

Type: UNI EN 5649 Cu ETP

Cross-section	Main busbars			Branch busbars			Earthing busbar		
	Rated current (A)	12 kV		Rated current (A)	12 kV		Rated current (A)	12 kV	
		Tubes (nr.)	Cross-section (mm)		Bars (nr.)	Cross-section (mm)		Bars (nr.)	Cross-section (mm)
1250	1250	1	Ø 100x2	800	1	40x8	–	1	50x8
1600	1600	1	Ø 100x3	1250	2	40x8	–	–	–
2000	2000	1	Ø 100x4	–	–	–	–	–	–
2500	2500	1	Ø 100x5	–	–	–	–	–	–

Weight: 112...322 Kg

Use: main busbars, top and bottom branches, branches for CT and VT, cable connections, fixed contacts of the monoblocks, fixed contacts of the earthing switch, earthing busbar.



- 1 Branch busbars
- 2 Earthing busbar
- 3 Fixed contacts of monoblocks
- 4 Main busbars

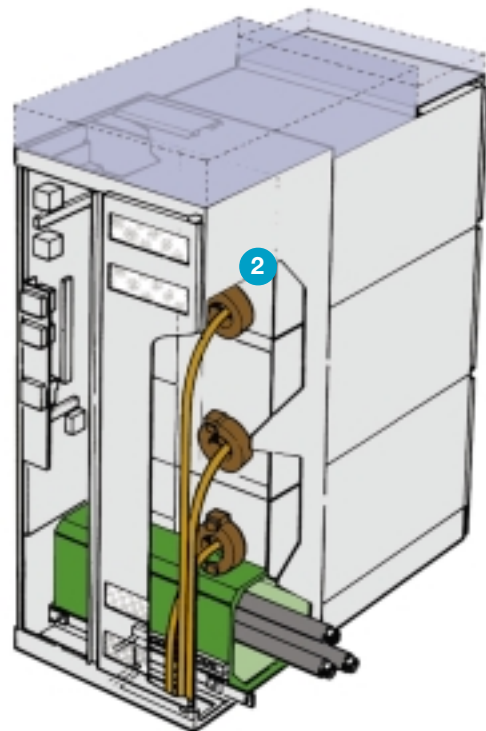
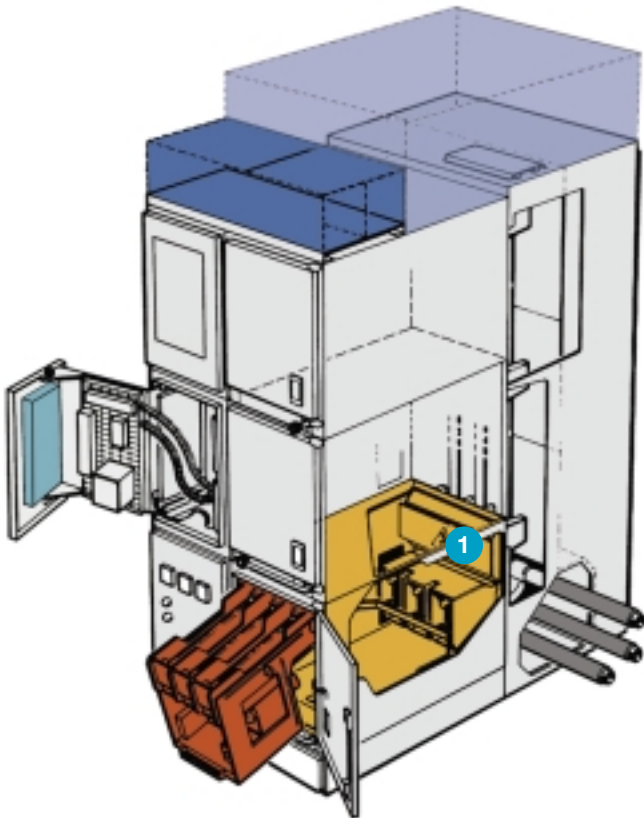
DESCRIPTION

10.2.4 Insulating materials

Type: polyester glass
Weight (average): 65...89 Kg
Use: contactor compartment monoblocks and withdrawable VT compartment.

Type: epoxy resin
Weight: variable
Use: CT, VT, insulators (in variable quantities, see single units in chap. 11).

Type: epoxy resin
Weight (average): 2 Kg
Use: insulating covering of busbars and branches (when requested).



1 Monoblock

2 CT

10.3 General electrical characteristics

UniSafe + UniMotor			
Rated voltage	[kV]	7.2	12
Rated insulation voltage	[kV]	7.2	12
Rated power frequency withstand voltage (50-60 Hz/1 min)	[kV]	20	28
Rated lightning impulse withstand voltage	[kV]	60	60 ⁽¹⁾
Rated frequency	[Hz]	50-60	50-60
Rated current of the main busbars (40 °C)	[A]	2500	2500
Rated current of the branch connectors (40 °C)	[A]	800-1250	800-1250
Rated short-time withstand current	[kAx1s]	31.5	31.5
Peak current	[kA]	80	80
Internal arc withstand current	[kAx1s]	31.5	31.5

⁽¹⁾ 75 kVp as far as the closed metal shutter with contactor truck isolated.

TYPICAL UNITS

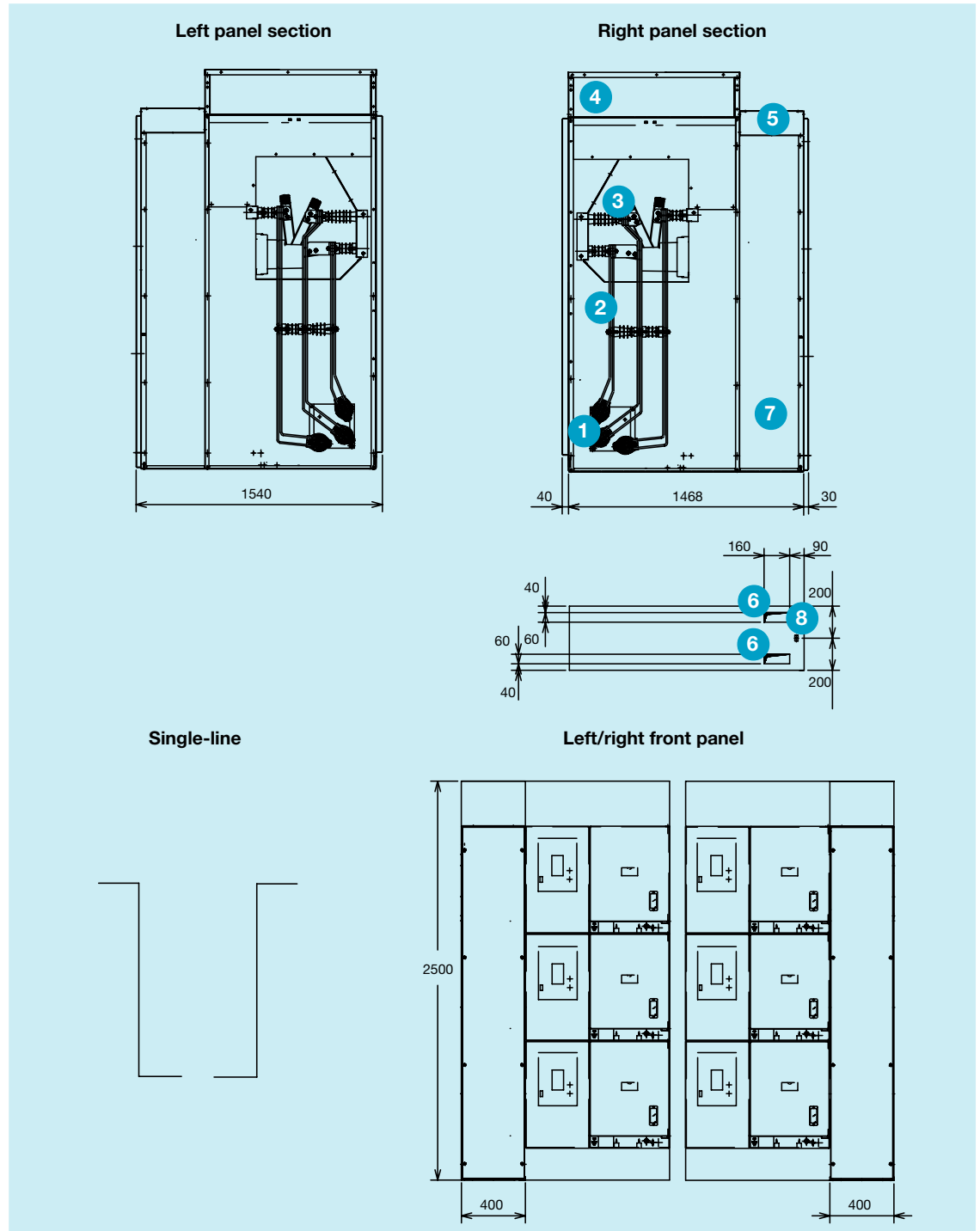
11.1	Coupling panel	11/2
11.2	Across the line feeders	11/3
11.3	Star-delta motor starting	11/4
11.4	Auto-transformer motor starting	11/5

TYPICAL UNITS

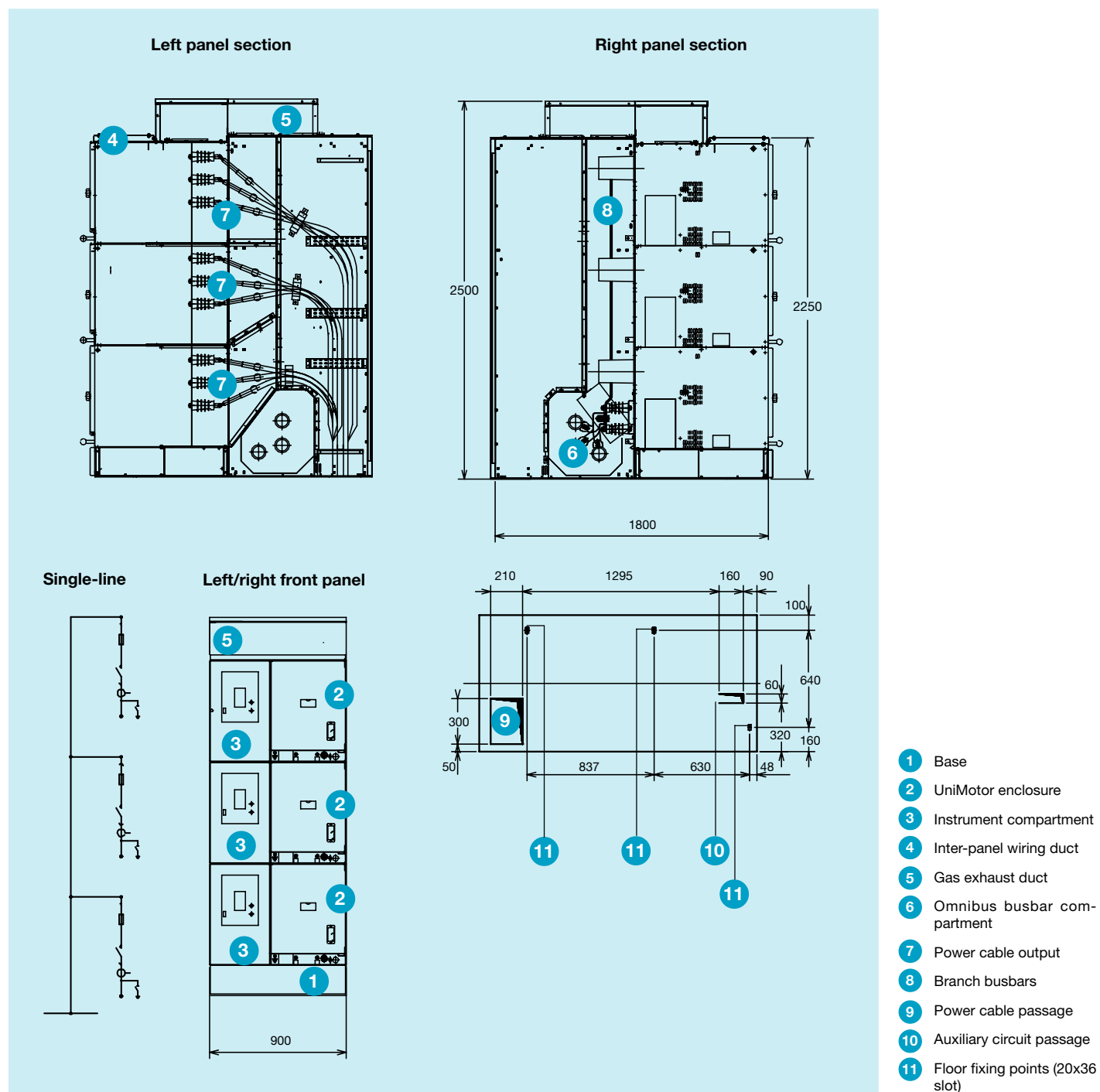
11.1 Coupling panel

The UniMotor switchboard cannot be placed against the wall.

The UniSafe switchboard coupled to the UniMotor switchboard cannot be placed against the wall.

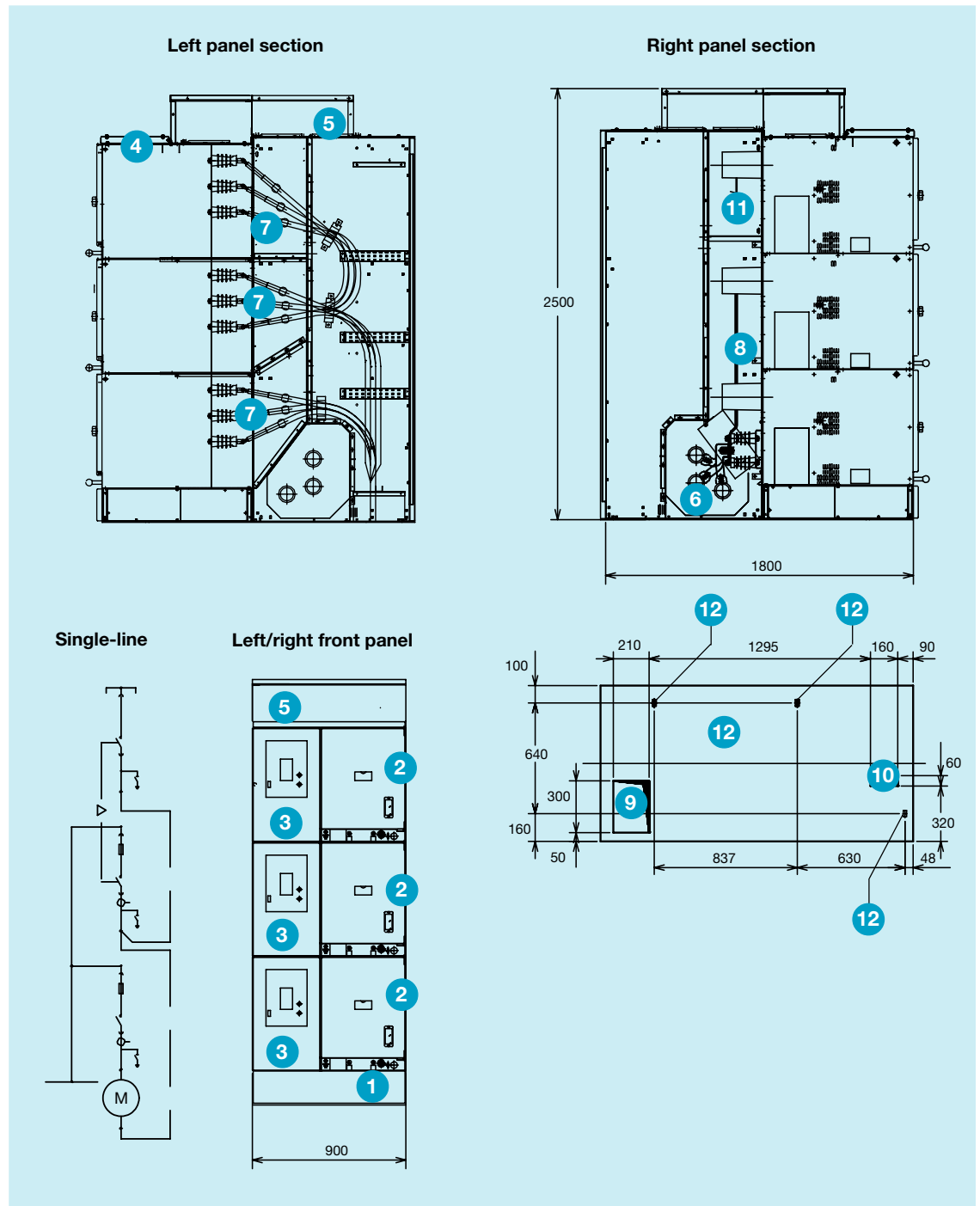


11.2 Across the line feeders

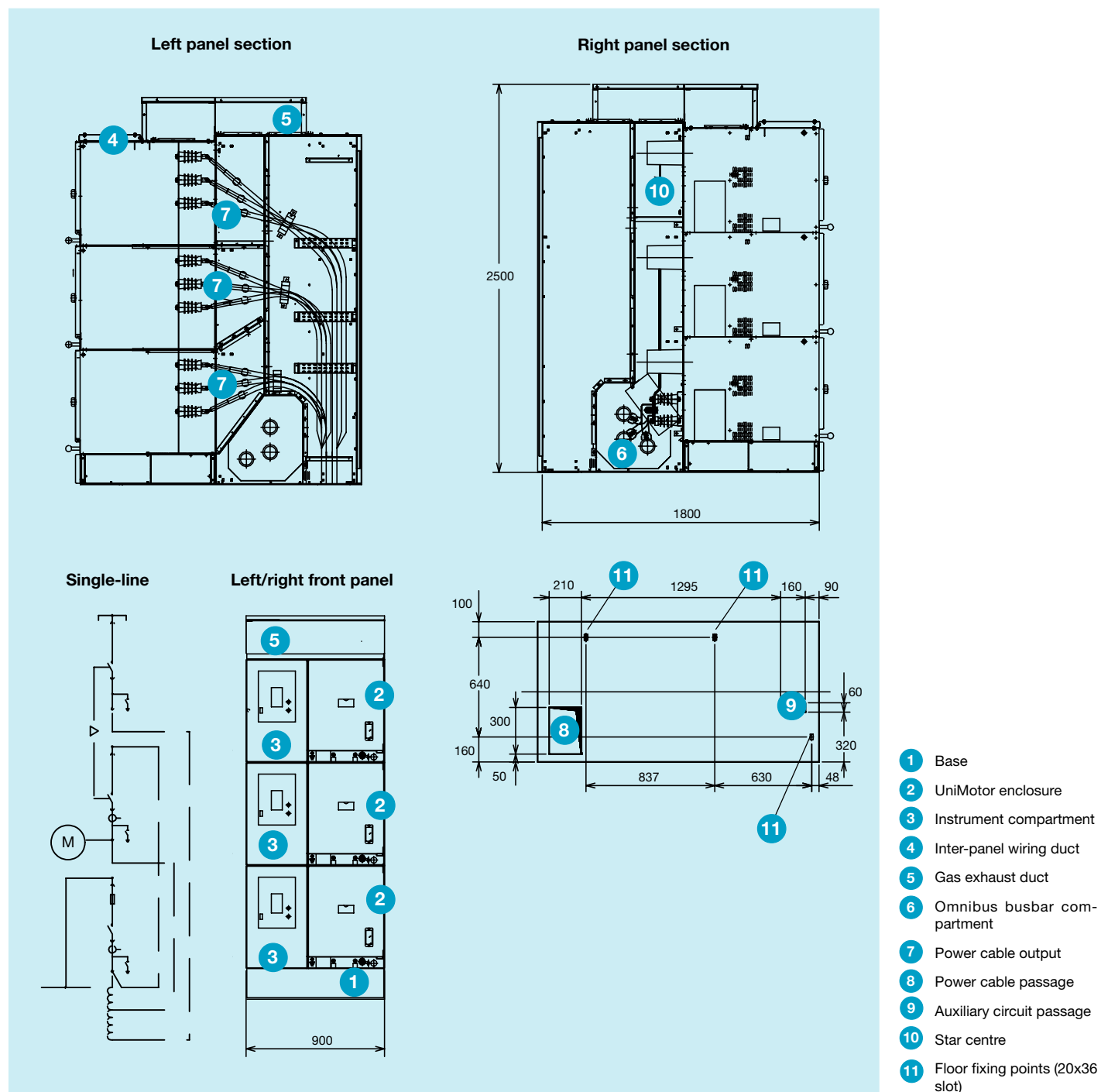


TYPICAL UNITS

11.3 Star-delta motor starting



11.4 Auto-transformer motor starting



V-CONTACT TYPE VACUUM CONTACTORS

12.1	Identification table and weights	12/2
12.2	Value of the rated currents	12/2

V-CONTACT TYPE VACUUM CONTACTORS

12.1 Identification table and weights

Rated voltage kV	Short-time withstand current kA ⁽¹⁾	Rated current A ⁽³⁾	Contactor	Weights Kg
7.2	16	400	V7/UN	45 ⁽²⁾
	25			
	31.5			
12	16	400	V12/UN	45 ⁽²⁾
	25			
	31.5			

⁽¹⁾ Guaranteed by using suitable fuses.

⁽²⁾ The weight of the fuses must be added (the largest size weighs 5.5. kg each).

⁽³⁾ Rated service current in category AC4. For the largest fuse size which can be used with the contactor, at the different service voltages and the type of load to be protected, refer to the technical catalogue of the V-Contact contactor.

12.2 Value of the rated currents

Value of the rated currents according to the ambient temperature.

The rated current is a function of the current of the fuses used and the position of the unit compartments.

As an example, three typical solutions are proposed.

Typical unit	A	B	C
Compartment	3	3	3
Fuse current [A]	200	315	–
Rated current [A]	160	250	–
Compartment	2	2	2
Fuse current [A]	315	315	315
Rated current [A]	200	200	250
Compartment	1	1	1
Fuse current [A]	315	315	315
Rated current [A]	250	200	250

Ambient temperature °C	A			B			C		
	1	2	3	1	2	3	1	2	3
	315 250	315 200	200 160	315 200	315 200	315 250	315 250	315 250	– –
40	250	200	160	200	200	250	250	250	–
45	240	190	150	190	190	240	240	240	–
50	230	180	150	180	180	230	230	230	–
55	220	170	140	170	170	220	220	220	–
60	200	160	130	160	160	200	200	200	–
65	170	140	110	140	140	170	170	170	–

DATA

13.1	Weight	13/2
13.2	Thermal dissipation	13/2

DATA

13.1 Weight

Withdrawable contactor complete with three fuses and voltage transformer	70 kg
Enclosure with current transformers	120 kg
Unit with three enclosures, three contactors, busbars, auxiliaries, etc.	1600 kg

13.2 Thermal dissipation

Average thermal dissipation valid for all the units.

Rated current of the fuses		Without fuses	160 A	200 A	250 A	315 A
Unit with contactor	[W]	70	230	290	360	450
Adaptation unit	[W]	110	–	–	–	–
Measurement unit	[W]	40	–	–	–	–

The auxiliary apparatus are excluded.



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