Dimensions

Switchgear installation

Room planning

Switchgear installation

Wall-standing arrangement, free-standing arrangement
- 1 row
- 2 rows (for face-to-face arrangement).

Room dimensions

See opposite dimension drawings.

Door dimensions

The door dimensions depend on the
- Number of panels in a transport unit
- Design with or without low-voltage compartment.

Switchgear fastening

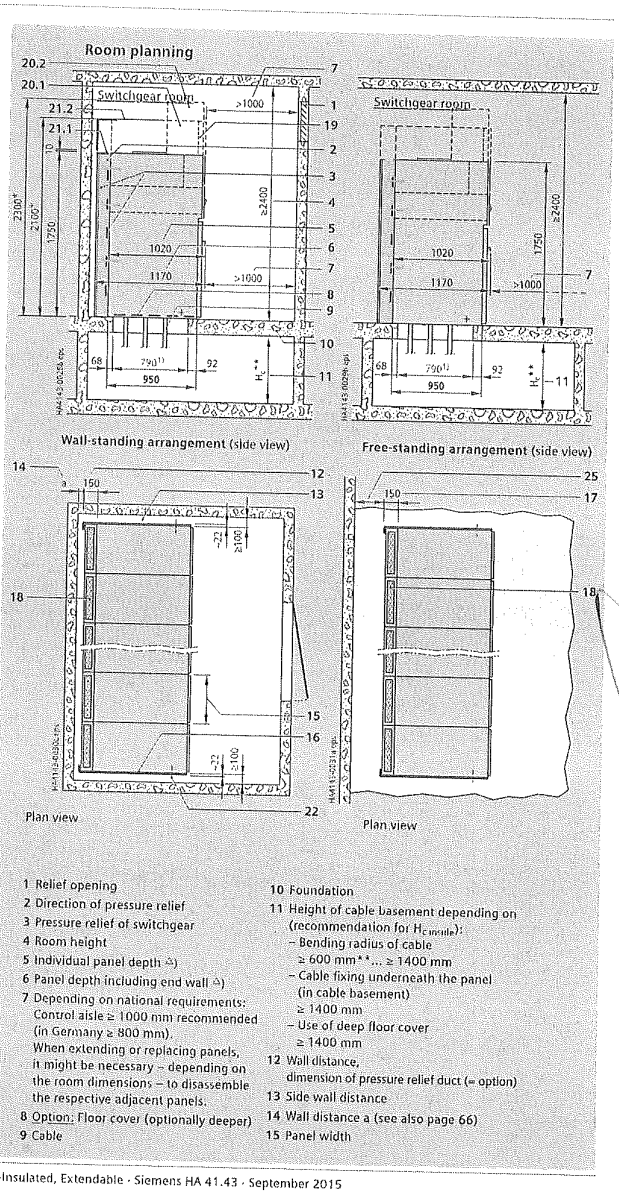
- For floor openings and fixing points of the switchgear, see pages 78 to 80
- Foundations:
  - Steel girder construction
  - Steel-reinforced concrete.

Panel dimensions

See pages 67 to 77

Weight

The weight of a panel depends on the extent to which it is equipped (e.g. with motor operating mechanism, voltage transformer). For details, please refer to page 81.



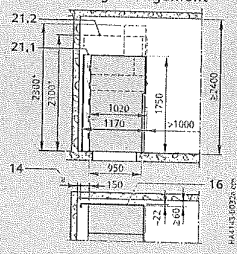
1) Floor opening

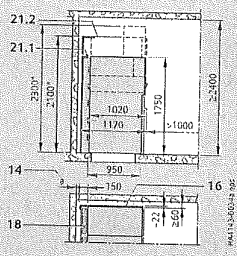
△) Panel type L, L1, L(1), L1(T) with VCB type 3AH569: Panel depth: 1080 mm, switchgear depth: 1230 mm

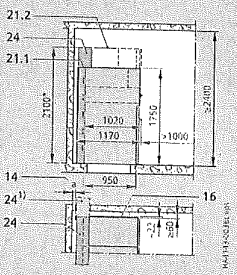
*) Switchgear height 2100 mm if height of low-voltage compartment 350 mm; switchgear height 2300 mm if height of low-voltage compartment 550 mm

**) Cable fixing in the panel, without deep floor cover

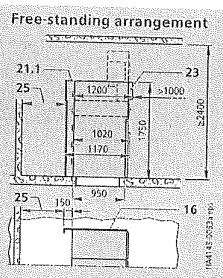
Wall-standing arrangement

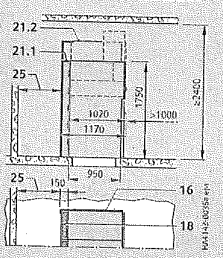


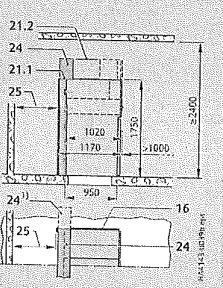




Free-standing arrangement







Design of switchgear

Type of installation	IAC	Rear pressure relief duct	Switchgear height in mm	Recommended height for switchgear room
Wall-standing	–	– △)	1750	≥ 2400
Free-standing	–	– △)	1750	≥ 2400
Floor cover: Available as option				
Wall-standing	IAC A FL 16 kA, 1 s	•	2100	≥ 2400
	IAC A FL 21 kA, 1 s	•	2100	≥ 2400
Free-standing	IAC A FLR 16 kA, 1 s	•	2100	≥ 2400
	IAC A FLR 21 kA, 1 s	•	2100	≥ 2400
Floor cover: Available as option				

On request

Wall-standing	IAC A FLR 16 kA, 1 s	•	2100	≥ 2400
Free-standing	IAC A FLR 21 kA, 1 s	•	2100	≥ 2400
Floor cover: Available as option				

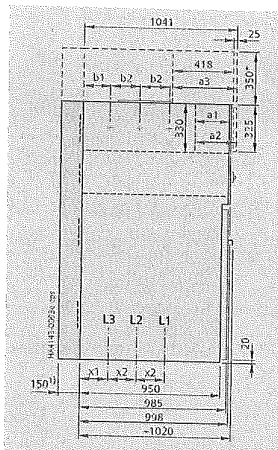
16 End wall
17 Depth of pressure relief duct
18 Option: Pressure relief duct for each panel, for wall-standing or free-standing arrangement
19 Option: Front cover
20.1 Option: Low-voltage compartment: 350 mm high
20.2 Option: Low-voltage compartment: 550 mm high
21.1 End wall: 1750 mm high
21.2 End wall: 2100 mm high (option)
22 Earthing terminal
23 Option: Low-voltage niche with door
24 On request: Option: Pressure relief duct with pressure relief towards outside, length ≤ 2.50 m, installation (for station building) on site
25 Distance to rear wall: ≥ 800 mm (for free-standing arrangement)

△) Option: Rear pressure relief duct
• As standard
*) Available as option

For standard dimensions and IAC design, see also page 66

Dimensions

Switchgear installation



Compartment	Dimensions for "Available mounting depth for low-voltage equipment"	in mm approx.
LV niche – with front cover	a_1	201
LV niche – with door (option)	a_2	246
LV compartment (option)	a_3	443

* Option:
Low-voltage compartment or front cover available in two heights: 350 mm or 550 mm

1) Option: Pressure relief duct

Rated voltage U_r	Dimensions in mm	
Position of cables △)	x1	x2
Up to 17.5 kV	187	210
24 kV	187	210
Position of busbar	b1	b2
24 kV	187	210

△) The position of the cables in the panel depends on the additional, optional built-in panel components (e.g. current and voltage transformers). Therefore, the dimensions x1 and x2 may be different.

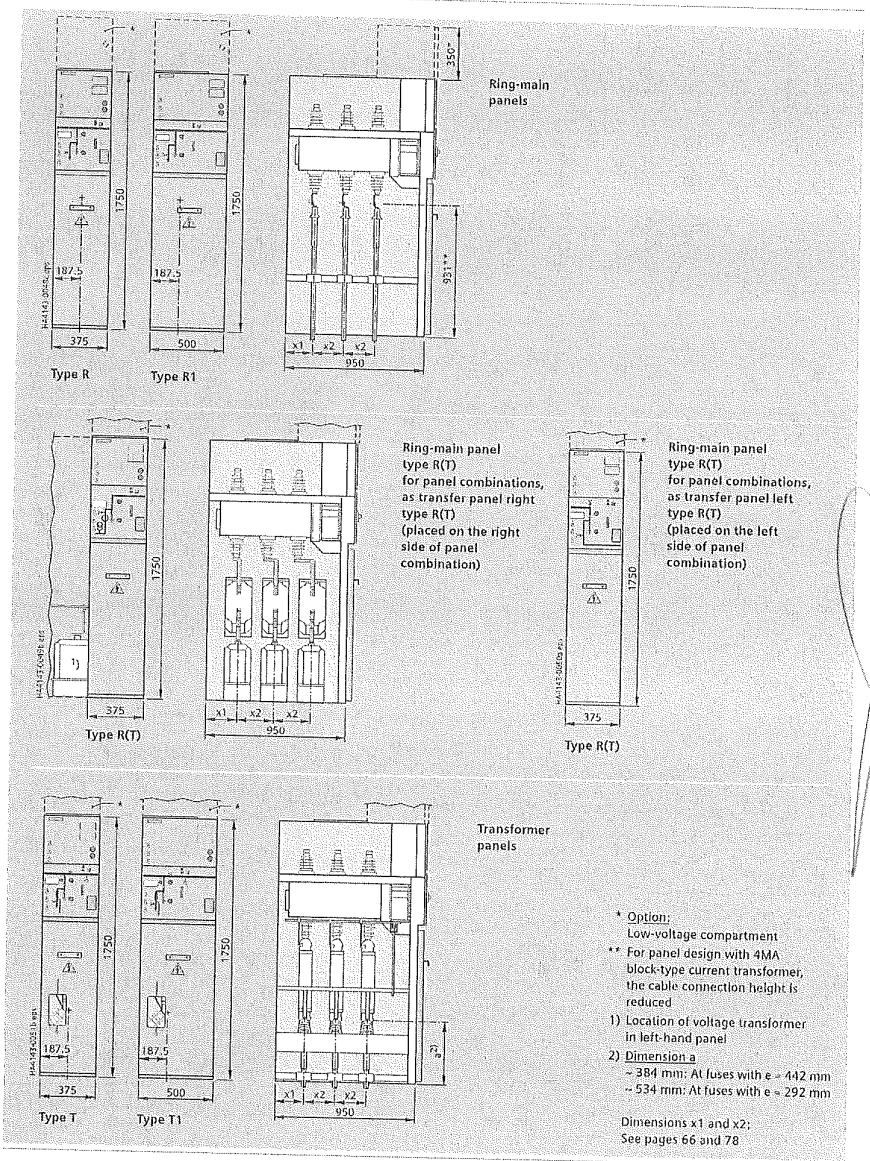
Standard dimensions of switchgear

IAC = Design of switchgear	Pressure relief duct (add to panel depth) Depth: 150 mm	Direction of pressure relief	Panel depth △)	Switchgear depth △)*)	Switchgear height	Switchgear arrangement	Distance "a" from switchgear to rear wall of switchgear room
			in mm	in mm	in mm		in mm
• without IAC (= standard)	without	to the rear/upwards	1020 *)	1170 *)	1750 **)	wall-standing	–
		to the rear				free-standing	–
	with	upwards	1020 *)	1170 *)	1750 **)	wall-standing	approx. ≥ 35 mm
	with	upwards	1020 *)	1170 *)	1750 **)	free-standing	approx. ≥ 35 mm
• with IAC A FLR	with (duct is standard)	upwards	1020*)	1170 *)	≤ 16 kA: ≥ 2100 ≤ 21 kA: ≥ 2100 (incl. front cover or low-voltage compartment)	wall-standing	approx. ≥ 35 mm
						free-standing	approx. ≥ 800 mm

△) Option: Low-voltage niche with door: Additionally 45 mm: Switchgear depth approx. 1041 mm

*) Panel depth: additionally deeper by 60 mm
Panel depth: 1080 mm, switchgear depth: 1230 mm
- Circuit-breaker panel types L, L1, L(T), L1(T): with circuit-breaker type "CB-f AR (3AH569)"
- Circuit-breaker panel types LS11, LS31, LS32: with circuit-breaker type 3AH6/"CB-r"

**) In addition, a low-voltage compartment can be selected optionally. The switchgear height is changed respectively



* Option:
Low-voltage compartment

** For panel design with 4MA block-type current transformer, the cable connection height is reduced

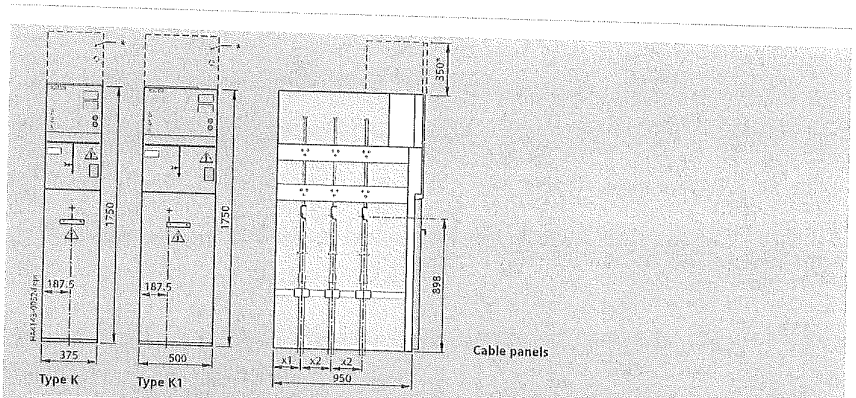
1) Location of voltage transformer in left-hand panel

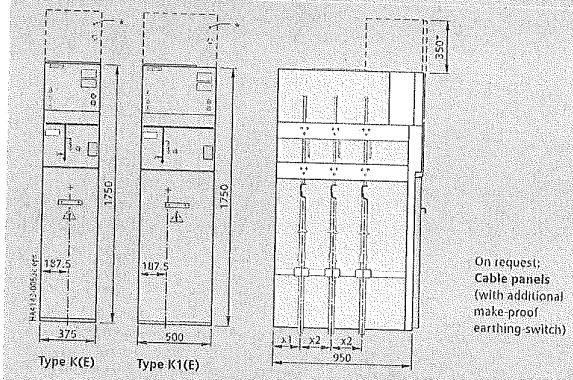
2) Dimension a
~ 384 mm: At fuses with e ≈ 442 mm
~ 534 mm: At fuses with e ≈ 292 mm

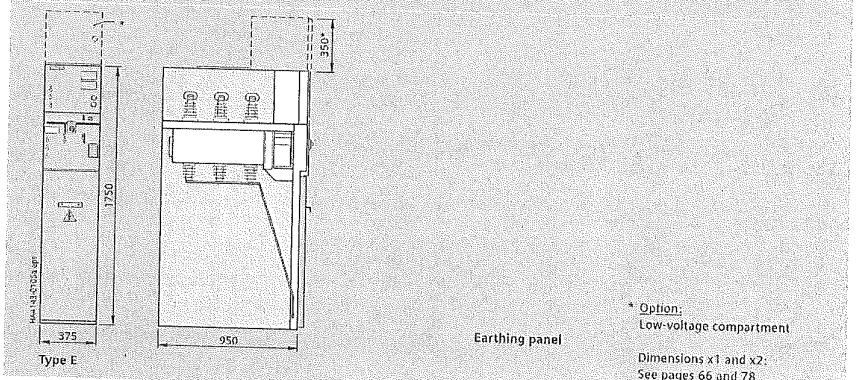
Dimensions x1 and x2:
See pages 66 and 78

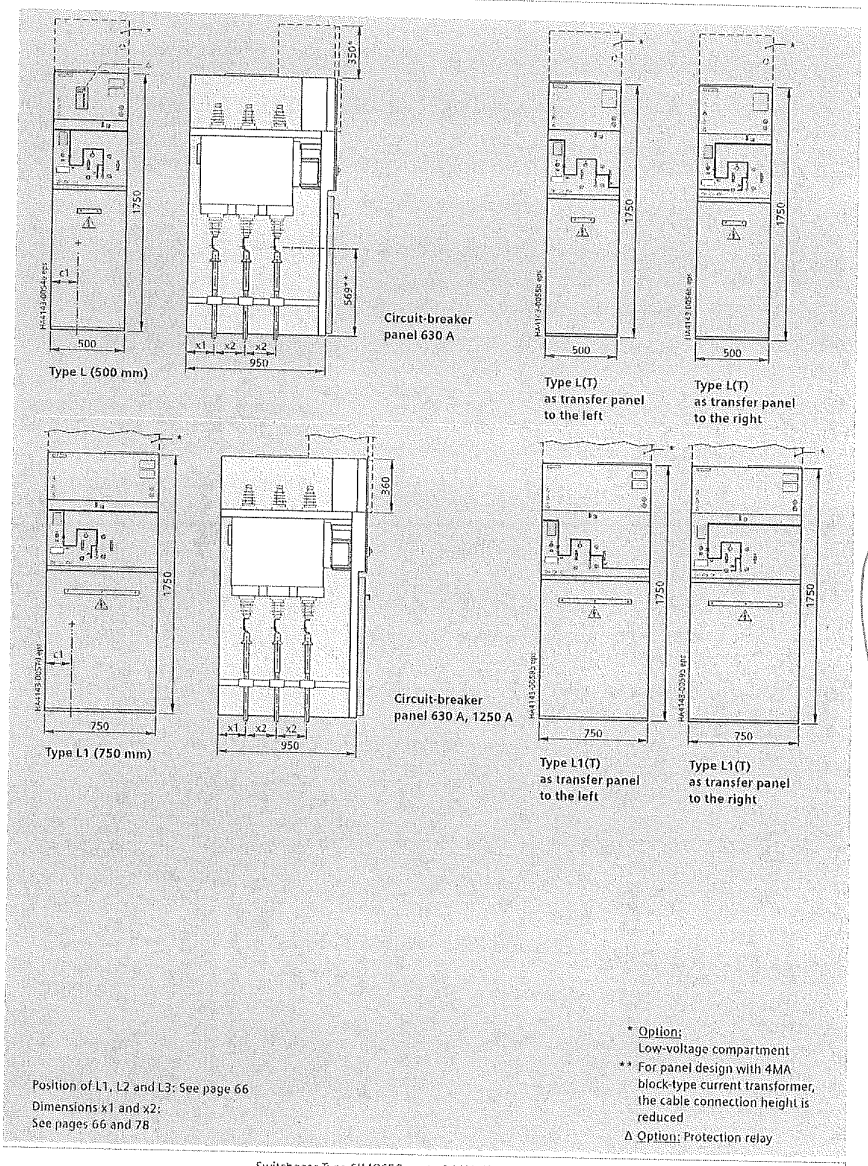
Dimensions

Cable panels







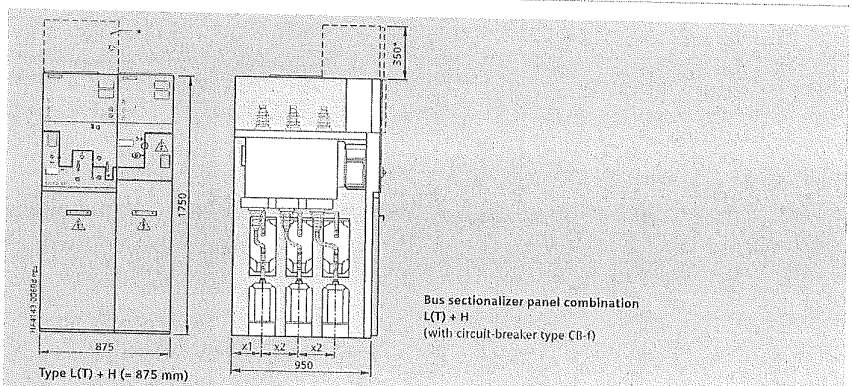


Position of L1, L2 and L3: See page 66
Dimensions x1 and x2:
See pages 66 and 78

* Option:
Low-voltage compartment
** For panel design with 4MA block-type current transformer, the cable connection height is reduced
Δ Option: Protection relay

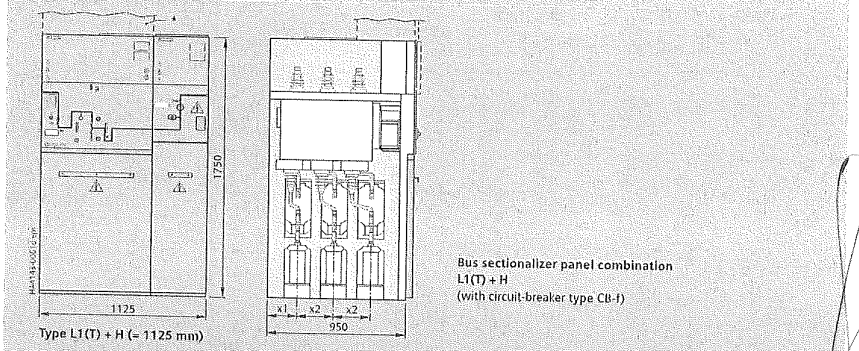
Dimensions

Panel combinations: Bus sectionalizer panels (circuit-breaker panel and bus riser panel)



Type L(T) + H (= 875 mm)

Bus sectionalizer panel combination
L(T) + H
(with circuit-breaker type CB-f)



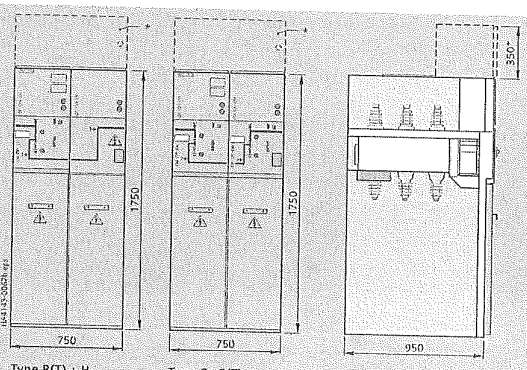
Type L1(T) + H (= 1125 mm)

Bus sectionalizer panel combination
L1(T) + H
(with circuit-breaker type CB-f)

U_r	Typical	Transformers (cast resin design)	Dimensions in mm	
			x1	x2
Up to 17.5 kV	L(T), L1(T), H	with	187	210
24 kV	L(T), L1(T), H	without	187	210
	L(T), L1(T), H	with	235	250

* Option:
Low-voltage compartment

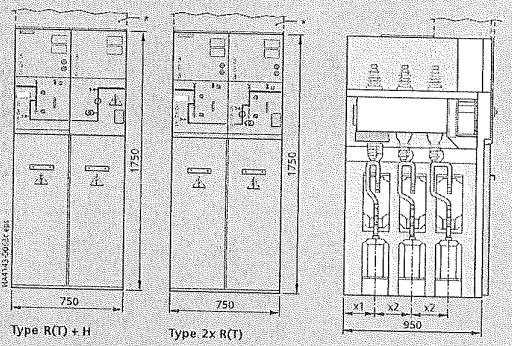
Panel combinations: Bus sectionalizer panels



Type R(T) + H

Type 2x R(T)

Ring-main transfer panel type R(T)
and
bus riser panel type H
without transformers



Type R(T) + H

Type 2x R(T)

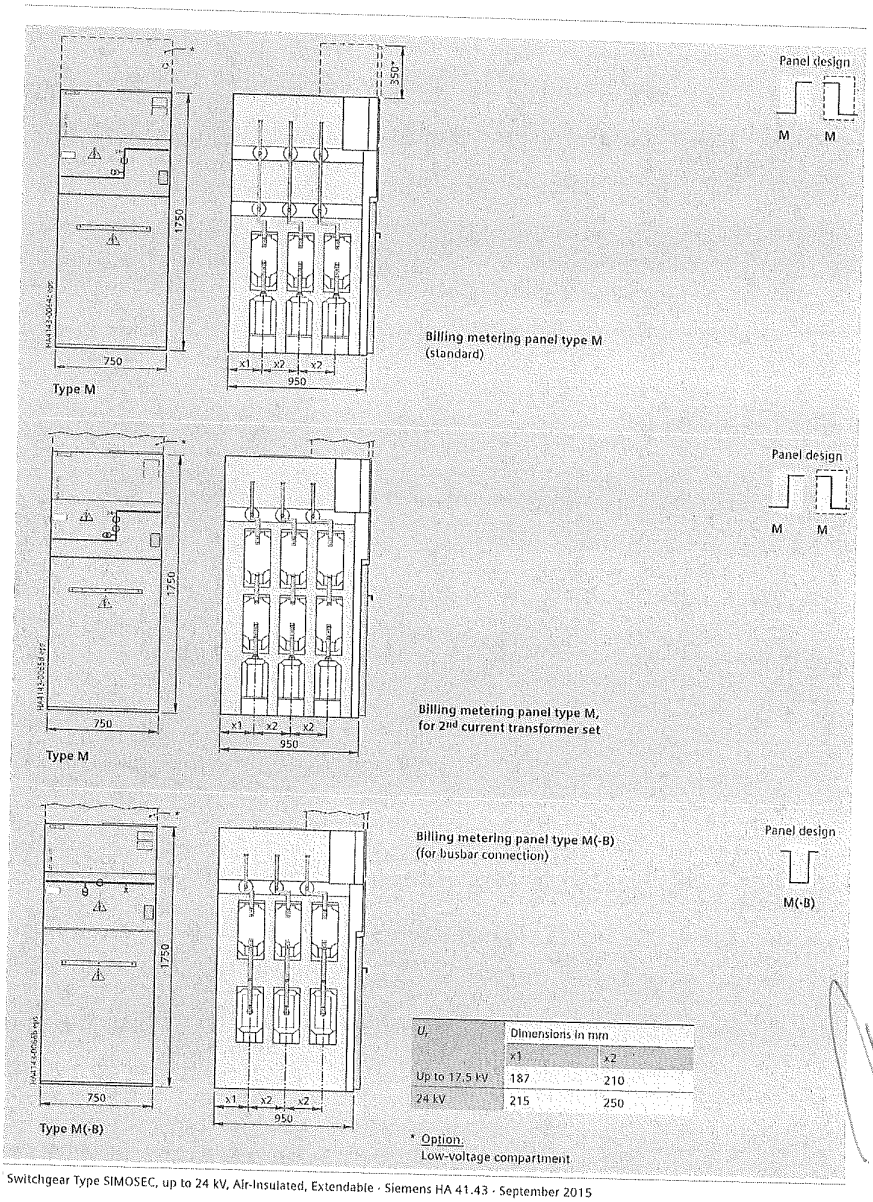
Ring-main transfer panel type R(T)
and
bus riser panel type H
with transformers

U_r	Dimensions in mm	
	x1	x2
Up to 17.5 kV	187	210
24 kV	215	250

* Option:
Low-voltage compartment

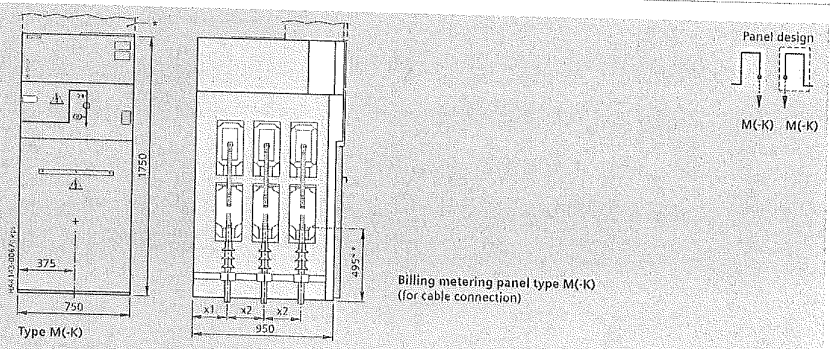
Dimensions

Billing metering panels



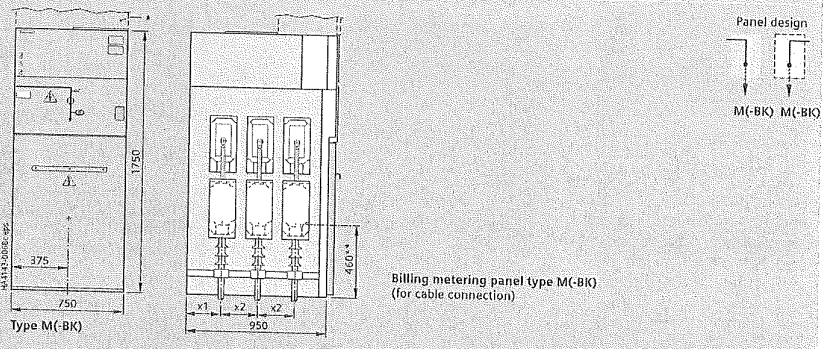
U_r	Dimensions in mm	
	x1	x2
Up to 17,5 kV	187	210
24 kV	215	250

* Option:
Low-voltage compartment



Type M(-K)

Billing metering panel type M(-K)
(for cable connection)



Type M(-BK)

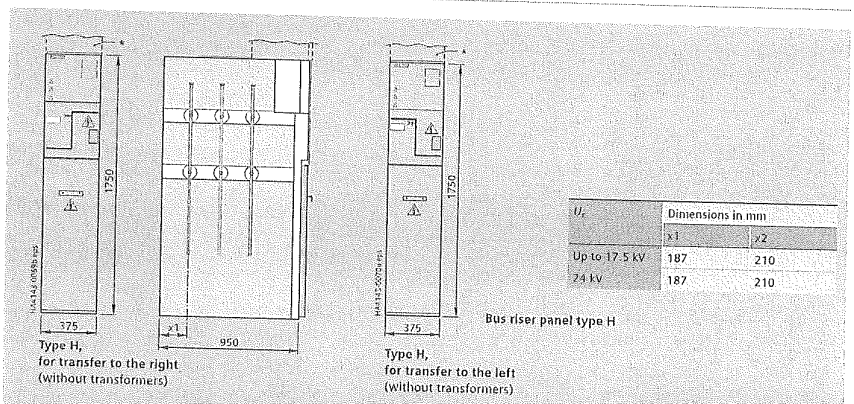
Billing metering panel type M(-BK)
(for cable connection)

Dimensions x1 and x2 for cable connection: See pages 78 and 80

* Option:
Low-voltage compartment
** The cable connection height depends on the rated voltage, the transformer design and the number of cable connections

Dimensions

Bus riser panels, busbar voltage metering panels

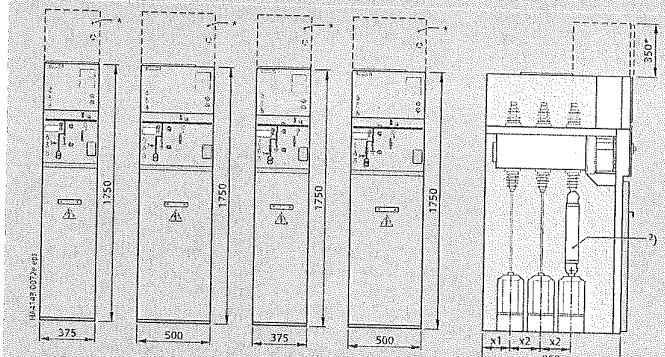


Type H,
for transfer to the right
(without transformers)

Type H,
for transfer to the left
(without transformers)

Bus riser panel type H

U_r	Dimensions in mm	
	x1	x2
Up to 17.5 kV	187	210
24 kV	187	210



Type M(VT) Type M1(VT) Type M(VT-F) (with fuses) Type M1(VT-F) (with fuses)

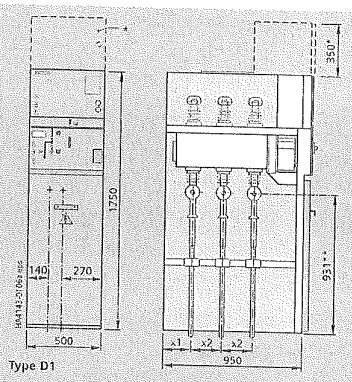
Busbar voltage metering panels

U_r	Dimensions in mm	
	x1	x2
Up to 17.5 kV	187	210
24 kV	215	250

* Option:
Low-voltage compartment

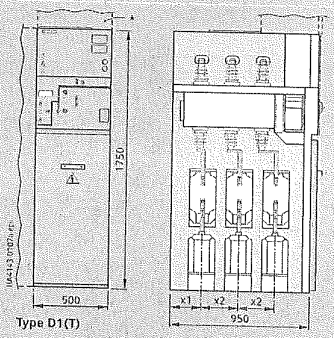
1) Mounting location of voltage transformer in left-hand panel

2) Option: Fuses



Type D1

Disconnector panels



Type D1(T)

Disconnector panel type D1(T)
for panel combinations
[e.g. metering panel type M or L1 (T)]
Option: on request
With current or voltage transformers

* Option:
Low-voltage compartment

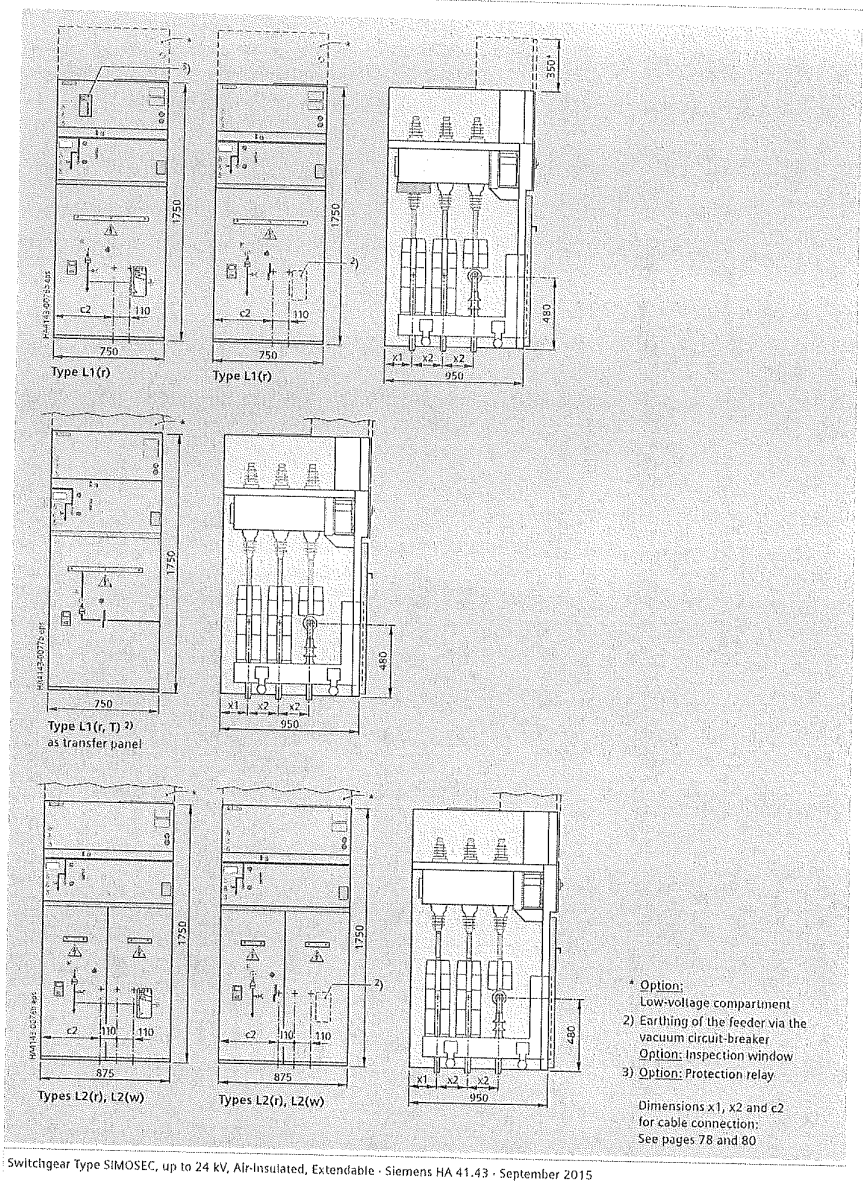
** For panel design with 4MA block-type current transformer, the cable connection height is reduced

1) Mounting location of voltage transformer in left-hand panel

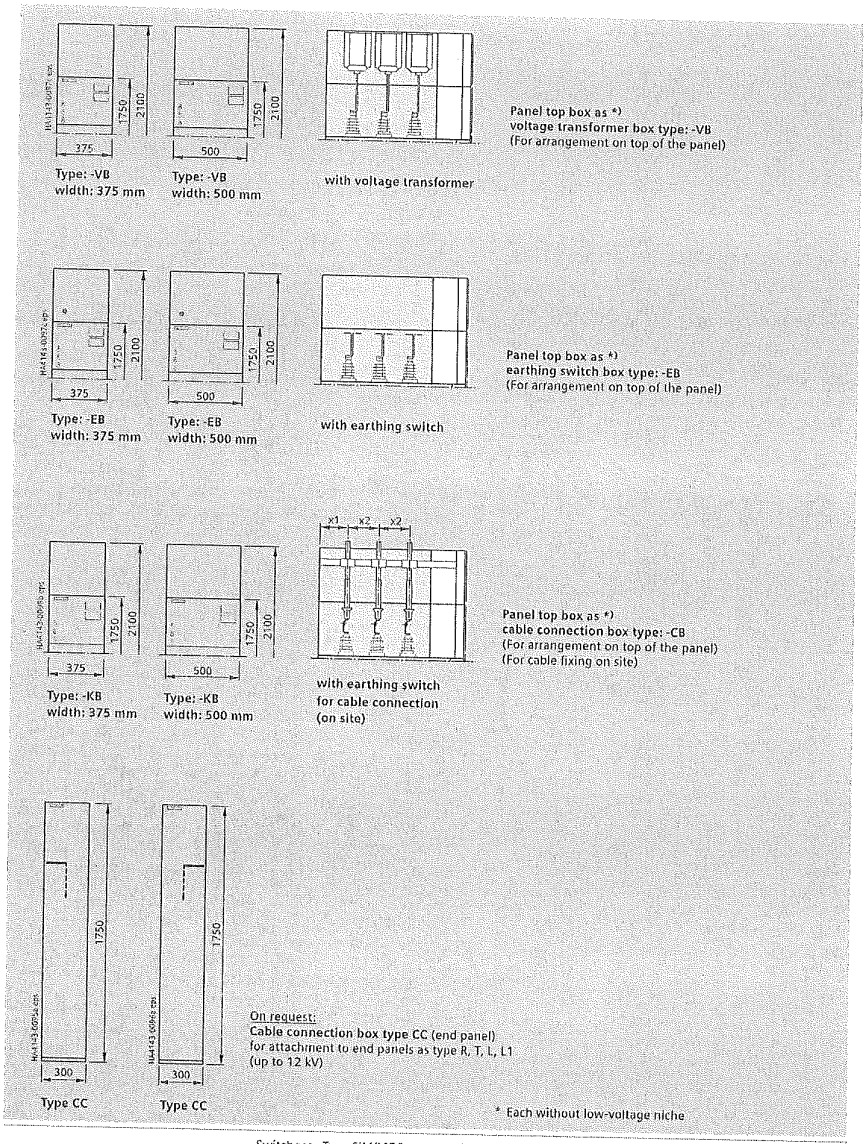
Dimensions x1 and x2 for cable connection:
See pages 78 and 80

Dimensions

On request: Circuit-breaker panels (for removable circuit-breaker type CB-r)



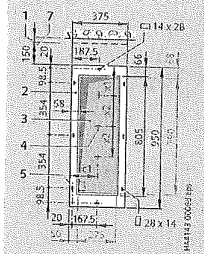
On request: Panel top box, cable connection box



Dimensions

Floor openings (dimensions in red) and fixing points

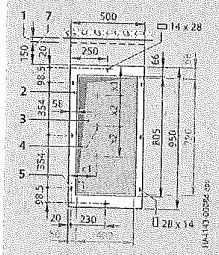
For panel width 375 mm



With cable connection

For panel type	Position of cables 1)					
	Dimensions in mm					
	x1	x1	x2		c1	
	17.5 kV	24 kV	17.5 kV	24 kV	17.5 kV	24 kV
R	187	187	210	210	187.5	187.5
K	187	187	210	210	187.5	187.5
T	187	187	210	210	187.5	187.5
D	187	187	210	210	187.5	187.5

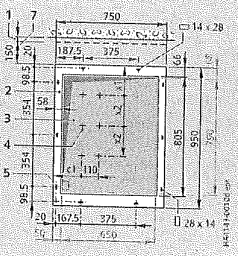
For panel width 500 mm



With cable connection

For panel type	Position of cables 1)					
	Dimensions in mm					
	x1	x1	x2		c1	
	17.5 kV	24 kV	17.5 kV	24 kV	17.5 kV	24 kV
R1, D1	187	187	210	210	187.5	187.5
K1	187	187	210	210	187.5	187.5
T1	187	187	210	210	187.5	187.5
L	187	187	210	210	187.5	187.5
L with CTs, VTs	187	235	210	230	250	300

For panel width 750 mm



With cable connection

For panel type	Position of cables 1)					
	Dimensions in mm					
	Number of cables	x1	x1	x2		c1	c1
		17.5 kV	24 kV	17.5 kV	24 kV	17.5 kV	24 kV
L1	1	187	187	210	210	187.5	187.5
	2	187	187	210	210	172.5	172.5
L1 mit CTs, VTs	1	187	235	210	230	235	335
	2	187	235	210	230	235	335

1 Wall distance (see page 66)
2 Fixing frame (base) of an individual panel or panel block
3 Floor opening for high-voltage cables and, where applicable, control cables

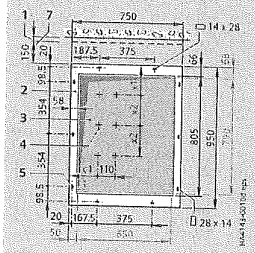
Note:
Connection of double cables: Depending on the panel type and version of the sealing end, the cable distance is approx. 110 mm.

4 Position of the led-in cables for the feeder 1)
5 Fixing points
6 Floor opening if required for panels without cable connection
7 Option: Pressure relief duct

1) The position of cables depends on the additional installed equipment in the cable compartment like e.g. current transformer and voltage transformer. Therefore the dimensions x1, x2, c1, c2 can deviate.

Floor openings (dimensions in red) and fixing points

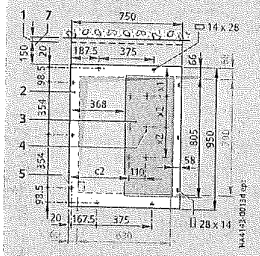
For panel width 750 mm



With cable connection

For panel type	Position of cables 1) Dimensions in mm						
	Number of cables	x1	x1	x2		c1	c1
		17.5 kV	24 kV	17.5 kV	24 kV	17.5 kV	24 kV
M(-K)	1	187	215	210	250	375	375
M(-BK)	1	187	215	210	250	375	375

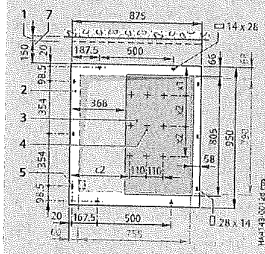
On request: For panel type L1(r), L1(w), width 750 mm



With cable connection

For panel type	Position of cables 1) Dimensions in mm						
	Number of cables	x1	x1	x2		c2	c2
		17.5 kV	24 kV	17.5 kV	24 kV	17.5 kV	24 kV
L1(r)	1	187	235	210	230	390	390
	2	187	235	210	230	390	390
L1(w)	1	187	235	210	230	390	390
	2	187	235	210	230	390	390

On request: For panel type L2(r), L2(w), width 875 mm



With cable connection (up to 3 cables)

For panel type	Position of cables 1) Dimensions in mm						
	Number of cables	x1	x1	x2		c2	c2
		17.5 kV	24 kV	17.5 kV	24 kV	17.5 kV	24 kV
L1(r)	1	187	235	210	230	390	390
	2	187	235	210	230	390	390
	3	187	235	210	230	390	390
L1(w)	1	187	235	210	230	390	390
	2	187	235	210	230	390	390
	3	187	235	210	230	390	390

1 Wall distance (see page 66)
2 Fixing frame (base) of an individual panel or panel block
3 Floor opening for high-voltage cables and, where applicable, control cables
4 Position of the led-in cables for the feeder 1)
5 Fixing points
6 Floor opening if required for panels without cable connection
7 Option: Pressure relief duct

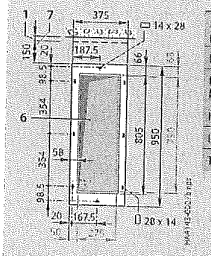
Note:
Connection of double cables: Depending on the panel type and version of the sealing end, the cable distance is approx. 110 mm.

1) The position of cables depends on the additional installed equipment in the cable compartment like e.g. current transformer and voltage transformer. Therefore the dimensions x1, x2, c1, c2 can deviate.

Dimensions

Floor openings (dimensions in red) and fixing points

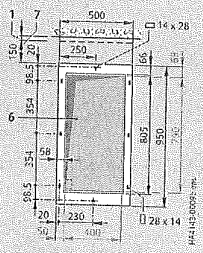
For panel width 375 mm



For panel type:
R(T)
M(VT), M(VT-F)
H, E
D(T)
T(T)

Without cable connection

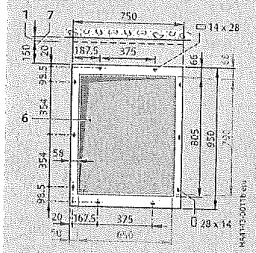
For panel width 500 mm



For panel type:
E1
M1(VT), M1(VT-F)
L(T)
D1(T)
T1(T)

Without cable connection

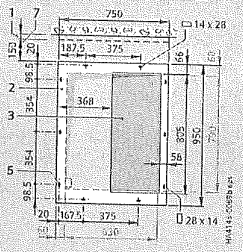
For panel width 750 mm



For panel type:
L1(T)
M, M(-B)
Panel combinations:
R(T) + H, R(T)+R(T) T(T) + H

Without cable connection

On request: For panel width L1(r, T), L1(w, T), width 750 mm



For panel type:
L1(r, T)
L1(w, T)

Without cable connection

1 Wall distance (see page 66)
2 Fixing frame (base) of an individual panel or panel block
3 Floor opening for high-voltage cables and, where applicable, control cables

Note:
Connection of double cables: Depending on the panel type and version of the sealing end, the cable distance is approx. 110 mm.

4 Position of the fed-in cables for the feeder [1]
5 Fixing points
6 Floor opening if required for panels without cable connection
7 Option: Pressure relief duct

1) The position of cables depends on the additional installed equipment in the cable compartment like e.g. current transformer and voltage transformer. Therefore the dimensions x1, x2, c1, c2 can deviate.

Individual panels or combinations thereof for standard switchgear	Panel type	Panel or panel combination		Transport unit "TU" (including packing) for standard panels (without/with pressure relief duct, option)				
		Width B1 mm	Net weight [1] approx. kg without/with LV C* /LV C*	Width B2 m	Height H Δ) of "TU" m without/with LV C* /LV C*	Depth T2 m	Volume m³ without/with LV C* /LV C*	Gross weight [1][4] approx. kg without/with LV C* /LV C*
Transport of individual panels								
Ring-main panel	R	375	160/220	1.08	1.95/2.3	1.40	2.95/3.48	220/280
	R1	500	180/240	1.08				240/300
Ring-main transfer panel	R(T)	375	250/310	1.08				310/370
Transformer panel	T, T(T)	375	180/240	1.08				240/300
	T1, T1(T)	500	200/260	1.08				260/320
Cable panel	K	375	140/200	1.08				200/260
	K1	500	150/210	1.08				210/270
Cable panel with make-proof earthing switch	K	375	150/210	1.08				210/270
	K1	500	170/220	1.08				230/330
Circuit-breaker panel (fixed-mounted circuit-breaker type "C8-1")	L	500	300/360	1.08				360/420
	L1	750	340/400	1.08				400/460
	L(T)	500	300/360	1.08				360/420
	L1(T)	750	340/400	1.08				400/460
Circuit-breaker panel (removable circuit-breaker)	L1(r)	750	450/410	1.08				410/470
	L2(r)	875	380/440	1.08				440/500
	L1(w)	750	350/410	1.08				410/470
	L2(w)	875	380/440	1.08				440/500
	L1(w, T), L1(r, T)	750	350/410	1.08				410/470
Disconnector panel	D	375	160/220	1.08				220/280
	D1	500	180/240	1.08				240/300
Disconnector transfer panel	D1(T)	500	250/310	1.08				310/370
Metering panel	M; M(-K)	750	270/330	1.08				340/390
	M(-B); M(-BK)	750	270/330	1.08				340/390
Metering panel	M(KK)	750	270/330	1.08				340/390
Busbar voltage metering panel	M(VT)	375	210/270	1.08				270/330
	M(VT-F)	375	230/290	1.08				290/350
	M1(VT)	500	240/300	1.08				310/370
	M1(VT-F)	500	250/310	1.08				
Switch-disconnector panel for auxiliary transformer	M(PT)	750	300/360	1.08				360/420
	M(PT)	750	320/380	1.08				380/40
Bus riser panel	H	375	170/230	1.08				230/290
	H [3]	375	280/340	1.08				340/400
Busbar earthing panel	E	375	180/240	1.08				240/300
	E1	500	250/310	1.08				310/370
Lateral cable connection box	CC	300	100/n.a.	1.08				130/n.a.
Panel combinations:					1.95/2.3	1.40	2.95/3.48	
Bus sectionalizer panel (with circuit-breaker)	L(T) + H	875	470/570	1.08				530/630
Bus sectionalizer panel (with circuit-breaker)	L(T) + D(T)	875	500/600	1.08				560/660
Bus sectionalizer panel (1 three-position switch-disconnector)	R(T) + H	750	250/350	1.08				310/410
	R(T) + H ○)	750	350/450	1.08				410/510
Bus sectionalizer panel (2 three-position switch disconnectors)	R(T) + R(T)	750	310/410	1.08				370/470
	R(T) + R(T) [3]	750	420/520	1.08				480/580

For individual panel	Panel width mm	Additional weight per duct and per panel approx. kg
Pressure relief duct (option) for wall/free-standing arrangement of switchgear	375	30
	500	40
	750	60
	875	70

* Low-voltage compartment, 350 mm high, weight approx. 60 kg depending on the panel type and on the extent to which it is equipped, or optionally 550 mm high

n.a. = not applicable

Δ) Other heights "H" of "TU" possible (depending on the equipment of the panel type and the packing type)

○) Depending on the delivering factory

1) The net weight and the gross weight depend on the extent to which the panel is equipped (e.g. current transformers, motor operating mechanisms) and are therefore given as mean value

2) Sum of the net weights of individual panels

3) Panel types including CTs and VTs: Weight per CT or VT as cast-resin design: Approx. 20 kg (example: 3 CTs and 3 VTs approx. additionally 120 kg per panel)

4) Add additional weight for pressure relief duct (according to table values)

Shipping data, transport

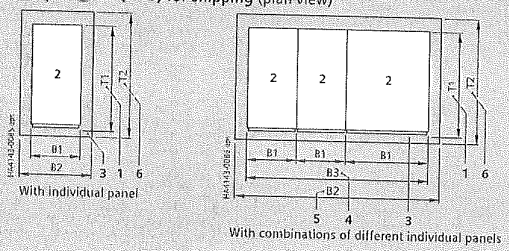
Individual panels or combinations thereof for standard switchgear	Panel type	Panel or panel combination		Transport unit "TU" (including packing) for standard panels (without/with pressure relief duct, option)				
		Width **B1** mm	Net weight 1) approx. kg without/with LV C* /LV C*	Width **B2** m	Height H Δ) of "TU" m without/with LV C* /LV C*	Depth **T2** m	Volume m³ without/with LV C* /LV C*	Gross weight 1) approx. kg without/with LV C* /LV C*
Transport unit: – Standard: As individual panels arranged side by side and not screwed together – Option: As multi-panel transport unit, panels screwed together		Max. width of switchgear unit "B3"		B2		T2		
		On request		0.70	1.95/2.3	1.40	1.91/2.25	
		≤ 875 mm		1.08	1.95/2.3	1.40	2.95/3.48	2) + 70 **
Standard packing for: – Truck		≤ 1000 mm ***		1.20	1.95/2.3	1.40	3.28/3.86	2) + 80 **
– Seaworthy crate, air freight		≤ 1500 mm		1.78	1.95/2.3	1.40	4.64/5.47	2) + 100 **
Container packing, standard (other dimensions on request)		≤ 2125 mm		2.33	1.95/2.3	1.40	6.36/7.50	2) + 120 **
		≤ 875 mm		1.10	1.95/2.3	1.40	3.00/3.50	2) + 80 **
		≤ 2000 mm		2.20	1.95/2.3	1.40	6.00/7.10	2) + 120 **

Transport dimensions of combinations of different individual panels ○)

Transport of individual panels and top boxes

Panel top box as earthing switch box	-EB	375	50/–	mounted on top of panel		50/–
Panel top box as voltage transformer box	-VB	375	90/–	mounted on top of panel		90/–
Panel top box as cable connection box	-CB	375	50/–	mounted on top of panel		50/–

Transport units (= TU) for shipping (plan view)



With individual panel

With combinations of different individual panels

1 T1 = Depth of individual panel
2 Individual panel dimension B1 x T1
3 Transport unit, dimension B2 x T2
4 B3 = Overall width of combination of different individual panels
5 B2 = Width of the transport unit
6 T2 = Depth of the transport unit

* Low-voltage compartment, 350 mm high, weight approx. 60 kg depending on the panel type and on the extent to which it is equipped, or optionally 550 mm high

** Packing weight

*** On request: Max. panel width "B3" ≤ 1125 mm (e.g. for 3 x 375 mm)

Δ) Other heights "H" of "TU" possible (depending on the equipment of the panel type and the packing type)

○) Depending on the delivering factory

1) The net weight and the gross weight depend on the extent to which the panel is equipped (e.g. current transformers, motor operating mechanisms) and are therefore given as mean value

2) Sum of the net weights of individual panels

Packing types (examples)

For size and weight of the transport units, see page 81.

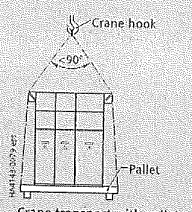
Place of destination and means of transport	Examples for packing O)
China / Europe by rail and truck	Type: Open PE protective foil pulled over the switchgear, with wooden base
Overseas by seafreight	Type: Seaworthy crate (standard) Welded PE protective foil, with closed wooden crate, with desiccant bag
	Type: Open for container PE protective foil pulled over the switchgear, with wooden base
Overseas by airfreight	Type: Open PE protective foil pulled over the switchgear, with wooden base and lattice or cardboard cover

Transport

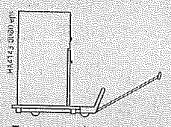
SIMOSEC switchgear is completely delivered in transport units. Please observe the following:

- Transport facilities on site
- Transport dimensions and weights
- Size of door openings in building
- Switchgear with low-voltage compartment: Please observe other transport dimensions and weights.

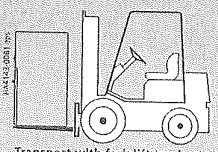
Types of transport (examples)



Crane transport with pallet



Transport with lifting truck
with or without pallet



Transport with fork-lift truck, standing

O) Depending on the delivering factory

Standards

Standards, specifications, guidelines

Standards

SIMOSEC switchgear complies with the relevant standards and specifications applicable at the time of type tests.

In accordance with the harmonization agreement reached by the countries of the European Union, their national specifications conform to the IEC standard.

Overview of standards (September 2015)

		IEC standard	VDE standard	EN standard	GB standard
Switchgear	SIMOSEC	IEC 62271-1	VDE 0671-1	EN 62271-1	GB/T 11022
		IEC 62271-200	VDE 0671-200	EN 62271-200	GB 3906
Devices	Circuit-breakers	IEC 62271-100	VDE 0671-100	EN 62271-100	GB 1984
	Disconnectors and earthing switches	IEC 62271-102	VDE 0671-102	EN 62271-102	GB 1985
	Switch-disconnectors	IEC 62271-103	VDE 0671-103 *	EN 62271-103 *	GB 3804
	Switch-disconnector/fuse combination	IEC 62271-105	VDE 0671-105	EN 62271-105	GB 16926
	HV HRC fuses	IEC 60282-1	VDE 0670-4	EN 60282-1	GB15166.2
	Voltage detecting systems Voltage presence indicating systems	IEC 61243-5 IEC 62271-206	VDE 0682-415 VDE 0671-206	EN 61243-5 EN 62271-206	DL/T 538-2006 (acc. to IEC 61958-2008, similar to Chinese standard)
Degree of protection	IP code	IEC 60529	VDE 0470-1	EN 60529	GB 4208
	IK code	IEC 62262	VDE 0470-100	EN 50102	
Insulation	–	IEC 60071	VDE 0111	EN 60071	GB/T 311.2
Transformers	Instrument transformers: General requirements	IEC 61869-1	VDE 0414-9-1	EN 61869-1	
	Current transformers	IEC 61869-2	VDE 0414-9-2	EN 61869-2	GB 1208
	Voltage transformers	IEC 61869-3	VDE 0414-9-3	EN 61869-3	GB 1207
Power installations	Common rules	IEC 61936-1	VDE 0101-1	EN 61936-1	–
	Earthing of power installations	–	VDE 0101-2	EN 50522	–
Insulating gas SF_6	Specification for sulfur hexafluoride (SF_6)	IEC 60376	VDE 0373-1	EN 60376	–

Type of service location

SIMOSEC switchgear can be used as an indoor installation in accordance with IEC 61936 (Power installations exceeding 1 kV AC) and VDE 0101:

- Outside lockable electrical service locations at places which are not accessible to the public. Enclosures of switchgear can only be removed with tools.
- Inside lockable electrical service locations. A lockable electrical service location is a place outdoors or indoors that is reserved exclusively for housing electrical equipment and which is kept under lock and key. Access is restricted to authorized personnel and persons who have been properly instructed in electrical engineering. Untrained or unskilled persons may only enter under the supervision of authorized personnel or properly instructed persons.

* Up to now: VDE 0670-301, EN 60265-1, IEC 60265-1

Dielectric strength

- The dielectric strength is verified by testing the switchgear with rated values of short duration power-frequency withstand voltage and lightning impulse withstand voltage according to IEC 62271-1 / VDE 0671-1 and GB 11022 (see table "Dielectric strength").
- The rated values are referred to sea level and to normal atmospheric conditions (1013 hPa, 20 °C, 11 g/m³ humidity in accordance with IEC 60071 and VDE 0111).
- The dielectric strength decreases with increasing altitude. For site altitudes above 1000 m (above sea level) the standards do not provide any guidelines for the insulation rating. Instead, special regulations apply to these altitudes.
- Site altitude
  - As the altitude increases, the dielectric strength of insulation in air decreases due to the decreasing air density. This reduction is permitted up to a site altitude of 1000 m according to IEC and VDE.
  - For site altitudes above 1000 m a higher insulation level must be selected. It results from the multiplication of the rated insulation level for 0 to 1000 m with the altitude correction factor K_a.

Table – Dielectric strength

Rated voltage (r.m.s. value)	kV	7.2	12		15	17.5	24
Rated short-duration power-frequency withstand voltage (r.m.s. value)							
– Across the isolating distances	kV	23	32	48 *	39	45	60
– Between phases and to earth	kV	20	28	42 *	36	38	50
Rated lightning impulse withstand voltage (peak value)							
– Across the isolating distances	kV	70	85		105	110	145
– Between phases and to earth	kV	60	75		95	95	125

Current carrying capacity

- According to IEC 62271-200 or IEC 62271-1, VDE 0671-200 or VDE 0671-1, the rated normal current refers to the following ambient air temperatures:
  - Maximum of 24-hour mean + 35 °C
  - Maximum + 40 °C
- The current carrying capacity of the panels and busbars depends on the ambient air temperature outside the enclosure.

Internal arc classification

- Protection of operating personnel by means of tests for verifying the internal arc classification
- Internal arcing tests must be performed in accordance with IEC 62271-200 or VDE 0671-200
- Definition of criteria:
  - Criterion 1:
    Correctly secured doors and covers do not open, limited deformations are accepted
  - Criterion 2:
    No fragmentation of the enclosure, no projection of small parts above 60 g
  - Criterion 3:
    No holes in accessible sides up to a height of 2 m
  - Criterion 4:
    No ignition of indicators due to hot gases
  - Criterion 5:
    The enclosure remains connected to its earthing point.

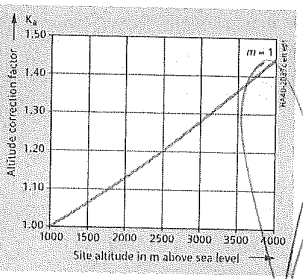
Resistance to internal faults (option)

In SIMOSEC switchgear, the appearance of internal faults (internal arcs) is less compared with earlier designs due to:

- Use of gas-insulated switching-device vessels
- Use of metal-enclosed switching-device vessels
- The fact that maloperation is practically excluded due to logical arrangement of operating elements and use of logical mechanical interlocks
- Short-circuit-proof feeder earthing by means of the three-position switch (make-proof earthing switch) or the circuit-breaker.

Altitude correction factor K_a

For site altitudes above 1000 m, the altitude correction factor K_a is recommended, depending on the actual site altitude above sea level.



Rated short-duration power-frequency withstand voltage for site altitudes > 1000 m to be selected
= Rated short-duration power-freq. withstand volt. up to ≤ 1000 m · K_a

Rated lightning impulse withstand voltage for site altitudes > 1000 m to be selected
= Rated lightning impulse withstand voltage up to ≤ 1000 m · K_a

Example 1:
3000 m site altitude above sea level
17.5 kV switchgear rated voltage
95 kV rated lightning impulse withstand voltage
Rated lightning impulse withstand volt. to be selected 95 kV · 1.28 = 122 kV
Result:
According to the above table, a switchgear for a rated voltage of 24 kV with a rated lightning impulse withstand voltage of 125 kV is to be selected.

Example 2:
2750 m site altitude above sea level
7.2 kV switchgear rated voltage
60 kV rated lightning impulse withstand voltage
Rated lightning impulse withstand volt. to be selected 60 kV · 1.25 = 75 kV
Result:
According to the above table, a switchgear for a rated voltage of 12 kV with a rated lightning impulse withstand voltage of 75 kV is to be selected.

* Value according to GB standard

Standards, specifications, guidelines

Cable testing

- For circuit-breaker and switch-disconnector feeders
- DC voltage test
  Before the test:
  Remove or disconnect any voltage transformers at the cable connection in SIMOSEC switchgear
- SIMOSEC switchgear, e.g. for rated voltages up to 17.5 kV can be subjected to cable tests at a max. DC test voltage of 38 kV according to VDE. The voltage at the busbar may be 17.5 kV in this case
- SIMOSEC switchgear for rated voltages up to 24 kV can be subjected to cable tests at a max. DC test voltage of 72 kV or according to VDE at 70 kV, 15 min. The voltage at the busbar may be 24 kV in this case.
- For cable testing
  - the installation and operating instructions of the switchgear
  - the standards IEC 62271-200/VDE 0671-200 Clause 5.105 *
  - the information on manufacturer-dependent cable sealing ends
  - the cable version (e.g. paper-insulated mass-impregnated cables, PVC cables or XLPE cables)

must be observed.

Test voltages:

Rated voltage	U_0 / U (U_m)	Max. test voltage applied to the connected cable		
		VLF [1], 0.1 Hz	acc. to IEC	VDE 0278
		3 x U_0 U_{VLF}	U =	6 x U_0, 15 min. max. U =
U_r (kV)	(kV)	AC (kV)	DC (kV)	DC (kV)
12	6/10 (12)	19	24	38 [2]
24	12/20 (24)	38	48	70

Climate and environmental influences

SIMOSEC switchgear may be used, subject to possible additional measures – e.g. panel heaters or floor covers – under the following environmental influences and climate classes:

- Environmental influences
  - Natural foreign materials
  - Chemically active pollutants
  - Small animals
- Climate classes
  The climate classes are classified according to IEC 60721-3-3.

SIMOSEC switchgear is largely insensitive to climate and environmental influences by virtue of the following features:

- No cross insulation for isolating distances between phases
- Metal enclosure of switching devices (e.g. three-position switch) in gas-filled stainless-steel switching-device vessel
- Dry-type bearings in operating mechanism
- Essential parts of the operating mechanism made of corrosion-proof materials
- Use of climate-independent three-phase current transformers.

Color of the switchgear

Panel front:

Siemens standard (SN) 47 030 G1, color no. 700/light basic (similar to RAL 7047/telegrey).

End walls:

Standard: Steel (sendzimir galvanized)
Option: Painted, color according to panel front.

Terms

"Make-proof earthing switches" are earthing switches with short-circuit making capacity according to
– IEC 62271-102 and
– VDE 0671-102.

PM

Metallic partition according to IEC 62271-200 (3.109.1). Metallic partitions between open, accessible compartments and live parts.

The SIMOSEC switchgear is suitable for application in indoor installations under normal operating conditions as defined in the standard IEC 62271-1.

* For standards, see page 84
1) VLF = very low frequency
2) Referred to: U_0/U (U_m = 6.35/11 (12) kV)

Protection against solid foreign objects, electric shock and water

SIMOSEC switchgear fulfills according to the standards *

IEC 62271-1	EN 62 271-1	VDE 0671-1
IEC 62271-200	EN 62 271-200	VDE 0671-200
IEC 60529	EN 60 529	VDE 0470-1
IEC 62262	EN 50 102	VDE 0470-100

the following degrees of protection (for explanations, see opposite table):

Degree of protection "IP"	Type of protection
IP2X (standard)	for switchgear enclosure
IP3X (option)	for switchgear enclosure (optional)
IP3XD (option on request)	for switchgear enclosure (on request)
IP65	for parts of the primary circuit of switching-device vessels under high voltage

Degree of protection IK	Type of protection
IK 07	for switchgear enclosure

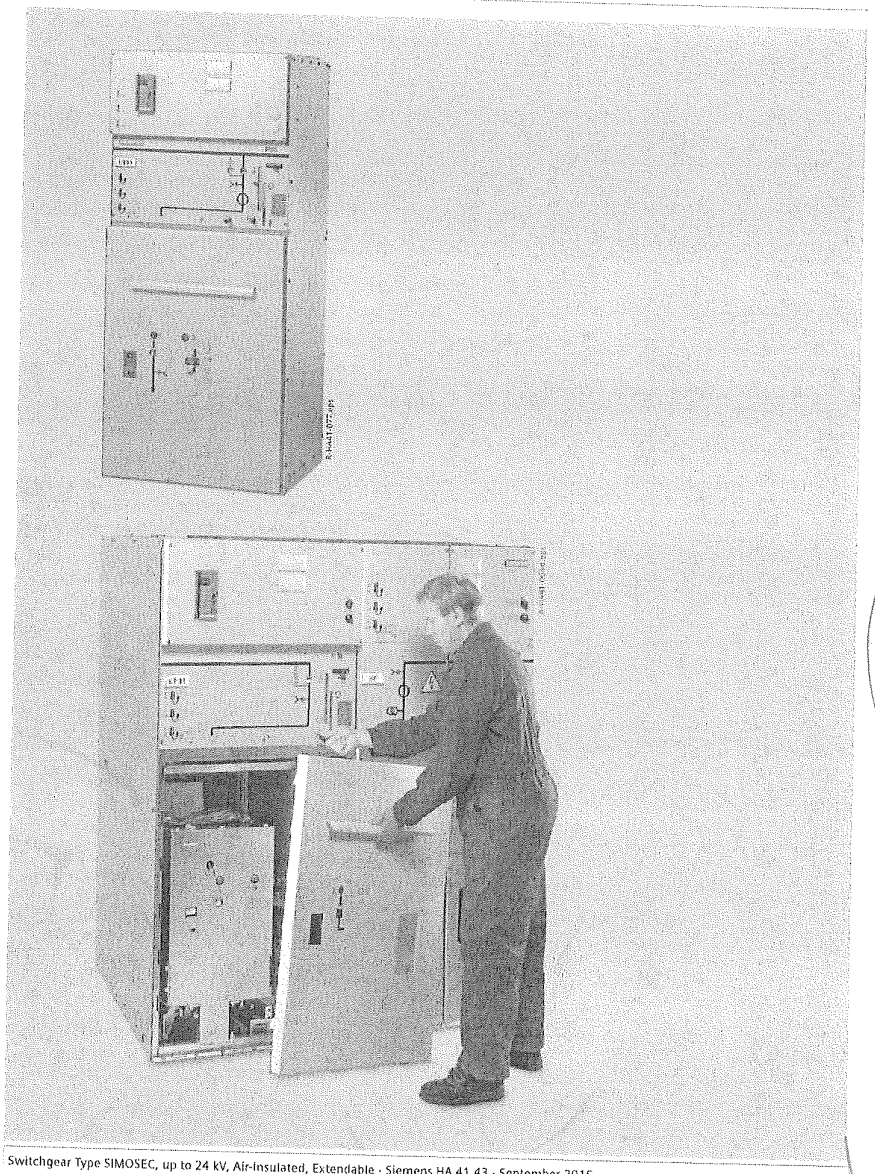
For secondary devices in the low-voltage door, the stipulations of the IP degree of protection apply according to the definitions for the switchgear enclosure.

IEC/EN 60529:

Type of protection	Degree of protection
Standard:	IP 2X
Protection against solid foreign objects: Protected against solid foreign objects of 12.5 mm diameter and greater (the object probe, sphere of 12.5 mm diameter, shall not fully penetrate)	
Protection against access to hazardous parts: Protected against access to hazardous parts with a finger (the jointed test finger of 12 mm diameter, 80 mm length, shall have adequate clearance from hazardous parts)	
Protection against water: No definition	
Option:	IP 3X
Protection against solid foreign objects: Protected against solid foreign objects of 2.5 mm diameter and greater (the object probe, sphere of 2.5 mm diameter, shall not penetrate at all)	
Protection against access to hazardous parts: Protected against access to hazardous parts with a tool (the access probe of 2.5 mm diameter shall not penetrate)	
Protection against water: No definition	
Option on request:	IP 3XD
Protection against solid foreign objects: Protected against solid foreign objects of 2.5 mm diameter and greater (the object probe, sphere of 2.5 mm diameter, shall not penetrate at all)	
Protection against water: No definition	
Protection against access to hazardous parts: Protected against access with a wire (the access probe of 1.0 mm diameter, 100 mm length, shall have adequate clearance from hazardous parts)	
	IP 65
Protection against solid foreign objects: Dust-tight (No ingress of dust)	
Protection against access to hazardous parts: Protected against access to hazardous parts with a wire (the access probe of 1.0 mm diameter shall not penetrate)	
Protection against water: Protected against water jets (water projected in jets against the enclosure from any direction shall have no harmful effects)	

* For standards, see page 84

Versions with removable circuit-breaker type 3AH6



Electrical data of the switchgear

Common data to electrical data and filling pressure

Rated insulation level	Rated voltage U_r		kV	7.2		12		17.5			24			
	Rated short-duration power-frequency withst. voltage U_d													
	– phase-to-phase, phase-to-earth, open contact gap		kV	20		28, 42 *)		38			50			
	– across the isolating distance		kV	23		32, 48 *)		45			60			
	Rated lightning impulse withstand voltage U_p													
	– phase-to-phase, phase-to-earth, open contact gap		kV	60		75		95			125			
	– across the isolating distance		kV	70		85		110			145			
Rated frequency f_r			Hz	50/60										
Rated normal current I_r 1) for busbar	Standard		A	630										
	Option		A	1250										
Rated short-time withstand current I_k	for switchgear with t_k = 1 s	up to kA	20	25	20	25	16	20	25	16	20			
	for switchgear with t_k = 3 s	up to kA	20	–	20	–	–	20	–	–	20			
Rated peak withstand current I_p	for switchgear with t_k = 1 s	up to kA	50	63	50	63	40	50	63	40	50			
Rated filling level p_{re} 2)	for insulation	absolute at 20 °C	1500 hPa											
Minimum functional level p_{me} 2)	for insulation	absolute at 20 °C	1300 hPa											

Circuit-breaker panel type LS..

Rated values		for feeder	with											
Rated normal current I_r 1)	for panel type	LS11	3AH6 **)	A	630									
	for panel type	LS31, LS32	3AH6 **)	A	1250									
Rated short-circuit making current I_{ma}			up to kA	50	63	50	63	40	50	63	40	50		
Rated short-circuit breaking current I_{sc}	for vacuum circuit-breaker 3AH6		up to kA	20	25	20	25	16	20	25	16	20		

Vacuum circuit-breaker 3AH6

Rated voltage U_r		kV	7.2	12	17.5	24
Rated normal current I_r of feeders	for 3AH6	A	630, 1250	630, 1250	630, 1250	630, 1250

Circuit-breaker: 3AH6 (CB-r AR)

Classification and number of operating cycles for circuit-breaker according to IEC/EN 62271-100/VDE 0671-100

Mechanical	Number of operating cycles	n	10,000
	Class		M2
Electrical	Number of operating cycles with I_r: 10000		Class E2
	Breaking of capacitive currents		Class C2
	Number of short-circuit breaking operations with I_{sc}	n	30 (I_{sc} = 25 kA), or 45 x
			Class S1
Rated operating sequence			O - 0.3 s - CO - 3 min - CO
			O - 0.3 s - CO - 30 s - CO
			O - 0.3 s - CO - 15 s - CO on request

Three-position switch (for panel types LS...)

Classification for disconnectors according to IEC/EN 62271-102/VDE 0671-102

Number of mechanical operating cycles		n	1000 (2000 *))
M-classification		M	M0 (M1 **))

Classification for earthing switches according to IEC/EN 62271-102/VDE 0671-102

Number of mechanical operating cycles/M-classification		n	1000 / M0
Number of short-circuit making operations with I_{ma}		n	n.a. as the feeder is earthed via the vacuum circuit-breaker, or via the separate make-proof earthing switch at the feeder
Classification		Class E	

Earthing switch at the feeder

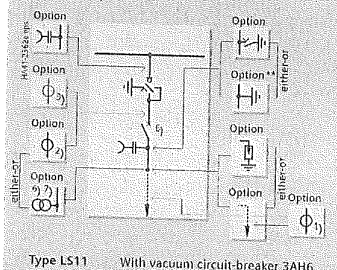
Rated voltage U_r			kV	7.2	12	17.5	24
Make-proof earthing function in the feeder of panels LS11, LS31 and LS32	Rated short-circuit making current I_{ma}	up to kA	63	63	63	50
	Rated short-time withstand current I_k	up to kA	25	25	25	20
Classification for earthing switches according to IEC/EN 62271-102/VDE 0671-102 (for panel types LS...) at the feeder							
Number of mechanical operating cycles/M-classification			n	1000 / M0			
Number of short-circuit making operations with I_{ma}			n	2	2	2	2
Classification			Class E	E1	E1	E1	E1

*) As design option, on request according to some national requirements (e.g.: GOST, GB, ...)
**) Type designation of the vacuum circuit-breaker

1) The rated normal currents apply to ambient air temperatures of max. 40 °C.
The 24-hour mean value is max. 35 °C (according to IEC 62271-1/VDE 0671-1)
2) Pressure values for SF_6-insulated vessels

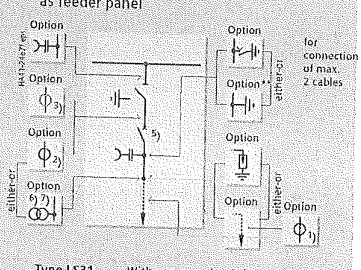
Circuit-breaker panels

Circuit-breaker panel 630 A
as feeder panel

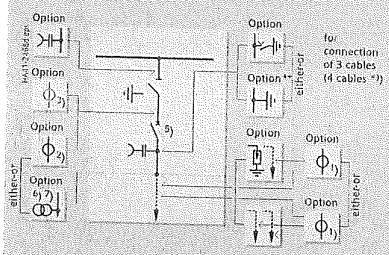


Type LS11 With vacuum circuit-breaker 3AH6,
750 mm wide removable

Circuit-breaker panel 1250 A
as feeder panel



Type LS31 With vacuum circuit-breaker 3AH6,
750 mm wide removable

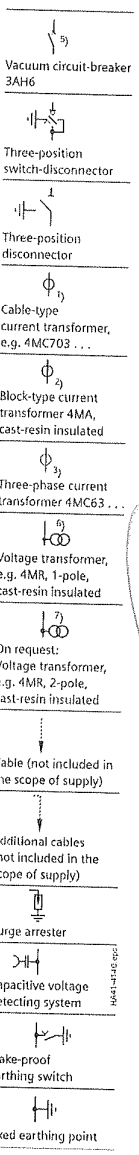


Type LS32 With vacuum circuit-breaker 3AH6,
825 mm wide removable

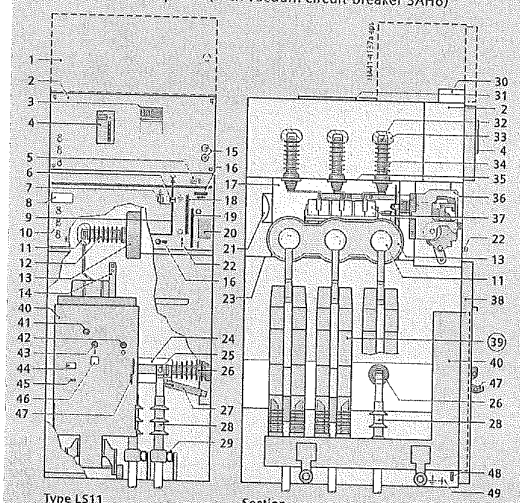
* On request

** Standard: Feeder earthing via the vacuum circuit-breaker type 3AH6 (without earthing switch at the feeder)

Option: Feeder earthing via the make-proof earthing switch at the feeder



Circuit-breaker panel (with vacuum circuit-breaker 3AH6)



Type LS11 Section

1 Option: Low-voltage compartment
2 Niche for optional low-voltage equipment, cover can be unscrewed
3 Option: CAPDIS voltage detecting system
4 Option: Overcurrent-time protection relay SIPROTEC easy 7SJ45
5 Option: Ready-for-service indicator for switching device
6 Position indicator for disconnecting function "CLOSE – OPEN"
7 Position indication for earthing function "OPEN – EARTHED"
8 Feeder designation label
9 Mimic diagram
10 Option: Sockets for capacitive voltage detecting system (depending on arrangement)
11 Insulating cap * at the bushing-type insulator
12 Bushing-type insulator for the feeder
13 Option: Three-phase current transformer 4MC63
14 Logical mechanical interlock for three-position switch
15 Option: Momentary-contact rotary control switch "CLOSED – OPEN" for motor operating mechanism with local-remote switch for three-position disconnector
16 For panel types LS11, LS31, LS 32: Logical mechanical interlock between circuit-breaker "OPEN" and three-position disconnector, as well as locking device for three-position disconnector
17 Gas-insulated vessel for switching device
18 Manual operation for the mechanism of the earthing function
19 Manual operation for the mechanism of the load-break function
20 Rating and type plate
21 Pressure relief device for switching device
22 Interlocking of cable compartment cover in circuit-breaker panels
23 Metallic partition of cable compartment
24 Cover * for screwed joint of the cable connections
25 Cable connection
26 Post insulator
28 Cable sealing end (not included in scope of supply)
29 Cable bracket with cable clamps (option) for fastening cables
30 Option: Wiring duct removable for control cables and/or bus wires
31 Busbar compartment cover for panel extension
32 Busbar
33 Insulating cap * at the busbar
34 Bushing-type insulator for busbar
35 Metallic partition of busbar compartment
36 Spring-operated mechanism for three-position disconnector
37 Three-position disconnector
38 Cable compartment cover

Vacuum circuit-breaker:

39 Vacuum circuit-breaker 3AH6
40 Operating mechanism box
41 Manual operation for "spring charging"
– for closing with manual operating mechanism
– for emergency operation with motor operating mechanism
42 Mechanical "OFF" pushbutton
43 Mechanical "ON" pushbutton (not supplied with spring-operated mechanism)
44 "Spring charged" indicator
45 Operations counter
46 Position indicator

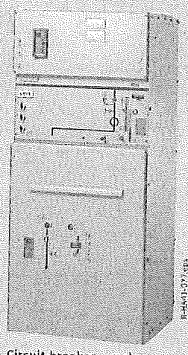
27 Option: Feeder earthing via make-proof earthing switch
or
47 Feeder earthing via vacuum circuit-breaker (= feeder earthed locking device with circuit-breaker "CLOSED")
48 Earthing busbar
49 Earthing connection (for location, see dimension drawing)

* for example for $U_p \geq 95$ kV, $U_i \geq 15$ kV

Product Range

Product range overview

Standard panel (example)



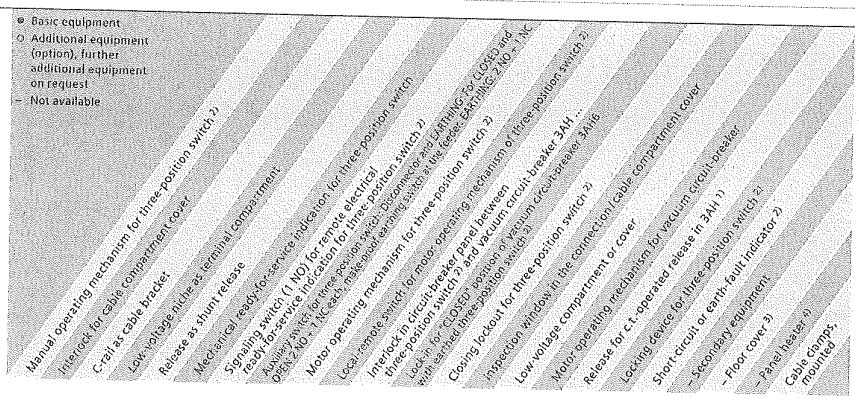
Circuit-breaker panel

Application as:	Panel designation	Panel type	Panel width mm
Column No.			
Feeder	Circuit-breaker panel 630 A, with 3AH6 [1]	LS11	750
	Circuit-breaker panel 1250 A, with 3AH6 [1]	LS31	750
		LS32	875

1) Type designation of the vacuum circuit-breaker
2) Three-position switch as three-position disconnector in panel types LS11, LS31 and LS32
3) Deeper floor cover required in special cases for panels with cable feeder (on request)
4) Panel heating: wired to terminal (standard), option: version with thermostat
5) Lock-in not to be applied for versions with separate feeder earthing switch in panel types LS11, LS31 and LS32
6) Inspection window is a standard equipment in panel types LS11, LS31 and LS32 for versions with separate earthing switch

Options for panels

- ● Basic equipment
- ○ Additional equipment (option), further additional equipment on request
- – Not available



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Panel type
●	●	●	●	○	○	○	○	○	○	●	○ 5)	○	○ 6)	○	○	○	○	–	○	○	○	○	LS11
●	●	●	●	○	○	○	○	○	○	●	○ 5)	○	○ 6)	○	○	○	○	–	○	○	○	○	LS31 LS32

Three-position switch as three-position disconnector

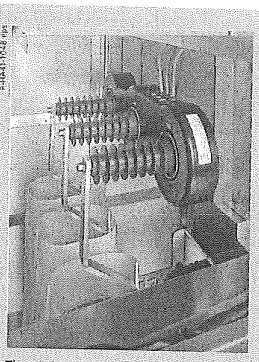
Three-position disconnector 630 A, 1250 A

- Up to 1250 A, for panel types LS11, LS31 and LS32
- Metal-enclosed.

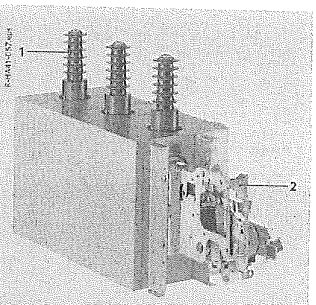
Operating mechanism

- Spring-operated mechanism as detachable lever mechanism
- Manual operation with the help of a slip-on operating lever
- Options:

– Mechanical ready-for-service indication
– Auxiliary switch
– Motor operating mechanism for the disconnector
– Locking device.

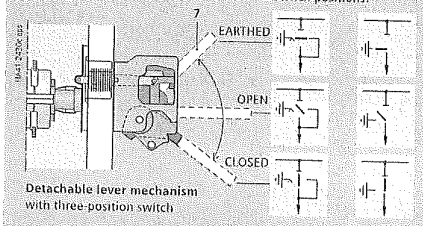


Three-phase current transformer 4MC63 at the bushings of the three-position disconnector



Three-position disconnector 630 A

1 Bushing-type insulator for the busbar
2 Spring-operated mechanism as detachable lever mechanism



Detachable lever mechanism with three-position switch

7 Operating lever inserted

Switch positions:

as three-position disconnector 630 A

as three-position disconnector 1250 A

Switching functions of the three-position disconnector 1250 A

- Disconnecting
- Switching functions according to
  – IEC 62271-102
  – VDE 0671-102
- Earthing function
- For panel types LS11, LS31 and LS32

General features

- Connecting lugs for sealing ends arranged one behind the other
- Uniform cable connection height for the respective panel types
- With cable bracket, e.g. type C40 according to DIN EN 50024
- Access to the cable compartment only if the feeder has been disconnected and earthed

Special features

– In the ring-main panel

– In the circuit-breaker panel

– In the cable panel

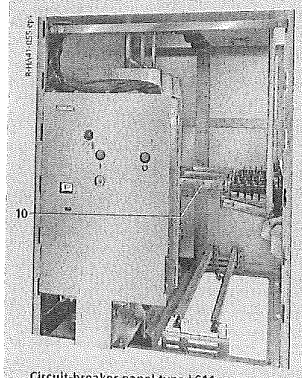
- For thermoplastic-insulated cables
- For paper-insulated mass-impregnated cables with adapter systems
- For connection cross-sections up to 300 mm² cable routing downwards

– In the transformer panel:

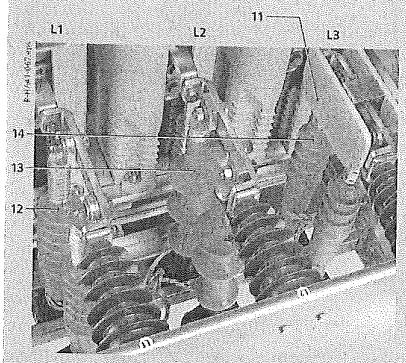
- For thermoplastic-insulated cables
- For connection cross-sections up to 120 mm²: Cable lug max. 32 mm wide
- For rated normal currents 200 A.

Cable cross-sections

Panel type	Connectable cables x connection cross-section No. x mm² for rated voltage		
	12 kV	17.5 kV	24 kV
LS11, LS31	2x400	2x400	2x300
LS32 Standard	3x400	3x400	3x300
Option	4x300	4x300	–
Inquiry	–	–	4x300



Circuit-breaker panel type LS11
cable compartment as delivered



Cable compartment with cable sealing ends
(options: A, C and D, see below)

10 As-delivered condition, e.g. for U_p < 95 kV, prepared for cable sealing end

11 As-delivered condition, e.g. for U_p ≥ 95 kV, additionally with insulating cap prepared for cable sealing end

12 Phase L1:
Make Lovink-Enertech, type IAES 20, 240 mm² (20 kV)

13 Phase L2:
Prysmian Kabel und Systeme (Pirelli Elektrik), type ELTI 1C-24-D-T3, 240 mm² (24 kV), as indoor sealing end, for adverse ambient conditions

14 Phase L3:
Make Euromold, type AIN 20, 240 mm² (24 kV)

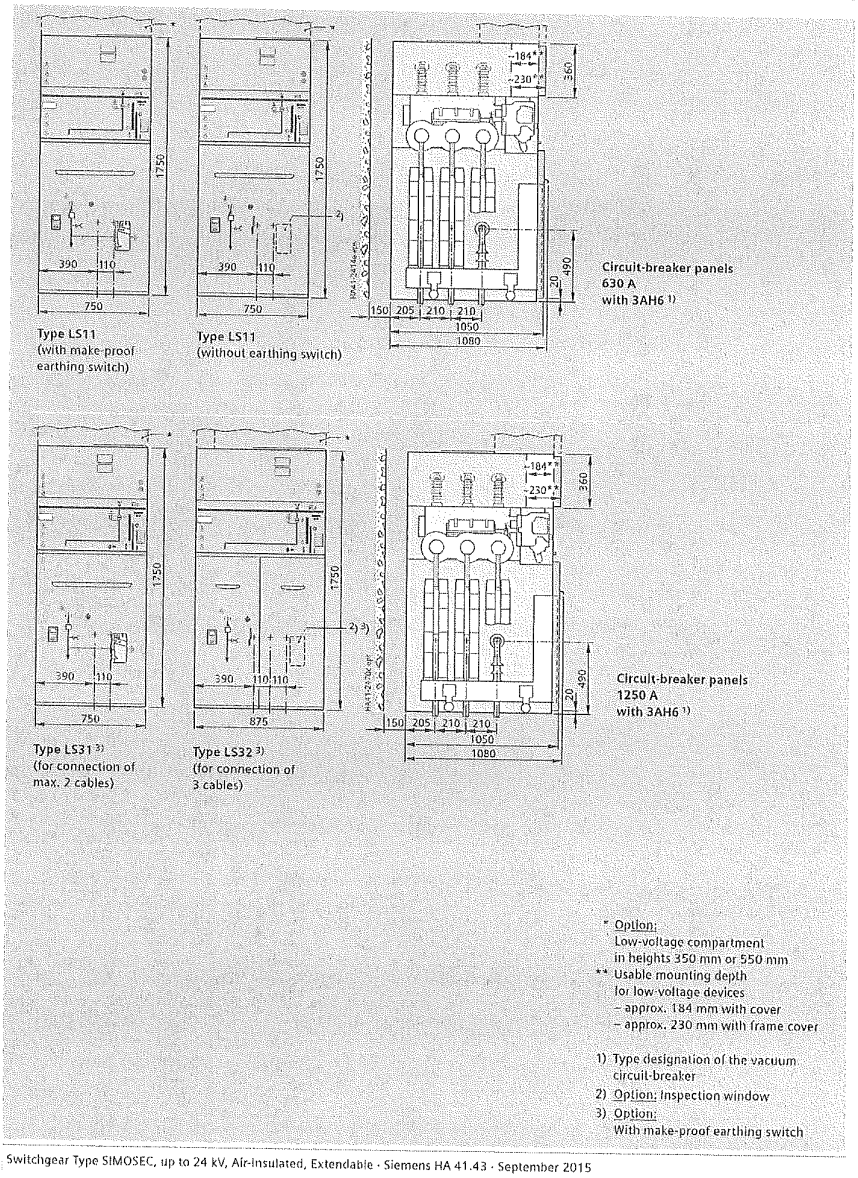
Options

A Cable clamps, mounted

C Double cable connection

D Suitable for connection of surge arresters make Siemens, type 3EK, other makes on request

Dimensions of circuit-breaker panels (type LS.., with 3AH6)



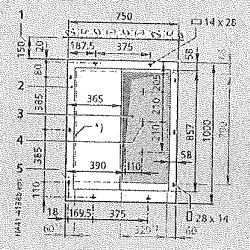
* Option:
Low-voltage compartment in heights 350 mm or 550 mm

** Usable mounting depth for low-voltage devices
- approx. 184 mm with cover
- approx. 230 mm with frame cover

1) Type designation of the vacuum circuit-breaker
2) Option: Inspection window
3) Option: With make-proof earthing switch

Floor openings (with dimensions marked in red) and fixing points

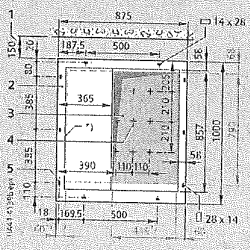
For panel width 750 mm



for panel type
LS11-U
LS31-U
LT31

For cable connection:
2 cables

For panel width 875 mm



for panel type
LS32

For cable connection:
3 cables

1 Wall distance
2 Fixing frame (base) of an individual panel
3 Floor opening for high-voltage cables and, where applicable, control cables
4 Position of the led-in cables for the feeder
5 Fixing points

△) Note for combination of LS.. panels to other SIMOSEC panels:
For adaption of panel types LS11, LS31, LS32 to other SIMOSEC panel types, an adapter wall (2.5 mm) is integrated at panel types LS (thus, the panel width is 752.5 mm or 877.5 mm)

*) Floor opening also possible below floor cover (provided by the customer; additional foundation rails, if required)

Information about the dimensions of a SIMOSEC "panel base frame"

Panel type	Base frame Depth in mm	Floor opening Depth in mm	Distance to panel rear side rear/front in mm
R, T, K, D, E L, L1 M, M(V1), H	950	950	68/192
LS11, LS31, LS32 △)	1000	790 (max. 850)	68/142 (102)

Notes

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www.siemens.com/medium-voltage-switchgear

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