



Circuit-Breaker Switchgear
Type SIMOPRIME, up to 17.5 kV, Air Insulated
Medium-Voltage Switchgear

Catalog HA 26.11 · 2007

SIEMENS

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Supersedes: Catalog HA 26.11 - 2004

Benefits (see also page 10 for details)

- Saves lives
- Peace of mind
- Increases productivity
- Saves money



The circuit-breaker switchgear type SIMOPRIME is a factory-assembled, type-tested switchgear for indoor installation according to IEC 62 271-200 and VDE 0670-6.

SIMOPRIME panel
Maximum ratings 17.5 kV / 31.5 kA / 3150 A

Typical uses

The SIMOPRIME circuit-breaker switchgear can be used in transformer and switching substations, e.g.:

Application: Power supply system

- Power supply companies

Application: Industry

- Power stations
- Cement industry
- Automobile industry
- Iron and steel works
- Rolling mills
- Mining industry
- Textile, paper and food industries

- Chemical industry
- Petroleum industry
- Pipeline installations
- Offshore installations
- Electrochemical plants
- Petrochemical plants
- Shipbuilding industry
- Diesel power plants
- Emergency power supply installations
- Lignite open-cast mines
- Traction power supplies



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Application

Typical uses

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Application
Industry

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Application
Public power
supply system

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SIMOPRIME switchgear

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Application
Industry

Technical Data

Ratings

Electrical data (maximum values) of SIMOPRIME

Ratings	Rated values (max.)
Switchgear up to 7.2 kV	
Rated voltage	7.2 kV
Rated frequency	50/60 Hz
Rated short-duration power-frequency withstand voltage	20 kV ¹⁾
Rated lightning impulse withstand voltage	60 kV
Rated short-time withstand current, 3 s	31.5 kA
Rated peak withstand current at 50/60 Hz	80/82 kA
Rated short-circuit breaking current	31.5 kA
Rated short-circuit making current at 50/60 Hz	80/82 kA
Rated normal current of busbar	3150 A
Rated normal current of feeders – with circuit-breaker – with vacuum contactor	3150 A 400 A ²⁾

Switchgear 12 kV

Rated voltage	12 kV
Rated frequency	50/60 Hz
Rated short-duration power-frequency withstand voltage	28 kV ¹⁾
Rated lightning impulse withstand voltage	75 kV
Rated short-time withstand current, 3 s	31.5 kA
Rated peak withstand current at 50/60 Hz	80/82 kA
Rated short-circuit breaking current	31.5 kA
Rated short-circuit making current at 50/60 Hz	80/82 kA
Rated normal current of busbar	3150 A
Rated normal current of feeders – with circuit-breaker – with vacuum contactor	3150 A 400 A ²⁾

Ratings	Rated values (max.)
Switchgear 15 kV	
Rated voltage	15 kV
Rated frequency	50/60 Hz
Rated short-duration power-frequency withstand voltage	35 kV
Rated lightning impulse withstand voltage	95 kV
Rated short-time withstand current, 3 s	31.5 kA
Rated peak withstand current at 50/60 Hz	80/82 kA
Rated short-circuit breaking current	31.5 kA
Rated short-circuit making current at 50/60 Hz	80/82 kA
Rated normal current of busbar	3150 A
Rated normal current of feeders – with circuit-breaker	3150 A

Switchgear 17.5 kV

Rated voltage	17.5 kV
Rated frequency	50/60 Hz
Rated short-duration power-frequency withstand voltage	38 kV
Rated lightning impulse withstand voltage	95 kV
Rated short-time withstand current, 3 s	31.5 kA
Rated peak withstand current at 50/60 Hz	80/82 kA
Rated short-circuit breaking current	31.5 kA
Rated short-circuit making current at 50/60 Hz	80/82 kA
Rated normal current of busbar	3150 A
Rated normal current of feeders – with circuit-breaker	3150 A

1) Option: Higher values
acc. to GOST standards

2) Depending on the rated current
of the HV HRC fuses installed

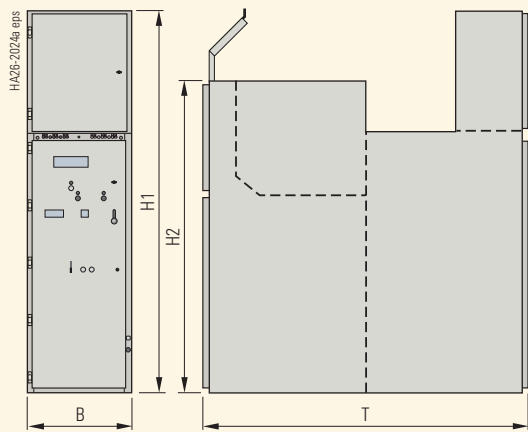
Classification, dimensions, room planning

Classification of the SIMOPRIME switchgear according to IEC 62 271-200

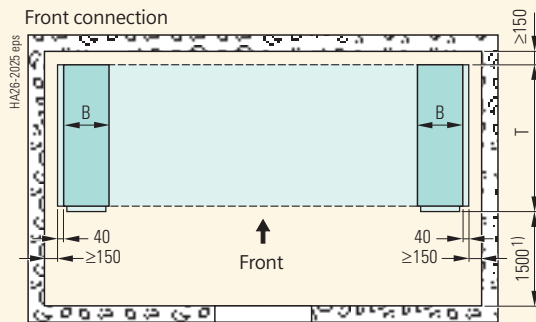
Internal arc classification	
Classification	IAC
Accessibility	Type A
- Front	Type A
- Rear	Type A
- Lateral	Type A
Test current	kA 25/31.5
Test duration	s 0.1/1.0

Construction and design	
Partition class	PM (metallic)
Loss of service continuity category	LSC2B (metal-clad)
Compartment accessibility (standard)	Tool-based
- Busbar compartment	Interlock-based
- Switching-device compartment	Tool-based
- Low-voltage compartment	Tool-based
- Connection compartment	Interlock-based and tool-based
- Front connection	Tool-based
- Rear connection	Tool-based

Dimensions



Room planning (room height ≥ 2800 mm)



Single-row arrangement (plan view)

For dimensions B (width) and T (depth) refer to table on this page

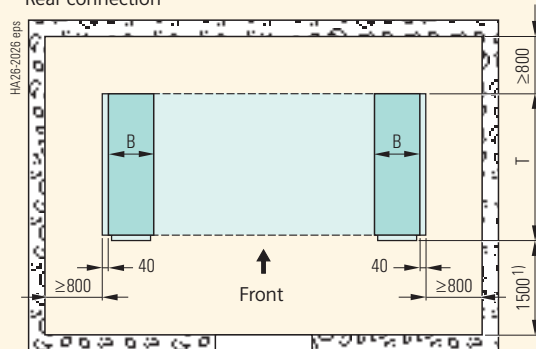
- 1) For panel replacement: Control aisle ≥ 2000 mm

All panel types

Dimensions in mm

Width B	Panel type	Dimensions in mm
Circuit-breaker panel	≤ 1250 A	600
	2500 A, 3150 A	800
Contactor panel		600
Disconnecting panel	≤ 1250 A	600
	2500 A, 3150 A	800
Bus sectionalizer/circuit-breaker panel	≤ 1250 A	600
	2500 A, 3150 A	800
Bus sectionalizer/bus riser panel	≤ 2500 A	600
	3150 A	800
Metering panel		600
Height H1	With standard low-voltage compartment and IAC 0.1 s	2200
	With standard low-voltage compartment and IAC 1.0 s	2437
H2	-	1780
Depth T	Standard	1860

Rear connection



Single-row arrangement (plan view)

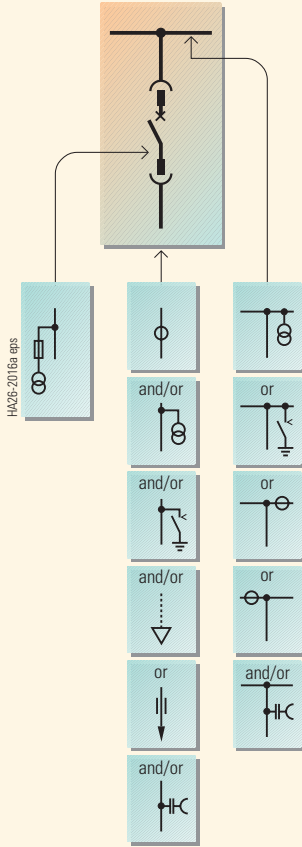
For dimensions B (width) and T (depth) refer to table on this page

- 1) For panel replacement: Control aisle ≥ 2000 mm

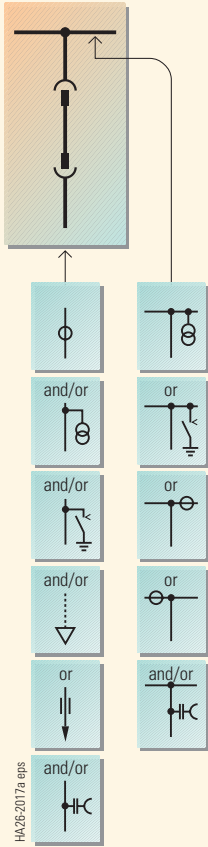
Product Range

Panels

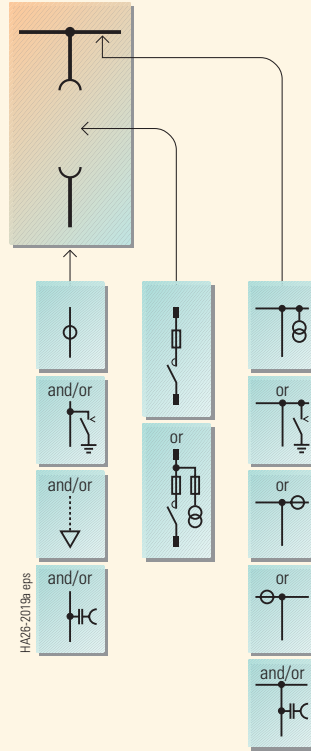
Circuit-breaker panel



Disconnecting panel



Vacuum contactor panel



Components

	Current transformer
	Voltage transformer without primary fuses
	Current transformer in run of busbar
	Voltage transformer with primary fuses
	Capacitive voltage detection system

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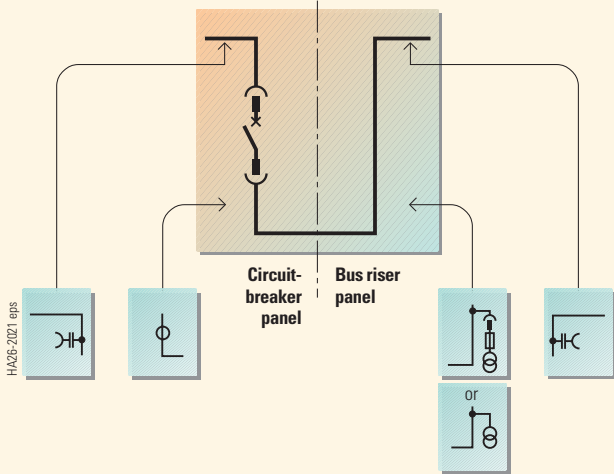
	Vacuum contactor with HV HRC fuses
	Vacuum contactor with control transformer and HV HRC fuses
	Make-proof earthing switch
	Cable sealing ends ¹⁾ max. 4 x 500 mm ² per phase
	Bar connection

	3AH5 vacuum circuit-breaker
	Disconnecter

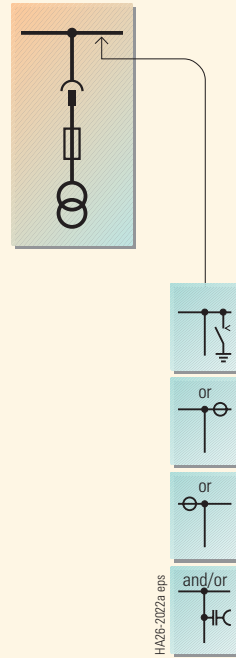
1) The details refer to conventional RXS single-core sealing ends for XLPE cables or other makes with similar dimensions.

Panels








Bus sectionalizer (mirror-image installation also possible)



Metering panel



Components

	Current transformer		Withdrawable voltage transformer with primary fuses		Make-proof earthing switch
	Voltage transformer without primary fuses		Capacitive voltage detection system		3AH5 vacuum circuit-breaker
	Current transformer in run of busbar				

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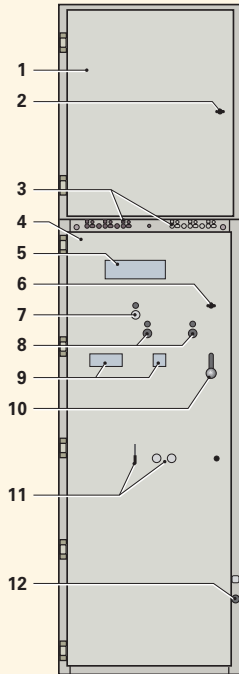
Design

Panel design

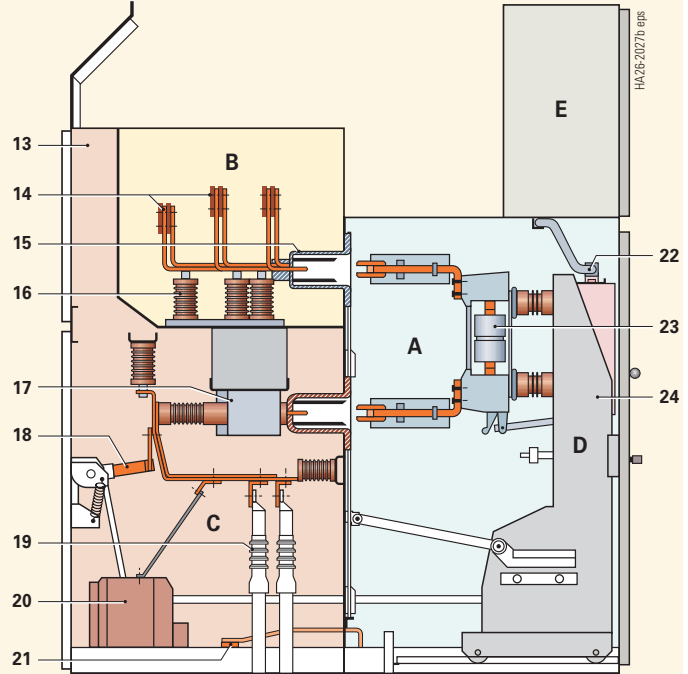
Legend for panel design:

- 1 Door of low-voltage compartment
- 2 Opening for locking or unlocking the low-voltage compartment door
- 3 Option: Capacitive voltage detection system for feeder and busbar
- 4 High-voltage door of switching-device compartment
- 5 Inspection window for checking the switching-device truck
- 6 Opening for locking or unlocking the high-voltage door
- 7 Opening for mechanical charging of circuit-breaker closing spring
- 8 Openings for manual operation (ON/OFF) of the circuit-breaker
- 9 Inspection window for reading the indicators
- 10 Door handle
- 11 Openings for switching-device truck operation
- 12 Opening for earthing-switch operation
- 13 Pressure relief duct
- 14 Busbars
- 15 Bushings
- 16 Post insulators
- 17 Option: Ring-core or block-type current transformer
- 18 Option: Make-proof earthing switch
- 19 Cable sealing ends
- 20 Option: Voltage transformer
- 21 Earthing busbar
- 22 Low-voltage plug connector
- 23 Vacuum interrupters
- 24 Switching-device truck

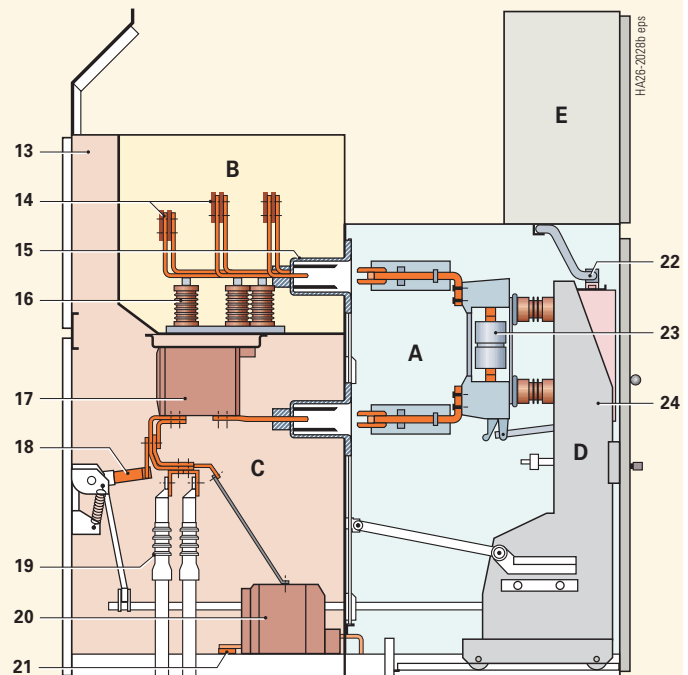
Basic panel design (example)



Circuit-breaker panel
12 kV, 1250 A



Design: Connection from front with ring-core current transformer, optionally with block-type current transformer



Design: Connection from rear with block-type current transformer, optionally with ring-core current transformer

- A Switching-device compartment
- B Busbar compartment
- C Connection compartment
- D Vacuum circuit-breaker truck
- E Low-voltage compartment

Compartments, interlocks, operation

Switching-device compartment

- All switching operations with high-voltage door closed
- Pressure relief upwards
- Panel powder-coated with epoxy resin
- Shutter operating mechanisms separately for
 - Busbar compartment
 - Connection compartment
- Metallic, earthed shutters and partitions ensure partition class PM
- High-voltage door pressure-resistant in the event of internal arcs in the panel
- Metallic ducts on the side for laying control cables
- Interlocking between high-voltage door and circuit-breaker truck ensures interlock-based access
- Option: Test sockets for capacitive voltage detection system
- Switching-device compartment to accommodate components for implementing various panel versions with
 - Vacuum circuit-breaker with or without voltage transformers on the truck
 - Disconnecter truck
 - Vacuum-contactor truck
 - Metering truck

Busbar compartment

- Pressure relief upwards and through rear pressure relief duct
- Option: Busbar transverse partition between panels
- Busbars made of flat copper, bolted from panel to panel
 - For rated normal currents up to 3150 A
 - Option: Insulated busbars
- Bolted rear and top covers provide tool-based access
- Option: Coupling electrode for capacitive voltage detection system
- Options: Possibility of installing the following components
 - Voltage transformers
 - Busbar earthing switch
 - Current transformers in the run of busbars

Connection compartment

- Pressure relief upwards through rear pressure relief duct
- Suitable for connection of
 - Single-core XLPE cables up to max. 6 x 500 mm² per phase
 - Three-core XLPE cables up to max. 3 x 300 mm² per panel
 - Bars made of flat copper with bushings in a floor cover or fully-insulated bars including floor cover
- Separately opening shutters to permit cable testing
- Earthing busbar
- Connection from front or rear
- Option: Pressure-resistant floor cover
- Use of ring-core or block-type current transformers
- Bolted rear covers of the connection compartment provide tool-based access for panels with connection from rear
- Interlocked high-voltage door and bolted partitions between connection compartment and switching-device compartment provide interlock-based and tool-based access for panels with connection from front

Components at the panel connection (option)

- Coupling electrode for capacitive voltage detection system
- Voltage transformers
 - Cast-resin insulated
 - Max. 3 x 1-pole
 - Fixed-mounted, without primary fuses

Make-proof earthing switches

- With manual operating mechanism
- In addition to standard interlocking of earthing switch/circuit-breaker truck, optionally lockable or with electromagnetic interlock
- Surge arresters or limiters
 - Surge arresters for protecting the switchgear against external overvoltages
 - Surge limiters for protecting consumers against switching overvoltages

Interlocks

- Interlocking conditions are satisfied according to IEC 62 271-200 / VDE 0670-6
- Earthing switch can only be operated with circuit-breaker truck in test position
- Circuit-breaker truck can only be moved with circuit-breaker "OPEN" and earthing switch "OPEN"
- Mechanical coding on the circuit-breaker truck prevents insertion of similar circuit-breaker trucks for lower rated normal currents into panels with higher rated normal currents
- Interlocking of high-voltage door against circuit-breaker truck
- The high-voltage door can only be opened when the circuit-breaker truck is in test position
- Option: Electromagnetic interlocks

Low-voltage compartment

- Accommodates equipment for protection, control, measuring and metering
- Separated from the high-voltage part of the panel, safe-to-touch
- Low-voltage compartment can be removed, bus wires and control cables are plugged in
- Option: Partition between panels

Low-voltage cables

- Control cables of the panel are flexible and have metallic covers
- Connection between switching-device truck and panel wiring to low-voltage compartment via 64-pole coded plug connectors
- Bus wires pluggable from panel to panel

Design

Benefits and features

Benefits	Features
<ul style="list-style-type: none"> • Saves lives 	<ul style="list-style-type: none"> • All switching operations including emergency manual operations with high-voltage door closed • Interlocking between high-voltage door and switching devices • Rack-in, rack-out operations of the circuit-breaker truck with high-voltage door closed • Metallic, earthed shutters and partitions, partition class: PM • Internal arc tested design up to 31.5 kA, 1 s, according to IEC 62 271-200, Annex A • Use of vacuum circuit-breakers
<ul style="list-style-type: none"> • Peace of mind 	<ul style="list-style-type: none"> • Factory-assembled, type-tested switchgear according to IEC 62 271-200 • Type testing of the circuit-breaker inside the panel • Use of standard, worldwide available components • Use of maintenance-free vacuum circuit-breakers • Quality management according to DIN EN ISO 9001 • Design based on global best practice sharing and experience • More than 300,000 air-insulated switchgear panels from Siemens in operation world-wide
<ul style="list-style-type: none"> • Increases productivity 	<ul style="list-style-type: none"> • Use of metallic, earthed shutters and partitions between the compartments ensures highest service continuity of the switchgear (LSC2B according to IEC 62 271-200) during maintenance • Use of maintenance-free vacuum circuit-breakers
<ul style="list-style-type: none"> • Saves money 	<ul style="list-style-type: none"> • Use of maintenance-free vacuum circuit-breakers



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Standards, specifications, guidelines

Standards

The 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 Community, their national specifications conform to the IEC standard.

Overview of standards (January 2007)

		IEC standard	VDE standard	EN standard
Switchgear	SIMOPRIME	IEC 60 694	VDE 0670-1000	EN 60 694
		IEC 62 271-200	VDE 0671-200	EN 62 271-200
Devices	Circuit-breaker	IEC 62 271-100	VDE 0671-100	EN 62 271-100
	Vacuum contactor	IEC 60 470	VDE 0670-501	EN 60 470
	Disconnecter and earthing switch	IEC 62 271-102	VDE 0671-102	EN 62 271-102
	Switch-disconnector	IEC 60 265-1	VDE 0670-301	EN 60 265-1
	Switch-disconnector / fuse combination	IEC 62 271-105	VDE 0671-105	EN 62 271-105
	HV HRC fuses	IEC 60 282	VDE 0670-4	EN 60 282
	Voltage detection systems	IEC 61 243-5	VDE 0682-415	EN 61 243-5
Degree of protection	–	IEC 60 529	VDE 0470-1	EN 60 529
Insulation	–	IEC 60 071	VDE 0111	EN 60 071
Transformers	Current transformer	IEC 60 044-1	VDE 0414-1	EN 60 044-1
	Voltage transformer	IEC 60 044-2	VDE 0414-2	EN 60 044-2
Installation	–	IEC 61 936-1	VDE 0101	–

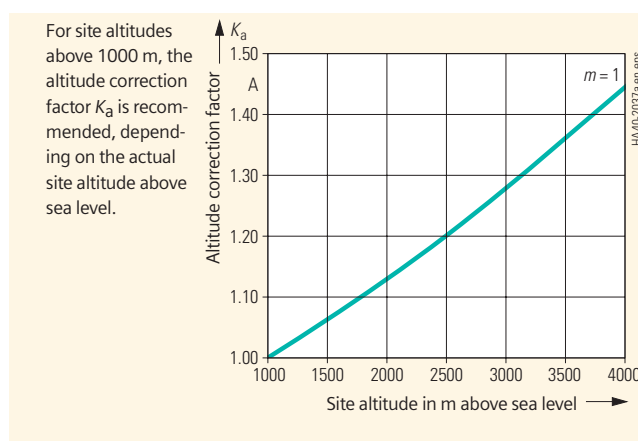
Type of service location

The switchgear can be used for indoor installation in accordance with IEC 61 936 (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.

Table – Insulating capacity

Rated voltage (rms value)	kV	7.2	12	15	17.5
Rated short-duration power-frequency withstand voltage (rms value)					
– Across isolating distances	kV	23	32	39	45
– Between phases and to earth	kV	20	28	35	38
Rated lightning impulse withstand voltage (peak value)					
– Across isolating distances	kV	70	85	105	110
– Between phases and to earth	kV	60	75	95	95

Altitude correction factor K_a 

Rated short-dur. power-freq. withstand volt. for site altitudes > 1000 m to be selected

≥ Rated short-duration power-frequency withstand voltage up to ≤ 1000 m · K_a

Rated lightning impulse withstand volt. for site altitudes > 1000 m to be selected

≥ Rated lightning impulse withstand voltage up to ≤ 1000 m · K_a

Example:

1800 m site altitude above sea level
12 kV switchgear rated voltage
75 kV rated lightning impulse withstand voltage

Rated lightning impulse withstand voltage to be selected $75 \text{ kV} \cdot 1.10 = 82.5 \text{ kV}$

Result:

According to the above table, a switchgear for a rated voltage of 17.5 kV is to be selected.

Insulating capacity

• The insulating capacity is verified by testing the switchgear with rated values of short-duration power-frequency withstand voltage and lightning impulse withstand voltage according to IEC 60 694/ VDE 0670-1000 (see table "Insulating capacity").

• 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 60 071 and VDE 0111).

• The insulating capacity 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 insulating capacity 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 .

Standards

Standards, specifications, guidelines

Terms

"Make-proof earthing switches" are earthing switches with short-circuit making capacity according to

- IEC 62 271-102 and
- VDE 0671-102 / EN 62 271-102

Internal arc classification

- Safety of operating personnel ensured by tests for verifying the internal arc classification.
- Internal arc tests in accordance with IEC 62 271-200, Annex A.
- The switchgear complies with criteria 1 to 5 specified in the mentioned standards for the basic version up to 31.5 kA.
- Definitions of the criteria:
 - Criterion 1
Correctly secured doors and covers do not open. Deformations are accepted conditionally.
 - Criterion 2
No fragmentation of enclosures occurs within the time specified for test. Projections of small parts up to 60 g are accepted.
 - Criterion 3
Arcing does not cause holes in the accessible sides up to a height of 2 m.
 - Criterion 4
Indicators do not ignite due to the effect of hot gases. Ignition caused by glowing particles rather than hot gases is allowed. Ignitions as a result of paint or sticker burning are also excluded.
 - Criterion 5
The enclosure remains connected to its earthing point.

Current-carrying capacity

- According to IEC 60 694 / VDE 0670-1000 and IEC 62 271-200 current-carrying capacities refer to the following ambient temperatures:
 - Maximum of 24-hour mean + 35 °C
 - Maximum + 40 °C
- The current-carrying capacity of the panels and busbars depends on the ambient temperature outside the enclosure.
- To attain the maximum rated normal currents, the panels are provided with natural or forced ventilation.

Climate and ambient conditions

The switchgear may be used, subject to possible additional measures, under the following ambient conditions and climate classes:

Ambient conditions

- Natural foreign materials
- Chemically active pollutants
- Small animals

Climate classes

- 3K3
- 3K5

The climate classes are classified according to IEC 60 721-3-3.

Protection against solid foreign bodies, electric shock and ingress of water

SIMOPRIME switchgear fulfills acc. to the standards

- IEC 62 271-200
- IEC 60 529
- VDE 0470-1
- VDE 0670-6

the following degrees of protection:

- Enclosure: IP 4X
- Compartments: IP 2X

Higher degree of protection for enclosure on request.

Notes

If not stated otherwise on the individual pages of this catalog, we reserve the right to include modifications, especially regarding the stated values, dimensions and weights.

Drawings are not binding.

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If not stated otherwise, all dimensions in this catalog are given in mm.



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