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

Medium-Voltage Switchgear

Catalog HA 26.11 · 2008

Answers for energy.

SIEMENS

Contents

Supersedes: Catalog HA 26.11 · 2007

The products and systems described in this catalog are manufactured and sold according to a certified quality and environmental management system (acc. to ISO 9001 and ISO 14001).
(DQS Certificate Reg. No. DQS 003473 QM UM).
The certificate is accepted in all IQNet countries.

Application

Benefits, typical uses

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 62271-200 and VDE 0671-200.

Loss of service continuity category: LSC 2B

Partition class: PM

Internal arc classification: IAC A FLR, $I_{sc} \leq 40$ kA, arc duration: 1 or 0.1 s

SIMOPRIME panel
Maximum ratings 17.5 kV / 40 kA / 3600 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

Application

Typical uses

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Application
Industry

R-HA25-308.eps

Application
Public power
supply system

R-HA26-012.tif

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	40 kA
Rated peak withstand current at 50/60 Hz	100/104 kA
Rated short-circuit breaking current	40 kA
Rated short-circuit making current at 50/60 Hz	100/104 kA
Rated normal current of busbar	3600 A
Rated normal current of feeders – with circuit-breaker – with vacuum contactor	 3600 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	40 kA
Rated peak withstand current at 50/60 Hz	100/104 kA
Rated short-circuit breaking current	40 kA
Rated short-circuit making current at 50/60 Hz	100/104 kA
Rated normal current of busbar	3600 A
Rated normal current of feeders – with circuit-breaker	 3600 A

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 [3]
Rated short-time withstand current, 3 s	40 kA
Rated peak withstand current at 50/60 Hz	100/104 kA
Rated short-circuit breaking current	40 kA
Rated short-circuit making current at 50/60 Hz	100/104 kA
Rated normal current of busbar	3600 A
Rated normal current of feeders – with circuit-breaker – with vacuum contactor	 3600 A 400 A [2]

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	40 kA
Rated peak withstand current at 50/60 Hz	100/104 kA
Rated short-circuit breaking current	40 kA
Rated short-circuit making current at 50/60 Hz	100/104 kA
Rated normal current of busbar	3600 A
Rated normal current of feeders – with circuit-breaker	 3600 A

1) Option: Higher values acc. to GOST standards

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

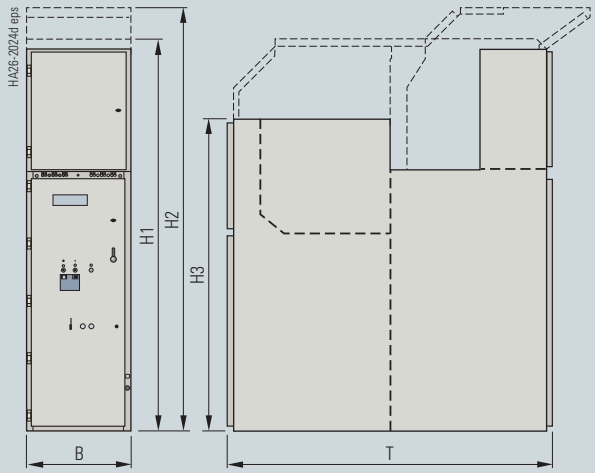
3) 60 kV for vacuum contactor

Classification of the SIMOPRIME switchgear according to IEC 62271-200

Internal arc classification		
Classification		IAC
Accessibility		
– Front		Type A
– Rear		Type A
– Lateral		Type A
Test current	kA	25/31.5/40
Arc duration	s	0.1/1.0

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

Dimensions



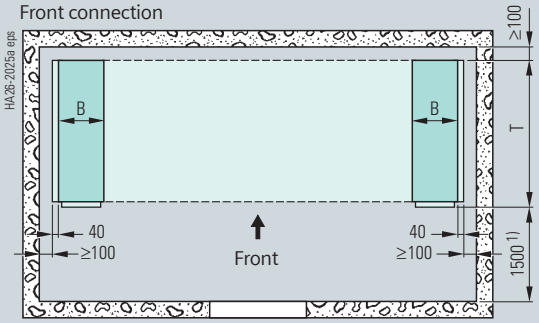
All panel types

Dimensions in mm

Width B			**up to 31.5 kA**	**40 kA**
		Circuit-breaker panel ≤ 1250 A	600	800
		2500 A, 3150 A, 3600 A	800	800
		Contactor panel	435 [2]/600	435 [2]
		Disconnecting panel ≤ 1250 A	600	800
		2500 A, 3150 A, 3600 A	800	800
		Bus sectionalizer/circuit-breaker panel ≤ 1250 A	600	800
		2500 A, 3150 A, 3600 A	800	800
		Bus sectionalizer/bus riser panel ≤ 2500 A	600	800
		3150 A, 3600 A	800	800
		Metering panel	600	800
Height	H1	With standard low-voltage compartment and IAC 0.1 s	2253	2253
	H2	With standard low-voltage compartment and IAC 1.0 s	2425	2460
	H3	–	1780	1780
Depth T		Standard	1860	1860

Room planning (room height ≥ 2800 mm)

Front connection

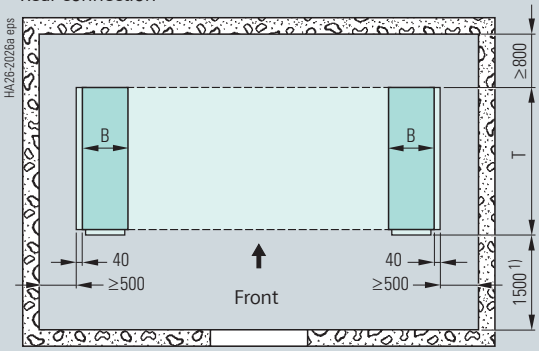


Single-row arrangement (plan view)

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

1) Control aisle widths
≤ 31.5 kA and ≤ 3150 A versions: ≥ 1500 mm
40 kA or 3600 A versions: ≥ 1700 mm
For panel replacement: ≥ 2000 mm

Rear connection



Single-row arrangement (plan view)

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

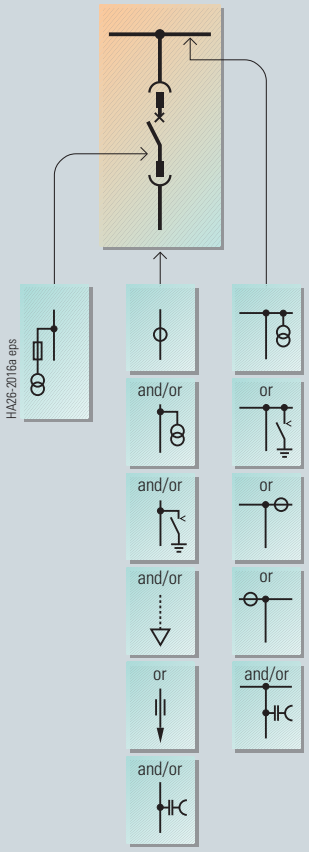
1) Control aisle widths
≤ 31.5 kA and ≤ 3150 A versions: ≥ 1500 mm
40 kA or 3600 A versions: ≥ 1700 mm
For panel replacement: ≥ 2000 mm

2) Can be ordered as of the year 2009

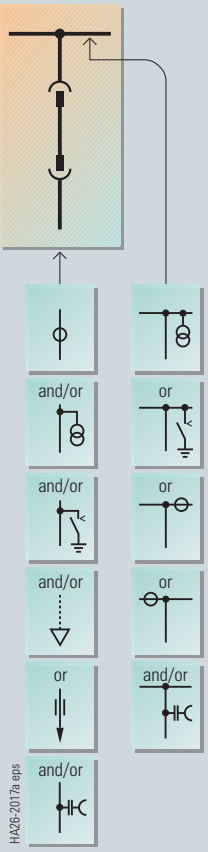
Product Range

Panels

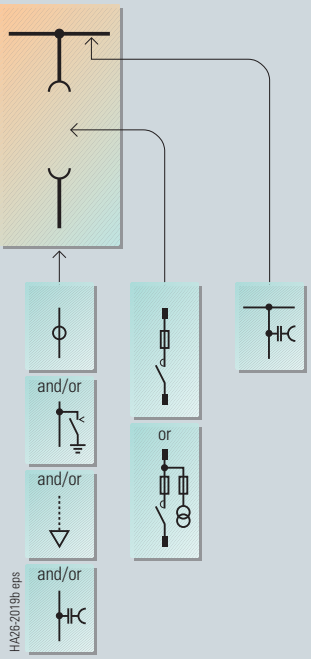
Circuit-breaker panel



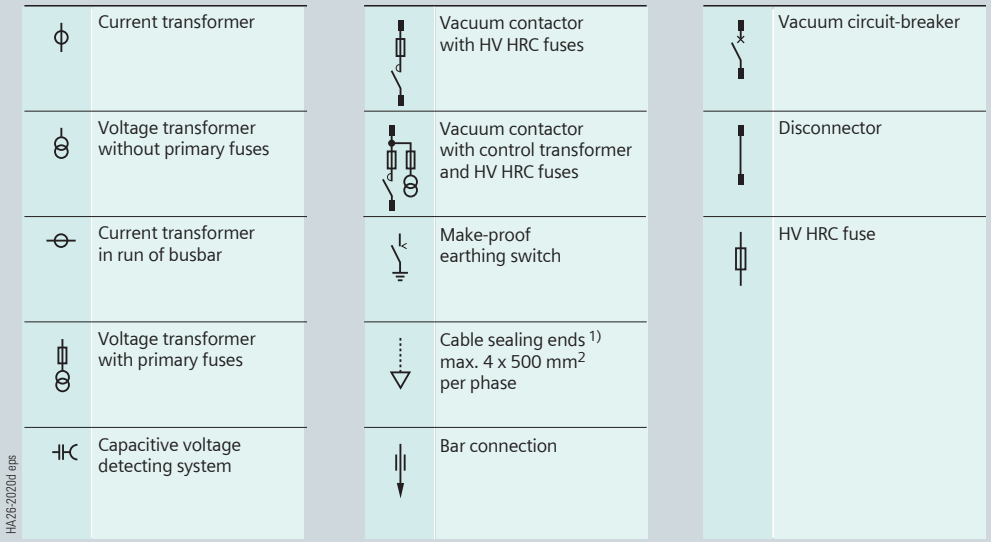
Disconnecting panel



Vacuum cantactor panel

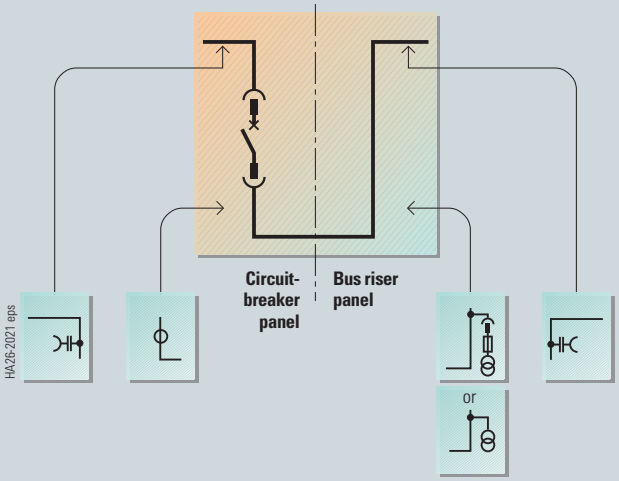


Components

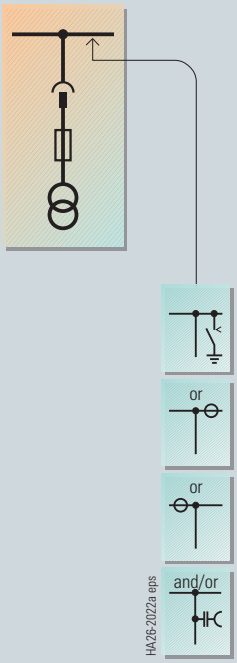


1) The details refer to conventional single-core sealing ends.

Bus sectionalizer (mirror-image installation also possible)



Metering panel



Components

	Current transformer
	Voltage transformer without primary fuses
	Current transformer in run of busbar
	Withdrawable voltage transformer with primary fuses
	Capacitive voltage detecting system
	Make-proof earthing switch
	Vacuum circuit-breaker

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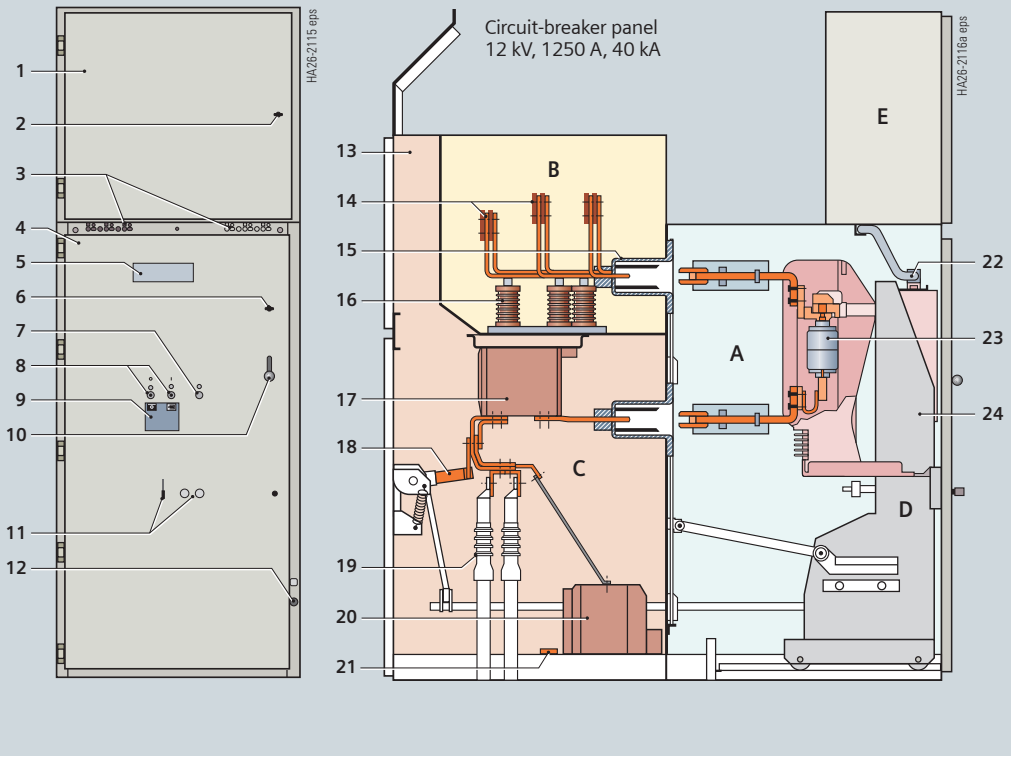
Design

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 detecting system for feeder and busbar
4 High-voltage door
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 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)



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

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 detecting system
- Switching-device compartment to accommodate components for implementing various panel versions with
  – Vacuum circuit-breaker with or without voltage transformers on the truck
  – Disconnector 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 3600 A
  – Option: Insulated busbars
- Bolted rear and top covers provide tool-based access
- Option: Coupling electrode for capacitive voltage detecting 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 mm^2 per phase
  – Three-core XLPE cables up to max. 3 x 300 mm^2 per panel
  – Bars made of flat copper with bushings in a floor cover or fully-insulated bars including floor cover
- Shutters to be opened separately to permit cable testing
- Earthing busbar
- Connection from front or rear
- Option: Pressure-resistant floor cover
- Use of 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 detecting 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 62271-200 / VDE 0671-200
- 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

- For accommodation of all protection, control, measuring and metering equipment
- Partitioned safe-to-touch from the high-voltage part
- 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 of switching-device truck and panel wiring to low-voltage compartment via 64-pole coded plug connectors
- Bus wires are pluggable from panel to panel

Design

Benefits and features

Benefits	Features
• **Saves lives**	• 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 (metallic partition) • Internal arc tested design up to 40 kA, 1 s, according to IEC 62271-200, VDE 0671-200 • Use of vacuum circuit-breakers
• **Peace of mind**	• Factory-assembled, type-tested switchgear according to IEC 62271-200 • Type testing of the circuit-breaker inside the panel • Use of standard, world-wide 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
• **Increases productivity**	• Use of metallic, earthed shutters and partitions between the compartments ensures highest loss of service continuity of the switchgear (LSC2B according to IEC 62271-200) during maintenance • Use of maintenance-free vacuum circuit-breakers
• **Saves money**	• Use of maintenance-free vacuum circuit-breakers

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 EU countries, their national specifications conform to the IEC standard.

Overview of standards (March 2008)

		IEC standard	VDE standard	EN standard
Switchgear	SIMOPRIME	IEC 62271-1	VDE 0671-1	EN 62271-1
		IEC 62271-200	VDE 0671-200	EN 62271-200
Devices	Circuit-breaker	IEC 62271-100	VDE 0671-100	EN 62271-100
	Vacuum contactor	IEC 60470	VDE 0670-501	EN 60470
	Disconnector and earthing switch	IEC 62271-102	VDE 0671-102	EN 62271-102
	HV HRC fuses	IEC 60282	VDE 0670-4	EN 60282
	Voltage detecting systems	IEC 61243-5	VDE 0682-415	EN 61243-5
Degree of protection	–	IEC 60529	VDE 0470-1	EN 60529
Insulation	–	IEC 60071	VDE 0111	EN 60071
Instrument transformers	Current transformer	IEC 60044-1	VDE 0414-1	EN 60044-1
	Voltage transformer	IEC 60044-2	VDE 0414-2	EN 60044-2
Installation	–	IEC 61936-1	VDE 0101	–

Type of service location

The switchgear can be used for indoor installation in accordance with IEC 61936 (Power installations exceeding 1 kV AC) and VDE 0101

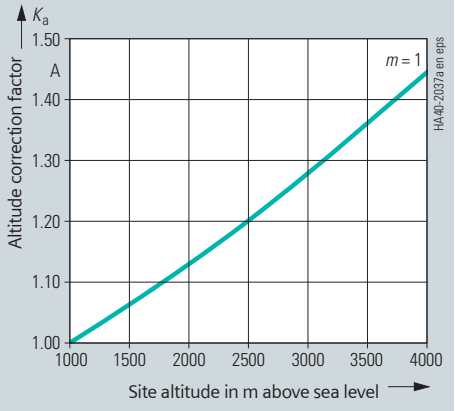
- Outside lockable electrical service locations at places which are not accessible to the public. Enclosures of switchgear can only be removed with tools.
- Inside lockable electrical service locations. A lockable electrical service location is a place outdoors or indoors that is reserved exclusively 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.

Table – Dielectric strength

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

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

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

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

≥ 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 kV · 1.10 = 82.5 kV

Result:

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

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 (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 / 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 arrangements apply to these altitudes.
- Site altitude
  – As the altitude increases, the dielectric strength 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 62271-102 and
– VDE 0671-102 / EN 62271-102

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 / VDE 0671-200
- The switchgear complies with criteria 1 to 5 specified in the mentioned standards for the basic version up to 40 kA.
- Definitions of the criteria:

– Criterion 1
Correctly secured doors and covers do not open. Limited deformations are accepted.
– Criterion 2
No fragmentation of the enclosure. Projection of small parts up to an individual mass of 60 g are accepted.
– Criterion 3
Arcing does not cause holes in the accessible sides up to a height of 2 m.
– Criterion 4
Horizontal and vertical indicators do no ignite due to the effect of hot gases.
– Criterion 5
The enclosure remains connected to its earthing point.

Current-carrying capacity

- According to IEC 62271-1 / VDE 0671-1 and IEC 62271-200 / VDE 0671-200 current-carrying capacities refer 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.
- To attain the maximum rated normal currents, the panels are provided with natural or forced ventilation.

Climate and environmental influences

The switchgear may be used, subject to possible additional measures, under the following environmental influences and climate classes:
Environmental influences
– Natural foreign materials
– Chemically active pollutants
– Small animals

Climate classes
– 3K3
– 3K5

The climate classes are classified according to IEC 60721-3-3.

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

SIMOPRIME switchgear fulfills acc. to the standards
– IEC 62271-200
– IEC 60529
– VDE 0470-1
– VDE 0671-200
the following degrees of protection:
– Enclosure:
IP 4X, IP 5X (protection against solid foreign bodies)
IP X1, IP X2 (protection against ingress of water)
– Compartments:
IP 2X (protection against solid foreign bodies)

Higher degree of protection for enclosure on request.

Comments

Responsible for

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