Circuit-Breaker Switchgear Type 8BT2 up to 36 kV, 31.5 kA, Air-Insulated

Medium-Voltage Switchgear

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Answers for energy.

SIEMENS

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Contents

IQNet
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The certificate is accepted in all IQNet countries.

Application

Typical uses, classification

Circuit-breaker switchgear type 8BT2 is a factory-assembled, type-tested, metal-enclosed and metal-clad switchgear for indoor installation according to IEC 62271-200

Typical uses
The 8BT2 circuit-breaker switchgear is used in transformer and switching substations, mainly at the primary distribution level, e.g.:

Application: Industry
- Power stations
- Cement industry
- Iron and steel works
- Rolling mills
- Mining industry
- Textile, paper and food industries
- Chemical industry
- Petroleum industry
- Pipeline installations
- Electrochemical plants
- Diesel power plants
- Emergency power supply installations
- Traction power supplies

Classification
The 8BT2 switchgear corresponds to the following classifications according to IEC 62271-200

Loss of service continuity category and partition class	
Loss of service continuity category	LSC 2B (metal-clad)
Partition class	PM (metallic partition)
Accessibility to compartments	
Busbar compartment	Tool-based
Switching-device compartment	Interlock-controlled
Cable compartment	Interlock-controlled and tool-based
Internal arc classification	
The following internal arc classifications are fulfilled: IAC A FLR, I_{sc}, t	
IAC	Internal arc classification
A	Distance between the indicators 300 mm, i.e. installation in rooms with access for authorized personnel only, closed electrical service location
F	Accessibility: Front arrangement of indicators for test
L	Accessibility: Lateral arrangement of indicators for test
R	Accessibility: Rear arrangement of indicators for test
I_{sc}	Test current for 8BT2 up to 31.5 kA
t	Internal arc duration (1 s)

Application: Industry

Application: Traction power supplies

Applicaton: Power stations

Customer benefits and features

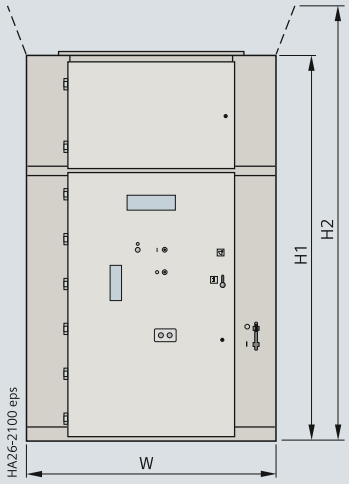
Customer benefits	Features
• **Peace of mind** For power supply companies and industrial plants, the certification of the 8BT2 according to the latest standards has very concrete advantages: Smooth operation, exemplary availability and maximum safety.	– Factory-assembled, type-tested switchgear according to IEC 62271-200 – More than 300,000 air-insulated switchgear panels from Siemens in operation worldwide – Use of maintenance-free vacuum circuit-breakers – Type testing of make-proof earthing switch in the panel – Use of standard, worldwide available components – Quality management according to DIN EN ISO 9001
• **Saves lives** 8BT2 is approved with internal arc classification IAC A FLR, loss of service continuity category LSC 2B, partition class PM. This makes it suitable for universal installation, meeting the highest requirements regarding personal safety.	– All switching operations with high-voltage door closed – Metallic enclosure, earthed shutters and partitions – Switchgear with internal arc classification according to IAC A FLR (front, lateral and rear accessibility) for all short-circuit currents and an arc duration of 1 s – Loss of service continuity category LSC 2B (separate partitions for busbar, cable and switching-device compartments) – Partition class PM – Clear switch position indicators and control elements on the high-voltage door – Use of vacuum circuit-breakers – Standard degree of protection IP4X – Logical mechanical interlocking system
• **Increases productivity** Use of metallic, earthed shutters and partitions between the compartments ensures highest service continuity of the switchgear during maintenance.	– Loss of service continuity category LSC 2B (separate partitions for busbar, connection and switching-device compartments) – Cable testing without isolating the busbar – Use of maintenance-free vacuum circuit-breakers
• **Saves money** Thanks to the use of the new circuit-breaker series 3AH, the economic design of the 8BT pays twice for the owner. On the one hand building costs can be reduced, and on the other hand, the maintenance-free circuit-breakers and the modular design enable continuous operation without expensive shutdown times.	– Use of maintenance-free vacuum circuit-breakers

Technical Data

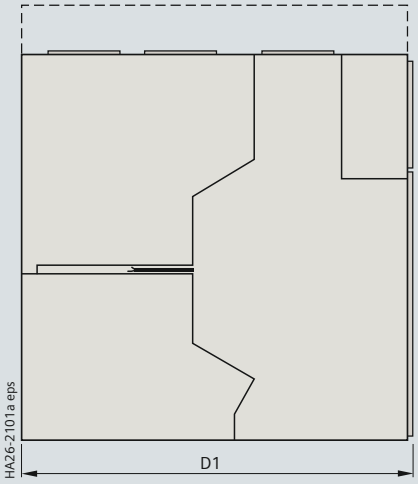
Electrical data, dimensions

Rated values			
Rated			
– voltage	kV	24	36
– frequency	Hz	50/60	50/60
– short-duration power-frequency withstand voltage	kV	50	70
– lightning impulse withstand voltage	kV	125	170
– short-circuit breaking current	kA	31.5	31.5
– short-time withstand current, 3 s	kA	31.5	31.5
– short-circuit making current	kA	82	82
– peak withstand current	kA	82	82
– normal current of busbar	A	2500	2500
– normal current of feeders:			
with circuit-breaker	A	2500	2500
with disconnector link	A	2500	2500
bus sectionalizer	A	2500	2500
busbar connection panel	A	2500	2500

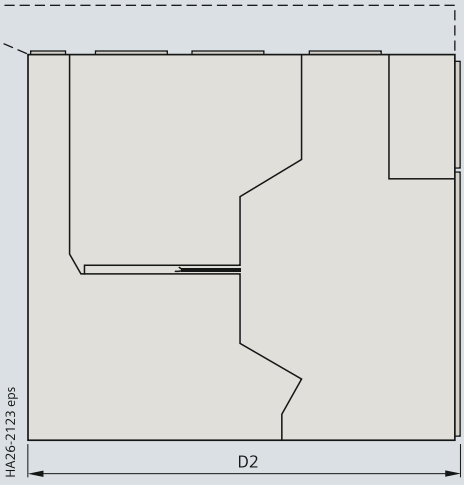
Dimensions			
Width	W	Circuit-breaker panel	1550 mm
		Disconnector panel	1550 mm
		Metering panel	1550 mm
		Bus sectionalizer	2x1550 mm
		Busbar connection panel	1550 mm
Height	H1	25 kA / 31.5 kA intermediate panel	2400 mm
	H2	25 kA / 31.5 kA end panel	2775 mm
Depth	D1	Wall-standing, IAC A FL panel	2450 mm
	D2	Free-standing, IAC A FLR panel	2700 mm



Front view



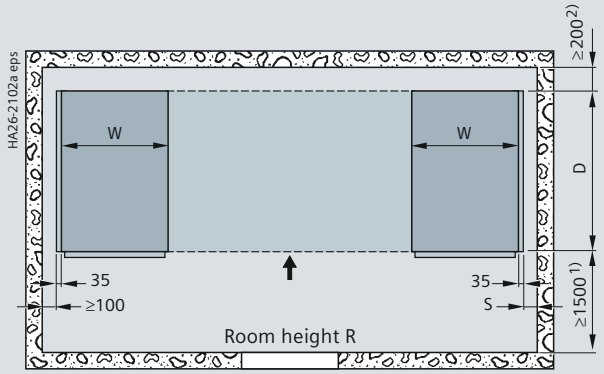
Side view (wall-standing version)



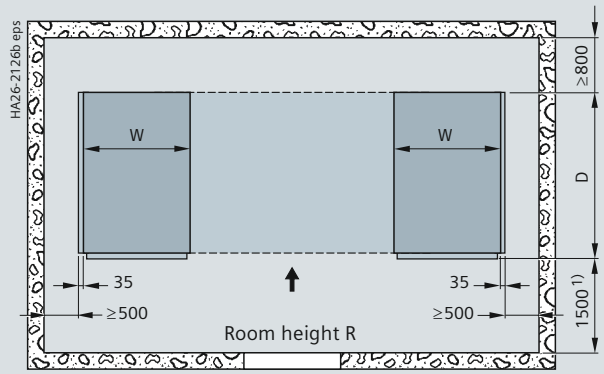
Side view (free-standing version)

Room planning

Single-row arrangement (plan view)		
Control aisle	Standard For panel replacement, IAC A FL For panel replacement, IAC A FLR	≥ 1500 mm ≥ 2750 mm ≥ 3000 mm
Room height R	25 kA 31.5 kA	≥ 3400 mm ≥ 3900 mm
Distance from end panel to left wall		≥ 100 mm
Distance from end panel to right wall S	Wall-standing, 25 kA Wall-standing, 31.5 kA Free-standing	≥ 100 mm ≥ 500 mm ≥ 500 mm 3)
Distance from end panel to rear wall	Wall-standing, IAC A FL panel Free-standing, IAC A FLR panel	≥ 200 mm 2) ≥ 800 mm



Plan view (wall-standing)

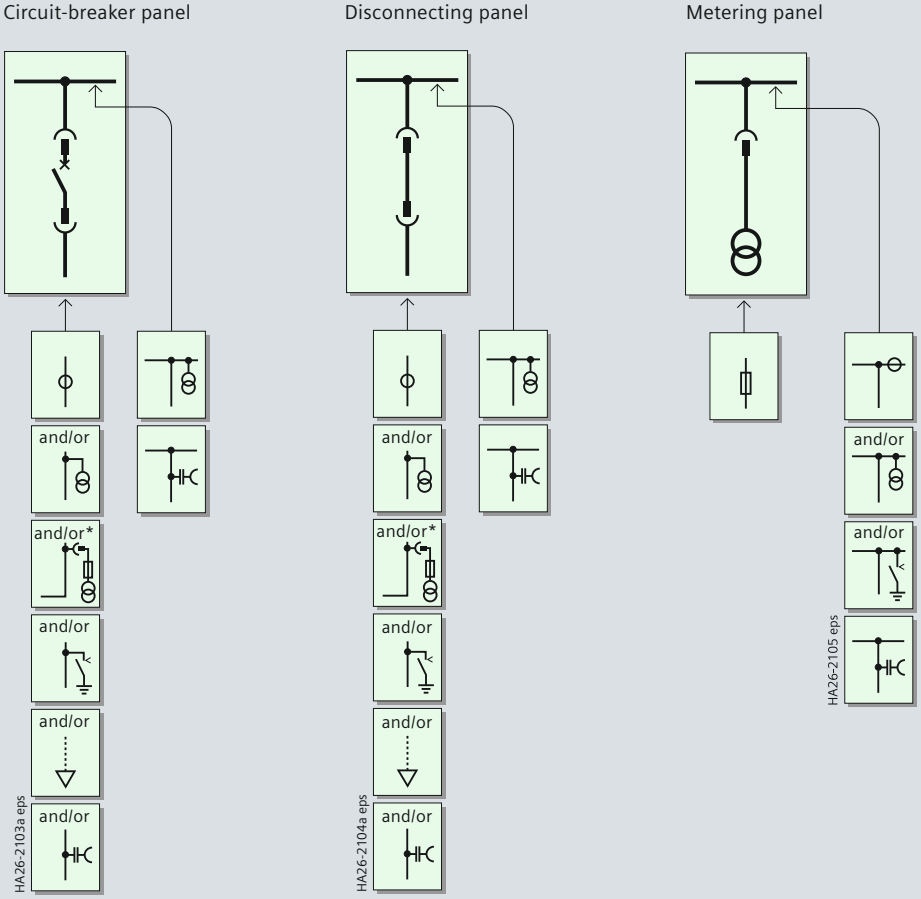


Plan view (free-standing)

1) For panel replacement, wall-standing ≥ 2750 mm
For panel replacement, free-standing ≥ 3000 mm
2) For wall-standing panel, both ends should be closed due to pressure relief
3) If there is no additional exit at the rear side, min. 500 mm distance (service aisle) must be provided from the left or right wall. (If the total width of the switchgear is less than 10 m, one service aisle on the left or right side is enough. Otherwise two service aisles on both sides are required)

Product Range

Panels



Components

	Current transformer
	Current transformer in run of busbar
	Voltage transformer
	Withdrawable voltage transformer with primary fuses

	Make-proof earthing switch
	Disconnector link
	Capacitive voltage detecting system

	Cable sealing ends max. 4 x 500 mm² per phase
	Withdrawable circuit-breaker
	HV HRC fuse

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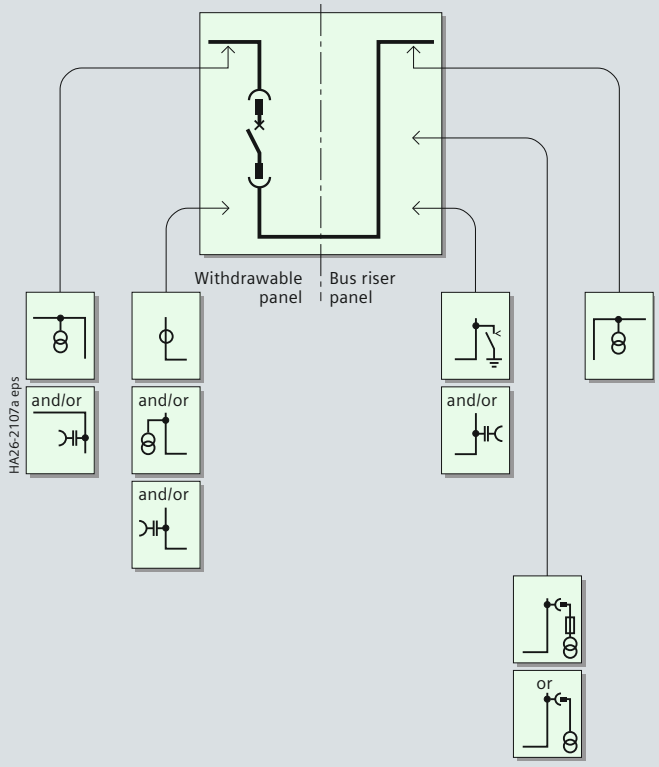
*) This version can only be selected for free-standing type.

Panels

Bus sectionalizer (mirror-image installation also possible)



Components

	Current transformer
	Voltage transformer
	Make-proof earthing switch
	Capactive voltage detecting system
	Withdrawable circuit-breaker
	Withdrawable voltage transformer with primary fuses
	Withdrawable voltage transformer

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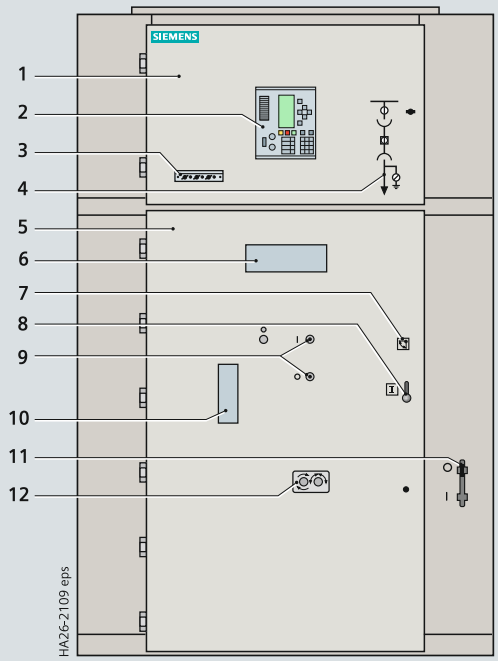
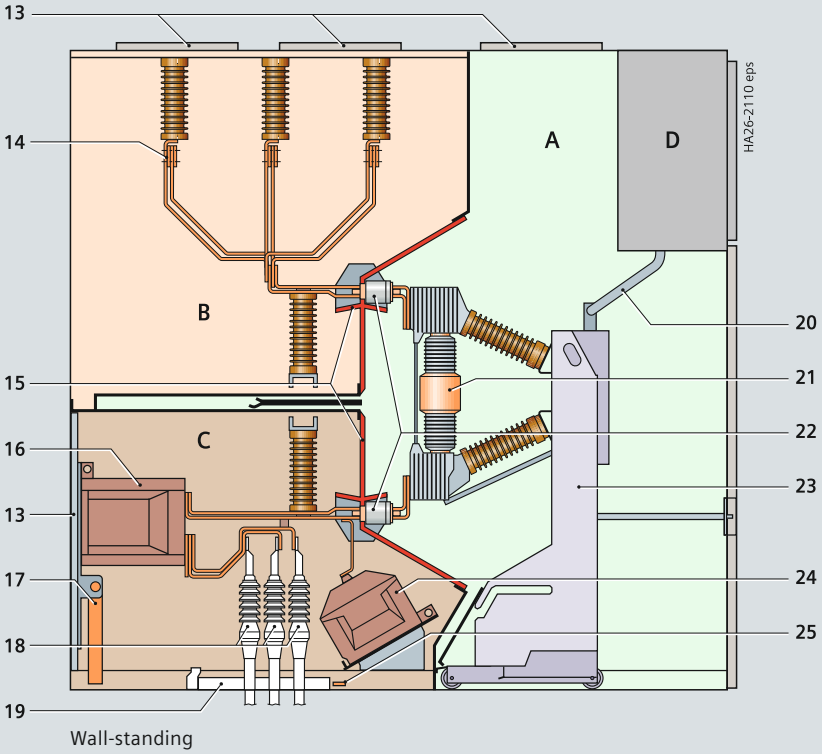
Design

Panel design



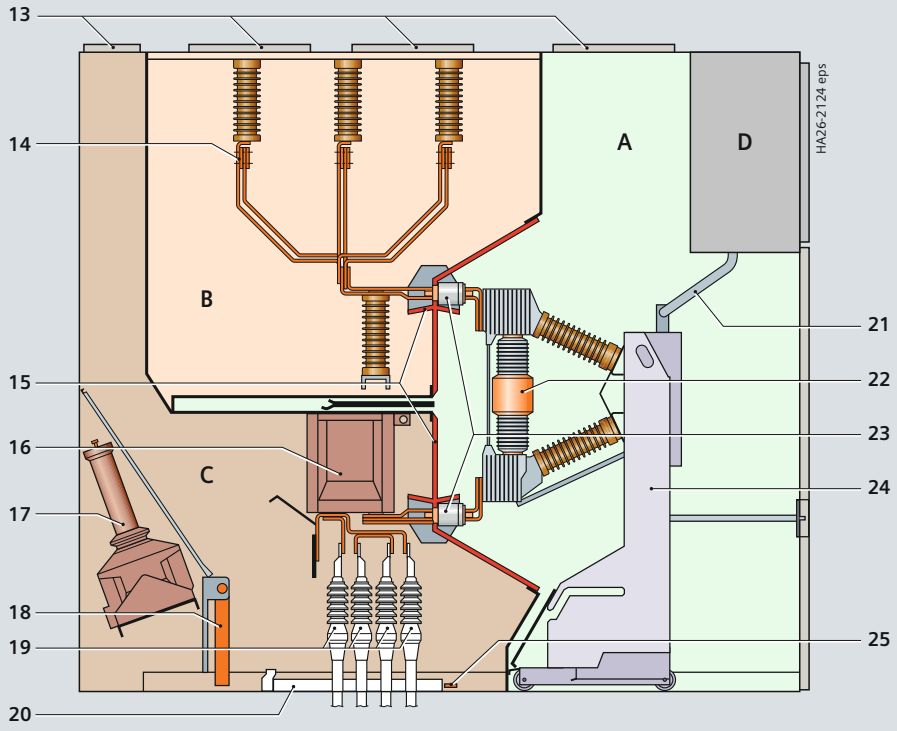


Wall-standing

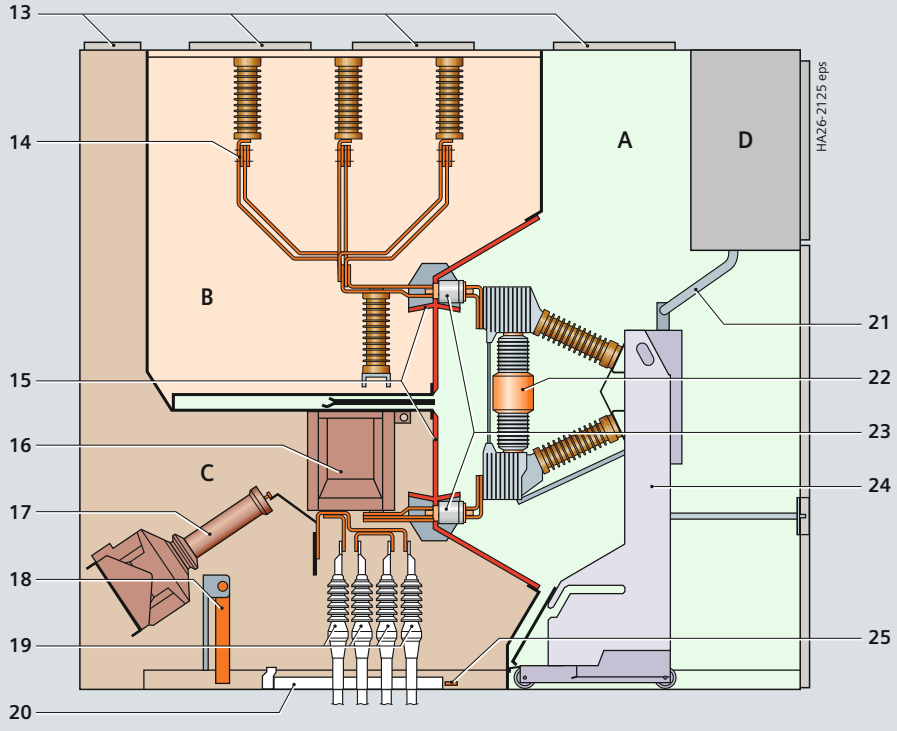
1 Door of low-voltage compartment
2 Protection device
3 Option: Capacitive voltage detecting system for feeder and busbar
4 Mimic diagram
5 High-voltage door
6 Inspection window for checking the switching-device truck
7 Opening for locking and unlocking the high-voltage door
8 Door handle
9 Opening for manual (ON/OFF) operation of the circuit-breaker
10 Inspection window for reading the indicators located on the circuit-breaker
11 Opening for earthing-switch (25 kA) operation
12 Openings for switching-device truck operation
13 Pressure relief flaps
14 Busbars
15 Bushings
16 Block-type current transformer
17 Earthing switch
18 Cable sealing ends
19 Cable bracket
20 Low-voltage plug connector
21 Vacuum interrupters
22 Contact system
23 Switching-device truck
24 Voltage transformer
25 Earthing busbar

A Switching-device compartment
B Busbar compartment
C Cable compartment
D Low-voltage compartment

Panel design



Free-standing, voltage transformer disconnected



Free-standing, voltage transformer connected

13 Pressure relief flaps
14 Busbars
15 Bushings
16 Block-type current transformer
17 Withdrawable voltage transformer with primary fuses
18 Earthing switch
19 Cable sealing ends
20 Cable bracket
21 Low-voltage plug connector
22 Vacuum interrupters
23 Contact system
24 Switching-device truck
25 Earthing busbar

A Switching-device compartment
B Busbar compartment
C Cable compartment
D Low-voltage compartment

Design

Compartments, operation, interlocks

Switching-device compartment
- All switching operations with high-voltage door closed
- Pressure relief upwards
- Panel powder-coated with epoxy resin
- Metallic, earthed shutters 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-controlled access
- Switching-device compartment to accommodate components for implementing various panel versions with

– Vacuum circuit-breaker truck
– Disconnector truck
– Metering truck

Busbar compartment
- Pressure relief upwards
- Busbars made of flat copper, bolted from panel to panel

– For rated normal current of up to 2500 A
– Option: Insulated busbars with removable polyester cover at joints

- Bolted top covers provide tool-based access

Components at the busbar (option)
- Busbar transverse partition between panels
- Voltage transformers

– Cast-resin insulated
– Max. 3x1-pole
– Fixed-mounted

- Current transformer in metering panel
- Busbar earthing switch in metering panel
- Surge arresters
- Coupling electrode for voltage detecting system

Cable compartment
- Pressure relief to the rear through rear wall
  Pressure relief upwards through rear pressure relief duct (for free-standing arrangement)
- Suitable for connection of single-core cables
- Earthing busbar
- Connection from front
  Connection from front or rear (for free-standing arrangement)
- Interlocked high-voltage door and bolted partitions between cable compartment and switching-device compartment provide interlock-controlled and tool-based access for panels with connection from front, tool-based access for panels with connection from rear
- Access to withdrawable voltage transformer with primary fuses is provided with a metallic, earthed shutter ensuring partition class PM (for free-standing arrangement)

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Components at the panel connection (option)
- Single-core XLPE cables up to max. 4 x 500 mm² per phase
- Coupling electrode for capacitive voltage detecting system
- Voltage transformers

– Cast-resin insulated
– Max. 3x1-pole
– Fixed-mounted

- Make-proof earthing switch

– Manual operating mechanism
– In addition to standard interlocking between earthing switch and circuit-breaker truck, optionally with padlock or electromagnetic interlocking

- Surge arresters

– Protection of the switchgear against external over-voltages.

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 can only be moved with circuit-breaker "OPEN" and earthing switch "OPEN"
- 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 interlocking
- Option: Mechanical key interlocking
  (based on interlocking scenarios)

Switching-device truck, low-voltage cables, low-voltage compartment

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Switching-device truck

- The truck frame is a precision structure of rigidly welded 4 mm sheet-steel elements
- A sliding contact touches a copper bar at the bottom of the truck frame to establish proper earthing
- 4 NO + 4 NC auxiliary switch contacts at the carriage mechanism indicate the service and test position of the truck
- Interlocks to the panel door and the earthing switch are integrated in the operating mechanism box
- The truck is mechanically interlocked with the circuit-breaker
- 1250 A, 25 kA VCB, with silver-plated finger contacts
- 1250 A, 31.5 kA / 2000 A, 25 kA / 2500 A, 31.5 kA, with silver-plated tulip contacts

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Low-voltage cables

- Low-voltage cables 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

Low-voltage compartment

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

Standards

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 (July 2008)

		IEC standard	VDE standard	EN standard
Switchgear	8BT2	IEC 62271-1	VDE 0671-1	EN 62271-1
		IEC 62271-200	VDE 0671-200	EN 62271-200
Switching devices	Circuit-breaker	IEC 62271-100	VDE 0671-100	EN 62271-100
	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	–

Standards, specifications, guidelines

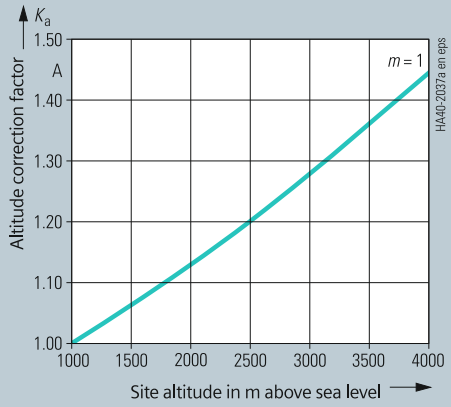
Type of service location

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.

Altitude correction factor K_a for site altitudes

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

Example:

3000 m site altitude above sea level
17.5 kV switchgear rated voltage
95 kV rated lightning impulse withstand voltage

Rated lightning impulse withstand voltage 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.

Table – Dielectric strength

Rated voltage (rms value)	kV	24	36
Rated short-duration power-frequency withstand voltage (rms value)			
– Between phases and to earth	kV	50	70
Rated lightning impulse withstand voltage (peak value)			
– Between phases and to earth	kV	125	170

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/m^3 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 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.

Standards

Standards, specifications, guidelines, notes

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.

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

The 8BT2 switchgear fulfills acc. to the standards

- IEC 62271-200
- IEC 60529
- VDE 0470-1
- VDE 0671-200

the following degrees of protection:

- Enclosure: IP4X
- Compartments: IP2X

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 60721-3-3.

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

- Safety of operating personnel ensured by tests to verify internal arc classification
- Internal arc tests 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 31.5 kA
- 8BT2 complies with the internal arc classification: IAC A FLR up to 31.5 kA, 1 s, providing for maximum personal safety
- Definitions of 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.

- If the switchgear is supplied with transverse partitions segregating adjacent panels (optional), internal arcing in any panel will not affect the adjacent panels. This means that the damage is limited to the panel where the fault has occured.

Notes

Responsible for

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