

Fixed-Mounted Circuit-Breaker Switchgear, Types 8DA and 8DB, up to 40.5 kV, Gas-Insulated Switchgear

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# **SIEMENS**

Page

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Types

Fixed-mounted

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## 8DA10

panel for single-busbar applications panel for traction power supply systems, 1-pole and 2-pole

design (example 8DA11)



## Typical uses



Application

## **Typical uses**

Fixed-mounted circuit-breaker switchgear 8DA and 8DB is used in transformer and switching substations, e.g.

### Application

### Public power supply system with 8DA10/8DB10

Power supply companies

### Application Industry with 8DA10/8DB10

- 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 supply systems

#### Application

## for single-pole and double-pole design with 8DA11/8DA12

Traction power supply systems

## Requirements

### Features

#### Environmental independence

Enclosures with modular standard housings made of corrosion-resistant aluminium alloy make 8DA and 8DB switchgear

- Insensitive to aggressive ambient conditions such as
- salt water
- air humidity
  dust
- temperature
- Primary part is hermetically tight to ingress of foreign bodies, such as
- dust
- dirt
- Independent of site altitude

#### **Compact design**

Thanks to the gas insulation, narrow panel widths of only 600 mm up to 40.5 kV are possible.

Thus,

- Existing switchgear rooms can be used effectively
- New constructions cost little
- Costly city-area space is saved

## Almost maintenance-free design

Switchgear housings designed as sealed pressure systems, maintenance-free switching devices and enclosed cable plugs ensure

- Maximized power supply reliability
- Personnel safety
- Reduced operating cost
- Cost-efficient investment

## Innovations

The use of digital secondary systems and combined protection and control devices ensure

- Clear integration in process control systems
- Flexible and highly simplified adaption to new system conditions and thus to cost-efficient operation

#### Fixed-Mounted Circuit-Breaker Switchgear, Types 8DA and 8DB, up to 40.5 kV, Gas-Insulated

## Requirements

### Safety

#### Personal safety

- Safe-to-touch and hermetically sealed primary enclosure
- All high-voltage parts including the cable terminations, busbars and voltage transformers are surrounded by earthed layers or metal enclosures
- Capacitive voltage detection system for verification of safe isolation from supply
- Operating mechanisms and auxiliary switches safely accessible outside the primary enclosure (switchgear housings)
- Protective system interlock to prevent operation when the enclosure is open
- Standard degree of protection IP65 (primary part) and IP3XD (secondary part) according to IEC 60 529 and VDE 0470-1 <u>Option:</u> Degree of protection

IP31D for low-voltage compartment

- High resistance to internal arcs by logical mechanical interlocks and tested enclosure
- Arc-fault classified panels according to IEC 62 271-200
- Mechanical and/or electrical interlocks prevent maloperation

#### Security of operation

- Hermetically sealed primary enclosure independent of environmental effects (dirt, moisture and small animals)
- Operating mechanisms of switching devices accessible outside the primary enclosure (switchgear housings)
- Metal-enclosed, plug-in inductive voltage transformers mounted outside the gas compartments
- Ring-core current transformers mounted outside the gas compartments
- Complete logical mechanical interlocking system
- Option: Aseismic design
- Minimum fire load

#### Reliability

- Type and routine-tested
- Standardized, NC production processes
- Quality assurance in accordance with DIN EN ISO 9001
- More than 38,000 switchgear panels of Siemens in operation worldwide for many years

## Technology

#### General

- Single-pole enclosure of primary conductors
- Insulating gas SF<sub>6</sub>
- Three-position disconnector as busbar disconnector and feeder earthing switch
- Make-proof earthing with vacuum circuit-breaker
- Outgoing and incoming feeder panel width: 600 mm
- Enclosure with standard housings made of corrosion-resistant aluminium alloy
- Cable connection with insidecone plug-in systems, or connection of solid-insulated or gas-insulated bars
- Existing switchgear extendable on both sides

#### Modular design

- Circuit-breaker or cable termination can be replaced without disconnecting the busbar
- Extension of double-busbar switchgear 8DB10 (option: without interrupting operation of existing feeders)
- Low-voltage compartment can be removed without interrupting the bus wires

#### Instrument transformers

• Can be removed without altering the position of the busbar modules (outside the gas compartments)

#### Vacuum circuit-breaker

- Maintenance-free under normal ambient conditions according to IEC 60 694 and VDE 0670-1000
- No relubrication or adjustment
- Up to 10,000 electrical operating cycles
- Up to 30,000 mechanical operating cycles
- Vacuum-tight for life

#### Secondary systems

- Digital multifunction protection relay with integrated protection, control, communications, operating and monitoring functions
- Can be integrated in process control systems

## **Electrical data, dimensions**

Designation	8DA10	8DB10
	3-pole	3-pole

#### **Rated values**

Rated									
-voltage	max. kV	12	<b>24</b> <sup>1)</sup>	36	<b>40.5</b> <sup>2)</sup>	12	24	36	40.5
-frequency		50 Hz <sup>3)</sup>		50 Hz <sup>3)</sup>					
-short-dur. power-frequency withst. v	olt. kV	28	50	70	85 <sup>4)</sup>	28	50	70	85
-lightning impulse withstand voltage	kV	75	125	170	185	75	125	170	185
-short-circuit breaking current		max.	40 kA	· —		max.	40 kA		
-short-time withstand current, 3 s		max. 40 kA →		max. 40 kA					
-short-circuit making current		max.	100 k	:A —		max.	100 k	A ——	
-peak withstand current		max.	100 k	A —		max.	100 k	A ——	
-normal current of busbar		max.	4000	Α—		max.	4000	Α	
-normal current of feeders		max.	2500	Α—		max.	2500	Α	
Ambient temperature		-5 to	+ 55 °	C					

### Dimensions in mm (dimension drawings see page 7)

Width B1		
Circuit-breaker panel	600	600
Disconnector panel	600	-
Bus coupler	-	600
Bus sectionalizer (2 panels)	2 x 600 →	2 x 600 →
Bus sectionalizer for connection in cable basement (2 panels)	2 x 600	2 x 600
Spare panel	600	600
Switchgear end wall width B2		
For left and right side of switchgear	152	152
Depth T		
For all panel types	1625	2660
Height H1		
Standard	2350	2350
With high low-voltage compartment	2700	2700
With make-proof busbar	2700	2700
earthing switch		
Height H2		
Standard	1850	2100
With make-proof busbar earthing switch	1960	2210
With top-mounted	2320	2570
Busbar fittings without disconnecting facility:		
With voltage transformer up to 24 kV	2160	2410
36/40.5 kV	2225	2475
With cable connection for		
- 1 plug, interface type 2	2050	2300
- 1 plug, interface type 3	2030	2280
- 2 or 3 plugs, interface type 2	2110	2360
- 2 or 3 plugs, interface type 3	2130	2380
- 4 to 6 plugs, interface type 2	2250	2500
With connection for fully insulated bar <sup>5)</sup>	1930	2180
Busbar fittings <u>with</u> disconnecting facility:		
With voltage transformer up to 24 kV	2360	2610
36/40.5 kV	2455	2705
With cable connection for		
- 1 plug, interface type 2	2180	2430
- 1 plug, interface type 3	2240	2490
- 2 or 3 plugs, interface type 2	2240	2490
- 2 or 3 plugs, interface type 3	2260	2510
- 4 to 6 plugs, interface type 2	2380	2630
With connection for fully insulated bar <sup>5)</sup>	2130	2380

Designation	8DA11/8DA12
	1-/2-pole

#### **Rated values**

kV	15	25
kV	17.5	27.5
Hz	16.7	50/60
kV kV	50 60	95 110
kV kV	125 145	200 220
-short-circuit breaking current		
-short-circuit making current		
-normal current of busbar		
-normal current of feeders		
Ambient temperature		55 °C
	kV kV Hz kV kV kV	kV         15           kV         17.5           Hz         16.7           kV         50           kV         50           kV         125           kV         145           max. 31         max. 32           max. 25         max. 25           max. 20         -5 to +5

## Dimensions in mm (dim. drawings see page 7)

Width B1	
Incoming feeder panel	600 →
Track section outgoing feeder panel	600
Switchgear end wall width B2	
For left and right side of switchgear	152 ───
Depth T	
For 8DA11, 1-pole	865
For 8DA12, 2-pole	1245→
Height H1	
Standard	2350
Height H2	
Standard	1850
Footnotes for left-hand table column:	
1) Acc. to Russian GOST standard for 6	10 kV systems

2) Acc. to Russian GOST standard for 36 kV systems

3) 60 Hz on request

4) Rated short-duration power-frequency withstand voltage 95 kV possible according to GB standard

5) Dimensions must be co-ordinated with the bar supplier

## Constructional data (see also dimension table on page 6)



HA35-2431b eps Ô . ₽ 0 0 0 . ₽ ₽ ₽ ₽ ₽ ₽ ₽ ₽ ₽\_०० ₽₽ 0. • 0 • **I** 6 B2 B2 B1

H

8DA11 1-pole, 8DA12 2-pole







Side view for 8DA11, 1-pole

270 320

Front view

H2

HA35-2432b eps



Side view for 8DA12, 2-pole

### Room planning, floor openings and fixing points



## **Shipping data**

#### **Transport units**

The following must be noted when defining the transport units:

- Transport facilities on site
- Transport dimensions and weights
- Size of door openings in building

Transport unit	Number of panels
8DA10 single-busbar panels	max. 4
8DA11(1-pole) and 8DA12 (2-pole) panels for traction power supply systems in 1-pole or 2-pole applications	max. 4
8DB10 double-busbar panels	max. 3

#### Packing

<u>Place of destination inside</u> <u>Germany or other European</u> <u>countries</u>

- Method of transport: Rail and truck
- Type of packing: – panels on open pallets,
- pallet height = 200 mm – open packing with PE protective foil

#### Place of destination overseas

- Method of transport: Ship
- Type of packing:
   panels on open pallets, pallet height = 200 mm
- in closed crates with sealed upper and lower PE protective foil
- with desiccant bags
- with sealed wooden floor
- max. storage time: 6 months

mm

1 x 600

2 x 600

3 x 600

8DA10 single b	ousbars
----------------	---------

Transmit diamatica				
I ransport dimensions				
Panel width	Vidth x Height x Depth			
	indii Anoight A Boptin			
mm	mm x mm x mm			
Transport inside Germany or to other Eu	ropean countries			
1 x 600	1764 x 2550 <sup>1)</sup> x 1840			
2 x 600	1764 x 2550 <sup>1)</sup> x	1840		
3 x 600	2400 x 2550 <sup>1)</sup> x	1840		
4 x 600	2964 x 2550 <sup>1)</sup> x	1840		
Transport Overseas				
1 x 600	1764 x 2700 <sup>2)</sup> x	1864		
2 x 600	1764 x 2700 <sup>2)</sup> x	1864		
3 x 600	2400 x 2700 <sup>2)</sup> x	1864		
4 x 600	2964 x 2700 <sup>2)</sup> x	1864		
Transport weights *				
Panel width	Transport weight with without			
	packing	packing		
mm	approx. kg	approx. kg		
1 x 600	850	750		
2 x 600	1700	1500		
3 x 600	2550	2250		
4 x 600	3400 3000			
PDP10 double busbars				
Transport dimensions				
Papel width	Transport dimon	sions		
	Width x Height x	Depth		
mm		m		
mm x mm x mm				
Transport inside Germany or to other Eu	ropean countries			
1 x 600	1816 x 2550 <sup>1)</sup> x	3124		
2 x 600	1816 x 2550 <sup>1)</sup> x 3124			
3 x 600	2416 x 2550 <sup>1)</sup> x	3124		
Transport Overseas				
1 x 600	1840 x 2850 <sup>3)</sup> x	3124		
2 x 600	1840 x 2850 <sup>3)</sup> x	3124		
3 x 600	2440 x 2850 <sup>3)</sup> x	3124		
Transport weights *				
Papel width	Transport			
	with	without		
	nacking	nacking		

Transport weights<br/>with<br/>packing<br/>approx. kgIntegration of the sector<br/>approx. kgIntegration of the sector<br/>approx. kg13001200260024003) 3050 mm high in case of<br/>facility3) 3050 mm high in case of<br/>approx. kg

3600

3900

3) 3050 mm high in case of 1200 mm high low-voltage box, busbar voltage transformer 36/ 40.5 kV without disconnecting facility, busbar voltage transformer ≤ 24 kV with disconnection facility and busbar connection 4 to 6 times plug size 2 with disconnecting facility

1) Height for standard panel:

 Average values depending on the degree to which panels are equipped

## Single-busbar panels 8DA10, 3-pole (8DA11, 1-pole and 8DA12, 2-pole panels, on request)



## Double-busbar panels 8DB10, 3-pole



Abbreviations: SS1 = Busbar 1 SS2 = Busbar 2

1) Capacitive voltage detection system

- 2) For plug-in cable connection with inside cone according to EN 50 181 Max. 6 connections possible per phase according to the plug size

3) The use of these fittings reduces the number of possible plug-in cables by 1 no. each

## Double-busbar panels 8DB10, 3-pole



<u>Abbreviations:</u> SS1 = Busbar 1 SS2 = Busbar 2

1) Capacitive voltage detection system

## Double-busbar panels 8DB10, 3-pole



<u>Abbreviations:</u> SS1 = Busbar 1 SS2 = Busbar 2

1) Capacitive voltage detection system



## **Basic panel design**

#### Panel

- Single-pole metal-enclosed
- Metal-clad
- Basic construction of castaluminium housings

#### Insulating system

- Panel housings filled with SF<sub>6</sub>-gas
- Features of SF<sub>6</sub>-gas:
- non-toxic
- odourless and colourless
- non-inflammable
- inert
- heavier than air - electronegative (high-guality
- insulator) • Overpressure of SF<sub>6</sub>-gas in the panel housings:
- normally 50 kPa up to 120 kPa (depending on insulation level and rated normal current)
- 180 kPa - design pressure - design pressure
- of SF<sub>6</sub>-gas 80 °C - operating pressure of rupture
- ≥ 300 kPa diaphragm\_ - bursting pressure\_≥ 600 kPa

## Panel pole

- · Poles arranged one behind the other
- · Consisting of a vertical housing containing the vacuum interrupter
- Arranged on top: - for single-busbar switchgear 8DA10: Horizontal housing containing the three-position disconnector and the busbars
- for double-busbar switchgear 8DB10: 2 vertical housings contain-

ing the three-position disconnector for busbar system 1 and the disconnector for busbar system 2, and, on top of these, 2 horizontal housings containing the busbars

- Arranged below: Panel connection housing
- Function compartments separated by gas-tight partitions for
- circuit-breaker
- three-position disconnector
- disconnector
- busbars

Low-voltage compartment See page 27.

#### Panel design (examples)





Panels for traction power supply systems

### Legend for 8DA10, 8DA11, 8DA12 and 8DB10

- 1 Low-voltage compartment
- 2 Electronic control board, e.g. multifunction protection
- 3 Operating mechanism and interlock for three-position disconnector as well as mechanical switch position indication for three-position disconnector and circuit-breaker
- 4 Manometer for gas monitoring of feeder gas compartments
- 5 Circuit-breaker operating mechanism
- 6 Operating shaft for vacuum interrupters
- 7 Voltage detection system
- 8 Operating shaft for threeposition disconnector

6

8DB10 3-pole

1

2

3

5

6

7

0.000

0

Û

Design

### Basic panel design

Single-pole design



1 Busbar housing

3 Three-position

disconnector

4 Gas-tight bushing

disconnector and

6 Vacuum interrupter

7 Current transformer

8 Pole supporting plate

9 Panel connection

5 Circuit-breaker housing

circuit-breaker

between three-position

2 Busba

Single busbar



Double busbar

#### Gas compartment principle

- Optimal availability by means of
- sealed pressure system
- distribution of gas compartments
   arrangement of manometers for pressure monitoring
- position of three-position disconnectors
- Operation and monitoring of a busbar section only possible if all busbar housings involved are in good working order:
- operation and monitoring of the entire busbar section as one gas compartment is sufficient
- lining up individual panels to one switchgear assembly forms one gas
- compartment for each busbar phase manometer for this gas compart-
- ment mounted in one end wallOperation and monitoring of one
- busbar section of a single-busbar switchgear assembly also possible if a feeder is faulty:
- "feeder" gas compartment separated from "busbar" gas compartment
- 3 circuit-breaker housings interconnected by a pipe, ensuring individual gas monitoring for each panel
- manometer for this gas compartment mounted at the panel front
- Operation and monitoring of a double-busbar switchgear also possible if one busbar system or the disconnector is faulty:
- gas compartments of both busbars separated from the gas compartments of both disconnectors
- 1 gas compartment available each for the 3 circuit-breaker housings, the disconnector housings and the three-position disconnector housings
- 3 manometers mounted on the panel front to monitor the gas pressure
- Separate, defined pressure relief for each gas compartment
- Pressure monitoring via manometers in connection with alarm contacts to signal any increase or drop in pressure
- Ratings according to IEC 62 271-200 resp. VDE 0671-200 remain unchanged after more than 20 years of operation. During this time, no refilling of SF<sub>6</sub>-gas will be necessary

Arrangement of gas compartments



4 Circuit-breaker



Gas compartments of single-busbar switchgear

- 1 Busbar 1: L1
- 2 Busbar 1: L2 3 Busbar 1: L3
- 4 Busbar 2: L1
- 5 Busbar 2: L2
- 6 Busbar 2: L3
- 7 Busbar 1:
- Three-position disconnector 8 Busbar 2: Disconnector
- 9 Circuit-breaker



Gas compartments of double-busbar switchgear

## **Busbars**

- Features
- Made of flat copper
- up to 2500 A per phase in separate busbar housing
- up to 4000 A per phase in top-mounted busbar housing (tandem design)
- Mounted on cross-insulators inside the housing and secured in longitudinal direction per busbar section
- Cross-insulators absorb transverse forces in case of shortcircuit and allow movement in the longitudinal direction of the busbar
- Installation of the 3 busbar phases in separate, continuous busbar compartments
- Separate gas monitoring per phase and per busbar compartment
- In single-busbar switchgear, mating contacts for the CLOSED position of the three-position disconnector mounted directly on the busbar (see figures "busbar designs")
- In double-busbar switchgear, busbar connection to the gas-tight bushing of the disconnector gas compartment by means of a flexible strip or copper angle
- Longitudinal compensation of the horizontally arranged busbar housings by means of expansion pieces and expansion joints with constant panel width (the busbar housing next to the expansion joint is appropriately shorter)



**Busbar designs** 

up to 2500 A



up to 4000 A (busbar housing in tandem design)

Busbar housings with flat conductor, cross-insulator and three-position disconnector Busbar fittings (sectional front views)



1

 For single-busbar switchgear without bus sectionalizer
 For double-busbar switchgear without bus sectionalizer and bus coupler If there is a bus sectionalizer or a bus coupler available, the busbar section is normally make-proof earthed by means of the three-position disconnector and the circuit-breaker.



without disconnecting facility stappg12-500H

- Possible for direct connection to the busbar with all versions of fully insulated panel connections
- Available with or without disconnector

**Busbar connection** 



- Possible on adjacent panels
- No additional space required with respect to the panel width



### **Three-position disconnector**

#### Features

- Rated normal currents up to 2500 A
- Up to 2000 operating cycles for the disconnector, 3000 operating cycles for 8DA11/12 switchgear
- Up to 1000 operating cycles for the earthing switch
- Operating shaft and contact blades with common centre of rotation and reliable switch position up to the control board of the panel
- Maintenance-free
- Three switch positions

   <u>CLOSED</u>: Contact blades connected with the busbars: Main circuit closed between busbar and circuit-breaker
- <u>OPEN</u>: Main circuit open between busbar and circuitbreaker: Test voltages for isolating distances are withstood
- <u>READY-TO-EARTH:</u> Contact blades connected with the earthing contact of the busbar housing: Feeder earthed and short-circuited by closing the circuit-breaker
- Gas-tight barriers separate the busbar and circuit-breaker housings from each other underneath the contact blades
- Cable connection and circuitbreaker housings can be removed without interrupting busbar operation.

#### **Operating mechanism**

- Only permissible operations possible due to logical mechanical interlocks
- Switch position indication via mechanically coupled flags
- Separate operating shafts for the "Disconnecting" and "Ready-to-earth" functions
- Basically available with manual or motor operating mechanism
- Same sense of rotation for the "CLOSE" or "OPEN" functions
- Logical mechanical interlocks for double-busbar switchgear interrogated by means of a control gate which selects the disconnector to be operated (for busbar system 1 or 2).

Switch positions for three-position disconnector













Feeder READY-TO-EARTH

![](_page_16_Figure_29.jpeg)

Feeder EARTHED

## Electrical data for three-position disconnector and disconnector

Power consumption and protection of the motor

Rated voltage	Rating	M.c.b. with C-characteristic
	W	Rated current A
DC 60 V	100	3
110 V	100	1.6
220 V	100	0.5
AC 110 V	100	1.6
220 V	100	0.5

Rated power and operating time of the interlocking magnet

Rated voltage	Rating	Operating time
	W	%
60/110/220 V DC	7.1	100
110/220 V AC	7.1	100

## omponents.

### Vacuum circuit-breaker

#### Features

- Maintenance-free vacuum interrupters in gas-filled switchgear housing
- Operating mechanism arranged outside the gas compartments behind the panel front
- Force transmission from the operating mechanism to the 3 circuit-breaker poles through a common operating shaft
- Basically available with manual or motor operating mechanism
- Maintenance-free under normal ambient conditions (in the switchgear room) and within the max. permissible number of operating cycles
- Switching sequence - up to 31.5 kA:
- O 0.3 s CO 3 min CO at 40 kA:
- O 3 min CO 3 min CO

#### Maintenance and service life

- Maintenance-free operating mechanism up to 10,000 operating cycles, without time limitation under normal operating conditions
- Vacuum interrupters
- maintenance-free - mechanical service life of up
- to 30,000 operating cycles - electrical service life dependent on breaking current (see opposite
- Other technical data
- Switching times

characteristics)

- Power consumption and tripping ranges of releases
- Power consumption and rated currents for shortcircuit protection of springcharging motor operating mechanism

See page 19.

![](_page_17_Figure_22.jpeg)

![](_page_17_Figure_23.jpeg)

31.5 kA (example)

![](_page_17_Figure_25.jpeg)

![](_page_17_Figure_26.jpeg)

![](_page_17_Figure_27.jpeg)

Vacuum circuit-breaker 40 kA, 50 Hz

Abbreviations: O = OPEN operation CO = CLOSE-OPEN operation

## Vacuum circuit-breaker

**Other technical data** See opposite table

### Switching times

Designation	Switching time of vacuum circuit-breakers	With the following equipment
Closing time 1)	95 ± 10 ms	-
Opening time 1)	< 70 ms	1st shunt release
	< 55 ms	2nd and 3rd release
	< 25 ms	Option: instantaneous release for 8DA11
Arcing time at 50 Hz	< 15 ms	-
Breaking time	< 85 ms	1st shunt release
	< 70 ms	2nd and 3rd release
Dead time	300 ms	-
CLOSED/OPEN contact time	< 80 ms	1st shunt release
	< 65 ms	2nd and 3rd release
Minimum command duration	45 ms	Closing solenoid
	40 ms	1st shunt release
	20 ms	2nd and 3rd release
Impulse time for circuit-breaker	> 15 ms	1st shunt release
tripping signal	> 10 ms	2nd and 3rd release
Charging time with elec. operation	< 15 s	-
Synchronism error between poles	2 ms	-

### Power consumption and rated currents for short-circuit protection of motors

Rated of ope mecha	voltage erating anism	Operatir voltage max.	ng min.	Power consumption of motor	Smallest possible rated current of m.c.b. with C-characteristic
DC	24 V	26 V	20 V	500 W	16 A
	48 V	53 V	41 V	500 W	8 A
	60 V	66 V	51 V	500 W	6 A
	110 V	121 V	93 V	500 W	3 A
	220 V	242 V	187 V	500 W	1.6 A
AC	110 V	121 V	93 V	650 VA	3 A
	230 V	244 V	187 V	650 VA	1.6 A

### Power consumption and tripping ranges of releases

Release	Order No.	Power consumption		Tripping ranges	
	of release	Operation		Tripping voltage	Tripping voltage or current
		at DC	at 50/60 Hz AC	at DC	at 50/60 Hz AC
Closing solenoid	3AY15 10	140 W	140 VA	85 up to 110 % U	85 up to 110 % U
1st shunt release (without energy store)	3AY15 10	140 W	140 VA	70 up to 110 % <i>U</i>	85 up to 110 % <i>U</i>
2nd shunt release (with energy store)	3AX11 01	60 W	55 VA	70 up to 110 % U	85 up to 110 % <i>U</i>
Undervoltage release	3AX11 03	13 W	15 VA	35 up to 0% <i>U</i>	35 up to 0% U

### **Current transformers**

#### **Ring-core current transformers**

- Ring-core as carrier of secondary winding
- Main circuit corresponds to primary winding
- Arranged outside the primary enclosure (switchgear housing)
- Free of dielectrically stressed cast-resin parts (due to design)
- According to IEC 60 044-1 and VDE 0414-1
- Certifiable

#### Mounting locations

- <u>At the busbar (1):</u> Inside diameter of transformer 300 mm, max. overall height 155 mm
- <u>At the circuit-breaker housing (2):</u> Inside diameter of transformer 300 mm, max. overall height 294 mm
- <u>At the panel connection (3):</u>
   with single connection up to interface type 2: Inside diameter of transformer 180 mm
- and outside diameter of transformer 376 mm, max. overall height 294 mm – with single connection for interface
- type 3: Inside diameter of transformer 300 mm, max. overall height 294 mm
- with multiple connection
   (2 or 3 cable plugs interface type 2)
   per phase:
   Inside diameter of transformer 300 mm,

max. overall height 214 mm

• <u>On the cable (cable-type current</u> transformer) (4) Depending on the cable

![](_page_19_Figure_19.jpeg)

### Technical data for ring-core current transformers

Operating voltage	max. 0.72 kV	
Rated short-duration power- frequency withstand voltage	3 kV (winding test)	
Rated frequency	50/60 Hz	
Rated continuous thermal current	max. 1.2 x <i>I</i> <sub>n</sub>	
Rated thermal short-time current	40 kA, max. 3 s	
Rated dynamic current	100 kA	
Rated primary current	40 up to 2500 A	
Multiratio (secondary)	200 – 100 up to 2500 – 1250 A	
Rated secondary current	1 A or 5 A	
Number of cores	max. 3	
Core data (according to rated primary current):		
Measuring Rating core Class Overcurrent factor	2.5 up to 10 VA 0.2 up to 1 FS10	
Protection Rating core Class Overcurrent factor	2.5 up to 30 VA 5 up to 10 P10 up to P30	
Permissible ambient temperature	max. 80 °C	
Insulation class	E	
Standards	IEC 60 044-1, VDE 0414-1	

1 Mounted on the busbar

- 2 Mounted on the circuit-breaker housing
- 3 Mounted on the panel connection, possible for:
   1 to 3 cables per phase, interface type 2
  - 1 cable per phase, interface type 3 or 4
     solid-insulated bar
- 4 Mounted on the cable

### Voltage transformers

#### Voltage transformer

- · Cast-resin insulated
- Inductive type
- Safe-to-touch due to metal enclosure/metal coating
- Plug-in type
- Arranged outside the primary enclosure (switchgear housing)
- Mounting locations
- at the busbar, metal-enclosed, directly connected or disconnectable through a three-position disconnector
- at the panel connection, metal-enclosed, directly plugged in or mounted separately via a plug-in cable
- According to IEC 60 044-2 / VDE 0414-2
- Certifiable

#### Low-power voltage transducers as resistor dividers

- According to IEC 60 044-7
- Mounted over the panel connection as flange dividers, or pluggable to any free socket as an inside-cone plug-in system
- Suitable for all protection and measuring functions
- No ferroresonance possible anymore
- No disconnection for switchgear or cable tests
- Resistant against transient overvoltages
- Extended voltage measuring range from 0.4 to 1.2 times rated voltage
- High reliability and availability
- Short-circuit-proof
- Rating-independent wiring
- System-conformity to numerical secondary systems

Mounting locations for inductive voltage transformers and low-power voltage transducers

![](_page_20_Figure_27.jpeg)

1 Mounted on the busbar directly connected or disconnectable through a three-position disconnector (figure)

![](_page_20_Figure_29.jpeg)

Operating voltage	max. kV	12	24	36	
Common data for inductive voltage transformers					
Primary voltage	kV	$\begin{array}{c} 3.3   \sqrt{3} \\ 3.6   \sqrt{3} \\ 4.8   \sqrt{3} \\ 5.0   \sqrt{3} \\ 6.0   \sqrt{3} \\ 6.6   \sqrt{3} \\ 7.2   \sqrt{3} \\ 10.0   \sqrt{3} \\ 11.0   \sqrt{3} \end{array}$	13.8/\3 15.0/\3 17.5/\3 20.0/\3 22.0/\3	$\begin{array}{c} 25.0/\sqrt{3}\\ 25.8/\sqrt{3}\\ 30.0/\sqrt{3}\\ 33.0/\sqrt{3}\\ 34.5/\sqrt{3}\\ 35.0/\sqrt{3}\\ \end{array}$	
Secondary voltage	V	100/√3 110/√3	$100/\sqrt{3}$ $110/\sqrt{3}$	100/√3 110/√3	

#### Busbar voltage transformer

Туре	4MT32	4MT34	4MU1/4MT6
Auxiliary winding for V earth-fault detection	100/3 110/3	100/3 110/3	100/3 110/3
Secondary, thermal limit A current of measuring winding	6	6	6
Rated voltage factor U <sub>N</sub> /8 h	1.9	1.9	1.9
Rated long-time current/8 h A	5	5	11
Accuracy	0.2/0.5/1	0.2/0.5/1	0.2/0.5/1
Rating VA	30/90/180	30/90/180	25/60/150

#### Voltage transformer, directly plugged in

	55		
Туре	4MT72	4MT74	4MT76
Auxiliary winding for V earth-fault detection	100/3 110/3	100/3 110/3	100/3 110/3
Secondary, thermal limit A current of measuring winding	7	7	6
Rated voltage factor U <sub>N</sub> /8 h	1.9	1.9	1.9
Rated long-time current/8 h A	6	6	6
Accuracy	0.2/0.5/1	0.2/0.5/1	0.2/0.5/1
Rating VA	10/30/75	10/30/75	10/30/75

#### Voltage transformer, mounted separately

Туре	4MU32	4MU34	4MU36	
Auxiliary winding for V earth-fault detection	100/3 110/3	100/3 110/3	100/3 110/3	
Secondary, thermal limit A current of measuring winding	6	6	6	
Rated voltage factor U <sub>N</sub> /8 h	1.9	1.9	1.9	
Rated long-time current/8 h A	6	6	6	
Accuracy	0.2/0.5/1	0.2/0.5/1	0.2/0.5/1	
Rating VA	30/90/180	30/90/180	30/90/180	

#### Low-power voltage transducer as resistor divider

Mounting location as above

![](_page_20_Picture_39.jpeg)

for inside-cone plug-in system

### Technical data for low-power voltage transducers

Operating voltage	max. 40.5 kV
Rated frequency	50/60 Hz
Secondary voltage	3.25 V/√3
Accuracy	0.2 up to 0.5
Permissible ambient	max. 60 °C
temperature	
Insulation class	E

<ul> <li>2</li> <li>Voltage transformer, directly plugged in (example for 36 kV)</li> </ul>

2 Mounted on the panel connection, metal-enclosed, directly plugged in (figure) or mounted separately via a plug-in cable

HA35-2154c eps

8DA10

Panel connection for plug-in cables (possible versions)

8DA11/8DA12

## Components

## Panel connection

#### Features

- Fully insulated
- For inside-cone plug-in system according to EN 50 181
- For interface types 2, 3 and 4
- Interface types depending on cable cross-section and rated voltage
- Single and multiple connections possible per phase, see connection drawings
- Multiple connections available with different interface types
- Solid-insulated or gasinsulated bar connection
- Number of possible cable connections is reduced by 1
- if directly plugged in or separately mounted inductive voltage transformers are connected
- if plug-in surge arresters are connected

#### Cable testing

Cable testing is possible through an inside-cone socket by means of a test unit.

Legend (pages 22 and 23)1 Upper part of subframe

- 2 Lower part of subframe
- **3** Gas insulation
- 4 Floor of switchgear room

![](_page_21_Figure_20.jpeg)

1x plug-in voltage transformer

Example: 2x interface type 2

## **Panel connection**

![](_page_22_Figure_3.jpeg)

![](_page_22_Figure_4.jpeg)

connection for bar

Panel

![](_page_22_Figure_5.jpeg)

for rated normal currents up to 2500 A

![](_page_22_Figure_7.jpeg)

for rated normal currents up to 2500 A

![](_page_22_Figure_9.jpeg)

![](_page_22_Figure_10.jpeg)

for rated normal currents up to 2500 A

![](_page_22_Figure_12.jpeg)

Â

## Components

## **Control board**

#### Features

- Mechanical control board located below the lowvoltage compartment
- Actuation next to the operating mechanisms
- Integrated mechanical switch position indications in the mimic diagram
- Unambiguous assignment of actuating openings and control elements to the corresponding switch position indications
- Convenient height of all control elements

#### Logical mechanical interlocks

- Internal panel interlocks are of the mechanical type
- Operation of three-position disconnector (disconnecting and earthing function) interlocked with vacuum circuitbreaker in both directions
- Selector lock (4) opens or locks the actuating openings for the disconnecting (3) and earthing function (2) in accordance with the circuitbreaker position
- Actuating openings (2 and 3) cannot be opened with a selector key as long as the vacuum circuit-breaker is CLOSED
- Operating lever can be inserted in open actuating openings
- Operating lever cannot be removed before the definite end position of the disconnecting or earthing function is reached – nor can the selector key
- Feeder de-earthing is secured by the vacuum circuit-breaker
- electrically via the auxiliary switch
   mechanically through the
- lever (13) of the mechanical circuit-breaker tripping block

![](_page_23_Picture_19.jpeg)

Operating mechanism for the three-position

disconnector and the vacuum circuit-breaker

![](_page_23_Picture_20.jpeg)

Control board for single-busbar panel 8DA10

![](_page_23_Picture_22.jpeg)

double-busbar panel 8DB10

#### Operating mechanism for three-position disconnector:

- 1 Switch position indicator CLOSED/OPEN for disconnecting function of three-position disconnector
- 2 Actuating opening for earthing function
- **3** Actuating opening for disconnecting function
- 4 Actuating opening for selector lock of respective switching operation
- 5 Switch position indicator CLOSED/OPEN for earthing function of three-position disconnector
- 6 Switch position indicator CLOSED/OPEN for vacuum circuit-breaker
- 7 Switch position indicator CLOSED/OPEN for 2nd disconnector in double-busbar switchgear
- 8 Actuating opening for 2nd disconnector in double-busbar switchgear
- 9 Control gate for selecting the three-position disconnector or the disconnector in doublebusbar switchgear
- B <u>Operating mechanism</u> for vacuum circuit-breaker:
- **10** Mechanical ON pushbutton for vacuum circuit-breaker
- 11 Actuating opening for manual charging of the circuit-breaker operating spring
- 12 Mechanical OFF pushbutton for vacuum circuit-breaker
- 13 Lever for locking the vacuum circuit-breaker against de-earthing
- 14 Spring charged indicator
- 15 Switch position indicator CLOSED/OPEN for vacuum circuit-breaker
- 16 Operating cycle counter for vacuum circuit-breaker

![](_page_24_Picture_1.jpeg)

### Indicating and measuring equipment

#### Gas monitoring

- With contact manometer
- 2 signalling contacts for "pressure too low" and "pressure too high"
- Easy verification of readiness for service by means of red/green indication areas
- Local indication, also without auxiliary voltage
- Refilling socket for SF<sub>6</sub>-gas with non-return valve and cover
- Number of manometers for 8DA switchgear:
- 3 nos. for the busbar phases (1 no. per phase) of a complete switchgear row, mounted in one of the two lateral end walls
- 1 no. for the 3 circuit-breaker poles (mounted on the front of each panel)
- Number of manometers for 8DB switchgear:
- 6 nos. for the busbar phases (1 no. per phase and busbar system) of a complete switchgear row, mounted in one of the two lateral end walls
- 3 nos. for the switchpanel poles;
- 1 no. thereof for the
- 3 circuit-breaker poles,
- 1 no. for the 3 three-position disconnector poles of the first busbar system and

R-HA35-096 eps

1 no. for the 3 disconnector poles of the second busbar system (mounted on the front of each panel)

#### Gas monitoring for 8DA switchgear (for single-busbar switchgear and traction power supply systems)

![](_page_24_Picture_20.jpeg)

Manometer (1) for circuit-breaker poles (mounted on the panel front)

![](_page_24_Picture_22.jpeg)

Manometer (2) for busbar phases, mounted in the lateral end wall (side cover open)

![](_page_24_Figure_24.jpeg)

Manometers (3) for circuit-breaker and disconnector poles (mounted on the panel front)

![](_page_24_Picture_26.jpeg)

Manometer (4) for busbar phases (mounted on the lateral end wall)

#### Indicating and measuring equipment

#### Voltage detection systems

For voltage detection according to IEC 61 243-5 / VDE 0682-415

- Detection systems (option):
- LRM system
   Integrated voltage detection systems, LRM system: CAPDIS-S1+ and -S2+

#### LRM system

- With voltage indicator (LRM system)
- Verification of safe isolation from supply phase by phase by insertion in each socket pair
- Voltage indicator flashes when high voltage is present
- Indicator suitable for continuous operation
- Safe-to-touch
- Routine-tested
- Measuring system and voltage indicator can be tested
- Without auxiliary voltage

#### Features of integrated voltage detection systems

Common features

- Maintenance-free
- Integrated display, without auxiliary power
- Integrated repeat test of the interfaces (self-testing)
  With integrated function
- test (without auxiliary power) by pressing the "Device-function-test" pushbutton
- With integrated 3-phase test socket for phase comparison (also suitable for plug-in voltage indicator)
- Degree of protection IP 54, temperature range -25 °C to +55 °C
- With circuit capacity

### Features of CAPDIS-S1+

- Without auxiliary power
- With indication "A1" to "A5" (see legend)
- Without ready-for-service monitoring
- Without signalling relay (thus without auxiliary contacts)

#### Features of CAPDIS-S2+

- With indication "A0" to "A6" (see legend)
- Only by pressing the "Device-function-test" pushbutton: "ERROR" indication (A6), e.g. in case of missing auxiliary voltage
- With ready-for-service monitoring (external auxiliary power required)
- With integrated signalling relay for signalling "M1" to "M4" (auxiliary power required):
- "M1": Operating voltage present at phases L1, L2, L3
- "M2": Voltage not present at L1, L2 and L3 (= active zero indication)
- "M3": Earth fault or voltage failure, e.g. in one phase
- "M4": External auxiliary power missing (operating voltage present or not)
- Separate circuit capacity

![](_page_25_Figure_40.jpeg)

Voltage detection systems

![](_page_25_Figure_41.jpeg)

#### Voltage detection

via capacitive voltage divider (principle)

- -C1 Capacity coupling electrode integrated into bushing
- -C2 Capacity of the coupling section (as well as connection leads of the voltage detection system) to earth
- $U_{\rm LE} = U_{\rm N} / \sqrt{3}$  during rated operation in the three-phase system
- $U_2$  = Voltage at the interface (for plug-in voltage detection system) or at the test socket (for integrated voltage detection system)

#### Symbols shown on

CAPDIS-S1+		CAPDIS-S2+	
	L1 L2 L3	L1 L2 L3	
0		000	
\1	4 4 4	f f f	
2			
3	4 4	4 4	
4	4 4 4	4 4 4	
\5	BBB	III.	
6			

1

- A0 CAPDIS-S2+: Operating voltage not present
- A1 Operating voltage present
- A2 Operating voltage not present – For CAPDIS-S2+: Auxiliary power not present
- A3 Earth fault or failure in phase L1, operating voltage at L2 and L3
- A4 Voltage (not operating voltage) present
- A5 Indication "Device-function-test" passed
- A6 Indication "ERROR", e.g. in case of missing auxiliary voltage (see: "error indication M4")

## Low-voltage equipment

#### Low-voltage compartment

- Accommodates equipment for protection, control, measuring and metering
- Separated from the high-voltage part, safe-to-touch
- Low-voltage compartment can be removed, bus wires and control cables are plugged in
- <u>Option:</u> High low-voltage compartment (1200 mm) possible

![](_page_26_Picture_8.jpeg)

Description of the SIPROTEC 4 multifunction protection relays, see page 28.

Low-voltage compartment with multifunction protection relay SIPROTEC 4 75J61 (example)

## omponents.

#### Low-voltage equipment

#### Multifunction protection relay SIPROTEC 4 75J600/75J602

- User-friendly operating program DIGSI 4 for configuration and analysis
- Communications and bus capability
- Functions: control, protection, indicating, communications and measuring
- LCD (2 text lines) and keyboard for local operation, configuration and display
- Four user-programmable LEDs for displaying any desired data
- Operation and fault indication memory
- Fault recording
- Circuit-breaker control

#### Multifunction protection relay SIPROTEC 4 7SJ61/7SJ62

- For stand-alone or master operation
- Communications and bus capability
- Functions: control, protection, indicating, communications and measuring
- LCD (4 text lines) for process and equipment data, in the form of a feeder mimic diagram and as text, e.q. for
- measuring and metering values
- information on status of switchgear and switching device
- protection data
- general indications
- alarms
- Four user-programmable function keys for frequently performed actions
- Seven user-programmable LEDs for displaying any desired data
- Keys for navigation in menus and for entering values

#### Multifunction protection relay SIPROTEC 4 7SJ63

- For stand-alone or master operation
- Communications and bus capability
- Functions: control, protection, indicating, communications and measuring
- LCD for process and equipment data, in the form of a feeder mimic diagram and as text, e.g. for
- measuring and metering values
- information on status of switchgear and switching device - protection data
- general indications alarms
- Four user-programmable function keys for frequently performed actions
- Fourteen user-programmable LEDs for displaying any desired data
- Two key-operated switches to switch between "local and remote control" and "interlocked and non-interlocked operation'
- Keys for navigation in menus and for entering values
- Integrated motor control by special relays with enhanced performance

#### **Multifunction protection relays SIPROTEC 4**

![](_page_27_Figure_39.jpeg)

![](_page_27_Figure_40.jpeg)

![](_page_27_Figure_41.jpeg)

![](_page_27_Figure_42.jpeg)

**Multifunction protection** relay SIPROTEC 4 7SJ63

## Legend

- 1 LCD
- 2 LEDs
- 3 Key-operated switches 4 Navigation keys
- 5 Control keys
- 6 Function keys
- 7 LCD (text display)

## Standards

## Standards, specifications, guidelines

#### Standards

The 8DA/8DB switchgear complies with the relevant standards and specifications applicable at the time of the type tests.

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

#### Overview of standards (January 2006)

		IEC standard	VDE standard	EN standard
Switchgear	8DA, 8DB	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
	Disconnector and earthing switch	IEC 62 271-102	VDE 0671-102	EN 62 271-102
	Switch-disconnector	IEC 62 265-1	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 transformers	IEC 60 044-1	VDE 0414-1	EN 60 044-1
	Voltage transformers	IEC 60 044-2	VDE 0414-2	EN 60 044-2

#### Overview of standards for traction applications

	IEC standard	EN standard
Supply voltage	IEC 60 850	EN 50 163
Switchgear	-	EN 50 152
Insulation	-	EN 50 124

#### Type of service location

8DA/8DB switchgear can be used as an indoor installation in accordance with VDE 0101 or the Harmonization Document HD 637 S1 (Power installations exceeding 1 kV AC)

- 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.

#### Aseismic capacity (option)

• 8DA/8DB switchgear can be upgraded for regions at risk from earthquakes.

For upgrading, earthquake qualification testing is carried out in accordance with the following standards:

- IEC 68-3-3 1993
- IEC 68-2-6 1995
- IABG TA13-TM-002/98 (guide)

Within the range of the prevailing earthquake frequencies from 1 Hz to 35 Hz, the category 1 required response spectrum to IABG TA13-TM-002/98 covers the following response spectra:

- Uniform Building Code zone 3
- Seismic Requirements Spec. 9067; Department of
- Water & Power, Los Angeles • GTS – 1.013 ENDESA, Chile
- VDE 0670-111

#### Insulating capacity

- The insulating capacity is verified by testing the switchgear at rated short-duration powerfrequency withstand voltage and rated lightning impulse withstand voltage in accordance with IEC 60 694 and VDE 0671-1000 (see following table).
- The rated values refer to sea level and to normal atmospheric conditions (1013 hPa, 20 °C, 11 g/m<sup>3</sup> water content in accordance with IEC 60 071 and VDE 0111).
- With increasing altitude, the insulating capacity decreases. This influence can be neglected for gas-insulated switchgear 8DA/8DB.

#### Current-carrying capacity

- According to IEC 62 271-200 or IEC 60 694 and VDE 0671-200 or VDE 0670-1000, currentcarrying 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.

#### Site altitude

The gas insulation permits installation of the switchgear at any altitude above sea level without influences on the dielectric strength. This also applies to cable connection.

#### Table – Insulating capacity

Rated voltage (r.m.s. value)	kV	7.2	12	15	17.5	24	36	38	40.5	40.5
Rated short-duration power-frequency withstand voltage (r.m.s. value)										
- across isolating distance	kV	23	32	39	45	60	80	90	90	110
- between phases and to earth	kV	20	28	35	38	50	70	80	85	95
Rated lightning impulse withstand voltage (peak value)										

- across isolating distance	kV	70	85	105	110	145	195	230	218	218
- between phases and to earth	kV	60	75	95	95	125	170	200	185	185

## Standards

## Standards, specifications, guidelines

#### Internal arc classification

#### Internal arc fault test

- Tests for verifying the internal arc classification should establish proper protection for operating personnel
- The tests must be performed in accordance with IEC 62 271-200/ VDE 0671-200

#### Additional safety

- No short-circuit arcing between phases due to single-pole metal enclosure
- Earth-fault arcing between phase and earthed enclosure harmless due to
- low current arcs in compensated and insulated
- systems – no important damages to insulation, main circuits and metal enclosure
- In effectively or resistively earthed systems the partition bushings restrict the effects of arc faults to the gas compartment affected (adjacent poles are not affected)
- Any excess pressure is relieved by means of rupture diaphragms: the aluminium enclosure does not tear open
- Probability of arcing considerably lower than in air-insulated switchgear as there are no effects due to
- pollution layers
  moisture
- small animals and foreign bodies
- Maloperation is practically excluded by logical arrangement of operating elements and logical mechanical interlocks
- Short-circuit-proof feeder earthing by means of threeposition disconnector in combination with vacuum circuitbreaker

Criteria for internal arc faults

- Criteria according to IEC 62 271-200/VDE-0671-200 with respect to the behaviour in case of internal arc faults
- Definitions of criteria:
- <u>Acceptance criterion 1</u>
   Covers and doors remain closed. Limited deformations are accepted
- Acceptance criterion 2 No fragmentation of the enclosure. No projection of small parts above 60 g weight
- Acceptance criterion 3
   No holes in the accessible sides up to a height of 2 m
- Acceptance criterion 4 Indicators do not ignite due to the effect of hot gases
- <u>Acceptance criterion 5</u>
   The enclosure remains connected to its earthing parts

#### Climate and ambient conditions

8DA/8DB indoor switchgear are highly insensitive to climate and ambient conditions due to the following features:

- Gas insulation of all highvoltage parts (no negative effects on the primary part of the switchgear)
- No cross-insulation of isolating distances from phase to phase
- Bearings in operating mechanisms are designed as dry bearings
- Operating mechanism parts which are functionally important are made of corrosionresistant materials
- Insensitive to ambient effects such as
- natural foreign bodies
- chemically active pollutants
- small animals and insects

## Standards

Degree of protection

IP 3XD

IP 65

### Standards, specifications, guidelines

#### Protection against solid foreign bodies, electric shock and water

8DA/8DB switchgear complies according to

IEC 60 694	VDE 0670-1000 EN 60 694
IEC 60 529	EN 60 529
IEC 62 271-200	VDE 0671-200

with the following degrees of protection:

Degree of protection	Type of protection
IP 3XD	for outer enclosure
IP 65	for all parts under high voltage
IP 31D (option)	for low-voltage compartment

See adjacent table for explanations about the degrees of protection

#### IEC 60 529 and EN 60 529:

Type of protection

#### Protection against solid foreign bodies

Protected against ingress of solid foreign bodies, diameter  $\ge 2.5$  mm (probe with diameter 2.5 mm must not ingress)

#### Protection against water No specification

### Protection against electric shock

Protected against access to hazardous parts with a wire (probe with diameter 1 mm, length 100 mm must be sufficiently clear of hazardous parts)

#### Protection against solid foreign bodies

Dust-tight: No ingress of dust Protection against electric shock

## Protected against access to hazardous parts with a wire

(probe with diameter 1 mm must not ingress)

#### Protection against water Protected against water jets;

water directed against the enclosure from any direction in the form of a jet must not have any harmful effect

### Protection against solid foreign bodies

Protected against ingress of solid foreign bodies, diameter  $\geq$  2.5 mm (probe with diameter 2.5 mm must not ingress)

#### Protection against water

Protected against dripping water (vertically falling drops must not have any harmful effect)

#### Protection against electric shock

Protected against access to hazardous parts with a wire (probe with diameter 1 mm, length 100 mm must be sufficiently clear of hazardous parts)

#### 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.

All product designations used are trademarks or product names of Siemens AG or other suppliers.

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

The information in this document contains general descriptions of the technical options available, which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract.

Some of the figures shown feature customer-specific constructions.

#### Responsible for

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![](_page_31_Picture_7.jpeg)

![](_page_31_Picture_8.jpeg)