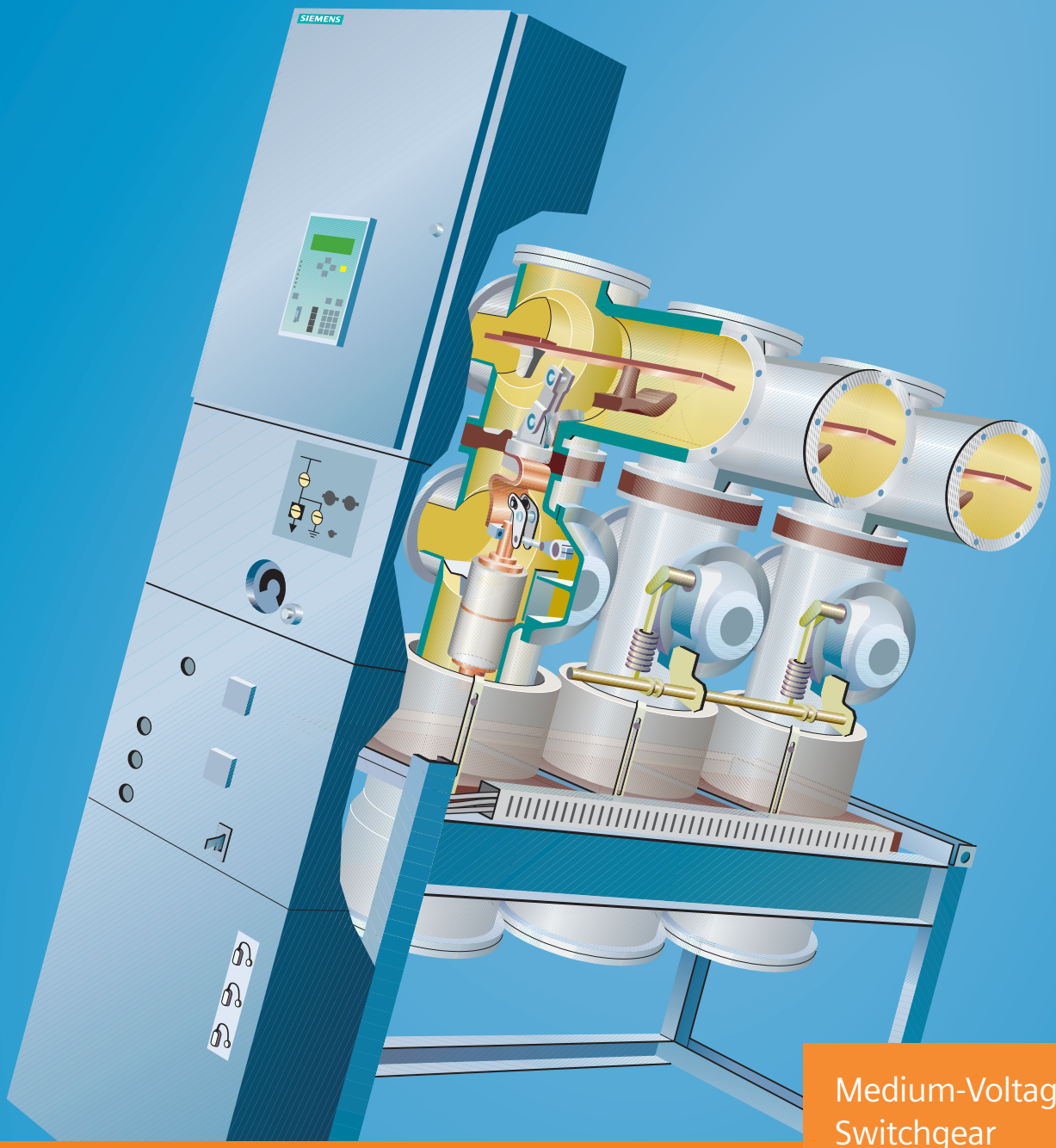


Fixed-Mounted Circuit-Breaker Switchgear Types 8DA and 8DB, up to 40.5 kV, SF_6-Insulated

Medium-Voltage Switchgear

Catalog HA 35.11
2003

Invalid:
Catalog HA 35.11 · 1996

SIEMENS

Contents

Application

Types

Fixed-mounted
circuit-breaker switchgear

- 8DA10 for single-busbar applications
- 8DA11/8DA12 (1-pole and 2-pole design) for traction power supply systems
- 8DB10 for double-busbar applications

are metal-enclosed, metal-clad and SF_6-insulated switchgear for indoor installation.

8DB10
panel
for double-busbar applications

8DA11/8DA12
panel
for traction power supply systems, 1-pole and 2-pole design
(example 8DA11)

8DA10
panel
for single-busbar applications

Application

Typical uses

R-HA35-090a eps

Application
Public power
supply system

R-HA35-101 eps

Application
Traction power
supply system

R-HA35-089 eps

8DA10 switchgear for single-busbar applications

R-HA35-088 eps

Application
Industry

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
- Hermetically tight to ingress of foreign bodies such as
  – dust
  – dirt
- Independent of site altitude

Compact design

Thanks to the SF_6-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

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 Part 1
  Option: Degree of protection IP31D for low-voltage compartment
- High resistance to internal arcs by logical mechanical interlocks and tested enclosure
- Arc-fault tested panels according to IEC 60 298 and VDE 0670 Part 6, Criteria 1 to 6
- 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
- Successfully tested for use down to -20° C
- 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 300,000 switchgear panels of Siemens in operation worldwide for many years

Technology

General

- Single-pole enclosure of primary conductors
- Insulating gas SF_6
- 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 inside-cone plug-in systems, or connection of solid-insulated or gas-insulated bars
- Wall-standing or free-standing arrangement
- Cable connection access from front or rear
- Extension of double-busbar switchgear 8DB10 (option: without interrupting operation of existing feeders)
- 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 Part 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

Technical Data

Electrical data, dimensions

Designation	8DA10 3-pole				8DB10 3-pole			
Rated values								
Rated voltage max. kV	12	24	36	40.5	12	24	36	40.5
frequency	50 Hz [1] →				50 Hz [1] →			
short-dur. power-frequency withst. volt. kV	28	50	70	85	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 kA →				max. 100 kA →			
peak withstand current	max. 100 kA →				max. 100 kA →			
normal current of busbar	max. 4000 A →				max. 4000 A →			
normal current of feeders	max. 2500 A →				max. 2500 A →			
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 →				220 →			
Depth T								
For all panel types	1625 →				2660 →			
Height H1								
Standard	2350 →				2350 →			
With high low-voltage compartment	2700 →				2700 →			
With make-proof busbar earthing switch	2700 →				2700 →			
Height H2								
Standard	1850 →				2100 →			
With make-proof busbar earthing switch	1960 →				2210 →			
With top-mounted bus sectionalizer	2320 →				2570 →			
Busbar fittings without disconnecting facility:								
With voltage transformer up to 24 kV	2220 →				2470 →			
With voltage transformer 36/40.5 kV	2390 →				2640 →			
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 [2]	1930 →				2180 →			
Busbar fittings with disconnecting facility:								
With voltage transformer up to 24 kV	2420 →				2670 →			
With voltage transformer 36/40.5 kV	2590 →				2840 →			
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 [2]	2130 →				2380 →			

Designation	8DA11/8DA12 1-/2-pole	
Rated values		
Rated voltage according to IEC 60 850 and EN 50 163 kV	15	25
insulation voltage max. kV	17.5	27.5
frequency Hz	16.7	50/60
short-duration power-frequency withstand voltage to earth kV	50	95
short-duration power-frequency withstand voltage across isolating distance kV	60	110
lightning impulse withstand voltage to earth kV	125	200
lightning impulse withstand voltage across isolating distance kV	145	220
short-circuit breaking current	max. 31.5 kA	
short-circuit making current	max. 80 kA	
normal current of busbar	max. 2500 A	
normal current of feeders	max. 2000 A	
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	

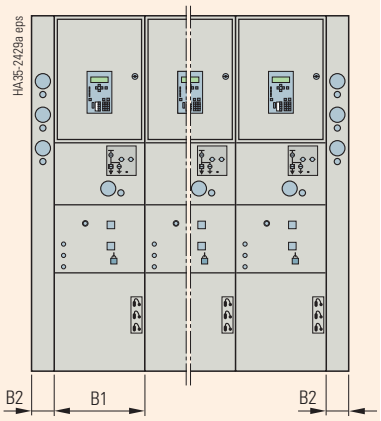
Footnotes for left-hand table column:

1) 60 Hz on request

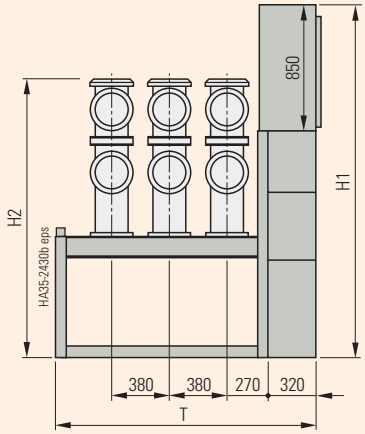
2) Dimensions must be co-ordinated with the bar supplier

Constructional data (see also dimension table on page 6)

8DA10 3-pole Single busbar

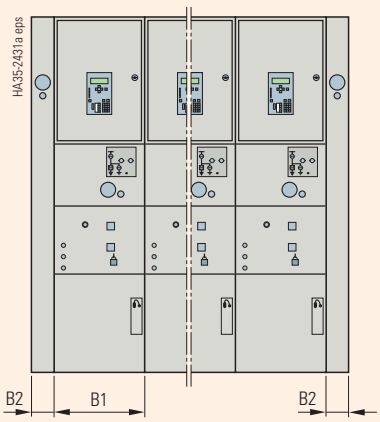


Front view

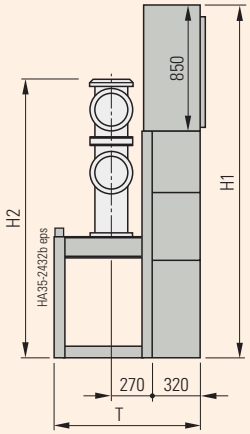


Side view

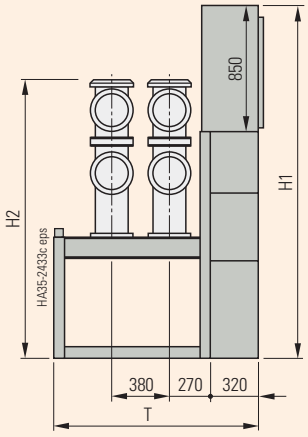
8DA11 1-pole, 8DA12 2-pole



Front view

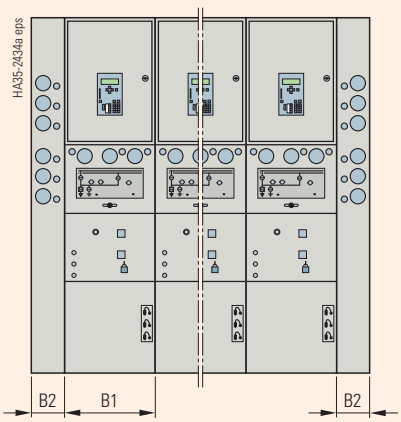


Side view
for 8DA11, 1-pole

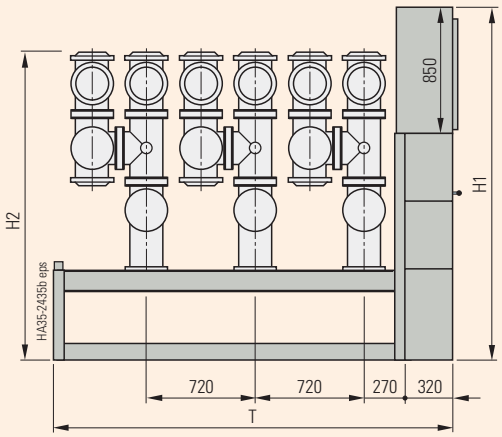


Side view
for 8DA12, 2-pole

8DB10 3-pole Double busbar



Front view

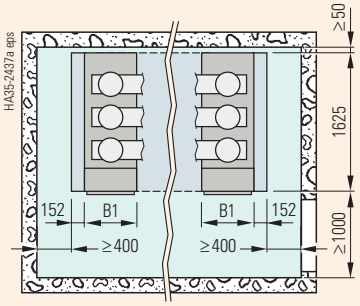


Side view

Technical Data

Room planning, floor openings and fixing points

8DA10 3-pole Single busbar

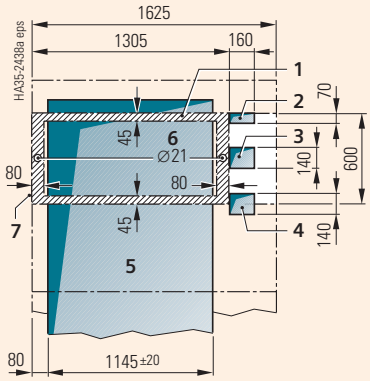


Room planning (dimension B1 see page 7)

Room height ≥ 2800 mm [1])

Door dimensions: dependent on
– the number of panels per transport unit and
– the transport dimensions (see page 9)

Net weight: approx. 580 kg per panel



Floor openings and fixing points

Floor openings

- Foundation as steel-reinforced concrete or steel structure with lower, adjustable support columns (false floor)
- Floor opening below each row of panels should be continuous

Fastening

Connection of the panel base frame to the foundation rails below the fixing holes:
– as bolted joints or
– welded design

Legend

1 Base frame

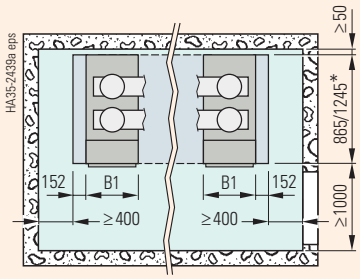
Floor opening for control cables:
2 For end panels
3 Central arrangement (standard)
4 Option

5 Floor opening for primary cables

6 Fixing hole in the base frame

7 Rear edge of base frame

8DA11 1-pole, 8DA12 2-pole



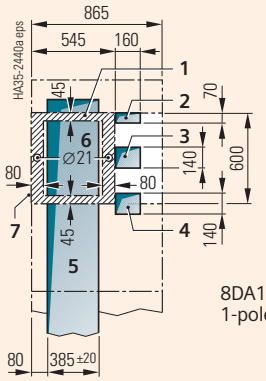
* 865 mm for 8DA11,
1245 mm for 8DA12

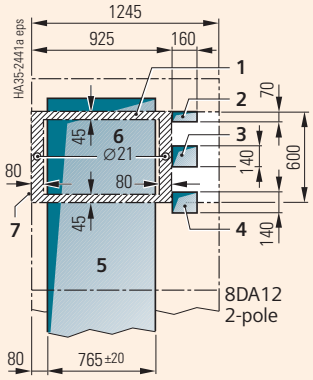
Room planning (dimension B1 see page 7)

Room height ≥ 2800 mm [1])

Door dimensions: dependent on
– the number of panels per transport unit and
– the transport dimensions (see page 9)

Net weight per panel:
– approx. 400 kg for 8DA11
– approx. 500 kg for 8DA12





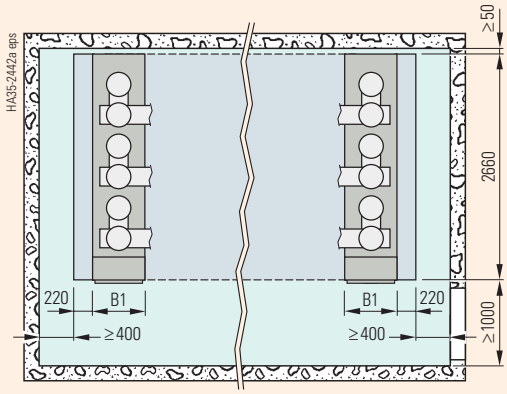
Floor openings and fixing points

Floor openings as per left-hand column

Fastening as per left-hand column

Legend as per left-hand column

8DB10 3-pole Double busbar

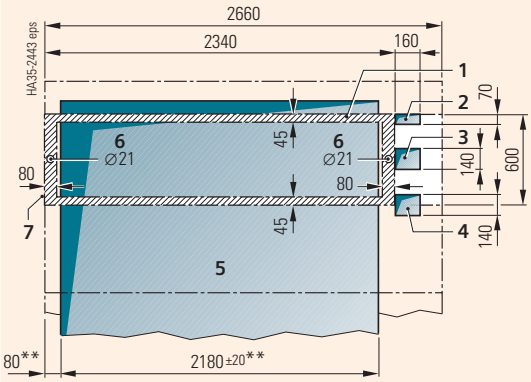


Room planning (dimension B1 see page 7)

Room height ≥ 2800 mm [1])

Door dimensions: dependent on
– the number of panels per transport unit and
– the transport dimensions (see page 9)

Net weight: approx. 1100 kg per panel



Floor openings and fixing points

Floor openings

- Foundation as steel-reinforced concrete or steel structure with lower, adjustable support columns (false floor)
- Floor opening below each row of panels should be continuous

Fastening

Connection of the panel base frame to the foundation rails below the fixing holes:
– as bolted joints or
– welded design

Legend

1 Base frame

Floor opening for control cables:
2 For end panels
3 Central arrangement (standard)
4 Option

5 Floor opening for primary cables

6 Fixing hole in the base frame

7 Rear edge of base frame

** Size of floor opening (5) may be reduced if the switchgear row is configured "without bus sectionalizers for connection in cable basement": Dimension 80 ** changes to 440 mm and dimension 2180** changes to 1820 mm

1) Dimension 2800 mm applies to standard panel height.
Room height with further busbar fittings = Actual panel height (see page 6) + 300 mm

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. 5
8DA11(1-pole) and 8DA12 (2-pole) panels for traction power supply systems in 1-pole or 2-pole applications	max. 5
8DB10 double-busbar panels	max. 3

Packing

Place of destination inside Germany or other European countries

- Method of transport: Rail and truck
- Type of packing:
  – panels on open pallets
  – open packing with PE protective foil

Place of destination overseas

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

* Pallet height thereof: 220 mm

Switchgear type	Panel type	Number of panels	Transport dimensions, volumes and weights						
			Length	Width	Height*	Floor area	Volume	Approx. weight Tare	Gross
			mm	mm	mm	m^2	m^3	kg	kg
Transport inside Germany or to other European countries									
8DA10, 3-pole single busbar	Intermediate panels or end panels with end wall on the right	1	1788	1488	2946	2.661	7.839	345	900
		2	1788	1638	2946	2.93	8.628	375	1500
		3	2388	1788	2946	4.270	12.578	470	2200
		4	2988	1788	2946	5.343	15.740	560	2900
		5	3588	1788	2946	6.415	18.899	650	3600
	End panels with end wall on the left	1	1788	1488	2946	2.661	7.839	345	900
		2	1788	1788	2946	3.197	9.418	375	1500
		3	2388	1788	2946	4.270	12.579	470	2200
		4	2988	1788	2946	5.343	15.740	560	2900
		5	3588	1788	2946	6.415	18.899	650	3600
8DB10, 3-pole double busbar	Intermediate panels or end panels with end wall on the right	1	3098	1488	3061	4.610	14.111	386	1500
		2	3098	1668	3061	5.167	15.818	411	2600
		3	3098	2268	3061	7.026	21.507	516	3900
	End panels with end wall on the left	1	3098	1488	3061	4.610	14.111	386	1500
		2	3098	1862	3061	5.768	17.657	462	2700
		3	3098	2462	3061	7.627	23.347	542	3900
Transport overseas									
8DA10, 3-pole single busbar	Intermediate panels or end panels with end wall on the right	1	1766	1466	2966	2.589	7.679	525	1100
		2	1766	1616	2966	2.854	8.465	555	1700
		3	2366	1766	2966	4.178	12.392	700	2500
		4	2966	1766	2966	5.238	15.536	825	3200
		5	3566	1766	2966	6.298	18.680	955	3900
	End panels with end wall on the left	1	1766	1466	2966	2.589	7.679	525	1100
		2	1766	1766	2966	3.119	9.251	580	1800
		3	2366	1766	2966	4.178	12.392	700	2500
		4	2966	1766	2966	5.238	15.536	825	3200
		5	3566	1766	2966	6.298	18.680	955	3900
8DB10, 3-pole double busbar	Intermediate panels or end panels with end wall on the right	1	3076	1466	3134	4.509	14.133	492	1600
		2	3076	1646	3134	5.063	15.868	554	2800
		3	3076	2246	3134	6.909	21.652	764	4100
	End panels with end wall on the left	1	3076	1466	3134	4.509	14.133	492	1600
		2	3076	1840	3134	5.660	17.738	623	2800
		3	3076	2440	3134	7.505	23.522	804	4100

Product Range

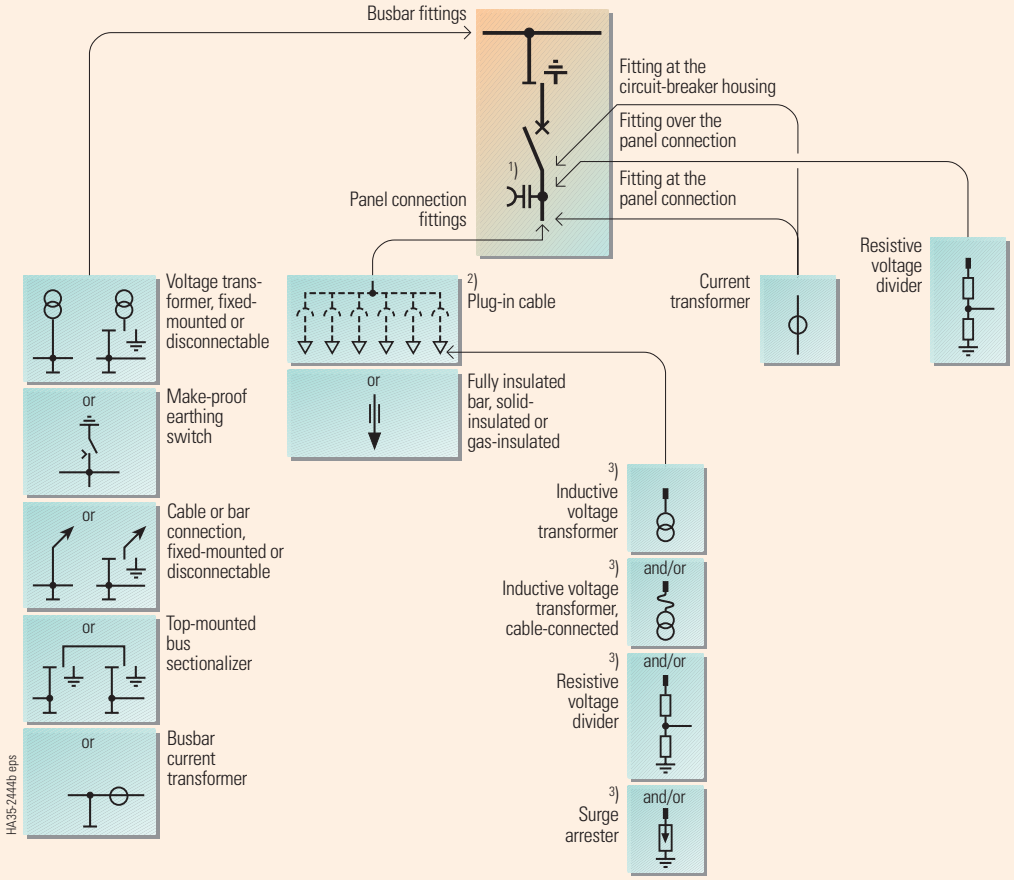
Single-busbar panels 8DA10, 3-pole (8DA11, 1-pole and 8DA12, 2-pole panels, on request)

Circuit-breaker panel

1) Capacitive voltage detection system

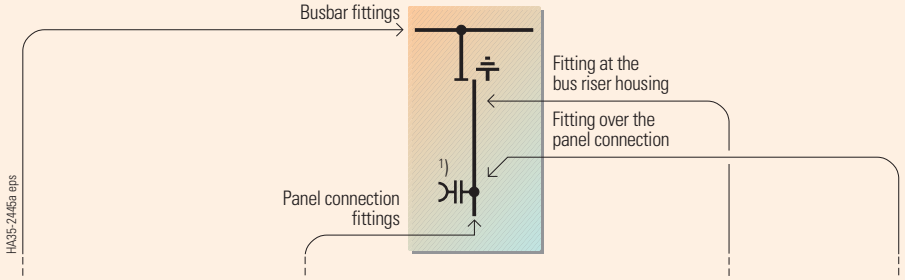
2) – For plug-in cable connection with inside cone according to EN 50 181
– Max. 6 connections possible per phase according to the plug size

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



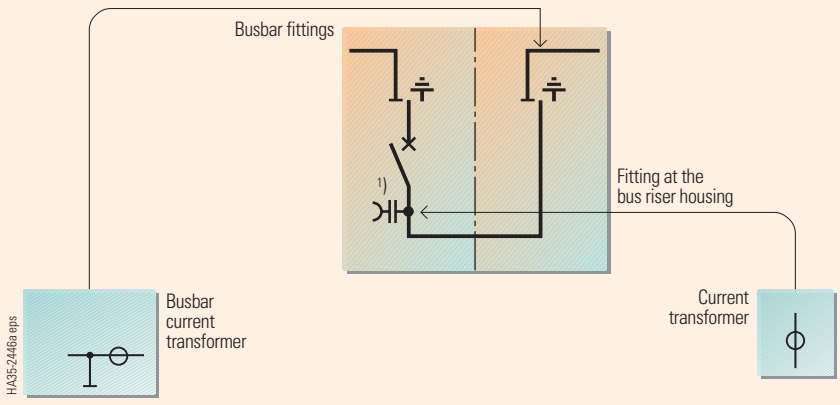
Disconnector panel

Same fittings and connections as for circuit-breaker panel

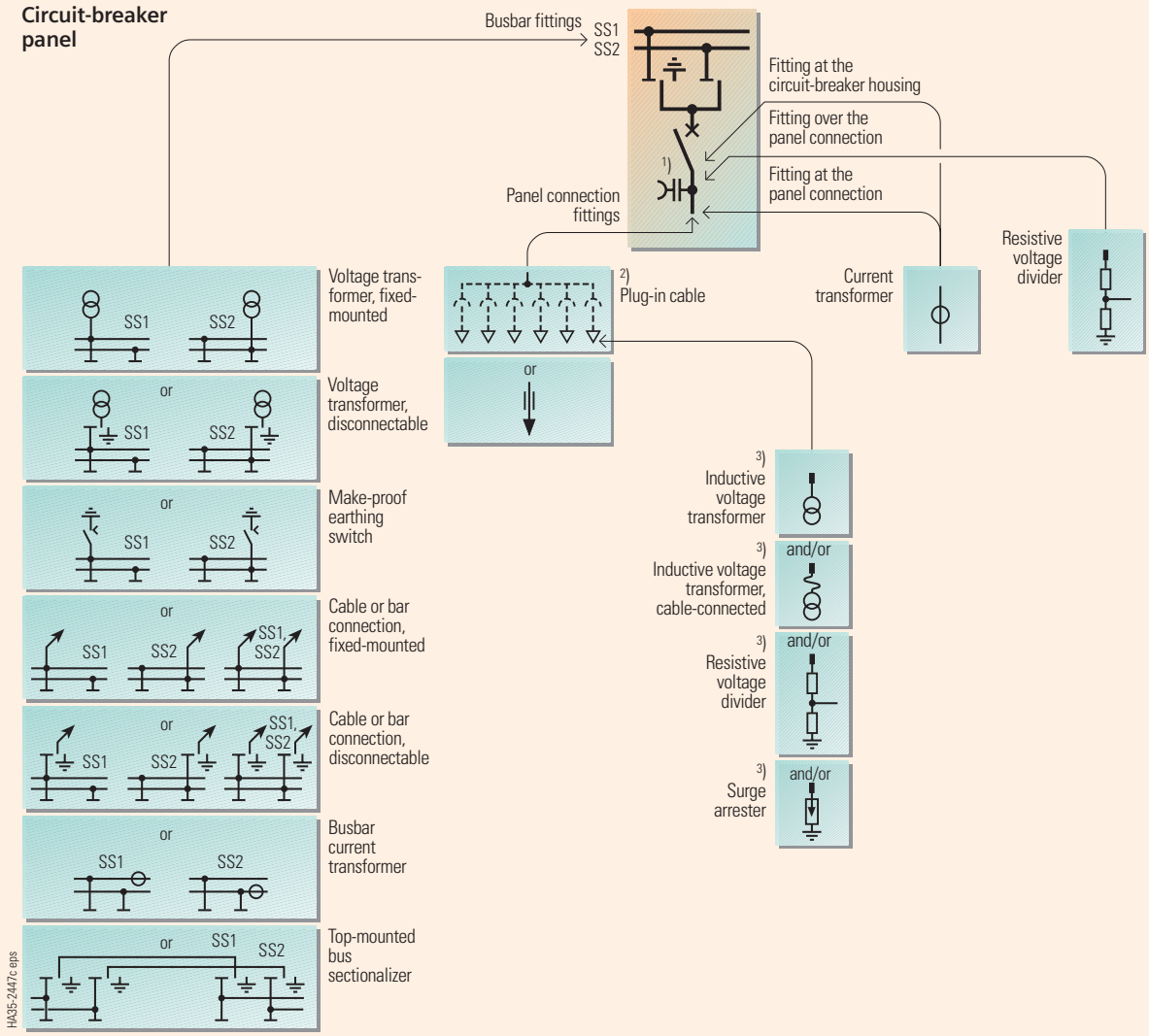


Bus sectionalizer

Consisting of 2 panels (circuit-breaker arranged in left-hand or right-hand panel optionally)



Double-busbar panels 8DB10, 3-pole



Abbreviations:

SS1 = Busbar 1
SS2 = Busbar 2

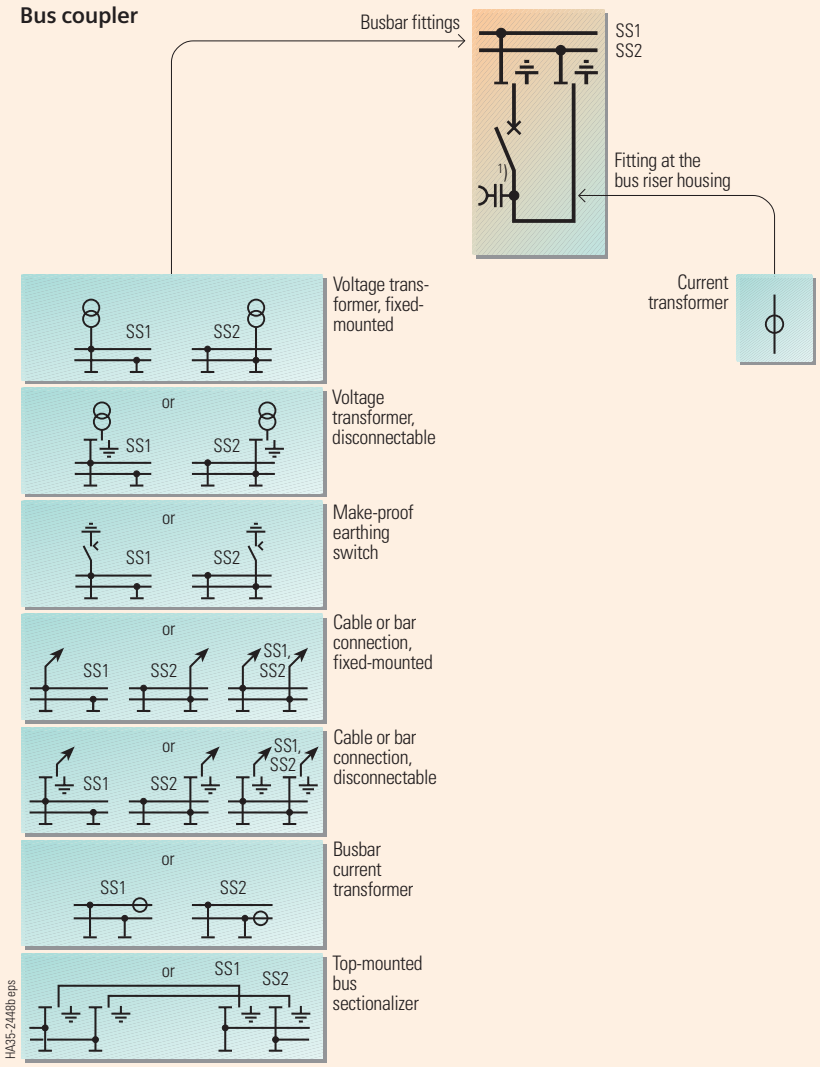
1) Capacitive voltage detection system

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

Product Range

Double-busbar panels 8DB10, 3-pole



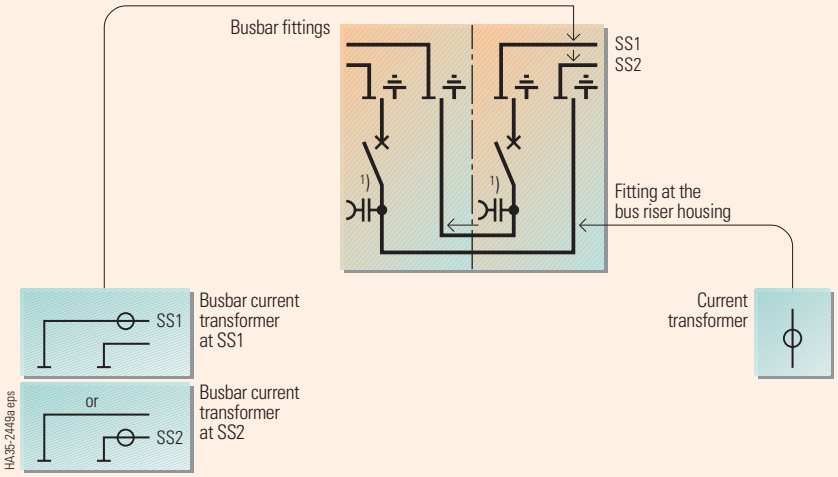
Abbreviations:

SS1 = Busbar 1
SS2 = Busbar 2

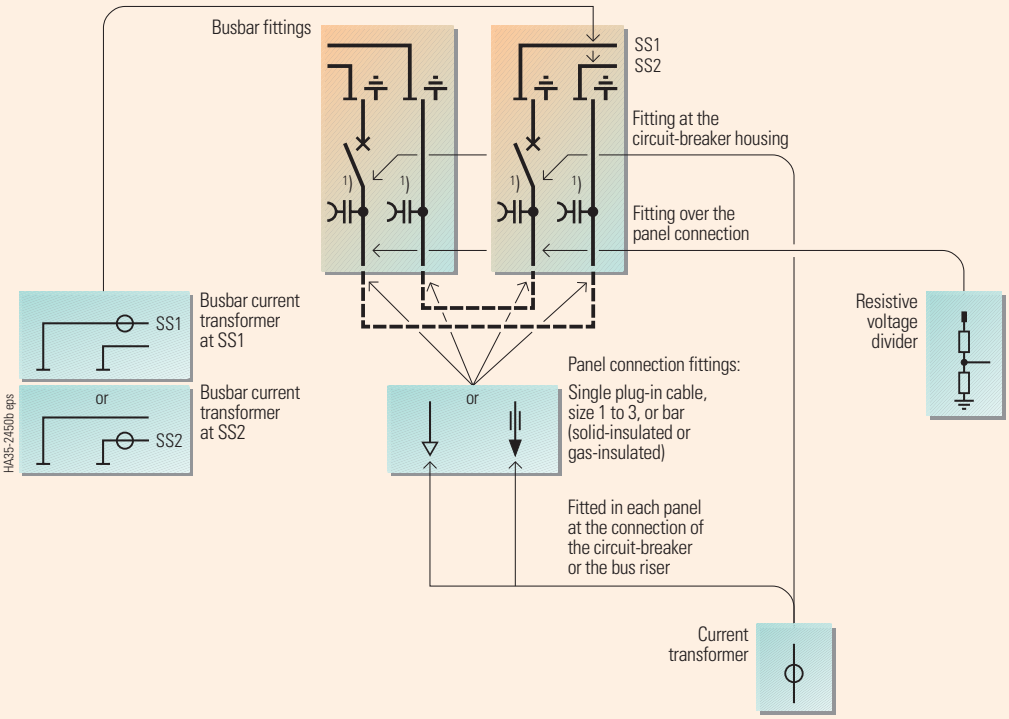
1) Capacitive voltage detection system

Double-busbar panels 8DB10, 3-pole

Bus sectionalizer for busbar 1 and 2
Consisting of 2 joined panels



Bus sectionalizer for connection in cable basement
Consisting of 2 separate panels



Abbreviations:

SS1 = Busbar 1
SS2 = Busbar 2

1) Capacitive voltage detection system

Design

Basic panel design

Panel

- Single-pole metal-enclosed
- Metal-clad
- Basic construction of cast-aluminium housings

Insulating system

- Panel housings filled with SF_6-gas
- Features of SF_6-gas:
  – non-toxic
  – odourless and colourless
  – non-inflammable
  – inert
  – heavier than air
  – electronegative (high-quality insulator)
- Overpressure of SF_6-gas in the panel housings:
  – normally 50 kPa up to 100 kPa (depending on insulation level and rated normal current)
  – design pressure_____180 kPa
  – design pressure of SF_6-gas_____80 °C
  – operating pressure of rupture diaphragm_____≥ 300 kPa
  – bursting pressure_≥ 600 kPa

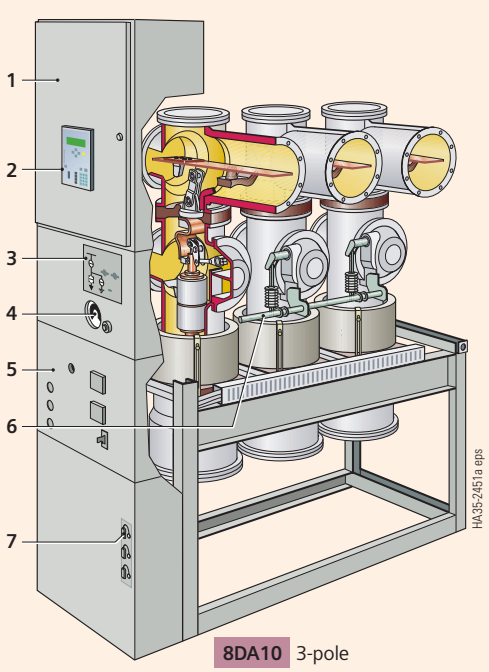
Panel pole

- 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 containing 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

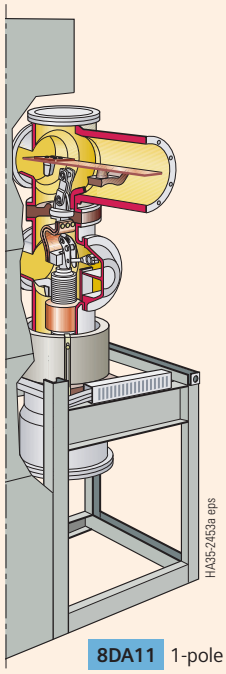
See page 28.

Panel design (examples)

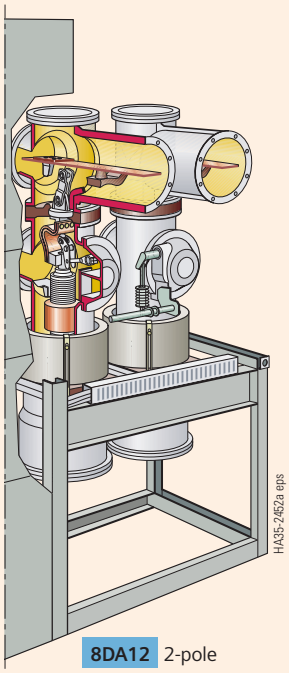


8DA10 3-pole

Single-busbar panel

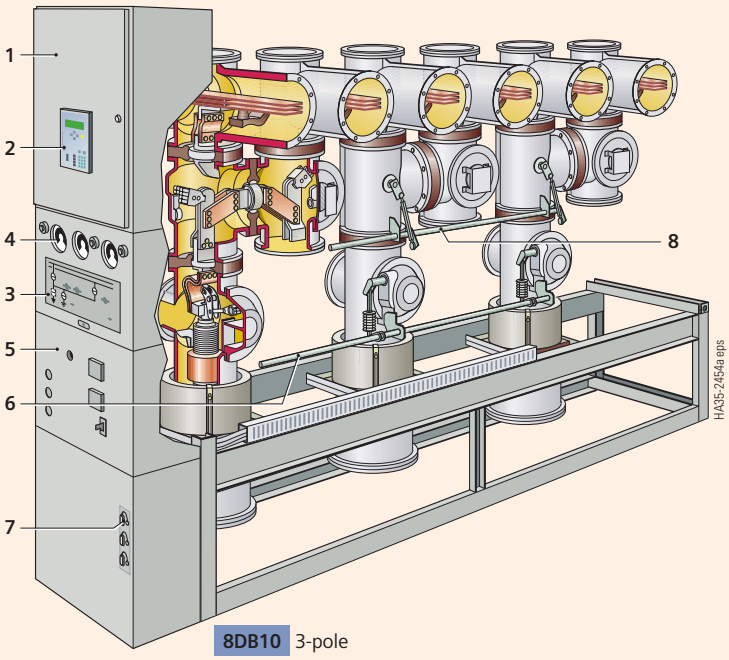


8DA11 1-pole



8DA12 2-pole

Panels for traction power supply systems



8DB10 3-pole

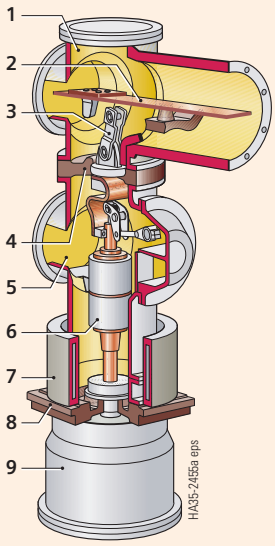
Double-busbar panel

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

1 Low-voltage compartment
2 Electronic control board, e.g. multi-function 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 three-position disconnector

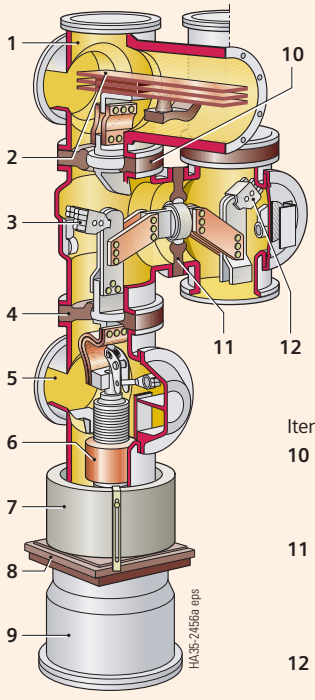
Basic panel design

Single-pole design



Single busbar

1 Busbar housing
2 Busbar
3 Three-position disconnector
4 Gas-tight bushing between three-position disconnector and circuit-breaker
5 Circuit-breaker housing
6 Vacuum interrupter
7 Current transformer
8 Pole supporting plate
9 Panel connection



Double busbar

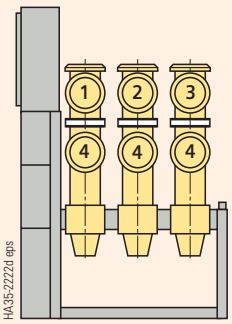
Items **1** to **9** as above
10 Gas-tight bushing between three-position disconnector or disconnector and busbar
11 Gas-tight bushing between three-position disconnector (busbar 1) and disconnector (busbar 2)
12 Busbar disconnector for busbar system 2

Gas compartment principle

- Optimal availability regarding
  – 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 compartment mounted in one end wall
- Operation 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
- If voltage transformers are mounted on the busbar: SF_6-pressure is monitored by means of a manometer at the panel front
- Pressure monitoring via manometers in connection with alarm contacts to signal any increase or drop in pressure
- Leakage rate per gas compartment < 0.5% per annum due to appropriately designed seals:
  – ratings according to IEC 60 298 resp. VDE 0670 Part 6 remain unchanged after more than 20 years of operation
  – during this time, no refilling of SF_6-gas will be necessary

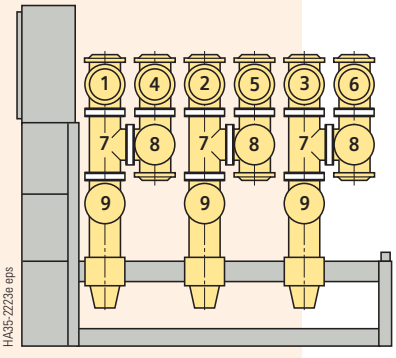
Arrangement of gas compartments

1 Busbar: L1
2 Busbar: L2
3 Busbar: L3
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

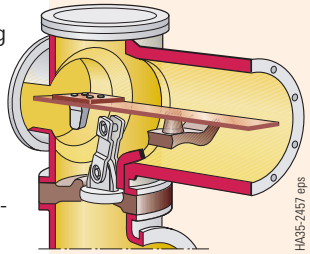
Components

Busbars

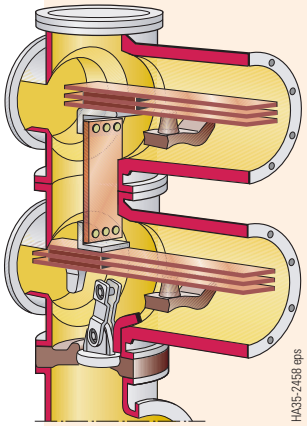
Features

- 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 short-circuit 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
- 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



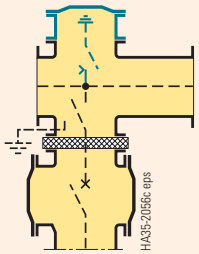
up to 2500 A



up to 4000 A
(busbar housing in tandem design)

Busbar housings with flat conductor, cross-insulator and three-position disconnector

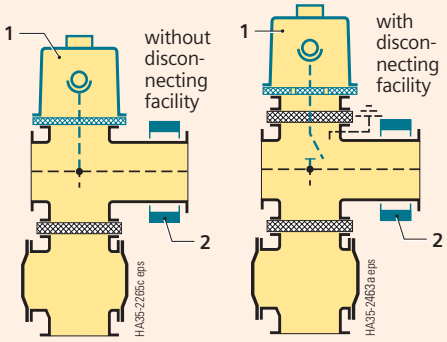
Busbar fittings
(sectional front views)



Make-proof busbar earthing switch

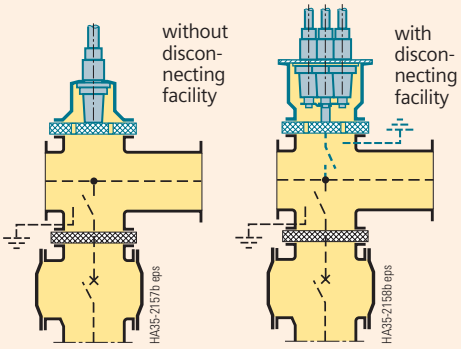
- For single-busbar switchgear without bus sectionalizer
- For double-busbar switchgear without bus sectionalizer and bus coupler

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.



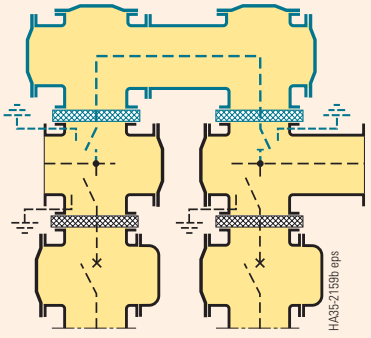
Busbar voltage and current transformers

1 Voltage transformer
2 Current transformer



Busbar connection

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



Top-mounted bus sectionalizer

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

Three-position disconnector

Features

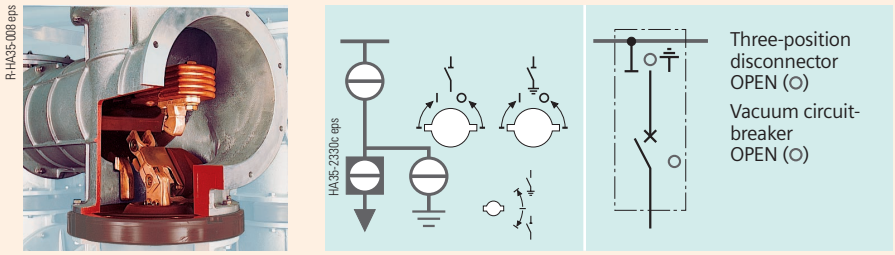
- Rated normal currents up to 2500 A
- Up to 2000 operating cycles (3000 operating cycles for 8DA11/8DA12 switchgear)
- Compact design due to short contact gaps in SF_6-gas
- Operating shaft and contact blades with common centre of rotation and reliable switch position up to the control board of the panel
- Maintenance-free
- Three switch positions
  – CLOSED: Contact blades connected with the busbars: Main circuit closed between busbar and circuit-breaker
  – OPEN: Main circuit open between busbar and circuit-breaker: Test voltages for isolating distances are withstood
  – READY-TO-EARTH: 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 circuit-breaker housings can be removed without interrupting busbar operation

Operating mechanism

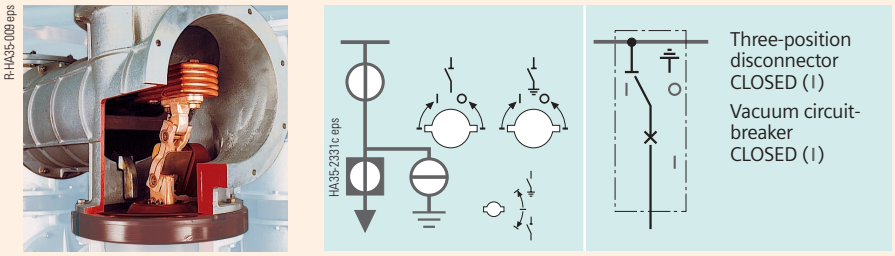
- Only permissible operations possible due to logical mechanical interlocks
- Switch position indication via mechanically coupled flags
- Separate operating shafts for the "Disconnecting" and "Ready-to-earth" functions
- Basically available with manual or motor operating mechanism
- Same sense of rotation 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

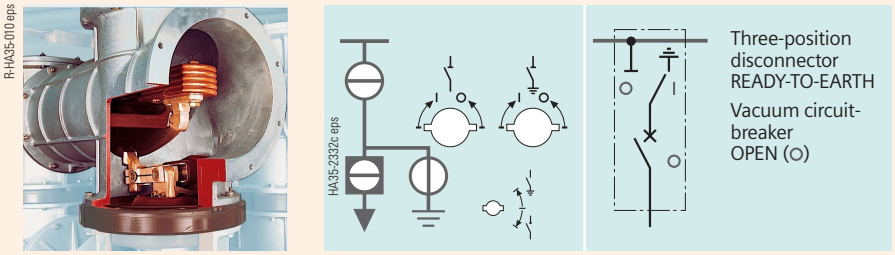
Switch position indications
for three-position disconnector and vacuum circuit-breaker



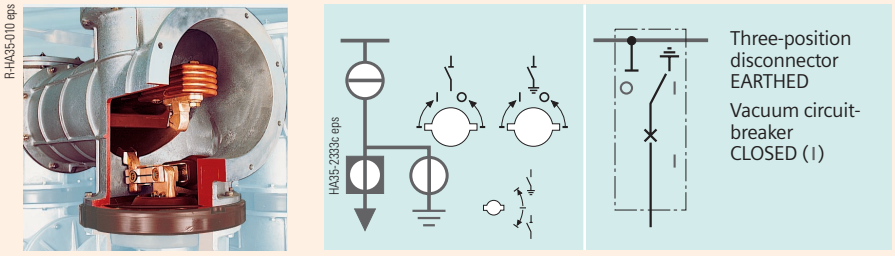
Feeder OFF



Feeder ON



Feeder READY-TO-EARTH



Feeder EARTHED

Electrical data for three-position disconnector and disconnector

Power consumption and protection of the motor

Rated voltage		Rating	M.c.b. with G-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

Power consumption and protection 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

Components

Vacuum circuit-breaker

Features

- Maintenance-free vacuum interrupters in SF_6-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

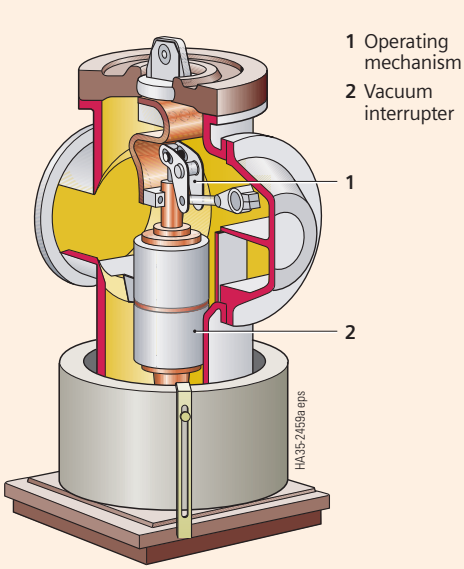
- Operating mechanism
  – maintenance-free up to 10,000 operating cycles, without time limitation under normal operating conditions
  – service life of 30,000 operating cycles
- Vacuum interrupters
  – maintenance-free
  – mechanical service life of 30,000 operating cycles
  – electrical service life dependent on breaking current (see opposite characteristics)

Other technical data

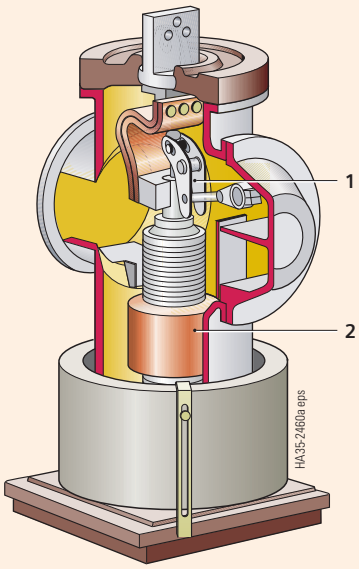
- Switching times
- Power consumption and tripping ranges of releases
- Power consumption and rated currents for short-circuit protection of spring-charging motor operating mechanism

See page 19.

Circuit-breaker housing

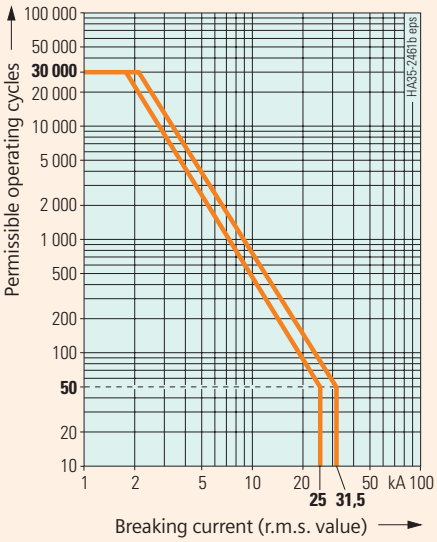


31.5 kA (example)

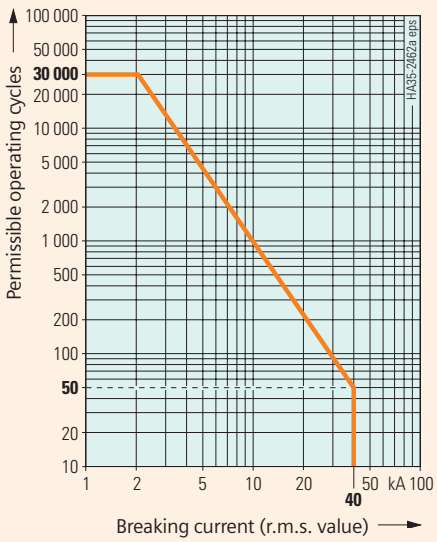


40 kA (example)

Electrical service life



Vacuum circuit-breaker 25 and 31.5 kA, 50 Hz



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]	< 65 ms	1st shunt release
	< 50 ms	2nd and 3rd release
	< 25 ms	Option: instantaneous release for 8DA11
Arcing time at 50 Hz	< 15 ms	–
Breaking time	< 80 ms	1st shunt release
	< 65 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 tripping signal	> 15 ms	1st shunt release
	> 10 ms	2nd and 3rd release
Charging time with elec. operation	< 15 s	–
Synchronism error between poles	2 ms	–

Power consumption and tripping ranges of releases

Rated voltage of operating mechanism		Operating voltage max.	Operating voltage min.	Power consumption of motor	Smallest possible rated current of m.c.b. with G-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 rated currents for short-circuit protection of motors

Release	Order No. of release	Power consumption Operation at DC	Power consumption Operation at 50/60 Hz AC	Tripping ranges Tripping voltage at DC	Tripping ranges Tripping voltage or current 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 % *U*	85 up to 110 % *U*
2nd shunt release (with energy store)	3AX11 01	60 W	55 VA	70 up to 110 % *U*	85 up to 110 % *U*
Undervoltage release	3AX11 03	13 W	15 VA	35 up to 0 % *U*	35 up to 0 % *U*

1) Shorter switching times on request

Components

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 Part 1
- Certifiable

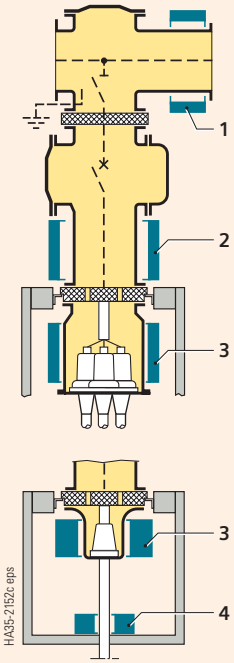
Mounting locations

- At the busbar (1):
  Inside diameter of transformer 300 mm, max. overall height 160 mm
- At the circuit-breaker housing (2):
  Inside diameter of transformer 300 mm, max. overall height 214 mm
  (for 36 kV: max. 294 mm)
- At the panel connection (3):

– with single connection up to interface type 2:
  Inside diameter of transformer 180 mm and outside diameter of transformer 290 mm, max. overall height 160 mm;
  Inside diameter of transformer 180 mm and outside diameter of transformer 376 mm,
  max. overall height 214 mm
– with single connection for interface type 3:
  Inside diameter of transformer 300 mm, max. overall height 160 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

- On the cable (cable-type current transformer) (4)
  Inside diameter of transformer 140 mm

Mounting locations for ring-core current transformers



1 Mounted on the busbar

2 Mounted on the circuit-breaker housing

3 Mounted on the panel connection (not possible for
– 2 or 3 cables per phase, interface type 2, 3 or 4
– 4 or 5 cables per phase, interface type 2 or 3
– directly plugged in voltage transformers)

4 Mounted on the cable

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_n
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 core	Rating Class Overcurrent factor	2.5 up to 10 VA 0.2 up to 1 FS10
Protection core	Rating 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 Part 1

Voltage transformers

Common features

- Cast-resin insulated
- Safe-to-touch due to metal enclosure or installation in a separate SF_6-gas compartment

Mounting locations

- At the busbar, in a separate SF_6-gas compartment, 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

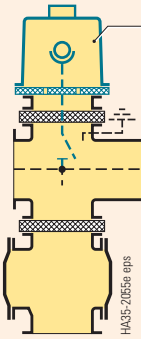
Inductive voltage transformers

- According to IEC 60 044-2 and VDE 0414 Part 2
- Certifiable

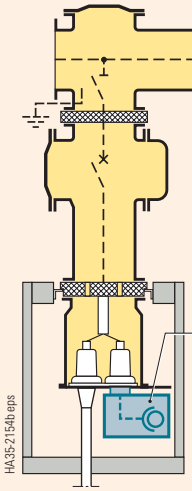
Low-power voltage transducers as resistor dividers

- 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



1 Mounted on the busbar in a separate SF_6-gas compartment, directly connected or disconnectable through a three-position disconnector (figure)



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

Technical data for inductive voltage transformers

Operating voltage	max. kV	12	24	36
Common data for inductive voltage transformers				
Primary voltage	kV	$3.3/\sqrt{3}$ $3.6/\sqrt{3}$ $4.8/\sqrt{3}$ $5.0/\sqrt{3}$ $6.0/\sqrt{3}$ $6.6/\sqrt{3}$ $7.2/\sqrt{3}$ $10.0/\sqrt{3}$ $11.0/\sqrt{3}$	$13.8/\sqrt{3}$ $15.0/\sqrt{3}$ $17.5/\sqrt{3}$ $20.0/\sqrt{3}$ $22.0/\sqrt{3}$	$25.0/\sqrt{3}$ $25.8/\sqrt{3}$ $30.0/\sqrt{3}$ $33.0/\sqrt{3}$ $34.5/\sqrt{3}$ $35.0/\sqrt{3}$
Secondary voltage	V	$100/\sqrt{3}$ $110/\sqrt{3}$	$100/\sqrt{3}$ $110/\sqrt{3}$	$100/\sqrt{3}$ $110/\sqrt{3}$
Busbar voltage transformer				
Type		4MT42	4MT44	4MT46
Auxiliary winding for earth-fault detection	V	100/3 110/3	100/3 110/3	100/3 110/3
Secondary, thermal limit current of measuring winding	A	8 (9 *)	8 (9 *)	13
Rated voltage factor U_N/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	30/90/200	30/90/200	30/90/200
Voltage transformer, directly plugged in				
Type		4MT72	4MT74	4MT76
Auxiliary winding for earth-fault detection	V	100/3 110/3	100/3 110/3	100/3 110/3
Secondary, thermal limit current of measuring winding	A	7	7	6
Rated voltage factor U_N/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				
Type		GBE12	GBE24	GBE36
Auxiliary winding for earth-fault detection	V	100/3 110/3	100/3 110/3	100/3 110/3
Secondary, thermal limit current of measuring winding	A	7 (10 *)	7 (10 *)	10
Rated voltage factor U_N/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

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	$3.25\ V/\sqrt{3}$
Accuracy	0.2 up to 0.5
Permissible ambient temperature	max. 60 °C
Insulation class	E

* On request

Components

Panel connection

Features

- Fully insulated
- For inside-cone plug-in system according to DIN EN 50 181
- For interface types 2, 3 and 4
- Interface types depending on cable cross-section and rated voltage:

Interface type [1]	Cable cross-section
Rated voltage 12 kV	
2 3	≤ 300 mm² 400 up to 630 mm²
Rated voltage 24 kV	
2 3	≤ 300 mm² 400 up to 630 mm²
Rated voltage 36 kV	
2 3 4	≤ 185 mm² ≤ 500 mm² ≤ 1250 mm²

The cross-section data are reference values; the respective cable cross-sections must be inquired of the corresponding manufacturers

- Single and multiple connections possible per phase, see connection drawings
- Multiple connections available with different interface types
- Solid-insulated or gas-insulated 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

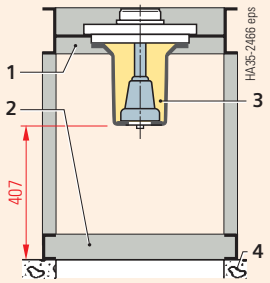
Cable testing is possible through an inside-cone socket by means of a test unit.

Legend (pages 22 and 23)
1 Upper part of subframe
2 Lower part of subframe
3 SF_6-insulation
4 Floor of switchgear room

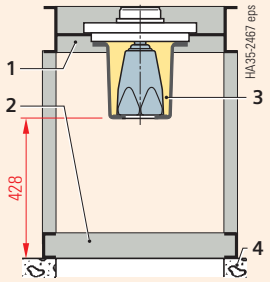
1) Interface type 2 for rated lightning impulse withstand voltage ≤185 kV

Panel connection for plug-in cables (possible versions)

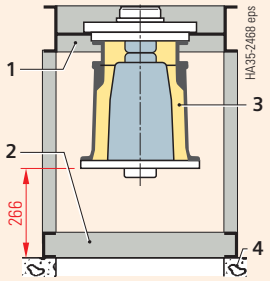
8DA10 **8DA11/8DA12**



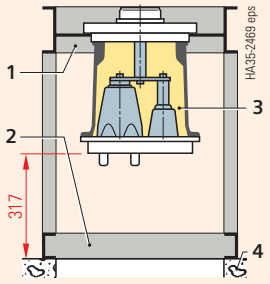
Number of cables	For interface type
1x	2



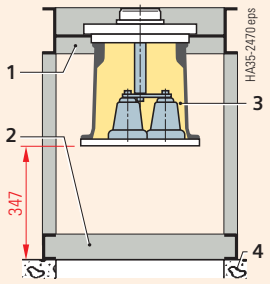
Number of cables	For interface type
1x	3



Number of cables	For interface type
1x	4

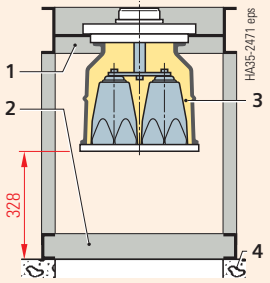


Number of cables	For interface type
1x and 1x	2 3



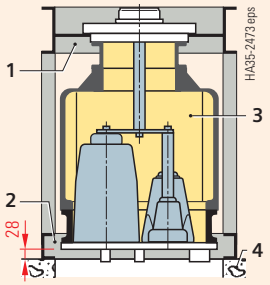
Number of cables	For interface type
2x	2
3x	3

Example: 2x interface type 2



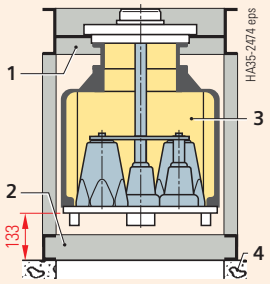
Number of cables	For interface type
2x	3
3x	3
2x and 1x	3 2
1x and 1x	3 2

Example: 2x interface type 3



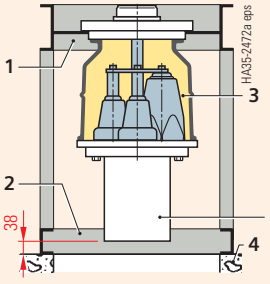
Number of cables	For interface type
1x and 1x and 1x	2 3 4
2x and 1x	2 4
1x and 1x	2 4
2x and 1x	3 4
1x and 1x	3 4
2x	4

Example:
1x interface type 2 and
1x interface type 3 and
1x interface type 4



Number of cables	For interface type
6x	2
5x	2
4x	2
4x and 1x	2 3
3x and 1x	2 3
3x and 2x	2 3
2x and 2x	2 3
2x and 3x	2 3
1x and 3x	2 3
1x and 4x	2 3
4x	3

Example:
2x interface type 2 and
3x interface type 3



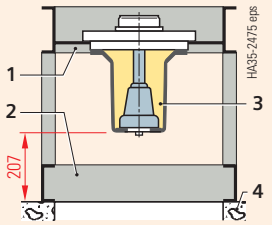
Number of cables	For interface type
2x	2
2x	3
1x and 1x	2 3

With plug-in voltage transformer

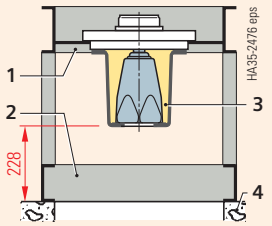
Example: 2x interface type 2

Panel connection

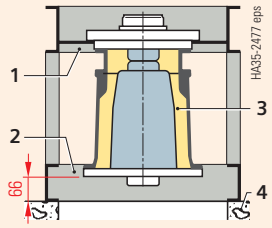
8DB10



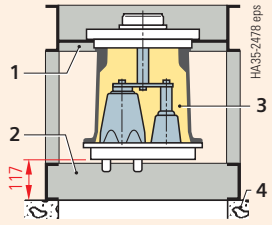
Number of cables	For interface type
1x	2



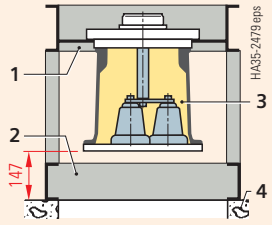
Number of cables	For interface type
1x	3



Number of cables	For interface type
1x	4

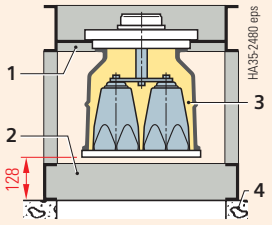


Number of cables	For interface type
1x	2
and 1x	3



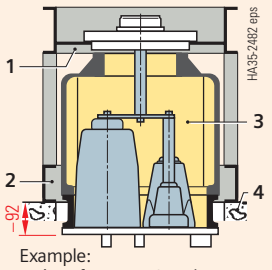
Example: 2x interface type 2

Number of cables	For interface type
2x	2
3x	3



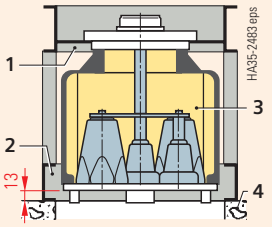
Example: 2x interface type 3

Number of cables	For interface type
2x	3
3x	3
2x and 1x	3 2
1x and 1x	3 2



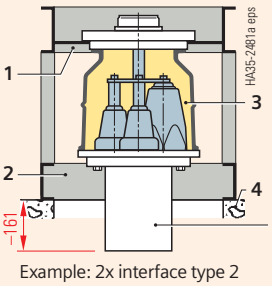
Example:
1x interface type 2 and
1x interface type 3 and
1x interface type 4

Number of cables	For interface type
1x and 1x and 1x	2 3 4
2x and 1x	2 4
1x and 1x	2 4
2x and 1x	3 4
1x and 1x	3 4
2x	4



Example:
2x interface type 2 and
3x interface type 3

Number of cables	For interface type
6x	2
5x	2
4x	2
4x and 1x	2 3
3x and 1x	2 3
3x and 2x	2 3
2x and 2x	2 3
2x and 3x	2 3
1x and 3x	2 3
1x and 4x	2 3
4x	3



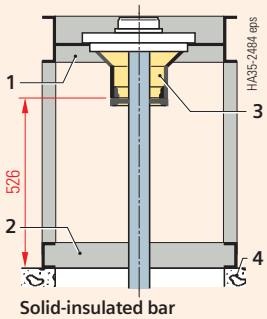
With plug-in voltage transformer

Example: 2x interface type 2

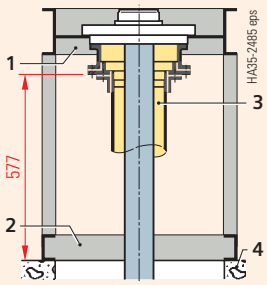
Number of cables	For interface type
2x	2
2x	3
1x and 1x	2 3

Panel connection for bar

8DA10 8DA11/8DA12

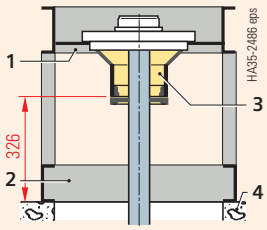


Solid-insulated bar
for rated normal currents
up to 2500 A

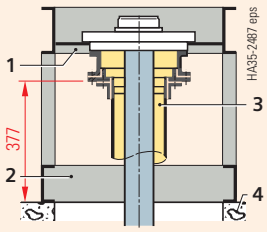


Gas-insulated bar
for rated normal currents
up to 2500 A

8DB10



Solid-insulated bar
for rated normal currents
up to 2500 A



Gas-insulated bar
for rated normal currents
up to 2500 A

Components

Control board

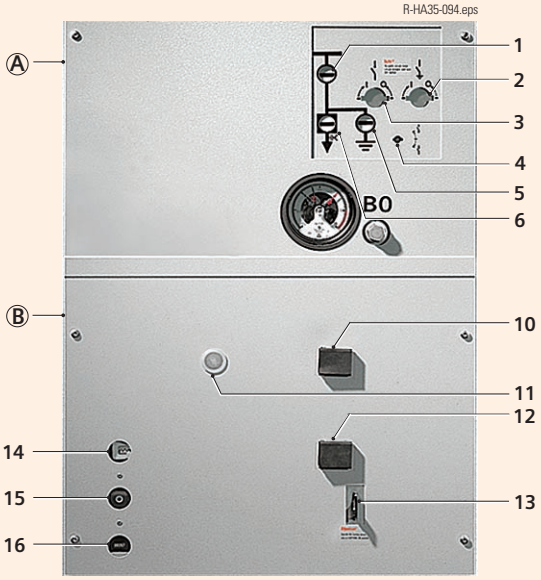
Features

- Mechanical control board located below the low-voltage 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

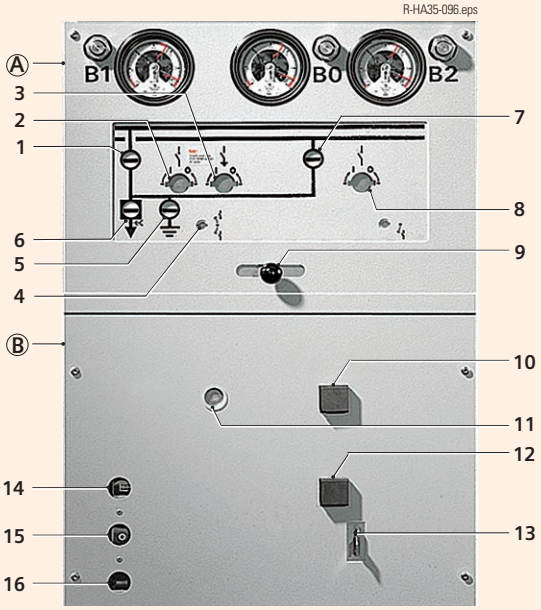
Logical mechanical interlocks

- Internal panel interlocks are of the mechanical type
- Operation of three-position disconnector (disconnecting and earthing function) interlocked with vacuum circuit-breaker in both directions
- Selector key (4) opens or locks the actuating openings for the disconnecting (3) and earthing function (2) in accordance with the circuit-breaker position
- Actuating openings (2 and 3) cannot be opened with the selector key (4) 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

Operating mechanism for the three-position disconnector and the vacuum circuit-breaker



Control board for single-busbar panel 8DA10



Control board for 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 key 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 double-busbar switchgear

Ⓑ Operating mechanism for vacuum circuit-breaker:

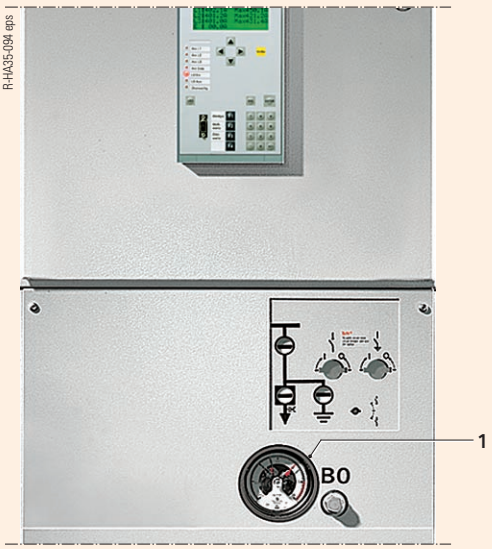
10 Mechanical ON pushbutton for vacuum circuit-breaker
11 Actuating opening for manual charging of the circuit-breaker operating spring
12 Mechanical OFF pushbutton for vacuum circuit-breaker
13 Lever for locking the vacuum circuit-breaker against de-earthing
14 Spring charged indicator
15 Switch position indicator CLOSED/OPEN for vacuum circuit-breaker
16 Operating cycle counter for vacuum circuit-breaker

Indicating and measuring equipment

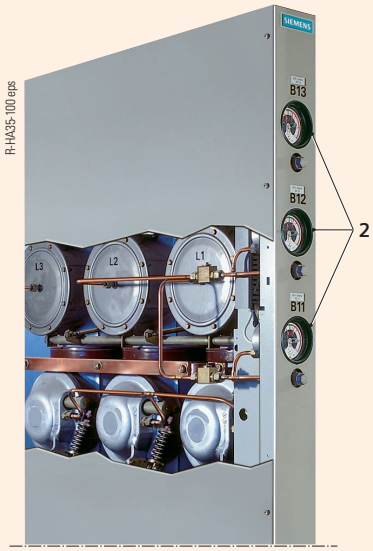
Gas monitoring

- 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_6-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
  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)

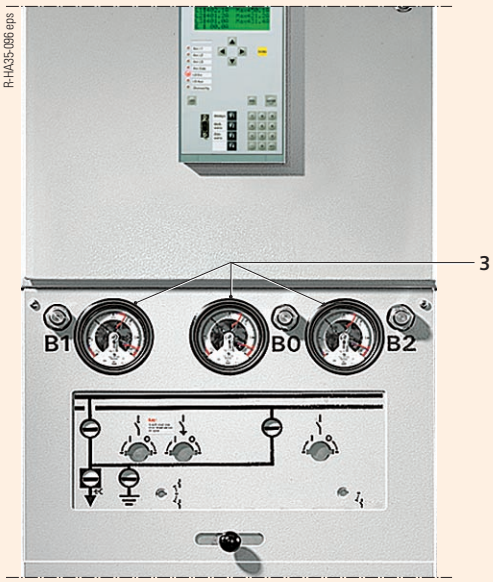


Manometer (1) for circuit-breaker poles
mounted on the panel front

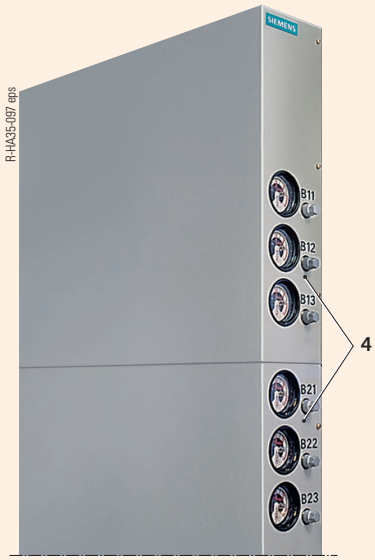


Manometer (2) for busbar phases
mounted in the lateral end wall (side cover open)

Gas monitoring for 8DB switchgear
(for double-busbar switchgear)



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



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

Components

Indicating and measuring equipment

Voltage detection systems

- To verify safe isolation from supply
- Detection systems (option):
– LRM system
– CAPDIS
– CAPDIS S1

LRM system

- With voltage indicator according to IEC 61 243-5 and VDE 0682 Part 415
- Verification of safe isolation from supply phase by phase by inserting the indicator in each socket pair
- Indicator suitable for continuous operation
- Safe-to-touch
- Routine-tested
- Measuring system and voltage indicator can be tested
- Voltage indicator flashes if high voltage is present

CAPDIS

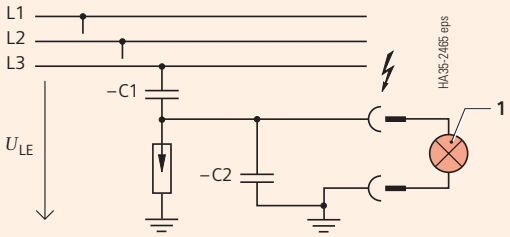
- Voltage detection system according to VDE 0682 Part 415
- Three-phase display
- Reliable indication of
– voltage state of switchgear
– isolation from supply by active zero indication
– error
- With integrated signalling relay for
– voltage present
– voltage not present
– error
- Self-testing, therefore repeated testing - as demanded in the standards - is not required
- Additional test sockets for phase comparison with an LRM phase comparison test unit

CAPDIS S1

Same design as CAPDIS voltage detection system, but:

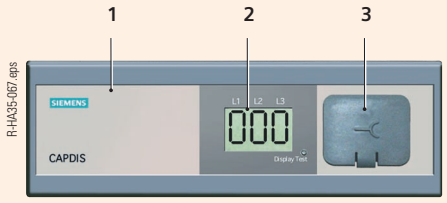
- Without active zero indication and without signalling relay
- Auxiliary voltage not required

Voltage indicator
pluggable per phase at the panel front



1 Pluggable voltage indicator

–C1 Capacity integrated in the pole supporting plate
–C2 Capacity of the connection leads and of the voltage indicator to earth



Voltage detection system CAPDIS

1 Signalling relay (accessible from the rear)
2 LCD
3 Test sockets

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
- Option: High low-voltage compartment (1200 mm) possible

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

R-HA35-094.eps

Low-voltage compartment with multifunction protection relay SIPROTEC 4 7SJ61 (example)

Components

Low-voltage equipment

Multifunction protection relay SIPROTEC 4 7SJ600/7SJ602

- 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

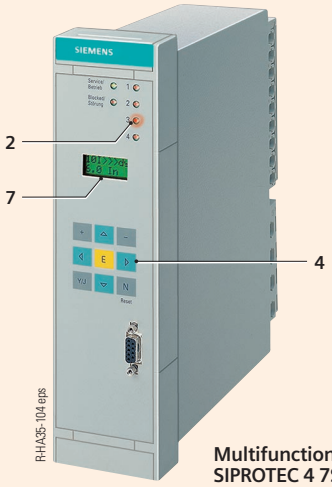
- For stand-alone or master operation
- Communications and bus capability
- Functions: control, protection, indicating, communications and measuring
- LCD (4 text lines) for process and equipment data, in the form of a feeder mimic diagram and as text, e.g. for
  – Measuring and metering values
  – Information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

Multifunction protection relay SIPROTEC 4 7SJ63

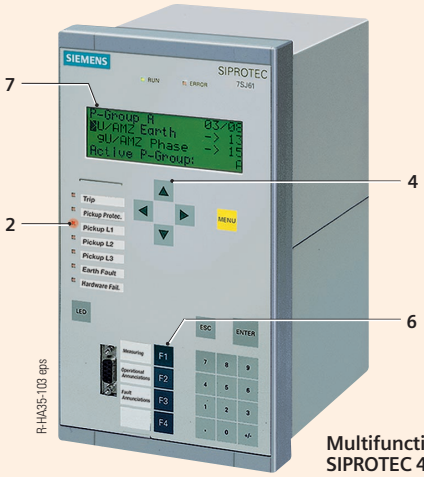
- For stand-alone or master operation
- Communications and bus capability
- Functions: control, protection, indicating, communications and measuring
- LCD for process and equipment data, in the form of a feeder mimic diagram and as text, e.g. for
  – Measuring and metering values
  – Information on status 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

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

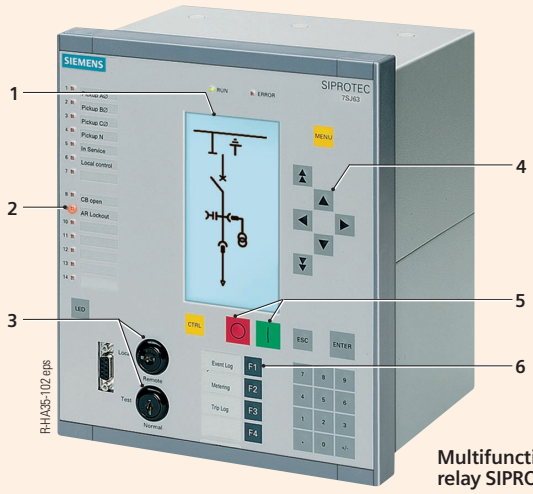
Multifunction protection relays SIPROTEC 4



Multifunction protection relay SIPROTEC 4 7SJ600/7SJ602



Multifunction protection relay SIPROTEC 4 7SJ61/7SJ62



Multifunction protection relay SIPROTEC 4 7SJ63

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

	IEC standard			VDE standard	EN standard
	up to now	present	future		
Switchgear	IEC 60 694 *	IEC 60 694 *	IEC 62 271-1	VDE 0670 Part 1000	EN 60 694
	IEC 60 298 *	IEC 60 298 *	IEC 62 271-200	VDE 0670 Part 6	EN 60 298
	IEC 60 850	IEC 60 850	IEC 60 850	VDE 0115 Part 102	EN 50 163
	IEC 60 056 *	IEC 62 271-100	IEC 62 271-100	VDE 0670 Parts 101 to 106	EN 60 056
	IEC 60 129 *	IEC 62 271-102	IEC 62 271-102	VDE 0670 Part 2	EN 60 129
	IEC 61 243-5	IEC 61 243-5	IEC 61 243-5	VDE 0682 Part 415	EN 61 243-5
	IEC 60 529	IEC 60 529	IEC 60 529	VDE 0470 Part 1	EN 60 529
	IEC 60 071	IEC 60 071	IEC 60 071	VDE 0111	EN 60 071
Current transformers	IEC 60 044-1	IEC 60 044-1	IEC 60 044-1	VDE 0414 Part 1	EN 60 044-1
Voltage transformers	IEC 60 044-2	IEC 60 044-2	IEC 60 044-2	VDE 0414 Part 2	EN 60 044-2

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 Part 111

Current-carrying capacity

- According to IEC 60 298, IEC 60 694 and VDE 0670 Part 6 and Part 1000, current-carrying capacities refer to the following ambient temperatures:
  – maximum of 24-hour mean + 35 °C
  – maximum + 40 °C
- The current-carrying capacity of the panels and busbars depends on the ambient temperature outside the enclosure.

Insulating capacity

- The insulating capacity is verified by testing the switchgear at rated short-duration power-frequency withstand voltage and rated lightning impulse withstand voltage in accordance with IEC 60 694 and VDE 0670 Part 1000 (see following table).
- The rated values refer to sea level and to normal atmospheric conditions (1013 hPa, 20 °C, 11 g/m^3 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.

Table - Insulating capacity

Rated voltage (r.m.s. value)	kV	**7.2**	**12**	**15**	**17.5**	**24**	**36**
Rated short-duration power-frequency withstand voltage (r.m.s. value)							
– across isolating distance	kV	23	32	39	45	60	80
– between phases and to earth	kV	20	28	35	38	50	70
Rated lightning impulse withstand voltage (peak value)							
– across isolating distance	kV	70	85	105	110	145	195
– between phases and to earth	kV	60	75	95	95	125	170

Site altitude

The SF_6-insulation permits installation of the switchgear at any altitude above sea level without influences on the dielectric strength. This also applies to cable connection.

* In future all standards for switching devices and switchgear will be summarized in IEC 62 271.

Standards

Standards, specifications, guidelines

Resistance to internal arc faults

Tests for resistance to internal arc faults

- Tests for verifying resistance to internal arc faults should establish proper protection for operating personnel.
- The tests must be performed in accordance with IEC 60 298 and VDE 0670 Part 6.

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 three-position disconnector in combination with vacuum circuit-breaker

Criteria for internal arc faults

- Criteria according to IEC 60298 and VDE 0670 Part 6 with respect to the behaviour in case of internal arc faults
- Definitions of criteria:
  – Criterion 1
  Correctly secured doors, covers etc. do not open
  – Criterion 2
  Parts of the enclosed switchgear which may cause a hazard do not fly off
  – Criterion 3
  No holes in the freely accessible external parts of the enclosure as the result of burning in or tearing open
  – Criterion 4
  Vertically arranged indicators do not ignite
  – Criterion 5
  Horizontally arranged indicators do not ignite
  – Criterion 6
  The effectiveness of the earth connection must not be detrimentally influenced

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 high-voltage 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 corrosion-resistant materials
- Insensitive to ambient effects such as
  – natural foreign bodies
  – chemically active pollutants
  – small animals and insects

Standards, specifications, guidelines

Protection against solid foreign bodies, electric shock and water

8DA/8DB switchgear complies according to

VDE 0670 Part 1000 DIN EN 60 694	IEC 60 694
DIN EN 60 529	IEC 60 529
VDE 0670 Part 6	IEC 60 298

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

DIN EN 60 529 and IEC 60 529:

Type of protection	Degree of protection

IP 3XD

Protection against solid foreign bodies
Protected against ingress of solid foreign bodies, diameter ≥ 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)

IP 65

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

IP 31D

Protection against solid foreign bodies
Protected against ingress of solid foreign bodies, diameter ≥ 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.

Responsible for

Technical contents:
Herbert Soens
Siemens AG, Dept. PTD M2 S2
Erlangen

General editing:
Gabriele Pollok
Siemens AG, Dept. PTD CC T
Erlangen

Printed in Germany
KGK 11.02 10.0 VO/- 28 En 100470
6101/D6254

Published by

Siemens AG

Power Transmission and Distribution
Medium Voltage Division
Postfach 32 20

91050 Erlangen
Germany

www.siemens.com/medium-voltage-switchgear

Order No.: E50001-K1435-A101-A8-7600