

SIEMENS



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

Medium-Voltage Switchgear

[siemens.com/medium-voltage-switchgear](https://www.siemens.com/medium-voltage-switchgear)

Application

Typical uses

Application
Public power supply
system



Application
Traction power supply



Application
Industry



Application
Offshore and industry



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

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www.siemens.com/medium-voltage-switchgear



The products and systems described in this catalog are manufactured and sold according to a certified management system (acc. to ISO 9001, ISO 14001 and BS OHSAS 18001).

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Application

Versions



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Circuit-breaker panel 8DA10



R-HA35-136.tif

Circuit-breaker panel 8DB10



R-HA35-137.tif

Circuit-breaker panel 8DA11/12

Fixed-mounted circuit-breaker switchgear 8DA and 8DB is indoor, factory-assembled, type-tested, single-pole metal-enclosed, gas-insulated switchgear with metallic partitions³⁾, for single-busbar and double-busbar applications, as well as for traction power supply systems.

It is used in transformer and switching substations, e.g., in:

- Power supply companies
- 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.

Electrical data (maximum values) and dimensions

Single-busbar and double-busbar switchgear

Rated voltage	kV	12	24	36	40.5
Rated frequency	Hz	50/60	50/60	50/60	50/60
Rated short-duration power-frequency withstand voltage	kV	28 ¹⁾	50	70	85 ²⁾
Rated lightning impulse withstand voltage	kV	75 ¹⁾	125	170	185 ²⁾
Rated peak withstand current	kA	100/104	100/104	100/104	100/104
Rated short-circuit making current	kA	100/104	100/104	100/104	100/104
Rated short-time withstand current 3 s	kA	40	40	40	40
Rated short-circuit breaking current	kA	40	40	40	40
Rated normal current of the busbar	A	5000	5000	5000	5000
Rated normal current of feeders	A	2750 ⁴⁾ 3150 ⁵⁾	2750 ⁴⁾ 3150 ⁵⁾	2750 ⁴⁾ 3150 ⁵⁾	2750 ⁴⁾ 3150 ⁵⁾
Width	mm	600	600	600	600
Depth (wall-standing arrangement)					
– Single busbar	mm	1625	1625	1625	1625
– Double busbar	mm	2665	2665	2665	2665
Height					
– Standard	mm	2350	2350	2350	2350
– With high low-voltage compartment	mm	2700	2700	2700	2700

Single-pole and double-pole traction power supply switchgear

Rated voltage	kV	17.25	27.5
Rated frequency	Hz	16.7	50/60
Rated short-duration power-frequency withstand voltage	kV	50	95
Rated lightning impulse withstand voltage	kV	125	200
Rated peak withstand current	kA	80	80
Rated short-circuit making current	kA	80	80
Rated short-time withstand current 3 s	kA	31.5	31.5
Rated short-circuit breaking current	kA	31.5	31.5
Rated normal current of the busbar	A	3150	3150
Rated normal current of feeders	A	2500	2500
Width	mm	600	600
Depth			
– Single-pole traction switchgear	mm	865	865
– Double-pole traction switchgear	mm	1245	1245
Height			
– Standard	mm	2350	2350
– With high low-voltage-compartment	mm	2700	2700

1) 42 kV / 70 kV according to some national requirements

2) 95 kV / 190 kV according to some national requirements

3) Corresponds to "metal-clad" according to former standard IEC 60298

4) 2750 A without forced ventilation (8DB10 on request)

5) 3150 A with forced ventilation (8DB10 on request)

Environmental independence

The enclosed high-voltage part of 8DA and 8DB switchgear is suitable for applications under aggressive ambient conditions, such as:

- Saline air
- Air humidity
- Dust
- Condensation.

It is tight to ingress of foreign objects, such as:

- Dust
- Pollution
- Small animals.

The application is independent of the site altitude.

Compact design

Thanks to the use of gas insulation, compact dimensions are possible.

Thus:

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

Maintenance-free design

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

- Maximum supply reliability
- Personnel safety
- Sealed-for-life design according to IEC 62271-200 (sealed pressure system)
- Reduced operating costs
- Cost-efficient investment.

Innovation

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

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

Service life

Under normal operating conditions, the expected service life of gas-insulated switchgear 8DA and 8DB is at least 35 years, probably 40 to 50 years, taking the tightness of the enclosed high-voltage part into account. The service life is limited by the maximum number of operating cycles of the switching devices installed:

- For circuit-breakers, according to the endurance class defined in IEC 62271-100
- For three-position disconnectors and earthing switches, according to the endurance class defined in IEC 62271-102.

Personal safety

- Safe-to-touch and hermetically sealed primary enclosure
- All high-voltage parts including the cable terminations, busbars and voltage transformers are metal-enclosed
- Capacitive voltage detecting system to verify safe isolation from supply
- Operating mechanisms and auxiliary switches safely accessible outside the primary enclosure (switchgear housings)
- Due to the system design, operation is only possible with closed switchgear enclosure
- Standard degree of protection IP 65 for all high-voltage parts of the primary circuit, IP 3XD for the switchgear enclosure according to IEC 60529
- High resistance to internal arcs by logical mechanical interlocks and tested switchgear enclosure
- Panels tested for resistance to internal faults up to 40 kA
- Logical mechanical interlocks prevent maloperation
- Make-proof earthing by means of the vacuum circuit-breaker.

Security of operation

- Hermetically sealed primary enclosure independent of environmental effects (pollution, humidity and small animals)
- Maintenance-free in an indoor environment according to IEC 62271-1
- Two-phase and three-phase short-circuits between the primary conductors are excluded by the single-pole primary enclosure
- In isolated or compensated systems, low-current earth-fault currents are self-extinguishing
- Operating mechanisms of switching devices accessible outside the primary enclosure (switchgear housings)
- Metal-enclosed, plug-in inductive voltage transformers mounted outside the switchgear housings
- Current transformers as ring-core current transformers mounted outside the switchgear housings
- Complete switchgear interlocking system with logical mechanical interlocks
- Bolted switchgear housings sealed for life
- Minimum fire load
- Option: Aseismic design.

Reliability

- Type and routine-tested
- Standardized, NC production processes
- Quality assurance in accordance with DIN EN ISO 9001, DIN EN ISO 14001 and BS OHSAS 18001
- More than 100,000 switchgear panels of Siemens in operation worldwide for many years.

General

- Single-pole enclosure of the primary part by modular switchgear housings made of corrosion-resistant aluminum alloy
- Insulating gas SF₆ (fluorinated greenhouse gas in sealed pressure system according to IEC 62271-1)
- Three-position disconnecter as busbar disconnecter and feeder earthing switch
- Make-proof earthing by means of the vacuum circuit-breaker
- Compact dimensions due to gas insulation
- Hermetically bolted switchgear housings made of corrosion-resistant aluminum alloy
- Single-pole metal-enclosed, gas-insulated busbars
- Cable connection with inside-cone plug-in system, or for connection of gas-insulated and solid-insulated bars
- Wall-standing or free-standing arrangement
- Installation and extension of existing switchgear at both ends without modification of existing panels.

Interlocks

- According to IEC 62271-200
- Logical mechanical interlocks prevent maloperation
- Three-position disconnecter can only be operated with circuit-breaker in OPEN position
- Circuit-breaker can only be operated with three-position disconnecter in end position and operating lever removed
- Locking device for circuit-breaker
- Locking device for three-position disconnecter
- "Feeder earthed" locking device
- Option: Electromagnetic interlocks.

Modular design

- Replacement of the panel connection housings or the circuit-breaker possible without interrupting busbar operation
- Low-voltage compartment removable, plug-in bus wires
- Extension of double-busbar switchgear 8DB10 possible without interrupting operation
- Option: Extension of single-busbar switchgear 8DA10 possible without interrupting operation.

Instrument transformers

- Current transformers not subjected to dielectric stress
- Metal-enclosed, plug-in and disconnectable voltage transformers.

Vacuum circuit-breaker

- Maintenance-free under normal ambient conditions according to IEC 62271-1
- No relubrication or readjustment
- Vacuum interrupters sealed for life
- Up to 10,000 operating cycles (maintenance-free)
- Option: Up to 30,000 operating cycles (maintenance required).

Secondary systems

- Customary protection, measuring and control equipment
- Option: Numerical multifunction protection relay with integrated protection, control, communication, operating and monitoring functions
- Can be integrated in process control systems.

Technical data

Electrical data, functional level, temperature for single-busbar and double-busbar switchgear

Common electrical data, functional level and temperature	Rated insulation level	Rated voltage U_r	kV	12	24	36	40.5
	Rated short-duration power-frequency withstand voltage U_d : – phase-to-earth, open contact gap – across the isolating distance		kV	28 ¹⁾	50 ²⁾	70	85 ³⁾
			kV	32 ¹⁾	60 ²⁾	80	90 ³⁾
		Rated lightning impulse withstand voltage U_p :					
		– phase-to-earth, open contact gap	kV	75	125	170	185 ⁴⁾
		– across the isolating distance	kV	85	145	195	220 ⁴⁾
	Rated frequency f_r		Hz	50/60	50/60	50/60	50/60
	Rated normal current I_r of the busbar ⁹⁾		A	1250	1250	1250	1250
			A	2000	2000	2000	2000
			A	2500	2500	2500	2500
			A	3150	3150	3150	3150
			A	4000	4000	4000	4000
			A	5000	5000	5000	5000
	Rated functional level p_{re} (relative) of the busbar			70/120 kPa at 20 °C			
	Minimum functional level p_{me}			50/100 kPa at 20 °C			
	Ambient air temperature			– 5 °C to + 55 °C ¹³⁾			

Data of the switchgear panels

Circuit-breaker panel, disconnecter panel ⁶⁾	Rated normal current I_r ⁹⁾	A	1250	1250	1250	1250
		A	1600	1600	1600	1600
		A	2000	2000	2000	2000
		A	2500	2500	2500	2500
		A	2750 ¹⁰⁾	2750 ¹⁰⁾	2750 ¹⁰⁾	2750 ¹⁰⁾
		A	3150 ¹¹⁾	3150 ¹¹⁾	3150 ¹¹⁾	3150 ¹¹⁾
	Rated short-time withstand current I_k $t_k = 3$ s	up to kA	40	40	40	40
	Rated peak withstand current I_p ⁵⁾	up to kA	100/104	100/104	100/104	100/104
	Rated short-circuit making current I_{ma} ⁵⁾	up to kA	100/104	100/104	100/104	100/104
	Rated short-circuit breaking current I_{sc}	up to kA	40	40	40	40
Electrical endurance of vacuum circuit-breakers	at rated normal current	10,000 operating cycles ¹²⁾				
	at rated short-circuit breaking current	50 breaking operations				
Rated functional level p_{re}	(relative) for feeders	70/120 kPa at 20 °C				
Minimum functional level p_{me}		50/100 kPa at 20 °C				
Bus section-alizer, bus coupler ⁷⁾	Rated normal current I_r ⁹⁾	A	1250	1250	1250	1250
		A	2000	2000	2000	2000
		A	2500	2500	2500	2500
		A	2750 ¹⁰⁾	2750 ¹⁰⁾	2750 ¹⁰⁾	2750 ¹⁰⁾
		A	3150 ¹¹⁾	3150 ¹¹⁾	3150 ¹¹⁾	3150 ¹¹⁾
	Rated short-time withstand current I_k $t_k = 3$ s	up to kA	40	40	40	40
	Rated peak withstand current I_p ⁵⁾	up to kA	100/104	100/104	100/104	100/104
	Rated short-circuit making current I_{ma} ⁵⁾	up to kA	100/104	100/104	100/104	100/104
	Rated short-circuit breaking current I_{sc}	up to kA	40	40	40	40
	Electrical endurance of vacuum circuit-breakers	at rated normal current	10,000 operating cycles ¹²⁾			
at rated short-circuit breaking current		50 breaking operations				
Rated functional level p_{re}	(relative) for feeders	70/120 kPa at 20 °C				
Minimum functional level p_{me}		50/100 kPa at 20 °C				
Cable connection panel, metering panel	Rated normal current I_r ^{8) 9)}	A	1250	1250	1250	1250
		A	2000	2000	2000	2000
		A	2500	2500	2500	2500
		A	2750 ¹⁰⁾	2750 ¹⁰⁾	2750 ¹⁰⁾	2750 ¹⁰⁾
		A	3150 ¹¹⁾	3150 ¹¹⁾	3150 ¹¹⁾	3150 ¹¹⁾
	Rated short-time withstand current I_k $t_k = 3$ s	up to kA	40	40	40	40
	Rated peak withstand current I_p ⁵⁾	up to kA	100/104	100/104	100/104	100/104
Rated functional level p_{re}	(relative) for feeders	70/120 kPa at 20 °C				
Minimum functional level p_{me}		50/100 kPa at 20 °C				

Common electrical data, functional level and temperature	Rated insulation level	Rated voltage U_r	kV	17.25	27.5
		Nominal voltage according to IEC 60850/EN 50163	kV	15	25
		Rated short-duration power-frequency withstand voltage U_d :			
		– phase-to-earth, open contact gap	kV	50	95
		– across the isolating distance	kV	60	110
		Rated lightning impulse withstand voltage U_p :			
		– phase-to-earth, open contact gap	kV	125	200
	– across the isolating distance	kV	145	220 ⁴⁾	
	Rated frequency f_r		Hz	16.7	50/60
	Rated normal current I_r	of the busbar ⁹⁾	A	1250	1250
			A	2000	2000
			A	2500	2500
			A	3150	3150
Rated functional level p_{re}	(relative) of the busbar		120 kPa at 20 °C		
Minimum functional level p_{me}			100 kPa at 20 °C		
Ambient air temperature			–5 °C to +55 °C ¹³⁾		

Data of the switchgear panels

Circuit-breaker panel, disconnect panel	Rated normal current I_r ⁹⁾	A	1250	1250
		A	1600	1600
		A	2000	2000
		A	2500	2500
	Rated short-time withstand current I_k $t_k = 3$ s	up to kA	31.5	31.5
	Rated peak withstand current I_p ⁵⁾	up to kA	80	80/82
	Rated short-circuit making current I_{ma} ⁵⁾	up to kA	80	80/82
	Rated short-circuit breaking current I_{sc}	up to kA	31.5	31.5
	Electrical endurance of vacuum circuit-breakers	at rated normal current	20,000 operating cycles	
		at rated short-circuit breaking current	50 breaking operations	
Rated functional level p_{re}	(relative) for feeders	120 kPa at 20 °C		
Minimum functional level p_{me}		100 kPa at 20 °C		

Bus sectionalizer	Rated normal current I_r ⁹⁾	A	1250	1250	
		A	2000	2000	
		A	2500	2500	
	Rated short-time withstand current I_k $t_k = 3$ s	up to kA	31.5	31.5	
	Rated peak withstand current I_p ⁵⁾	up to kA	80	80/82	
	Rated short-circuit making current I_{ma} ⁵⁾	up to kA	80	80/82	
	Rated short-circuit breaking current I_{sc}	up to kA	31.5	31.5	
	Electrical endurance of vacuum circuit-breakers	at rated normal current		20,000 operating cycles	
		at rated short-circuit breaking current		50 breaking operations	
	Rated functional level p_{re}	(relative) for feeders		120 kPa at 20 °C	
Minimum functional level p_{me}			100 kPa at 20 °C		

Footnotes for pages 8 and 9

- Higher values of the rated short-duration power-frequency withstand voltage available with:
 - 42 kV for phase-to-earth and open contact gap, as well as
 - 48 kV across the isolating distance
- Higher values of the rated short-duration power-frequency withstand voltage available with:
 - 65 kV for phase-to-earth and open contact gap, as well as
 - 75 kV across the isolating distance
- Higher values of the rated short-duration power-frequency withstand voltage available with:
 - 95 kV for phase-to-earth and open contact gap, as well as
 - 120 kV across the isolating distance
- Higher values of the rated lightning impulse withstand voltage available with:
 - 190 kV for phase-to-earth and open contact gap, as well as
 - 230 kV across the isolating distance
- Higher value applies to 60 Hz
- Disconnecter panel available for single-busbar switchgear 8DA10
- Bus coupler available for double-busbar switchgear 8DB10
- Rated normal current I_r for cable connection panels
- Maximum permissible normal current dependent on ambient air temperature
- 2750 A without forced ventilation (8DB10 on request)
- 3150 A with forced ventilation (8DB10 on request)
- Option: 30,000 operating cycles
- Option: Ambient air temperature –25 °C to +55 °C

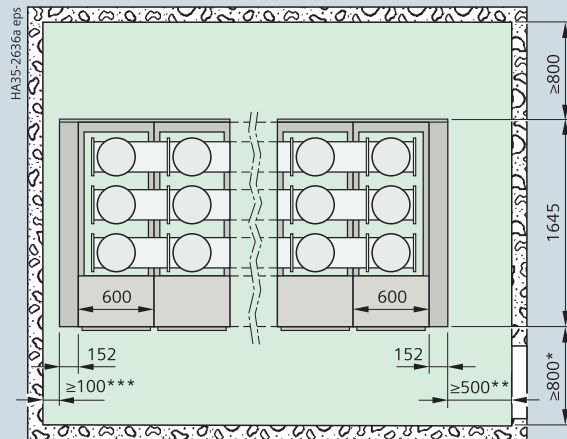
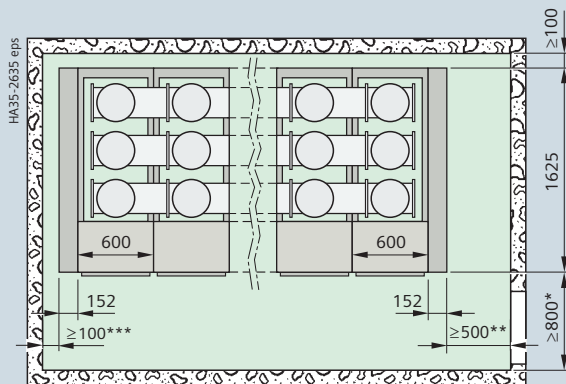
Technical data

Room planning

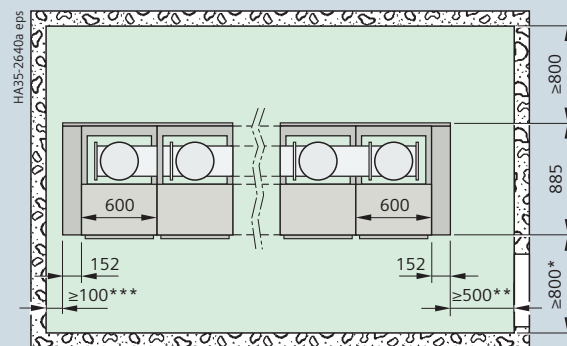
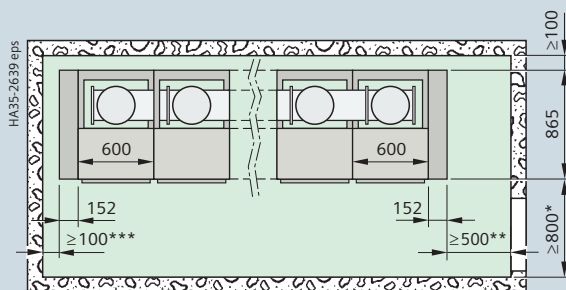
Wall-standing arrangement (top view)

Free-standing arrangement (top view)

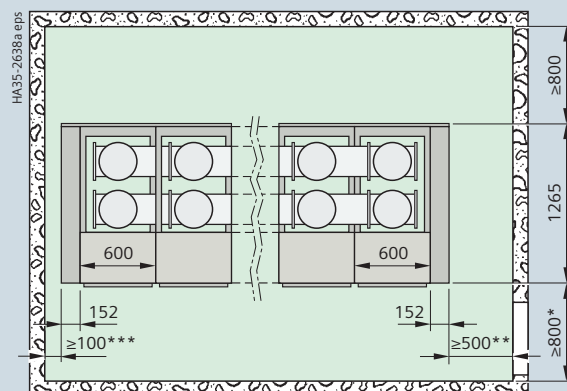
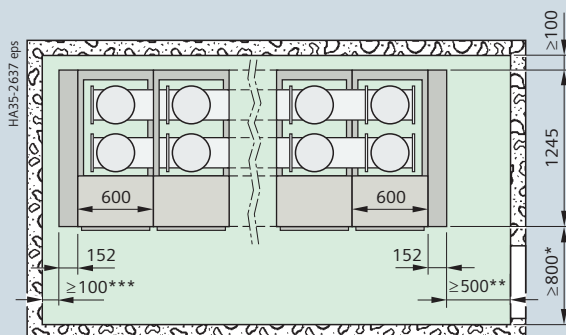
Room planning for single-busbar switchgear 8DA10



Room planning for traction power supply switchgear 8DA11



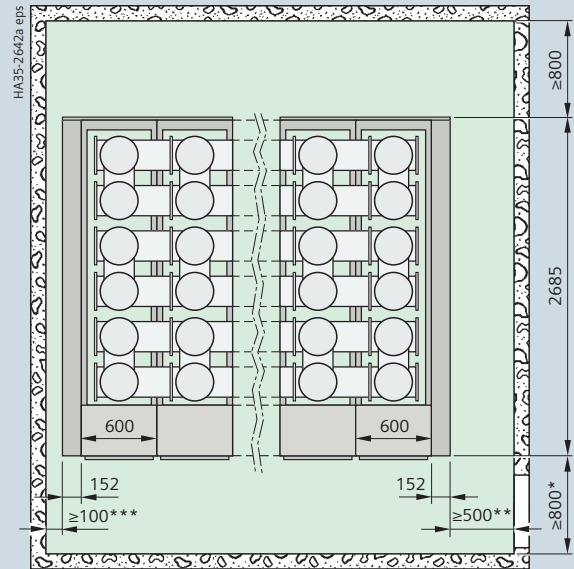
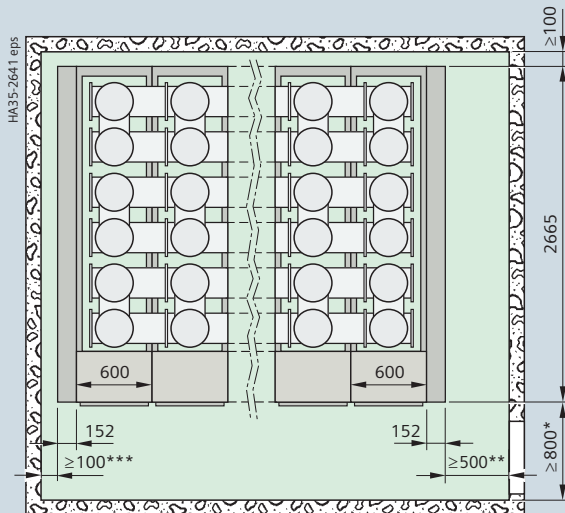
Room planning for traction power supply switchgear 8DA12



Wall-standing arrangement (top view)

Free-standing arrangement (top view)

Room planning for double-busbar switchgear 8DB10



Switchgear installation

- Wall-standing arrangement without rear wall (IAC FL)
- Free-standing arrangement without rear wall (IAC FL)
- Free-standing arrangement with rear wall (IAC FLR).

Room dimensions

See dimension drawings above.

Room height: $\geq$ switchgear height + 200 mm.

If there are any busbar components, the minimum room height may have to be higher.

For switchable busbar components in 8DB10, free-standing arrangement is required.

Door dimensions

The door dimensions depend on the dimensions of the individual panels (see pages 14 to 21).

Switchgear fixing

- For floor openings and fixing points of the switchgear, see pages 14 to 21
- Foundations:
 - Steel girder construction
 - Steel-reinforced concrete with foundation rails, welded or bolted on.

Panel dimensions

See pages 14 to 21.

*) Depending on national requirements

**) Lateral wall distance $\geq$ 500 mm optionally required on the left or on the right

***) Lateral minimum wall distance $\geq$ 100 mm optionally possible on the left or on the right

Technical data

Shipping data

Transport

Single-busbar switchgear 8DA10 and traction power supply switchgear 8DA11/12 is delivered in transport units comprising up to four panels.

Double-busbar switchgear 8DB10 is delivered in transport units comprising up to three panels.

Please observe the following:

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

Packing

- Means of transport: Truck
 - Panels on pallets
 - Open packing with PE protective foil.
- Means of transport: Ship and airplane
 - Panels on pallets
 - In closed crates with sealed upper and lower PE protective foil
 - With desiccant bags
 - With sealed wooden base
 - Max. storage time: 6 months.
- Long-time packing
 - Panels on pallets
 - In closed crates with sealed, aluminum-coated PE protective foil
 - With desiccant bags
 - With sealed wooden base
 - Max. storage time: 12 months.

Transport dimensions, transport weights ¹⁾

Panel widths	Transport dimensions	Transport weight	Transport weight
mm	Width x Height x Depth	with packing	without packing
	mm x mm x mm	approx. kg	approx. kg

Single-busbar switchgear 8DA10

Means of transport: Truck

1 x 600	1370 x 2550 x 1888	850	750
2 x 600	1764 x 2550 x 1870	1700	1500
3 x 600	2400 x 2550 x 1870	2550	2250
4 x 600	2964 x 2550 x 1870	3400	3000

Means of transport: Ship and airplane

1 x 600	1388 x 2700 x 1888	850	750
2 x 600	1764 x 2700 x 1888	1700	1500
3 x 600	2400 x 2700 x 1888	2550	2250
4 x 600	2964 x 2700 x 1888	3400	3000

Double-busbar switchgear 8DB10

Means of transport: Truck

1 x 600	1370 x 2550 x 3124	1300	1200
2 x 600	1870 x 2550 x 3124	2600	2400
3 x 600	2416 x 2550 x 3124	3900	3600

Means of transport: Ship and airplane

1 x 600	1388 x 2850 x 3124	1300	1200
2 x 600	1888 x 2850 x 3124	2600	2400
3 x 600	2440 x 2850 x 3124	3900	3600

Traction power supply switchgear 8DA11/12

Means of transport: Truck

1 x 600	1370 x 2550 x 1888	600	500
2 x 600	1764 x 2550 x 1870	1200	1000
3 x 600	2400 x 2550 x 1870	1800	1500
4 x 600	2964 x 2550 x 1870	2400	2000

Means of transport: Ship and airplane

1 x 600	1388 x 2700 x 1888	600	500
2 x 600	1764 x 2700 x 1888	1200	1000
3 x 600	2400 x 2700 x 1888	1800	1500
4 x 600	2964 x 2700 x 1888	2400	2000

1) Average values based on standard subframe with LV compartment
850 mm depending on the degree to which panels are equipped

Classification of 8DA and 8DB switchgear according to IEC 62271-200

Design and construction

Partition class	PM (metallic partition) ¹⁾
Loss of service continuity category	LSC 2
Accessibility to compartments (enclosure)	
Busbar compartment	Tool-based
Switching-device compartment	Tool-based
Low-voltage compartment	Tool-based
Cable compartment	Tool-based

Internal arc classification

Designation of the internal arc classification IAC	
IAC class for:	
Wall-standing arrangement	IAC A FL 40 kA, 1 s
Free-standing arrangement	IAC A FLR 40 kA, 1 s
Type of accessibility A	Switchgear in closed electrical service location, access "for authorized personnel only" according to IEC 62271-200
– F	Front
– L	Lateral
– R	Rear (for free-standing arrangement)
Rated short-time withstand current	40 kA
Rated duration of short-circuit	1 s

Classification of 8DA and 8DB switchgear according to IEEE Std C37.20.7™-2007

Internal arc classification

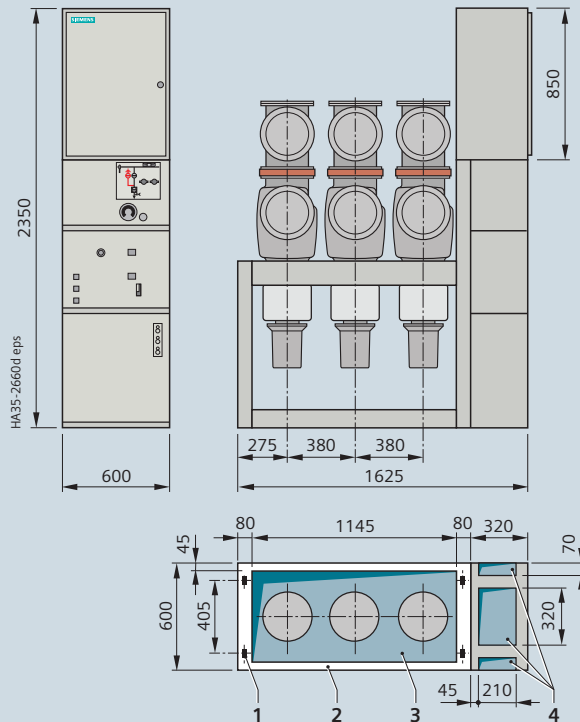
Designation of the internal arc classification IAC	
IAC class for:	
Wall-standing arrangement	Type 1B 40 kA, 0.5 s
Free-standing arrangement	Type 2B 40 kA, 0.5 s
Type of accessibility	Switchgear in closed electrical service location, access "for authorized personnel only" according to IEEE Std C37.20.7™-2007
– Type 1B	Front
– Type 2B	Front, lateral, rear (for free-standing arrangement)
– Type BC	Front with open low-voltage compartment
Rated short-time withstand current	40 kA
Rated duration of short-circuit	0.5 s

1) Corresponds to "metal-clad" according to former standard IEC 60298

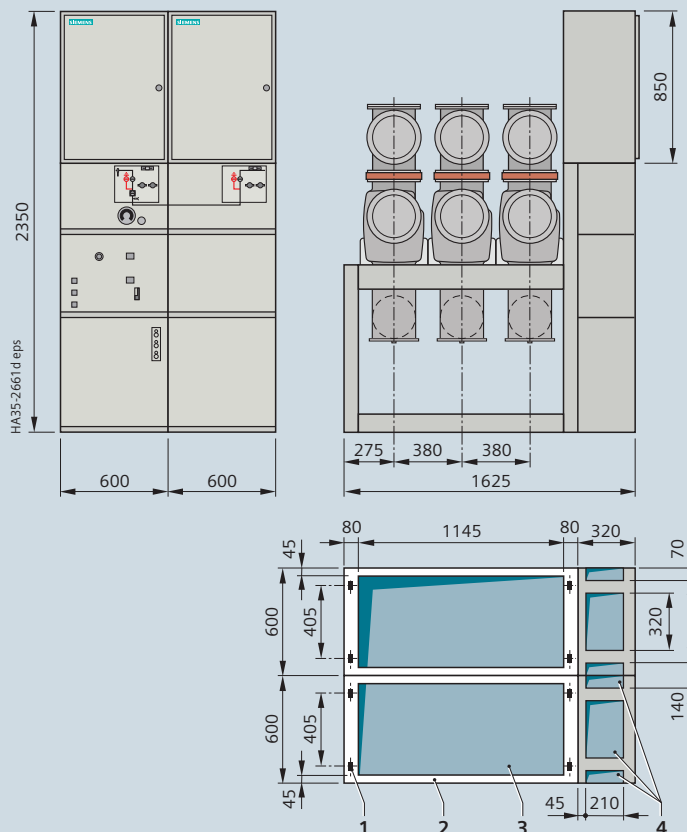
Dimensions

Front views, sections, floor openings, fixing points for 8DA10

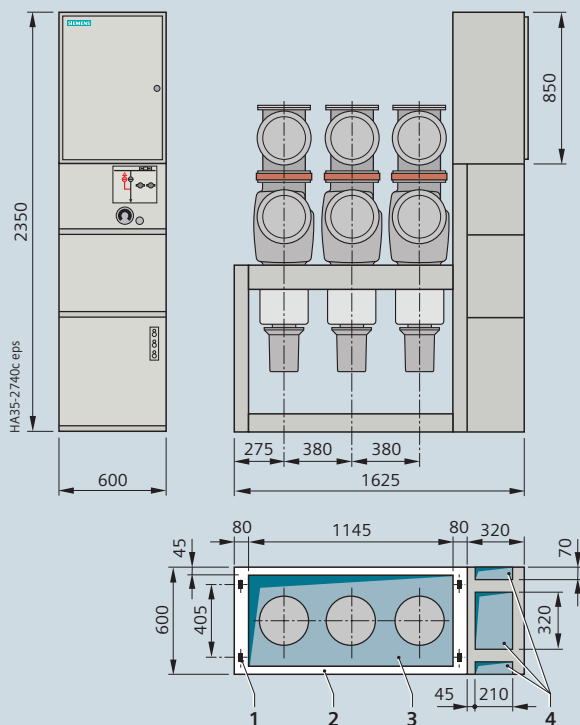
Circuit-breaker panel up to 3150 A



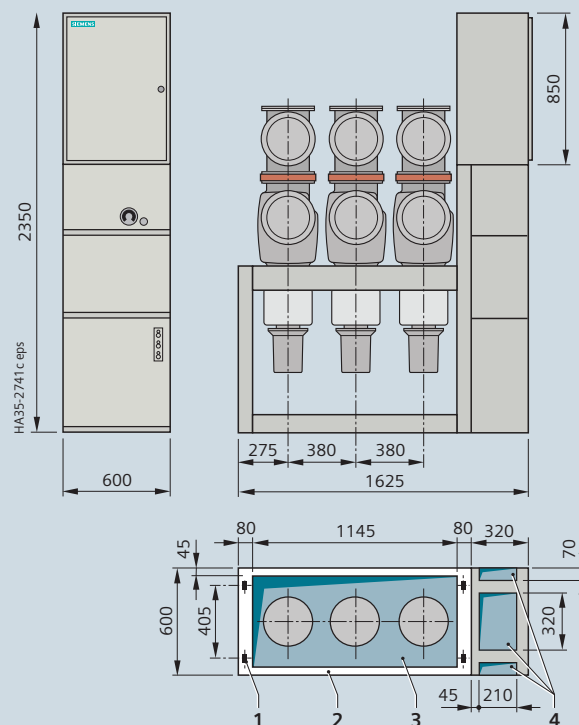
Bus sectionalizer up to 3150 A



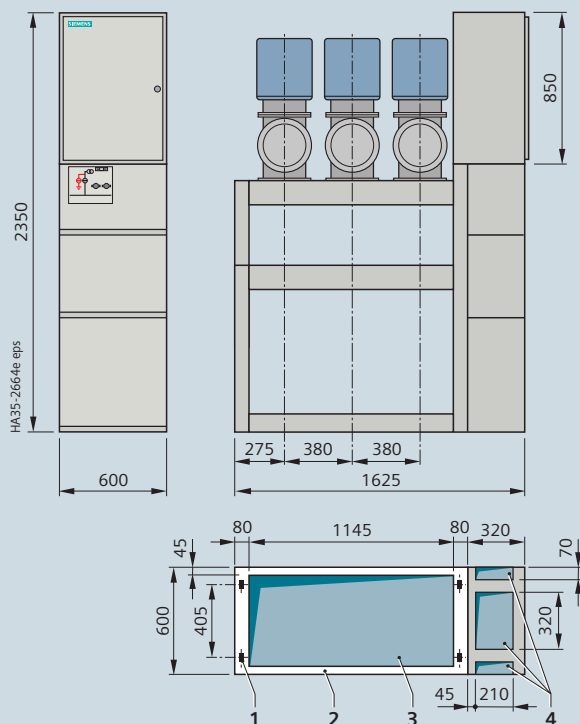
Disconnector panel up to 3150 A



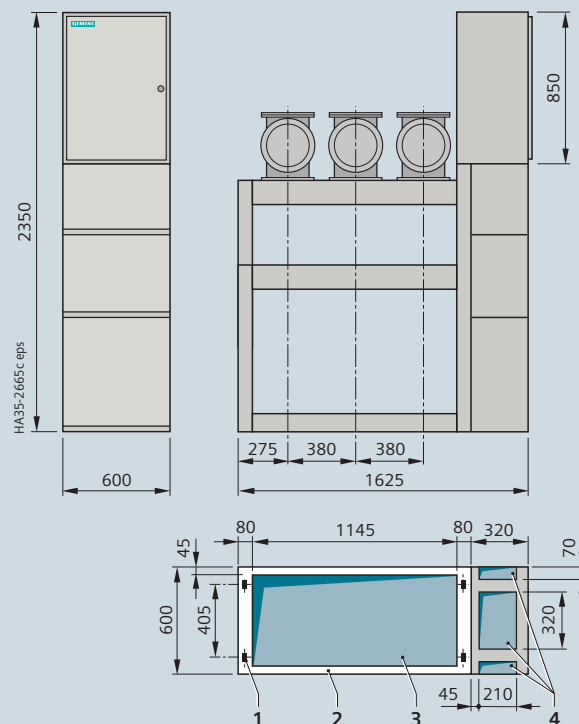
Cable connection panel up to 3150 A



Metering panel



Dummy panel



Legend and footnotes for pages 14 and 15

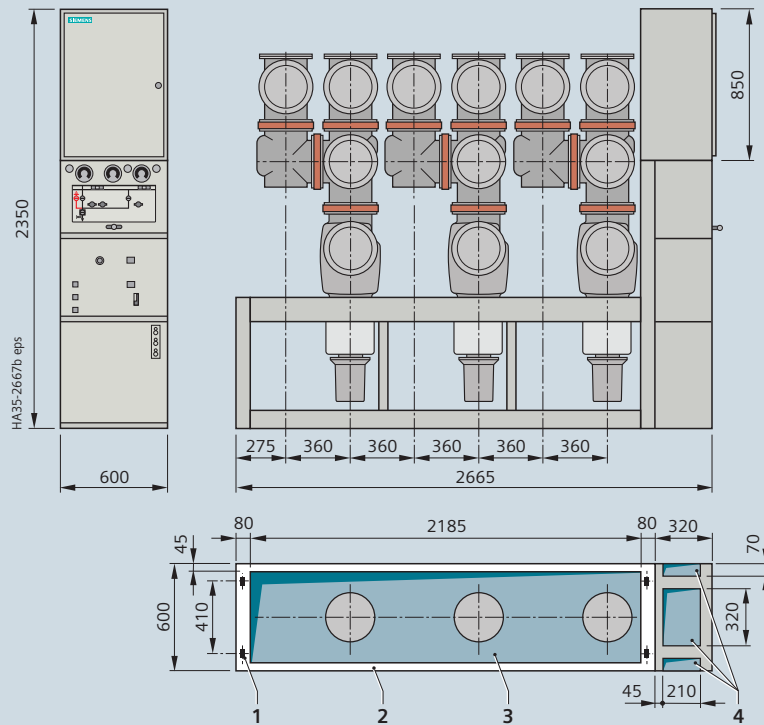
- 1 Fixing hole for 26 mm x 45 mm
- 2 Base frame

- 3 Floor opening for high-voltage cables
- 4 Area for floor openings for control cables

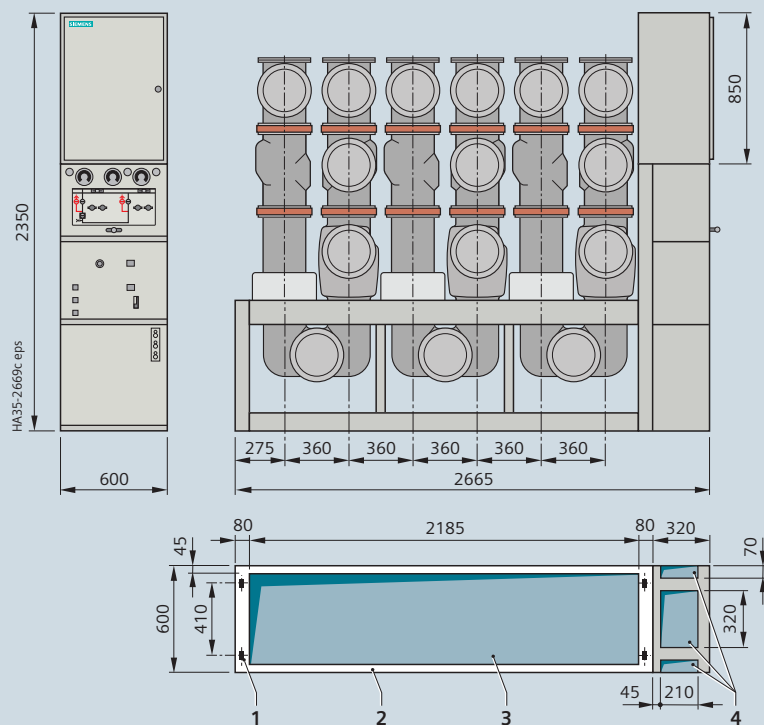
Dimensions

Front views, sections, floor openings, fixing points for 8DB10

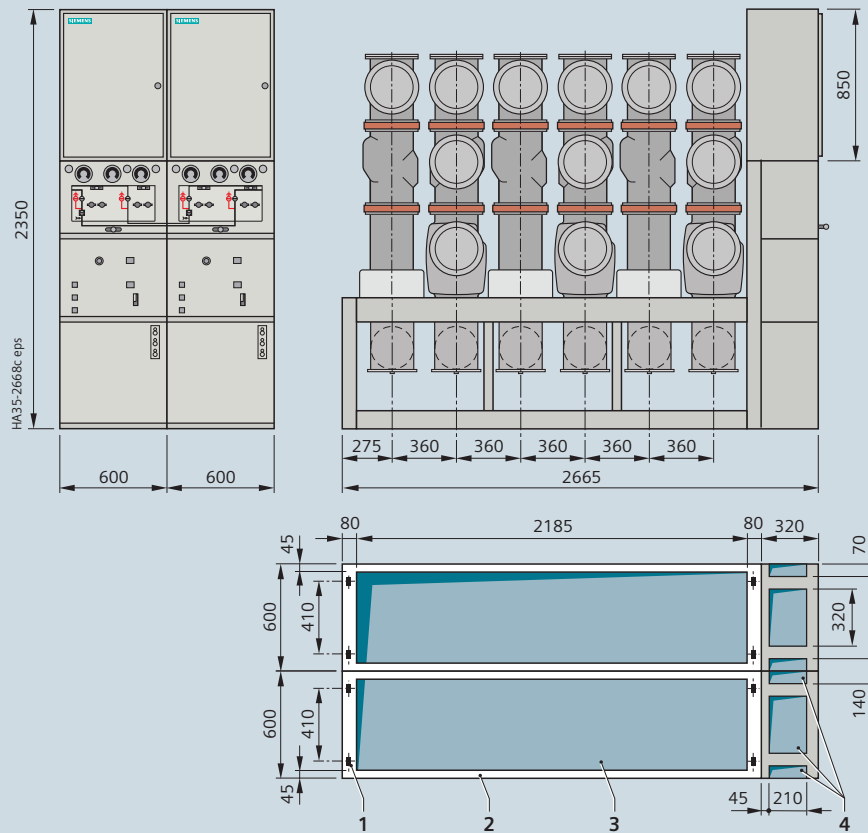
Circuit-breaker panel up to 2500 A



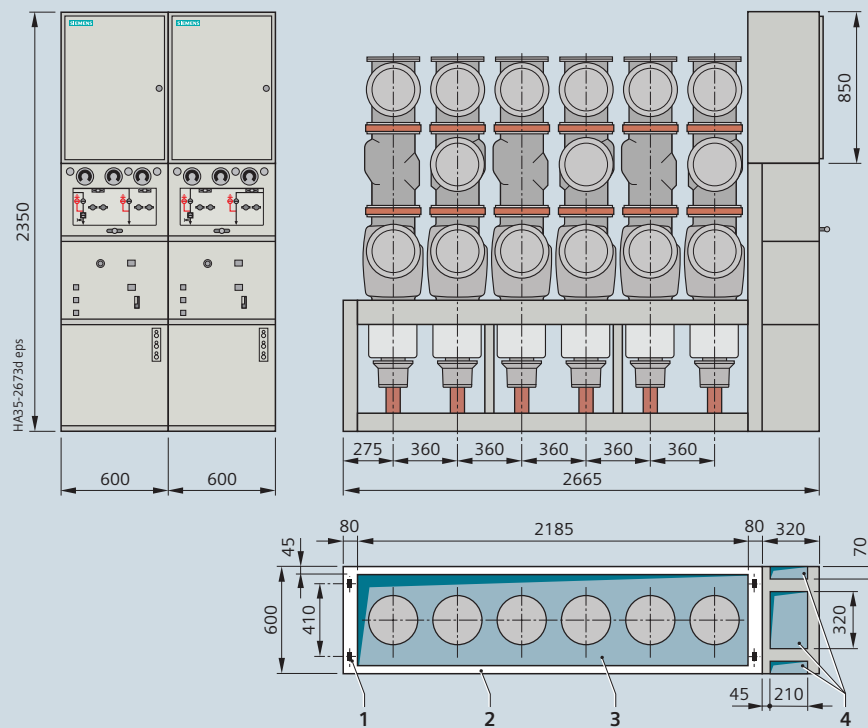
Bus coupler up to 2500 A



Bus sectionalizer up to 2500 A (busbar system 1 and 2)



Bus sectionalizer with panel connection up to 2500 A (busbar system 1 and 2)



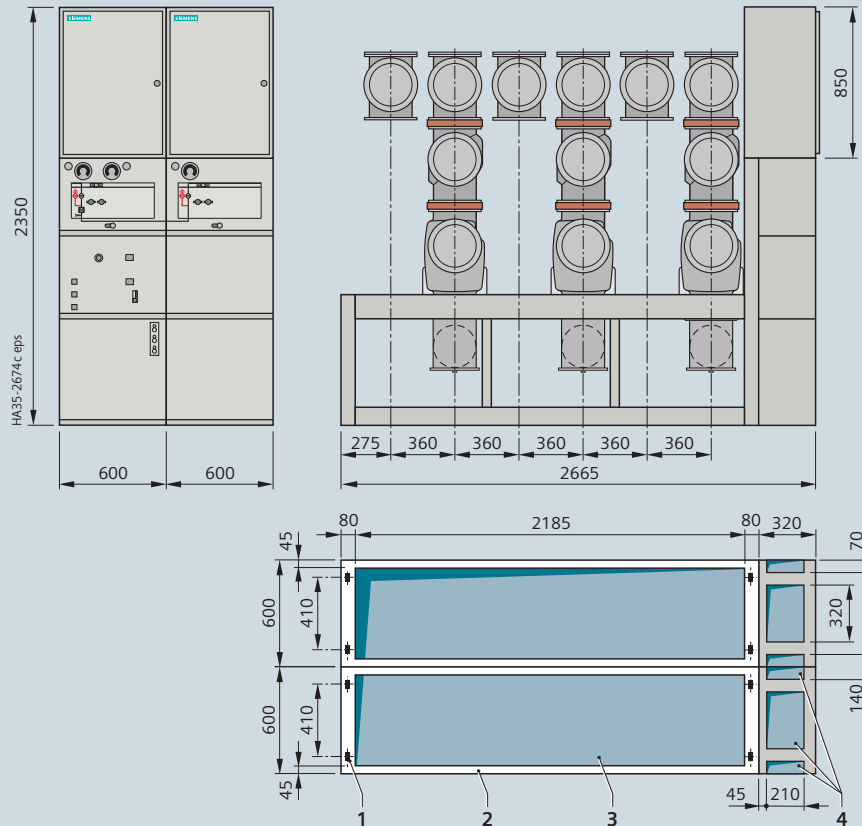
**Legend and footnotes
for pages 16 and 17**

- 1 Fixing hole for 26 mm x 45 mm
- 2 Base frame
- 3 Floor opening for high-voltage cables
- 4 Area for floor openings for control cables

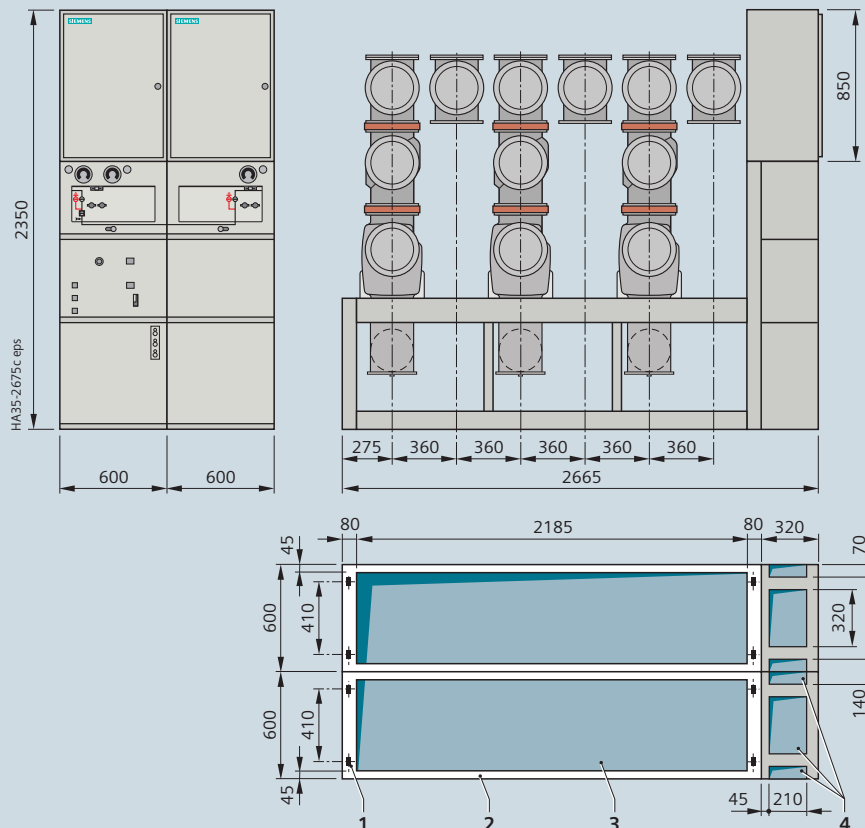
Dimensions

Front views, sections, floor openings, fixing points for für 8DB10

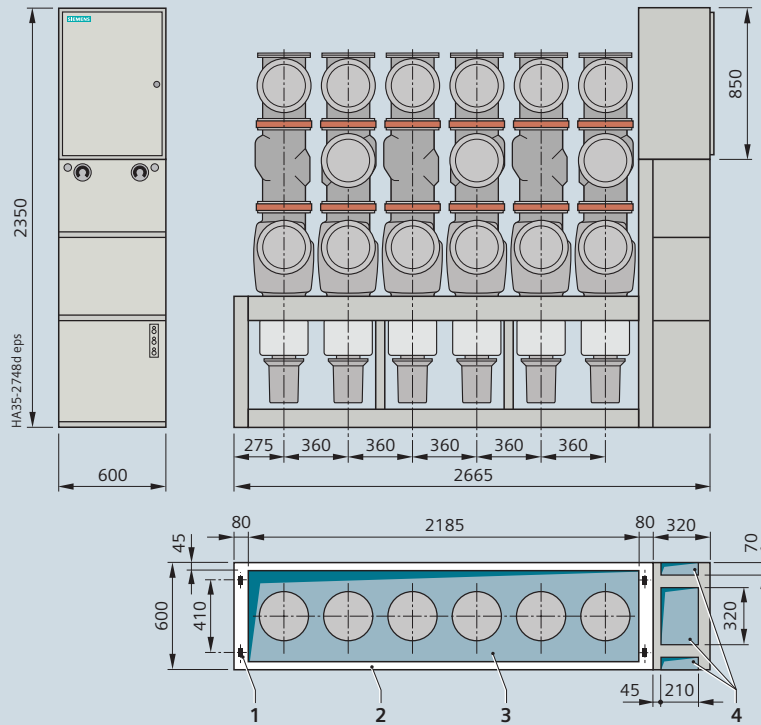
Bus sectionalizer up to 2500 A (busbar system 1)



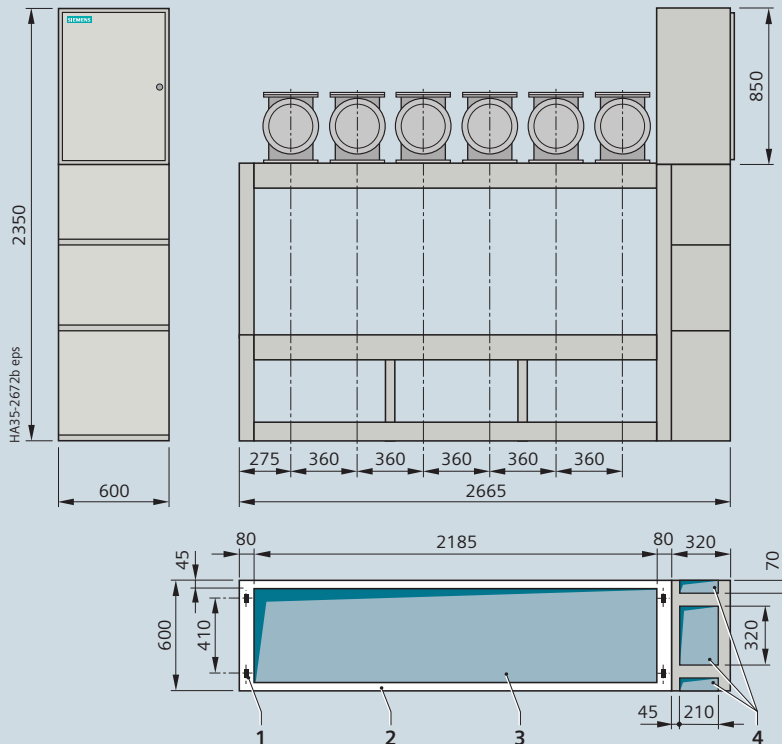
Bus sectionalizer up to 2500 A (busbar system 2)



Cable connection panel up 2500 A



Dummy panel

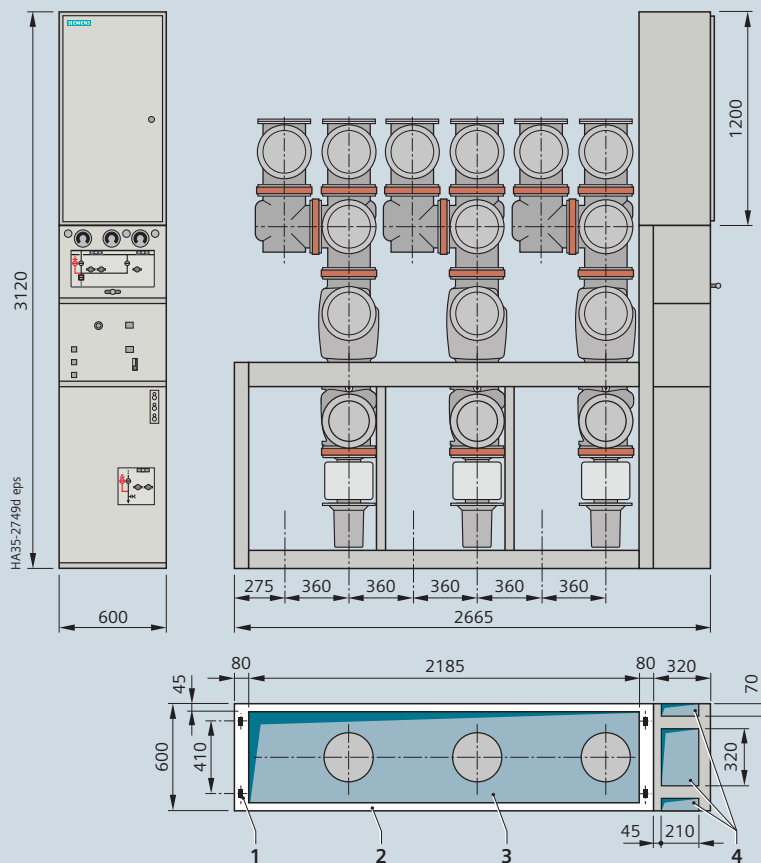


**Legend and footnotes
for pages 18 and 19**

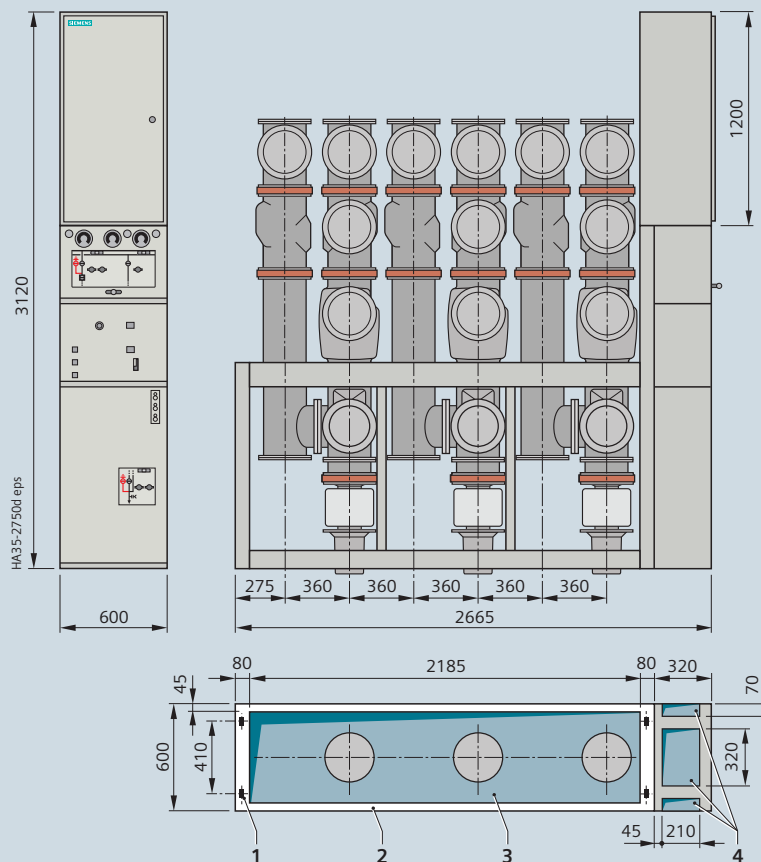
- 1 Fixing hole for
26 mm x 45 mm
- 2 Base frame
- 3 Floor opening for
high-voltage cables
- 4 Area for floor openings
for control cables

Dimensions

Front views, sections, floor openings, fixing points for 8DB10 ANSI

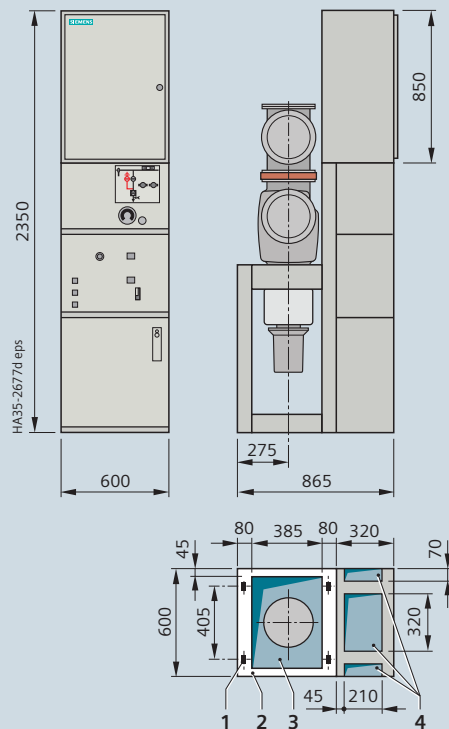


Example: Circuit-breaker panel with three-position disconnectors at the feeder (option)

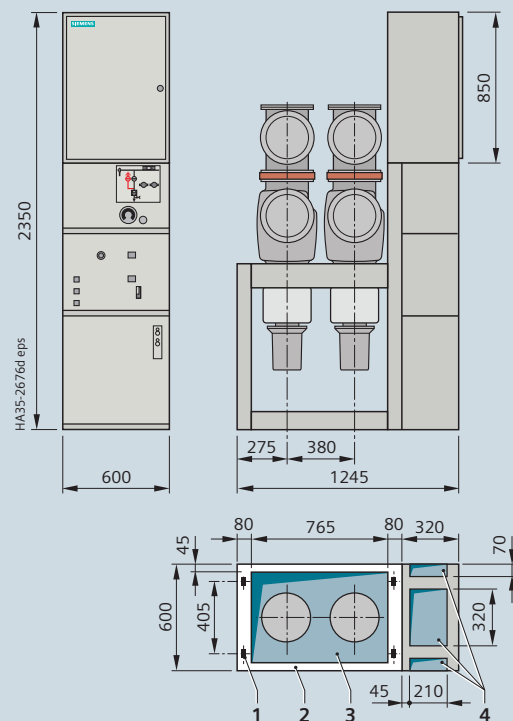


Example: Circuit-breaker panel with disconnectors bypass

Single-pole circuit-breaker panel up to 2500 A



Double-pole circuit-breaker panel up to 2500 A

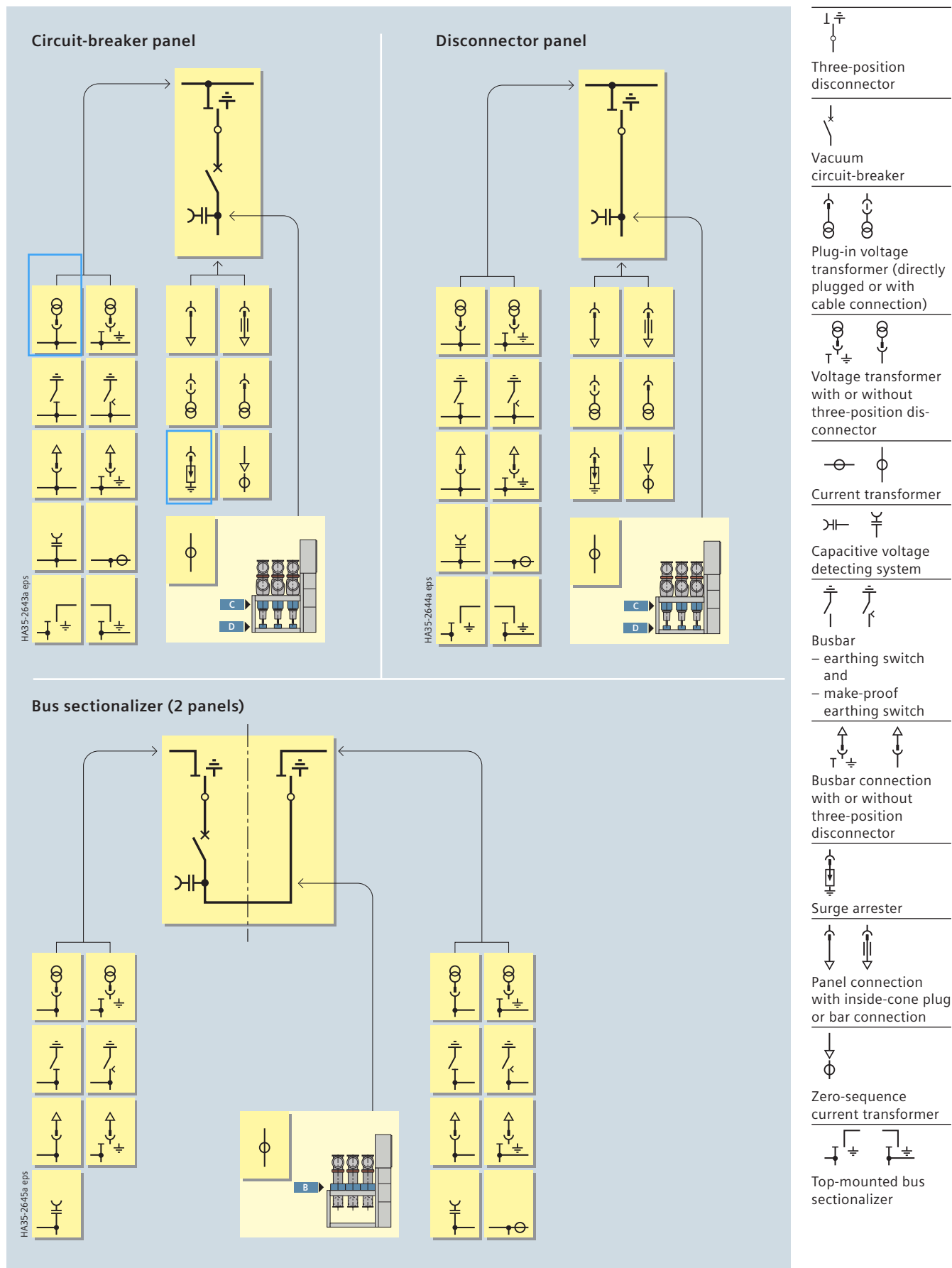


Legend and footnotes for pages 20 and 21

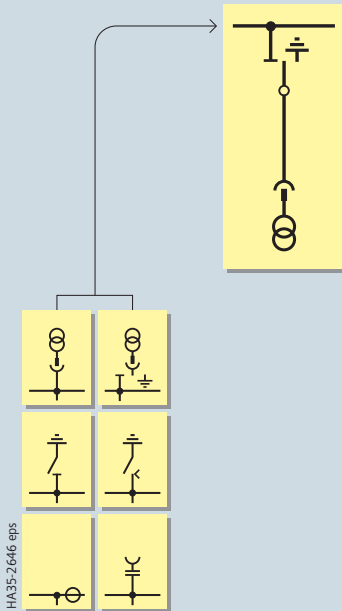
- 1 Fixing hole for 26 mm x 45 mm
- 2 Base frame
- 3 Floor opening for high-voltage cables
- 4 Area for floor openings for control cables

Product range

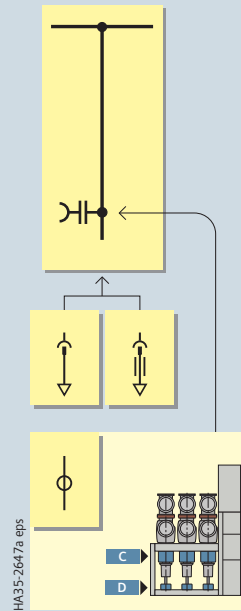
Single-busbar panels 8DA10



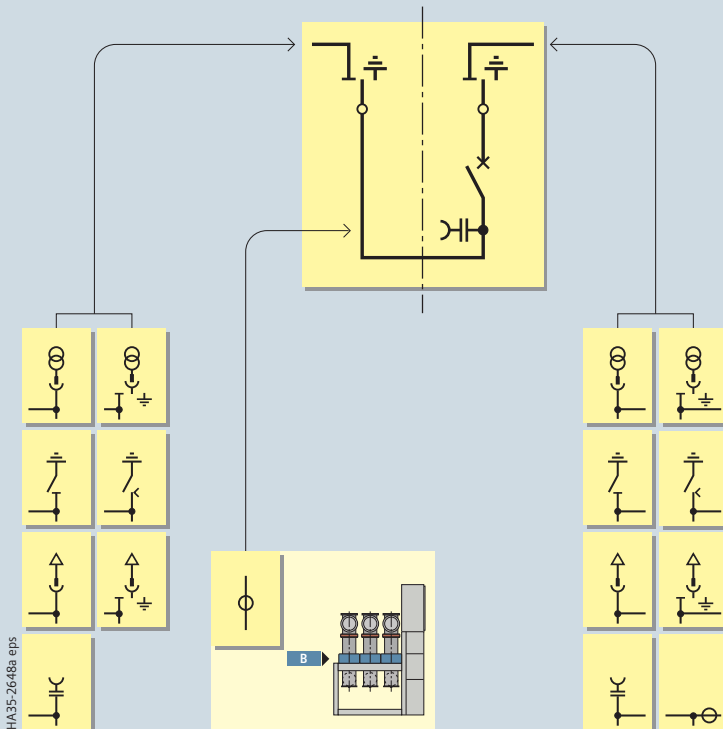
Metering panel



Cable connection panel



Bus sectionalizer (2 panels)



Three-position
disconnecter



Vacuum
circuit-breaker



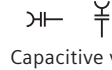
Plug-in voltage
transformer (directly
plugged or with
cable connection)



Voltage transformer
with or without
three-position dis-
connector



Current transformer



Capacitive voltage
detecting system



Busbar
– earthing switch
and
– make-proof
earthing switch



Busbar connection
with or without
three-position
disconnecter

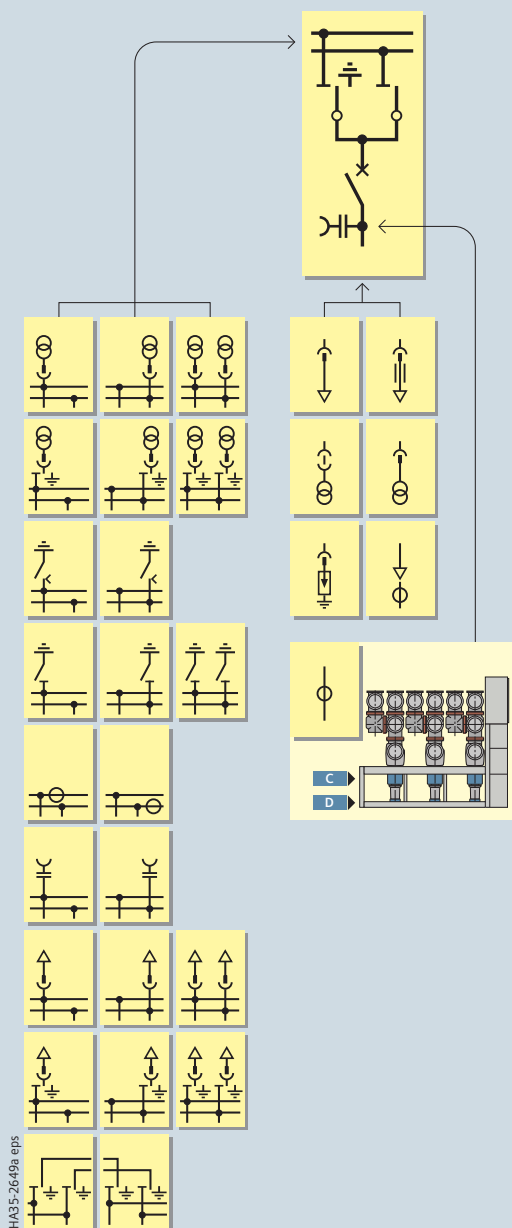


Panel connection
with inside-cone plug
or bar connection

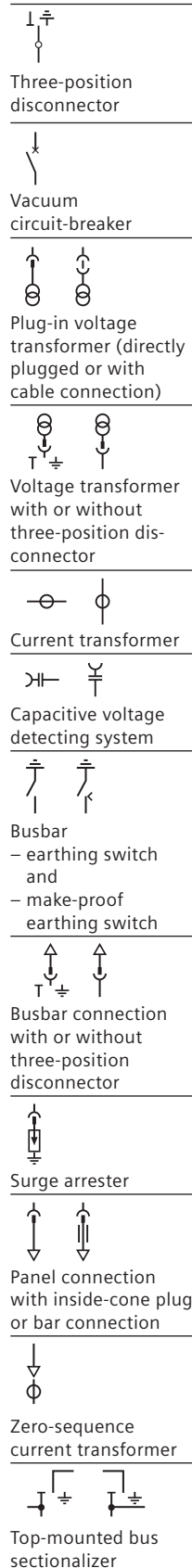
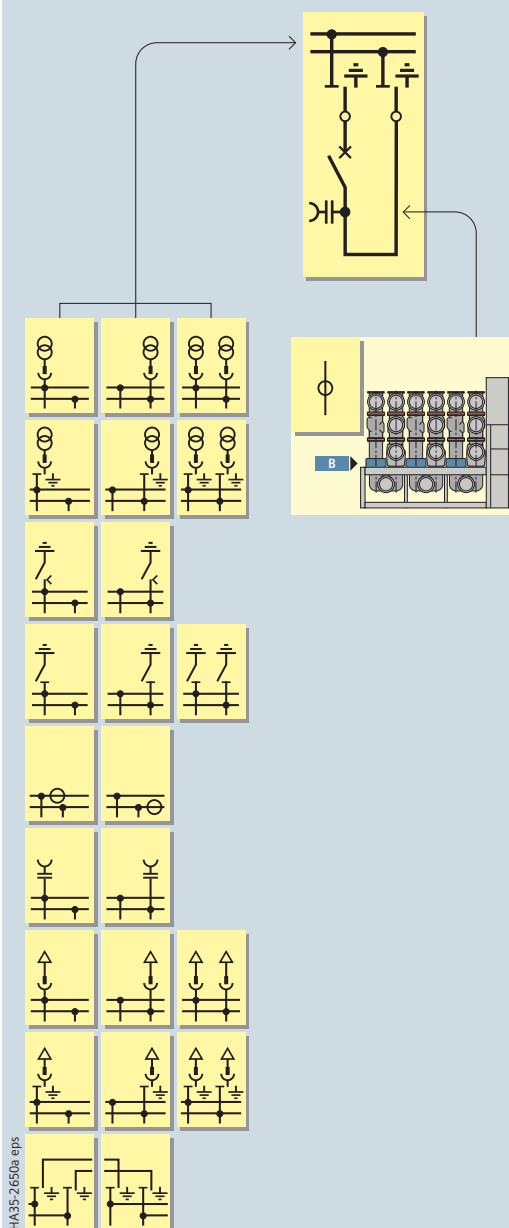
Product range

Double-busbar panels 8DB10

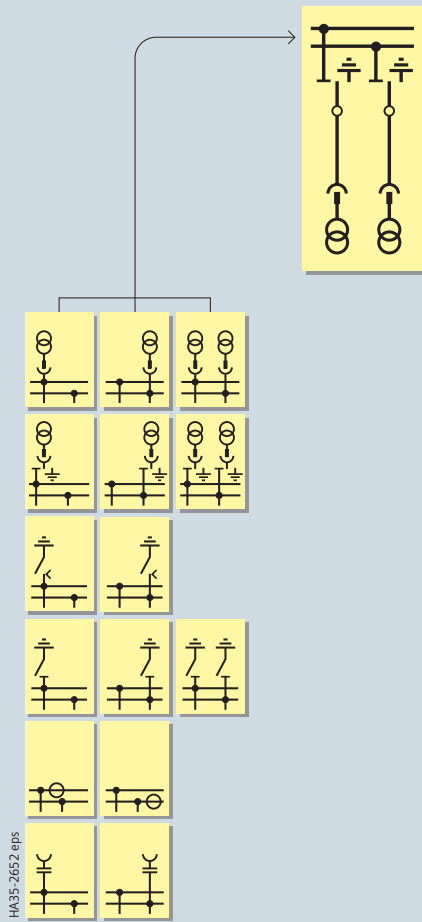
Circuit-breaker panel



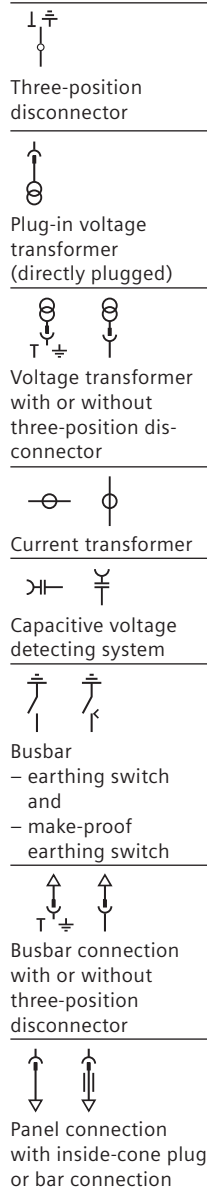
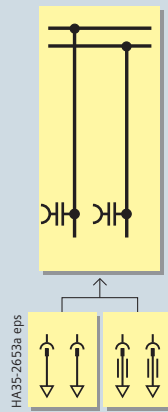
Bus coupler



Metering panel



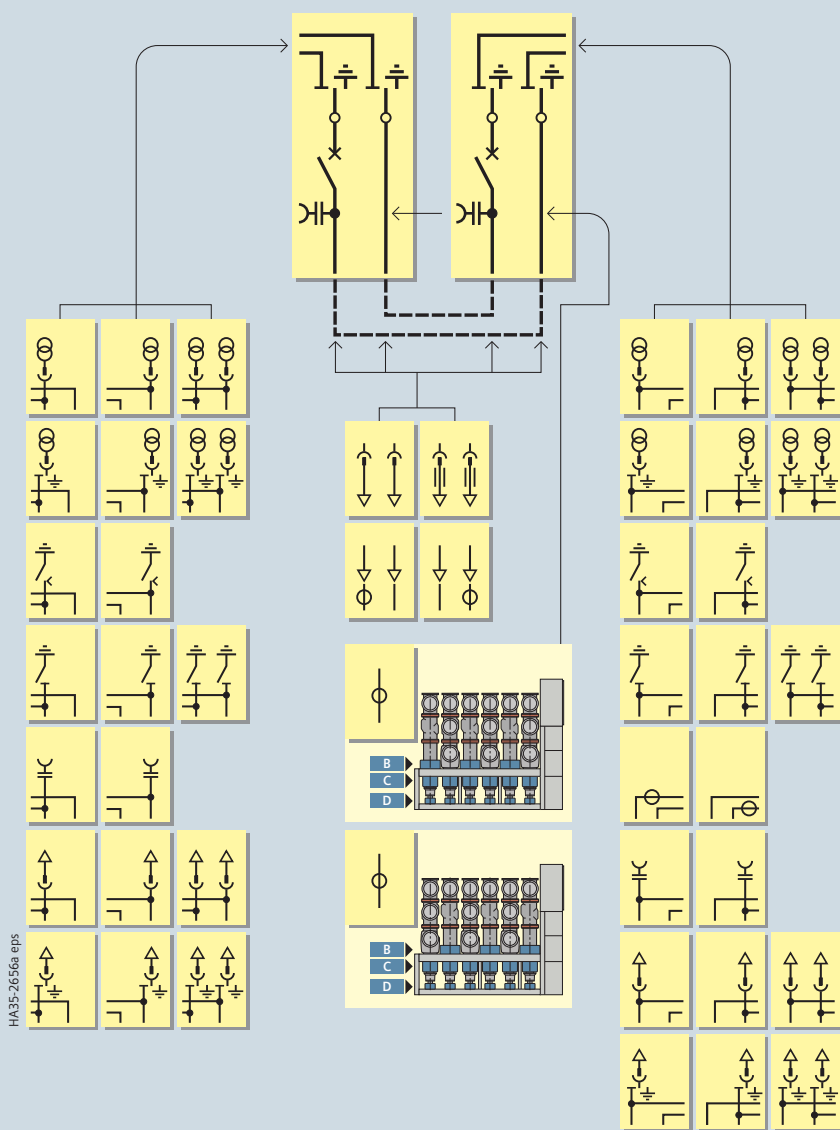
Cable connection panel



Product range

Double-busbar panels 8DB10

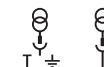
Bus sectionalizer (busbar system 1 and 2)



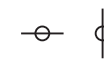
Three-position
disconnect



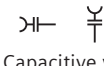
Vacuum
circuit-breaker



Voltage transformer
with or without
three-position dis-
connector



Current transformer



Capacitive voltage
detecting system



Busbar
– earthing switch
and
– make-proof
earthing switch



Busbar connection
with or without
three-position
disconnect

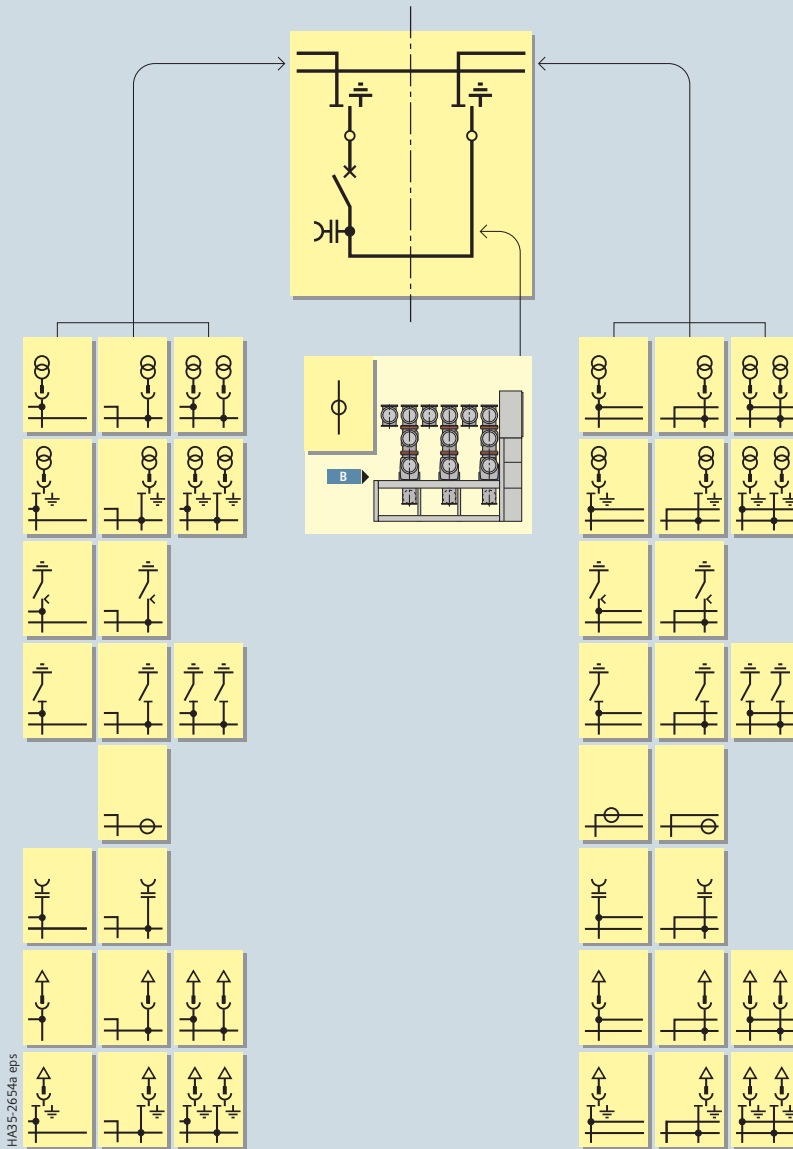


Panel connection
with inside-cone plug
or bar connection



Zero-sequence
current transformer

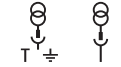
Bus sectionalizer (busbar system 1)



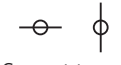
Three-position
disconnecter



Vacuum
circuit-breaker



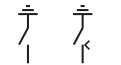
Voltage transformer
with or without
three-position dis-
connector



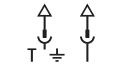
Current transformer



Capacitive voltage
detecting system



Busbar
– earthing switch
and
– make-proof
earthing switch

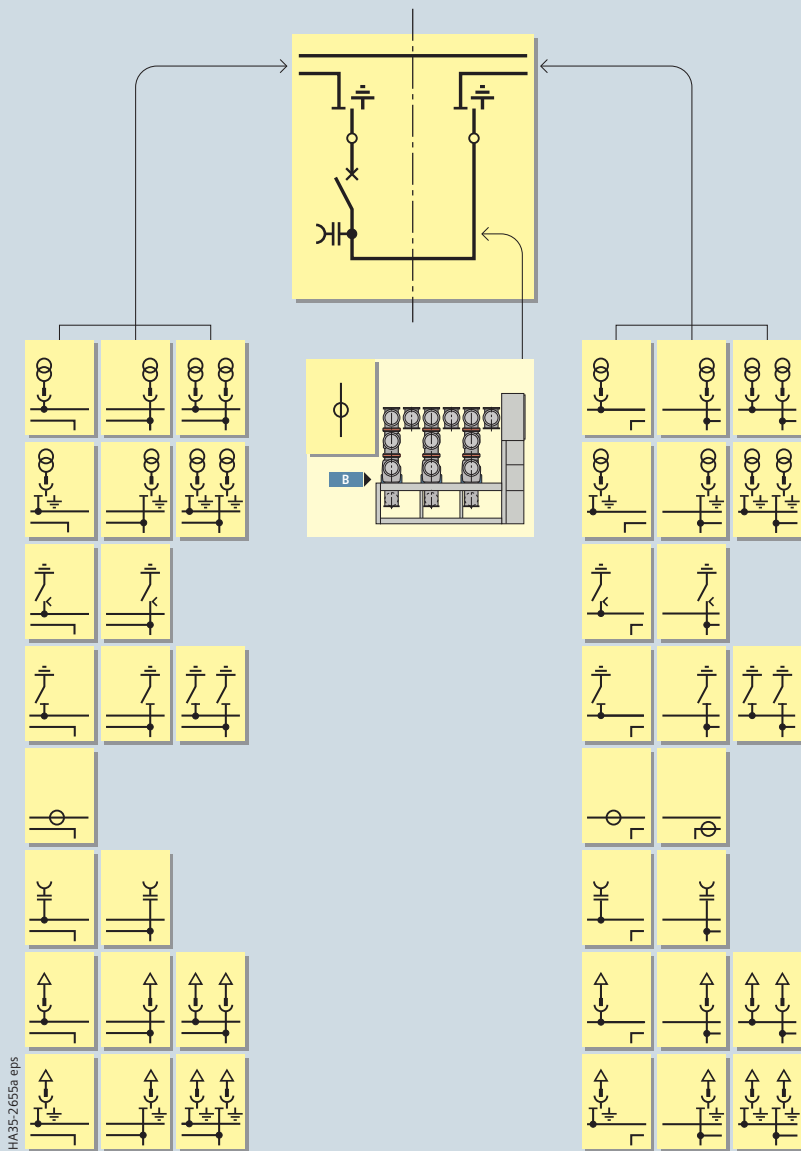


Busbar connection
with or without
three-position
disconnecter

Product range

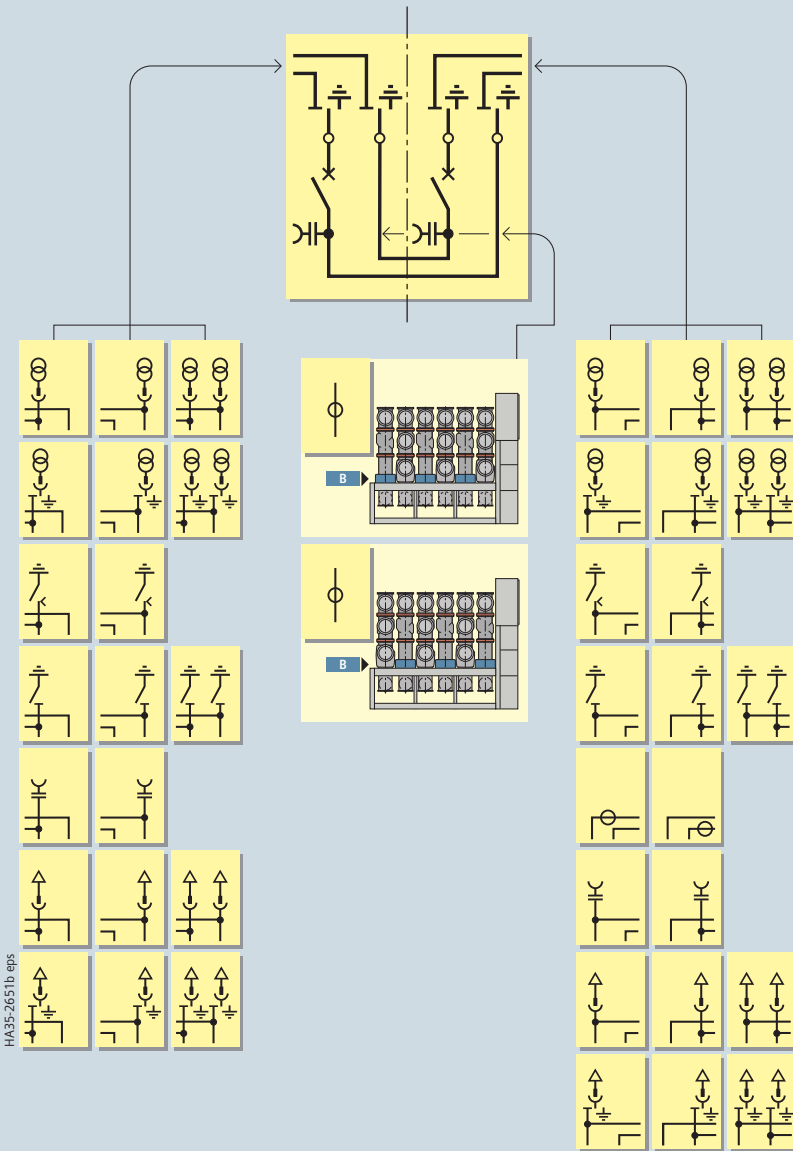
Double-busbar panels 8DB10

Bus sectionalizer (busbar system 2)



	Three-position disconnector
	Vacuum circuit-breaker
	Voltage transformer with or without three-position disconnector
	Current transformer
	Capacitive voltage detecting system
	Busbar - earthing switch and - make-proof earthing switch
	Busbar connection with or without three-position disconnector

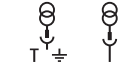
Bus sectionalizer (busbar system 1 and 2)



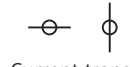
Three-position
disconnecter



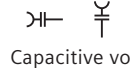
Vacuum
circuit-breaker



Voltage transformer
with or without
three-position dis-
connector



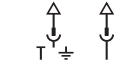
Current transformer



Capacitive voltage
detecting system



Busbar
– earthing switch
and
– make-proof
earthing switch

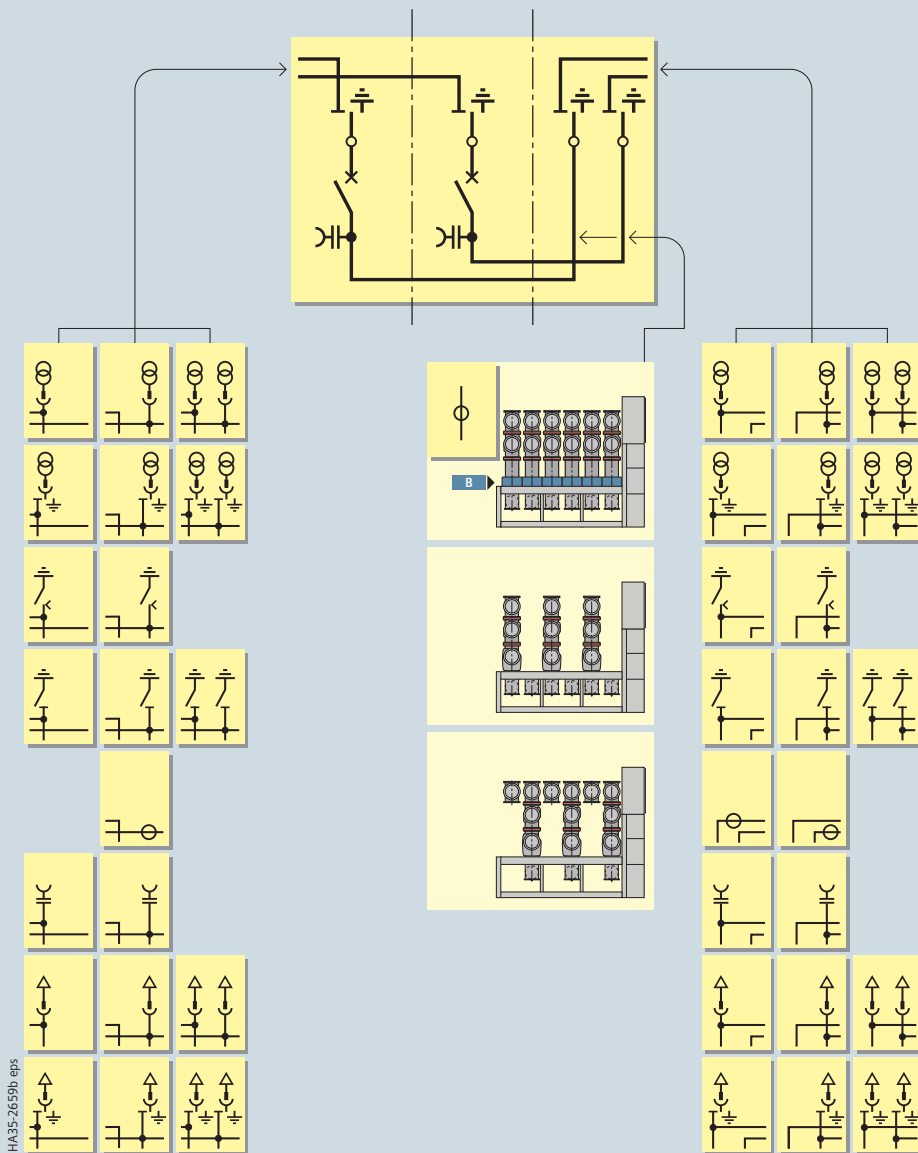


Busbar connection
with or without
three-position
disconnecter

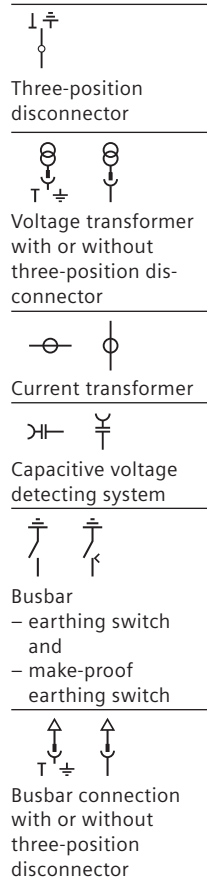
Product range

Double-busbar panels 8DB10

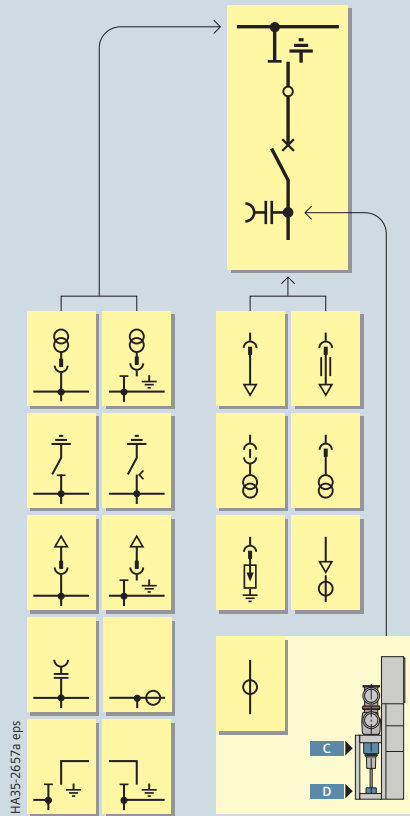
Bus sectionalizer (busbar system 1 and 2)



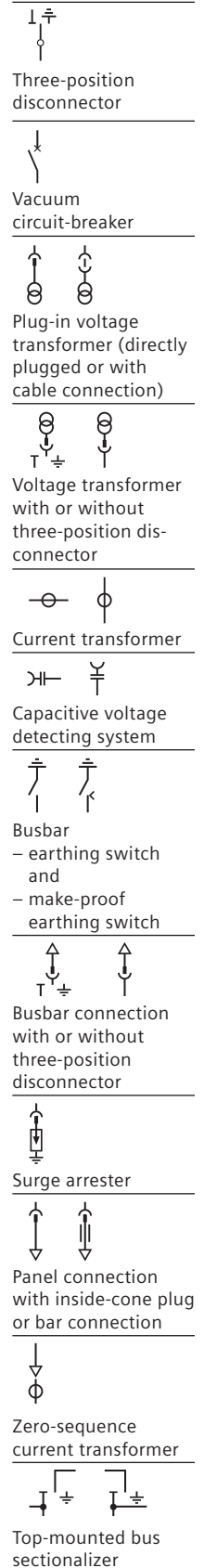
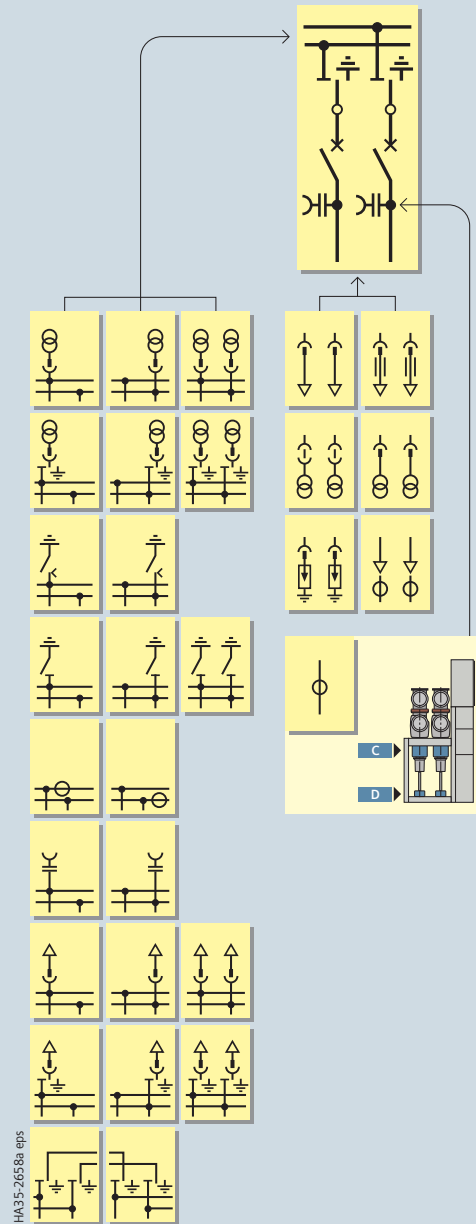
HA35-2659b.dps



Single-pole circuit-breaker panel



Double-pole circuit-breaker panel



Design

Basic panel design

Insulating system

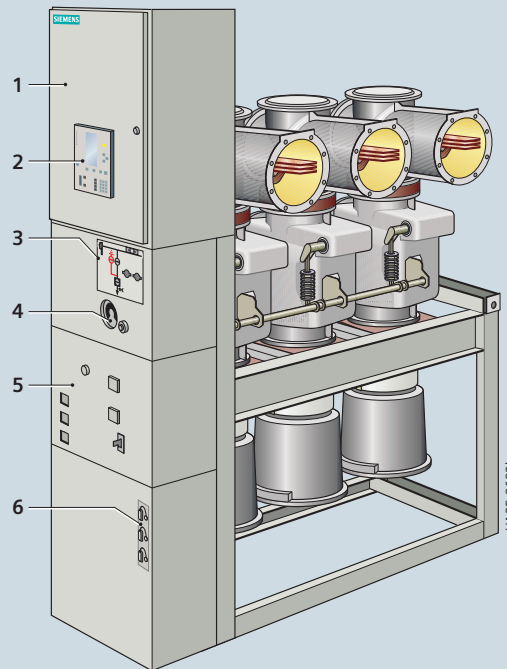
- Switchgear housing filled with SF₆ gas
- Features of SF₆ gas:
 - Non-toxic
 - Odorless and colorless
 - Non-inflammable
 - Chemically neutral
 - Heavier than air
 - Electronegative (high-quality insulator)
- GWP (Global Warming Potential) = 22,800
- Pressure of the SF₆ gas in the switchgear housing dependent on the electrical ratings (relative pressure at 20 °C):
 - Rated functional level (relative): 70 kPa to 120 kPa
 - Design pressure: 190 kPa
 - Design temperature of the SF₆ gas: 90 °C
 - Operating pressure of bursting disc: ≥ 300 kPa
 - Bursting pressure: ≥ 600 kPa
 - Gas leakage rate: < 0.1 % per year.

Panel design

- Factory-assembled, type-tested
- Single-pole metal-enclosed, with metallic partitions¹⁾
- Hermetically bolted switchgear housings made of corrosion-resistant aluminum alloy
- Switchpanel poles arranged one behind the other
- Maintenance-free in an indoor environment (IEC 62271-1)
- Degree of protection
 - IP 65 for all high-voltage parts of the primary circuit
 - IP 3XD for the switchgear enclosure
- Option: IP 31D for the switchgear enclosure
- Option: IP 41 for the low-voltage compartment
- Vacuum circuit-breaker
- Three-position disconnector for disconnecting and earthing
- Make-proof earthing by means of the vacuum circuit-breaker
- Cable connection with inside-cone plug-in system according to EN 50181
- Wall-standing or free-standing arrangement
- Instrument transformers removable, located outside the gas compartments
- Subframe, front cover, rear cover and end walls powder-coated in color "light basic" (SN 700)
- Low-voltage compartment removable, plug-in bus wires
- Standardized production processes and certified quality and environmental management system according to ISO 9001 and ISO 14001.

1) Corresponds to "metal-clad" according to former standard IEC 60298

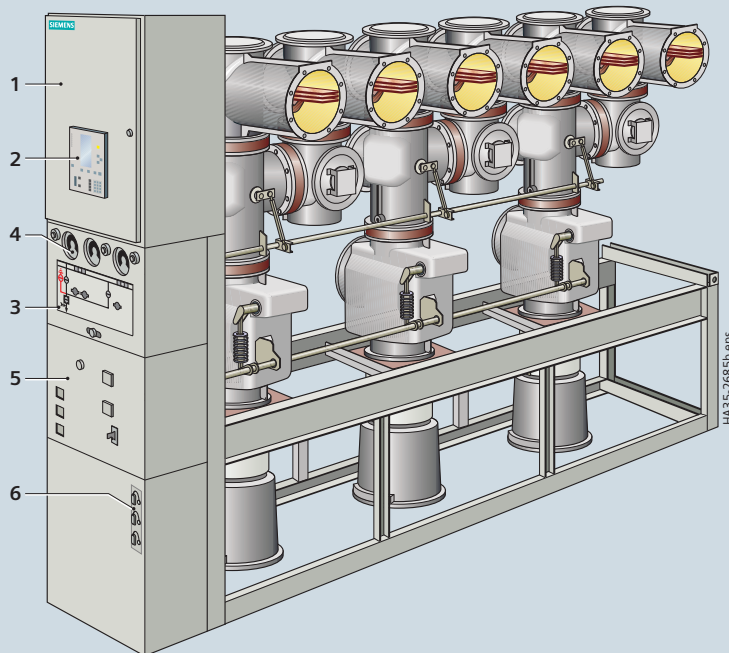
Panel design (examples)



8DA10
Panel for single-busbar switchgear

Legend for 8DA10 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 position indicators for three-position disconnector and circuit-breaker
- 4 Manometer for gas monitoring of feeder gas compartments
- 5 Circuit-breaker operating mechanism
- 6 Voltage detecting system



8DB10
Panel for double-busbar switchgear

Single-pole and double-pole design for AC traction power supply

Typical uses

- Single-pole and double-pole panels 8DA11/12 for the supply of overhead contact line sections in AC traction power supply systems
- Double-pole panels 8DA12 for application in traction power supply systems with autotransformers, e.g. for high-speed railway traffic.

Panel design

- Panel design based on standard version of single-busbar switchgear 8DA10.

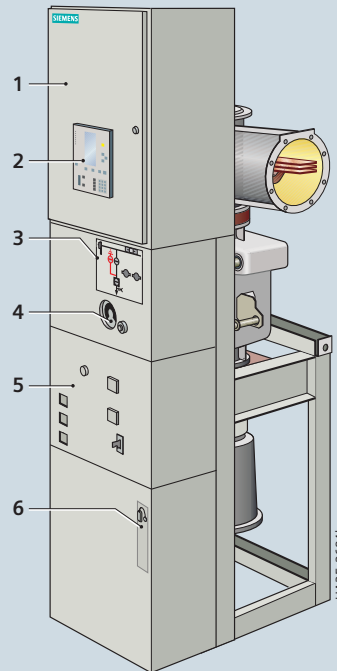
8DA11

Single-pole switchgear panel for traction power supply.

8DA12

Double-pole switchgear panel for traction power supply.

Panel design (examples)

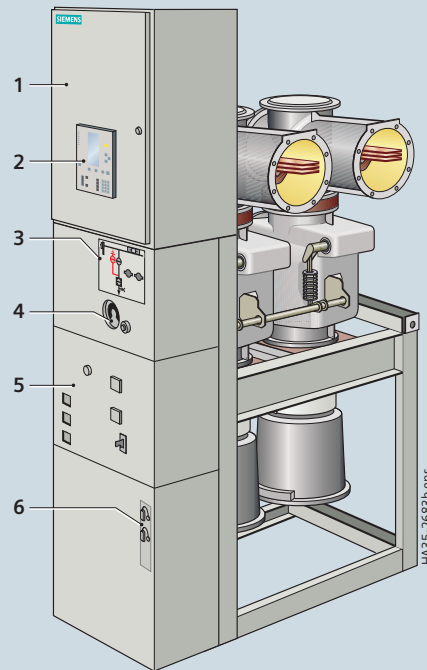


Legend for 8DA11 and 8DA12

- 1 Low-voltage compartment
- 2 Electronic control board, e.g. multifunction protection
- 3 Operating mechanism and interlock for three-position disconnecter, as well as mechanical position indicators for three-position disconnecter and circuit-breaker
- 4 Manometer for gas monitoring of feeder gas compartments
- 5 Circuit-breaker operating mechanism
- 6 Voltage detecting system

8DA11

Single-pole switchgear panel for traction power supply



8DA12

Double-pole switchgear panel for traction power supply

Design

Gas compartment scheme of 8DA10

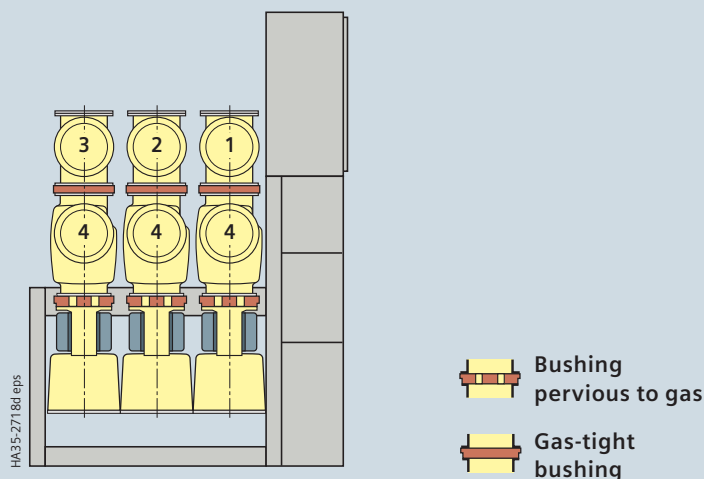
Gas compartment scheme

- Sealed pressure system (according to IEC 62271-1)
- No refilling required throughout the entire service life
- Gas compartments distributed to several areas
- Simple, visual check of the ready-for-service indicator by red/green indication areas
- Indication of gas pressure also guaranteed without auxiliary voltage supply
- Gas pressure manometers arranged at the switchgear front
- Gas filling equipment with non-return valve arranged at the switchgear front beside the associated gas pressure manometer
- Gas pressure manometers with two signaling contacts for "gas pressure too low / gas pressure too high" indication
- Option: Gas pressure manometers with three signaling contacts for "gas pressure too low / very low" and "gas pressure too high" indication
- Option: Gas pressure manometers with temperature and pressure compensation.

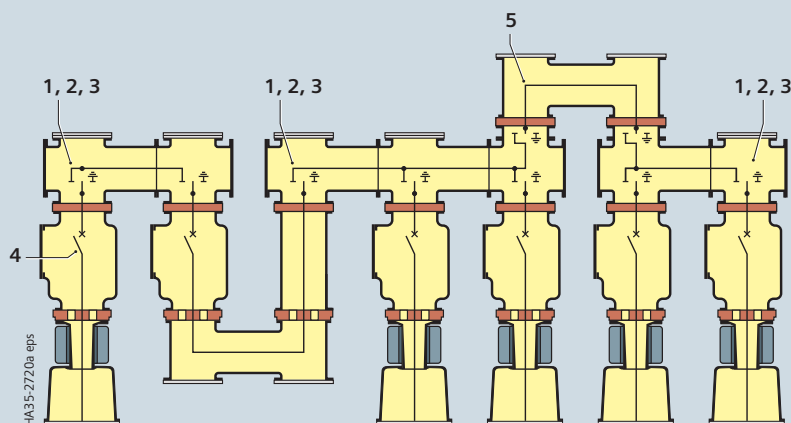
Example: Gas quantity circuit-breaker panel (36 kV, 40 kA, 1250 A, cable connection 1 x plug size S2)

- 8DA10:
 $\text{SF}_6 = 2.5 \text{ kg}$
 $\text{CO}_2\text{e} = 57 \text{ t}$
- 8DB10:
 $\text{SF}_6 = 4.5 \text{ kg}$
 $\text{CO}_2\text{e} = 105 \text{ t}$

Arrangement of gas compartments in 8DA10



Single-busbar panel 8DA10

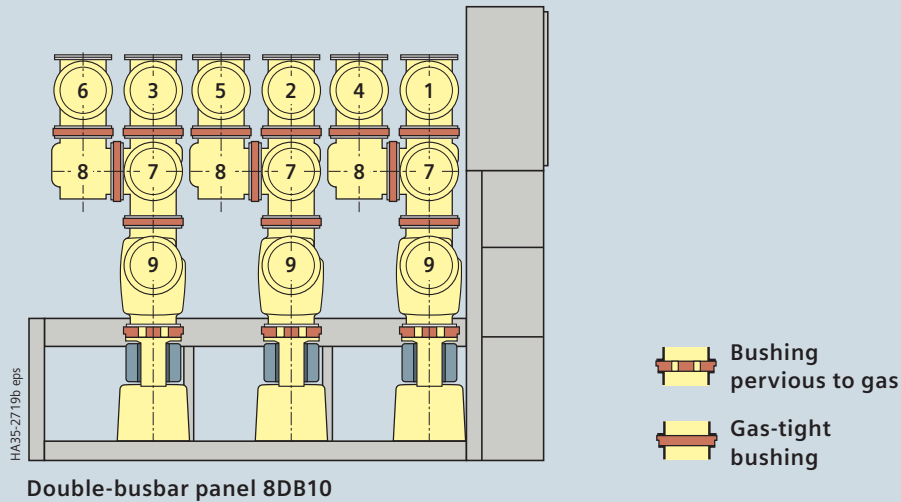


Single-busbar switchgear 8DA10

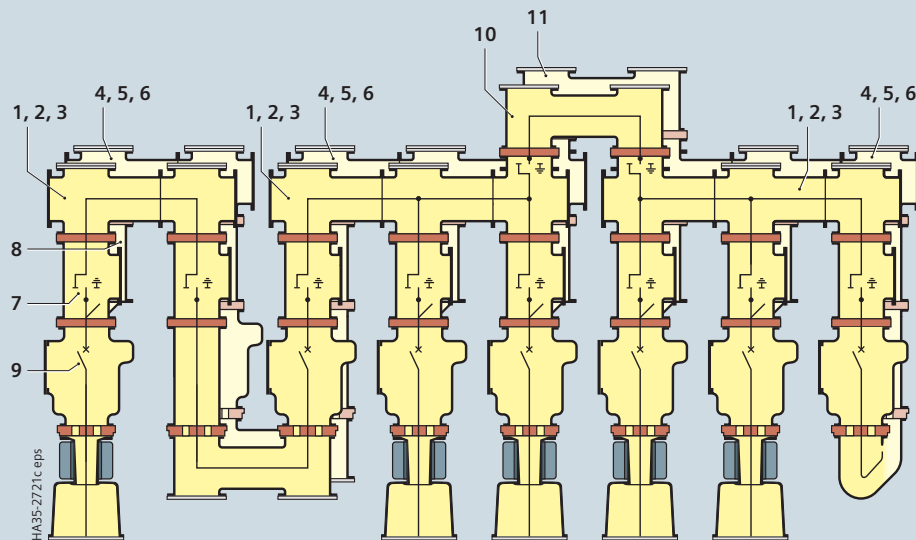
Legend for 8DA10

- 1 Busbar L1 (manometer B11)
- 2 Busbar L2 (manometer B12)
- 3 Busbar L3 (manometer B13)
- 4 Circuit-breaker L1, L2, L3 (manometer B0)
- 5 Top-mounted bus sectionalizer L1, L2, L3 (manometer B15)

Arrangement of gas compartments in 8DB10



Double-busbar panel 8DB10



Double-busbar switchgear 8DB10

Legend for 8DB10

- 1 Busbar system 1, L1 (manometer B11)
- 2 Busbar system 1, L2 (manometer B12)
- 3 Busbar system 1, L3 (manometer B13)
- 4 Busbar system 2, L1 (manometer B21)
- 5 Busbar system 2, L2 (manometer B22)
- 6 Busbar system 2, L3 (manometer B23)
- 7 Three-position disconnector, busbar system 1, L1, L2, L3 (manometer B1)
- 8 Disconnector, busbar system 2, L1, L2, L3 (manometer B2)
- 9 Circuit-breaker L1, L2, L3 (manometer B0)
- 10 Top-mounted bus sectionalizer, busbar system 1, L1, L2, L3 (manometer B15)
- 11 Top-mounted bus sectionalizer, busbar system 2, L1, L2, L3 (manometer B25)

Components

Vacuum circuit-breaker

Features

- According to IEC 62271-100 (for standards, see page 56)
- Application in hermetically bolted switchgear housings in conformity with the system
- Vacuum interrupter in gas-filled switchgear housing
- Maintenance-free for indoor installation according to IEC 62271-1
- Individual secondary equipment
- A metal bellows is used for gasketless separation between the gas insulation and the vacuum (already used with success for over 5 million vacuum interrupters).

Trip-free mechanism

The vacuum circuit-breaker is fitted with a trip-free mechanism according to IEC 62271-100.

Switching duties and operating mechanisms

The switching duties of the vacuum circuit-breaker are dependent, among other factors, on its type of operating mechanism.

Motor operating mechanism

- Motor-operating stored-energy mechanism
 - For auto-reclosing (K)
 - For synchronization and rapid load transfer (U)

Further operating mechanism features

- Located outside the switchgear housings in the operating mechanism box and behind the control board
- Stored-energy spring mechanism for 10,000 operating cycles
- Optional: Stored-energy spring mechanism for 30,000 operating cycles.

Operating mechanism functions

Motor operating mechanism ¹⁾ (M1 *)

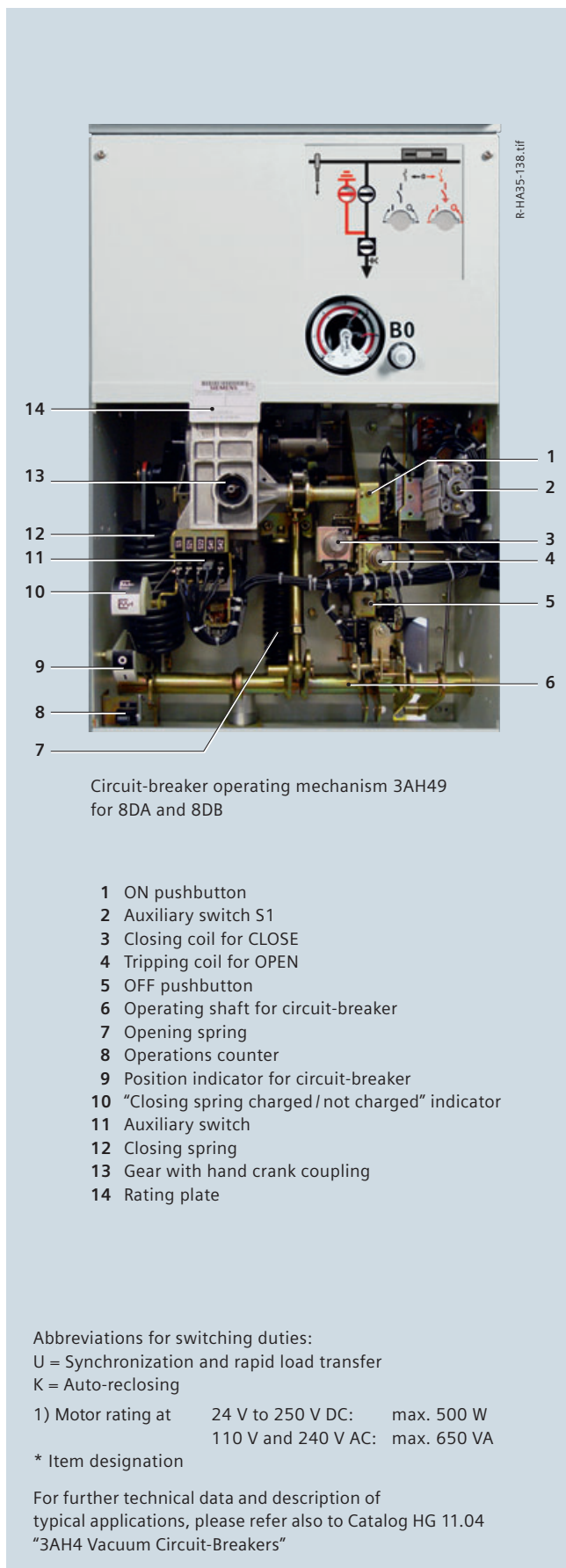
In the case of motor operating mechanism, the closing spring is charged by means of a motor and latched in the charged position ("spring charged" indication is visible). Closing is effected either by means of an ON pushbutton or a closing solenoid. The closing spring is recharged automatically (for auto-reclosing).

Endurance class of circuit-breaker

Function	Class	Standard	Property of 8DA and 8DB
BREAKING	M2	IEC 62271-100	10,000 times mechanically without maintenance
	E2	IEC 62271-100	10,000 times rated normal current without maintenance 50 times short-circuit breaking current without maintenance
	C2	IEC 62271-100	Very low probability of restrikes

Operating times

Closing time	Closing solenoid	< 80 ms
Opening time	1 st shunt release	< 60 ms
	2 nd shunt release	> 60 ms
	Undervoltage release	< 60 ms
Arcing time	at 50 Hz	< 15 ms
	at 60 Hz	< 12 ms
Break time	at 50 Hz	1 st shunt release
		2 nd shunt release
		Undervoltage release
Dead time		300 ms
Total charging time		< 15 s



Circuit-breaker operating mechanism 3AH49 for 8DA and 8DB

- 1 ON pushbutton
- 2 Auxiliary switch S1
- 3 Closing coil for CLOSE
- 4 Tripping coil for OPEN
- 5 OFF pushbutton
- 6 Operating shaft for circuit-breaker
- 7 Opening spring
- 8 Operations counter
- 9 Position indicator for circuit-breaker
- 10 "Closing spring charged / not charged" indicator
- 11 Auxiliary switch
- 12 Closing spring
- 13 Gear with hand crank coupling
- 14 Rating plate

Abbreviations for switching duties:

U = Synchronization and rapid load transfer

K = Auto-reclosing

1) Motor rating at 24 V to 250 V DC: max. 500 W
110 V and 240 V AC: max. 650 VA

* Item designation

For further technical data and description of typical applications, please refer also to Catalog HG 11.04 "3AH4 Vacuum Circuit-Breakers"

Secondary equipment

The scope of the secondary equipment of the vacuum circuit-breaker depends on the type of application and offers a wide range of possible variations, allowing almost every requirement to be satisfied.

Closing solenoid

- Type 3AY15 10 (Y9 *)
- For electrical closing.

Shunt releases

- Types:
 - Standard: 3AY15 10 (Y1 *)
 - Option: 3AX11 01 (Y2 *), with energy store
- Tripping by protection relay or electrical actuation.

Undervoltage release

- Type 3AX11 03 (Y7 *)
- Comprising:
 - Energy store and unlatching mechanism
 - Electromagnetic system, which is permanently connected to voltage while the vacuum circuit-breaker is closed; tripping is initiated when this voltage drops
- Connection to voltage transformers possible.

Anti-pumping

- Function: If constant CLOSE and OPEN commands are present at the vacuum circuit-breaker at the same time, the vacuum circuit-breaker will return to the open position after closing. It remains in this position until a new CLOSE command is given. In this manner, continuous closing and opening (= pumping) is avoided.

Circuit-breaker tripping signal

- For electrical signaling (as pulse > 10 ms), e.g. to remote control systems, in the case of automatic tripping (e.g. protection)
- Via limit switch (S6 *) and cutout switch (S7 *).

Varistor module

- To limit overvoltages to approx. 500 V for protection devices (when inductive components are mounted in the vacuum circuit-breaker)
- For auxiliary voltages ≥ 60 V DC.

Auxiliary switch

- Type 3SV9 (S1 *)
- Standard: Up to 22 NO + 22 NC.

Position switch

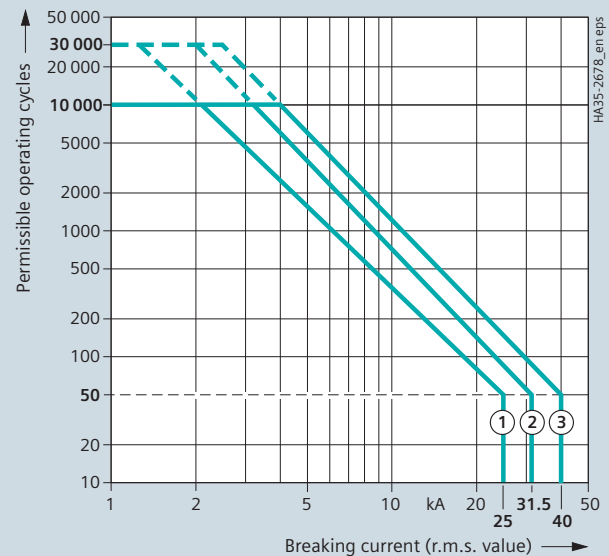
- Type 3SE4 (S4 *)
- For signaling "closing spring charged".

Mechanical interlock

- Mechanical interlocking to the three-position disconnect
- During operation of the three-position disconnect, the vacuum circuit-breaker cannot be operated.

Abbreviations: NO = normally open contact,
NC = normally closed contact

Operating cycle diagram



Examples

Electrical data (curve 1)

Rated short-circuit breaking current 25 kA
Rated normal current 1250 A

Electrical data (curve 2)

Rated short-circuit breaking current 31.5 kA
Rated normal current 2000 A

Electrical data (curve 3)

Rated short-circuit breaking current 40 kA
Rated normal current 2500 A

Rated operating sequences

Rapid load transfer (U): O-t-CO-t'-CO (t = 0.3 s, t' = 3 min)

Auto-reclosing (K): O-t-CO-t'-CO (t = 0.3 s, t' = 3 min)

Auto-reclosing (K): O-t-CO-t'-CO (t = 0.3 s, t' = 15 s)

O = OPEN operation

CO = CLOSE operation with subsequent OPEN operation at the shortest internal close-open time of the vacuum circuit-breaker

Possible release combinations

Release	1	2	3	4
1 st shunt release type type 3AY15 10	•	•	•	•
2 nd shunt release type type 3AX11 01	–	•	–	•
Undervoltage release type 3AX11 03	–	–	•	•

* Item designation

Components

Three-position disconnector

Features

- Rated normal currents up to 3150 A
- 2000 operating cycles for the disconnector (higher operating cycles on request)
- 1000 operating cycles for the earthing switch (higher operating cycles on request)
- Option: Up to 2000 operating cycles for the earthing switch
- Operating shaft and contact blades with common center of rotation and reliable switch position up to the operating front of the panel
- Gas-tight bushings separate the busbar and circuit-breaker housings underneath the busbar disconnector contacts
- Cable connection and circuit-breaker housings can be removed without interrupting busbar operation
- Maintenance-free.

Switch positions

- CLOSED, OPEN, EARTHED or READY-TO-EARTH
- CLOSED: Contact blades connected with the busbar: 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
- EARTHED: Feeder earthed and short-circuited by closing the circuit-breaker.

Operating mechanism

- Only permissible operations possible due to logical mechanical interlocks
- Mechanically coupled position indicator
- Separate operating shafts for the "DISCONNECTING", "EARTHING" and "READY-TO-EARTH" functions
- With manual operating mechanism
- Option: With motor operating mechanism
Motor rating at 24 V to 250 V DC: max. 100 W
110 V to 240 V AC: max. 130 VA
- Same sense of rotation for the switching operations of the "CLOSE" or "OPEN" functions.

Endurance class of three-position disconnector

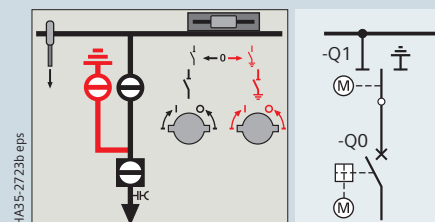
Function	Class	Standard	Property of 8DA and 8DB
DISCONNECTING	M1	IEC 62271-102	2000 times mechanically without maintenance
READY-TO-EARTH			1000 times mechanically without maintenance
EARTHING	E2 ¹⁾	IEC 62271-102	50 times rated short-circuit making current I_{ma} without maintenance

Endurance class of make-proof earthing switch

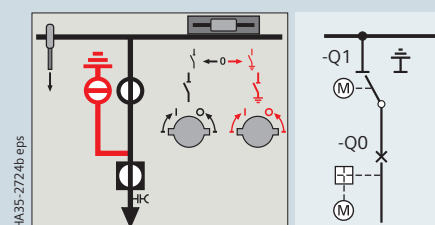
Function	Class	Standard	Property of 8DA and 8DB
EARTHING	E1	IEC 62271-102	1000 times mechanically without maintenance 2 times rated short-circuit making current I_{ma} without maintenance

1) By closing the circuit-breaker

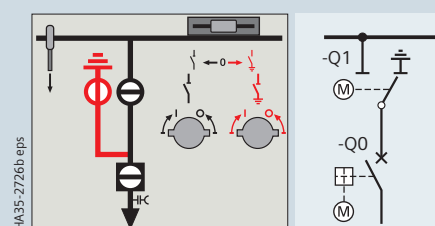
Position indicators of 8DA10 for three-position disconnector and vacuum circuit-breaker



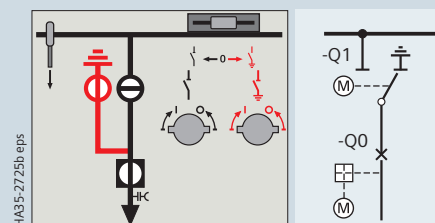
Feeder OPEN



Feeder CLOSED



Feeder READY-TO-EARTH

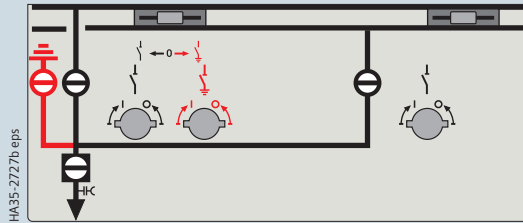


Feeder EARTHED

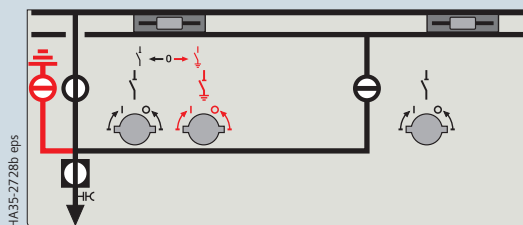
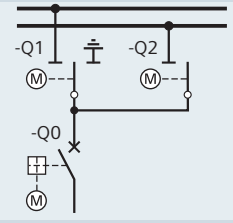
Interlocks

- Selection of permissible switching operations by means of a control gate with mechanically interlocked vacuum circuit-breaker
- Selection of permissible switching operations in double-busbar switchgear additionally by means of a control gate with mechanically interlocked vacuum circuit-breaker
- Corresponding operating shafts are not released at the operating front until they have been pre-selected with the control gate
- Operating lever cannot be removed until switching operation has been completed
- Circuit-breaker cannot be closed until the control gate is in neutral position again
- Option: Switchgear interlocking system with electromechanical interlocks (mechanical interlocking for manual operation remains).

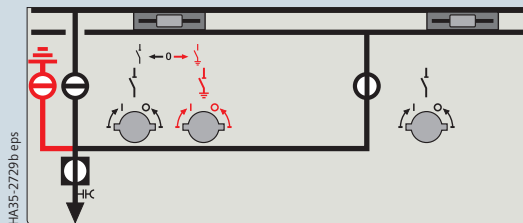
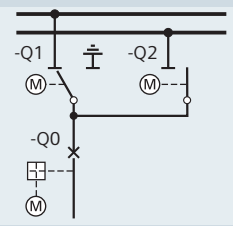
Position indicators of 8DB10 for three-position disconnect and vacuum circuit-breaker



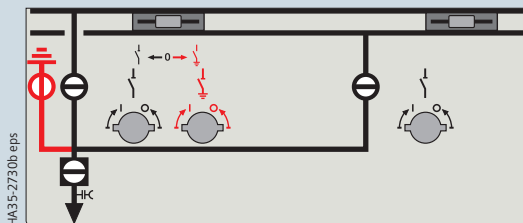
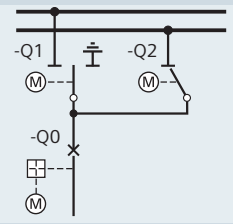
Feeder OPEN



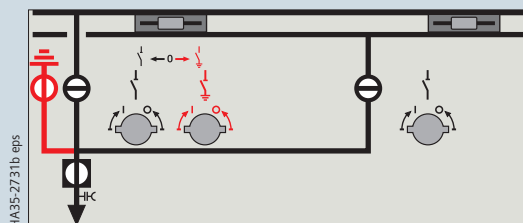
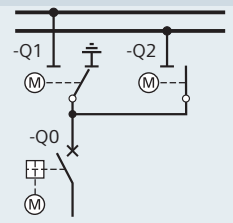
Feeder busbar system 1 CLOSED



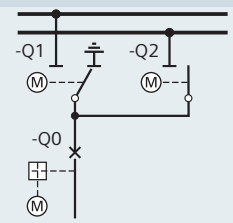
Feeder busbar system 2 CLOSED



Feeder READY-TO-EARTH



Feeder EARTHED



Components

Control board

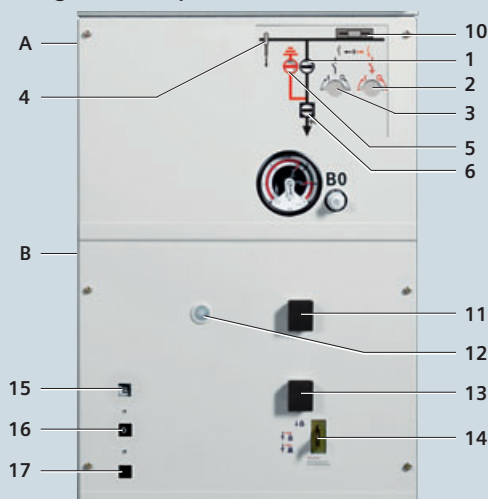
Features

- Mechanical control board below the low-voltage compartment
- Actuators directly at the operating mechanisms
- Mechanical position indicators integrated in the switchgear front
- Unambiguous assignment of actuating openings and control elements to the corresponding position indicators
- Ergonomic height of all control elements.

Interlocking

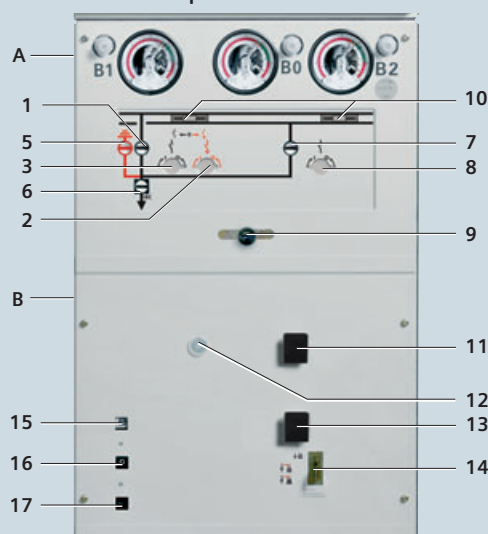
- Panel-internal mechanical interlocks
- Operation of three-position disconnecter (CLOSED, OPEN, EARTHED or READY-TO-EARTH)
- Vacuum circuit-breaker interlocked mechanically
- Control gate for opening the actuating openings (with single-busbar systems it can only be operated if the interrogation lever (4) is pushed downwards)
- Actuating openings (2, 3 and 8) cannot be opened as long as the vacuum circuit-breaker is in CLOSED position
- Operating lever can be inserted when the actuating openings are open
- Operating lever cannot be removed before the definite end position of the disconnecting or earthing function is reached
- Feeder de-earthing is secured by the vacuum circuit-breaker
 - electrically via the auxiliary switch
 - mechanically through the lever (14) of the mechanical circuit-breaker tripping block.

Single-busbar panels 8DA10



R-HA35-139.tif

Double-busbar panels 8DB10



R-HA35-140.tif

A Operating mechanism of the three-position disconnecter

- 1 CLOSED/OPEN position indicator for disconnecting function of three-position disconnecter
- 2 Actuating opening for earthing function
- 3 Actuating opening for disconnecter function
- 4 Interrogation lever
- 5 CLOSED/OPEN position indicator for earthing function of three-position disconnecter
- 6 CLOSED/OPEN position indicator for vacuum circuit-breaker
- 7 CLOSED/OPEN position indicator for 2nd disconnecter in double-busbar systems
- 8 Actuating opening for 2nd disconnecter in double-busbar systems
- 9 Selector gate for selecting the three-position disconnecter or the disconnecter in double-busbar systems
- 10 Control gate for opening the actuating openings (with single-busbar systems it can only be operated if the interrogation lever (4) is pushed downwards)

B Operating mechanism of the vacuum circuit-breaker

- 11 Mechanical ON pushbutton for vacuum circuit-breaker
- 12 Actuating opening for manual charging of the circuit-breaker operating spring
- 13 Mechanical OFF pushbutton for vacuum circuit-breaker
- 14 Lever for locking the vacuum circuit-breaker against "de-earthing"
- 15 "Circuit-breaker spring charged" indicator
- 16 CLOSED/OPEN position indicator for vacuum circuit-breaker
- 17 Operations counter for vacuum circuit-breaker

Busbar features

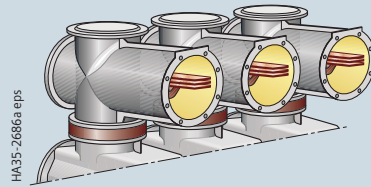
- Single-pole enclosure with modular switchgear housings made of corrosion-resistant aluminum alloy
- Continuous gas insulation without plug-in connections or adapters
- No alteration of the insulating medium throughout the complete busbar assembly
- Up to 4000 A with copper bar connection in one busbar housing
- 5000 A with copper bar connection in two busbar housings (twin busbar).

Design of busbar components

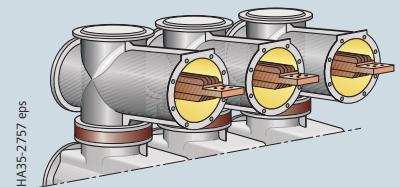
The busbars of single-busbar switchgear 8DA and double-busbar switchgear 8DB can be equipped with the following busbar components:

- Plug-in, metal-enclosed busbar voltage transformers with or without three-position disconnecter
- Busbar current transformers
- Busbar connection with cable plug, or with solid-insulated or gas-insulated bar connection, with or without three-position disconnecter
- Busbar earthing switch or make-proof earthing switch
- Capacitive voltage detecting system according to IEC 61243-5 or IEC 61958
- Top-mounted bus sectionalizer for distribution into two busbar sections without additional switchgear panels and space requirements.

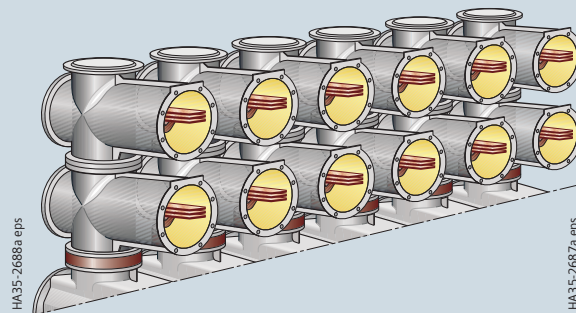
Busbar versions



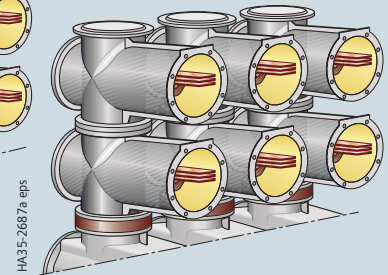
Busbar version up to 3150 A
Example 8DA10



Busbar version 4000 A
Example 8DA10

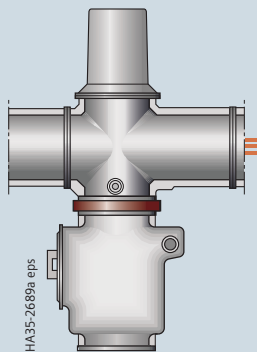


Busbar version 5000 A (twin busbar)
Example 8DB10

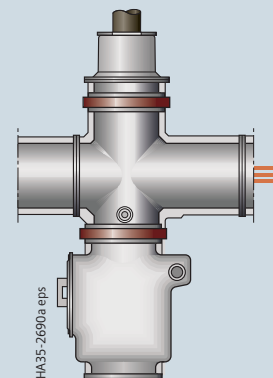


Busbar version 5000 A (twin busbar)
Example 8DA10

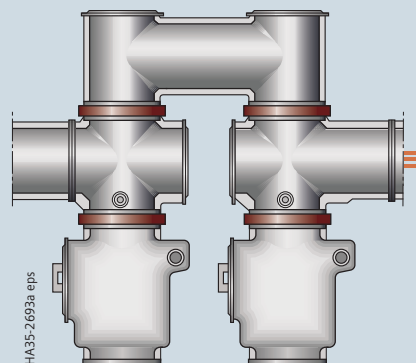
Busbar components



Busbar connection with cable plug
size S2 or size S3



Busbar connection with solid-insulated or gas-insulated bar



Top-mounted bus sectionalizer

Components

Current transformers

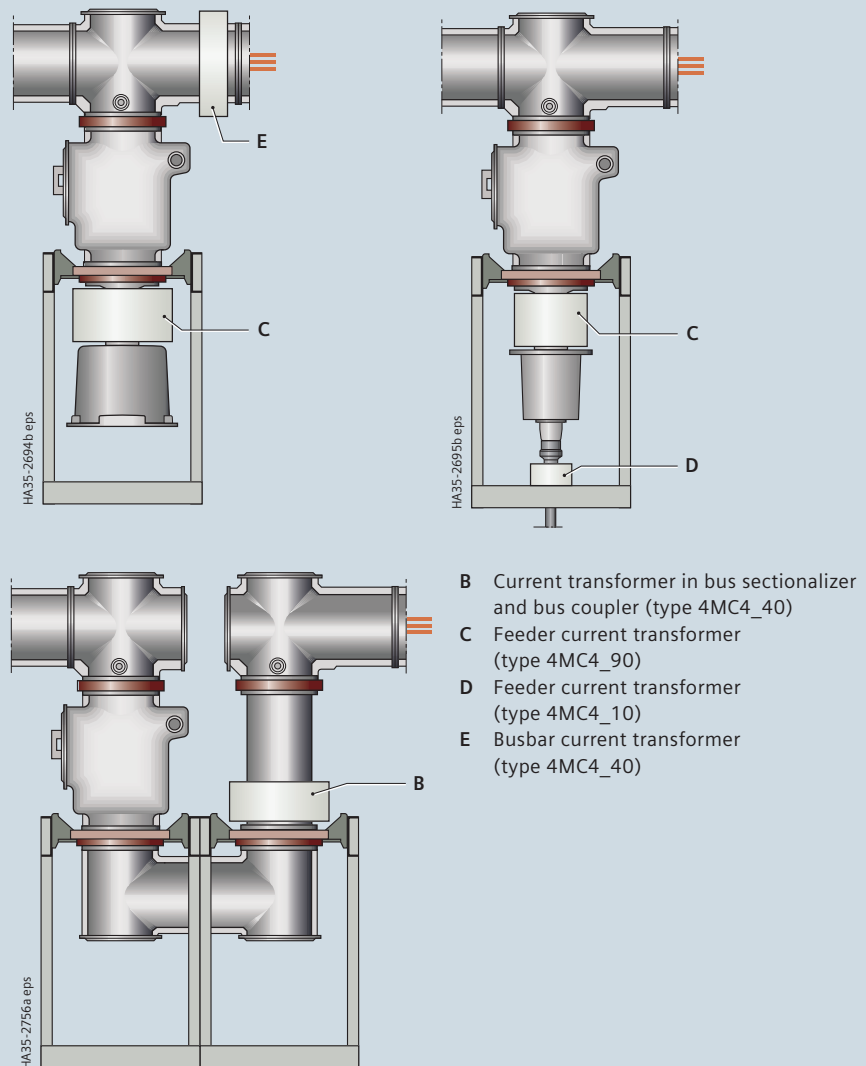
Features

- According to IEC 61869-2
- Designed as ring-core current transformers, single-pole
- Free of dielectrically stressed cast-resin parts (due to design)
- Insulation class E
- Inductive type
- Certifiable
- Climate-independent
- Secondary connection by means of a terminal strip in the low-voltage compartment of the panel
- Cast-resin insulated.

Installation

- Arranged outside the primary enclosure (switchgear housing).

Current transformers



Current transformer installation (basic scheme)

Electrical data *

Designation	Type 4MC4	Designation	Type 4MC4
Operating voltage	max. 0.8 kV	Multiratio (secondary)	200 A – 100 A up to 3150 A – 1575 A
Rated short-duration power-frequency withstand voltage (winding test)	3 kV	Core data according to rated primary current:	max. 3 cores
Rated frequency	50/60 Hz	Measuring core	Rating Class 2.5 VA to 30 VA 0.2 to 1 Overcurrent factor FS 5, FS 10
Rated continuous thermal current	max. 1.2 × rated current (primary)	Protection core	Rating Class 2.5 VA to 30 VA 5 P or 10 P Overcurrent factor 10 to 30
Rated thermal short-time current, max. 3 s	max. 40 kA	Permissible ambient air temperature	max. 60 °C
Rated current	dynamic primary unlimited 40 A to 3150 A secondary 1 A and 5 A	Insulation class	E

* Further electrical data on request

Features

- According to IEC 61869-3
- Single-pole, plug-in design
- Connection system with plug-in contact according to EN 50181
- Inductive type
- Safe-to-touch due to metal enclosure
- Certifiable
- Climate-independent
- Secondary connection by means of plugs in the low-voltage compartment of the panel
- Cast-resin insulated.

Installation

- Arranged outside the primary enclosure (switch-gear housing).

Mounting locations

- On the busbar
- At the panel connection housing.

Voltage transformer types

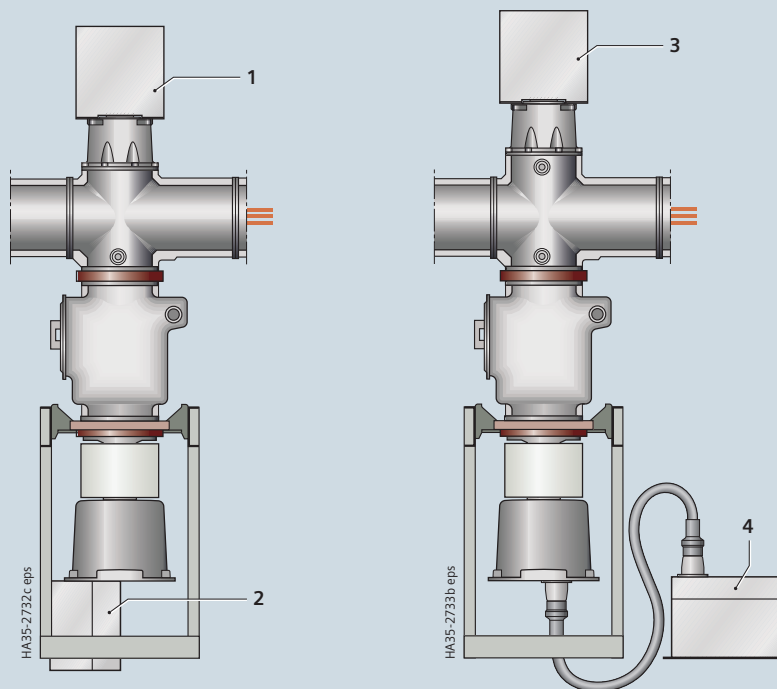
Busbar voltage transformers 4MT3 and 4MU4

- Pluggable on the busbar with plug-in system according to EN 50181
- No separate metering panel required
- Option: Three-position disconnecter for busbar voltage transformer CLOSED – OPEN – EARTHED
- Option 4MU4: Repeat test at 80 % of the rated short-duration power-frequency withstand voltage possible with mounted voltage transformer.

Feeder voltage transformers 4MT7 and 4MU3

- Pluggable at the feeder with plug-in system according to EN 50181
- Connection of 4MT7 directly at the panel connection housing
- Connection of 4MU3 via flexible cable with plug size S2 at the panel connection housing, and metal-enclosed voltage transformer.

Voltage transformers



Voltage transformer installation (basic scheme)

- 1 Busbar voltage transformer 4MU4
- 2 Feeder voltage transformer 4MT7 (connection at panel connection housing)

- 3 Busbar voltage transformer 4MU4 with three-position disconnecter
- 4 Feeder voltage transformer 4MU3 (not in the panel, connection via flexible cable with plug size S2 at the panel connection housing, and metal-enclosed voltage transformer)

Electrical data (maximum values)

Designation	4MT3	4MU4	4MT7	4MU3
Rated voltage kV	24.0	40.5	40.5	40.5
Rated short-duration power-frequency withstand voltage kV	65	95	95	95
Rated lightning impulse withstand voltage kV	125	200	200	200
Rated voltage factor	$U_n/8h = 1.9$ $U_n/\text{continuous} = 1.2$	$U_n/8h = 1.9$ $U_n/\text{continuous} = 1.2$	$U_n/8h = 1.9$ $U_n/\text{continuous} = 1.2$	$U_n/8h = 1.9$ $U_n/\text{continuous} = 1.2$
Standard	IEC GOST GB	IEC GOST GB	IEC GOST GB	IEC GOST GB

Components

Panel connection

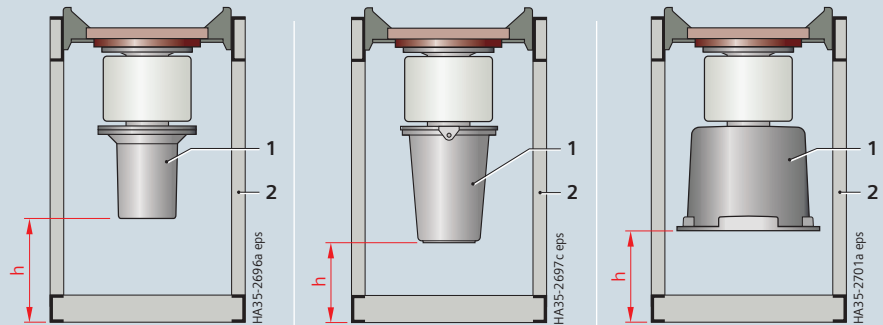
Features

- Bushings for plugs with inside-cone plug-in system according to EN 50181
- Inside-cone plug-in system for plug sizes 2, 3 and 4
- Single and multiple connections possible per phase
- Connection of several cables with different plug sizes possible per phase
- Connection of solid-insulated or gas-insulated bar possible
- Connection of 4MT7 voltage transformer plugged in at the panel connection housing version 3
- Connection of 4MU3 voltage transformer via flexible cable and plug size 2 at the panel connection housing
- For rated normal currents up to 3150 A.

Surge arresters

- Pluggable via inside-cone plug-in system size 2 or 3
- Surge arresters recommended if, at the same time,
 - the cable system is directly connected to the overhead line,
 - the protection zone of the surge arrester at the end tower of the overhead line does not cover the switch-gear.

Panel connection of 8DA10, 8DB10 and 8DA11/12 for cable plugs and bar systems



Version 1		Version 2		Version 3			
S2		S3		S2	S3	4MT7	Solid-insulated bar connection
1		1		1	1	–	–
				2	–	–	–
				3	–	–	–
				–	2	–	–
				–	3	–	–
				1	2	–	–
				1	–	1	–
				2	–	1	–
				–	1	1	–
				–	2	1	–
				1	1	1	–
				–	–	1	1
				1	–	–	1
				2	1	–	–

Switch-gear type	Rated normal current [A]	Standard subframe	High subframe	Connection height of panel connection versions (mm)			
8DA10	up to 3150	X		320	240	275	240.5
8DA11 8DA12			X	540	460	495	460.5
8DB10	up to 2500 ¹⁾	X		120	40	75	40.5
			X	540	460	495	460.5

Legend

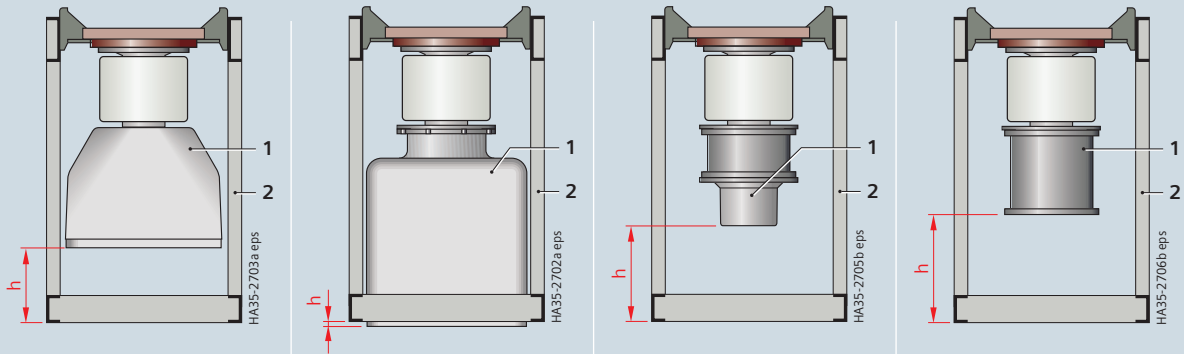
1 Panel connection housing

2 Subframe

h Connection height of panel connection versions

1) 3150 A on request

Panel connection of 8DA10, 8DB10 and 8DA11/12 for cable plugs and bar systems



Version 4			Version 5			Version 6	Version 7
S2	S3	Solid-insulated bar connection	S2	S3	S4	Solid-insulated bar connection	Gas-insulated bar connection
4	–	–	–	–	1	1	1
5	–	–	1	–	1		
6	–	–	2	–	1		
–	4	–	–	1	1		
1	3	–	1	1	1		
1	4	–	–	–	2		
2	2	–	–	2	1		
2	3	–					
3	1	–					
3	2	–					
4	1	–					
2	–	1					
–	1	1					
–	2	1					
1	1	1					
Connection height of panel connection versions (mm)							
222		219	-15			290	327
442		439	205			510	547
22		19	-215			90	127
442		439	205			510	547

Components

Panel connection (commercially available cable plugs and bar connections)

Busbar and panel connection (commercially available cable plugs)

Cable type	Cable sealing end					Remark
	Make	Type	Size	Diameter across cable insulation mm	Conductor cross-section mm ²	

Thermoplastic-insulated cables ≤ 12 kV according to IEC 60502-2

Single-core cable or three-core cable, PE and XLPE-insulated, N2YSY (Cu) and N2XSY (Cu) or NA2YSY (Al) and NA2XSY (Al)	nkt cables	CPI 2	2	12.7 - 33.6	25 - 300	Insulation material silicone rubber, with or without metal housing, installation without special tools
		CPI 3	3	21.2 - 45.6	185 - 630	
	Pfisterer	CONNEX	2	13.5 - 44.0	25 - 400	Insulation material silicone rubber, with metal housing
		CONNEX	3	15.5 - 55.0	35 - 800	
		CONNEX	4	33.0 - 78.5	95 - 1600	
	Südkabel	SEIK 14	2	13.0 - 40.6	25 - 300	Insulation material silicone rubber, with metal housing
		SEIK 15	3	19.3 - 50.6	120 - 630	
	Tyco Electronics	RPIT-321x	2	19.5 - 36.0	95 - 300	Insulation material silicone rubber, with metal housing
		RPIT-331x	3	26.0 - 50.0	240 - 630	

Thermoplastic-insulated cables ≤ 24 kV according to IEC 60502-2

Single-core cable or three-core cable, PE and XLPE-insulated, N2YSY (Cu) and N2XSY (Cu) or NA2YSY (Al) and NA2XSY (Al)	nkt cables	CPI 2	2	17.0 - 40.0	25 - 300	Insulation material silicone rubber, with or without metal housing, installation without special tools
		CPI 3	3	21.2 - 45.6	95 - 630	
	Pfisterer	CONNEX	2	13.5 - 44.0	25 - 400	Insulation material silicone rubber, with metal housing
		CONNEX	3	15.5 - 55.0	35 - 800	
		CONNEX	4	33.0 - 78.5	95 - 1600	
	Südkabel	SEIK 24	2	13.0 - 40.6	25 - 300	Insulation material silicone rubber, with metal housing
		SEIK 25	3	19.3 - 50.6	50 - 630	
	Tyco Electronics	RPIT-521x	2	19.5 - 36.0	50 - 300	Insulation material silicone rubber, with metal housing
		RPIT-531x	3	26.0 - 50.0	150 - 630	

Thermoplastic-insulated cables ≤ 40.5 kV according to IEC 60502-2

Single-core cable or three-core cable, PE and XLPE-insulated, N2YSY (Cu) and N2XSY (Cu) or NA2YSY (Al) and NA2XSY (Al)	nkt cables	CPI 2	2	17.0 - 40.0	25 - 300	Insulation material silicone rubber, with or without metal housing, installation without special tools
		CPI 3	3	21.2 - 51.0	50 - 630	
	Pfisterer	CONNEX	2	13.5 - 44.0	25 - 400	Insulation material silicone rubber, with metal housing
		CONNEX	3	15.5 - 55.0	35 - 800	
		CONNEX	4	33.0 - 78.5	95 - 1600	
	Südkabel	SEIK 34	2	13.0 - 40.6	35 - 300	Insulation material silicone rubber, with metal housing
		SEIK 35	3	19.3 - 50.6	50 - 630	
	Tyco Electronics	RPIT-621x	2	19.5 - 36.0	50 - 185	Insulation material silicone rubber, with metal housing
		RPIT-631x	3	26.0 - 50.0	95 - 630	

Busbar and panel connection (commercially available bar systems)

Bar type	Bar connection				Remark
	Make	Type	Conductor material	Max. rated current ¹⁾	
Solid-insulated bar	MGC	Duresca DE	Copper, aluminum	2500 A	Outer sheath made of polyamide
	Moser Glaser	Duresca DG	Copper, aluminum	2500 A	Outer sheath made of CrNi steel or aluminum
	Tefelen Preissinger	ISOBUS MR	Copper, aluminum	2500 A	Outer sheath made of heat shrinkable tube
	Ritz	SIS	Copper, aluminum	2500 A	Outer sheath made of heat shrinkable tube
Gas-insulated bar	MGC Moser Glaser	Gaslink	Copper	2500 A	Aluminum housing
	Tefelen Preissinger	ISOBUS MG	Copper	2500 A	Aluminum housing

Busbar and panel connection (commercially available dummy plugs)

Accessories	Dummy plug				Remark
	Make	Type	Size	Rated voltage	
Inside-cone plug-in system according to EN 50181	nkt cables	FPI 2	2	40.5 kV	Insulation material silicone rubber, with metal housing
		FPI 3	3	40.5 kV	
	Pfisterer Blindstecker		2	40.5 kV	Insulation material silicone rubber, with metal housing
			3	40.5 kV	
			4	40.5 kV	
	Südkabel	ISIK 14/24/34	2	12 / 24 / 40.5 kV	Insulation material silicone rubber, with metal housing
		ISIK 15/25/35	3	12 / 24 / 40.5 kV	
	Tyco Electronics	RPIC-2	2	40.5 kV	Insulation material silicone rubber, with metal housing
		RPIC-3	3	40.5 kV	

1) Higher values on request

Voltage detecting systems according to IEC 61243-5 or VDE 0682-415, IEC 62271-206

- To verify safe isolation from supply
- LRM detecting systems
- with plug-in indicator
- with integrated indicator, type VOIS+, VOIS R+
- with integrated indicator, with integrated repeat test of the interface, with integrated function test, type CAPDIS-S1+, WEGA 1.2 C, WEGA 1.2 C Vario, with integrated signaling relay, type CAPDIS-S2+, WEGA 2.2 C, WEGA 3.

Plug-in voltage indicator

- Verification of safe isolation from supply phase by phase
- Indicator suitable for continuous operation
- Measuring system and voltage indicator can be tested, repeat test according to local specifications and standards
- Voltage indicator flashes if high voltage is present.

VOIS+, VOIS R+

- Integrated display, without auxiliary power
- With indication "A1" to "A3" (see legend)
- Maintenance-free, repeat test according to local specifications and standards required
- With integrated 3-phase LRM test socket for phase comparison
- With integrated signaling relay (only VOIS R+)
- Degree of protection IP54.

Common features of CAPDIS-Sx+

- Maintenance-free
- Integrated display, without auxiliary power
- Integrated repeat test of the interfaces (self-monitoring)
- With integrated function test (without auxiliary power) by pressing the "Display-Test" pushbutton
- Adjustable for different operating voltages (adjustable capacitance C2)
- With integrated 3-phase LRM test socket for phase comparison
- With connectable signal-lead test
- With overvoltage monitoring and signaling (1.2 times operating voltage)
- Degree of protection IP54.

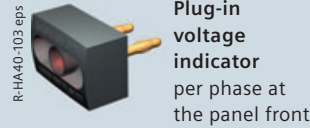
CAPDIS-S1+

- Without auxiliary power
- With indication "A1" to "A7" (see legend)
- Without ready-for-service monitoring
- Without signaling relays (without auxiliary contacts).

CAPDIS-S2+

- With indication "A0" to "A8" (see legend)
- Only by pressing the "Test" pushbutton: "ERROR" indication (A8), e.g. in case of missing auxiliary voltage
- With ready-for-service monitoring (auxiliary power required)
- With integrated signaling relay for signals (auxiliary power required).

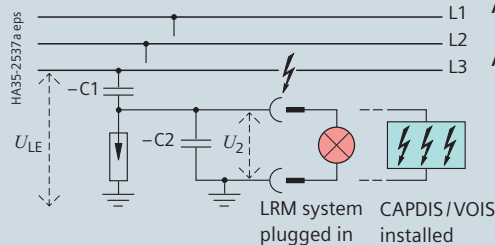
Indicators and detecting systems



Integrated voltage indicator VOIS+, VOIS R+



Integrated voltage detecting system CAPDIS-S1+, -S2+



Voltage indication

via capacitive voltage divider (principle)

- C1 Capacitance integrated into bushing
- C2 Capacitance of the connection leads and the voltage indicator to earth

$$U_{LE} = U_N / \sqrt{3} \text{ during rated operation in the three-phase system}$$

$$U_2 = U_A = \text{Voltage at the capacitive interface of the switchgear or at the voltage indicator}$$

Symbols shown

	VOIS+, VOIS R+			CAPDIS-S1+			CAPDIS-S2+			
	L1	L2	L3	L1	L2	L3	L1	L2	L3	
A0							000			U=0 ● U=0 ● U=0
A1	⚡	⚡	⚡	⚡	⚡	⚡	⚡	⚡	⚡	U=0 ● U=0 ● U=0
A2										U=0 ● U=0 ● U=0
A3	⚡	⚡		⚡	⚡		⚡	⚡		U=0 ● U=0 ● U=0
A4				⚡	⚡	⚡	⚡	⚡	⚡	U=0 ● U=0 ● U=0
A5				000	000	000	000	000	000	U=0 ● U=0 ● U=0
A6				000	000	000	000	000	000	U=0 ● U=0 ● U=0
A7				000	000	000	000	000	000	U=0 ● U=0 ● U=0
A8							000	000	000	U=0 ● U=0 ● U=0

CAPDIS S2+: The red and green LEDs show the state of the relay contacts

● LED doesn't light up

● LED lights up

U = Operating voltage

- A0 CAPDIS-S2+: Operating voltage not present
- A1 Operating voltage present
- A2 – Operating voltage not present
– For CAPDIS-S2+: Auxiliary power not present
- A3 Failure in phase L1, operating voltage at L2 and L3 (for CAPDIS-Sx+ also earth-fault indication)
- A4 Voltage (not operating voltage) present
- A5 Indication "Test" passed (lights up briefly)
- A6 Indication "Test" not passed (lights up briefly)
- A7 Overvoltage present (lights up permanently)
- A8 Indication "ERROR", e.g.: in case of missing auxiliary voltage

Components

Indicating and measuring equipment

WEGA 3

- Display indication "A1" to "A5"
- Integrated repeat test of the interface (self-monitoring)
- With integrated 3-phase LRM test socket for phase comparison.

WEGA 1.2 C, WEGA 1.2 C Vario

- Display indication "A1" to "A6" (see legend)
- Maintenance-free
- Integrated repeat test of the interface (self-monitoring)
- With integrated function test (without auxiliary power) by pressing the "Display Test" pushbutton
- With integrated 3-phase LRM test socket for phase comparison
- Without integrated signaling relay
- Without auxiliary power
- Degree of protection IP54
- Adjustable for different operating voltages (adjustable capacitance C2) (only for WEGA 1.2 C Vario).

WEGA 2.2 C

- Display indication "A0" to "A7" (see legend)
- Maintenance-free
- Integrated repeat test of the interface (self-monitoring)
- With integrated function test (without auxiliary power) by pressing the "Display Test" pushbutton
- With integrated 3-phase LRM test socket for phase comparison
- With two integrated signaling relays (auxiliary power required)
- Degree of protection IP54.



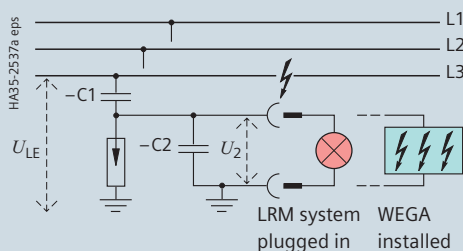
Integrated voltage indicator
WEGA 3



Integrated voltage indicator
WEGA 1.2 C, WEGA 1.2 C Vario



Integrated voltage indicator
WEGA 2.2 C



Voltage indication

via capacitive voltage divider (principle)

- C1 Capacitance integrated into bushing
- C2 Capacitance of the connection leads and the voltage indicator to earth

$$U_{LE} = U_N / \sqrt{3} \text{ during rated operation in the three-phase system}$$

$$U_2 = U_A = \text{Voltage at the capacitive interface of the switchgear or at the voltage indicator}$$

Symbols shown

	WEGA 3			WEGA 1.2 C WEGA 1.2 C Vario			WEGA 2.2 C			
	L1	L2	L3	L1	L2	L3	L1	L2	L3	
A0										U=0 U=0 U=0
A1	⚡	⚡	⚡	⚡	⚡	⚡	⚡	⚡	⚡	U=0 U=0 U=0
A2										U=0 U=0 U=0
A3	⚡	⚡		⚡	⚡		⚡	⚡		U=0 U=0 U=0
A4	⚡	⚡	⚡	⚡	⚡	⚡	⚡	⚡	⚡	U=0 U=0 U=0
A5	⚡	⚡	⚡	⚡	⚡	⚡	⚡	⚡	⚡	U=0 U=0 U=0
A6				⚡	⚡	⚡	⚡	⚡	⚡	U=0 U=0 U=0
A7							⚡	⚡	⚡	U=0 U=0 U=0

LC display gray: not illuminated

LC display white: illuminated

WEGA 2.2 C: The red and green LEDs show the state of the relay contacts

○ LED doesn't light up

● LED lights up

U = Operating voltage

A0 For WEGA 2.2 C:

Operating voltage not present,
auxiliary power present,
LCD illuminated

A1 Operating voltage present

For WEGA 2.2 C: Auxiliary power
present, LCD illuminated

A2 Operating voltage not present

For WEGA 2.2 C: Auxiliary power
not present, LCD not illuminated

A3 Failure in phase L1,

operating voltage at L2 and L3

For WEGA 2.2 C: Auxiliary power
present, LCD illuminated

A4 Voltage present,

current monitoring of coupling

section below limit value

For WEGA 2.2 C: Auxiliary power
present, LCD illuminated

A5 Indication "Display-Test" passed

For WEGA 2.2 C: Auxiliary power
present, LCD illuminated

A6 Indication "Display Test" passed

For WEGA 2.2 C:

Auxiliary power present

A7 For WEGA 2.2 C: LCD for missing

auxiliary voltage is not illuminated

Verification of correct terminal-phase connections

- Verification of correct terminal-phase connections possible by means of a phase comparison test unit (can be ordered separately)
- Safe-to-touch handling of the phase comparison test unit by inserting it into the capacitive taps (socket pairs) of the switchgear.

Phase comparison test units according to IEC 61243-5 or VDE 0682-415



Phase comparison test unit make Pfisterer, type EPV
as combined test unit (HR and LRM) for:

- Voltage detection
- Phase comparison
- Interface test
- Integrated self-test
- Indication via LED.



Phase comparison test unit make Kries, type CAP-Phase
as combined test unit (HR and LRM) for:

- Voltage detection
- Repeat test
- Phase comparison
- Phase sequence test
- Self-test

The unit does not require a battery.



Phase comparison test unit make Horstmann, type ORION 3.1
as combined test unit (HR and LRM) for:

- Phase comparison
- Interface testing at the switchgear
- Voltage detection
- Integrated self-test
- Indication via LED and acoustic alarm
- Phase sequence indicator.



Phase comparison test unit make Horstmann, type ORION M1
as combined test unit (HR and LRM) for:

- Voltage detection
- Phase comparison
- Interface testing at the switchgear
- Integrated self-test
- Indication via display and acoustic alarm
- Phase sequence indication and status LED
- Measurement of interface current up to 25μA
- Measurement of phase angle from -180° to +180°
- Measurement of harmonics up to 40th harmonic
- Securing the measured values via PC software (ORION explorer) and USB.

Components

Indicating and measuring equipment

Ready-for-service indication

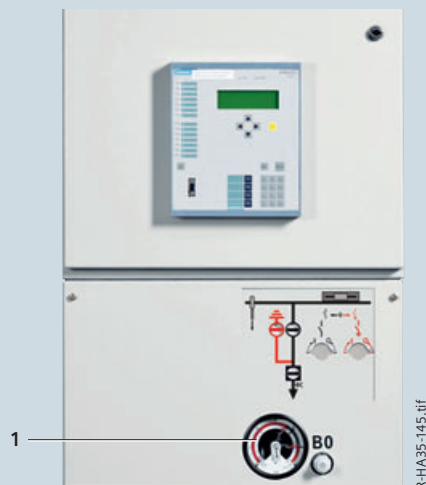
Features

- Simple, visual check of the ready-for-service indicator by red/green indication areas
- Indication of gas pressure also guaranteed without auxiliary voltage supply
- Gas pressure manometers arranged at the switchgear front
- Gas filling equipment with non-return valve arranged at the switchgear front beside the associated gas pressure manometer
- Gas pressure manometers with two signaling contacts for "gas pressure too low / gas pressure too high" indication
- Option: Gas pressure manometers with three signaling contacts for "gas pressure too low / very low" and "gas pressure too high" indication
- Option: Gas pressure manometers with temperature and pressure compensation.

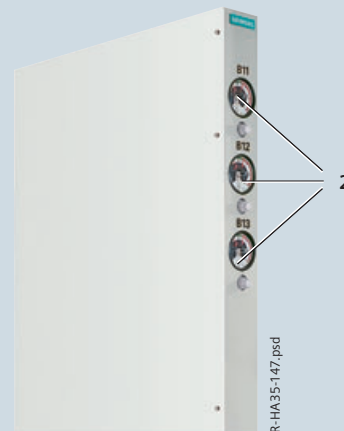
Low-voltage compartment

- For accommodation of protection, control, measuring and metering equipment
- Partitioned safe-to-touch from the high-voltage part of the panel
- Low-voltage compartment can be removed, bus wires and control cables are plugged in
- Option: Higher low-voltage compartment (1200 mm instead of 850 mm) possible.

Gas monitoring of single-busbar switchgear 8DA10

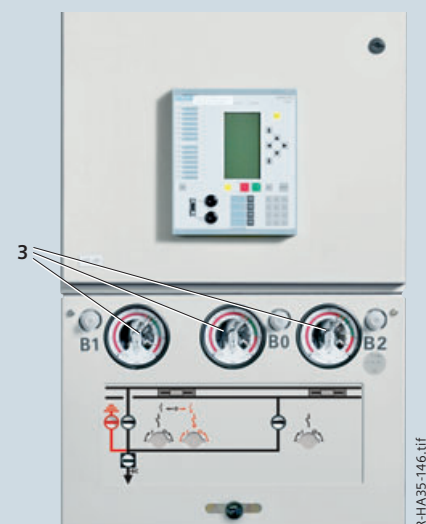


Gas pressure manometer (1) for circuit-breaker housing (arranged at the panel front)

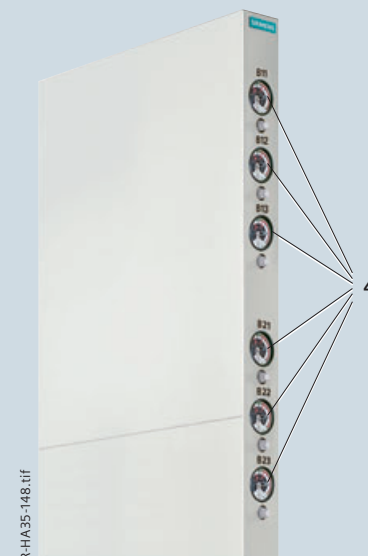


Gas pressure manometers (2) for busbar housings (arranged at the lateral switchgear termination)

Gas monitoring of double-busbar switchgear 8DB10



Gas pressure manometers (3) for circuit-breaker and disconnecter housings (arranged at the panel front)



Gas pressure manometers (4) for busbar housings (arranged at the lateral switchgear termination)

Protecting, controlling and monitoring are the basic requirements placed on a complete bay controller across all technology generations. The properties the user expects from modern bay controllers are: multifunctionality, reliability, safety and communication capability.

The increasing integration of many functions in one multifunctional device leads to an optimally supported engineering

process, IT security, service and testability, or simple and safe operability of the devices and tools.

On the following pages you will find functional descriptions for some selected devices. The low-voltage compartment can accommodate all customary protection, control, measuring and monitoring equipment available on the market:

Overview of the device types of the SIPROTEC device series: SIPROTEC 5, SIPROTEC Compact and SIPROTEC 4

SIPROTEC 5

	Overcurrent protection with PMU, control and power quality	7SJ82, 7SJ85
	Distance protection with PMU and control	7SA84, 7SA86, 7SA87
	Line differential protection with PMU and control	7SD84, 7SD86, 7SD87
	Combined line differential and distance protection with PMU and control	7SL86, 7SL87
	Circuit-breaker management device with PMU and control	7VK87
	Overcurrent protection for lines	7SJ86
	Transformer protection with PMU, control, monitoring	7UT85
		7UT86
		7UT87
	Motor protection with PMU	7SK82, 7SK85
	Central busbar protection	7SS85
	Bay controllers for control/interlocking tasks with PMU and monitoring, optionally with protection functions	6MD85, 6MD86
	Digital fault recorder	7KE85

SIPROTEC Compact

	Overcurrent protection	7SJ80, 7SJ81
	Motor protection	7SK80, 7SK81
	Voltage and frequency protection	7RW80
	Line differential protection	7SD80
	Distribution system controller	7SC80

SIPROTEC 4

	Overcurrent protection	EASY 7SJ45/7SJ46
		7SJ600, 7SJ601, 7SJ602
		7SJ61, 62, 63, 64
	Distance protection	7SA522
		7SA6
	Line differential protection	7SD600, 7SD610
		7SD52, 53
	Transformer differential protection	7UT612, 613, 63
	Busbar protection	7SS60, 7SS522
		7SS52
	Generator and motor protection	7UM61, 7UM62, 7VE6
		7UM518
	Accessories for generator and motor protection	7UW50; 7XR, 3PP, 7KG61, 7XT, 4NC
	Rapid changeover device	7VU683
	Bay controllers	6MD61, 6MD63
		6MD662, 663, 664
		6MB525
	U/f relay	7RW600
	Transient earth-fault relay	7SN600
	Breaker failure protection	7SV600
	Automatic reclosing, synchrocheck	7VK61
	High-impedance protection	7VH60

Components

ANSI design

Panel design

- Factory-assembled, type-tested according to IEC 62271
- Single-pole metal-enclosed, with metallic partitions¹⁾
- Hermetically bolted switchgear housings made of corrosion-resistant aluminum alloy
- Switchpanel poles arranged one behind the other
- Maintenance-free in an indoor environment (IEC 62271-1)
- Cable connection with inside-cone plug-in system according to EN 50181
- Wall-standing or free-standing arrangement
- Subframe, front cover, rear cover and end walls powder-coated in color "light basic" (SN 700)
- Low-voltage compartment removable, plug-in bus wires
- Degree of protection
 - IP 65 for all high-voltage parts of the primary circuit
 - IP 3XD for the switchgear enclosure
- Option: IP 31D for the switchgear enclosure
- Option: IP 41 for the low-voltage compartment
- Vacuum circuit-breaker
- Three-position disconnecter for disconnecting and earthing by means of the circuit-breaker
- Make-proof earthing by means of the vacuum circuit-breaker
- Option: Three-position disconnecter for disconnecting and earthing at the feeder
- For further dimensions and product range, see pages 14 to 31.

Insulating system

- Switchgear housing filled with SF₆ gas
- Features of SF₆ gas:
 - Non-toxic
 - Odorless and colorless
 - Non-inflammable
 - Chemically neutral
 - Heavier than air
 - Electronegative (high-quality insulator)
 - GWP (Global Warming Potential) = 22,800
- Pressure of the SF₆ gas in the switchgear housing dependent on the electrical ratings (relative pressure at 20 °C):
 - Rated functional level (relative): 120 kPa
 - Gas leakage rate: < 0.1 % per year.

Camera system

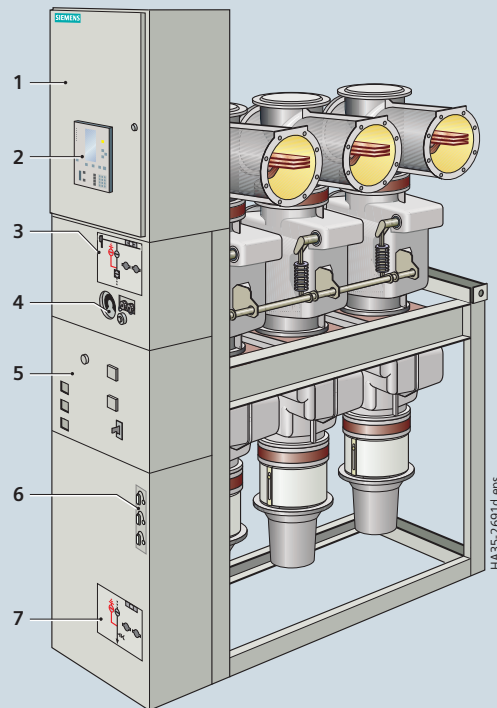
- Camera system for visual monitoring of the switch positions of the disconnectors and earthing switches (see also page 54).

UL certification

- For 8DA and 8DB ANSI design options there is a UL or cUL certificate available.

1) Corresponds to "metal-clad" according to former standard IEC 60298

Basic panel design



Legend for 8DA10

- 1 Low-voltage compartment
- 2 Electronic control board, e.g. multifunction protection
- 3 Operating mechanism and interlock for three-position disconnecter, as well as mechanical position indicators for three-position disconnecter and circuit-breaker
- 4 Manometer for gas monitoring of feeder gas compartments
- 5 Circuit-breaker operating mechanism
- 6 Voltage detecting system
- 7 Operating mechanism and interlock for the three-position disconnecter, as well as mechanical position indicator for the three-position disconnecter at the feeder

Example 8DA10

Single-busbar panel with three-position disconnecter at the feeder



Electrical data, functional level, temperature for single-busbar and double-busbar switchgear according to ANSI

Common electrical data, functional level and temperature	Rated insulation level	Rated voltage U_r	kV	4.76	8.25	15	27	38	40.5 ¹⁾	
		Rated short-duration power-frequency withstand voltage U_d : – phase-to-phase, phase-to-earth, open contact gap	kV	19	36	36	70	80	80	
			– across the isolating distance	kV	21	40	40	80	95	95
			Rated lightning impulse withstand voltage U_p : – phase-to-phase, phase-to-earth, open contact gap	kV	60	95	95	125	200	200
		– across the isolating distance		kV	66	105	105	138	220	220
		Rated frequency f_r		Hz	60	60	60	60	60	60
	Rated normal current I_r ⁶⁾	of the busbar	A	1250	1250	1250	1250	1250		
			A	2000	2000	2000	2000	2000		
			A	2500	2500	2500	2500	2500		
			A	3000	3000	3000	3000	3000		
			A	4000	4000	4000	4000	4000		
A			5000	5000	5000	5000	5000	5000		
Rated functional level p_{re}	(relative) of the busbar	120 kPa at 20 °C								
Minimum functional level p_{me}	100 kPa at 20 °C									
Ambient air temperature	– 5 °C to + 55 °C ⁸⁾									

Data of the switchgear panels

Circuit-breaker panel, disconnecter panel ²⁾ , bus sectionalizer, bus coupler ³⁾	Rated normal current I_r ⁴⁾	A	1250	1250	1250	1250	1250	
		A	1600	1600	1600	1600	1600	
		A	2000	2000	2000	2000	2000	
		A	2500	2500	2500	2500	2500	
		A	2700 ⁵⁾	2700 ⁵⁾	2700 ⁵⁾	2700 ⁵⁾	2700 ⁵⁾	
		A	3000 ⁶⁾	3000 ⁶⁾	3000 ⁶⁾	3000 ⁶⁾	3000 ⁶⁾	
	Rated short-time withstand current I_k $t_k = 3$ s		bis kA	40	40	40	40	40
	Rated peak withstand current I_p		bis kA	104	104	104	104	104
	Rated short-circuit making current I_{ma}		bis kA	104	104	104	104	104
	Rated short-circuit breaking current I_{sc}		bis kA	40	40	40	40	40
	Electrical endurance of vacuum circuit-breakers at rated normal current		10,000 operating cycles ⁷⁾					
	at rated short-circuit breaking current		50 breaking operations					
Rated functional level p_{re} (relative) for feeders		120 kPa at 20 °C						
Minimum functional level p_{me}		100 kPa at 20 °C						

- 1) Higher values of the rated voltage available with 42 kV
- 2) Disconnecter panel available for single-busbar switchgear 8DA10
- 3) Bus coupler available for double-busbar switchgear 8DB10
- 4) Maximum permissible normal current dependent on ambient air temperature
- 5) 2700 A without forced ventilation (8DB10 on request)
- 6) 3000 A with forced ventilation (8DB10 on request)
- 7) Option: 30,000 operating cycles
- 8) Option: Ambient air temperature –30 °C to +55 °C

Components

ANSI design

Camera system

8DA and 8DB switchgear can be designed according to ANSI requirements. For this purpose, every three-position disconnect is equipped with a digital camera monitoring system VDMS (Visible Disconnect Monitoring System). The CLOSED - OPEN - EARTHED positions are transmitted per phase through a USB / RJ45 interface and signaled to a mobile computer.

Current transformer features

- Designed as ring-core current transformers, single-pole
- Free of dielectrically stressed cast-resin parts (due to design)
- Inductive type
- Climate-independent
- Secondary connection by means of a terminal strip in the low-voltage compartment of the panel
- Cast-resin insulated.

Voltage transformer features

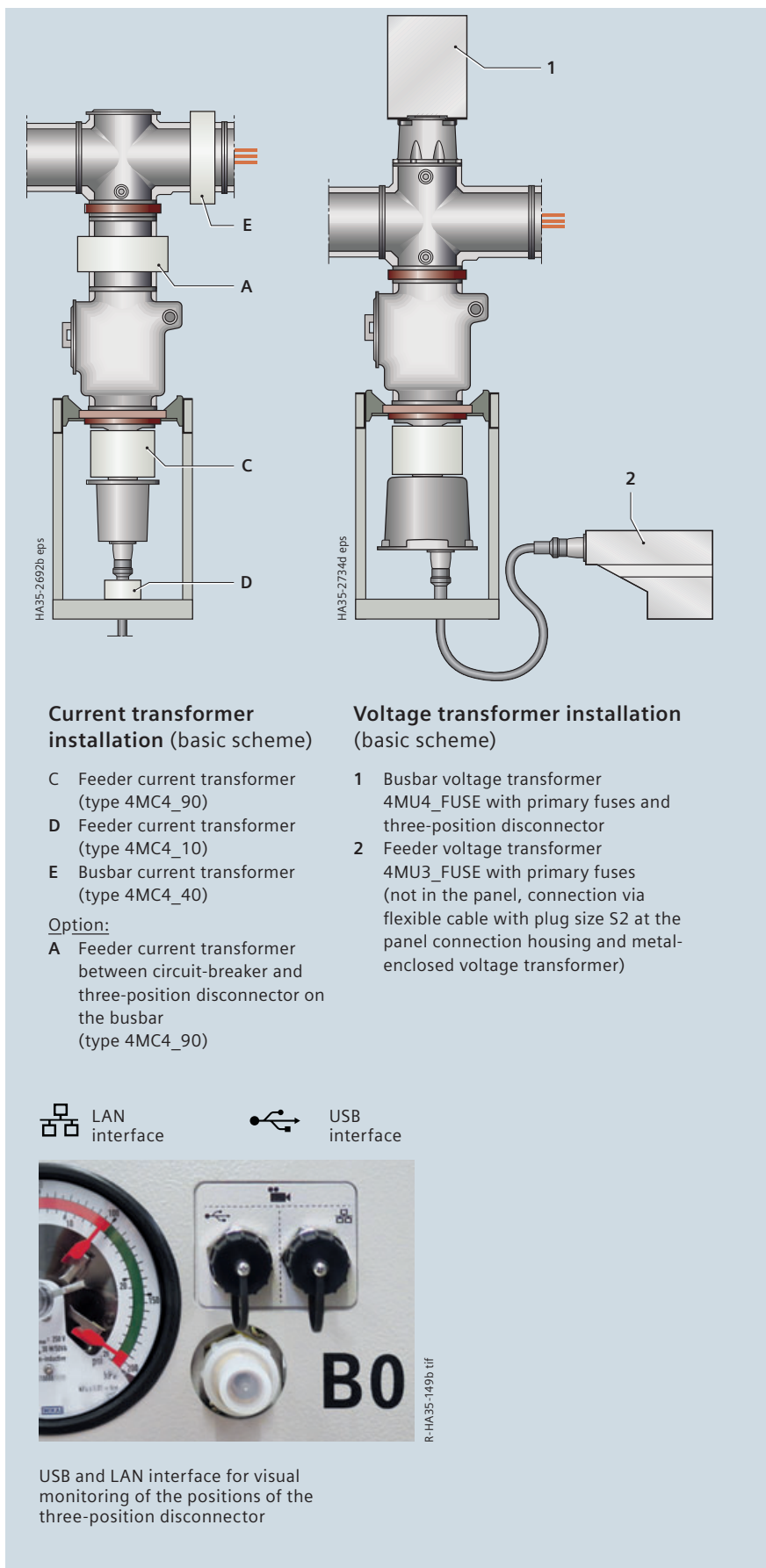
- Single-pole, plug-in design
- Connection system with plug-in contact according to EN 50181
- Inductive type
- Safe-to-touch due to metal enclosure
- Climate-independent
- Secondary connection by means of plugs in the low-voltage compartment of the panel
- Cast-resin insulated.

Installation

Arranged outside the primary enclosure (switchgear housing).

Internal arc classification

- Internal arcing test according to IEEE Std C37.20.7™-2007 (see also page 13).



Option:

In accordance with ANSI requirements, 8DA and 8DB switchgear can be equipped with an additional three-position disconnecter at the feeder.

Features

- Rated normal currents up to 2000 A
- 2000 operating cycles for the disconnecter (higher operating cycles on request)
- 1000 operating cycles for the earthing switch (higher operating cycles on request)
- Operating shaft and disconnecter contacts with common center of rotation and reliable switch position up to the operating front of the panel
- Gas-tight bushings separate the busbar and circuit-breaker housings underneath the busbar disconnecter contacts
- Cable connection and circuit-breaker housings can be removed without interrupting busbar operation
- Maintenance-free.

Switch positions

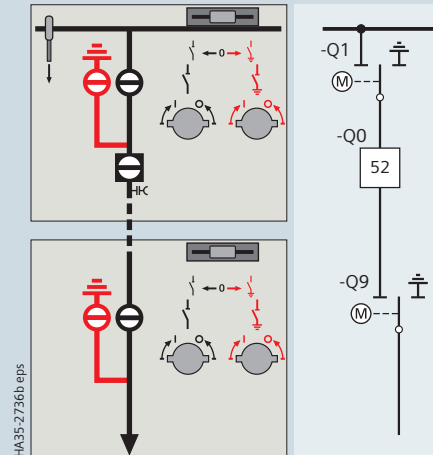
- CLOSED, OPEN, EARTHED or READY-TO-EARTH
- CLOSED: Disconnector contact connected with the busbar: Main circuit closed between busbar, circuit-breaker and feeder
- OPEN: Main circuit open between busbar, circuit-breaker and feeder: Test voltages for isolating distances are withstood
- READY-TO-EARTH: Contact blades connected with the earthing contact
- EARTHED: Circuit-breaker closed. Three-position disconnecter at the feeder connected with earthing contact.

Operating mechanism

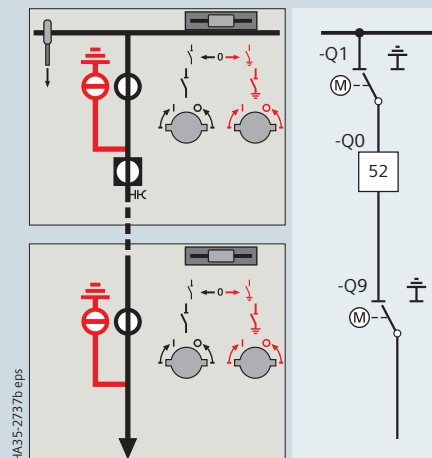
- Only permissible operations possible due to logical mechanical interlocks
- Mechanically coupled position indicators
- Separate operating shafts for the "DISCONNECTING", "EARTHING" and "READY-TO-EARTH" functions
- With manual operating mechanism
- Option: With motor operating mechanism
Motor rating at
24 V to 250 V DC: max. 100 W
110 V to 240 V AC: max. 130 VA
- Same sense of rotation for the switching operations of the "CLOSE" or "OPEN" functions.

Example:

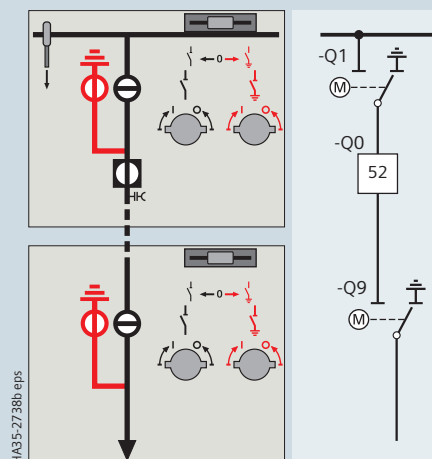
Position indicators of 8DA10 with additional three-position disconnecter at the feeder



Feeder OPEN



Feeder CLOSED



Feeder EARTHED

Standards

Standards, specifications, guidelines

Type of service location

The switchgear can be used as indoor installation according to IEC 61936 (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
- In 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.

Terms

“Make-proof earthing switches” are earthing switches with short-circuit making capacity according to IEC 62271-102 and EN 62271-102.

Dielectric strength

- The dielectric strength is verified by testing the switchgear with rated values of short-duration power-frequency withstand voltage and lightning impulse withstand voltage according to IEC 62271-1 (see table “Dielectric strength”).
- The rated values are referred to sea level and to normal atmospheric conditions (1013 hPa, 20 °C, 11g/m3 humidity according to IEC 60071).

The gas insulation at a relative gas pressure of > 50 kPa permits switchgear installation at any desired altitude above sea level without the dielectric strength being adversely affected.

Standards

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

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

Table – Dielectric strength

Single-busbar and double-busbar switchgear 8DA10 and 8DB10

Rated voltage	kV	12	24	36	40.5
Rated short-duration power-frequency withstand voltage					
– Between phase and earth	kV	28	50	70	85
– Across isolating distance	kV	32	60	80	90
Rated lightning impulse withstand voltage					
– Between phase and earth	kV	75	125	170	185
– Across isolating distance	kV	85	145	195	220

Table – Dielectric strength

Traction power supply switchgear 8DA11/12

Rated voltage according to EN 50124-1	kV	17.25	27.5
Nominal voltage according to IEC 60850 / EN 50163	kV	15	25
Rated short-duration power-frequency withstand voltage			
– Between phase and earth	kV	50	95
– Across isolating distance	kV	60	110
Rated lightning impulse withstand voltage			
– Between phase and earth	kV	125	200
– Across isolating distance	kV	145	220

Overview of standards (April 2017)

		IEC standard	VDE standard	EN standard
Switchgear	8DA and 8DB	IEC 62271-1	VDE 0671-1	EN 62271-1
		IEC 62271-200	VDE 0671-200	EN 62271-200
Devices	Circuit-breakers	IEC 62271-100	VDE 0671-100	EN 62271-100
	Disconnectors and earthing switches	IEC 62271-102	VDE 0671-102	EN 62271-102
	Voltage detecting systems	IEC 61243-5	VDE 0682-415	EN 61243-5
Degree of protection	IP code	IEC 60529	VDE 0470-1	EN 60529
	IK code	IEC 62262	VDE 0470-100	EN 50102
Insulation	–	IEC 60071	VDE 0111	EN 60071
Instrument transformers	–	IEC 61869-1	VDE 0414-9-1	EN 61869-1
	Current transformers	IEC 61869-2	VDE 0414-9-2	EN 61869-2
	Voltage transformers	IEC 61869-3	VDE 0414-9-3	EN 61869-3
Installation, erection	–	IEC 61936-1	VDE 0101	–
Insulating gas SF ₆	Use and handling of SF ₆	IEC 62271-4	VDE 0671-4	EN 62271-4
	Specification for new SF ₆	IEC 60376	VDE 0373-1	EN 60376
	Guidelines for the checking and treatment of SF ₆ taken from electrical equipment	IEC 60480	VDE 0373-2	EN 60480

Overview of standards for traction applications

		IEC standard	–	EN standard
Supply voltage	8DA11 and 8DA12	IEC 60850	VDE 0115-102	EN 50163
Switchgear	8DA11 and 8DA12	IEC 62505	VDE 0115-320	EN 50152
Insulation	8DA11 and 8DA12	–	VDE 0115-107	EN 50124

Current carrying capacity

- According to IEC 62271-200 or IEC 62271-1, the rated normal current refers to the following ambient air temperatures:
 - Maximum of 24-hour mean + 35 °C
 - Maximum + 40 °C
- The current carrying capacity of the panels and busbars depends on the ambient air temperature outside the enclosure.

Internal arc classifications

- Protection of operating personnel by means of tests for verifying the internal arc classification
- Internal arcing tests must be performed in accordance with IEC 62271-200 and IEEE Std C37.20.7™-2007
- Definition of criteria according to IEC:
 - Criterion 1
Correctly secured doors and covers do not open, limited deformations are accepted
 - Criterion 2
No fragmentation of the enclosure, no projection of small parts above 60 g
 - Criterion 3
No holes in accessible sides up to a height of 2 m
 - Criterion 4
No ignition of indicators due to hot gases
 - Criterion 5
The enclosure remains connected to its earthing point.

Resistance to internal faults

Due to the single-pole enclosure and the gas insulation of the switchgear and the switching devices, the possibility of faults in gas-insulated switchgear is a mere fraction of that typical of other switchgear types:

- There are no effects due to external influences, such as:
 - Pollution layers
 - Humidity
 - Small animals and foreign objects
- Maloperation is practically excluded due to logical arrangement of operating elements
- Short-circuit-proof feeder earthing by means of the circuit-breaker.

In the unlikely event of a fault within the switchgear housing, the energy conversion in the case of an internal arc fault is minor thanks to the SF₆ insulation and the shorter length of the arc, approximately only 1/3 of the converted energy of an arc in air insulation.

Resistance to short circuits and earth faults

Two-phase and three-phase short circuits between the primary conductors are excluded by the single-pole primary enclosure.

Seismic withstand capability (optional)

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

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

- IEC 60068-3-3 "Guidance – seismic test methods for equipment"
- IEC 60068-2-57 "Test Ff: Vibration – Time-history method"
- IEC 60068-2-6 "Test Fc: Vibration (sinusoidal)"
- IEEE 693-2005 "Recommended Practice for Seismic Design of Substations"
- IEEE 344-2004 "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations"

- IEEE C37-81-1989 "IEEE Guide for Seismic Qualification of Class 1E Metal-Enclosed Power Switchgear Assemblies"
- IEC 60980-1989 "Recommended practices for seismic qualification of electrical equipment of the safety system for nuclear generating stations".

For installation on even and rigid concrete or steel structure (without considering building influences), the tested ground accelerations meet the following requirements:

- Uniform Building Code 1997 (UBC) – Zone 4
- California Building Code 1998 (CBC) – Zone 4
- International Building Code 2006 (IBC) – 200 %
- American Society of Civil Engineers 2005 (ASCE) – 200 %
- IEEE 693-2005 – High required response spectrum (Figure A.1).

Color of the panel front

Siemens standard (SN) 47 030 G1, color "light basic" (SN700) (similar to RAL 7047 / gray).

Climate and environmental influences

8DA and 8DB switchgear is completely enclosed and insensitive to climatic influences.

- All medium-voltage devices are installed in gas-tight and bolted switchgear housings made of corrosion-resistant aluminum alloy and filled with SF₆ gas
- Live parts inside and outside the switchgear housing are provided with single-pole enclosure
- At no point can creepage currents flow from high-voltage potentials to earth
- Operating mechanism parts which are functionally important are made of corrosion-resistant materials
- Bearings in the operating mechanism are designed as dry-type bearings and do not require lubrication.

Recycling

The switchgear can be recycled in ecological manner in compliance with existing legislation. Auxiliary devices such as short-circuit indicators have to be recycled as electronic scrap. Batteries have to be recycled professionally. Insulating gas SF₆ has to be evacuated professionally as a reusable material and recycled (SF₆ must not be released into the environment).

Protection against solid foreign objects, electric shock and water

8DA and 8DB switchgear fulfills according to the standards

IEC 62271-1	EN 62271-1
IEC 62271-200	EN 62271-200
IEC 60529	EN 60529
IEC 62262	EN 50102

the following degrees of protection:

Degree of protection	Type of protection
IP 65	for parts of the primary circuit under high voltage
IP 3XD	for switchgear enclosure
IP 31D	for switchgear enclosure (optional)
IP 41	for low-voltage compartment (optional)

Degree of protection	Type of protection
IK 07	for switchgear enclosure

First circuit-breaker switchgear 8DA10 – 1982

Up to now, more than 100,000 8DA and 8DB switchgear panels successfully in operation worldwide.



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R-HA35-154.tif



R-HA35-153.tif



R-HA35-150.eps



R-HA35-152.eps

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Energy Management Division
Medium Voltage & Systems
Mozartstraße 31 C
91052 Erlangen, Germany

For further information please contact
our Customer Support Center
Phone: +49 180 524 70 00
Fax: +49 180 524 24 71
E-mail: support.energy@siemens.com
siemens.com/medium-voltage-switchgear

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