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ПРИЛОЖЕНИЕ №5

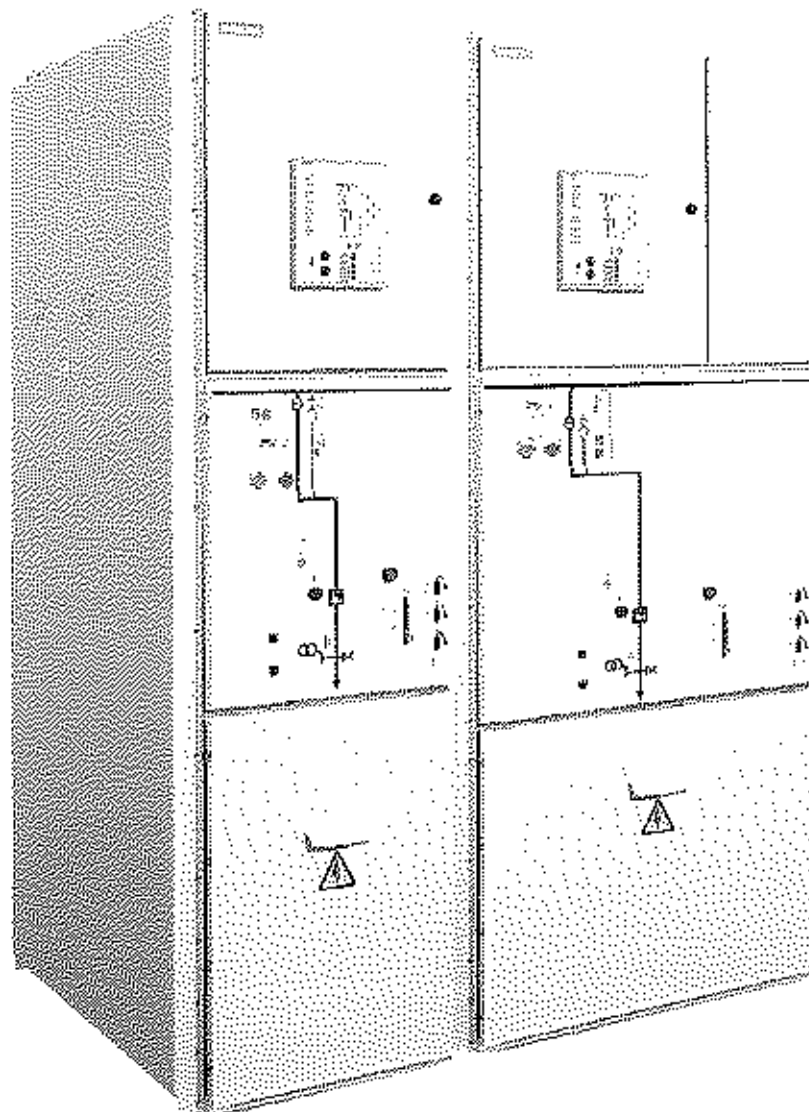
SIEMENS NXPLUS-C КАТАЛОГ

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Catalog
HA 35-41
2016

Fixed-Mounted Circuit-Breaker Switchgear
Type NXPLUS C up to 24 kV, Gas-Insulated
Medium-Voltage Switchgear

siemens.com/medium-voltage-switchgear

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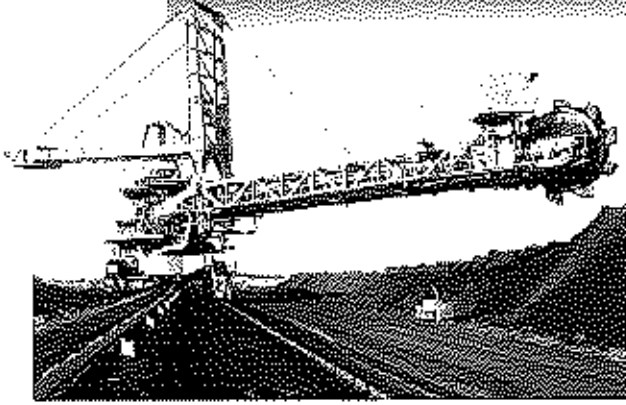
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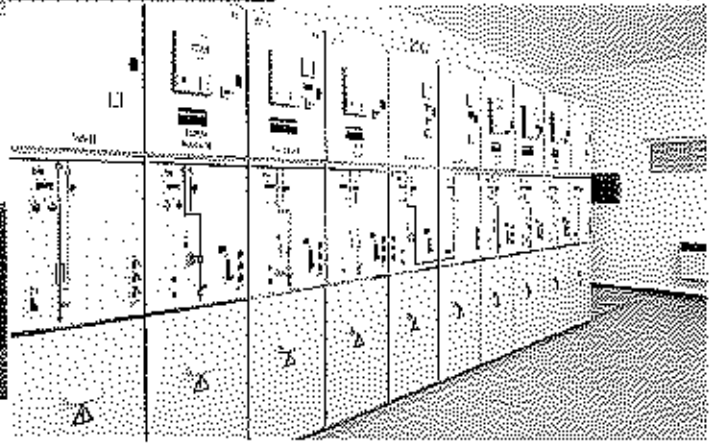
Application
Public power
supply system

R-HA35-106.eps

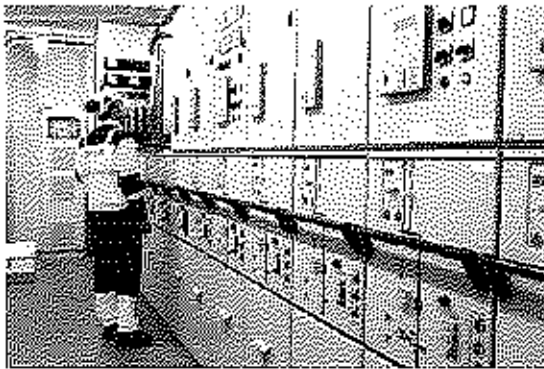


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Application
Industry

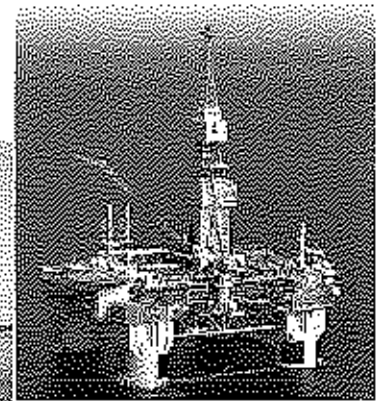
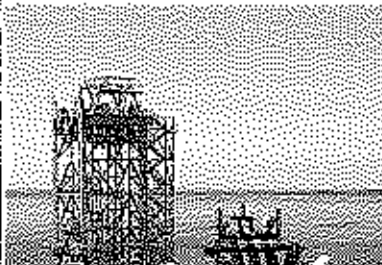


NXPLUS C switchgear 20 kV (example)



R-HA35-185.01

Application
Industry and offshore



R-HA35-124.eps



R-HA35-151(4)15.07
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Fixed-Mounted Circuit-Breaker Switchgear Type NXPLUS C up to 24 kV, Gas-Insulated

Medium-Voltage Switchgear

Catalog HA 35.41 - 2016

English Catalog HA 35.41 - 2016

www.siemens.com/medium-voltage-switchgear
www.siemens.com/NXPLUSC-GBB
www.siemens.com/NXPLUSC-GBR

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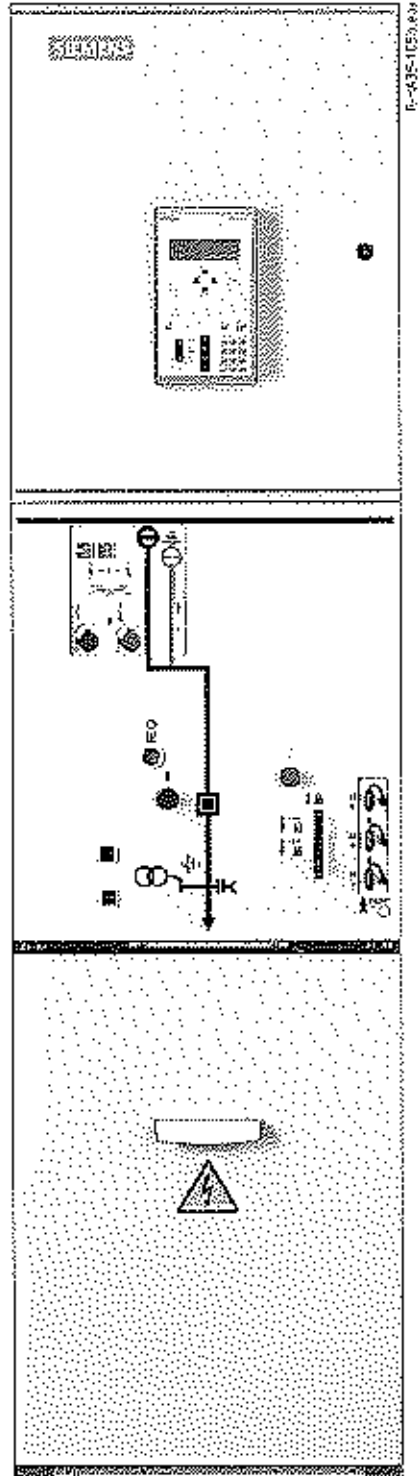
The products and systems described in this catalog are manufactured and sold according to a certified management system (acc. to ISO 9001, ISO 14001 and BS OHSAS 18001).

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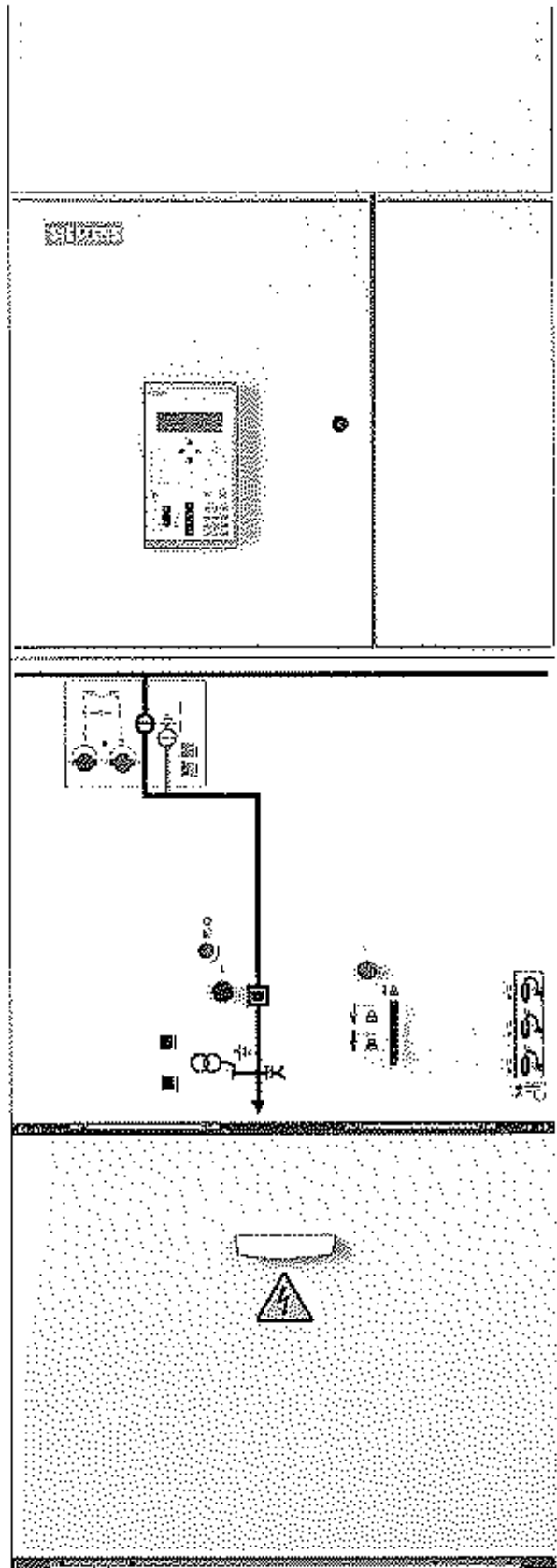
Application

Types



E-635-1153 600

Circuit-breaker panel 600 mm



E-635-1258 900

Circuit breaker panel 900 mm

Application

Typical uses, ratings, approvals

Fixed-mounted circuit-breaker switchgear NXPLUS C is indoor, factory-assembled, type-tested, metal-enclosed, SF₆-insulated switchgear with metallic partitions ⁴⁾ for single- and double-busbar applications for indoor installation.

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.

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Electrical data (maximum values) and dimensions

Rated voltage	kV	7.2	12	15	17.5	24
Rated frequency	Hz	50/60	50/60	50/60	50/60	50/60
Rated short-duration power-frequency withstand voltage	kV	20 ¹⁾	28 ²⁾	36	38	50
Rated lightning impulse withstand voltage	kV	60 ¹⁾	75 ²⁾	95	95	125
Rated peak withstand current	kA	80/82	80/82	80/82	63/65	63/65
Rated short-circuit making current	kA	80/82	80/82	80/82	63/65	63/65
Rated short-time withstand current I _{sc}	kA	31.5	31.5	31.5	25	25
Rated short-circuit breaking current	kA	31.5	31.5	31.5	25	25
Rated normal current of the busbar	A	2500	2500	2500	2500	2500
Rated normal current of feeders	A	2500	2500	2500	2000	2000
Width	mm	600 ³⁾	600 ³⁾	600 ³⁾	600 ³⁾	600 ³⁾
Depth						
– without pressure relief duct at the rear	mm	1100	1100	1100	1100	1100
– with pressure relief duct at the rear	mm	1225	1225	1225	1225	1225
Height						
– 600 mm panels		2250	2250	2250	2250	2250
– 900 mm panels		2550	2550	2550	2550	2550

1) 32 kV/60 kV according to some national requirements

2) 42 kV/75 kV according to some national requirements

3) 900 mm for rated normal feeder currents of 2000 A and 2500 A

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

Type approval

NXPLUS C switchgear has been type-approved by the following classification societies:

- Lloyds Register of Shipping (LRS)
- Det Norske Veritas (DNV)
- Germanischer Lloyd (GL)
- Russian Maritime Register of Shipping (RMR)
- American Bureau of Shipping (ABS)

The switchgear is therefore also approved for application on ships and platforms.



ABS

TYPE APPROVED PRODUCT

National approval GOST

By certification in the system GOST R in Russia, NXPLUS C is approved for application at the voltage levels 6 kV, 10 kV and 20 kV. Compliance with the requirements of the GOST standard has been confirmed in the Declaration No. РОСС.ДЕ.АВ28.Д04717 of April 28, 2011. The approval is valid in the countries Russia, Belarus, Kazakhstan and Ukraine.



The application of NXPLUS C in all transmission and distribution systems in Russia is additionally authorized by the FSK/ MRSK Approval No. 80-10 of October 5, 2011.

National approval CSA

By certification in the system CSA in Canada, NXPLUS C is approved for application at the voltage levels 4.16 kV, 7.2 kV and 13.8 kV. Compliance with the requirements of the CSA standard has been confirmed in the Certificate of Compliance No. 70043303 of December 4, 2015. The approval is valid in Canada.



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A. Kocic

Requirements

Features

Environmental independence

Hermetically tight, welded switchgear vessels made of stainless steel as well as single-pole solid insulation make the parts of the primary circuit under high voltage of NXPLUS C switchgear

- Insensitive to certain aggressive ambient conditions, such as:
 - Saline air
 - Air humidity
 - Dust
 - Condensation
- Tight to ingress of foreign objects, such as:
 - Dust
 - Pollution
 - Small animals
 - Humidity
- Independent of the site altitude.



Compact design

Thanks to the use of SF₆ insulation, compact dimensions are possible.

Thus:

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

Maintenance-free design

Switchgear vessels 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)
- Installation, operation, extension and replacement without SF₆ gas work
- Reduced operating costs
- Cost-efficient investment
- No maintenance cycles.

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 the gas-insulated switchgear NXPLUS C is at least 35 years, probably 40 to 50 years, taking the tightness of the hermetically welded switchgear vessel 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
- For three-position switch-disconnectors and earthing switches according to the endurance class defined in IEC 62271-103.

Safety

Personal safety

- Safe-to-touch and hermetically sealed primary enclosure
- Cable terminations, busbars and voltage transformers are surrounded by earthed layers
- 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 vessel)
- 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 and VDE 0470-1)
- High resistance to internal arcs by logical mechanical interlocks and tested switchgear enclosure
- Panels tested for resistance to internal faults up to 31.5 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 (IEC 62271-1 and VDE 0671-1)
- Operating mechanisms of switching devices accessible outside the primary enclosure (switchgear vessel)
- Metal-coated, plug-in inductive voltage transformers mounted outside the SF₆ switchgear vessel
- Current transformers as ring-core current transformers mounted outside the SF₆ switchgear vessel
- Complete switchgear interlocking system with logical mechanical interlocks
- Welded switchgear vessels, sealed for life
- Minimum fire load
- Type and routine-tested
- Standardized, NC production processes
- Quality assurance in accordance with DIN EN ISO 9001
- More than 500,000 switchgear panels of Siemens in operation worldwide for many years
- Option: Resistance against shock, vibration, earthquakes.

Reliability

- Type and routine tested
- Standardized, NC production processes
- Quality assurance in accordance with DIN EN ISO 9001
- More than 500,000 switchgear panels of Siemens in operation worldwide for many years.

General

- 3-pole enclosure of the primary part consisting of a switchgear vessel made of stainless steel
- Insulating gas SF₆ (Fluorinated greenhouse gas)
- Three-position switch as busbar disconnecter and feeder earthing switch
- Make-proof earthing by means of the vacuum circuit-breaker
- Compact dimensions due to SF₆ insulation
- Hermetically tight, welded switchgear vessel made of stainless steel
- 1-pole, solid-insulated, screened busbars, plug-in type
- Cable connection with outside-cone plug-in system, or for connection of solid-insulated bars
- Wall-standing or free-standing arrangement
- Cable connection access from front
- Option: Cable connection access from rear (only circuit-breaker panel 1250 A)
- Hinge of the low-voltage door on the left or right
- Installation and extension of existing switchgear at both ends without gas work and without modification of existing panels
- Option: Flexible pressure relief duct systems.

Interlocks

- According to IEC 62271-200 and VDE 0671-200
- Logical mechanical interlocks prevent maloperation.
- Three position disconnecter can only be operated with circuit-breaker in OPEN position
- Circuit breaker or contactor can only be operated with three-position switch in end position and operating lever removed
- Switch disconnecter, contactor, ring-main and metering panels are not interlocked due to their own switching capacity
- Three position disconnecter interlocked against the circuit-breaker in circuit-breaker panels and in bus sectionalizers with one panel width
- Locking device for "feeder earthed"
- Locking device for three-position switch
- The following interlocks can be fulfilled by placing the padlock accordingly:
 - ... Padlock on the left:
Three-position switch "DISCONNECTING" function cannot be operated, three-position switch "READY-TO-EARTH" function can be operated
 - ... Padlock in the center:
Control gate blocked, no switching operations possible
 - ... Padlock on the right:
Three position switch "DISCONNECTING" function can be operated, three-position switch "READY-TO-EARTH" function cannot be operated
- Cable compartment cover (access to HV HRC fuses) always interlocked against the three-position switch-disconnector in panels with HV HRC fuses (switch-disconnector panel, metering panel and contactor panel with fuses)
- Option: Cable compartment cover interlocked against the three-position switch (circuit-breaker panel, disconnecter panel, contactor panel without fuses, ring-main panel)
- Option: Electromagnetic interlocks
- Option: Actuating openings of the circuit-breaker can be padlocked
- Option: Locking device for "feeder".

Modular design

- Panel replacement possible without SF₆ gas work
- Low-voltage compartment removable, plug-in bus wires.

Instrument transformers

- Current transformers not subjected to dielectric stress
- Easy replacement of current transformers designed as ring-core transformers
- Metal-coated, plug-in and disconnectable voltage transformers.

Vacuum circuit-breaker

- Maintenance-free under normal ambient conditions according to IEC 62271-1 and VDE 0671-1
- No relubrication or readjustment
- Up to 10,000 operating cycles
- Option: Up to 30,000 operating cycles
- Vacuum-tight for life.

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.

Standards (see page 71)

A. Red

Technical data

Electrical data, filling pressure, temperature for single-busbar switchgear

Common electrical data, filling pressure and temperature	Rated insulation level	Rated voltage U_n	kV	7.2	12	15	17.5	24
	Rated short-duration power-frequency withstand voltage U_{sf} - phase-to-phase, phase-to-earth, open contact gap - across the isolating distance	Rated short-duration power-frequency withstand voltage U_{sf}	kV	20 ¹⁾	28 ²⁾	36	38	50
		Rated lightning impulse withstand voltage U_{li} - phase-to-phase, phase-to-earth, open contact gap - across the isolating distance	kV	23 ¹⁾	32 ²⁾	40	45	60
		Rated lightning impulse withstand voltage U_{li} - phase-to-phase, phase-to-earth, open contact gap - across the isolating distance	kV	60 ¹⁾	75 ²⁾	95	95	125
	Rated frequency f_n	Hz	50/60	50/60	50/60	50/60	50/60	
	Rated normal current I_n ³⁾ for the busbar	up to A	2500	2500	2500	2500	2500	
Rated filling level $p_{n,4)$		150 kPa (absolute) at 20 °C						
Minimum functional level $p_{m,4)$		130 kPa (absolute) at 20 °C						
Ambient air temperature		-5 °C to +55 °C ¹²⁾						

Data of the switchgear panels

Circuit-breaker panel 630 A	Rated normal current I_n ³⁾	A	630	630	630	630	630	
	Rated short-time withstand current I_{st} for switchgear with $t_{st} = 1$ s for switchgear with $t_{st} = 3$ s	up to kA	20	25	20/25	20/25	20/25	20/25
		up to kA	20	20	20	20	20	20
	Rated peak withstand current I_p 50 Hz 60 Hz	up to kA	50	63	50/63	50/63	50/63	50/63
		up to kA	52	65	52/65	52/65	52/65	52/65
	Rated short-circuit making current I_{ms} 50 Hz 60 Hz	up to kA	50	63	50/63	50/63	50/63	50/63
		up to kA	50	63	50/63	50/63	50/63	50/63
	Rated short-circuit breaking current I_{sc}	up to kA	20	25	20/25	20/25	20/25	20/25
Electrical endurance of vacuum circuit-breakers	at rated normal current		10,000 operating cycles					
	at rated short-circuit breaking current		50 breaking operations					
Circuit-breaker panel and bus sectionalizer 1000 A ⁵⁾ 1250 A ⁶⁾ 2000 A 2500 A	Rated normal current I_n ³⁾	A	1000	1000	1000	1000	1000	
		A	1250	1250	1250	1250	1250	
		A	2000	2000	2000	2000	2000	
		A	2500	2500	2500	—	—	
	Rated short-time withstand current I_{st} for switchgear with $t_{st} = 1$ s for switchgear with $t_{st} = 3$ s	up to kA	31.5	31.5	31.5	25	25	
		up to kA	31.5	31.5	31.5	25	25	
	Rated peak withstand current I_p 50 Hz/60 Hz	up to kA	80/82	80/82	80/82	63/65	63/65	
	Rated short-circuit making current I_{ms} 50 Hz/60 Hz	up to kA	80/82	80/82	80/82	63/65	63/65	
Rated short-circuit breaking current I_{sc}	up to kA	31.5	31.5	31.5	25	25		
Electrical endurance of vacuum circuit-breakers	at rated normal current		10,000 operating cycles ¹¹⁾					
	at rated short-circuit breaking current		50 breaking operations					
Disconnecter panel 1000 A ⁵⁾ 1250 A 2000 A 2500 A	Rated normal current I_n ³⁾	A	1000	1000	1000	1000	1000	
		A	1250	1250	1250	1250	1250	
		A	2000	2000	2000	2000	2000	
		A	2500	2500	2500	—	—	
	Rated short-time withstand current I_{st} for switchgear with $t_{st} = 1$ s for switchgear with $t_{st} = 3$ s	up to kA	31.5	31.5	31.5	25	25	
		up to kA	31.5	31.5	31.5	25	25	
Rated peak withstand current I_p 50 Hz/60 Hz	up to kA	80/82	80/82	80/82	63/65	63/65		
Dimension "e" of HV HRC fuse-links	mm	292 ⁸⁾	292 ⁸⁾	442	442	442		
Switch-disconnector panel (with HV HRC fuses)	Rated normal current I_n ³⁾ for feeder ⁷⁾	A	200	200	200	200	200	
	Rated short-time withstand current I_{st} for switchgear with $t_{st} = 1$ s for switchgear with $t_{st} = 3$ s	up to kA	31.5	31.5	31.5	25	25	
		up to kA	31.5	31.5	31.5	25	25	
	Rated peak withstand current I_p 50 Hz/60 Hz	up to kA	80/82	80/82	80/82	63/65	63/65	
	Rated short-circuit making current I_{ms} 50 Hz/60 Hz	up to kA	80/82	80/82	80/82	63/65	63/65	
	Dimension "e" of HV HRC fuse-links	mm	292 ⁸⁾	292 ⁸⁾	442	442	442	
	Ring-main panel (switch-disconnector panel without HV HRC fuses)	Rated normal current I_n ³⁾ for feeder	A	630	630	630	630	630
		Rated short-time withstand current I_{st} for switchgear with $t_{st} = 1$ s for switchgear with $t_{st} = 3$ s	up to kA	20	25	20/25	20/25	20
up to kA			20	20	20	20	20	
Rated peak withstand current I_p 50 Hz 60 Hz		up to kA	50	63	50/63	50/63	50	
		up to kA	52	65	52/65	52/65	52/65	
Rated short-circuit making current I_{ms} 50 Hz 60 Hz		up to kA	50	63	50/63	50/63	50	
up to kA		52	65	52/65	52/65	52		
Vacuum contactor panel (with HV HRC fuses)		Rated normal current I_n ³⁾ for feeder ⁷⁾	A	450	450	450	450	450
	Rated short-time withstand current I_{st} for switchgear with $t_{st} = 1$ s for switchgear with $t_{st} = 3$ s	up to kA	31.5 ⁹⁾	31.5 ⁹⁾	31.5 ⁹⁾	25 ⁹⁾	25 ⁹⁾	
		up to kA	31.5 ⁹⁾	31.5 ⁹⁾	31.5 ⁹⁾	25 ⁹⁾	25 ⁹⁾	
	Rated peak withstand current I_p 50 Hz/60 Hz	up to kA	80/82	80/82	80/82	63/65	63/65	
	Rated short-circuit making current I_{ms} 50 Hz/60 Hz	up to kA	80/82	80/82	80/82	63/65	63/65	
	Electrical endurance at rated normal current		100,000 or 500,000 operating cycles ¹⁴⁾					
Dimension "e" of HV HRC fuse-links	mm	292 ⁸⁾	442	442	442	442		
Metering panel (with HV HRC fuses)	Rated short-time withstand current I_{st} for switchgear with $t_{st} = 1$ s for switchgear with $t_{st} = 3$ s	up to kA	31.5	31.5	31.5	25	25	
		up to kA	31.5	31.5	31.5	25	25	
	Rated peak withstand current I_p 50 Hz/60 Hz	up to kA	80/82	80/82	80/82	63/65	63/65	
	Dimension "e" of HV HRC fuse-links	mm	292 ⁸⁾	292 ⁸⁾	442	442	442	



Electrical data, filling pressure, temperature for double-busbar switchgear

Common electrical data, filling pressure and temperature	Rated insulation level	Rated voltage U_n	kV	7.2	12	15	17.5	24
	Rated short-duration power-frequency withstand voltage U_{1s}	phase-to-phase, phase-to-earth, open contact gap	kV	20 ¹⁾	28 ²⁾	36	38	50
		across the isolating distance	kV	23 ¹⁾	32 ²⁾	39	45	60
	Rated lightning impulse withstand voltage U_{lp}	phase-to-phase, phase-to-earth, open contact gap	kV	60 ¹⁾	75 ²⁾	95	95	125
		across the isolating distance	kV	70 ¹⁾	85 ²⁾	110	110	145
	Rated frequency f_n		Hz	50/60	50/60	50/60	50/60	50/60
Rated normal current I_n ³⁾	for the busbar	up to A	2500	2500	2500	2500	2500	
Rated filling level p_{fill} ⁴⁾			150 kPa (absolute) at 20 °C					
Minimum functional level p_{min} ⁴⁾			130 kPa (absolute) at 20 °C					
Ambient air temperature			-5 °C to +55 °C ¹²⁾					

Data of the switchgear panels

Circuit-breaker panel, bus coupler ¹⁰⁾ 1000 A	Rated normal current I_n ³⁾	A	1000	1000	1000	1000	1000	
	Rated short-time withstand current I_{sc}	for switchgear with $t_c = 1$ s	up to kA	25	25	25	25	25
		for switchgear with $t_c = 3$ s	up to kA	25	25	25	25	25
	Rated peak withstand current I_p , 50 Hz/60 Hz	up to kA	63/65	63/65	63/65	63/65	63/65	
	Rated short-circuit making current I_{sm} , 50 Hz/60 Hz	up to kA	63/65	63/65	63/65	63/65	63/65	
	Rated short-circuit breaking current I_{sc}	up to kA	25	25	25	25	25	
Electrical endurance of vacuum circuit-breakers	at rated normal current		10,000 operating cycles					
	at rated short-circuit breaking current		50 breaking operations					
Incoming sectionalizer 1250 A	Rated normal current I_n ³⁾	A	1250	1250	1250	1250	1250	
	Rated short-time withstand current I_{sc}	for switchgear with $t_c = 1$ s	up to kA	25	25	25	25	25
		for switchgear with $t_c = 3$ s	up to kA	25	25	25	25	25
	Rated peak withstand current I_p , 50 Hz/60 Hz	up to kA	63/65	63/65	63/65	63/65	63/65	
	Rated short-circuit making current I_{sm} , 50 Hz/60 Hz	up to kA	63/65	63/65	63/65	63/65	63/65	
	Rated short-circuit breaking current I_{sc}	up to kA	25	25	25	25	25	
Electrical endurance of vacuum circuit-breakers	at rated normal current		10,000 operating cycles					
	at rated short-circuit breaking current		50 breaking operations					
Further panel types	The above-mentioned panel types can on request be combined with panel types of the single-busbar range.							

Footnotes for pages 8 and 9

- Higher values of the rated short-duration power-frequency withstand voltage available with:
 - 32 kV for phase-to-phase, phase-to-earth and open contact gap, as well as
 - 37 kV across the isolating distance
 Higher values of the rated lightning impulse withstand voltage:
 - 60 kV for phase-to-phase, phase-to-earth and open contact gap, as well as
 - 70 kV across the isolating distance
- Higher values of the rated short-duration power-frequency withstand voltage available with:
 - 42 kV for phase-to-phase, phase-to-earth and open contact gap, as well as
 - 48 kV across the isolating distance
 Higher values of the rated lightning impulse withstand voltage:
 - 95 kV for phase-to-phase, phase-to-earth and open contact gap, as well as
 - 110 kV across the isolating distance
- The rated normal currents apply to ambient air temperatures of max. 40 °C. The 24-hour mean value is max. 35 °C (according to IEC 62271-1/VDI 6671-1) 2500 A with natural ventilation.
- Pressure values for SF₆-insulated switchgear vessels
- Bus sectionalizer panel 1000 A and disconnecter panel 1000 A only possible with rated short-time withstand current I_{sc} 25 kA (t_c 1 s and 3 s), rated peak withstand current I_p 63 kA and rated short-circuit breaking current I_{sc} 25 kA
- Bus sectionalizer panel 1250 A in 2 panel widths only possible with rated short-time withstand current I_{sc} 25 kA (t_c 1 s and 3 s), rated peak withstand current I_p 63 kA and rated short-circuit breaking current I_{sc} 25 kA
- Depending on the HV HRC fuse link, observe max. permissible let-through current I_{lt} of the HV HRC fuse-links
- Extension tube (150 mm long) required additionally
- Applies to combination of vacuum contactor with HV HRC fuses: Vacuum contactor without HV HRC fuse reaches rated short-time withstand current I_{sc} 8 kA (t_c 1 s) and rated peak withstand current I_p 20 kA (applies to the complete switchgear)
- Bus coupler 1250 A on request
- For circuit-breaker panel up to 15 kV, up to 31.5 kA, up to 1250 A, the following operating cycles are optionally available:
 - 5000 operating cycles for DISCONNECTING function
 - 5000 operating cycles for READY TO EARTH function
 - 30,000 operating cycles for circuit-breaker
 - 10,000 operating cycles for DISCONNECTING function
 - 10,000 operating cycles for READY TO EARTH function
 - 30,000 operating cycles for circuit-breaker
- Optional ambient air temperature -25 °C to +55 °C (secondary devices (e.g. protection devices, meters, measuring transducers, etc.) must be suitable for the given ambient air temperature).
- Without mechanical closing latch: 500,000
With mechanical closing latch: 100,000
Max. 60 operating cycles per hour.

Technical data

Room planning

Switchgear installation

- For single-busbar applications:
 - Wall-standing arrangement or
 - Free-standing arrangement
 - Face-to-face arrangement accordingly
- For double-busbar applications:
 - Back-to-back arrangement (free-standing arrangement).

Room dimensions

See opposite dimension drawings.

Room height

- ≥ 2750 mm
NXPLUS C, all technical data, all types of arrangement, with/without horizontal pressure relief duct
- ≥ 2400 mm
NXPLUS C, wall-standing and free-standing arrangement with rear pressure relief duct, busbar 1250 A, LV compartment 761 mm, without horizontal pressure relief duct.

Door dimensions

The following dimensions are recommended as a minimum for the door dimensions:

- Door height: ≥ 2500 mm
- Door width: ≥ 900 mm (for panel widths of 600 mm)
- ≥ 1200 mm (for panel widths of 900 mm).

Switchgear fixing

- For floor openings and fixing points of the switchgear, see pages 12 to 22
- Foundations:
 - Steel girder construction
 - Steel-reinforced concrete with foundation rails, welded or bolted on.

Panel dimensions

See pages 12 to 22.

Weights

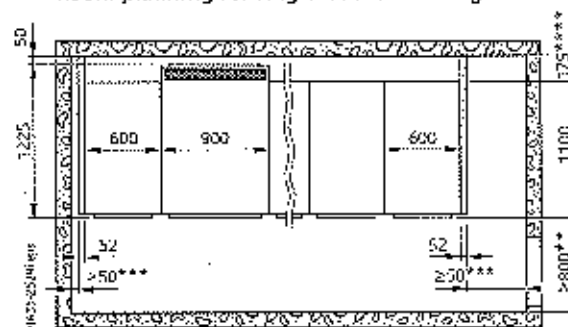
Single-busbar panels

- Panels for ≤ 1250 A: Approx. 800 kg
- Panels for > 1250 A: Approx. 1400 kg.

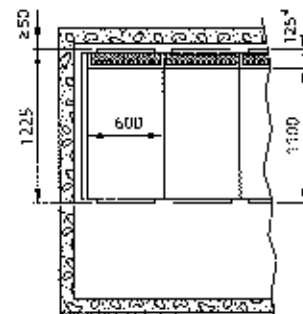
Double-busbar panels

- Panels for ≤ 1250 A: Approx. 1600 kg.

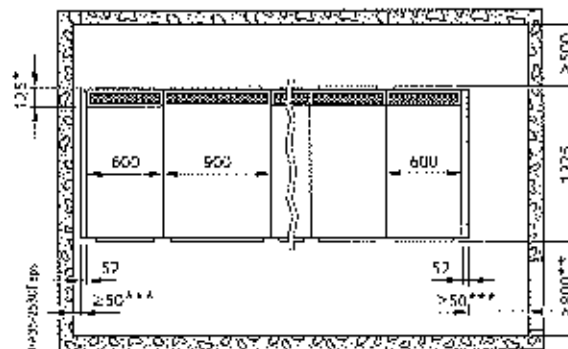
Room planning for single-busbar switchgear



Wall-standing arrangement (top view)
Panels without rear pressure relief duct



Wall-standing arrangement (same as left side) but panels with rear pressure relief duct



Free-standing arrangement (top view)
Panels with rear pressure relief duct

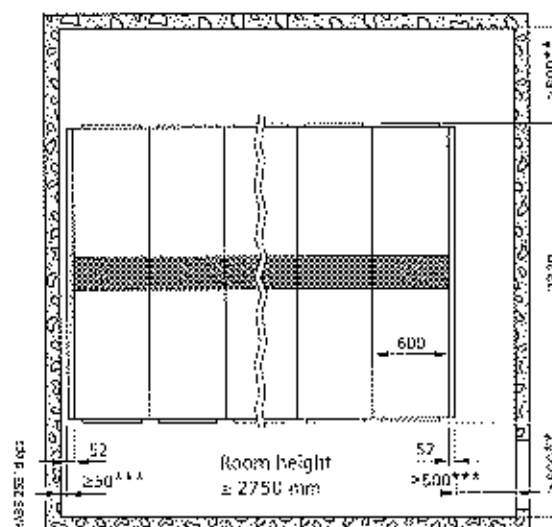
* Rear pressure relief duct: Depth 325 mm

** Depending on national requirements; for extension/panel replacement: Control aisle ≥ 1400 mm recommended (600 mm panels) ≥ 1600 mm recommended (900 mm panels)

*** Lateral wall distances on the left or on the right: ≥ 500 mm is recommended

**** 125 mm, if there are exclusively 600 mm panels

Room planning for double-busbar switchgear



Free-standing arrangement (top view)

** For panel replacement: Control aisle ≥ 1400 mm necessary

*** Lateral wall distance ≥ 50 mm optionally possible on the left or on the right

A. H. U. C.

M



Transport

NXPLUS C switchgear is delivered in form of individual panels.

Please observe the following:

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

In case of double-busbar panels the A and B sides are supplied separately.

Packing

Means of transport: Rail and truck

- Panels on pallets
- Open packing with PE protective foil.

Means of transport: Ship and airplane

- Panels on pallets
- In closed crates (cardboard) with sealed upper and lower PE protective foil
- With desiccant bags
- With sealed wooden base
- Max. storage time: 6 months.

Transport dimensions, transport weights ¹⁾

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

Single-busbar switchgear transport with rail or truck

1 x 600	1100 x 2460 x 1450	900	800
1 x 900	1100 x 2460 x 1450	1500	1400
1 x 600 (top-rear cable connection)	1100 x 2460 x 2100	900	800

Single-busbar switchgear transport with ship or airplane

1 x 600	1130 x 2550 x 1450	900	800
1 x 900	1130 x 2550 x 1450	1500	1400
1 x 600 (top-rear cable connection)	1130 x 2550 x 2100	900	800

Double-busbar switchgear transport with rail or truck

1 x 600	1100 x 2460 x 1450	900	800
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Double-busbar switchgear transport with ship or airplane

1 x 600	1130 x 2550 x 1450	900	800
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Classification of NXPLUS C switchgear according to IEC 62271-200

Design and construction

Partition class	PM (metallic partition) ²⁾
Loss of service continuity category	
Panels with HV HRC fuses	LSC 2
Panels without HV HRC fuses	LSC 2
Accessibility to compartments (enclosure)	
Busbar compartment	Tool-based
Switching device compartment	Non accessible
Low-voltage compartment	Tool-based
Cable compartment	
- without HV HRC fuses	Tool based
- with HV HRC fuses	Interlock-controlled and tool-based

Internal arc classification

Designation of the internal arc classification IAC	7.2 kV, 12 kV, 15 kV	17.5 kV, 24 kV
IAC class for:		
Wall-standing arrangement	IAC A FL 31.5 kA, 1 s	IAC A FL 25 kA, 1 s
Free-standing arrangement	IAC A FLR 31.5 kA, 1 s	IAC A FLR 25 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)	
Arc test current	25 kA, 31.5 kA	
Test duration	1 s	

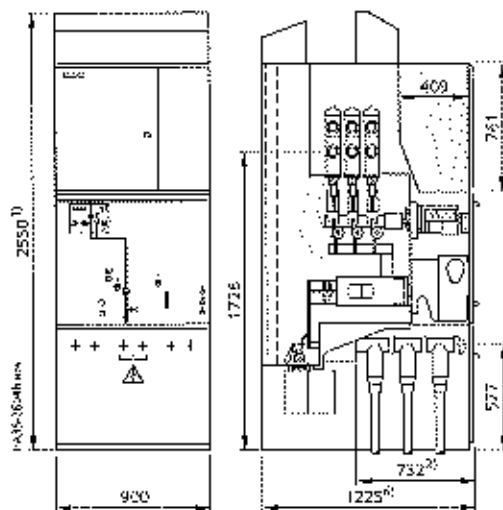
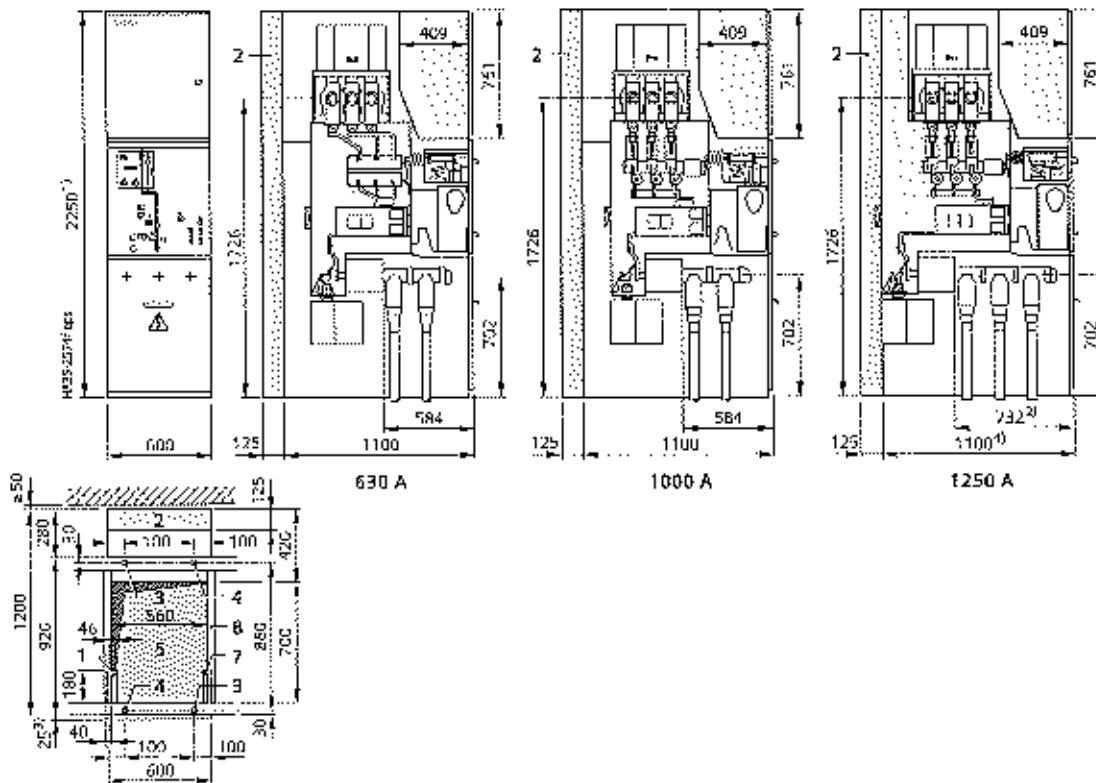
¹⁾ Average values depending on the degree to which panels are equipped

²⁾ Corresponds to 'metal- clad' according to former standard IEC 60298

Dimensions

Front views, sections, floor openings, fixing points for single-busbar switchgear

Circuit-breaker panels



Legend

- 1 Left-side floor opening for control cables
- 2 Option: Pressure relief duct
- 3 Fixing hole for M8/M10
- 4 Fixing hole for M8/M10 (only for resistance against shock, vibration, earthquakes)
- 5 Floor opening for high voltage cables
- 7 Right side floor opening for control cables (only required for zero-sequence current transformers in the cable basement)
- 8 Cross member (necessary for panel replacement)

Footnotes

- 1) 2650 mm for higher low voltage compartment
- 2) 752 mm for deeper cable compartment cover
- 3) 45 mm for deeper cable compartment cover
- 6) 1245 mm for deeper cable compartment cover

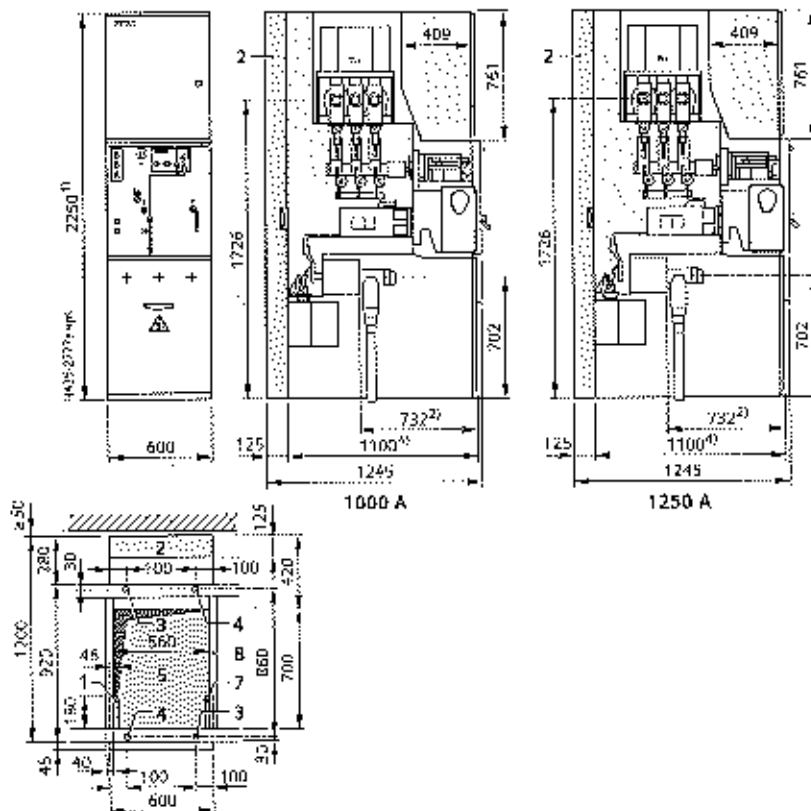
A. P. ...



Dimensions

Front views, sections, floor openings, fixing points for single-busbar switchgear

Circuit-breaker panels (5000-5000/30,000 operating cycles or 10,000-10,000/30,000 operating cycles)



Legend

- 1 Left-side floor opening for control cables
- 2 Option: Pressure relief duct
- 3 Fixing hole for MR/M10
- 4 Fixing hole for M8/M10 (only for resistance against shock, vibration, earthquakes)
- 5 Floor opening for high-voltage cables
- 7 Right-side floor opening for control cables (only required for zero-sequence current transformers in the cable basement)
- 8 Cross member (necessary for panel replacement)

Footnotes

- 1) 2650 mm for higher low-voltage compartment
- 2) 752 mm for deeper cable compartment cover
- 4) 1120 mm for deeper cable compartment cover

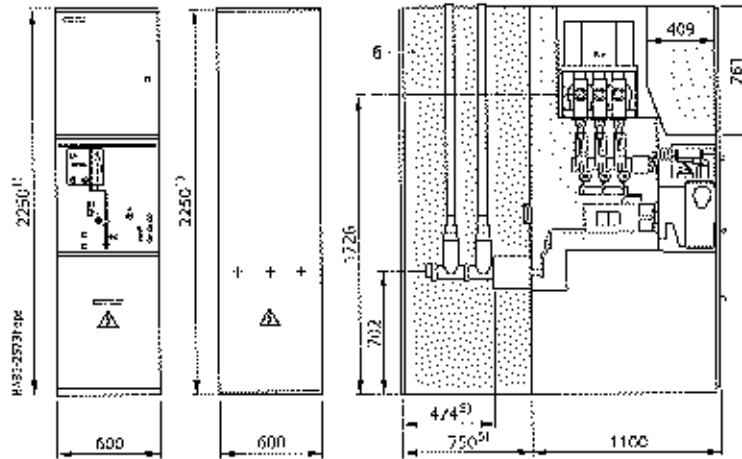
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Dimensions

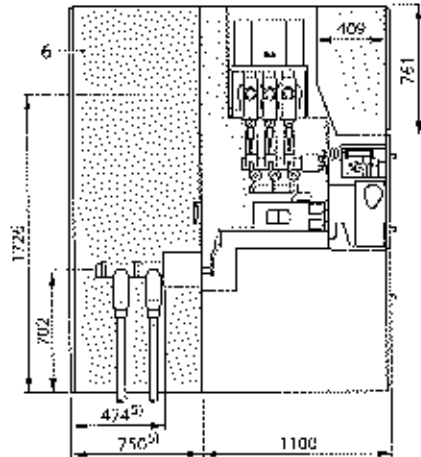
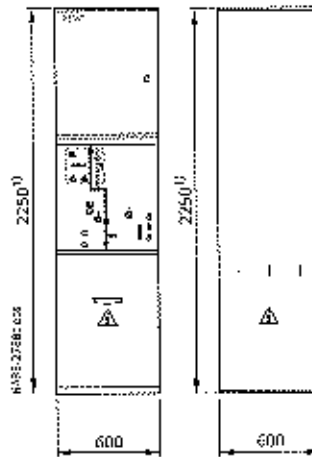
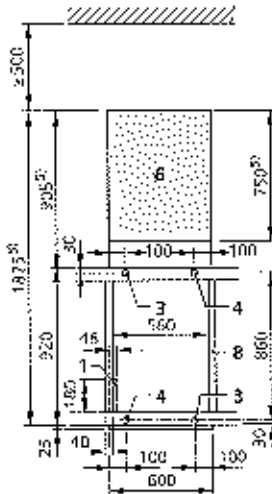
Front views, sections, floor openings, fixing points for single-busbar switchgear

Circuit-breaker panels cable connection from top rear



1250 A

Cable connection from rear bottom

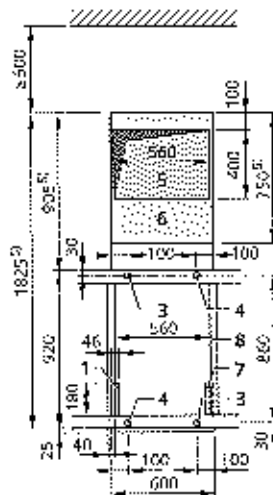


1250 A

Legend and footnotes

- 1 Left side floor opening for control cables
- 3 Fixing hole for M8/M10
- 4 Fixing hole for M8/M10 (only for resistance against shock, vibration, earthquakes)
- 5 Floor opening for high-voltage cables
- 6 Cable compartment/pressure relief duct
- 7 Right-side floor opening for control cables (only required for zero-sequence current transformers in the cable basement)
- 8 Cross member (necessary for panel replacement)

- 1) 2650 mm for higher low-voltage compartment
- 5) When only one cable is connected, the dimension is reduced by 275 mm



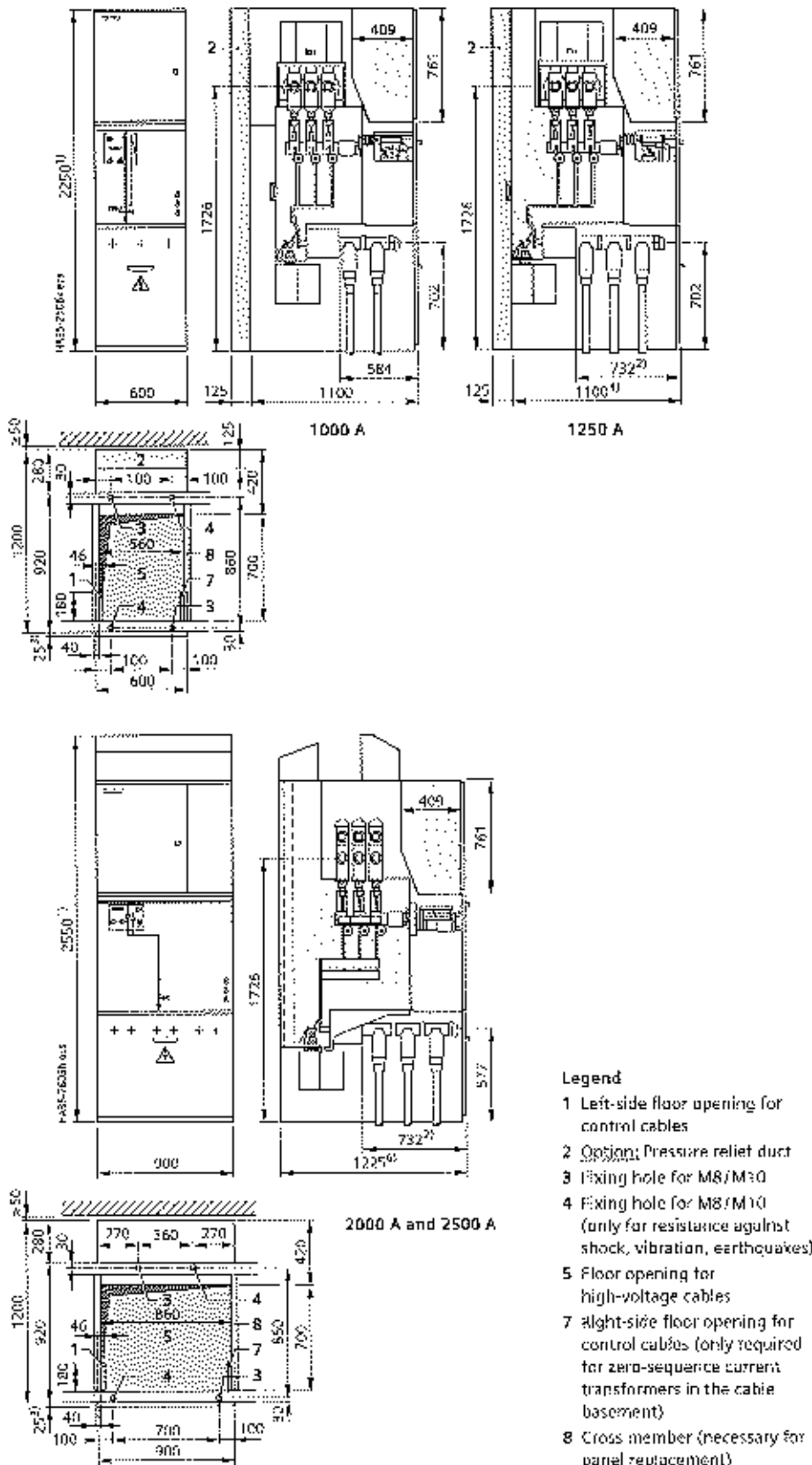
A. Reif



Dimensions

Front views, sections, floor openings, fixing points for single-busbar switchgear

Disconnecter panels



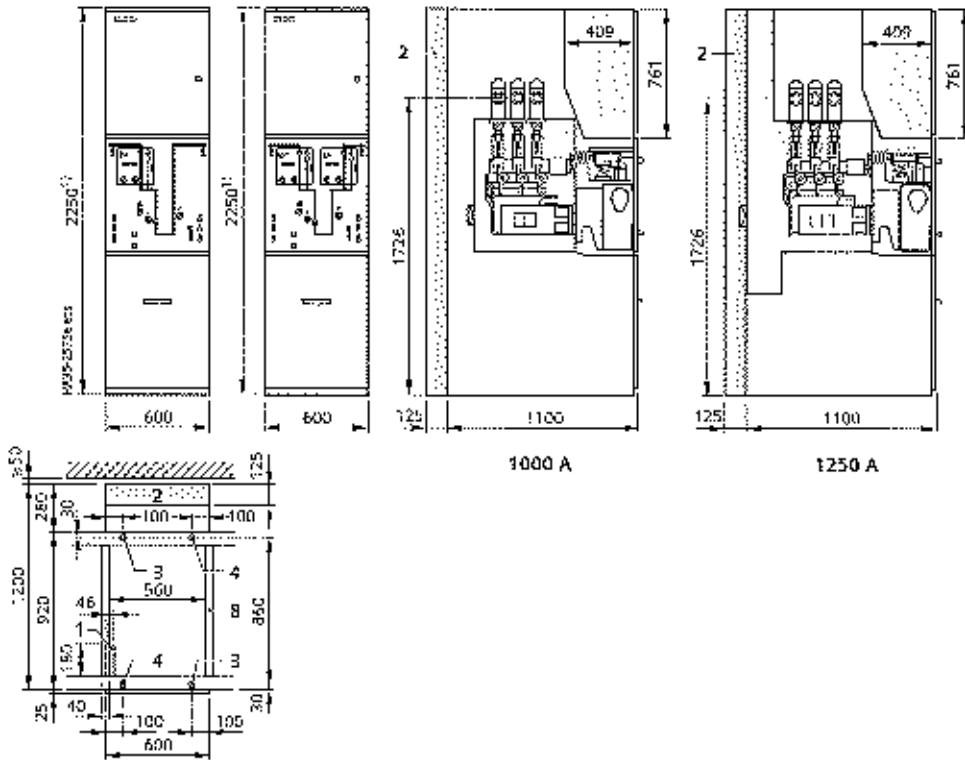
A. P...

Dimensions



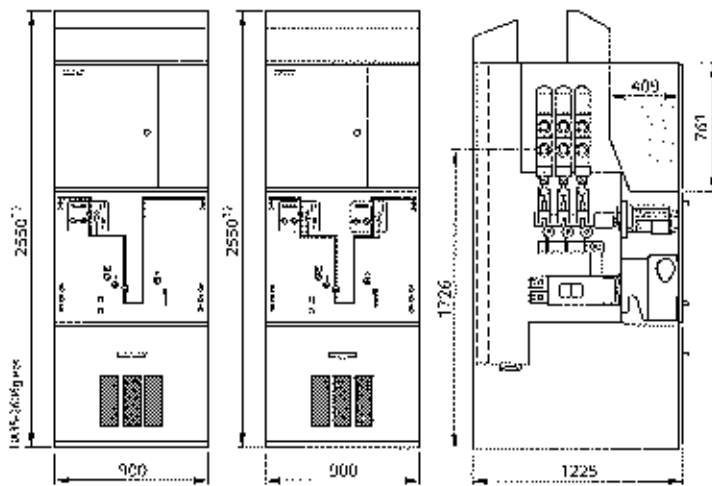
Front views, sections, floor openings, fixing points for single-busbar switchgear

Bus sectionalizers with one or two disconnectors (1 panel width)



1000 A

1250 A



2000 A and 2500 A

Legend and footnote

- 1 Left-side floor opening for control cables
 - 2 Option: Pressure relief duct
 - 3 Fixing hole for MB/IM1C
 - 4 Fixing hole for MB/IM1C (only for resistance against shock, vibration, earthquakes)
 - 8 Cross member (necessary for panel replacement)
- 1) 2650 mm for higher low-voltage compartment

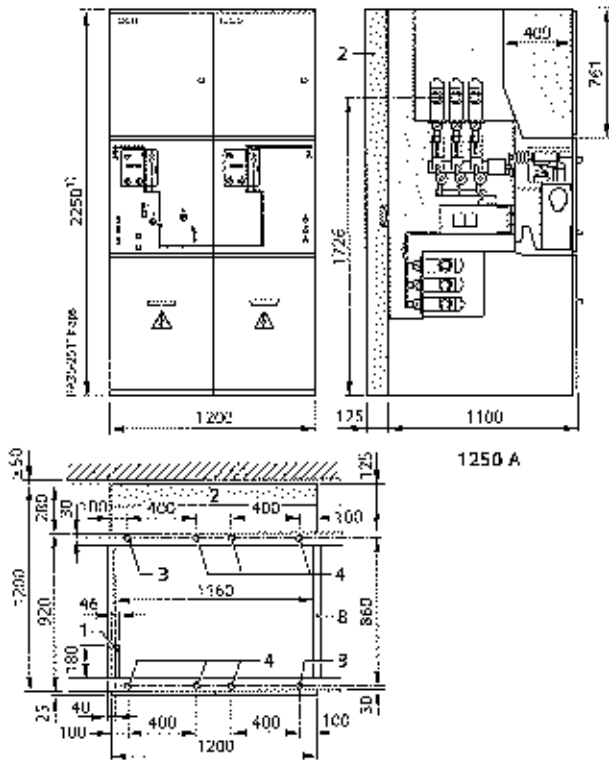


M. Rieger



Front views, sections, floor openings, fixing points for single-busbar switchgear

Bus sectionalizers with disconnecter (2 panel widths)



1250 A

Legend

- 1 Floor opening for control cables
- 2 Option: Pressure relief duct
- 3 Fixing hole for MB/M10
- 4 Fixing hole for MB/M10 (only for resistance against shock, vibration, earthquakes)
- 8 Cross member (necessary for panel replacement)

Footnote

- 1) 2650 mm for higher low-voltage compartment

McRae

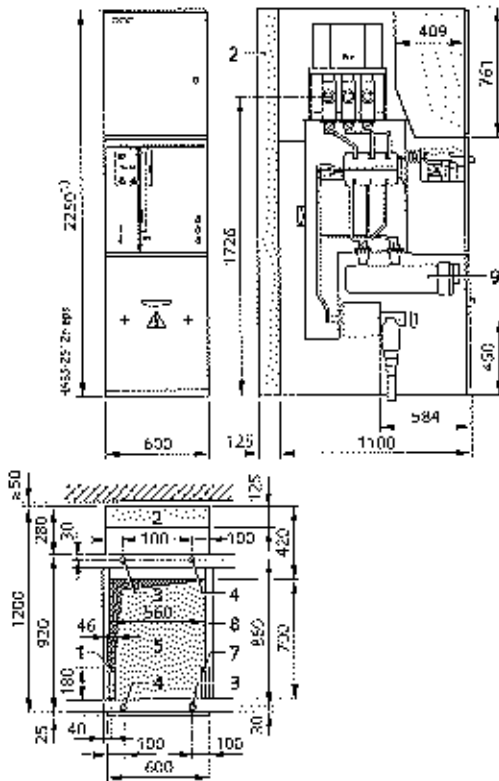
McRae

Dimensions

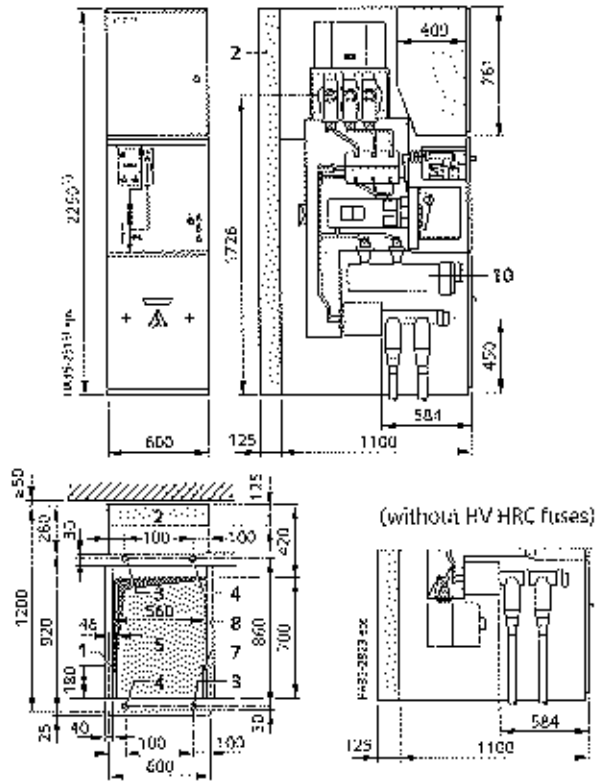


Front views, sections, floor openings, fixing points for single-busbar switchgear

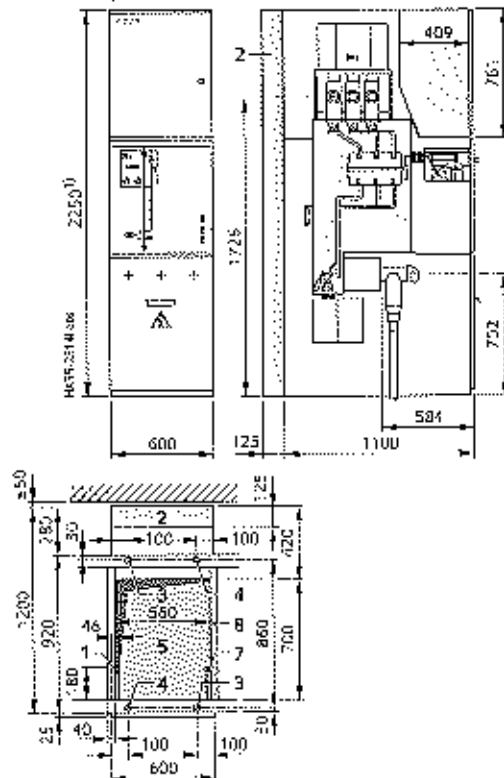
Switch-disconnector panel with HV HRC fuses



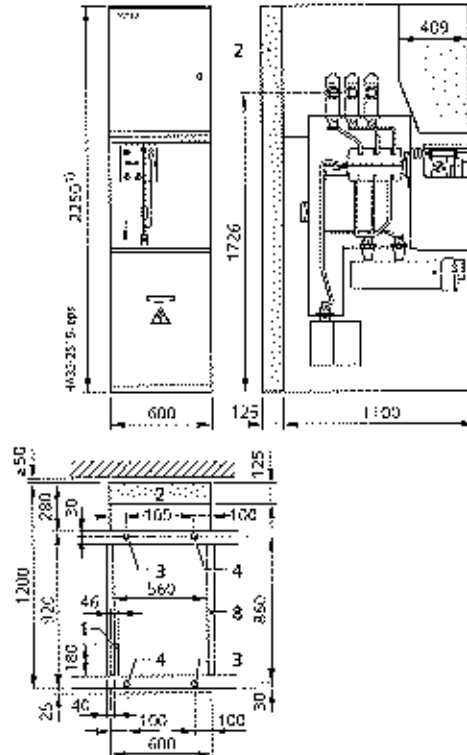
Vacuum contactor panel with HV HRC fuses



Ring-main panel (switch-disconnector panel without HV HRC fuses)



Metering panel with HV HRC fuses



Legend and footnote

- 1 Left-side floor opening for control cables
 - 2 Option: Pressure relief duct
 - 3 Fixing hole for M8/M10
 - 4 Fixing hole for M8/M10 (only for resistance against shock, vibration, earthquakes)
 - 5 Floor opening for high-voltage cables
 - 7 Right-side floor opening for control cables (only required for zero-sequence current transformers in the cable basement)
 - 8 Cross member (necessary for panel replacement)
 - 9 HV HRC fuses
 - 10 Option: HV HRC fuses
- 1) 2650 mm for higher low-voltage compartment

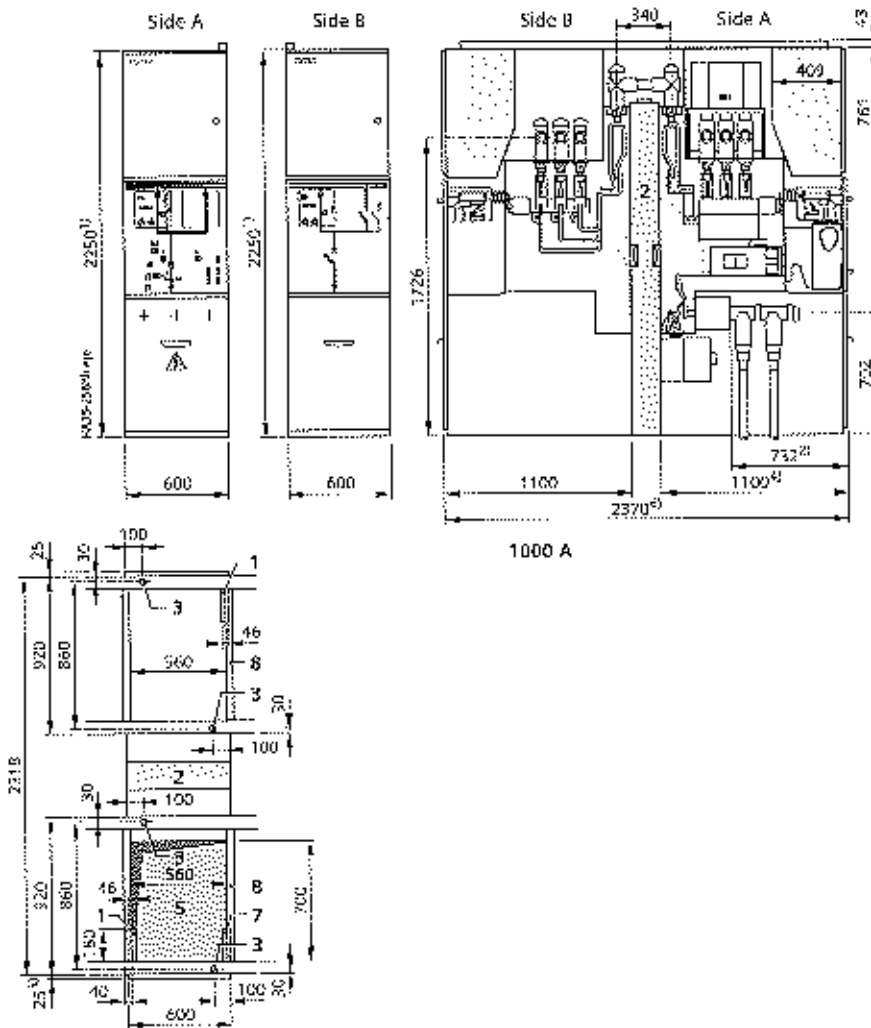
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Dimensions

Front views, sections, floor openings, fixing points for double-busbar switchgear

Circuit-breaker panels



1000 A

Legend

- 1 Left side floor opening for control cables
- 2 Pressure relief duct
- 3 Fixing hole for M8/M10
- 5 Floor opening for high-voltage cables
- 7 Right-side floor opening for control cables (only required for zero-sequence current transformers in the cable basement)
- B Cross member (necessary for panel replacement)

Footnotes

- 1) 2650 mm for higher low-voltage compartment
- 2) 752 mm for deeper cable compartment cover
- 3) 45 mm for deeper cable compartment cover
- 4) 1120 mm for deeper cable compartment cover
- 6) 2390 mm for deeper cable compartment cover

M. Beck

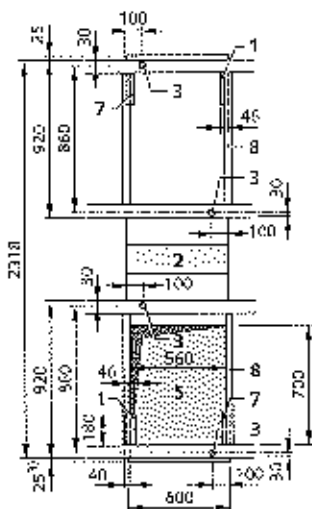
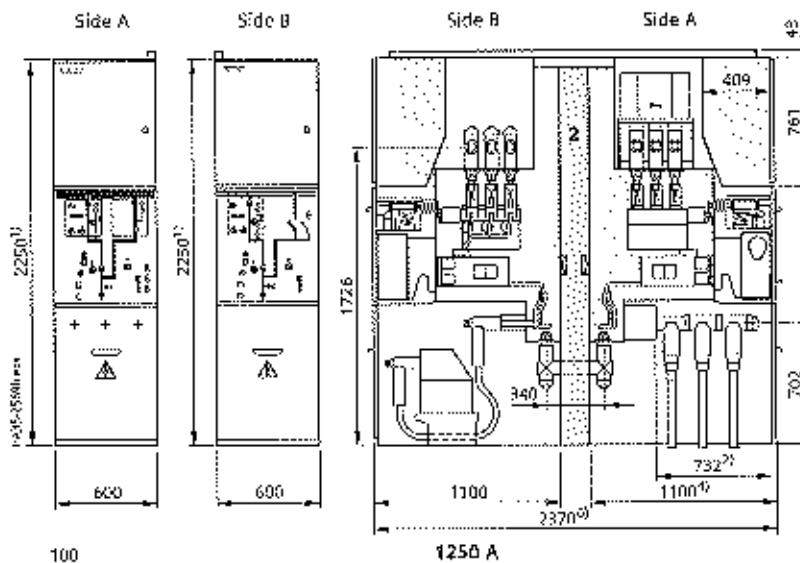
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Dimensions



Front views, sections, floor openings, fixing points for double-busbar switchgear

Incoming sectionalizer

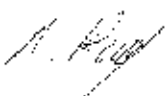


Legend

- 1 Left side floor opening for control cables
- 2 Pressure relief duct
- 3 Fixing hole for M8/M10
- 5 Floor opening for high-voltage cables
- 7 Right side floor opening for control cables (only required for zero-sequence current transformers in the cable basement)
- 8 Cross member (necessary for panel replacement)

Footnotes

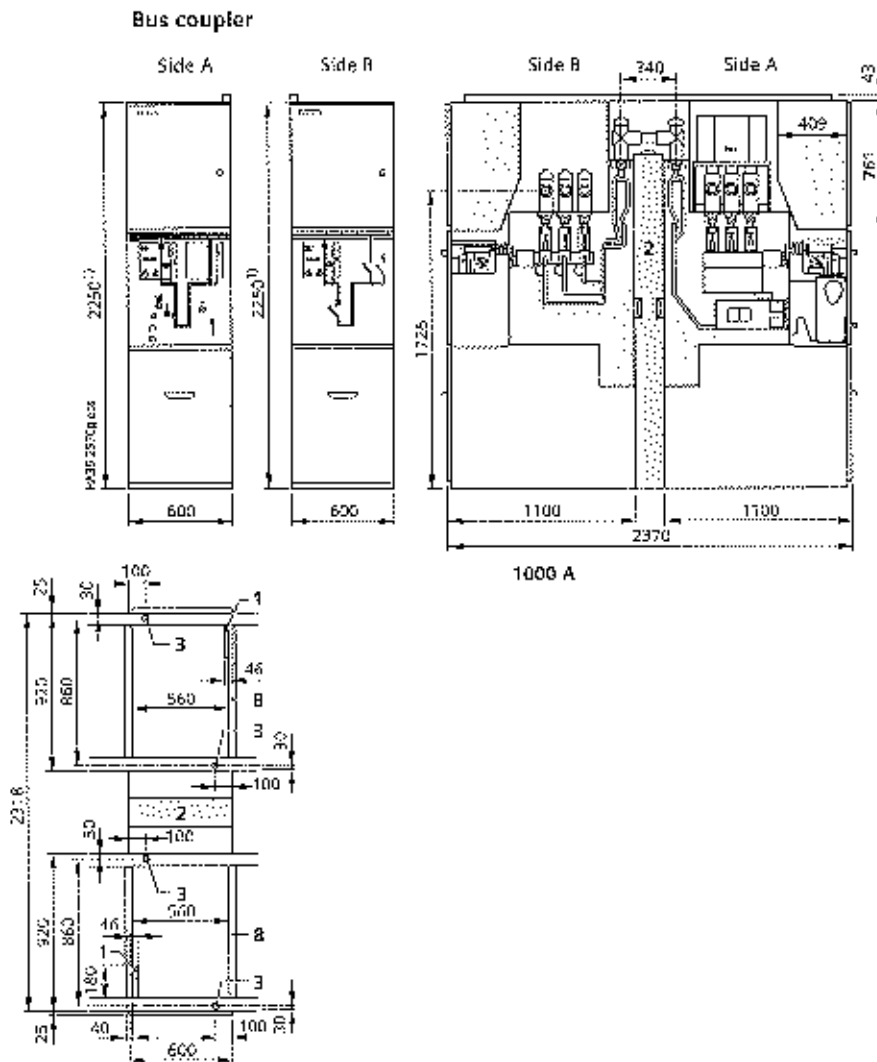
- 1) 2650 mm for higher low-voltage compartment
- 2) 752 mm for deeper cable compartment cover
- 3) 45 mm for deeper cable compartment cover
- 4) 1120 mm for deeper cable compartment cover
- 6) 1245 mm for deeper cable compartment cover





Dimensions

Front views, sections, floor openings, fixing points for double-busbar switchgear



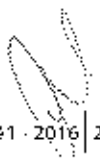
Legend

- 1 Floor opening for control cables
- 2 Pressure relief duct
- 3 Fixing hole for M8/M10
- 6 Cross member (necessary for panel replacement)

Footnote

- 1) 2650 mm for higher low-voltage compartment

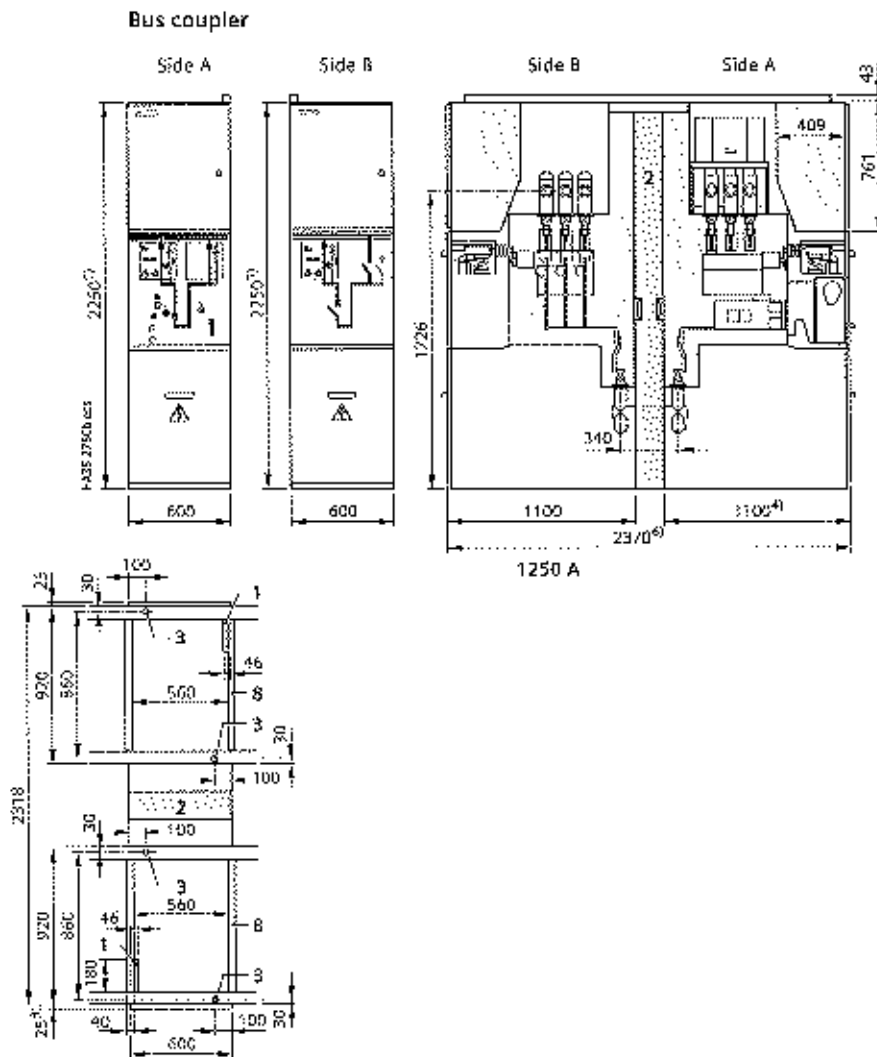
M. Breda



Dimensions



Front views, sections, floor openings, fixing points for double-busbar switchgear



Legend

- 1 Floor opening for control cables
- 2 Pressure relief duct
- 3 Fixing hole for M8/M10
- 4 Cross member (necessary for panel replacement)

Footnotes

- 1) 2650 mm for higher low voltage compartment
- 3) 45 mm for deeper cable compartment cover
- 4) 1120 mm for deeper cable compartment cover
- 6) 1245 mm for deeper cable compartment cover



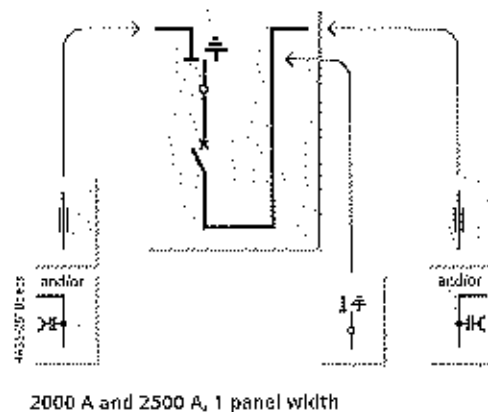
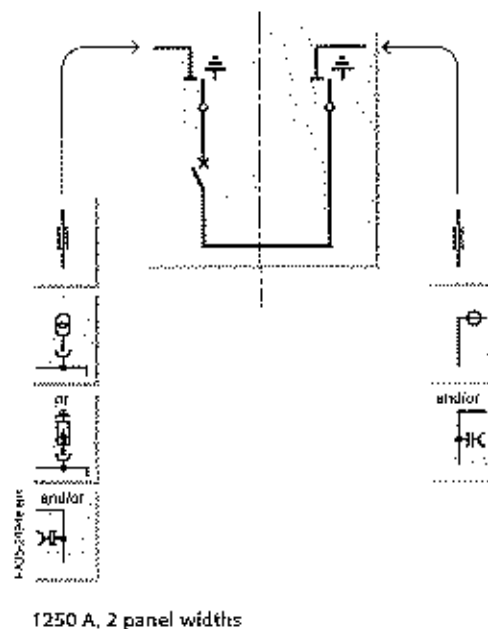
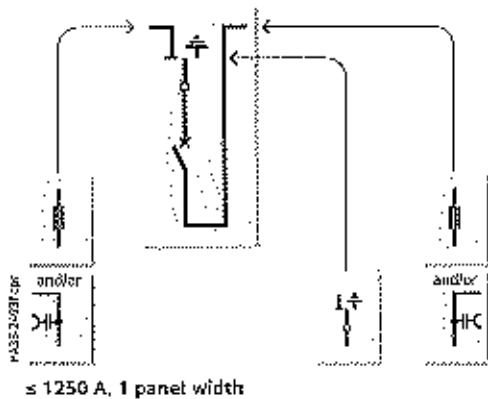
H. Beck

Product range

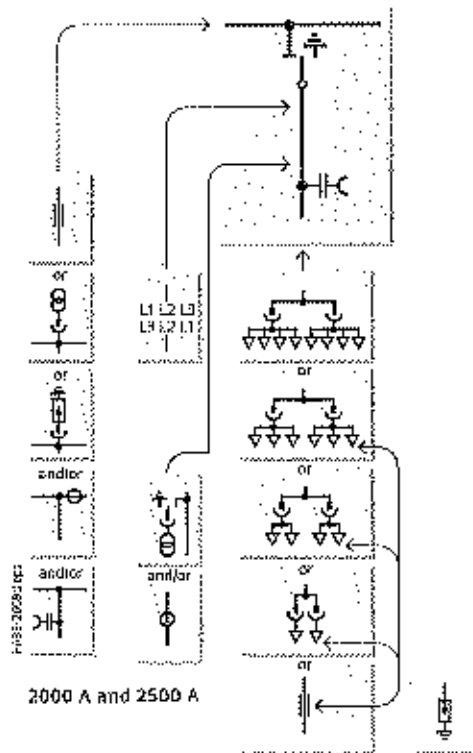
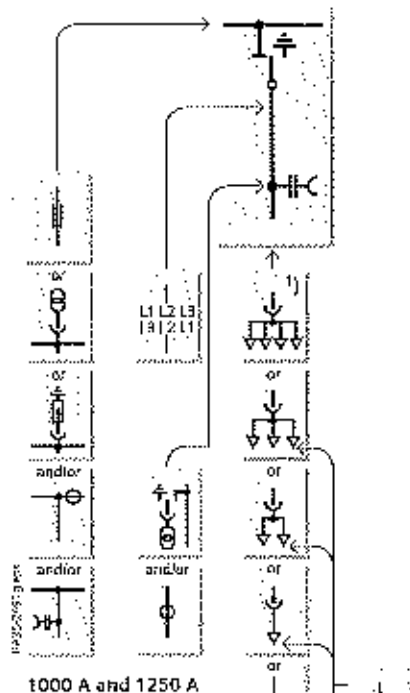
Single-busbar panels




Bus sectionalizers





Disconnecter panels





1) Only for 1250 A


-  Three-position disconnecter


-  Vacuum circuit-breaker


-  Inverted phases


-  Plug-in voltage transformer


-  Disconnectable and plug-in voltage transformer

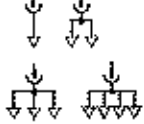
-  Current transformer


-  Capacitive voltage detecting system

-  Busbar earthing switch

-  Surge arrester or limiter

-  Solid-insulated bar

-  Cable connection with outside-core plug (not included in the scope of supply)

-  Cable connection with outside-core plug (not included in the scope of supply)

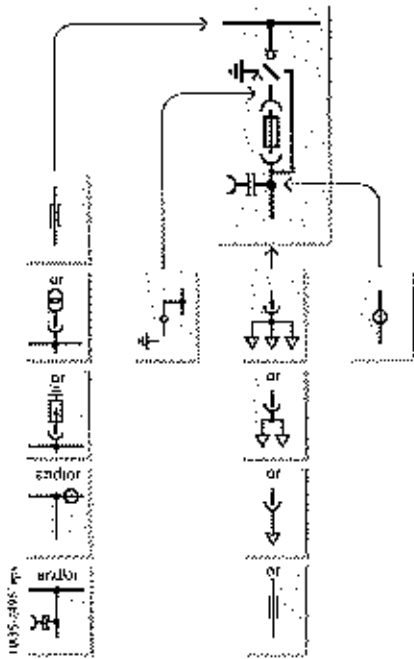
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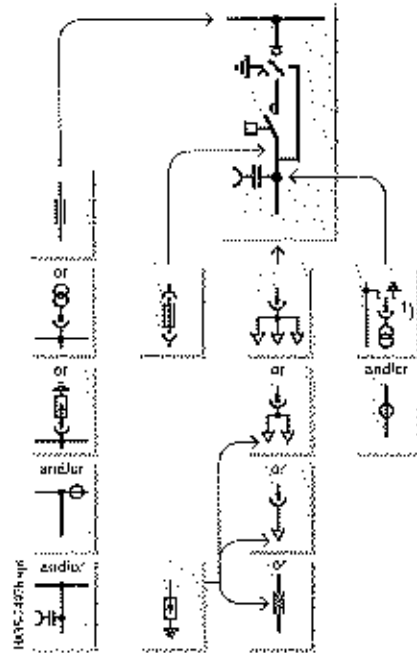
Product range








Single-busbar panels

Switch-disconnector panel

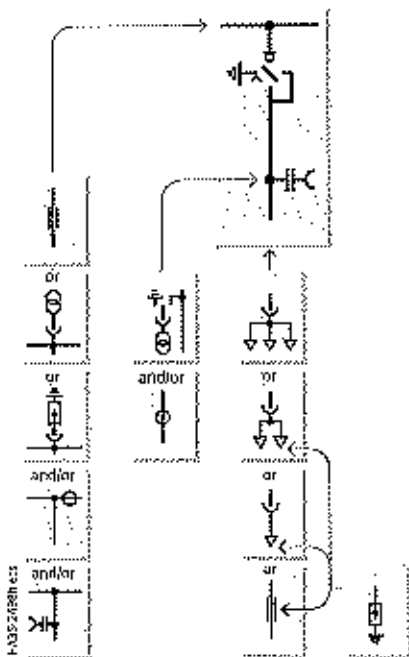


Vacuum contactor panel

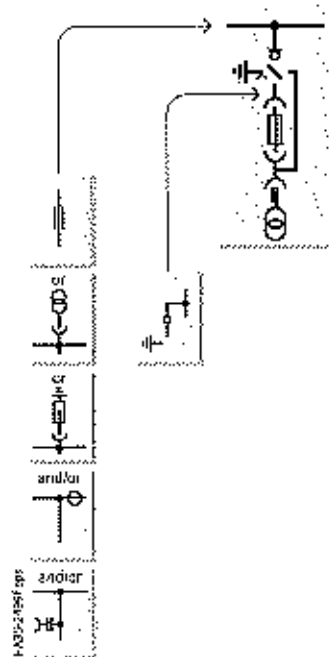






-  Three-position switch-disconnector
-  Vacuum contactor
-  HV HRC fuses
-  Plug in voltage transformer
-  Disconnectable and plug-in voltage transformer
-  Current transformer
-  Capacitive voltage detecting system

Ring-main panel



Metering panel



-  2nd earthing switch for fuses
-  Surge arrester or limiter
-  Solid-insulated bar
-  Cable connection with outside-cone plug (not included in the scope of supply)

1) Only possible when vacuum contactor panel is designed without fuse

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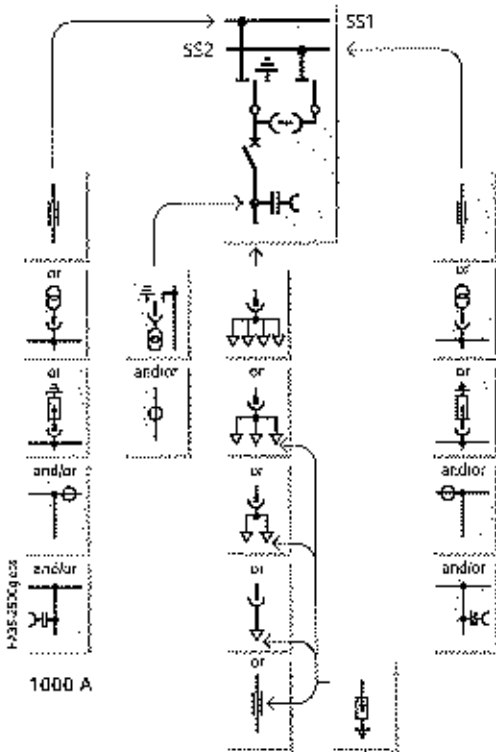
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Product range

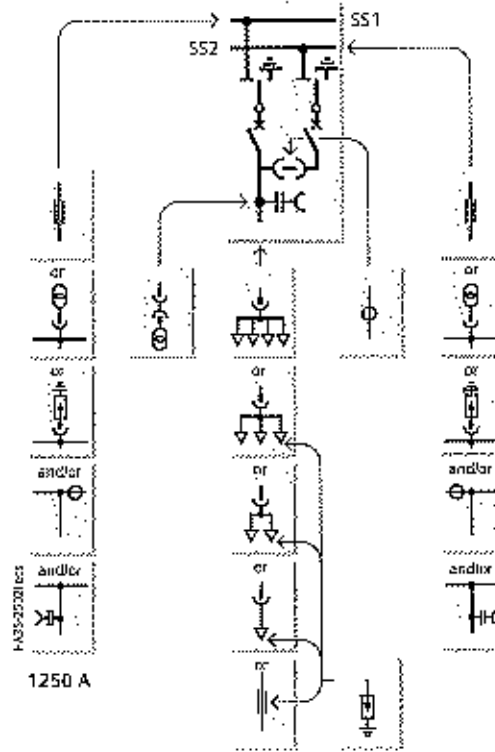
Double-busbar panels

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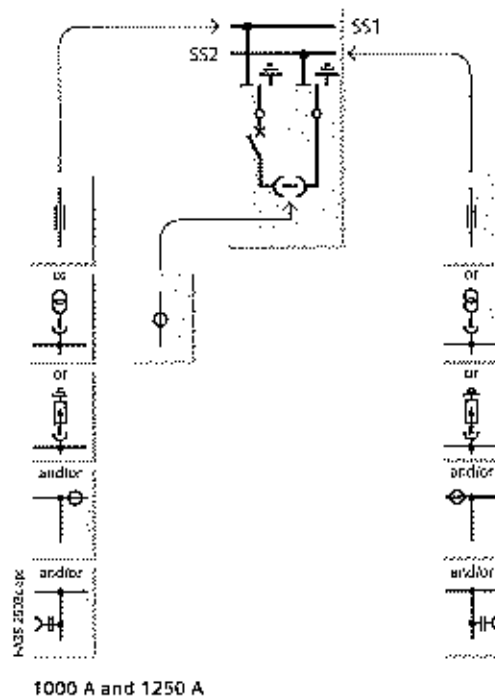
Circuit-breaker panels














Incoming sectionalizer



Bus coupler

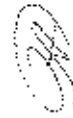


-  Three-position disconnecter
-  Vacuum circuit-breaker
-  Plug in voltage transformer
-  Disconnectable and plug-in voltage transformer
-  Plug-in voltage transformer, mounted separately, connected through a short cable
-  Current transformer
-  Capacitive voltage detecting system
-  Panel bars
-  Surge arrester or limiter
-  Solid-insulated bar
-  Cable connection with outside-cone plug (not included in the scope of supply)

Abbreviations:
 SS1 = Busbar 1
 SS2 = Busbar 2

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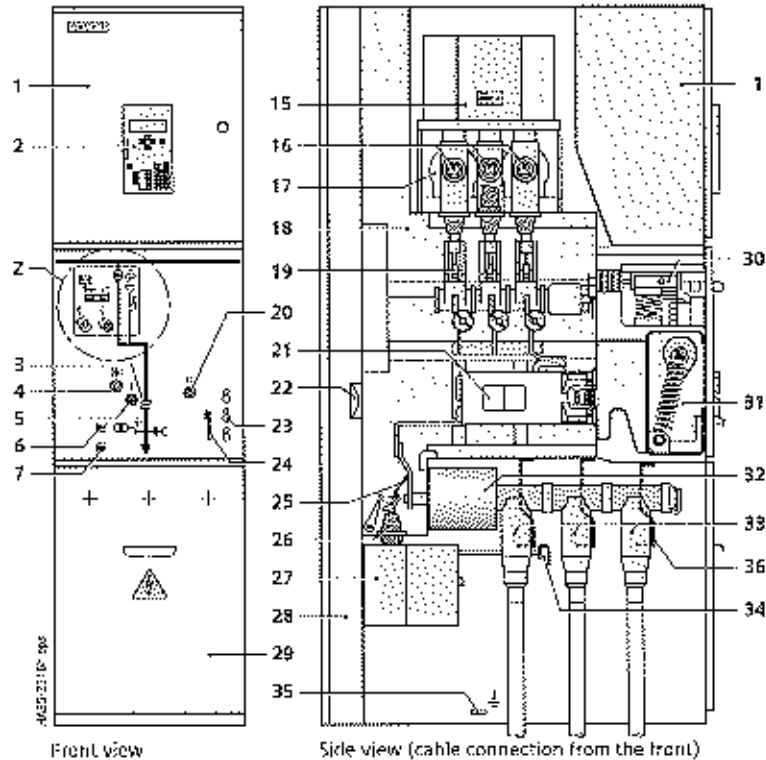
Insulating system

- Switchgear vessel filled with SF₆ gas
- Features of SF₆ gas:
 - Non-toxic
 - Odorless and colorless
 - Non-inflammable
 - Chemically neutral
 - Heavier than air
 - Electronegative (high-quality insulator)
- GWP²⁾ = 22,800
- Pressure of SF₆ gas in the switchgear vessel (absolute values at 20 °C):
 - Rated filling level: 150 kPa
 - Design pressure: 180 kPa
- Design temperature of the SF₆ gas: 80 °C
- Operating pressure of bursting disc: ≥ 300 kPa
- Bursting pressure: ≥ 550 kPa
- Gas leakage rate: < 0.1 % per year.

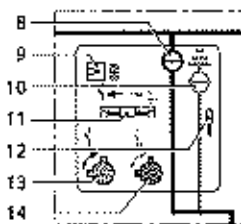
Panel design

- Factory-assembled, type-tested
- Metal¹⁾ enclosed, with metallic partitions¹⁾
- Hermetically tight, welded switchgear vessel made of stainless steel
- 1-pole, solid-insulated, screened busbars, plug in type
- Maintenance-free
- Degree of protection
 - IP 65 for all high-voltage parts of the primary circuit
 - IP 3XD for the switchgear enclosure
- Vacuum circuit-breaker or vacuum contactor
- Three-position disconnecting facility for disconnecting and earthing by means of the circuit-breaker
- Make-proof earthing by means of the vacuum circuit-breaker
- Three-position switch-disconnector
- Cable connection with outside-cone plug-in system according to DIN EN 50 181
- Wall-standing or free-standing arrangement
- Installation and possible later extension of existing panels without gas work
- Replacement of switchgear vessel without gas work
- Replacement of instrument transformers without gas work, as they are located outside the gas compartments
- Enclosure made of sendzimir-galvanized sheet steel, front cover, rear cover and end walls powder-coated in color "light basic" (SN 700)
- Low-voltage compartment removable, plug-in bus wires
- Lateral, metallic wiring ducts for control cables.

Circuit-breaker panel (example)



Detail Z:



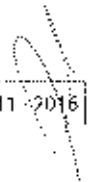
- 1 Low-voltage compartment
- 2 Multifunction protection relay SIPROTEC 4 (example)
- 3 Position indicator for circuit-breaker
- 4 Actuating opening for charging the circuit-breaker springs
- 5 ON pushbutton for circuit breaker
- 6 "Spring charged" indicator
- 7 Operations counter for circuit-breaker
- 8 Position indicator for "disconnecting" function of three-position switch
- 9 Ready for service indicator
- 10 Position indicator for "ready-to-earth" function of three-position switch

- 11 Control gate and locking device for "disconnecting/earthing" functions of three-position switch
- 12 Interrogation lever
- 13 Actuating opening for "disconnecting" function of three-position switch
- 14 Actuating opening for "ready-to-earth" function of three-position switch
- 15 Option: Busbar voltage transformer, plug-in type
- 16 Busbar, 1-pole, fully insulated, plug-in type, earthed on the outside
- 17 Option: Busbar current transformer
- 18 Switchgear vessel, hermetically welded, filled with SF₆ gas
- 19 Three position disconnecter
- 20 OFF pushbutton for circuit-breaker
- 21 Vacuum interrupter of circuit breaker
- 22 Pressure relief (bursting disc)
- 23 Capacitive voltage detecting system
- 24 Feeder locking device (suitable for padlocking)
- 25 Disconnecting facility for feeder voltage transformer
- 26 Bushing for feeder voltage transformer
- 27 Option: Feeder voltage transformer
- 28 Option: Pressure relief duct
- 29 Cable compartment
- 30 Operating mechanism for three-position switch
- 31 Operating mechanism for circuit-breaker
- 32 Feeder current transformer
- 33 Cable connection with outside-cone 1-plug
- 34 Operation of disconnecting facility of the feeder voltage transformer
- 35 Earthing busbar with earthing connection
- 36 Air guides for cable connection

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

2) Global Warming Potential

A. P. ...



Components



Vacuum circuit-breaker

Features

- According to IEC 62271-100 and VDE 0671-100 (for standards, see page 71)
- Application in hermetically welded switchgear vessel in conformity with the system
- Climate-independent vacuum interrupter poles in the SF₆-filled switchgear vessel
- Maintenance-free for indoor installation acc. to IEC 62271-1 and VDE 0671-1
- Individual secondary equipment
- A metal bellows is used for gasketless separation of the SF₆ insulation and the operating mechanism (already used with success for over 2 million vacuum interrupters).

Trip-free mechanism

The vacuum circuit-breaker is fitted with a trip-free mechanism according to IEC 62271 and VDE 0671.

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 vessel in the operating mechanism box and behind the control board
- Stored-energy spring mechanism for 10,000 operating cycles
- **Option:** 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 (standard)

Function	Class	Standard	Property of NXPLUS-C
BREAKING	M2	IEC 62271-100	10,000 times mechanically without maintenance
	F2	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

Endurance class of circuit-breaker (option)

(only up to 15 kV, up to 31.5 kA, up to 1250 A)

Function	Class	Standard	Property of NXPLUS-C
BREAKING	M7	IEC 62271-100	30,000 times mechanically without maintenance
	E2	IEC 62271-100	30,000 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	< 75 ms
Opening time	1 st release	< 65 ms
	2 nd release	< 50 ms
Arching time at 50 Hz		< 15 ms
Break time	1 st release	< 80 ms
	2 nd release	< 65 ms
Dead time		300 ms
Total charging time		< 15 s

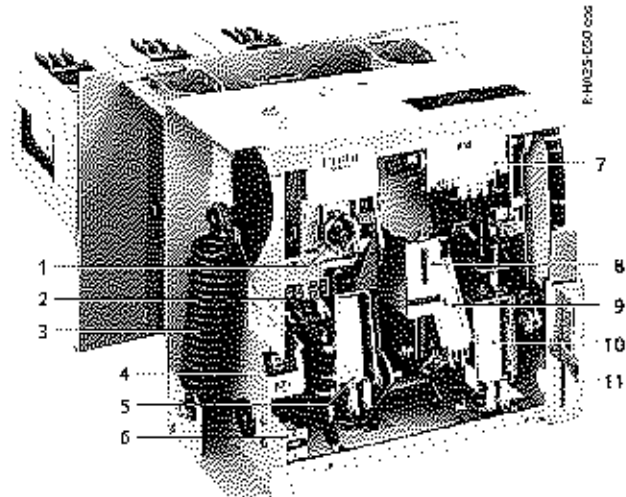
Abbreviations for switching duties:

U = Synchronization and rapid load transfer (closing time ≤ 90 ms)

K = Auto-reclosing

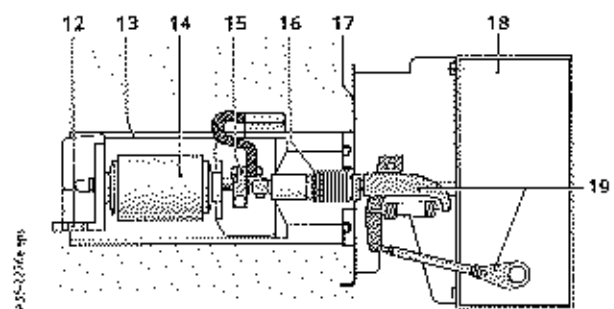
* Item designation

Vacuum circuit-breaker



Open on the side of the operating mechanism

- 1 Gear with motor (M1 *)
- 2 Position switch (S4 *)
- 3 Closing spring
- 4 "Closing spring charged" indication
- 5 Closing solenoid (Y9 *)
- 6 Operations counter
- 7 Auxiliary switch 6 NO + 6 NC (S1 *), option: 12 NO + 12 NC
- 8 CLOSED/OPEN position indicator for circuit-breaker
- 9 **Option:** 2nd release (Y2 *)
- 10 1st release (Y1 *)
- 11 Feeder locking device



Section through the vacuum circuit-breaker

- 12 Fixed terminal
- 13 Pole support
- 14 Vacuum interrupter
- 15 Moving terminal
- 16 Metal bellows
- 17 Switchgear vessel, SF₆ insulated, with vacuum interrupter
- 18 Operating mechanism box (see figure above)
- 19 Operating kinematics

For further technical data and description of typical applications, please refer also to Catalog HG 11.05 "3AH5 Vacuum Circuit-Breakers".

1) Motor rating at:
24 V to 240 V DC: 600 W / 700 W (for 30,000 operating cycles)
180 V to 240 V AC: 750 VA / 1100 VA (for 30,000 operating cycles)

A. Reiser



Secondary equipment

The scope of secondary equipment of the vacuum circuit-breaker depends on the type of application and offers a wide range of variations, thus allowing even the highest requirements to be satisfied:

Closing solenoid

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

Shunt releases

- Types:
 - Standard: 3AY15 10 (Y1 *)
 - Option: 3AX11 03 (Y2 *), with energy store
- Tripping by protection relay or electrical actuation.

C.t.-operated release

- Type 3AX11 02 (Y4 *), 0.5 A
- Type 3AX11 04 (Y6 *) for tripping pulse ≥ 0.1 Ws in conjunction with suitable protection systems
- Used if external auxiliary voltage is missing, tripping via protection relay.

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 (mechanical and electrical)

- 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 cut-out 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: 6 NO + 6 NC, free contacts thereof ¹⁾ 3 NO + 4 NC
- Option: 12 NO + 12 NC, free contacts thereof ¹⁾ 9 NO + 6 NC.

Position switch

- Type 3SE4 (S4 *, S16 *)
- For signaling "closing spring charged"
- For signaling "circuit-breaker blocked".

Mechanical interlocking

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

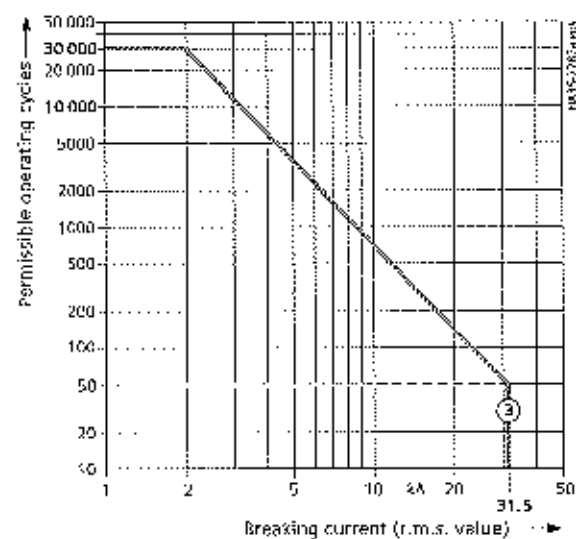
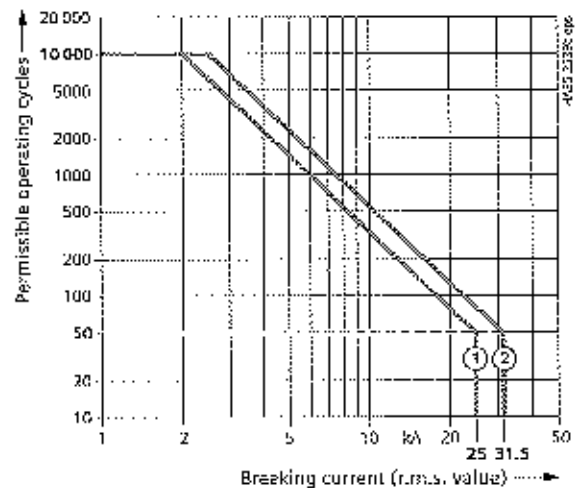
Possible release combinations

Release	Release combination				
	1	2	3	4	5
1st shunt release type 3AY15 10	-	*	*	-	*
2nd shunt release type 3AX11 03	-	*	-	-	-
C.t.-operated release type 3AX11 02 0.5 A, or type 3AX11 04: 0.1 Ws	-	*	*	*	-
Undervoltage release type 3AX11 03	*	*	-	*	*

1 unit of each release, a maximum of 2 releases can be combined only.

1) For utilization by the customer * Item designation

Switching rate of the vacuum interrupter



Electrical data (curve 1)

- Rated voltage 17.5 kV, 24 kV
- Rated short-circuit breaking current ≤ 25 kA
- Rated normal current ≤ 2000 A

Electrical data (curve 2)

- Rated voltage 7.2 kV, 12 kV, 15 kV
- Rated short-circuit breaking current ≤ 31.5 kA
- Rated normal current ≤ 2500 A

Electrical data (curve 3)

- Rated voltage 7.2 kV, 12 kV, 15 kV
- Rated short-circuit breaking current ≤ 31.5 kA
- Rated normal current ≤ 1250 A

Rated operating sequences

- Rapid load transfer (U): O -> CO -> I' - CO (t 0.3 s, t' 3 min)
- Auto-reclosing (K): O -> CO -> I' - CO (t 0.3 s, t' 3 min)
- Auto-reclosing (K): O -> CO -> I' - 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

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

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Components

Three-position switches

Common features

- According to IEC 62271-102 and VDE 0671-102 (for standards, see page 71)
- Application in hermetically welded switchgear vessel in conformity with the system
- Climate-independent contacts in the SF₆-filled switchgear vessel
- Maintenance-free for indoor installation according to IEC 62271-1 and VDE 0671-1
- Individual secondary equipment
- A metal bellows is used for gasketless separation of the SF₆ insulation and the operating mechanism (already used with success for over 2 million vacuum interrupters)
- A rotary bushing is used for separation of the SF₆ insulation and the operating mechanism (already used with success millions of times in medium-voltage and high-voltage switchgear)
- Compact design due to short contact gaps in SF₆ gas
- Operation via gas-tight welded-in metal bellows or rotary bushing at the front of the switchgear vessel
- Reliable mechanical switch position up to the operating front of the panel (in double-busbar switchgear, the position indication for side B is done on side A via electrical position indicators).

Three-position disconnecter

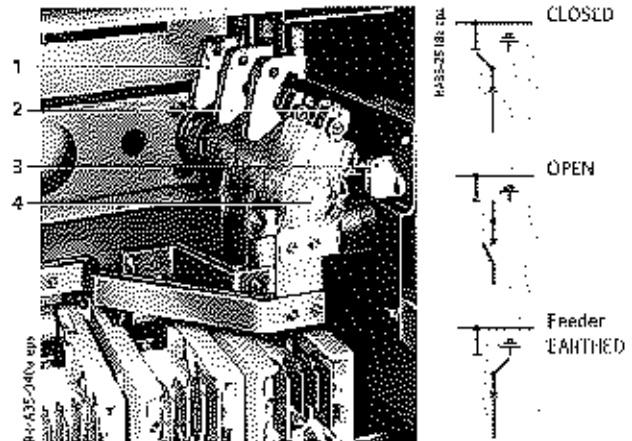
- Application in:
 - Circuit-breaker panel 630 A to 2500 A (with interlock against the circuit-breaker)
 - Disconnector panel 1000 A to 2500 A
 - Bus sectionalizer 1000 A to 2500 A
- 2000 mechanical operating cycles for CLOSED / OPEN
- 1000 mechanical operating cycles for OPEN / READY-TO-EARTH
- Option: 5000 or 10,000 mechanical operating cycles for the duty cycle (CLOSED / OPEN / READY-TO-EARTH) (only up to 15 kV, 31.5 kA and 1,250 A).

Three-position switch-disconnector

- Application in:
 - Switch-disconnector panel
 - Ring-main panel
 - Contactor panel
 - Metering panel
- 2000¹⁾ mechanical operating cycles for CLOSED / OPEN
- 1000 mechanical operating cycles for OPEN / EARTHED
- Switching functions as general-purpose switch-disconnector according to:
 - IEC 62271-103
 - VDE 0670-301
 - IEC 62271-102
 - VDE 0671-102 (for standards, see page 71)
- Designed as a multi-chamber three-position switch with the functions:
 - Switch-disconnector and
 - Make-proof earthing switch.

1) For switch-disconnector panel: 1000 mechanical operating cycles for (CLOSED / OPEN / EARTHED)

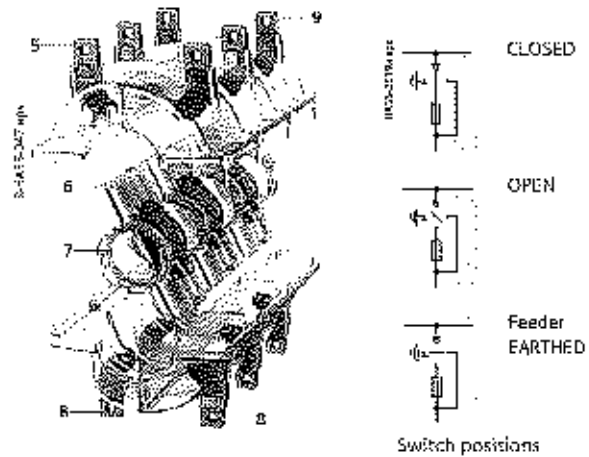
Switch positions of the three-position switches



Three-position disconnecter (in OPEN position) with vacuum circuit-breaker arranged below (view into the switchgear vessel opened at the rear)

Switch positions of the three-position disconnecter

- | | | |
|---|--|--|
| <p>"CLOSED"</p> <ul style="list-style-type: none"> • Closed current path between busbar and vacuum circuit-breaker • Contact blades connected with fixed contacts at the busbar bushings | <p>"OPEN"</p> <ul style="list-style-type: none"> • Open current path between busbar and vacuum circuit-breaker • Isolating distances withstand prescribed test voltages | <p>"READY-TO-EARTH"</p> <ul style="list-style-type: none"> • Contact blades connected with earth contact of switchgear vessel • Earthing and short circuiting the cable connection possible by closing the vacuum circuit-breaker |
|---|--|--|



Three-position switch-disconnector (exploded view)

Switch positions of the three-position switch-disconnector

- | | | |
|---|--|---|
| <p>"CLOSED"</p> <ul style="list-style-type: none"> • Closed current path between busbar and vacuum circuit-breaker • Contact blades connected with fixed contacts at the busbar bushings | <p>"OPEN"</p> <ul style="list-style-type: none"> • Open current path between busbar and vacuum circuit-breaker • Isolating distances withstand prescribed test voltages | <p>"EARTHED"</p> <ul style="list-style-type: none"> • Contact blades connected with fixed contacts to earth |
|---|--|---|

- | | |
|--|--|
| <ul style="list-style-type: none"> 1 Fixed contacts at the busbar 2 Swivel-mounted contact blade 3 Fixed contacts for "Feeder EARTHED" 4 Operating shaft | <ul style="list-style-type: none"> 5 Fixed contacts to earth 6 Rotary contact blade 7 Operating shaft 8 Fixed contacts to the feeder 9 Fixed contacts to the busbar |
|--|--|



Components

Three-position switches

Interlocks

- Selection of permissible switching operations 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 control gate is in neutral position again
- Switchgear interlocking system also possible with electro-mechanical interlocks if switchgear is equipped with motor operating mechanisms (mechanical interlocking for manual operation remains).

Switch positions

- "CLOSED", "OPEN", "EARTHED" or "READY-TO-EARTH"
- in circuit-breaker panels, earthing and short-circuiting the cable connection is completed by closing the vacuum circuit-breaker.

Operating mechanism

- Spring-operated mechanism, used in:
 - Circuit-breaker panels 630 A to 1250 A
 - Bus sectionalizers 1000 A, 1250 A
 - Incoming sectionalizer
 - Bus coupler
 - Disconnecter panels 1000 A, 1250 A
 - Vacuum contactor panel
 - Metering panel
 - Ring-main panel
- Slow motion mechanism, used in:
 - Circuit-breaker panels 1000 A, 1250 A with 30,000 operating cycles
 - Circuit-breaker panels 2000 A, 2500 A
 - Bus sectionalizers 2000 A, 2500 A
 - Disconnecter panels 2000 A, 2500 A
- Spring-operated / stored-energy mechanism, used in:
 - Switch-disconnector panel
 - Spring-operated and spring-operated / stored-energy and slow motion mechanism actuated via operating lever at the operating front of the panel
- Separate operating shafts for the DISCONNECTING and EARTHING or READY-TO-EARTH functions
- Option: Motor operating mechanism for the DISCONNECTING and EARTHING or READY-TO-EARTH functions
- Spring-operated / stored-energy mechanism for the switch-disconnector function with fuses: Opening spring precharged (after closing)
- Maintenance-free due to non-rusting design of parts subjected to mechanical stress
- Bearings which require no lubrication.

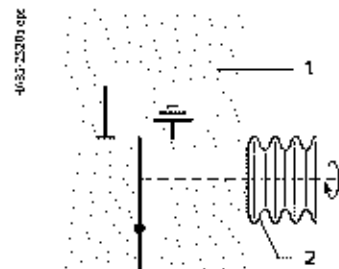
Transmission principle for operating mechanisms (see illustration)

- Transmission of operating power from outside into the gas filled switchgear vessel by means of a metal bellows or a rotary bushing
- Gas-tight
- Maintenance free.

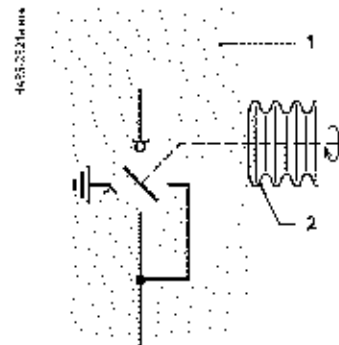
Endurance class of three-position switch-disconnector

Function	Class	Standard	Property of NXPLUS C
DISCONNECTING	M1 ²⁾	IEC 62271-102	2000 times mechanically without maintenance
LOAD BREAKING	M1	IEC 60265-1	1000 times mechanically without maintenance
	E3	IEC 60265-1	100 times rated mainly ac live load breaking current I_L without maintenance 5 times rated short circuit making current I_{ms} without maintenance
EARTHING	M0	IEC 62271-102	1000 times mechanically without maintenance
	E2	IEC 62271-102	5 times rated short-circuit making current I_{ms} without maintenance

Transmission principle for operating mechanisms



Three-position disconnecter



Three-position switch-disconnector

- 1 Gas-filled switch-gear vessel
- 2 Gas-tight welded-in metal bellows or rotary bushing

Endurance class of three-position disconnecter (standard)

Function	Class	Standard	Property of NXPLUS C
DISCONNECTING	M1	IEC 62271-102	2000 times mechanically without maintenance
READY-TO-EARTH	M0	IEC 62271-102	1000 times mechanically without maintenance
	E0	IEC 62271-102	no making capacity
EARTHING	E2 ¹⁾	IEC 62271-200 IEC 62271-102	50 times rated short-circuit making current I_{ms} without maintenance

Endurance class of three-position disconnecter (option) (only up to 15 kV, up to 31.5 kA, up to 1250 A)

Function	Class	Standard	Property of NXPLUS C
DISCONNECTING	M1	IEC 62271-102	5000 times mechanically without maintenance
READY-TO-EARTH	M0	IEC 62271-102	5000 times mechanically without maintenance
	E0	IEC 62271-102	no making capacity
EARTHING	E2 ¹⁾	IEC 62271-200 IEC 62271-102	50 times rated short-circuit making current I_{ms} without maintenance

Endurance class of three-position disconnecter (option) (only up to 15 kV, up to 31.5 kA, up to 1250 A)

Function	Class	Standard	Property of NXPLUS C
DISCONNECTING	M2	IEC 62271-102	10,000 times mechanically without maintenance
READY-TO-EARTH	M0	IEC 62271-102	10,000 times mechanically without maintenance
	E0	IEC 62271-102	no making capacity
EARTHING	E2 ¹⁾	IEC 62271-200 IEC 62271-102	50 times rated short-circuit making current I_{ms} without maintenance

1) The EARTHING function with endurance class E2 is achieved by closing the circuit-breaker in combination with the three-position disconnecter (endurance class E0)

2) For switch-disconnector panel: M0 1000 times mechanically without maintenance

Components



Key-operated interlocks

Features

Installation of key-operated interlocks is optionally possible

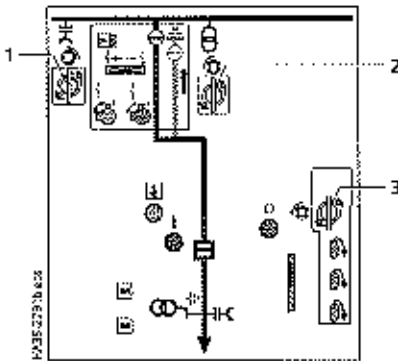
- Key-operated interlock make Castell Safety International Ltd. (type F5)

- Key-operated interlock make Fortress Interlocks Ltd. (type CLIS)

- Key-operated interlock from other suppliers on request

Made of operation

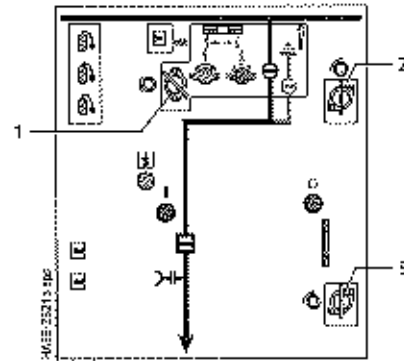
Key-operated Interlock for circuit-breaker panel



Switching device	Key Function (KF)	
Disconnecter -Q1	Key free in OPEN	
	KF1 Key trapped in CLOSED	
or		
	Key trapped in OPEN	
	KF4 Key free in CLOSED	
Earthing switch -Q1	Key free in OPEN	
	KF2 Key trapped in READY-TO-EARTH	
and/or		
	Key trapped in OPEN	
	KF3 Key free in EARTHED	

- Legend
- 1 KF1 or KF4
 - 2 KF2
 - 3 KF3

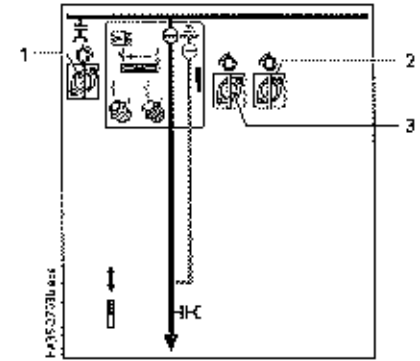
Key-operated interlock for circuit-breaker panel for 30,000 operating cycles



Switching device	Key Function (KF)	
Disconnecter -Q1	Key free in OPEN	
	KF1 Key trapped in CLOSED	
or		
	Key trapped in OPEN	
	KF4 Key free in CLOSED	
Earthing switch -Q1	Key free in OPEN	
	KF2 Key trapped in READY-TO-EARTH	
and/or		
	Key trapped in OPEN	
	KF3 Key free in EARTHED	

- Legend
- 1 KF1 or KF4
 - 2 KF2
 - 3 KF3

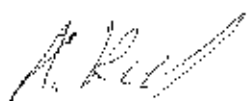
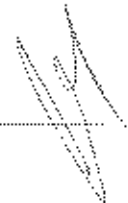
Key-operated Interlock for disconnecter panel, switch-disconnector panel, vacuum contactor panel, ring-main panel, metering panel



Switching device	Key Function (KF)	
Disconnecter -Q1	Key free in OPEN	
	KF1 Key trapped in CLOSED	
Earthing switch -Q1	Key free in OPEN	
	KF2 Key trapped in EARTHED	
and/or		
	Key trapped in OPEN	
	KF3 Key free in EARTHED	

- Legend
- 1 KF1
 - 2 KF2
 - 3 KF3

- Legend
- key free
 - key trapped



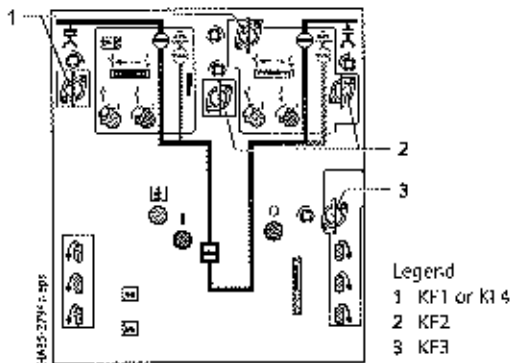


Components

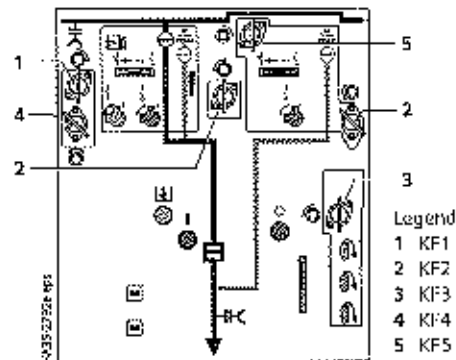
Key-operated interlocks

Mode of operation

Key-operated interlock for bus sectionalizer



Key-operated interlock for circuit-breaker panel with busbar earthing



Switching device: Key function (KF)			
Disconnectors -Q1, -Q10	Key free in OPEN		
	Key trapped in CLOSED		
or	Key trapped in OPEN		
	Key free in CLOSED		
Earthing switch -Q1, -Q10	Key free in OPEN		
	Key trapped in READY-TO-EARTH		
and/or	Key trapped in OPEN		
	KF3	Key free in EARTHED	
		Key free in OPEN	

Legend
 - key free
 - key trapped

Switching device: Key function (KF)		
Disconnectors -Q1	Key free in OPEN	
	Key trapped in CLOSED	
and/or	Key trapped in OPEN	
	Key free in CLOSED	
Earthing switch -Q1	Key free in OPEN	
	Key trapped in READY-TO-EARTH	
and/or	Key trapped in OPEN	
	KF3	Key free in EARTHED
Earthing switch -Q15	Key free in OPEN	
	Key trapped in READY-TO-EARTH	
and/or	Key trapped in OPEN	
	KF5	Key free in READY-TO-EARTH

Components



HV HRC fuse assembly

Features

- Application in:
 - Switch-disconnector panel
 - Contactor panel
 - Metering panel
- HV HRC fuse-links according to DIN 43 625 (main dimensions) with striker in "medium" version according to IEC 60282 / VDE 0670-4
- As short-circuit protection before transformers in the switch-disconnector panel
- As short-circuit protection before motors in the contactor panel
- As short-circuit protection before voltage transformers in the metering panel
- With selectivity (depending on correct selection) to upstream and downstream connected equipment
- 1-pole insulated
- Requirements according to IEC 62271-105 and VDE 067-105 fulfilled by combination of HV HRC fuses with the three-position switch-disconnector
- Climate-independent and maintenance-free, with fuse boxes made of cast resin
- Fuse assembly connected to the three-position switch-disconnector via welded-in bushings and connecting bars
- Arrangement of fuse assembly below the switchgear vessel
- Fuses can only be replaced if feeder is earthed
- Option: "Fuse tripped" indication for remote electrical indication with 1 normally open contact.

Mode of operation

In the event that an HV HRC fuse-link has tripped, the switch is tripped via an articulation which is integrated into the cover of the fuse box (see figure).

In the event that the fuse tripping fails, e.g. if the fuse has been inserted incorrectly, the fuse box is protected by thermal protection. The overpressure generated by overheating trips the switch via the diaphragm in the cover of the fuse box and via an articulation. This breaks the current before the fuse box incurs irreparable damage.

This thermal protection works independently of the type and design of the HV HRC fuse used. Like the fuse itself, it is maintenance-free and independent of any outside climatic effects. Furthermore, the SIBA HV HRC fuses release the striker depending on the temperature and trip the three-position switch-disconnector as early as in the fuse overload range. Impermissible heating of the fuse box can be avoided in this way.

Replacement of HV HRC fuse-links

- The transformer feeder has to be isolated and earthed.
- Subsequent manual replacement of the HV HRC fuse-link after removing the cable compartment cover.

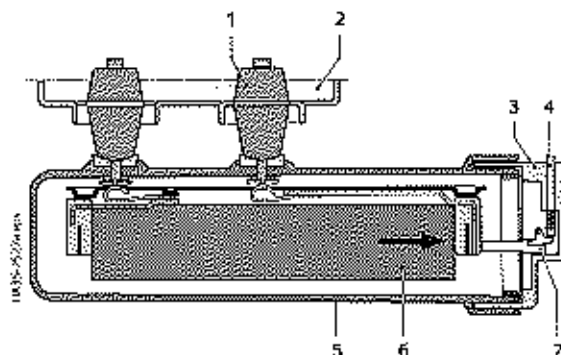
Note to HV HRC fuse-links

According to IEC 60282-1 (2009) Clause 6.6, the breaking capacity of HV HRC fuses is tested within the scope of the type test at 87% of their rated voltage.

In three-phase systems with resonance-earthed or isolated neutral, under double earth fault and other conditions, the full phase-to-phase voltage may be available at the HV HRC fuse during breaking. Depending on the size of the operating voltage of such a system, this applied voltage may then exceed 87% of the rated voltage.

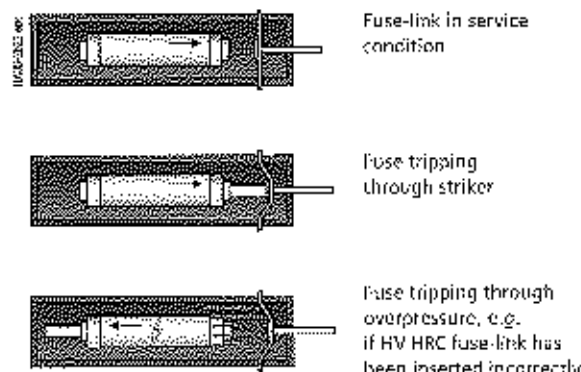
It must therefore already be ensured during configuration of the switching devices and selection of the HV HRC fuse that only such fuse-links are used, which either satisfy the above operating conditions, or whose breaking capacity was tested at least with the maximum system voltage. In case of doubt, a suitable HV HRC fuse must be selected together with the fuse manufacturer.

HV HRC fuse assembly



Basic design

- 1 Bushing
- 2 Switchgear vessel
- 3 Sealing cover with seal
- 4 Tripping pin for spring-operated / stored-energy mechanism
- 5 Fuse box
- 6 HV HRC fuse-link
- 7 Striker of the HV HRC fuse-link and articulation for tripping the spring-operated / stored-energy mechanism



Schematic sketches for fuse tripping

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Allocation of three-position switch-disconnector with HV HRC fuses, transformer ratings

The table shows the recommended HV HRC fuse-links make SIBA (electrical data valid for ambient air temperatures of up to 40 °C) for fuse protection of transformers.

Recommendation

The three-position switch-disconnector in the transformer feeder (transformer switch) was combined with HV HRC fuse-links and tested in accordance with IEC 62271-105. Higher transformer ratings on request.

Standards

- HV HRC fuse-links with striker in "medium" version according to
 - IEC 60282
 - VDE 0670-4 and 402
 - DIN 43 625 main dimensions.

Note: The exact selection of the SIBA fuse to be used is given in the NXPLUS C operating and installation instructions.
Dimension e = 292 mm with extension tube SIBA 3400601.

MV system Operating voltage U_n kV	Transformer		HV HRC fuse-link				
	Rated power S_T kVA	Relative impedance voltage u_k %	Rated current I_n A	Rated current I_r A	Min. operating/rated voltage U_r kV	Dimension e mm	Order No. Make SIBA
3.3 to 3.6	20	4	3.5	6.3	3 to 7.2	292	30 098 13.6,3
				10	3 to 7.2	292	30 098 13.10
	30	4	5.25	10	3 to 7.2	292	30 098 13.10
				16	3 to 7.2	292	30 098 13.16
	50	4	8.75	16	3 to 7.2	292	30 098 13.16
				20	3 to 7.2	292	30 098 13.20
	75	4	13.1	20	3 to 7.2	292	30 098 13.20
				25	3 to 7.2	292	30 098 13.25
	100	4	17.5	31.5	3 to 7.2	292	30 098 13.31,5
				40	3 to 7.2	292	30 098 13.40
	125	4	21.9	31.5	3 to 7.2	292	30 098 13.31,5
				40	3 to 7.2	292	30 098 13.40
160	4	28	40	3 to 7.2	292	30 098 13.40	
			50	3 to 7.2	292	30 098 13.50	
200	4	35	50	3 to 7.2	292	30 098 13.50	
			63	3 to 7.2	292	30 098 13.63	
250	4	43.7	63	3 to 7.2	292	30 098 13.63	
			80	3 to 7.2	292	30 098 13.80	
315	4	55.1	80	3 to 7.2	292	30 098 13.80	
			100	3 to 7.2	292	30 098 13.100	
400	4	70	100	3 to 7.2	292	30 098 13.100	
4 to 4.8	20	4	2.9	6.3	3 to 7.2	292	30 098 13.6,3
				10	3 to 7.2	292	30 098 13.10
	30	4	4.4	10	3 to 7.2	292	30 098 13.10
				16	3 to 7.2	292	30 098 13.16
	50	4	7.3	16	3 to 7.2	292	30 098 13.16
				20	3 to 7.2	292	30 098 13.20
	75	4	11	20	3 to 7.2	292	30 098 13.20
				25	3 to 7.2	292	30 098 13.25
	100	4	14.5	25	3 to 7.2	292	30 098 13.25
				31.5	3 to 7.2	292	30 098 13.31,5
	125	4	18.1	25	3 to 7.2	292	30 098 13.25
				31.5	3 to 7.2	292	30 098 13.31,5
	160	4	23.1	31.5	3 to 7.2	292	30 098 13.31,5
				40	3 to 7.2	292	30 098 13.40
	200	4	28.7	40	3 to 7.2	292	30 098 13.40
50				3 to 7.2	292	30 098 13.50	
250	4	36.1	50	3 to 7.2	292	30 098 13.50	
			63	3 to 7.2	292	30 098 13.63	
315	4	45.5	63	3 to 7.2	292	30 098 13.63	
			80	3 to 7.2	292	30 098 13.80	
400	4	57.8	80	3 to 7.2	292	30 098 13.80	
			100	3 to 7.2	292	30 098 13.100	
500	4	72.2	100	3 to 7.2	292	30 098 13.100	
5 to 5.5	20	4	2.3	6.3	3 to 7.2	292	30 098 13.6,3
				10	3 to 7.2	292	30 098 13.10
	30	4	3.4	6.3	3 to 7.2	292	30 098 13.6,3
				10	3 to 7.2	292	30 098 13.10
	50	4	5.7	10	3 to 7.2	292	30 098 13.10
				16	3 to 7.2	292	30 098 13.16
	75	4	8.6	16	3 to 7.2	292	30 098 13.16
				20	3 to 7.2	292	30 098 13.20
100	4	11.5	16	3 to 7.2	292	30 098 13.16	
			20	3 to 7.2	292	30 098 13.20	
125	4	14.4	20	3 to 7.2	292	30 098 13.20	
			25	3 to 7.2	292	30 098 13.25	

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Components



Allocation of three-position switch-disconnector with HV HRC fuses, transformer ratings

MV system Operating voltage U_n kV	Transformer		HV HRC fuses (mk)				Dimension e mm	Order No. Make SIR
	Rated power S_T kVA	Relative impedance voltage u_k %	Rated current I_n A	Rated current I_f A	Min. operating voltage U_1 kV	Rated current		
5 to 5.5	160	4	18.4	31.5	3 to 7.2	292	30 098 13.31,5	
				60	3 to 7.2	292	30 098 13.40	
	200	4	23	40	3 to 7.2	292	30 098 13.40	
				50	3 to 7.2	292	30 098 13.50	
	250	4	28.8	40	3 to 7.2	292	30 098 13.40	
				50	3 to 7.2	292	30 098 13.50	
	315	4	36.3	50	3 to 7.2	292	30 098 13.50	
				63	3 to 7.2	292	30 099 13.63	
400	4	46.1	63	3 to 7.2	292	30 099 13.63		
			80	3 to 7.2	292	30 099 13.80		
500	4	57.7	80	3 to 7.2	292	30 099 13.80		
			100	3 to 7.2	292	30 099 13.100		
630	4	72.74	100	3 to 7.2	292	30 099 13.100		
6 to 7.2	20	4	1.9	6.3	6 to 12	292	30 004 13.6,3	
				6.3	3 to 7.2	292	30 098 13.6,3	
				6.3	6 to 12	442	30 101 13.6,3	
	30	4	2.8	6.3	6 to 12	292	30 004 13.6,3	
				6.3	3 to 7.2	292	30 098 13.6,3	
				6.3	6 to 12	442	30 101 13.6,3	
	50	4	4.8	10	3 to 7.2	292	30 098 13.10	
				10	6 to 12	292	30 004 13.10	
				10	6 to 12	442	30 101 13.10	
				16	3 to 7.2	292	30 098 13.16	
				16	6 to 12	292	30 004 13.16	
				16	6 to 12	442	30 101 13.16	
	75	4	7.2	16	3 to 7.2	292	30 098 13.16	
				16	6 to 12	292	30 004 13.16	
				16	6 to 12	442	30 101 13.16	
	100	4	9.6	16	3 to 7.2	292	30 098 13.16	
				16	6 to 12	292	30 004 13.16	
				16	6 to 12	442	30 101 13.16	
				20	3 to 7.2	292	30 098 13.20	
				20	6 to 12	292	30 004 13.20	
				20	6 to 12	442	30 101 13.20	
	125	4	12	20	3 to 7.2	292	30 098 13.20	
				20	6 to 12	292	30 004 13.20	
				20	6 to 12	442	30 101 13.20	
				25	3 to 7.2	292	30 098 13.25	
				25	6 to 12	292	30 004 13.25	
				25	6 to 12	442	30 101 13.25	
	160	4	15.4	31.5	3 to 7.2	292	30 098 13.31,5	
				31.5	6 to 12	292	30 004 13.31,5	
				31.5	6 to 12	442	30 101 13.31,5	
	200	4	19.2	31.5	3 to 7.2	292	30 098 13.31,5	
				31.5	6 to 12	292	30 004 13.31,5	
				31.5	6 to 12	442	30 101 13.31,5	
				40	3 to 7.2	292	30 098 13.40	
				40	6 to 12	292	30 004 13.40	
				40	6 to 12	442	30 101 13.40	
250	4	24	40	3 to 7.2	292	30 098 13.40		
			40	6 to 12	292	30 004 13.40		
			40	6 to 12	442	30 101 13.40		
			50	3 to 7.2	292	30 098 13.50		
			50	6 to 12	292	30 004 13.50		
			50	6 to 12	442	30 101 13.50		
315	4	30.3	50	3 to 7.2	292	30 098 13.50		
			50	6 to 12	292	30 004 13.50		
			50	6 to 12	442	30 101 13.50		
			63	6 to 12	292	30 012 43.63		
400	4	38.4	63	3 to 7.2	292	30 099 13.63		
			63	6 to 12	292	30 012 43.63		
			63	6 to 12	442	30 102 43.63		
			63	6 to 12	292	30 012 43.63		
			80	6 to 12	292	30 012 43.80		
			80	6 to 12	442	30 102 43.80		

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Allocation of three-position switch-disconnector with HV HRC fuses, transformer ratings

MV system Operating voltage U_n kV	Transformer		HV HRC fuse link				
	Rated power S_r kVA	Relative impedance voltage u_k %	Rated current I_r A	Rated current I_f A	Min. operating/rated voltage U_f kV	Dimension e mm	Order No. Make SIBA
6 to 7.2	500	4	48	20	6 to 12	292	30 012 43.80
				80	6 to 12	442	30 102 43.80
				80	3 to 7.2	292	30 099 13.80
				80	6 to 12	292	30 012 13.80
				80	6 to 12	442	30 102 13.80
				100	6 to 12	292	30 012 43.100
	630	4	61	100	3 to 7.2	292	30 099 13.100
				100	6 to 12	292	30 012 13.100
				100	6 to 12	442	30 102 13.100
				100	6 to 12	292	30 012 43.100
				100	6 to 12	442	30 102 43.100
				125	6 to 12	292	30 020 43.125
7.6 to 8.4	20	4	1.5	6.3	6 to 12	292	30 004 13.6,3
				6.3	6 to 12	442	30 101 13.6,3
	30	4	2.27	5	6 to 12	292	30 004 13.5
				6.3	6 to 12	292	30 004 13.6,3
	50	4	3.7	10	6 to 12	292	30 004 13.10
				10	6 to 12	442	30 101 13.10
	75	4	5.7	16	6 to 12	292	30 004 13.16
				16	6 to 12	442	30 101 13.16
	100	4	7.6	16	6 to 12	292	30 004 13.16
				16	6 to 12	442	30 101 13.16
	125	4	9.5	20	6 to 12	292	30 004 13.20
				20	6 to 12	442	30 101 13.20
160	4	12.1	31.5	6 to 12	292	30 004 13.31,5	
			31.5	6 to 12	442	30 101 13.31,5	
200	4	15.2	31.5	6 to 12	292	30 004 13.31,5	
			31.5	6 to 12	442	30 101 13.31,5	
250	4	19	40	6 to 12	292	30 004 13.40	
			40	6 to 12	442	30 101 13.40	
315	4	23.9	50	6 to 12	292	30 004 13.50	
			50	6 to 12	442	30 101 13.50	
400	4	30.3	63	6 to 12	292	30 012 13.63	
			63	6 to 12	442	30 102 13.63	
500	4	37.9	80	6 to 12	292	30 012 43.80	
			80	6 to 12	442	30 102 43.80	
630	4	47.8	100	6 to 12	292	30 012 43.100	
			100	6 to 12	442	30 102 43.100	
8.9	20	4	1.3	6.3	6 to 12	292	30 004 13.6,3
				6.3	6 to 12	442	30 101 13.6,3
	30	4	2	5	6 to 12	292	30 004 13.5
				6.3	6 to 12	292	30 004 13.6,3
	50	4	3.3	10	6 to 12	292	30 004 13.10
				10	6 to 12	442	30 101 13.10
	75	4	4.9	16	6 to 12	292	30 004 13.16
				16	6 to 12	442	30 101 13.16
	100	4	6.5	16	6 to 12	292	30 004 13.16
				16	6 to 12	442	30 101 13.16
	125	4	8.1	20	6 to 12	292	30 004 13.20
				20	6 to 12	442	30 101 13.20
	160	4	10.4	25	6 to 12	292	30 004 13.25
				25	6 to 12	442	30 101 13.25
	200	4	13	31.5	6 to 12	292	30 004 13.31,5
				31.5	6 to 12	442	30 101 13.31,5
	250	4	16.2	40	6 to 12	292	30 004 13.40
				40	6 to 12	442	30 101 13.40
315	4	20.5	50	6 to 12	292	30 004 13.50	
			50	6 to 12	442	30 101 13.50	

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Components



Allocation of three-position switch-disconnector with HV HRC fuses, transformer ratings

MV system Operating voltage U_n kV	Transformer		HV HRC fuse-link				Dimension e mm	Order No. Make SIBA
	Rated power S_T kVA	Relative impedance voltage u_k %	Rated current I_n A	Rated current I_n A	Min. operating voltage U_f kV	Rated		
6.9	400	4	26	63	6 to 12	292	30 012 13.63	
				63	6 to 12	442	30 102 13.63	
	500	4	32.5	80	6 to 12	292	30 012 13.80	
				80	6 to 12	442	30 102 13.80	
	630	4	41	100	6 to 12	292	30 012 13.100	
				100	6 to 12	442	30 102 13.100	
10 to 12	20	4	1.15	4	6 to 12	292	30 004 13.4	
				6.3	6 to 12	442	30 101 13.6,3	
				10	6 to 12	292	30 004 13.10	
				10	6 to 12	442	30 101 13.10	
				10	10 to 17.5	292	30 255 13.10	
				10	10 to 17.5	442	30 231 13.10	
	75	4	4.3	10	6 to 12	292	30 004 13.10	
				10	6 to 12	442	30 101 13.10	
				10	10 to 17.5	292	30 255 13.10	
				10	10 to 17.5	442	30 231 13.10	
				10	10 to 24	442	30 006 13.10	
				10	10 to 24	442	30 006 13.10	
	100	4	5.8	16	6 to 12	292	30 004 13.16	
				16	6 to 12	442	30 101 13.16	
				16	10 to 17.5	292	30 255 13.16	
				16	10 to 17.5	442	30 231 13.16	
				16	10 to 24	442	30 006 13.16	
				16	10 to 24	442	30 006 13.16	
	125	4	7.2	16	6 to 12	292	30 004 13.16	
				16	6 to 12	442	30 101 13.16	
				16	10 to 17.5	292	30 255 13.16	
				16	10 to 17.5	442	30 231 13.16	
				16	10 to 24	442	30 006 13.16	
				16	10 to 24	442	30 006 13.16	
	160	4	9.3	20	6 to 12	292	30 004 13.20	
				20	6 to 12	442	30 101 13.20	
				20	10 to 17.5	292	30 221 13.20	
				20	10 to 17.5	442	30 231 13.20	
				20	10 to 24	442	30 006 13.20	
				20	10 to 24	442	30 006 13.20	
	200	4	11.5	25	6 to 12	292	30 004 13.25	
				25	6 to 12	442	30 101 13.25	
				25	10 to 17.5	292	30 221 13.25	
				25	10 to 17.5	442	30 231 13.25	
				25	10 to 24	442	30 006 13.25	
				25	10 to 24	442	30 006 13.25	
	250	4	14.5	25	6 to 12	292	30 004 13.25	
				25	6 to 12	442	30 101 13.25	
				25	10 to 17.5	292	30 221 13.25	
				25	10 to 17.5	442	30 231 13.25	
				25	10 to 24	442	30 006 13.25	
				31.5	6 to 12	292	30 004 13.31,5	
				31.5	6 to 12	442	30 101 13.31,5	
				31.5	10 to 17.5	292	30 221 13.31,5	
				31.5	10 to 17.5	442	30 231 13.31,5	
				31.5	10 to 24	442	30 006 13.31,5	
				31.5	10 to 24	442	30 006 13.31,5	
				315	4	18.3	31.5	6 to 12
31.5	6 to 12	442	30 101 13.31,5					
31.5	10 to 17.5	292	30 221 13.31,5					
31.5	10 to 17.5	442	30 231 13.31,5					
31.5	10 to 24	442	30 006 13.31,5					
40	6 to 12	292	30 004 13.40					
40	6 to 12	442	30 101 13.40					
40	10 to 17.5	292	30 221 13.40					
40	10 to 17.5	442	30 231 13.40					
40	10 to 24	442	30 006 13.40					
40	10 to 24	442	30 006 13.40					
400	4	23.1	40				6 to 12	292
			40	6 to 12	442	30 101 13.40		
			40	10 to 17.5	292	30 221 13.40		
			40	10 to 17.5	442	30 231 13.40		
			40	10 to 24	442	30 006 13.40		
			50	6 to 12	292	30 004 13.50		
			50	6 to 12	442	30 101 13.50		
			50	10 to 17.5	292	30 221 13.50		
			50	10 to 17.5	442	30 231 13.50		
			50	10 to 24	442	30 014 13.50		
			50	10 to 24	442	30 014 13.50		

(continued on
next page)



A. Lee



Allocation of three-position switch-disconnector with HV HRC fuses, transformer ratings

MV system Operating voltage U_n kV	Transformer		HV HRC fuse-link					Order No. Make SIBA
	Rated power S_T kVA	Relative impedance Voltage U_k %	Rated current I_T A	Rated current I_n A	Min. operating/rated voltage U_f kV	Dimension e mm		
10 to 12	500	4	29	50	6 to 12	292	30 004 13.50	
				50	6 to 12	442	30 101 13.50	
				50	10 to 17.5	292	30 221 13.50	
				50	10 to 17.5	442	30 232 13.50	
				50	10 to 24	442	30 014 13.50	
				63	6 to 12	292	30 012 43.63	
	63	10 to 24	442	30 014 43.63				
	630	4	36.1	63	6 to 12	292	30 012 13.63	
				63	6 to 12	442	30 102 13.63	
				63	10 to 17.5	442	30 232 13.63	
				63	6 to 12	292	30 012 43.63	
				63	10 to 24	442	30 014 43.63	
				80	6 to 12	292	30 012 43.80	
	80	6 to 12	442	30 102 43.80				
	80	10 to 24	442	30 014 43.80				
	800	5 to 6	46.2	63	6 to 12	292	30 012 13.63	
63				6 to 12	442	30 102 13.63		
80				6 to 12	292	30 012 43.80		
80				6 to 12	442	30 102 43.80		
1000	5 to 6	58	100	6 to 12	292	30 012 43.100		
			100	6 to 12	442	30 102 43.100		
			100	10 to 24	442	30 022 43.100		
1250	5 to 6	72	125	6 to 12	292	30 020 43.125		
			125	6 to 12	442	30 103 43.125		
12.4 to 13.4	20	4	0.94	4	10 to 24	442	30 006 13.4	
	30	4	1.4	6.3	10 to 24	442	30 006 13.6,3	
				6.3	10 to 24	442	30 231 13.6,3	
	50	4	2.4	10	10 to 17.5	442	30 231 13.10	
				10	10 to 24	442	30 006 13.10	
	75	4	3.5	10	10 to 17.5	442	30 231 13.10	
				10	10 to 24	442	30 006 13.10	
	100	4	4.7	16	10 to 17.5	442	30 231 13.16	
				16	10 to 24	442	30 006 13.16	
	125	4	5.9	16	10 to 17.5	442	30 231 13.16	
				16	10 to 24	442	30 006 13.16	
	160	4	7.5	16	10 to 17.5	442	30 231 13.16	
				16	10 to 24	442	30 006 13.16	
	200	4	9.4	20	10 to 17.5	442	30 231 13.20	
				20	10 to 24	442	30 006 13.20	
	250	4	11.7	25	10 to 17.5	442	30 231 13.25	
				31.5	10 to 17.5	442	30 231 13.31.5	
				25	10 to 24	442	30 006 13.25	
				31.5	10 to 24	442	30 006 13.31.5	
	315	4	14.7	31.5	10 to 17.5	442	30 231 13.31.5	
31.5				10 to 24	442	30 006 13.31.5		
400	4	18.7	40	10 to 17.5	442	30 231 13.40		
			40	10 to 24	442	30 006 13.40		
500	4	23.3	50	10 to 17.5	442	30 232 13.50		
			50	10 to 24	442	30 014 13.50		
630	4	29.4	63	10 to 17.5	442	30 232 13.63		
			63	10 to 24	442	30 014 13.63		
800	5 to 6	37.3	80	10 to 24	442	30 014 43.80		
13.8	20	4	0.8	3.15	10 to 24	442	30 006 13.3.15	
	30	4	1.25	4	10 to 24	442	30 006 13.4	
				6.3	10 to 17.5	442	30 231 13.6,3	
	6.3	10 to 24	442	30 006 13.6,3				
	75	4	3.2	6.3	10 to 17.5	442	30 231 13.6,3	
				10	10 to 17.5	442	30 231 13.10	
	10	10 to 24	442	30 006 13.10				
	100	4	4.2	10	10 to 17.5	442	30 231 13.10	
				16	10 to 17.5	442	30 231 13.16	
				16	10 to 24	442	30 006 13.16	
125	4	5.3	10	10 to 17.5	442	30 231 13.10		
			16	10 to 17.5	442	30 231 13.16		
			16	10 to 24	442	30 006 13.16		

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next page)

A. K. ...

M. ...

Components



Allocation of three-position switch-disconnector with HV HRC fuses, transformer ratings

MV system Operating voltage U_n kV	Transformer		HV HRC fuse link				Dimension e mm	Order No. Make SIBA
	Rated power S_n kVA	Relative impedance voltage u_k %	Rated current I_n A	Rated current I_n A	Min. operating (rated voltage U_n kV			
13.8	160	4	6.7	16	10 to 17.5	442	30 231 13.16	
				20	10 to 17.5	442	30 231 13.16	
	200	4	8.4	20	10 to 17.5	442	30 231 13.20	
				25	10 to 24	442	30 006 13.20	
	250	4	10.5	20	10 to 17.5	442	30 231 13.20	
				25	10 to 17.5	442	30 231 13.25	
	315	4	13.2	25	10 to 17.5	442	30 231 13.25	
				31.5	10 to 17.5	442	30 231 13.31,5	
	400	4	16.8	31.5	10 to 17.5	442	30 231 13.31,5	
				31.5	10 to 24	442	30 006 13.31,5	
	500	4	21	40	10 to 17.5	442	30 231 13.40	
				40	10 to 24	442	30 006 13.40	
	630	4	26.4	50	10 to 17.5	442	30 232 13.50	
				50	10 to 24	442	30 014 13.50	
800	5 to 6	33.5	63	10 to 17.5	442	30 232 13.63		
			63	10 to 24	442	30 014 13.63		
			63	10 to 24	442	30 014 43.63		
1000	5 to 6	41.9	80	10 to 24	442	30 014 43.80		
1250	5 to 6	52.3	100	10 to 24	442	30 022 43.100		
14.4	20	4	0.8	3.15	10 to 24	442	30 006 13.3,15	
				3.15	10 to 24	442	30 006 13.3,15	
	30	4	1.2	6.3	10 to 17.5	442	30 231 13.6,3	
				6.3	10 to 24	442	30 006 13.6,3	
	50	4	2	6.3	10 to 17.5	442	30 231 13.6,3	
				6.3	10 to 24	442	30 006 13.6,3	
	75	4	3	6.3	10 to 17.5	442	30 231 13.6,3	
				6.3	10 to 24	442	30 006 13.6,3	
	100	4	4	10	10 to 17.5	442	30 231 13.10	
				16	10 to 17.5	442	30 231 13.16	
				16	10 to 24	442	30 006 13.16	
	125	4	5	10	10 to 17.5	442	30 231 13.10	
				16	10 to 17.5	442	30 231 13.16	
				16	10 to 24	442	30 006 13.16	
	160	4	6.5	16	10 to 17.5	442	30 231 13.16	
				16	10 to 24	442	30 006 13.16	
	200	4	8	16	10 to 17.5	442	30 231 13.16	
				16	10 to 24	442	30 006 13.16	
				20	10 to 17.5	442	30 231 13.20	
				20	10 to 24	442	30 006 13.20	
250	4	10	20	10 to 17.5	442	30 231 13.20		
			20	10 to 24	442	30 006 13.20		
			25	10 to 17.5	442	30 231 13.25		
			25	10 to 24	442	30 006 13.25		
315	4	12.6	20	10 to 17.5	442	30 231 13.20		
			20	10 to 24	442	30 006 13.20		
			25	10 to 17.5	442	30 231 13.25		
			25	10 to 24	442	30 006 13.25		
400	4	16.1	31.5	10 to 17.5	442	30 231 13.31,5		
			31.5	10 to 24	442	30 006 13.31,5		
500	4	20.1	40	10 to 17.5	442	30 231 13.40		
			40	10 to 24	442	30 006 13.40		
630	4	25.3	50	10 to 17.5	442	30 232 13.50		
			50	10 to 24	442	30 014 13.50		
800	5 to 6	32.1	63	10 to 24	442	30 014 43.63		
			63	10 to 24	442	30 014 43.80		
1000	5 to 6	40.1	80	10 to 24	442	30 014 43.80		
1250	5 to 6	50.2	100	10 to 24	442	30 022 43.100		
15 to 17.5	20	4	0.77	3.15	10 to 24	442	30 006 13.3,15	
				3.15	10 to 24	442	30 006 13.3,15	
	30	4	1.15	6.3	10 to 17.5	442	30 231 13.6,3	
				6.3	10 to 24	442	30 006 13.6,3	
	50	4	1.9	6.3	10 to 17.5	442	30 231 13.6,3	
				6.3	10 to 24	442	30 006 13.6,3	
	75	4	2.9	6.3	10 to 17.5	442	30 231 13.6,3	
				6.3	10 to 24	442	30 006 13.6,3	
	100	4	3.9	10	10 to 17.5	442	30 231 13.10	
				10	10 to 24	442	30 006 13.16	
125	4	4.8	16	10 to 17.5	442	30 231 13.16		
			16	10 to 24	442	30 006 13.16		
160	4	6.2	16	10 to 17.5	442	30 231 13.16		
			16	10 to 24	442	30 006 13.16		
200	4	7.7	20	10 to 17.5	442	30 231 13.20		
			20	10 to 24	442	30 006 13.20		

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next page)

M. Kroll



Allocation of three-position switch-disconnector with HV HRC fuses, transformer ratings

MV system Operating voltage U_n kV	Transformer		HV HRC fuse-link				Order No. Make SIBA
	Rated power S_n kVA	Relative impedance voltage u_k %	Rated current I_n A	Rated current I_f A	Min. operating/rated voltage U_f kV	Dimension e mm	
15 to 17,5	250	4	9.7	25	10 to 17.5	442	30 231 13.25
				25	10 to 24	442	30 006 13.25
	315	4	12.2	31.5	10 to 17.5	442	30 231 13.31,5
				31.5	10 to 24	442	30 006 13.31,5
	400	4	15.5	31.5	10 to 17.5	442	30 231 13.31,5
				31.5	10 to 24	442	30 006 13.31,5
	500	4	19.3	31.5	10 to 17.5	442	30 231 13.31,5
				31.5	10 to 24	442	30 006 13.31,5
				40	10 to 17.5	442	30 231 13.40
				40	10 to 24	442	30 006 13.40
630	4	24.3	40	10 to 17.5	442	30 231 13.40	
			40	10 to 24	442	30 006 13.40	
			50	10 to 17.5	442	30 232 13.50	
			50	10 to 24	442	30 014 13.50	
			63	10 to 24	442	30 014 43.63	
800	5 to 6	30.9	63	10 to 24	442	30 014 43.63	
1000	5 to 6	38.5	63	10 to 24	442	30 014 43.63	
			80	10 to 24	442	30 014 43.80	
1250	5 to 6	48.2	100	10 to 24	442	30 022 43.100	
18 to 19	20	4	0.61	3.15	10 to 24	442	30 006 13.3.15
	30	4	0.96	3.15	10 to 24	442	30 006 13.3.15
	50	4	1.6	6.3	10 to 24	442	30 006 13.6.3
	75	4	2.4	6.3	10 to 24	442	30 006 13.6.3
	100	4	3.2	10	10 to 24	442	30 006 13.10
	125	4	4	10	10 to 24	442	30 006 13.10
	160	4	5.1	16	10 to 24	442	30 006 13.16
	200	4	6.4	16	10 to 24	442	30 006 13.16
	250	4	8.1	20	10 to 24	442	30 006 13.20
	315	4	10.1	25	10 to 24	442	30 006 13.25
	400	4	12.9	31.5	10 to 24	442	30 006 13.31,5
				40	10 to 24	442	30 006 13.40
	500	4	16.1	31.5	10 to 24	442	30 006 13.31,5
				40	10 to 24	442	30 006 13.40
				50	10 to 24	442	30 006 13.50
	630	4	20.2	40	10 to 24	442	30 006 13.40
				50	10 to 24	442	30 006 13.50
63				10 to 24	442	30 014 43.63	
800	4 to 5	25.7	50	10 to 24	442	30 014 13.50	
			63	10 to 24	442	30 014 43.63	
1000	5 to 6	32.1	63	10 to 24	442	30 014 43.63	
1250	5 to 6	40.1	80	10 to 24	442	30 014 43.80	
20 to 23	20	4	0.57	3.15	10 to 24	442	30 006 13.3.15
	30	4	0.86	3.15	10 to 24	442	30 006 13.3.15
	50	4	1.5	6.3	10 to 24	442	30 006 13.6.3
	75	4	2.2	6.3	10 to 24	442	30 006 13.6.3
	100	4	2.9	10	10 to 24	442	30 006 13.6.3
	125	4	3.6	10	10 to 24	442	30 006 13.10
	160	4	4.7	10	10 to 24	442	30 006 13.10
	200	4	5.8	16	10 to 24	442	30 006 13.16
	250	4	7.3	16	10 to 24	442	30 006 13.16
	315	4	9.2	16	10 to 24	442	30 006 13.16
				20	10 to 24	442	30 006 13.20
	400	4	11.6	20	10 to 24	442	30 006 13.20
				25	10 to 24	442	30 006 13.25
	500	4	14.5	25	10 to 24	442	30 006 13.25
				31.5	10 to 24	442	30 006 13.31,5
	630	4	18.2	31.5	10 to 24	442	30 006 13.31,5
				40	10 to 24	442	30 006 13.40
	800	5 to 6	23.1	31.5	10 to 24	442	30 006 13.31,5
	1000	5 to 6	29	50	10 to 24	442	30 014 13.50
1250	5 to 6	36	50	10 to 24	442	30 014 13.50	
			63	10 to 24	442	30 014 43.63	
1600	5 to 6	46.5	80	10 to 24	442	30 014 43.80	
			100	10 to 24	442	30 022 43.100	
2000	5 to 6	57.8	100	10 to 24	442	30 022 43.100	

A. Reed

Components

Vacuum contactor, motor protection

Features

- According to IEC 60470 and VDE 0670-501 (for standards, see page 71)
- Application in hermetically welded switchgear vessel in conformity with the system
- Climate-independent vacuum interrupter poles in the SF₆ filled switchgear vessel
- Maintenance-free for indoor installation according to IEC 62271-1 and VDE 0671-1
- Individual secondary equipment
- Varistor module for limiting overvoltages to approx. 500 V for protection devices (when inductive components are mounted in the vacuum contactor)
- A metal bellows is used for gasketless separation of the SF₆ insulation and the operating mechanism (already used with success for over 2 million vacuum interrupters)
- Magnet coil for operation located outside the switchgear vessel
- With mechanical opening
- With mechanical closing latch, electrical latch release with a shunt or undervoltage release (option)
- 100,000 operating cycles at rated normal current (with closing latch)
- 500,000 operating cycles at rated normal current (without closing latch)
- Max. 60 operating cycles per hour.

Mechanical closing latch

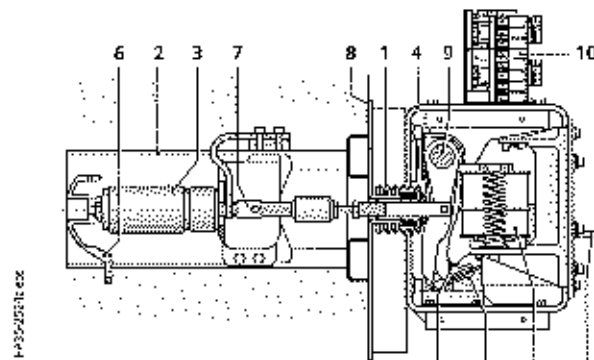
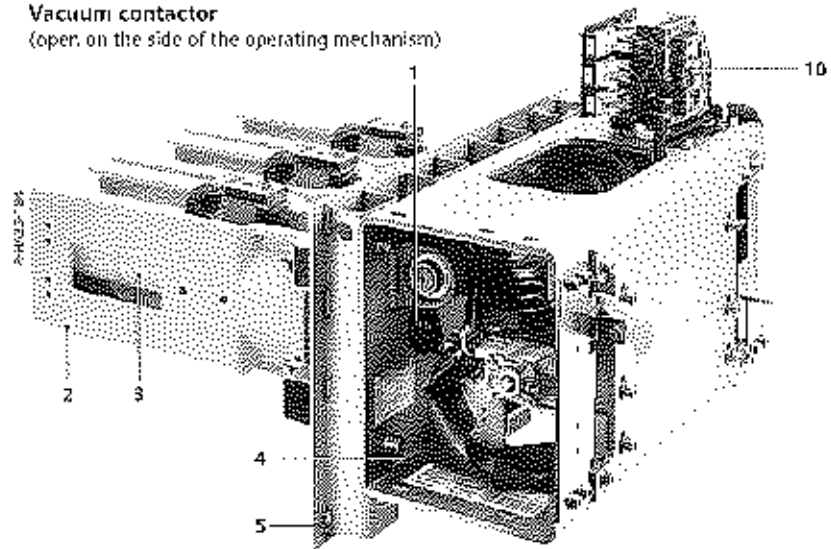
When the magnet system is energized, the integral rocker is latched mechanically in the "CLOSED" position through a lever and roller system.

A latch holds the vacuum contactor in closed position even without excitation of the magnet system.

The vacuum contactor is released electrically by means of a shunt or undervoltage release, or mechanically by means of a pushbutton in the switchgear front.

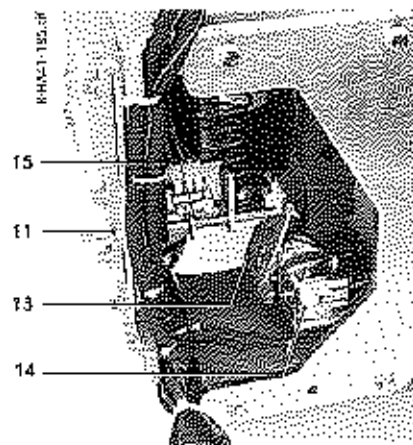
Vacuum contactor

(open on the side of the operating mechanism)

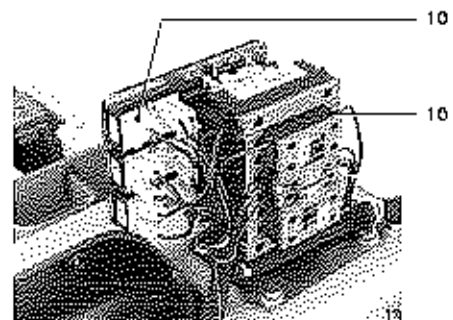


Section through the vacuum contactor

- 1 Metal bellows
- 2 Pole support
- 3 vacuum interrupter
- 4 Operating mechanism box with magnet coil
- 5 Base plate (welded into the switchgear vessel)
- 6 fixed terminal
- 7 Moving terminal
- 8 Switchgear vessel, SF₆-insulated, with vacuum interrupter
- 9 Operating kinematics
- 10 Auxiliary contactors and rectifiers
- 11 Mechanical opening
- 12 Magnet coil
- 13 Mechanical closing latch
- 14 Electrical latch release
- 15 Auxiliary switch



Mechanical closing latch



Auxiliary contactors and rectifiers



Vacuum contactor, motor protection

Short-circuit and overload protection in connection with motors

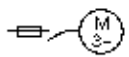
In circuits subjected to short-circuit currents, HV HRC fuse links protect switching devices (e.g. vacuum contactors) without

short-circuit breaking capacity. The instant when the motor starts represents the maximum stress for the HV HRC fuse-links (starting currents, starting time and starting frequency). Motor starting must neither operate nor pre-damage the fuses.

Fuse protection table for vacuum contactor panel (with HV HRC fuses make SIBA)

Motor	Fuse				
	Rated current of fuse I _n A	Reference dimension mm	Maximum permissible normal current I A	Order No. SIBA	
3.3 to 7.2 kV	40	292	30	30 098 13.40	
	50	442	38	30 108 53.50	
	63	442	47	30 108 53.63	
	80	442	60	30 108 53.80	
	100	442	75	30 108 53.100	
	125	442	85	30 109 53.125	
	160	442	109	30 109 53.160	
	200	442	130	30 110 54.200	
	224	442	137	30 110 54.224	
	250	442	157	30 110 54.250	
> 7.2 to 12 kV	40	442	29	30 101 13.40	
	50	442	36	30 101 53.50	
	63	442	45	30 101 53.63	
	80	442	47	30 102 53.80	
	100	442	59	30 102 53.100	
	125	442	74	30 102 53.125	
	160	442	90	30 103 53.160	
	200	442	105	30 103 54.200	
	≥ 12 to 23 kV	40	442	23	30 006 13.40
		50	442	29	30 014 13.50
63		442	36	30 014 43.63	
80		442	46	30 014 43.80	
100		442	54	30 022 43.100	

Motor protection table (see also note on page 34)

Number of starts per hour	Maximum permissible motor starting current in A at rated normal current of HV HRC fuse											
		40 A	50 A	63 A	80 A	100 A	125 A	160 A	200 A	224 A	250 A	
	3.3 to 7.2 kV	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	> 7.2 to 12 kV	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
	> 12 to 23 kV	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
HV motors with starting times up to 5 s	2	95	115	135	160	210	415	560	765	860	960	
	4	85	105	120	145	190	370	500	705	810	960	
	8	75	95	110	130	170	340	455	610	760	960	
	16	70	85	95	115	150	300	405	575	680	925	
	32	63	75	85	105	140	270	370	520	615	810	
HV motors with starting times up to 15 s	2	90	105	120	145	190	335	445	625	730	960	
	4	80	95	110	130	170	300	400	560	655	890	
	8	70	85	100	120	155	270	360	510	595	805	
	16	65	75	90	105	140	240	325	455	535	720	
	32	60	70	80	95	125	220	290	410	485	655	
HV motors with starting times up to 30 s	2	85	100	115	140	185	300	390	555	645	865	
	4	75	90	105	125	165	265	350	500	575	780	
	8	70	80	95	115	150	245	320	450	525	705	
	16	60	75	85	100	135	210	285	405	470	630	
	32	55	65	75	90	120	190	260	365	425	570	

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Components

Busbars

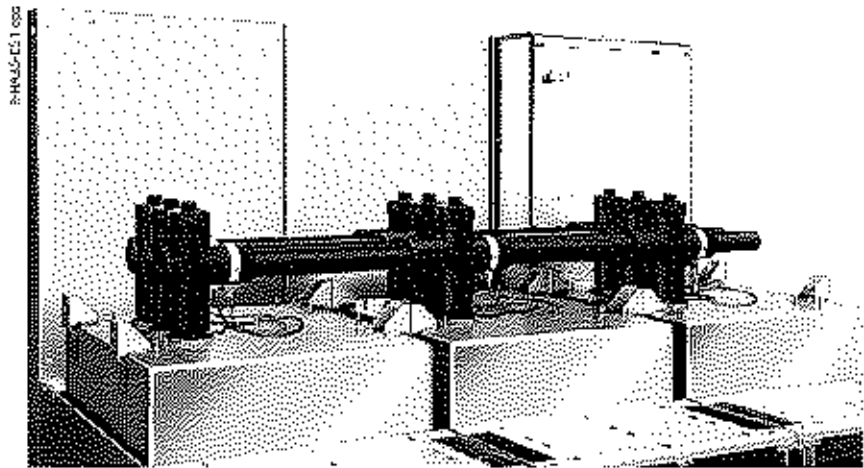
Features

- 1-pole, plug-in and bolted design
- Consisting of round-bar copper, insulated by means of silicone rubber
- Busbar joints with cross and end adapters, insulated by means of silicone rubber
- Field control by means of electrically conductive layers on the silicone-rubber insulation (both inside and outside)
- Touchable as the external layers are earthed with the switchgear vessel
- Insensitive to pollution and condensation
- Safe-to-touch due to metal cover
- Switchgear extension or panel replacement is possible without SF₆ gas work.

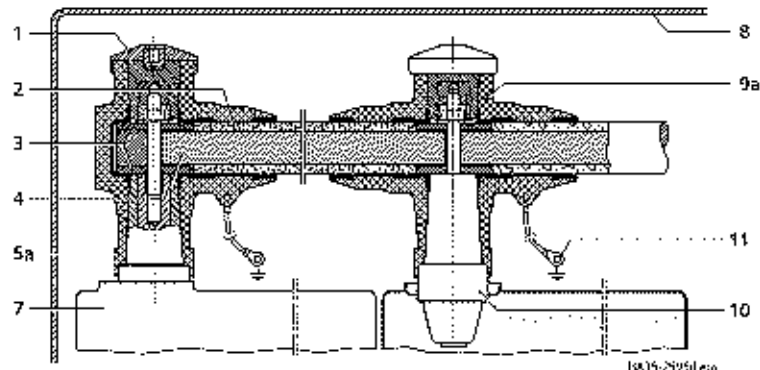
Possible components

- Current transformers
- Voltage transformers
- Surge arresters
- Cables with T-plug
- Fully-insulated bars (e.g. make Durasca).

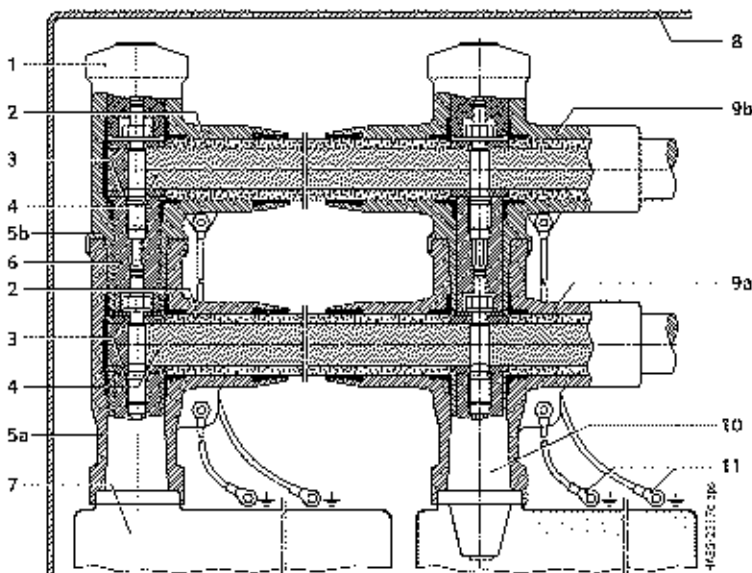
Busbars (example)



Busbars 1250 A, plug-in type, fully insulated
(as front view of three panels, without low-voltage compartments)



Section of 1250 A busbar (basic design)
Panel width 600 mm



Section of 1600 A, 2000 A or 2500 A busbar (basic design)
Panel width 600 mm

Legend

- 1 Cap
- 2 Busbar insulation made of silicone rubber
- 3 Clamps
- 4 Busbar (round-bar copper)
- 5a End adapter
- 5b Coupling end adapter
- 6 Connection bolt
- 7 Switchgear vessel
- 8 Metal cover of busbars
- 9a Cross adapter
- 9b Coupling cross adapter
- 10 Bushing
- 11 Earthing connection

M. Rex

M. Rex



Components

Current transformers

Features

- According to IEC 61869-2 and VDE 0414-9-2
- Designed as ring-core current transformers, 1-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.

Installation

- Arranged outside the primary enclosure (switchgear vessel).

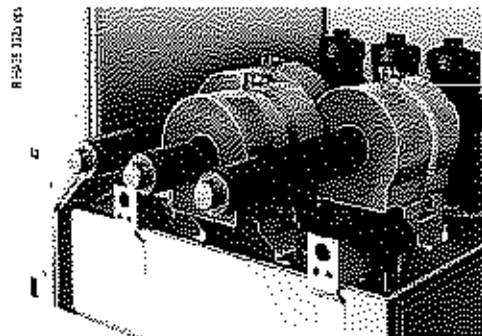
Mounting locations

- At the busbar (1)
- At the panel connection (2)
- Around the cable (3).

Current transformer types

- Busbar current transformer (1):
 - inside \varnothing of transformer 56 mm / \leq 1250 A and 55 x 355 mm / $>$ 1250 A
 - Usable height max. 160 mm at \leq 1250 A max. 130 mm at $>$ 1250 A
- Feeder current transformer (2):
 - Inside \varnothing of transformer 106 mm / \leq 1250 A and 100 x 200 mm / $>$ 1250 A
 - Max. usable height 205 mm
- Cable-type current transformer (3) for shielded cables:
 - Inside \varnothing of transformer 55 mm
 - Max. usable height 170 mm
- Zero-sequence current transformer (4) underneath the panels (included in the scope of supply); on-site installation.

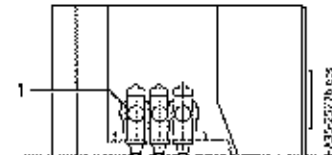
Current transformers



Busbar current transformers
Example 1250 A

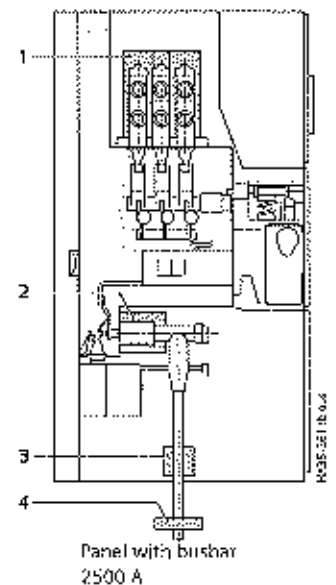
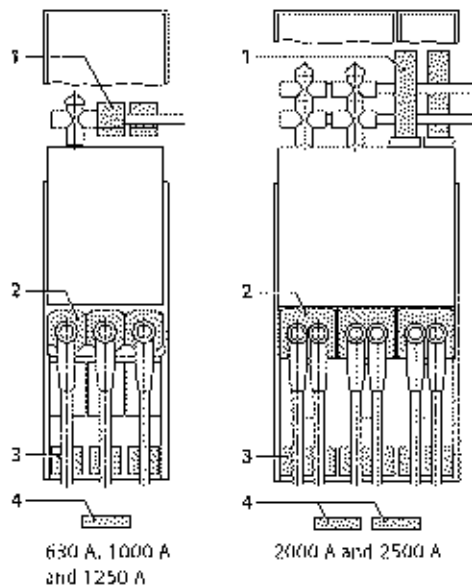
- 1 Busbar current transformer
- 2 Feeder current transformer at the panel connection
- 3 Cable-type current transformer
- 4 Zero-sequence current transformer

Side views:



Panel with busbar
1250 A

Front views:



Panel with busbar
2500 A

Current transformer installation (basic scheme)

Electrical data

Designation	Type 4MC
Operating voltage	max. 0.8 kV
Rated short-duration power frequency withstand voltage (winding test)	3 kV
Rated frequency	50/60 Hz
Rated continuous thermal current	1.0; 1.2; 1.33; 1.5; 2.0 x rated current (primary)
Rated thermal short-time current, max. 3 s	max. 31.5 kA
Rated current	dynamic primary unlimited 40 A to 2500 A secondary 1 A and 5 A

Designation	Type 4MC	
Multiratio (secondary)	200 A - 100 A to 2500 A - 1250 A	
Core data according to rated primary current	max. 3 cores	
Measuring core	Rating Class	2.5 VA to 30 VA 0.2 to 1
	Overcurrent factor	FS 5, FS 10
Protection core	Rating Class	2.5 VA to 30 VA 5 P or 10 P
	Overcurrent factor	10 to 30
Permissible ambient air temperature	max. 60 °C	
Insulation class	E	

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Components

Voltage transformers

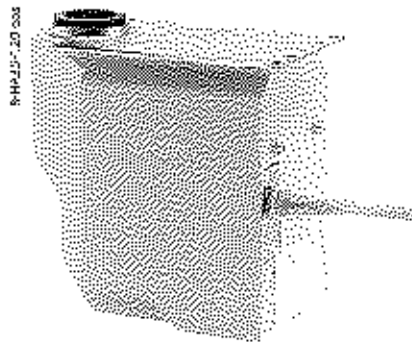
Features

- According to IEC 61869-3 and VDE 0414-9-3
- 1-pole, plug-in design
- Connection system with plug-in contact
- Inductive type
- Safe-to-touch due to metal cover
- Certifiable
- Climate-independent
- Secondary connection by means of plugs inside the panel
- Cast-resin insulated
- Arranged outside the primary enclosure (switchgear vessel)
- Mounting locations:
 - At the busbar
 - At the panel connection.

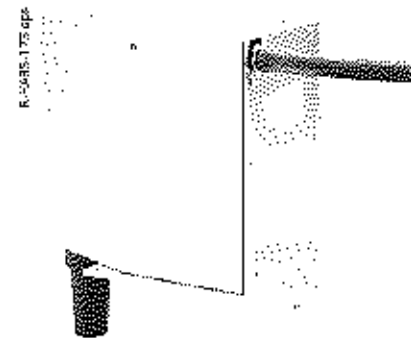
Voltage transformer types

- Busbar voltage transformer 4MT2:
 - Pluggable in the cross adapters of the busbar ≤ 1250 A using additional adapters (> 1250 A on request)
 - No separate metering panel required
 - Suitable for 80 % of the rated short-duration power-frequency withstand voltage at rated frequency
 - Repeat test at 80 % of the rated short-duration power-frequency withstand voltage possible with mounted voltage transformer (also valid for higher insulation ratings according to GOST and GB standards)
- Feeder voltage transformer 4MT3 at the panel connection:
 - Switchable through an SF₆-insulated disconnecting facility in the switchgear vessel
 - Positions: "CLOSED" and "Transformer bushing EARTHED"
 - Operation of the disconnecting facility from outside through a metal bellows welded in the switchgear vessel
 - Option: Disconnecting facility with auxiliary switch (-ST5)
 - Prepared for surge-proof termination with end cover outside cone type "A"
 - Voltage testing of switchgear and cables possible with mounted and earthed voltage transformer
- Feeder voltage transformer 4MT2 at the panel connection of the incoming sectionalizer (side B)
 - Connection to bushing with short, flexible cable.

Voltage transformers

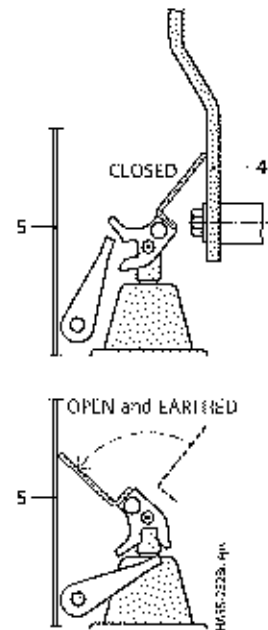
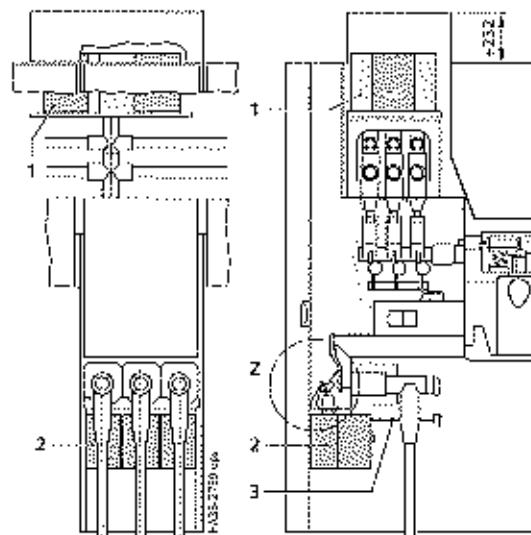
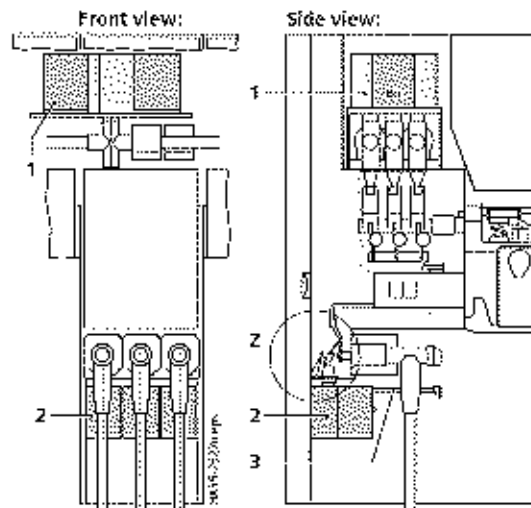


Feeder voltage transformer (metal-coated)
4MT3



Busbar voltage transformer (metal-enclosed)
4MT2

Voltage transformer installation (basic design)



Disconnecting facility for feeder voltage transformer (detail 2)

- 1 Busbar voltage transformer
- 2 Feeder voltage transformer at the panel connection
- 3 Operating lever for disconnecting facility
- 4 Panel connection
- 5 Switchgear vessel wall (earthed)

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Electrical data

Primary data

For types 4MT3, 4MT2 and 4MU2

For operating voltages from 3.3 kV to 23 kV, rated voltage factor $U_n/8h = 1.9$; $U_n/continuous = 1.2$

Rated voltage kV	Rated short-duration power-frequency withstand voltage kV	Rated lightning impulse withstand voltage kV	Standard	Operating voltage kV
3.6	10	20	IEC	$3\sqrt{3}/\sqrt{3}$
7.2	20	60	IEC	$3.6\sqrt{3}; 4.0\sqrt{3}; 4.16\sqrt{3};$ $4.2\sqrt{3}; 4.8\sqrt{3}; 5.0\sqrt{3};$ $5.5\sqrt{3}; 6.0\sqrt{3}; 6.2\sqrt{3};$ $6.3\sqrt{3}; 6.6\sqrt{3}; 6.9\sqrt{3}$
	32	60	GOST	$6.0\sqrt{3}; 6.3\sqrt{3}; 6.6\sqrt{3}$
12	28	75	IEC	$7.2\sqrt{3}; 7.8\sqrt{3}; 8.0\sqrt{3};$ $8.3\sqrt{3}; 8.4\sqrt{3}; 8.9\sqrt{3};$ $10\sqrt{3}; 10.5\sqrt{3}; 11\sqrt{3};$ $11.4\sqrt{3}; 11.5\sqrt{3}; 11.6\sqrt{3}$
	38	75	GOST	$10\sqrt{3}; 10.5\sqrt{3}; 11\sqrt{3}$
	42	75	GB	$10\sqrt{3}; 10.5\sqrt{3}; 11\sqrt{3}$
17.5	38	95	IEC	$12\sqrt{3}; 12.4\sqrt{3}; 12.47\sqrt{3};$ $12.5\sqrt{3}; 12.8\sqrt{3}; 13.2\sqrt{3};$ $13.4\sqrt{3}; 13.8\sqrt{3}; 14.4\sqrt{3};$ $15\sqrt{3}; 15.8\sqrt{3}; 16\sqrt{3};$ $17\sqrt{3}$
24	50	125	IEC	$17.5\sqrt{3}; 18\sqrt{3}; 19\sqrt{3};$ $20\sqrt{3}; 22\sqrt{3}; 23\sqrt{3}$

Secondary data

For type	Operating voltage V	Auxiliary winding V	Thermal limit current (measuring winding) A	Rated long- time current 8 h A	Rating at accuracy class			
					0.2 VA	0.5 VA	1 VA	3 VA
4MT3 4MU2	$100\sqrt{3};$ $110\sqrt{3};$ $120\sqrt{3}$	100/3; 110/3; 120/3	6	4	IEC			
					10, 15, 20, 25, 30	10, 15, 20, 25, 30, 45, 50, 60, 75, 90	10, 15, 20, 25, 30, 45, 50, 60, 75, 90, 100, 120, 150, 180	10, 15, 20, 25, 30, 45, 50, 60, 75, 90, 100, 120, 150, 180
					GOST 32/60 kV			
					10, 15, 20, 25, 30	10, 15, 20, 25, 30, 45, 50, 60, 75, 90	10, 15, 20, 25, 30, 45, 50, 60, 75, 90, 100, 120, 150, 180	10, 15, 20, 25, 30, 45, 50, 60, 75, 90, 100, 120, 150, 180
4MT2	$100\sqrt{3};$ $110\sqrt{3};$ $120\sqrt{3}$	100/3; 110/3; 120/3	8	6	IEC			
					5, 10, 15, 20, 25	10, 15, 20, 25, 30, 45, 50, 60, 75	10, 15, 20, 25, 30, 45, 50, 60, 75, 90, 100, 120, 150	10, 15, 20, 25, 30, 45, 50, 60, 75, 90, 100, 120, 150
					GOST 32/60 kV			
					5	10, 15, 25, 30	10, 15, 20, 25, 30	10, 15, 20, 25, 30
					GOST 42/75 kV, GB 42/75 kV			
					5, 10	10, 15, 20, 25, 30	10, 15, 20, 25, 30, 45, 50, 60	10, 15, 20, 25, 30, 45, 50, 60

GOST: Russian standard
GB: Chinese standard

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Components



Horizontal pressure relief duct

Design

- Modular design per panel
- Various elements for flexible design of the evacuation
- Pressure flap insertion element for wall penetration (masonry opening).

Dimensions

- Height of switchgear panel 2640 mm
- Minimum room height ≥ 2750 mm
- See dimensions of evacuation elements on the next page.

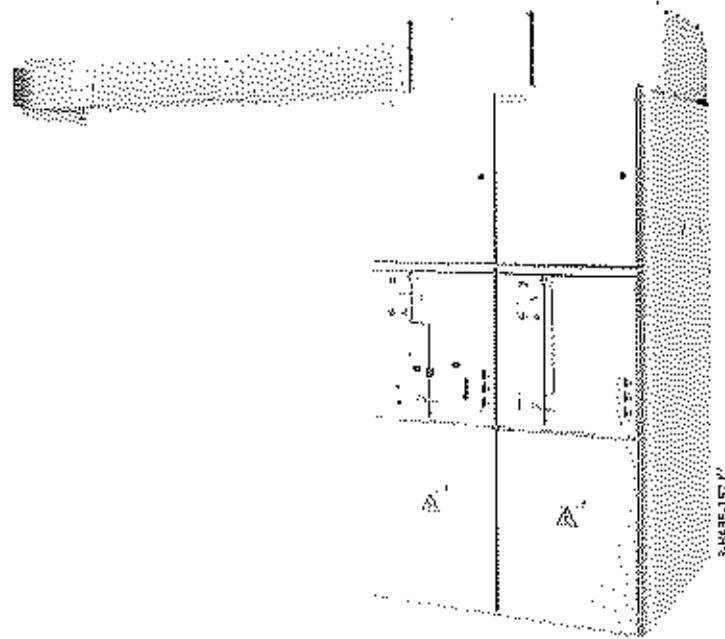
Tests

- Type-tested design.

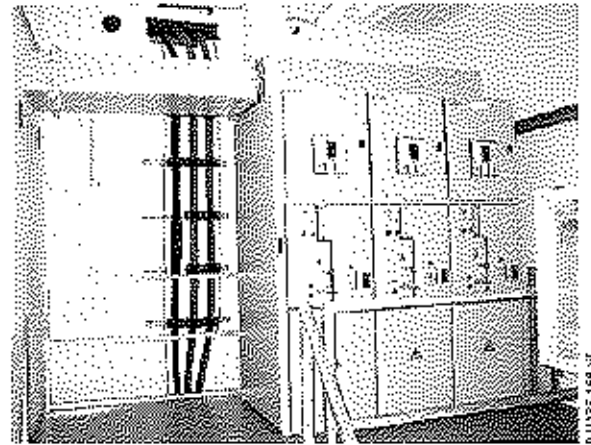
Installation

- The horizontal pressure relief duct on the panel is installed on site
- Evacuation elements according to constructional planning.

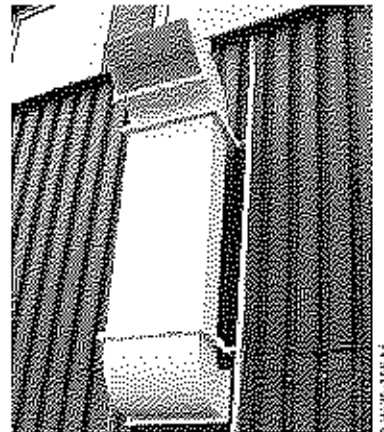
NXPLUS C with horizontal pressure relief duct



Example: 3 panels NXPLUS C with pressure relief duct and evacuation to the left



Example for evacuation outside the substation room



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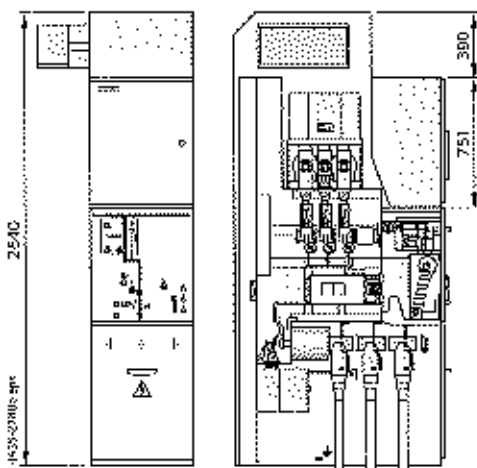
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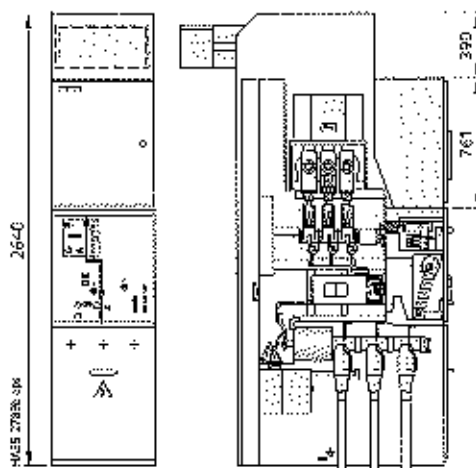
Components

Horizontal pressure relief duct, dimensions

NXPLUS C with horizontal pressure relief duct and evacuation

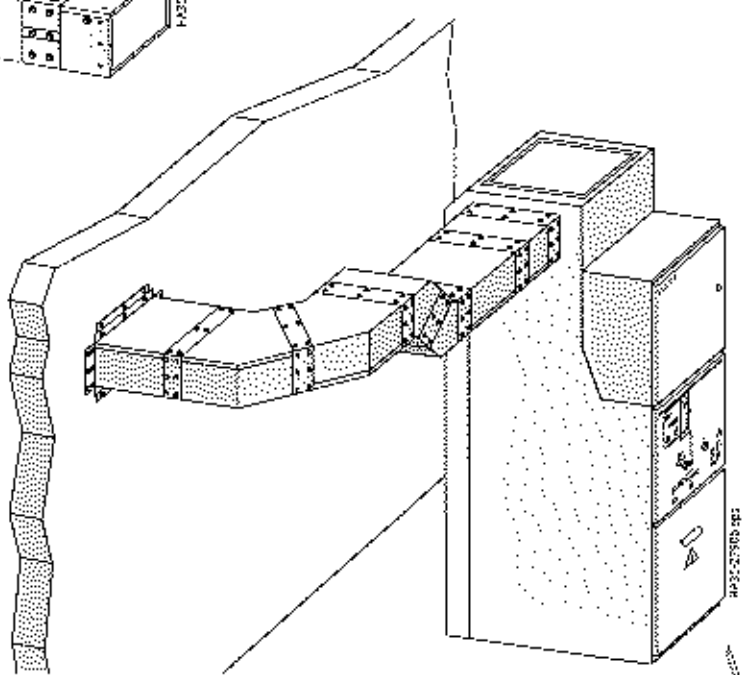
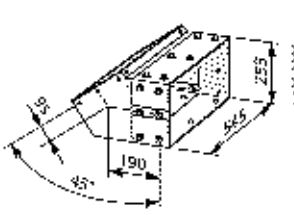
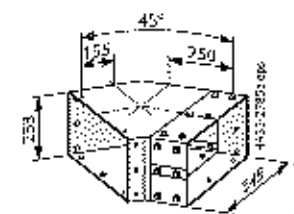
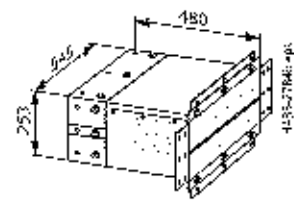
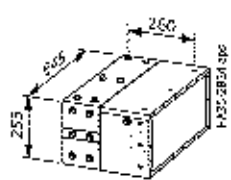
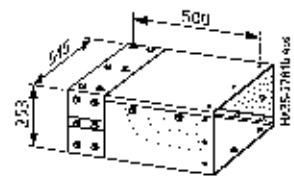
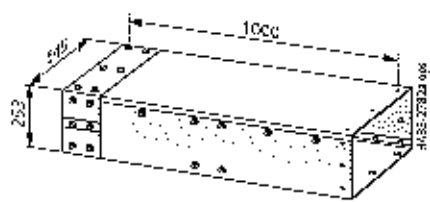
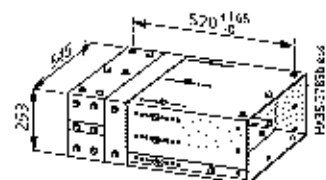


Evacuation to the left (also possible to the right)



Evacuation to the rear

Elements for the evacuation duct



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Components



Panel connection

Features

- Bushings with outside cone
- With bolted contact (M16) as interface type "C" according to EN 50 181
- For cable connection heights, see table on the right
- Max. connection depth: 584 mm or 732 mm with standard cable compartment cover, 752 mm with deep cable compartment cover
- With cable bracket type C40 according to DIN EN 50 024
- Option: Access to the cable compartment only if the feeder has been isolated and earthed
- For thermoplastic-insulated cables
- For shielded cable T-plugs or cable elbow plugs with bolted contact
- For connection cross-sections up to 3200 mm²
- Larger cross-sections on request
- Cable routing downwards, cable connection from the front
- Option: Cable routing upwards to the rear, cable connection from the rear (only for circuit-breaker panel 1250 A)
- For rated normal currents up to 2500 A
- Cable T-plugs are not included in the scope of supply.

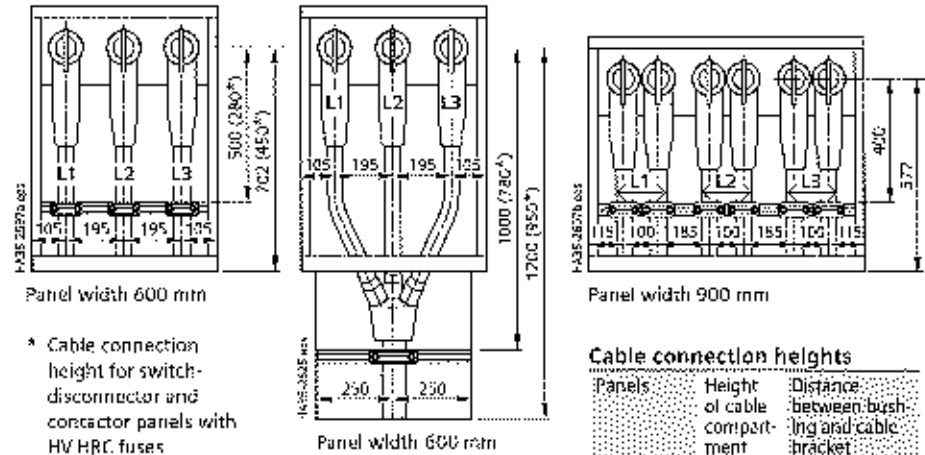
Surge arresters

- Pluggable on cable T-plug
- 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 lower of the overhead line does not cover the switchgear.

Surge limiters

- Pluggable on cable T-plug
- Surge limiters recommended when motors with starting currents < 600 A are connected.

Cable compartment



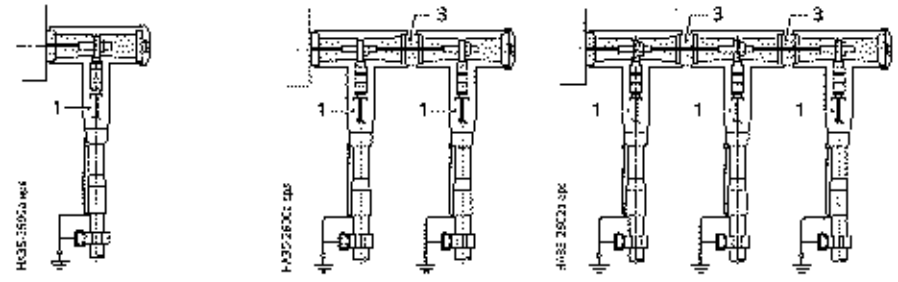
Cable connection heights

Panels	Height of cable compartment	Distance between bushing and cable bracket
	mm	mm
600 mm	702	500
900 mm	577	400
Switch-disconnector panel and contactor panel with fuse	450	280

Connectable cables

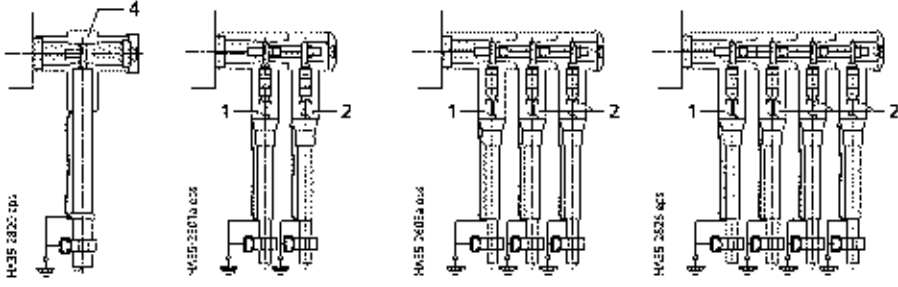
Cable T-plug with coupling insert

- a) Panel width 600 mm
- b) Panel width 900 mm



- a) Connection with 1 cable per phase
- b) Connection with 2 cables per phase
- a) Connection with 2 cables per phase
- b) Connection with 4 cables per phase
- a) Connection with 3 cables per phase
- b) Connection with 6 cables per phase

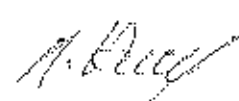
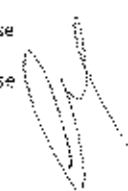
Solid-insulated bar



- a) Connection with 2 cables per phase
- b) Connection with 4 cables per phase
- a) Connection with 3 cables per phase
- b) Connection with 6 cables per phase
- a) Connection with 4 cables per phase
- b) Connection with 8 cables per phase

Legend

- 1 Cable T-plug
- 2 Coupling T-plug
- 3 Screw-type coupling insert
- 4 End adapter





Panel connection (commercially available cable T-plugs)

Cable type	Cable T-plugs			Comment
	Make	Type	Cross-section min ²	
Thermoplastic-insulated cables ≤ 12 kV according to IEC 60502-2 and VDE 0276-620				
Single-core cable, PE and XLPE-insulated N2YSY (Cu) and N2XSY (Cu) or NA2YSY (Al) and NA2XSY (Al)	Nexans Euromold	K30TB/G	35 to 300	EPDM with semi-conductive layer
		K40TB/G	35 to 300	EPDM with semi-conductive layer
		K44TB/G	50 to 630	EPDM with semi-conductive layer
		K49TB/G	800 to 1200	EPDM with semi-conductive layer
	nkt cables	CR12-630	25 to 300	Silicone with semi-conductive layer (optionally with metal housing)
		CB17-5-630	25 to 500	Silicone with semi-conductive layer
		CB24-1250-2	185 to 500	Silicone with semi-conductive layer
		CB36-630(1250)	400 to 630	Silicone with semi-conductive layer
		CB42-1250-3	630 to 1000	Silicone with semi-conductive layer
	Südkaibel	SET-12	50 to 300	Silicone with semi-conductive layer (optionally with metal housing)
		SEHDT-13	400 to 500	Silicone with semi-conductive layer (optionally with metal housing)
	Tyco Electronics Raychem	RST1-58xx	25 to 300	Silicone with semi-conductive layer, with capacitive measuring point
		RST1-395x	400 to 800	Silicone with semi-conductive layer, with capacitive measuring point
	3M	93-EE-705-6	50 to 240	Silicone with semi-conductive layer (optionally with metal housing)
		93-EE-715-6	300 to 400	Silicone with semi-conductive layer (optionally with metal housing)
GCA	CR10-630	35 to 500	Silicone with semi-conductive layer	
ABB Kabelden	CSE-A 12630-xx	25 to 630	EPDM with semi-conductive layer	
Cellpack	CTS 630A 24kV	50 to 400	EPDM with semi-conductive layer, with capacitive measuring point	
Ample	AQT3-151630	25 to 400	EPDM with semi-conductive layer	
Three-core cable, PE and XLPE-insulated N2YSY (Cu) and N2XSY (Cu) or NA2YSY (Al) and NA2XSY (Al)	Nexans Euromold	K30TB/G	35 to 300	EPDM with semi-conductive layer, in combination with distribution kit
		K40TB/G	35 to 300	EPDM with semi-conductive layer, in combination with distribution kit
	nkt cables	CB12-630	25 to 300	Silicone with semi-conductive layer (optionally with metal housing), in comb. with distribution kit
		CB24-1250-2	185 to 500	Silicone with semi-conductive layer, in combination with distribution kit
		CB17-5-630	25 to 500	Silicone with semi-conductive layer, in combination with distribution kit
	Südkaibel	SE1-12	50 to 300	Silicone with semi-conductive layer (optionally with metal housing), in comb. with distribution kit
		SEHDT-13	400 to 500	Silicone with semi-conductive layer (optionally with metal housing), in comb. with distribution kit
	Tyco Electronics Raychem	RST1-58xx	25 to 300	Silicone with semi-conductive layer, with capacitive measuring point, in combination with distribution kit RST1-TRFOx
	3M	93-EE-705-6	50 to 240	Silicone with semi-conductive layer (optionally with metal housing), in comb. with distribution kit
		93-EE-715-6	300 to 400	Silicone with semi-conductive layer (optionally with metal housing), in comb. with distribution kit
	GCA	CR10-630	35 to 500	Silicone with semi-conductive layer, in combination with distribution kit
	ABB Kabelden	CSE-A 12630-xx	25 to 630	EPDM with semi-conductive layer, in combination with distribution kit
	Cellpack	CTS 630A 24kV	50 to 400	EPDM with semi-conductive layer, with capacitive measuring point, in comb. with distribution kit
	Ample	AQT3-151630	25 to 400	EPDM with semi-conductive layer, in combination with distribution kit
Thermoplastic-insulated cables 15/17.5/24 kV according to IEC 60502-2 and VDE 0276-620				
Single-core cable, PE and XLPE-insulated N2YSY (Cu) and N2XSY (Cu) or NA2YSY (Al) and NA2XSY (Al)	Nexans Euromold	K430TB/G	35 to 300	EPDM with semi-conductive layer
		K480TB/G	35 to 300	EPDM with semi-conductive layer
		K484TB/G	35 to 630	EPDM with semi-conductive layer
		K490TB/G	800 to 1200	EPDM with semi-conductive layer
	nkt cables	CB24-630	25 to 300	Silicone with semi-conductive layer (optionally with metal housing)
		CB24-1250-2	95 to 500	Silicone with semi-conductive layer
		CB36-630(1250)	400 to 630	Silicone with semi-conductive layer
		CB42-1250-3	630 to 1000	Silicone with semi-conductive layer
	Südkaibel	SET-24	50 to 300	Silicone with semi-conductive layer (optionally with metal housing)
		SEHDT-23	400 to 500	Silicone with semi-conductive layer (optionally with metal housing)
	Tyco Electronics Raychem	RST1-58xx	25 to 300	Silicone with semi-conductive layer, with capacitive measuring point
		RST1-595x	400 to 800	Silicone with semi-conductive layer, with capacitive measuring point
	3M	93-EE-705-6	25 to 240	Silicone with semi-conductive layer (optionally with metal housing)
		93-EE-715-6	300 to 400	Silicone with semi-conductive layer (optionally with metal housing)
GCA	CR20-630	35 to 500	Silicone with semi-conductive layer	
ABB Kabelden	CSE-A 24630-xx	25 to 630	EPDM with semi-conductive layer	
Cellpack	CTS 630A 24kV	25 to 300	EPDM with semi-conductive layer, with capacitive measuring point	
Ample	AQT3-241630	35 to 500	EPDM with semi-conductive layer	
Three-core cable, PE and XLPE-insulated N2YSY (Cu) and N2XSY (Cu) or NA2YSY (Al) and NA2XSY (Al)	Nexans Euromold	K430TB/G	35 to 300	EPDM with semi-conductive layer, in combination with distribution kit
		K480TB/G	35 to 300	EPDM with semi-conductive layer, in combination with distribution kit
	nkt cables	CB24-630	25 to 300	Silicone with semi-conductive layer (optionally with metal housing), in comb. with distribution kit
		CB24-1250-2	185 to 500	Silicone with semi-conductive layer, in combination with distribution kit
	Südkaibel	SET-24	50 to 300	Silicone with semi-conductive layer (optionally with metal housing), in comb. with distribution kit
		SEHDT-23	400 to 500	Silicone with semi-conductive layer (optionally with metal housing), in comb. with distribution kit
	Tyco Electronics Raychem	RST1-58xx	25 to 300	Silicone with semi-conductive layer, with capacitive measuring point, in combination with distribution kit RST1-TRFOx
	3M	93-EE-705-6	25 to 240	Silicone with semi-conductive layer (optionally with metal housing), in comb. with distribution kit
		93-EE-715-6	300 to 400	Silicone with semi-conductive layer (optionally with metal housing), in comb. with distribution kit
	GCA	CR20-630	25 to 500	Silicone with semi-conductive layer, in combination with distribution kit
	ABB Kabelden	CSE-A 24630-xx	25 to 630	EPDM with semi-conductive layer, in combination with distribution kit
	Cellpack	CTS 630A 24kV	25 to 300	EPDM with semi-conductive layer, with capacitive measuring point, in combination with distribution kit
	Ample	AQT3-241630	35 to 500	EPDM with semi-conductive layer, in combination with distribution kit

Components

Panel connection (commercially available cable T-plugs)

Cable type	Cable T-plugs			Comment
	Make	Type	Cross-section mm ²	
Paper-insulated belted cables (non-draining cables) ≤ 12 kV according to IEC 60 055 and VDE 0255				
Three-core cable paper-insulated NAKBA (Cu), NAKBY (Cu), NAKBA (Cu) and NAKFA (Cu) or NAKBA (Al), NAKBY (Al), NAKBA (Al) and NAKFA (Al)	Nexans Euromold	430TB/G	35 to 300	EPDM with semi-conductive layer, in combination with distribution kit MIN
	nkt cables	CB 24-630	25 to 240	Silicone with semi-conductive layer (optionally with metal housing), in combination with transition sealing end type SDEV 10
Paper-insulated belted cables (non-draining cables) ≤ 12 kV according to GOST 18410-73				
Three-core cable paper-insulated ASB and ASBL	Nexans Euromold	430TB/G	35 to 300	EPDM with semi-conductive layer, in combination with distribution kit MEND
	nkt cables	CB 24-630	25 to 240	Silicone with semi-conductive layer (optionally with metal housing), in combination with transition sealing end type SDEV 30
Paper-insulated belted cables (mass-impregnated cables) ≤ 12 kV according to IEC 60055 and VDE 0255				
Three-core cable paper-insulated NAKBA (Cu), NAKBY (Cu), NAKBA (Cu) and NAKFA (Cu) or NAKBA (Al), NAKBY (Al), NAKBA (Al) and NAKFA (Al)	nkt cables	CB 24-630	25 to 240	Silicone with semi-conductive layer (optionally with metal housing), in combination with transition sealing end type SDEV 30
Paper-insulated belted cables (mass-impregnated cables) ≤ 12 kV according to GOST 18410-73				
Three-core cable paper-insulated ASB and ASBL	nkt cables	CB 24-630	25 to 240	Silicone with semi-conductive layer (optionally with metal housing), in combination with transition sealing end type SDEV 10

Commercially available bar systems

Type of bar	Bar connection			Max. rated current	Remarks
	Make	Type	Conductor material		
Solid-insulated bar	MGC Moser Glaser	Fluoresc-DF	Copper	1250 A / 2500 A	Outer sheath made of polyamide (polyamide tube)
		Durmsis-DS	Copper	1250 A / 2500 A	Outer sheath made of CrNi steel or aluminum (metal sheath)
	Preissinger	ISOBUS-MB	Copper	1250 A / 2500 A	Outer sheath made of epoxy resin (if required with heat shrinkable tube)
	Ritz	SIS	Copper	1250 A / 2500 A	Outer sheath made of epoxy resin (if required with heat shrinkable tube)

Surge-proof end covers

Make	Type	Size	Rated voltage	Remark
3M	SP 33	Outside cone type "C"	12 kV	Silicone with semi-conductive layer
		Outside cone type "C"	24 kV	
	SP 21	Outside cone type "A"	12 kV	Silicone with semi-conductive layer
		Outside cone type "A"	24 kV	
Nexans Euromold	400DR E	Outside cone type "C"	12 kV	EPDM with semi-conductive layer
		Outside cone type "C"	24 kV	
	450CRIG	Outside cone type "A"	12 kV	EPDM with semi-conductive layer
		Outside cone type "A"	24 kV	
nkt cables	CB 40, 5-630	Outside cone type "C"	12 kV	Silicone with semi-conductive layer
		Outside cone type "C"	24 kV	
Süd Kabel	SP 33	Outside cone type "C"	12 kV	Silicone with semi-conductive layer
		Outside cone type "C"	24 kV	
	SP 21	Outside cone type "A"	12 kV	Silicone with semi-conductive layer
		Outside cone type "A"	24 kV	
CeBpack	CIK	Outside cone type "C"	12 kV	EPDM with semi-conductive layer
		Outside cone type "C"	24 kV	
	CIx	Outside cone type "A"	12 kV	EPDM with semi-conductive layer
		Outside cone type "A"	24 kV	
Ample	AJM-15/630	Outside cone type "C"	12 kV	Silicone with semi-conductive layer
		Outside cone type "C"	24 kV	
	AJM-15/250	Outside cone type "A"	12 kV	Silicone with semi-conductive layer
		Outside cone type "A"	24 kV	

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Components

Installation possibilities for cable connections and surge arresters, single-core PE and XLPE-insulated

Number of cables per panel and phase	Make	Conductor cross-section 1)	Cable T-plugs	Coupling Inserts/ coupling plugs	Surge arresters with coupling inserts	Coupling Inserts	According to standard		
			bolted 12 kV 24 kV	bolted 12 kV 24 kV	Arresters	additionally			
• Circuit-breaker panel 630 A, 1000 A • Switch-disconnector panel 630 A • Disconnector panel 1000 A • Ring-main panel: 630 A • Contactor panel • Circuit-breaker panel with top-rear cable connection 1250 A 2)									
1	Nexans Euromold	35 to 300	1x K30TB/G 1x K430TB/G 1x K430TB/G-CSxxx	—	300SA-5(10)SA 300SA-5(10)SA 300SA-5(10)SA	—	IEC, GOST, GB/DL IEC GOST, GB/DL		
		35 to 300	1x 480TB/G 1x K480TB/G	—	800SA 10-xxx 800SA 10-xxx	—	IEC, GOST, GB/DL IEC		
		50 to 630 35 to 630	1x 484TB/G 1x K484TB/G	—	800SA-10-xxx 800SA-10-xxx	—	IEC IEC		
		800 to 1200	1x 489TB/G 1x K489TB/G	—	800SA-10-xxx 800SA-10-xxx	—	IEC IEC		
	Südkabel	50 to 300 35 to 240	1x SET 12 1x SET 24	—	MUT 23 MUT 23	—	IEC, GOST, GB/DL IEC, GOST, GB/DL		
		300 to 500 300 to 630	1x SEHD 13 1x SEHDT 23	—	MUJ 23 MUJ 23	—	IEC, GOST, GB/DL IEC, GOST, GB/DL		
		nkt cables	25 to 300 25 to 500 25 to 300	1x CB 17-630 1x CB 17,5-630 1x CB 24-630	—	CSA 12-x CSA 17,5-y CSA 24-x	—	IEC GOST, GB/DL IEC, GOST, GB/DL	
	185 to 500 95 to 500		1x CB 24-1250-2 1x CB 24-1250-2	—	CSA 12-x CSA 24-x	—	IEC IEC		
	400 to 630		1x CB 36-630(1250) 1x CB 36-630(1250)	—	CSA 12-x CSA 24-x	—	IEC, GOST, GB/DL IEC, GOST, GB/DL		
	630 to 1000		1x CB 42-1250-3 1x CB 42-1250-3	—	CSA 12-x CSA 24-x	—	IEC IEC		
	Iyco Electronics Haychem	25 to 300	1x RSTI 58xx 1x RSTI-68xx	—	RSTI-CC-58SAxxxx RSTI-CC-68SAxxxx	RSTI-SA-PIN	IEC IEC		
		25 to 300	1x RSTI-58xx-CEED1 1x RSTI-58xx-CEED1	—	RSTI-CC-58SAxxxx RSTI-CC-68SAxxxx	RSTI-SA-PIN	GOST GOST		
		400 to 800	1x RSTI 595x 1x RSTI-595x	—	RSTI-CC-58SAxxxx RSTI-CC-68SAxxxx	RSTI-SA-PIN RSTI-SA-PIN	IEC IEC		
		400 to 800	1x RSTI-595x-CEED1 1x RSTI-595x-CEED1	—	RSTI-CC-58SAxxxx RSTI-CC-68SAxxxx	RSTI-SA-PIN RSTI-SA-PIN	GOST GOST		
	3M	50 to 240 25 to 240	1x 93-EE 705-6 1x 93-EE 705-6	—	—	—	IEC, GOST, GB/DL IEC, GOST, GB/DL		
		300 to 400	1x 93-EE 715-6 1x 93-EE 715-6	—	—	—	IEC, GOST, GB/DL IEC, GOST, GB/DL		
	GCA	35 to 500 25 to 500	1x C1810 630 1x C1820 630	—	—	—	GB/DL GB/DL		
		ABB Kabelbus	25 to 630	1x CSE-A 12630-xx 1x CSE-A 24630-xx	—	—	—	IEC, GOST IEC, GOST	
	Cellpack		50 to 400 25 to 300	1x CTS 630A 24kV 1x CTS 630A 24kV	—	CTKSA CTKSA	—	IEC IEC	
		Ample	25 to 400 35 to 500	1x AQT3-15/630 1x AQT3-24/630	—	AHY5WZ7 AHY5WZ7	—	GB/DL GB/DL	
	2		Nexans Euromold	35 to 300	1x K30PB/G 1x K430PB/G 1x K430PB/G-CSxxx	1x K30PB/G 1x K300PB/G 1x K300PB/G-CSxxx	300SA-5(10)SA 300SA-5(10)SA 300SA-5(10)SA	—	IEC, GOST, GB/DL IEC GOST, GB/DL
		35 to 300		1x 480PB/G 1x K480PB/G	1x 800PB/G 1x K800PB/G	800SA-10-xxx 800SA-10-xxx	—	IEC, GOST, GB/DL IEC	
		50 to 630 35 to 630		1x 484PB/G 1x K484PB/G	1x 804PB/G 1x K804PB/G	800SA 10-xxx 800SA 10-xxx	—	IEC IEC	
		800 to 1200		1x 489PB/G 1x K489PB/G	1x 809PB/G 1x K809PB/G	800SA-10-xxx 800SA-10-xxx	—	IEC IEC	
Südkabel		50 to 300 25 to 240	1x SE1 12 1x SET 24	1x SEHDK 13.1 1x SEHDK 23.1	—	—	—	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		50 to 300 25 to 240	2x SET 12 2x SET 24	1x KU 23.1 1x KU 23.2	—	—	—	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		300 to 500 300 to 630	2x SEHD 13 2x SEHDT 23	1x KU 23 1x KU 23	—	—	—	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		3	Nexans Euromold	35 to 300	1x K30TB/G 1x K430TB/G 1x K430TB/G-CSxxx	—	300SA-5(10)SA 300SA-5(10)SA 300SA-5(10)SA	—	IEC, GOST, GB/DL IEC GOST, GB/DL
				35 to 300	1x 480TB/G 1x K480TB/G	—	800SA 10-xxx 800SA 10-xxx	—	IEC, GOST, GB/DL IEC
				50 to 630 35 to 630	1x 484TB/G 1x K484TB/G	—	800SA-10-xxx 800SA-10-xxx	—	IEC IEC
800 to 1200				1x 489TB/G 1x K489TB/G	—	800SA-10-xxx 800SA-10-xxx	—	IEC IEC	
Südkabel			50 to 300 25 to 240	1x SET 12 1x SET 24	1x SEHDK 13.1 1x SEHDK 23.1	—	—	—	IEC, GOST, GB/DL IEC, GOST, GB/DL
			50 to 300 25 to 240	2x SET 12 2x SET 24	1x KU 23.1 1x KU 23.2	—	—	—	IEC, GOST, GB/DL IEC, GOST, GB/DL
			300 to 500 300 to 630	2x SEHD 13 2x SEHDT 23	1x KU 23 1x KU 23	—	—	—	IEC, GOST, GB/DL IEC, GOST, GB/DL

1) Observe the actual short-circuit and current carrying capacity of the cables and sealing ends

2) At a normal current of more than 1150 A, cable sealing ends with tin-plated, nickel-plated or silver-plated cable lugs are required

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Components

Installation possibilities for cable connections and surge arresters, single-core PE and XLPE-insulated



Number of cables per panel and phase	Make	Conductor cross-section 3) in mm ²	Cable T-plugs		Coupling inserts/ coupling plugs		Surge arresters with coupling inserts		According to standard
			bolted 12 kV 24 kV	bolted 12 kV 24 kV	Arresters	Coupling inserts additionally			
• Circuit-breaker panel 630 A, 1000 A • Switch-disconnector panel 630 A • Disconnecter panel 1000 A • Ring-main panel 630 A • Contactor panel • Circuit-breaker panel with top-rear cable connection 1250 A 2)									
2	nkt cables	25 to 300	1x CB 12-630	1x CC 12-630	CSA 12-x	-	-	IEC	
		25 to 500	1x CB 17.5-630	1x CC 17.5-630	CSA 17.5-x	-	-	GOST, GB/DL	
		25 to 300	1x CB 24-630	1x CC 24-630	CSA 24-x	-	-	IEC, GOST, GB/DL	
		25 to 300	2x CB 12-630	1x CP 630-C	CSA 12-x	-	-	IEC	
		25 to 300	2x CB 24-630	1x CP 630-C	CSA 24-x	-	-	IEC, GOST, GB/DL	
		185 to 500	1x CR 24-1250-2	1x CC 24-1250-2	CSA 12-x	-	-	IEC	
		95 to 500	1x CR 24-1250-2	1x CC 24-1250-2	CSA 24-x	-	-	IEC	
		185 to 500	2x CR 24-1250-2	1x CP 630-C	CSA 12-x	-	-	IEC	
		95 to 500	2x CR 24-1250-2	1x CP 630-C	CSA 24-x	-	-	IEC	
		400 to 630	1x CR 36-630(1250)	1x CC 36-630(1250)	CSA 12-x	-	-	IEC, GOST, GB/DL	
		400 to 630	1x CR 36-630(1250)	1x CC 36-630(1250)	CSA 24-x	-	-	IEC, GOST, GB/DL	
		400 to 630	2x CR 36-630(1250)	1x CP 630-M16	CSA 12-x	-	-	IEC, GOST, GB/DL	
		400 to 630	2x CR 36-630(1250)	1x CP 630-M16	CSA 24-x	-	-	IEC, GOST, GB/DL	
		630 to 1000	1x CB 42-1250-3	1x CC 42-2500-3	CSA 12-x	-	-	IEC	
		630 to 1000	1x CB 42-1250-3	1x CC 42-2500-3	CSA 24-x	-	-	IEC	
	Tyco Electronics Raychem	25 to 300	1x RSTI 58xx	1x RSTI-CC-58xx	RSTI-CC-58SAxxxx	-	RSTI-SA-PIN	IEC	
		25 to 300	1x RSTI 58xx	1x RSTI-CC-58xx	RSTI-CC-68SAxxxx	-	RSTI-SA-PIN	IEC	
		25 to 300	1x RSTI 58xx-CEE01	1x RSTI-CC-58xx-CEE01	RSTI-CC-58SAxxxx	-	RSTI-SA-PIN	GOST	
		25 to 300	1x RSTI 58xx-CEE01	1x RSTI-CC-58xx-CEE01	RSTI-CC-68SAxxxx	-	RSTI-SA-PIN	GOST	
		400 to 800	1x RSTI 595x	1x RSTI-CC-595x	RSTI-CC-58SAxxxx	-	RSTI-SA-PIN	IEC	
	3M	50 to 240	2x 93-EE 705-6	1x KU 23.2	-	-	-	IEC, GOST, GB/DL	
		25 to 240	2x 93-EE 705-6	1x KU 23.2	-	-	-	IEC, GOST, GB/DL	
		240	1x 93-EE 705-6	1x 93-EE 718-6	-	-	-	IEC, GOST, GB/DL	
		150 to 240	1x 93-EE 705-6	1x 93-EE 718-6	-	-	-	IEC, GOST, GB/DL	
		300 to 400	2x 93-EE 715-6	1x KU 23.2	-	-	-	IEC, GOST, GB/DL	
	GCA	35 to 500	1x CJB10-630	1x CJBK10-630	-	-	-	GB/DL	
		25 to 500	1x CJP20-630	1x CJBK20-630	-	-	-	GB/DL	
	ABB Kabeldon	25 to 630	2x CSE-A 12630-xx	PC 630-3	-	-	-	IEC, GOST	
		25 to 630	2x CSE-A 24630-xx	PC 630-3	-	-	-	IEC, GOST	
	Cellpack	50 to 400	2x CTS 630A 24kV	1x CTS 630A 24kV	-	-	-	IEC	
25 to 300		2x CTS 630A 24kV	1x CTS 630A 24kV	-	-	-	IEC		
50 to 240		1x CTS 630A 24kV	2x CTKS 630A 24kV	CTKSA	-	-	IEC		
Ample	25 to 400	1x AQT3-15/630	1x AHT3-15/630	AIHYSW27	-	-	GOST		
	35 to 500	1x AQT3-24/630	1x AHT3-24/630	AIHYSW27	-	-	GOST		
4	Nexans Euromold	35 to 300	1x K430TB/G	2x K300PB/G	-	-	IEC, GOST, GB/DL		
		35 to 300	1x K430TB/G	2x K300PB/G	-	-	IEC		
		35 to 300	1x K430TB/G-CSxxxx	2x K300PB/G-CSxxxx	-	-	GOST, GB/DL		
		35 to 300	1x K480TB/G	2x K800PB/G	-	-	IEC		
		35 to 300	1x K480TB/G	2x K800PB/G	-	-	IEC		
	nkt cables	25 to 300	1x CB 12-630	2x CC 12-630	-	-	-	IEC	
		25 to 500	1x CB 17.5-630	2x CC 17.5-630	-	-	-	GOST, GB/DL	
		25 to 300	1x CB 24-630	2x CC 24-630	-	-	-	IEC, GOST, GB/DL	
		185 to 500	1x CR 24-1250-2	2x CC 24-1250-2	-	-	-	IEC	
		95 to 500	1x CR 24-1250-2	2x CC 24-1250-2	-	-	-	IEC	
	Tyco Electronics Raychem	25 to 300	1x RSTI 58xx	2x RSTI-CC-58xx	-	-	-	IEC	
		25 to 300	1x RSTI 58xx	2x RSTI-CC-58xx	-	-	-	IEC	
		25 to 300	1x RSTI 58xx-CEE01	2x RSTI-CC-58xx-CEE01	-	-	-	GOST	
		25 to 300	1x RSTI 58xx-CEE01	2x RSTI-CC-58xx-CEE01	-	-	-	GOST	
		400 to 800	1x RSTI 595x	2x RSTI-CC-595x	-	-	-	IEC	
Cellpack	50 to 240	1x CTS 630A 24kV	2x CTKS 630A 24kV	-	-	-	IEC		
	25 to 240	1x CTS 630A 24kV	2x CTKS 630A 24kV	-	-	-	IEC		

1) Observe the actual short-circuit and current carrying capacity of the cables and sealing ends
 2) At a normal current of more than 1150 A, cable sealing ends with tin-plated, nickel-plated or silver-plated cable lugs are required

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Components

Installation possibilities for cable connections and surge arresters, single-core PE and XLPE-insulated

Number of cables per panel and phase	Make	Conductor cross-section 1) mm ²	Cable T-plugs	Coupling inserts / coupling plugs	Surge arresters with coupling inserts	According to standard	
			bolted 12 kV 24 kV	bolted 12 kV 24 kV	Arresters Coupling inserts		
• Circuit-breaker panel 1250 A 2) • Disconnector panel 1250 A 2) • DBB circuit-breaker panel 1000 A • DBB incoming sectionalizer 2)							
3	Nexans Eurolead	35 to 300	1x K30TB/G 1x K430TB/G 1x K430TB/G-CSxxx	—	300SA-5(10)SA 300SA-5(10)SA 300SA-5(10)SA	IEC, GOST, GB/DL IEC GOST, GB/DL	
		35 to 300	1x K40TB/G 1x K480TB/G	—	B00SA-10-xxx B00SA-10-xxx	IEC, GOST, GB/DL IEC	
		50 to 630 35 to 630	1x K41TB/G 1x K484TB/G	—	B00SA-10-xxx B00SA-10-xxx	IEC IEC	
		800 to 1200	1x K489TB/G 1x K489TB/G	—	B00SA-10-xxx B00SA-10-xxx	IEC IEC	
	Siirtkabel	50 to 300 25 to 240	1x SET 12 1x SET 24	—	MUI 23 MUI 23	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		300 to 500 300 to 630	1x SEHDT 13 1x SEHDT 23	—	MUI 23 MUI 23	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		nkt cables	25 to 300	1x CB 12-630	—	CSA 12-x	IEC
	25 to 500		1x CB 17.5-630	—	CSA 17.5-x	IEC, GOST, GB/DL	
	25 to 300		1x CB 24-630	—	CSA 24-x	IEC, GOST, GB/DL	
	185 to 500 95 to 500		1x CB 24-1250-2 1x CB 24-1250-2	—	CSA 12-x CSA 24-x	IEC IEC	
	400 to 630 630 to 1000		1x CB 36-630(1250) 1x CB 36-630(1250)	—	CSA 12-x CSA 24-x	IEC, GOST, GB/DL IEC, GOST, GB/DL	
	630 to 1000		1x CB 42-1250-3 1x CB 42-1250-3	—	CSA 12-x CSA 24-x	IEC IEC	
	Tyco Electronics Raychem	25 to 300	1x RSTI-5Bxx 1x RSTI-5Bxx	—	RS11-CC-5BSAxxxx RS11-CC-6BSAxxxx	IEC IEC	
		25 to 300	1x RSTI-5Bxx-CEE01 1x RSTI-5Bxx-CEE01	—	RS11-CC-5BSAxxxx RS11-CC-6BSAxxxx	GOST GOST	
		400 to 800	1x RSTI-595x 1x RSTI-595x	—	RS11-CC-5BSAxxxx RS11-CC-6BSAxxxx	IEC IEC	
		400 to 800	1x RSTI-595x-CEE01 1x RSTI-595x-CEE01	—	RS11-CC-5BSAxxxx RS11-CC-6BSAxxxx	GOST GOST	
	3M	50 to 240 25 to 240	1x 93-EE 705-6 1x 93-EE 705-6	—	—	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		300 to 400	1x 93-CE 715-6 1x 93-CE 715-6	—	—	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		GCA	25 to 500 25 to 500	1x CJB20-630 1x CJB20-630	—	—	IEC IEC
	ABB Kabridom		25 to 630	1x CSE-A 12630-xx 1x CSE-A 24630-xx	—	—	IEC, GOST IEC, GOST
		Cellpack	50 to 400 25 to 300	1x CTS 630A 24kV 1x CTS 630A 24kV	—	CTKSA CTKSA	IEC IEC
	Ample		25 to 400 35 to 500	1x AQ13-151630 1x AQ13-241630	—	AHY5W27 AHY5W27	GB/DL GB/DL
		2	Nexans Eurolead	35 to 300	1x K30TB/G 1x K430TB/G 1x K430TB/G-CSxxx	1x K300PB/G 1x K300PB/G 1x K300PB/G-CSxxx	300SA-5(10)SA 300SA-5(10)SA 300SA-5(10)SA
	35 to 300			1x K40TB/G 1x K480TB/G	1x K800PB/G 1x K800PB/G	B00SA-10-xxx B00SA-10-xxx	IEC, GOST, GB/DL IEC
	50 to 630 35 to 630			1x K41TB/G 1x K484TB/G	1x K801PB/G 1x K804PB/G	B00SA-10-xxx B00SA-10-xxx	IEC IEC
	800 to 1200			1x K489TB/G 1x K489TB/G	1x K809PB/G 1x K809PB/G	B00SA-10-xxx B00SA-10-xxx	IEC IEC
	Siirtkabel		50 to 300 25 to 240	1x SET 12 1x SET 24	1x SEIDK 13.1 1x SEIDK 23.1	MUI 23 MUI 23	IEC, GOST, GB/DL IEC, GOST, GB/DL
			50 to 300 25 to 240	2x SET 12 2x SET 24	1x KU 23.2 1x KU 23.2	MUI 23 MUI 23	IEC, GOST, GB/DL IEC, GOST, GB/DL
			300 to 500 300 to 630	2x SEHDT 13 2x SEHDT 23	1x KU 23 1x KU 23	MUI 23 MUI 23	IEC, GOST, GB/DL IEC, GOST, GB/DL

1) Observe the actual short-circuit and current carrying capacity of the cables and sealing ends
 2) At a normal current of more than 1150 A, cable sealing ends with tin-plated, nickel plated or silver plated cable lugs are required

Mr. K. Koc...

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Components

Installation possibilities for cable connections and surge arresters, single-core PE and XLPE-insulated

Number of cables per panel and phase	Make	Conductor cross-section 1)	Cable T-plugs		Coupling inserts / coupling plugs		Surge arresters with coupling inserts		According to standard
			bolted 12 kV 24 kV	bolted 12 kV 24 kV	Arresters	Coupling inserts additionally			
* Circuit-breaker panel 1250 A 2) • Disconnecter panel 1250 A 2) • DRB circuit-breaker panel 1000 A • DRB incoming sectionalizer 2)									
2	nkt cables	25 to 300	1x CB 12-630	1x CC 12-630	CSA 12-x	-	-	IEC	
		25 to 500	1x CB 17,5-630	3x CC 17,5-630	CSA 17,5-x	-	-	GOST, GB/DL	
		25 to 300	1x CB 24-630	3x CC 24-630	CSA 24-x	-	-	IEC, GOST, GB/DL	
		25 to 300	2x CB 12-630	1x CP 630-C	CSA 17-x	-	-	IEC	
		25 to 300	2x CB 24-630	1x CP 630-C	CSA 24-x	-	-	IEC, GOST, GB/DL	
		185 to 500	1x CB 24-1250-2	1x CC 24-1250-2	CSA 12-x	-	-	IEC	
		95 to 500	1x CB 24-1250-2	1x CC 24-1250-2	CSA 24-x	-	-	IEC	
		185 to 500	2x CB 24-1250-2	1x CP 630-C	CSA 17-x	-	-	IEC	
		95 to 500	2x CB 24-1250-2	1x CP 630-C	CSA 24-x	-	-	IEC	
		400 to 630	1x CB 36-630(1250)	1x CC 36-630(1250)	CSA 12-x	-	-	IEC, GOST, GB/DL	
		400 to 630	1x CB 36-630(1250)	1x CC 36-630(1250)	CSA 24-x	-	-	IEC, GOST, GB/DL	
		400 to 630	2x CB 36-630(1250)	1x CP 630-M16	CSA 17-x	-	-	IEC, GOST, GB/DL	
		400 to 630	2x CB 36-630(1250)	1x CP 630-M16	CSA 24-x	-	-	IEC, GOST, GB/DL	
		630 to 1000	1x CB 42-1250-3	1x CC 42-2500-3	CSA 12-x	-	-	IEC	
	630 to 1000	1x CB 42-1250-3	1x CC 42-2500-3	CSA 24-x	-	-	IEC		
	Tyco Electronics Raychem	25 to 300	1x RSTI-5Bxx 1x RSTI-5Bxx	1x RSTI-CC-5Bxx 1x RSTI-CC-5Bxx	RSTI-CC-5B5Axxxx RSTI-CC-6B5Axxxx	-	RSTI-SA-PIN	IEC IEC	
		25 to 300	2x RSTI-5Bxx-CEE01 1x RSTI-5Bxx-CEE01	1x RSTI-CC-5Bxx-CEE01 1x RSTI-CC-5Bxx-CEE01	RSTI-CC-5B5Axxxx RSTI-CC-6B5Axxxx	-	RSTI-SA-PIN	GOST GOST	
		400 to 800	1x RSTI-5B5x 1x RSTI-5B5x	1x RSTI-CC-5B5x 1x RSTI-CC-5B5x	RSTI-CC-5B5Axxxx RSTI-CC-6B5Axxxx	-	RSTI-SA-PIN RSTI-SA-PIN	IEC IEC	
		400 to 800	1x RSTI-5B5x-CEE01 1x RSTI-5B5x-CEE01	1x RSTI-CC-5B5x-CEE01 1x RSTI-CC-5B5x-CEE01	RSTI-CC-5B5Axxxx RSTI-CC-6B5Axxxx	-	RSTI-SA-PIN RSTI-SA-PIN	GOST GOST	
		BM	50 to 240	2x 93-EE 705-6	1x KU 23.2	-	-	-	IEC, GOST, GB/DL
			25 to 240	2x 93-EE 705-6	1x KU 23.2	-	-	-	IEC, GOST, GB/DL
			240	1x 93-EE 705-6	1x 93-EE 719-6	-	-	-	IEC, GOST, GB/DL
			150 to 240	1x 93-EE 705-6	1x 93-EE 719-6	-	-	-	IEC, GOST, GB/DL
	300 to 400	2x 93-EE 715-6	1x KU 23.2	-	-	-	IEC, GOST, GB/DL		
	300 to 400	2x 93-EE 715-6	1x KU 23.2	-	-	-	IEC, GOST, GB/DL		
	GCA	25 to 500	1x CJB10-630	1x CJBK10-630	-	-	-	GB	
		25 to 500	1x CJB20-630	1x CJBK20-630	-	-	-	GB	
	ABB Kabeldon	25 to 630	2x C5E-A 12630-xx 2x C5E-A 24630-xx	1x PC-630-3 1x PC-630-3	-	-	-	IEC, GOST IEC, GOST	
Cellpack		50 to 400	2x CTS 630A 24kV	1x CKS 630A 24kV	CTKSA	-	-	IEC	
	25 to 300	2x CTS 630A 24kV	1x CKS 630A 24kV	CTKSA	-	-	IEC		
	50 to 240	1x CTS 630A 24kV	1x CKS 630A 24kV	CTKSA	-	-	IEC		
	25 to 240	1x CTS 630A 24kV	1x CKS 630A 24kV	CTKSA	-	-	IEC		
Ample	25 to 400	1x AQT3-151630	1x AHT3-151630	AHYSWZ7	-	-	GB/DL GB/DL		
	25 to 500	1x AQT3-241630	1x AHT3-241630	AHYSWZ7	-	-	GB/DL GB/DL		
3	Nexans Euro mold	35 to 300	1x K430TB/G 1x K430TB/G 1x K430TB/G-CSxxx	2x K300PB/G 2x K300PB/G 2x K300PB/G-CSxxx	300SA-5(10)SA 300SA-5(10)SA 300SA-5(10)SA	-	IEC, GOST, GB/DL IEC GOST, GB/DL		
		35 to 300	1x K480TB/G 1x K480TB/G	2x K800PB/G 2x K800PB/G	800SA-10 xxx 800SA-10 xxx	-	IEC, GOST, GB/DL IEC		
		50 to 630	1x K484TB/G	2x K804PB/G	800SA-10-xxx	-	IEC		
		35 to 630	1x K484TB/G	2x K804PB/G	800SA-10-xxx	-	IEC		
		800 to 1200	1x K489TB/G	2x K809PB/G	800SA-10 xxx	-	IEC		
		800 to 1200	1x K489TB/G	2x K809PB/G	800SA-10 xxx	-	IEC		
	nkt cables	25 to 300	1x CB 12-630	2x CC 12-630	CSA 12-x	-	-	IEC	
		25 to 500	2x CB 17,5-630	2x CC 17,5-630	CSA 17,5-x	-	-	GOST, GB/DL	
		25 to 300	1x CB 24-630	2x CC 24-630	CSA 24-x	-	-	IEC, GOST, GB/DL	
		25 to 300	3x CB 12-630	2x CP 630-C	-	-	-	IEC	
		25 to 300	3x CB 24-630	2x CP 630-C	-	-	-	IEC, GOST, GB/DL	
		185 to 500	1x CB 24-1250-2	2x CC 24-1250-2	CSA 17-x	-	-	IEC	
		95 to 500	1x CB 24-1250-2	2x CC 24-1250-2	CSA 24-x	-	-	IEC	
		185 to 500	3x CB 24-1250-2	2x CP 630-C	-	-	-	IEC	
95 to 500		3x CB 24-1250-2	2x CP 630-C	-	-	-	IEC		
400 to 630		1x CB 36-630(1250)	2x CC 36-630(1250)	CSA 12-x	-	-	IEC, GOST, GB/DL		
400 to 630		1x CB 36-630(1250)	2x CC 36-630(1250)	CSA 24-x	-	-	IEC, GOST, GB/DL		
400 to 630		3x CB 36-630(1250)	2x CP 630-M16	-	-	-	IEC, GOST, GB/DL		
400 to 630		3x CB 36-630(1250)	2x CP 630-M16	-	-	-	IEC, GOST, GB/DL		
630 to 1000		1x CB 42-1250-3	2x CC 42-2500-3	CSA 12-x	-	-	IEC		
630 to 1000	1x CB 42-1250-3	2x CC 42-2500-3	CSA 24-x	-	-	IEC			

1) Observe the actual short circuit and current carrying capacity of the cables and sealing ends

2) At a normal current of more than 150 A, cable sealing ends with tin-plated, nickel-plated or silver-plated cable lugs are required

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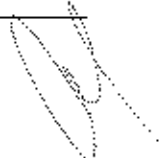
Components

Installation possibilities for cable connections and surge arresters, single-core PE and XLPE-insulated

Number of cables per panel and phase	Make	Conductor cross-section 1) mm²	Cable T-plugs	Coupling inserts / coupling plugs	Surge arresters with coupling inserts	According to standard	
			bolted 12 kV 24 kV	bolted 12 kV 24 kV	Arresters Coupling inserts	additionally	
• Circuit-breaker panel 1250 A 2) • Disconnect panel 1250 A 2) • DBB circuit-breaker panel 1000 A • DBB incoming sectionalizer 2)							
3	Tyco Electronics Raychem	25 to 300	1x RSTI-58xx 1x RSTI-58xxx	2x RSTI-CC-58xx 2x RSTI-CC-58xxx	RSTI-CC-58SAxxxx RSTI-CC-68SAxxxx	IEC IEC	
		25 to 300	1x RSTI-58xx-CEE01 1x RSTI-58xx-CEE01	2x RSTI-CC-58xx-CEE01 2x RSTI-CC-58xx-CEE01	RSTI-CC-58SAxxxx RSTI-CC-68SAxxxx	GOST GOST	
		400 to 600	1x RSTI-595x 1x RSTI-595x	2x RSTI-CC-595x 2x RSTI-CC-595x	RSTI-CC-58SAxxxx RSTI-CC-68SAxxxx	IEC IEC	
		400 to 800	1x RSTI-595x-CEE01 1x RSTI-595x-CEE01	2x RSTI-CC-595x-CEE01 2x RSTI-CC-595x-CEE01	RSTI-CC-58SAxxxx RSTI-CC-68SAxxxx	GOST GOST	
	Cellpack	50 to 240	1x CTS 630A 24kV	2x CTKS 630A 24kV	-	IEC	
		25 to 240	1x CTS 630A 24kV	2x CTKS 630A 24kV	-	IEC	
	4	Nexans Eurobind	35 to 300	1x K430TB/G 1x K430TB/G 1x K430TB/G-CSxxx	3x K300PB/G 3x K300PB/G 3x K300PB/G-CSxxx	-	IEC, GOST, GB/IDL IEC GOST, EN/IDL
			35 to 300	1x K480TB/G 1x K480TB/G	3x K800PB/G 3x K800PB/G	-	IEC IEC
			50 to 630	1x K484TB/G	3x K804PB/G	-	IEC
			35 to 630	1x K484TB/G	3x K804PB/G	-	IEC
			800 to 1200	1x K489TB/G 1x K489TB/G	3x K809PB/G 3x K809PB/G	-	IEC IEC
			nkt cables	185 to 500	1x CB 24-1250-2 1x CB 24-1250-2	3x CC 24-1250-2 3x CC 24-1250-2	-
630 to 1000		1x CR 42-1250-3 1x CR 42-1250-3		3x CC 42-2500-3 3x CC 42-2500-3	-	IEC IEC	
Tyco Electronics Raychem		25 to 300	1x RSTI-58xx 1x RSTI-58xxx	3x RSTI-CC-58xx 3x RSTI-CC-58xxx	-	IEC IEC	
		25 to 300	1x RSTI-58xx-CEE1 1x RSTI-58xx-CEE1	3x RSTI-CC-58xx-CEE1 3x RSTI-CC-58xx-CEE1	-	GOST GOST	
• Circuit-breaker and disconnect panel 2000 A, 2500 A							
2		Nexans Eurobind	35 to 500	2x K30TB/G 2x K430TB/G 2x K430TB/G-CSxxx	-	300SA-5(10)SA 300SA-5(10)SA 300SA-5(10)SA	IEC, GOST, GB/IDL IEC GOST, GB/IDL
			35 to 300	2x K480TB/G 2x K480TB/G	-	800SA-10-xxx 800SA-10-xxx	IEC, GOST, GB/IDL IEC
	50 to 630		2x K484TB/G	-	800SA-10-xxx	IEC	
	35 to 630		2x K484TB/G	-	800SA-10-xxx	IEC	
	Südkabel		50 to 300	2x SET 12	-	MGT 23	IEC, GOST, GB/IDL
			25 to 240	2x SET 24	-	MGT 23	IEC, GOST, GB/IDL
	nkt cables	300 to 500	2x SFHDT 13	-	MHT 23	IEC, GOST, GB/IDL	
		300 to 630	2x SEHDT 23	-	MHT 23	IEC, GOST, GB/IDL	
		25 to 300	2x CB 12-630	-	CSA 12-x	IEC	
		25 to 500	2x CB 17,5-630	-	CSA 17,5-x	GOST, GB/IDL	
	25 to 300	2x CB 24-630	-	CSA 24-x	IEC, GOST, GB/IDL		
	nkt cables	185 to 500	2x CB 24-1250-2	-	CSA 12-x	IEC	
		95 to 500	2x CB 24-1250-2	-	CSA 24-x	IEC	
	400 to 630	2x CB 36-630(1250) 2x CB 36-630(1250)	-	CSA 12 x CSA 24 x	IEC, GOST, GB/IDL IEC, GOST, GB/IDL		
		Tyco Electronics Raychem	25 to 300	2x RSTI-58xx 2x RSTI-58xxx	-	RSTI-CC-58SAxxxx RSTI-CC-68SAxxxx	IEC IEC
	25 to 300		2x RSTI-58xx-CEE01 2x RSTI-58xx-CEE01	-	RSTI-CC-58SAxxxx RSTI-CC-68SAxxxx	GOST GOST	
	400 to 600		2x RSTI-595x 2x RSTI-595x	-	RSTI-CC-58SAxxxx RSTI-CC-68SAxxxx	IEC IEC	
	400 to 800		2x RSTI-595x-CEE01 2x RSTI-595x-CEE01	-	RSTI-CC-58SAxxxx RSTI-CC-68SAxxxx	GOST GOST	
	3M	50 to 240	2x 93-EE 705-6	-	-	IEC, GOST, GB/IDL	
		25 to 240	2x 93-EE 705-6	-	-	IEC, GOST, GB/IDL	
		300 to 400	2x 93-EE 715-6 2x 93-EE 715-6	-	-	IEC, GOST, GB/IDL IEC, GOST, GB/IDL	
	GCA	35 to 500	2x C1010-610	-	-	GB	
		25 to 500	2x C1020-630	-	-	GB	
	ABB Kabeldon	25 to 630	2x CSE-A 12630-xx 2x CSE-A 24630-xx	-	-	IEC, GOST IEC, GOST	
Cellpack		50 to 400	2x CTS 630A 24kV	-	CTKSA	IEC	
	25 to 300	2x CTS 630A 24kV	-	CTKSA	IEC		
Ample	25 to 300	2x AQ13-15/630	-	AH5WZ/	GB/IDL		
	35 to 500	2x AQ13-24/630	-	AH5WZ/	GB/IDL		

1) Observe the actual short-circuit and current carrying capacity of the cables and sealing ends
 2) At a normal current of more than 1150 A, cable sealing ends with tin-plated, nickel-plated or silver-plated cable lugs are required

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Components

Installation possibilities for cable connections and surge arresters, single-core PE and XLPE-insulated

Number of cables per panel and phase	Make	Conductor cross-section 1) mm ²	Cable T-plugs	Coupling inserts / coupling plugs	Surge arresters with coupling inserts	According to standard	
			bolted 12 kV 24 kV	bolted 12 kV 24 kV	Arresters Coupling inserts additionally		
• Circuit-breaker and disconnecter panel 2000 A, 2500 A							
4	Nexans Euro Mold	35 to 300	2x 430TB/G 2x K430TB/G 2x K430TB/G-CSxxx	2x 300PB/G 2x K300PB/G 2x K300PB/G-CSxxx	300SA-5(10)SA 300SA-5(10)SA 300SA-5(10)SA	IEC, GOST, GB/DL IEC GOST, GB/DL	
		35 to 300	2x 480TB/G 2x K480TB/G	2x 800PB/G 2x K800PB/G	800SA-10-xxx 800SA-10-xxx	IEC, GOST, GB/DL IEC	
		50 to 630 35 to 630	2x 464TB/G 2x K464TB/G	2x 804PB/G 2x K804PB/G	800SA-10-xxx 800SA-10-xxx	IEC IEC	
	Süd Kabel	50 to 300 25 to 240	2x SET 12 2x SET 24	2x SEHDK 12.1 2x SEHDK 23.1	MUT 23 MUT 23	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		50 to 300 25 to 240	4x SET 12 4x SET 24	2x KU 23.2 2x KU 23.2	MU1 23 MU1 23	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		300 to 500 300 to 630	4x SEHD 13 4x SEHD 23	2x KU 23 2x KU 23	MLT 23 MLT 23	IEC, GOST, GB/DL IEC, GOST, GB/DL	
	nkl cables	25 to 300	2x CB 12-630 2x CB 17.5-630 2x CB 24-630	2x CC 12-630 2x CC 12-630 2x CC 24-630	CSA 12-x CSA 17.5-x CSA 24-x	IEC GOST, GB/DL IEC, GOST, GB/DL	
		25 to 300	4x CB 12-630 4x CB 24-630	2x CP 630-C 2x CP 630-C	CSA 12-x CSA 24-x	IEC IEC, GOST, GB/DL	
		185 to 500 95 to 500	2x CB 24-1250-2 2x CB 24-1250-2	2x CC 24-1250-2 2x CC 24-1250-2	CSA 12-x CSA 24-x	IEC IEC	
		185 to 500 95 to 500	4x CB 24-1250-2 4x CB 24-1250-2	2x CP 630-C 2x CP 630-C	CSA 12-x CSA 24-x	IEC IEC	
		400 to 630	2x CB 36-630(1250) 2x CB 36-630(1250)	2x CC 36-630(1250) 2x CC 36-630(1250)	CSA 12-x CSA 24-x	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		400 to 630	4x CB 36-630(1250) 4x CB 36-630(1250)	2x CP 630-M16 2x CP 630-M16	CSA 12-x CSA 24-x	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		Tyco Electronics Raychem	25 to 300	2x RSTI-58xx 2x RSTI-58xx	2x RSTI-CC-58xx 2x RSTI-CC-58xx	RSTI-CC-585Axxxx RSTI-CC-685Axxxx	IEC IEC
			75 to 300	2x RSTI-58xx-CEE01 2x RSTI-58xx-CEE01	2x RSTI-CC-58xx-CEE01 2x RSTI-CC-58xx-CEE01	RSTI-CC-585Axxxx RSTI-CC-585Axxxx	GOST GOST
			400 to 800	2x RSTI-595x 2x RSTI-595x	2x RSTI-CC-595x 2x RSTI-CC-595x	RSTI-CC-585Axxxx RSTI-CC-685Axxxx	RSTI-SA-PIN RSTI-SA-PIN
			400 to 800	2x RSTI-595x-CEE01 2x RSTI-595x-CEE01	2x RSTI-CC-595x-CEE01 2x RSTI-CC-595x-CEE01	RSTI-CC-585Axxxx RSTI-CC-685Axxxx	RSTI-SA-PIN RSTI-SA-PIN
	3M	50 to 240 25 to 240	4x 93-EE 705-6 4x 93-EE 705-6	2x KU 23.2 2x KU 23.2	— —	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		240 150 to 240	2x 93-EE 705-6 2x 93-EE 705-6	2x 93-EE 718-6 2x 93-EE 718-6	— —	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		300 to 400	4x 93-EE 715-6 4x 93-EE 715-6	2x KU 23.2 2x KU 23.2	— —	IEC, GOST, GB/DL IEC, GOST, GB/DL	
		GCA	35 to 500	2x CJB10-630 2x CJB20-630	2x CJBK10-630 2x CJBK20-630	— —	GA GA
	ABB Kabedon		25 to 630	4x CSE-A 12630-xx 4x CSE-A 24630-xx	2x PC 630-3 2x PC 630-3	— —	IEC, GOST IEC, GOST
		Collpack	50 to 400 25 to 300	4x CTS 630A 24kV 4x CTS 630A 24kV	2x CTS 630A 24kV 2x CTS 630A 24kV	— —	IEC IEC
	50 to 240 25 to 240		2x CTS 630A 24kV 2x CTS 630A 24kV	2x CTK5 630A 24kV 2x CTK5 630A 24kV	CTKSA CTKSA	IEC IEC	
	Ample	25 to 400 15 to 500	2x AQT3-15/630 2x AQT3-24/630	2x AHT3-15/630 2x AHT3-24/630	AHY5WZ / AHY5WZ /	GB/DL GB/DL	
Nexans Euro Mold		35 to 300	2x 430TB/G 2x K430TB/G 2x K430TB/G-CSxxx	4x 300PB/G 4x K300PB/G 4x K300PB/G-CSxxx	300SA 5(10)SA 300SA 5(10)SA 300SA 5(10)SA	IEC, GOST, GB/DL IEC GOST, GB/DL	
	35 to 300	2x 480TB/G 2x K480TB/G	4x 800PB/G 4x K800PB/G	800SA-10-xxx 800SA-10-xxx	IEC, GOST, GB/DL IEC		
	50 to 630 35 to 630	2x 464TB/G 2x K464TB/G	4x 804PB/G 4x K804PB/G	800SA-10-xxx 800SA-10-xxx	IEC IEC		

1) Observe the actual short-circuit and current carrying capacity of the cables and sealing ends

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Components

Installation possibilities for cable connections and surge arresters, single-core PE and XLPE-insulated

Number of cables per panel and phase	Make	Conductor cross-section 1)	Cable T-plugs		Coupling inserts / coupling plugs		Surge arresters with coupling inserts		According to standard
			bolted	12 kV	bolted	12 kV	Arresters	Coupling Inserts	
		mm²		24 kV		24 kV		additionally	GOST for Russia & GUS GB/DL for China
- Circuit-breaker and disconnecter panel 2000 A, 2500 A									
6	nkt cables	25 to 300	2x CB 12-630	4x CC 12-630	CSA 12-x	-	-	IEC	
		25 to 500	2x CB 17.5-630	4x CC 12-630	CSA 17.5-x	-	-	GOST, GB/DL	
		25 to 300	2x CB 24-630	4x CC 24-630	CSA 24-x	-	-	IEC, GOST, GB/DL	
		25 to 300	6x CB 12-630	4x CP 630-C	-	-	-	IEC	
		25 to 300	6x CB 24-630	4x CP 630-C	-	-	-	IEC, GOST, GB/DL	
		185 to 500	7x CB 24-1250-2	4x CC 24-1250-2	CSA 17-x	-	-	IEC	
		95 to 500	2x CB 24-1250-2	4x CC 24-1250-2	CSA 24-x	-	-	IEC	
		185 to 500	6x CB 24-1250-2	4x CP 630-C	-	-	-	IEC	
		95 to 500	6x CB 24-1250-2	4x CP 630-C	-	-	-	IEC	
		400 to 630	2x CB 36-630(1250) 2x CB 36-630(1250)	4x CC 36-630(1250) 4x CC 36-630(1250)	CSA 12-x CSA 24-x	-	-	-	IEC, GOST, GB/DL IEC, GOST, GB/DL
	Tyco Electronics Raychem	25 to 300	2x RSTI-5Bxx	4x RSTI-CC-5Bxx	RSTI-CC-6B5Axxxx	RSTI-SA-PIN	-	IEC	
		25 to 300	2x RSTI-5Bxx	4x RSTI-CC-5Bxx	RSTI-CC-6B5Axxxx	RSTI-SA-PIN	-	IEC	
		25 to 300	2x RSTI-5Bxx-CEE01	4x RSTI-CC-5Bxx-CEE01	RSTI-CC-6B5Axxxx	RSTI-SA-PIN	-	GOST	
		25 to 300	2x RSTI-5Bxx-CEE01	4x RSTI-CC-5Bxx-CEE01	RSTI-CC-6B5Axxxx	RSTI-SA-PIN	-	GOST	
		400 to 630	2x RSTI-595x	4x RSTI-CC-595x	RSTI-CC-6B5Axxxx	RSTI-SA-PIN	-	IEC	
		400 to 630	2x RSTI-595x	4x RSTI-CC-595x	RSTI-CC-6B5Axxxx	RSTI-SA-PIN	-	IEC	
	Cellpack	50 to 240	2x CTS 630A 24kV	4x CTK5 630A 24kV	-	-	-	IEC	
		25 to 240	2x CTS 630A 24kV	4x CTK5 630A 24kV	-	-	-	IEC	
	8	Nexans Euromold	35 to 300	2x K430TB/G	6x K300PB/G	-	-	-	IEC, GOST, GB/DL
			35 to 300	2x K430TB/G	6x K300PB/G	-	-	-	IEC
35 to 300			2x K430TB/G-CSxxx	6x K300PB/G-CSxxx	-	-	-	GOST, GB/DL	
35 to 300			2x K480TB/G	6x K800PB/G	-	-	-	IEC	
35 to 300			2x K480TB/G	6x K800PB/G	-	-	-	IEC	
nkt cables		185 to 500	2x CB 24-1250-2	6x CC 24-1250-2	-	-	-	IEC	
		95 to 500	2x CB 24-1250-2	6x CC 24-1250-2	-	-	-	IEC	
Tyco Electronics Raychem		25 to 300	2x RSTI-5Bxx	6x RSTI-CC-5Bxx	-	-	-	IEC	
		25 to 300	2x RSTI-5Bxx	6x RSTI-CC-5Bxx	-	-	-	IEC	
		25 to 300	2x RSTI-5Bxx-CEE1	6x RSTI-CC-5Bxx-CEE1	-	-	-	GOST	
25 to 300	2x RSTI-5Bxx-CEE1	6x RSTI-CC-5Bxx-CEE1	-	-	-	GOST			

1) Observe the actual short-circuit and current carrying capacity of the cables and sealing ends.

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Components

Installation possibilities for cable connections and surge arresters, three-core PE and XLPE-insulated

Number of cables per panel and phase	Make	Conductor cross-section 1)	Cable T-plugs		Coupling inserts / coupling plugs		Surge arresters with coupling inserts		According to standard
			bolted 12 kV 24 kV	bolted 12 kV 24 kV	Arresters	Coupling inserts additionally			
1)	Nexans Eurocord	35 to 300	1x 430TB/G	---	1x trifurcation	3005A-5(10)SA	IEC, GOST, GB/DL IEC		
			1x K430TB/G 1x K430TB/G-CSxxx	---	1x trifurcation 1x trifurcation	3005A-5(10)SA 3005A-5(10)SA			
	50kabel	35 to 300	1x 480TB/G	---	1x trifurcation	8005A-10-xxx	IEC, GOST, GB/DL IEC		
			1x K480TB/G	---	1x trifurcation	8005A-10-xxx			
	elit cables	25 to 300	1x SET 12	---	1x trifurcation SAT	MJ1: 23	IEC, GOST, GB/DL IEC, GOST, GB/DL		
			1x SET 24	---	1x trifurcation SAT	MJ1: 23			
			1x CB 12-630	---	1x trifurcation ATS	CSA 12-x			
			1x CB 17.5-630	---	1x trifurcation ATS	CSA 17.5-x			
	Tyco Electronics Raychem	25 to 300	1x CB 24-630	---	1x trifurcation ATS	CSA 24-x	IEC, GOST, GB/DL IEC, GOST, GB/DL		
			1x CR 24-1250-2	---	1x trifurcation ATS	CSA 12-x			
	3M	25 to 300	1x CR 24-1250-2	---	1x trifurcation ATS	CSA 24-x	IEC IEC		
			1x RSTI 58xx	---	1x trifurcation RSTI-TRF0x	RSTI-CC-58SAxxx			
	GCA	25 to 300	1x RSTI 58xx-CLE01	---	1x trifurcation RSTI-TRF0x	RSTI-CC-68SAxxx	GOST GOST		
			1x RSTI 58xx-CLE01	---	1x trifurcation RSTI-TRF0x	RSTI-CC-68SAxxx			
	ABB (Kabeldon)	50 to 240	1x 93-EE 705-6	---	1x trifurcation	---	IEC, GOST, GB/DL IEC, GOST, GB/DL		
			1x 93-EE 715-6	---	1x trifurcation	---			
	Cellpack	25 to 240	1x 93-EE 715-6	---	1x trifurcation	---	IEC, GOST, GB/DL IEC, GOST, GB/DL		
			1x 93-EE 715-6	---	1x trifurcation	---			
	Ample	35 to 500	1x C/B 10-630	---	1x trifurcation	---	IEC, GOST, GB/DL IEC, GOST, GB/DL		
			1x C/B 20-630	---	1x trifurcation	---			
	Cellpack	25 to 300	1x CSE-A 12610-xx	---	1x trifurcation	---	IEC, GOST IEC, GOST		
			1x CSE-A 24630-xx	---	1x trifurcation	---			
	Ample	50 to 400	1x CTS 630A 24kV	---	1x trifurcation	CTKSA	IEC IEC		
			1x CTS 630A 24kV	---	1x trifurcation	CTKSA			
Ample	25 to 400	1x AQT3 15/630	---	1x trifurcation	AHY5WZ7	GB/DL GB/DL			
		1x AQT3 24/630	---	1x trifurcation	AHY5WZ7				

1) Observe the actual short-circuit and current carrying capacity of the cables and sealing ends

2) At a normal current of more than 1150 A, cable sealing ends with tin-plated, nickel-plated or silver-plated cable lugs are required

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Components

Installation possibilities for cable connections and surge arresters, three-core PE and XLPE-insulated

Number of cables per panel and phase	Make	Conductor cross-section ¹⁾ mm ²	Cable T-plugs	Coupling inserts/ coupling plugs	Distribution lid for three-core cables	Surge arresters	According to standard
			bolted 12 kV 24 kV	bolted 12 kV 24 kV			
2	Nexans Euromold	35 to 300	1x 430TB/G 1x K430TB/G 1x K430TB/G-CSxxx	1x 300PB/G 1x K300PB/G 1x K300PB/G-CSxxx	2x trifurcation 2x trifurcation 2x trifurcation	300SA-5(10)SA 300SA-5(10)SA 300SA-5(10)SA	IEC, GOST, GB/DL IEC GOST, GB/DL
		35 to 300	1x 480TB/G 1x K480TB/G	1x 300PB/G 1x K300PB/G	2x trifurcation 2x trifurcation	300SA-10-xxx 300SA-10-xxx	IEC, GOST, GB/DL IEC
nkt cables	Südkaebel	50 to 300 25 to 240	1x SET 12 1x SET 24	1x SEHDK 13.1 1x SEHDK 25.1	2x trifurcation SA1 2x trifurcation SAT	- -	IEC, GOST, GB/DL IEC, GOST, GB/DL
		50 to 300 25 to 240	2x SET 12 2x SET 24	1x KU 23.2 1x KU 23.2	2x trifurcation SA1 2x trifurcation SAT	- -	IEC, GOST, GB/DL IEC, GOST, GB/DL
	25 to 300 25 to 500 25 to 300	1x CB 12-630 1x CB 17.5-630 1x CB 24-630	1x CC 12-630 1x CC 17.5-630 1x CC 24-630	2x trifurcation AIS 2x trifurcation AIS 2x trifurcation AIS	CSA 12-x CSA 17.5-x CSA 24-x	IEC GOST, GB/DL IEC, GOST, GB/DL	
	25 to 300	2x CB 12-630 2x CB 24-630	1x CP 630-C 1x CP 630-C	2x trifurcation ATS 2x trifurcation ATS	CSA 12-x CSA 24-x	IEC IEC, GOST, GB/DL	
	185 to 500 95 to 500	1x CB 24-1250-2 1x CB 24-1250-2	1x CC 24-1250-2 1x CC 24-1250-2	2x trifurcation ATS 2x trifurcation ATS	CSA 12-x CSA 24-x	IEC IEC	
	185 to 500 95 to 500	2x CB 24-1250-2 2x CB 24-1250-2	1x CP 630-C 1x CP 630-C	2x trifurcation ATS 2x trifurcation ATS	CSA 12-x CSA 24-x	IEC IEC	
	Tycos Electronics Raychem	25 to 300	1x RST1-5Bxx 1x RST1-5Bxx	1x RST1-CC-5Bxx 1x RST1-CC-5Bxx	2x trifurcation RST1-TRF0x 2x trifurcation RST1-TRF0x	RST1-CC-5B5Axxxx RST1-CC-6B5Axxxx	IEC IEC
		25 to 300	1x RST1-5Bxx-CEE01 1x RST1-5Bxx-CEE01	1x RST1-CC-5Bxx-CEE01 1x RST1-CC-5Bxx-CEE01	2x trifurcation RST1-TRF0x 2x trifurcation RST1-TRF0x	RST1-CC-5B5Axxxx RST1-CC-6B5Axxxx	GOST GOST
	3M	50 to 240 25 to 240	2x 93-CC 705-6 2x 93-EE 705-6	1x KU 23.2 1x KU 23.2	2x trifurcation 2x trifurcation	- -	IEC, GOST, GB/DL IEC, GOST, GB/DL
		240 150 to 240	1x 93-CC 705-6 1x 93-EE 705-6	1x 93-CC 718-6 1x 93-EE 718-6	2x trifurcation 2x trifurcation	- -	IEC, GOST, GB/DL IEC, GOST, GB/DL
		300 to 400	2x 93-EE 715-6 2x 93-EE 715-6	1x KU 23.2 1x KU 23.2	2x trifurcation 2x trifurcation	- -	IEC, GOST, GB/DL IEC, GOST, GB/DL
		25 to 500 25 to 500	1x CJB10-630 1x CJB20-630	1x CJBK10-630 1x CJBK20-630	2x trifurcation 2x trifurcation	- -	GB GB
ABB Kabeldon	25 to 300	2x CSE-A 12630-xx 2x CSE-A 24630-xx	PC 630-3 PC 630-3	2x trifurcation 2x trifurcation	- -	IEC, GOST IEC, GOST	
	50 to 400 25 to 300	2x CTS 630A 24kV 2x CTS 630A 24kV	1x CKS 630A 24kV 1x CKS 630A 24kV	2x trifurcation 2x trifurcation	- -	IEC IEC	
Ample	50 to 240 25 to 240	1x CTS 630A 24kV 1x CTS 630A 24kV	1x CTKS 630A 24kV 1x CTKS 630A 24kV	2x trifurcation 2x trifurcation	CTKSA CTKSA	IEC IEC	
	25 to 400 35 to 500	1x AQT3-15/630 1x AQT3-24/630	1x AHT3-35/630 1x AHT3-24/630	2x trifurcation 2x trifurcation	AHYSWZ7 AHYSWZ7	GB/DL GB/DL	
3	Nexans Euromold	35 to 300	1x 430TB/G 1x K430TB/G 1x K430TB/G-CSxxx	2x 300PB/G 2x K300PB/G 2x K300PB/G-CSxxx	3x trifurcation 3x trifurcation 3x trifurcation	- - -	IEC, GOST, GB/DL IEC GOST, GB/DL
		35 to 300	1x 480TB/G 1x K480TB/G	2x 300PB/G 2x K300PB/G	3x trifurcation 3x trifurcation	300SA-10-xxx 300SA-10-xxx	IEC, GOST, GB/DL IEC
	nkt cables	25 to 300 25 to 500 25 to 300	1x CB 12-630 1x CB 17.5-630 1x CB 24-630	2x CC 12-630 2x CC 17.5-630 2x CC 24-630	3x trifurcation AIS 3x trifurcation AIS 3x trifurcation AIS	- - -	IEC GOST, GB/DL IEC, GOST, GB/DL
		185 to 500 95 to 500	1x CB 24-1250-2 1x CB 24-1250-2	2x CC 24-1250-2 2x CC 24-1250-2	3x trifurcation ATS 3x trifurcation ATS	- -	IEC IEC
		25 to 300	1x RST1-5Bxx 1x RST1-5Bxx	2x RST1-CC-5Bxx 2x RST1-CC-5Bxx	3x trifurcation RST1-TRF0x 3x trifurcation RST1-TRF0x	- -	IEC IEC
		25 to 300	1x RST1-5Bxx-CEE01 1x RST1-5Bxx-CEE01	2x RST1-CC-5Bxx-CEE01 2x RST1-CC-5Bxx-CEE01	3x trifurcation RST1-TRF0x 3x trifurcation RST1-TRF0x	- -	GOST GOST
	Cellpack	50 to 400 25 to 300	1x CTS 630A 24kV 1x CTS 630A 24kV	2x CKS 630A 24kV 2x CKS 630A 24kV	3x trifurcation 3x trifurcation	- -	IEC IEC

1) Observe the actual short-circuit end current carrying capacity of the cables and sealing ends

2) At a normal current of more than 1150 A, cable sealing ends with tin-plated, nickel-plated or silver-plated cable lugs are required

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Components

Installation possibilities for cable connections and surge arresters, three-core PE and XLPE-insulated, paper-insulated non-draining cables and paper-insulated mass-impregnated cables

Number of cables per panel and phase	Make	Conductor cross-section ¹⁾ mm ²	Cable T-plugs	Coupling inserts / coupling plugs	Distribution kit for three-core cables	Surge arresters	According to standard
			bolted 12 kV 24 kV	bolted 12 kV 24 kV		additionally	GOST for Russia & GUS GB/DL for China

Three-core paper-insulated non-draining cables

- Circuit-breaker panel 630 A, 1000 A • Switch-disconnector panel 630 A • Disconnecter panel 1000 A • Ring-main panel 630 A
- Contactor panel • Circuit-breaker panel 1250 A²⁾ • Disconnecter panel 1250 A²⁾ • DBB circuit-breaker panel 1000 A
- DBB incoming sectionalizer²⁾

1	Nexans	35 to 300	1x 430TR/G	—	1x trifurcation MIND	300SA-5(10)SA	IEC, GOST, GB/DL
	Euromold	—	—	—	—	—	—
	nkt cables	25 to 120	1x SÜEV10-120CU-xxxx-CB24	—	—	CSA 12-x	IEC, GOST, GB/DL
		150 to 240	3x SÜEV10-240CU-xxxx-CB24	—	—	CSA 12-x	IEC, GOST, GB/DL
2	Nexans	35 to 300	1x 430TR/G	1x 300PB/G	2x trifurcation MIND	—	IEC, GOST, GB/DL
	Euromold	—	—	—	—	—	—
	nkt cables	25 to 120	1x SÜEV10-120CU-xxxx-CB24	1x SÜEV10-120CU-xxxx-CC24	—	CSA 12-x	IEC, GOST, GB/DL
		150 to 240	1x SÜEV10-240CU-xxxx-CB24	1x SÜEV10-240CU-xxxx-CC24	—	CSA 12-x	IEC, GOST, GB/DL
3	Nexans	35 to 300	1x 430TR/G	2x 300PB/G	3x trifurcation MIND	—	IEC, GOST, GB/DL
	Euromold	—	—	—	—	—	IEC, GOST, GB/DL

Three-core paper-insulated mass-impregnated cables

- Circuit-breaker panel 630 A, 1000 A • Switch-disconnector panel 630 A • Disconnecter panel 1000 A • Ring-main panel 630 A
- Contactor panel • Circuit-breaker panel 1250 A²⁾ • Disconnecter panel 1250 A²⁾ • DBB circuit-breaker panel 1000 A
- DBB incoming sectionalizer²⁾

1	nkt cables	25 to 120	1x SÜEV10-120CU-xxxx-CB24	—	—	CSA 12-x	IEC, GOST, GB/DL
		150 to 240	1x SÜEV10-240CU-xxxx-CB24	—	—	CSA 12-x	IEC, GOST, GB/DL
2	nkt cables	25 to 120	1x SÜEV10-120CU-xxxx-CB24	1x SÜEV10-120CU-xxxx-CC24	—	CSA 12-x	IEC, GOST, GB/DL
		150 to 240	1x SÜEV10-240CU-xxxx-CB24	1x SÜEV10-240CU-xxxx-CC24	—	CSA 12-x	IEC, GOST, GB/DL

1) Observe the actual short-circuit and current carrying capacity of the cables and sealing ends

2) At a nominal current of more than 1150 A, cable sealing ends with tin-plated, nickel-plated or silver-plated cable lugs are required

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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-load 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).

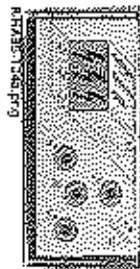
CAPDIS-S2+

- 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



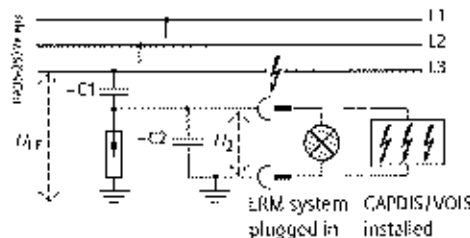
Plug-in voltage indicator per phase at the panel front



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
- $U_U = U_N / \sqrt{3}$ during rated operation in the three-phase system
- $U_U = U_N =$ Voltage at the capacitive interface of the switchgear or at the voltage indicator

Symbols shown

	VOIS+, VOIS R+			CAPDIS-S1+			CAPDIS-S2+			Symbol
	L1	L2	L3	L1	L2	L3	L1	L2	L3	
A0							000			LED
A1	⚡	⚡	⚡	⚡	⚡	⚡	⚡	⚡	⚡	LED
A2										LED
A3		⚡	⚡	⚡	⚡			⚡	⚡	LED
A4				⚡	⚡	⚡	⚡	⚡	⚡	LED
A5				000			000			LED
A6				000			000			LED
A7				000			000			LED
A8							000			LED

CAPDIS-S2+: The red and green LEDs show the state of the relay contacts
 ○ LED doesn't light up
 ● LED lights up
 ⊖ = Operating voltage

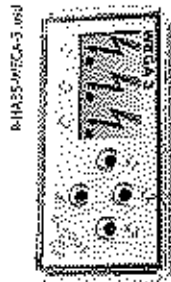
- A0 CAPDIS-S2+: Operating voltage not present
- A1 Operating voltage present
- A2 - Operating voltage not present
 - For CAPDIS-S2+: Auxiliary power not present
- A3 Failure in phase L1, operating voltage at L2 and L3 (for CAPDIS-Sx: also earth-fault indication)
- A4 Voltage (not operating voltage) 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

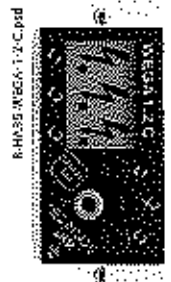
- Display indication "A1" to "A5"
- Integrated repeat test of the interface (self-monitoring)
- With integrated 3-phase LRM test socket for phase comparison.



Integrated voltage indicator
WEGA 3

WEGA 1.2 C, WEGA 1.2 C Vario

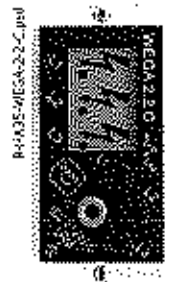
- Display indication "A1" to "A6" (see legend)
- Maintenance-free
- Integrated repeat test of the interface (self-monitoring)
- With integrated function test (without auxiliary power) by pressing the "Display Test" pushbutton
- With integrated 3-phase LRM test socket for phase comparison
- Without integrated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



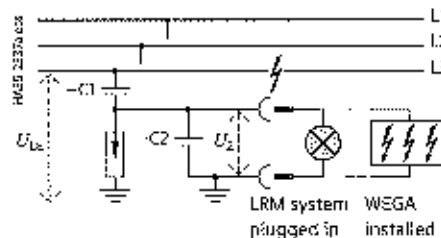
Integrated voltage detecting system
WEGA 1.2 C, WEGA 1.2 C Vario

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 detecting system
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
- $U_{LE} = I_N \cdot \sqrt{3}$ during rated operation in the three-phase system
- $U_2 = U_A$ - Voltage at the capacitive interface of the switchgear or at the voltage indicator

Symbols shown

	WEGA 3			WEGA 1.2 C			WEGA 2.2 C			Legend
	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

U₀ display gray: not illuminated
U₀ 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

⚡ = 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



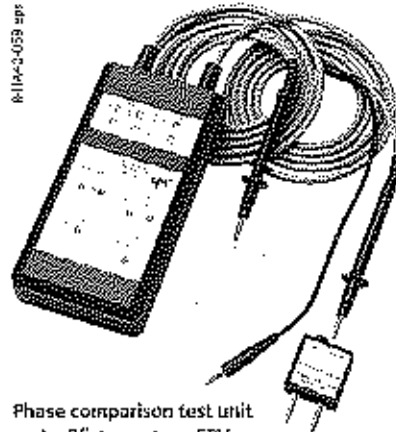
Components

Indicating and measuring equipment

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



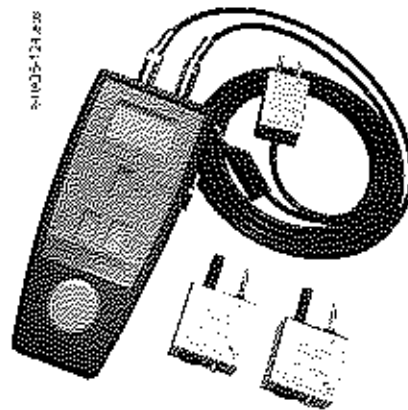
Phase comparison test unit make Pfisterer, type EPV as combined test unit (HR and LRM) for:

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



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

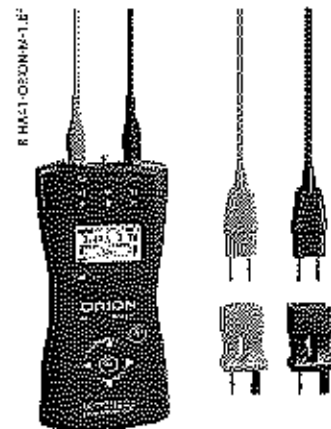
- Phase comparison
- Interface testing at the switchgear
- Voltage detection
- Integrated self-test
- Indication via LED and acoustic alarm
- Phase sequence indicator



Phase comparison test unit make 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 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 25 μ A
- Measurement of phase angle from -180° to $+180^\circ$
- Measurement of harmonics up to 40th harmonic
- Securing the measured values via PC software (ORION explorer) and USB.

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Components

Indicating and measuring equipment

Ready-for-service Indicator

Features

- Self-monitoring; easy to read
- Independent of temperature and pressure variations
- Independent of the site altitude
- Only responds to changes in gas density
- **Option:** Alarm switch "INO + INC" for remote electrical indication.

Mode of operation

For the ready-for-service indicator, a gas-tight measurement box is installed inside the switchgear vessel.

A coupling magnet, which is fitted to the bottom end of the measurement box, transmits its position to an outside armature through the non-magnetizable switchgear vessel. This armature moves the ready-for-service indicator of the switchgear.

While changes in the gas density during the loss of gas, which are decisive for the dielectric strength, are displayed, temperature-dependent changes in the gas pressure are not.

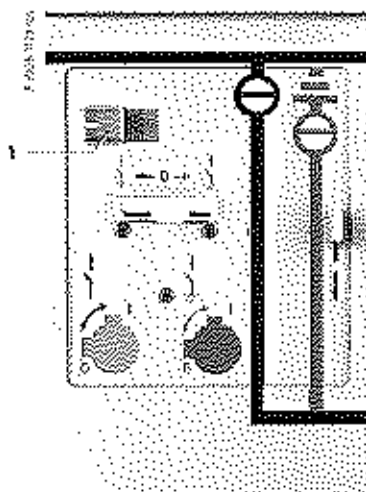
The gas in the measurement box has the same temperature as that in the switchgear.

The temperature effect is compensated via the same pressure change in both gas volumes.

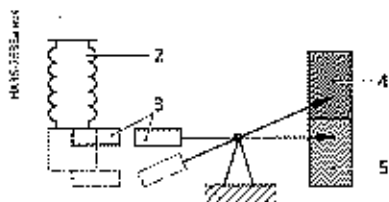
Low-voltage compartment

- 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 (1361 mm instead of 761 mm) possible.

Gas monitoring



Control board (detail) with red / green ready-for-service indicator



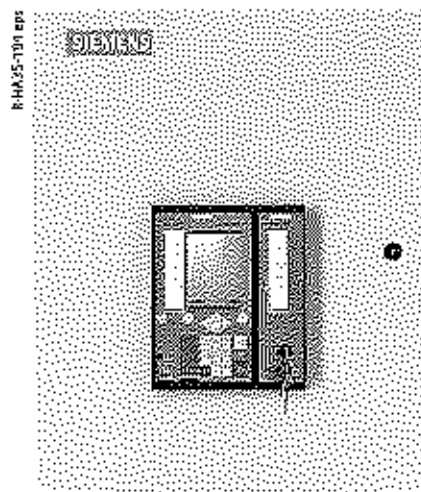
Stainless-steel vessel filled with SF₆ gas, relative pressure 50 kPa at 20 °C

Ready for-service indicator

Principle of operation of gas monitoring with ready-for-service indicator

- 1 Ready for-service indicator
- 2 Measurement box
- 3 Magnetic coupling
- 4 Red indication: not ready for service
- 5 Green indication: Ready for service

Low-voltage compartment



Low-voltage compartment with SIPROTEC 5 75J86 (example)

For description of the SIPROTEC 5 protection devices, see page 67 and 68

AskTec

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Protection, control, measuring and monitoring equipment

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 /U187
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	7UM50; 7XR, 3PP, 7KG61, 7XT, 4NC
Rapid changeover device	7VU683
Bay controllers	6MD61, 6MD63
	6MD662, 663, 664
UIF relay	6MU525
UIF relay	7RW600
Transient earth-fault relay	7SN600
Breaker failure protection	7SV600
Automatic reclosing, synchrocheck	7VK61
High impedance protection	7VH60

Components

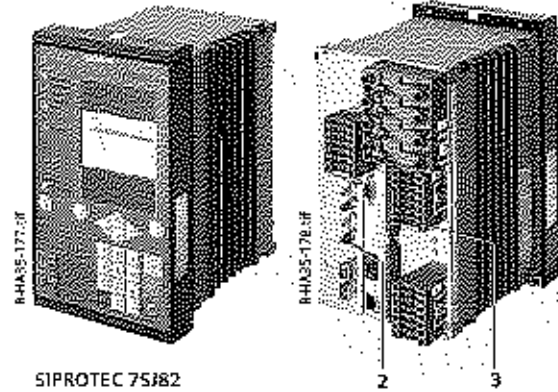
Protection, control, measuring and monitoring equipment

SIPROTEC 5 device series

- Powerful automation with graphical CFC (Continuous Function Chart)
- Secure serial protection data communication, also over large distances and all available physical media (fiber-optic cable, 2-wire connections and communication networks)
- Recognition of static and transient earth faults (passing contact function in resonant-earthed and isolated systems)
- Measurement of operational values
- Phasor Measurement Unit (PMU) for synchrophasor measured values and IEEE C37.118 protocol
- Powerful fault recording
- Control of switching devices.

Overcurrent protection device SIPROTEC 7SJ82

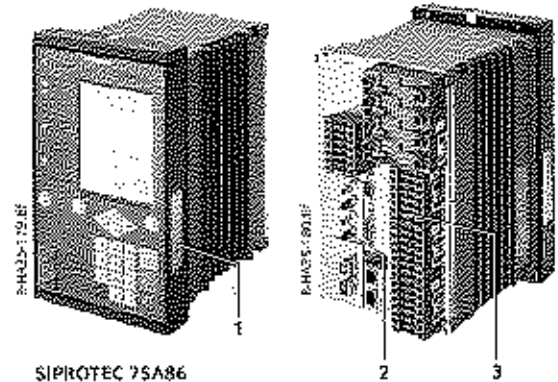
- Directional and non-directional time-overcurrent protection with additional functions
- Time optimization of the tripping times by directional comparison and protection data communication
- Frequency protection and rate-of-frequency-change protection for load shedding applications
- Overvoltage and undervoltage protection in all required variations
- Power protection, configurable as active or reactive power protection
- Control, synchrocheck and system interlocking
- Firmly integrated electrical Ethernet port J for DIGSI
- Complete IEC 61850 (reporting and GOOSE) via integrated port J
- Two optional, pluggable communication modules usable for different and redundant protocols (IEC 61850, IEC 60870-5-103, DNP3 (serial+TCP), Modbus RTU Slave, protection data communication).



SIPROTEC 7SJ82

Distance protection SIPROTEC 7SA86

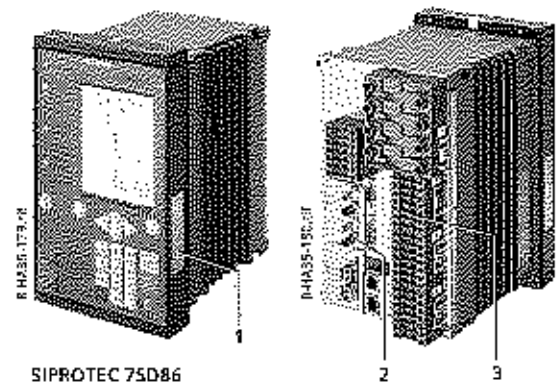
- Line protection for all voltage levels with 3-pole tripping
- Very short tripping time
- Selective protection of overhead lines and cables with single- and multi-ended infeeds
- Time-graded backup protection to differential protection relays
- Suitable for radial, ring-shaped, or any type of meshed systems of any voltage level with earthed, resonant-earthed or isolated neutral point
- Main protection function: 6-system distance protection
- Detection of current transformer saturation for fast tripping with high accuracy at the same time.



SIPROTEC 7SA86

Differential protection SIPROTEC 7SD86

- Line protection for all voltage levels with 3-pole tripping
- Phase-selective protection of overhead lines and cables with single- and multi-ended infeeds of all lengths with up to 6 line ends
- Transformers and shunt reactors within the protection zone are possible
- Suitable for radial, ring-shaped, or any type of meshed systems of any voltage level with earthed, resonant-earthed or isolated neutral point
- Protection of lines with capacitive series compensation
- Directional backup protection and various additional functions.



SIPROTEC 7SD86

- 1 Modularly expandable
- 2 Pluggable and retrofitable communication ports
- 3 Pluggable current and voltage terminal blocks

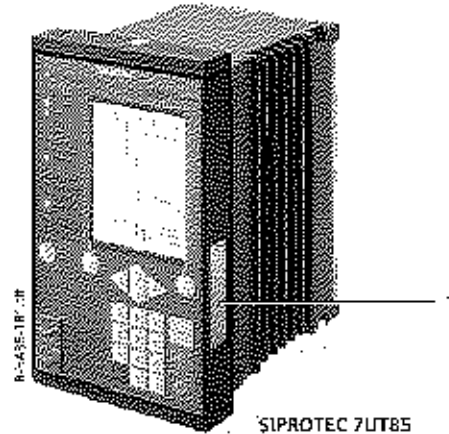
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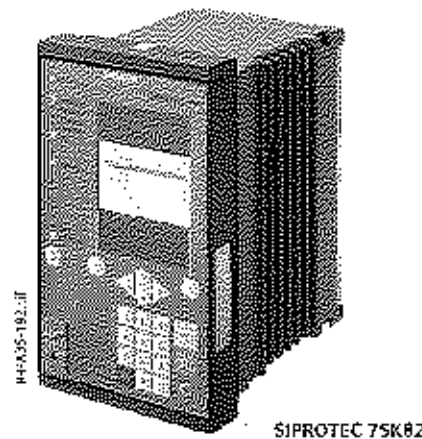
Transformer differential protection SIPROTEC 7UT85

- Transformer differential protection for two-winding transformers with versatile additional protection functions
- Universal utilization of the permissible measuring points
- Flexible adjustment to the transformer vector group, controlling of making and overexcitation processes, secure performance in case of current transformer saturation with different saturation degrees.
- Protection of standard power transformers and auto-transformers
- Increased sensitivity in case of earth short-circuits close to the neutral point by means of a separate earth-fault differential protection
- Additional current and voltage inputs can be provided for standard protection functions such as overcurrent, voltage, frequency, etc.
- In the standard version, two communication modules can be plugged in, and different protocols can be used (IEC 61850, IEC 60870-5-103, DNP3 (serial, TCP), Modbus RTU Slave).



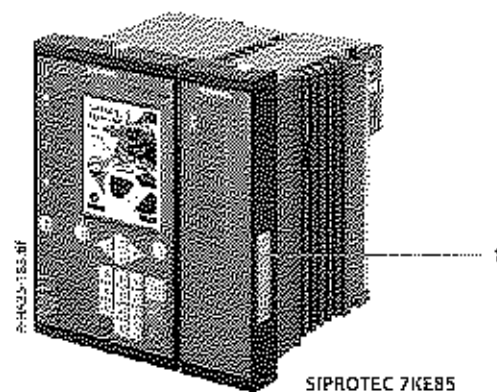
Motor protection SIPROTEC 7SK82

- Motor protection functions; start-time supervision, thermal overload protection for stator and rotor, restart inhibit, unbalanced load protection, load-jump protection
- Stator and bearing temperature monitoring via a temperature sensor with an external RTD box
- Directional and non-directional time-overcurrent protection (short-circuit protection) with additional functions
- Overvoltage and undervoltage protection in all required variations
- Power protection, configurable as active or reactive power protection
- Control, synchrocheck and switchgear interlocking system
- Firmly integrated electrical Ethernet port J for DIGS
- Complete IEC 61850 (reporting and GOOSE) via integrated port J
- Two optional, pluggable communication modules usable for different and redundant protocols (IEC 61850, IEC 60870-5-103, DNP3 (serial+TCP), Modbus RTU Slave, protection data communication).



Digital fault recorder SIPROTEC 7KE85

- Fast-scan recorder
- Up to 2 slow scan recorders
- Up to 5 continuous recorders
- Usable as Phasor Measurement Unit (PMU) according to IEEE C37.118 Standard
- Transfer of recordings and triggering via IEC 61850
- Variable sampling rates programmable between 1 kHz – 16 kHz
- No-loss data compression
- Time synchronization via IRIG-B, DCF77 and SNTP
- Free mapping of measured values to the individual recorders
- Free combination of measuring groups for power calculation
- Quality bits for displaying the momentary channel quality
- The trigger functions of a function block are the fundamental value, r.m.s. value, zero-sequence, positive-sequence, negative-sequence system, Σ active, Σ reactive and Σ apparent power
- Level trigger and gradient trigger for each trigger function
- Flexible cross and network trigger
- Creation of trigger functions with the graphical automation editor CFC (Continuous Function Chart)
- Trigger functions by combination of single signals, double signals, analog values, binary signals, Bool signals and GOOSE messages.



1 Modularly expandable

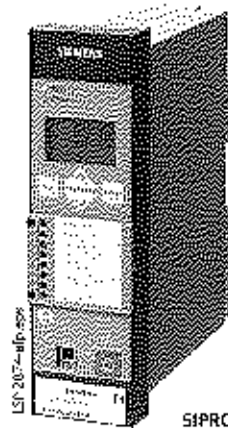
Components

Protection, control, measuring and monitoring equipment

SIPROTEC Compact series

Overcurrent protection SIPROTEC 7SJ80

- Pluggable current and voltage terminals
- Binary input thresholds settable using DIGSI (3 stages)
- Secondary current transformer values (1A/5A) settable using DIGSI
- 9 programmable function keys
- 6-line display
- Buffer battery exchangeable from the front
- USB front port
- 2 additional communication ports
- IEC 61850 with integrated redundancy (electrical or optical)
- Relay-to-relay communication through Ethernet with IEC 61850 GOOSE
- Millisecond-accurate time synchronization through Ethernet with SNTP

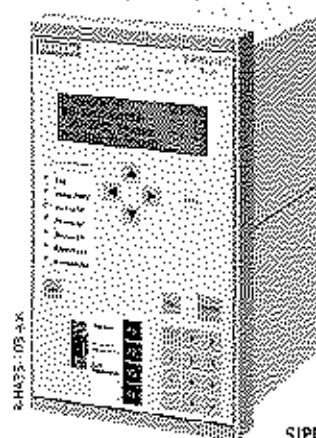


SIPROTEC Compact 7SJ80

SIPROTEC 4 series

Overcurrent and motor protection SIPROTEC 7SJ61/7SJ62

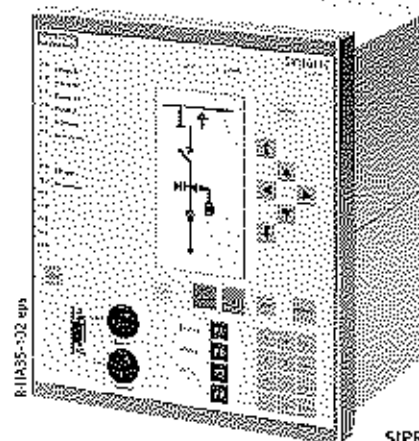
- For stand-alone or master operation
- Communications and bus capability
- Functions: Protection, control, signaling, communication and measuring
- LC text display (4 lines) for process and equipment data, as text, e.g. for
 - Measuring and metering values
 - Information on status of switchgear and switching device
 - Protection data
 - General indications
 - Alarms
- Four freely programmable function keys for frequently performed functions
- Seven freely programmable LEDs for displaying any desired data
- Keys for navigation in menus and for entering values
- Fault recorder.



SIPROTEC 7SJ61/7SJ62

Overcurrent and motor protection SIPROTEC 7SJ63

- For stand-alone or master operation
- Communications and bus capability
- Functions: Protection, control, signaling, communication and measuring
- LC display for process and equipment data in the form of a feeder control diagram and as text, e.g. for
 - Measuring and metering values
 - Information on status of switchgear and switching device
 - Protection data
 - General indications
 - Alarms
- Four freely programmable function keys for frequently performed functions
- Fourteen freely programmable LEDs for displaying any desired data
- Two key-operated switches to switch between "local and remote control" and "interlocked and non-interlocked operation"
- Keys for navigation in menus and for entering values
- Integrated motor control by special relays with enhanced performance
- Fault recorder.



SIPROTEC 7SJ63



Type of service location

The switchgear can be used as indoor installation according to IEC 61936 (Power installations exceeding 1 kV AC) and VDE 0101

- Outside lockable electrical service locations at places which are not accessible to the public. Enclosures of switchgear can only be removed with tools
- 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 VDE 0671-102/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/VDE 0671-1 (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 and VDE 0111).

The gas insulation at a relative gas pressure of 50 kPa permits switchgear installation at an altitude of up to 4000 m above sea level without the dielectric strength being adversely affected. This also applies to the cable connection when plug-in sealing ends are used.

A decrease (reduction) of the dielectric strength with increasing site altitude must only be considered for panels with HV HRC fuses.

For site altitudes above 1000 m, a higher insulation level must be selected. It results from the multiplication of the rated insulation level for 0 to 1000 m with the altitude correction factor K_a (see illustration and example).

Standards

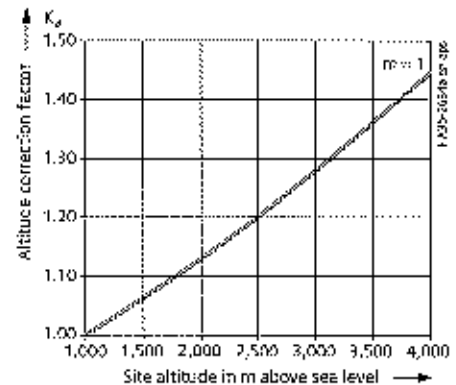
NXPPLUS C switchgear complies with the relevant standards and specifications applicable at the time of type tests. In accordance with the harmonization agreement reached by the countries of the European Union, their national specifications conform to the IEC standard.

Table – Dielectric strength

Rated voltage (r.m.s. value)	kV	7.2	12	15	17.5	24
Rated short-duration power-frequency withstand voltage (r.m.s. value)						
Between phases and to earth	kV	20	28	35	38	50
Across isolating distances	kV	23	32	39	45	60
Rated lightning impulse withstand voltage (peak value)						
Between phases and to earth	kV	60	75	95	95	125
Across isolating distances	kV	70	85	105	110	145

Altitude correction factor K_a

For site altitudes above 1000 m, the altitude correction factor K_a is recommended, depending on the site altitude above sea level. Curve $m = 1$ for rated short-duration power-frequency withstand voltage and rated lightning impulse withstand voltage according to IEC 62271-1



(Only for panels with HV HRC fuses)

Example:

3000 m site altitude above sea level ($K_a = 1.28$),
17.5 kV switchgear rated voltage,
95 kV rated lightning impulse withstand voltage
Rated lightning impulse withstand voltage to be selected =
95 kV · 1.28 = 122 kV

Result:

According to the above table, a switchgear for a rated voltage of 24 kV with a rated lightning impulse withstand voltage of 125 kV is to be selected.

Overview of standards (December 2016)

		IEC standard	VDE standard	EN standard
Switchgear	NXPPLUS C	IEC 62271-1	VDE 0671-1	EN 62271-1
		IEC 62271-200	VDE 0671-200	EN 62271-200
		IEC 62271-304		IEC/TS 62271-304
Devices	Circuit breakers	IEC 62271-100	VDE 0671-100	EN 62271-100
	Vacuum contactors	IEC 60470	VDE 0670-501	EN 60470
	Disconnectors and earthing switches	IEC 62271-102	VDE 0671-102	EN 62271-102
	Switch-disconnectors	IEC 60265-1	VDE 0670-301	EN 60265-1
	Switch-disconnector / fuse combination	IEC 62271-105	VDE 0671-105	EN 62271-105
	HV HRC fuses	IEC 60282	VDE 0670-4	EN 60282
	Voltage detecting systems	IEC 61243-5	VDE 0682-415	EN 61243-5
Degree of protection	IP code	IEC 60529	VDE 0470-1	EN 60529
	IK code	IEC 62262	VDE 0470-100	EN 50102
Insulation	...	IEC 60073	VDE 0111	EN 60073
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	Specification for new SF ₆	IEC 60376	VDE 0373-1	EN 60376



Standards, specifications, guidelines

Current carrying capacity

- According to IEC 62271-200 or IEC 62271-1, VDE 0671-200 or VDE 0671-1, 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 or VDE 0671-200
- Definition of criteria:
 - 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 of external components and the SF₆ insulation of switching devices, the possibility of faults in SF₆-insulated switchgear is improbable and a mere fraction of that typical of earlier 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 or the three-position switch-disconnector.

In the unlikely event of a fault within the switchgear vessel, the energy conversion in the case of an internal arc fault is minor thanks to the SF₆ insulation and the shorter arc length, approximately only 1/4 of the converted energy of an arc in air insulation. The escaping gases are discharged upwards through a pressure relief duct (option for wall-standing arrangement up to 25 kA).

Aseismic capacity (option)

NXPLUS C 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 on seismic test methods for equipment"
- IEC 60068-2-57 "Test Ff: Vibration – Time-history method"
- IEC 60068-2-59 "Test Fc: Vibration – Sine-beat method"
- IEEE 693-2005 "Recommended Practice for Seismic Design of Substations".

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
- IEEE 693-2005 – High required response spectrum (Figure A.1).

Shock, vibration (option)

NXPLUS C switchgear can be upgraded to withstand stress caused by shock and vibration. For upgrading, shock and vibration tests have been carried out in accordance with the following standards:

- ETSI EN 300 019-2-2; T2.3 Public Transportation
- IEC 60068-2-6, Environmental Testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)
- IEC 60068-2-64, Environmental Testing – Part 2-64: Tests – Test Fh: Vibration, broad-band, random and guidance (noise spectrum according to DNV).

Color of the panel front

Siemens standard (SN) 47 030 G1, color no. 700 (light basic) (similar to RAL 7047/telegrey).

Climate and environmental influences

The parts of the primary circuit of NXPLUS C switchgear under high voltage are completely enclosed and insensitive to climatic influences.

- All medium-voltage devices (except for HV HRC fuses) are installed in a gas-tight, welded stainless-steel switchgear vessel which is filled with SF₆ gas
- Live parts outside the switchgear vessel 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.

The NXPLUS C switchgear is suitable for application in indoor installations under normal operating conditions as defined in the standard IEC 62271-1.

- Temperature: –5 °C up to +55 °C
–25 °C up to +55 °C ¹⁾ (optional)
- Relative air humidity: Mean value over 24 hours ¹⁾: ≤ 98 %
Mean value over 1 month: ≤ 90 %
- Condensation: Occasionally
Frequently (degree of protection min. IP31D, with anti-condensation heater in the low-voltage part ²⁾)
- Site altitude: Panels without HV HRC fuse:
No restriction
Panels with HV HRC fuse:
Altitude correction to be considered (see page 71)

Furthermore, the high-voltage part of the NXPLUS C switchgear can be used in environmental conditions of the climatic category 3C2 according to the standard IEC 60721-3-3.

NXPLUS C has been subjected to a climatic test according to IEC 60932, Level 2, and is suitable for operating conditions according to "Design Class 2". This test also meets the requirements of IEC 62271-304 for "Design Class 2".

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).

- 1) Secondary devices (e.g. protection devices, meters, measuring transducers, etc.) must be suitable for the given operating conditions
- 2) Heater in the low-voltage compartment and operating mechanism box of the circuit-breaker

Protection against solid foreign objects, electric shock and water

NXP LUIS C switchgear fulfills according to the standards

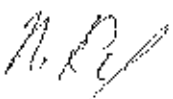
IEC 62271-1	VDE 0671-1, EN 62 271-1
IEC 62271-200	VDE 0671-200, EN 62 271-200
IEC 60529	VDE 0470-1, EN 60 529
IEC 62262	VDE 0470-100, EN 50 102

the following degrees of protection:

Degree of protection IP	Type of protection
IP 65	for parts of the primary circuit under high voltage
IP 3XD	for switchgear enclosure
IP 33D	for switchgear enclosure (optional)
IP 32D	for switchgear enclosure (optional)
IP 34D	for switchgear enclosure (optional)
IP 4X	for switchgear enclosure (optional)
IP 54	for switchgear enclosure (optional)
Degree of protection IK	Type of protection
IK 07	for switchgear enclosure

For secondary devices in the low-voltage door, the stipulations of the IP degree of protection apply according to the definitions for the switchgear enclosure.

Notes



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The requested performance features are binding only when they are expressly agreed upon in the concluded contract.



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