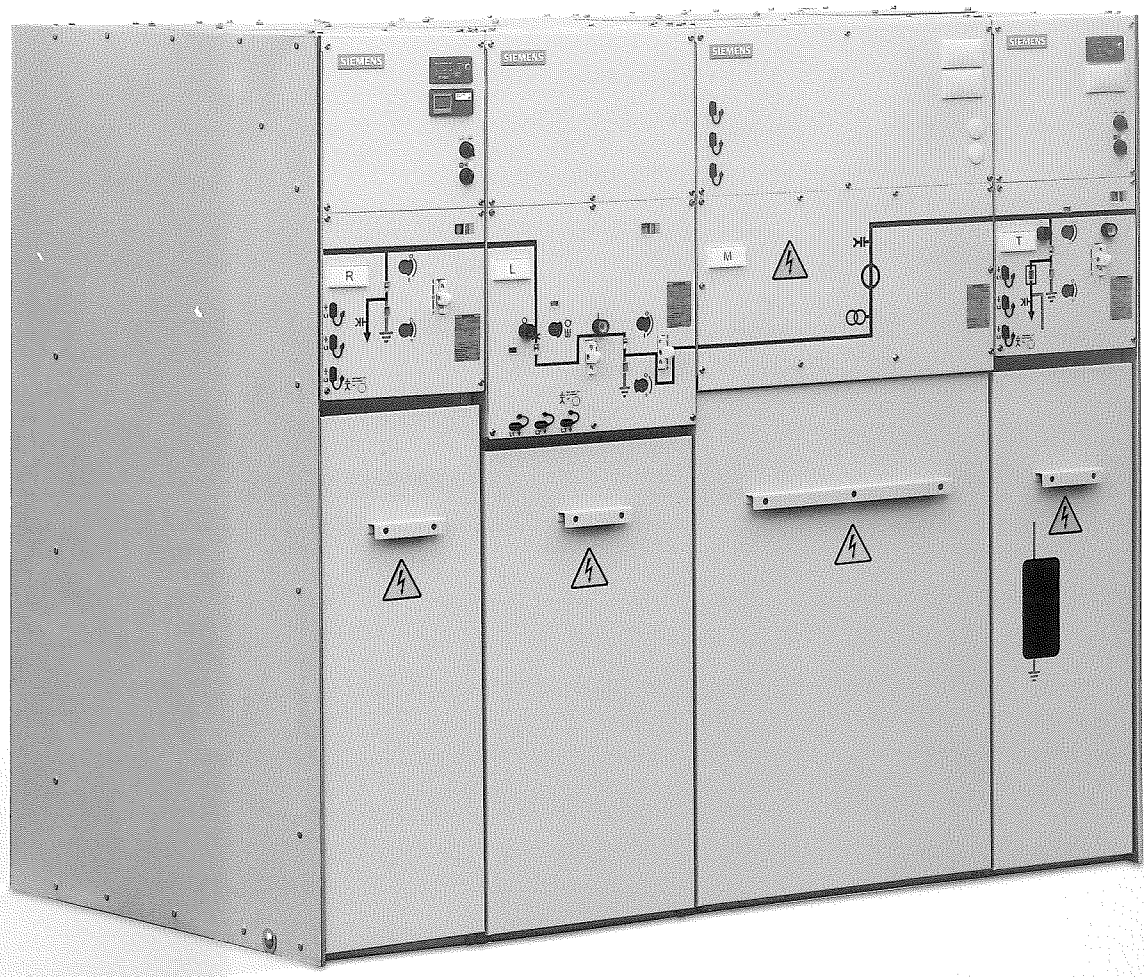
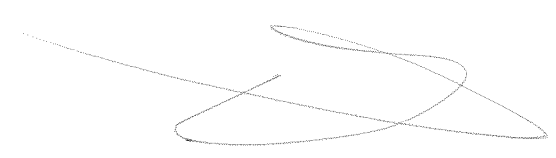


SIEMENS



Catalog
HA 41.43-
Edition 2018

Switchgear Type SIMOSEC, up to 24 kV, Air-Insulated, Extendable Medium-Voltage Switchgear

siemens.com/SIMOSEC



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R-HA41-115.tif

Example
Transfer switchgear with
integrated low-voltage niche

R-HA40-112.tif



R-HA41-135.tif

Utilities transfer substation
for industrial plants

Switchgear Type SIMOSEC, up to 24 kV, Air-Insulated, Extendable

Medium-Voltage Switchgear

Catalog HA 41.43 · 2018

[Invalid: Catalog HA 41.43 · 2017](#)

siemens.com/medium-voltage-switchgear
siemens.com/SIMOSEC

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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SIMOSEC switchgear is a factory-assembled, type-tested, three-phase, metal-enclosed, indoor switchgear according to IEC 62271-200 *) and GB 3906 *) for single busbars.

Typical uses

SIMOSEC switchgear is used for power distribution in distribution systems with busbar currents up to 1250 A.

The modular, space saving design enables application in

- Substations, customer transfer substations, distribution substations and switching substations of power supply and public utilities
- Public buildings, such as high-rise buildings, railway stations, hospitals
- Industrial plants.

Typical applications

- Wind power stations
- High-rise buildings
- Airports
- Underground railway stations
- Sewage treatment plants
- Port facilities
- Traction power supply systems
- Automobile industry
- Petroleum industry
- Chemical industry
- Unit-type heating power stations
- Textile, paper and food industries
- Emergency power supply installations
- Shopping centers and data centers.

Modular design

- Individual panels, for free combination and extension
- Option: Low-voltage compartments can be supplied in two overall heights
- Circuit-breaker panels for various applications.

Reliability

- Type and routine-tested *)
- No cross insulation between phases
- Standardized and manufactured using numerically controlled machines
- Quality management system according to DIN EN ISO 9001
- More than 100,000 switchgear components in operation worldwide for many years.

Personal safety

- All switching operations can be performed with closed panel front
- Metal-enclosed LSC 2 panels
- HV HRC fuses and cable sealing ends are only accessible when the outgoing feeders are earthed
- Logical mechanical interlocking
- Capacitive voltage detecting system for verification of safe isolation from supply
- Earthing of outgoing feeders by means of make-proof earthing switches
- Partition class: **PM** (metallic partition).

Compact design

Thanks to the use of gas-insulated switching-device vessel compact dimensions are possible.

Thus:

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

Security of operation

- Components, e.g. operating mechanisms, three-position switches, vacuum circuit-breakers proven for years
- LSC 2 panels:
 - Panels with metallic partition (metal-clad) between busbar and switching device and between switching device and cable compartment (R, T, L)
 - Panels with metallic partition between switching device and busbar compartment
- Metal-enclosed switching-device vessel with three-position switch, gas-insulated
 - Welded sealed-for-life switching-device vessel
 - No cross insulation between phases
 - With welded-in rotary bushings for operation
 - Three-position switch-disconnector with gas-insulated switching functions
- Three-position disconnector, gas-insulated
 - Switching functions CLOSE-OPEN-EARTH
- Operating mechanisms of switching devices accessible outside the switching-device vessel
- Maintenance-free operating mechanism parts (IEC 62271-1/VDE 0671-1 *) and GB 11022 *)
- Mechanical position indication integrated in mimic diagram
- Switchgear interlocking system with logical mechanical interlocks
- Partition class: **PM** (metallic partition).

Reavailability

- Three-position switch-disconnector with gas-insulated, maintenance-free quenching principle
- Metallic partition between busbar compartment, switching devices and cable compartment
- Separate pressure relief for each compartment
- Cable testing without the need to isolate the busbar
- Mounting location of three-phase current transformer for selective disconnection of circuit-breaker feeders.

*) For standards, see page 72

Insulating system

- Switching-device 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)
 - Global Warming Potential GWP = 22,800
- Pressure of SF₆ gas in the switching-device vessel (absolute values at 20 °C):
 - Rated filling level: 140 kPa
 - Design pressure: 180 kPa
 - Design temperature of the SF₆ gas: 80 °C
 - Operating pressure of bursting disc: ≥ 270 kPa
 - Bursting pressure: ≥ 550 kPa
 - Gas leakage rate: < 0.1 % per year.

Panel design

- Factory-assembled, type-tested
- Metal-enclosed, with metallic partitions
- LSC 2 panels, LSC 1 panels (without isolating distance)
- Pressure relief
 - To the rear and upwards
 - Separately for each compartment
- Air-insulated cable connection system for conventional cable sealing ends
- Option: Three-phase current transformer, factory-assembled on the feeder bushings
- Integrated low-voltage niche (standard) for installation of, e.g.
 - Terminals, MCBs, pushbuttons
 - Protection devices
- Option: Top-mounted low-voltage compartment
- Option: Panel heating for severe ambient conditions, e.g. condensation.

Standards (see page 72)

Cost-efficiency

Low "lifecycle costs" and high availability throughout the entire product service lifecycle as a result of:

- Minimum space requirement
- Easy switchgear extension, without gas work
- Maintenance-free gas-insulated switching functions of the three-position switch (gas-insulated quenching principle)
- Vacuum circuit-breaker
- Modular product range and design, e.g. circuit-breaker panels
- Low maintenance
- Option: Numerical multifunction protection relay (SIPROTEC protection device family, optionally external makes).

Quality and environment

- Quality and environmental management system according to DIN EN ISO 9001 and DIN EN ISO 14001
- Easy switchgear extension, without gas work on site
- Minimum space requirements.

Service life

Under normal operating conditions, the expected service life of air-insulated switchgear SIMOSEC is at least 35 years, probably 40 to 50 years, taking the tightness of the hermetically welded switching-device vessel into account. The service life is limited by the maximum number of operating cycles of the switchgear 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, according to the endurance class defined in IEC 62271-103.

Technology

- Air-insulated indoor switchgear
- Gas-insulated, maintenance-free switching functions for the three-position switch as switch-disconnector
- Partition class: **PM** (metallic partition)
- Three-pole primary enclosure
- Phases arranged one behind the other
- No cross insulation between phases
- Busbar system at the top
- Air-insulated busbar and cable connection system
- Three-position switch, metal-enclosed, with air-insulated primary terminals and gas-insulated switching functions
- Vacuum circuit-breaker, metal-enclosed, up to 1250 A, fixed-mounted in gas-insulated switching-device vessel
- Option: Vacuum circuit-breaker (type 3A_), air-insulated, up to 1250 A, removable design: Easy to remove after loosening the fixing bolts
- Hermetically-sealed by welded, stainless-steel switching-device vessel
 - For switching devices
 - With insulating gas SF₆ (fluorinated greenhouse gas).

Electrical features

- Rated voltages up to 24 kV
- Rated short-time withstand current up to 25 kA
- Rated normal current of feeders
 - Up to 800 A, e.g. for ring-main, metering panels
 - Up to 1250 A, for circuit-breaker panels
 - Up to 1250 A, for bus sectionalizer panels
- Rated normal current of busbar up to 1250 A.

SIMOSEC switchgear is a factory-assembled, type-tested, metal-enclosed switchgear for indoor installation. SIMOSEC switchgear is classified according to IEC 62271-200 / VDE 0671-200.

Design and construction

Partition class	PM (metallic partition)
Loss of service continuity category	
Panels	
– With HV HRC fuses [T, M(VT-F), ...]	LSC 2
– Without HV HRC fuses (R, L, D, ...)	LSC 2
– Metering panels type M or H1 or bus riser panel type H	LSC 1
Accessibility to compartments (enclosure)	
– Busbar compartment	– Tool-based
– Switching-device compartment	– Non-accessible
– Switching-device compartment with removable circuit-breaker	– Interlock-controlled
– Low-voltage compartment (Option)	– Tool-based
– Cable compartment for panels:	
– Without HV HRC fuses (R, L, ...)	– Interlock-controlled
– With HV HRC fuses (T, ...)	– Interlock-controlled
– Cable feeder (K)	– Tool-based
– Metering panel (air-insulated) (M, ...H)	– Tool-based

Internal arc classification (option)

The following internal arc classifications are fulfilled: IAC A FL(R), I_{SC} , t	
IAC	= Internal arc classification
IAC class for	Rated voltage 7.2 kV to 24 kV:
– Wall-standing arrangement	IAC A FL, I_{SC} , t
– Free-standing arrangement	IAC A FLR, I_{SC} , t
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 I_{SC}	Up to 21 kA
Test duration t	1 s

Common electrical data

Rated insulation level	Rated voltage U_r	kV	7.2	12	17.5	24						
Rated short-dur. power-frequency withstand voltage U_d	– phase-to-phase, phase-to-earth, open contact gap	kV	20	28, 42 *)	38	50						
	– across the isolating distance	kV	23	32, 48 *)	45	60						
	Rated lightning impulse withstand voltage U_p											
Rated lightning impulse withstand voltage U_p	– phase-to-phase, phase-to-earth, open contact gap	kV	60	75	95	125						
	– across the isolating distance	kV	70	85	110	145						
Rated frequency f_r		Hz	50/60									
Rated normal current I_r **) for busbar	Standard	A	630									
	Option	A	800, 1250									
50 Hz	Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1$ s, 2 s *)	up to kA	21	25	21	25	21	25	21	25	
		for rated duration of short-circuit $t_k = 3$ s (20 kA/4 s *)	up to kA	21	–	21	–	21	–	16	20	–
	Rated peak withstand current I_p	up to kA	52.5	63	52.5	63	52.5	63	40	50	63	
60 Hz	Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1$ s, 2 s *)	up to kA	21	25	21	25	21	25	16	20	25
		for rated duration of short-circuit $t_k = 3$ s	up to kA	21	–	21	–	21	–	16	20	–
	Rated peak withstand current I_p	up to kA	55	65	55	65	55	65	42	52	65	

Pressure values, temperature

Pressure in gas-insulated switching-device vessel for SF ₆ gas-insulated switching devices (pressure values at 20 °C)	Rated filling level for insulation p_{re} (absolute)	kPa	140
	Minimum functional level for insulation p_{me} (absolute)	kPa	120
	Signal of filling level for insulation p_{ae} (absolute)	kPa	120
Ambient air temperature T (minimum/maximum air temperature depends on the secondary equipment used)	Operation:	Standard	°C –5 to +55 1)
		Option	°C –25 1) Δ)
	Storage/transport	Standard	°C –5 to +55 1)
		Option	°C –25, +70 1)
	Option *)	°C –40	
Degree of protection	for gas-filled switching-device vessel	IP65	
	for switchgear enclosure	IP2X/IP3X *)	
	for low-voltage compartment	IP3X/IP4X *)	

*) As design option, according to some national requirements (e.g.: GOST, GB, ...)
 **) 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/VDE 0671-1)
 1) Depending on the secondary equipment used
 Δ) If panel heating available

Common electrical data of the switchgear panels

Rated insulation level	Rated voltage U_r	kV	7.2	12	17.5	24
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Ring-main panel types R, R1, R(T), R1(T), cable panel types K and K1 ³⁾

Rated normal current I_r ^{**)}	Standard	A	630									
			Option									
50 Hz	Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^*)$	up to kA	21	25	21	25	21	25	16	20	25
		for rated duration of short-circuit $t_k = 3\text{ s} (4\text{ s}^*)$	up to kA	21	-	21	-	21	-	16	20	-
	Rated peak withstand current I_p		up to kA	52.5	63	52.5	63	52.5	63	40	50	63
	Rated short-circuit making current I_{ma}	for ring-main feeders	up to kA	52.5	63	52.5	63	52.5	63	40	50	63
60 Hz	Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^*)$	up to kA	21	25	21	25	21	25	16	20	25
		for rated duration of short-circuit $t_k = 3\text{ s}$	up to kA	21	-	21	-	21	-	16	20	-
	Rated peak withstand current I_p		up to kA	55	65	55	65	55	65	42	52	65
	Rated short-circuit making current I_{ma}	for ring-main feeders	up to kA	55	65	55	65	55	65	42	52	65

Transformer panel types T, T1, T(T) as switch-fuse combination according to IEC 62271-105

Rated normal current I_r ^{**1)}	Standard	A	200									
			Option									
50 Hz	Rated short-time withstand current I_k ^{1) 4)}	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^*)$	up to kA	21	25	21	25	21	25	16	20	25
		for rated duration of short-circuit $t_k = 3\text{ s} (4\text{ s}^*)$	up to kA	21	-	21	-	21	-	16	20	-
	Rated peak withstand current I_p ¹⁾	for transformer feeders ¹⁾	up to kA	52.5	63	52.5	63	52.5	63	40	50	63
	Rated short-circuit making current I_{ma} ¹⁾	for transformer feeders ¹⁾	up to kA	52.5	63	52.5	63	52.5	63	40	50	63
60 Hz	Rated short-time withstand current I_k ^{1) 4)}	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^*)$	up to kA	21	25	21	25	21	25	16	20	25
		for rated duration of short-circuit $t_k = 3\text{ s}$	up to kA	21	-	21	-	21	-	16	20	-
	Rated peak withstand current I_p ¹⁾	for transformer feeders ¹⁾	up to kA	55	65	55	65	55	65	42	52	65
	Rated short-circuit making current I_{ma} ¹⁾	for transformer feeders ¹⁾	up to kA	55	65	55	65	55	65	42	52	65
Dimension e of HV HRC fuse-link		e = 292 mm		•		•		•				
		e = 442 mm		•		•		•				

Disconnecter panel types D1, D1(T)

Rated normal current I_r ^{**)}	Standard	A	1250									
			On request									
50 Hz	Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^*)$	up to kA	21	25	21	25	21	25	16	20	25
		for rated duration of short-circuit $t_k = 3\text{ s} (4\text{ s}^*)$	up to kA	21	-	21	-	21	-	16	20	-
	Rated peak withstand current I_p		up to kA	52.5	63	52.5	63	52.5	63	40	50	63
	Rated short-circuit making current I_{ma}		up to kA	52.5	63	52.5	63	52.5	63	40	50	63
60 Hz	Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^*)$	up to kA	21	25	21	25	21	25	16	20	25
		for rated duration of short-circuit $t_k = 3\text{ s}$	up to kA	21	-	21	-	21	-	16	20	-
	Rated peak withstand current I_p		up to kA	55	65	55	65	55	65	42	52	65
	Rated short-circuit making current I_{ma}		up to kA	55	65	55	65	55	65	42	52	65

- possible
- not possible

*) As design option, on request according to some national requirements (e.g.: GOST, GB, ...)

***) 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/VDE 0671-1)

- 1) Depending on HV HRC fuse-link (depending on the let-through current of the HV HRC fuse-link), earthing switch at the feeder: see page 11
- 3) On request: Panel types K and K1, each with make-proof earthing switch
- 4) Busbar

Common electrical data of the switchgear panels

Rated insulation level	Rated voltage U_r	kV	7.2	12	17.5	24
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Circuit-breaker panel ²⁾ types L, L1, L(T), L1(T)

Rated normal current I_r ^{**)}	Standard	A	630									
			Option: L1, L1(T)									
50 Hz	Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^*)$	up to kA	21	25	21	25	21	25	16	20	25
		for rated duration of short-circuit $t_k = 3\text{ s} (4\text{ s}^*)$	up to kA	21	-	21	-	21	-	16	20	-
	Rated peak withstand current I_p		up to kA	52.5	63	52.5	63	52.5	63	40	50	63
	Rated short-circuit making current I_{ma}		up to kA	52.5	63	52.5	63	52.5	63	40	50	63
60 Hz	Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^*)$	up to kA	21	25	21	25	21	25	16	20	25
		for rated duration of short-circuit $t_k = 3\text{ s}$	up to kA	21	-	21	-	21	-	16	20	-
	Rated peak withstand current I_p		up to kA	55	65	55	65	55	65	42	52	65
	Rated short-circuit making current I_{ma}		up to kA	55	65	55	65	55	65	42	52	65
Rated short-circuit breaking current I_{sc}			up to kA	21	25	21	25	21	25	16	20	25

Metering panel types M, bus riser panel types H, H1

Rated normal current I_r ^{**)} for:	Standard	A	630									
			Option									
M, M(-K), M(-B), M(-BK), H, M(KK), H1												
M, M(-K), M(-B), M(-BK), H, H1												
50 Hz	Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^*)$	up to kA	21	25	21	25	21	25	16	20	25
		for rated duration of short-circuit $t_k = 3\text{ s} (4\text{ s}^*)$	up to kA	21	-	21	-	21	-	16	20	-
	Rated peak withstand current I_p		up to kA	52.5	63	52.5	63	52.5	63	40	50	63
	Rated short-circuit making current I_{ma}		up to kA	52.5	63	52.5	63	52.5	63	40	50	63
60 Hz	Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^*)$	up to kA	21	25	21	25	21	25	16	20	25
		for rated duration of short-circuit $t_k = 3\text{ s}$	up to kA	21	-	21	-	21	-	16	20	-
	Rated peak withstand current I_p		up to kA	55	65	55	65	55	65	42	52	65
	Rated short-circuit making current I_{ma}		up to kA	55	65	55	65	55	65	42	52	65

Circuit-breaker panel types L1(r), L2(r), L1(r, T), L2(r, T)

Rated normal current I_r ^{**)}	Standard	A	630									
			Option: L2(r), L2(r, T)									
50 Hz	Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^*)$	up to kA	21	25	21	25	21	25	16	20	25
		for rated duration of short-circuit $t_k = 3\text{ s}$	up to kA	21	-	21	-	21	-	16	20	-
	Rated peak withstand current I_p		up to kA	52.5	63	52.5	63	52.5	63	40	50	63
	Rated short-circuit making current I_{ma}		up to kA	52.5	63	52.5	63	52.5	63	40	50	63
60 Hz	Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^*)$	up to kA	21	25	21	25	21	25	16	20	25
		for rated duration of short-circuit $t_k = 3\text{ s}$	up to kA	21	-	21	-	21	-	16	20	-
	Rated peak withstand current I_p		up to kA	55	65	55	65	55	65	42	52	65
	Rated short-circuit making current I_{ma}		up to kA	55	65	55	65	55	65	42	52	65
Rated short-circuit breaking current I_{sc}			up to kA	21	25	21	25	21	25	16	20	25

- possible
- not possible

*) As design option, on request according to some national requirements (e.g.: GOST, GB, ...)

***) 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/VDE 0671-1)

- 2) With vacuum circuit-breaker in gas-filled switching-device vessel (maintenance-free under normal ambient conditions according to IEC 62271-1)
- Δ) 1250 A in preparation

Common electrical data of the switchgear panels

Rated insulation level	Rated voltage U_r	kV	7.2	12	17.5	24
------------------------	---------------------	----	-----	----	------	----

Busbar voltage metering panel types M(VT-F), M1(VT-F)

Rated normal current $I_r^{**1)}$	Standard	A	200								
50 Hz Rated short-time withstand current $I_k^{2)}$	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^{*)}$	up to kA	21	25	21	25	21	25	16	20	25
	for rated duration of short-circuit $t_k = 3\text{ s} (4\text{ s}^{*)}$	up to kA	21	-	21	-	21	-	16	20	-
Rated peak withstand current $I_p^{1)2)}$		up to kA	52.5	63	52.5	63	52.5	63	40	50	63
60 Hz Rated short-time withstand current $I_k^{2)}$	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^{*)}$	up to kA	21	25	21	25	21	25	16	20	25
	for rated duration of short-circuit $t_k = 3\text{ s}$	up to kA	21	-	21	-	21	-	16	20	-
Rated peak withstand current $I_p^{1)2)}$		up to kA	55	65	55	65	55	65	42	52	65
Dimension of HV HRC fuse-link	Standard: For HV HRC fuse-link application of fuses for voltage transformer protection										
	On request: Option: For HV HRC fuse-link according to IEC/EN 60282-1/VDE 0670-4 and DIN 43625	e = 292 mm	•		•		•				
		e = 442 mm	-		-		-				

Busbar voltage metering panel types M(VT), M1(VT)

Rated normal current $I_r^{**1)}$	Standard	A	200								
50 Hz Rated short-time withstand current $I_k^{2)}$	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^{*)}$	up to kA	21	25	21	25	21	25	16	20	25
	for rated duration of short-circuit $t_k = 3\text{ s} (4\text{ s}^{*)}$	up to kA	21	-	21	-	21	-	16	20	-
Rated peak withstand current $I_p^{2)}$		up to kA	52.5	63	52.5	63	52.5	63	40	50	63
60 Hz Rated short-time withstand current $I_k^{2)}$	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^{*)}$	up to kA	21	25	21	25	21	25	16	20	25
	for rated duration of short-circuit $t_k = 3\text{ s}$	up to kA	21	-	21	-	21	-	16	20	-
Rated peak withstand current $I_p^{2)}$		up to kA	55	65	55	65	55	65	42	52	65

Busbar earthing panel type E

50 Hz Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^{*)}$	up to kA	21	25	21	25	21	25	16	20	25
	for rated duration of short-circuit $t_k = 3\text{ s} (4\text{ s}^{*)}$	up to kA	21	-	21	-	21	-	16	20	-
Rated peak withstand current I_p		up to kA	52.5	63	52.5	63	52.5	63	40	50	63
Rated short-circuit making current I_{ma}		up to kA	52.5	63	52.5	63	52.5	63	40	50	63
60 Hz Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^{*)}$	up to kA	21	25	21	25	21	25	16	20	25
	for rated duration of short-circuit $t_k = 3\text{ s}$	up to kA	21	-	21	-	21	-	16	20	-
Rated peak withstand current I_p		up to kA	55	65	55	65	55	65	42	52	65
Rated short-circuit making current I_{ma}		up to kA	55	65	55	65	55	65	42	52	65

- possible
- not possible

Footnotes: for page 10

- *) As design option, on request according to some national requirements (e.g.: GOST, GB, ...)
- **) The rated normal currents apply to ambient air temperatures of max. 40 °C.
- 1) Depending on HV HRC fuse-link (depending on the let-through current of the HV HRC fuse-link)
- 2) Busbar

Footnotes: for page 11

- *) As design option, on request according to some national requirements (e.g.: GOST, GB, $I_{load} = 800\text{ A}$, ...)
- **) 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/VDE 0671-1)
- 1) Depending on HV HRC fuse-link (depending on the let-through current of the HV HRC fuse-link)
- 2) The following values apply to 60 Hz: 2 resp. E1

Three-position switch-disconnector

Rated insulation level	Rated voltage U_r	kV	7.2	12	17.5	24
	Rated short-duration power-frequency withstand voltage U_d	kV	20	28, 42 *)	38	50
	- phase-to-phase, phase-to-earth, open contact gap	kV	23	32, 48 *)	45	60
	- across the isolating distance					
	Rated lightning impulse withstand voltage U_p	kV	60	75	95	125
	- phase-to-phase, phase-to-earth, open contact gap	kV	70	85	110	145
	- across the isolating distance					
Rated frequency f_r		Hz	50/60			
Rated normal current $I_r^{**1)}$	Standard:	A	630			
	Option:	A	800			
50 Hz Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^{*)}$	up to kA	21	25	21	25
	for rated duration of short-circuit $t_k = 3\text{ s} (4\text{ s}^{*)}$	up to kA	21	-	21	-
Rated peak withstand current I_p		up to kA	52.5	63	52.5	63
Rated short-circuit making current I_{ma}		up to kA	52.5	63	52.5	63
60 Hz Rated short-time withstand current I_k	for rated duration of short-circuit $t_k = 1\text{ s}, 2\text{ s}^{*)}$	up to kA	21	25	21	25
	for rated duration of short-circuit $t_k = 3\text{ s}$	up to kA	21	-	21	-
Rated peak withstand current I_p		up to kA	55	65	55	65
Rated short-circuit making current I_{ma}		up to kA	55	65	55	65

Switching capacity for general-purpose switches according to IEC/EN 62271-103

Test duty TD_{load}	Rated mainly active load-breaking current I_{load}	100 operations $I_{load} [I_1]^*$	A	630								
	Rated closed-loop breaking current $I_{loop} [I_{2a}]$	20 operations $0.05 I_{load} [I_1]$	A	31.5								
Test duty TD_{loop}	Rated cable-charging breaking current $I_{cc} [I_{4a}]$		A	630								
	Rated line-charging breaking current $I_{lc} [I_{4b}]$		A	68								
Test duty TD_{lc}	Rated short-circuit making current I_{ma}	50 Hz	up to kA	52.5	63	52.5	63	52.5	63	40	50	63
		60 Hz	up to kA	55	65	55	65	55	65	42	52	65
Test duty TD_{ef1}	Rated earth-fault breaking current $I_{ef1} [I_{6a}]$		A	200								
Test duty TD_{ef2}	Rated cable-charging breaking current and line-charging breaking current under earth-fault conditions I_{ef2}		A	115								
Number of mechanical operating cycles / M-classification		n	1000 / M1; 2000 *) / M1									
Number of electrical operating cycles with I_{load} / Classification		n	100 / E3									
Number of short-circuit making operations with I_{ma}		n	5	5	5	5	5	5	5	5	5	
Classification		E3	E3	E3	E3	E3	E3	E3	E3	E3	E3	
C-classification	for general-purpose switch (no restriks, TD: I_{cc}, I_{lc})	C2	C2	C2	C2	C2	C2	C2	C2	C2	C2	

Classification for disconnectors according to IEC/EN 62271-102/VDE 0671-102

Number of mechanical operating cycles	n	1000 (2000 *)
M-classification	M0 (M1 *)	

Technical data and switching capacity for earthing switch according to IEC/EN 62271-102/VDE 0671-102

Rated short-time withstand current I_k	50 Hz	up to kA	21	25	21	25	21	25	16	20	25
Rated short-circuit making current I_{ma}	50 Hz	up to kA	52.5	63	52.5	63	52.5	63	40	50	63
Rated short-time withstand current I_k	60 Hz	up to kA	21	25	21	25	21	25	16	20	25
Rated short-circuit making current I_{ma}	60 Hz	up to kA	55	65	55	65	55	65	42	52	65
Number of mechanical operating cycles / M-classification	n	1000 / M0									
Number of short-circuit making operations with I_{ma}	n	5									
Classification	E2	E2									

Switch-disconnector/fuse combination according to IEC/EN 62271-105/VDE 0671-105

Rated voltage U_r	kV	7.2	12	17.5	24
Rated normal current $I_r^{**1)}$	A	200			
Rated transfer current $I_{transfer}$	A	1750	1750	1500	1400
Maximum transformer rating	kVA	800	1600	1600	2500

Switching capacity for make-proof earthing switch, arranged on feeder side, downstream from HV HRC fuse, for typical: T, T1, M(VT-F)

Rated short-time withstand current $t_k = 1\text{ s}$	kA	2					
Rated short-circuit making current I_{ma}	50 Hz	kA	5				
	60 Hz	kA	5.2				
Number of short-circuit making operations with I_{ma} / E-classification	n	5/E2	5/E2	5/E2	5/E2	5/E2	
Number of mechanical operating cycles / M-classification	n	1000 / M0					

For footnotes, see page 10

Three-position disconnecter, with the functions: Disconnecting CLOSE/OPEN-EARTH,
[e.g. for disconnecter panel types D1, D1(T), for circuit-breaker panel types L1(r), L2(r), L1(r,T), L2(r,T)]
Technical data and classification for disconnecters according to IEC/EN 62271-102/VDE 0671-102

Rated voltage U_r	kV	7.2	12	17.5	24					
Rated frequency f_r	Hz	50/60								
Rated normal current I_r^{**}	A	630 (on request: 800)								
for panel types:										
Types L1(r), L1(r,T)	A	1250								
Types L2(r), L2(r,T), D1, D1(T)	A	1250								
50 Hz Rated short-time withstand current I_k for rated duration of short-circuit $t_k = 1 s, 2 s^{*)}$	up to kA	21	25	21	25	21	25	16	20	25
Rated peak withstand current I_p for rated duration of short-circuit $t_k = 3 s (4 s^{**})$	up to kA	21	-	21	-	21	-	16	20	-
Rated short-circuit making current I_{ma}	up to kA	52.5	63	52.5	63	52.5	63	40	50	63
60 Hz Rated short-time withstand current I_k for rated duration of short-circuit $t_k = 1 s, 2 s^{*)}$	up to kA	21	25	21	25	21	25	16	20	25
Rated peak withstand current I_p for rated duration of short-circuit $t_k = 3 s$	up to kA	21	-	21	-	21	-	16	20	-
Rated short-circuit making current I_{ma}	up to kA	55	65	55	65	55	65	42	52	65
Number of mechanical operating cycles	n	1000 (2000 ^{*)})								
M-classification		M0 (M1 ^{*)})								

Classification for earthing switch according to IEC/EN 62271-102/VDE 0671-102 [for panel types D1, D1(T)]

Number of mechanical operating cycles / M-classification	n	5	5	5	5	5	5	5	5
Number of short-circuit making operations with I_{ma}	n	5	5	5	5	5	5	5	5
Classification		E2	E2	E2	E2	E2	E2	E2	E2

Make-proof earthing switch

Technical data and switching capacity for earthing switch according to IEC/EN 62271-102/VDE 0671-102 (for panel types: R, D, E)

Rated voltage U_r	kV	7.2	12	17.5	24					
50 Hz Rated short-time withstand current I_k for rated duration of short-circuit $t_k = 1 s, 2 s^{*)}$	up to kA	21	25	21	25	21	25	16	20	25
Rated short-circuit making current I_{ma} for rated duration of short-circuit $t_k = 3 s (4 s^{**})$	up to kA	21	-	21	-	21	-	16	20	-
Rated short-circuit making current I_{ma}	up to kA	52.5	63	52.5	63	52.5	63	40	50	63
60 Hz Rated short-time withstand current I_k for rated duration of short-circuit $t_k = 1 s, 2 s^{*)}$	up to kA	21	25	21	25	21	25	16	20	25
Rated short-circuit making current I_{ma} for rated duration of short-circuit $t_k = 3 s$	up to kA	21	-	21	-	21	-	16	20	-
Rated short-circuit making current I_{ma}	up to kA	55	65	55	65	55	65	42	52	65
Number of mechanical operating cycles / M-classification	n	1000/M0								
Number of short-circuit making operations with I_{ma}	n	5	5	5	5	5	5	5	5	5
Classification		E2	E2	E2	E2	E2	E2	E2	E2	E2

Make-proof earthing switch (air-insulated, arranged at cable feeder)

[e.g. for circuit-breaker panel types L1(r), L2(r)]

Technical data and switching capacity for earthing switch according to IEC/EN 62271-102/VDE 0671-102

Rated voltage U_r	kV	7.2	12	17.5	24					
50 Hz Rated short-time withstand current I_k for rated duration of short-circuit $t_k = 1 s$	up to kA	20	25	20	25	20	25	16	20	
Rated short-circuit making current I_{ma} for rated duration of short-circuit $t_k = 3 s$	up to kA	20	-	20	-	20	-	16	20	
Rated short-circuit making current I_{ma}	up to kA	50	63	50	63	50	63	40	50	
Rated peak withstand current I_p	up to kA	50	63	50	63	50	63	40	50	
60 Hz Rated short-time withstand current I_k for rated duration of short-circuit $t_k = 1 s$	up to kA	20	25	20	25	20	25	16	20	
Rated short-circuit making current I_{ma} for rated duration of short-circuit $t_k = 3 s$	up to kA	20	-	20	-	20	-	16	20	
Rated short-circuit making current I_{ma}	up to kA	52	65	52	65	52	65	42	52	
Rated peak withstand current I_p	up to kA	52	65	52	65	52	65	42	52	
Number of mechanical operating cycles / M-classification	n	1000/M0								
Number of short-circuit making operations with I_{ma}	n	2	2	2	2	2	2	2	2	2
Classification		E1	E1	E1	E1	E1	E1	E1	E1	E1

*) As design option, on request according to some national requirements (e.g.: GOST, GB, ...)
**) 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/VDE 0671-1)

Vacuum circuit-breaker

Switching capacity according to IEC/EN 62271-100/VDE 0671-100

Type CB-f^{1) 4)}, combined with three-position disconnecter, in gas-insulated switching-device vessel⁴⁾

Type CB-r / SION L (3AE6)¹⁾

Rated voltage U_r	kV	7.2	12	17.5	24					
Rated normal current I_r^{**} for circuit-breaker type	A	630								
for circuit-breaker type	A	on request: 800								
Rated frequency f_r	Hz	50/60								
50 Hz Rated short-time withstand current I_k for rated duration of short-circuit $t_k = 1 s, 2 s^{*)}$	up to kA	21	25	21	25	21	25	16	20	25
Rated peak withstand current I_p for rated duration of short-circuit $t_k = 3 s (4 s^{**})$	up to kA	21	-	21	-	21	-	16	20	-
Rated short-circuit breaking current I_{sc}	up to kA	52.5	63	52.5	63	52.5	63	40	50	63
Rated short-circuit making current I_{ma}	up to kA	21	25	21	25	21	25	16	20	25
60 Hz Rated short-time withstand current I_k for rated duration of short-circuit $t_k = 1 s, 2 s^{*)}$	up to kA	21	25	21	25	21	25	16	20	25
Rated peak withstand current I_p for rated duration of short-circuit $t_k = 3 s$	up to kA	21	-	21	-	21	-	16	20	-
Rated short-circuit breaking current I_{sc}	up to kA	55	65	55	65	55	65	42	52	65
Rated short-circuit making current I_{ma}	up to kA	21	25	21	25	21	25	16	20	25
60 Hz Rated short-time withstand current I_k for rated duration of short-circuit $t_k = 3 s$	up to kA	21	-	21	-	21	-	16	20	-
Rated peak withstand current I_p	up to kA	55	65	55	65	55	65	42	52	65
Rated short-circuit breaking current I_{sc}	up to kA	21	25	21	25	21	25	16	20	25
Rated short-circuit making current I_{ma}	up to kA	55	65	55	65	55	65	42	52	65

Classification and number of operating cycles for circuit-breaker according to IEC/EN 62271-100/VDE 0671-100

Circuit-breaker: CB-f NAR³⁾

Mechanical	Number of operating cycles	2000
	Class	M1
Electrical	Number of operating cycles with I_r : 2000	Class E2
	Breaking of capacitive currents	Class C1
	Number of short-circuit breaking operations with I_{sc}	n 20
		Class S1
Rated operating sequence	CB-f NAR	O - 3 min - CO - 3 min - CO

Circuit-breaker: CB-f AR¹⁾; CB-r AR^{1) 3)}

Mechanical	Number of operating cycles	n 10 000
	Class	M2
Electrical	Number of operating cycles with I_r : 10,000	Class E2
	Breaking of capacitive currents	Class C2
	Number of short-circuit breaking operations with I_{sc} for CB-f AR	n 30 or 50
	Number of short-circuit breaking operations with I_{sc} for CB-r AR	n 30
		Class S2
Rated operating sequence	CB-f	O - 0.3 s - CO - 3 min - CO
	CB-f	O - 0.3 s - CO - 30 s - CO
	CB-r (SION L)	O - 0.3 s - CO - 15 s - CO

Classification for disconnecter according to IEC/EN 62271-102/VDE 0671-102 (for panel types L, L1, ...)

Number of mechanical operating cycles	n	1000 (2000 ^{*)})			
M-classification		M0 (M1 ^{*)})			

Classification for earthing switch according to IEC/EN 62271-102/VDE 0671-102 (for panel types L, L1, ...)

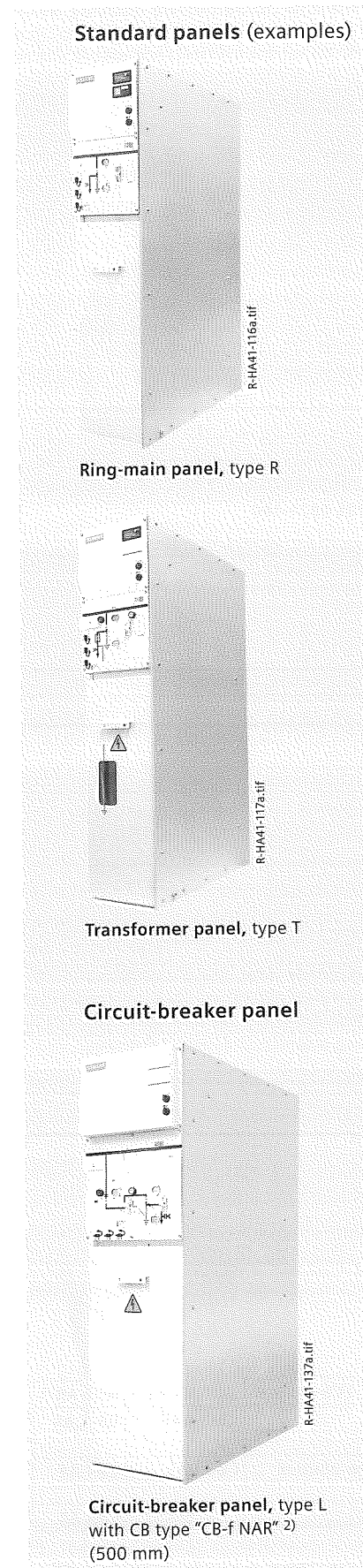
Number of mechanical operating cycles / M-classification	n	5	5	5	5	5	5	5	5
Number of short-circuit making operations with I_{ma}	n	5	5	5	5	5	5	5	5
Classification		E2	E2	E2	E2	E2	E2	E2	E2

*) As design option, on request according to some national requirements (e.g.: GOST, GB, ...)
**) The rated normal currents apply to ambient air temperatures of max. 40 °C.
The 24-hour mean value is max. 35 °C (acc. to IEC 62271-1/VDE 0671-1)
D) Only for CB-f

1) Definition of the different types of vacuum circuit-breakers (= VCB):			VCB version:	
Panel type	VCB type	Vacuum circuit-breaker - Design:	without AR ³⁾	with AR ³⁾
L, L1	CB-f	fixed-mounted in gas-insulated switching-device vessel, combined with three-position disconnecter	CB-f NAR	CB-f AR
L1(r), L2(r)	CB-r (SION L)	air-insulated, removable, separate three-position disconnecter		CB-r AR

3) AR = Automatic reclosing; NAR = Non-automatic reclosing

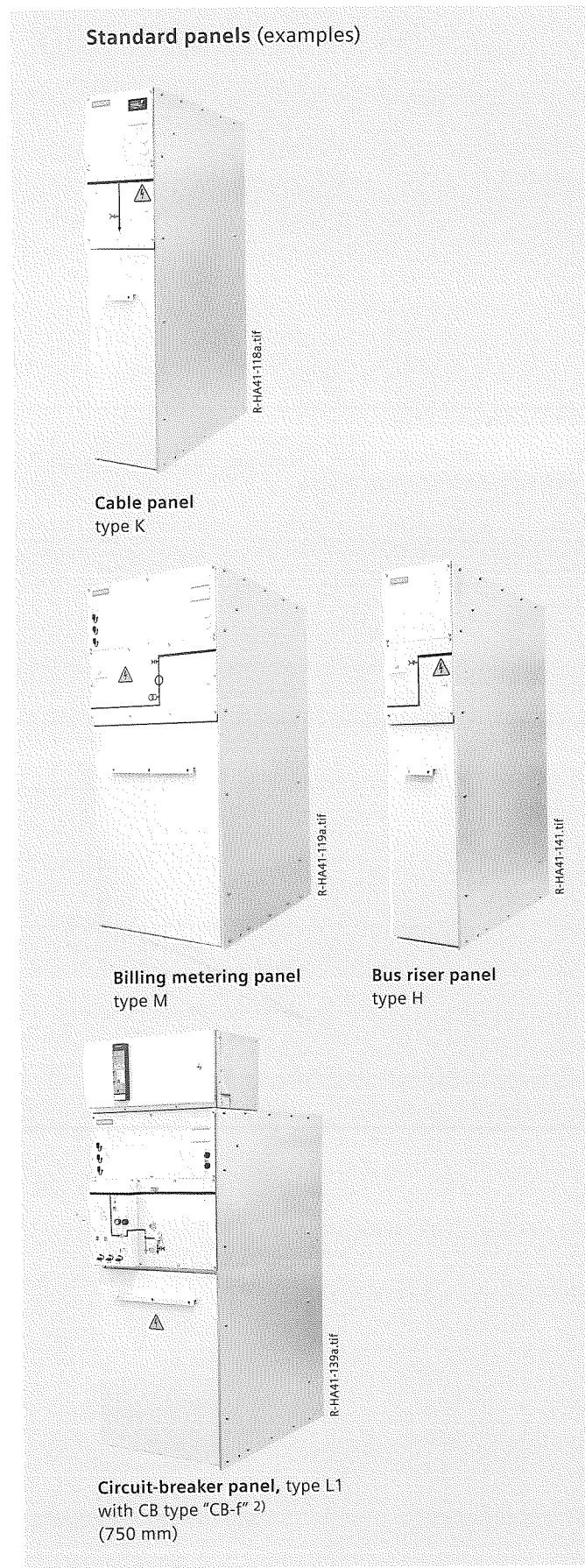
4) VCB in switching-device vessel (maintenance-free under normal ambient conditions according to IEC 62271-1)



Application as:	Panel designation	Panel type	Panel width mm	Rated current	Three-phase CT	CT as cast-resin CT (e.g. type 4MA)	CT as cable-type CT	VT (1-pole) as cast-resin VT	VT (2-pole) as cast-resin VT	2nd cable	3rd cable	Surge arrester instead of 2nd cable (3rd cable)	LSC category (Loss of service continuity category)	Rated voltage	
					● Available	○ Optionally available	- Not applicable								
Column No.					1	2	3	4	5	6	7	8	9	10	Panel type
Cable feeder panels	Ring-main panel 1)	R	375	630 A, 800 A	●	-	●	-	-	○ (up to 17.5 kV)	-	○ (up to 17.5 kV)	LSC 2	24 kV	R
		R1	500	630 A, 800 A	●	●	●	○	-	-	-	○	LSC 2	24 kV	R1
	Transformer panel 1)	T	375	200 A	-	-	●	-	-	-	-	-	LSC 2	24 kV	T
		T1	500	200 A	-	-	●	-	-	-	-	-	LSC 2	24 kV	T1
	Cable panel	K	375	630 A	-	-	●	-	-	○ (up to 17.5 kV)	-	○ (up to 17.5 kV)	LSC 1	24 kV	K
		K1	500	630 A, 1250 A	-	●	●	○	-	○	-	○	LSC 1	24 kV	K1
	Circuit-breaker panel (fixed-mounted CB, gas-insul.) 1) (with CB type "CB-f" 2)	L	500	630 A	●	●	●	○	-	○	-	○	LSC 2	24 kV	L
		L1	750	630 A, 1250 A Δ)	●	●	●	○	-	○	-	○	LSC 2	24 kV	L1
	Circuit-breaker panel (removable CB) type "CB-r"	L1(r)	750	630 A	●	●	●	○	-	○	-	○	LSC 2	24 kV	L1(r)
		L2(r)	875	1250 A	●	●	●	○	-	○	-	○	LSC 2	24 kV	L2(r)
Disconnecter panel 1)	D1 Δ)	500	1250 A Δ)	●	●	●	○	-	○	-	○	LSC 2	24 kV	D1 Δ)	
Transfer panels	Ring-main transfer panel 1)	R(T)	375	630 A, 800 A	-	-	-	-	-	-	-	-	LSC 2	24 kV	R(T)
	Ring-main transfer panel 1)	R1(T)	500	630 A	-	-	-	-	-	-	-	-	LSC 2	24 kV	R1(T)
	Circuit-breaker transfer panel 1)	L(T)	500	630 A	●	●	-	○	-	-	-	-	LSC 2	24 kV	L(T)
	Circuit-breaker transfer panel 1)	L1(T)	750	630 A, 1250 A	●	●	-	○	-	-	-	-	LSC 2	24 kV	L1(T)
	Circuit-breaker transfer panel (removable CB)	L1(r, T)	750	630 A	●	●	-	○	-	-	-	-	LSC 2	24 kV	L1(r, T)
		L2(r, T)	875	1250 A	●	●	-	○	-	-	-	-	LSC 2	24 kV	L2(r, T)
Disconnecter transfer panel 1)	D1(T)	500	1250 A	-	-	-	-	-	-	-	-	LSC 2	24 kV	D1(T)	
Metering panels and other panel versions	Metering panel as billing metering panel	M	750	630 A, 800 A, 1250 A	-	●	-	○	○	-	-	-	-	24 kV	M
	Metering panel with cable connection	M(-K)	750	630 A, 800 A, 1250 A	-	●	-	○	○	○	-	○	-	24 kV	M(-K)
	Metering panel with busbar connection	M(-B)	750	630 A, 800 A, 1250 A	-	●	-	○	○	-	-	-	LSC 1	24 kV	M(-B)
	Metering panel with busbar and cable connection	M(-BK)	750	630 A, 800 A, 1250 A	-	●	-	○	○	○	-	○	-	24 kV	M(-BK)
	Metering panel with cable connection: Individual panel	M(KK)	750	630 A, 800 A	-	●	-	○	○	○	-	○	-	24 kV	M(KK)
	Busbar voltage metering panel	M(VT)	375	200 A	-	-	-	○	-	-	-	-	-	17.5 kV	M(VT)
	Busbar voltage metering panel	M1(VT)	500	200 A	-	-	-	○	-	-	-	-	-	24 kV	M1(VT)
	Busbar voltage metering panel with fuse	M(VT-F)	375	200 A	-	-	-	○	-	-	-	-	LSC 2	17.5 kV	M(VT-F)
	Busbar voltage metering panel with fuse	M1(VT-F)	500	200 A	-	-	-	○	-	-	-	-	-	24 kV	M1(VT-F)
	Bus riser panel	H	375	630 A, 800 A, 1250 A	-	○	-	○	-	-	-	-	-	LSC 1	24 kV
Metering panel / bus riser panel	H1	500	630 A, 1250 A	-	○	-	○	○	-	-	-	-	LSC 1	24 kV	H1
Busbar earthing panel	Busbar earthing panel	E	375	-	-	-	-	-	-	-	-	-	LSC 2	24 kV	E

Δ) In preparation

1) Panel type: Metal-clad
2) Type designation of vacuum circuit-breaker



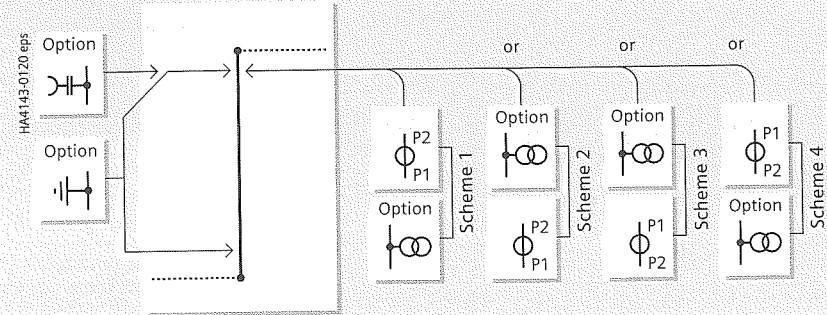
Panel designation	Panel type	Panel width mm	
			<ul style="list-style-type: none"> ● Basic equipment ○ Additional equipment (option), further additional equipment on request - Not available
			Manual operating mechanism for three-position switch 1) 2) (or earthing switch)
			Interlock for cable compartment cover
			Cable compartment cover
			C-rail as cable bracket
			Low-voltage niche as terminal compartment
			Release as shunt release
			Mechanical ready-for-service indicator for three-position switch 1) 2) 7)
			Signaling switch (1/NO) for remote electrical ready-for-service indicator for three-position switch 1) 2) 7)
			Auxiliary switch for three-position switch and make-proof earthing switch (for disconnector, switch-disconnector and earthing switch)
			Motor operating mechanism for three-position switch 1) 2) 7)
			Local-remote switch for motor operating mechanism of three-position switch 1) 2) 7)
			Interlock in circuit-breaker panel between three-position switch 1) and vacuum circuit-breaker
			Spring charged indicator for three-position switch 1) 2)
			Closing lock-out for three-position switch 1) 2)
			De-energizing indicator (for stored-energy "ON"/"OFF")
			Inspection window for three-position switch 1) 2)
			Low-voltage compartment for make-proof earthing switch
			Motor operating mechanism or cover
			Release as c.t.-operated release in vacuum circuit-breaker
			Locking device for three-position switch 1) 2) or earthing switch
			Short-circuit or earth-fault indicator
			Secondary equipment
			Floor cover 4)
			Panel heating (wired on terminal)
			Premounted cable clamps
			Locking device for switch position (COSSED or VCB with earthed three-position switch 2) 5)

Column No.				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Panel type
Ring-main panel 1)	as feeder	R	375	● ¹⁾	●	-	●	●	-	●	○	○	○	○	-	-	○	-	○	-	-	○	○	○	○	○	○	○	-	R
		R1	500																										R1	
Ring-main panel 1)	as transfer	R(T)	375	●	●	-	-	●	-	●	○	○	○	○	-	-	○	-	○	-	-	○	○	○	○	○	○	-	R(T)	
		R1(T)	500																										R1(T)	
Transformer panel 1)	as feeder	T	375	●	●	-	● ⁸⁾	○	●	○	○	○	○	○	-	●	○	○	●	○	-	-	○	-	○	○	○	○	-	T
		T1	500																										T1	
Cable panel	as feeder	K	375	-	-	●	●	●	-	-	-	-	-	-	-	-	-	-	○	○	-	-	-	○	○	○	○	○	-	K
		K1	500																										K1	
Circuit-breaker panel 1) with CB type "CB-f" 2)	as feeder	L	500	● ²⁾	●	-	●	○	●	○	○	○	○	○	○	○	-	○	○	○	○	○	○	○	○	○	○	○	-	L
		L1	750																										L1	
Circuit-breaker panel 1) with CB type 3AE 2)	as transfer	L(T)	500	● ²⁾	●	-	-	○	●	○	○	○	○	○	○	○	-	○	○	○	○	○	○	○	○	○	○	○	-	L(T)
		L1(T)	750																										L1(T)	
Circuit-breaker panel 1) with CB type 3AE 2)	as feeder	L1(r)	750	● ²⁾	●	-	●	○	●	○	○	○	○	○	○	○	-	○ ⁶⁾	○	○	○	○	○	○	○	○	○	○	○	L1(r)
		L2(r)	875																										L2(r)	
Circuit-breaker panel 1) with CB type 3AE 2)	as transfer	L1(r, T)	750	● ²⁾	●	-	-	○	●	○	○	○	○	○	○	○	-	○	○	○	○	○	○	○	○	○	○	○	L1(r, T)	
		L2(r, T)	875																										L2(r, T)	
Metering panels (as billing metering panel)	standard	M	750	-	-	●	-	●	-	-	-	-	-	-	-	-	-	-	○	○	-	-	-	○	○	○	○	-	M	
		M(-B)	750																										M(-B)	
Metering panels (as billing metering panel)	as end panel	M(-K)	750	-	-	●	●	-	-	-	-	-	-	-	-	-	-	-	○	○	-	-	-	○	○	○	○	-	M(-K)	
		M(-BK)	750																										M(-BK)	
Metering panel	as individual panel	M(KK)	750	-	-	●	●	●	-	-	-	-	-	-	-	-	-	-	○	○	-	-	-	○	○	○	○	-	M(KK)	
		M(VT)	375																										M(VT)	
Busbar voltage metering panel 1)		M1(VT)	500	● ¹⁾	●	-	-	●	-	●	○	○	○	○	-	-	-	-	○	○	-	-	-	○	○	○	○	-	M1(VT)	
		M(VT-F)	375	● ¹⁾	●	-	-	●	-	●	○	○	○	○	-	-	-	-	-	○	○	-	-	-	○	○	○	-	M(VT-F)	
Busbar voltage metering panel 1)		M1(VT-F)	500	● ¹⁾	●	-	-	●	-	●	○	○	○	○	-	-	-	-	-	○	○	-	-	-	○	○	○	-	M1(VT-F)	
		H	375																										H	
Bus riser panel		H1	500	-	-	●	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	H1		
		H	375																										H	
Metering panel / bus riser panel		H1	500	-	-	●	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	H1		
		H	375																										H	
Disconnecter panel 1)	as feeder	D1 Δ)	500	●	●	-	●	●	-	●	○	○	○	○	-	-	-	-	○	○	-	-	-	○	○	○	○	○	D1 Δ)	
		D1(T) Δ)	500	●	●	-	-	●	-	●	○	○	○	○	-	-	-	-	-	○	○	-	-	-	○	○	○	○	D1(T) Δ)	
Busbar earthing panel		E	375	●	-	●	-	●	-	●	○	○	-	-	-	-	-	-	-	○	○	-	-	-	○	○	○	-	E	

Δ) In preparation
1) Panel type: Metal-clad
2) Type designation of vacuum circuit-breaker

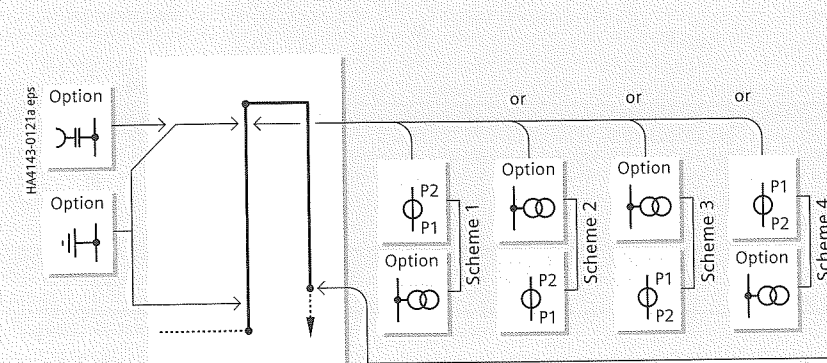
Δ) In preparation
1) Three-position switch as three-position switch-disconnector
2) Three-position switch as three-position disconnector
3) In special cases, deeper floor cover for panels with cable feeder required. Design of floor cover: Depending of direction of pressure relief
4) In special cases, deeper floor cover for panels with cable feeder required. Design of floor cover: Depending of direction of pressure relief
5) Not to be applied for versions with separate feeder earthing switch in panel types L1(r), L2(r)
6) Inspection window is a standard equipment in panel types L1(r), L2(r) for versions with separate earthing switch at the cable feeder
7) Or for earthing switch in panel type E
8) For panel type T with a rated voltage of 24 kV: Deeper cable fixing located underneath the panel

Billing metering panels 630 A, 800 A, 1250 A Standard



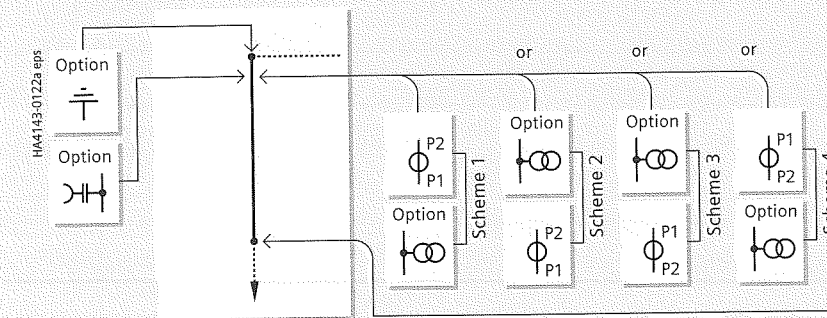
Type M 750 mm wide

Billing metering panels 630 A, 800 A, 1250 A for cable connection



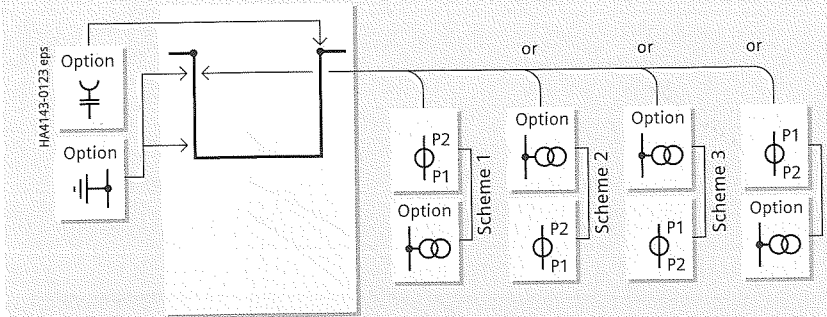
Type M-(K) 750 mm wide

Billing metering panels 630 A, 800 A, 1250 A for busbar connection



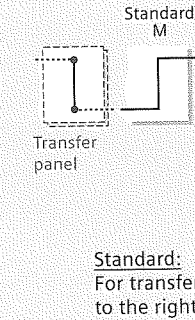
Type M-(BK) 750 mm wide

Billing metering panels 630 A, 800 A, 1250 A for busbar connection

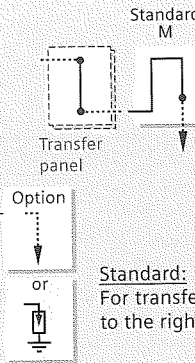


Type M-(B) 750 mm wide

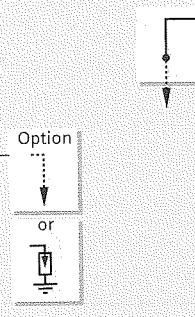
Panel design of M



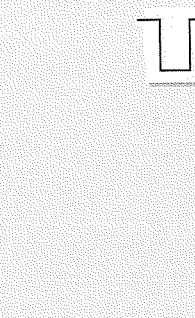
Panel design of M(K)



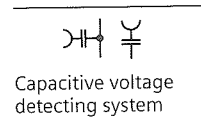
Panel design of M-(BK)



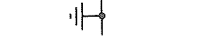
Panel design of M-(B)



Panel equipment with devices and current and voltage transformers depends on the rated voltage and the panel type (e.g. L1, R) as well as on the panel combination [e.g. R(T)]



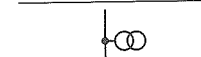
Capacitive voltage detecting system



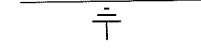
Fixed earthing point



Block-type current transformer 4MA, cast-resin insulated



Voltage transformer, e.g. 4MR, 1-pole, cast-resin insulated



Fixed earthing point for busbar earthing

Cable (not included in the scope of supply)

2nd cable (not included in the scope of supply)

Surge arrester

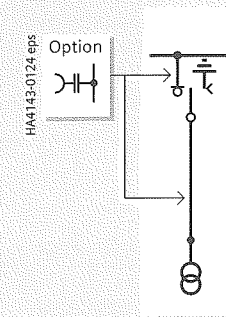
Option

Individual metering panel type M(KK)

2) P1 and P2 are terminal designations of the current transformer

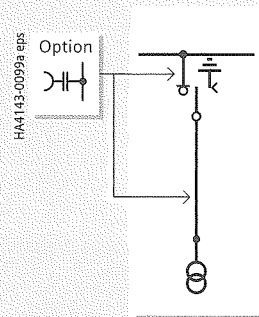
Busbar voltage metering panels

up to 17.5 kV

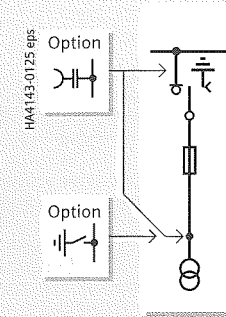


Type M(VT) 375 mm wide

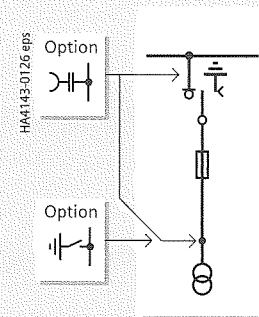
up to 24 kV



Type M1(VT) 500 mm wide

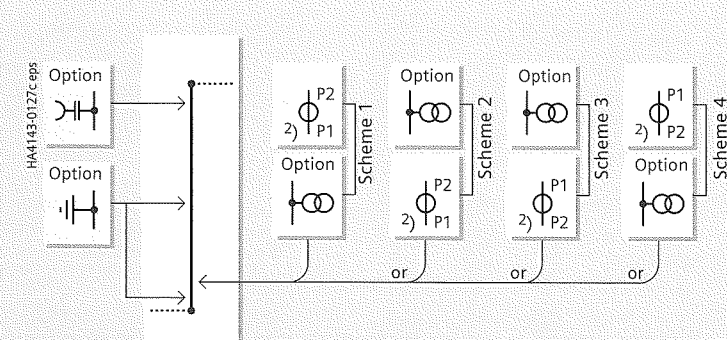


Type M(VT-F) 375 mm wide

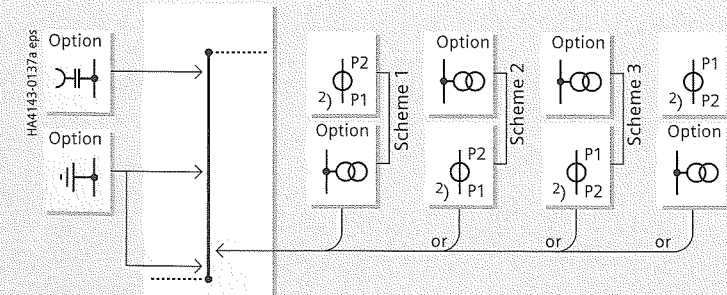


Type M1(VT-F) 500 mm wide

Metering panel and/or bus riser panels



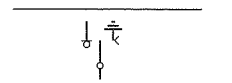
Type H, 630 A, 800 A, 1250 A 375 mm wide



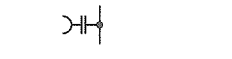
Type H1, 630 A, 1250 A 500 mm wide

Schemes 1 to 4 depend on:
- Rated voltage U_r
- Panel combinations (TC-xx) with the adjacent panel types

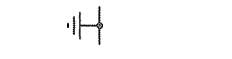
Panel equipment with devices and current and voltage transformers depends on the rated voltage and the panel type (e.g. L1, R) as well as on the panel combination [e.g. R(T)]



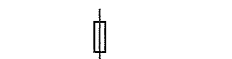
Three-position switch-disconnector



Capacitive voltage detecting system



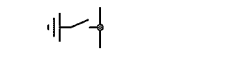
Fixed earthing point



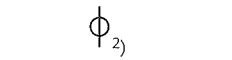
HV HRC fuse



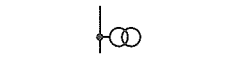
Voltage transformer, e.g. 4MR, 1-pole, cast-resin insulated



Discharge switch



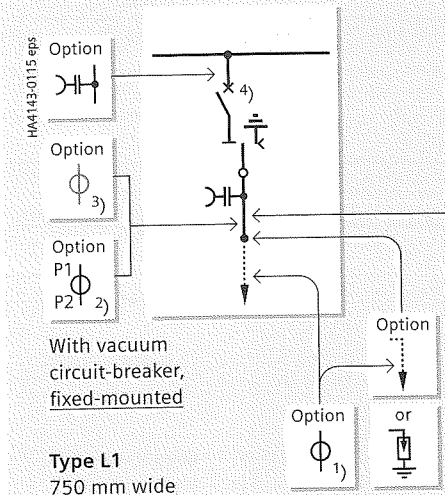
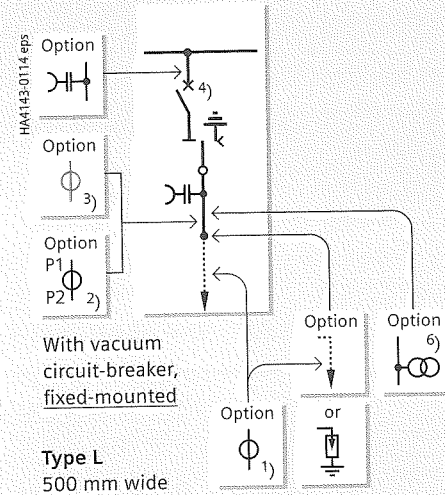
Block-type current transformer 4MA, cast-resin insulated



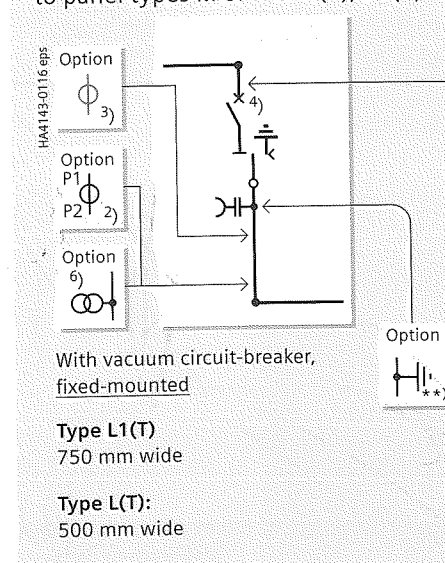
Voltage transformer, e.g. 4MR, 1-pole, cast-resin insulated

2) P1 and P2 are terminal designations of the current transformer

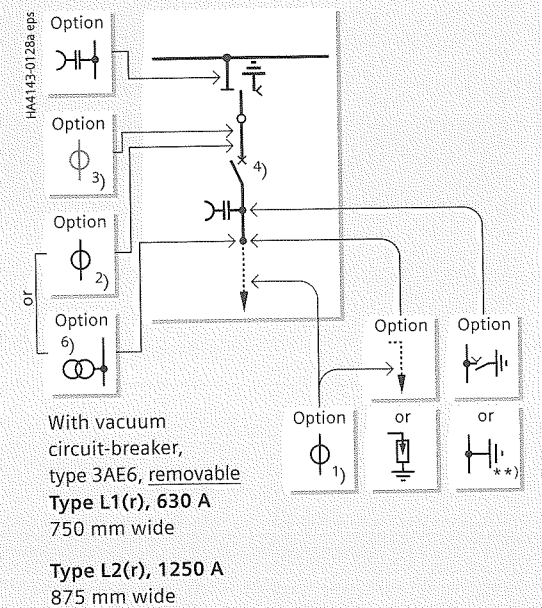
**Circuit-breaker panels 630 A
as feeder panels**



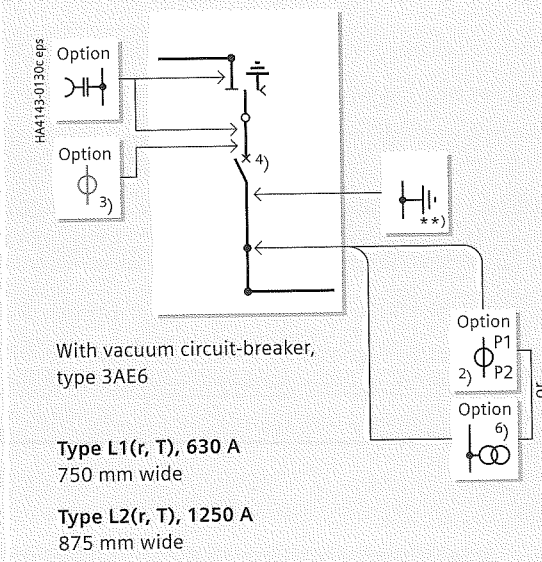
**as transfer panel for attachment
to panel types M or H or R(T), D1(T)**



**Circuit-breaker panels 630 A, 1250 A
as feeder panels**



**as transfer panel for attachment
to panel types,
see table below**



**) Standard: Feeder earthing via the vacuum circuit-breaker type 3AE6 (with interlocks, without earthing switch)

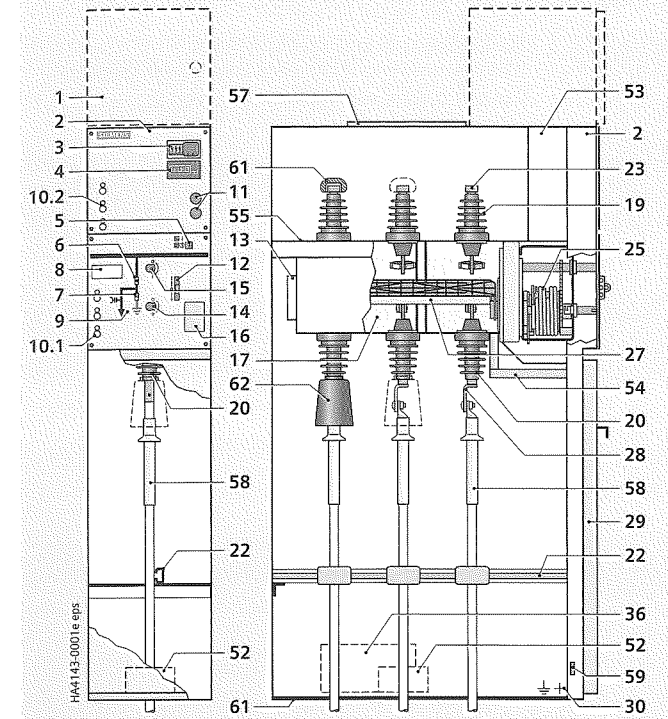
Panel combinations	Design	Rated current
L1(r, T) + H1	Standard	630 A
L1(r, T) + R1(T)	Standard	630 A
L2(r, T) + D1(T)	Standard	1250 A
L2(r, T) + H1	Standard	1250 A

Panel equipment with devices and current and voltage transformers depends on the rated voltage and the panel type (e.g. L1, R) as well as on the panel combination [e.g. R(T)]

- Three-position disconnecter
- Vacuum circuit-breaker (type 3AE6 (CB-r) removable)
- Make-proof earthing switch
- Capacitive voltage detecting system
- Fixed earthing point
- Cable-type current transformer, e.g. 4MC703 ...
- Block-type current transformer 4MA, cast-resin insulated
- Three-phase current transformer 4MC63 ...
- Voltage transformer, e.g. 4MR, 1-pole, cast-resin insulated
- Cable (no scope of supply)
- 2nd cable (no scope of supply)
- Surge arrester

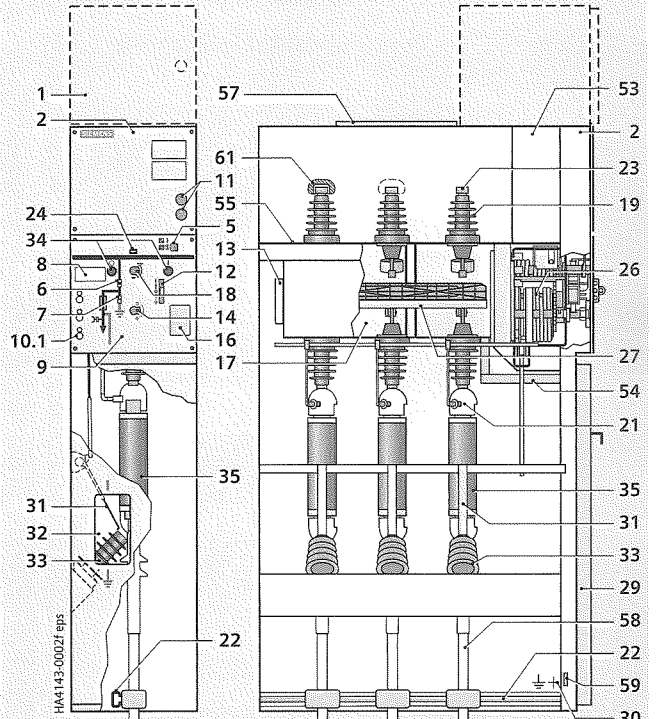
2) P1 and P2 are terminal designations of the current transformer

Ring-main panel as feeder



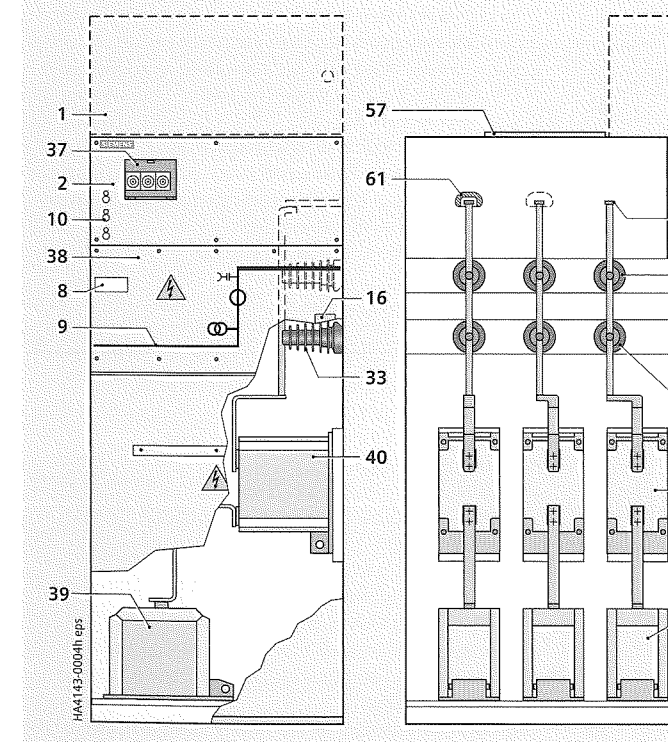
Type R Section

Transformer panel as feeder



Type T Section

Billing metering panel

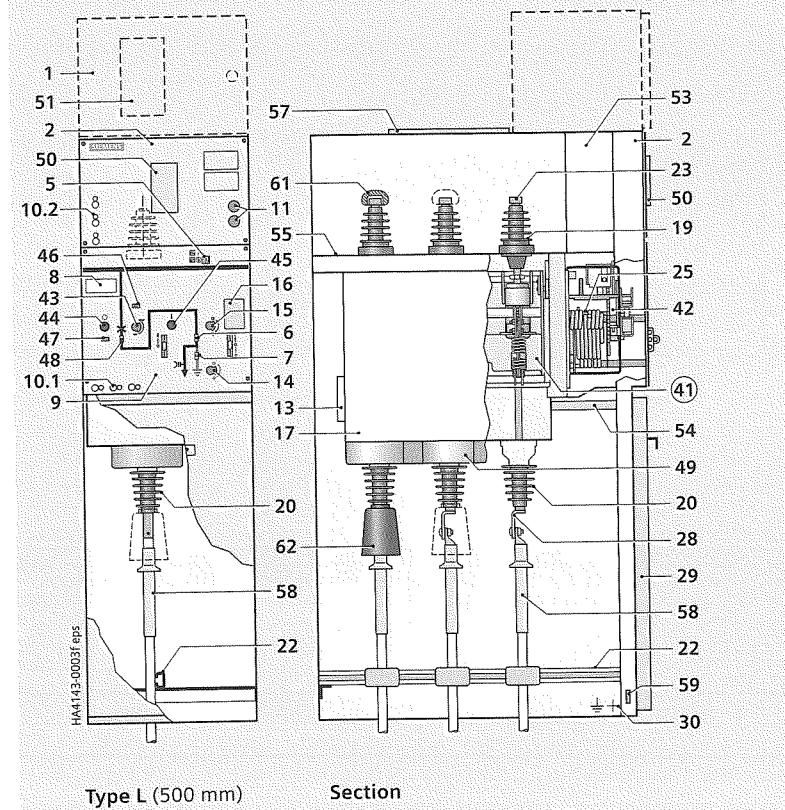


Type M Section

Legend for pages 23 and 24 (contin. on page 24)

- 1 Option: Low-voltage compartment
- 2 Niche for optional low-voltage equipment, cover can be unscrewed
- 3 Option: CAPDIS-Sx voltage detecting system
- 4 Option: Short-circuit/earth-fault indicator
- 5 Option: Ready-for-service indicator for switching device
- 6 Position indication for load-break function "CLOSED - OPEN"
- 7 Position indication for earthing function "OPEN - EARTHED"
- 8 Feeder designation label
- 9 Mimic diagram
- 10 Option: Sockets for capacitive voltage detecting system (depending on arrangement)
- 10.1 for feeder
- 10.2 for busbar
- 11 Option: Momentary-contact rotary control switch "CLOSED - OPEN" for motor operating mechanism with local-remote switch for three-position switch-disconnector
- 12 Option: Locking device for three-position switch-disconnector
- 13 Pressure relief device for switching device
- 14 Manual operation for the mechanism of the earthing function
- 15 Manual operation for the mechanism of the load-break or disconnecting function in L panels
- 16 Rating and type plate
- 17 Gas-insulated vessel for switching device (contains fluorinated greenhouse gas SF₆)
- 18 Manual operation for mechanism "spring charging"
- 19 Bushing-type insulator for busbar

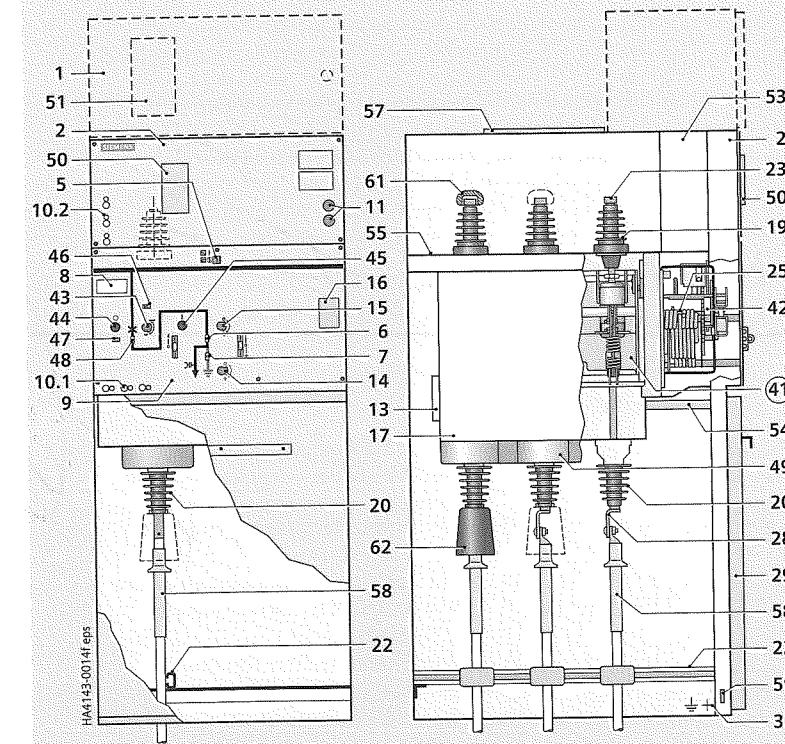
Circuit-breaker panel (with vacuum circuit-breaker type CB-f NAR)



Type L (500 mm)

Section

Circuit-breaker panel (with vacuum circuit-breaker type CB-f NAR)



Type L1 (750 mm)

Section

Legend for pages 23 and 24

- 20 Bushing-type insulator for feeder
- 21 Terminal for HV HRC fuse assembly (with tripping)
- 22 Cable bracket with cable clamps (option) for fastening cables
- 23 Busbar
- 24 "Spring charged" indicator for stored-energy "OPEN"
- 25 Spring-operated mechanism for three-position switch-disconnector
- 26 Spring-operated / stored-energy mechanism for three-position switch-disconnector
- 27 Three-position switch-disconnector
- 28 Cable connection
- 29 Cable compartment cover
- 30 Earthing connection (for location, see dimension drawings)
- 31 Earthing switch for cable connection
- 32 Inspection window
- 33 Post insulator
- 34 Operation for stored-energy mechanism
 - stored-energy "OPEN" (red)
 - stored-energy "CLOSED" (black)
- 35 Option: HV HRC fuse-link (e = 292 mm or 442 mm)
- 36 Option: Heating in the panel
- 37 Option: Secondary protection for voltage transformer
- 38 Cover, screwed on
- 39 4MR voltage transformer
- 40 4MA7 block-type current transformer

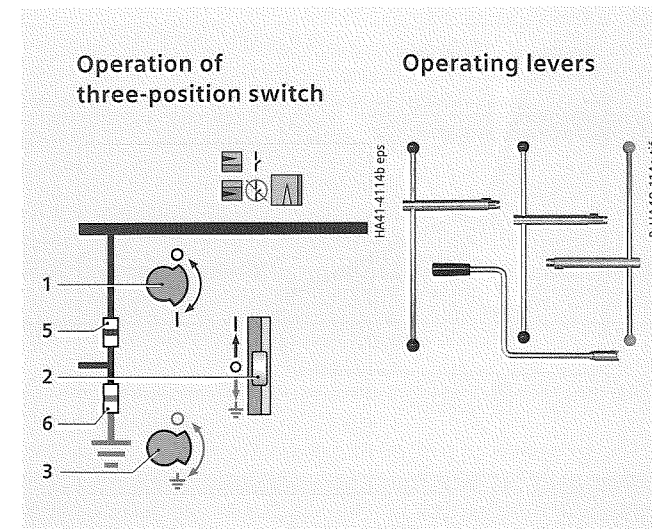
Vacuum circuit-breaker:

- 41 Vacuum circuit-breaker, (VCB) fixed-mounted
- 42 Operating mechanism box
- 43 Manual operation for "spring charging"
 - for closing with manual operating mechanism
 - for emergency operation with motor operating mechanism
- 44 Mechanical "OFF" pushbutton
- 45 Mechanical "ON" pushbutton (not supplied with spring-operated mechanism)
- 46 "Spring charged" indicator
- 47 Operations counter (option for VCB type: CB-f NAR)
- 48 Position indicator

- 49 Option: Three-phase current transformer 4MC63
- 50 Option: Overcurrent-time protection relay (type 7SR45 or similar)
- 51 Option: Multifunction protection relay SIPROTEC 5 7SJ82
- 52 Cable-type current transformer
- 53 Niche applicable for control cables and / or bus wires
- 54 Option: Additional earthing busbar for switching-device vessel
- 55 Metallic partition of busbar compartment
- 57 Busbar compartment cover for panel extension
- 58 Cable sealing end (not included in scope of supply)
- 59 Earthing busbar
- 60 Cover for transformer connection compartment
- 61 Insulating cap on the busbar (for $U_T > 17.5$ kV)
- 62 Insulating cap for cable connection (for $U_T > 17.5$ kV)

Control board

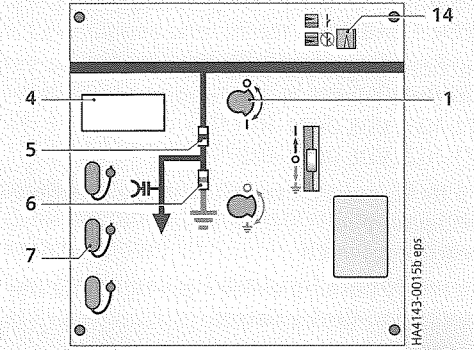
The control boards are function-related. They integrate operation, mimic diagram and position indication. Furthermore, the respective indicating, measuring and monitoring equipment as well as locking devices and control elements (e.g. local-remote switch) are arranged there according to the panel type and version. The ready-for-service indicator and rating plates are also located at the operating front. Operation is identical for transformer and circuit-breaker feeders. First, the operating mechanism must be charged; then, closing / opening is done through separate pushbuttons. The condition of the energy store is indicated. All actuating openings are functionally interlocked against each other, and are optionally lockable. The operating lever carries two plug inserts, separately for the disconnecting and earthing function.



- 1 Manual operation of load-break function (R, T) or disconnecting function (L)
- 2 Locking function (option for ring-main feeders)
- 3 Manual operation of earthing function
- 4 Panel designation label
- 5 Position indicator for switch-disconnector
- 6 Position indicator for earthing switch
- 7 Sockets of capacitive voltage detecting system
- 8 "Fuse tripped" indicator
- 9 ON pushbutton for transformer or circuit-breaker function
- 10 OFF pushbutton for transformer or circuit-breaker function
- 11 Manual operation for "spring charging"
- 12 "Spring charged" indicator
- 13 Position indicator for circuit-breaker
- 14 Ready-for-service indicator
- 15 Operations counter
- 16 Preselection for manual charging of circuit-breaker panels

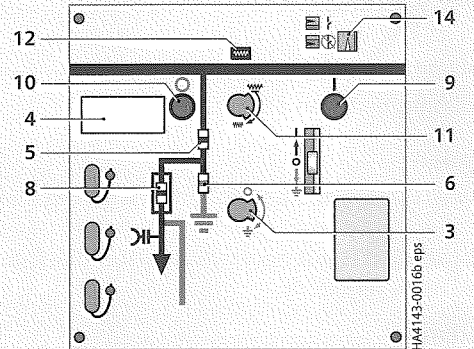
*) AR = Automatic reclosing
NAR = Non automatic reclosing

Front of ring-main feeder, type R



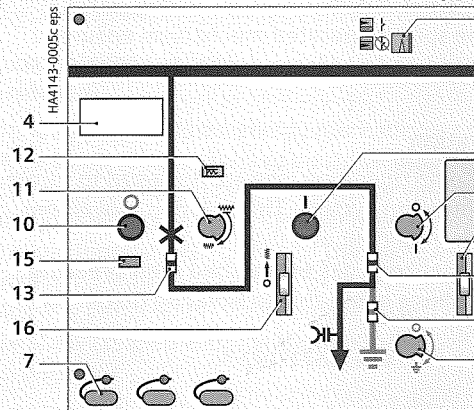
Panel width: 375 mm

Front of transformer feeder, type T

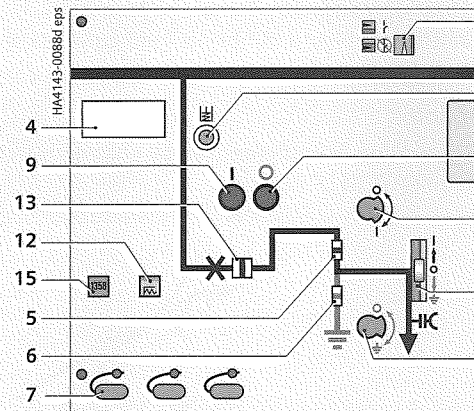


Panel width: 375 mm

Front of circuit-breaker feeder, type L



Panel width: 500 mm, with circuit-breaker type CB-f NAR *)



Panel width: 500 mm, with circuit-breaker type CB-f AR *)

Features

- Switch positions:
CLOSED – OPEN – EARTHED
- Switching functions as general-purpose switch-disconnector (class E3) according to
– IEC/EN 62271-103/VDE 0671-103 *)
– IEC/EN 62271-102/VDE 0671-102 *)
- Designed as a three-position switch with the functions
– Switch-disconnector and
– Make-proof earthing switch
- Operation via rotary bushing welded gas-tight into the front of the switching-device vessel
- Climate-independent contact in the gas-filled switching-device vessel
- Maintenance-free according to IEC/EN 62271-1/VDE 0671-1
- Individual secondary equipment
- No cross insulation between phases.

Mode of operation

The operating shaft forms one unit together with the three contact blades. Due to the arrangement of the fixed contacts (earth – busbar), it is not necessary to interlock the CLOSE and EARTHING functions.

Closing operation

During the closing operation, the operating shaft with the moving contact blades changes from the "OPEN" to the "CLOSED" position.

The force of the spring-operated mechanism ensures a high closing speed and a reliable connection of the main circuit.

Opening operation

During the opening operation, the arc is caused to rotate by the arc-suppression system. This rotation movement prevents the development of a fixed root.

The isolating distance in gas established after breaking fulfills the conditions applicable to isolating distances in accordance with

– IEC/EN 62271-102/VDE 0671-102 *)

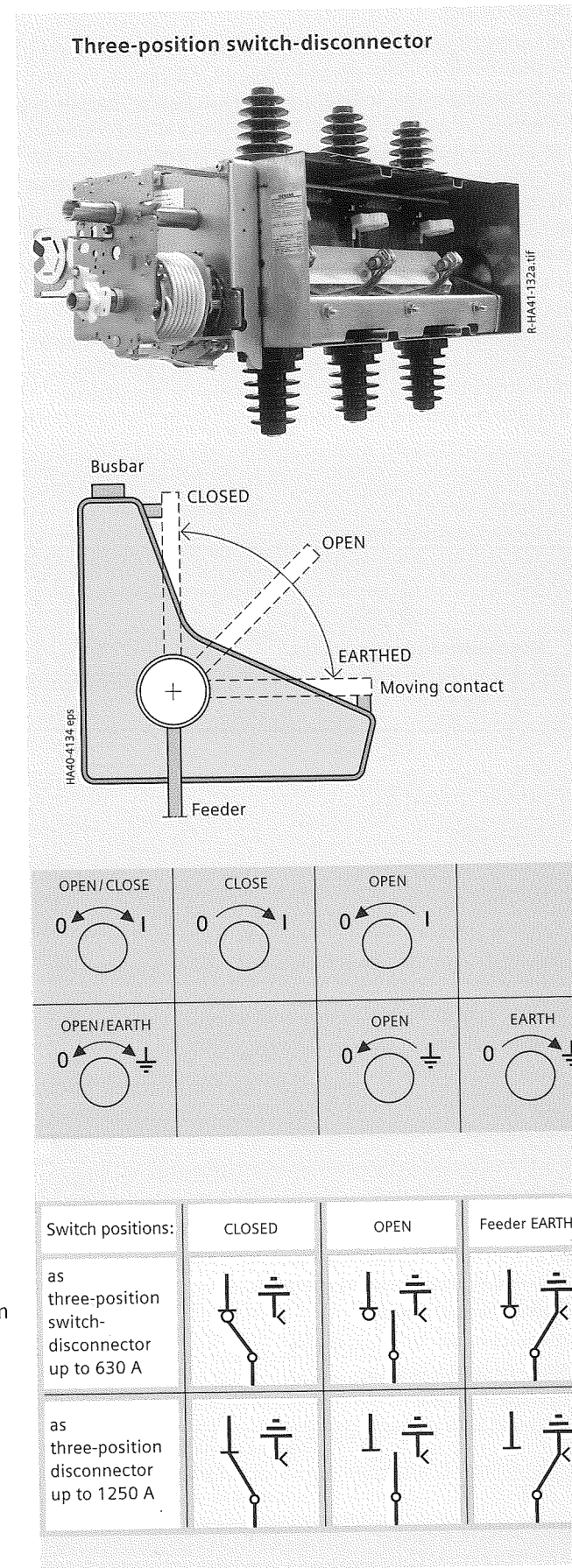
and

– IEC/EN 62271-1/VDE 0671-1 *).

Due to the arc rotation caused by the arc-suppression system, both load currents and minor no-load currents are safely interrupted.

Earthing operation

The EARTHING operation is implemented by changing from the "OPEN" to the "EARTHED" position.



*) For standards, see page 72

• Motor operating mechanism (option)

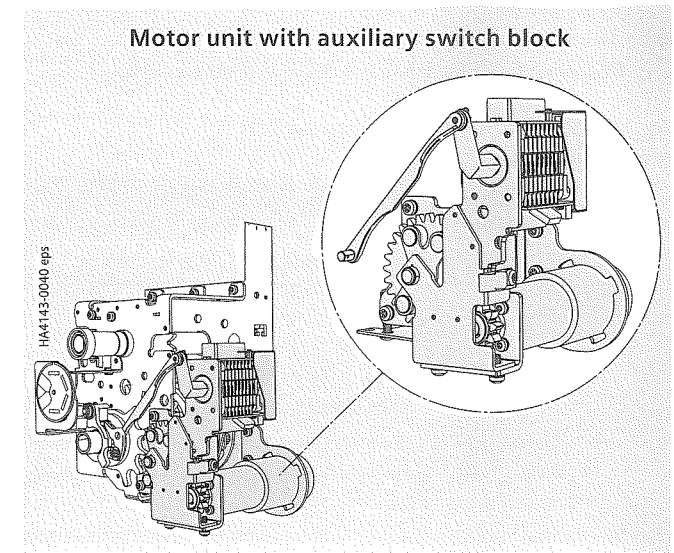
The manual operating mechanisms of SIMOSEC switchgear can be equipped with motor operating mechanisms for the three-position switch-disconnector. Retrofitting is possible.

Operating voltages for motor operating mechanisms:

- 24, 48, 60, 110, 220 V DC
- 110 and 230 V AC, 50/60 Hz.

Operation:

- Local operation by momentary-contact rotary control switch (option)
- Remote operation (standard) applied to terminal.



Shunt release (option) (f-release)

Spring-operated/stored-energy mechanisms can be equipped with a shunt release. Remote electrical tripping of the three-position switch-disconnector is possible via the magnet coil of the shunt release, e.g. transformer overtemperature tripping. To avoid thermal overloading of the shunt release in the event of a continuous signal that may be applied, the shunt release is switched off via an auxiliary switch which is mechanically coupled with the three-position switch-disconnector.

Features

- Mechanical endurance of more than 1000 operating cycles
- Parts subjected to mechanical stress are highly corrosion-proof
- Manual operation with the help of a slip-on operating lever
- Option: Motor operation
- Control board with accordingly cut-out switching gate prevents the three-position switch-disconnector from being switched directly from the "CLOSED" via the "OPEN" to the "EARTHED" position
- Two separate actuating openings are provided for unambiguous selection of the DISCONNECTING and EARTHING functions
- Operation via rotary movement, operating direction according to IEC/EN 60447/VDE 0196 (recommendation of FNN *).

Spring-operated mechanism

The switching movements are performed independently of the operating speed.

Spring-operated/stored-energy mechanism

The switching movements are performed independently of the operating speed.

During the charging process, the closing and opening springs are charged. This ensures that the switch-disconnector/fuse combination can switch off all types of faults reliably even during closing.

Closing and opening is done via pushbuttons, and is therefore identical with the operation of circuit-breaker operating mechanisms.

An energy store is available for tripping by means of an operating HV HRC fuse or via a shunt release (f-release). After tripping, a red bar appears on the position indicator.

Assignment of operating mechanism type of three-position switch to panel types

Panel type	R, L, D1, L(r)	E	T, M(VT-F), M(VT)	
Function	Switch-disconnector (R) Disconnecter (L, D) Disconnecter [L1(r), L2(r)]	Earthing switch	Switch-disconnector (T, T1) Disconnecter [M(VT), M(VT-F)]	Earthing switch
Type of operating mechanism	Spring-operated	Spring-operated	Stored-energy	Spring-operated
Operation	Manual Motor (option)	Manual	Manual Motor (option)	Manual

Legend

- D = Disconnecter feeder
- E = Earthing panel
- L = Circuit-breaker feeder
- R = Ring-main feeder
- T = Transformer feeder
- M(VT), M(VT-F) = Busbar voltage metering panel

*) FNN: Forum network technology/network operation of the VDE (FNN)

Auxiliary switch (option)

Each operating mechanism of the three-position switch-disconnector (or three-position disconnecter) can be optionally equipped with an auxiliary switch for the position indication:

- Switch-disconnector function: **)
 - CLOSED and OPEN: 1 NO + 1 NC + 2 changeover (manually operated)
- Earthing switch function:
 - CLOSED and OPEN: 1 NO + 1 NC + 2 changeover
- Switch-disconnector function in T typical: **)
 - CLOSED and OPEN: 2 changeover (manually operated, motor-operated)
- Earthing switch function:
 - CLOSED and OPEN: 1 NO + 1 NC + 2 changeover.

Technical data of the auxiliary switch

Breaking capacity

AC operation at 40 Hz up to 60 Hz		DC operation		
Operating voltage	Normal current	Operating voltage	Normal current	
V	A	V	A	A
up to 230	10	24	10	10
		48	10	9
		60	9	7
		110	5	4
		240	2.5	2

Rated switching capacity

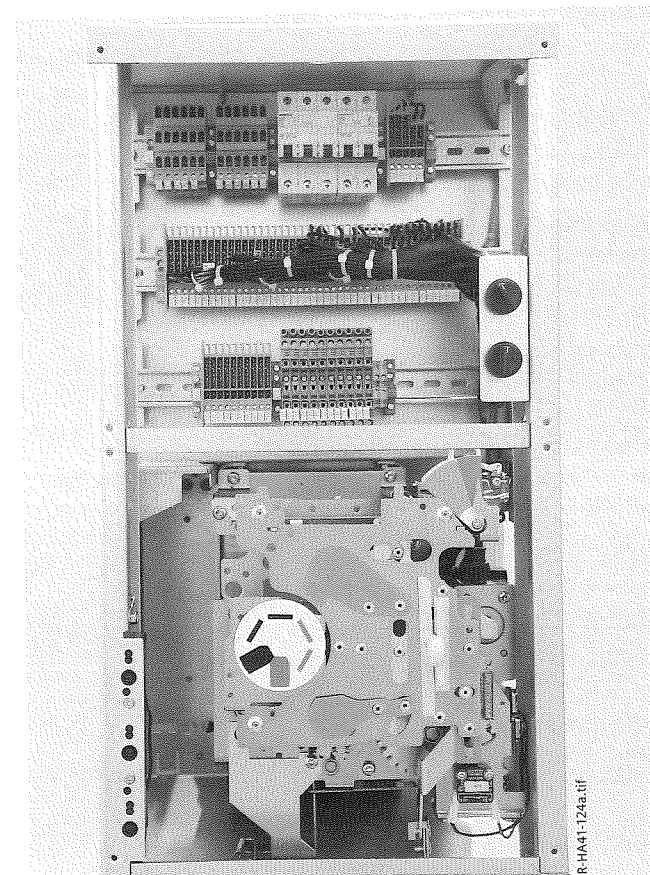
Rated insulation level	250 V AC/DC
Insulation group	C according to VDE 0110
Continuous current	10 A
Making capacity	50 A

Abbreviations:

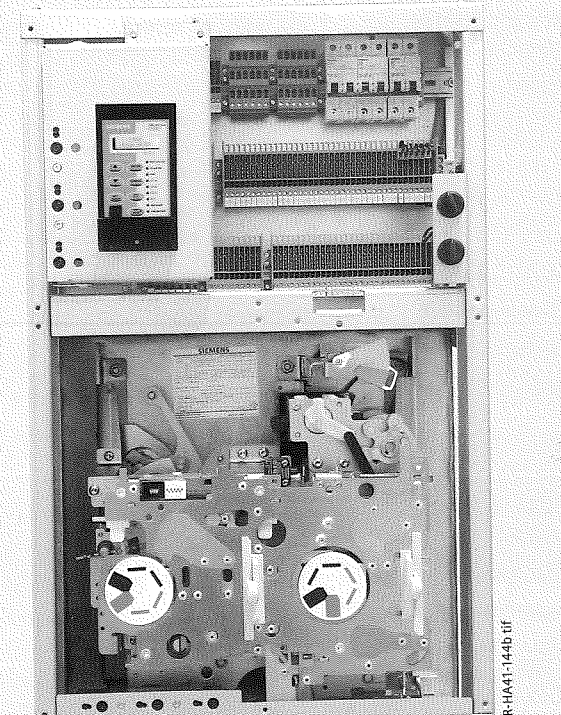
NO = Normally open contact

NC = Normally closed contact

**) Depending on the secondary equipment of the three-position switch



Panel type R:
Operating mechanism for three-position switch, and low-voltage niche with terminals and MCB's (options)



Panel type L:
Motor operating mechanism for three-position switch, and circuit-breaker type "CB-f NAR"

Features

- According to IEC/EN 62271-100/VDE 0671-100/GB 1984 *)
- Application in hermetically welded switching-device vessel in conformity with the system
- Climate-independent vacuum interrupter poles in the gas-filled switching-device vessel
- Operating mechanism located outside the switching-device vessel in the front operating mechanism box
- Maintenance-free for indoor installation according to IEC/EN 62271-1/VDE 0671-1 *)
- Individual secondary equipment.

Operating mechanism functions

The closing spring is charged by means of the operating lever or the hand crank supplied, or by the motor (option), until the latching of the closing spring is indicated ("spring charged" indicator). Then, the vacuum circuit-breaker can be closed manually or electrically.

In operating mechanisms provided for automatic reclosing (AR), the closing spring can be recharged manually or automatically in case of motor operating mechanism. Thus, the "closing option" is available again.

Operating mechanism

The operating mechanism assigned to a circuit-breaker feeder consists of the following components:

- Operating mechanism for circuit-breaker
- Operating mechanism for three-position disconnecter
- Motor operating mechanism (optional)
- Position indicators
- Pushbuttons for CLOSING and OPENING the circuit-breaker
- Operations counter (optional)
- Interlocking between circuit-breaker and disconnecter.

Assignment of operating mechanism type

Panel type	L, L1, L1(r), L1(r), L2(r)	Three-position disconnecter	
Function	Circuit-breaker	Disconnecter	Earthing switch
Type of operating mechanism	Stored-energy	Spring-operated	Spring-operated
Operation	Manual/motor	Manual/motor	Manual

Trip-free mechanism

The vacuum circuit-breaker is fitted with a trip-free mechanism according to IEC/EN 62271-100/VDE 0671-100 *). In the event of an opening command being given after a closing operation has been initiated, the moving contacts return to the open position and remain there even if the closing command is sustained. This means that the contacts are momentarily in the closed position, which is permissible according to the mentioned standard.

*) For standards, see page 72

Technical data of the vacuum circuit-breaker

Vacuum circuit-breaker	Type	CB-f AR *)	CB-f NAR *)	CB-f 3AE6 *)
Short-circuit breaking current	up to 25 kA	up to 25 kA	up to 25 kA	up to 25 kA
Rated operating sequence:				
- O - 0.3 s - CO - 3 min - CO	•	-	-	-
- O - 0.3 s - CO - 15 s - CO	on request	-	•	-
- O - 0.3 s - CO - 30 s - CO	•	-	-	-
- O - 3 min - CO - 3 min - CO	-	•	-	-
Number of breaking operations I _r	10 000	2 000	10 000	10 000
Number of short-circuit breaking operations I _{sc}	30	20	30	30
Individual panel type L ...:	500 mm	L	L	-
Individual panel type L1 ...:	750 mm	L1	L1	L1(r)
Individual panel type L1 ...:	875 mm	-	-	L2(r)

Explanations:

- Design option
- Not available

*) AR = Automatic reclosing; NAR = Non automatic reclosing
Δ) In preparation; circuit-breaker design; • CB-r: removable

Vacuum circuit-breaker type CB-f

The vacuum circuit-breaker consists of a vacuum interrupter unit with integrated three-position disconnecter located in the switching-device vessel, and the associated operating mechanisms.

Circuit-breaker secondary equipment

Circuit-breaker	Type	Type	Type
	CB-f AR	CB-f NAR	CB-f AR
Motor operating mechanism	○	○	○
Closing solenoid	●	○	●
Shunt release	○	○	○
C.t.-operated release	○	○	○
Low-energy magnetic release	-	○	-
Undervoltage release	○	○	○
Anti-pumping	●	o.r.	●
Circuit-breaker tripping signal	●	○	●
Varistor module	for ≥ 60 V DC	for ≥ 60 V DC	for ≥ 60 V DC
Auxiliary switch			
6 NO + 6 NC	●	●	●
free contacts thereof ¹⁾	1 NO + 2 NC + 2 change-over	1 NO + 1 NC + 2 change-over	2 NO + 2 NC + 2 change-over
11 NO + 11 NC	○	-	○
free contacts thereof ¹⁾	6 NO + 7 NC + 2 change-over	-	7 NO + 7 NC + 2 change-over
Position switch	●	●	●
Mechanical interlocking	●	●	●
Operations counter	●	○	●

- = Standard
- = Option
- o.r. = on request

Abbreviations:

NO = Normally open contact
NC = Normally closed contact

¹⁾ Depending on the selected secondary components

Motor operating mechanism (option)

Operating voltages for motor operating mechanisms:

- 24, 48, 60, 110, 220 V DC
- 110 and 230 V AC, 50/60 Hz.

Further values on request.

Motor rating for circuit-breaker operating mechanism at:

- CB-f AR: *)
- Maximum 500 W
 - Maximum 650 VA

- CB-f NAR: *)
- Maximum 80 W
 - Maximum 80 VA.

Secondary components

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

Closing solenoid

- For electrical closing.

Shunt release

- Standard: Magnet coil
- Option: Magnet coil with energy store
- Tripping by protection relay or electrical actuation.

C.t.-operated release

- For tripping pulse 0.1 Ws in conjunction with suitable protection systems, e.g. protection system 7SJ45, make Woodward/SEG type WIC; other designs on request
- Used if external auxiliary voltage is missing, tripping via protection relay.

Low-energy magnetic release (for CB-f NAR)

- For tripping pulse 0.02 Ws, tripping via transformer monitor (IKI-30).

Undervoltage release

- 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 (standard for CB-f AR) *)
(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 and cutout switch.

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

- For electrical position indication.

Position switch

- For signaling "closing spring charged".

Mechanical interlocking

- Dependent on the type of operating mechanism
- Logical mechanical interlock between the three-position disconnecter and the circuit-breaker (option: Closing lock-out for the three-position disconnecter in circuit-breaker panels)
- Option: Operating mechanism with mechanical interlocking as
 - Spring-operated mechanism: Opening for operating crank is blocked
 - Stored-energy mechanism with closing solenoid and pushbutton: The pushbutton operated by the mechanical interlock prevents a continuous command to the closing solenoid
- During operation of the three-position disconnecter from CLOSED to OPEN, the vacuum circuit-breaker cannot be in CLOSED position.

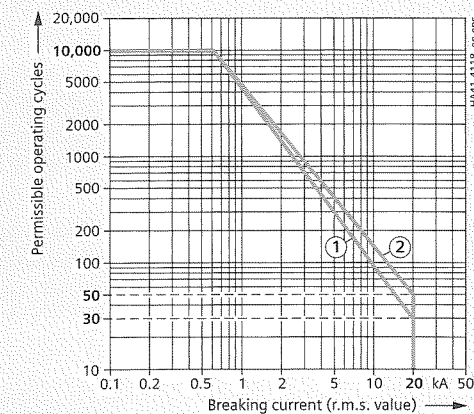
Operations counter

- As numeric indicator, 5 digits, mechanical.

*) AR = Automatic reclosing
NAR = Non automatic reclosing

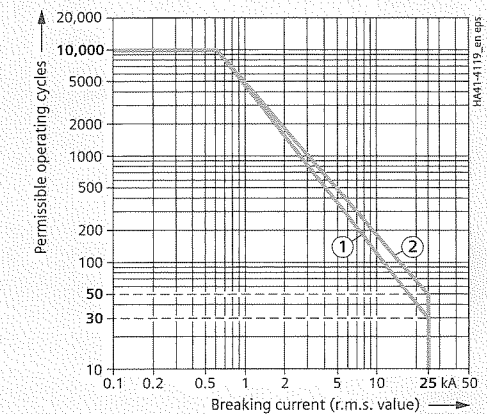
Electrical service life

Vacuum circuit-breaker type CB-f AR *)



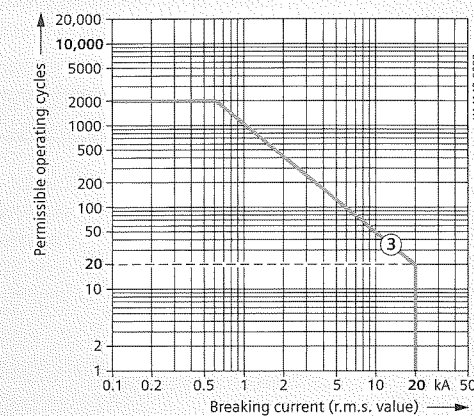
Rated short-circuit breaking current 20 kA

Max. number of short-circuit breaking operations: ① n = 30, ② n = 50



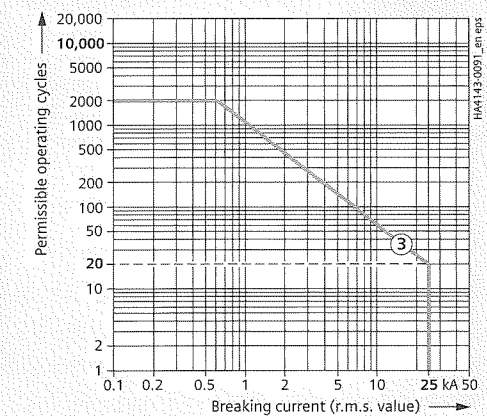
Rated short-circuit breaking current 25 kA

Vacuum circuit-breaker type CB-f NAR *)



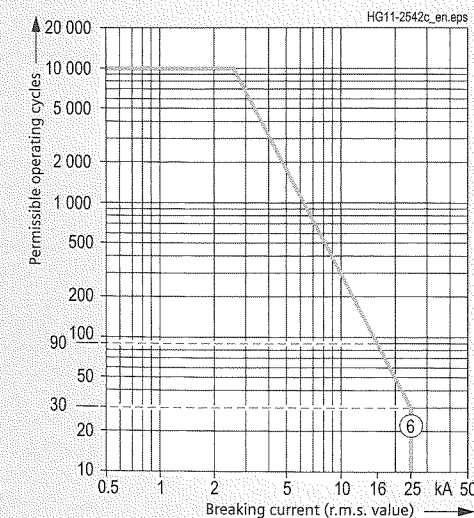
Rated short-circuit breaking current 20 kA

Max. number of short-circuit breaking operations: ③ n = 20



Rated short-circuit breaking current 25 kA

Vacuum circuit-breaker type 3AE6, for switchgear type SIMOSEC as CB-r AR *)

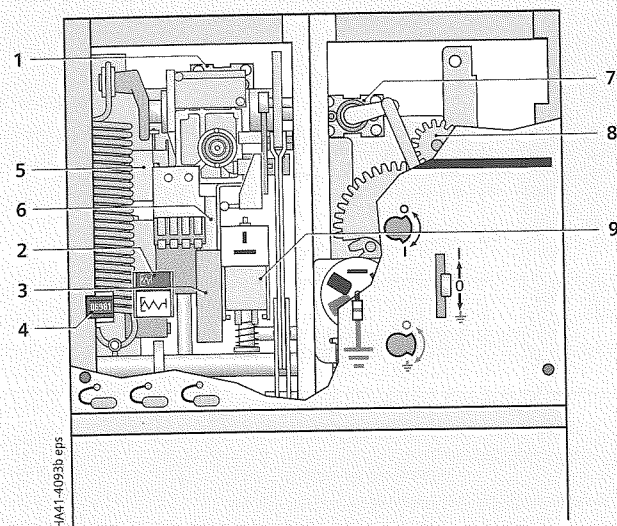


Rated short-circuit breaking current 25 kA

Max. number of short-circuit breaking operations: ⑥ n = 30

*) AR = Automatic reclosing
NAR = Non automatic reclosing

Vacuum circuit-breaker type CB-f AR *)



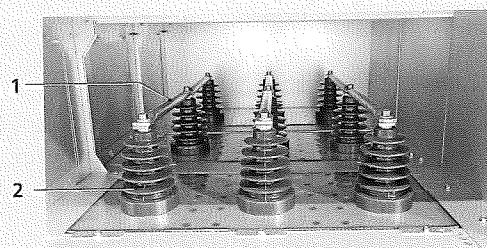
Maximum secondary equipment

- 1 Auxiliary switch at the circuit-breaker
- 2 Position switch "spring charged"
- 3 2nd release
- 4 Operations counter
- 5 1st release
- 6 Motor operating mechanism, circuit-breaker
- 7 Auxiliary switch at the three-position disconnecter
- 8 Motor operating mechanism, three-position disconnecter
- 9 Closing solenoid, circuit-breaker

Busbars

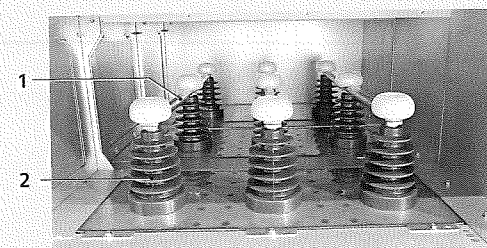
- Safe-to-touch due to metallic enclosure
- Metal-clad busbar compartment
- Three-pole design, bolted from panel to panel
- Easy switchgear extension
- Made of copper: Round E-Cu.

Busbars



- 1 Busbar
- 2 Bushing-type insulator for busbar

Busbar compartment extending over 3 panels (example ≤ 17.5 kV)
Side view



- 1 Busbar
- 2 Bushing-type insulator for busbar

Busbar compartment extending over 3 panels (example 24 kV)
Side view

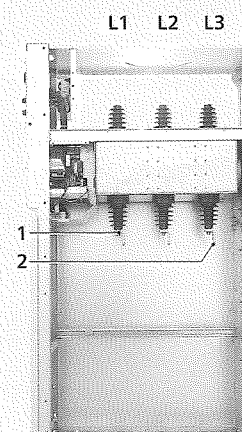
General features

- Connecting lugs for sealing ends arranged one behind the other
- Uniform cable connection height for the respective panel types
- With cable bracket, e.g. type C40 according to DIN EN 50024
- Access to the cable compartment only if feeder has been isolated and earthed.

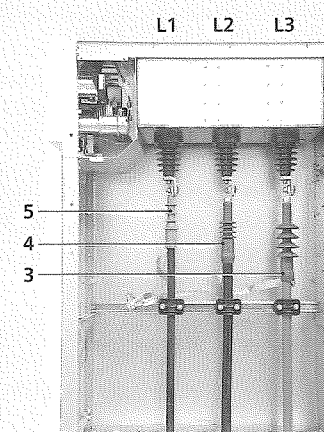
Special features

- In cable panels (type K)
- In ring-main panels (type R)
- In circuit-breaker panels (type L)
- For thermoplastic-insulated cables
- For paper-insulated mass-impregnated cables with adapter systems
- For connection cross-sections up to 300 mm²
- Cable routing downwards.
- In transformer panels (type T)
- For thermoplastic-insulated cables
- For connection cross-sections up to 120 mm²: Cable lug max. 32 mm wide
- For rated normal currents of 200 A.

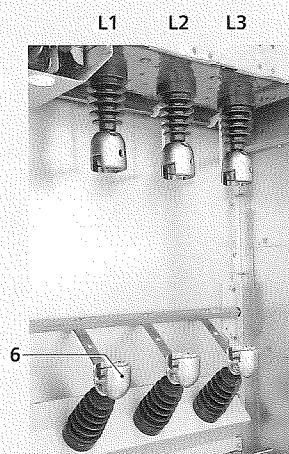
Cable connection (examples)



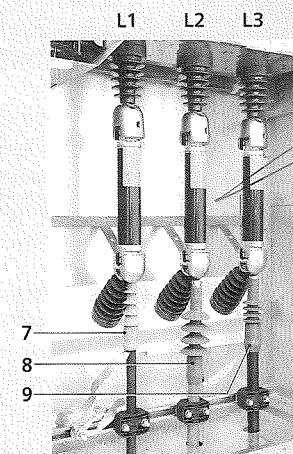
Ring-main panel type R
Cable compartment as delivered



Cable compartment with cable sealing ends (options: A, B, C ¹⁾ and D ¹⁾, see below)



Transformer panel type T
Cable compartment as delivered



Cable compartment with cable sealing ends (option: A ²⁾, see below)

- Options**
- A Mounted cable clamps ²⁾
 - B Short-circuit/earth-fault indicator
 - C Double cable connection
 - D Suitable for connection of surge arresters ³⁾

Cable sealing ends (examples)

- 1 As-delivered condition
- 2 Connection for cable
- 3 Phase L1: Make Lovink-Enertech, type IAEM 20, 240 mm² (20 kV)
- 4 Phase L2: Make Prysmian Kabel und Systeme (Pirelli Elektrik) type ELTI mb-1C-2h-C-T3, 240 mm² (24 kV)
- 5 Phase L3: Make Tyco Electronics Raychem, type EPKT 24 C/1X, 185 mm² (24 kV), as shrink-on sealing end, for severe ambient conditions
- 6 As-delivered condition, prepared for cable sealing end
- 7 Phase L1: Make Lovink-Enertech, type IAEM 20, 95 mm² (20 kV)
- 8 Phase L2: Make Tyco Electronics Raychem, type TFTI/5131, 95 mm² (24 kV), as push-on sealing end
- 9 Phase L3: Make Euromold, type ITK, 95 mm² (24 kV)

Note:
- Cable sealing ends and cable clamps are not included in the scope of supply

For options, see figures:

- 1) Only with ring-main panel
- 2) Cable clamps in transformer panels type T... partly mounted underneath the panel in the cable basement (for 24 kV = standard)
- 3) Make Siemens, type 3EK, other makes on request

*) AR: Automatic reclosing