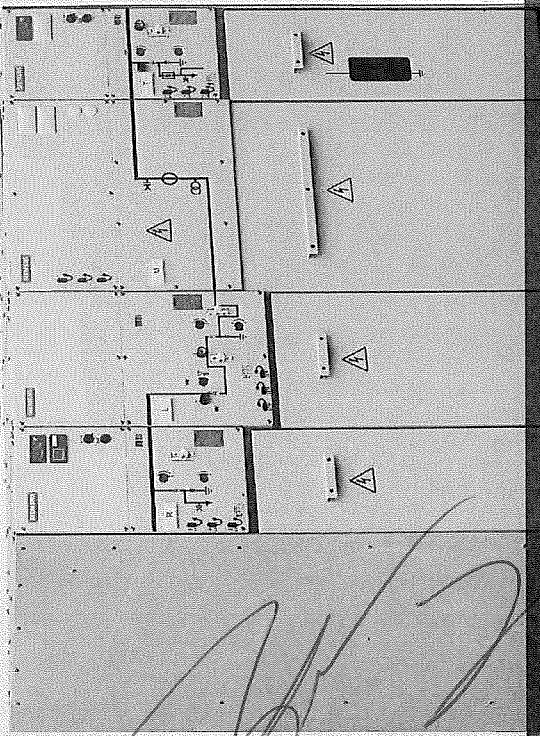


**SIEMENS**



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

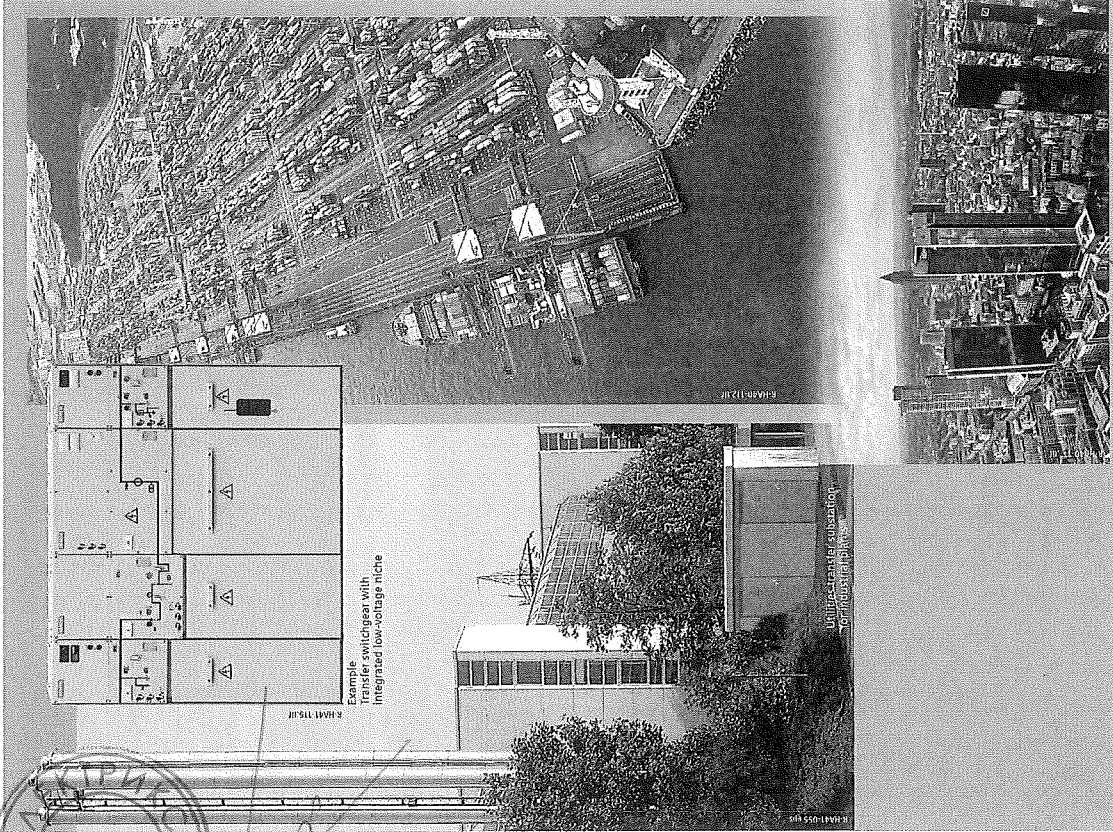
Medium-Voltage Switchgear

Totally Integrated Power – SIMOSEC

Edition  
September  
2015

Catalog  
HA 41.43

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



2 Switchgear Type SIMOSEC, up to 24 kV, Air-Insulated, Extendable - Siemens HA 41.43 - September 2015

# Contents

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


Medium-Voltage Switchgear

Catalog HA 41.43 · September 2015

Invalid: Catalog HA 41.43 · Sept. 2014

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

Application, Requirements Features, Classification	Pages
Technical Data	4 to 6
Electrical data of the switchgear	7 to 10
Technical data, switching capacity and classification of switching devices	11 to 13
Product Range	14 and 15
Product range overview, options for panels	16 and 17
Product range overview, equipment features	18 to 29
Design	30 and 31
Panel design	32
Operation (examples)	
Components	
Three-position switch	33
Operating mechanisms, equipment	34 and 35
Vacuum circuit-breaker, busbars	36 to 39
Cable connection	40 and 41
Cable cross-sections, HV HRC fuse assembly	42 to 47
Instrument transformers	48 to 50
Indicating and measuring equipment	51 to 60
Protection systems	61
Low-voltage compartment	62
Low-voltage niche	63
Dimensions	
Switchgear installation	64 to 66
Panels	67 to 77
Floor openings and fixing points	78 to 80
Installation	
Shipping data, transport	81 to 83
Standards	
Standards, specifications, guidelines	84 to 87
Product Range	
With Removable Circuit-Breaker Type 3AH6	
Versions	88
Electrical data of the switchgear	89
Circuit-breaker panels; panel design	90 and 91
Product range overview, options for panels	92 and 93
Three-position switch as	
three-position disconnecter	94
Cable connection	95
Dimensions of circuit-breaker panels	96
Floor openings and fixing points	97



ISO 9001 = ISO 14001  
OHSAS 18001

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).

# Application, Requirements

## Features

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. Modular space-saving design allows use in
- Substations, customer transfer substations, distribution 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 (partition of metal).

### 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 disconnecter, 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 (partition of metal).

### 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 84

# Application, Requirements

## Features

### Cost-efficiency

- Low "life-cycle costs" and high availability throughout the entire product service life cycle 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, as well as 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 (partition of metal)
- 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, loosening the fixing bolts
- Hermetically-sealed by welded, stainless-steel switching-device vessel
  - For switching devices
  - With insulating gas SF<sub>6</sub>
- LSC 2 panels, LSC 1 panels (without isolating distance)
- Pressure relief
  - To the rear and upwards
  - Separately for each compartment
  - **Option:** Pressure relief downwards
- 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 84)

# Application, Requirements

## Features, classification

### Electrical features

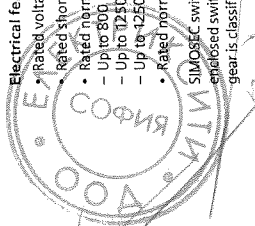
- Rated voltages up to 24 kV
  - Rated short-time withstand current up to 25 kA
  - Rated normal current of feeders
    - Up to 800 A, e.g. for ring-main, metering panels
    - Up to 1250 A, for circuit-breaker panels
    - Up to 1250 A, for bus sectionalizer panels
  - Rated normal current of busbar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

Loss of service continuity category	PM (metallic partition)
<ul style="list-style-type: none"> <li>– With HV/HRC buses (T, MV/TF, ...)</li> <li>– Without HV/HRC buses (R, L, D, ...)</li> <li>– Meeting panels Type M or busbar panel Type H</li> </ul>	<ul style="list-style-type: none"> <li>– LSC 2</li> <li>– LSC 1</li> </ul>
<ul style="list-style-type: none"> <li>– Accessibility to compartments (enclosures)</li> <li>– Busbar compartment</li> <li>– Switching device compartment with removable circuit-breaker</li> <li>– Low voltage compartment</li> <li>– Option: Cable connection system for 3-phase cables</li> <li>– With HV/HRC buses (R, L, ...)</li> <li>– With HV/HRC buses (D, ...)</li> <li>– Cable feeder (X)</li> <li>– Metering panel (air-insulated) (M, ...H)</li> </ul>	<ul style="list-style-type: none"> <li>– Tool-based</li> <li>– Interlock controlled</li> <li>– Interlock controlled</li> <li>– Tool-based</li> <li>– Tool-based</li> </ul>

### Internal arc classification (option)

The following internal arc classifications are fulfilled:	Internal arc classification
IAC A (L/R), IAC T	– Internal arc classification
IAC	– Rated voltage 7.2 kV to 24 kV; – IAC A (L/R), IAC T; – IAC A (R), IAC T
IAC class for	– Switchgear in closed electrical service location, access "for authorized personnel only" (according to IEC 62271-200)
– Free-standing arrangement	– Front
– Type of accessibility A	– Rear (for free-standing arrangement)
– F	– Arc test current I <sub>sc</sub> up to 21 kA
– R	– Test duration t
– R	– 1 s



28

# Technical Data

## Electrical data of the switchgear

Rated voltage $U_N$ — phase-to-phase, phase-to-earth, open contact gap — phase-to-phase, phase-to-earth, open contact gap — across the isolating distance	kV	7.2	12	17.5	24
Rated short-circuit power (frequency withstand voltage $U_N$ ) — across the isolating distance	kV	20	28,42*)	36	50
Rated lightning impulse withstand voltage $U_{LI}$ — phase-to-phase, phase-to-earth, open contact gap — across the isolating distance	kV	60	75	95	129
Rated normal current $I_N$ ***) for busbar	kA	60	85	110	145
Rated normal current $I_N$ ***) for ring-main feeder	A	630	—	—	—
Rated normal current $I_N$ ***) for HV-HRC fuse-link	A	800, 1250	—	—	—
50 Hz Rated short-time withstand current $I_{sh}$ for rated duration of short-circuit $t_{sc} = 1 s, 2 s, 3 s$ )	up to kA	21	25	21	25
Rated peak withstand current $I_p$	up to kA	21	—	21	—
60 Hz Rated short-time withstand current $I_{sh}$ for rated duration of short-circuit $t_{sc} = 1 s, 2 s, 3 s$ )	up to kA	21	25	21	25
Rated peak withstand current $I_p$	up to kA	21	—	21	—
Rated peak withstand current $I_{p,trans}$ for transformer feeders	up to kA	55	55	65	65

Pressure values, temperature	kPa	140
Filling pressure for gas-insulated switching devices (pressure values at 20 °C)	kPa	120
Ambient air temperature $T$ (minimum/maximum air temperature of the secondary equipment used)	°C	-25/+40
Degree of protection for switchgear enclosure	IP	IP55
Degree of protection for low-voltage compartment	IP	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/VDI 0671-1)  
 1) Depending on the secondary equipment used  
 Δ) If panel heating available

Switchgear Type SIMOSEC, up to 24 kV, Air-insulated, Extendable - Siemens HA 41.43 - September 2015 | 7

# Technical Data

## Electrical data of the switchgear

Rated insulation level	kV	7.2	12	17.5	24
Rated normal current $I_N$ ***) Standard	A	630	—	—	—
Rated normal current $I_N$ ***) Option	A	800, 1250	—	—	—
Rated short-time withstand current $I_{sh}$ for rated duration of short-circuit $t_{sc} = 1 s, 2 s, 3 s$ )	up to kA	21	25	21	25
Rated peak withstand current $I_p$	up to kA	21	—	21	—
Rated peak withstand current $I_{p,trans}$ for ring-main feeder	up to kA	52.5	63	52.5	63
60 Hz Rated short-time withstand current $I_{sh}$ for rated duration of short-circuit $t_{sc} = 1 s, 2 s, 3 s$ )	up to kA	21	25	21	25
Rated peak withstand current $I_p$	up to kA	21	—	21	—
Rated peak withstand current $I_{p,trans}$ for ring-main feeder	up to kA	55	55	65	65
Rated peak withstand current $I_{p,trans}$ for ring-main feeders	up to kA	55	55	65	65

Transformer panel types T, T1, TCT as switch-fuse combination according to IEC 62271-105	Standard	A <th>200</th>	200
Rated normal current $I_N$ ***)	Standard	—	—
Rated short-time withstand current $I_{sh}$	for rated duration of short-circuit $t_{sc} = 1 s, 2 s, 3 s$ )	up to kA	21
Rated peak withstand current $I_p$	for transformer feeders 1)	—	—
Rated short-circuit making current $I_{mk}$	for transformer feeders 1)	up to kA	52.5
Rated short-circuit making current $I_{mk,trans}$	for transformer feeders 1)	—	—
60 Hz Rated short-time withstand current $I_{sh}$	for rated duration of short-circuit $t_{sc} = 1 s, 2 s, 3 s$ )	up to kA	21
Rated peak withstand current $I_p$	for transformer feeders 1)	—	—
Rated short-circuit making current $I_{mk}$	for transformer feeders 1)	up to kA	55
Rated short-circuit making current $I_{mk,trans}$	for transformer feeders 1)	—	—
Dimension $e$ of HV-HRC fuse-link		up to kA	55
Dimension $f$ of HV-HRC fuse-link		up to kA	55
		$a = 292 \text{ mm}$ $e = 442 \text{ mm}$	

Circuit-breaker panel 2) types L, L1, L1TD, L1CTD	Standard	L	L1	L1TD	L1CTD
Rated normal current $I_N$ ***) Option	Standard	A	630	—	—
Rated normal current $I_N$ ***) Option	A	1250(A, Δ)	—	—	—
50 Hz Rated short-time withstand current $I_{sh}$	for rated duration of short-circuit $t_{sc} = 1 s, 2 s, 3 s$ )	up to kA	21	25	21
Rated peak withstand current $I_p$	for rated duration of short-circuit $t_{sc} = 3 s$ (4 s**))	up to kA	21	—	—
Rated short-circuit making current $I_{mk}$	up to kA	52.5	63	52.5	63
Rated short-circuit making current $I_{mk,trans}$	up to kA	52.5	63	52.5	63
60 Hz Rated short-time withstand current $I_{sh}$	for rated duration of short-circuit $t_{sc} = 1 s, 2 s, 3 s$ )	up to kA	21	25	21
Rated peak withstand current $I_p$	for transformer feeders 1)	—	—	—	—
Rated short-circuit making current $I_{mk}$	for transformer feeders 1)	up to kA	55	55	65
Rated short-circuit making current $I_{mk,trans}$	for transformer feeders 1)	—	—	—	—
Rated peak withstand current $I_{p,trans}$	for transformer feeders 1)	up to kA	55	55	65
Rated short-circuit breaking current $I_{br}$		up to kA	21	25	21
Rated short-circuit breaking current $I_{br,trans}$		up to kA	21	25	21

- \*) As design option, on request according to some national requirements (e.g.: GOST, GB, ...)  
 \*\*) The 24-hour mean value is max. 35 °C (according to IEC 62271-1/VDI 0671-1)  
 1) Depending on HV-HRC fuse-link (depending on the IEC-tough current of the HV HRC fuse-link), earthing switch at the feeder; see page 11  
 2) Vacuum circuit-breaker in gas-filled switching-device vessel (maintenance-free under normal ambient conditions according to IEC 62271-1)  
 Δ) Busbar  
 4) 1250 A in preparation

8 Switchgear Type SIMOSEC, up to 24 kV, Air-insulated, Extendable - Siemens HA 41.43 - September 2015



ВАРИАНТ С ОПТИМИЗАЦИЕЙ

# Technical Data

## Electrical data of the switchgear

Rated insulation level	Rated voltage U <sub>r</sub>	kV	7.2	12	17.5	24
Common electrical data of the switchgear panels						
On request: Circuit-breaker panel types L1(O), L2(O), L1(W), L2(W)						
Rated normal current I <sub>n</sub> **	Standard: A1 630 Optional: L1(O), L1(W), L2(O), L2(W), L1(W), L2(W), L1(W), L2(W)	A1 630, 1250	25	21	25	21
Rated short-time withstand current I <sub>ks</sub>	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s** up to kA 21	25	21	25	21	25
Rated peak withstand current I <sub>p</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 21	21	21	21	21
Rated short-circuit making current I <sub>mk</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 52.5	63	52.5	63	52.5
Rated short-circuit breaking current I <sub>bk</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 52.5	63	52.5	63	52.5
Rated short-time withstand current I <sub>st</sub>	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s** up to kA 21	25	21	25	21	25
Rated peak withstand current I <sub>p</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 21	21	21	21	21
Rated short-circuit making current I <sub>mk</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 55	65	55	65	55
Rated short-circuit breaking current I <sub>bk</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 55	65	55	65	55
Busbar earthing panel type E						
Rated short-time withstand current I <sub>st</sub>	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s** up to kA 21	25	21	25	21	25
Rated peak withstand current I <sub>p</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 21	21	21	21	21
Rated short-circuit making current I <sub>mk</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 52.5	63	52.5	63	52.5
Rated short-circuit breaking current I <sub>bk</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 52.5	63	52.5	63	52.5
Rated short-time withstand current I <sub>st</sub>	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s** up to kA 21	25	21	25	21	25
Rated peak withstand current I <sub>p</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 21	21	21	21	21
Rated short-circuit making current I <sub>mk</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 55	65	55	65	55
Rated short-circuit breaking current I <sub>bk</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 55	65	55	65	55
Busbar voltage metering panel types MV(PE), MV(TFP)						
Rated normal current I <sub>n</sub> **	Standard: A1 200	A1 200	25	21	25	21
Rated short-time withstand current I <sub>st</sub> **	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s** up to kA 21	25	21	25	21	25
Rated peak withstand current I <sub>p</sub> **	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 21	21	21	21	21
Rated short-circuit making current I <sub>mk</sub> **	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 52.5	63	52.5	63	52.5
Rated short-circuit breaking current I <sub>bk</sub> **	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 52.5	63	52.5	63	52.5
Rated short-time withstand current I <sub>st</sub> **	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s** up to kA 21	25	21	25	21	25
Rated peak withstand current I <sub>p</sub> **	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 21	21	21	21	21
Rated short-circuit making current I <sub>mk</sub> **	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 55	65	55	65	55
Rated short-circuit breaking current I <sub>bk</sub> **	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 55	65	55	65	55
Dimension of fuse-link	Standard: Fuses HRC fuse-link On HV HRC fuse-link, application of fuses for voltage transformer protection IEC EN 60283-1/1VDE 0671-1 IEC EN 60283-2/1VDE 0671-2 e = 292 mm e = 442 mm					
Busbar voltage metering panel types MV(T), MV(TP)						
Rated normal current I <sub>n</sub> **	Standard: A1 200	A1 200	25	21	25	21
Rated short-time withstand current I <sub>st</sub> **	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s** up to kA 21	25	21	25	21	25
Rated peak withstand current I <sub>p&gt;**</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 21	21	21	21	21
Rated short-circuit making current I <sub>mk**</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 52.5	63	52.5	63	52.5
Rated short-circuit breaking current I <sub>bk**</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 52.5	63	52.5	63	52.5
Rated short-time withstand current I <sub>st**</sub>	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s** up to kA 21	25	21	25	21	25
Rated peak withstand current I <sub>p**</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 21	21	21	21	21
Rated short-circuit making current I <sub>mk**</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 55	65	55	65	55
Rated short-circuit breaking current I <sub>bk**</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 55	65	55	65	55

\*) 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 62271-1/1VDE 0671-1)

\*\*\*) Up to 650 A

1) Depending on HV HRC fuse-link (depending on the let-through current of the HV HRC fuse-link)

2) Busbar

Switchgear Type SIMOSEC, up to 24 kV, Air-Insulated, Extendable - Siemens HA 41.43 - September 2015

# Technical Data

## Electrical data of the switchgear

Rated insulation level	Rated voltage U <sub>r</sub>	kV	7.2	12	17.5	24
Common electrical data of the switchgear panels						
On request: Circuit-breaker panel types D1, D1(T) **						
Rated normal current I <sub>n</sub> **	Standard: A1 630 On request: A1 1250	A1 630	25	21	25	21
Rated short-time withstand current I <sub>st</sub>	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s** up to kA 21	25	21	25	21	25
Rated peak withstand current I <sub>p</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 21	21	21	21	21
Rated short-circuit making current I <sub>mk</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 52.5	63	52.5	63	52.5
Rated short-circuit breaking current I <sub>bk</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 52.5	63	52.5	63	52.5
Rated short-time withstand current I <sub>st</sub>	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s** up to kA 21	25	21	25	21	25
Rated peak withstand current I <sub>p</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 21	21	21	21	21
Rated short-circuit making current I <sub>mk</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 55	65	55	65	55
Rated short-circuit breaking current I <sub>bk</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s**)	up to kA 55	65	55	65	55

\*) 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 62271-1/1VDE 0671-1)

Δ) In preparation

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.

\*\*) The 24-hour mean value is max. 35 °C (according to IEC 62271-1/1VDE 0671-1)

Δ) In preparation

Footnotes for page 11

\*) 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 62271-1/1VDE 0671-1)

1) Depending on HV HRC fuse-link (depending on the let-through current of the HV HRC fuse-link)

2) Busbar

Switchgear Type SIMOSEC, up to 24 kV, Air-Insulated, Extendable - Siemens HA 41.43 - September 2015





## Technical Data

Technical data, switching capacity and classification of switching devices

Rated insulation level	KV		7.2		12		17.5		24	
	Rated voltage U <sub>r</sub>	Rated short-circuit power frequency withstand voltage U <sub>sc</sub>	20	23	28 (42*)	32 (48*)	38	45	50	60
Three-position switch-disconnector										
Rated frequency f <sub>n</sub>										
Rated normal current I <sub>n</sub> (*)										
Rated short-time withstand current I <sub>st</sub>										
Rated peak short-time withstand current I <sub>pk</sub>										
Rated short-circuit making current I <sub>cm</sub>										
Rated short-circuit breaking current I <sub>cb</sub>										
Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>										
Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>										
Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>										
Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>										

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

Rated voltage U <sub>r</sub>	Rated normal current I <sub>n</sub> (*)	Rated short-time withstand current I <sub>st</sub>	Rated peak short-time withstand current I <sub>pk</sub>	Rated short-circuit making current I <sub>cm</sub>	Rated short-circuit breaking current I <sub>cb</sub>	Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>
50 Hz	up to KA 21	25	21	25	21	25
60 Hz	up to KA 21	25	21	25	21	25
Number of mechanical operating cycles / M-classification	n: 1000 / M1					
Number of electrical operating cycles / E-classification	n: 5					
Classification	E2					
Number of mechanical operating cycles / M-classification	n: 1000 / M1					
Number of electrical operating cycles / E-classification	n: 5					
Classification	E2					

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

Rated voltage U <sub>r</sub>	Rated normal current I <sub>n</sub> (*)	Rated short-time withstand current I <sub>st</sub>	Rated peak short-time withstand current I <sub>pk</sub>	Rated short-circuit making current I <sub>cm</sub>	Rated short-circuit breaking current I <sub>cb</sub>	Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>
50 Hz	up to KA 21	25	21	25	21	25
60 Hz	up to KA 21	25	21	25	21	25
Number of mechanical operating cycles / M-classification	n: 1000 / M1					
Number of electrical operating cycles / E-classification	n: 5					
Classification	E2					

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

Rated voltage U <sub>r</sub>	Rated normal current I <sub>n</sub> (*)	Rated short-time withstand current I <sub>st</sub>	Rated peak short-time withstand current I <sub>pk</sub>	Rated short-circuit making current I <sub>cm</sub>	Rated short-circuit breaking current I <sub>cb</sub>	Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>
50 Hz	up to KA 21	25	21	25	21	25
60 Hz	up to KA 21	25	21	25	21	25
Number of mechanical operating cycles / M-classification	n: 1000 / M1					
Number of electrical operating cycles / E-classification	n: 5					
Classification	E2					

For footnotes, see page 10

## Technical Data

Technical data, switching capacity and classification of switching devices

Rated insulation level	KV		7.2		12		17.5		24	
Rated voltage U <sub>r</sub>	Rated short-circuit power frequency withstand voltage U <sub>sc</sub>	KV	20	23	28 (42*)	32 (48*)	38	45	50	60
Three-position disconnecter, with the functions: Disconnecting CLOSE/OPEN-EARTH, (e.g. for disconnector panel types D1, D1(T), on request for circuit-breaker panel types L1(r), L1(w))										
Technical data and classification for disconnector according to IEC/EN 62271-102/VEDE 0671-102										
Rated voltage U <sub>r</sub>										
Rated normal current I <sub>n</sub> (*)										
Rated short-time withstand current I <sub>st</sub>										
Rated peak short-time withstand current I <sub>pk</sub>										
Rated short-circuit making current I <sub>cm</sub>										
Rated short-circuit breaking current I <sub>cb</sub>										
Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>										
Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>										
Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>										
Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>										
Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>										

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

Rated voltage U <sub>r</sub>	Rated normal current I <sub>n</sub> (*)	Rated short-time withstand current I <sub>st</sub>	Rated peak short-time withstand current I <sub>pk</sub>	Rated short-circuit making current I <sub>cm</sub>	Rated short-circuit breaking current I <sub>cb</sub>	Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>
50 Hz	up to KA 21	25	21	25	21	25
60 Hz	up to KA 21	25	21	25	21	25
Number of mechanical operating cycles / M-classification	n: 1000 / M1					
Number of electrical operating cycles / E-classification	n: 5					
Classification	E2					

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

Rated voltage U <sub>r</sub>	Rated normal current I <sub>n</sub> (*)	Rated short-time withstand current I <sub>st</sub>	Rated peak short-time withstand current I <sub>pk</sub>	Rated short-circuit making current I <sub>cm</sub>	Rated short-circuit breaking current I <sub>cb</sub>	Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>
50 Hz	up to KA 21	25	21	25	21	25
60 Hz	up to KA 21	25	21	25	21	25
Number of mechanical operating cycles / M-classification	n: 1000 / M1					
Number of electrical operating cycles / E-classification	n: 5					
Classification	E2					

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

Rated voltage U <sub>r</sub>	Rated normal current I <sub>n</sub> (*)	Rated short-time withstand current I <sub>st</sub>	Rated peak short-time withstand current I <sub>pk</sub>	Rated short-circuit making current I <sub>cm</sub>	Rated short-circuit breaking current I <sub>cb</sub>	Rated short-circuit making and breaking current I <sub>cm</sub> /I <sub>cb</sub>
50 Hz	up to KA 21	25	21	25	21	25
60 Hz	up to KA 21	25	21	25	21	25
Number of mechanical operating cycles / M-classification	n: 1000 / M1					
Number of electrical operating cycles / E-classification	n: 5					
Classification	E2					

For footnotes, see 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.  
The 24-hour mean value is max. 35 °C (according to IEC 62271-1/VEDE 0671-1)

# Product Range

## Product range overview

# Technical Data

## Technical data, switching capacity and classification of switching devices

Vacuum circuit-breaker  
Switching capacity according to IEC/EN 62271-100/VDE 0671-100  
Type CB-f 1) 4), combined with three-position disconnector, in gas-insulated switching device vessel 4)  
On request: Type CB-r 1)(10). CB-w 1)(10). CB-w 1)(L)(w) 1)

Rated voltage U <sub>n</sub>	17.5	17.5	24
Rated normal current I <sub>n</sub> (**)	800	1250	1750
Rated frequency f <sub>n</sub>	50 Hz		
Rated short-time withstand current I <sub>sc</sub>	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s, 4 s		
Rated peak withstand current I <sub>p</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s (4 s, 6 s)		
Rated short-circuit breaking current I <sub>cb</sub>	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s, 4 s		
Rated short-circuit breaking current I <sub>cb</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s		
Rated peak withstand current I <sub>p</sub>	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s, 4 s		
Rated short-time withstand current I <sub>sc</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s		
Rated short-circuit breaking current I <sub>cb</sub>	for rated duration of short-circuit t <sub>sc</sub> = 1 s, 2 s, 4 s		
Rated short-circuit breaking current I <sub>cb</sub>	for rated duration of short-circuit t <sub>sc</sub> = 3 s		

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

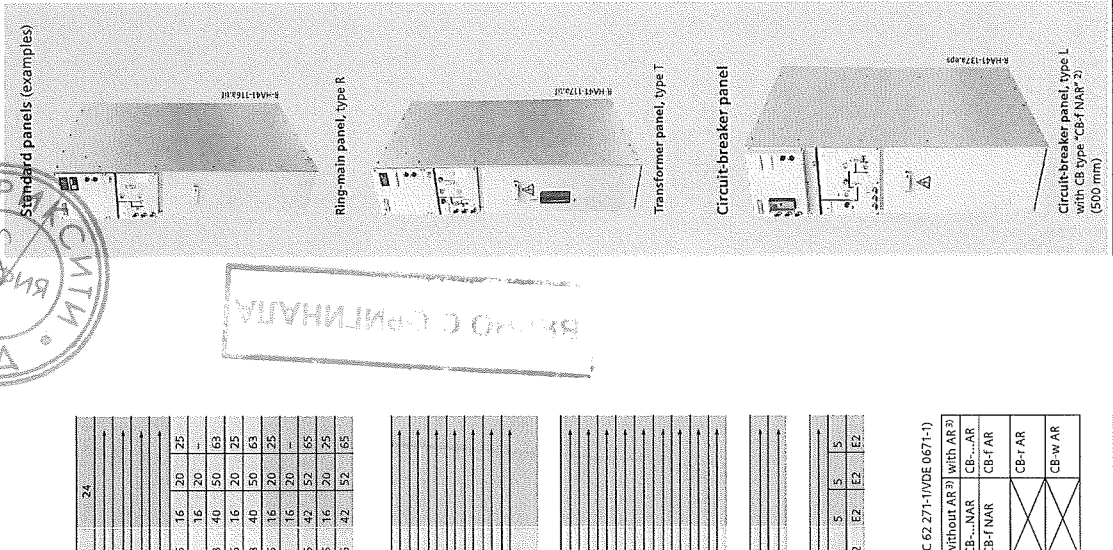
Mechanical	Electrical	Rated operating sequence
Number of operating cycles	Number of operating cycles with I <sub>sc</sub> 2000	Number of operating cycles with I <sub>sc</sub> 10000
Class	Class E2	Class E2
Number of operating cycles with I <sub>sc</sub> 2000	Class C2	Class C2
Class	Class S1	Class S1
Number of operating cycles with I <sub>sc</sub> 2000	Class S2	Class S2
Class	Class S3	Class S3
Number of operating cycles with I <sub>sc</sub> 2000	Class S4	Class S4
Class	Class S5	Class S5

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

Mechanical	Electrical	Rated operating sequence
Number of operating cycles	Number of operating cycles with I <sub>sc</sub> 10000	Number of operating cycles with I <sub>sc</sub> 10000
Class	Class E2	Class E2
Number of operating cycles with I <sub>sc</sub> 10000	Class C2	Class C2
Class	Class S1	Class S1
Number of operating cycles with I <sub>sc</sub> 10000	Class S2	Class S2
Class	Class S3	Class S3
Number of operating cycles with I <sub>sc</sub> 10000	Class S4	Class S4
Class	Class S5	Class S5

\*) 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 62271-100/VDE 0671-100)  
1) Definition of the different types of vacuum circuit-breakers (= VCB):  
Panel type: CB-f, CB-r, CB-w  
L, L1: CB-f, CB-r, CB-w  
L(10): CB-f, CB-r, CB-w  
L1(W): CB-f, CB-r, CB-w  
2) CB-f: Vacuum circuit-breaker, fixed-mounted in gas-insulated switching device vessel, combined with three-position disconnector  
CB-r: Vacuum circuit-breaker, air-insulated, removable, separate three-position disconnector  
CB-w: Vacuum circuit-breaker, air-insulated, withdrawable, separate three-position disconnector  
3) ΔE = Automatic gas-filling, ΔEAT = Non-argon-arc-extinguishing  
4) VCB in switching device vessel (maintenance-free under normal ambient conditions according to IEC 62271-100)

Application as:	Panel designation	Panel Type	Panel width (mm)	Rated current
Ring-main panel 1)	R	R	375	630 A, 800 A
Cable feeder panels	R1	R1	500	630 A, 800 A
Transformer panel 1)	T	T	375	200 A
	T1	T1	500	200 A
Cable panel	K	K	375	630 A
	K1	K1	500	630 A, 1250 A
Cable panel, with earthing switch	K *	K *	375	630 A
	K1 *	K1 *	500	630 A
Circuit-breaker panel (fixed-mounted, CB, gas-insul.) 1)	L	L	500	630 A
Circuit-breaker panel (removable CB) type "CB-f" (with CB type "CB-f-2")	L1(1) *	L1	750	630 A, 1250 A
	L2(0) *	L2	875	630 A, 1250 A
Circuit-breaker panel (removable CB) type "CB-r"	L1(10) *	L1	750	630 A, 1250 A
	L2(10) *	L2	875	630 A, 1250 A
Circuit-breaker panel (withdrawable CB)	L1(W) *	L1	750	630 A, 1250 A
	L2(W) *	L2	875	630 A, 1250 A
Disconnector panel 1)	D *	D *	375	630 A
	D1 *	D1 *	500	1250 A
Disconnector panel	D	D	375	630 A, 800 A
	D1	D1	500	200 A
Ring-main transfer panel 1)	RT	RT	375	200 A
Transformer transfer panel	TT	TT	375	200 A
Circuit-breaker transfer panel 1)	LT	LT	500	630 A
Circuit-breaker transfer panel (removable CB)	L1(L) T	L1	750	630 A, 1250 A
Circuit-breaker transfer panel (withdrawable CB)	L1(W) T	L1	750	630 A, 1250 A
Disconnector transfer panel 1)	DT	DT	375	630 A, 1250 A
Disconnector transfer panel	D1T	D1	500	1250 A
Measuring panel as billing metering panel	M	M	750	630 A, 800 A, 1250 A
Measuring panel with cable connection	M(C)	M	750	630 A, 800 A, 1250 A
Measuring panel with busbar connection	M(B)	M	750	630 A, 800 A, 1250 A
Measuring panel with busbar con. and cable con.	M(B-C)	M	750	630 A, 800 A, 1250 A
Measuring panel with cable connection: individual panel	M(CG)	M	750	630 A, 800 A
Busbar voltage metering panel	M(V)	M	375	200 A
Busbar voltage metering panel with fuse	M(VF)	M	500	200 A
Busbar voltage metering panel with fuse	M(VFP)	M	375	200 A
Busbar voltage metering panel with fuse	M(VFP)	M	500	200 A
Switch-disconnector panel for auxiliary transformer	M(PT) *	M	750	200 A
Version with fuse	M(PT) *	M	750	200 A
Bus riser panel	H	H	375	630 A, 800 A, 1250 A
Busbar earthing panel	E	E	375	n.a.
	E1 *	E1 *	500	n.a.
Bus sectionalizer panel (panel combination) (1 three-position switch/disconnector)	R(T) + H	R(T) + H	750	630 A, 800 A
Bus sectionalizer panel (panel combination) (2 three-position switch/disconnector)	2 x R(T)	2 x R(T)	750	630 A, 800 A
Cable box (Cable connection box, (GB standard) *)	CC *	CC *	300	630 A



14 Switchgear Type SIMOSEC, up to 24 kV, Air-Insulated, Extendable - Siemens HA 41.43 - September 2015

# Product Range

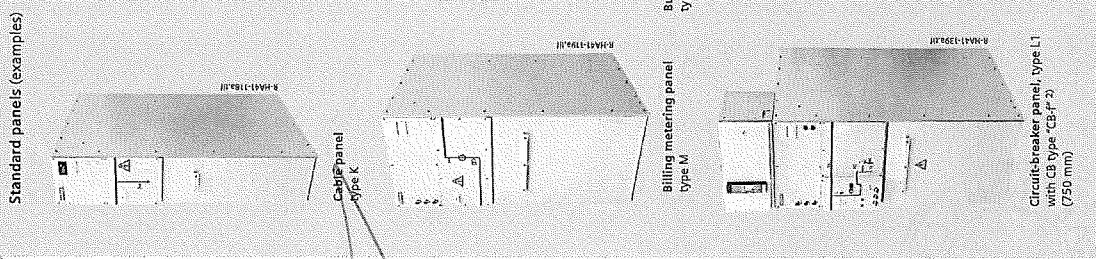
Options for panels

● Available	○ Optionally available	- Not applicable	l.p. In preparation
Panel in preparation (l.p.)	Three-phase CT	CT as cast-resin (l.p. type 4M)	VT (1 pole) as cast-resin VT
	VT (2 pole) as cast-resin VT	2nd cable	3rd cable
	Surge arrester instead of 2nd cable	LSC category (loss of service continuity category)	Rated voltage

	1	2	3	4	5	6	7	8	9	10	11	Panel type
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	R
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	R1
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	T
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	T1
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	K
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	K1
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	K1 *
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	L
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	L1
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	L1(1) *
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	L2(1) *
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	L1(w) *
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	L2(w) *
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	D *
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	D1
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	T(1)
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	T(2)
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	L(T)
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	L1(T)
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	L1(w, T)
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	D1(T) *
	●	●	●	●	●	●	●	○	○	LSC 2	24 kV	D1(T)
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	M
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	M(K)
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	M(B)
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	M(BK)
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	M(KK)
	●	●	●	●	●	●	●	○	○	LSC 2	17.5 kV	M(VT)
	●	●	●	●	●	●	●	○	○	LSC 2	17.5 kV	M1(VT)
	●	●	●	●	●	●	●	○	○	LSC 2	17.5 kV	M(VTF)
	●	●	●	●	●	●	●	○	○	LSC 2	17.5 kV	M1(VTF)
	●	●	●	●	●	●	●	○	○	LSC 2	12 kV	M(PT) *
	●	●	●	●	●	●	●	○	○	LSC 2	12 kV	M(PT)
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	H
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	E
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	E1 *
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	R(D) + H
	●	●	●	●	●	●	●	○	○	LSC 1	24 kV	2 x R(D)
	●	●	●	●	●	●	●	○	○	LSC 1	12 kV	CC *

△ In preparation  
 \*) On request  
 1) Panel type: Metal-clad  
 2) Type designation of vacuum circuit-breaker

Switchgear Type SIMOSEC, up to 24 kV, Air-Insulated, Extendable - Siemens HA 41.43 - September 2015 | 15



Panel designation	Panel type	Panel width mm
Ring-main panel 1)	as feeder R as transfer RT	375 500
Transformer panel 1)	as feeder T	375
Cable panel	as feeder K as feeder K1	500 500
Cable panel with make-prover earthing switch	as feeder K *	375
Circuit-breaker panel 1)	as feeder L with CB type 'CB-F-2'	500 500
Circuit-breaker panel 1)	as transfer L(D)	500
Circuit-breaker panel 1)	as feeder L1(1) *	750
Circuit-breaker panel 1)	as transfer L1(w, T) *	750
Billing metering panel	standard M as end panel M(B) as individual panel M(KK)	750 750 750
Metering panel	M(PT) *	750
Switch-disconnector panel for auxiliary transformer	M(VT)	375
Busbar voltage metering panel 1)	M1(VT)	500
	M1(VTF)	375
	M1(VTF)	500
Bus riser panel	H	375
Disconnector panel 1)	as feeder D1	500
	as transfer D1(T)	500
Busbar earthing panel	E E1 *	375 500

\*) On request  
 1) Panel type: Metal-clad  
 2) Type designation of vacuum circuit-breaker

16 Switchgear Type SIMOSEC, up to 24 kV, Air-Insulated, Extendable - Siemens HA 41.43 - September 2015



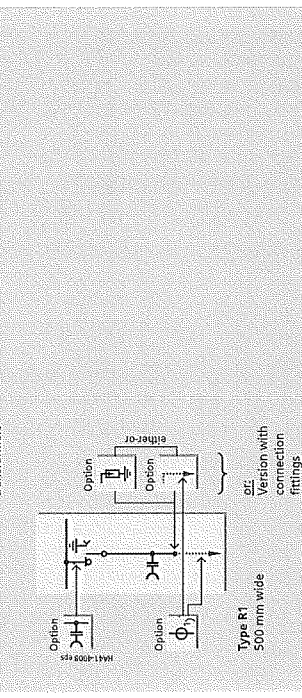
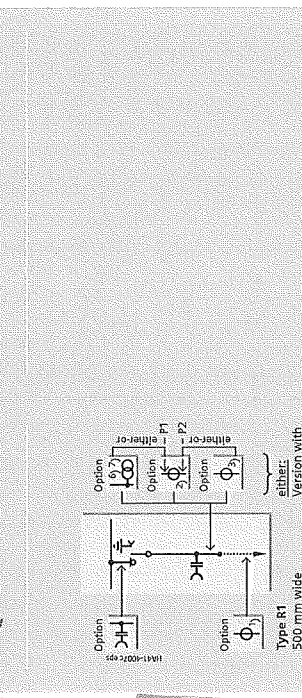
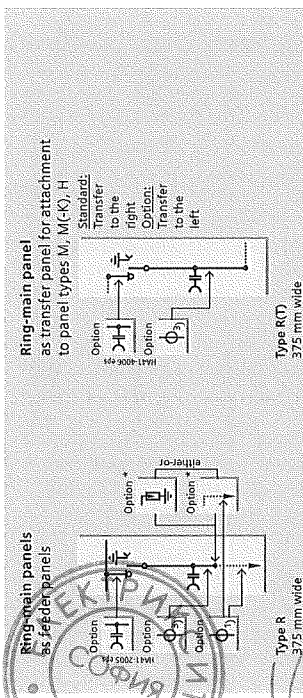
# Product Range

## Equipment features

Feature	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	
Manual opening mechanism for three position switch (1) (for earthing switch)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Call compartment cover locked in place	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Low voltage switch as terminal compartment	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Mechanical interlocking	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (1)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (2)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (3)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (4)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (5)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (6)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (7)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (8)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (9)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (10)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (11)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (12)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (13)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (14)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (15)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (16)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (17)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (18)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (19)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (20)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (21)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (22)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (23)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (24)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (25)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Special interlocking indicator for interposition switch (1) (26)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

# Product Range

## Ring-main panels



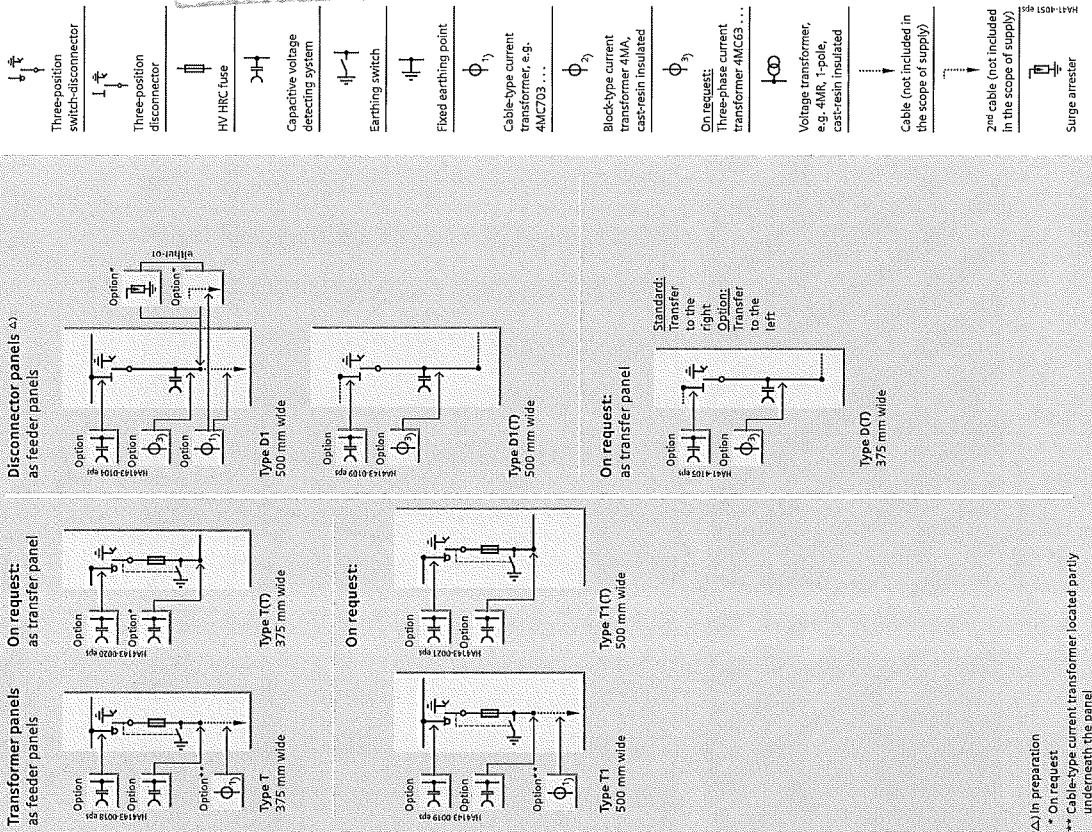
- Three-position switch-disconnector
- Capacitive voltage detecting system
- Cable-type current transformer, e.g. 4MCO/03...
- Block-type current transformer 4MA, cast-resin insulated
- On request: Three-phase current transformer 4MCG3...
- Voltage transformer, e.g. 4MR, 1-pole, cast-resin insulated
- Voltage transformer, e.g. 4MR, 2-pole, cast-resin insulated
- Cable (not included in the scope of supply)
- 2<sup>nd</sup> cable (not included in the scope of supply)
- Surge arrester

34

- On request
- Three-position switch as three-position switch-disconnector
- Three-position switch as three-position switch-disconnector
- Type designation of the vacuum circuit-breaker
- In special cases, deeper floor cover for panels with cable feeder required.
- Design of floor cover: Depending on direction of pressure relief
- On request
- Not to be applied for versions with separate feeder earthing switch in panel types L1(r), L1(w)
- Inspection window is a standard equipment in panel types L1(r) for versions with separate feeder earthing switch at cable
- On request
- On request

# Product Range

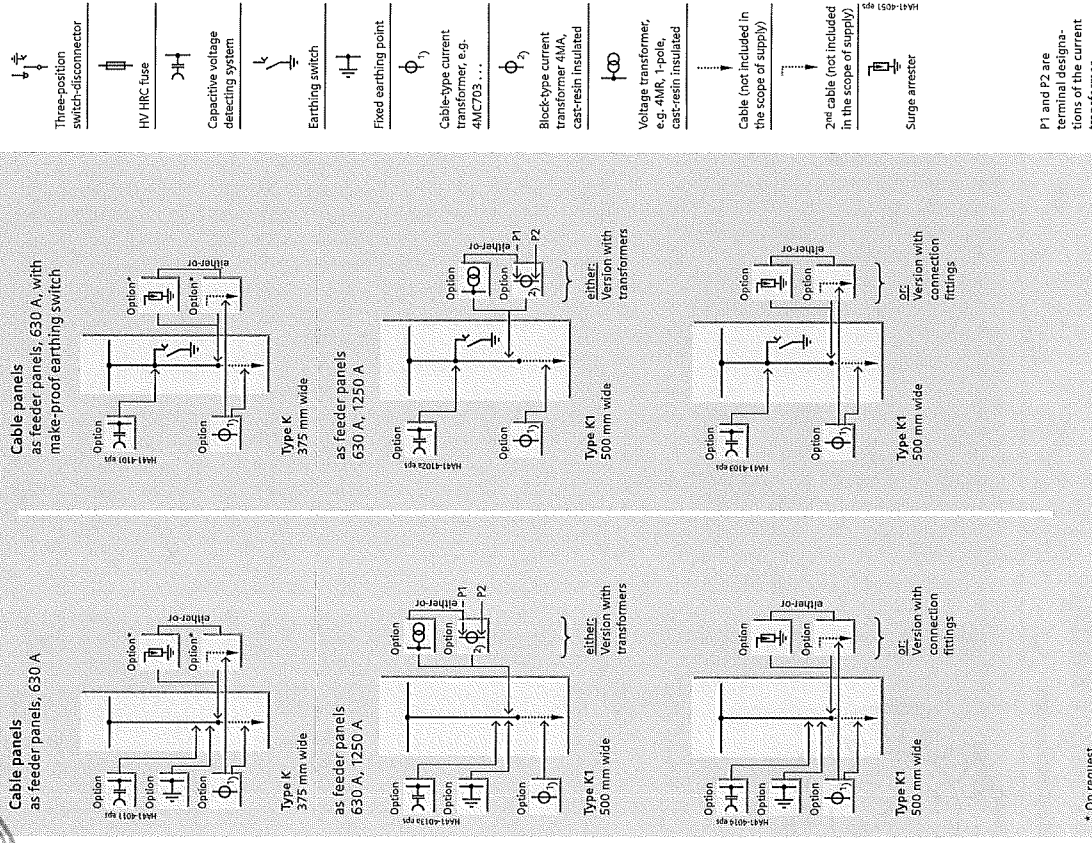
## Transformer panels and disconnecter panels



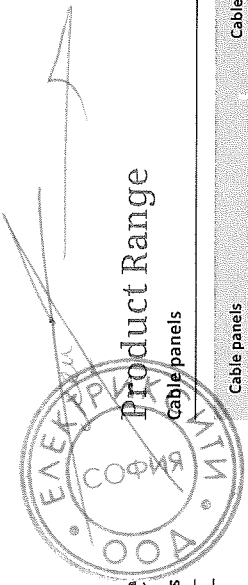
Δ) In preparation  
 \* On request  
 \*\* Cable-type current transformer located partly underneath the panel

# Product Range

## Cable panels



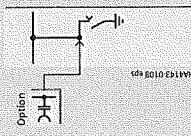
\* On request



# Product Range

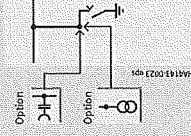
## Busbar earthing panels, lateral cable connection box and panel top box

**Busbar earthing panel**



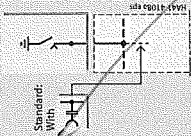
Option  
Type E  
375 mm wide  
HA41-0103 opt

**On request: Busbar earthing panel with voltage transformer**



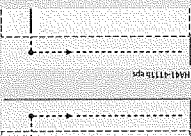
Option  
Option  
Type E1  
500 mm wide  
HA41-0203 opt

**On request: Panel top box as earthing switch box**



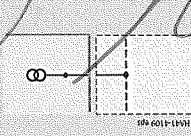
Standard:  
With  
Type-EB  
375 mm wide, or 500 mm wide  
Height: 350 mm or 550 mm  
HA41-0104 opt

**On request: Lateral cable connection box**



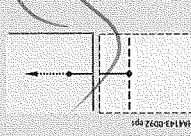
Type CC  
300 mm wide (up to 12 kV)  
for end panels type: R, T, L  
HA41-1100 opt

**On request: Panel top box as voltage transformer box**



Type-VB  
375 mm wide, or 500 mm wide  
Height: 350 mm or 550 mm  
HA41-109 opt

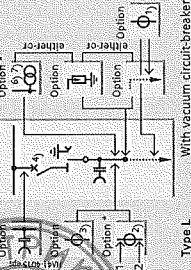
**On request: Panel top box as cable connection box**



Type-KB  
375 mm wide, or 500 mm wide  
Height: 350 mm or 550 mm  
HA41-0072 opt

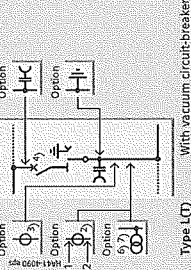
## Circuit-breaker panels

**Circuit-breaker panels 650 A as feeder panels**



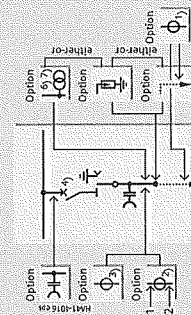
Option  
Option  
Option  
Option  
Option  
Option  
Option  
Type L  
500 mm wide  
With vacuum circuit-breaker, fixed-mounted  
HA41-0119 opt

**as transfer panels for attachment to panel types M or H**



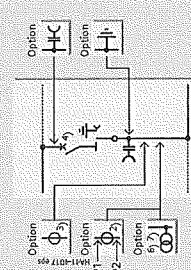
Option  
Option  
Option  
Option  
Option  
Option  
Option  
Type L(T)  
500 mm wide  
With vacuum circuit-breaker, fixed-mounted  
HA41-1079 opt

**Circuit-breaker panels up to 1250 A as feeder panels**

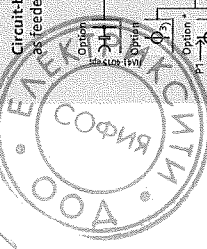














Option  
Option  
Option  
Option  
Option  
Option  
Option  
Type L1  
750 mm wide  
With vacuum circuit-breaker, fixed-mounted  
HA41-0162 opt

**as transfer panels for attachment to panel types M or H**



Option  
Option  
Option  
Option  
Option  
Option  
Option  
Type L1(T)  
750 mm wide  
With vacuum circuit-breaker, fixed-mounted  
HA41-1077 opt



-  Vacuum circuit-breaker (type "CB-F")
-  Three-position disconnecter
-  Capacitive voltage detecting system
-  Cable-type current transformer, e.g. 4MCT03...
-  Block-type current transformer 4M/A, cast-resin insulated
-  Three-phase current transformer 4MCT3...
-  Voltage transformer, e.g. 4MR, 1-pole, cast-resin insulated
-  Voltage transformer, e.g. 4MR, 2-pole, cast-resin insulated
-  Cable (not included in the scope of supply)
-  Additional cables (not included in the scope of supply)
-  Surge arrester
-  Fixed earthing point

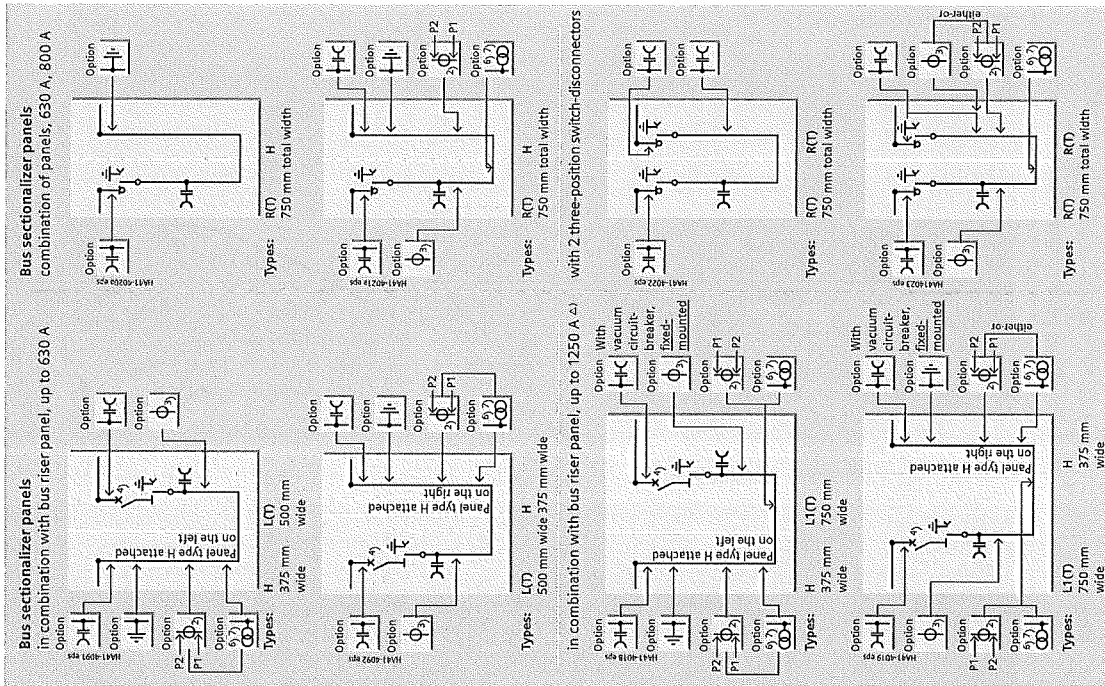
P1 and P2 are terminal designations of the current transformer

HA41-0051 opt

△) In preparation  
→ On request: Combination CT  $\Phi_2$  and VT  $\Phi_3$

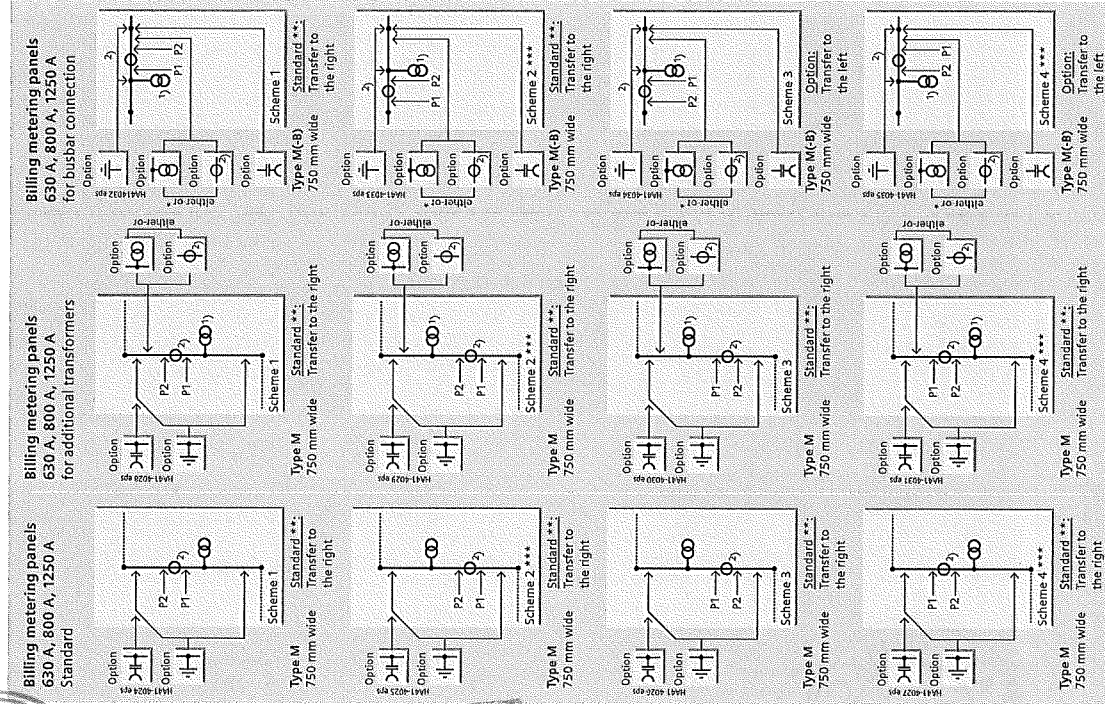
# Product Range

## Panel combinations: Bus sectionalizer panels



## Product Range

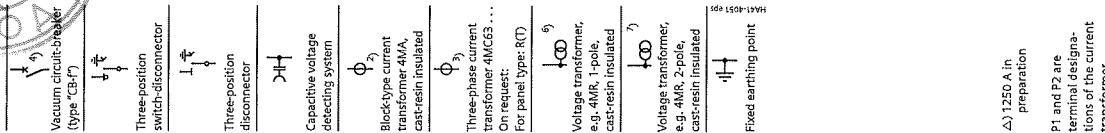
### Billing metering panels



Panel design of Mt:  
 M  
 M(-B)  
 Capacitive voltage detecting system  
 $\phi_3$   
 Block-type current transformer 4MA, cast-resin insulated  
 $\phi_3$   
 Voltage transformer, e.g. 4MR, 1-pole, cast-resin insulated or:  
 On request:  
 $\phi_3$   
 Voltage transformer, e.g. 4MR, 1-pole, cast-resin insulated, with HV/HRC fuse, instead of a pair set of current or voltage transformers  
 $\phi_3$   
 Voltage transformer, e.g. 4MR, 1- or 2-pole, cast-resin insulated  
 Fixed earthing point  
 $\phi_3$   
 Fixed earthing point for busbar earthing  
 P1 and P2 are terminal designations of the current transformer  
 \* On request  
 \*\* Option:  
 \*\*\* Transfer to the left  
 \*\*\*\* Transfer to the right  
 \*\*\*\*\* Interchanged

## Product Range

### Billing metering panels



# Product Range

## Billing metering panels

**Billing metering panels**  
630 A, 800 A, 1250 A \*)  
for cable connection 1)

**Billing metering panels**  
630 A, 800 A, 1250 A \*)  
for busbar connection

Panel design of M:

M(K)      M(BK)

Capacitive voltage detecting system

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

Voltage transformer, e.g. 4MR, 1- or 2-pole, cast-resin insulated

Fixed earthing point

1) On request:  
As single metering panel type M(K) with incoming and outgoing cable terminals

\* Connection for 2<sup>nd</sup> cable possible

\*\* Option:  
Transfer to the left

P1 and P2 are terminal designations of the current transformer

# Product Range

## Busbar voltage metering panels and bus riser panels

**Busbar voltage metering panels**

Type MV(VT) \*\*  
375 mm wide

Type MV(VT)  
500 mm wide

Type MV(VT-F)  
500 mm wide

**Bus riser panels**  
630 A, 800 A, 1250 A

Scheme 1  
Type H \*  
375 mm wide

Scheme 2  
Type H \*  
375 mm wide

Scheme 3  
Type H \*  
375 mm wide

Scheme 4  
Type H \*  
375 mm wide

1) On request:  
As single metering panel type M(K) with incoming and outgoing cable terminals

\* Connection for 2<sup>nd</sup> cable possible

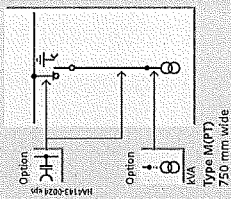
\*\* Option:  
Transfer to the left

P1 and P2 are terminal designations of the current transformer

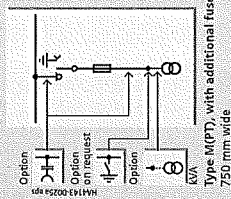
# Product Range

On request: Switch-disconnector panels

On request:  
Switch-disconnector panels  
for auxiliary transformer



kVA  
Type M(P)T  
750 mm wide



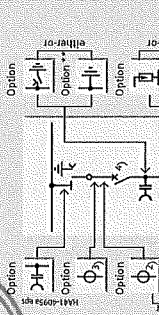
kVA  
Type M(P)T, with additional fuses  
750 mm wide

- Three-position switch-disconnector
- HV-HRC fuse
- Capacitive voltage detecting system
- Earthing switch
- Voltage transformer, e.g. 4MR, 1- or 2-pole, cast-resin insulated
- Voltage transformer, e.g. 4MR, 1-pole, cast-resin insulated
- Fixed earthing point

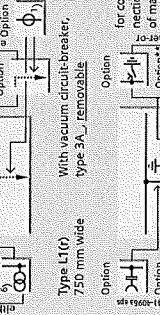
# Product Range

On request: Circuit-breaker panels

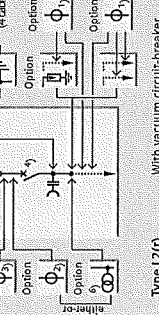
Circuit-breaker panels 630 A, 1250 A as feeder panels



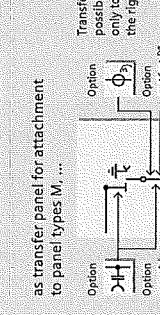
Type L1(r)  
750 mm wide



Type L1(w)  
750 mm wide

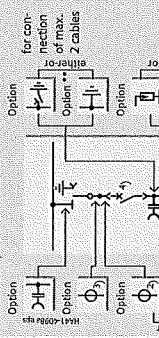


Type L2(r)  
875 mm wide

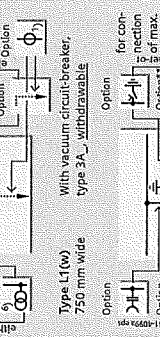


Type L2(w)  
875 mm wide

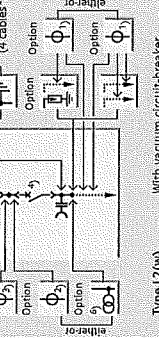
Circuit-breaker panels 630 A, 1250 A as feeder panels



Type L1(w, T)  
750 mm wide



Type L1(w, T)  
750 mm wide



Type L1(w, T)  
750 mm wide

- Vacuum circuit-breaker (type 3A<sub>1</sub>)
- Three-position switch-disconnector
- Cable-type current transformer, e.g. 4MC/703 ...
- Block-type current transformer 4MA, cast-resin insulated
- Three-phase current transformer 4MCE3 ...
- Voltage transformer, e.g. 4MR, 1-pole, cast-resin insulated
- Cable (not included in the scope of supply)
- Additional cables (not included in the scope of supply)
- Surge arrester
- Capacitive voltage detecting system
- Make-proof earthing switch
- Fixed earthing point

\* On request  
\*\* Standard: Feeder earthing via the vacuum circuit-breaker Type 3A<sub>1</sub> with interlocks (without earthing switch)

Panel combinations of L1(r)		Design	Rated current
L1(r, T) + H	standard	630 A, 1250 A	630 A, 1250 A
H + L1(r, T)	on request	-	-
L1(r, T) + RCD	standard	630 A	630 A
RCD + L1(r, T)	on request	-	-
L1(r, T) + 017	standard	630 A, 1250 A	630 A, 1250 A

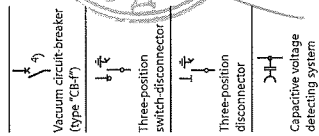
Δ Mounting position of the current transformer with terminal P1 at the top only. P1 and P2 are terminal designations of the CT.

Panel combinations of L1(w, T)		Design	Rated current
L1(w, T) + H	standard	630 A, 1250 A	630 A, 1250 A
H + L1(w, T)	on request	-	-
L1(w, T) + RCD	standard	630 A	630 A
RCD + L1(w, T)	on request	-	-
L1(w, T) + 017	standard	630 A, 1250 A	630 A, 1250 A

39

# Product Range

## Panel combinations

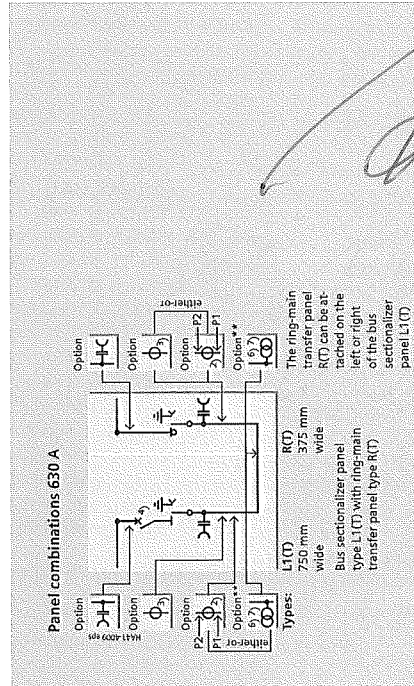


Black-type current transformer 4MA, cast-resin insulated

Three-phase current transformer 4MC63 ... On request: For panel type: RT)

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

Voltage transformer, e.g. 4MR, 2-pole, cast-resin insulated

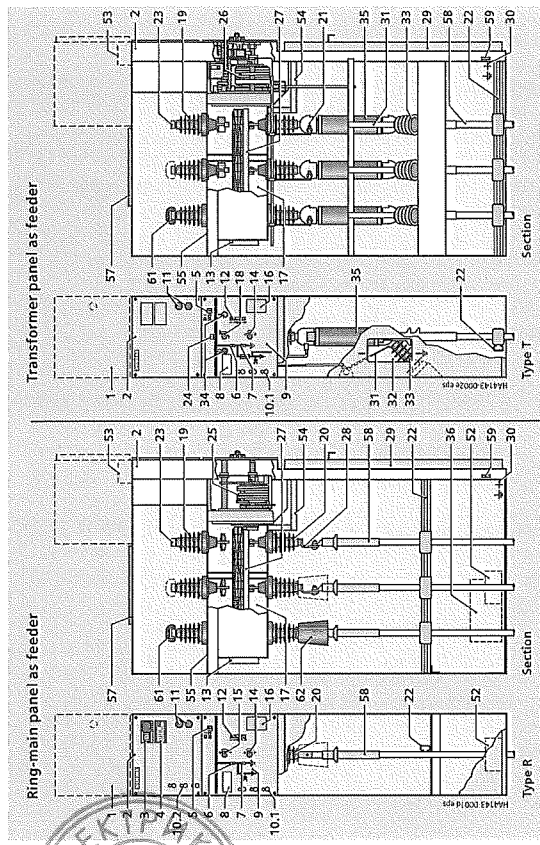


With vacuum circuit-breaker, fixed-mounted

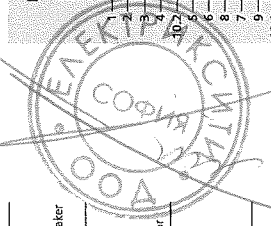
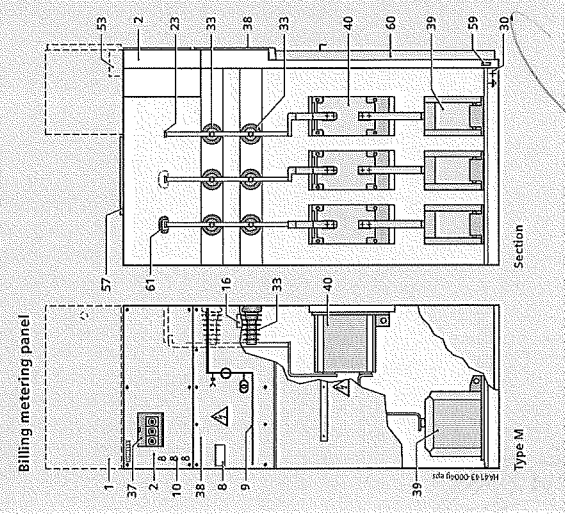
Further panel combinations available:	Rated current
For example:	I <sub>n</sub> (A)
L(T) + R(T)	up to 630 A
L(T) + H	875 mm
L(T) + D1(T)	1250 mm
	up to 630 A
	up to 1250 A

# Design

## Panel design (examples)



- Legend for pages 30 and 31 (contin. on page 31)
- Option: Low-voltage compartment cover can be unscrewed
  - Niche for optional low-voltage equipment
  - Option: CAPDIS-5x voltage detecting system
  - Option: Short-circuit earth-fault indicator
  - Option: Ready-for-service indicator for switching device
  - Position indication for load-break function "CLOSED - OPEN"
  - Position indication for earthing function "OPEN - EARTHED"
  - Feeder designation label
  - Mimic diagram
  - Option: Sockets for capacitive voltage detecting system (depending on arrangement)
  - Option: Sockets for busbar
  - Option: Momentary-contact rotary control switch "CLOSED - OPEN" for motor operating mechanism with local-remote switch for three-position switch-disconnector
  - Option: Locking device for three-position switch-disconnector
  - Pressure relief device for switching device
  - Manual operation for the mechanism of the earthing function
  - Manual operation for the mechanism of the load-break or disconnecting function in L panels
  - Railing and type plate
  - Gas-insulated vessel for switching device
  - Manual operation for mechanism "spring changing"
  - Bushing-type insulator for busbar



# Design (examples)

## Operation (examples)

**Legend for pages 30 and 31**

- 20 Bushing-type insulator for feeder
- 21 Terminal for HV HRC fuse assembly (with tripping)
- 22 Cable bracket with cable clamps (optional) 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 4MVA voltage transformer
- 40 4MVA back-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

**Other options:**

- 49 Option: Three-phase current transformer 4MC63
- 50 Option: Overcurrent-time protection relay SIPROTEC easy 75J45
- 51 Option: Multifunction protection relay SIPROTEC 4.75J62
- 52 Cable-type current transformer
- 53 Option: On request: wiring duct, removable, 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  $U_n > 17.5$  kV)
- 62 Insulating cap for cable connection (for  $U_n > 17.5$  kV)

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

**Type L (500 mm)**

**Type L1 (750 mm)**

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

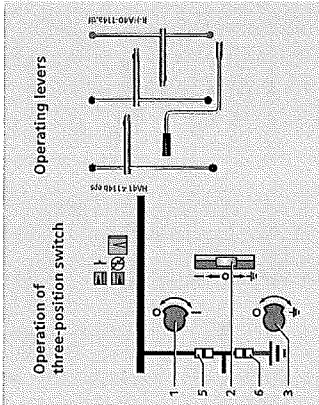
**Type L1 (750 mm)**

**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

**Front of circuit-breaker type CB-F NAR \*)**  
Panel width: 500 mm, with circuit-breaker type CB-F NAR \*)



- 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 charges" indicator
- 13 Position indicator for circuit-breaker
- 14 Ready-for-service indicator
- 15 Operations counter
- 16 Preselection for manual changing of circuit-breaker panels

\*) AR = Automatic reclosing  
NAR = Non automatic reclosing

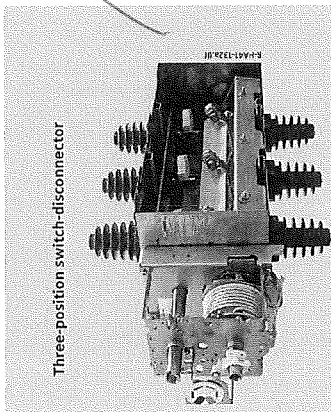


41



# Components

## Three-position switch



- 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 fulfils the conditions applicable to isolating distances in accordance with
 

- IEC/EN 62271-102 / VDE 0671-102 \*)

and
 

- IEC/EN 62271-1 / VDE 0671-1 \*)

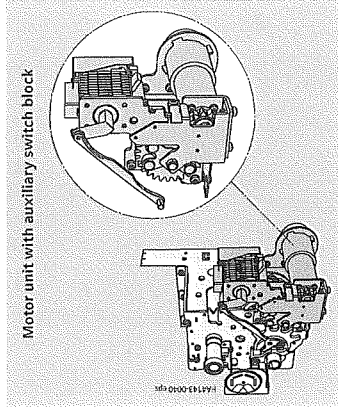
 Due to the arc rotation caused by the arc-suppression system, both load currents and minor no-load currents are safely interrupted.

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

# Components

## Operating mechanisms for the three-position switch

- Features**
- Mechanical endurance of more than 1000 operating cycles
  - Parts subjected to mechanical stress are made of non-rusting materials
  - 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.



Motor unit with auxiliary switch block

### 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.

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

Panel type	R, L, M (PT)	E	T, M (VFP), M (VT)
Function	Switch-disconnector (F) Disconnector (S), (D)	Earthing switch	Switch-disconnector Earthing switch
Type of operating mechanism	Spring-operated	Spring-operated	Stored-energy Spring-operated
Operation	Manual Motor (option)	Manual	Manual Motor (option)

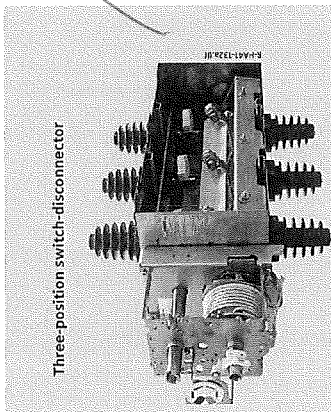
**Legend**

- R = Ring-main feeder
- T = Transformer feeder
- L = Circuit-breaker feeder
- M (VT), M (VFP) = Busbar voltage metering panel
- D = Disconnector feeder

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

# Components

## Three-position switch



- 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 fulfils 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.

# Components

## Equipment (optional)

### Vacuum circuit-breaker

#### 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 (manually operated)
- 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

Operating voltage V	Normal current A	DC operation	
		Operating voltage V	Normal current Resistive inductive; L = 20 mH A
up to 230	10	24	10 10
		48	10 9
		60	9 7
up to 230	10	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

#### Features

- According to IEC/EN 62271-100/VDE 0671-100/GB 1984 \*
- Application in hermetically welded switching-device vessel in conformity with the system
- 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
- 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, L1D, L1TD	Three-position disconnecter	Earth switch
Function	Circuit-breaker	Disconnecter	Earth 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.

#### Explanation:

- Not available
- \* AR = Automatic reclosing
- NAR = Non automatic reclosing
- Δ) Design of circuit-breaker:
  - CB-r as removable
  - CB-w as withdrawable

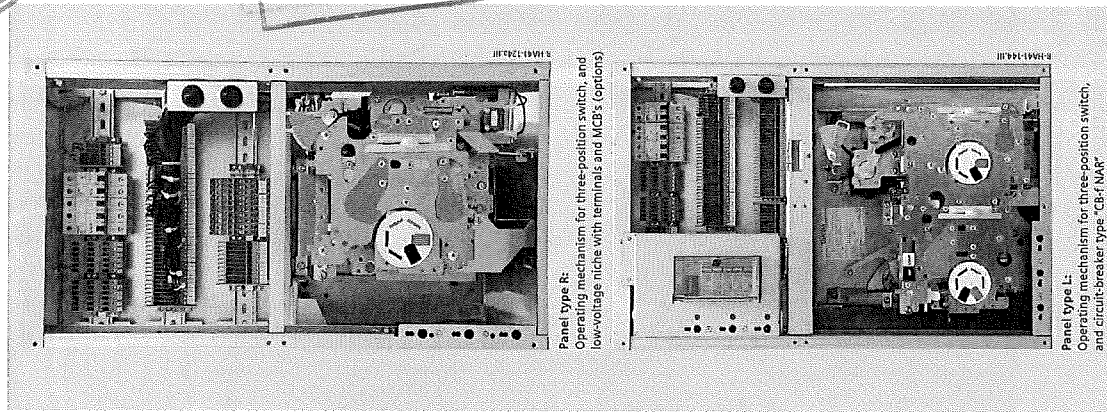
#### Technical data of the vacuum circuit-breaker

Vacuum circuit-breaker	Type (CB/F/AR*)	CB (F/NAR*)	On request (3AE Δ)
Short-circuit breaking current		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	*	*
Number of breaking operations L		10000	2000
Number of short-circuit breaking operations I.c.		30	20
Individual panel type L1 ...	500 mm L	Option: 50	L
Individual panel type L1 ...	750 mm L1	L1	L1
			L1 (P), L1 (W)
			L2 (P), L2 (W)

#### 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.

\* For standards, see page 84



Panel type R:

Operating mechanism for three-position switch, and low-voltage niche with terminals and MCBs (options)

Panel type L:

Operating mechanism for three-position switch, and circuit-breaker type CB-f/NAR

## Components

### Secondary equipment of the vacuum circuit-breaker

#### 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: \*)
  - 24 V to 220 V DC: Maximum 500 W
  - 110 V and 230 V AC: Maximum 650 VA
- CB-f NAR: \*)
  - 24 V to 220 V DC: Maximum 80 W
  - 110 V and 230 V AC: Maximum 80 W.

#### 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 (as option for CB-f NAR)

- For electrical closing.

#### Shunt release

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

#### C.L.-operated release

- For tripping pulse 0.1 Ws in conjunction with suitable protection systems, e.g. protection system YSJ45, 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  $\approx$  60 V DC.

#### Auxiliary switch

- Standard: 6 NO + 6 NC, free contacts thereof \*\*) for:
  - CB-f NAR: 1 NO + 1 NC + 2 changeover
  - CB-f AR: 2 NO + 2 NC + 2 changeover
- Option (for CB-f AR): 11 NO + 11 NC, free contacts thereof: \*\*)
  - 7 NO + 7 NC + 2 changeover.

#### 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
- Store-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

- Standard for circuit-breaker type CB-f AR (with AR \*) function)
- Option for circuit-breaker type CB-f NAR (without AR function: NAR \*\*).

#### Abbreviations:

NO = Normally open contact  
 NC = Normally closed contact

\*) AR = Automatic reclosing  
 NAR = Non-automatic reclosing

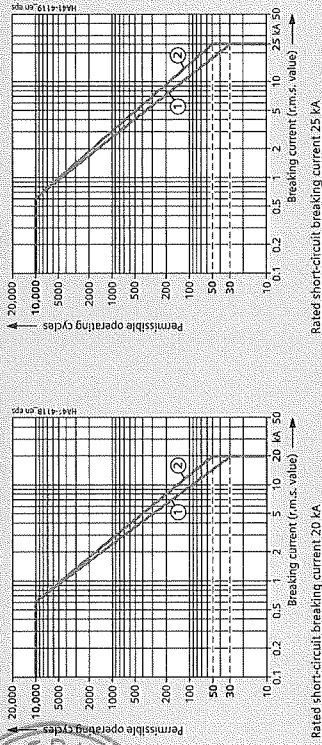
\*\*) Depending on the secondary equipment

## Components

### Vacuum circuit-breaker

#### Electrical service life

##### Vacuum circuit-breaker type CB-f AR \*)

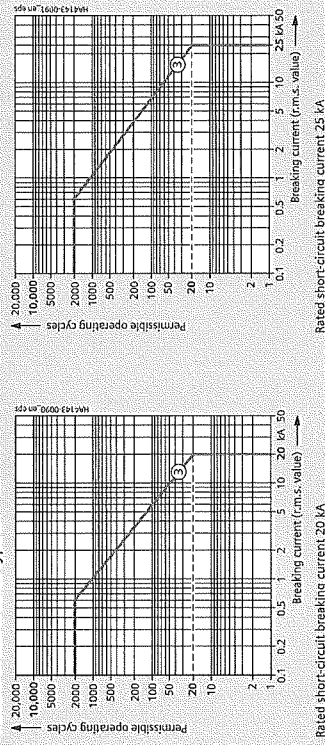


Rated short-circuit breaking current 20 kA

#### Max. number of short-circuit breaking operations

- n = 30
- n = 50

##### Vacuum circuit-breaker type CB-f NAR \*)



Rated short-circuit breaking current 20 kA

#### Max. number of short-circuit breaking operations

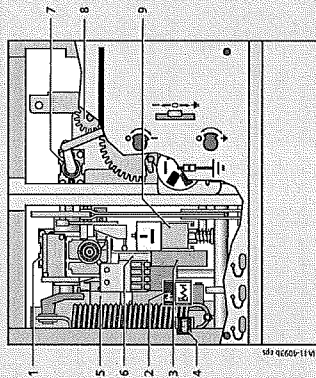
- n = 20

\*) AR = Automatic reclosing  
 NAR = Non-automatic reclosing

# Components

## Secondary equipment of the vacuum circuit-breaker, busbars

Vacuum circuit-breaker type CB-FAR \*)

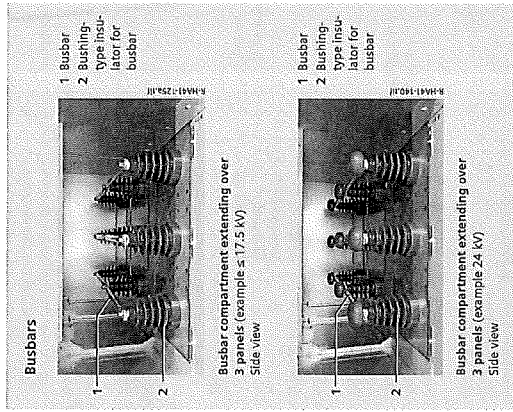


**Maximum secondary equipment**

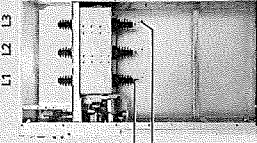
- 1 Auxiliary switch at the circuit-breaker
- 2 Position switch "spring charged"
- 3 2nd release
- 4 Operations counter
- 5 1st release
- 6 Motor operating mechanism, circuit-breaker
- 7 Auxiliary switch at the three-position disconnector
- 8 Motor operating mechanism, three-position disconnector
- 9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

**Busbars**

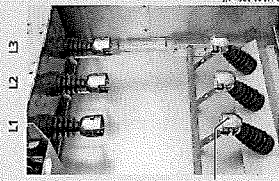
- Safe-to-touch due to metallic enclosure
- Metal-clad busbar compartment
- Three-pole design, bolted from panel to panel
- Easy switchgear extension
- Made of copper: Round E-Cu.



Cable connection (examples)

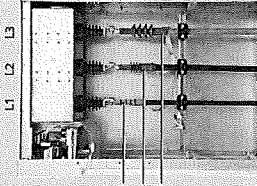


Ring-main panel type R  
Cable compartment as delivered

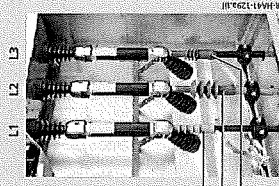


Transformer panel type T  
Cable compartment as delivered

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



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



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

- Options**
- A Mounted cable clamps 2)
  - B Short-circuit/earth-fault indicator

**Cable sealing ends (examples)**

- 1 As-delivered condition
- 2 Connection for cable
- 3 Phase L1:  
Make Lovynk-Eventech, type IAE M 20, 240 mm<sup>2</sup> (20 kV)
- 4 Phase L2:  
Make Prysmian Kabel und Systeme (Pirelli Elektrik) type ELT mb-TC-2h-C-T3, 240 mm<sup>2</sup> (24 kV)
- 5 Phase L3:  
Make Tyco Electronics Raychem, type EPKT 24 C/IX, 185 mm<sup>2</sup> (24 kV), as shrink-on sealing end, for severe ambient conditions
- 6 As-delivered condition, prepared for cable sealing end
- 7 Phase L1:  
Make Lovynk-Eventech, type IAE M 20, 95 mm<sup>2</sup> (20 kV)
- 8 Phase L2:  
Make Tyco Electronics Raychem, type IFTI 5131, 95 mm<sup>2</sup> (24 kV), as push-on sealing end
- 9 Phase L3:  
Make Euromold, type ITX, 95 mm<sup>2</sup> (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 with transformer panels type T... partly mounted underneath the panel in the cable basement
- 3) Make Siemens, type 3EK, other makes on request.

# Components

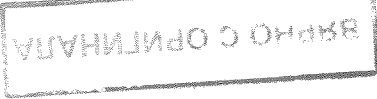
## Cable connection

**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
- In ring-main panels
- In circuit-breaker panels
- For thermoplastic-insulated cables
- For paper-insulated mass-impregnated cables with adapter systems
- For connection cross-sections up to 300 mm<sup>2</sup>
- Cable routing downwards.
- In transformer panels
- For thermoplastic-insulated cables
- For connection cross-sections up to 120 mm<sup>2</sup>; Cable lug max. 32 mm wide
- For rated normal currents of 200 A.



\*) AE: Automatic reclosing

# Components

## Selection data for various cable sealing ends 1)

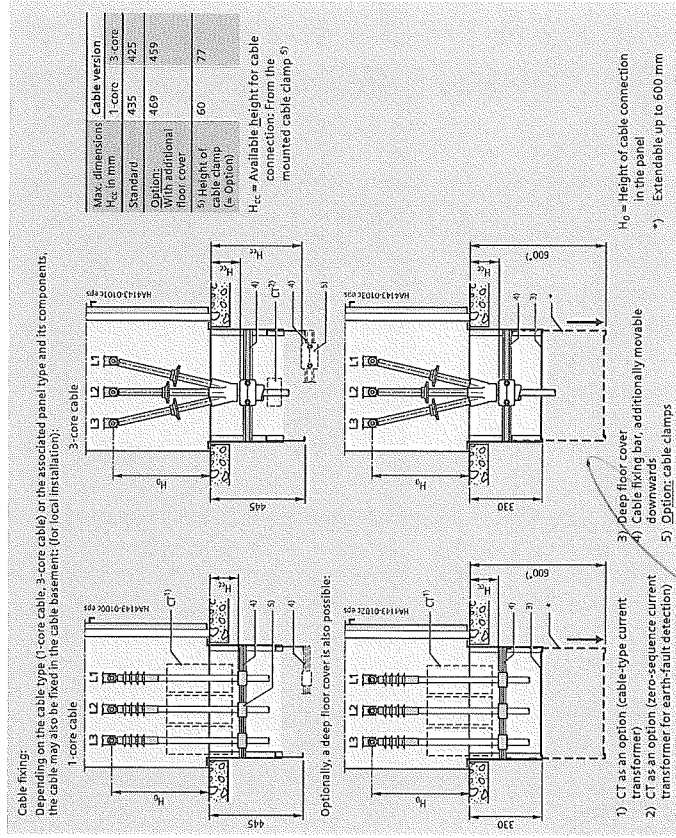
Cable sealing end, e.g. for panel types R...K...D...M(K), M(BK), L... and T...3 (for connection height of cables, see opposite dimension drawings)	Type	Cross-section in mm²	Connection height *** of cables above floor or above lower edge of panel:	
				Panel type R... Panel type L... Panel type T...
Single-core thermoplastic-insulated cables for ≤ 12 kV (6/10 kV): for IEC standard *	Euromold	AN 10, AFN 10 5)	25-300 (500 **)	
	Siemens	17 TIGI 7)	25-300 (500 **)	
	Prospan Kabel und Systeme	ELI-TB-12 7)	30-300 (400 **)	
	ELI-TB-12	35-240		
	Tycos Electronics Raychem	ELI-TB-12	25-300	
	XLSP-F	16-300 (500 **)		
	MVLI-011xx	25-300 (400 **)		
	EPKT 2)	16-300		
	Loxvik-EnerTech	IAEM 10	25-300	
	IAES 10	25-300 (500 **)		
	3M	93-EB 6x-1	35-300 (400 **)	
Südcoabel	SEHDI 10.2	35-300 (500 **)		
	TI 12	25-240		
	TI 24	25-300 (500 **)		
	TO 24	25-300 (500 **)		
Three-core thermoplastic-insulated cables for ≤ 12 kV (6/10 kV): for IEC standard *	Euromold	AN 10 7)	35-300 (500 **)	
	Siemens	17 TIGI 7)	35-300 (500 **)	
	Prospan Kabel und Systeme	IXSL-F33xx	35-300 (500 **)	
	Tycos Electronics Raychem	IXSL-F33xx	35-300 (500 **)	
	Loxvik-EnerTech	IAES 10	35-300	
	GHKI	16-300 (400 **)		
	Single-core thermoplastic-insulated cables for > 12 kV to ≤ 24 kV (12/20 kV) 1)	Euromold	AN 20, AFN 20	200-300 (630 **)
		Siemens	24 TIGI	25-300 (500 **)
		Prospan Kabel und Systeme	36 M5C 3)	95-300 (500 **)
		Tycos Electronics Raychem	36 M5C 3)	95-300 (500 **)
		IXSL-F33xx	95-300 (500 **)	
Loxvik-EnerTech		TIK-224	25-240	
ELI-TB-1C-24		35-240		
ELI-TB-24		25-300		
XLSP-F		25-300 (500 **)		
MVLI-011xx		25-300 (400 **)		
EPKT		16-300 (500 **)		
Loxvik-EnerTech	IAEM 20	25-300		
IAES 20	25-300 (500 **)			
3M	93-EB 6x-1	50-300 (400 **)		
Südcoabel	SEHDI 20.2	35-300 (500 **)		
	SEI 24	25-240		
	TI 24	25-240		
	TO 24	25-300 (500 **)		
Three-core thermoplastic-insulated cables for > 12 kV to ≤ 24 kV (12/20 kV) 1)	Euromold	SR-DI 24 3)	35-300 (500 **)	
	Siemens	AFN 10	35-300	
	Loxvik-EnerTech	GHKI	25-300 (500 **)	
	Tycos Electronics Raychem	o.r. IXSL-F33xx	n/a	

1) For standards, see page 84  
 \*\* On request: Max. connection cross-section of cable sealing end types  
 \*\*\* Due to the installation of 4MA cast-resin insulated block-type current transformers, the connection height of the cables is reduced in the corresponding panel types [e.g.: L, L, M (K), ...]  
 1) Note:  
 For cable connections, the manufacturer information about the sealing end and the design of the cable must be taken into account (e.g., operating voltage, rated power-frequency withstand voltage, cable type, core material)  
 2) Transformer panel types T...:  
 - Lower edge of sealing end below panel  
 - Cable lugs of sealing ends up to 32 mm width  
 - Owing to the various sealing end lengths, some of the mounted cable clamps are underneath the panel  
 3) Circuit-breaker panel types L...:  
 Lower edge of sealing end below panel  
 4) Cable sealing end type with insulation shields  
 \*) Remark concerning applications with requirements according to the GB standard (China): Type suitable for rated short-duration power-frequency withstand voltage  $U_{sc}$  = 42 kV according to IEC 62271-1 and  $U_{sm}$  = 42 kV according to EN/HD 629  
 Switchgear Type SIMOSEC, up to 24 kV, Air-insulated, Extendable - Siemens HA 41.43 - September 2015

# Components

## Cable cross-sections

Panel type	Panel width	Version	Connected cables x connection cross-section number x mm² for rated voltage	Transformer combination in the connection compartment	Current transformer
K	375	Standard	1 x 300	1 x 300	0
		On request	2 x 300	2 x 300	0
		Option	1 x 300	1 x 300	0
L	500	Standard	1 x 300	1 x 300	0
		On request	2 x 300	2 x 300	0
		Option	1 x 300	1 x 300	0
K(D)	375	Standard	1 x 300	1 x 300	0
		On request	2 x 300	2 x 300	0
		Option	1 x 300	1 x 300	0
L(D)	500	Standard	1 x 300	1 x 300	0
		On request	2 x 300	2 x 300	0
		Option	1 x 300	1 x 300	0
L	500	Standard	1 x 300	1 x 300	0
		On request	2 x 240	2 x 240	0
		Option	1 x 300	1 x 300	0
M(K)	750	Standard	1 x 300	1 x 300	0
		On request	2 x 300	2 x 300	0
		Option	1 x 300	1 x 300	0
M(BK)	750	Standard	1 x 400	1 x 300	0
		On request	3 x 400	3 x 300	0
		Option	1 x 400	1 x 300	0
M(KK)	750	Standard	1 x 400	1 x 300	0
		On request	2 x 300	2 x 300	0
		Option	1 x 300	1 x 300	0
L1(W)	750	Standard	1 x 300	1 x 300	0
		On request	2 x 300	2 x 300	0
		Option	1 x 300	1 x 300	0
L2	300	Standard	1 x 240	1 x 240	0
		On request	1 x 240	1 x 240	0
		Option	1 x 240	1 x 240	0
o possible	-	-	-	-	-



# Components

## HV HRC fuse assembly

### HV HRC fuse assembly

#### Features

- Application for
  - Transformer panel types T (375 mm) and T1 (500 mm)
  - Busbar voltage metering panel type M(VI-F), M1(VI-F)
- HV HRC fuse-links acc. to DIN 43625 (main dimensions) with striker; version "medium" acc. to IEC 60282-1/VE 0670-4\*)
- As short-circuit protection before transformers
- With selectivity (depending on correct selection) to upstream and downstream connected equipment
- Requirements according IEC 62271-105 fulfilled as HV alternating current switch-fuse combination
- Selection of HV HRC fuses for transformers
- Fuse replacement possible only when feeder is earthed
- Option: Shunt release on operating mechanism of three-position switch-disconnector
- Option: "Tripped indication" of three-position switch-disconnector in transformer feeder (transformer switch) for remote electrical indication with one normally-open contact (1 NO).

#### Mode of operation

##### "HV HRC fuse tripped"

Following the tripping of an HV HRC fuse-link, the mechanism for charging the spring must be set to the "OPEN" position. Subsequently, earthing can be implemented by means of the three-position switch-disconnector and e.g. the fuse can be replaced.

##### Replacement of HV HRC fuse-links (without any tools)

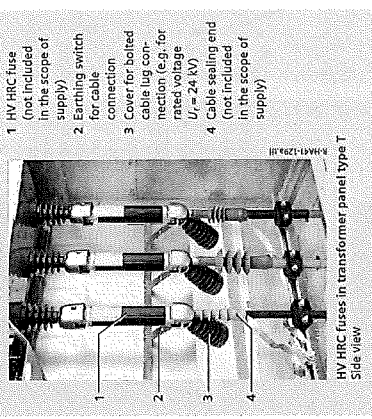
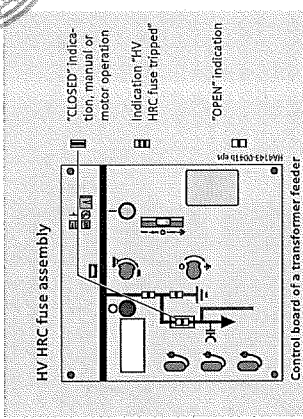
- Isolating and earthing of the transformer feeder
- Opening the connection compartment cover
- Subsequent manual replacement of the HV HRC fuse-link.

##### 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.



# Components

## Allocation of HV HRC fuses and transformers

### Recommended HV HRC fuses make SIBA for switchgear type SIMOSEC

#### Standards

- HV HRC fuse-links "medium" version with striker and for tripping energy  $1 \pm 0.5$  Joule according to
  - IEC/EN 60282-1/VE 0670-4
  - IEC/EN 60787/VE 0670-402
  - DIN 43625 main dimensions.

#### Fuse protection table

The three-position switch-disconnector in the transformer feeder (transformer switch) was combined and tested with HV HRC fuse-links.

MV system operating voltage $U_n$ kV	Transformer Rated power $S_T$ kVA	Relative impedance voltage $u_k$ %	Rated current $I_n$ A	Rated current $I_n$ A	HV HRC fuse-link Rated current $I_n$ A	Min. operating / rated voltage $U_n$ kV	Dimension e mm	Outside diameter $d$ mm	Order No. make SIBA
3 to 3.6	20	4	3.5	3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 463
				3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 116
				3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 20
				3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 20
	50	4	6.75	3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40
				3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40
				3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40
				3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40
	75	4	13.1	3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 20
				3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 20
				3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 20
				3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 20
	100	4	17.5	3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 31,5
				3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40
				3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40
				3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40
125	4	21.87	3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40	
			3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40	
			3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40	
			3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40	
160	4	28	3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40	
			3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40	
			3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40	
			3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 40	
200	4	35	3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 50	
			3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 50	
			3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 50	
			3 to 7.2	3 to 7.2	3 to 7.2	292	53	30 098 13 50	
250	4	43.74	3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 63	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 63	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 63	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 63	
315	4	55.1	3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 80	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 80	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 80	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 80	
400	4	70	3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 100	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 100	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 100	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 100	
500	4	87.8	3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 63	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 63	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 63	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 63	
630	4	110	3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 100	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 100	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 100	
			3 to 7.2	3 to 7.2	3 to 7.2	292	67	30 099 13 100	

\*) For standards, see page 84

77

## Components

Allocation of HV HRC fuses and transformers  
Recommended HV HRC fuses make SIBA for switchgear type SIMOSEC

IMV system	Transformer	Relative impedance	Rated current I <sub>r</sub>	Rated current I <sub>r</sub>	HV HRC fuse-link	Dimension e	Outside diameter d	Order No. Make SIBA
Operating voltage U <sub>s</sub> , kV	Rated power S <sub>r</sub> , kVA	Impedance %	Rated current I <sub>r</sub> , A	Rated current I <sub>r</sub> , A	Min. operating/ rated voltage U <sub>r</sub> , kV	mm		
6 to 7.2	20	4	1.9	6.3	6 to 12	292	53	30 004 13.6.3
	30	4	2.9	6.3	6 to 12	442	53	30 101 13.1.25
	50	4	4.8	6.3	6 to 12	292	53	30 004 13.6.3
	75	4	7.2	10	6 to 12	292	53	30 004 13.1.0
	100	4	9.6	16	6 to 12	442	53	30 004 13.1.6
	125	4	12	20	6 to 12	442	53	30 101 13.1.16
	160	4	15.4	25	6 to 12	292	53	30 101 13.1.15
	200	4	19.2	31.5	6 to 12	442	53	30 231 13.3.15
10 to 12	250	4	24	40	6 to 12	442	53	30 101 13.1.20
	315	4	30.3	50	6 to 12	442	53	30 004 13.2.25
	400	4	38.4	63	6 to 12	292	53	30 101 13.3.15
	500	4	48	80	6 to 12	442	53	30 004 13.4.0
	630	4	61	100	6 to 12	292	53	30 101 13.3.15
	800	5 (6.5)	77	125	6 to 12	442	53	30 004 13.2.5
	1000	5 (6.5)	96	160	6 to 12	442	53	30 101 13.4.0
	1750	5 (6.5)	125	200	6 to 12	442	53	30 004 13.1.0
13.8	50	4	4.3	10	10 to 24	292	53	30 004 13.3.0
	75	4	6.4	16	10 to 24	292	53	30 004 13.3.6
	100	4	8.5	20	10 to 24	292	53	30 004 13.3.10
	125	4	10.6	25	10 to 24	292	53	30 004 13.3.15
	160	4	13.8	31.5	10 to 24	292	53	30 004 13.3.20
	200	4	17.0	40	10 to 24	292	53	30 004 13.3.25
	250	4	21.3	50	10 to 24	292	53	30 004 13.3.30
	315	4	27.4	63	10 to 24	292	53	30 004 13.3.35
	400	4	35.6	80	10 to 24	292	53	30 004 13.3.40
	500	4	45.0	100	10 to 24	292	53	30 004 13.3.45
	630	4	56.7	125	10 to 24	292	53	30 004 13.3.50
	800	5 (6.5)	73.0	160	10 to 24	292	53	30 004 13.3.55
	1000	5 (6.5)	92.3	200	10 to 24	292	53	30 004 13.3.60
	1750	5 (6.5)	121.5	250	10 to 24	292	53	30 004 13.3.65
	2500	5 (6.5)	151.8	315	10 to 24	292	53	30 004 13.3.70
	3000	5 (6.5)	182.2	400	10 to 24	292	53	30 004 13.3.75
13.8	50	4	4.2	10	10 to 17.5	292	53	30 004 13.2.5
	75	4	6.3	16	10 to 17.5	292	53	30 004 13.3.10
	100	4	8.4	20	10 to 17.5	292	53	30 004 13.3.15
	125	4	10.5	25	10 to 17.5	292	53	30 004 13.3.20
	160	4	13.8	31.5	10 to 17.5	292	53	30 004 13.3.25
	200	4	17.0	40	10 to 17.5	292	53	30 004 13.3.30
	250	4	21.3	50	10 to 17.5	292	53	30 004 13.3.35
	315	4	27.4	63	10 to 17.5	292	53	30 004 13.3.40
	400	4	35.6	80	10 to 17.5	292	53	30 004 13.3.45
	500	4	45.0	100	10 to 17.5	292	53	30 004 13.3.50
	630	4	56.7	125	10 to 17.5	292	53	30 004 13.3.55
	800	5 (6.5)	73.0	160	10 to 17.5	292	53	30 004 13.3.60
	1000	5 (6.5)	92.3	200	10 to 17.5	292	53	30 004 13.3.65
	1750	5 (6.5)	121.5	250	10 to 17.5	292	53	30 004 13.3.70
	2500	5 (6.5)	151.8	315	10 to 17.5	292	53	30 004 13.3.75
	3000	5 (6.5)	182.2	400	10 to 17.5	292	53	30 004 13.3.80

48

## Components

Allocation of HV HRC fuses and transformers  
Recommended HV HRC fuses make SIBA for switchgear type SIMOSEC

IMV system	Transformer	Relative impedance	Rated current I <sub>r</sub>	Rated current I <sub>r</sub>	HV HRC fuse-link	Dimension e	Outside diameter d	Order No. Make SIBA
Operating voltage U <sub>s</sub> , kV	Rated power S <sub>r</sub> , kVA	Impedance %	Rated current I <sub>r</sub> , A	Rated current I <sub>r</sub> , A	Min. operating/ rated voltage U <sub>r</sub> , kV	mm		
10 to 12	200	4	11.5	25	6 to 12	292	53	30 004 13.2.5
	300	4	17.2	31.5	6 to 12	442	53	30 101 13.1.25
	400	4	22.9	40	6 to 12	292	53	30 004 13.2.15
	500	4	29.2	50	6 to 12	442	53	30 231 13.2.15
	630	4	36.4	63	6 to 12	292	53	30 004 13.2.5
	800	5 (6.5)	46.2	80	6 to 12	442	53	30 004 13.2.15
	1000	5 (6.5)	58	100	6 to 12	442	53	30 004 13.2.5
	1750	5 (6.5)	77.2	125	6 to 12	442	53	30 004 13.2.15
13.8	50	4	4.2	10	10 to 17.5	292	53	30 004 13.1.5
	75	4	6.3	16	10 to 17.5	292	53	30 004 13.1.10
	100	4	8.4	20	10 to 17.5	292	53	30 004 13.1.15
	125	4	10.5	25	10 to 17.5	292	53	30 004 13.1.20
	160	4	13.8	31.5	10 to 17.5	292	53	30 004 13.1.25
	200	4	17.0	40	10 to 17.5	292	53	30 004 13.1.30
	250	4	21.3	50	10 to 17.5	292	53	30 004 13.1.35
	315	4	27.4	63	10 to 17.5	292	53	30 004 13.1.40
	400	4	35.6	80	10 to 17.5	292	53	30 004 13.1.45
	500	4	45.0	100	10 to 17.5	292	53	30 004 13.1.50
	630	4	56.7	125	10 to 17.5	292	53	30 004 13.1.55
	800	5 (6.5)	73.0	160	10 to 17.5	292	53	30 004 13.1.60
	1000	5 (6.5)	92.3	200	10 to 17.5	292	53	30 004 13.1.65
	1750	5 (6.5)	121.5	250	10 to 17.5	292	53	30 004 13.1.70
	2500	5 (6.5)	151.8	315	10 to 17.5	292	53	30 004 13.1.75
	3000	5 (6.5)	182.2	400	10 to 17.5	292	53	30 004 13.1.80

# Components

Allocation of HV HRC fuses and transformers  
 Recommended HV HRC fuses make SIBA for switchgear type SIMOSEC

IMV system Operating voltage U <sub>o</sub>	Transformer Rated power S <sub>r</sub> kVA	Relative impedance voltage %	Rated current I <sub>n</sub> A	Rated current I <sub>n</sub> A	Min. operating / rated voltage U <sub>o</sub> kV	Dimension a (mm)	Outside diameter d	Order No. Make SIBA
13.8	315	4	13.2	25	10 to 17.5	442	53	30 231 13 23
				31.5	10 to 17.5	442	53	30 231 13 31
				40	10 to 17.5	442	53	30 231 13 40
				50	10 to 17.5	442	53	30 231 13 50
15 to 17.5	400	4	16.8	31.5	10 to 17.5	442	53	30 231 13 31.5
				40	10 to 17.5	442	53	30 231 13 40
				50	10 to 17.5	442	53	30 231 13 50
				63	10 to 17.5	442	53	30 231 13 63
20	500	4	21	40	10 to 24	442	53	30 006 13 40
				50	10 to 24	442	53	30 006 13 50
				63	10 to 24	442	53	30 006 13 63
				80	10 to 24	442	53	30 006 13 80
25	630	4	26.4	50	10 to 24	442	53	30 014 13 50
				63	10 to 24	442	53	30 014 13 63
				80	10 to 24	442	53	30 014 13 80
				100	10 to 24	442	53	30 022 13 100
30	1000	4	32.3	63	10 to 24	442	53	30 022 13 63
				80	10 to 24	442	53	30 022 13 80
				100	10 to 24	442	53	30 022 13 100
				125	10 to 24	442	53	30 022 13 125
35	1600	4	37.7	80	10 to 24	442	53	30 022 13 80
				100	10 to 24	442	53	30 022 13 100
				125	10 to 24	442	53	30 022 13 125
				160	10 to 24	442	53	30 022 13 160
40	2000	4	42.2	100	10 to 24	442	53	30 022 13 100
				125	10 to 24	442	53	30 022 13 125
				160	10 to 24	442	53	30 022 13 160
				200	10 to 24	442	53	30 022 13 200
45	2500	4	47.7	125	10 to 24	442	53	30 022 13 125
				160	10 to 24	442	53	30 022 13 160
				200	10 to 24	442	53	30 022 13 200
				250	10 to 24	442	53	30 022 13 250
50	3000	4	52.2	160	10 to 24	442	53	30 022 13 160
				200	10 to 24	442	53	30 022 13 200
				250	10 to 24	442	53	30 022 13 250
				315	10 to 24	442	53	30 022 13 315
55	4000	4	57.7	200	10 to 24	442	53	30 022 13 200
				250	10 to 24	442	53	30 022 13 250
				315	10 to 24	442	53	30 022 13 315
				400	10 to 24	442	53	30 022 13 400
60	5000	4	62.2	250	10 to 24	442	53	30 022 13 250
				315	10 to 24	442	53	30 022 13 315
				400	10 to 24	442	53	30 022 13 400
				500	10 to 24	442	53	30 022 13 500
65	6300	4	67.7	315	10 to 24	442	53	30 022 13 315
				400	10 to 24	442	53	30 022 13 400
				500	10 to 24	442	53	30 022 13 500
				630	10 to 24	442	53	30 022 13 630
70	8000	4	72.2	400	10 to 24	442	53	30 022 13 400
				500	10 to 24	442	53	30 022 13 500
				630	10 to 24	442	53	30 022 13 630
				800	10 to 24	442	53	30 022 13 800
75	10000	4	77.7	500	10 to 24	442	53	30 022 13 500
				630	10 to 24	442	53	30 022 13 630
				800	10 to 24	442	53	30 022 13 800
				1000	10 to 24	442	53	30 022 13 1000
80	12500	4	82.2	630	10 to 24	442	53	30 022 13 630
				800	10 to 24	442	53	30 022 13 800
				1000	10 to 24	442	53	30 022 13 1000
				1250	10 to 24	442	53	30 022 13 1250
85	15000	4	87.7	800	10 to 24	442	53	30 022 13 800
				1000	10 to 24	442	53	30 022 13 1000
				1250	10 to 24	442	53	30 022 13 1250
				1600	10 to 24	442	53	30 022 13 1600
90	20000	4	92.2	1000	10 to 24	442	53	30 022 13 1000
				1250	10 to 24	442	53	30 022 13 1250
				1600	10 to 24	442	53	30 022 13 1600
				2000	10 to 24	442	53	30 022 13 2000
95	25000	4	97.7	1250	10 to 24	442	53	30 022 13 1250
				1600	10 to 24	442	53	30 022 13 1600
				2000	10 to 24	442	53	30 022 13 2000
				2500	10 to 24	442	53	30 022 13 2500

# Components

Three-phase current transformer 4MC63

### Features

- According to IEC 61869-2
- DIN EN 61869-2 \*
- Designed as a three-pole ring-core current transformer
- Free of dielectrically stressed cast-resin parts (due to design)
- Insulation class E
- Inductive type
- Climate-independent
- Secondary connection by means of a terminal strip in the panel.

Three-phase current transformer 4MC63 ... installed on bushing-type insulators



**Technical data**

Three-phase current transformer 4MC63 60 (Standard type) 1)

for I<sub>n</sub> = 1000 A  
for I<sub>n</sub> = 690 A

**Primary data**

High voltage for equipment U <sub>m</sub>	Rated current I <sub>n</sub>	0.72 kV	0.72 kV	0.72 kV	0.72 kV	0.72 kV	0.72 kV		
	150	100	75	50	400	300	200		
	3 kV			3 kV			3 kV		
Rated short-circuit power (frequency 50 Hz) (with duty test)	25 kA (I <sub>sc</sub> 2 s)			25 kA (I <sub>sc</sub> 2 s)			25 kA (I <sub>sc</sub> 2 s)		
Rated thermal current I <sub>th</sub>	630 A			630 A			630 A		
Rated dynamic current I <sub>dyn</sub>	2.5 x I <sub>n</sub>			2.5 x I <sub>n</sub>			2.5 x I <sub>n</sub>		

**Secondary data**

Rated current	1	0.67	0.5	0.33	1	0.75	0.5	1	0.75	0.6	0.5	
Rated current (output)	5 A		3.33		2.5		1.67		5		3.75	
Current ratio	4:2 A		5:4		10:5		15:5		10:5		1.25 A	
Protection Class	10 P		10 P		10 P		10 P		10 P		10 P	
Overcurrent ratio	10		10		10		10		10		10	

1) Other values on request, e.g. as additional type 4MC63 63 (complementary types)

### Installation

- Arranged outside the switching-device vessel on the bushings
- Factory-assembled
- Mounting location: For circuit-breaker panels type L...
- For bus sectionalizer panels type L(T)
- Option: On request for ring-main-panels type R...

### Other designs

For protection equipment based on the current-transformer operation principle: Three-phase current transformer type 4MC63 60 for protection relay 7SJ4x as definite-time overcurrent protection

### Definite-time overcurrent protection relay, make Woodward/SEG, type WIP-I.

Three-phase current transformer 4MC63 64 for protection relay, make Woodward/SEG, type WIC.

\* For standards, see page 84

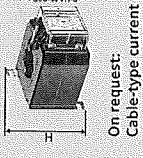
49



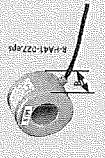
# Components

## Cable-type current transformers 4MC70 33 and 4MC70 31

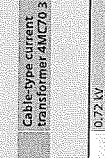
**Cable-type current transformer 4MC70 33, 4 overall heights**



**Cable-type current transformer 4MC70 31**



**On request: Cable-type current transformer**



Cable-type current transformer 4MC70 33		Cable-type current transformer 4MC70 31	
Highest voltage for equipment $U_n$	0.72 kV	0.72 kV	0.72 kV
Rated current $I_n$	20 A to 600 A	50 A to 600 A	50 A to 600 A
Rated short-circuit power-frequency withstand voltage $U_{sc}$	3 kV	3 kV	3 kV
Rated lightning impulse withstand voltage $U_{li}$	up to 25 kA/1 s or 25 kA/3 s or 2.5 kA/3 s	25 kA/1 s or 25 kA/3 s or 14.5 kA/3 s	25 kA/1 s or 25 kA/3 s or 14.5 kA/3 s
Rated continuous thermal current $I_{th}$	1.08 $I_n$	1.08 $I_n$	1.08 $I_n$
Rated dynamic current $I_{dyn}$	1.5 $I_n$ / 1 h or 2.2 $I_n$ / 0.5 h	1.5 $I_n$ / 1 h or 2.2 $I_n$ / 0.5 h	1.5 $I_n$ / 1 h or 2.2 $I_n$ / 0.5 h
Rated dynamic current $I_{dyn}$	2.5 $I_n$	2.5 $I_n$	2.5 $I_n$

Secondary data	
Rated current	1 A or 5 A
Measuring core	0.2 without F55 F50
Overcurrent factor	2.5 VA to 30 VA
Rating	2.5 VA to 10 VA
Protection core	10 P 5 P
Overcurrent factor	10 10
Rating	2.5 VA to 10 VA
Dynamic Secondary tap	1:2 (e.g. 150 A - 300 A)

Dimensions	
Overall height H, mm	65   110   170   285   89
Outside diameter	150 mm
Inside diameter	85 mm x 114 mm
For cable diameter	50 mm
	36 mm

Other values on request.

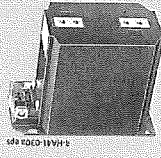
- Features**
- According to IEC 61869-2/ DIN EN 61869-2 \*
  - Designed as a single-pole ring-core current transformer
  - Climate-independent
  - Free of dielectrically stressed cast-resin parts (due to design)
  - Insulation class E
  - Inductive type
  - Secondary connection by means of a terminal strip inside the panel.
- Application**
- For circuit-breaker panels type L...
  - For ring-main panels type R...
  - For transformer panels type L...
- Installation**
- Cable-type current transformer 4MC70 33 for panel types R..., K..., L...
  - Cable-type current transformer 4MC70 31; e.g. for panel types R..., K..., L... and T...
  - Arranged on the cable at the panel connection
  - For shielded cables
  - Transformers mounted on a supporting plate at our factory: final assembly on the cables on site.

\*) For standards, see page 84  
 1) Depending on the core data  
 2) Available installation space for cable-type current transformers inside the panels depends on make, type and cross-section of sealing end.  
 Example: Panel type R or K; installation space approx. 285 mm

# Components

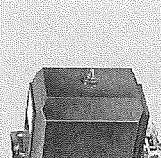
## Current transformers 4MA7 and voltage transformers 4MR for air-insulated billing metering panels

**Current transformer 4MA7**



**Current transformer 4MA7, single-pole**

**Voltage transformer 4MR14**



**Voltage transformer 4MR14, single-pole**

**Application**

- For panel types:
  - Billing metering panels type M...
  - Bus riser panel type H
  - Busbar voltage transformer panel types M(VT), M(VTF), L...
  - For mounting at the feeder.

**Features**

- Current transformer 4MA7
- According to IEC 61869-2/ DIN EN 61869-2 \*
- Dimensions according to DIN 42600-8
- Designed as a single-pole indoor block-type current transformer
- Cast-resin insulated
- Insulation class E
- Secondary connection by means of screw-type terminals.

**Voltage transformer 4MR**

- According to IEC 61869-3/ DIN EN 61869-3 \*
- Dimensions according to DIN 42600-9 (small model)
- Designed as an indoor voltage transformer:
  - Type 4MR, single-pole
  - Option: type 4MR, two-pole
  - Cast-resin insulated
  - Insulation class E
  - Secondary connection by means of screw-type terminals.

**Technical data**

**Current transformer 4MA7, single-pole (other values on request)**

Highest voltage for equipment $U_n$	3.6	7.2	12	17.5	24
Rated short-circuit power-frequency withstand voltage $U_{sc}$	10	20	28	42	38
Rated lightning impulse withstand voltage $U_{li}$	20	40	56	84	75
Rated current $I_n$	20	60	75	95	125
Rated short-circuit thermal current $I_{th}$	A, 20 to 1200				
Rated continuous thermal current $I_{th}$	VA, up to 20 kA/3 s, or up to 25 kA/1 s				
Rated dynamic current $I_{dyn}$	up to 1.0 $I_n$ , (option: 1.2 $I_n$ )				
Rated dynamic current $I_{dyn}$	max. 2.5 $I_n$				

**Secondary data**

Measuring core	Class	0.2	0.5	1
Overcurrent factor	without F55	F50	F50	F50
Rating	VA	2.5 to 30	2.5 to 30	2.5 to 30
Protection core	Class	5 P or 10 P	5 P or 10 P	5 P or 10 P
Overcurrent factor	Rating	10	10	10
Rating	VA	2.5 to 30	2.5 to 30	2.5 to 30

**Voltage transformer 4MR, single-pole (other values on request)**

Highest voltage for equipment $U_n$ (= 1.2 $U_{sc}$ )	kV	3.6	7.2	12	17.5	24
Rated short-circuit power-frequency withstand voltage $U_{sc}$	kV	10	20	28	42	38
Rated lightning impulse withstand voltage $U_{li}$	kV	20	40	56	84	75
Rated voltage $U_n$	kV	3.31/3	6.61/3	12.1/3	17.5/3	24.0/3
		4.21/3	8.41/3	12.81/3	19.21/3	25.21/3
		4.81/3	9.61/3	14.41/3	21.61/3	28.81/3
		5.01/3	10.01/3	15.01/3	22.51/3	30.01/3
		6.31/3	12.61/3	18.91/3	28.351/3	37.81/3
		6.61/3	13.21/3	19.81/3	29.71/3	39.61/3

**Secondary data**

Rated voltage	V	100/√3	110/√3 (option)	120/√3 (option)	150/√3 (option)	175/√3 (option)
Rated voltage for auxiliary winding (option)	V	100/3	110/3 (option)	120/3 (option)	150/3 (option)	175/3 (option)
Rating	VA	20	30	100	100	100
Class		0.2	0.5	1.0	1.0	1.0

# Components

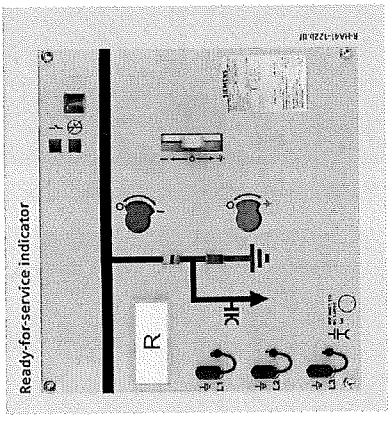
## Indicating and measuring equipment

### Ready-for-service indicator

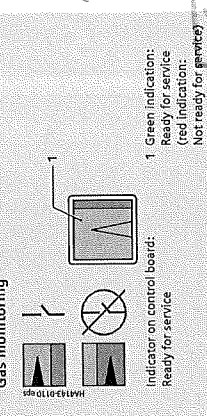
- Features**
- Self-monitoring; easy to read
  - Independent of temperature and pressure variations
  - Independent of the site altitude
  - Only responds to changes in gas density
  - Option: Alarm switch "1, ND" for remote electrical indication.

### Mode of operation

For the ready-for-service indicator, a gas-tight measurement box is installed inside the switching-device 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 stainless-steel switching-device 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 switching-device vessel. The temperature effect is compensated via the same pressure change in both gas volumes.



### Gas monitoring



1 Green indicator: Ready for service  
2 Red indicator: Not ready for service

3 Magnetic coupling

Stainless-steel vessel filled with SF<sub>6</sub> gas

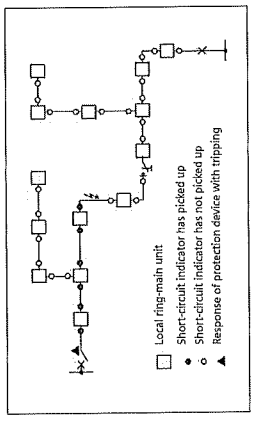
Ready-for-service indicator

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

### Short-circuit/earth-fault indicators

Short-circuit/earth-fault indicators (option) make Horstmann Ring-main, cable, transformer and circuit-breaker feeders can optionally be equipped with short-circuit or earth-fault indicators in different designs.

The equipment features are shown in the table on page 53. Short-circuit and earth-fault indicators reduce the downtimes of a power system by limitation of fault locations in medium-voltage systems.



Short-circuit/earth-fault indicators can be used in radial systems and in openly operated ring systems. In impedance-earthed and solidly earthed systems, every short-circuit indicator can also be used as an earth-fault indicator.

### Basic functions

- Adjustable pickup values
- Phase-selective fault indication
- Reset of fault indication: manually, automatically, from remote
- Remote indication with relay contacts.

### Measuring function with ComPass A

- Measuring and indication of phase and earth currents
- Transfer of measured values, fault indications and events via RS485/Modbus.

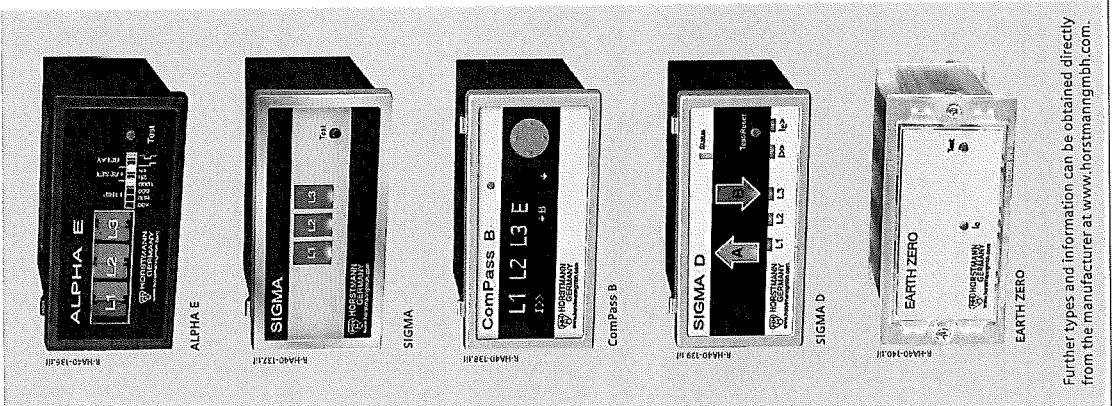
### ComPass B with further functions

- Short-circuit and earth-fault indication depending on direction
- Voltage detection via voltage detecting system type WEGA. This provides further measured values such as:

- Phase and displacement voltage
- Active, reactive and apparent power
- Power factor cos φ
- Load flow direction
- Undervoltage and overvoltage signaling, indication
- Directional/non-directional fault detection for all types of neutral treatment.

### SIGMA D, SIGMA D+ universal fault direction indicator

- Current-transformer operated short-circuit direction indicator and earth-fault direction indicator for all systems and neutral point connection types
- Unambiguous signaling of the fault direction
- Simple and flexible configuration via DIP switch and USB
- Event memory for fault evaluation.



Further types and information can be obtained directly from the manufacturer at [www.horstmannmbh.com](http://www.horstmannmbh.com).