Switchgear Type SIMOSEC 12, up to 12 kV, Air-Insulated, Extendable

Medium-Voltage Switchgear

Catalog HA 41.41 · 2009

Answers for energy.

SIEMENS

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Example
4-panel transfer switchgear with
integrated low-voltage niche

R-HA41-055.eps

Utilities transfer substation
for industrial plants

R-HA40-112.tif

R-HA40-111.tif

Contents

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The products and systems described in this catalog are manufactured and sold according to a certified quality and environmental management system (acc. to ISO 9001 and ISO 14001).
(DQS Certificate Reg. No. DQS 003473 QM UM).
The certificate is accepted in all IQNet countries.

Application, Requirements

Features

SIMOSEC 12 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 12 switchgear is used for power distribution in distribution systems with busbar currents up to 1,250 A.

Modular space-saving design allows use in
- Substations, customer transfer substations, distribution substations and switching substations of power supply and public utilities
- Public buildings, such as high-rise buildings, railway stations, hospitals
- Industrial plants.

Typical examples
- 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 industry
- Emergency power supply installations.

Modular design
- Individual panels, for free combination and extension
- Option: Low-voltage compartments can be supplied in two overall heights.

Technical features
- Air-insulated indoor switchgear
- Gas-insulated, maintenance-free switching functions for the three-position switch
- 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 630 A, fixed-mounted in gas-insulated switchgear vessel
- Hermetically-sealed by welding, stainless-steel switchgear vessel,
  – For switching devices
  – With insulating gas SF_6
- LSC 2 A or LSC 2 B panels
- Pressure relief
  – To the rear and upwards
  – Separately for each compartment
- Air-insulated cable connection system for conventional cable sealing ends
- 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
- Panel heating for severe ambient conditions, e.g. condensation.

* Standards see page 57

Features

Reliability
- Type and routine-tested *
- Standardized and manufactured using numerically controlled machines
- Quality management system according to DIN EN ISO 9001
- More than 500,000 switchgear components in operation worldwide for many years
- No cross-insulation between phases.

Personal safety
- All switching operations can be performed with closed panel front
- Metal-enclosed LSC 2 A or LSC 2 B 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.

Security of operation
- Components, e.g. operating mechanisms, three-position switches, vacuum circuit-breakers proven for years
- LSC 2 B panels (metal compartmentalization (metal-clad) between busbar and switching device and between switching device and cable connection compartment)
- LSC 2 A panels with metal compartmentalization between switching device and busbar compartment
- Three-position switch metal-enclosed with gas-insulated switching functions

– Welded sealed-for-life switchgear vessel
– No cross-insulation between phases
– With welded-in rotary bushings for operation

- Switch operating mechanisms outside switchgear vessel
- Maintenance-free operating mechanism parts (IEC 62271-1 / VDE 0671-1 * and GB 11022 *)
- Mechanical switch position indications integrated in mimic diagram
- Switchgear interlocking system with logical mechanical interlocks.

Reavailability
- Three-position switch disconnector with gas-insulated, maintenance-free quenching principle
- Metal compartmentalization between busbar compartment, switching devices and cable connection 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.

Cost-efficiency
Low "life-cycle costs" throughout the entire product service life thanks to:
- Low maintenance
- Minimum space requirements
- Easy switchgear extension
- Gas-insulated switching functions of the three-position switch.

Security of investment
Innovative developments, e.g.
- Modular design
- Easy switchgear extension, without gas work on site
- Maintenance-free, gas-insulated switching functions of the three-position switch
- Maintenance-free vacuum circuit-breaker
- SIPROTEC protection device family as well as external makes.

Electrical features
- Rated voltages up to 12 kV
- Rated short-time withstand current up to 25 kA
- Rated normal current of feeders

– Up to 630 A, e.g. for ring-main, metering and circuit-breaker panels
– Up to 630 A, for bus sectionalizer panels

- Rated normal current of busbar up to 1,250 A.

* Standards see page 57

Technical Data

Electrical data of the switchgear

Electrical data

Rated insulation level	Rated voltage U_r	kV	7.2		12	
	Rated short-duration power-frequency withstand voltage U_d					
	– phase-to-phase, phase-to-earth, open contact gap	kV	20		42 (28) Δ	
	– across the isolating distance	kV	23		48 (32) Δ	
	Rated lightning impulse withstand voltage U_p					
	– phase-to-phase, phase-to-earth, open contact gap	kV	60		75	
	– across the isolating distance	kV	70		85	
Rated frequency f_r		Hz	50/60 →			
Rated normal current I_r for feeders **	for ring-main feeders	A	630 →			
	for circuit-breaker feeders	A	630 →			
	for transformer feeders	A	200 [1] →			
Rated normal current for busbar	Standard	A	630 A →			
	Option on request	A	1,250 →			
Rated short-time withstand current I_k	for switchgear with t_k = 1 s	to kA	20	25 [2]	20	25 [2]
	for switchgear with t_k = 3 s (design option)	kA	20 →			
Rated peak withstand current I_p		to kA	50	63 [2]	50	63 [2]
Rated short-circuit making current I_{ma}	for ring-main feeders	to kA	50	63 [2]	50	63 [2]
	for circuit-breaker feeders	to kA	50	63 [2]	50	63 [2]
	for transformer feeders [3]	kA	25	25	25	25
Filling pressure (pressure values at 20 °C)	Rated filling level p_{re} for insulation (absolute)	kPa	140 →			
	Minimum functional level p_{re} for insulation (absolute)	kPa	120 →			
Ambient air temperature T	without secondary equipment	°C	–25 to + 55 →			
	with secondary equipment	°C	–5/–15 */–25 * to + 55 →			
	Storage/transport including secondary systems	°C	–40 to + 70 →			
Degree of protection	Metal enclosure of gas-filled switchgear vessels		IP65 →			
	for switchgear enclosure		IP2X/IP3X * →			
	for low-voltage compartment		IP3X/IP4X * →			

* Design version as option

** The rated normal currents apply to ambient temperatures of 40 °C. The 24-hour-mean value is max. 35 °C (according to IEC 62271-1)

Standards see page 57

Δ Values according to GB, values in brackets according to IEC standards

1) Depending on the HV HRC fuse links

2) Not for 60 Hz

3) Depending on the max. cut-off current of the HV HRC fuse links

Electrical data of panels, pressure values, temperature

Common details on electrical data, filling pressure and temperature

Rated insulation level	Rated voltage U_r	kV	7.2	12
	Rated short-duration power-frequency withstand voltage U_d			
	– phase-to-phase, phase-to-earth, open contact gap	kV	20	42 (28) Δ
	– across the isolating distance	kV	23	48 (32) Δ
	Rated lightning impulse withstand voltage U_p			
	– phase-to-phase, phase-to-earth, open contact gap	kV	60	75
	– across the isolating distance	kV	70	85

Ring-main panel type R and cable connection panel type K

Rated normal current I_r 1)	for feeder and transfer, panel type R		630 A (standard) →			
	for feeder, panel type K		630 A (standard) →			
	for feeder, panel type K1		630 A, 1,250 A * →			
Rated short-circuit making current I_{ma}		up to kA	50	63	50	63

Transformer panel type T

Rated normal current I_r 1)	for feeder 4)		200 A →			
Rated peak withstand current I_p 4)		up to kA	50	63	50	63
Rated short-circuit making current I_{ma} 4)		up to kA	50	63	50	63
Reference dimension "e"	for HV HRC fuse links	mm	292 3), 442		292, 442	

Circuit-breaker panel type L

	for feeder	for transfer	with				
Rated normal current I_r 1)	for panel type L	and L (T)	VCB	630 A →			
Rated short-circuit making current I_{ma}			up to kA	50	63	50	63
Rated short-circuit breaking current I_{sc}	for vacuum circuit-breaker (type 1.1)		up to kA	20	25	20	25

Busbar voltage metering panels type M (VT) and type M (VT-F)

Rated peak withstand current I_p 4)		up to kA	50	63	50	63
Rated short-circuit making current I_{ma} 4)		up to kA	50	63	50	63
Reference dim. "e" in panel type M (VT-F)	for HV HRC fuse links		292 mm →			

Billing metering panels type M

Rated normal current I_r 1)	for transfer, panel type M		630 A →			
	for feeder as cable-connection, panel type M (-K)		630 A, 1,250 A * →			
	for busbar connection, panel type M (-B) and M (-BK)		630 A, 1,250 A * →			
	for bus riser panel type H		630 A, 1,250 A * →			

Bus sectionalizer panels type L

Rated normal current I_r 1)	for panel types L (T) + H		630 A →			
	for panel types R (T) + H		630 A →			
	for panel types R (T) + R (T)		630 A →			
Rated short-circuit making current I_{ma}		up to kA	50	63	50	63
Rated short-circuit breaking current I_{sc}	for vacuum circuit-breaker (type 1.1)	up to kA	20	25	20	25
Electrical service life	for vacuum circuit-breaker (type 1.1): at rated normal current I_r 1)		10,000 operating cycles			
	at rated short-circuit breaking current I_{sc}		25 breaking operations			

Overview of typicals

Name	Short identification	Panel width (mm)
Application as feeder panels		
Ring-main feeder	R, R1	375, 500
Transformer feeder	T, T1	375, 500
Metering panel as billing-metering panel	M	750
Metering panel with cable connection	M (-K)	750
Metering panel with busbar connection	M (-B)	750
Metering panel with busbar connection and cable connection	M (-BK)	750
Busbar voltage metering panel	M (VT)	375
Busbar voltage metering panel with fuse	M (VT-F), M1 (VT-F) *	375, 500 *
Circuit-breaker feeder	L, L1	500, 750
Cable feeder	K, K1	375, 500
Bus riser	H	375
Application as transfer panels		
Ring-main transfer panel	R (T)	375
Circuit-breaker transfer panel	L (T), L1 (T)	500, 750

* On request

Δ Values according to GB, values in brackets according to IEC standards

1) The rated normal currents apply to ambient temperatures of 40 °C. The 24-hour-mean value is max. 35 °C (according to IEC 62271-1)

2) Pressure values for SF_6-insulated vessels

3) With reference dimension e = 192 mm, an extension tube (100 mm long) is additionally required for fuse mounting 292 mm

4) For panel types T and M (VT-F) depending on the max. cut-off current of the HV HRC fuse link ($I_D \leq 25$ kA)

Technical Data

Electrical data Δ of the switching devices

Three-position switch-disconnector

					7.2	12
Rated insulation level	Rated voltage		U_r	kV	7.2	12
	Rated short-duration power-frequency withstand volt.		U_d	kV	20	42
	Rated lightning impulse withstand voltage		U_p	kV	60	75
Rated frequency			f_r	Hz	50/60	50/60
Rated normal current for	ring-main feeders		I_r	A	630	630
	transformer feeders [1]		I_r	A	200	200
Rated short-time withstand current	for switchgear with t_k = 1 s		I_k	up to kA	25	25
	for switchgear with t_k = 3 s		I_k	kA	20	20
Rated peak withstand current			I_p	up to kA	63	63
Rated short-circuit making current for	transformer feeders [2]		I_{ma}	kA	25	25
	ring-main feeders		I_{ma}	up to kA	63	63
Number of operating cycles / Mechanical stability (class M1 = 1,000, according to IEC 60265-1*)					2,000	2,000
Classification, electrical					E3 →	
Switching capacity of general-purpose switches (according to IEC 60265-1 and GB 3804 *)						
Test duty 1	Rated mainly active load breaking current	for 100 switching operations	I_1	A	630	630
		for 20 switching operations	I_1	A	31.5	31.5
Test duty 2a	Rated closed-loop breaking current		I_{2a}	A	630	630
Test duty 3	Rated transformer breaking current		I_3	A	40	40
Test duty 4a	Rated cable-charging breaking current		I_{4a}	A	68	68
Test duty 4b	Rated line-charging breaking current		I_{4b}	A	68	68
Test duty 5	Rated short-circuit making current		I_{ma}	up to kA	63	63
Test duty 6a	Rated earth-fault breaking current		I_{6a}	A	200	200
Test duty 6b	Rated cable-charging breaking current and line-charging breaking current under earth-fault conditions		I_{6b}	A	115	115
–	Cable-charging breaking current under earth-fault conditions with superimposed load current		$I_L + \sqrt{3} \cdot I_{CL}$	A	630 + 50	630 + 50

Switch-disconnector / fuse combination

				7.2	12
Switching capacity of switch-disconnector / fuse combination (acc. to IEC 62271-105 *)					
Rated transfer current	I_4	A		1,700	1,700
Maximum transformer rating		kVA		1,000	1,250

Switching capacity for make-proof earthing switch, on feeder side with HV HRC fuse (in panel type T...)

Rated short-circuit making current	I_{ma}	kA	5 →		
Rated short-time withstand current with t_k = 1 s	I_k	kA	2 →		

Earthing switch

					7.2	12
Rated voltage			U_r	kV	7.2	12
Make-proof earthing function of the three-position switch-disc.	Rated short-circuit making current		I_{ma}	up to kA	63	63
	Rated short-time withstand current		I_k	up to kA	25	25
Number of short-circuit making operations / Classification				n	5 / E2 →	
Number of operating cycles / Classification					2,000 / M1	2,000 / M1

Vacuum circuit-breaker type 1.1 (switching capacity according to IEC / EN 62271-100 and GB 1984 *)

Rated voltage			U_r	kV	7.2	12
Rated normal current of feeders			I_r	A	630 →	
Rated short-time withstand current	for switchgear with t_k = 1 s		I_k (I_{th})	up to kA	25	25
	for switchgear with t_k = 3 s		I_k (I_{th})	kA	20 →	
Rated peak withstand current			I_p	up to kA	63	63
Rated short-circuit breaking current			I_{sc}	up to kA	25	25
Rated short-circuit making current			I_{ma}	up to kA	63	63
Number of mechanical operating cycles for circuit-breaker / Classification				n	10,000 / M2 →	
Classification, electrical					E2, C2 →	
Rated operating sequence					O – 0.3 s – CO – 3 min – CO →	
Number of short-circuit breaking operations				n	25 →	

Three-position disconnector (in panel type L)

					7.2	12
Rated voltage			U_r	kV	7.2	12
Rated normal current of feeders			I_r	A	630 →	
Rated short-time withstand current	for switchgear with t_k = 1 s		I_k (I_{th})	up to kA	25	25
	for switchgear with t_k = 3 s		I_k (I_{th})	kA	20	20
Rated peak withstand current			I_p	up to kA	63	63
Number of mechanical operating cycles for disconnector / Classification				n	2,000 / M1 →	
Number of mechanical operating cycles for earthing switch / Classification				n	2,000 / M1 →	

* Standards see page 57

Δ Higher values of electrical data available on request

1) Depending on the HV HRC fuse links

2) Corresponds to the max. cut-off current of the HV HRC fuse

Room planning
Switchgear installation

Wall-standing arrangement, free-standing arrangement
– Single row
– Double row (for face-to-face arrangement).

Room dimensions
See opposite dimension drawings.

Door dimensions
The door dimensions depend on the
– Number of panels in a transport unit
– Design with or without low-voltage compartment.

Switchgear fastening
• For floor openings and fixing points of the switchgear, see page 54

• Foundations:
– Steel structure
– Steel-reinforced concrete.

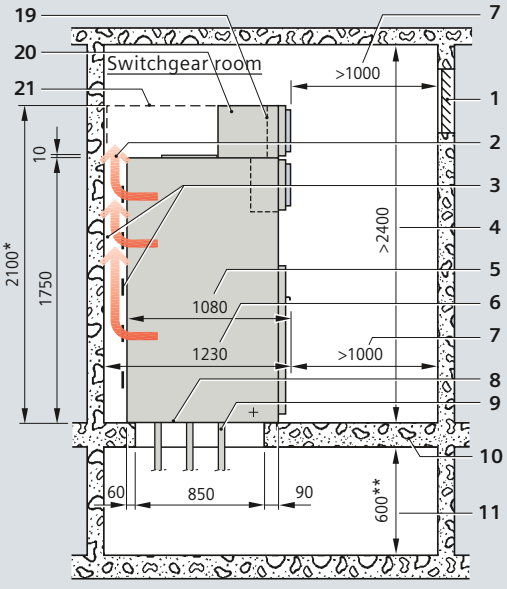
Panel dimensions
See pages 47 to 53

Weight
The weight of a panel depends on the extent to which it is equipped (e.g. with motor operating mechanism, voltage transformer). For details, please refer to page 55.

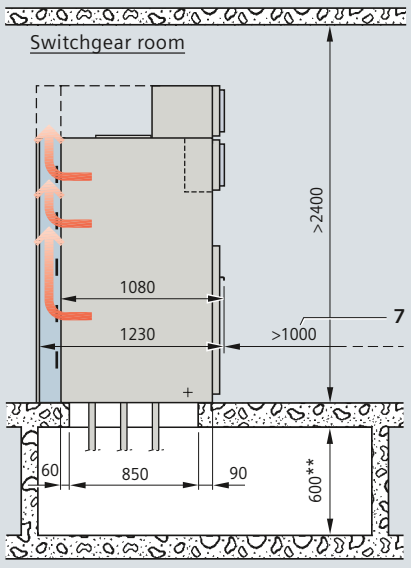
* Switchgear height 2,100 mm if height of low-voltage compartment 350 mm; switchgear height 2,300 mm if height of low-voltage compartment 550 mm

** Depending on bending radius of cable

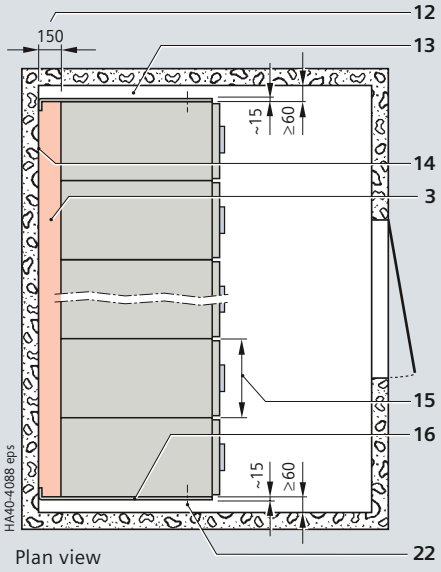
Room planning



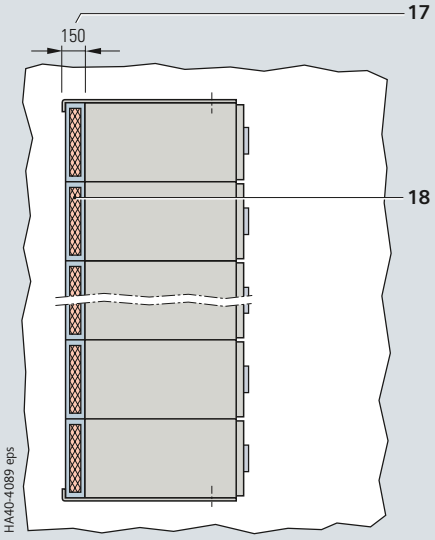
Wall-standing arrangement (side view)



Free-standing arrangement (side view)



Plan view



Plan view

1 Relief opening
2 Direction of pressure relief
3 Pressure relief of switchgear
4 Room height
5 Individual panel depth
6 Panel depth including end wall
7 Depending on national requirements: Control aisle ≥ 1,000 mm recommended (in Germany ≥ 800 mm). When extending or replacing panels, it might be necessary – depending on the room dimensions – to disassemble the respective neighbouring panels.
8 Option: Floor cover
9 Cable
10 Foundation
11 Height of cable basement corresponding to cable bending radius
12 Wall distance
13 Side wall distance
14 Installation flush with rear wall
15 Panel width
16 End wall
17 Depth of pressure relief duct
18 Option: For free-standing arrangement pressure relief duct for each panel for rated short-time withstand current $I_k \leq 20$ kA
19 Option: Front cover
20 Option: Low-voltage compartment
21 Option: High end wall
22 Earthing terminal

Product Range

Product range overview

Standard panels (examples)

Ring-main panel
type R

Transformer panel
type T

Cable panel
type K

Billing metering panel
type M

Panel designation		Panel type	Panel width mm
Column No.			
Ring-main panel [1]	as feeder	R R1	375 500
	as transfer	R (T)	375
Transformer panel [1]	as feeder	T T1	375 500
Cable panel	as feeder	K K1	375 500
Circuit-breaker panel 630 A [1] with type 1.1 [2]	as feeder	L L1	500 750
	as transfer	L (T) L1 (T)	500 750
Bus sectionalizer panel 630 A [1] with type 1.1 [2], for panel type H		L (T)+H L1 (T)+H	500 + 375 750 + 375
Bus sectionalizer panel 630 A [1]		R (T)+H	750 375 + 375
		R (T)+R (T)	750 375 + 375
Billing metering panel	Standard	M M (-B)	750 750
	as end panel	M (-K) M (-BK)	750 750
Billing metering panel for additional current transformer		M	750
Busbar voltage metering panel [1]		M (VT) M (VT-F)	375 375
		M1 (VT-F) *	500 *
Bus riser panel		H	375

* On request

1) Panels type LSC2B (metal-clad)

2) Type designation of vacuum circuit-breaker

Equipment features

- ● Basic equipment
- ○ Additional equipment (option), further additional equipment on request
- – Not available

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	Panel type
●	●	–	●	●	–	●	○	○	○	○	–	–	○	–	○	○	–	–	○	○	○	○	○	○	R R1
●	●	–	–	●	–	●	○	○	○	○	–	–	○	–	–	○	–	–	○	–	○	●	○	–	R (T)
●	●	–	●	●	○	●	○	○	○	○	–	●	–	○	●	○	–	–	○	–	○	○	○	○	T T1
–	–	●	●	●	–	–	–	–	–	–	–	–	–	–	○	○	–	–	–	○	○	○	○	○	K K1
●[2]	●	–	●	●	○	●	○	○	○	○	●	–	○	–	○	○	○	○	○	○	○	○	○	○	L L1
●[2]	●	–	–	●	○	●	○	○	○	○	●	–	○	–	–	○	○	○	○	–	○	●	○	–	L (T) L1 (T)
●	●	●	–	●	○	●	○	○	○	○	●	–	○	–	–	○	○	○	○	–	○	●	○	–	L (T)+H L1 (T)+H
●	●	●	–	●	○	●	○	○	○	○	–	–	○	–	–	○	–	–	○	–	○	●	○	–	R (T)+H
●	●	–	–	●	–	●	○	○	○	○	–	–	○	–	–	○	–	–	○	–	○	●	○	–	R (T)+R (T)
–	–	●	–	●	–	–	–	–	–	–	–	–	–	–	○	○	–	–	–	–	○	●	○	–	M M (-B)
–	–	●	●	●	–	–	–	–	–	–	–	–	–	–	○	○	–	–	–	–	○	○	○	○	M (-K) M (-BK)
–	–	●	–	●	–	–	–	–	–	–	–	–	–	–	○	○	–	–	–	–	○	●	○	–	M
●	●	–	–	●	–	○	○	○	○	○	–	●	– – ○ ○	○ ○	– – ○ ○	○	–	–	○	–	○	●	○	–	M (VT) M1 (VT-F)
																									M1 (VT-F) *
–	–	●	–	●	–	–	–	–	–	–	–	–	–	–	–	○	–	–	–	–	○	●	○	–	H

* On request

1) Three-position switch as three-position switch-disconnector

2) Three-position switch as three-position disconnector

3) Type designation of the vacuum circuit-breaker

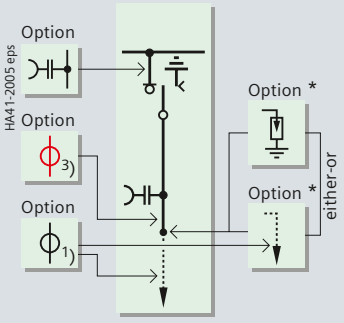
4) In special cases, deeper floor cover for panels with cable feeder required

5) Panel heating: wired on terminal (standard)
Option: version with thermostat

Product Range

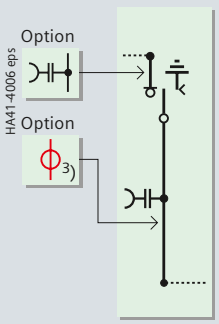
Ring-main panels

Ring-main panels
as feeder panels



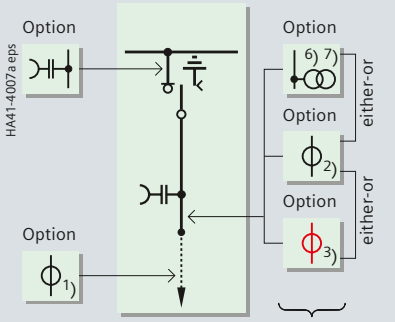
Type R
375 mm wide

Ring-main panel
as transfer panel for attachment to panel types M, M (-K)



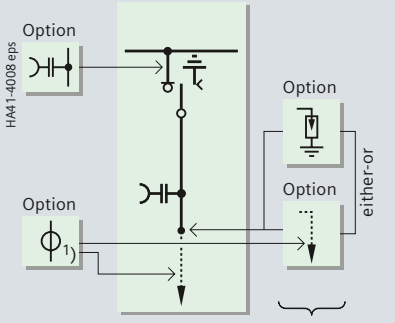
Standard:
transfer to the right
Option:
transfer to the left

Type R (T)
375 mm wide



Type R1
500 mm wide

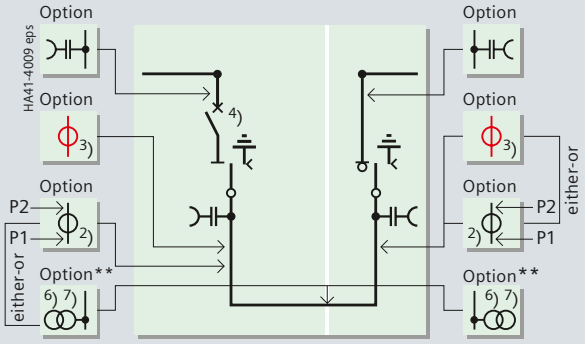
either:
Version with transformers



Type R1
500 mm wide

or:
Version with connection fittings

For other panel combinations



Type L1 (T)
750 mm wide

Bus sectionalizer panel type L1 (T) with ring-main transfer panel type R (T)

Type R (T)
375 mm wide

The ring-main transfer panel R (T) can be attached on the left or right of the bus sectionalizer panel L1 (T)

With vacuum circuit-breaker, fixed-mounted

P1 and P2 are terminal designations of the current transformer

4) Vacuum circuit-breaker (type 1.1)

Three-position switch-disconnector

Three-position disconnector

Capacitive voltage detecting system

1) Cable-type current transformer e.g. 4MC703 . . .

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

3) On request: Three-phase current transformer 4MC63 . . .

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

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

On request: voltage transformer e.g. 4MR, 2-pole, cast-resin insulated, only up to 17.5 kV

Cable (not included in the scope of supply)

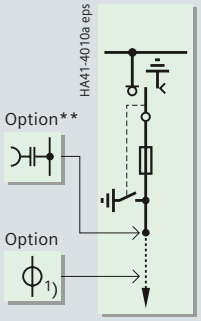
2nd cable (not included in the scope of supply)

Surge arrester

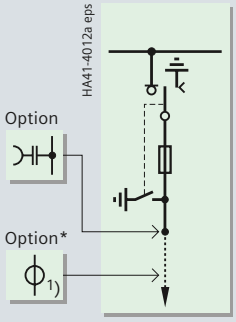
HA41-4051 eps

* On request up to 12 kV
** On request: Only 1 set of voltage transformers possible

Transformer panels
as feeder panels

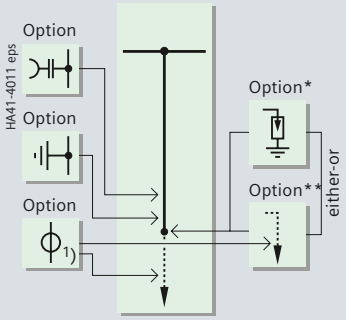


Type T
375 mm wide



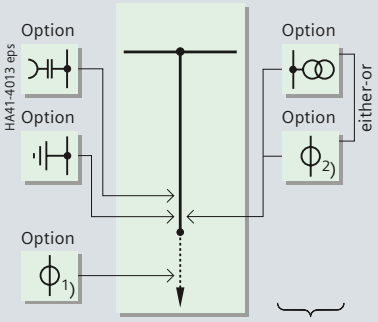
Type T1
500 mm wide

Cable panels
as feeder panels, 630 A



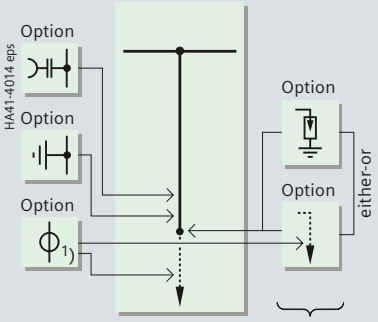
Type K
375 mm wide

as feeder panels
630 A, on request: 1,250 A



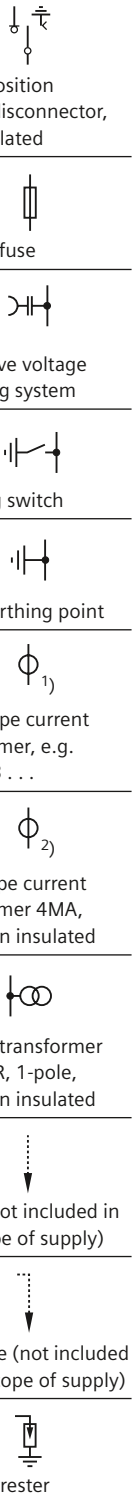
Type K1
500 mm wide

either:
Version with transformers



Type K1
500 mm wide

or:
Version with connection fittings

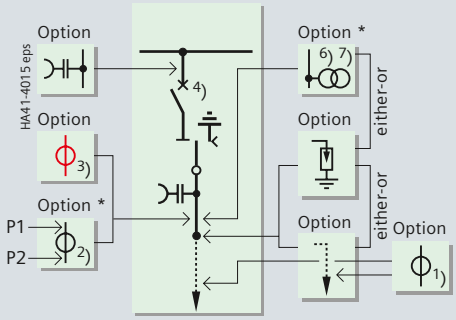


* Current transformer located partly underneath the panel
** On request

Product Range

Circuit-breaker panels

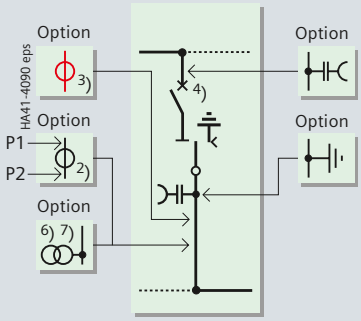
Circuit-breaker panels 630 A
as feeder panels



Type L
500 mm wide

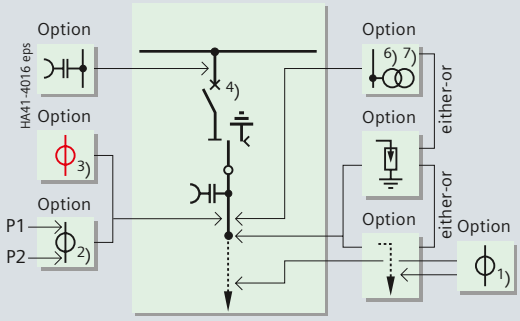
With vacuum circuit-breaker, fixed-mounted

as transfer panels
for attachment to panel types M or H



Type L (T)
500 mm wide

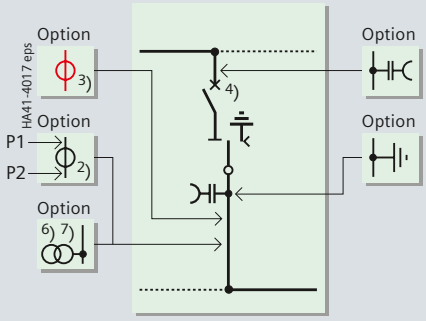
With vacuum circuit-breaker, fixed-mounted



Type L1
750 mm wide

With vacuum circuit-breaker, fixed-mounted

as transfer panels
for attachment to panel types M or H



Type L1 (T)
750 mm wide

With vacuum circuit-breaker, fixed-mounted

* On request: Combination CT 2) and VT 6) 7)

Vacuum circuit-breaker (type 1.1) 4)

Three-position disconnector

Capacitive voltage detecting system

Cable-type current transformer e.g. 4MC703 . . . 1)

Block-type current transformer 4MA, cast-resin insulated 2)

Three-phase current transformer 4MC63 . . . 3)

Voltage transformer e.g. 4MR, 1-pole, cast-resin insulated 6)

Voltage transformer e.g. 4MR, 2-pole, cast-resin insulated 7)

Cable (not included in the scope of supply)

Addit. cables (not included in the scope of supply)

Surge arrester

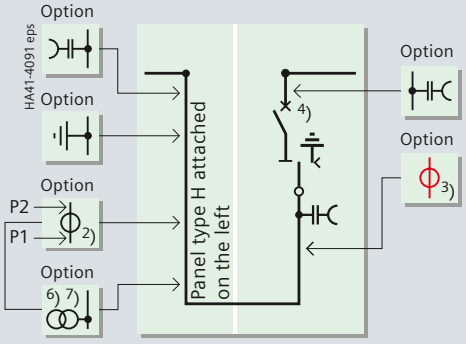
Earthing switch

Fixed earthing point

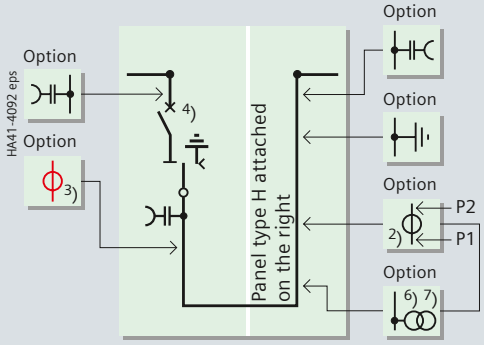
P1 and P2 are terminal designations of the current transformer

HA41-4051 eps

Bus sectionalizer panels 630 A
in combination with bus riser panel

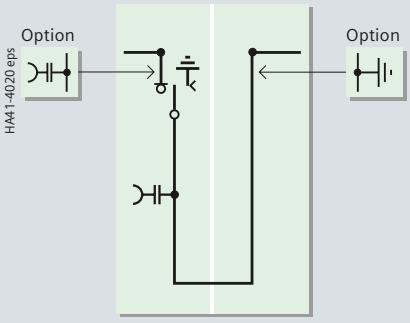


Type H 375 mm
Type L (T) 500 mm wide

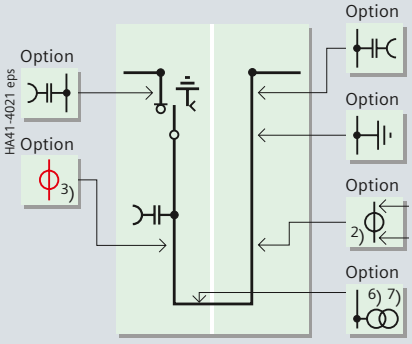


Type L (T) 500 mm wide
Type H 375 mm

Bus sectionalizer panels 630 A
in combination with bus riser panel

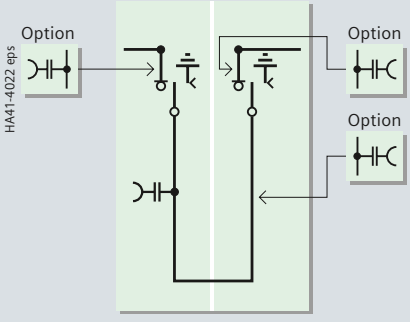


Type R (T)+H 750 mm wide

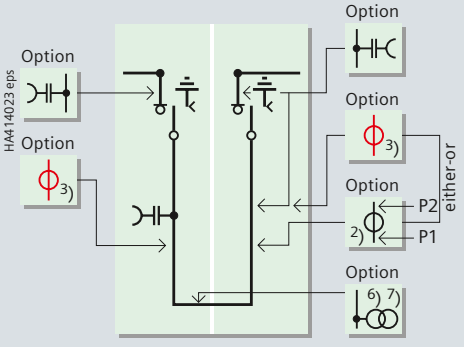


Type R (T)+H 750 mm wide

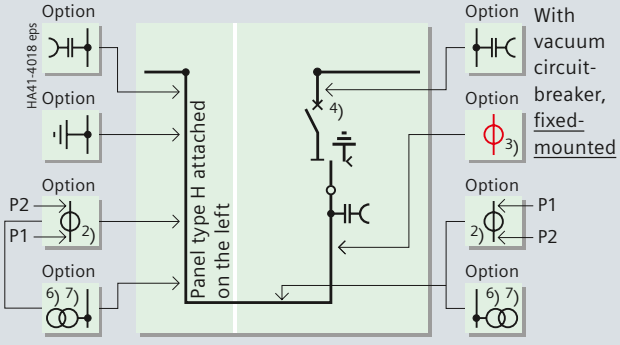
with 2 three-position switch-disconnectors



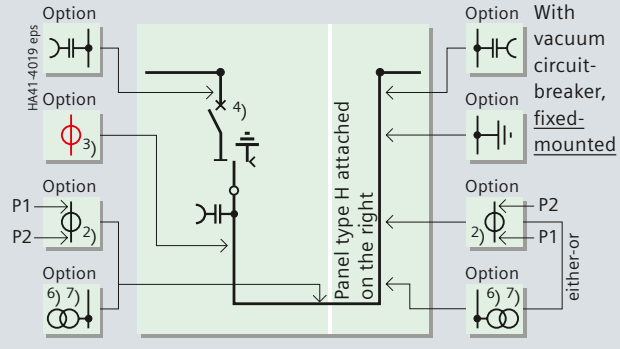
Type R (T)+R (T) 750 mm wide



Type R (T)+R (T) 750 mm wide



Type H 375 mm
Type L1 (T) 750 mm wide



Type L1 (T) 750 mm wide
Type H 375 mm

Vacuum circuit-breaker (type 1.1)

Three-position switch-disconnector

Three-position disconnector

Capacitive voltage detecting system

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

Three-phase current transformer 4MC63 . . .

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

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

Fixed earthing point

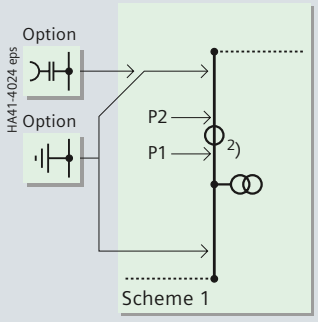
HA41-4051 eps

P1 and P2 are terminal designations of the current transformer

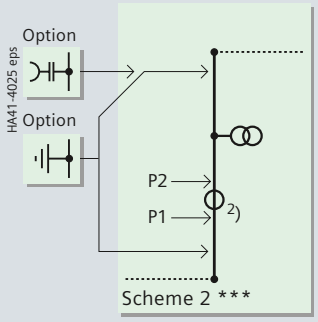
Product Range

Billing metering panels

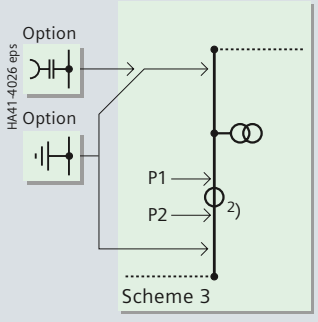
Billing metering panels 630 A
Standard



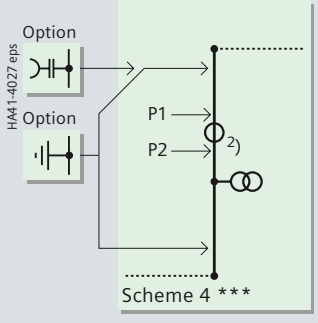
Type M 750 mm wide — Standard **: Transfer to the right



Type M 750 mm wide — Standard **: Transfer to the right

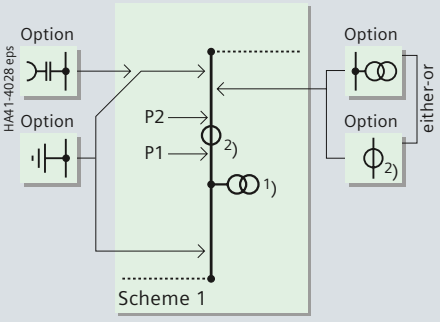


Type M 750 mm wide — Standard **: Transfer to the right

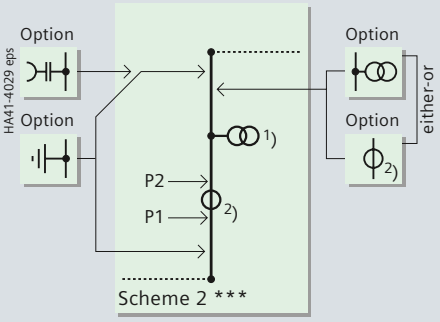


Type M 750 mm wide — Standard **: Transfer to the right

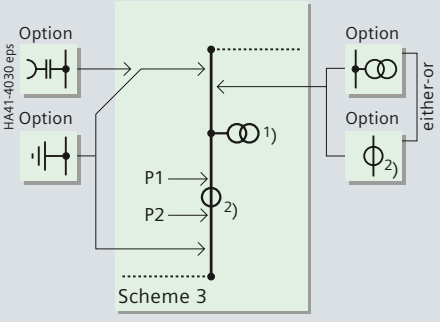
Billing metering panels 630 A
for additional transformer



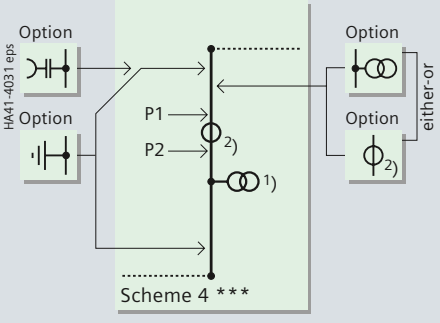
Type M 750 mm wide — Standard **: Transfer to the right



Type M 750 mm wide — Standard **: Transfer to the right

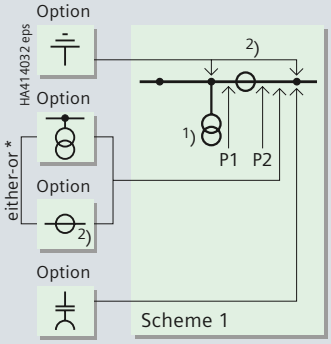


Type M 750 mm wide — Standard **: Transfer to the right

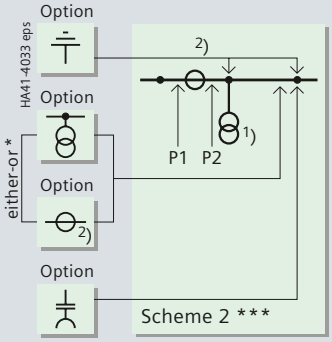


Type M 750 mm wide — Standard **: Transfer to the right

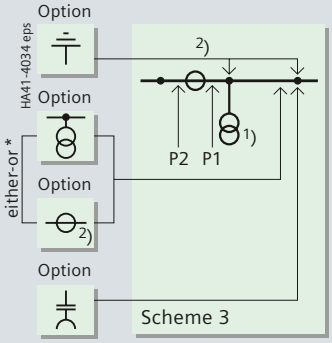
Billing metering panels 630 A, on request: 1,250 A
for busbar connection



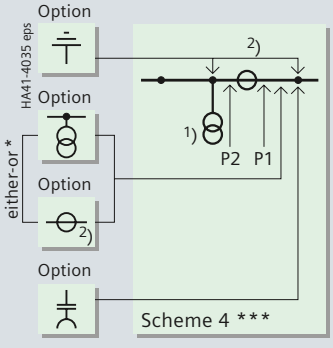
Type M (-B) 750 mm wide — Standard **: Transfer to the right



Type M (-B) 750 mm wide — Standard **: Transfer to the right



Type M (-B) 750 mm wide — Standard **: Transfer to the right



Type M (-B) 750 mm wide — Standard **: Transfer to the right

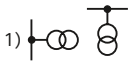
Panel design of M:

M

M (-B)

Capacitive voltage detecting system

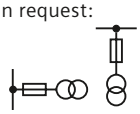
Block-type current transformer 4MA, cast-resin insulated



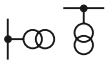
Voltage transformer, e.g. 4MR, 1-pole, cast-resin insulated

or:

On request:



Voltage transformer, e.g. 4MR, 1-pole, cast-resin insulated, with HV HRC fuse, instead of a 2nd set of current or voltage transformers



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

Fixed earthing point

Fixed earthing point for busbar earthing

HA41-4051 eps

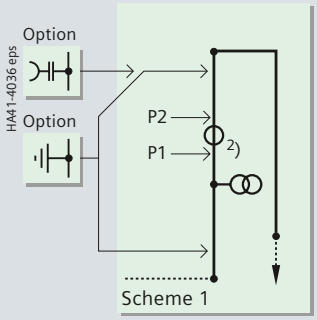
P1 and P2 are terminal designations of the current transformer

* On request

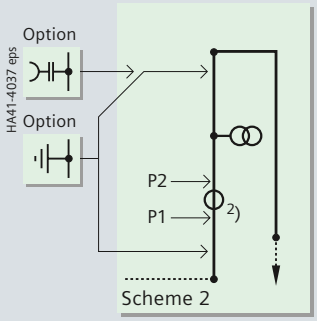
** Option: Transfer to the left

*** Transformer terminals interchanged

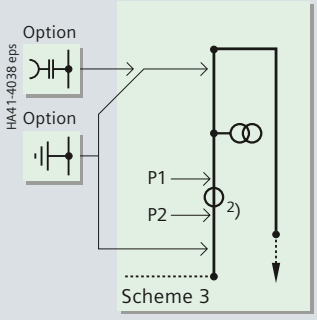
Billing metering panels 630 A
for cable connection



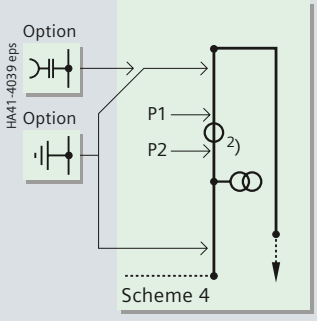
Type M (-K) Standard **:
750 mm wide Transfer to the right



Type M (-K) Standard **:
750 mm wide Transfer to the right

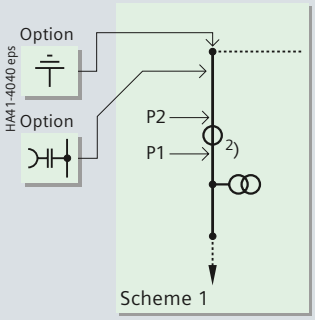


Type M (-K) Standard **:
750 mm wide Transfer to the right

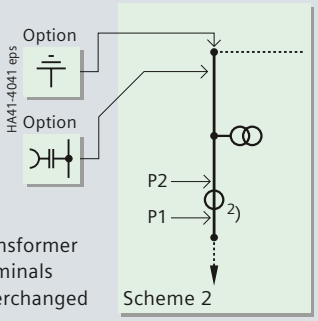


Type M (-K) Standard **:
750 mm wide Transfer to the right

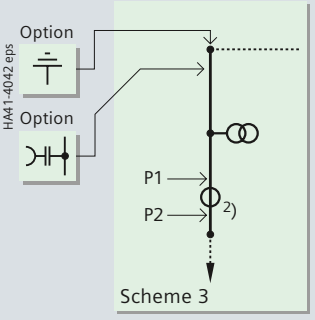
Billing metering panels
630 A, on request: 1,250 A *
for busbar connection



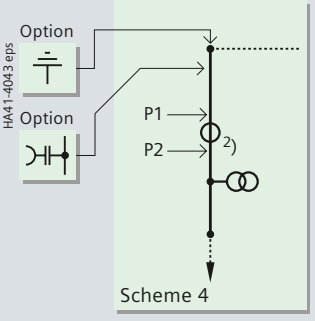
Type M (-BK) as right or left
750 mm wide end panel



Type M (-BK) as right or left
750 mm wide end panel



Type M (-BK) as right or left
750 mm wide end panel



Type M (-BK) as right or left
750 mm wide end panel

Panel design of M:

M (-K)

M (-BK)

HV HRC fuse

Capacitive voltage detecting system

Earthing switch

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

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

HA41-4051 eps

P1 and P2 are terminal designations of the current transformer

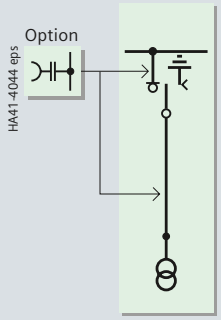
* Connection for 3 cables possible

** Option:
Transfer to the left

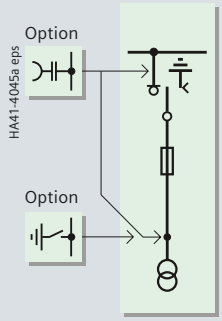
Product Range

Busbar voltage metering panels and bus riser panels

Busbar voltage metering panels

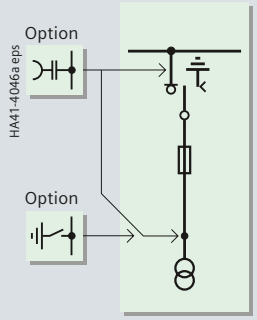


Type M (VT)
375 mm wide



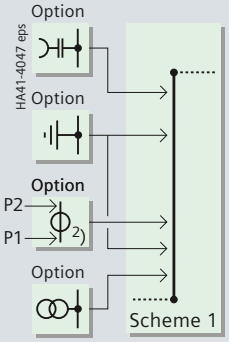
Type M (VT-F)
375 mm wide

On request:

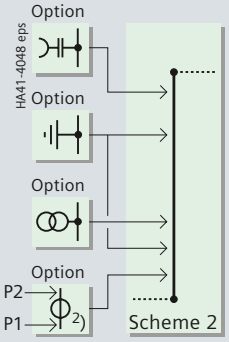


Type M1 (VT-F)
500 mm wide

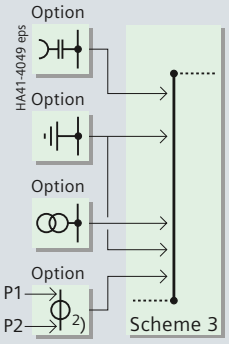
Bus riser panels 630 A, on request: 1,250 A



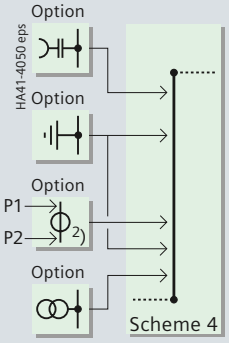
Type H *
375 mm wide



Type H *
375 mm wide



Type H *
375 mm wide



Type H *
375 mm wide

Three-position switch-disconnector

HV HRC fuse

Capacitive voltage detecting system

Earthing switch

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

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

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

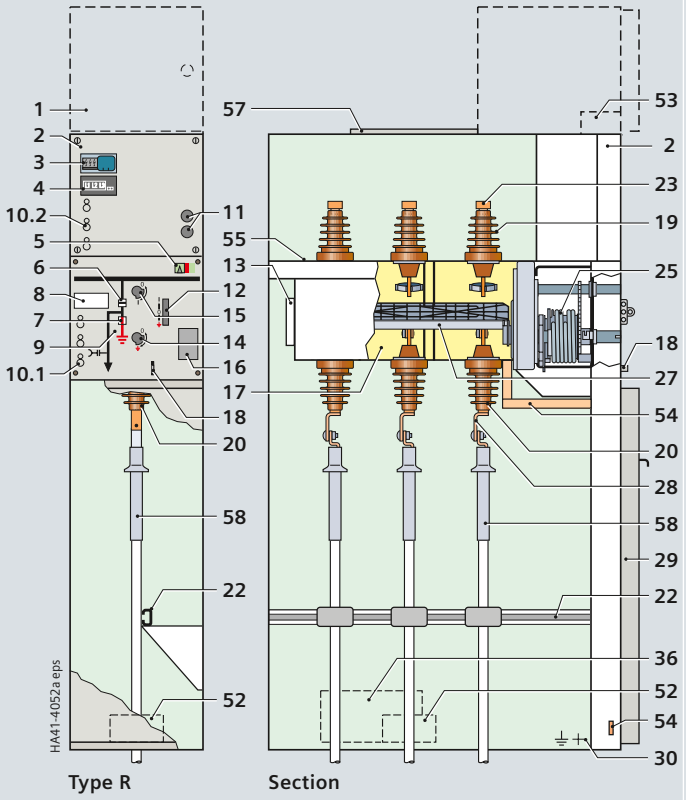
Fixed earthing point

HA41-4051 eps

P1 and P2 are terminal designations of the current transformer

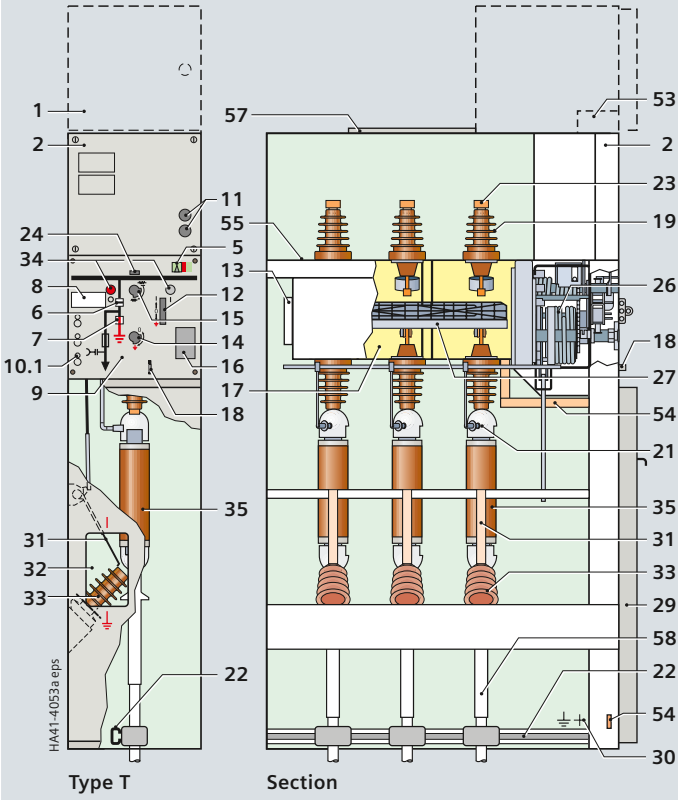
* For attachment to left or right panel types R (T) and L (T)

Ring-main panel as feeder



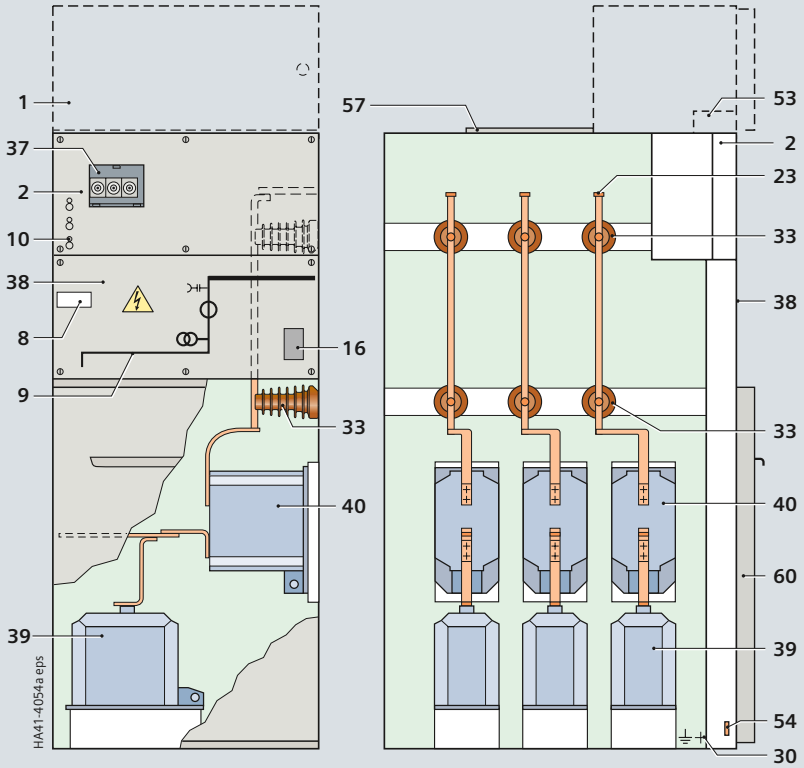
Type R Section

Transformer panel as feeder



Type T Section

Billing metering panel



Type M Section

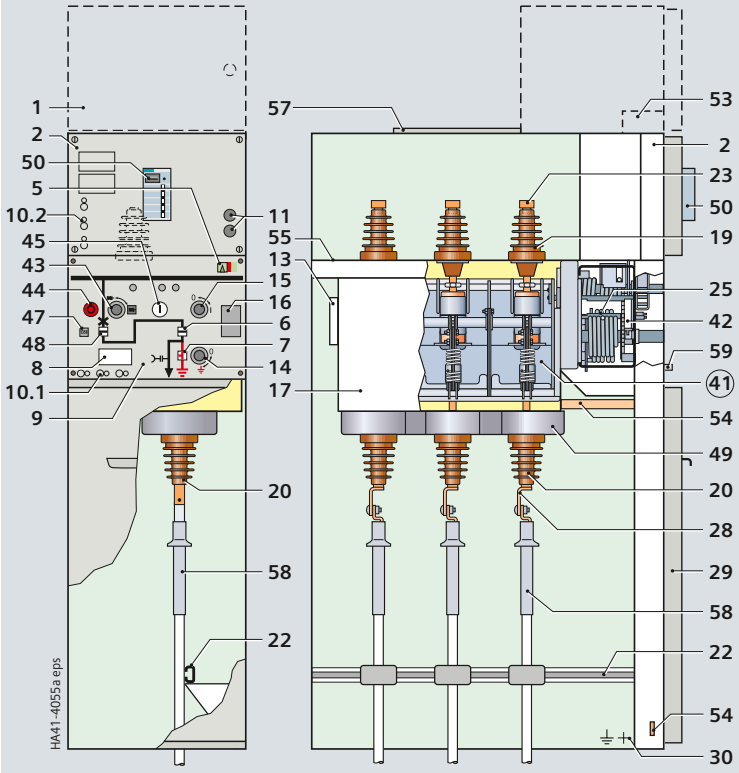
Legend for pages 19 and 20

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

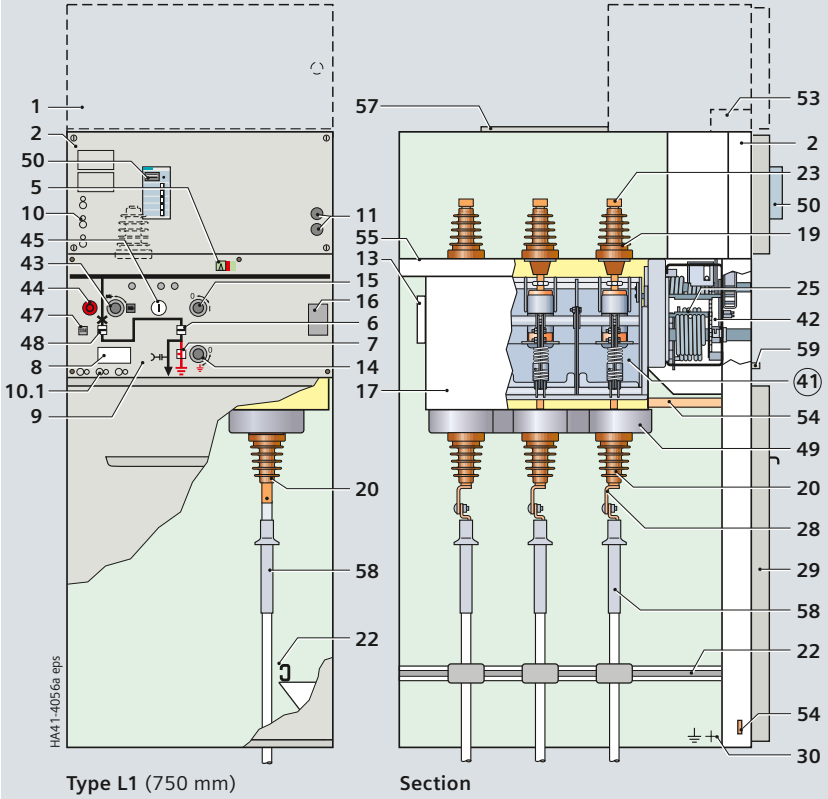
Design

Panel design (examples)

Circuit-breaker panel (with vacuum circuit-breaker type 1.1)



Type L (500 mm) **Section**



Type L1 (750 mm) **Section**

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

Vacuum circuit-breaker:

(41) Vacuum circuit-breaker, fixed-mounted
42 Operating mechanism box
43 Manual operation
– 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 Operating cycle counter
48 Switch position indication

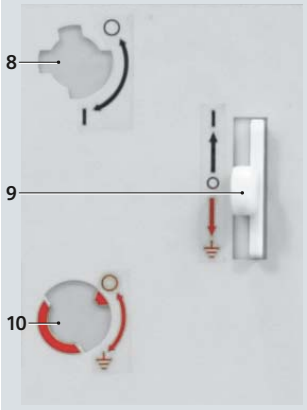
49 Option: Three-phase current transformer 4MC63 53
50 Option: Overcurrent-time protection relay SIPROTEC easy 7SJ45
51 Option: Multifunction protection relay SIPROTEC 4 7SJ62
52 Cable-type current transformer
53 Option: Wiring duct, removable, for control cables and / or bus wires
54 Earthing busbar
55 Metal compartmentalization of busbar compartment
56 Metal compartmentalization of cable connection compartment
57 Busbar compartment cover for panel extension
58 Cable sealing end (not included in scope of supply)
59 Interlocking of cable compartment cover in circuit-breaker panels
60 Cover for transformer connection compartment

The control boards are function-related. They integrate operation, mimic diagram and position indication. Furthermore, respective indicating, measuring and monitoring equipment as well as locking devices and control elements (e.g. local-remote switch) are arranged there according to the panel type and version. The ready-for-service indicator and rating plates are also located at the operating front.

Operation is identical for transformer and circuit-breaker feeders. First, the operating mechanism must be charged; then, closing / opening is done through separate pushbuttons. The condition of the energy store is indicated.

All actuating openings are functionally interlocked against each other, and are optionally lockable. The operating lever carries two plug inserts, separately for the disconnecting and earthing function.

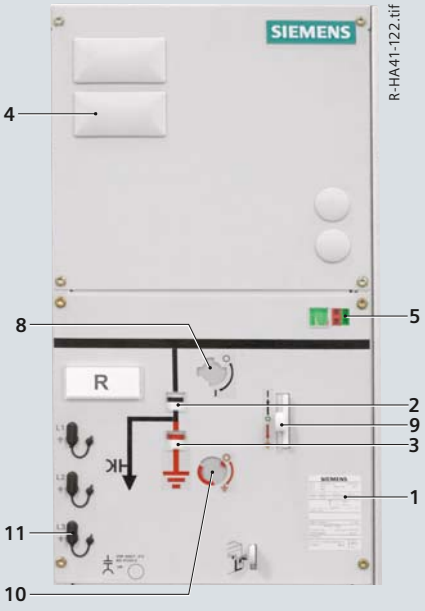
Locking device



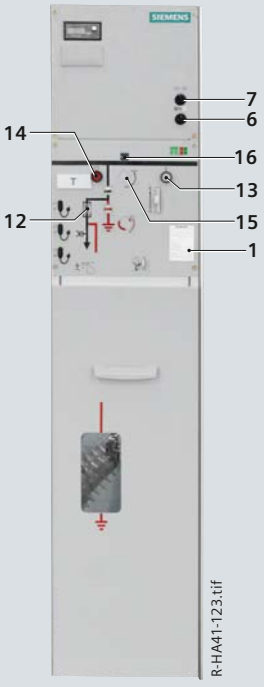
Operating lever

1 Rating plate
2 Position indicator for switch-disconnector
3 Position indicator for earthing switch
4 Short-circuit / earth-fault indicator (option)
5 Ready-for-service indicator
6 Local-remote switch for motor operating mechanism (option)
7 ON / OFF switch for motor operating mechanism (option)
8 Manual operation of load-break function
9 Locking function (option)
10 Manual operation of earthing function
11 Sockets of capacitive voltage detecting system
12 "Fuse tripped" indicator
13 ON pushbutton for transformer function and/or circuit-breaker function
14 OFF pushbutton for transformer function and/or circuit-breaker function
15 Manual spring charging
16 "Spring charged" indicator

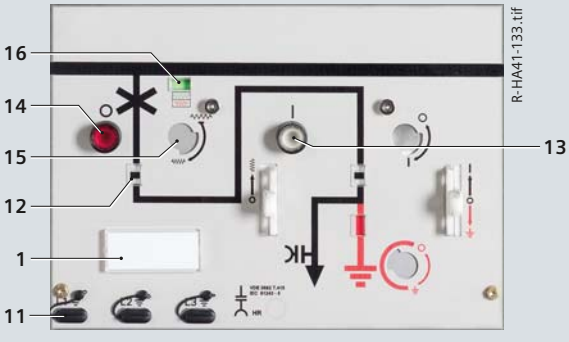
Front of ring-main feeder



Front of transformer feeder



Front of circuit-breaker feeder



Components

Three-position switch-disconnector

Features
- Switch positions:
  CLOSED – OPEN – EARTHED
- Switching functions as general-purpose switch-disconnector (class E3) according to
– IEC / EN 60265-1 / VDE 0670-301 / GB 3804 *
– IEC / EN 62271-102 / VDE 0671-102 / GB 1985 *
- 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 switchgear vessel
- Climate-independent contact in the gas-filled switchgear vessel
- Maintenance-free according to IEC / EN 62271-1 / VDE 0671-1
- Individual secondary equipment
- No cross insulation between phases.

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

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

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

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

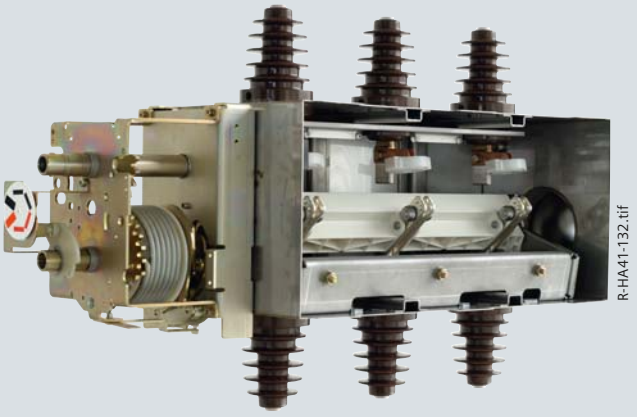
The isolating distance in gas established after breaking fulfills the conditions applicable to isolating distances in accordance with

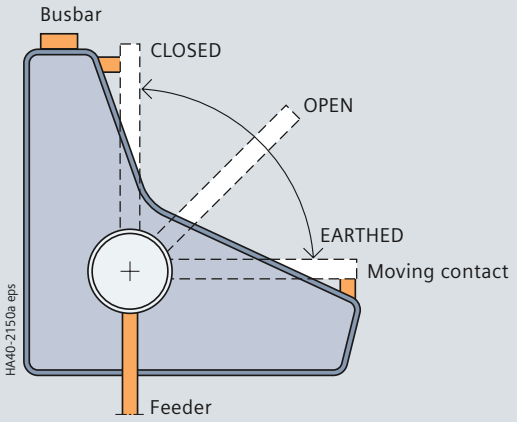
– IEC / EN 62271-102 / VDE 0671-102 / GB 1985 *
and
– IEC / EN 62271-1 / VDE 0671-1 / GB / T 11022 *.

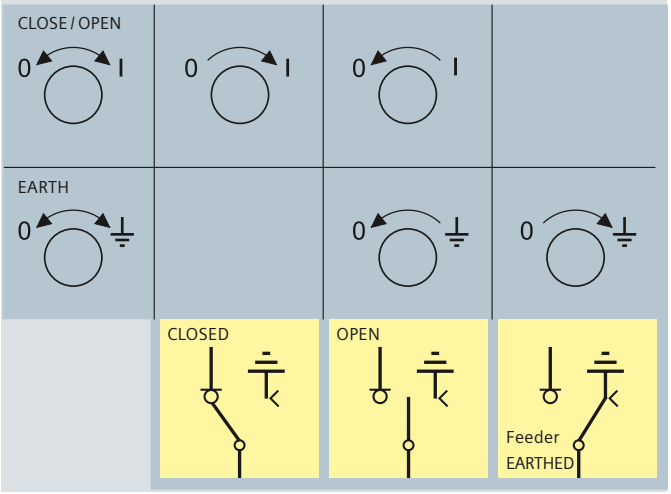
Due to the arc rotation caused by the arc-suppression system, both load currents and minor no-load currents are safely interrupted.

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

Three-position switch-disconnector







* Standards see page 57

Operating mechanisms for the three-position switch

Features
- Mechanical endurance of 2,000 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 recommendation of VDN/VDEW. *

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).

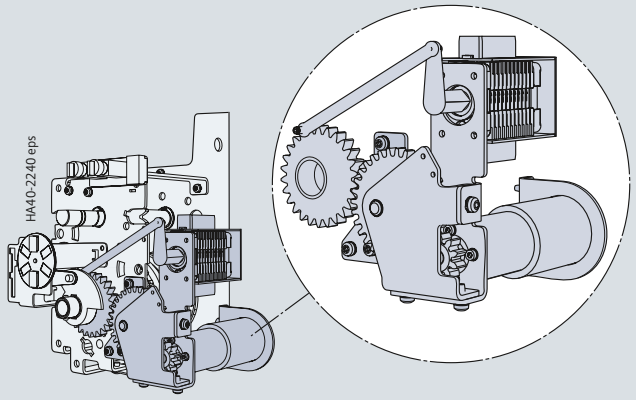
After tripping, a red bar appears on the position indicator.

Motor operating mechanism (option)
The manual operating mechanisms of SIMOSEC 12 switchgear can be equipped with motor operating mechanisms for the three-position switch-disconnector. Retrofitting is possible.

Operating voltages for motor operating mechanisms:
– 24, 48, 60, 110, 220 V DC
– 110 and 230 V AC, 50 / 60 Hz.

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

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		T, M (VT), M (VT-F)	
Function	Switch-disconnector (R) Disconnector (L)	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)	Manual

* VDN: Association of German network operators VDN e.V. at the VDEW in Germany
VDEW: Association of German Power Stations VDEW e.V.

Equipment (optional)

Auxiliary switch (option)
Each operating mechanism of the three-position switch-disconnector can be optionally equipped with an auxiliary switch for the position indication:
– Switch-disconnector function:
  CLOSED and OPEN: 1 NO + 1 NC + 1 changeover
– Earthing switch function:
  CLOSED and OPEN: 1 NO + 1 NC + 1 changeover.

Technical data of the auxiliary switch
Breaking capacity

AC operation at 40 Hz up to 60 Hz		DC operation		
Operating voltage	Normal current	Operating voltage	Normal current Resistive	Inductive, T = 20 ms
V	A	V	A	A
up to 230	10	24	10	10
		48	10	9
		60	9	7
		110	5	4
		240	2.5	2

Rated switching capacity

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

Panel type T:
Operating mechanism for three-position switch and low-voltage niche

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

Features
- According to IEC / EN 62271-100 / VDE 0671-100 / GB 1984 *
- Application in hermetically welded switchgear vessel in conformity with the system
- Climate-independent vacuum interrupter poles in the gas-filled switchgear vessel
- Operating mechanism located outside the switchgear 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 (ARE), the closing spring can be recharged by hand 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 disconnector
- Motor operating mechanism (optional)
- Position indicators
- Pushbuttons for CLOSING and OPENING the circuit-breaker
- Operations counter (optional)
- Interlocking between circuit-breaker and disconnector.

Assignment of operating mechanism type

Panel type	L		
Function	Circuit-breaker	Three-position disconnector	
		Disconnector	Earthing switch
Type	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.

Technical data of the vacuum circuit-breaker

Vacuum circuit-breaker	Type 1.1		
Short-circuit breaking current	up to 25 kA		
Rated operating sequence O – 0.3 s – CO – 3 min – CO	•		
O – 3 min – CO – 3 min – CO	–		
Number of breaking operations I_r	10,000		
Number of short-circuit breaking operations I_{SC}	25		
Individual panel 500 mm	•		
Individual panel 750 mm	•		

Vacuum circuit-breaker type 1.1
The vacuum circuit-breaker consists of a vacuum interrupter unit with integrated three-position disconnector located in the switchgear vessel, and the associated operating mechanisms.

Explanations:
- Design option

– Not available

* Standards see page 57

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
24 V to 220 V DC: maximum 350 W
110 V and 230 V AC: maximum 400 VA.

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

Closing solenoid
- For electrical closing.

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

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

On request: Low-energy magnetic release
- For tripping pulse 0.01 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)
(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 (standard)
- For electrical signaling (as pulse > 10 ms), e.g. to remote control systems, in the case of automatic tripping (e.g. protection)
- Via limit switch and cutout switch.

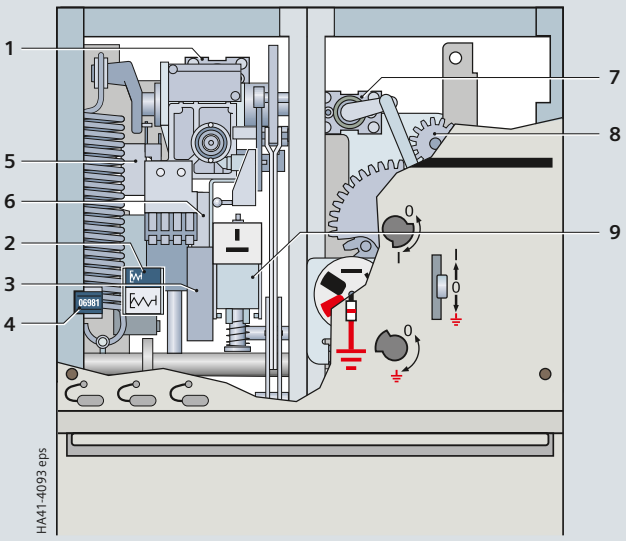
Varistor module
- To limit overvoltages to approx. 500 V for protection devices (when inductive components are mounted in the vacuum circuit-breaker)
- For auxiliary voltages ≥ 60 V DC.

Auxiliary switch
- Standard: 6 NO + 6 NC,
  free contacts thereof
  2 NO + 2 NC + 2 changeover

Position switch
- For signaling "closing spring charged".

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

Vacuum circuit-breaker type 1.1

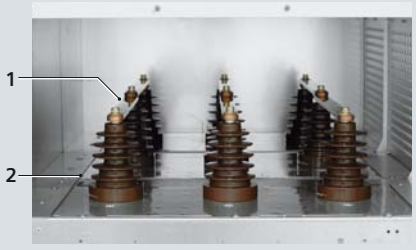


Maximum secondary equipment
1 Auxiliary switch at the circuit-breaker
2 Position switch "spring charged"
3 2nd release
4 Operations counter
5 1st release
6 Motor operating mechanism, circuit-breaker
7 Auxiliary switch at the three-position disconnector
8 Motor operating mechanism, three-position disconnector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

– Fl E-Cu for ≤ 630 A
– On request: Rd E-Cu for > 630 A to 1,250 A.

Busbars



1 Busbar
2 Bushing-type insulator for busbar

Busbar compartment extending over 3 panels (example)
Side view

Components

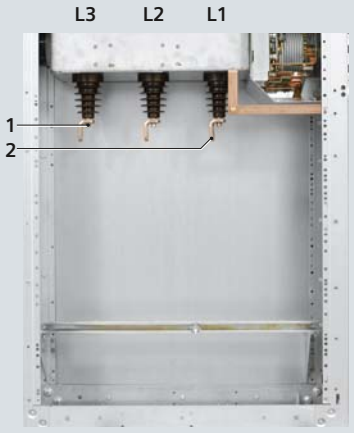
Cable connection

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 connection compartment only if feeder has been isolated and earthed.

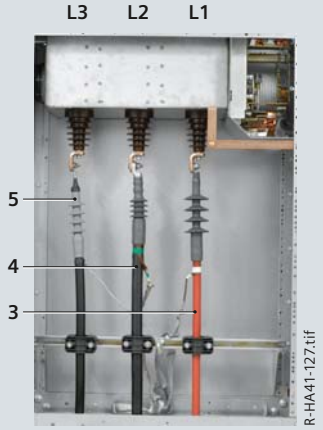
Special features
– In cable panels
– In ring-main panels
– In circuit-breaker panels
- For thermoplastic-insulated cables
- For paper-insulated mass-impregnated cables with adapter systems
- For connection cross-sections up to 300 mm²
- Cable routing downwards.

– In transformer panels:
- For thermoplastic-insulated cables
- For connection cross-sections up to 120 mm²: Cable lug max. 32 mm wide
- For rated normal currents of 200 A.

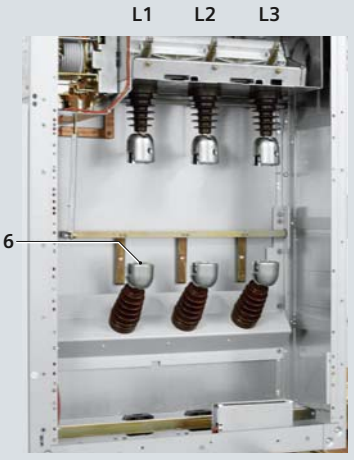
Cable connection (examples)



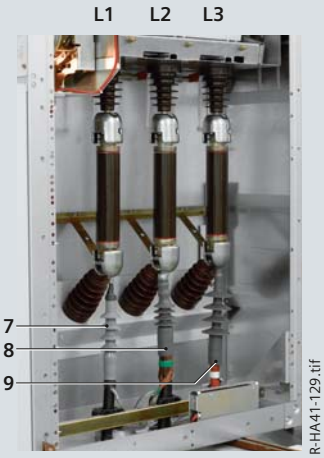
Ring-main panel type R
Cable connection compartment as delivered



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



Transformer panel type T
Cable connection compartment as delivered



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

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

Cable sealing ends (examples)

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

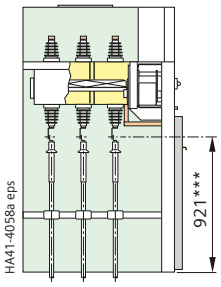
Note:
– Cable sealing ends and cable clamps are not included in the scope of supply
– Most common types in China have to be defined

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 3EK7, other makes on request

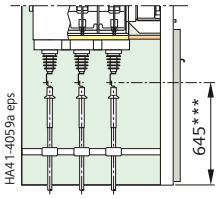
Selection data for various cable sealing ends [1)]

Cable sealing end, e.g. for panel types R..., L... and T...[2)] (for connection heights of cables see opposite dimension drawings)		
Make	Type	Cross-section in mm²
Single-core thermoplastic-insulated cables for ≤ 12 kV (6/10 kV); for IEC standard *		
Euromold	AIN 10	25–300 (500 **)
	17 TTGI	25–300 (500 **)
	ITK-212	50–300 (400 **)
Prysmian Kabel und Systeme	ELTI mb-1C-12	35–240
	ELTI-1C-12	25–300
Tyco Electronics Raychem	IXSU-F	16–300 (500 **)
	TFTI	25–300 (400 **)
	EPKT [2)]	16–300
Lovink-Enertech	IAEM 10	25–300
	IAES 10	25–300 (500 **)
3M Germany	92-EB 6x-1	35–300 (400 **)
Südkabel	SEHDI 10.2	35–300 (500 **)
	SEI 12	70–300
nkt cables	TI 12	25–240
	AV 10 C AV 10 E	25–300 (500 **) 25–300 (500 **)
Three-core thermoplastic-insulated cables for ≤ 12 kV (6/10 kV); for IEC standard *		
Euromold	AIN 10	25–300 (500 **)
	17 TTGI	35–300 (500 **)
Prysmian Kabel und Systeme	ELTI-3C-12	25–300
Tyco Electronics Raychem	IXSU-F	16–300 (500 **)
Lovink-Enertech	IAES 10	25–300
	GHKI	16–300 (400 **)
Single-core thermoplastic-insulated cables for > 12 kV to ≤ 24 kV (12/20 kV); for GB standard *		
Euromold	AIN 20	20–300 (630 **)
	24 TTGI	25–300 (500 **)
	36 MSC [3)] 36 MSC (Option [4)])	95–300 (500 **) 95–300 (500 **)
	ITK-224	25–240
Prysmian Kabel und Systeme	ELTI mb-1C-24	35–240
	ELTI-1C-24	25–300
Tyco Electronics	IXSU-F	25–300 (500 **)
	TFTI	25–300 (400 **)
	EPKT	16–300 (500 **)
Lovink-Enertech	IAEM 20	25–300
	IAES 20	25–300 (500 **)
3M Deutschland	93-EB 6x-1	50–300 (400 **)
Südkabel	SEHDI 20.2	35–300 (500 **)
	SEI 24	25–240
nkt cables	TI 24	25–240
	AV 20 E	25–300 (500 **)
	AV 10 E	25–300 (500 **)
Three-core thermoplastic-insulated cables for > 12 kV to ≤ 24 kV (12/20 kV); for GB standard *		
Euromold	SR-DI 24 [3)]	35–300 (500 **)
Lovink-Enertech	GHKI	25–300 (500 **)

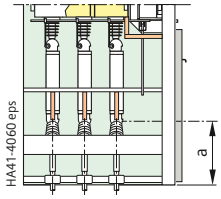
Connection height *** of cables above floor or above lower edge of panel:



Panel type R...



Panel type L...



Panel type T...

Dimension a
~ 373 mm:
at fuses with e = 442 mm
~ 523 mm:
at fuses with e = 292 mm

Note:
Depending on make and type, the termination of the cable sealing end (= shield earth) for the 3-core thermoplastic-insulated cable and the fitted cable clamp (option) may be located underneath the panel in the cable basement. This must be taken into account in panels with floor cover (option).

* Standard see page 57

** On request: Max. connection cross-section of cable sealing end types

*** Due to the installation of 4MA cast-resin insulated block-type current transformers in panels R1 and L , the connection height of the cables is reduced to 380 mm

○ Combination possible

– Combination not possible

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

Cable cross-sections, HV HRC fuse assembly

Cable cross-sections

Panel type	Panel width	Version	Connection cables x connection cross-section No. x mm² for rated voltage	Transformer combination in the connection compartment Current transformer		
			12 kV	4MC70	4MA	4MR
K	375	Standard	1 x 300	○		
		On request	2 x 300			
	500	Standard	1 x 300	○		
		Option	2 x 400			
R	375	Standard	1 x 300	○		
		On request	2 x 300			
	500	Standard	1 x 300	○		
		Option	2 x 300			
L	500	Standard	1 x 300	○		
		Option	2 x 240		–	–
	750	Standard	1 x 300	○		
		Option	2 x 300		○	○
M (-K), M (-BK)	750	Standard	1 x 400		○	○
		Option	3 x 400		○	○

Features
- Application for
  – Transformer panels type T (375 mm) and T1 (500 mm)
  – Busbar voltage metering panel type M (VT-F)
- HV HRC fuse links acc. to DIN 43625 (main dimensions) with striker; version "medium" acc. to IEC 60282/VDE 0670-4 *
  – As short-circuit protection before transformers
  – With selectivity (depending on correct selection) to upstream and downstream connected equipment
- Requirements to 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 (1NO).

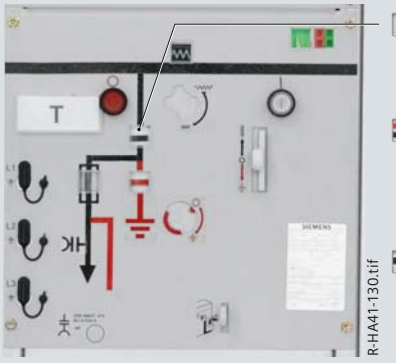
Mode of operation

"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
- Open the connection compartment cover
- Subsequent manual replacement of the HV HRC fuse link.

HV HRC fuse assembly

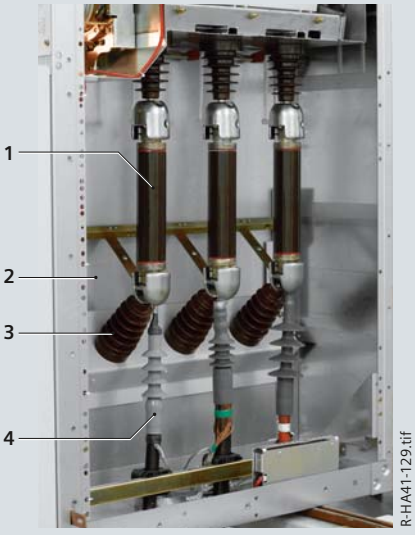


"CLOSED" indication, manual or motor operation

Indication "HV HRC fuse tripped" or "shunt release tripped"

"OPEN" indication

Control board of a transformer feeder



1 HV HRC fuse (not included in the scope of supply)
2 Earthing switch (rated short-circuit making current I_{ma} = 4 kA) for cable connection
3 Cover for bolted cable lug connection (e.g. for rated voltage U_r = 24 kV)
4 Cable sealing end (not included in the scope of supply)

HV HRC fuses in transformer panel type T
Side view

* Standards see page 57

Allocation of HV HRC fuses and transformers
Recommended HV HRC fuses make SIBA for switchgear type SIMOSEC 12

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

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

Please refer also to the SIMOSEC 12 operating and installation instructions for the selection of the applicable HV HRC fuses, make SIBA.

Standards
HV HRC fuse links "medium" version with striker and for a tripping energy of 1 ± 0.5 Joule according to

- IEC 60282-1 / VDE 0670-4 [1)]
- IEC 60787 / VDE 0670-402 [1)]
- DIN 43625 main dimensions.

	Transformer			HV HRC fuse				
Operating voltage	Rated power S_N	Relative impedance voltage u_k	Rated current I_1	Rated normal current of the HV HRC fuse I_{fuse}	Operating voltage U_{fuse}	Dimension e	Outside diameter d	Order No.
kV	kVA	%	A	A	kV	mm	mm	Make SIBA
6 up to 7.2	50	4	4.8	10	3 to 7.2	292	53	**30 098 13.10**
				10	6 to 12	292	53	**30 004 13.10 ***
				10	6 to 12	442	53	**30 101 13.10 ***
	75	4	7.2	16	3 to 7.2	292	53	**30 098 13.16**
				16	6 to 12	292	53	**30 004 13.16**
				16	6 to 12	442	53	**30 101 13.16**
	100	4	9.6	16	3 to 7.2	292	53	**30 098 13.16**
				16	6 to 12	292	53	**30 004 13.16**
				16	6 to 12	442	53	**30 101 13.16**
				20	3 to 7.2	292	53	**30 098 13.20**
				20	6 to 12	292	53	**30 004 13.20**
				20	6 to 12	442	53	**30 101 13.20**
	125	4	12	20	3 to 7.2	292	53	**30 098 13.20**
				20	6 to 12	292	53	**30 004 13.20**
				20	6 to 12	442	53	**30 101 13.20**
				25	3 to 7.2	292	53	**30 098 13.25**
				25	6 to 12	292	53	**30 004 13.25 ***
				25	6 to 12	442	53	**30 101 13.25 ***
	160	4	15.4	31.5	3 to 7.2	292	53	**30 098 13.31.5**
				31.5	6 to 12	292	53	**30 004 13.31.5**
				31.5	6 to 12	442	53	**30 101 13.31.5 ***
	200	4	19.2	31.5	3 to 7.2	292	53	**30 098 13.31.5**
				31.5	6 to 12	292	53	**30 004 13.31.5**
				31.5	6 to 12	442	53	**30 101 13.31.5 ***
				40	3 to 7.2	292	53	**30 098 13.40**
				40	6 to 12	292	53	**30 004 13.40**
				40	6 to 12	442	53	**30 101 13.40 ***
	250	4	24	40	3 to 7.2	292	53	**30 098 13.40**
				40	6 to 12	292	53	**30 004 13.40 ***
				40	6 to 12	442	53	**30 101 13.40 ***
				50	3 to 7.2	292	53	**30 098 13.50**
				50	6 to 12	292	53	**30 004 13.50**
				50	6 to 12	442	53	**30 101 13.50 ***
	315	4	30.3	50	3 to 7.2	292	53	**30 098 13.50**
				50	6 to 12	292	53	**30 004 13.50 ***
				50	6 to 12	442	53	**30 101 13.50 ***
				63	6 to 12	292	67	**30 012 43.63 ***
	400	4	38.4	63	3 to 7.2	292	67	**30 099 13.63**
				63	6 to 12	292	67	**30 012 13.63 ***
				63	6 to 12	442	67	**30 102 13.63**
				63	6 to 12	292	67	**30 012 43.63**
				80	6 to 12	292	67	**30 012 43.80 ***
				80	6 to 12	442	67	**30 102 43.80**
	500	4	48	80	6 to 12	292	67	**30 012 43.80 ***
				80	6 to 12	442	67	**30 102 43.80**
				80	3 to 7.2	292	67	**30 099 13.80 ***
				80	6 to 12	292	67	**30 012 13.80 ***
				80	6 to 12	442	67	**30 102 13.80**
				100	6 to 12	292	67	**30 012 43.100**
				100	6 to 12	442	67	**30 102 43.100 ***

* Preferred types for short delivery times

1) Standards see Page 57

Allocation of HV HRC fuses and transformers
Recommended HV HRC fuses make SIBA for switchgear type SIMOSEC 12

	Transformer			HV HRC fuse				
Operating voltage	Rated power S_N	Relative impedance voltage u_k	Rated current I_1	Rated normal current of the HV HRC fuse I_{fuse}	Operating voltage U_{fuse}	Dimension e	Outside diameter d	Order No.
kV	kVA	%	A	A	kV	mm	mm	Make SIBA
6 up to 7.2	630	4	61	100	3 to 7.2	292	67	**30 012 43.100 Δ**
				100	3 to 7.2	292	67	**30 099 13.100**
				100	6 to 12	292	67	**30 102 43.100 *Δ**
				100	6 to 12	292	67	**30 012 13.100**
				100	6 to 12	442	67	**30 102 13.100**
				125	6 to 12	292	85	**30 020 43.125 Δ**
				125	6 to 12	442	85	**30 103 43.125 Δ**
	800		77	125	6 to 12	292	85	**30 020 43.125 Δ**
			77	125	6 to 12	442	85	**30 103 43.125 Δ**
10 up to 12	50	4	2.9	10	6 to 12	292	53	**30 004 13.10 ***
				10	6 to 12	442	53	**30 101 13.10 ***
				10	10 to 17.5	292	53	**30 255 13.10 ***
				10	10 to 17.5	442	53	**30 231 13.10 ***
				10	10 to 24	442	53	**30 006 13.10 ***
	75	4	4.3	10	6 to 12	292	53	**30 004 13.10 ***
				10	6 to 12	442	53	**30 101 13.10 ***
				10	10 to 17.5	292	53	**30 255 13.10 ***
				10	10 to 17.5	442	53	**30 231 13.10 ***
				10	10 to 24	442	53	**30 006 13.10 ***
	100	4	5.8	16	6 to 12	292	53	**30 004 13.16**
				16	6 to 12	442	53	**30 101 13.16**
				16	10 to 17.5	292	53	**30 255 13.16**
				16	10 to 17.5	442	53	**30 231 13.16 ***
				16	10 to 24	442	53	**30 006 13.16 ***
	125	4	7.2	16	6 to 12	292	53	**30 004 13.16**
				16	6 to 12	442	53	**30 101 13.16**
				16	10 to 17.5	292	53	**30 255 13.16**
				16	10 to 17.5	442	53	**30 231 13.16 ***
				16	10 to 24	442	53	**30 006 13.16 ***
	160	4	9.3	20	6 to 12	292	53	**30 004 13.20**
				20	6 to 12	442	53	**30 101 13.20**
				20	10 to 17.5	292	67	**30 221 13.20**
				20	10 to 17.5	442	53	**30 231 13.20 ***
				20	10 to 24	442	53	**30 006 13.20 ***
	200	4	11.5	25	6 to 12	292	53	**30 004 13.25 ***
				25	6 to 12	442	53	**30 101 13.25 ***
				25	10 to 17.5	292	67	**30 221 13.25 ***
				25	10 to 17.5	442	53	**30 231 13.25 ***
				25	10 to 24	442	53	**30 006 13.25 ***
	250	4	14.5	25	6 to 12	292	53	**30 004 13.25 ***
				25	6 to 12	442	53	**30 101 13.25 ***
				25	10 to 17.5	292	67	**30 221 13.25 ***
				25	10 to 17.5	442	53	**30 231 13.25 ***
				25	10 to 24	442	53	**30 006 13.25 ***
				31.5	6 to 12	292	53	**30 004 13.31.5**
				31.5	6 to 12	442	53	**30 101 13.31.5 ***
				31.5	10 to 17.5	292	67	**30 221 13.31.5 ***
				31.5	10 to 17.5	442	53	**30 231 13.31.5 ***
				31.5	10 to 24	442	53	**30 006 13.31.5 ***
	315	4	18.3	31.5	6 to 12	292	53	**30 004 13.31.5**
				31.5	6 to 12	442	53	**30 101 13.31.5 ***
				31.5	10 to 17.5	292	67	**30 221 13.31.5 ***
				31.5	10 to 17.5	442	53	**30 231 13.31.5 ***
				31.5	10 to 24	442	53	**30 006 13.31.5 ***
				40	6 to 12	292	53	**30 004 13.40 ***
				40	6 to 12	442	53	**30 101 13.40 ***
				40	10 to 17.5	292	67	**30 221 13.40 ***
				40	10 to 17.5	442	53	**30 231 13.40 ***
				40	10 to 24	442	53	**30 006 13.40 ***
	400	4	23.1	40	6 to 12	292	53	**30 004 13.40 ***
				40	6 to 12	442	53	**30 101 13.40 ***
				40	10 to 17.5	292	67	**30 221 13.40 ***
				40	10 to 17.5	442	53	**30 231 13.40 ***
				40	10 to 24	442	53	**30 006 13.40 ***
	500	4	29	50	6 to 12	292	53	**30 004 13.50 ***
				50	6 to 12	442	53	**30 101 13.50 ***
				50	10 to 17.5	292	67	**30 221 13.50 ***
				50	10 to 17.5	442	67	**30 232 13.50 ***
				50	10 to 24	442	67	**30 014 13.50 ***
				63	6 to 12	292	67	**30 012 43.63 ***
				63	10 to 24	442	67	**30 014 43.63 ***

* Preferred types for short delivery times

Δ As SSK type

Allocation of HV HRC fuses and transformers
Recommended HV HRC fuses make SIBA for switchgear type SIMOSEC 12

	Transformer			HV HRC fuse				
Operating voltage	Rated power S_N	Relative impedance voltage u_k	Rated current I_1	Rated normal current of the HV HRC fuse I_{fuse}	Operating voltage U_{fuse}	Dimension e	Outside diameter d	Order No.
kV	kVA	%	A	A	kV	mm	mm	Make SIBA
10 up to 12	630	4	36.4	63	6 to 12	292	67	**30 012 13.63 ***
				63	6 to 12	442	67	**30 102 13.63**
				63	10 to 17.5	442	67	**30 232 13.63 ***
				63	6 to 12	292	67	**30 012 43.63 * Δ**
				63	10 to 24	442	67	**30 014 43.63 * Δ**
				63	10 to 17.5	292	85	**30 222 13.63**
				63	10 to 24	442	67	**30 014 13.63**
				80	6 to 12	292	67	**30 012 43.80 * Δ**
				80	6 to 12	442	67	**30 102 43.80 * Δ**
				80	10 to 24	442	67	**30 014 43.80 * Δ**
	800	4	46.2	63	10 to 17.5	292	85	**30 222 13.63**
		4		63	10 to 24	442	67	**30 014 13.63**
		5 to 6		63	6 to 12	292	67	**30 012 13.63 ***
				63	6 to 12	442	67	**30 102 13.63**
				63	10 to 17.5	442	67	**30 232 13.63 ***
				80	6 to 12	292	67	**30 012 43.80 * Δ**
				80	6 to 12	442	67	**30 102 43.80 * Δ**
				80	10 to 24	442	67	**30 014 43.80 * Δ**
	1,000	5 to 6	58	100	6 to 12	292	67	**30 012 43.100 Δ**
				100	6 to 12	442	67	**30 102 43.100 * Δ**
				100	10 to 24	442	67	**30 022 43.100 * Δ**
	1,250	5 to 6	72.2	125	6 to 12	292	85	**30 020 43.125 Δ**
	1,600	5 to 6	92.4					**On request**

* Preferred types for short delivery times

Δ As SSK type

Three-phase current transformer 4MC63

Features
- According to IEC/EN 60044-1/ VDE 0414-1 *
- 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.

Installation
- Arranged outside the switchgear 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
(option)

For protection equipment based on the current-transformer operation principle:

Three-phase current transformer type 4MC63 53 for
- Protection system 7SJ4x as definite-time overcurrent protection

- Definite-time overcurrent protection relay, make Woodward/SEG, type WIP-1.

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

Three-phase current transformer 4MC63 53

Technical data	Three-phase current transformer 4MC63 53		
	for $I_N \leq 150$ A for $I_D = 630$ A	for $I_N \leq 400$ A for $I_D = 630$ A	

Primary data

Highest voltage for equipment U_m		0.72 kV				0.72 kV		
Rated current I_N	A	150	100	75	50	400	300	200
Rated short-duration power-frequency withstand voltage (winding test)		3 kV				3 kV		
Rated short-time thermal current I_{th}		25 kA				25 kA		
Rated continuous thermal current I_D		630 A				630 A		
Transient overload current		1.5 x I_D/1 h				2 x I_D/0.5 h		
Rated dynamic current I_{dyn}		2.5 x I_{th}				2.5 x I_{th}		

Secondary data

Rated current	A	1	0.67	0.5	0.33	1	0.75	0.5
Rating	VA	5	3.33	2.5	1.67	5	3.75	2.5
Rated current (option)		5 A				5 A		
Current at I_D		4.2 A				1,575 A		
Protection core	Class	10 P				10 P		
	Overcurrent factor	10				10		

Other values on request

* Standards see page 57

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

Features
- According to IEC 60044-1 / VDE 0414-1 *
- 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 T...

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... 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.

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

Cable-type current transformer 4MC70 31

Technical data	Cable-type current transformer 4MC70 33	Cable-type current transformer 4MC70 31
Primary data		
Highest voltage for equipment U_m	0.72 kV	0.72 kV
Rated current I_N	20 A to 600 A	50 A to 600 A
Rated short-duration power-frequency withstand voltage (winding test)	3 kV	3 kV
Rated short-time thermal current I_{th}	up to 25 kA / 1s or 20 kA / 3s	25 kA
Rated continuous thermal current I_D	1.0 x I_N option: 1.2 x I_N	1.0 x I_N option: 1.2 x I_N
Transient overload current	1.5 x I_D / 1 h or 2 x I_D / 0.5 h	1.5 x I_D / 1 h or 2 x I_D / 0.5 h
Rated dynamic current I_{dyn}	2.5 x I_{th}	2.5 x I_{th}
Secondary data		
Rated current	1 A or 5 A	1 A or 5 A
Measuring core – Class	0.2 | 0.5 | 1	1
Measuring core – Overcurrent factor	without | FS5 | FS10	FS5 (option: FS10)
Measuring core – Rating	2.5 VA to 30 VA	2.5 VA to 10 VA
Protection core – Class	10 P | 5 P	–
Protection core – Overcurrent factor	10 | 10	–
Protection core – Rating	2.5 VA to 10 VA	–
Option: Secondary tap	1 : 2 (e.g. 150 A – 300 A)	1 : 2
Dimensions		
Overall height H [2] mm	65 [1] | 110 [1] | 170 [1] | 285 [1]	89
Outside diameter	150 mm	85 mm x 114 mm
Inside diameter	55 mm	40 mm
For cable diameter	50 mm	36 mm

Other values on request

* Standards see page 57

1) Depending on the core data

2) Available installation height inside panel types R...: Approx. 285 mm, depending on make, type and cross-section of sealing end

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

Features

Current transformer 4MA7
- According to IEC 60044-1 / VDE 0414-1 *
- 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 60044-2 / VDE 0414-2 *
- 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.

Application

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

Current transformer 4MA7, single-pole

Voltage transformer 4MR14, single-pole

Technical data

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

Primary data							On request:	
Highest voltage for equipment U_m		kV	**3.6**	**7.2**	**12**	**12**	**17.5** [1]	**24** [1]
Rated short-duration power-frequency withstand voltage U_d		kV	10	20	28	42	38	50
Rated lightning impulse withstand voltage U_p		kV	20	60	75	75	95	125
Rated current I_N		A	20 to 1250 →					
Rated short-time thermal current I_{th}		kA	up to 20 kA / 3 s, or up to 25 kA / 1 s →					
Rated continuous thermal current I_D			up to 1.0 x I_n (option: 1.2 x I_n) →					
Rated dynamic current I_{dyn}			max. 2.5 x I_{th} →					
Secondary data								
Rated current		A	1 or 5 →					
Measuring core	Class		0.2 | 0.5 | 1 →					
	Overcurrent factor		without | FS5 | FS10 →					
	Rating	VA	2.5 to 30 →					
Protection core	Class		5 P or 10 P →					
	Overcurrent factor		10 →					
	Rating	VA	2.5 to 30 →					

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

Primary data						On request:	
Highest voltage for equipment U_m (= 1.2 x U_N)	kV	**3.6**	**7.2**	**12**	**12**	**17.5** [1]	**24** [1]
Rated short-duration power-frequency withstand voltage U_d	kV	10	20	28	42	38	50
Rated lightning impulse withstand voltage U_p	kV	20	60	75	75	95	125
Rated voltage U_N	kV	$3.3/\sqrt{3}$	$3.6/\sqrt{3}$ $4.2/\sqrt{3}$ $4.8/\sqrt{3}$ $5.0/\sqrt{3}$ $6.0/\sqrt{3}$ $6.6/\sqrt{3}$	$7.2/\sqrt{3}$ $10.0/\sqrt{3}$ $11.0/\sqrt{3}$ $11.6/\sqrt{3}$	$10.0/\sqrt{3}$ $11.0/\sqrt{3}$	$12.8/\sqrt{3}$ $13.2/\sqrt{3}$ $13.8/\sqrt{3}$ $15.0/\sqrt{3}$ $16.0/\sqrt{3}$	$17.5/\sqrt{3}$ $20.0/\sqrt{3}$ $22.0/\sqrt{3}$
Rated voltage factor (8 h)		1.9 x U_N →					
Secondary data							
Rated voltage	V	$100/\sqrt{3}$ →					
		$110/\sqrt{3}$ (option) →					
		$120/\sqrt{3}$ (option) →					
Rated voltage for auxiliary winding (option)	V	100/3 →					
		110/3 (option) →					
		120/3 (option) →					
Rating	VA	20 | 50 | 100 →					
Class		0.2 | 0.5 | 1.0 →					

* Standards see page 57

1) Only for switchgear with rated voltage > 12 kV

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 "1NO" for remote electrical indication.

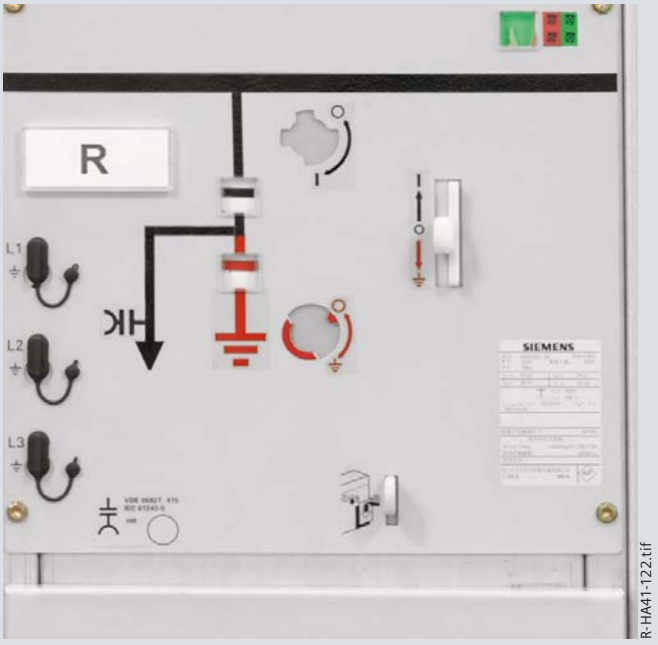
Mode of operation
For the ready-for-service indicator, a gas-tight measurement box is installed inside the switchgear vessel.

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

While changes in the gas density during the loss of gas, which are decisive for the dielectric strength, are displayed, temperature-dependent changes in the gas pressure are not. The gas in the measurement box has the same temperature as that in the switchgear vessel.

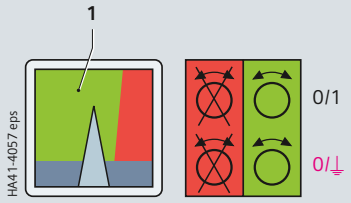
The temperature effect is compensated via the same pressure change in both gas volumes.

Ready-for-service indicator



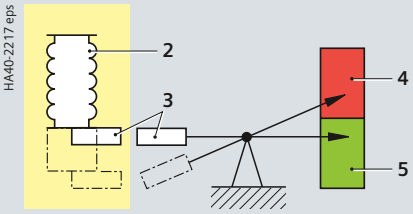
Voltage detecting systems according to
IEC / EN 61243-5 or VDE 0682-415
- To verify safe isolation from supply
- Detecting systems:
– Standard: HR system with plug-in indicator
– Option: LRM system with plug-in indicator
– LRM system with integrated indicator, type VOIS+, VOIS R+
– LRM system with integrated indicator, integrated repeat test of the interface and function test, type CAPDIS-S1+; with additional integrated signaling relay, type CAPDIS-S2+.

Gas monitoring



1 Green indication
Ready for service
(red indication:
Not ready for service)

Indicator on control board:
Ready for service

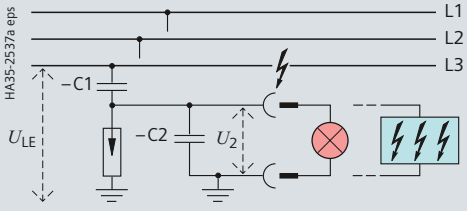


Stainless-steel vessel filled with SF_6 gas, relative pressure 400 hPa at 20 °C

Ready-for-service indicator

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

2 Measurement box
3 Magnetic coupling
4 Red indication:
Not ready for service
5 Green indication:
Ready for service



Volt. indicator (HR) plugged in

CAPDIS-Sx or VOIS+ installed

Voltage indication
via capacitive voltage divider (principle)
– C_1 Capacitive coupling electrode integrated into bushing
– C_2 Capacity of the coupling unit (as well as connection leads of the voltage detecting system) to earth

U_{LE} = $U_N/\sqrt{3}$ during rated operation in the three-phase system
U_2 Voltage at the interface (for plug-in voltage detecting system) or at the test socket (for integrated voltage detecting system)

Components

Indicating and measuring equipment

Short-circuit/earth-fault indicator (option)
All ring-main feeders can be optionally equipped with a 3-phase short-circuit or earth-fault indicator.

Features
- Use depends on network conditions
- Optical signal when a preselected pickup value is exceeded
- Depending on the type, reset
  – Manually
  – Automatically after a preset time (e.g. 2 h)
- With ring-type sensors
- Display unit, withdrawable housing, depending on the type
- Pickup values are adjustable (depending on the type of device)
- Options:
  Remote electrical indication via contact (1 NO + 1 NC) adjustable as passing contact (W) or maintained contact (D), depending on the type of device.

Short-circuit/earth-fault indicators
(examples)

R-HA40-105 eps

Short-circuit indicator SIGMA F+E

Red indication:
Short-circuit indicator has picked up

R-HA40-095 eps

R-HA40-094a eps

Short-circuit indicator ALPHA E

R-HA40-098 eps

Short-circuit/earth-fault indicator EKA-3

R-HA40-097 eps

Earth-fault indicator EKA-3/1

R-HA40-100 eps

Short-circuit indicator Opto F

R-HA40-106 eps

Short-circuit indicator IKI-20

Selection of short-circuit/earth-fault indicators

Indicator type [1]	Reset		Remote reset: A: By aux. voltage B: Via NO contact (floating)	Automatic reset after return of auxiliary voltage supply	Pickup values Short-circuit current I_K (A) Standard, other values on request	Pickup values Earth-fault current I_E (A) Standard, other values on request	Opt.: Remote ind. as W (passing contact = standard) D (maintained contact = option)
	manually	automatically after					
Short-circuit indicator							
ALPHA M [5]	x	–	–	–	400, 600, 800, 1,000	–	W, D
ALPHA E [5]	x	2 h or 4 h	A (12–60 V AC/DC)	–	400, 600, 800, 1,000	–	W, D
KA-Opto F [3] [5] [8]	x	after 2 h or 4 h	B (1NO)	–	400, 600, 800, 1,000	–	W, D
SIGMA	x	after 1, 2, 4, 8 h	B (1NO)	–	300, 400, 600, 800, 1,000	–	W, D
SIGMA AC/DC [2] [5]	x	after 1, 2, 4, 8 h	B (1NO)	x (adjustable)	300, 400, 600, 800, 1,000	–	W, D
IKI-20-B1 [6]	x	after 2 h or 4 h	B (1NO)	–	400, 600, 800, 1,000	–	W, D
IKI-20-T1 [6]	x	after 2 h or 4 h	B (1NO)	x (50/60 Hz, 110–230 V AC)	400, 600, 800, 1,000	–	W, D
Earth-fault/short-circuit indicator							
EKA-3 [4] [5]	–		–	x (50 Hz, 230 V AC) [4]	450	40, 80, 160	W, D
SIGMA F+E [5]	x	after 1, 2, 4, 8 h	B (1NO)	–	300, 400, 600, 800, 1,000	adjustable	W, D
SIGMA F+E [5] AC/DC	x	after 1, 2, 4, 8 h	B (1NO)	x (adjustable)	300, 400, 600, 800, 1,000	adjustable	W, D
DELTA E [5]	x	after 2 h or 4 h	A (12–60 V AC/DC)	–	400, 600, 800, 1,000	200	W, D
KA-Opto F+E [5]	x	after 2 h or 4 h	B (1NO)	–	400, 600, 800, 1,000	40, 60, 80	W, D
IKI-20-B1 [6] [7]	x	after 2 h or 4 h	B (1NO)	–	400, 600, 800, 1,000	10 % or 25 % of I_K	W, D
IKI-20-T1 [6] [7]	x	after 2 h or 4 h	B (1NO)	x (50/60 Hz, 110–230 V AC)	400, 600, 800, 1,000	10 % or 25 % of I_K	W, D
Earth-fault indicator							
EKA-3/1 [2] [4] [5]	–		–	x (50 Hz, 230 V AC) [4]	–	40, 80, 160	W, D
CN-E [5]	x	after 1, 2, 4, 8 h	B (1NO)	–	–	adjustable	D
IKI-20-T1 [6] [7]	x	after 2 h or 4 h	B (1NO)	x (50/60 Hz, 110–230 V AC)	–	30, 55, 80, 100	W, D

1) Further types on request
2) External auxiliary voltage required (120 V AC or 240 V AC)
3) Power supply required for the LED indication (indication by means of an integrated battery or 12 V AC to 60 V AC voltage)
4) External auxiliary voltage required (230 V AC, 50 Hz), device with integrated battery (capacity for approx. 10 h)
5) Make Horstmann
6) Make Kries Energietechnik
7) Ring-type sensor: d = 110 mm
8) With 3 LED indications

Components

Indicating and measuring equipment

HR system, LRM system
- Verification of safe isolation from supply phase by phase through insertion in each socket pair
- Indicator suitable for continuous operation
- Safe-to-touch
- Routine-tested
- Measuring system and voltage indicator can be tested
- Voltage indicator flashes if high voltage is present.

VOIS+, VOIS R+
- Integrated display, without auxiliary power
- With indication "A1" to "A3" (see legend)
- Maintenance-free, repeat test required
- With integrated 3-phase test socket for phase comparison (also suitable for plug-in voltage indicator)
- With integrated signaling relays (only VOIS R+)

– "M1": Voltage present at one phase L1, L2 or L3 as a minimum
– "M2": Voltage not present at L1, L2 and L3.

CAPDIS-Sx+

Common features
- Maintenance-free
- Integrated display, without auxiliary power
- Integrated repeat test of the interfaces (self-monitoring)
- With integrated function test (without auxiliary power) by pressing the "Device-Function-Test" pushbutton
- With integrated, 3-phase test socket for phase comparison (also suitable for plug-in voltage indicator)
- With capacitance circuit.

Features of CAPDIS-S1+
- Without auxiliary power
- With indication "A1" to "A5" (see legend)
- Without ready-for-service monitoring
- Without signaling relay (thus without auxiliary contacts).

Features of CAPDIS-S2+
- With indication "A0" to "A6" (see legend)
- Only by pressing the "Device-Function-Test" pushbutton: "ERROR" indication (A6), e.g. in case of missing auxiliary voltage
- With ready-for-service monitoring (external auxiliary power required)
- With integrated signaling relay for signals "M1" to "M4" (auxiliary power required):

– "M1": Voltage present at phases L1, L2 and L3
– "M2": Voltage not present at phases L1, L2 and L3 (= active zero indication)
– "M3": Earth fault or voltage failure, e.g. in one phase
– "M4": External auxiliary power missing (with operating voltage present or not).

Version	HR system, LRM system	VOIS		CAPDIS-S	
		VOIS+	VOIS R+	-S1+	-S2+
Degree of protection	IP54	IP67		IP54	
Temperature range	–40 °C to +55 °C	–25 °C to +55 °C		–25 °C to +55 °C	
Integrated signaling relays (auxiliary voltage required)	–	–	with	–	with

Indicator and detecting systems

R-HA40-103 eps

Plug-in voltage indicator
per phase at the panel front

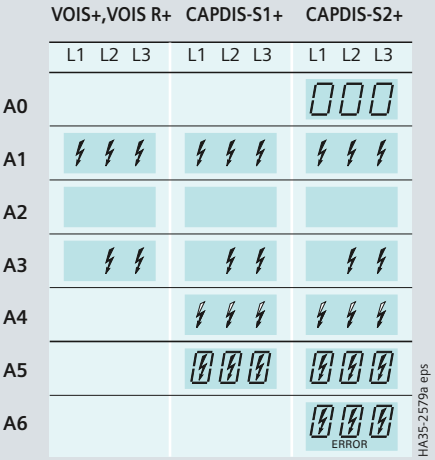
R-HA40-104 eps

Integrated voltage indicator VOIS+, VOIS R+

R-HA40-102a eps

Integrated voltage indicator CAPDIS-S1+, -S2+

Symbols shown



HA35-2579a eps

A0 CAPDIS-S2+: Operating voltage not present
A1 Operating voltage present
A2 – Operating voltage not present,
– For CAPDIS-S2+: Auxiliary power not present
A3 Failure in phase L1, operating voltage at L2 and L3 (for CAPDIS-Sx+ also earth-fault indication)
A4 Voltage (not operating voltage) present
A5 Indication "Device-Function-Test" passed
A6 Indication "ERROR", e.g.: in case of missing auxiliary voltage (see: "Error indication M4")

Verification of correct terminal-phase connections

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

Phase comparison test units

R-HA40-059 eps

Make Pfisterer, type EPV
– For plug-in voltage detecting systems
– For integrated voltage detecting systems (CAPDIS-S1+, -S2+)

R-HA40-089 eps

Make Horstmann, type ORION 3.0
combined test unit for:
– Phase comparison
– Interface testing at switchgear
– Voltage detecting for LRM systems

R-HA35-124.eps

Make Kries, type CAP-Phase
as combined test unit (HR and LRM) for:
– Voltage detecting
– Repeat test
– Phase comparison
– Phase sequence test
– Self-test
The unit does not require a battery

or other makes

Transformer monitor systems

Application with switch-fuse combination (panel type T...)
Monitoring of the overload range of distribution transformers with
- Tripping of the switch in case of overload (current smaller than the rated current of the switch)
- Blocking of the tripping function in the short-circuit range (here, the fuse takes over the disconnecting function).

On request: For circuit-breaker panels (type L)
Protection of distribution transformers with ratings that cannot or should not be protected with HV HRC fuses:
- Tripping of the circuit-breaker in case of overload (delayed)
- Tripping of the circuit-breaker when the short-circuit current arises.

Features
- Current-transformer operated (cable-type transformer)
- Instrument transformers
– Current sensors instead of classical transformers
– No direction-dependent installation required
– No earthing of a transformer pole required
– No short-circuit terminals required for maintenance
- Low-energy magnetic release (0.01 Ws)
- Mounting location
– In the front operating mechanism box of the feeder panel
– In the low-voltage compartment (option) of the circuit-breaker feeder
- Response performance
– Definite-time overcurrent characteristic
– Definite-time overcurrent characteristic for earth-fault protection
– Inverse-time overcurrent characteristic
  – extremely inverse
  – normal inverse
– Externally undelayed instantaneous tripping
- Self-test function
– Display test LED (red)
– Battery test (under load) LED (green)
– Primary current test with tripping and with primary current injection into the transformers
- Indication
– LED indication for tripping (single flash: starting, double flash: tripping)
– Reset after 2 h, 4 h or automatically (after return of power) or manually with reset pushbutton

Transformer monitor IKI-30

Example for selection of transformer protection

Operating voltage (kV)	Transformer rating (kVA) Make and type of the device		
	Siemens 7SJ45/7SJ46	**Woodward/SEG WIC 1-2P**	**Kries IKI-30**
5	≥ 160	≥ 160	≥ 160
6	≥ 160	≥ 160	≥ 160
6.6	≥ 160	≥ 160	≥ 160
10	≥ 200	≥ 250	≥ 160
11	≥ 200	≥ 250	≥ 160
13.8	≥ 250	≥ 400	≥ 160
15	≥ 315	≥ 400	≥ 160
20	≥ 400	≥ 500	≥ 250

- Outputs
– Tripping signal: 1 floating relay output (NC contact) for telecommunication as passing contact
– Starting signal: 1 floating relay output (NC contact) – is activated as long as the starting criterion is reached, e.g. to block an upstream primary protection
– 1 watchdog (relay)
– 1 external tripping output for control of an existing release, e.g. via capacitor
– Tripping output designed as impulse output for direct control of the low-energy release
- Input
– Remote tripping signal, control via floating external contact
– Instantaneous tripping.

Simple protection systems
As a simple protection for distribution transformers and circuit-breaker feeders, standard protection systems are available, consisting of:
• Current-transformer operated protection device
– Siemens: Type 7SJ45
– Woodward / SEG: Type WIC 1-2P, WIC 1-3P, WIP-1
• Protection device with auxiliary voltage supply
– Siemens: Type 7SJ46
• Release at the circuit-breaker as
– Shunt release (f)
or
– C.t.-operated release (low-energy 0.1 Ws)
• Instrument transformer as
– Cable-type current transformer (standard)
– Three-phase current transformer as option for SIMOSEC 12 switchgear panels type L...
Mounting location
• In 350-mm-high top low-voltage compartment of the circuit-breaker feeder, or in the low-voltage niche.

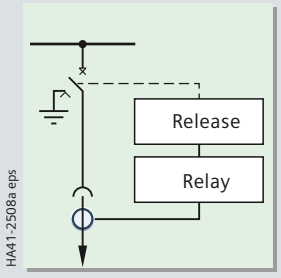
Multifunction protection (selection):
SIPROTEC multifunction protection
Common features
• User-friendly operating program DIGSI 4 for parameterizing and analysis
• Freely programmable LEDs for displaying any desired data
• Communications and bus capability
• Functions: Protection, control, indicating, communications and measuring
• Operation and fault indication memory.

7SJ600 / 7SJ602
• LC text display (2 lines) and keyboard for local operation, parameterizing and indication
• Control of the circuit-breaker.

7SJ80
• LC text display (6 lines) and keyboard for local operation, parameterizing and indication
• Control of circuit-breaker and disconnector.

7SJ61 / 7SJ62
• For stand-alone or master operation
• LC text display (4 lines) for process and equipment data
• Four freely programmable function keys for frequently performed functions
• Keys for navigation in menus and for entering values.

Other types and makes on request
Mounting location
• In the 350-mm or 550-mm-high low-voltage compartment (option) of the circuit-breaker feeder.



Scheme

SIPROTEC Compact
7SJ600, 7SJ602

SIPROTEC Compact
7SJ80

SIPROTEC 4
7SJ61, 7SJ62

Overcurrent-time
protection 7SJ45

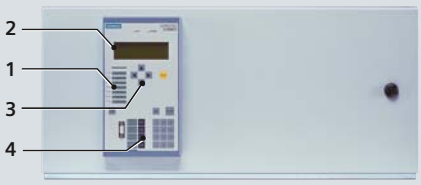
Components

Low-voltage compartment

Features low-voltage compartment (option)
- Overall heights
– 350 mm
– 550 mm
– Option: Cover
- Partitioned safe-to-touch from the high-voltage part of the panel
- Installation on the panel:
– Possible per feeder
- Customer-specific equipment
  For accommodation of protection, control, measuring and metering equipment
- Overall height depends on the panel-specific configuration of primary and secondary equipment
- Option (on request): Door with hinge on the left (standard 350 and 550 mm).

Low-voltage cables
- Control cables of the panel to the low-voltage compartment via multi-pole, coded module plug connectors
- Option: Plug-in bus wires from panel to panel inside the low-voltage niche, or optionally in the separate wiring duct on the panel.

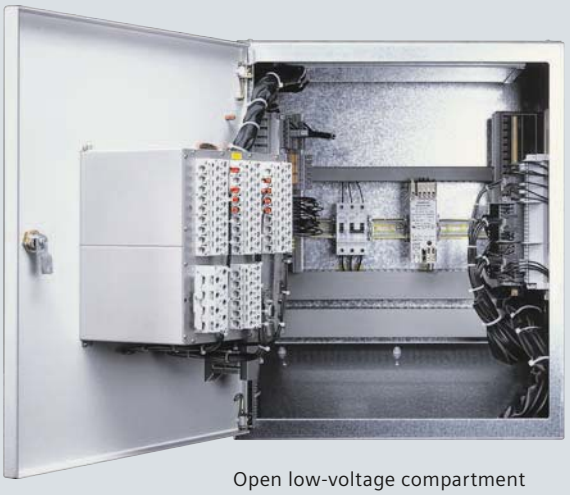
Low-voltage compartment (option)



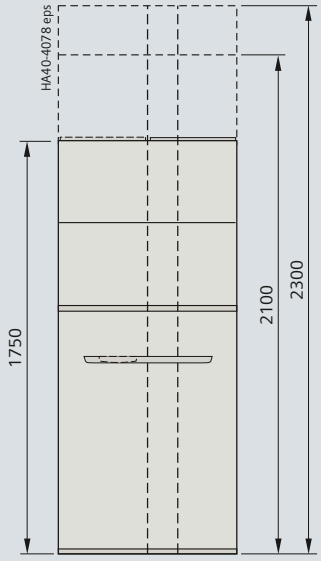
SIPROTEC 4
7SJ61:
1 LED indications
2 LCD
3 Navigation keys
4 Function keys

On circuit-breaker panel type L
for additional low-voltage equipment

Low-voltage compartment (example 500 x 550 mm)



Open low-voltage compartment
with built-in equipment (option)

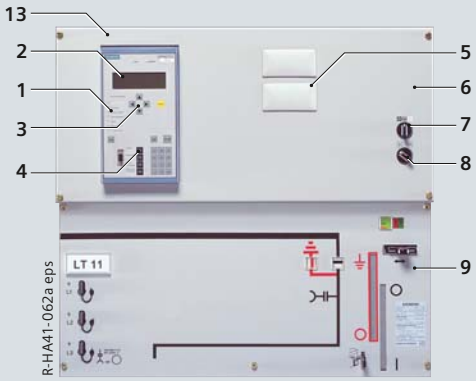


Switchgear height
1,750 mm

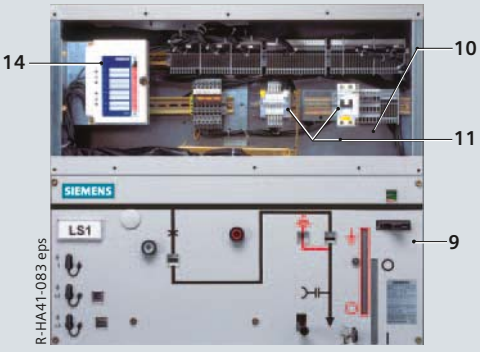
Low-voltage niche (standard)
- Inside the panel
- • Screwed-on cover as
– Cover (available mounting depth behind of approx. 202 mm)
– Frame cover, approx. 46 mm deeper version (available mounting depth behind of approx. 248 mm)
- For accommodation of terminals and standard protection devices, e.g. in circuit-breaker panels combined with frame cover for panels
– Protection relays (with max. 75 mm wide mounting frame), e.g.
  – Type 7SJ45, 7SJ46: for type L and L1
  – Make Woodward / SEG, type WIC: for type L and L1

  On request:
  – 7SJ60, 7SJ80
  – Make Woodward / SEG, WIP-1
- For bus wires and / or control cables; niche open at the side to the adjacent panel
- Safe-to-touch, separated from high-voltage part of the panel
- Degree of protection IP3X (standard).

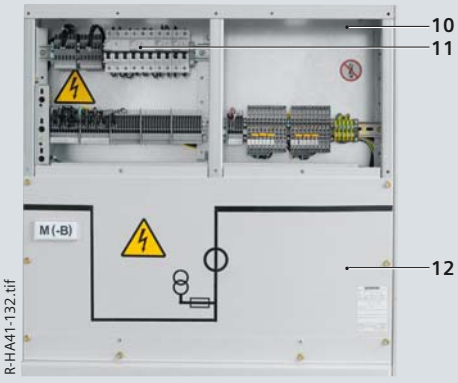
Low-voltage niche (examples)



In circuit-breaker panel type L1
(low-voltage niche closed)



In circuit-breaker panel type L1
(low-voltage niche open)



In billing metering panel type M
(low-voltage niche open)

1 LED indications
2 LCD
3 Navigation keys
4 Function keys
5 Option:
Short-circuit / earth-fault indicator
6 Frame cover of low-voltage niche (can be unscrewed)
7 Momentary-contact rotary control switch ON-OFF for motor operating mechanism of the three-position switch-disconnector
8 Local-remote switch for three-position switch-disconnector
9 Control board
10 Low-voltage niche open
11 Option:
Installed equipment
12 Panel front
13 Option:
Multifunction protection relay SIPROTEC 4 type 7SJ61 on swing-out frame
14 Option:
Protection device make Woodward / SEG, type WIC

Interlocks, locking devices

Standard interlocks
- Three-position switch: Disconnecting function against earthing function
- Circuit-breaker feeder: Circuit-breaker against three-position disconnector
- Access to cable compartment is generally only possible if

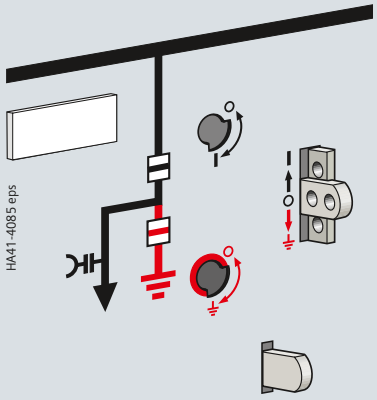
– the feeder is isolated
and
– the feeder is earthed (“EARTHED” position).

For ring-main and circuit-breaker feeders:
- Option: Closing lockout
  Prevents switching the three-position switch-disconnector from “OPEN” position to “CLOSED” position when the cable compartment cover is removed.

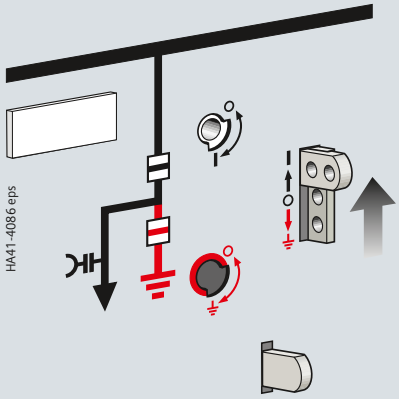
For transformer feeders:
- The three-position switch-disconnector cannot be switched from “EARTHED” to “OPEN” position when the cable compartment cover / the HV HRC fuse compartment is open.

Locking device
- For padlock, hook diameter 12 mm
- Standard for transformer and circuit-breaker feeders (stored-energy mechanisms)
- Option: For ring-main feeders (spring-operated mechanisms)
- Three-position switch-disconnector lockable at the operating mechanism in any desired switch position.

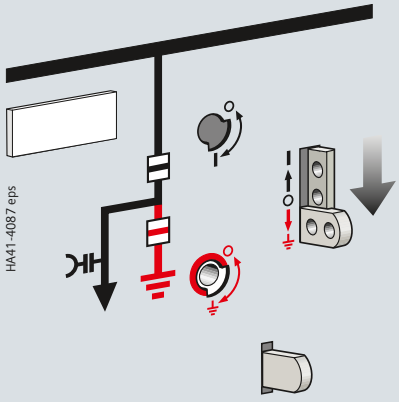
Interlocking of the three-position switch
(Option: Locking device)



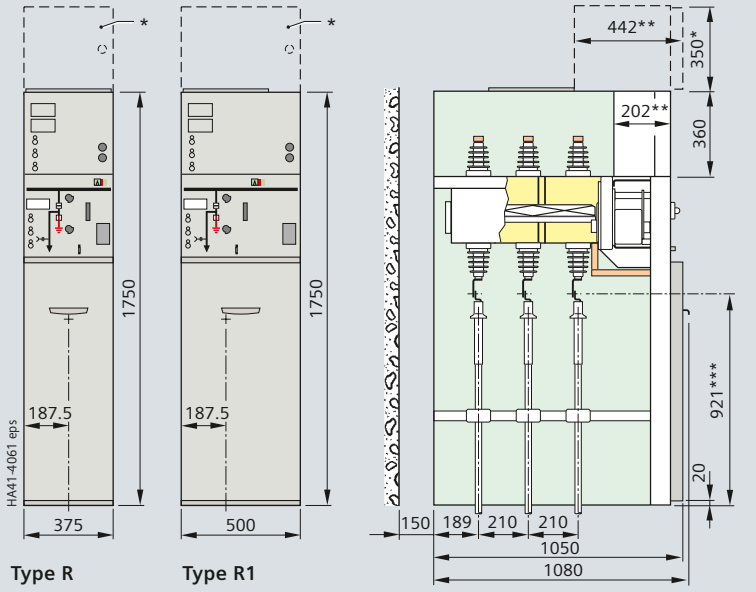
Initial state



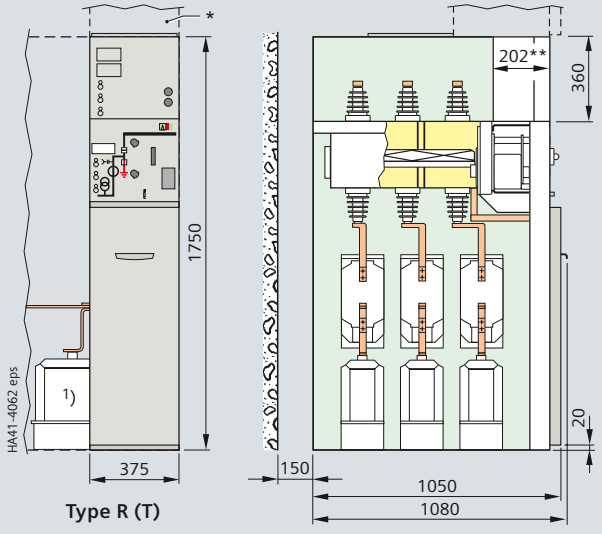
Release of disconnector operation



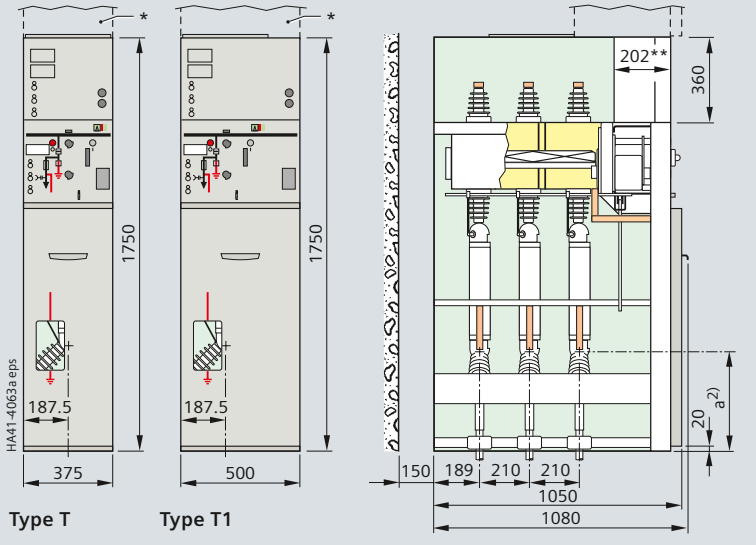
Release of earthing-switch operation



Ring-main panels



Ring-main panel for panel combinations



Transformer panels

* Option:
Low-voltage compartment available in two heights: 350 mm or 550 mm

** Available mounting depth for low-voltage equipment

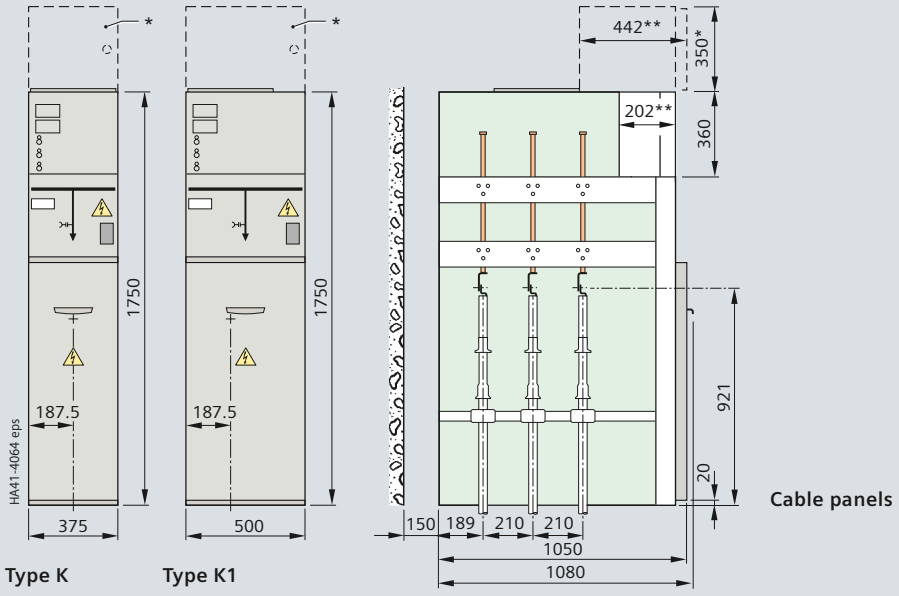
*** For panel type R1 the cable connection height is reduced to approx. 380 mm for panel version with 4MA block-type current transformer

1) Location of voltage transformer in left-hand panel, e.g. in panel type L (T)

2) Dimension a
~ 373 mm:
at fuses with e = 442 mm
~ 523 mm:
at fuses with e = 292 mm

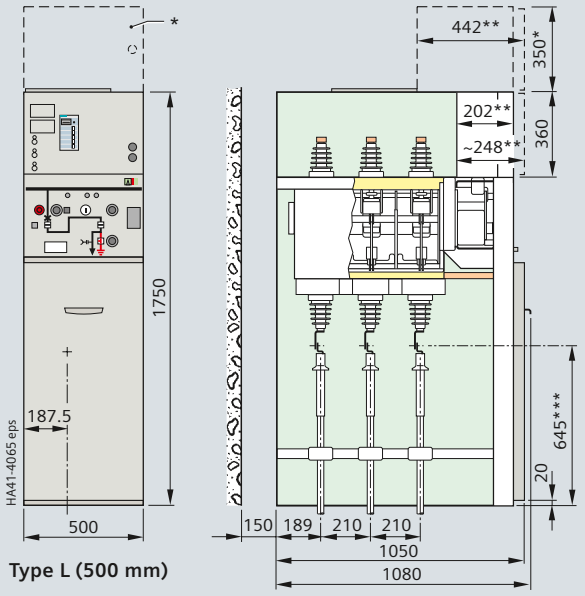
Dimensions

Cable panels



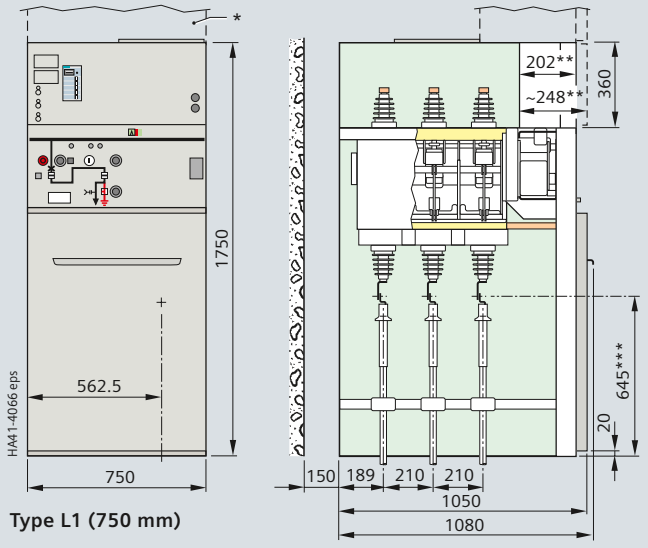
* Option:
Low-voltage compartment available in two heights:
350 mm or 550 mm

** Available mounting depth for low-voltage equipment



Type L (500 mm)

Circuit-breaker panel 630 A



Type L1 (750 mm)

Circuit-breaker panel 630 A

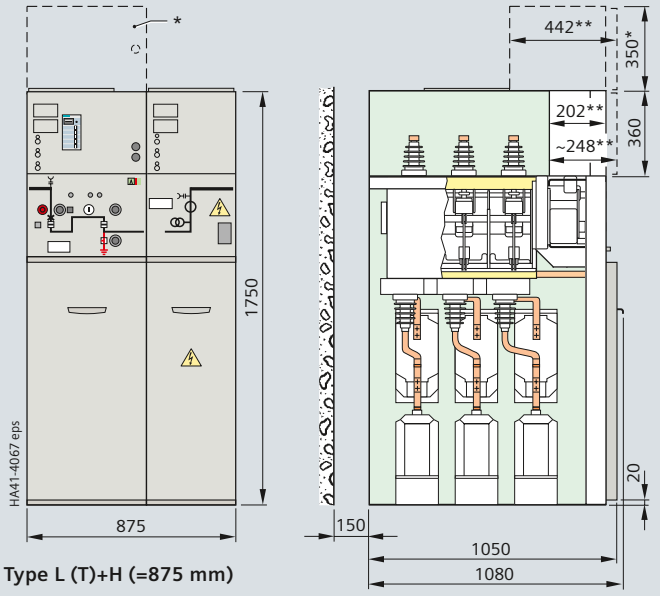
*Option:
Low-voltage compartment available in two heights: 350 mm or 550 mm

** Available mounting depth for low-voltage equipment
– Approx. 202 mm with cover
– Approx. 248 mm with extended frame cover

*** The cable connection height is reduced to approx. 380 mm for panel version with 4MA block-type current transformer

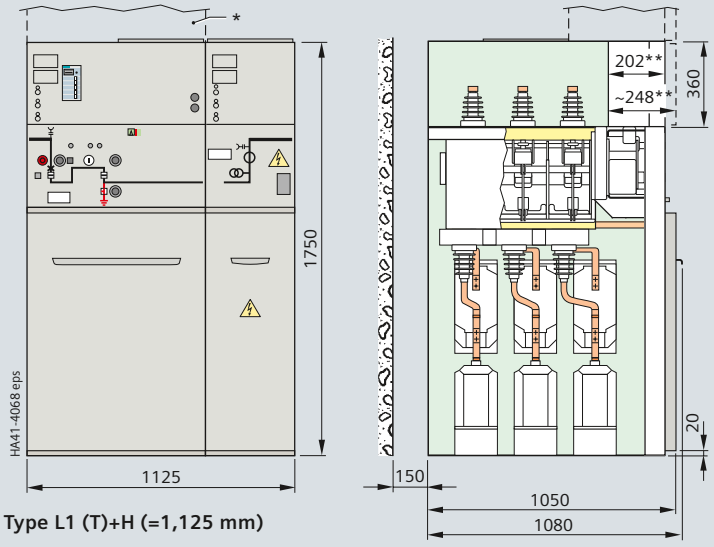
Dimensions

Bus sectionalizer panels with bus riser panel



Type L (T)+H (=875 mm)

Bus sectionalizer panel 630 A with circuit-breaker

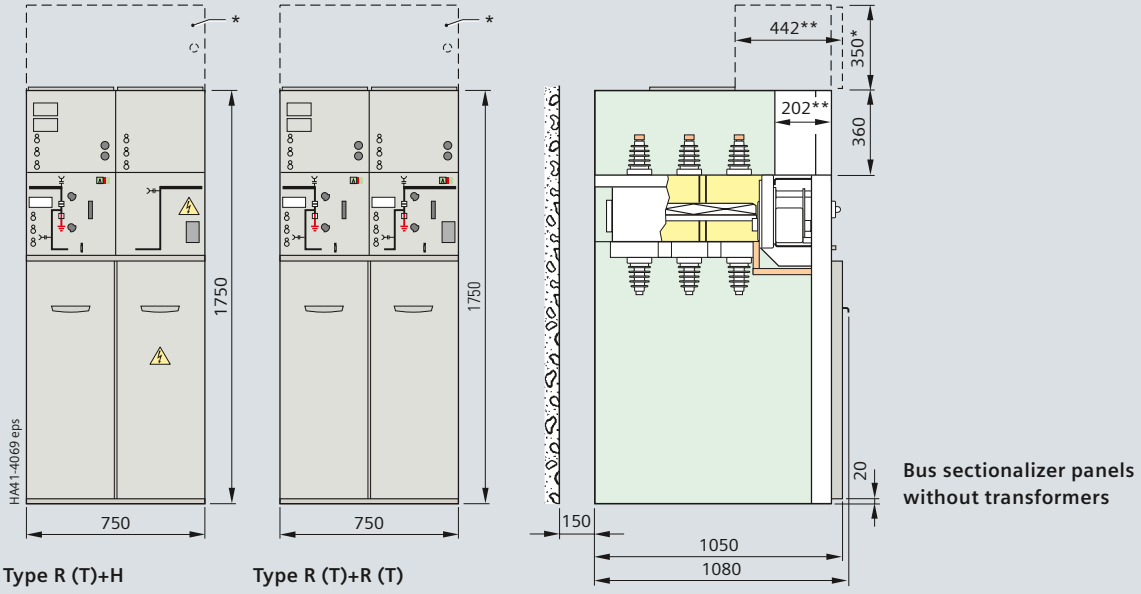


Type L1 (T)+H (=1,125 mm)

Bus sectionalizer panel 630 A with circuit-breaker

*Option:
Low-voltage compartment available in two heights:
350 mm or 550 mm

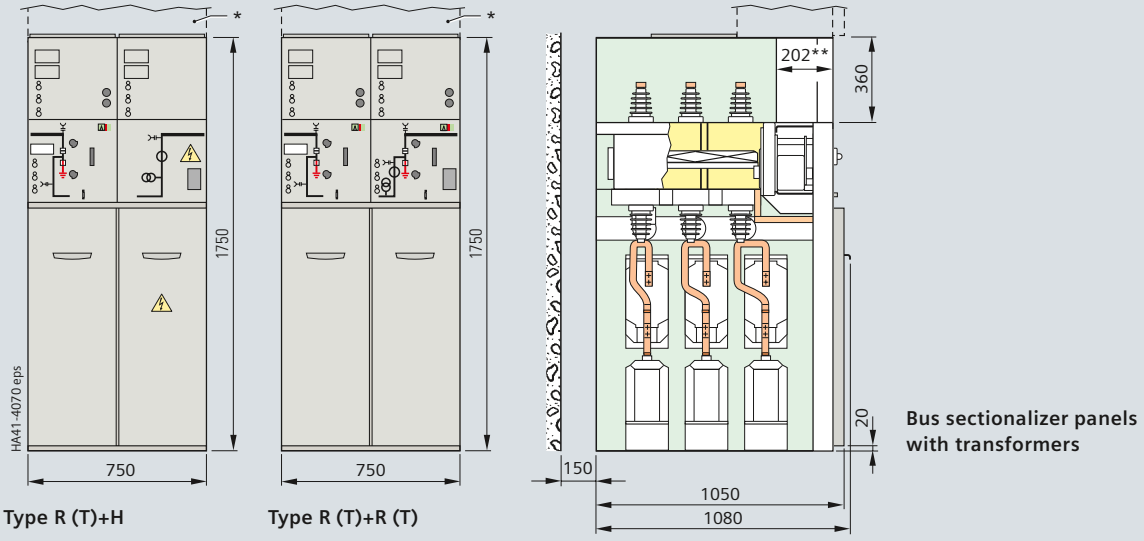
** Available mounting depth for low-voltage equipment
– Approx. 202 mm with cover
– Approx. 248 mm with extended frame cover



Type R (T)+H

Type R (T)+R (T)

Bus sectionalizer panels without transformers



Type R (T)+H

Type R (T)+R (T)

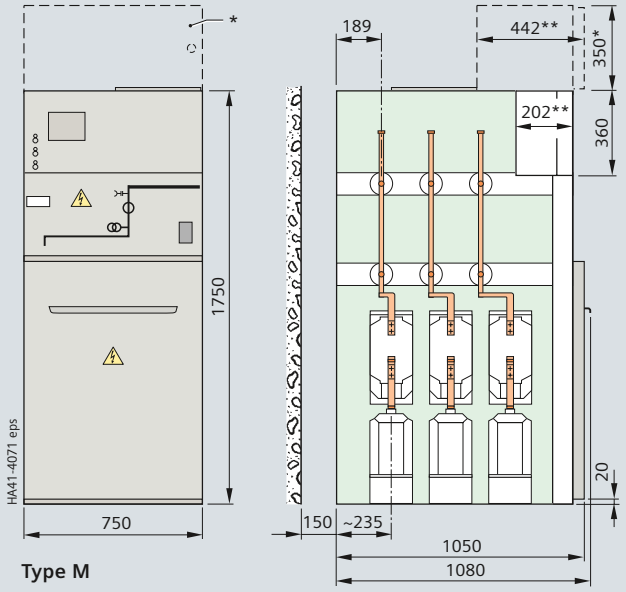
Bus sectionalizer panels with transformers

* Option:
Low-voltage compartment available in two heights:
350 mm or 550 mm

** Available mounting depth for low-voltage equipment

Dimensions

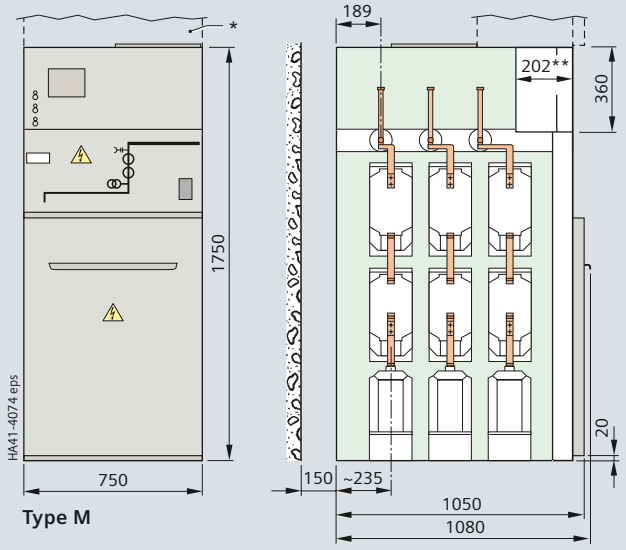
Billing metering panels



Type M

Panel design

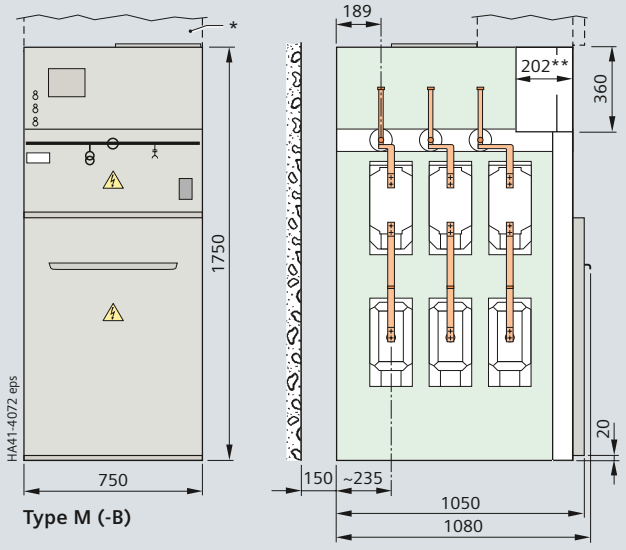
Billing metering panel
(standard)



Type M

Panel design

Billing metering panel for 2nd current transformer set



Type M (-B)

Panel design

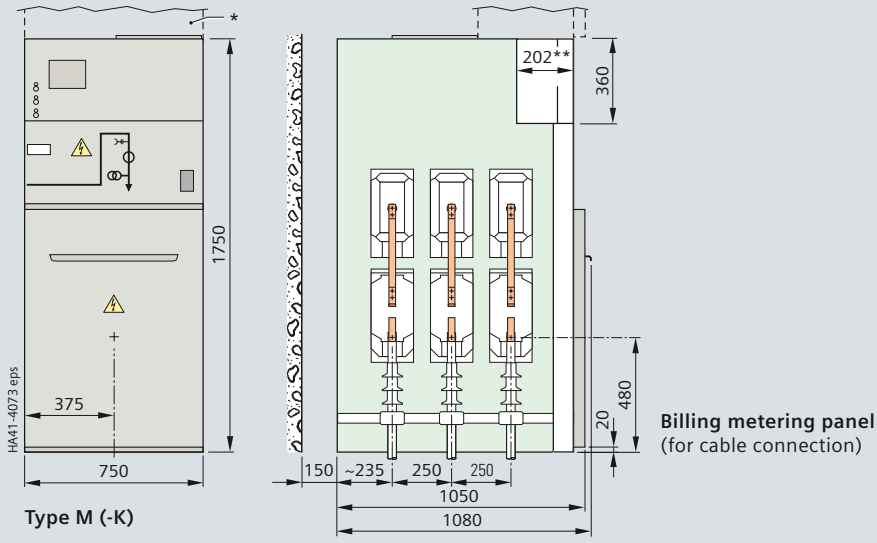
Billing metering panel
(for busbar connection)

* Option:
Low-voltage compartment available in two heights: 350 mm or 550 mm

** Available mounting depth for low-voltage equipment

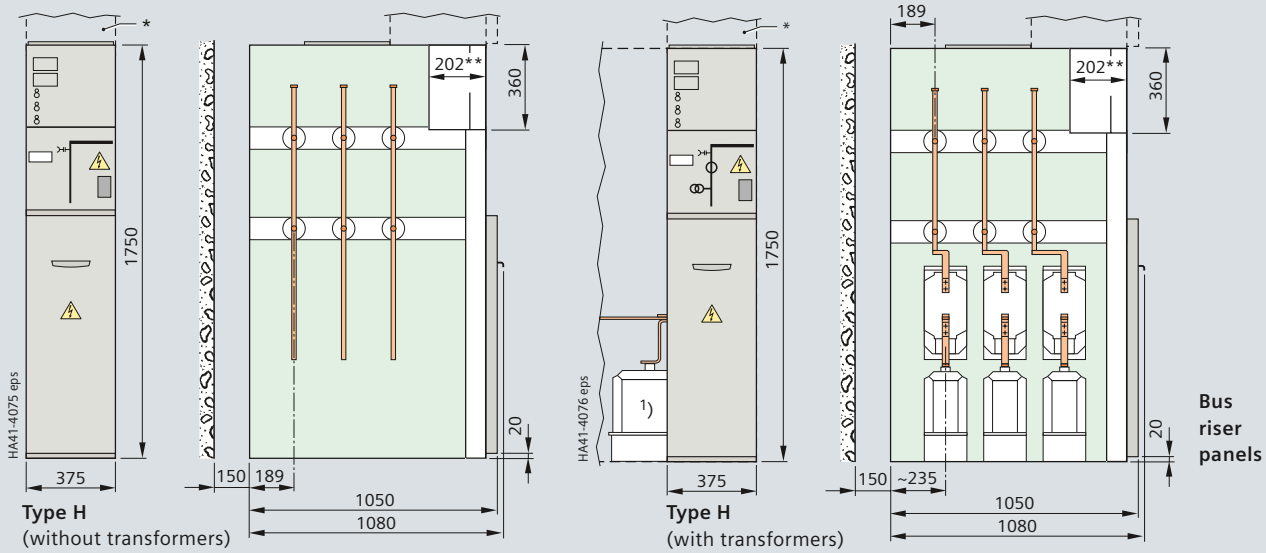
Billing metering panel, bus riser panels, busbar voltage metering panels

Panel design



Type M (-K)

Billing metering panel
(for cable connection)

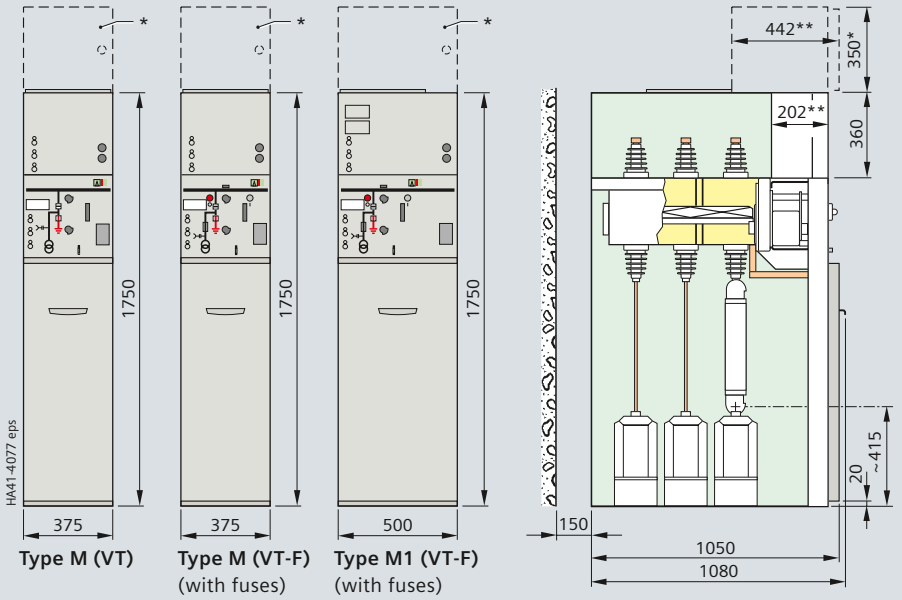


Type H
(without transformers)

Type H
(with transformers)

Bus riser panels

On request:



Type M (VT)

Type M (VT-F)
(with fuses)

Type M1 (VT-F)
(with fuses)

Busbar voltage metering panels, type M (VT-F)

* Option:
Low-voltage compartment available in two heights: 350 mm or 550 mm

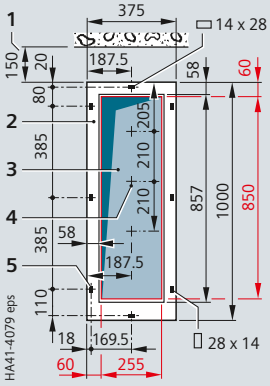
** Available mounting depth for low-voltage equipment

1) Location of voltage transformer in left-hand panel

Dimensions

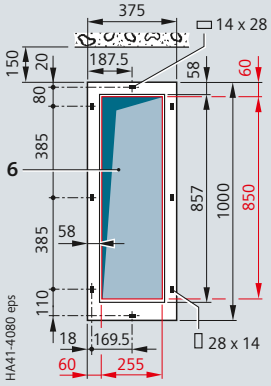
Floor openings (dimensions in red) and fixing points

For panel width 375 mm



For panel type:
R
K
T

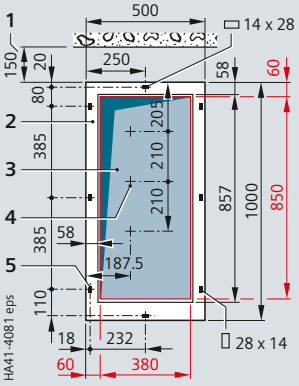
With cable connection



For panel type:
R (T)
M (VT), M (VT-F)
H

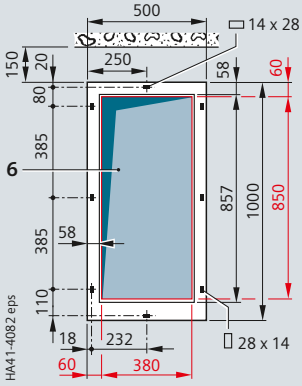
Without cable connection

For panel width 500 mm



For panel type:
R1
K1
T1
L

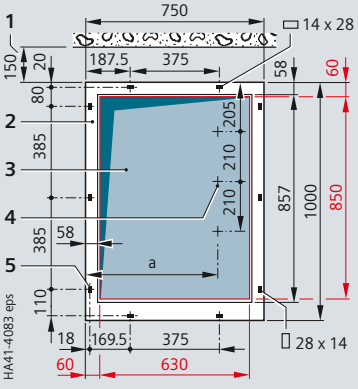
With cable connection



For panel type:
R1 (T)
M1 (VT-F)
L (T)

Without cable connection

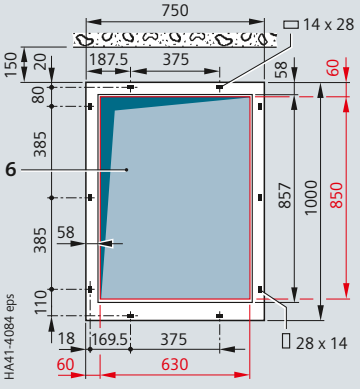
For panel width 750 mm



For panel type:
L1
M (-K)
M (-BK)

Dimension a:
562.5
375
375

With cable connection



For panel type:
L1 (T)
M
M (-B)

Without cable connection

1 Wall distance
2 Fixing frame (base) of an individual panel or panel block
3 Floor opening for high-voltage cables and, where applicable, control cables
4 Position of the led-in cables for the feeder
5 Fixing points
6 Floor opening if required for panels without cable connection

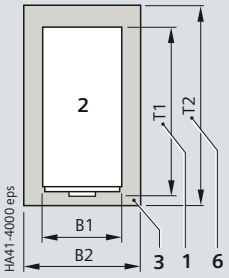
Note:
Connection of double cables: Depending on the panel type and version of the sealing end, the cable distance is approx. 110 mm.

Packing types (examples)
For size and weight of the transport units, see page 56.

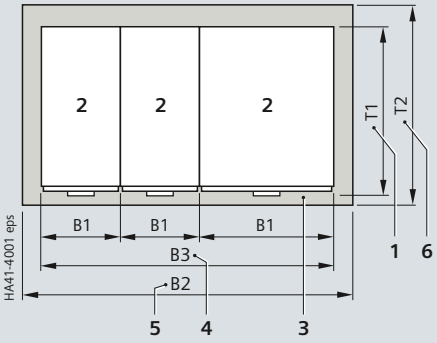
Place of destination and means of transport	Examples for packing
China / Europe by rail and truck	Type: Open PE protective foil pulled over the switchgear, with wooden base
Overseas by seafreight	Type: Seaworthy crate (standard) Welded PE protective foil, with closed wooden crate, with desiccant bag
	Type: Open for container PE protective foil pulled over the switchgear, with wooden base
Overseas by airfreight	Type: Open PE protective foil pulled over the switchgear, with wooden base and lattice or cardboard cover

Transport
SIMOSEC 12 switchgear is completely delivered in transport units. Please observe the following:
- Transport facilities on site
- Transport dimensions and weights
- Size of door openings in building
- Switchgear with low-voltage compartment: Please observe other transport dimensions and weights.

Transport units for shipping (plan view)

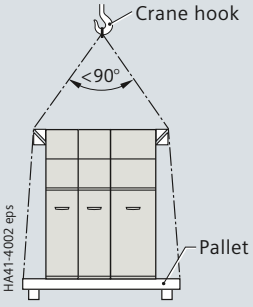


With individual panel



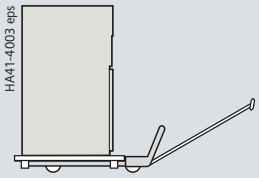
With combinations of different individual panels

Types of transport (examples)

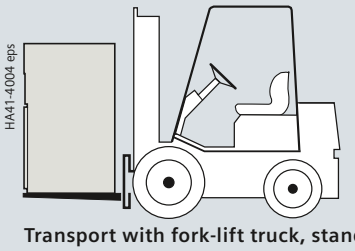


Crane transport with pallet

1 T1 = Depth of individual panel
2 Individual panel dimension B1 x T1
3 Transport unit, dimension B2 x T2
4 B3 = Overall width of combination of different individual panels
5 B2 = Width of the transport unit
6 T2 = Depth of the transport unit



Transport with lifting truck
with or without pallet



Transport with fork-lift truck, standing

Installation

Shipping data, transport

Individual panel or combinations thereof for standard switchgear (without pressure relief duct)	Panel type	Panel or panel combination		Transport unit (including packing) for standard panels (without pressure relief duct)				
		Width B1 mm	Net weight [1] approx. kg	Width B2 m	Hight m	Depth T2 m	Volume m^3	Gross weight [1] approx. kg
			with-/without LVC*/LVC*		with-/without LVC*/LVC*		with-/without LVC*/LVC*	with-/without LVC*/LVC*
Transport of individual panels								
Ring-main panel	R	375	160/220	1.08	1.95/2.3	1.40	2.95/3.48	220/280
	R1	500	180/240	1.08				240/300
Ring-main panel for panel combinations	R (T)	375	250/310	1.08				310/370
Cable panel	K	375	170/230	1.08				230/290
	K1	500	190/250	1.08				250/310
Transformer panel	T	375	180/240	1.08				240/300
	T1	500	200/260	1.08				260/320
Circuit-breaker panel 630 A	L	500	300/360	1.08				370/430
	L1	750	340/400	1.08				410/460
Bus sectionalizer panel 630 A	L (T)+H	875	320/380	1.08				390/440
Bus sectionalizer panel combination	R (T)+H	750	240/300	1.08				310/360
	R (T)+R (T) [3]	750	300/360	1.08				370/420
Bus sectionalizer panel combination	R (T)+R (T)	750	280/340	1.08				350/400
	R (T)+R (T) [3]	750	340/400	1.08				410/460
Billing metering panel standard	M	750	270/330	1.08				340/390
Billing metering panel with add. set ct's	M	750	330/390	1.08				400/450
Busbar voltage metering panel	M (VT)	375	210/270	1.08				270/330
	M (VT-F)	375	240/300	1.08				300/360
	M1 (VT-F)	500	260/320	1.08				320/380
Bus riser panel without transformers	H	375	170/230	1.08				230/290
Bus riser panel with transformers	H	375	260/320	1.08				320/380
On request: Busbar earthing panel	SE	500	260/320	1.08				320/380

For individual panel	Panel width mm	Additional weight approx. kg
Pressure relief duct for free-standing arrangement of switchgear	375	30
	500	40
	750	60

Transport dimensions of combinations of different individual panels

Transport unit: – Standard: As individual panels arranged side by side and not screwed together – Option: As multi-panel transport unit, panels screwed together Standard packing for: – Truck – Seaworthy crate, air freight	Max. width of switchgear unit "B3"	B2		T2		
	On request	0.70	1.95/2.3	1.40	1.91/2.25	
	≤ 875 mm	1.08	1.95/2.3	1.40	2.95/3.48	[2] + 70**
	≤ 1,000 mm ***	1.20	1.95/2.3	1.40	3.28/3.86	[2] + 80**
	≤ 1,500 mm	1.78	1.95/2.3	1.40	4.64/5.47	[2] + 100**
	≤ 2,125 mm	2.33	1.95/2.3	1.40	6.36/7.50	[2] + 120**
Container packing, standard (other dimensions on request)	≤ 875 mm	1.10	1.95/2.3	1.40	3.00/3.50	[2] + 80**
	≤ 2,000 mm	2.20	1.95/2.3	1.40	6.00/7.10	[2] + 120**

* Low-voltage compartment, 350 mm high, weight approx. 60 kg depending on the panel type and on the extent to which it is equipped, or optionally 550 mm high

** Packing weight

*** ≤ 1125 mm on request

1) The net weight and the gross weight depend on the extent to which the panel is equipped (e.g. current transformers, motor operating mechanisms) and are therefore given as mean value

2) Sum of the net weights of individual panels

3) Panel types with ct's and vt's

Standards

The SIMOSEC 12 switchgear complies with the relevant standards and specifications applicable at the time of type tests.
In accordance with the harmonization agreement reached by the countries of the European Community, their national specifications conform to the IEC standard.

Overview of standards (February 2009)

		IEC standard	VDE standard	EN standard	GB standard
Switchgear	SIMOSEC 12	IEC 62271-1	VDE 0671-1	EN 62271-1	GB/T 11022
		IEC 62271-200	VDE 0671-200	EN 62271-200	GB 3906
Devices	Circuit-breaker	IEC 62271-100	VDE 0671-100	EN 62271-100	GB 1984
	Disconnector and earthing switch	IEC 62271-102	VDE 0671-102	EN 62271-102	GB 1985
	Switch-disconnector	IEC 60265-1	VDE 0670-301	EN 60265-1	GB 3804
	Switch-disconnector/fuse combination	IEC 62271-105	VDE 0671-105	EN 62271-105	GB 16926
	HV HRC fuses	IEC 60282-1	VDE 0670-4	EN 60282	GB 15166.2
	Voltage detecting system	IEC 61243-5	VDE 0682-415	EN 61243-5	DL/T 538-2006 (acc. to IEC 61958-2008, similar to Chinese standard)
Degree of protection	–	IEC 60529	VDE 0470-1	EN 60529	GB 4208
Insulation	–	IEC 60071	VDE 0111	EN 60071	GB/T 311.2
Transformers	Current transformer	IEC 60044-1	VDE 0414-1	EN 60044-1	GB 1208
	Voltage transformer	IEC 60044-2	VDE 0414-2	EN 60044-2	GB 1207
Installation	–	IEC 61936-1	VDE 0101	–	–

Type of service location

SIMOSEC 12 switchgear can be used as an indoor installation in accordance with IEC 61936 (Power installations exceeding 1 kV AC) and VDE 0101

- Outside lockable electrical service locations at places which are not accessible to the public. Enclosures of switchgear can only be removed with tools.
- Inside lockable electrical service locations. A lockable electrical service location is a place outdoors or indoors that is reserved exclusively for housing electrical equipment and which is kept under lock and key. Access is restricted to authorized personnel and persons who have been properly instructed in electrical engineering.
  Untrained or unskilled persons may only enter under the supervision of authorized personnel or properly instructed persons.

Standards, specifications, guidelines, classification

Insulating capacity

- The insulating capacity is verified by testing the switchgear with rated values of short duration power-frequency withstand voltage and lightning impulse withstand voltage according to IEC 62271-1 / VDE 0671-1 and GB 11022 (see table "Insulating capacity").
- The rated values are referred to sea level and to normal atmospheric conditions (1013 hPa, 20 °C, 11 g/m³ humidity in accordance with IEC 60071 and VDE 0111).
- The insulating capacity decreases with increasing altitude. For site altitudes above 1,000 m (above sea level) the standards do not provide any guidelines for the insulation rating. Instead, special regulations apply to these altitudes.
- Site altitude

– As the altitude increases, the insulating capacity of insulation in air decreases due to the decreasing air density. This reduction is permitted up to a site altitude of 1,000 m according to IEC and VDE.

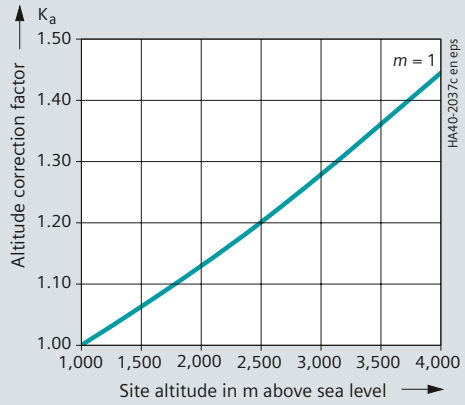
– For site altitudes above 1,000 m a higher insulation level must be selected. It results from the multiplication of the rated insulation level for 0 to 1,000 m with the altitude correction factor K_a.

Table – Insulating capacity

Rated voltage (rms value)	kV	7.2	12	
Rated short-duration power-frequency withstand voltage (rms value)				
– Across isolating distances	kV	23	32	48 Δ
– Between phases and to earth	kV	20	28	42 Δ
Rated lightning impulse withstand voltage (peak value)				
– Across isolating distances	kV	70	85	
– Between phases and to earth	kV	60	75	

Altitude correction factor K_a

For site altitudes above 1,000 m, the altitude correction factor K_a is recommended, depending on the actual site altitude above sea level.



Rated short-duration power-frequency withstand voltage for site altitudes > 1,000 m to be selected

≥ Rated short-duration power-freq. withstand volt. up to ≤ 1,000 m · K_a

Rated lightning impulse withstand voltage for site altitudes > 1,000 m to be selected

≥ Rated lightning impulse withstand voltage up to ≤ 1,000 m · K_a

Example 1:
3,000 m site altitude above sea level
17.5 kV switchgear rated voltage
95 kV rated lightning impulse withstand voltage
Rated lightning impulse withstand volt. to be selected 95 kV · 1.28 = 122 kV
Result:
According to the above table, a switchgear for a rated voltage of 24 kV with a rated lightning impulse withstand voltage of 125 kV is to be selected.

Example 2:
2,750 m site altitude above sea level
7.2 kV switchgear rated voltage
60 kV rated lightning impulse withstand voltage
Rated lightning impulse withstand volt. to be selected 60 kV · 1.25 = 75 kV
Result:
According to the above table, a switchgear for a rated voltage of 12 kV with a rated lightning impulse withstand voltage of 75 kV is to be selected.

Δ Value according to GB standard

Cable testing

- For circuit-breaker and switch-disconnector feeders
- DC voltage test
  Before the test:
  Remove or disconnect any voltage transformers at the cable-connection in SIMOSEC 12 switchgear.
- SIMOSEC 12 switchgear for rated voltages up to 12 kV can be subjected to cable tests at a max. DC test voltage of 38 kV according to VDE. The voltage at the busbar may be 12 kV in this case.
- For cable testing

– the installation and operating instructions of the switchgear
– the standards IEC 62271-200/VDE 0671-200 Section 5.105 *
– the information on manufacturer-dependent cable sealing ends
– the cable version (e.g. paper-insulated massimpregnated cables, PVC cables or XLPE cables)
– must be observed.

Test voltages:

Rated voltage	U_0 / U (U_m)	Max. test voltage applied to cable		
		VLF [1], 0.1 Hz	acc. to IEC	VDE 0278
		3 xU_0 U_{LF}	U =	6 x U_0, 15 min. max. U =
U_r (kV)	(kV)	AC (kV)	DC (kV)	DC (kV)
12	6/10 (12)	19	24	38 [2]

Climate and ambient conditions

SIMOSEC 12 switchgear may be used, subject to possible additional measures – e.g. panel heaters or floor covers – under the following ambient conditions and climate classes:

- Ambient conditions

– Natural foreign materials
– Chemically active pollutants
– Small animals

- Climate classes
  The climate classes are classified according to IEC 60721-3-3.

SIMOSEC 12 switchgear is largely insensitive to climate and ambient conditions by virtue of the following features:

- No cross insulation for isolating distances between phases
- Metal enclosure of switching devices (e.g. three-position switch) in gas-filled stainless-steel switchgear vessel
- Dry-type bearings in operating mechanism
- Essential parts of the operating mechanism made of corrosion-proof materials
- Use of climate-independent three-phase current transformers.

Classification of the SIMOSEC 12 switchgear according to IEC 62271-200 and GB 3906 *

Construction and design

Partition class	PM (partition of metal)
Loss of service continuity category [3] Panels • With HV HRC fuses • Without HV HRC fuses • In a SIMOSEC 12 switchgear, panel types M or H are also part of the busbar. According to IEC 62271-200 a category is not applicable	 LSC 2A LSC 2B –
Accessibility to compartments • Busbar compartment • Switching-device compartment • Low-voltage compartment • Cable connection compartment – Without HV HRC fuses – With HV HRC fuses	 Tool-based Non-accessible Tool-based Tool-based Interlock-controlled and tool-based

Color of panel front

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

Terms

"Make-proof earthing switches" are earthing switches with short-circuit making capacity according to
– IEC 62271-102 and
– VDE 0671-102.

* Standards see page 57

1) VLF = very low frequency

2) Referred to: U_0 / U (U_m = 6.35/11 (12) kV)

3) The loss of service continuity category always refers to the complete switchgear, i.e. the panel with the lowest category determines the loss of service continuity category of the complete switchgear

Standards

Standards, specifications, guidelines

Protection against solid foreign objects, electric shock and water

SIMOSEC 12 switchgear fulfills according to the standards *

IEC/EN 62271-1	VDE 0671-1
IEC/EN 62271-200	VDE 0671-200
IEC/EN 60529	EN 60529

the following degrees of protection (for explanations, see opposite table):

Degree of protection	Type of protection
IP2X (standard)	for switchgear enclosure
IP3X (option)	for switchgear enclosure (optional)
IP3XD (option on request)	for switchgear enclosure (on request)
IP65	for parts of the primary circuit under high voltage

IEC/EN 60529:

Type of protection	Degree of protection

Standard: **IP 2 X**

Protection against solid foreign objects

Protected against solid objects of 12.5 mm diameter and greater (The object probe, sphere of 12.5 mm diameter, shall not fully penetrate)

Protection against access to hazardous parts

Protected against access to hazardous parts with a finger (The jointed test finger of 12 mm diameter, 80 mm length, shall have adequate clearance from hazardous parts)

Protection against water

No definition

Option: **IP 3 X**

Protection against solid foreign objects

Protected against solid foreign objects of 2.5 mm diameter and greater (The object probe, sphere of 2.5 mm diameter, shall not penetrate at all)

Protection against access to hazardous parts

Protected against access to hazardous parts with a tool (The access probe of 2.5 mm diameter shall not penetrate)

Protection against water

No definition

Option on request: **IP 3 X D**

Protection against solid foreign objects

Protected against solid foreign objects of 2.5 mm diameter and greater (The object probe, sphere of 2.5 mm diameter, shall not penetrate at all)

Protection against water

No definition

Protection against access to hazardous parts

Protected against access with a wire (The access probe of 1.0 mm diameter, 100 mm length, shall have adequate clearance from hazardous parts)

IP 6 5

Protection against solid foreign objects

Dust-tight (No ingress of dust)

Protection against access to hazardous parts

Protected against access to hazardous parts with a wire (The access probe of 1.0 mm diameter shall not penetrate)

Protection against water

Protected against water jets (Water projected in jets against the enclosure from any direction shall have no harmful effects)

* Standards see page 57

Notes

Responsible for

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