



# Metal-Enclosed Interrupter Switchgear Type SIMOSEC, up to 27.6 kV, ANSI, **Air-Insulated**, Extendable

Medium-Voltage Switchgear

Catalog HA 41.31 · 2008

Answers for energy.

**SIEMENS**

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SIMOSEC ANSI switchgear

# Application

## Typical uses

R-HA41-103 eps



R-HA41-085 eps

R-HA41-110 eps



R-HA41-111 eps



R-HA41-112 eps

# Application, Requirements

## Features

SIMOSEC ANSI switchgear is a factory-assembled, type-tested, three-phase, metal-enclosed, indoor switchgear according to ANSI/IEEE C37.20.3 \* for single busbars.

### Typical uses

SIMOSEC ANSI switchgear is used for power distribution in distribution systems with feeder currents up to 1200 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

- Office parks
- Airports
- Underground railway stations
- Sewage treatment plants
- Schools
- Shopping centers
- Petroleum industry
- Chemical industry
- Industrial plants
- Textile, paper and food industry

### Modular design

- Individual panels, for free combination and extension

### Technical features

- Air-insulated indoor switchgear
- Gas-insulated, maintenance-free switching functions for the two/three-position switch
- Three-pole primary enclosure
- Phases arranged one behind the other
- No cross-insulation between phases
- Busbar system at the top or bottom, as required by application
- Air-insulated busbar and cable connection system
- Two/three-position switch, metal-enclosed, with air-insulated primary terminals and gas-insulated switching functions
- Hermetically-sealed (welded) stainless-steel switchgear vessel,
  - For switching devices
  - With welded-in bushings (for electrical connections and mechanical components)
  - With insulating gas SF<sub>6</sub>
- Metal-enclosed design
- Pressure relief
  - To the rear and upwards
  - Separately for each compartment
- Air-insulated cable connection system for conventional cable lugs
- Three-phase current transformer, factory-assembled on the feeder bushings
- Integrated low-voltage niche (standard) for installation of low-voltage devices
  - E.g. terminals, pushbuttons
  - MCBs
- Option: Space heaters for severe ambient conditions, e.g. condensation

### Reliability

- Type (design) tested with third-party witness
- Standardized and manufactured using numerically controlled machines
- Quality management system according to ISO 9001
- More than 500,000 switchgear panels 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 switchgear
- HV CL fuses and cable terminations are only accessible when the outgoing feeders are grounded
- Logical mechanical interlocking
- Capacitive voltage detection system for verification of safe isolation from supply
- Grounding of outgoing feeders by means of make-proof grounding switches

### Security of operation

- Components, e.g., operating mechanisms, three-position switches proven for years
- Metal-enclosed panels plus metal compartmentalization between busbar and switching device and between switching device and cable connection 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 bushings for cable connection, busbar and operating mechanism
- Switch operating mechanisms outside switchgear vessel
- Maintenance-free operating mechanism parts

- Mechanical switch position indications integrated in mimic diagram
- Switchgear interlocking system with logical mechanical interlocks

### Life-cycle cost-efficiency

Extremely low life-cycle costs and extremely high availability throughout the entire product service life cycle as a result of:

- Two/three-position switch with gas-insulated quenching principle
- Minimum space requirement
- Easy switchgear extension

### Electrical features

- Rated voltages up to 27.6 kV
- Rated short-circuit current (fused) up to 63 kA at 15 kV and below, and 20 kA at 27.6 kV
- Rated short-time withstand current up to 20 kA, 2 second or 25 kA, 2 seconds
- Rated normal current of feeders
  - Up to 600 A (feeders)
  - Up to 1200 A (panel without switch)
- Rated normal current of busbar up to 1200 A

\* Standards see page 40

# Technical Data

## Electrical data of panels, pressure values, temperature

### Complete switchgear

Rated insulation level	Rated voltage $U_r$	kV	<b>4.76</b>	<b>15</b>	<b>27.6</b>		
	Rated short-duration (one minute) power-frequency withstand voltage $U_{dr}, r_{ms}$	kV	19	36	60		
	Rated lightning impulse withstand voltage $U_{pr}$ , peak	kV	60	95	125		
Rated frequency $f_r$		Hz	50/60				
Rated continuous current $I_r$ <sup>1)</sup> of busbar	On request	A	600				
	Standard	A	1200				
Rated short-circuit current	for switchgear with all feeders fused (panel type FS)	kA (sym)	63	63	20		
		kA (asym)	101	101	32		
		kA (peak)	164	164	52		
Rated short-time withstand current $I_k$ <sup>6)</sup>	for switchgear with $t_k = 2$ s rated duration	up to kA	20	25	20	25	20
Rated peak withstand current $I_p$ <sup>6)</sup>		up to kA	52	65	52	65	52
Rated filling pressure $p_{re}$ <sup>2)</sup>		PSI (kPa)	21.8 (150)				
Minimum operating pressure $p_{me}$ <sup>2)</sup>		at 20 °C/68 °F (absolute)	18.9 (130)				
Ambient temperature $T$	for panels without secondary equipment	°C/°F	-30 to +40 / -22 to +104				

### Cable switch panel type CS, cable connection panel type CC, cable grounding panel type CG

Rated voltage $U_r$		kV	<b>4.76</b>	<b>15</b>	<b>27.6</b>		
Rated continuous current $I_r$ <sup>1)</sup>	for panel type CS, CG	A	600				
	only for panel type CC	A	600, 1200				
Rated fault closing current $I_{ma}$ <sup>6)</sup>	only for panel type CS	kA (asym)	32	40	32	40	32
		kA (peak)	52	65	52	65	52

### Fuse panel types FS, FU

Rated voltage $U_r$		kV	<b>4.76</b>	<b>15</b>	<b>27.6</b>
Rated continuous current $I_r$ <sup>1) 4)</sup>	for feeder	A	200, 600		
Rated peak withstand current $I_p$ <sup>5)</sup>		up to kA	164	164	52
Rated fault closing current $I_{ma}$ <sup>5)</sup>	only for panel type FS	kA (asym)	101	101	32
		kA (peak)	164	164	52
Reference dimension "e" <sup>3)</sup>	for HV CL (current limiting) fuses	mm/inch	537/21.1		
Maximum fuse rating	for panel FS-1	A	450E	200E	65E
	for panel FS-2	A	two 350E	two 200E	two 65E
	for panel FS-3	A	three 200E	three 200E	three 65E

### Busbar grounding panel type BG

Rated voltage $U_r$		kV	<b>4.76</b>	<b>15</b>	<b>27.6</b>		
Rated fault closing current $I_{ma}$ <sup>6)</sup>		kA (asym)	32	40	32	40	32
		kA (peak)	52	65	52	65	52

### Busbar voltage metering switch panel types MS2, MS3

Rated voltage $U_r$		kV	<b>4.76</b>	<b>15</b>	<b>27.6</b>		
Rated peak withstand current $I_p$ <sup>5)</sup>		up to kA	52	65	52	65	52
Rated fault closing current $I_{ma}$ <sup>5)</sup>		kA (asym)	32	40	32	40	32
		kA (peak)	52	65	52	65	52

### Metering panel types MT3, MC3, bus riser panel BR

Rated voltage $U_r$		kV	<b>4.76</b>	<b>15</b>	<b>27.6</b>
Rated continuous current $I_r$ <sup>1)</sup>		A	600, 1200		

- 1) The rated continuous currents apply to ambient temperatures of 40 °C/104 °F.
- 2) Pressure values for SF<sub>6</sub>-insulated vessels.
- 3) The fuse assembly is designed for a reference dimension "e" = 537 mm/21.1 inch. With reference dimension "e" = 442 mm/17.4 inch, an extension tube (95 mm/3.7 inch long) is required.
- 4) Depending on the HV CL fuse links.
- 5) Fused
- 6) Without fuses

# Technical Data

## Switchgear installation

### Room planning

#### Switchgear installation

- Wall-standing or 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
  - Height of the panel

#### Switchgear fastening

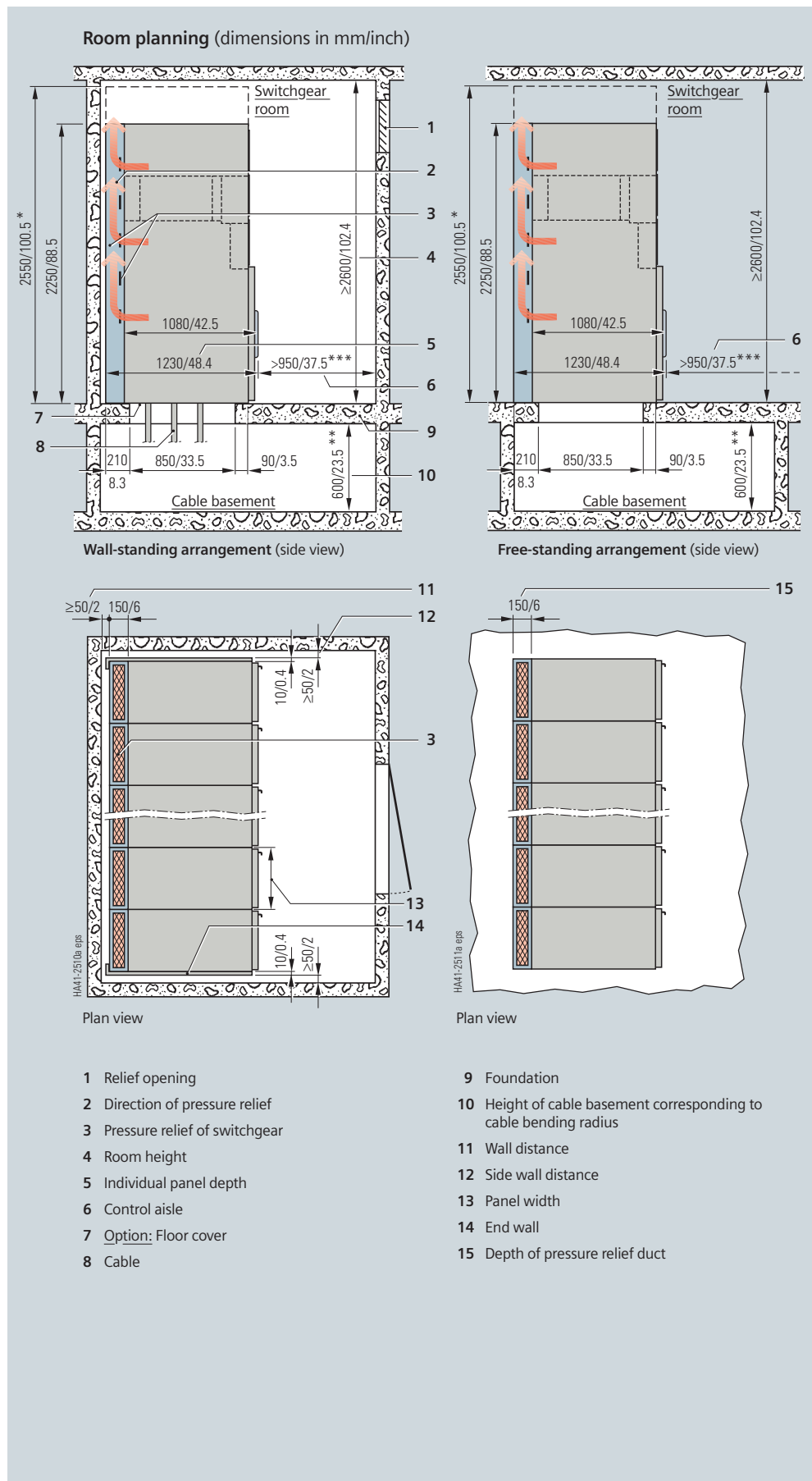
- For floor openings and fixing points of the switchgear, see page 39
- Foundations:
  - Steel structure
  - Steel-reinforced concrete

#### Panel dimensions

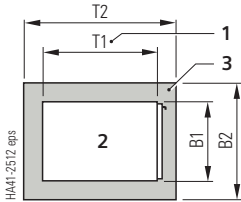
See pages 30 to 38

#### Weight

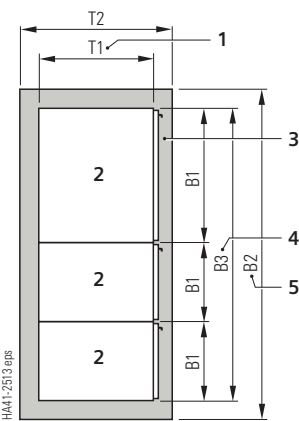
The weight of a panel depends on the extent to which it is equipped (e.g. with motor operating mechanism, voltage transformer). For details, please refer to page 7.



### Transport units for shipping (plan view)



With individual panel



With combinations of different individual panels

- 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

### Transport of individual panels

Panel type		Weight kg/lb	Width B1 mm / inch	Height H1 mm / inch	Depth T1 mm / inch
Cable switch panel	CS1	180/397	375 / 14.8	2250 / 88.6	1230 / 48.4
	CS2	205/452	500 / 19.7	2250 / 88.6	1230 / 48.4
Fuse switch panel	FS1	205/452	375 / 14.8	2250 / 88.6	1230 / 48.4
	FS2	230/507	500 / 19.7	2250 / 88.6	1230 / 48.4
	FS3	250/551	750 / 29.5	2250 / 88.6	1230 / 48.4
Fuse panel	FU1	160/353	375 / 14.8	2250 / 88.6	1230 / 48.4
	FU2	185/408	500 / 19.7	2250 / 88.6	1230 / 48.4
	FU3	210/463	750 / 29.5	2250 / 88.6	1230 / 48.4
Cable connection panel	CC1	145/320	375 / 14.8	2250 / 88.6	1230 / 48.4
	CC2	170/375	500 / 19.7	2250 / 88.6	1230 / 48.4
Cable grounding panel	CG1	180/397	375 / 14.8	2250 / 88.6	1230 / 48.4
	CG2	205/452	500 / 19.7	2250 / 88.6	1230 / 48.4
Metering panel	MT3	420/926	750 / 29.5	2250 / 88.6	1230 / 48.4
Metering cable panel	MC3	420/926	750 / 29.5	2250 / 88.6	1230 / 48.4
Metering switch panel	MS2	350/772	500 / 19.7	2250 / 88.6	1230 / 48.4
	MS3	420/926	750 / 29.5	2250 / 88.6	1230 / 48.4
Bus riser panel	BR1	145/320	375 / 14.8	2250 / 88.6	1230 / 48.4
	BR2	170/375	500 / 19.7	2250 / 88.6	1230 / 48.4
Busbar grounding panel	BG1	180/397	375 / 14.8	2250 / 88.6	1230 / 48.4

### Transport of combinations of different individual panels

Transport unit	Overall width B3	Weight *	Width B2	Height H2 **	Depth T2	Volume B2 x H2 x T2
	mm / inch	kg/lb	mm / inch	mm / inch	mm / inch	m <sup>3</sup> / yd <sup>3</sup>
Transport unit	≤ 750 / 29.5	70/155	1100 / 43.3	2450 / 96.5	1400 / 56.1	3.8 / 5.0
Transport unit	≤ 1750 / 58.9	120/265	2200 / 86.6	2450 / 96.5	1400 / 56.1	7.6 / 10.0

Top case necessary for cable top entry, delivered in accessory bag

### Packing, transport (examples)

Packing	Version	For supply	Transport
Panels mounted on wooden floor and covered with protection sheeting	For container	Overseas	Ship + truck

\* Additional packing weight in kg/lb (without weight of panels)

\*\* Transport unit for air freight, height H2 2610 mm/102.8 inch and width B2 1700 mm/66.9 inch

# Product Range

## Product range overview

### Standard panels



Cable switch panel  
type CS



Fuse switch panel  
type FS



Cable connection panel  
type CC

Panel designation	Panel type	Panel width
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Column No.

Cable switch panel	CS1	375 mm / 14.8"
	CS2	500 mm / 19.7"
Fuse switch panel	FS1	375 mm / 14.8"
	FS2	500 mm / 19.7"
	FS3	750 mm / 29.5"
Fuse panel	FU1	375 mm / 14.8"
	FU2	500 mm / 19.7"
	FU3	750 mm / 29.5"
Cable connection panel	CC1	375 mm / 14.8"
	CC2	500 mm / 19.7"
Cable grounding panel (= cable connection panel with grounding switch)	CG1	375 mm / 14.8"
	CG2	500 mm / 19.7"
Metering panel	MT3	750 mm / 29.5"
Metering cable panel	MC3	750 mm / 29.5"
Metering switch panel	MS2	500 mm / 19.7"
	MS3	750 mm / 29.5"
Bus riser panel	BR1	375 mm / 14.8"
	BR2	500 mm / 19.7"
Busbar grounding panel	BG1	375 mm / 14.8"



# Product Range

## Equipment features

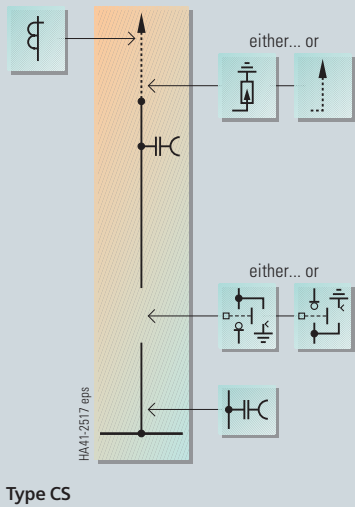
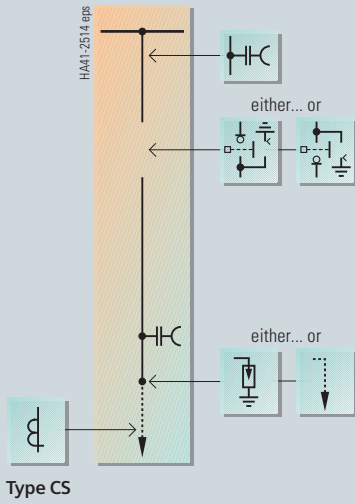
	Two-position switch-disconnector (CLOSED-OPEN) Three-position switch-disconnector (CLOSED-OPEN-GROUNDED) Grounding switch (GROUNDED-OPEN) Manual operating mechanism Stored-energy mechanism with stored-energy mechanism Stored-energy mechanism operated by shunt release Signal energy mechanism – electrical tripping by time delay relay Signal switch (1NO) for remote electrical ready-for-service indication Auxiliary fuse blown Motor operating mechanism (CLOSED-OPEN-GROUNDED) Local remote switch Cable compartment cover with inspection window Cable compartment cover with infrared window Interlocking – closing if the door is open Interlocking – closing not possible if the door is open is installed and intact C-rail to fix cable C-rail with brackets to fix cable Floor cover Heating Heating with thermostat Heating with humidistat Panel type																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
CS1	•	○	–	•	○	○	–	–	○	–	○	○	○	○	○	–	○	–	○	○	○	○	○	○
CS2	•	○	–	•	○	○	–	–	○	–	○	○	○	○	○	–	○	–	○	○	○	○	○	○
FS1	•	○	–	•	○	○	○	○	○	○	○	○	○	○	○	○	–	○	○	○	○	○	○	○
FS2	•	○	–	•	○	○	○	○	○	○	○	○	○	○	○	○	–	○	○	○	○	○	○	○
FS3	•	○	–	•	○	○	○	○	○	○	○	○	○	○	○	○	–	○	○	○	○	○	○	○
FU1	–	–	–	–	–	–	–	–	–	○	–	–	–	○	○	–	–	–	○	○	○	○	○	○
FU2	–	–	–	–	–	–	–	–	–	○	–	–	–	○	○	–	–	–	○	○	○	○	○	○
FU3	–	–	–	–	–	–	–	–	–	○	–	–	–	○	○	–	–	–	○	○	○	○	○	○
CC1	–	–	–	–	–	–	–	–	–	–	–	–	–	○	○	–	–	–	○	○	○	○	○	○
CC2	–	–	–	–	–	–	–	–	–	–	–	–	–	○	○	–	–	–	○	○	○	○	○	○
CG1	–	–	•	•	–	–	–	–	○	–	○	–	–	○	○	–	–	–	○	○	○	○	○	○
CG2	–	–	•	•	–	–	–	–	○	–	○	–	–	○	○	–	–	–	○	○	○	○	○	○
MT3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	○	○
MC3	–	–	–	–	–	–	–	–	–	–	–	–	–	○	○	–	–	–	○	○	○	○	○	○
MS2	–	•	–	–	•	–	–	–	○	–	○	○	○	–	–	–	–	–	–	–	○	○	○	○
MS3	–	•	–	–	•	–	–	–	○	–	○	○	○	–	–	–	–	–	–	–	○	○	○	○
BR1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	○	○
BR2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	○	○
BG1	–	–	•	•	–	–	–	–	○	–	○	–	–	–	–	–	–	–	–	–	–	○	○	○

- Basic equipment
- Additional (optional) equipment
- Not available

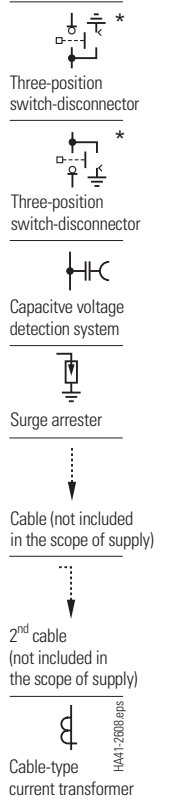
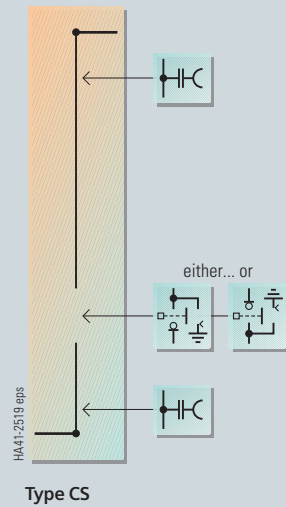
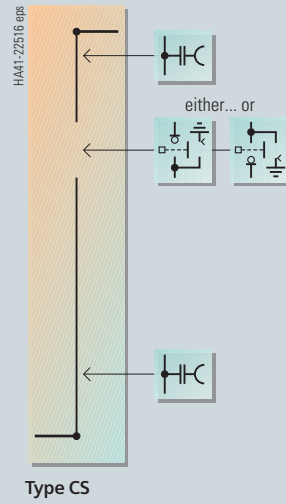
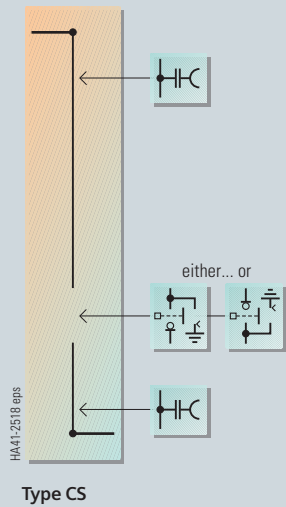
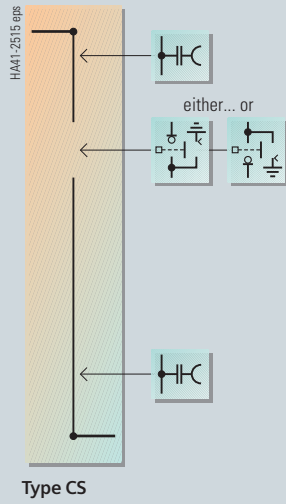
# Product Range

## Cable switch panel

### Cable switch panel as feeder panel



### Cable switch panel as transfer panel



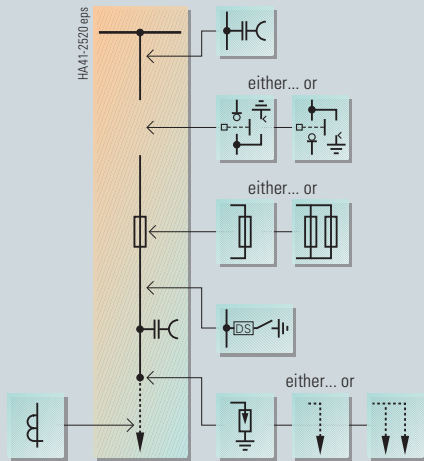
Note: For detailed design, please contact your local Siemens partner.

\* Switch-disconnector as:  
 – two-position switch-disconnector  
 – three-position switch-disconnector

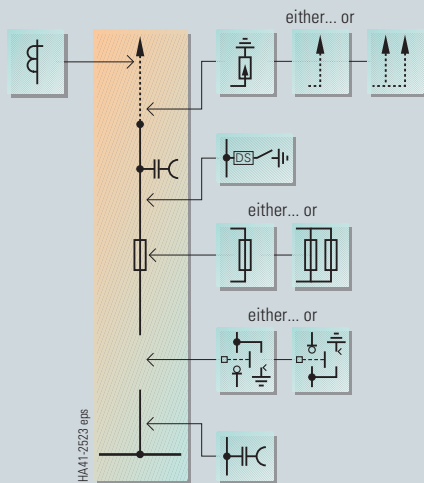
# Product Range

## Fuse switch panel

### Fuse switch panel as feeder panel

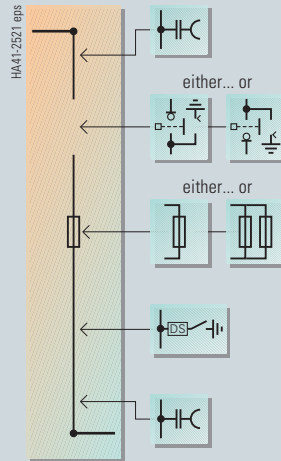


Type FS

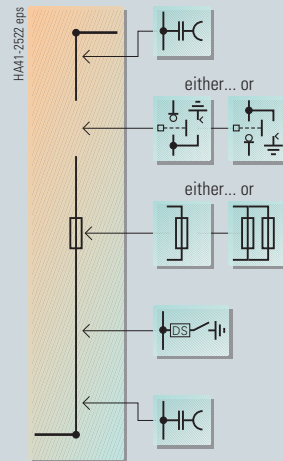


Type FS

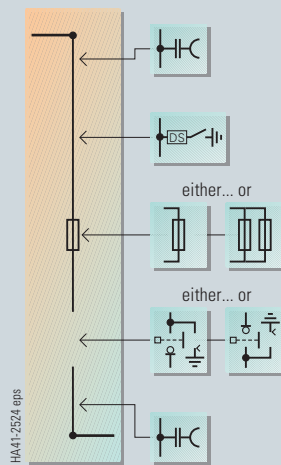
### Fuse switch panel as transfer panel



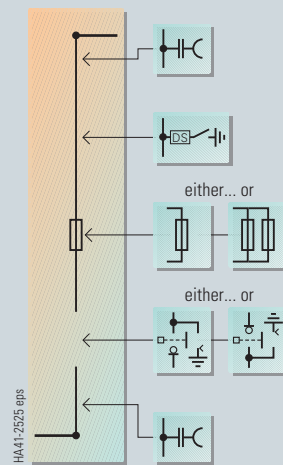
Type FS



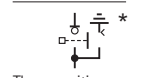
Type FS



Type FS



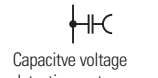
Type FS



Three-position switch-disconnector \*



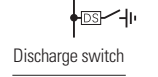
Three-position switch-disconnector \*



Capacitive voltage detection system



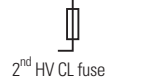
Surge arrester



Discharge switch



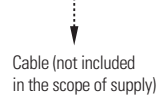
HV CL fuse



2<sup>nd</sup> HV CL fuse



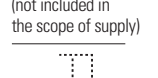
2<sup>nd</sup> and 3<sup>rd</sup> HV CL fuse



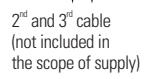
Cable (not included in the scope of supply)



2<sup>nd</sup> cable (not included in the scope of supply)



2<sup>nd</sup> and 3<sup>rd</sup> cable (not included in the scope of supply)



Cable-type current transformer HA41-2808 eps

Cable-type current transformer

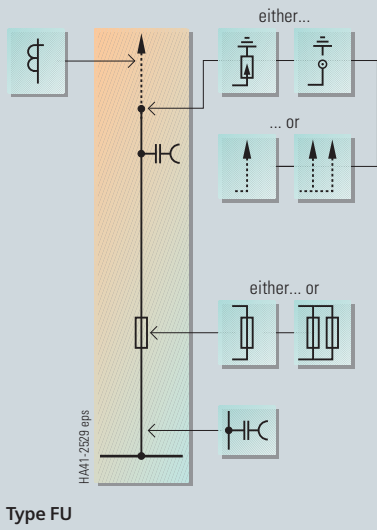
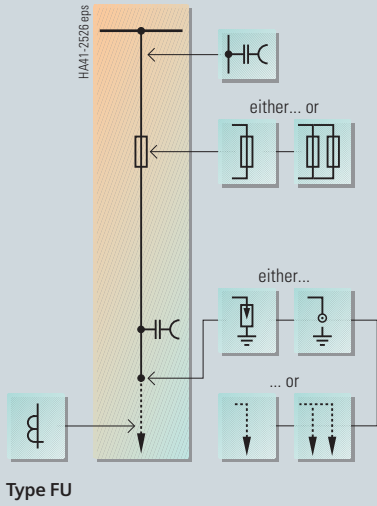
\* Switch-disconnector as:  
 – two-position switch-disconnector  
 – three-position switch-disconnector

Note: For detailed design, please contact your local Siemens partner.

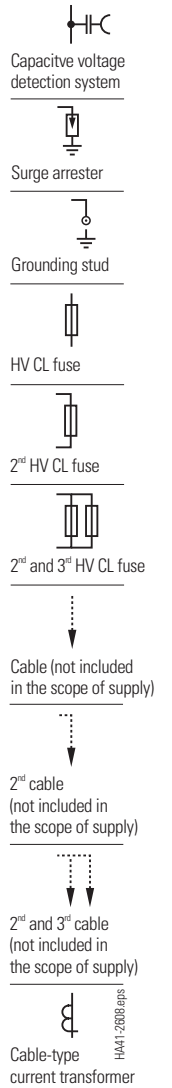
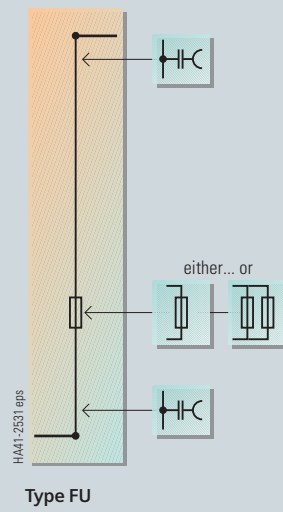
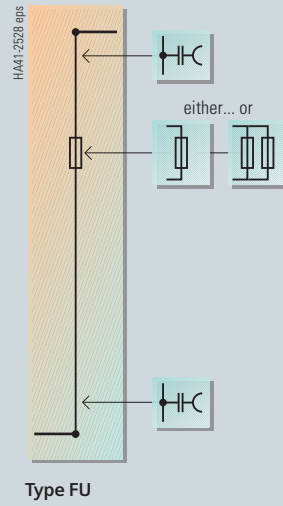
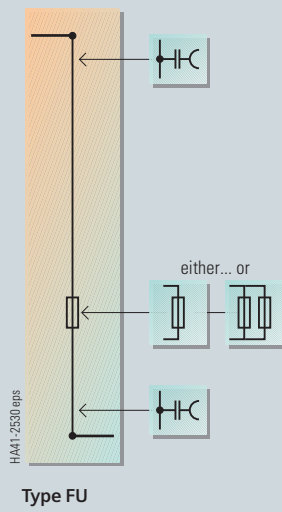
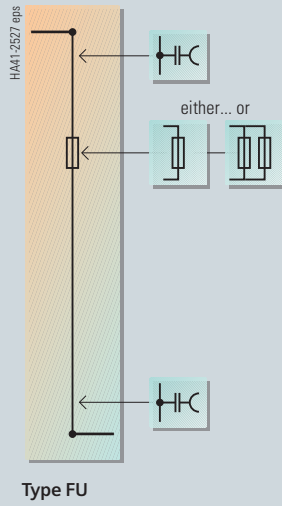
# Product Range

## Fuse panel

### Fuse panel as feeder panel



### Fuse panel as transfer panel

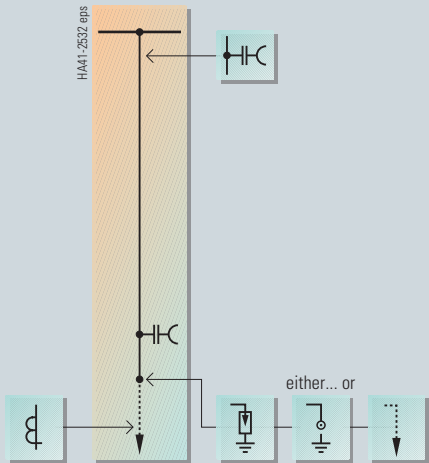


Note: For detailed design, please contact your local Siemens partner.

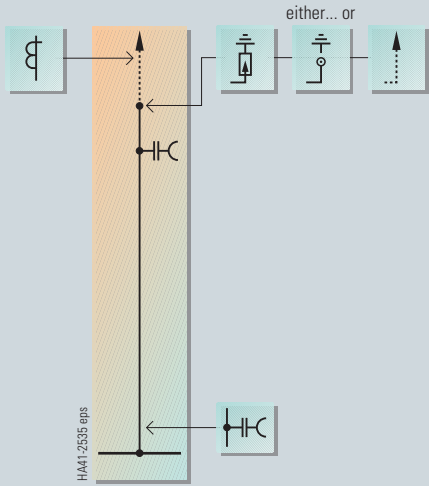
# Product Range

## Cable connection panel

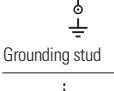
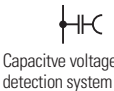
### Cable connection panel as feeder panel



Type CC

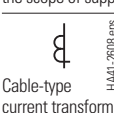


Type CC



Cable (not included in the scope of supply)

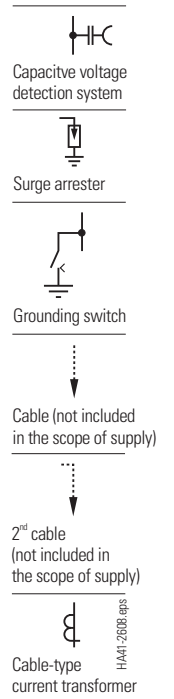
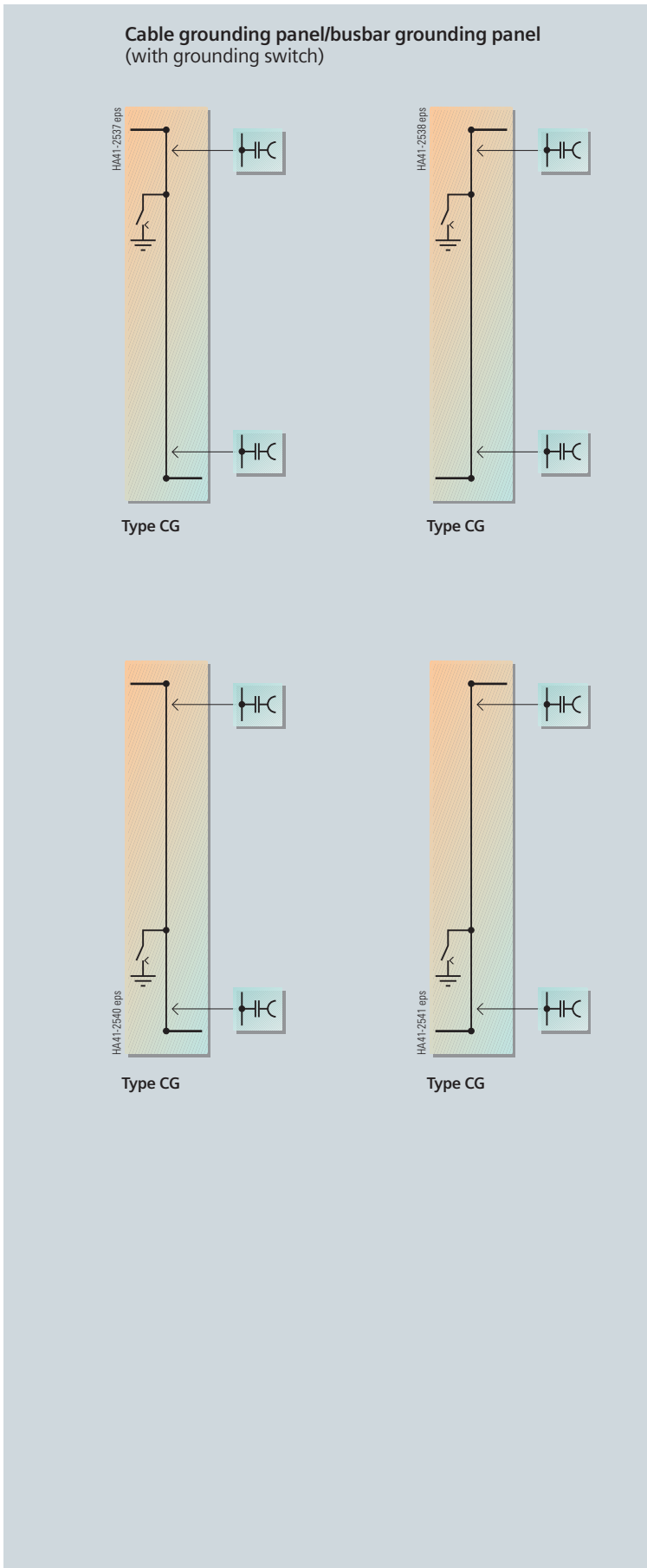
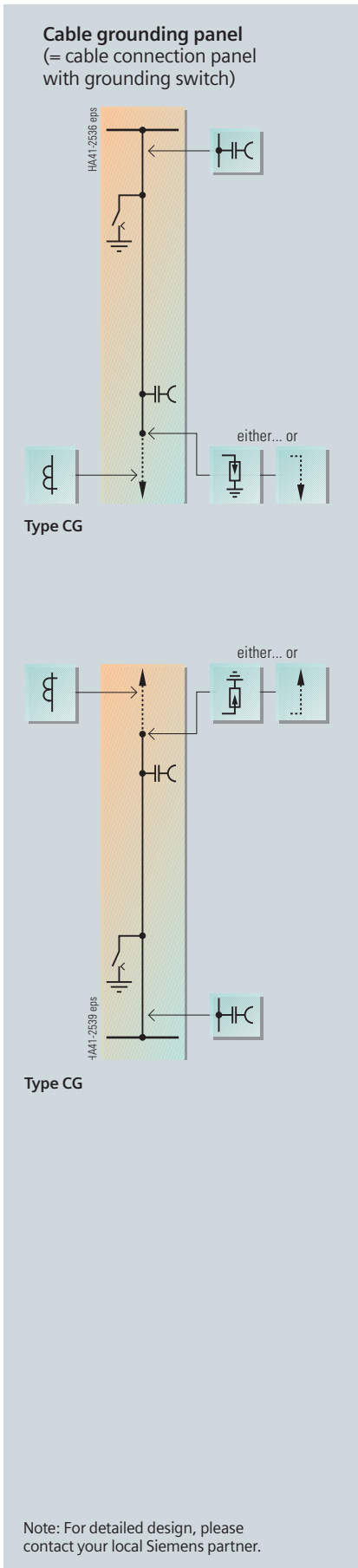
2<sup>nd</sup> cable (not included in the scope of supply)



Note: For detailed design, please contact your local Siemens partner.

# Product Range

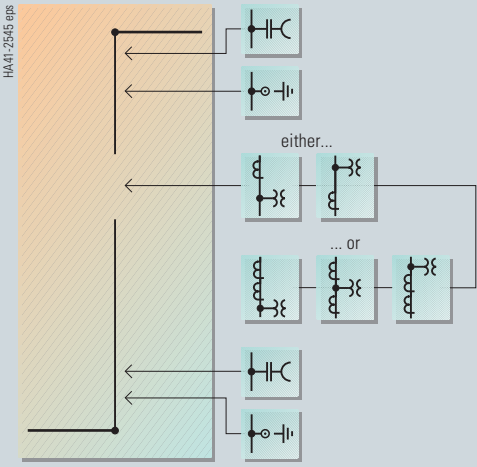
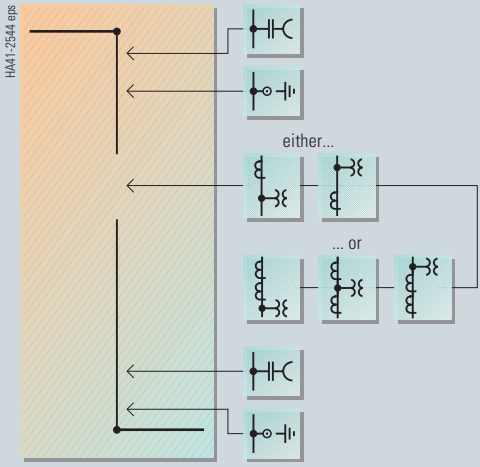
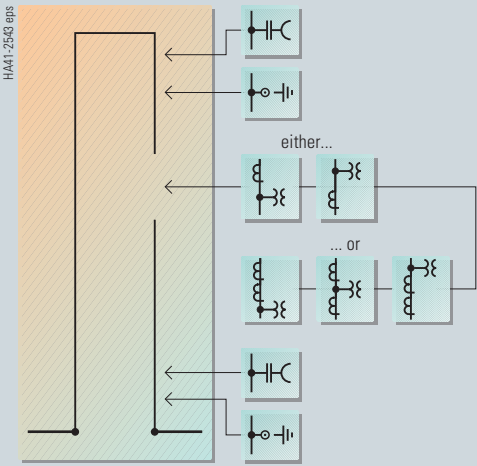
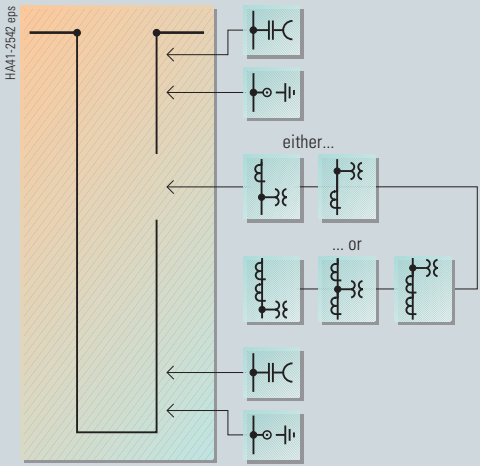
## Cable grounding panel, busbar grounding panel




# Product Range


## Metering panel


### Metering panel





 Capacitive voltage detection system


 Grounding stud

 Block-type current-transformer 4MA and voltage transformer 4MR (both cast-resin insulated)

 Block-type current-transformer 4MA and voltage transformer 4MR (both cast-resin insulated)

 Block-type current-transformer 4MA and voltage transformer 4MR (both cast-resin insulated)

 Block-type current-transformer 4MA and voltage transformer 4MR (both cast-resin insulated)

 Block-type current-transformer 4MA and voltage transformer 4MR (both cast-resin insulated)

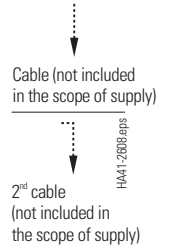
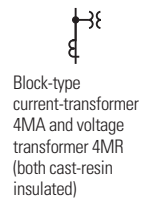
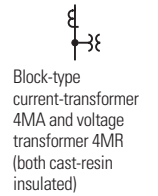
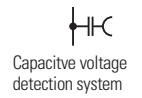
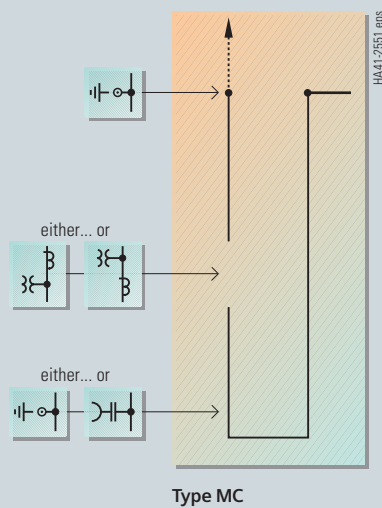
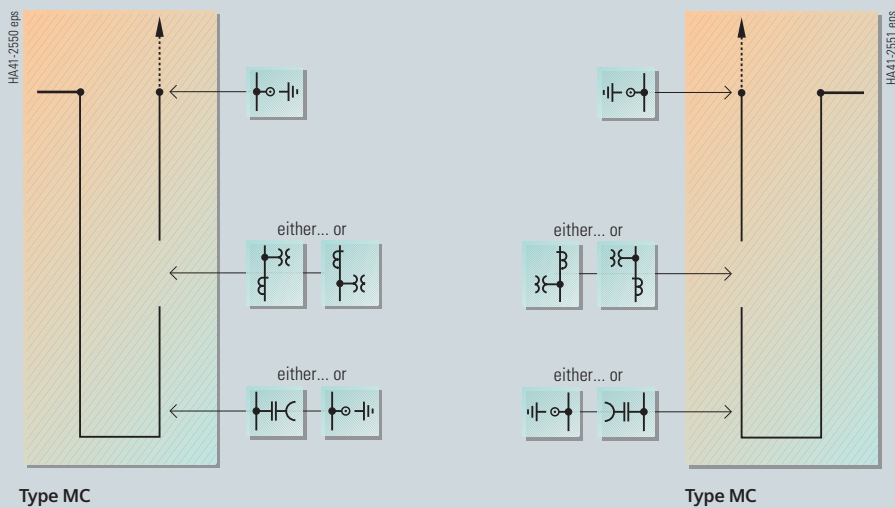
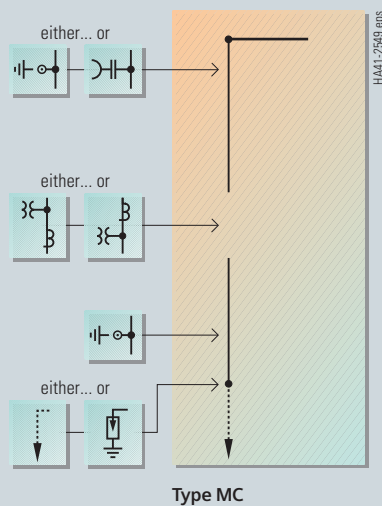
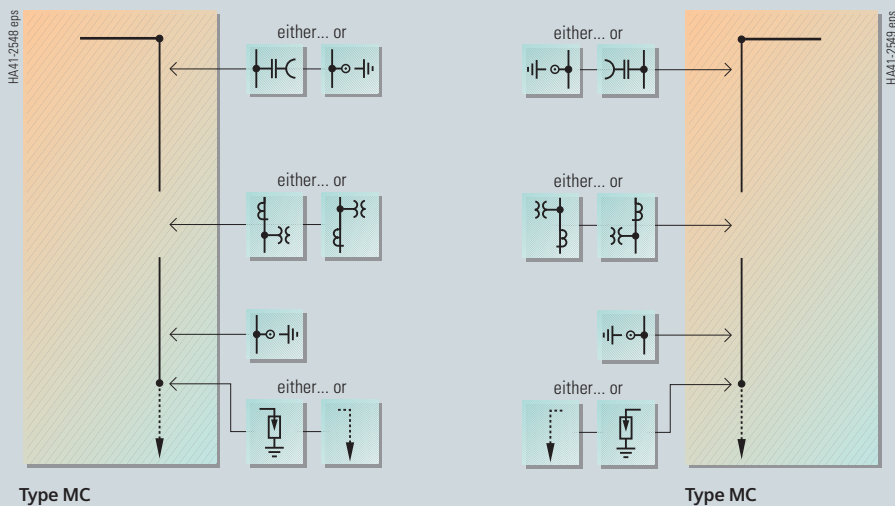
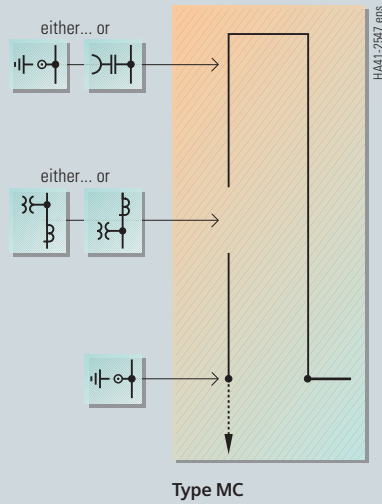
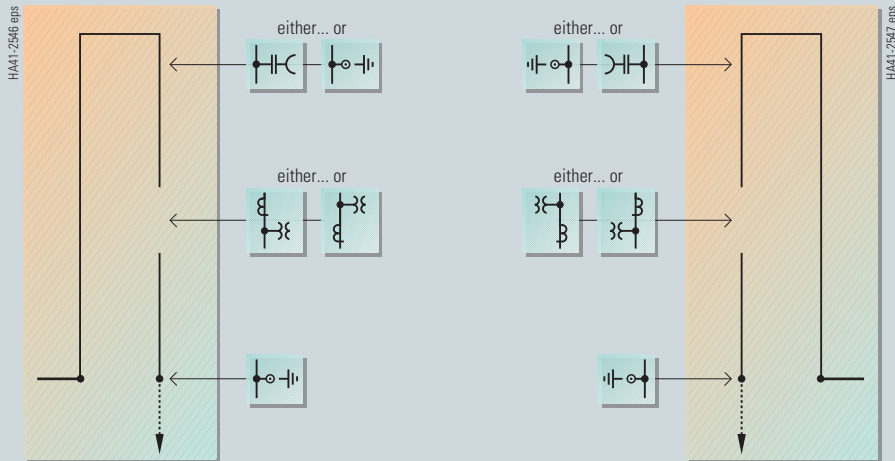
HA41-2508 eps

Note: For detailed design, please contact your local Siemens partner.

# Product Range

## Metering panel with cable

### Metering panel with cable



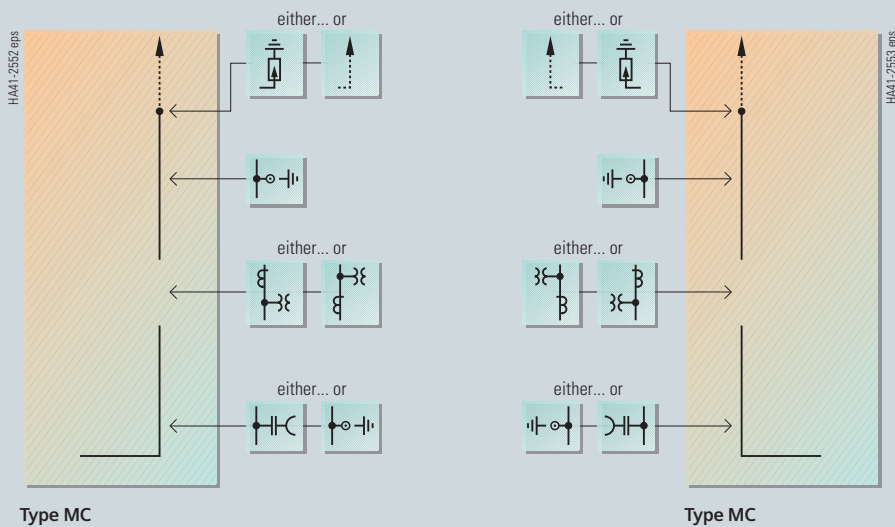
Note: For detailed design, please contact your local Siemens partner.



# Product Range

## Metering panel with cable (continued), metering switch panel

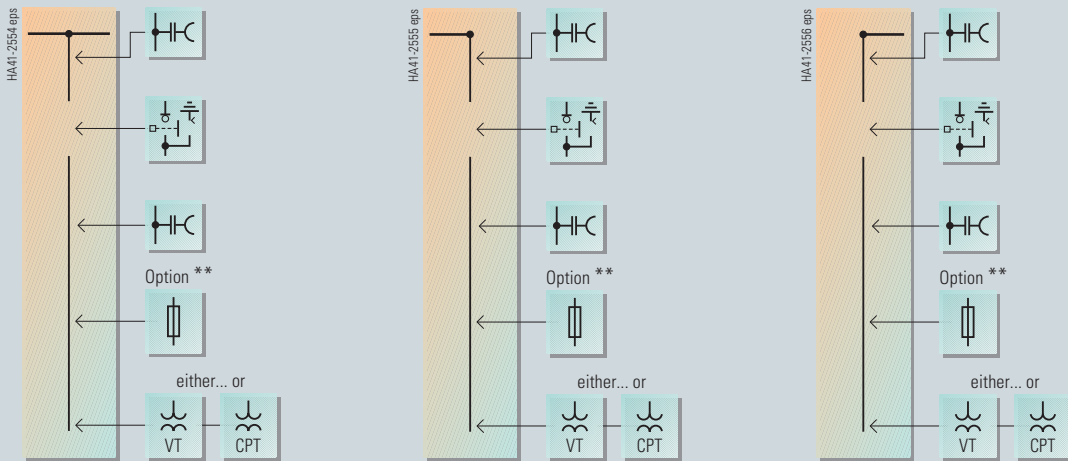
### Metering panel with cable



Type MC

Type MC

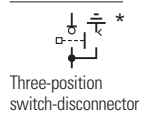
### Metering switch panel



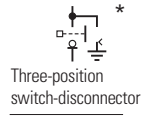
Type MS

Type MS

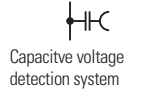
Type MS



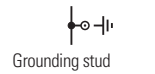
Three-position switch-disconnector



Three-position switch-disconnector



Capacitive voltage detection system



Grounding stud



Block-type current-transformer 4MA and voltage transformer 4MR (both cast-resin insulated)



Block-type current-transformer 4MA and voltage transformer 4MR (both cast-resin insulated)



Surge arrester



HV CL fuse \*\*\*



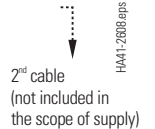
Voltage transformer 4MR (cast-resin insulated)



Control power transformer (CPT) make ITI



Cable (not included in the scope of supply)



2<sup>nd</sup> cable (not included in the scope of supply)

- \* Switch-disconnector as:
  - two-position switch-disconnector
  - three-position switch-disconnector

\*\* Only in combination with VT or CPT

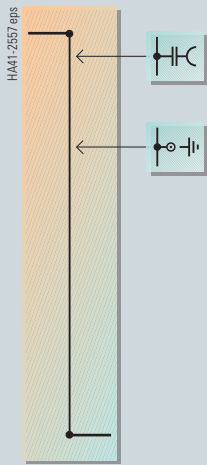
\*\*\* Fuses: Potential transformer fuses type CAV

Note: For detailed design, please contact your local Siemens partner.

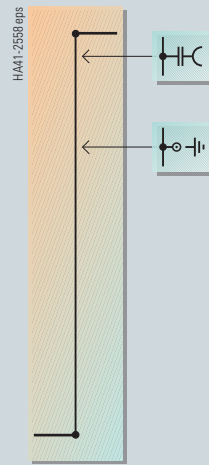
# Product Range

## Bus riser panel, busbar grounding panel

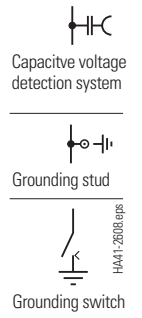
### Bus riser panel



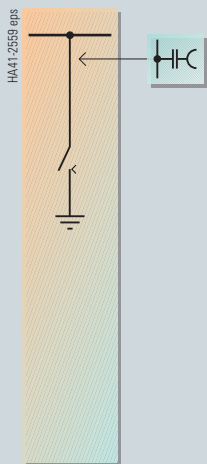
Type BR



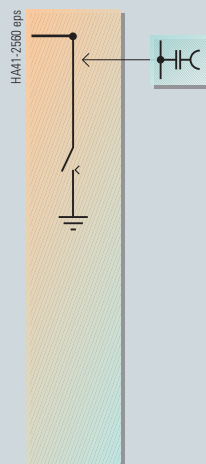
Type BR



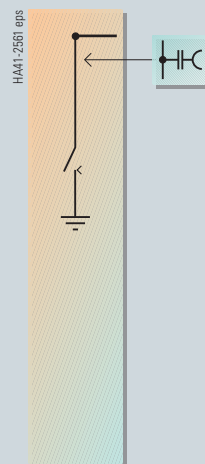
### Busbar grounding panel



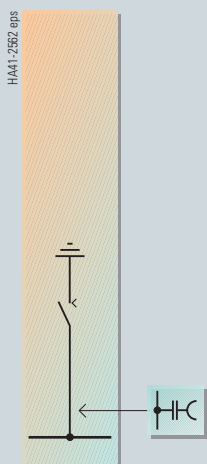
Type BG



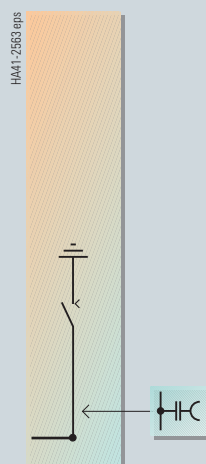
Type BG



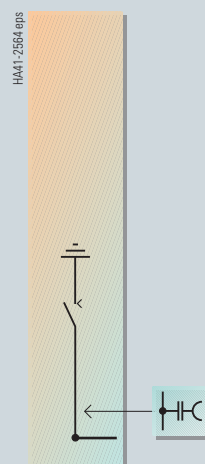
Type BG



Type BG



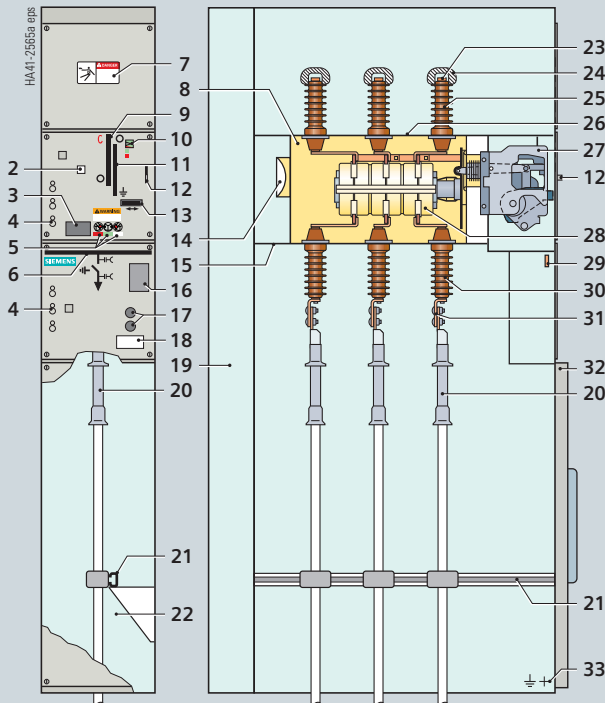
Type BG



Type BG

Note: For detailed design, please contact your local Siemens partner.

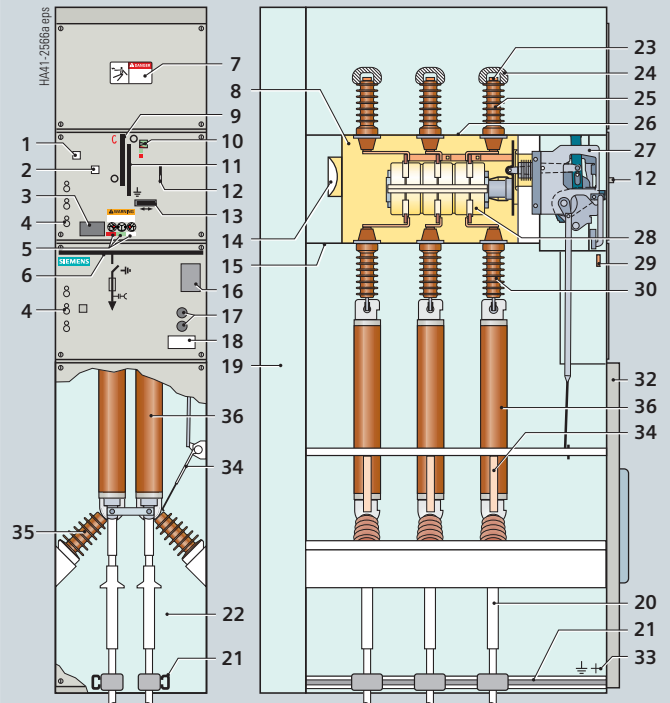
### Cable switch panel type CS



Type CS1

Section

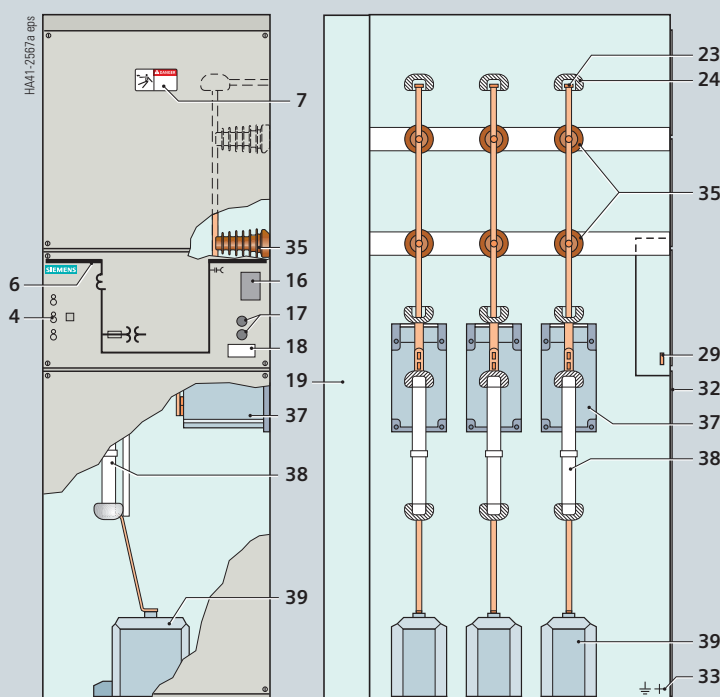
### Fuse switch panel type FS



Type FS2

Section

### Metering panel type MT



Type MT3

Section

#### Legend

- |  |  |
|--|--|
| 1 Indicator "Fuse intact/fuse blown"   | 18 Feeder designation label  |
| 2 Switch position indicator  | 19 Pressure relief duct  |
| 3 View port for switch blade position  | 20 Cable termination (not incl. in scope of supply)                    |
| 4 Sockets for capacitive voltage detection system  | 21 Cable bracket with clamps   |
| 5 Information label for view port  | 22 Cable connection compartment  |
| 6 Mimic diagram  | 23 Busbar  |
| 7 Warning label  | 24 Insulating cap on busbar (for > 15 kV)                              |
| 8 Gas-insulated vessel for switching device  | 25 Bushing-type insulator for busbar                                   |
| 9 Manual operation for the mechanism of the load-break-disconnecting function  | 26 Metal compartmentalization of busbar compartment                    |
| 10 "Ready-for-service" indicator for switching device  | 27 Spring-operated mechanism for three-position switch                 |
| 11 Manual operation for the mechanism of the grounding function  | 28 Three-position switch   |
| 12 Interlocking lever of cable compartment cover (option)  | 29 Grounding busbar  |
| 13 Option: Locking device for three-position switch  | 30 Bushing-type insulator for feeder                                   |
| 14 Pressure relief device for switching device   | 31 Cable connection  |
| 15 Metal compartmentalization of cable connection compartment  | 32 Cable compartment: As cover or door (latched or screwed-on)         |
| 16 Rating and type plate   | 33 Grounding connection  |
| 17 Option: Local-remote switch and momentary-contact rotary control switch "CLOSED-OPEN" for the motor operating mechanism | 34 Grounding switch to discharge capacitance of connected transformers |
|  | 35 Post insulator  |
|  | 36 HV CL (current limiting) fuse                                       |
|  | 37 4MA7 block-type current transformer                                 |
|  | 38 Fuse holder for VT fuse   |
|  | 39 4MR voltage transformer   |

# Components

## Two/three-position switch-disconnector

### Characteristics

- Switch positions:
  - CLOSED-OPEN
  - or
  - CLOSED-OPEN-GROUNDED
- Designed as a multi-chamber switch incorporating the following functions
  - Switch-disconnector and
  - Make-proof grounding switch
- Operation via gas-tight welded bushing at the front of the switchgear vessel
- Switching functions as general purpose switch-disconnector according to ANSI/IEEE C37.20.3 \*

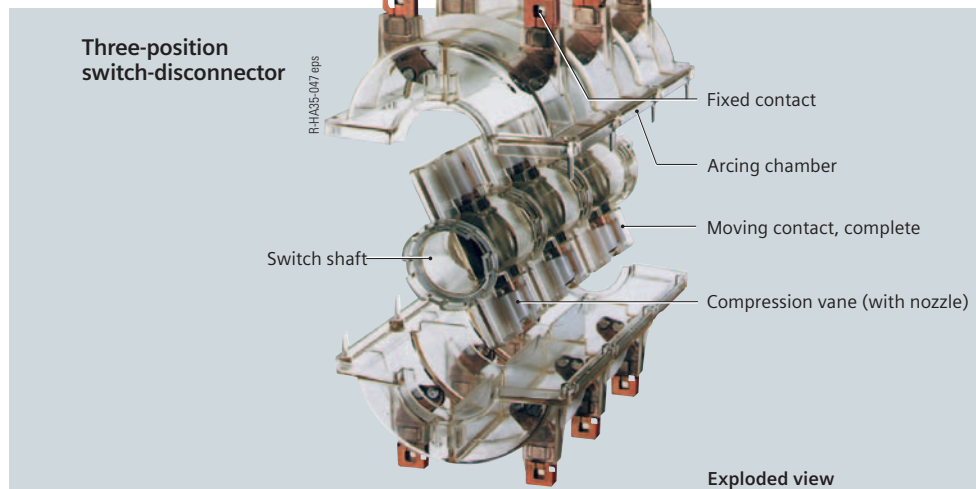
### Mode of operation

The switch shaft with the moving contacts rotates inside the chamber containing the fixed contacts.

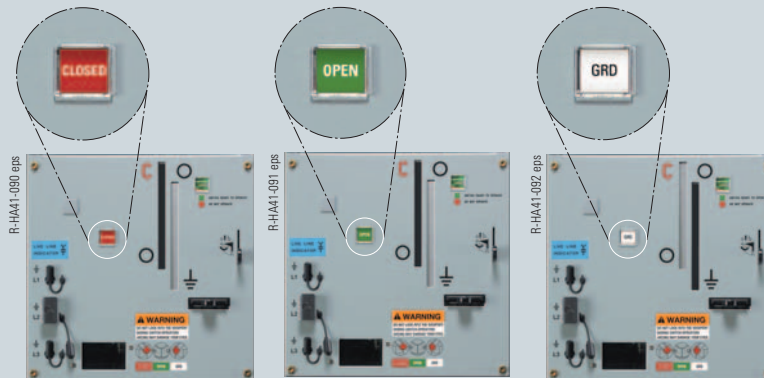
Compression vanes, which rotate in conjunction with the switch shaft, divide the arcing chamber into two subchambers each of which changes in conjunction with the rotation.

During the switching movement, the compression vanes generate a pressure difference between the subchambers. The SF<sub>6</sub> gas flows through a nozzle, causes a directional blow-out of the breaking arc and quenches it rapidly.

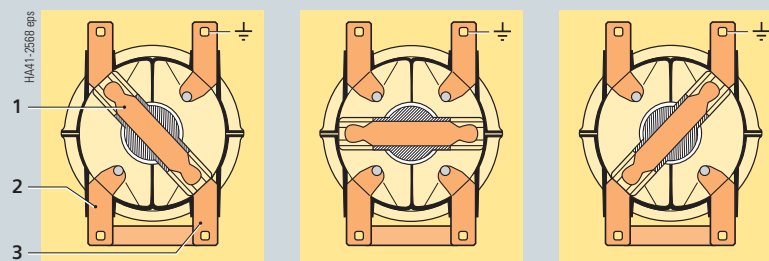
Interlocking is not necessary as the CLOSED and GROUNDED functions cannot be implemented simultaneously.



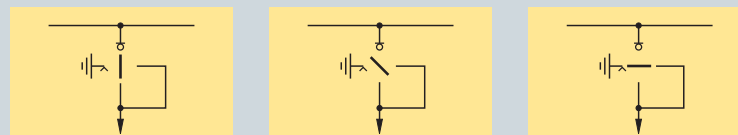
### Switching functions



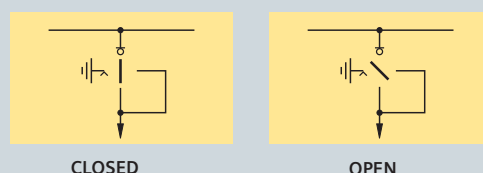
Control board with switch position indicators for detachable lever mechanism



Switch positions:  
Three-position switch-disconnector  
– CLOSED  
– OPEN  
– GROUNDED



Switch positions of three-position switch-disconnector



Switch positions of two-position switch-disconnector

### Legend

- 1 Moving contact
- 2 Fixed contact for GROUNDED
- 3 Fixed contact for CLOSED

\* Standards see page 40

## Two/three-position switch as two/three-position switch-disconnector

### Common features

- Metal-enclosed
- Located in a gas-insulated switchgear vessel
- Switch positions:
  - CLOSED-OPEN or
  - CLOSED-OPEN-GROUNDED
- No cross insulation between phases
- Two/three-position switch with air-insulated primary connections for busbar and feeder
- Operation via a gas-tight welded-in metal bellows in the front of the switchgear vessel

### View port

The visual inspection of the actual position of the two/three-position switch is possible via a view port. (Fig. shown on the right)

### Two/three-position switch-disconnector 600 A

- Up to 600 A
- With gas-insulated, maintenance-free quenching principle

### Operating mechanism

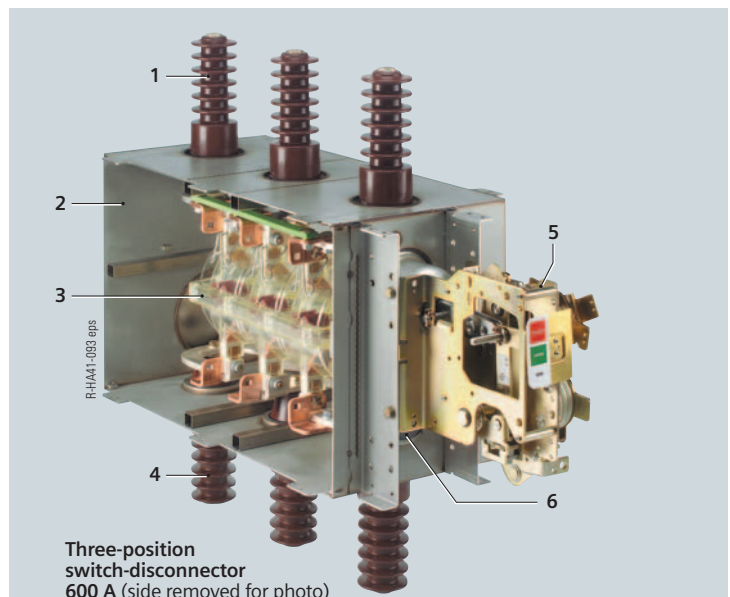
- Spring-operated mechanism with detachable lever
- Manual operation with the aid of a detachable lever
- **Options:**
  - Mechanical ready-for-service indication
  - Auxiliary switch
  - Motor operating mechanism for switch-disconnector
  - Locking device
- Spring-operated/stored-energy mechanism for transformer panel type FS

### Interlocks

- Opening of panel cover or cable compartment cover only in "GROUNDED" position

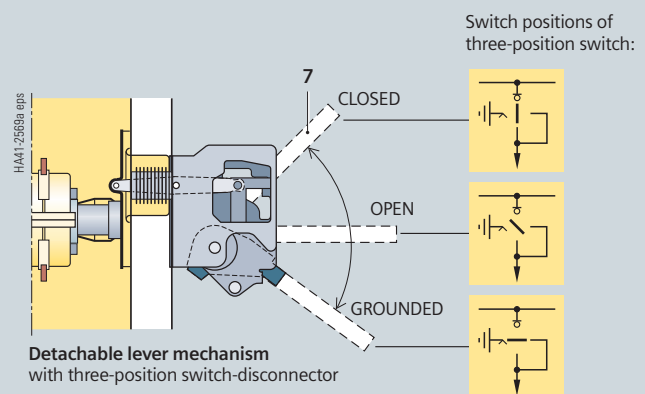
### Operating cycles

- Capable of 100 operating cycles at rated continuous current 600 A
- Mechanical endurance of 1000 operating cycles



Three-position switch-disconnector 600 A (side removed for photo)

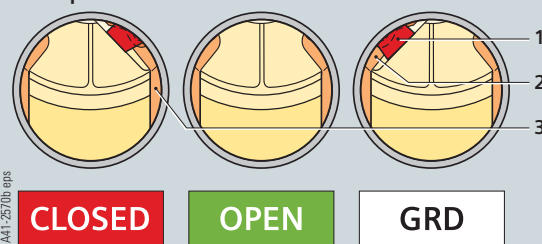
- 1 Bushing-type insulator for busbar
- 2 Switchgear vessel for gas insulation
- 3 Three-position switch-disconnector
- 4 Bushing-type insulator for feeder
- 5 Spring-operated mechanism with detachable lever
- 6 View port



### Switching functions of the three-position switch-disconnector 600 A

- Switching and disconnecting under load
- General-purpose switching function
- Make-proof grounding function

### View port



### Legend for view port

- 1 Moving contact
- 2 Fixed contact for CLOSED
- 3 Fixed contact for GROUNDED

# Components

## Busbars, HV CL (current-limiting) fuse assembly

### Busbars

- Metal-enclosed busbar compartment
- Three-pole design, bolted from panel to panel
- Easy switchgear extension
- Made of copper: Round-edge copper for up to 1200 A

#### Option:

Shrink-on sleeve

### HV CL fuse assembly

- For fuse panel type FS
- For busbar voltage metering panel type MS
- HV CL fuse links acc. to ANSI/IEEE C37.41/C37.46 \*
  - As short-circuit protection before transformers
  - With selectivity (depending on correct selection) to upstream and downstream connected equipment
- Requirements fulfilled as HV alternating current switch fuse combination
- Selection of HV CL fuses for transformers
- Fuse replacement possible only when feeder is grounded
- Option: Shunt release on operating mechanism of two/three-position switch-disconnector
- Option: "Tripped indication" of two/three-position switch-disconnector in transformer feeder (transformer switch) for remote electrical indication with one normally-open contact (1NO)

#### "HV CL fuse tripped"

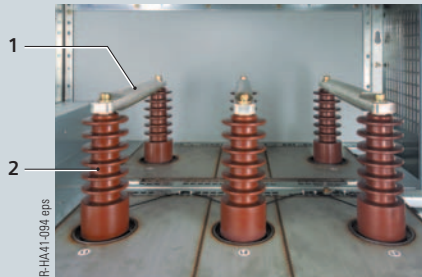
Following the tripping of an HV CL fuse link, the mechanism for charging the spring must be set to the "OPEN" position

Subsequently, grounding can be implemented by means of the two/three-position switch-disconnector and e.g., the fuse can be replaced.

#### Replacement of HV CL fuse links

- Isolating and grounding of the transformer feeder
- Subsequent manual replacement of the HV CL fuse links

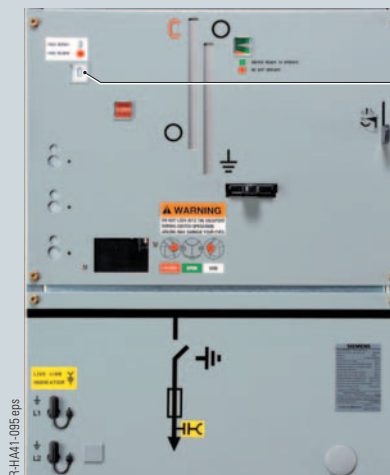
### Busbars



- 1 Busbar
- 2 Bushing-type insulator for busbar

Busbar compartment extending over 2 panels, example (side view)

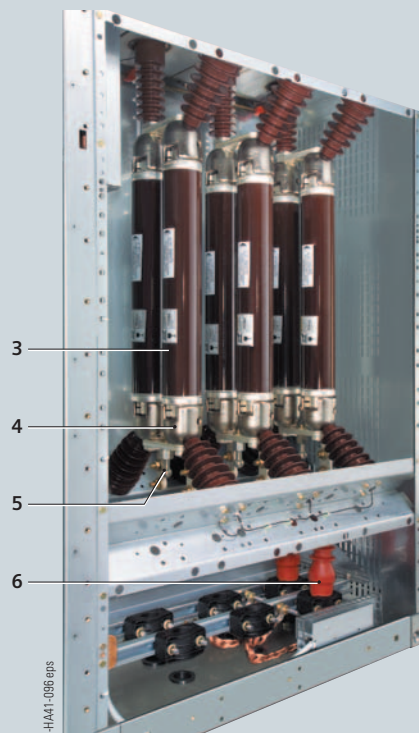
### HV HRC fuse assembly



#### Displays

- Fuse intact
- Fuse blown

Control board of a fuse panel



- 3 HV CL fuse
- 4 Lower fuse holder
- 5 Grounding stud
- 6 Cable termination (not included in the scope of supply)

HV CL fuses in fuse panel type FS (side view, 2 sets of fuses shown)

\* Standards see page 40

The table opposite shows the recommended fuse links (electrical data valid for ambient temperatures of up to 40 °C/ 104 °F) for the fuse protection of transformers

### Recommendation

The two/three-position switch-disconnector in the transformer feeder (transformer switch) is combined with Bussmann fuse links. Dimensions according to DIN standards (especially manufactured for Siemens)

### Standards

HV CL fuse links according to ANSI/IEEE C37.41/C37.46 \*

### Bussmann fuses

Rated voltage kV	Length mm / inch	Diameter mm / inch	Rated current $I_n$ A	Power loss W	Panel type **			Code/reference No. for SIMOSEC ANSI
					FS1/FU1 Permissible A	FS2/FU2 continuous current A	FS3/FU3 continuous current A	
5.5	442 / 17.4	51 / 2.0	10	8	10	18	24	55GDMSJ10ES
5.5	442 / 17.4	51 / 2.0	15	11	15	27	36	55GDMSJ15ES
5.5	442 / 17.4	51 / 2.0	20	11	20	36	48	55GDMSJ20ES
5.5	442 / 17.4	51 / 2.0	25	15	25	45	60	55GDMSJ25ES
5.5	442 / 17.4	51 / 2.0	30	17	30	54	72	55GDMSJ30ES
5.5	442 / 17.4	51 / 2.0	40	27	40	72	96	55GDMSJ40ES
5.5	442 / 17.4	51 / 2.0	50	36	50	90	120	55GDMSJ50ES
5.5	442 / 17.4	51 / 2.0	65	44	65	117	156	55GDMSJ65ES
5.5	442 / 17.4	51 / 2.0	80	53	80	144	192	55GDMSJ80ES
5.5	442 / 17.4	51 / 2.0	100	69	100	180	240	55GDMSJ100ES
5.5	442 / 17.4	51 / 2.0	125	94	120	220	300	55GDMSJ125ES
5.5	442 / 17.4	76 / 3.0	150	103	150	270	360	55GDMSJ150ES
5.5	442 / 17.4	76 / 3.0	175	121	164	292	416	55GDMSJ175ES
5.5	442 / 17.4	76 / 3.0	200	126	183	327	466	55GDMSJ200ES
5.5	442 / 17.4	76 / 3.0	250	139	220	390	555	55GDMSJ250ES
5.5	442 / 17.4	76 / 3.0	300	147	241	429	598	55GDMSJ300ES
5.5	442 / 17.4	76 / 3.0	350	161	269	478	600	55GDMSJ350ES
5.5	442 / 17.4	76 / 3.0	400	167	302	536	600	55GDMSJ400ES
5.5	442 / 17.4	76 / 3.0	450	183	325	575	600	55GDMSJ450ES
15.5	537 / 21.14	88 / 3.5	175	177	167	310	420	175GXQSJ175ES
15.5	537 / 21.14	88 / 3.5	200	238	165	305	430	175GXQSJ200ES
17.5	442 / 17.4	51 / 2.0	10	22	10	18	24	175GDMSJ10ES
17.5	442 / 17.4	51 / 2.0	15	30	15	27	36	175GDMSJ15ES
17.5	442 / 17.4	51 / 2.0	20	32	20	36	48	175GDMSJ20ES
17.5	442 / 17.4	51 / 2.0	25	41	25	45	60	175GDMSJ25ES
17.5	442 / 17.4	51 / 2.0	30	47	30	54	72	175GDMSJ30ES
17.5	442 / 17.4	76 / 3.0	40	79	40	72	69	175GFMSJ40ES
17.5	442 / 17.4	76 / 3.0	50	95	50	90	120	175GFMSJ50ES
17.5	442 / 17.4	76 / 3.0	65	130	59	104	149	175GFMSJ65ES
17.5	442 / 17.4	76 / 3.0	80	126	73	131	186	175GXMSJ80ES
17.5	442 / 17.4	88 / 3.5	100	169	85	155	225	175GXMSJ100ES
17.5	537 / 21.14	88 / 3.5	125	203	112	207	292	175GXQSJ125ES
17.5	537 / 21.14	88 / 3.5	150	221	123	238	336	175GXQSJ150ES
25.8	537 / 21.14	51 / 2.0	10	27	10	18	24	258GDQSJ10ES
25.8	537 / 21.14	51 / 2.0	15	41	15	27	36	258GDQSJ15ES
25.8	537 / 21.14	51 / 2.0	20	44	20	36	48	252GDQSJ20ES
25.8	537 / 21.14	51 / 2.0	25	50	25	45	60	252GDQSJ25ES
25.8	537 / 21.14	51 / 2.0	30	67	30	54	72	252GDQSJ30ES
25.8	537 / 21.14	88 / 3.5	40	87	40	72	96	252GDQSJ40ES
25.8	537 / 21.14	88 / 3.5	50	103	50	90	120	252GDQSJ50ES
25.8	537 / 21.14	88 / 3.5	65	140	65	117	156	252GDQSJ65ES

\* Standards see page 40

\*\* FS1/FU1: Single fuse  
FS2/FU2: Two fuses in parallel  
FS3/FU3: Three fuses in parallel

# Components

## Operating mechanisms for two/three-position switches

### Manual operating mechanism

- **Standard:**  
As detachable lever mechanism
- **Spring-operated mechanism**
  - For cable-switch panel type CS
  - For all two/three-position switches (except in panel type FS)
- **Spring-operated/stored-energy mechanism**  
For fuse panel type FS as well as for busbar voltage metering switch panel type MS

The two/three-position switch is operated via a rocker with metal bellows which is gas-tight and welded at the switchgear vessel.

### Motor operating mechanism (option)

The manual operating mechanisms can be equipped with motor operating mechanisms for the two/three-position switch-disconnector.

Operating voltages for motor operating mechanisms:

- 24, 48, 60, 125 V DC
- 50/60 Hz 120 and 240 V AC

Electrical operation:

- **Standard:** Remote operation (applied to terminal)
- **Option:** Local operation by momentary-contact rotary control switch

### Shunt release (option)

Spring-operated/stored-energy mechanisms can be equipped with a shunt release. Remote electrical tripping of the two/three-position switch-disconnector is possible via the magnetic coil of the shunt release, e.g., transformer overtemperature tripping.

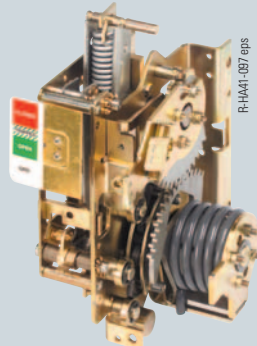
To avoid thermal overloading of the shunt release in the event of a continuous signal that may be applied, the shunt release is switched off via an auxiliary switch which is mechanically coupled with the three-position switch-disconnector.

### Auxiliary switch (option)

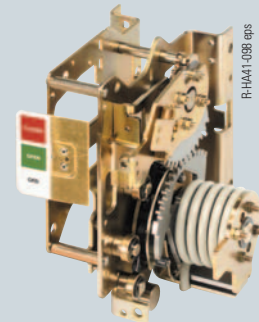
Each operating mechanism of the two/three-position switch-disconnector can be optionally equipped with an auxiliary switch for the switch position indication:

- Function switch-disconnector or disconnector:  
CLOSED and OPEN:  
2NO + 2NC
- Function grounding switch at the two/three-position switch:  
CLOSED and OPEN:  
2NO + 2NC

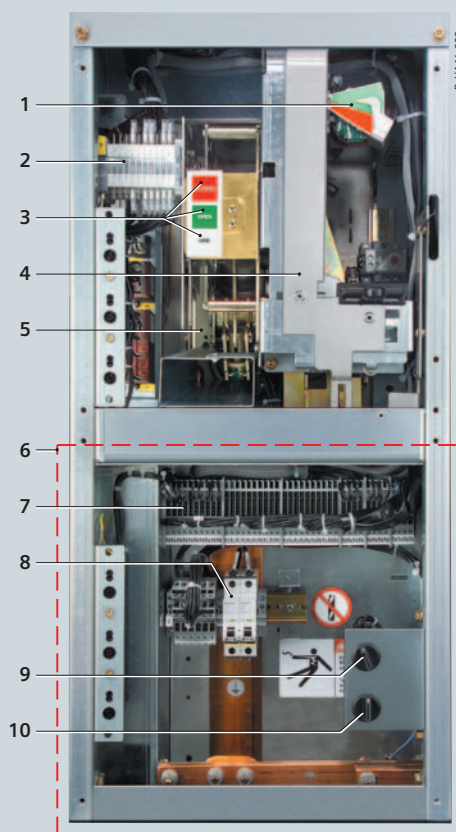
### Operating mechanisms



Detachable lever mechanism as spring-operated/stored-energy mechanism



Detachable lever mechanism as spring-operated mechanism



Operating mechanism parts in panel types FS... (transformer feeders)

- 1 Ready-for-service indicator
- 2 Auxiliary switch
- 3 Switch position indicator for the three-position switch-disconnector
- 4 Locking device (standard for motor operating mechanism)
- 5 Operating mechanism for the three-position switch-disconnector coupled with the motor operating mechanism
- 6 Low-voltage niche
- 7 Terminal strip located in the low-voltage niche
- 8 M.c.b. (option) in the low-voltage niche
- 9 Local-remote switch (option)
- 10 Actuation for the motor operating mechanism of the three-position switch-disconnector

### Technical data of the auxiliary switch

#### Breaking capacity

AC operation at 50 Hz 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 240	10	24	10	10
		48	10	9
		60	9	7
		110	5	4
		125	5	4
240		2.5	2	

#### Rated switching capacity

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

Abbreviations:

NO = normally-open contact  
NC = normally-closed contact



### Ready-for-service indicator (option for three-position switch)

- Self-monitoring; easy to read
- Independent of temperature and pressure variations
- Independent of site altitude
- Only responds to changes in gas density
- Option: Alarm switch "1NO contact"

### Mode of operation

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

A coupling magnet, which is fitted to the bottom end of the measuring box, transmits its position to an outside armature through the 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 insulating capacity, are displayed, temperature-dependent changes in the gas pressure are not. The gas in the measuring box has the same temperature as that in the switchgear.

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

### Voltage detection systems

For voltage detection according to IEC 61 243-5 / VDE 0682-415

#### Plug-in voltage detection systems

- Standard: HR system

#### Features of the HR system

- Voltage indicator HR system (standard)
- Verification of safe isolation from supply phase by phase through insertion in each socket pair
- Voltage indicator flashes if high voltage is present
- For continuous operation
- Safe-to-touch
- Measuring system and voltage indicator can be tested
- Fixed-mounted capacitive voltage divider in bushings
- Without auxiliary power

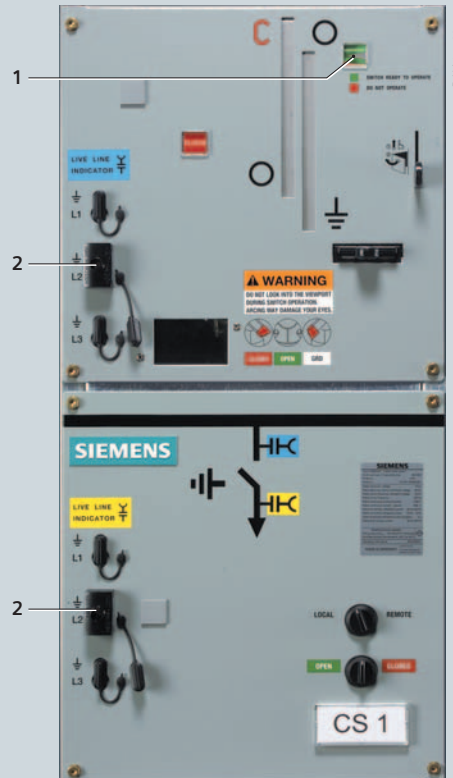
#### Mounting of voltage detection systems

See "Product range" pages 10 to 18

#### Verification of correct terminal-phase connections

- Possible by means of a phase comparison test unit (optional)
- Safe-to-touch handling of the phase comparison test unit by inserting it into the capacitive taps (socket pairs) of the switchgear

### Indicating and measuring equipment (examples)



Control board of a ring-main panel (example)

Mounting locations in the control board for

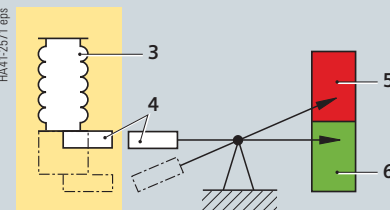
- 1 Ready-for-service indicator (option)
- 2 Voltage indicator, HR system, plugged-in (standard)

R-HA41-000 eps



Voltage indicator, HR system (standard)

HA41-2571 eps



Stainless-steel vessel filled with SF<sub>6</sub> gas, gauge pressure 50 kPa (7.25 psi) at 20 °C

Ready-for-service indicator

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

- 3 Measuring box
- 4 Magnetic coupling
- 5 Red indication: not ready for service
- 6 Green indication: ready for service

# Components

## 4MC70 33 cable-type current transformers

### Application

- For cable panel types CS, CC, CG
- For fuse panel types FS, FU

### Features

- According to ANSI / IEEE C57.13
- Designed as a single-pole ring-core current transformer
- Only for shielded cables
- Climate-independent
- Free of dielectrically stressed cast-resin parts (due to design)
- Inductive type
- Secondary connection by means of a terminal strip inside the panel

### Installation

- Arranged on the cable at the panel connection
- Transformers mounted on a supporting plate at the factory; final assembly on the cables at site



4MC70 33 cable-type current transformers on the cable at the panel connection \*\*

### Technical data

#### MC70 33 cable-type current transformer

#### Primary data

Max. equipment operating voltage $U_m$	0.60 kV
Rated current $I_N$	30 A to 600 A
Rated short-duration power-frequency withstand voltage (winding test)	3 kV
Rated thermal short-time withstand current $I_{th}$	25 kA
Rated continuous thermal current $I_D$	1.0 x $I_N$ option: 1.2 x $I_N$
Rated peak withstand current $I_{dyn}$	unlimited

#### Secondary data

Rated current	5 A	
Measuring core	Class ***	0.3   0.6   1.2
	Burden	0.2 VA to 1.8 VA
Protection core	Class ***	C10 ... C200

#### Dimensions

Overall height H	mm	50*   100*   170*   285*
Outside diameter		Ø 145 mm / 5.7 inch
Inside diameter		Ø 55 mm / 2.2 inch
For cable diameter		Ø 36 ... 50 mm / 1.4 ... 2.0 inch

Other values available on request

\* Depending on the core data

\*\* Assembly normally under the panel floor

\*\*\* Accuracy class varies according to CT data

# Components

## 4MA7 block-type current transformers and 4MR voltage transformers

### Application

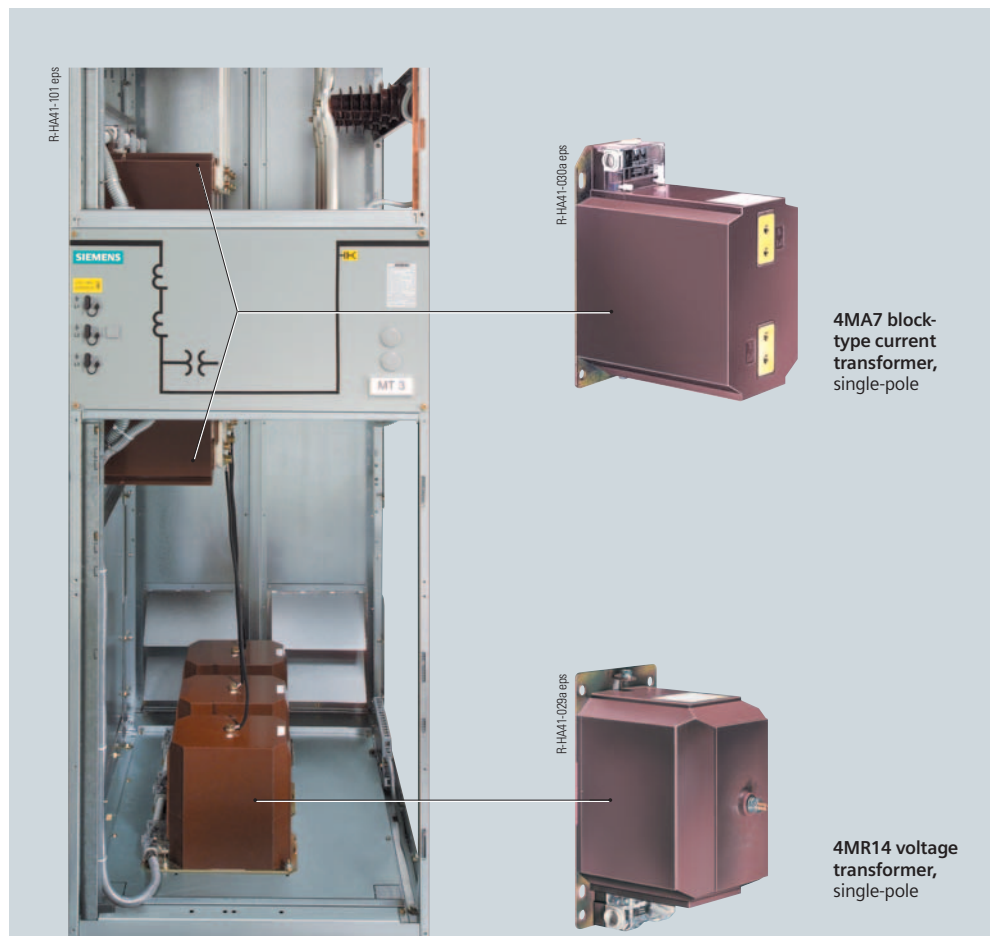
- For metering panel types MT, MS, MC

### Features

- 4MA7 current transformer
- According to ANSI / IEEE C57.13
- Dimensions according to DIN 42 600-8
- Designed as a single-pole indoor block-type current transformer
- Cast-resin insulated
- Secondary connection by means of screw-type terminals

### 4MR voltage transformer

- According to ANSI / IEEE C57.13
- Dimensions according to DIN 42 600-9 (small model)
- Designed as an indoor voltage transformer:
  - Type 4MR, single-pole
  - Option: Type 4MR, two-pole
- Cast-resin insulated
- Secondary connection by means of screw-type terminals



4MR voltage transformer and 4MA7 block-type current transformer installed in metering panel

### Technical data

#### 4MA7 single-pole block-type current transf.      4MR single-pole voltage transformer

#### Primary data

Max. equipment operating voltage $U_m$	<b>15.5 kV</b>	<b>27.6 kV</b>
Rated short-duration power-frequency withstand voltage	34 kV <sup>1)</sup>	40 kV <sup>1)</sup>
Rated lightning impulse withstand voltage $U_p$	95 kV	125 kV
Rated current $I_N$	50 A to 600 A > 600 A: on request	
Rated thermal short-time withstand current $I_{th}$	up to 25 kA	
Rated continuous thermal current $I_D$	up to $1.0 \times I_N$ option: $1.2 \times I_N$	
R. peak withst. current $I_{dyn}$	max. $2.5 \times I_{th}$	

#### Secondary data

Rated current	5 A
Measuring core	Class <sup>3)</sup> 0.3   0.6   1.2
	Burden 0.2 to 1.8 VA
Protection core	Class <sup>3)</sup> C10 ... C200

Other values available on request

Max. equipment operating voltage $U_m$	<b>5.6 kV</b>	<b>9.52 kV</b>	<b>15.5 kV</b>	<b>25.5 kV</b> $\Delta$
Rated short-duration power-frequency withstand voltage	16 kV <sup>1)</sup>	26 kV <sup>1)</sup>	34 kV <sup>1)</sup>	40 kV <sup>1)</sup>
Rated lightning impulse withstand voltage $U_p$	20 kV <sup>2)</sup>	28 kV <sup>2)</sup>	36 kV <sup>2)</sup>	60 kV <sup>2)</sup>
Rated lightning impulse withstand voltage $U_p$	60 kV	75 kV	95 kV	125 kV

Rated voltage	$100/\sqrt{3}$ V $110/\sqrt{3}$ V $120/\sqrt{3}$ V
Rated voltage for auxiliary winding	100/3 V 110/3 V 120/3 V
Burden	25 ... 200 VA
Class	0.3   0.5   1.2

Other values available on request

$\Delta$  On request: operating voltage  $U_m > 25.5$  kV, e.g. 27.6 kV

1) Acc. to ANSI/IEEE C57.13 (standard)

2) Option: on request

3) Accuracy class varies according to CT data

# Components

## Cable connection

### General features

- Cable termination points are arranged one behind the other
- Uniform cable connection height per panel (see dimension drawings)
- With cable bracket or cable clamps and grounding points for cable shields
- Access to the cable connection compartment only when feeder has been grounded

### Features for cable terminals

- For thermoplastic-insulated cables
- For paper-insulated mass-impregnated cables
- For connection cross-sections (cable size) \* up to 300 mm<sup>2</sup> (600 kcmil)
- Cable bottom entry from below (standard)
- Cable top entry from above (optional)

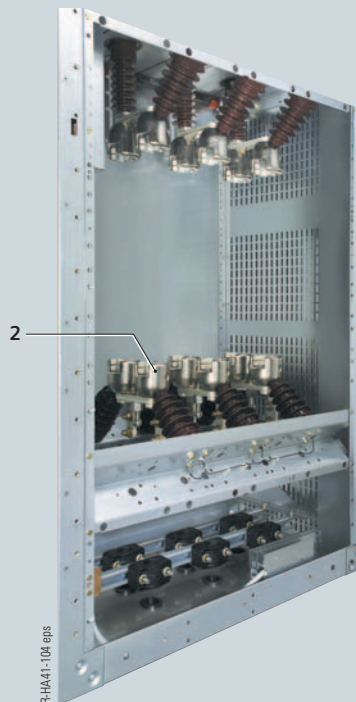
### Cable connection (examples)



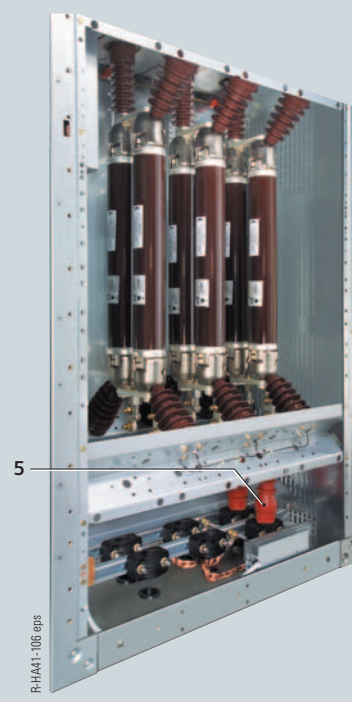
**Cable switch panel type CS**  
Cable connection compartment as delivered



Cable connection compartment with cable termination



**Fuse panel type F5**  
Cable connection compartment as delivered



Cable connection compartment with cable termination

### Legend

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>1 As delivered condition for cable termination</li> <li>2 As delivered condition, prepared for cable termination</li> <li>3 Cold shrink brand 3M</li> </ul> | <ul style="list-style-type: none"> <li>4 Cable termination brand 3M or Tyco Electronics Raychem</li> <li>5 Cable termination brand 3M or Tyco Electronics Raychem (with cold shrink brand 3M)</li> </ul> |
|--|--|

\* Larger connection cross-sections on request.

# Components

## Selection data for various cable terminations

Panel type	CS1 + 2		FS1 + 2 + 3		FU1 + 2 + 3		CC1 + 2		CG1 + 2		MC3	
	Cable termination height in mm/inch	Panel height in mm/inch	Cable termination height in mm/inch	Panel height in mm/inch	Cable termination height in mm/inch	Panel height in mm/inch	Cable termination height in mm/inch	Panel height in mm/inch	Cable termination height in mm/inch	Panel height in mm/inch	Cable termination height in mm/inch	Panel height in mm/inch

### Top cable entry

Main switch or vertical copper bar in upper position (fuse assembly in lower position)	490/19.3	2550/100.4	490/19.3	2550/100.4	490/19.3	2550/100.4	490/19.3	2550/100.4	490/19.3	2550/100.4	530/20.8	2250/88.6
Main switch or vertical copper bar in lower position (fuse assembly in upper position)	not available	not available	not available	not available	490/19.3	2550/100.4	not available	not available	not available	not available	not available	not available

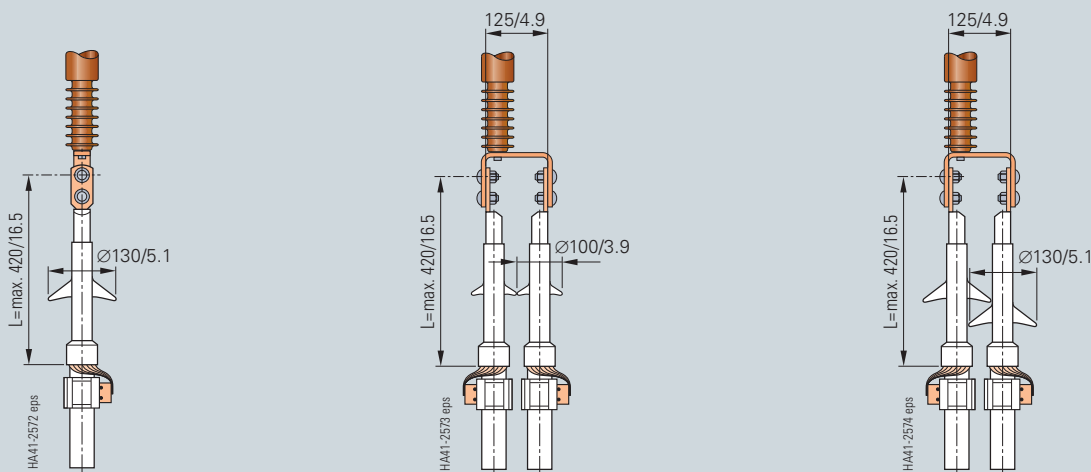
### Middle cable connection

to top	940/37	2250/88.6	not available	not available	940/37	2250/88.6	940/37	2250/88.6	940/37	2250/88.6	not available	not available
to bottom	1240/48.8	2250/88.6	not available	not available	1240/48.8	2250/88.6	1240/48.8	2250/88.6	1240/48.8	2250/88.6	not available	not available

### Bottom cable entry

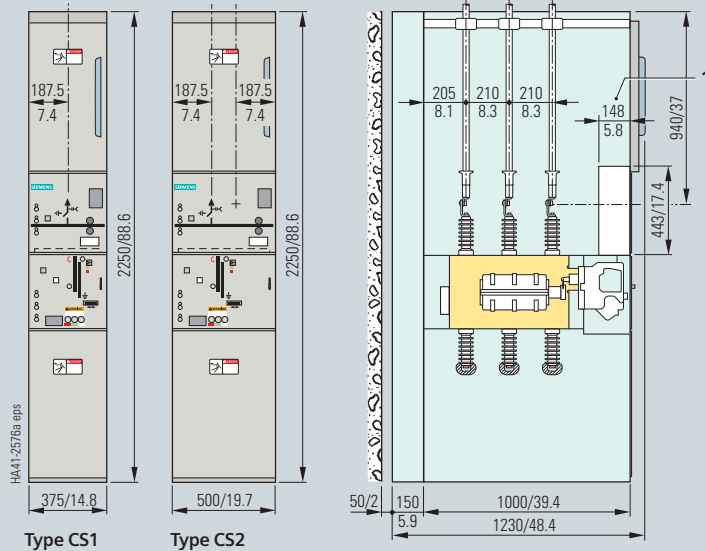
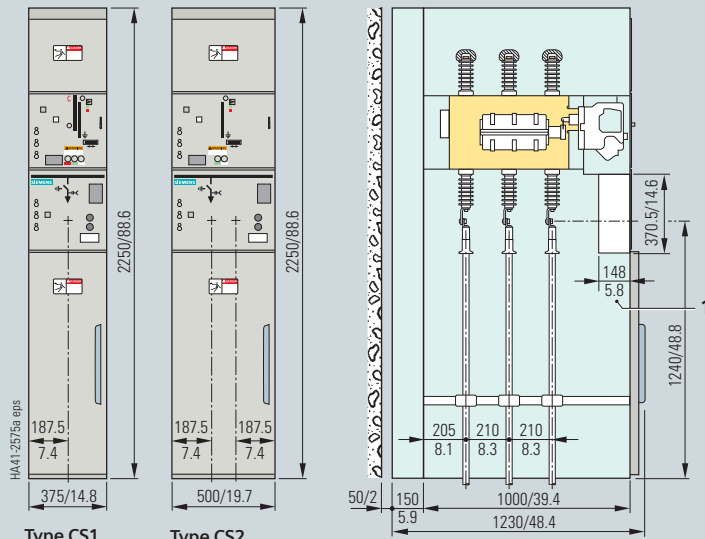
Main switch or vertical copper bar in upper position (fuse assembly in upper position)	not available	not available	not available	not available	490/19.3	2250/88.6	not available	not available	not available	not available	not available	not available
Main switch or vertical copper bar in upper position (fuse assembly in lower position)	490/19.3	2250/88.6	490/19.3	2250/88.6	not available	not available	490/19.3	2250/88.6	490/19.3	2250/88.6	490/19.3	2250/88.6

### Principle of cable connection (dimensions in mm/inch) (e.g. for panel type CS)



# Dimensions

Cable switch panel types CS... (dimensions in mm/inch)

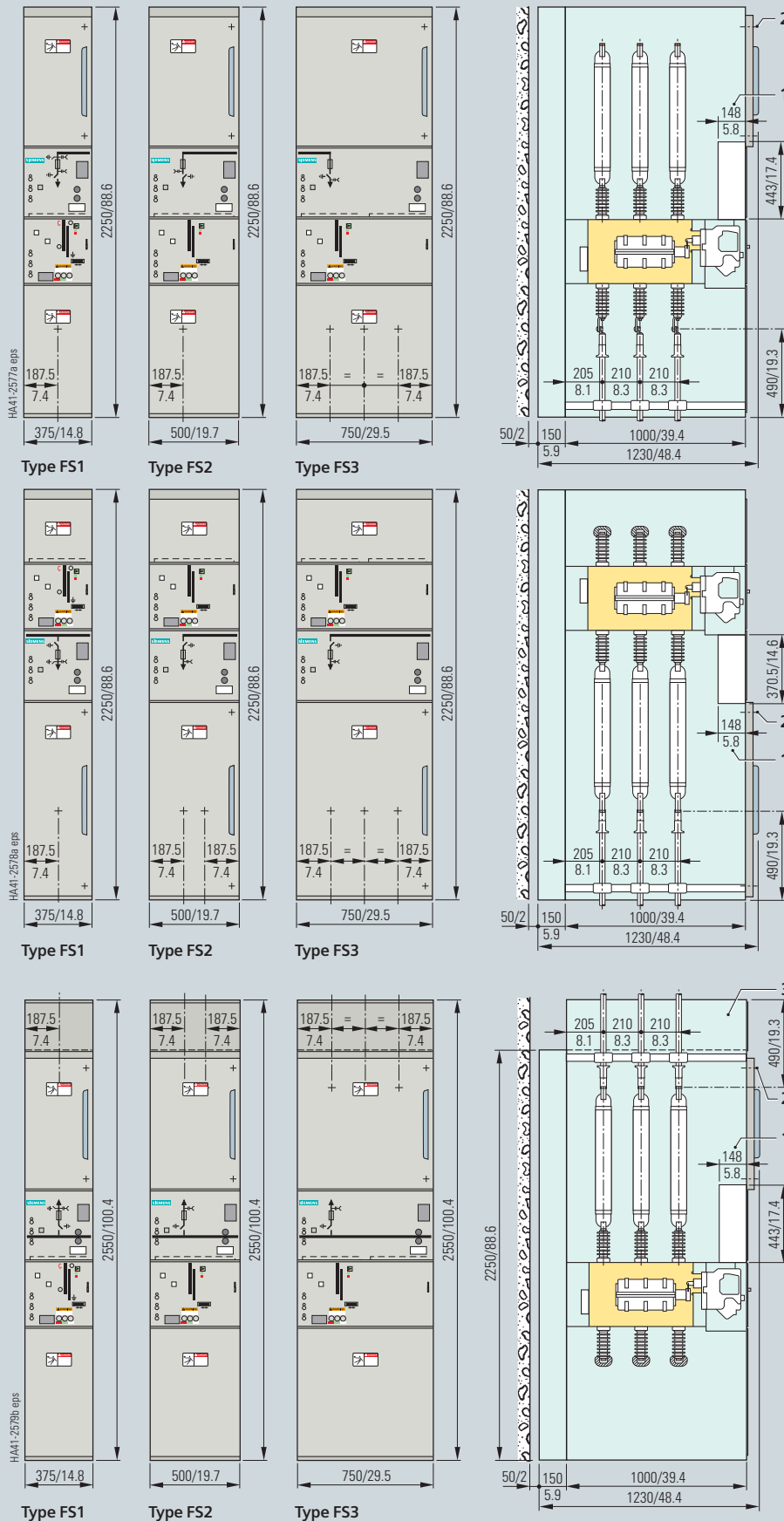


### Legend

- 1 Available mounting depth in the LV niche

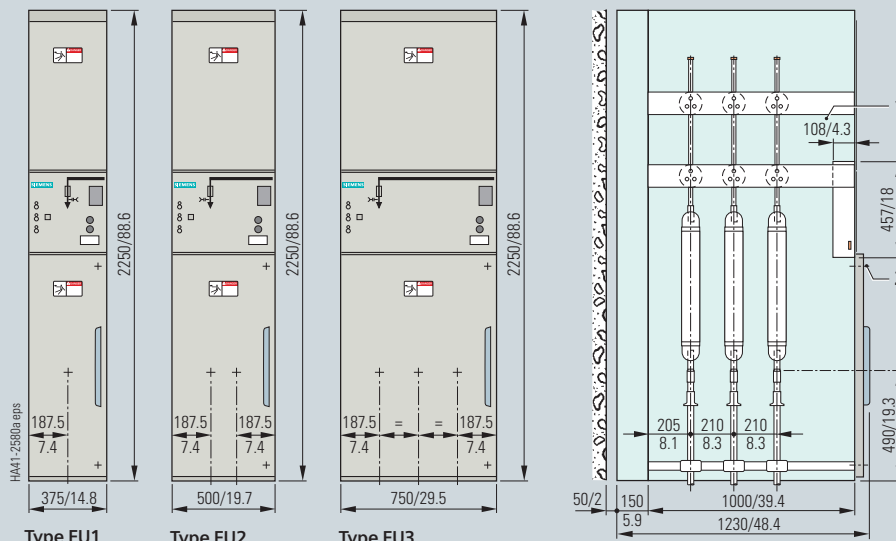
# Dimensions

Fuse switch panel types FS... (dimensions in mm/inch)



# Dimensions

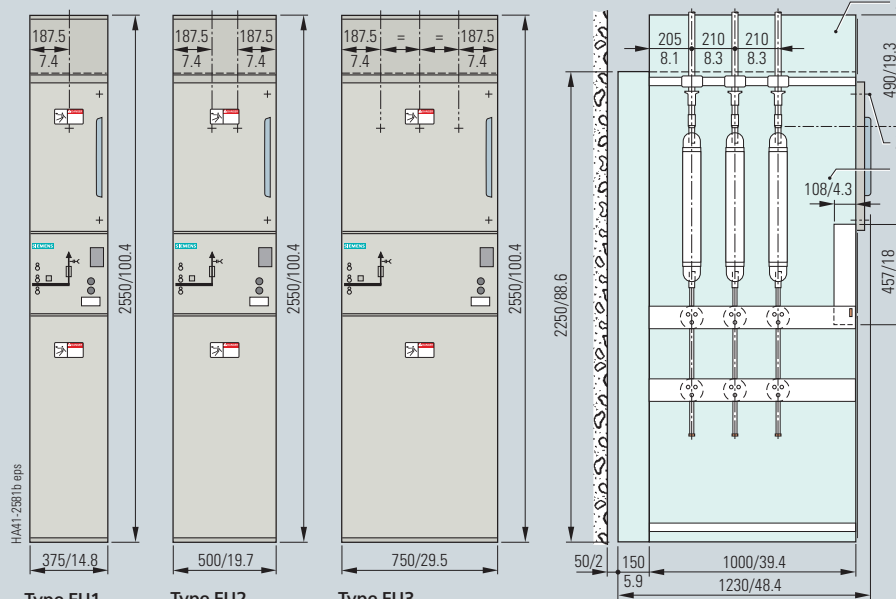
Fuse panel types FU... (dimensions in mm/inch)



Type FU1

Type FU2

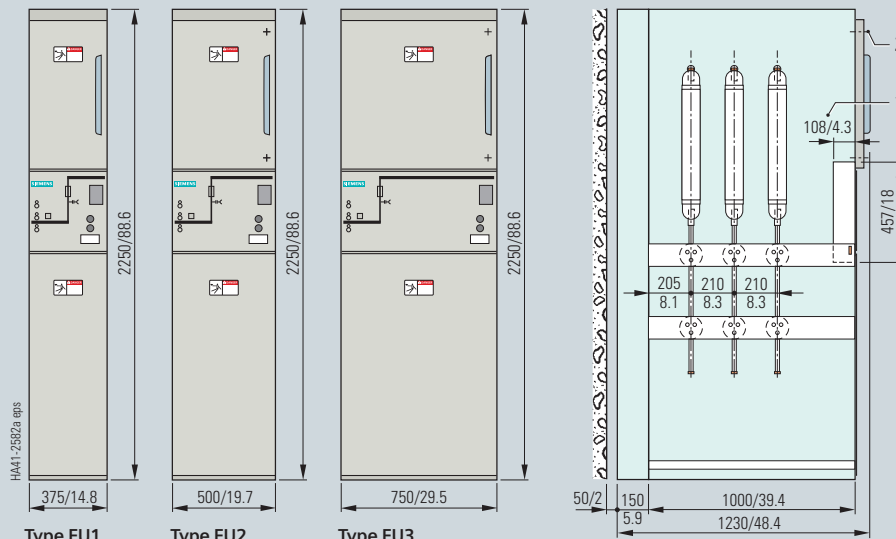
Type FU3



Type FU1

Type FU2

Type FU3



Type FU1

Type FU2

Type FU3

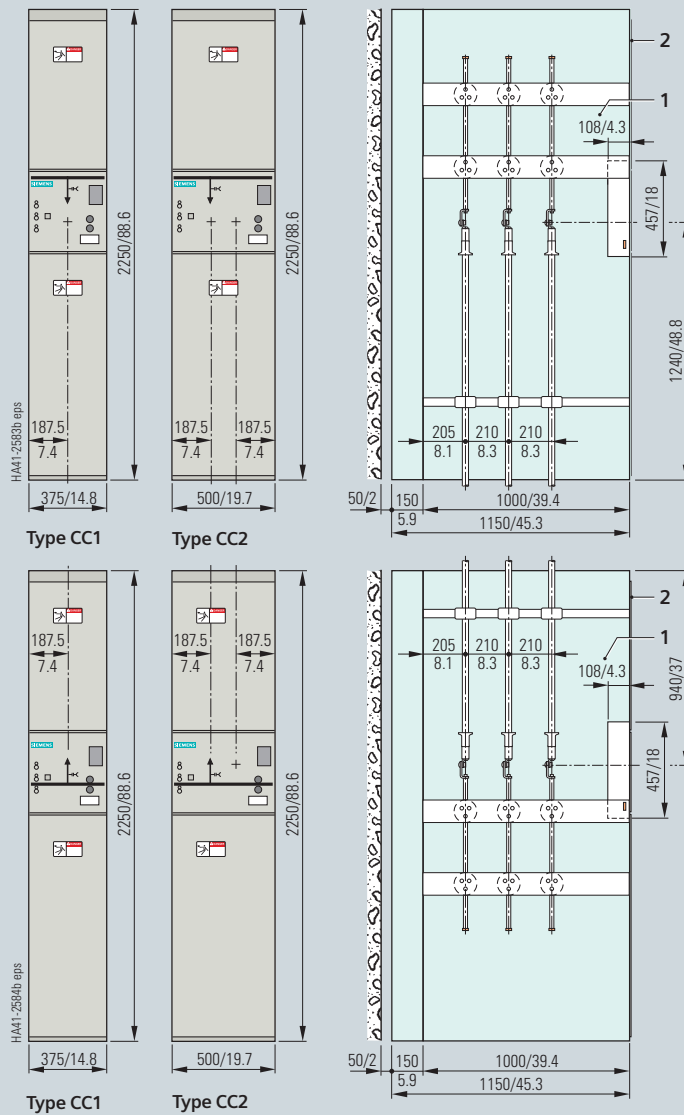
### Legend

- 1 Available mounting depth in the LV niche
- 2 Screwed-on door (fuse compartment)
- 3 Top case for cable top entry



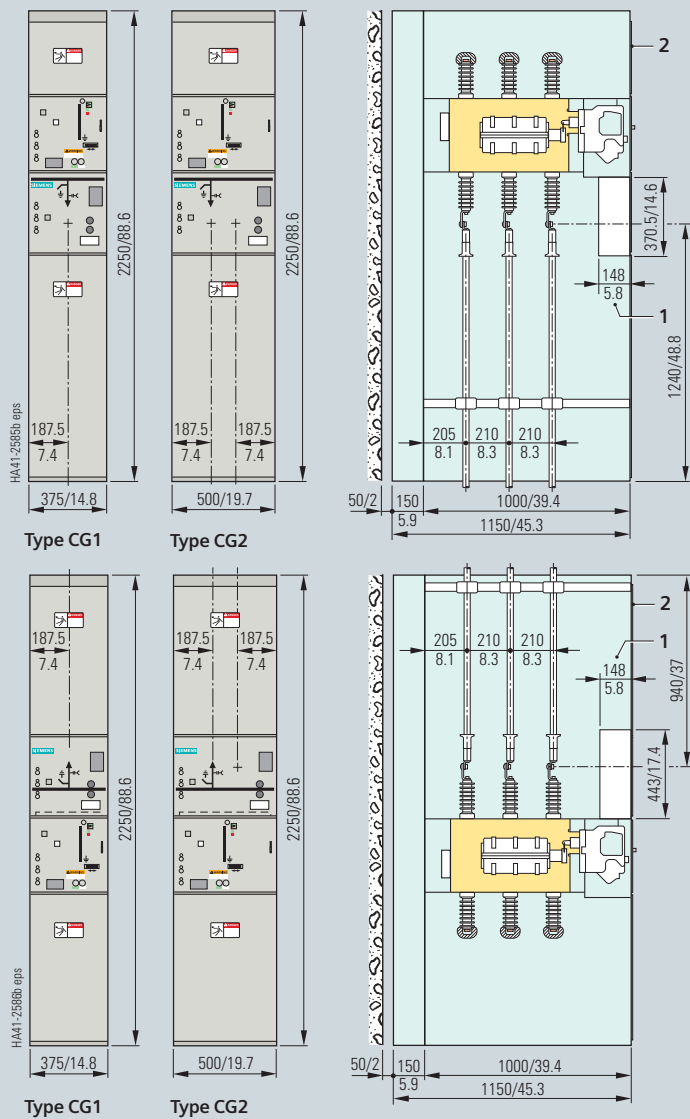
# Dimensions

Cable connection panel types CC... (dimensions in mm/inch)



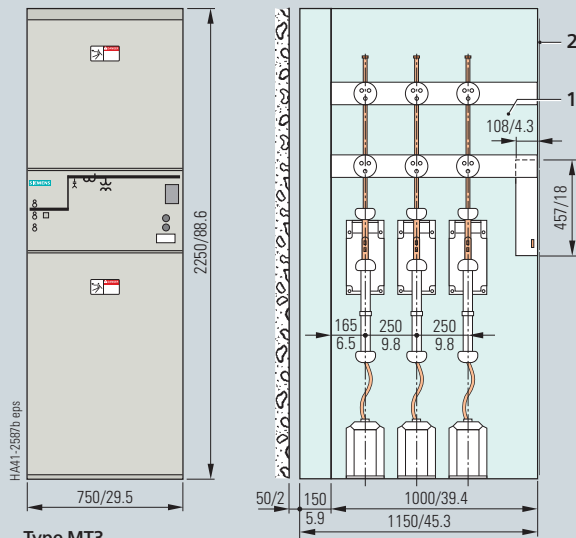
# Dimensions

Cable grounding panel types CG... (dimensions in mm/inch)

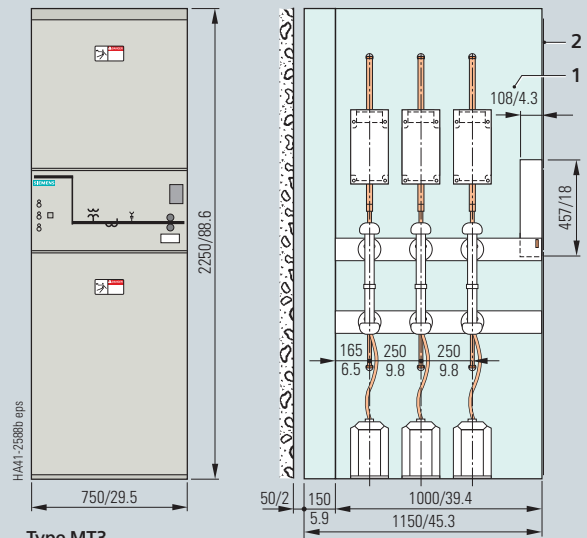


# Dimensions

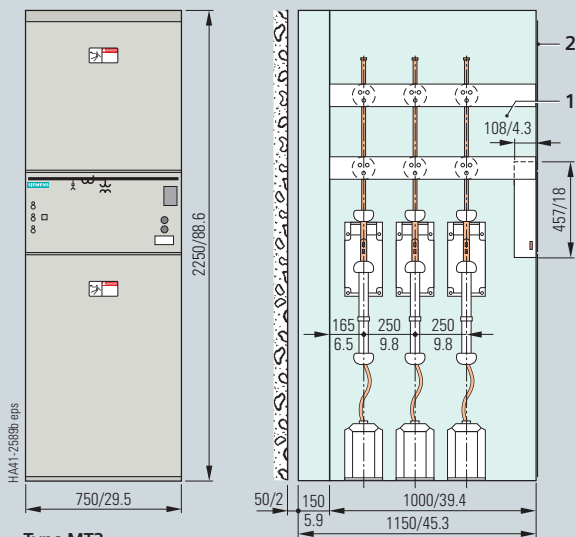
Metering panel type MT3, metering switch panel types MS (dimensions in mm/inch)



Type MT3



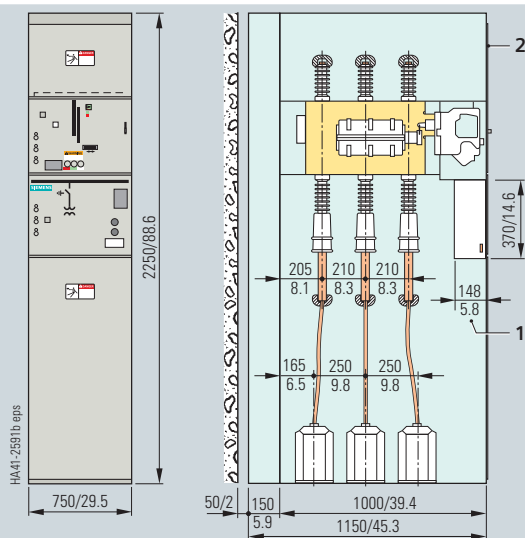
Type MT3



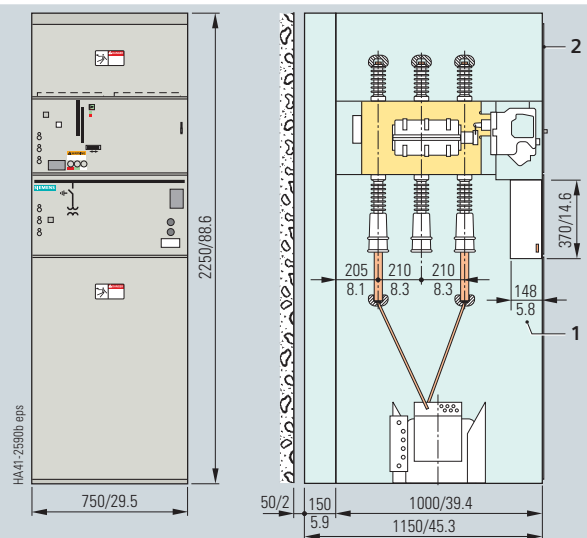
Type MT3

### Legend

- 1 Available mounting depth in the LV niche
- 2 Screwed-on cover



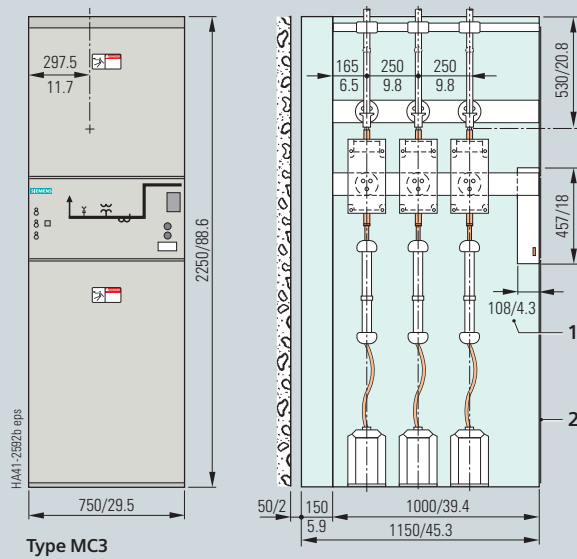
Type MS2 (with voltage transformer 4MR)



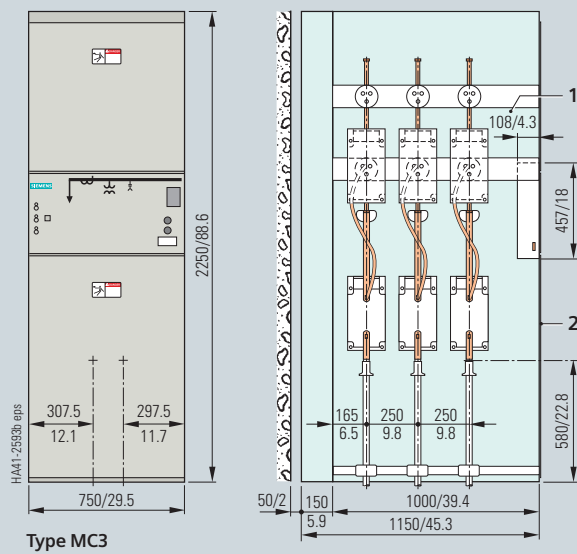
Type MS3 (with control power transformer make ITI)

# Dimensions

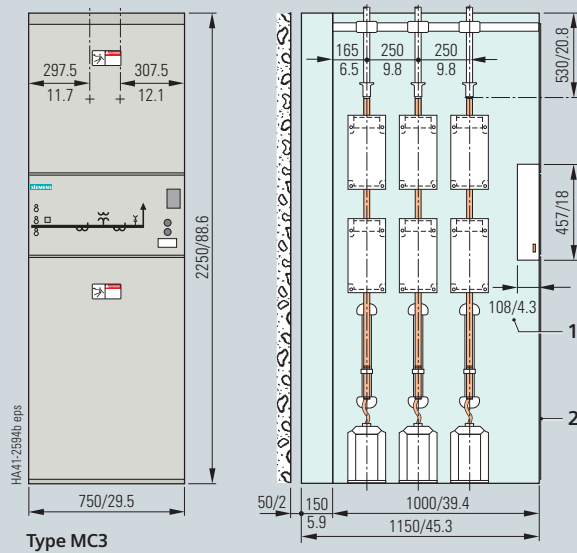
## Metering cable panel type MC3 (dimensions in mm/inch)



Type MC3



Type MC3



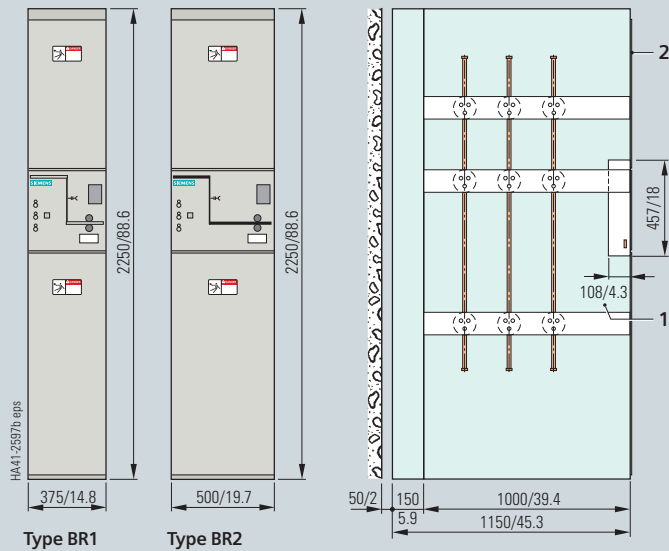
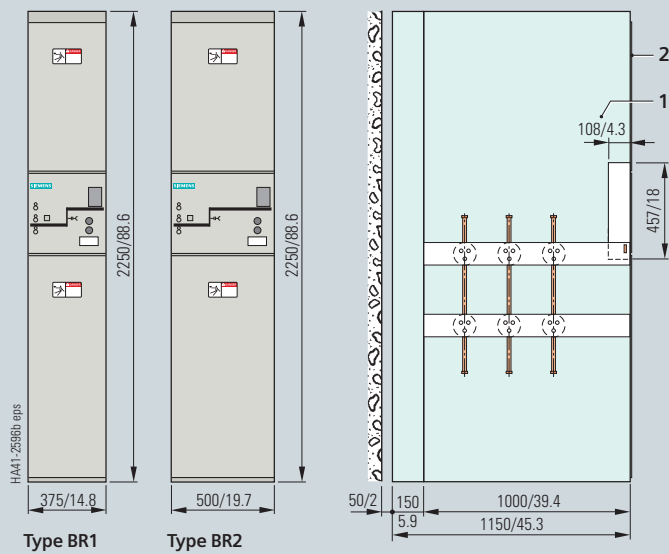
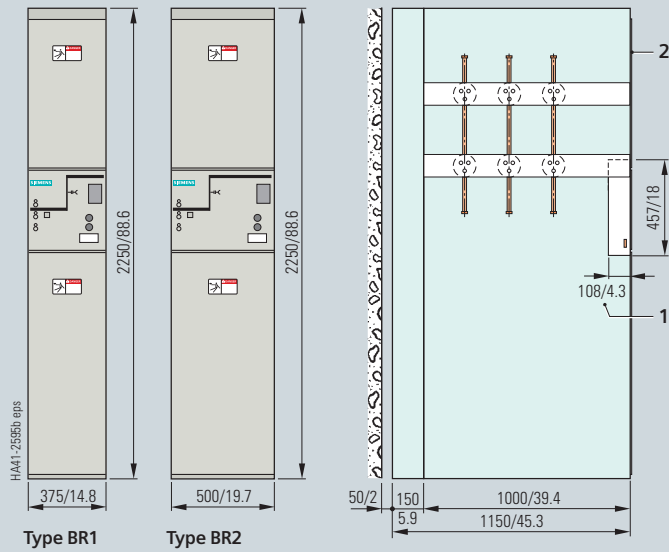
Type MC3

### Legend

- 1 Available mounting depth in the LV niche
- 2 Screwed-on cover

# Dimensions

Bus riser panel types BR... (dimensions in mm/inch)

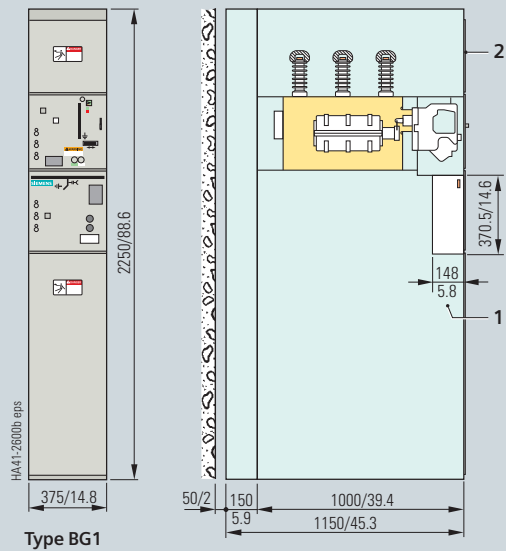
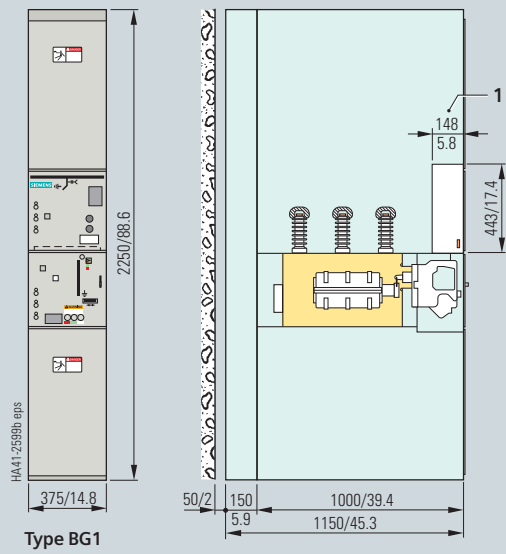
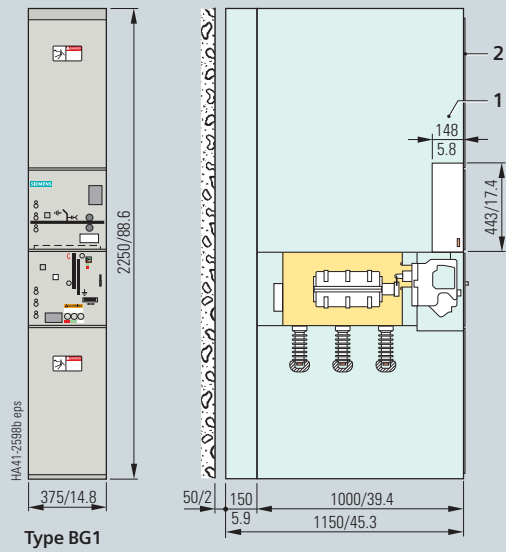


## Legend

- 1 Available mounting depth in the LV niche
- 2 Screwed-on cover

# Dimensions

## Busbar grounding panel type BG1 (dimensions in mm/inch)

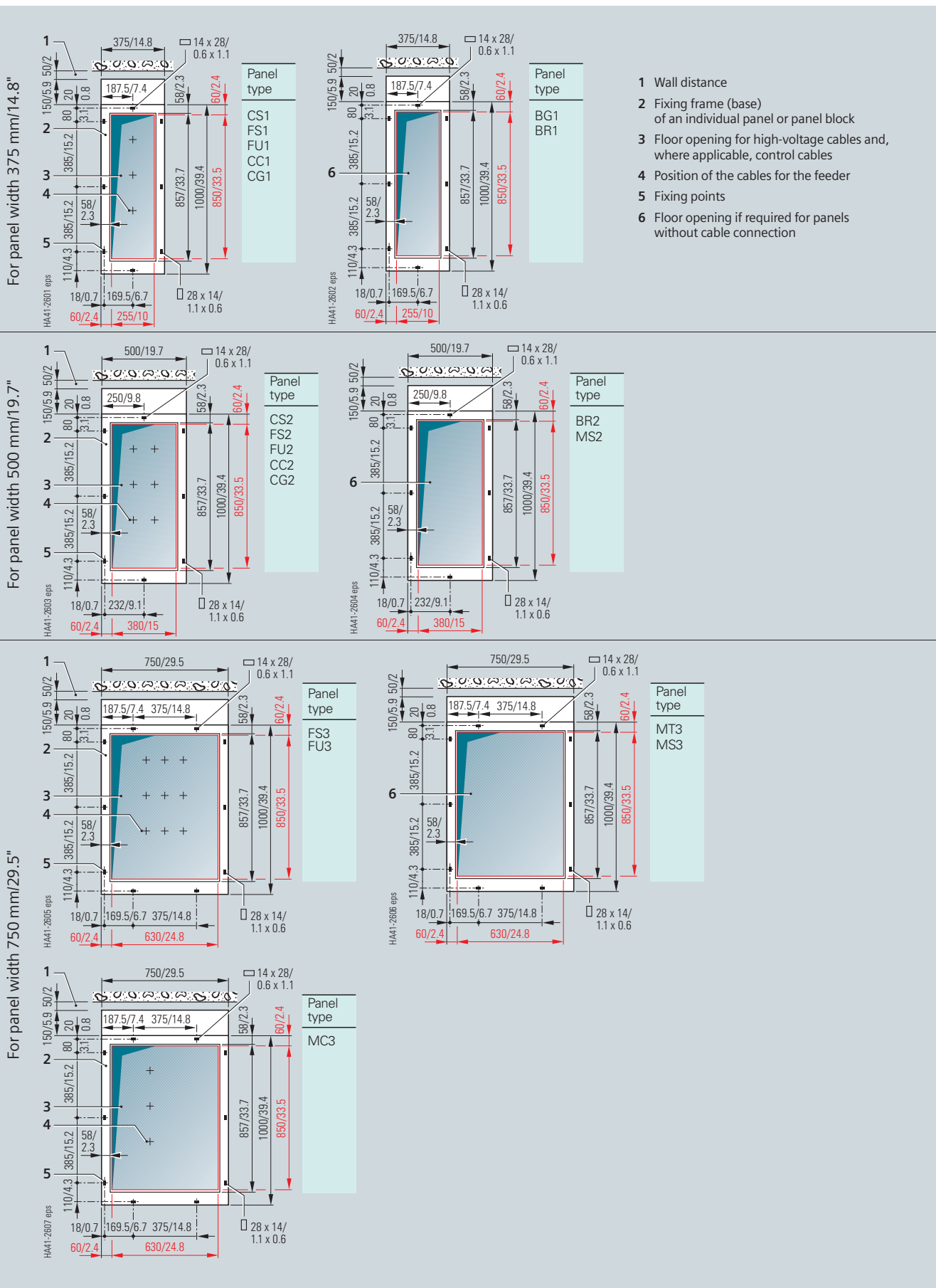


### Legend

- 1 Available mounting depth in the LV niche
- 2 Screwed-on cover

# Dimensions

## Floor openings (dimensions in mm/inch in red) and fixing points



# Standards

## Standards, specifications, guidelines

### Overview of standards

SIMOSEC ANSI switchgear complies with the following relevant standards and specifications as applicable:

- ANSI/IEEE Std. C37.20.3-2001
- ANSI/IEEE Std. C37.20.4-2001
- ANSI/IEEE Std. C37.57-2003
- ANSI/IEEE Std. C37.58-2003
- ANSI/IEEE Std. 1247-2005
- ANSI/IEEE Std. C37.22-1997
- CSA C22.2 No. 193-M 1983
- CSA C22.2 No. 31-04
- EEMAC G11-1 (measurement of Corona)
- IEC 62 271-105

### Third-party listing

SIMOSEC ANSI is available for most configurations with UL or C-UL listing.

### Type of service location

SIMOSEC ANSI switchgear can be used as an indoor installation in accordance with NEC (NFPA70)

- 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.

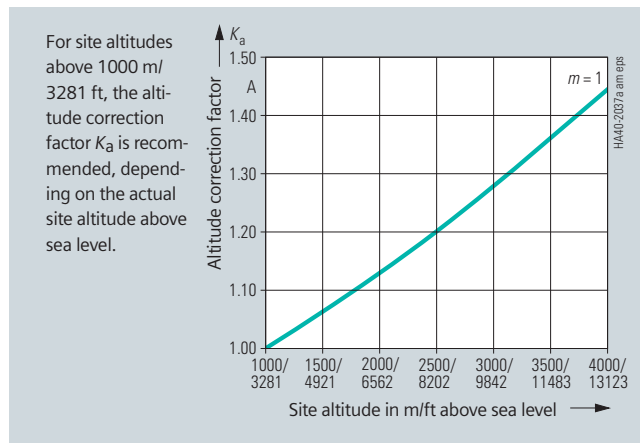
### Terms

- "Make-proof grounding switches" are grounding switches with short-circuit making capacity according to IEC 62 271-102
- Switch-disconnector corresponds to interrupter switch
- HV CL are high-voltage current limiting fuse links

**Table – Insulating capacity**

Rated voltage (rms value)	kV	8.25	15	27.6
Rated short-duration (1 minute) power-frequency withstand voltage (rms value)				
– Across isolating distances	kV	39.6	39.6	66
– Between phases and to ground	kV	36	36	60
Rated lightning impulse withstand voltage (peak value)				
– Across isolating distances	kV	105	105	138
– Between phases and to ground	kV	95	95	125

### Altitude correction factor $K_a$



Rated short-duration power-frequency withstand voltage to be selected

$$\geq \text{Rated short-duration power-frequency withstand voltage} \cdot K_a$$

Rated lightning impulse withstand voltage to be selected

$$\geq \text{Rated lightning impulse withstand voltage} \cdot K_a$$

### Example:

3000 m/9842 ft site altitude above sea level  
15 kV switchgear rated voltage  
95.0 kV rated lightning impulse withstand voltage

Rated lightning impulse withstand voltage to be selected  $95 \text{ kV} \cdot 1.28 = 122 \text{ kV}$

### Result:

According to the above table, a switchgear for a rated voltage of 27.6 kV is to be selected.

### 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 60 694/VDE 0670-1000 and ANSI/IEEE C37.20.3.
- The rated values are referred to sea level and to normal atmospheric conditions 14.7 PSI, 68 °F, 0.00068 lb/ft<sup>3</sup> humidity in accordance with IEC 60 071/VDE 0111 and ANSI/IEEE.
- The insulating capacity decreases with increasing altitude. For site altitudes above 1000 m/3281 ft (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.
- For site altitudes above 1000 m/3281 ft a higher insulation level must be selected. This results from the multiplication of the rated insulation level for 0 mm/0 ft to 1000 m/3281 ft (above sea level) with altitude correction factor  $K_a$ .



### Cable testing

- For switch-disconnector feeders
- **DC voltage test**  
*before the test:*  
Remove or disconnect any voltage transformers at the cable connection in SIMOSEC ANSI switchgear.

SIMOSEC ANSI switchgear for rated voltages up to 27.6 kV can be subjected to cable tests at a max. DC test voltage of 70 kV. The voltage at the busbar may be 27.6 kV in this case.

#### Test voltages:

Rated voltage of switchgear	DC test voltage, maximum value	VLF* test voltage cosine-rectangular waveform rms (peak) voltage	VLF* test voltage sinusoidal waveform rms (peak) voltage
kV	kV	kV	kV
15	55	22 (22)	16 (22)
27.6	72	33 (33)	23 (33)

### Climate and ambient conditions

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

- Ambient conditions
  - Natural foreign materials
  - Chemically active pollutants
  - Small animals
- Operating temperatures  
The operating temperatures are classified according to ANSI/IEEE C37.20.3

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

- No cross insulation for isolating distances between phases

\* VLF = Very Low Frequency. Refer to IEEE Standard 400.2-2004 "IEEE Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF)". For cosine-rectangular waveform, the rms value is taken as equal to the peak value. For sinusoidal waveform, the rms value is 0.707 times the peak value, if distortion is less than 5%.

- For cable testing
  - the installation and operating instructions of the switchgear
  - the information on manufacturer-dependent cable sealing ends
  - the cable version (e.g. paper-insulated mass-impregnated cables, PVC cables or XLPE cables) must be observed.

### Aseismic capacity (optional)

SIMOSEC ANSI switchgear can be upgraded for regions at risk from earthquake.

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

- IEC 60 068-3-3, 1993
- IEC 60 068-2-6, 1195
- IABG TA13-TM-002/98 (guide)
- NFPA 5000 and IBC Level Seismic Simulation

Within the range of the prevailing earthquake frequencies from 1 to 35 Hz, the required response spectrum to IBC 200 % and 300 % covers the following response spectra:

- Uniform Building Code zone 4
- Seismic Requirements Spec. 9067; Department of Water & Power, Los Angeles
- GTS-1.1013 ENDES, Chile
- VDE 0670-111
- IABG TA13-TM-002/98 category 2

### Switchgear color

Light grey No. 61 according to ASTM D1535 97 (Munsell notation 8.3 G6.10/0.54)

- 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 cable-type current transformers
- All contacts (switch disconnector and make-proof grounding switch) are maintenance-free
- Joints of the energized copper bars are silver plated
- Under indoor operating conditions, SIMOSEC ANSI requires low maintenance

### Protection against solid foreign bodies, electric shock and ingress of water

SIMOSEC ANSI switchgear fulfills acc. to the standards ANSI/IEEE C37.20.3 the following type of protection: All openings in the enclosure prevent the entrance of a rod with a diameter of 3.2 mm/ 0.13 inch.

Responsible for

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