# SIEMENS

# Switchgear up to 24 kV, SF<sub>6</sub>-Insulated, Extendable, Type 8DH10



Medium-Voltage Switchgear Catalog HA 41.11 2001

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See Catalog HA 40.1



#### Applications, features, requirements

8DH10 switchgear are factoryassembled, type-tested, threephase, metal-enclosed, metal-clad single-busbar switchgear for indoor installation:

- Up to 24 kV
- Feeder currents up to 630 A
- Busbar currents up to 1250 A

#### Typical uses

8DH10 switchgear is used – even under severe environmental conditions – for power distribution in secondary distribution systems, e.g. in

- Substations, customer transfer substations, distribution substations and switching substations of power supply and public utilities
- Industrial plants, such as:
- · Wind power stations
- High-rise buildings
- Airports
- Lignite open-cast mines
- Underground railway stations
- Sewage treatment plants
- Port facilities
- Traction power supplies
- Automobile industry
- Mineral oil industry
- Chemical industry
- Cement industry
- Unit-type heating power plants
- Fibrous material and foodstuff
  industry
- Stand-by power generating plants

#### Modular design

- Individual panels and panel blocks can be freely combined and extended – <u>without the</u> <u>need for work involving SF<sub>6</sub> gas</u>
- Low-voltage compartments can be supplied in two overall heights and are wired to the panel by means of plug-in connections

#### Reliability

- Type and routine tested
- Standardized and manufactured using numerically controlled machines
- Quality management system according to DIN EN ISO 9001
- More than 300 000 8DJ/8DH panels have been in service for many years all over the world

#### **Operator safety**

- Primary enclosure provides protection against accidental contact and is hermetically sealed
- HV HRC fuses and cable sealing ends are only accessible when the feeders are earthed
- Operation is possible only when the enclosure is closed
- Logical mechanical interlocking
- Capacitive voltage detection system for verification of safe isolation from supply
- Earthing of outgoing feeders by means of make-proof earthing switches

#### **Operational reliability**

- Hermetically sealed primary enclosure – independent of environmental effects such as dirt, humidity and small animals – sealed for the entire service life:
- Welded vessel
- Welded-in bushings and operating mechanism
- The operating mechanism parts are maintenance-free – (VDE 0670, Part 1000 and IEC 60 694)
- The switch operating mechanisms are accessible outside the vessel
- 100% switchgear interlocking by means of logical mechanical interlocking
- Mechanical switch position indications are integrated in the mimic diagram

#### **Economic considerations**

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

- Maintenance-free concept
- Climatic independence
- Minimum space requirement
- Extremely high availability

Innovative developments, such as:

- Modular design
- Extendability of the switchgear without the need for work involving SF<sub>6</sub> gas
- 3AH maintenance-free vacuum circuit-breakers
- SIPROTEC protection unit product range

### General

#### Typical design

#### **Technical features**

- Maintenance-free
- Independent of climate
- Three-pole primary enclosure, metal-enclosed, metal-clad
- Insulation gas SF<sub>6</sub>
- Gas-tight, welded switchgear vessel of stainless steel with welded-in bushings for electrical connections and mechanical components
- Three-position switch-disconnector with load-break and make-proof earthing function
- Cable connection for bushings
   with outside cone
- Connection by means of cable
   plugs
- in ring-main feeders and circuit-breaker feeders with bolted contact (M16)
- in transformer feeders with plug-in contact
- <u>Option</u>: Connection employing conventional cable sealing ends
- for thermoplastic-insulated cable via elbow adapter AKE 20/630 (make Siemens)
- for paper-insulated mass-impregnated cable via commercially available adapter systems
- · Easy installation

#### Standards

#### 8DH10 switchgear:

IEC Standard	VDE Standard						
IEC 60 694	VDE 0670, Part 1000						
IEC 60 298	VDE 0670, Part 6						
IEC 60 056	VDE 0670, Parts 101 to 107						
IEC 60129	VDE 0670, Part 2						
IEC 60 265-1	VDE 0670, Part 301						
IEC 60 420	VDE 0670, Part 303						
IEC 61 243-5	E VDE 0682, Part 415, DIN EN 61 243-5 (E)						
IEC 60 529	VDE 0470, Part 1						
IEC 60 071	VDE 0111						
IEC 60 470	VDE 0660, Part 103 *						
IEC 60 632	VDE 0660, Part 105 *						

#### Transformers:

IEC Standard	VDE Standard									
Current transformers										
IEC 60 044-1	VDE 0414, Part 1									
Voltage transfo	mers									
IEC 60 044-2	VDE 0414, Part 2									
Combined instrument transformers										
IEC 60 044-3	VDE 0414, Part 5									

\* Standards for vacuum contactors



Power supply of high-rise buildings

### Technical Data

#### Electrical data

	Rated voltage Ur	kV	7.2	12	15	17.5	24
Rated insulation level	Rated short-duration power-frequency withstand voltage $U_{d}$		20	28	36	38	50
	Rated lightning impulse withstand voltage $U_{\rm p}$	kV	60	75	95	95	125
Rated frequency j	fr	Hz	50/60	50/60	50/60	50/60	50/60
Rated normal	For busbar (standard)	А	630	630	630	630	630
current I <sub>r</sub> <sup>-1</sup> ) (not for billing- metering panels type ME1)	For busbar (option)	A	1250	1250	1250	1250	1250

#### Ring-main panel type RK, bus-sectionalizer panel type LT2, cable-connection panel type K

Rated	For feeder (for panels type RK and K)	A	400	, 630	400	, 630	400	, 630	400	, 630	400, 630
current Ir <sup>1</sup> )	For bus sectionalizer panel type LT2	А	400	, 630	400	, 630	400	, 630	400	, 630	400, 630
Rated short-time	For systems with $t_k = 1$ s	up to kA	20	25	20	25	20	25	20	25	20
withstand current Ik	For systems with $t_{\rm k}$ = 3 s (option)	up to kA	20	-	20	-	20	-	20	-	20
Rated peak withsta	ind current Ip	up to kA	50	63	50	63	50	63	50	63	50
Rated short-circuit	making current I <sub>ma</sub>	up to kA	50	63	50	63	50	63	50	63	50

#### Transformer panel type TR

Rated normal current <i>I</i> <sup>r</sup> <sup>1</sup> )	For feeder <sup>2</sup> )	A	200		200		200		200		200
Rated short-time	For systems with $t_{\rm k}$ = 1 s	up to kA	20	25	20	25	20	25	20	25	20
withstand current I	$k$ For systems with $t_k = 3$ s	up to kA	20	-	20	-	20	-	20	-	20
Rated peak withsta	and current Ip <sup>2</sup> )	up to kA	50	63	50	63	50	63	50	63	50
Rated short-circuit	making current I <sub>ma</sub> <sup>2</sup> )	up to kA	25	25	25	25	25	25	25	25	25
Reference dimens	ion "e" of the HV HRC fuse links	mm	292	3)	292		442		442		442

#### Circuit-breaker panel type LS, bus-sectionalizer panel type LT1

Rated normal	For feeder (for panels type LS)	А	400	, 630	400	, 630	400	, 630	400	630	400, 630
current $I_r$ <sup>1</sup> )	For bus-sectionalizer panel type LT1	А	400	, 630	400	, 630	400	, 630	400	630	400, 630
Rated short-time	For systems with $t_{\rm k} = 1$ s	up to kA	20	25	20	25	20	25	20	25	20
withstand current I	k For systems with $t_{\rm k} = 3$ s	up to kA	20	-	20	-	20	-	20	-	20
Rated peak withstand current Ip			50	63	50	63	50	63	50	63	50
Rated short-circuit	making current I <sub>ma</sub>	up to kA	50	63	50	63	50	63	50	63	50
Rated short-circuit	breaking current I <sub>SC</sub> <sup>4</sup> )	up to kA	20	25	20	25	20	25	20	25	20
Electrical	At rated normal current		10000 operating cycles						_		
service life of 3AH vacuum circuit-breakers	At rated short-circuit breaking current		50 r	nake-	e-break operations —						

#### Busbar-earthing panel type SE, busbar voltage-metering panel type ME3

Rated short-time	For systems with $t_{\rm K}$ = 1 s	up to kA	20	25	20	25	20	25	20	25	20
withstand current I	For systems with $t_{\rm k}$ = 3 s	up to kA	20	-	20	-	20	-	20	-	20
Rated peak withsta	nd current Ip	up to kA	50	63	50	63	50	63	50	63	50
Rated short-circuit	making current I <sub>ma</sub>	up to kA	50	63	50	63	50	63	50	63	50

#### Contactor panel type SC with 3TL8 vacuum contactor (on request)

Rated normal current Ir 1)	For feeder <sup>2</sup> )	A	200		-	-	-	-
Rated short-time	For systems with $t_{\rm k}$ = 1 s	up to kA	20	25	-	-	-	-
withstand current I	$k$ For systems with $t_k = 3$ s	up to kA	20	-	-	-	-	-
Rated peak withsta	and current Ip <sup>2</sup> )	up to kA	50	63	-	-	-	-
Rated short-circuit	making current I <sub>ma</sub> <sup>2</sup> )	up to kA	25	25	-	-	-	-
Reference dimens	ion "e" of the HV HRC fuse links	mm	292	3)	-	-	-	-

#### Billing-metering panels type ME1 and type ME2

	For transfer	up to A	630	)	630		630		630		630
Rated normal current Ir 1)	For feeder (cable-connec. pan. type ME1-K)	up to A	630	630 630 6		630		630		630	
	For busbar metering	up to A	630 630			630		630		630	
Rated short-time	For systems with $t_k = 1$ s	up to kA	20	25	20	25	20	25	20	25	20
withstand current I	$k$ For systems with $t_k = 3$ s	up to kA	20	-	20	-	20	-	20	-	20
Rated peak withsta	and current Ip	up to kA	50	63	50	63	50	63	50	63	50

#### The rated normal currents are designed for maximum ambient temperatures of 40 °C. The 24 hour mean may not exceed 35 °C (according to IEC 60 694 / VDE 0670, Part 1000)

- Depending on the HV HRC fuse link; the maximum permissible cut-off current of the HV HRC fuses must be observed
- An additional extension tube (150 mm long) is required for fuse mounting 442 mm
- 4) For 3AH vacuum circuit-breakers

#### Filling pressure, temperature

Pressure values at 20 °C									
Rated filling pressure p <sub>re</sub> for insulation	500 hPa								
Minimum operational pressure <i>p</i> <sub>me</sub> for insulation	300 hPa								

#### Ambient temperature T

Panels without secondary equipment	– 40 °C to +70 °C
Panels with secon- dary equipment and circuit-breaker panels	– 5 °C to +55 °C

#### Switchgear installation

#### Room planning

Switchgear installation

Wall-mounted arrangement

- Single row

- Double row (for face-to-face arrangement)

#### Room dimensions

Refer to the adjacent dimension drawings

#### Door dimensions

The door dimensions are dependent on the

- Number of panels in a transport group
- Design with or without low-voltage compartment

Fixing of the switchgear

- · For the floor openings and fixing points of the switchgear, refer to pages 34 and 35
- · Foundations:
- Steel girder construction - Reinforced concrete structures

Panel dimensions

Refer to pages 28 to 32

#### Weight

The weight of a panel is dependent on the extent to which it is equipped (e.g. with motor-operated mechanism, voltage transformer). For details, please refer to page 6.



Room planning

Switchgear room

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Switchgear installation of the standard product range

- 1 Relief opening
- 2 Room height
- 3 Panel depth of the standard panel
- 4 Operating aisle
- Panel depth of panels with extended cable 5 compartment cover
- 6 Extended cable compartment cover
- 7 Standard cable compartment cover
- 8 Foundation
- 2<sup>nd</sup> cable connected by means of double T-plugs in 9 conjunction with extended floor opening and design with extended cable compartment cover
- 10 Height of the cable basement corresponding to the cable bending radius



Plan view

Switchgear installation with rear-side pressure-absorber duct (option)

- 11 Cable
- 12 Direction of pressure relief
- 13 Option: Pressure-absorber duct can be supplied for max. 4 panels per transport unit; for rated short-time current  $I_k \le 16$  kA
- 14 Height of the pressure-absorber duct beneath the panel
- 15 Depth of the pressure-absorber duct behind the panel
- Wall distance (in the case of switchgear in 16 combination with contactor panels of type SC, the wall distance increases to  $\geq$  60 mm)
- 17 End wall
- 18 Width of a panel

Product range overview

Individual panels

**Ring-main panel** - as feeder or transfer panel

- gas-insulated

Cable panel

- gas-insulated **Transformer panel** – with HV HRC fuses - as feeder or transfer panel - gas-insulated

- as feeder or transfer panel

Circuit-breaker panel with or without busbar voltage transformer – as feeder or transfer panel - gas-insulated

**Bus-sectionalizer** 

panel - gas-insulated

#### Shipping details

Individual panel, panel block or of combinations thereof for standard switchgear (without pressure-relief duct)		Туре	Panel or panel combination		Transport unit (including packing material) for standard panels (without pressure-absorber system)				
			Width B1 mm	Net weight <sup>1</sup> ) approx. kg without/with LVC */LVC *	Width B2 m	Height m without/with LVC */LVC *	Depth T2 m	Volume m <sup>3</sup> without/with LVC */LVC *	Gross weight approx. kg without/with LVC */LVC *
Transport of indivi	idual panels								
Ring-main panel (s	tandard)	RK	350	150/210	0.70	1.60/2.20	1.10	1.23 / 1.69	210/270
Cable panel (stand	ard)	К	350	145 / 205	0.70	1.60/2.20	1.10	1.23 / 1.69	205 / 265
Transformer panel		TR	500	180/240	0.70	1.60/2.20	1.10	1.23 / 1.69	240 / 300
Circuit-breaker panel (standard)		LS1	500	- / 260	0.70	- / 2.20	1.10	- / 1.69	- / 320
		LS2	500	- / 380	0.70	- / 2.20	1.10	- / 1.69	- / 440
Bus-sectionalizer p	banel	LT1	500	- / 280	0.70	- / 2.20	1.10	- / 1.69	- / 340
		LT1-V	500	- / 380	0.70	- / 2.20	1.10	- / 1.69	- / 440
		LT2	500	150/210	0.70	1.60/2.20	1.10	1.23 / 1.69	210/270
Busbar-earthing pa	anel	SE1	500	150/210	0.70	1.60/2.20	1.10	1.23 / 1.69	210/270
		SE2	500	250/310	0.70	1.60/2.20	1.10	1.23 / 1.69	310/370
Contactor panel		SC	500	280/ -	0.70	1.60/ -	1.10	1.23/ -	340/ -
Busbar voltage-me	etering panel	ME3	500	250/310	0.70	1.60/2.20	1.10	1.23 / 1.69	310/370
Billing-metering	low-profile design	ME1	850	250/310	1.08	1.60 / 2.20	1.10	1.90 / 2.61	310/370
panels, air-	high-profile design	ME1-H	850	350/ -	1.08	1.60 / -	1.10	1.90/ -	410/ -
insulated	with combined instru- ment transformers	ME2	600	390 / 450	1.08	1.60 / 2.20	1.10	1.90 / 2.61	450 / 510

#### Transport of panel blocks

Ring-main panel block	R-B2	700	280 / 400	1.08	1.60 / 2.20	1.10	1.90/2.61	340 / 460
	R-B3	1050	400 / 580	1.40	1.60 / 2.20	1.10	2.46/3.40	470 / 650
Transformer-panel block	T-B2	1000	320 / 440	1.40	1.60 / 2.20	1.10	2.46/3.40	390 / 510
	T-B3	1500	480 / 660	2.03	1.60 / 2.20	1.10	3.57 / 4.91	560 / 740
Ring-main transformer-panel block	RT-B2	700	300 / 420	1.08	1.60 / 2.20	1.10	1.90 / 2.61	360 / 480
	2RT-B3	1050	450 / 630	1.40	1.60 / 2.20	1.10	2.46 / 3.40	520 / 700
	3RT-B4	1400	580 / 820	2.03	1.60 / 2.20	1.10	3.57 / 4.91	660 / 900
Cable-connection transformer-panel block	KT-B2	700	300 / 420	1.08	1.60 / 2.20	1.10	1.90 / 2.61	360 / 480

#### Transport of combinations of different individual panels or panel blocks

Comprising	Overall width B3	B2		T2			
<ul> <li>a number of individual panels or</li> <li>1 panel block or</li> </ul>	≤ 850 mm	1.08	1.60 / 2.20	1.10	1.90/2.61	<sup>2</sup> ) +	60 **
- a number of panel blocks or	≤ 1200 mm	1.40	1.60 / 2.20	1.10	2.46/3.39	2) +	70 **
- individual panels with panel blocks	≤ 1800 mm	2.03	1.60 / 2.20	1.10	3.57 / 4.91	<sup>2</sup> ) +	85 **
	≤ 2350 mm	2.55	1.60 / 2.20	1.10	4.49/6.17	<sup>2</sup> ) + <sup>·</sup>	100 **

#### HA41-2284a 1 Ē 72 2 B1 3 B2 With individual panel or panel block



1) The net weight is dependent on the extent to which it is equipped (e.g. with current transformers, motor-operated mechanism, extended cable-compartment cover) and is therefore given as a mean value

- 2) Sum of the net weights of individual panels and / or panel blocks
- \* Low-voltage compart-ment, 600 mm high, weight approx. 60 kg depending on the panel type and on the extent to which it is equipped

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

\*\* Packing weight

– gas-insulated – for 7.2 kV

Contactor panel (on request)

Busbar earthing panel - gas-insulated

#### Busbar voltagemetering panel - gas-insulated

Billing-metering panel as transfer panel
air-insulated

Billing-metering panel - air-insulated

Panel blocks

**Ring-main** panel block

Transformerpanel block

Ring-main transformerpanel block

Cable-connection transformerpanel block



3RT-B4

KT-B2

1400 mm

700 mm

3 ring-main panels and 1 transformer panel as a block of four

1 cable-connection panel and 1 transformer panel as a block of two

Туре	Panel	Equipment features			Product
51	width	Basic equipment	Additional equipment (option)		range
RK	350 mm	<ul> <li>Manually-operated mechanism</li> <li>Interlock for cable compartment cover</li> <li>Ready-for-service indicator (also for panel blocks: 1x per block)</li> </ul>	<ul> <li>Motor-operated mechanism for three-position switch-disconnector</li> <li>Auxiliary contacts <sup>1</sup>) for three-position switch-disconnector</li> <li>Short-circuit or earth-fault indicator</li> <li>Locking device</li> </ul>	<ul> <li>Ring-main closing lock-out</li> <li>Capacitive voltage detection system for the busbar</li> <li>Current transformers</li> <li>Secondary equipment</li> <li>Mounted cable clamps</li> <li>Low-voltage compartment or shutter</li> </ul>	Page 8
к	350 mm	<ul><li>Manually-operated mechanism</li><li>Ready-for-service indicator</li></ul>	<ul> <li>Make-proof earthing switch with / without auxiliary contacts <sup>1</sup>)</li> <li>Mounted cable clamps</li> </ul>	Current transformers     Low-voltage compartment or shutter	Page 8
TR	500 mm	<ul> <li>Manually-operated mechanism</li> <li>Interlock for cable compartment cover</li> <li>Ready-for-service indicator (also for panel blocks: 1x per block)</li> </ul>	<ul> <li>Motor-operated mechanism for three-position switch-disconnector</li> <li>Auxiliary contacts <sup>1</sup>) for three-position switch-disconnector</li> <li>Locking device</li> <li>Shunt release</li> </ul>	<ul> <li>Capacitive voltage detection system for busbars and / or feeder</li> <li>Current transformers</li> <li>Secondary equipment</li> <li>Mounted cable clamps</li> <li>Low-voltage compartment or shutter</li> </ul>	Page 8
LS	500 mm	<ul> <li>Manually-operated mechanism for three-position switch-disconnector</li> <li>vacuum circuit-breaker, with auxiliary contacts</li> <li>Interlock for cable compartment cover</li> <li>Ready-for-service indicator</li> <li>Low-voltage compartment</li> </ul>	<ul> <li>Motor-operated mechanism for three-position switch-disconnector</li> <li>Motor-operated mechanism for vacuum circuit-breaker</li> <li>Auxiliary contacts <sup>1</sup>) for three-position switch-disconnector</li> <li>Electrical "local operation" for vacuum circuit-breaker</li> <li>Closing lock-out for three-position switch-disconnector</li> </ul>	<ul> <li>Interlock between the vacuum circuit- breaker and the three-position switch- disconnector (not with closing lock-out)</li> <li>Locking device</li> <li>Capacitive voltage detection system for busbars</li> <li>Current transformers</li> <li>Secondary equipment</li> <li>Mounted cable clamps</li> </ul>	Page 10
LT	500 mm	<ul> <li>Manually-operated mechanism for three-position switch-disconnector</li> <li>Locking device</li> <li>Ready-for-service indicator</li> <li>Low-voltage compartment (for panels with vacuum circuit-breaker)</li> </ul>	<ul> <li>Motor-operated mechanism for three-position switch-disconnector</li> <li>Auxiliary contacts <sup>1</sup>) for three-position switch-disconnector</li> <li>Secondary equipment</li> <li>Current transformers at the busbars</li> </ul>	<ul> <li>Capacitive voltage detection system for the left-hand busbar section</li> <li>Low-voltage compartment or shutter (for panels without vacuum circuit-breaker)</li> </ul>	Page 11
SE	350 mm and 500 mm	<ul> <li>Manually-operated mechanism for make-proof earthing switch</li> <li>Locking device</li> <li>Ready-for-service indicator</li> </ul>	<ul> <li>Auxiliary contacts <sup>1</sup>) for make-proof earthing switch</li> <li>Secondary equipment</li> </ul>	Low-voltage compartment or shutter	Page 11
SC	500 mm	<ul> <li>Manually-operated mechanism for three-position switch-disconnector</li> <li>Ready-for-service indicator</li> <li>Interlock for cable comp. cover</li> <li>Low-voltage niche</li> <li>2NO+2NC auxiliary contacts for vacuum contactor</li> </ul>	<ul> <li>Motor-operated mechanism for three-position switch-disconnector</li> <li>Auxiliary contacts <sup>1</sup>) for three-position switch-disconnector</li> <li>Locking device</li> </ul>	<ul> <li>Capacitive voltage detection system for busbars and / or feeder</li> <li>Secondary equipment</li> <li>Mounted cable clamps</li> </ul>	Page 11
ME3	500 mm	<ul> <li>Ready-for-service indicator</li> <li>Manually-operated mechanism for three-position switch-disconnector</li> </ul>	<ul> <li>Auxiliary contacts <sup>1</sup>) for three-position switch-disconnector</li> <li>Locking device</li> </ul>	<ul><li>Secondary equipment</li><li>Low-voltage compartment or shutter</li></ul>	Page 11
ME1	850 mm	Prepared for installation of current and voltage transformers	<ul> <li>Earthing studs</li> <li>Transformers and secondary equipment to customer's specification</li> </ul>	<ul> <li>Cable connection</li> <li>Additional current transformers</li> <li>Low-voltage compartment or shutter</li> </ul>	Pages 12 and 13
ME2	600 mm	Combined instrument transformers	Transformers and secondary     equipment to customer's specification	Low-voltage compartment or shutter	Page 13
Туре	Block width	Comprising		Equipment features	Product range
R-B2	700 mm	2 ring-main panels as a block of two			
R-B3	1050 mm	3 ring-main panels as a block of three			
T-B2	1000 mm	2 transformer panels as a block of tw	0		
T-B3	1500 mm	3 transformer panels as a block of thr	ee	- as for individual papels	Page 9
RT-B2	700 mm	1 ring-main panel and 1 transformer p	anel as a block of two		ruge 7
2RT-B3	1050 mm	2 ring-main panels and 1 transformer	panel as a block of three		

1) 2NO+1NC for switch position " CLOSED / EARTHED" and 2NO for "OPEN"

## Product Range

Ring-main panels, cable and transformer panels as individual panels



### Product Range

#### Ring-main panels, cable and transformer panels in panel blocks



#### Transformer-panel blocks

Designs and options for each panel are to be found on page 8



Designs

- Arrangement of the busbar-connection system for attachment to individual panels or panel blocks: In the left-hand panel of the panel block (in consequence thereof, extendable at a later date)
- Only either the left-hand <u>or</u> the right-hand panel of the panel block can be designed as a transfer panel with busbar connection
- Panel blocks are also available without a busbar-connection system (in this case they are extendable at a later date only via the cable feeder)



#### Cable-connection transformer-panel block

Designs and options for each panel are to be found on page 8



#### Designs

- Arrangement of the busbar-connection system for attachment to individual panels or panel blocks: In the left-hand panel of the panel block (in consequence thereof, extendable at a later date)
- Only either the left-hand <u>or</u> the right-hand panel of the panel block can be designed as a transfer panel with busbar connection
- Panel blocks are also available without a busbar connection system (in this case they are extendable at a later date only via the cable feeder)

\* A plug-in voltage transformer cannot be provided at the connection

#### Circuit-breaker panels as individual panels



## Product Range

Bus-sectionalizer panels, busbar-earthing panels and busbar voltage-metering panels as well as contactor panels as individual panels



### Product Range

Air-insulated metering panels as transfer panels



Air-insulated metering panels as transfer panels



### Design

#### Panel design (examples)



Billing-metering panel, air-insulated





#### Legend for pages 14 and 15

- 1 Option: Low-voltage compartment
- 2 Niche for customer-side low-voltage equipment, with swing-out cover
- 3 Switch position indication for load-break function "CLOSED OPEN"
- 4 Switch position indication for earthing function" OPEN - EARTHED"
- 5 Ready-for-service indicator
- 6 Rating plate
- 7 Mimic diagram
- 8 Option: Short-circuit / earth-fault indicator
- 9 Sockets for voltage detection system
- 10 Arrangement of the busbars
- **11** Feeder designation plate
- 12 Option: Locking device for three-position switch-disconnector
- **13** Manual operation for the mechanism of the earthing function
- 14 Manual operation for the mechanism of the load-break function
- 15 Interlocking of the cable compartment cover
- 16 Arrangement of the cable connections
- 17 Busbar system
- 18 Switchgear vessel filled with  $SF_6$  gas
- 19 Busbar connection

#### Panel design (examples)





20 Pressure-relief device

- **21** Compartmentalization for busbar
- 22 Earthing busbar
- 23 Three-position switch-disconnector
- 24 Spring-operated mechanism
- 25 Bushing for cable plug
- with bolted contact (M16)
- 26 Option: Cable T-plug
- 27 Cable compartment cover
- **28** Cable connection compartment
- 29 Cable brackets
- 30 Earthing connection
- 31 HV HRC fuse assembly with cover removed
- 32 Grip for replacing HV HRC fuse links
- 33 Interlock for HV HRC fuse assembly
- **34** Cover of the HV HRC fuse compartment
- 35 Spring-operated / stored-energy mechanism
- 36 Bushing for cable plug with plug-in contact
- 37 Cable elbow plug with plug-in contact
- 38 Switch position indication for load-break function "CLOSED – OPEN" and, where appropriate, "HV HRC fuse tripped" or "f-release tripped"
- **39** Cover for busbar connection and access to the instrument transformers screwed on
- 40 4MR voltage transformer
- 41 4MA7 current transformer
- 42 Cover to busbar connection compartment screwed on
- **43** Option: SIPROTEC bay control unit
- 44 Low-voltage compartment (standard)

Vacuum circuit-breaker:

- 45 Opening for the operation crank
  - for switching-on with manually-operated mechanism
     for emergency operation with motor-operated mechanism
- **46** Operating mechanism housing with drive mechanism
- 47 Mechanical CLOSED button (not supplied with spring-operated mechanism)
- 48 Mechanical OPEN button
- 49 Operating cycle counter
- 50 "Spring charged" indicator
- 51 Vacuum interrupter
- 52 Switch position indication
- **53** Option: Interlock between vacuum circuit-breaker and three-position switch-disconnector
- 54 Option: Three-phase current transformer (protection transformer)
- 55 Cable-type current transformer
- 56 Plug-in type voltage transformer at the busbar
- 57 Bushing for connection of plug-in type voltage transformers
- 58 Plug-in connection according to EN 50181 / DIN EN 50181 as interface type "A"
- 59 Option: Plug-in type voltage transformer at connection
- 60 Extended cable compartment cover
- 61 Cable duct, removable, for control and / or ring conductors

#### 3AH vacuum circuit-breakers

#### Features

- · According to IEC 60 056 and VDE 0670, Parts 101 to 107
- All 8DH10 switchgear can be employed in conformity with the system in hermeticallysealed vessels
- · Climatically independent vacuum interrupter poles in the SF<sub>6</sub>-filled switchgear vessel
- Maintenance-free for use indoors according to VDE 0670, Part 1000 and IEC 60 694
- · Individual secondary equipment
- · A metal bellows is used for gasketless separation of the ŠF<sub>6</sub> insulation and the operating mechanism - as already used with success for over 100 000 vacuum interrupters

#### Switching duties and operating mechanisms

The switching duties of the vacuum circuit-breaker are dependent, among other factors, on its type of operating mechanism. Three operating mechanism variants are available:

- Motor-operated stored-energy mechanism
- for auto-reclosure (K), - for synchronization and rapid load transfer (U)
- · Manually-operated storedenergy mechanism
- for auto-reclosure (K)
- · Manual spring-operated mechanism (= spring CLOSED, stored-energy OPEN)
- <u>not</u> for auto-reclosure (K)
- for normal closing and
- for storage of energy for a single opening

Further operating mechanism features

- · Located outside the switchgear vessel in the operating mechanism housing and behind the control board
- Stored-energy spring-operated mechanism for 10,000 operating cycles

### Operating mechanism functions

Motor-operated mechanism <sup>1</sup>) (M1 \*)

In the case of the motor-operated mechanism, the closing spring is charged by means of a motor and latched in the charged position (the "spring charged" indication is visible). Closing is effected either by means of a closing button or a closing solenoid. The closing spring is recharged automatically (for auto-reclosure).

Manually-operated storedenergy mechanism

The closing spring is charged by means of the hand crank supplied until latching of the closing latch is indicated (= "spring charged" indication).

Subsequently the vacuum circuit-breaker can be closed either manually or electrically and the closing spring can be recharged manually. The " closing energy" is thus stored once more (for auto-reclosure).

Manual spring-operated mechanism (= spring CLOSED, stored-energy OPĖN)

The closing spring of the vacuum circuit-breaker is charged by means of the hand crank supplied until the vacuum circuitbreaker closes. Subsequently either manual or electrical opening is possible.

Vacuum circuit-breakers with spring-operated mechanism are not suitable for auto-reclosure.

#### Trip-free mechanism

The vacuum circuit-breakers are fitted with a trip-free mechanism according to IEC 60 056 and DIN VDE 0670.

- 1) Motor rating at 24 V to 220 V DC: 350 W 110 V and 220 V AC: 400 VA
- 2) With closing solenoid
- Equipment identification code

At du	obre tie:	eviations for switching s and applications:	С	=	Closing
U	=	Synchronization and rapid load transfer (make time $\leq$ 90 ms)	СО	=	Closing with subsequent opening in the vacuum circuit-breaker's shortest close-open time
Κ	=	Auto-reclosure	t	=	Dead time 0.3 s
0	=	Opening	ť'	=	Dead time 3 min

For further technical data and description of typical applications. please refer to Catalog HG 11.11 " 3AH Vacuum Circuit-Breakers"



Operating mechanism of the vacuum circuit-breaker (For the legend, please refer to page 17)

#### Key differences between the vacuum circuit-breakers depending on the operating mechanism variant

Operating mechanism variant	Motor-operated stored-energy mechanism	Manually- operated stored-energy mechanism	Manual spring- operated mechanism
Typical uses	Utility substations and industrial plants	Classic transfer substations and substations without auxiliary voltage supply	Simple utility substations (circuit-breaker employed as transformer switch)
Mechanism function	Stored-energy CLOSED, stored-energy OPEN	Stored-energy CLOSED, stored-energy OPEN	Spring CLOSED, stored-energy OPEN
Mechanism operation	With motor <sup>1</sup> ), manual (emer- gency) oper- ation locally including anti- pumping device	With hand crank	With hand crank
Closing the vacuum circuit-breaker	Electrically <sup>2</sup> ) or mechanically locally by means of pushbutton	Mechanically locally by means of push- button, option: electrically <sup>2</sup> )	Mechanically locally by means of hand crank (charging function)
Closing solenoid, e.g. for electrical remote closing	Always provid- ed, with elec- trical checkback signal " closing spring charged"	Option	Without
Rated switching sequence	O- <i>t-</i> CO or O- <i>t-</i> CO- <i>t</i> '-CO	0- <i>t</i> -CO	O or CO
Auto- reclosure (K)	Suitable (multi- ple auto-reclo- sure is possible)	Suitable (only with closing solenoid)	-

#### Secondary equipment of the 3AH vacuum circuit-breaker

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

#### **Closing solenoid**

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

#### Shunt releases

- · Types:
- Standard: 3AY15 10 (Y1 \*)
- Option: 3AX11 01 (Y2 \*), with energy store
- Tripping by protection relay or electrical actuation

#### Current transformeroperated releases

- Type 3AX11 04 (Y6 \*) for tripping pulse  $\geq 0.1$  Ws in conjunction with suitable protection systems, e.g. 7SJ41. protection relay, 4MC6.. transformer protection system, SEG relay (other designs on request)
- Used where no external auxiliary voltage is available, tripping by protection relay

#### Undervoltage releases

- Type 3AX11 03 (Y7 \*)
- · Comprising:
- Energy store and unlatching mechanism
- Electromagnetic system, to which voltage is permanently applied in the CLOSED position of the vacuum circuitbreaker; tripping is initiated when this voltage falls
- Connection to voltage transformers is possible

#### Anti-pumping (standard) (mechanical and electrical)

• Function: If CLOSE and OPEN commands are applied simultaneously and continuously to the vacuum circuit-breaker, this reverts to its OPEN position subsequent to closing. The circuit-breaker remains in this position until a new CLOSE command is given. Thus continuous closing and opening (= pumping) is obviated.

#### Equipment 1) For utilization Abbreviations = normally-open contact by the identification NO custome code NC = normally-closed contact

For further technical data and description of typical applications, please refer to Catalog HG 11.11 " 3AH Vacuum Circuit-Breakers

#### Breaker tripping signal (standard)

- For electrical signalling (as pulse > 10 ms), e.g. to remote control systems, in the case of spontaneous tripping (e.g. protection)
- Via NO contact (S6 \*) and cut-out switch (S7 \*)

#### Varistor module

- · As overvoltage protection for protection devices in conjunction with inductive devices in the vacuum circuit-breaker (limiting to approx. 500 V)
- For auxiliary voltages ≥ 60 V DC

#### Auxiliary switches

- Type 3SV9 (S1 \*)
- Standard: 6NO+6NC, of which 2NO+2NC+2 changeover contacts are free 1)
- Option: 12NO+12NC, of which 7NO+4NC+2 changeover contacts are free 1)

#### Position switches

- Type 3SE4 (S4 \*)
- · For signalling " closing spring charged"
- · Only in conjunction with storedenergy mechanisms

#### Mechanical interlocking

- · Dependent on the type of operating mechanism
- Option: Switchgear interlocking with the three-position switchdisconnector (not possible: closing lock-out for the three-position switch-disconnector in circuitbreaker panels type LS and LT1)
- Operating mechanism with mechanical interlocking (option) as Spring-operated mechanism: Mechanical closing is prevented in the OPEN position of the threeposition switch-disconnector by the operating crank; opening of the operating crank is "blocked" Stored-energy mechanism with closing solenoid 3AY15 10 (Y9 \*) and pushbutton (S12 \*) In the OPEN position of the three-position switch-disconnector the vacuum circuit-breaker cannot be closed. The pushbutton (S12 \*) operated by the mechanical interlock prevents a continuous command to the closing solenoid.







Maximum equipment (with motor-operated stored-energy mechanism)

Secondary equipment (view into the operating mechanism housing) 11 Circuit-breaker "OPEN"

- 1 Gearing
- 2 Position switch (S4 \*)
- 3 Closing spring
- 4 Motor (M1 \*)
- 5 "Closing spring charged" indicator
- 6 Operating cycle counter
- 7 Closing solenoid (Y9 \*)
- Option: Auxiliary switch 12NO+12NC
- Auxiliary switch 6NO+6NC (S1 \*)
- 10 Circuit-breaker "CLOSED"

- 12 Option: 2<sup>nd</sup> release
- 13 1st release (Y1 \*)
- 14 Option: Mechanical interlocking with interrogation of the three-position switch-disconnector
- 15 Operating rod with contact pressure springs
- 16 Interlocking with the threeposition switch-disconnector
- 17 Actuation for closing the vacuum circuit-breake

#### Three-position switch-disconnector

#### Features

- Switching positions: CLOSED – OPEN – EARTHED
- Switching functions as multi-purpose switchdisconnector (class E3) according to VDE 0670, Part 301 and IEC 60 265-1; VDE 0670, Part 2 and IEC 60 129
- Designed as a multi-chamber switch with the functions
- <u>Switch-disconnector</u> and
   <u>Make-proof earthing switch</u>
- Operation via a gas-tight welded-in bushing in the front of the switchgear vessel



Three-position switch-disconnector



- 3 Switchgear vessel
- 4 Operating mechanism rocker
- 5 Detachable lever mechanism
- 6 Operating lever, plugged in

For further details, please refer to Catalog HA 40.1 " Switchgear for Secondary Distribution Systems up to 24 kV, SF<sub>6</sub>-Insulated, Types 8DJ and 8DH: General Part"

#### Busbars

#### Features

- Safe-to-touch as a result of use of metallic covers
- Single-pole, plug-in designConsisting of round-bar
- consisting of round-bai copper, insulated by means of silicon rubber
- Busbar joints with cross and end adapters, insulated by means of silicon rubber
- Insensitive to fouling and condensation
- Extension or panel replacement is possible without the need to work with SF<sub>6</sub> gas
- Special busbar connections to metering panels type ME1 are possible. Connection to the
- Cable-connection bushings of the neighboring panel or to the
- Busbar bushings
- Busbar arrangement for the panel blocks within the switchgear vessel filled with SF<sub>6</sub> gas
- <u>Option:</u> Screened busbar:
- Field control with the aid of conductive layers on the silicon-rubber insulation (both inside and outside);
- Installation of 4MC70 32 current transformers is possible
- <u>Option:</u> Capacitive voltage detection system for the busbar; refer also to the product range, pages 8 to 13



Busbar compartment extending over 2 panels with busbar connections, busbar covers removed



Single-pole, unscreened design

#### Busbar system

- 1 End adapter
- 2 Cross adapter
- 3 Busbar insulation of silicon rubber
- 4 Threaded bolt M12 / M16
- 5 Busbar, Cu, Ø 32 mm
- 6 Stopper

#### Switchgear vessel

- 7 Primary enclosure panel 1
- 8 Primary enclosure panel 2
- 9 Bushing
- 10 Capacitive tap at the bushings, earthed (standard)



#### 4MT3 \* and 4MT8 \* plug-in type voltage transformers for panel types LS, TR, SE and ME3



2 4MT8 \* at the cable connection

#### Features

- · According to VDE 0414, Part 2 and IEC 60 044-2
- Single-pole, plug-in design
- · Metal-enclosed, safe-to-touch
- · Connection system with plug-in contact and
- Inside cone for 4MT3 voltage transformers
- Outside cone for 4MT8 voltage transformers
- Inductive type
- · Climatically independent
- · Secondary connection by means of plugs inside the panel

#### Installation

- · Arrangement on the switchgear vessel for busbar metering:
- 4MT3 voltage transformer for panel types LS2, SE2, ME3 and LT1-V
- · Arrangement at the cable connection:
- 4MT8 voltage transformer, plug-in type on screened cable T-plug, for panel types LS1-V, LS2-V and TR-V (extended cable compartment cover required)
- 4MT8 voltage transformer, which is plugged in directly on the bushing via an adapter with a plug-in contact (interface type "A"), for panel type TR-V (extended cable compartment cover required)



**Technical data** 

### 4MT3 \* and 4MT8 \* voltage transformers

Primary data					
12 kV					
3.3/√3 kV at 10 kV 3.6/√3 kV at 10 kV					
4.8/v3 kV at 20 kV 5.0/v3 kV at 20 kV 6.0/v3 kV at 20 kV 6.6/v3 kV at 20 kV 7.2/v3 kV at 20 kV					
10.0/√3 kV at 28 kV 11.0/√3 kV at 28 kV					
75 kV					
1.9 x <i>U</i> N					
24 kV					
13.8/√3 kV at 38 kV 15.0/√3 kV at 38 kV					
17.5/√3 kV at 50 kV 22.0/√3 kV at 50 kV					
125 kV					
1.9 x U <sub>N</sub>					

Secondary data for 4MT3 voltage transformers						
Rated voltage	100/√3 V 110/√3 V					
Rated voltage for auxiliary winding (option)	100/3 V 110/3 V					
Rated thermal current limit (measuring winding)	8 A					
Rated long-term thermal current (8 h)	5 A					
Rated output VA	25   75   100   150					
Class	0.2 0.5 1 1					

#### Secondary data for 4MT8 voltage transformers

Rated voltage	100/√3 V 110/√3 V
Rated voltage for auxiliary winding (option)	100/3 V 110/3 V
Rated thermal current limit (measuring winding)	4 A
Rated long-term thermal current (8 h)	3 A
Rated output VA	15   15   30   30   100
Class	0.2 0.5 0.5 1 3

#### Combination of 4MT8 \* voltage transformers with cable T-plugs (screened, without metallic housing)

Make / type	Combination	Make / type	Combination
Euromold / (K)400 TB, (K)400 TBS, AGT	10/20 Yes	ABB/Kabel&Draht / SEHDT 13/23	Yes
nkt cables-F&G / ASTS 10/630, ASTS 20	0/630 Yes	ABB/Kabel&Draht / SEHDT 13.1/23.1	On request
Pirelli Elektrik / FMCTs-400, FMCTg-400	) Yes	Cooper / DT 400 P	Yes
		Raychem / RSTI	On request

Disassembly is necessary in order to carry out a local plant-side voltage test

#### 4MC63 three-phase current transformers for panel type LS



1 4MC63 three-phase current transformer

#### Features

- According to VDE 0414, Part 1 and IEC 60 044-1
- Designed as a three-pole toroidal-core current transformer
- The cast-resin components are free of dielectric stress (inherent design feature)
- Insulation class E
- Inductive type
- Climatically independent
- Secondary connection by means of a terminal strip inside the panel

#### Installation

- Arranged outside the switchgear vessel at the bushings of the cable connection
- Mounted at our works

### Other designs

(option)

Three-phase current transformers with protection equipment based on the transformer tripping principle:

- 7SJ4. protection system as definite-time overcurrent protection, incl. protection relay
- 4MC6 32 and 4MC6 33 protection systems for transformers, incl. protection relay
- Overcurrent protection relay, make SEG, type WIP 1



4MC63 three-phase current transformer at the bushings of the cable connection

#### Technical data

4MC63 10 three-phase cu	rrent transformer						
Primary data							
Max. equipment operating voltage Um	0.72 kV						
Rated current I <sub>N</sub> A	150   100   75   50						
Rated power-frequency withstand voltage (winding test)	3 kV						
Rated short-time thermal current I <sub>th</sub>	25 kA						
Rated continuous thermal current <i>I</i> <sub>D</sub>	630 A						
Transient overload current	1.5 x <i>I</i> <sub>D</sub> / 1 h						
Rated peak withstand current I <sub>dyn</sub>	unlimited						
Secondary data							
Rated current A	1   0.67   0.5   0.33						

Rated output VA	2.5   1.7   1.25   0.8
Rated current (option)	5 A
Current at ID	4.2 A
Protec- Class	10 P
tion Overcurrent factor core	10



4MC63 three-phase current transformer

#### 4MC63 11 three-phase current transformer

Primary data	
Max. equipment operating voltage $U_{\rm m}$	0.72 kV
Rated current I <sub>N</sub> A	400   300   200
Rated power-frequency withstand voltage (winding test)	3 kV
Rated short-time thermal current <i>I</i> <sub>th</sub>	25 kA
Rated continuous thermal current <i>I</i> <sub>D</sub>	630 A
Transient overload current	2 x <i>I</i> <sub>D</sub> / 0.5 h
Rated peak withstand current I <sub>dyn</sub>	unlimited
$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	$2 \times I_D / 0.5 h$ unlimited

#### Secondary data

Rated current A		1	0.75	0.5	
Rated output VA		/A	4	3	2
Rated c	urrent (option)		5 A		
Current	at I <sub>D</sub>		1.575	δA	
Protec-	Class		10 P		
tion core	Overcurrent fac	tor	10		

Other values available on request

Other values available on request

#### 4MC70 33 and 4MC70 31 cable-type current transformers for panel types LS, RK and TR



Cable-type current transformer
 Cable shield

#### Features

- · According to VDE 0414, Part 1 and IEC 60 044-1
- Designed as a single-pole toroidal-core current transformer
- The cast-resin components are free of dielectric stress (inherent design feature)
- Insulation class E
- · Inductive type
- · Climatically independent
- · Secondary connection by means of a terminal strip inside the panel

#### Installation

- 4MC70 33 cable-type current transformer for panel type LS
- 4MC70 31 cable-type current transformer for panel types RK and TR
- · Arranged outside the switchgear vessel around the cable at the panel connection
- Mounted at our works on a transformer supporting plate; to be installed locally on the cable
- Max. 230 mm, depending on the core data of the 4MC70 33 cable-type current transformer, overall height 170 mm and 285 mm (the floor openings on page 34 should be observed)



4MC70 33 cable-type current transformer for the cables at the panel connection

#### Technical data

4MC70 33 cable-type current transformer			
Primary	data		
Max. eo voltage	quipment operating <i>U</i> m	0.72 kV	
Rated c	urrent I <sub>N</sub>	30 A to 6	500 A
Rated p withsta (winding	ower-frequency nd voltage g test)	3 kV	
Rated s current	hort-time thermal I <sub>th</sub>	25 kA	
Rated continuous thermal current $I_{\rm D}$		max. 1.2	× I <sub>N</sub>
Transient overload current		1.5 x I <sub>D</sub> / 2 x I <sub>D</sub> / 0	1 h or 1.5 h
Rated peak withstand current I <sub>dyn</sub>		unlimited	t
Secondary data			
Rated c	urrent	1 A (opti	on: 5 A)
Meas-	Class	0.2	0.5   1
uring	Overcurrent factor	FS10 (option: FS5)	
COLE	Rating	2.5 VA to 10 VA	
Pro- tection core	Class	10 P	5 P
	Overcurrent factor	10	10
	Rating	2.5 VA to	o 10 VA
Option: Secondary tap		1 : 2 (e.g. 150	A – 300 A)

#### Dimensions

Overall height H, mm dependent on the core data	50 100 170 285
External diameter	145 mm
Inside diameter	55 mm
For cable diameter	50 mm
For cable diameter	50 mm

Other values available on request



4MC70 31 cable-type current transformer

4MC70 33 cable-type current transformers, 4 different

overall heights

4MC70 31 cable-type

124 ens

current transformer

Primary data		
Max. equipment operating voltage Um	0.72 kV	
Rated current I <sub>N</sub>	50 A to 600 A	
Rated power-frequency withstand voltage (winding test)	3 kV	
Rated short-time thermal current <i>I</i> <sub>th</sub>	25 kA	
Rated continuous thermal current <i>I</i> <sub>D</sub>	max. 1.2 x <i>I</i> <sub>N</sub>	
Transient overload current	1.5 x <i>I</i> <sub>D</sub> / 1 h or 2 x <i>I</i> <sub>D</sub> / 0.5 h	
Rated peak withstand current I <sub>dyn</sub>	unlimited	
Conservations along		

	<b>J</b>	
Rated c	urrent	1 A (option: 5 A)
Meas-	Class	1
uring	Overcurrent factor	FS5 (option: FS10)
core	Rating	2.5 VA to 10 VA
Option: Secondary tap		1:2
Dimensi	ons	
Overall	height H	89 mm
Width x	Depth	85 mm x 114 mm
Inside d	iameter	40 mm
For cabl	e diameter	36 mm

#### 4MC70 32 busbar-mounted current transformers for panel type LT (for screened busbars only)



1 4MC70 32 busbar-mounted current transformer

#### Features

- <u>Used exclusively for</u> screened busbars
- Preferably in combination with panel type ME2
- According to VDE 0414, Part 1 and IEC 60 044-1
- Designed as a single-pole toroidal-core current transformer
- The cast-resin components are free of dielectric stress (inherent design feature)
- Insulation class E
- Inductive type
- Climatically independent
- Secondary connection by means a terminal strip inside the panel

#### Installation

- Arranged outside the switchgear vessel on the screened busbars
- Installation of the busbar-mounted current transformers either between the panels <u>or alternatively</u>
- Supplied loosely (including the busbar connections), where the installation point of the busbar-mounted current transformers lies at the sectioning point of a transport unit



4MC70 32 busbar-mounted current transformer, mounted on screened busbars, in some cases between the panels

#### Technical data

4MC70 32 busbar-mounted current transformer

#### Primary data

Max. eo voltage	quipment operating <i>U</i> m	0.72 kV
Rated c	urrent I <sub>N</sub>	200 A to 600 A
Rated p withsta (winding	ower-frequency nd voltage g test)	3 kV
Rated s current	hort-time thermal I <sub>th</sub>	25 kA
Rated c current	ontinuous thermal I <sub>D</sub>	max. 1.2 x <i>I</i> <sub>N</sub>
Transie current	nt overload	1.5 x <i>I</i> <sub>D</sub> / 1 h or 2 x <i>I</i> <sub>D</sub> / 0.5 h
Rated p current	eak withstand I <sub>dyn</sub>	unlimited
Seconda	iry data	
Rated c	urrent	1 A (option: 5 A)
Meas-	Class	0.2   0.5   1
urina	Oursel irrest faster	ES10 (option: ESE)

IVIEdS-	Cidos	0.2 1 0	J.J
uring	Overcurrent factor	FS10 (op	tion: FS5)
core	Rating	2.5 VA to	10 VA
Pro-	Class	10 P	5P*
tection	Overcurrent factor	10	10
core	Rating	2.5 VA to	15 VA
Option:	Secondary tap	1:2 (e.g. 150	Δ = 300 Δ)

#### Dimensions

Overall width B, dependent on the core data	80 mm   150 mm
Outside diameter	125 mm
Inside diameter	55 mm





4MC70 32 busbar-mounted

current transformer

4MA7 current transformers and 4MR voltage transformers for air-insulated billing-metering panels type ME1



4MR voltage transformer 1 2 4MA7 current transformer

#### Features

- 4MA7 current transformer
- · According to VDE 0414, Part 1 and IEC 60 044-1
- Dimensions according to DIN 42 600, Part 8
- Designed as a single-pole indoor support-type current transformer
- · Cast-resin insulated
- Insulation class E

#### 4MR voltage transformer

- · According to VDE 0414, Part 2 and IEC 60 044-2
- · Dimensions according to DIN 42600, Part 9 (small model)
- Designed as a indoor-type 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



4MA7 current transformer installed in billing-metering panel type ME1

#### Technical data

#### 4MA7 single-pole current transformer

Primary data				
Max. eo voltage	quipment operating <i>U</i> m	12 kV 24 kV		
Rated p withsta	ower-frequency nd voltage	38 kV	50 kV	
Rated li withsta	ghtning impulse nd voltage	95 kV	125 kV	
Rated c	urrent I <sub>N</sub>	25 A to 6	25 A to 600 A	
Rated short-time thermal current $I_{\rm th}$		up to 25	kA	
Rated continuous thermal current I <sub>D</sub>		up to 1.2	2 x I <sub>N</sub>	
Rated peak withstand current I <sub>dyn</sub>		max. 2.5	x I <sub>th</sub>	
Secondary data				
Rated current		1 A or 5	A	
Meas-	Class	0.2	0.5   1	
uring	Overcurrent factor	FS5 or FS10		
core	Rating	10 VA to 15 VA		
Pro-	Class	5 P or 10	) P	
tection core	Overcurrent factor	10		
	Rating	5 VA or	15 VA	



4MA7 current transformer

#### 4MR single-pole voltage transformer

Primary data			
Max. equipment operating voltage $U_{m}$ (= 1.2 x $U_{N}$ )	12 kV		
Rated voltage <i>U</i> <sub>N</sub> at max. rated power-frequency	3.3/√3 kV at 10 kV 3.6/√3 kV at 10 kV		
withstand voltage Ud	4.8/v3 kV at 20 kV 5.0/v3 kV at 20 kV 6.0/v3 kV at 20 kV 6.6/v3 kV at 20 kV 7.2/v3 kV at 20 kV		
	10.0/√3 kV at 28 kV 11.0/√3 kV at 28 kV		
Rated lightning impulse withstand voltage Up	75 kV		
Rated voltage factor (8 h)	1.9 x <i>U</i> <sub>N</sub>		
Max. equipment operating voltage $U_{\rm m}$ (= 1.2 x $U_{\rm N}$ )	24 kV		
Rated voltage U <sub>N</sub> at max. rated power-frequency withstand voltage	13.8/√3 kV at 38 kV 15.0/√3 kV at 38 kV		
	17.5/√3 kV at 50 kV 20.0/√3 kV at 50 kV 22.0/√3 kV at 50 kV		
Rated lightning impulse withstand voltage	125 kV		
Rated voltage factor (8 h)	1.9 x <i>U</i> N		
Secondary data			
Rated voltage	100/√3 V 110/√3 V 120/√3 V		
Rated voltage for auxiliary winding (option)	100/3 V 110/3 V 120/3 V		
Rated power	20 VA   50 VA   100 VA		
Class	0.2 0.5 1		

Other values available on request

Other values available on request

#### 4MK \* metal-enclosed combined instrument transformers for billing-metering panels type ME2



a AMK1 combined voltage transformer2 4MK3 combined current transformer

#### Features

- 4MK \* combined instrument transformer, comprising
- 4MK3 combined current transformer
- 4MK1 combined voltage transformer
- According to VDE 0414, Part 5 and IEC 60 044-3
- Designed as a single-pole, combined indoor instrument transformer
- · Metal-enclosed
- Insulation class E
- Inductive type
- Secondary connection by means of screw-type terminals



4MK combined instrument transformer installed in billing-metering panel type ME2

#### **Technical data** 4MK3 combined current transformer Primary data Max. equipment operating 24 kV 12 kV voltage $U_{\rm m}$ Rated power-frequency withstand voltage 50 kV 28 kV Rated lightning impulse withstand voltage 75 kV 125 kV Rated current IN 50 A to 600 A Rated short-time thermal up to 25 kA current Ith Rated continuous thermal up to $1.2 \times I_N$ current ID Rated peak withstand max. 2.5 x I<sub>th</sub> current Idyn Secondary data Rated current 1 A or 5 A Meas-0.2 | 0.5 Class T. uring FS5 or FS10 Overcurrent factor core Rating 10 VA to 15 VA 10 P Pro-Class tection Overcurrent factor 10 core Rating 5 VA or 15 VA Secondary multi-ratio Option function

#### 4MK1 combined voltage transformer

Primary data	
Max. equipment operating voltage $U_{\rm m}$ (= 1.2 x $U_{\rm N}$ )	12 kV
Rated voltage <i>U</i> <sub>N</sub> at max. rated power-frequency	3.3/√3 kV at 10 kV 3.6/√3 kV at 10 kV
withstand voltage U <sub>d</sub>	4.8/v/3 kV at 20 kV 5.0/v/3 kV at 20 kV 6.0/v/3 kV at 20 kV 6.6/v/3 kV at 20 kV 7.2/v/3 kV at 20 kV
	10.0/√3 kV at 28 kV 11.0/√3 kV at 28 kV
Rated lightning impulse withstand voltage Up	75 kV
Rated voltage factor (8 h)	1.9 x <i>U</i> <sub>N</sub>
Max. equipment operating voltage $U_{\rm m}$ (= 1.2 x $U_{\rm N}$ )	24 kV
Rated voltage $U_{\rm N}$ at max. rated power-frequency withstand voltage	13.8/√3 kV at 38 kV 15.0/√3 kV at 38 kV
	17.5/√3 kV at 50 kV 20.0/√3 kV at 50 kV 22.0/√3 kV at 50 kV
Rated lightning impulse withstand voltage	125 kV
Rated voltage factor (8 h)	1.9 x <i>U</i> <sub>N</sub>
Secondary data	
Rated voltage	100/√3 V 110/√3 V
Rated voltage for auxiliary winding (option)	100/3 V 110/3 V
Rated power	30 VA  75 VA  150 VA
Class	0.2 0.5 1

Other values available on request

Other values available on request

#### Cable connection

#### Features

- · Bushings with outside cone
- Uniform cable connection height 575 mm
- · With cable bracket, e.g. type C40 according to DIN EN 50 024
- · Access to the cable connection compartment only if feeder has been isolated and earthed

#### Special features

- in ring-main feeders
- in circuit-breaker feeders
- in cable feeders
- in contactor feeders:
- With bolted contact (M16) as interface type "C" according to EN 50181/ DIN EN 50181
- · For thermoplasticinsulated cables
- · For paper-insulated mass-impregnated cables with adapter systems
- · For conventional cable sealing ends via elbow adapter AKE 20/630 (make Siemens)
- · For cable T-plugs or cable elbow plugs
- · For connection crosssections up to 300 mm<sup>2</sup> (standard)
- · Cable routing from below, cable connection from the front
- · For rated normal currents of 400/630 A
- in transformer feeders:
- · With plug-in contact as interface type "A" according to EN 50 181/ DIN EN 50 181
- · For cable elbow plugs with plug-in contact
- · For thermoplasticinsulated cables
- · For connection crosssections up to 120 mm<sup>2</sup>
- · For rated normal currents of 200 A
- Cable plugs, cable sealing ends and cable clamps are not included in the scope of supply



Cable connection · Examples

Cable connection compartment, supplied without cable clamps

11

5

-035 eps

HA41

q

1-037 eps

IA41

Options

11

12

Cable connection compartment,

A Ready-mounted cable clamps

C Double cable connection with

B Short-circuit / earth-fault indicator

corresponding cable plugs and

extended cable compartment cover

supplied without cable clamps

L2

L3



bolted contact (M16)

12 L3 11

12

L3

bolted contact (M16)

L1

10

11

12

#### Cable connections in ring-main feeders

- Prepared for cable plugs with bolted contact (M16)
- 2 Phase L1: make: Euromold, type K400 LB as cable elbow plug
- 3 Phase L2: make: Euromold, type K400 TB as cable T-plug
- 4 Phase L3: make: Euromold, type AGT 20/630 as cable T-plug

For the options A, B, C and E, see below

#### Cable connections in circuit-breaker feeders

- 5 Prepared for cable plugs with bolted contact (M16)
- 6 Phase L1: elbow adapter, make: Siemens type AKE 20/630
- Phase L2: 7 make: Euromold, type K400 TB as cable T-plug
- 8 <u>Phase L3:</u> make: Euromold, type AGT 20/630 as cable T-plug

For the options A, B, C, E and F, see below

#### Cable connections in transformer feeders

- 9 Prepared for cable elbow plugs with plug-in contact
- 10 Phase L1: make: Euromold, type AWGL
- Phase L2: make: Euromold, 11 type K158 LR
- 12 <u>Phase L3:</u> make: Euromold, type AWG 20/250 (with metal housing)

For options A, D and F, see below

Cable elbow plug with plug-in contact

F

- D Bushings as interface type "C" according to EN 50 131 / DIN EN 50 181 for cable plugs with bolted contact (M16)
- E Suitable for connection of surge arresters in conjunction with corresponding cable T-plugs
- Suitable for attachment of metal-enclosed voltage transformers in F conjunction with corresponding cable T-plugs; extended cable compartment cover is required



13

#### Low-voltage equipment

#### Low-voltage compartment

- Height
- Standard 600 mm
- <u>Option</u> 900 mm
- Safe-to-touch design in separate compartment from the high-voltage section of the panel
- Attachment to the panel:
   Standard for circuit-breaker panels type LS and bus
- sectionalizer panels type LT1 – <u>Option</u> for all other panel types, dependent on the scope of the secondary equipment
- For installation of equipment for protection, control, measurement and metering, e. g. suitable for SIPROTEC 4 bay controller type 7SJ63
- <u>Solid-state HMI</u> (human-machine interface) of the SIPROTEC 4 bay controller type 7SJ63 with the following features:
- 1 Freely programmable LED with application-specific label, for indication of freely selectable process and equipment data
- 2 LCD for process and equipment data, e.g. for Measured and metered values
- Binary data respecting the status of switching point and device
- Protection data
- General messages
- Alarm
- 3 Keys for navigation in the menus and for entry of values
- 4 Four freely programmable function keys for frequently performed actions

#### Low-voltage niche

- Employed only inside billingmetering panels type ME1
- <u>Option:</u> For installation, for example, of voltage transformer mcbs

#### Low-voltage cables

- Control cables of the panel to the low-voltage compartment are connected via multi-pole, coded module plug connectors
- <u>Option:</u> Plug-in ring wires from panel to panel are routed in the separate cable duct on the panel





Opened low-voltage compartment with (optional) equipment installed

#### Low-voltage niche





2 (Optional) equipment installed

Modules



#### Ring-main panels, cable panels, transformer and circuit-breaker panels as individual panels



Cable panel type K:

1 Option: Earthing function

- 2 Interlocking of the cable compartment cover in conjunction with earthing function
- 3 Cable compartment cover screwed-on (without earthing function)
- Option: With low-voltage compartment
- Dependent on the type of cable plug
- Available mounting depth for low-voltage equipment
- Option: With extended low-voltage compartment 900 mm

#### Ring-main panels, cable and transformer panels in panel blocks





#### Bus sectionalizer panels and voltage-metering panels as individual panels



- 1 Cable compartment cover screwed-on
- \* Option: With low-voltage compartment
- Available mounting depth for low-voltage equipment
- \*\* Option: With extended low-voltage compartment 900 mm



#### Busbar-earthing panels, contactor panels and billing-metering panels as individual panels



1 Cover screwed-on

Option:

- With low-voltage compartment
- Dependent on the type of cable plug

Depth of the low-voltage niche

### Billing-metering panels as individual panels





- 1 Cover screwed-on
- \* Option:
- With low-voltage compartment

#### Cable-connection fittings in ring-main feeders, cable and circuit-breaker feeders · Examples

HA41-2342a ens





Cable compartment cover extended by 300 mm for double cable connection

- \* Dimension for bushing as interface type "C" with bolted contact (M16)
- \*\* Dependent on the type of cable plug
- \*\*\* Mounting depth for combination of cable T-plug and surge arrester







Cable compartment cover extended by 25 mm



Cable compartment cover extended by 150 mm



Standard cable compartment cover



Cable compartment cover extended by 150 mm

Typical designs are for reference only!

- 1 Elbow adapter, make: Siemens, type AKE 20/630 with conventional cable sealing end, make: RXS cable accessories, type IAE 20
- 2 Cable T-plug, make: Euromold, types K400 TB/TBS
- 3 Cable T-plug, make: Euromold, type K400 TB
- 4 Cable T-plug, make: Euromold, type K400 TB as 2<sup>nd</sup> cable (option: cable elbow plug type K400 LB); identical make to be used throughout
- 5 Elbow adapter, make: Siemens, type AKE 20/630 with conventional cable sealing end, make: RXS cable accessories, type IAE 20
- 6 Surge arrester, make: Siemens, type 3EG2 (on request)
- 7 Cable plug, make: Raychem, type RICS 5139
- 8 Surge arrester, make: Raychem, type RDA 21 (in the case of type RDA 24, other floor openings are required)
- 9 Cable T-plug, make: nkt cables-F&G, types ASTS or AWKS
- 10 Surge arrester, make: nkt cables-F&G, type AÜTIS (for cable T-plug type ASTS) or type AÜATIS (for cable T-plug type AWKS) \*\*\*
- 11 Cable T-plug, make: ABB, type SEHDT
- 12 Surge arrester, make: ABB, type MUT
- or
- 11 Cable T-plug, make: Euromold, types 400 TB / K400 TB
- **12** Surge arrester, e.g. make: Euromold, types 156 SA, K156 SA, 400 Pb or similar designs
- 13 Busbar system for billing-metering panel type ME1
- 14 Cable T-plug, make: Euromold, type K400 TB
- 15 4MT8 plug-in type voltage transformer

#### Floor openings (dimensions in red) and fixing points



#### Floor openings (dimensions in red) and fixing points



\*\*\* For panel type TR, connection with plug-in contact

#### Standards, specifications, guidelines

#### Standards

8DH10 switchgear comply with the following current standards and specifications:

#### 8DH10 switchgear:

IEC	VDE		
standard	standard		
IEC 60 694	VDE 0670, Part 1000		
IEC 60 298	VDE 0670, Part 6		
IEC 60 056	VDE 0670, Parts 101 to 107		
IEC 60 129	VDE 0670, Part 2		
IEC 60 265-1	VDE 0670, Part 301		
IEC 60 420	VDE 0670, Part 303		
IEC 61 243-5	E VDE 0682, Part 415, DIN EN 61 243-5 (E)		
IEC 60 529	VDE 0470, Part 1		
IEC 60 071	VDE 0111		
IEC 60 470	VDE 0660, Part 103 *		
IEC 60 632	VDE 0660, Part 105 *		

#### Instrument transformers:

IEC standard	VDE standard			
Current transformers				
IEC 60 044-1 VDE 0414, Part 1				
Voltage transformers				
IEC 60 044-2 VDE 0414, Part 2				
Combined instrument transformers				
IEC 60 044-3 VDE 0414, Part 5 (IEC 44-3)				

In accordance with the harmonization agreement reached by the EU member states, their national standards conform to IEC 60 298.

#### Definitions

" Make-proof earthing switches" are earthing switches with short-circuit making capacity (VDE 0670, Part 2/ DIN EN 60 129 and IEC 60 129).

#### Service location

8DH10 switchgear may be employed as indoor installations in accordance with VDE 0101 and harmonization document HD 637 S1 (Power installations exceeding AC 1 kV).

- Outside lockable electrical service locations at places which are not accessible to the public. Enclosures of switchgear require tools for removal.
- Inside lockable electrical service locations. A lockable electrical service location is a room or place which is reserved exclusively for the operation of electrical equipment and is kept under lock and key. Access is restricted to experts in electrical engineering and persons instructed in electrical engineering: non-experts may enter only when accompanied by such experts or suitably instructed personnel.

# Resistance to internal arc faults

The possibility of faults in  $SF_{6}$ -insulated secondary distribution switchgear is much less than in earlier switchgear types due to the single-phase enclosure of external components and the  $SF_{6}$  insulation of the switching devices:

- No causes for disturbances due to outside influences exist such as
- Pollution layers
- Humidity
- Small animals and foreign bodies
- Maloperations are practically excluded due to the logical positioning of the operating mechanism elements
- Short-circuit-proof earthing of the feeder by means of the three-position switchdisconnector

In the event of an arc fault at the cable termination, pressure relief is effected downwards into the cable basement.

In the improbable event of a fault inside the switchgear vessel, the SF<sub>6</sub> insulation restricts the arc energy to only about one-third of that for air. The emerging gases are directed downwards.

#### <u>Option:</u>

A pressure-relief duct directs the gases upwards.

Pressure-absorber system (option) for 8DH10 switchgear

8DH10 maintenance-free and climatically-independent switchgear can be designed with a modified pressure-relief system with absorber for applications in substation buildings without resistance to internal arc faults, e.g. in " old" substations.

This maintenance-free pressure-absorber system acts as a "special cooling system" and reduces the pressuredependent and thermal effects of internal arc faults in switchgear vessels and cable connection compartments, so that persons and buildings are protected.

The totally-enclosed switchgear system is suitable both for wall-mounting and free-standing arrangement.

Design of the pressureabsorber system:

- With 300 mm high pressureabsorber duct below the switchgear
- With 100 mm deep pressure-absorber duct for relief upwards
- Only 1 system is required for multi-panel transport units

### Climate and environmental effects

8DH10 switchgear are completely enclosed and immune to climatic influences.

- Climatic tests are fulfilled according to IEC 60 932 (Report).
- All medium-voltage devices are installed in a gas-tight welded stainless-steel housing which is filled with SF<sub>6</sub> gas.
- Live parts outside the switchgear vessel are single-phase enclosed.
- Nowhere can creepage currents flow from highvoltage potentials to earth.
- All essential parts of the operating mechanism are made of corrosion-proof materials.
- The bearings in the operating mechanism are of the dry type and require no lubrication.

\* Standards for vacuum contactors

#### Power Transmission and Distribution

#### Catalog Index of the Medium-Voltage Division (please contact your Siemens Representative)

	Designation	Title	Order No.	
High-Voltage				
and Medium-	High-Voltage	e Equipment (Above 52 kV)		
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	Medium-Vo	tage Equipment (High-Voltage Equipment up to 52 kV)		
	HG 11.11	3AH Vacuum Circuit-Breakers (also available as online catalog *)	E50001-K1511-A111-A4-7600	
	HG 11.15 HG 11.21 HG 11.31 HG 11.51	3AY2 Components up to 36 kV for 3AH Vacuum Circuit-Breakers 3TL Vacuum Contactors (also available as online catalog *) Disconnectors and Earthing Switches NXACT Vacuum Circuit-Breaker Modules	E50001-K1511-A151-A1-7600 E50001-K1511-A211-A1-7600 E50001-K1511-A311-A1-7600 E50001-K1511-A311-A1-7600	
	HG 12	Vacuum Switches, Switch-Disconnectors, HV HRC Fuse	E50001-K1512-A101-A4-7600	
	HG 13	Switchgear Interlock Units, Control Valves, Compressed Air Systems	E86010-K1513-A101-A1-7600	
	HG 21 HG 21.2.5 HG 21.2.7	Overvoltage Protection 3EH2 Surge Arresters 2EE2 Special-Purpose Surge Arresters for the Protection of Motors,	E50001-K1521-A101-A1-7600 E50001-K1521-A251-A3-7600	
		Generators and Furnace Transformers	E50001-K1521-A271-A3-7600	
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	HG 24	Current and Voltage Transformers	E50001-K1524-A101-A2-7600	
	HG 25	Air-Cored Reactors, High-Voltage Capacitors	E86010-K1525-A101-A4-7600	
Switchgear	Medium-Voltage Switchgear (High-Voltage Indoor Distribution Switchgear)			
	HA 25.21 HA 25.31 HA 25.71	Type 8BK20 Switchgear up to 24 kV with Withdrawable Circuit-Breakers (Metal-Clad) Type 8BK40 Switchgear up to 17.5 kV/63 kA with Withdrawable Circuit-Breakers NXAIR Withdrawable Circuit-Breaker Module Switchgear up to 12 kV, Air-Insulated NXAIR M Withdrawable Circuit-Breaker Module Switchgear up to 24 kV, Air-Insulated	E50001-K1425-A311-A6-7600 E50001-K1425-A411-A3-7600 E50001-K1425-A811-A1-7600 E50001-K1425-E811-A1-7600	
	HA 27.11	Type 8BK30 Switchgear up to 12 kV with Withdrawable Vacuum Contactors	E50001-K1427-A111-A3-7600	
	HA 35.11	Panels up to 36 kV with Fixed-Mounted Circuit-Breakers, SF <sub>6</sub> -Insulated, Types 8DA10 and 8DB10, Single-Pole, Metal-Enclosed, Metal-Clad, Single-Busbar Switchgear, Duplicate-Busbar Switchgear	E50001-K1535-A101-A6-7600	
	HA 35.41	Type 8DC11 Panels up to 24 kV, Fixed-Mounted Vacuum Circuit-Breaker Switchgear, SF <sub>6</sub> -Insulated	E50001-K1435-A401-A4-7600	
	HA 35.51	NXPLUS Fixed-Mounted Circuit-Breaker Switchgear up to 36 kV, SF <sub>6</sub> -Insulated	E50001-K1435-A511-A2-7600	
	HA 40.1	Switchgear for Secondary Distribution Systems up to 24 kV, $\rm SF_6\mathchar`-Insulated,$ Types 8DJ and 8DH: General Part	E50001-K1440-A111-A2-7600	
	HA 41.11	Switchgear up to 24 kV, SF <sub>6</sub> -Insulated, Extendable, Type 8DH10	E50001-K1441-A101-A3-7600	
	HA 45.11 HA 45.31	Secondary Distribution Switchgear up to 24 kV, SF_6-Insulated, Type 8DJ10 Secondary Distribution Switchgear up to 24 kV, SF_6-Insulated, Type 8DJ20	E50001-K1445-A111-A7-7600 E50001-K1445-A311-A3-7600	

\* Internet address: www.ev.siemens.de/en/mediumvoltage

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