REGIONE SICILIANA
Città Metropolitana di Catania
COMUNI DI CASTEL DI IUDICA E RAMACCA

PROGETTO PER LA REALIZZAZIONE DI UN IMPIANTO AGRIVOLTAICO DELLA POTENZA DI PICCO DI 181,6 MWp E POTENZA DI IMMISSIONE 150 MW E DELLE RELATIVE OPERE CONNESSE NEI COMUNI DI CASTEL DI IUDICA E RAMACCA (CT)

Proponente:

INNOVAZIONE AGRISOLARE SRL
CORSO GIACOMO MATTEOTTI, 1
20121 MILANO (MI)
CF/P.IVA **12275870967**
PEC: innovazioneagrisolaresrl@pec.it

Progettazione:

Cesit Ingegneria S.r.l.
C.da Monte Cenere s.n
Belpasso (CT) CAP 95032
CF/P.IVA 03438580874
info@cesit.it

SPECIFICHE TECNICHE "POWER SKID"

Pratica: CEE1458

DATA	FORMATO	SCALA	LIVELLO PROGETTAZIONE	REV.	VISTO	ELABORATO
Dicembre 2023	--	--		1° edizione		**AVIURAM-VIA02-024**

PROGETTAZIONE	Progettista **Dott. Ing. Igor Giuffrida** Firmato digitalmente da: GIUFFRIDA IGOR Data: 27/03/2024 09:06:17	Consulente Ambientale **PhD Ing. Salvatore Cartarrasa**	Firmato digitalmente da **SALVATORE CARTARRASA** CN = SALVATORE CARTARRASA SerialNumber = TINIT-CRTSVT56E31G580M C = IT

Cesit Ingegneria s.r.l.
www.cesit.net

T +39 095 7178544
F +39 095 7177165
info@cesit.net

Sede Operativa e Legale
C.da Monte Cenere s.n.
95032
Belpasso (CT)

Sedi Distaccate
Via Fabio Mangone,1
20123
Milano

Cap. Soc. € 516.456,00 i.v.
P.IVA e C.F. 03438580874
R.E.A. Catania n° 236456

Via Giacomo Matteotti, 35
36075
Montecchio Maggiore (VI)

P.F.T.E. IMPIANTO ELETTRICO

IMPIANTO AGRIVOLTAICO
RAMACCA – CASTEL DI IUDICA 150 MW

SPECIFICHE TECNICHE
POWER SKID

1	Dicembre 2023	1° Edizione	Ing. D. Spampinato	Ing. I. Giuffrida	Ing. I. Giuffrida
N.	DATA	AGGIORNAMENTO	EMESSO	CONTROLLATO	APPROVATO

CODICE DOCUMENTO	CEE1458	DATA: Dicembre 2023

SIEMENS

Catalog
HA 40.3 ·
Edition 2017

Switchgear Type 8DJH 36 for Secondary Distribution Systems up to 36 kV, Gas-Insulated

Medium-Voltage Switchgear

siemens.com/8DJH36

Application

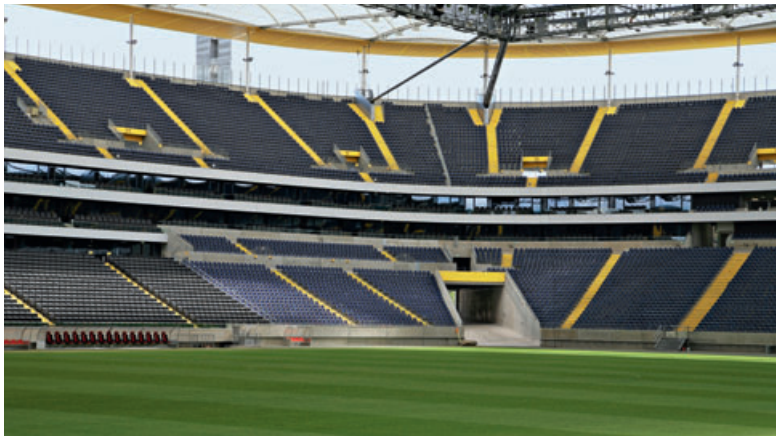
Typical uses

R-HA40-134.tif

R-HA40-112.tif

Application
in public
and industrial
energy systems

R_HA40-150a.tif



R-HA40-147.tif

R-HA40-148.tif

R-HA40-135.tif

Switchgear Type 8DJH 36 for Secondary Distribution Systems up to 36 kV, Gas-Insulated

Medium-Voltage Switchgear

Catalog HA 40.3 · 2017

Invalid: Catalog HA 40.3 · 2014

siemens.com/medium-voltage-switchgear
siemens.com/8DJH36

The products and systems described in this catalog are manufactured and sold according to a certified management system (acc. to ISO 9001, ISO 14001 and BS OHSAS 18001).

Application
Typical uses 2
Types, ratings 4 and 5

Requirements
Features, safety 6
Technology 7

Technical Data
Electrical data of the switchgear, classification 8
Switching capacity and classification of switching devices 9 and 10

Product Range
Individual panels and modules 11
Air-insulated billing metering panel 12
Product range overview of panel blocks 13

Design
Panel design 14 to 16
Outdoor enclosure 17
Operation 18

Components
Three-position switch-disconnector 19 and 20
Vacuum circuit-breaker 21 to 23
Busbar extension, modularity 24
HV HRC fuse assembly 25 to 27
Current and voltage transformers 28 to 30
Current and voltage sensors 31 and 32
Cable connection, cable testing 33 to 38
Interlocks, locking devices 39
Indicating and measuring equipment 40 to 48
Transformer monitor system, protection systems 49 and 50
Intelligent transformer substation 51 and 52
Low-voltage compartment 53

Dimensions
Room planning 54 and 55
Individual panels and modules, billing metering panel as individual panel, panel blocks 56 to 58
Outdoor enclosure 59
Floor openings and fixing points 60 to 62

Installation
Shipping data, transport 63 and 64

Standards
Standards, specifications, guidelines 65 to 67

Application

Types

R-HA40-160.jpg

Ring-main panel and circuit-breaker panel
as individual panels

R-HA40-138.psd

RRT block

8DJH 36 switchgear is a factory-assembled, type-tested, 3-pole metal-enclosed single-busbar switchgear for indoor installation.

8DJH 36 switchgear is used in public and industrial energy systems of the secondary distribution level, e.g. in

- Local ring-main units, customer transfer substations and switching substations of power supply and public utilities
- Wind power plants and solar plants, hydroelectric power stations
- Water and liquid waste processing systems
- Airports, train stations, underground stations
- High-rise buildings.

Electrical data (maximum values) and dimensions

Rated voltage	kV	**36**
Rated frequency	Hz	50/60
Rated short-duration power-frequency withstand voltage	kV	70
Rated lightning impulse withstand voltage	kV	170
Rated peak withstand current	kA	50/52
Rated short-circuit making current	kA	50/52
Rated short-time withstand current 3 s	kA	20
Rated normal current of the busbar	A	630
Rated normal current of the feeders	A	200/630
Width		
– Ring-main feeder	mm	430
– Transformer feeder	mm	500
– Circuit-breaker feeder	mm	590
– Metering panel	mm	1100
Depth		
– Without pressure relief duct	mm	920 [1)]
– With pressure relief duct	mm	1035 [1)]
Height		
– Standard	mm	1600
– With low-voltage compartment	mm	1800/2000/2200

1) In circuit-breaker feeders, the depth in the area of the front operating mechanism of the circuit-breaker is increased by 60 mm. In metering panels, the depth is increased by 60 mm.

Requirements

Features

Environmental independence

Hermetically tight, welded switchgear vessels made of stainless steel as well as single-pole solid insulation make the parts of the primary circuit under high voltage of 8DJH 36 switchgear

- Insensitive to certain aggressive ambient conditions, such as:
  - Saline air
  - Humidity
  - Dust
  - Condensation
- Tight to ingress of foreign objects, such as:
  - Dust
  - Pollution
  - Small animals
  - Humidity.

Compact design

Thanks to the use of SF_6 insulation, compact dimensions are possible.
Thus:

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

Maintenance-free design

Switchgear vessels designed as sealed pressure systems, maintenance-free switching devices and enclosed cable plugs ensure:

- Maximum supply reliability
- Personnel safety
- Sealed-for-life design according to IEC 62271-200 (sealed pressure system)
- Installation, operation, extension and replacement without SF_6 gas work
- Reduced operating costs
- Cost-efficient investment
- No maintenance cycles.

Innovation

The use of digital secondary systems and combined protection and control devices ensures:

- Clear integration in process control systems
- Flexible and highly simplified adaptation to new system conditions and thus to cost-efficient operation.

Service life

Under normal operating conditions, the expected service life of gas-insulated switchgear 8DJH 36 is at least 35 years, probably 40 to 50 years, taking the tightness of the hermetically welded switchgear vessel into account. The service life is limited by the maximum number of operating cycles of the switchgear devices installed:

- For circuit-breakers, according to the endurance class defined in IEC 62271-100
- For three-position disconnectors and earthing switches, according to the endurance class defined in IEC 62271-102
- For three-position switch-disconnectors and earthing switches, according to the endurance class defined in IEC 62271-103.

Safety

Personal safety

- Safe-to-touch and hermetically sealed primary enclosure
- Standard degree of protection IP 65 for all high-voltage parts of the primary circuit, at least IP 2X for the switchgear enclosure according to IEC 60529 and VDE 0470-1
- Cable terminations, busbars and voltage transformers are surrounded by earthed layers in all feeders except for the air-insulated metering panels. All high-voltage parts including the cable terminations, busbars and voltage transformers are metal-enclosed
- Operating mechanisms and auxiliary switches safely accessible outside the primary enclosure (switchgear vessel)
- High resistance to internal arcs by logical mechanical interlocks and tested switchgear enclosure
- Panels tested for resistance to internal faults up to 20 kA
- Capacitive voltage detecting system to verify safe isolation from supply
- Due to the system design, operation is only possible with closed switchgear enclosure
- Logical mechanical interlocks prevent maloperation
- HV HRC fuses and cable sealing ends are only accessible when outgoing feeders are earthed
- Feeder earthing via make-proof earthing switches.

Security of operation

- Hermetically sealed primary enclosure independent of environmental effects (pollution, humidity and small animals)
- Maintenance-free in an indoor environment (IEC 62271-1 and VDE 0671-1)
- Operating mechanisms of switching devices accessible outside the primary enclosure (switchgear vessel)
- Metal-enclosed and plug-in inductive voltage transformers mounted outside the SF_6 switchgear vessel
- Current transformers as ring-core current transformers mounted outside the SF_6 switchgear vessel
- Complete switchgear interlocking system with logical mechanical interlocks
- Welded switchgear vessels, sealed for life
- Minimum fire load
- Type and routine-tested
- Standardized and manufactured using numerically controlled machines
- Quality assurance in accordance with DIN EN ISO 9001
- More than 500,000 switchgear panels of Siemens in operation worldwide for many years.

Reliability

- Type and routine-tested
- Standardized and manufactured using numerically controlled machines
- Quality assurance in accordance with DIN EN ISO 9001
- More than 500,000 switchgear panels of Siemens in operation worldwide for many years.

General

- Three-pole primary enclosure, metal-enclosed
- Welded switchgear vessel, made of stainless steel, with welded-in bushings for electrical connections and mechanical components
- Insulating gas SF_6 (fluorinated greenhouse gas)
- Maintenance-free components under normal ambient conditions according to IEC 62271-1 and VDE 0671-1
- Three-position switch-disconnector with load-break function and make-proof earthing function
- Vacuum circuit-breaker
- Cable connection with outside-cone plug-in system
- In ring-main, circuit-breaker and transformer feeders with bolted contact (M16)
- In transformer feeders optionally with plug-in contact
- Wall-standing or free-standing arrangement
- Cable connection access from front
- Installation and extension of existing switchgear at both ends without gas work and without modification of existing panels
- Pressure relief downwards, optionally to the rear/upwards, or via pressure relief duct and optionally with pressure absorber systems upwards.

Interlocks

- According to IEC 62271-200 and VDE 0671-200
- Logical mechanical interlocks prevent maloperation
- Logical mechanical interlocks and the constructive features of the three-position switches prevent maloperation as well as access to the cable connection of the feeders and HV HRC fuses under voltage
- Impermissible and undesired operations can be prevented by means of locking devices on the switching devices
- A detailed description of all interlocking options is available on page 39.

Insulating system

- Switchgear vessel filled with SF_6 gas
- Features of SF_6 gas:
  - Non-toxic
  - Odorless and colorless
  - Non-inflammable
  - Chemically neutral
  - Heavier than air
  - Electronegative (high-quality insulator)
  - Global Warming Potential GWP = 22,800
- Pressure of SF_6 gas in the switchgear vessel (absolute values at 20 °C):
  - Rated filling level: 150 kPa
  - Design pressure: 180 kPa
  - Design temperature of the SF_6 gas: 80 °C
  - Operating pressure of bursting disc: ≥ 300 kPa
  - Bursting pressure: ≥ 550 kPa
  - Gas leakage rate: < 0.1 % per year.

Modular design

- Individual panels and panel blocks can be lined up and extended at will – without gas work on site
- Low-voltage compartment available in 3 overall heights, wiring to the panel via plug connectors.

Panel design

- Factory-assembled, type-tested
- Metal-enclosed, with metallic partitions [1)]
- Hermetically tight, welded switchgear vessel made of stainless steel
- Maintenance-free
- Degree of protection
  - IP 65 for all high-voltage parts of the primary circuit in the gas-insulated panels
  - IP 2X for the switchgear enclosure
- Vacuum circuit-breaker with three-position disconnector for disconnecting and earthing
- Three-position switch-disconnector
- Cable connection with outside-cone plug-in system according to DIN EN 50181
- Wall-standing arrangement, optionally free-standing arrangement
- Installation and possible later extension of existing panels without gas work
- Replacement of instrument transformers without gas work, as they are located outside the gas compartments
- Enclosure made of sendzimir-galvanized sheet steel, front cover powder-coated in color "light basic" (SN 700)
- Low-voltage compartment removable, plug-in bus wires
- Lateral, metallic wiring ducts for control cables.

Instrument transformers

- Current transformers not subjected to dielectric stress
- Easy replacement of current transformers designed as ring-core transformers
- Metal-enclosed, plug-in voltage transformers.

Vacuum circuit-breaker

- Maintenance-free under normal ambient conditions according to IEC 62271-1 and VDE 0671-1
- No relubrication or readjustment
- Up to 10,000 operating cycles
- Vacuum-tight for life.

Secondary systems

- Customary protection, measuring and control equipment
- Option: Numerical multifunction protection relay with integrated protection, control, communication, operating and monitoring functions
- Can be integrated in process control systems.

1) Corresponds to "metal-clad" according to former standard IEC 60298

Technical Data

Electrical data of the switchgear, classification

Rated insulation level		Rated voltage U_r		kV	**36**
		Rated short-duration power-frequency withstand voltage U_d			
		– phase-to-phase, phase-to-earth, open contact gap		kV	70
		– across the isolating distance		kV	80
		Rated lightning impulse withstand voltage U_p			
		– phase-to-phase, phase-to-earth, open contact gap		kV	170
		– across the isolating distance		kV	195
Rated frequency f_r				Hz	50 / 60
Rated normal current I_r [2]		for ring-main feeders		A	630
		for circuit-breaker feeders		A	630
		for busbar		A	630
		for transformer feeders		A	200 [3]
50 Hz	Rated short-time withstand current I_k	for switchgear with t_k = 3 s		up to kA	20
	Rated peak withstand current I_p			up to kA	50
	Rated short-circuit making current I_{ma}	for ring-main feeders		up to kA	50
		for circuit-breaker feeders		kA	50
		for transformer feeders		up to kA	50
60 Hz	Rated short-time withstand current I_k	for switchgear with t_k = 3 s		up to kA	20
	Rated peak withstand current I_p			up to kA	52
	Rated short-circuit making current I_{ma}	for ring-main feeders		up to kA	52
		for circuit-breaker feeders		kA	52
		for transformer feeders		up to kA	52
Filling pressure (pressure values at 20 °C)		Rated filling level p_{re} (absolute)		kPa	150
		Minimum functional level p_{me} (absolute)		kPa	130
Ambient air temperature T [4]		Operation	standard	°C	–25 to +55
		Storage / transport	standard	°C	–25 to +55
			on request	°C	–40 to +70
Degree of protection		for gas-filled switchgear vessel			IP65
		for switchgear enclosure			IP2X / IP3X [1]
		for low-voltage compartment			IP3X / IP4X [1]

8DJH 36 switchgear is classified according to IEC / EN 62271-200 / VDE 0671-200.

Design and construction

Partition class	PM (partition of metal)
Loss of service continuity category for panels or panel blocks	
– With HV HRC fuses (T)	LSC 2
– Without HV HRC fuses (R, L)	LSC 2
– Billing metering panel M, cable panel K	LSC 1
Accessibility to compartments (enclosure)	
– Busbar compartment	– Non accessible
– Switching-device compartment	– Non accessible
– Low-voltage compartment (option)	– Tool-based
– Cable compartment for panels or panel blocks	
– With HV HRC fuses (T)	– Interlock-controlled
– Without HV HRC fuses (R, L)	– Interlock-controlled
– Cable feeder only (K)	– Tool-based
– Metering panels (air-insulated) (M)	– Tool-based

Internal arc classification (option)

Designation of the internal arc classification IAC	Rated voltage 36 kV
IAC class for	
– Wall-standing arrangement	IAC A FL
– Free-standing arrangement	IAC A FLR
Type of accessibility A	Switchgear in closed electrical service location, access "for authorized personnel only" (according to IEC / EN 62271-200)
– F	Front
– L	Lateral
– R	Rear (for free-standing arrangement)
Arc test current	Up to 20 kA
Test duration	1 s

1) Design option

2) The rated normal currents apply to ambient air temperatures of max. 40 °C. The 24-hour mean value is max. 35° C (according to IEC / EN 62271-1 / VDE 0671-1)

3) Depending on the HV HRC fuse-link

4) Minimum and maximum permissible ambient air temperature depending on the secondary equipment used

Three-position switch-disconnector

Switching capacity for general-purpose switches according to IEC / EN 62271-103 / VDE 0671-103

	Rated voltage U_r			kV	**36**
Test duty TD_{load}	Rated mainly active load-breaking current I_{load}	100 operations I_{load} [I_1]		A	630
		20 operations 0.05 I_{load} [I_1]		A	31.5
Test duty TD_{loop}	Rated closed-loop breaking current I_{loop} [I_{2a}]			A	630
Test duty TD_{cc}	Rated cable-charging breaking current I_{cc} [I_{4a}]			A	50
Test duty TD_{lc}	Rated line-charging breaking current I_{lc} [I_{4b}]			A	50
Test duty TD_{ma}	Rated short-circuit making current I_{ma}	50 Hz	up to kA		50
		60 Hz	up to kA		52
Test duty TD_{ef1}	Rated earth-fault breaking current TD_{ef1} [I_{6a}]			A	150
Test duty TD_{ef2}	Rated cable-charging breaking current and line-charging breaking current under earth-fault conditions I_{ef2} [formerI_{6b} ($\sqrt{3} \cdot I_{4a}$ or I_{4b})]			A	87
Number of mechanical operating cycles / M-classification				n	1000 / M1 [1]
Number of electrical operating cycles with I_{load} / Classification				n	100 / E3
Number of short-circuit making operations with I_{ma} / Classification				n	5 / E3
C-classification	For general-purpose switches (no restrikes, TD: I_{cc}, I_{lc})				C2

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

Number of mechanical operating cycles	n	1000
M-classification		M0

Switching capacity for make-proof earthing switch according to IEC / EN 62271-102 / VDE 0671-102

Rated short-time withstand current I_k	50 Hz	up to kA		20
Rated short-circuit making current I_{ma}	50 Hz	up to kA		50
Rated short-time withstand current I_k	60 Hz	up to kA		20
Rated short-circuit making current I_{ma}	60 Hz	up to kA		52
Number of mechanical operating cycles / M-classification			n	1000 / M0
Number of short-circuit making operations / Classification			n	5 / E2

Switch-disconnector / fuse combination

Switch-disconnector / fuse combination

Rated voltage U_r	kV	36
Rated normal current I_r	A	200 [2]

Switching capacity for switch-disconnector / fuse combination according to IEC / EN 62271-105 / VDE 0671-105

Rated transfer current $I_{transfer}$	A	740 [3]
Maximum transformer rating	kVA	2500

Switching capacity for make-proof earthing switch, feeder side, in transformer feeder with HV HRC fuses

Rated short-time withstand current I_k with t_k = 1 s		kA	2
Rated short-circuit making current I_{ma}	50 Hz	kA	5
	60 Hz	kA	5.2

1) Optionally 2000 operating cycles at 36 kV and 50 Hz
2) Depending on the HV HRC fuse-link
3) Up to 800 A at 36 kV and 50 Hz

Technical Data

Switching capacity and classification of switching devices

Vacuum circuit-breaker

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

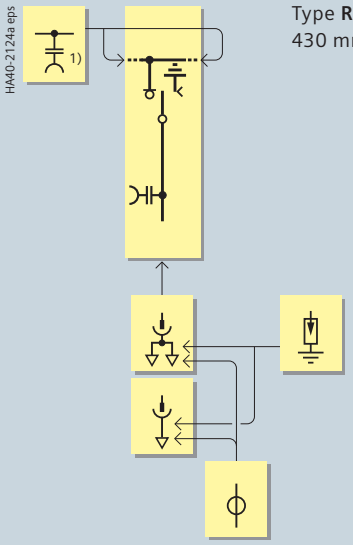
Type 1 with three-position disconnector

Rated voltage U_r			kV	**36**
Rated normal current of feeders I_r			A	630
50 Hz	Rated short-time withstand current I_k	for switchgear with t_k = 3 s	up to kA	20
	Rated peak withstand current I_p		up to kA	50
	Rated short-circuit breaking current I_{sc}		up to kA	20
	Rated short-circuit making current I_{ma}		up to kA	50
60 Hz	Rated short-time withstand current I_k	for switchgear with t_k = 3 s	up to kA	20
	Rated peak withstand current I_p		up to kA	52
	Rated short-circuit breaking current I_{sc}		up to kA	20
	Rated short-circuit making current I_{ma}		up to kA	52
Number of mechanical operating cycles, disconnector			n	1000
Number of mechanical operating cycles, earthing switch			n	1000
Number of mechanical operating cycles, circuit-breaker			n	10,000
Classification of circuit-breaker				M2, E2, C2
Classification of disconnector				M0
Classification of make-proof earthing switch				M0, E2
Rated operating sequence				O – 0.3 s – CO – 3 min – CO O – 0.3 s – CO – 15 s – CO on request
Number of short-circuit breaking operations			n	25 or 50

Type 2 with three-position disconnector

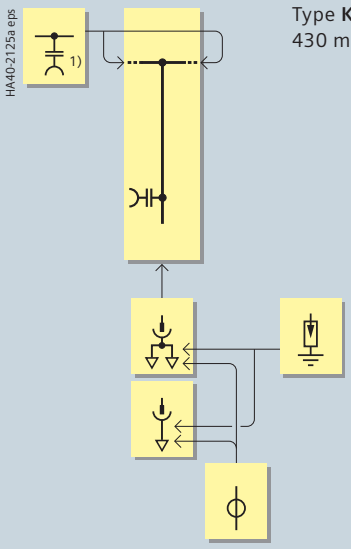
Rated voltage U_r			kV	**36**
Rated normal current of feeders I_r			A	630
50 Hz	Rated short-time withstand current I_k	for switchgear with t_k = 3 s	up to kA	20
	Rated peak withstand current I_p		up to kA	50
	Rated short-circuit breaking current I_{sc}		up to kA	20
	Rated short-circuit making current I_{ma}		up to kA	50
60 Hz	Rated short-time withstand current I_k	for switchgear with t_k = 3 s	up to kA	20
	Rated peak withstand current I_p		up to kA	52
	Rated short-circuit breaking current I_{sc}		up to kA	20
	Rated short-circuit making current I_{ma}		up to kA	52
Number of mechanical operating cycles, disconnector			n	1000
Number of mechanical operating cycles, earthing switch			n	1000
Number of mechanical operating cycles, circuit-breaker			n	2000
Classification of circuit-breaker				M1, E2, C2
Classification of disconnector				M0
Classification of make-proof earthing switch				M0, E2
Rated operating sequence				O – 3 min – CO – 3 min – CO
Number of short-circuit breaking operations			n	6 or 20

Ring-main feeder



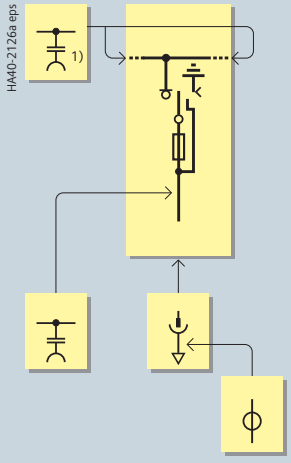
Type **R**
430 mm wide

Cable feeder



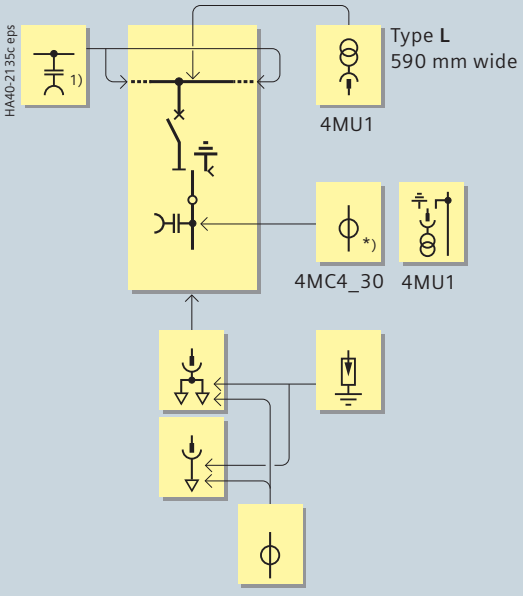
Type **K**
430 mm wide

Transformer feeder



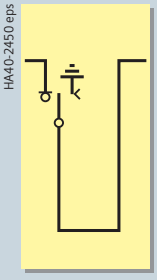
Type **T**
500 mm wide

Circuit-breaker feeder

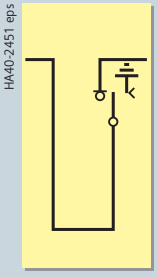


Type **L**
590 mm wide

Bus sectionalizer panel



Type **S**
(earthing on the right)
590 mm wide



Type **S**
(earthing on the left)
590 mm wide

Vacuum circuit-breaker

Three-position switch-disconnector

Three-position disconnector

Capacitive voltage detecting system

HV HRC fuse

Current transformer on the bushing

Cable-type current transformer

Cable connection with outside cone (not included in the scope of supply)

Surge arrester

Plug-in voltage transformer

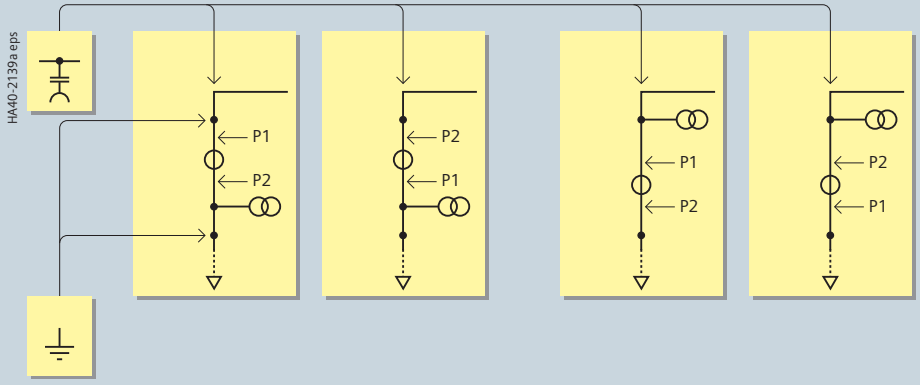
Disconnectable and plug-in voltage transformer

1) Only for end panel, on the free connection side of the busbar

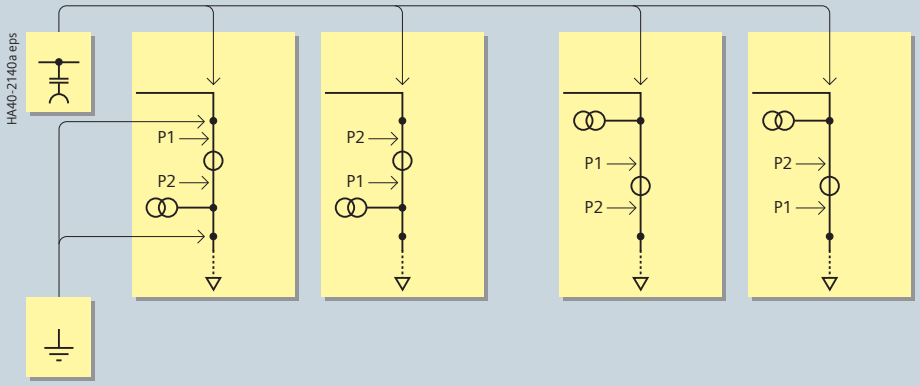
Product Range

Air-insulated billing metering panel type M, 1100 mm wide

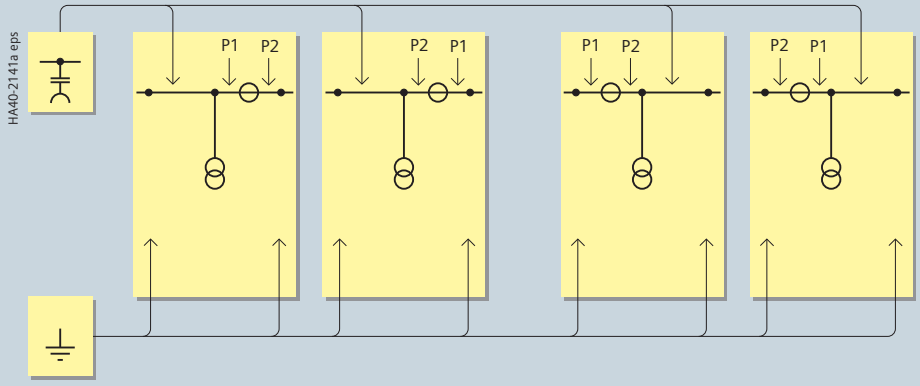
Billing metering panels with cable connection on the left



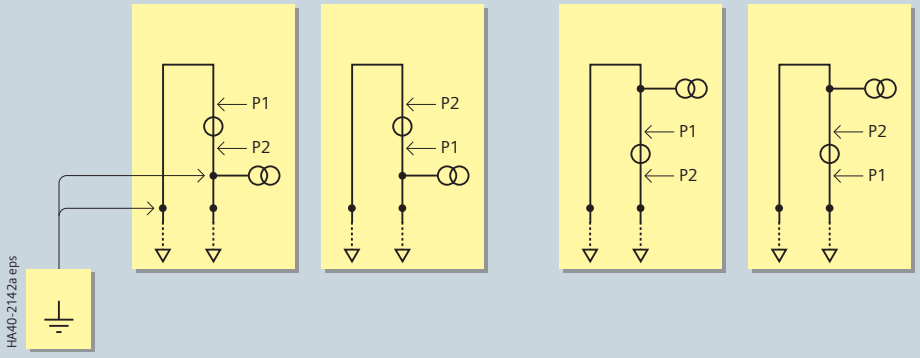
Billing metering panels with cable connection on the right



Billing metering panels with busbar connection on both sides



Billing metering panels with cable connection on both sides



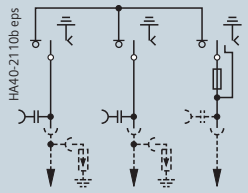
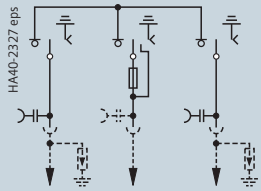
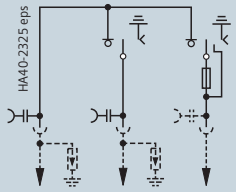
Current transformer, cast-resin insulated

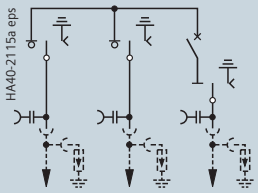
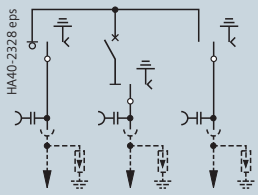
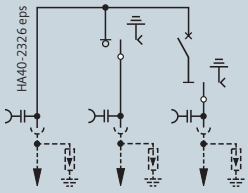
Voltage transformer, cast-resin insulated

Capacitive voltage detecting system

Fixed earthing points for busbar earthing

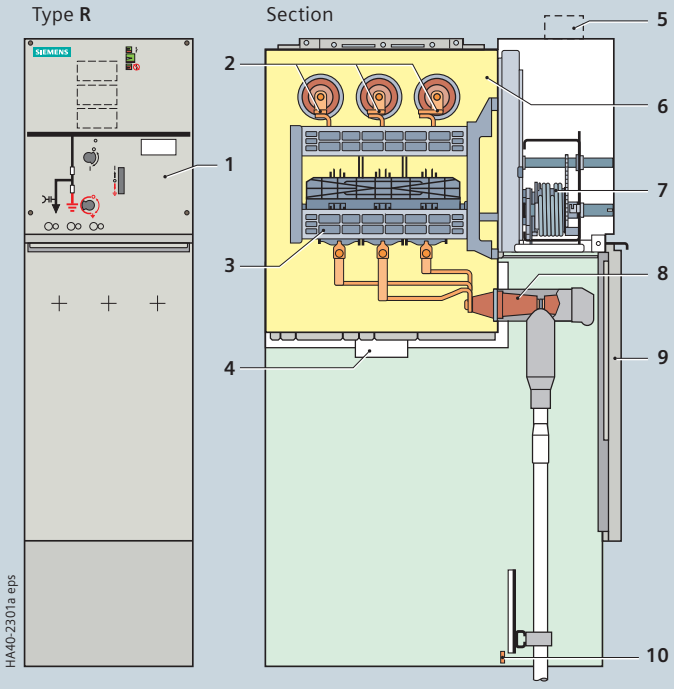
P1 and P2 are terminal designations of the current transformer

Panel block Components shown in dotted lines can be used optionally.	Installation dimensions		
	Width mm	Depth mm	Height mm
Panel blocks with transformer feeders, optionally with busbar extension			
RRT 	2 ring-main feeders, 1 transformer feeder		
	1360	920	1600
RTR 	2 ring-main feeders, 1 transformer feeder		
	1360	920	1600
KRT 	1 cable feeder, 1 ring-main feeder, 1 transformer feeder		
	1360	920	1600

Panel block Components shown in dotted lines can be used optionally.	Installation dimensions		
	Width mm	Depth mm	Height mm
Panel blocks with circuit-breaker feeders, optionally with busbar extension			
RRL 	2 ring-main feeders, 1 circuit-breaker feeder		
	1450	920	1600
RLR 	2 ring-main feeders, 1 circuit-breaker feeder		
	1450	920	1600
KRL 	1 cable feeder, 1 ring-main feeder, 1 circuit-breaker feeder		
	1450	920	1600

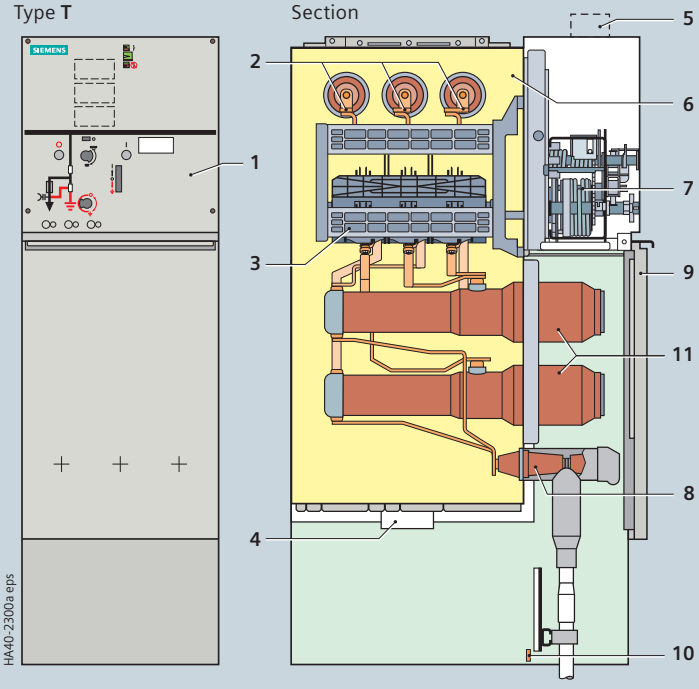
Ring-main feeder

Type **R**



Transformer feeder

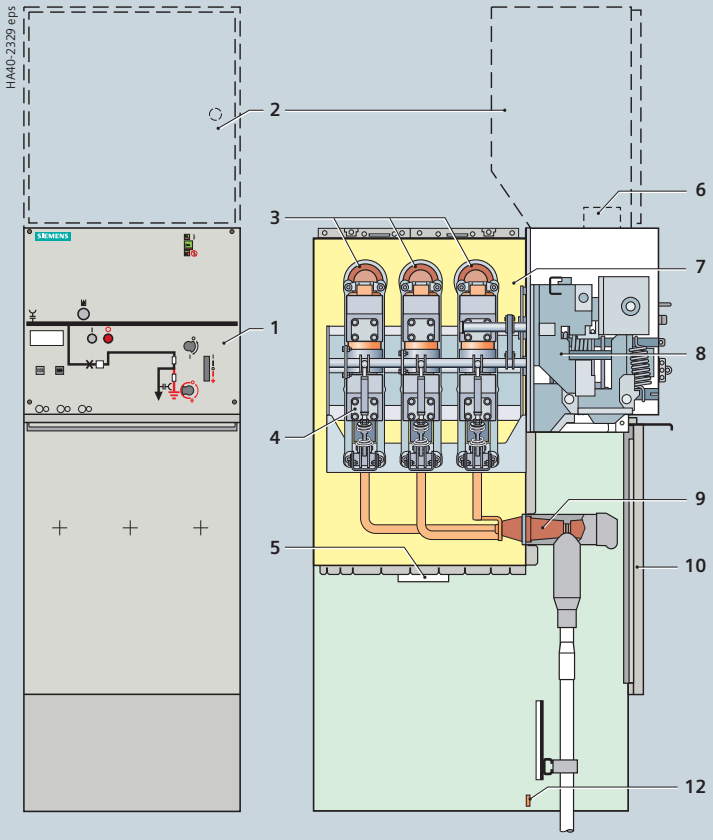
Type **T**



1 Control board (for details, see page 18)
2 Busbar arrangement
3 Three-position switch-disconnector
4 Pressure relief device
5 Wiring duct, removable, for protection and/or bus wires
6 Switchgear vessel, filled with gas
7 Operating mechanism of switching device
8 Bushing for cable plug with bolted contact (M16)
9 Cable compartment cover
10 Earthing busbar with earthing connection
11 HV HRC fuse assembly

Circuit-breaker panel with indicated low-voltage compartment

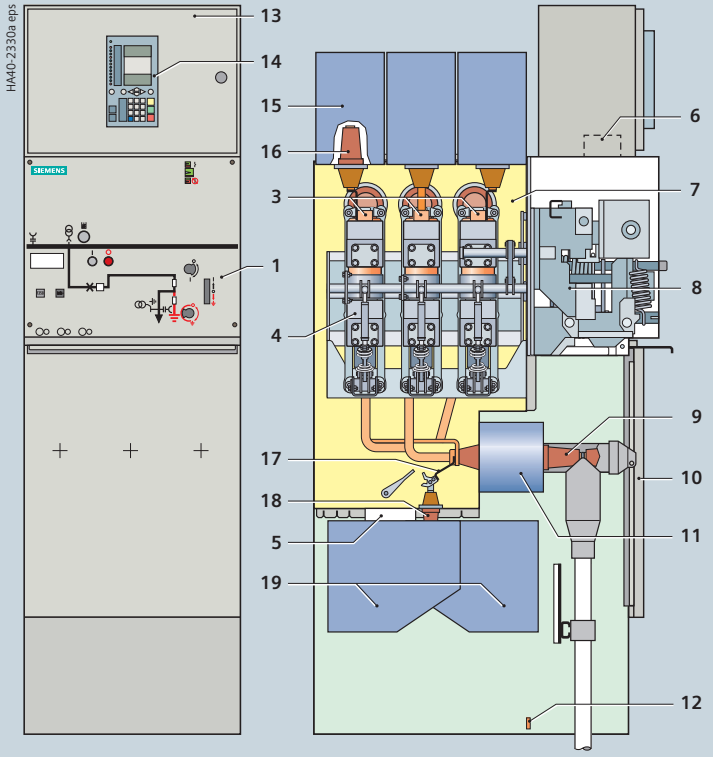
Section



1 Control board (for details, see page 18)
2 Option: Low-voltage compartment
3 Busbar arrangement
4 Vacuum circuit-breaker and three-position switch module
5 Pressure relief device
6 Wiring duct, removable, for protection and/or bus wires
7 Switchgear vessel, filled with gas
8 Operating mechanism of switching devices
9 Bushing for cable plug with bolted contact (M16)
10 Cable compartment cover
11 Option: Current transformers on the bushing
12 Earthing busbar with earthing connection
13 Low-voltage compartment
14 Option: SIPROTEC bay controller
15 Option: Plug-in voltage transformer 4MU1 on the busbar
16 Option: Bushing for connection of plug-in voltage transformers on the busbar
17 Option: Disconnecting facility for the plug-in voltage transformer 4MU1 at the cable connection
18 Option: Bushing for connection of plug-in voltage transformers at the cable connection
19 Option: Plug-in voltage transformer 4MU1 at the cable connection

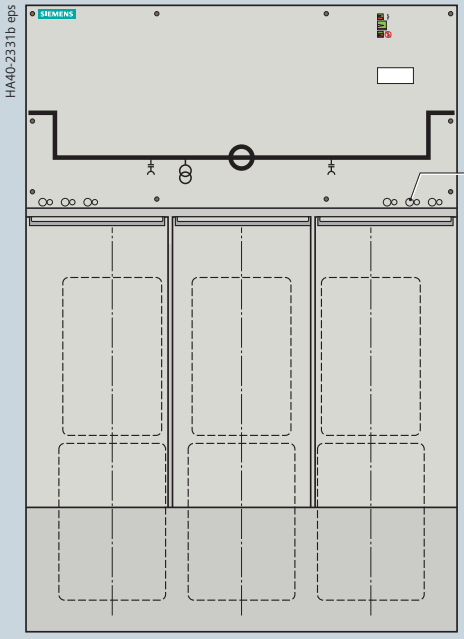
Circuit-breaker panel with 400 mm high low-voltage compartment

Section

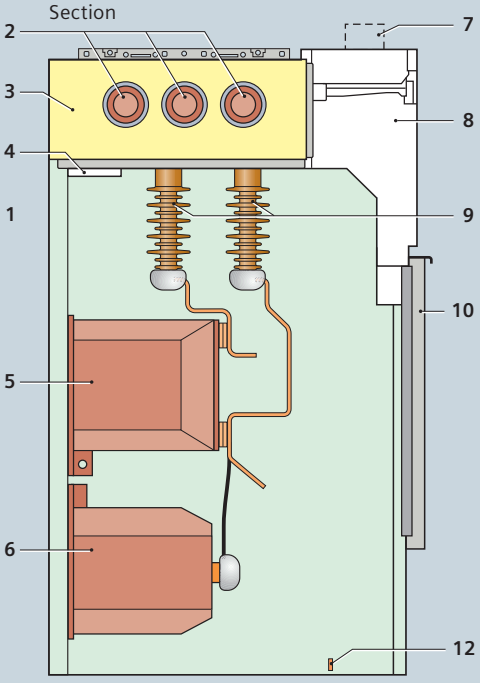


Billing metering panel

Type **M,** air-insulated

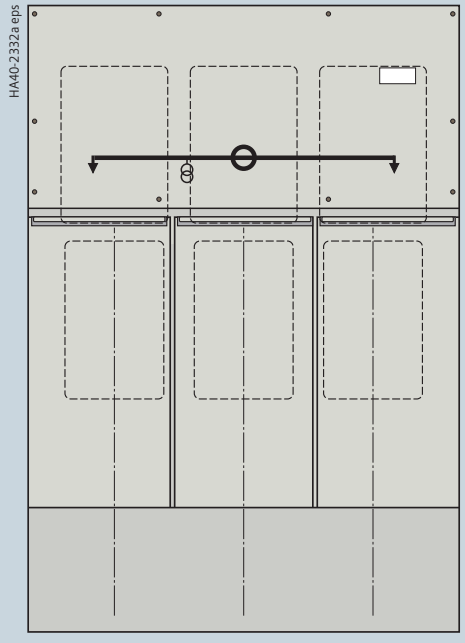


Section

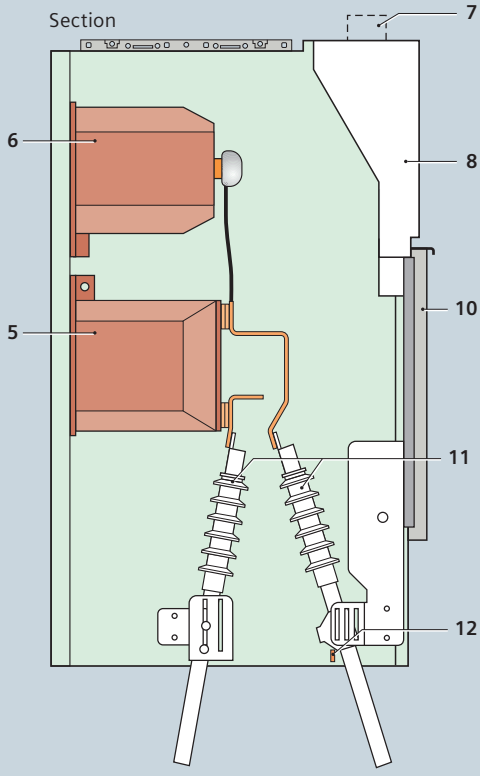


Connection: busbar – busbar

1 Sockets for voltage detecting system
2 Busbar connection
3 Busbar vessel, filled with gas
4 Pressure relief device
5 Current transformer type 4MA7
6 Voltage transformer type 4MR
7 Wiring duct, removable, for protection and/or bus wires
8 Niche for customer-side low-voltage equipment, screwed cover
9 Bushings for connection of transformer bars
10 Transformer compartment cover
11 Cable connection
12 Earthing busbar with earthing connection



Section



Connection: cable – cable

On request, 8DJH 36 switchgear can be provided with an outdoor enclosure with the following features:

- For outdoor applications on company grounds
- Enclosure attached to standard indoor panels
- Enclosure with three different heights (optionally with low-voltage compartment as a 200 mm, 400 mm or 600 mm high version)
- Enclosure with three different widths for freely configurable, non-extendable switchgear rows up to a switchgear width of 2040 mm (for dimensions, see page 59)
- Internal arc classification IAC A FL or FLR to 20 kA/1 s according to IEC 62271-200
- Degree of protection IP 54.

R-HA40-161 tif

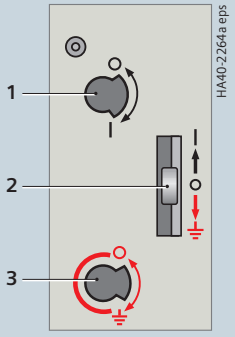
Outdoor enclosure (front closed)

The control boards are function-related. They integrate operation, mimic diagram and position indication. Furthermore, indicating, measuring and monitoring equipment as well as locking devices and local-remote switches are arranged according to the panel type and version. The ready-for-service indicator and rating plates are fitted in accordance with the panel blocks.

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

All actuating openings are functionally interlocked against each other, and are optionally lockable. Separate operating levers for the disconnecting and earthing function are optionally available.

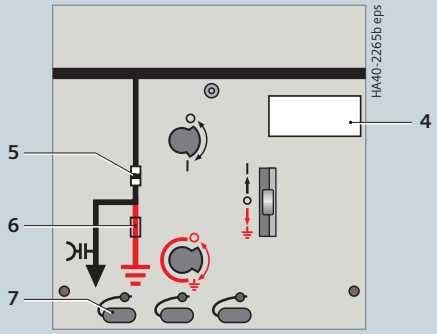
Operation of three-position switch



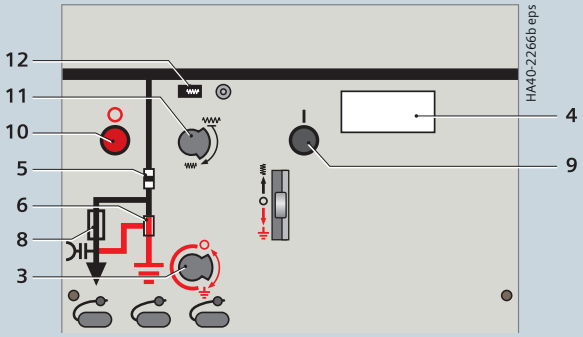
Operating levers

1 Manual operation of load-break function
2 Locking function (option for ring-main feeders)
3 Manual operation of earthing function
4 Panel designation label
5 Position indicator for switch-disconnector
6 Position indicator for earthing switch
7 Sockets of capacitive voltage detecting system
8 "Fuse tripped" indicator
9 ON pushbutton for transformer feeder and circuit-breaker feeder
10 OFF pushbutton for transformer feeder and circuit-breaker feeder
11 Manual spring charging
12 "Spring charged" indicator
13 Position indicator for circuit-breaker
14 Operations counter

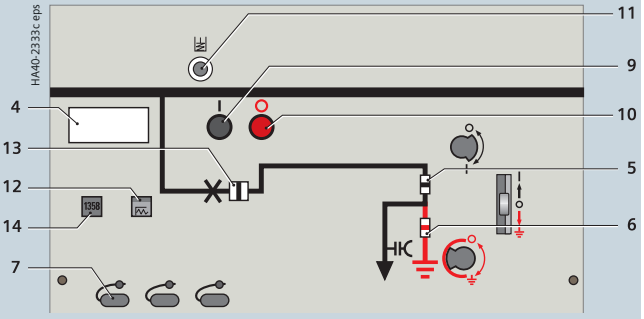
Front of ring-main feeder



Front of transformer feeder



Front of circuit-breaker feeder



Features

- Switch positions: CLOSED – OPEN – EARTHED
- Switching functions as general-purpose switch-disconnector (class E3) according to
– IEC/EN 62271-103/VDE 0671-103
– IEC/EN 62271-102/VDE 0671-102
- Designed as a three-position switch with the functions
– Switch-disconnector and
– Make-proof earthing switch
- Operation via rotary bushing welded gas-tight into the front of the switchgear vessel
- Climate-independent contact in the gas-filled switchgear vessel
- Maintenance-free for indoor installation according to IEC/EN 62271-1/VDE 0671-1
- Individual secondary equipment.

Mode of operation

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

Closing operation

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

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

Opening operation

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

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

– IEC/EN 62271-102/VDE 0671-102

and

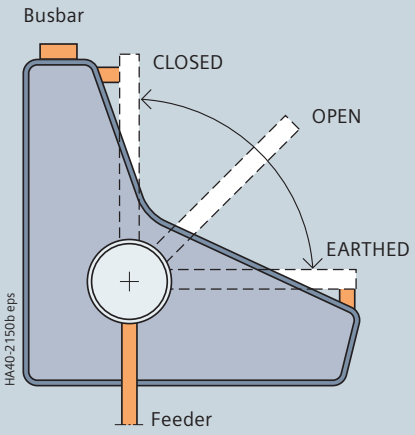
– IEC/EN 62271-1/VDE 0671-1.

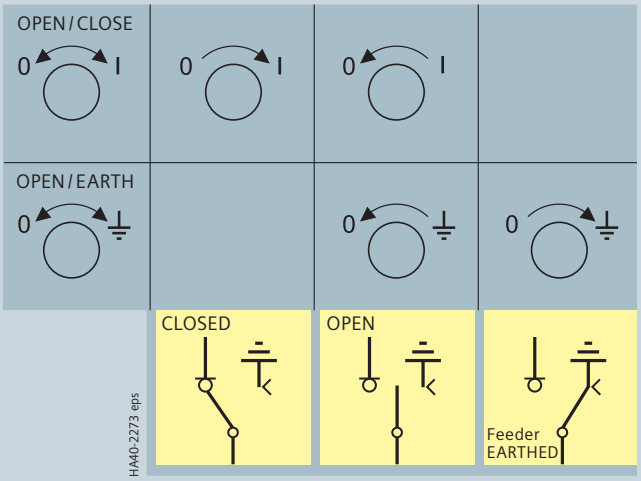
Due to the arc rotation caused by the arc-suppression system, both load currents and minor no-load currents are safely interrupted.

Earthing operation

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

Three-position switch-disconnector





Features

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

Spring-operated mechanism

The switching movements are performed independently of the operating speed.

Spring-operated/stored-energy mechanism

The switching movements are performed independently of the operating speed.

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

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

An energy store is available for tripping by means of an operating HV HRC fuse or via a shunt release (f-release).

After tripping, a red bar appears on the switch position indication.

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

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

Legend:
R = Ring-main feeder
S = Bus sectionalizer panel
L = Circuit-breaker feeder
T = Transformer feeder

Motor operating mechanism (option)

The manual operating mechanisms of 8DJH 36 switchgear can be equipped with motor operating mechanisms for the three-position switch-disconnector. Retrofitting is possible.

Operating voltages for motor operating mechanisms:

- 24, 48, 60, 110, 220 V DC
- 110 and 230 V AC, 50/60 Hz
- Motor rating: maximum 80 W/80 VA

Operation:

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

Shunt release (option)
(f-release)

Stored-energy mechanisms can be equipped with a shunt release. Remote electrical tripping of the three-position switch-disconnector is possible via the magnet coil of the shunt release, e.g. transformer overtemperature tripping.

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

Auxiliary switch (option)

Each operating mechanism of the three-position switch-disconnector can be optionally equipped with an auxiliary switch for the position indication. Free contacts (for manual operating mechanism):
– Switch-disconnector function:
CLOSED and OPEN: 1 NO + 1 NC + 2 changeover
– Earthing switch function:
CLOSED and OPEN: 1 NO + 1 NC + 2 changeover.

Technical data of the auxiliary switch

Breaking capacity

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

Rated switching capacity

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

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

Features

- The vacuum circuit-breaker consists of a vacuum interrupter unit with integrated three-position disconnector located in the switchgear vessel, and the associated operating mechanisms.
- According to IEC / EN 62271-100 / VDE 0671-100
- Application in hermetically welded switchgear vessel in conformity with the system
- Climate-independent vacuum interrupter poles in the gas-filled switchgear vessel
- Operating mechanism located outside the switchgear vessel in the front operating mechanism box
- Maintenance-free for indoor installation according to IEC / EN 62271-1 / VDE 0671-1
- Individual secondary equipment.

Operating mechanism functions

The closing spring is charged by means of the operating lever or the hand crank supplied, or by the motor (option in L2 panel), until the latching of the closing spring is indicated ("spring charged" indicator). Then, the vacuum circuit-breaker can be closed manually or electrically.

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

Operating mechanism

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

- Operating mechanism for circuit-breaker
- Operating mechanism for three-position disconnector
- Motor operating mechanism (option in L2 panel)
- Position indicators
- Pushbuttons for CLOSING and OPENING the circuit-breaker
- Interlocking between circuit-breaker and three-position disconnector.

Assignment of operating mechanism type

Panel type	L		
Function	Circuit-breaker	Three-position disconnector	
		Disconnector	Earthing switch
Type	Stored-energy	Spring-operated	Spring-operated
Operation	Manual / Motor	Manual / Motor	Manual

Trip-free mechanism

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

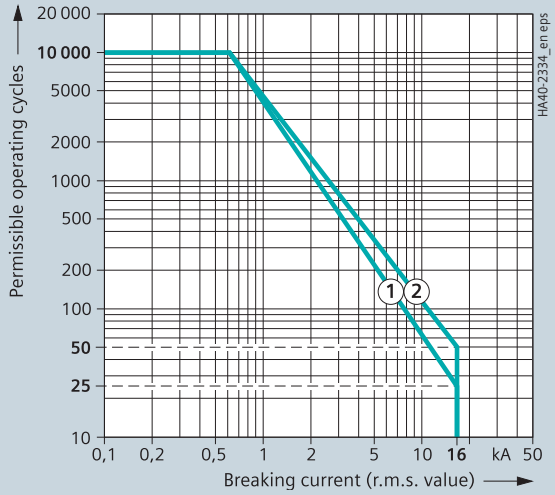
Circuit-breaker

Circuit-breaker	Type 1	Type 2
Short-circuit breaking current I_{SC}	up to 20 kA	up to 20 kA
Rated operating sequence O – 0.3 s – CO – 3 min – CO O – 0.3 s – CO – 15 s – CO	 • on request	 – –
O – 3 min – CO – 3 min – CO	–	•
Number of breaking operations I_r	10,000	2000
short-circuit breaking operations	up to 50	up to 20
In individual panel 590 mm	•	•
In panel block 590 mm	•	•

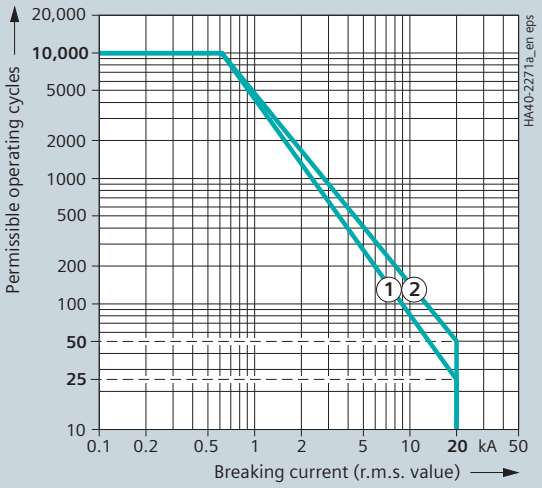
Explanations:
- • Design option
- – Not available

Electrical service life

Vacuum circuit-breaker type 1

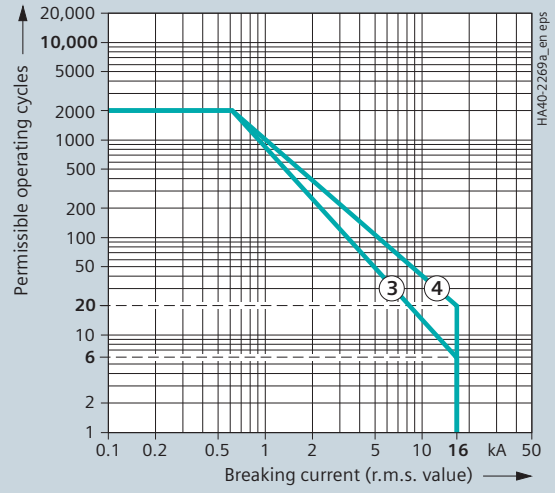


Rated short-circuit breaking current 16 kA

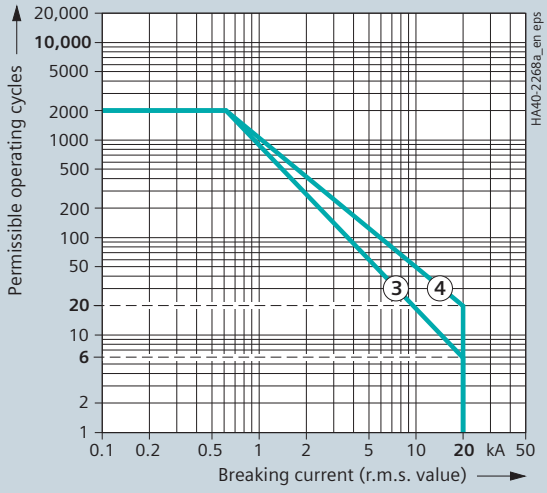


Rated short-circuit breaking current 20 kA

Vacuum circuit-breaker type 2



Rated short-circuit breaking current 16 kA



Rated short-circuit breaking current 20 kA

Max. number of
short-circuit breaking operations

① n = 25 ③ n = 6
② n = 50 ④ n = 20

Motor operating mechanism (option for type 2)

Operating voltages for motor operating mechanisms:

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

Further values on request.

Motor rating for circuit-breaker operating mechanism at
DC: maximum 500 W
AC: maximum 650 VA.

Secondary components

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

Closing solenoid (option for type 2)

- For electrical closing.

Shunt release

- Magnet coil for tripping by protection device or electrical actuation.

C.t.-operated release

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

Undervoltage release

- Comprising:
– Energy store and unlatching mechanism
– Electromagnetic system, which is permanently connected to voltage while the vacuum circuit-breaker is closed; tripping is initiated when this voltage drops.

Anti-pumping
(mechanical and electrical)

- Function: If constant CLOSE and OPEN commands are present at the vacuum circuit-breaker at the same time, the vacuum circuit-breaker will return to the open position after closing. It remains in this position until a new CLOSE command is given. In this manner, continuous closing and opening (= pumping) is avoided.

Circuit-breaker tripping signal

- For electrical signaling (as pulse > 10 ms), e.g. to remote control systems, in the case of automatic tripping (e.g. protection)
- Via limit switch and cutout switch.

Varistor module

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

Auxiliary switch

- Standard: 6 NO + 6 NC, free contacts thereof [1)]
  1 NO + 2 NC + 2 changeover
- Option: 11 NO + 11 NC, free contacts thereof [1)]
  6 NO + 7 NC + 2 changeover.

Position switch

- For signaling “closing spring charged”.

Mechanical interlocking

- Dependent on the type of operating mechanism
- Interrogation of the three-position disconnector from the switchgear side
- Option: Operating mechanism with mechanical interlocking as
– Stored-energy mechanism with closing solenoid and pushbutton: The pushbutton operated by the mechanical interlocking prevents a continuous command to the closing solenoid
- During operation of the three-position disconnector from CLOSED to OPEN, the vacuum circuit-breaker cannot be closed.

Operations counter

1) Depending on the secondary components selected

Features

- Busbar extension possible on all individual panels and panel blocks (ordering option)
- Plug-in unit consisting of contact coupling and screened silicone coupling
- Insensitive to pollution and condensation
- Switchgear installation, extension or panel replacement is possible without gas work.

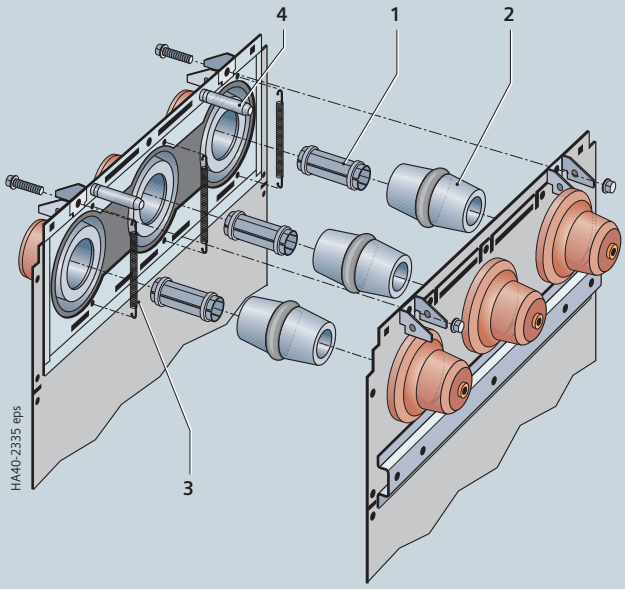
Every switchgear block and every individual panel is optionally available with busbar extension on the right, on the left or on both sides. This offers a high flexibility for the creation of switchgear configurations the functional units of which are lined up in any order. Local installation and lining up is done without gas work.

Lining up takes place as follows:

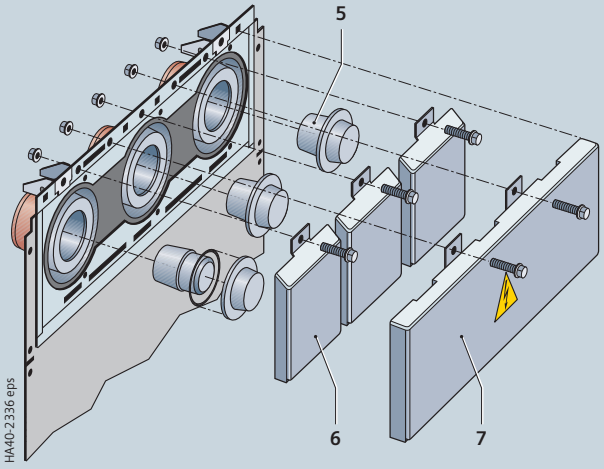
- By the busbar couplings on the medium-voltage side. Tolerances between adjacent panels are compensated by spherical fixed contacts and the movable contact coupling with degrees of freedom in all axis directions.
- By safe dielectric sealing with screened silicone couplings that are externally earthed and adjustable to tolerances. These silicone couplings are pressed on with a defined pressure when the panels are interconnected.
- On free busbar ends, screened dummy plugs are inserted, each of which is pressed on through a metal cover. A common protective cover with a warning is fixed over all three covers.
- By centering bolts for easier switchgear installation and fixing of adjacent panels.
- By bolted panel joints with defined stops for the distances between adjacent panels and the associated pressure of contact pieces and silicone couplings.

Switchgear installation, extension or replacement of one or more functional units requires a lateral wall distance ≥ 200 mm.

Interconnecting the panels



Surge-proof termination



1 Contact piece
2 Silicone coupling
3 Tension spring for earthing
4 Centering bolt
5 Silicone dummy plug with insertable sleeve
6 Clamping cover for dummy plugs
7 Busbar termination cover

Features

- Application for switch-disconnector/fuse combination in
– Transformer feeders (T)
- HV HRC fuse-links according to DIN 43625 (main dimensions) with striker; "medium" version according to IEC/EN 60282-1/VDE 0670-4
– As short-circuit protection for transformers
– With selectivity – depending on correct selection – to upstream and downstream connected equipment
– 1-pole insulated
- Requirements according to IEC/EN 62271-105/VDE 0671-105 fulfilled in high-voltage switch-fuse combinations
- Climate-independent and maintenance-free
- Arrangement of fuse assembly in the switchgear vessel
- Fuse can only be replaced if feeder is earthed
- Fuse assembly for applications with a reference dimension of 537 mm.

Option with three-position switch-disconnector

- Shunt release (f-release)
- "Tripped signal" of the transformer switch for remote electrical indication with 1 normally open contact.

Mode of operation

In the event that an HV HRC fuse-link has tripped, the switch-disconnector is tripped via an articulation which is integrated into the cover of the fuse box (see figure).

In the event that the fuse tripping fails, e.g. if the fuse has been inserted incorrectly, the fuse box is protected by thermal protection. The overpressure generated by overheating trips the switch via the diaphragm in the cover of the fuse box and via an articulation. This prevents the fuse box from incurring irreparable damage.

This thermal protection works independently of the type and design of the HV HRC fuse used. Like the fuse itself, it is maintenance-free and independent of any outside climatic effects.

Furthermore, the HV HRC fuses (e.g. make SIBA) release the striker depending on the temperature and trip the switch-disconnector as early as in the fuse overload range.

Impermissible heating of the fuse box can be avoided in this way.

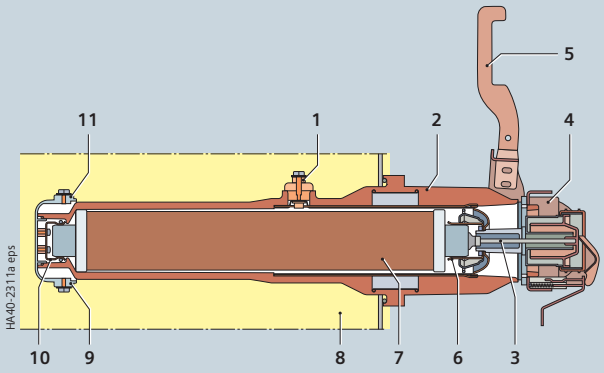
Replacement of HV HRC fuse-links

- Isolate and earth the transformer feeder
- Open the cover of the fuse access
- Replace the HV HRC fuse-link.

Note to HV HRC fuse-links

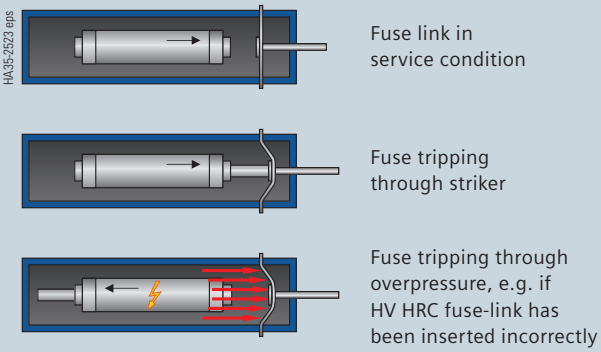
According to IEC 60282-1 (2009) Clause 6.6, the breaking capacity of HV HRC fuses is tested within the scope of the type test at 87 % of their rated voltage. In three-phase systems with resonance-earthed or isolated neutral, under double earth fault and other conditions, the full phase-to-phase voltage may be available at the HV HRC fuse during breaking. Depending on the size of the operating voltage of such a system, this applied voltage may then exceed 87 % of the rated voltage. It must therefore already be ensured during configuration of the switching devices and selection of the HV HRC fuse that only such fuse-links are used, which either satisfy the above operating conditions, or whose breaking capacity was tested at least with the maximum system voltage. In case of doubt, a suitable HV HRC fuse must be selected together with the fuse manufacturer.

HV HRC fuse assembly



1 Front connection of fuse box
2 Fuse box
3 Tripping pin for spring-operated/stored-energy mechanism
4 Sealing cover with seal
5 Handle of locking system
6 Front fuse contact
7 HV HRC fuse
8 Switchgear vessel
9 Rear connection of fuse box
10 Rear fuse contact
11 Connection for second earthing switch

Schematic sketches for fuse tripping



Allocation of HV HRC fuses and transformers

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

Fuse protection table

The three-position switch-disconnector in the transformer feeder (transformer switch) was combined and tested according to IEC 62271-105 with HV HRC fuse-links type HHD-B resp. HHD-BSSK.

Standards

HV HRC fuse-links "medium" version with striker and tripping energy 1 ± 0.5 Joule according to

- IEC / EN 60282-1 / VDE 0670-4
- IEC / TR 62655 / VDE 0670-402
- DIN 43625 main dimensions.

MV system	Transformer			HV HRC fuse-link				
Operating voltage U_n	Rated power S_r	Relative impedance voltage u_k	Rated current I_r	Rated current I_r	Min. operating/ rated voltage U_r	Dimension "e"	Outside diameter d	Order No. Make SIBA
kV	kVA	%	A	A	kV	mm	mm	
24	75	4	1.8	6.3	20 to 36	537	53	**30 008 13.6.3**
	100	4	2.4	6.3	20 to 36	537	53	**30 008 13.6.3**
	125	4	3.0	10	20 to 36	537	53	**30 008 13.10**
	160	4	3.9	10	20 to 36	537	53	**30 008 13.10**
	200	4	4.8	16	20 to 36	537	53	**30 008 13.16**
	250	4	6.0	16	20 to 36	537	53	**30 008 13.16**
	315	4	7.6	20	20 to 36	537	53	**30 008 13.20**
	400	4	9.6	20	20 to 36	537	53	**30 008 13.20**
	500	4	12.0	25	20 to 36	537	53	**30 008 13.25**
	630	4	15.2	31.5	20 to 36	537	67	**30 016 13.31.5**
	800	5	19.3	31.5	20 to 36	537	67	**30 016 13.31.5**
	800	6	19.3	31.5	20 to 36	537	67	**30 016 13.31.5**
	1000	5	24.1	40	20 to 36	537	67	**30 016 13.40**
	1000	6	24.1	40	20 to 36	537	67	**30 016 13.40**
	1250	5	30.1	50	20 to 36	537	85	**30 024 13.50**
	1250	6	30.1	50	20 to 36	537	85	**30 024 13.50**
	1600	5	38.5	63	20 to 36	537	85	**30 024 43.63** [1]
	1600	6	38.5	63	20 to 36	537	85	**30 024 43.63** [1]
	2000	5	48.1	80	20 to 36	537	85	**30 024 43.80** [1]
	2000	6	48.1	80	20 to 36	537	85	**30 024 43.80** [1]
25	75	4	1.7	6.3	20 to 36	537	53	**30 008 13.6.3**
	100	4	2.3	6.3	20 to 36	537	53	**30 008 13.6.3**
	125	4	2.9	10	20 to 36	537	53	**30 008 13.10**
	160	4	3.7	10	20 to 36	537	53	**30 008 13.10**
	200	4	4.6	16	20 to 36	537	53	**30 008 13.16**
	250	4	5.8	16	20 to 36	537	53	**30 008 13.16**
	315	4	7.3	20	20 to 36	537	53	**30 008 13.20**
	400	4	9.2	20	20 to 36	537	53	**30 008 13.20**
	500	4	11.6	25	20 to 36	537	53	**30 008 13.25**
	630	4	14.6	31.5	20 to 36	537	67	**30 016 13.31.5**
	800	5	18.5	31.5	20 to 36	537	67	**30 016 13.31.5**
	800	6	18.5	31.5	20 to 36	537	67	**30 016 13.31.5**
	1000	5	24.1	40	20 to 36	537	67	**30 016 13.40**
	1000	6	24.1	40	20 to 36	537	67	**30 016 13.40**
	1250	5	30.1	50	20 to 36	537	85	**30 024 13.50**
	1250	6	30.1	50	20 to 36	537	85	**30 024 13.50**
	1600	5	38.5	63	20 to 36	537	85	**30 024 43.63** [1]
	1600	6	38.5	63	20 to 36	537	85	**30 024 43.63** [1]
	2000	5	48.1	80	20 to 36	537	85	**30 024 43.80** [1]
	2000	6	48.1	80	20 to 36	537	85	**30 024 43.80** [1]
25.8	75	4	1.7	6.3	20 to 36	537	53	**30 008 13.6.3**
	100	4	2.2	6.3	20 to 36	537	53	**30 008 13.6.3**
	125	4	2.8	10	20 to 36	537	53	**30 008 13.10**
	160	4	3.6	10	20 to 36	537	53	**30 008 13.10**
	200	4	4.5	16	20 to 36	537	53	**30 008 13.16**
	250	4	5.6	16	20 to 36	537	53	**30 008 13.16**
	315	4	7.1	20	20 to 36	537	53	**30 008 13.20**
	400	4	9.0	20	20 to 36	537	53	**30 008 13.20**
	500	4	11.2	25	20 to 36	537	53	**30 008 13.25**
	630	4	14.1	31.5	20 to 36	537	67	**30 016 13.31.5**
	800	5	17.9	31.5	20 to 36	537	67	**30 016 13.31.5**
	800	6	17.9	31.5	20 to 36	537	67	**30 016 13.31.5**
	1000	5	22.4	40	20 to 36	537	67	**30 016 13.40**
	1000	6	22.4	40	20 to 36	537	67	**30 016 13.40**
	1250	5	28.0	50	20 to 36	537	85	**30 024 13.50**
	1250	6	28.0	50	20 to 36	537	85	**30 024 13.50**
	1600	5	35.8	63	20 to 36	537	85	**30 024 43.63** [1]
	1600	6	35.8	63	20 to 36	537	85	**30 024 43.63** [1]
	2000	5	44.8	80	20 to 36	537	85	**30 024 43.80** [1]
	2000	6	44.8	80	20 to 36	537	85	**30 024 43.80** [1]

1) For 1600 kVA and 2000 kVA, HHD-BSSK fuse-links are used.

Continued on next page

MV system	Transformer			HV HRC fuse-link				
Operating voltage U_n	Rated power S_r	Relative impedance voltage u_k	Rated current I_r	Rated current I_r	Min. operating/ rated voltage U_r	Dimension "e"	Outside diameter d	Order No. Make SIBA
kV	kVA	%	A	A	kV	mm	mm	
27.6	75	4	1.6	6.3	20 to 36	537	53	**30 008 13.6.3**
	100	4	2.1	6.3	20 to 36	537	53	**30 008 13.6.3**
	125	4	2.6	10	20 to 36	537	53	**30 008 13.10**
	160	4	3.4	10	20 to 36	537	53	**30 008 13.10**
	200	4	4.2	10	20 to 36	537	53	**30 008 13.10**
	250	4	5.2	16	20 to 36	537	53	**30 008 13.16**
	315	4	6.6	16	20 to 36	537	53	**30 008 13.16**
	400	4	8.4	20	20 to 36	537	53	**30 008 13.20**
	500	4	10.5	25	20 to 36	537	53	**30 008 13.25**
	630	4	13.2	31.5	20 to 36	537	67	**30 016 13.31.5**
	800	5	16.8	31.5	20 to 36	537	67	**30 016 13.31.5**
	800	6	16.8	31.5	20 to 36	537	67	**30 016 13.31.5**
	1000	5	21.0	40	20 to 36	537	67	**30 016 13.40**
	1000	6	21.0	40	20 to 36	537	67	**30 016 13.40**
	1250	5	26.2	50	20 to 36	537	85	**30 024 13.50**
	1250	6	26.2	50	20 to 36	537	85	**30 024 13.50**
	1600	5	33.5	63	20 to 36	537	85	**30 024 43.63** [1]
	1600	6	33.5	63	20 to 36	537	85	**30 024 43.63** [1]
	2000	5	41.9	80	20 to 36	537	85	**30 024 43.80** [1]
	2000	6	41.9	80	20 to 36	537	85	**30 024 43.80** [1]
	2500	5	52.4	80	20 to 36	537	85	**30 024 43.80** [1]
	2500	6	52.4	80	20 to 36	537	85	**30 024 43.80** [1]
30	75	4	1.5	6.3	20 to 36	537	53	**30 008 13.6.3**
	100	4	1.9	6.3	20 to 36	537	53	**30 008 13.6.3**
	125	4	2.4	6.3	20 to 36	537	53	**30 008 13.6.3**
	160	4	3.1	10	20 to 36	537	53	**30 008 13.10**
	200	4	3.9	10	20 to 36	537	53	**30 008 13.10**
	250	4	4.8	16	20 to 36	537	53	**30 008 13.16**
	315	4	6.1	16	20 to 36	537	53	**30 008 13.16**
	400	4	7.7	20	20 to 36	537	53	**30 008 13.20**
	500	4	9.6	20	20 to 36	537	53	**30 008 13.20**
	630	4	12.1	25	20 to 36	537	53	**30 008 13.25**
	800	5	15.4	31.5	20 to 36	537	67	**30 016 13.31.5**
	800	6	15.4	31.5	20 to 36	537	67	**30 016 13.31.5**
	1000	5	19.3	31.5	20 to 36	537	67	**30 016 13.31.5**
	1000	6	19.3	31.5	20 to 36	537	67	**30 016 13.31.5**
	1250	5	24.1	40	20 to 36	537	67	**30 016 13.40**
	1250	6	24.1	40	20 to 36	537	67	**30 016 13.40**
	1600	5	30.8	63	20 to 36	537	85	**30 024 43.63** [1]
	1600	6	30.8	63	20 to 36	537	85	**30 024 43.63** [1]
	2000	5	38.5	80	20 to 36	537	85	**30 024 43.80** [1]
	2000	6	38.5	80	20 to 36	537	85	**30 024 43.80** [1]
	2500	5	48.2	80	20 to 36	537	85	**30 024 43.80** [1]
	2500	6	48.2	80	20 to 36	537	85	**30 024 43.80** [1]
36	100	4	1.6	6.3	20 to 36	537	53	**30 008 13.6.3**
	125	4	2	6.3	20 to 36	537	53	**30 008 13.6.3**
	160	4	2.6	10	20 to 36	537	53	**30 008 13.10**
	200	4	3.2	10	20 to 36	537	53	**30 008 13.10**
	250	4	4	10	20 to 36	537	53	**30 008 13.10**
	315	4	5.1	16	20 to 36	537	53	**30 008 13.16**
	400	4	6.4	16	20 to 36	537	53	**30 008 13.16**
	500	4	8	20	20 to 36	537	53	**30 008 13.20**
	630	4	10.1	20	20 to 36	537	53	**30 008 13.20**
	800	5	12.9	20	20 to 36	537	53	**30 008 13.20**
	800	6	12.9	20	20 to 36	537	53	**30 008 13.20**
	1000	5	16.1	31.5	20 to 36	537	67	**30 016 13.31.5**
	1000	6	16.1	31.5	20 to 36	537	67	**30 016 13.31.5**
	1250	5	20.1	40	20 to 36	537	67	**30 016 13.40**
	1250	6	20.1	40	20 to 36	537	67	**30 016 13.40**
	1600	5	25.7	40	20 to 36	537	67	**30 016 13.40**
	1600	6	25.7	40	20 to 36	537	67	**30 016 13.40**
	2000	5	32.1	63	20 to 36	537	85	**30 024 43.63** [1]
	2000	6	32.1	63	20 to 36	537	85	**30 024 43.63** [1]
	2500	5	40.1	80	20 to 36	537	85	**30 024 43.80** [1]
	2500	6	40.1	80	20 to 36	537	85	**30 024 43.80** [1]

1) For voltages up to and including 30 kV, HHD-BSSK fuse-links are used for 1600 kVA, 2000 kVA and 2500 kVA.
For voltages up to and including 36 kV, HHD-BSSK fuse-links are used for 2000 kVA and 2500 kVA.

Features

- According to IEC / EN 61869-1 and -2 / VDE 0414-9-1 and -2
- Designed as ring-core current transformers, 1-pole
- Free of dielectrically stressed cast-resin parts (due to design)
- Insulation class E
- Inductive type
- Secondary connection by means of a terminal strip in the panel.

Installation

The mounting location is outside the switchgear vessel, around the cable at the panel connection or at the bushings of the cable connection (option for current transformer type 4MC4_30 in circuit-breaker panel); installation on the cable on site.

Note: Installation inside or underneath the panel depending on the panel type and the overall transformer height.

Cable-type current transformer 4MC7033, 4 overall heights

Technical data

Cable-type current transformer 4MC7033

Primary data

Highest voltage for equipment U_m	0.72 kV
Rated current I_N	20 A to 600 A
Rated short-duration power-frequency withstand voltage (winding test)	3 kV
Rated short-time thermal current I_{th}	up to 20 kA / 3 s
Rated continuous thermal current I_D	1.2 × I_N
Transient overload current	1.5 × I_D / 1 h or 2 × I_D / 0.5 h
Rated dynamic current I_{dyn}	2.5 × I_{th}

Secondary data

Rated current		1 A or 5 A, optionally: multiratio		
Measuring core	Class	0.2	0.5	1
	Overcurrent factor	without	FS5	FS10
	Rating	2.5 VA to 30 VA		
Protection core	Class	10 P	5 P	
	Overcurrent factor	10	20	30
	Rating	1 VA to 30 VA		

Dimensions

Overall height H, mm depending on core data	65	110	170	285
Outside diameter	150 mm			
Inside diameter	55 mm			
For cable diameter	50 mm			

Other values on request

Technical data

Cable-type current transformer and current transformer on the bushing, 4MC4_30

Primary data

Highest voltage for equipment U_m	0.72 kV
Rated current I_N	50 A to 600 A
Rated short-duration power-frequency withstand voltage (winding test)	3 kV
Rated short-time thermal current I_{th}	up to 20 kA / 3 s
Rated continuous thermal current I_D	1.2 × I_N
Transient overload current	1.5 × I_D / 1 h or 2 × I_D / 0.5 h
Rated dynamic current I_{dyn}	2.5 × I_{th}

Secondary data

Rated current		1 A or 5 A
Measuring core	Class	0.2 to 1
	Overcurrent factor	FS 5, FS 10
	Rating	2.5 VA to 30 VA
Protection core	Class	5 P or 10 P
	Overcurrent factor	10 to 30
	Rating	2.5 VA to 30 VA

Dimensions

Overall height H mm	50	100	170	214
Outside diameter	190 mm			
Inside diameter	106 mm			
For cable diameter	100 mm			

Other values on request

Features

- According to IEC / EN 61869-1 and -3 / VDE 0414-9-1 and -3
- 1-pole, plug-in design
- Inductive type
- Connection with plug-in contact
- Safe-to-touch due to metal enclosure
- Secondary connection by means of plugs inside the panel
- For outside-cone system type C
- Voltage transformers at the cable connection can be disconnected from the main circuit for cable testing without being removed
- Busbar voltage transformers designed for up to 80 % of the rated short-duration power-frequency withstand voltage at rated frequency (option).

Installation

- Mounting location:
  - Arranged above the switchgear vessel in individual panels type L; connection directly at the busbar
  - Arranged below the switchgear vessel in individual panels type L; can be switched off through SF_6-insulated disconnecting facility in the switchgear vessel.

Plug-in voltage transformer 4MU1

Technical data

for type 4MU1

Primary data

Highest voltage for equipment 1.2 × U_n	
Rated voltage U_r	Operating voltage U_n
kV	kV / √3
36	24.0
	25.0
	25.8
	27.6
	30.0
	33.0
	34.5
	35.0

Secondary data

Rated voltage	1st winding	100 / √3 110 / √3 120 / √3
	Auxiliary winding (option)	100 / 3 110 / 3 120 / 3
Rated long-time current (8 h)	6 A	Class
Rating in VA up to	25	0.2
	60	0.5
	150	1.0

Components

Current transformers 4MA76 and voltage transformers 4MR56 for air-insulated billing metering panels

Features

Current transformer 4MA76

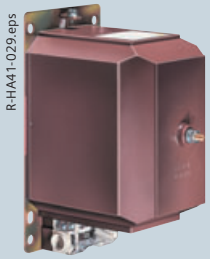
- According to IEC / EN 61869-1 and -2 / VDE 0414-9-1 and -2
- Dimensions according to DIN 42600-5
- Designed as indoor block-type current transformer, 1-pole
- Cast-resin insulated
- Insulation class E
- Secondary connection by means of screw-type terminals.

Voltage transformer 4MR56

- According to IEC / EN 61869-1 and -3 / VDE 0414-9-1 and -3
- Dimensions according to DIN 42600-3
- Designed as indoor voltage transformer, 1-pole
- Cast-resin insulated
- Insulation class E
- Secondary connection by means of screw-type terminals.

Current transformer 4MA7

Voltage transformer 4MR



Technical data

Current transformer 4MA76, 1 pole

Primary data

Highest voltage for equipment U_m		36 kV		
Rated short-duration power-frequency withstand voltage U_d		70 kV		
Rated lightning impulse withstand voltage U_p		170 kV		
Rated current I_N				
Rated short-time thermal current I_{th}		20 A to 600 A		
Rated continuous thermal current I_D		1.2 × I_N		
Rated dynamic current I_{dyn}		max. 2.5 × I_{th}		

Secondary data

Rated current		1 A or 5 A		
Measuring core	Class	0.2	0.5	1
	Overcurrent factor	without	FS5	FS10
	Rating	2.5 VA to 30 VA		
Protection core	Class	5 P or 10 P		
	Overcurrent factor	10		
	Rating	2.5 VA to 30 VA		

Other values on request

Technical data

Voltage transformer 4MR56, 1 pole

Primary data

Highest voltage for equipment	1.2 × U_n resp. max. 36 kV
Rated voltage (8 h) = 1.9 × U_n	
Rated voltage U_r	Operating voltage U_n
kV	kV / √3
36	24.0
	25.0
	25.8
	27.6
	30.0
	33.0
	34.5
	35.0

Secondary data

Rated voltage in V	1st winding	100 / √3 110 / √3 120 / √3
	Auxiliary winding (option)	100 / 3 110 / 3 120 / 3
Rating in VA up to		Class
	20	0.2
	60	0.5
	100	1.0

Other values on request

Common features

- According to IEC 60044-8 (low-power current transformers)
- Example for available secondary devices that can be connected:
  – SICAM FCM
  – 7SJ81

Current sensors

(make Zelisko)

The current sensors are inductive current transformers whose secondary winding delivers a voltage signal through a precision shunt. At the rated primary current, this is 225 mV. Depending on their version, the sensors have a dual accuracy class; the output signal can be equally used for measuring, protection and, if required, earth-fault detection. The outgoing leads of the sensors are directly connected to the secondary device (SICAM FCM, 7SJ81).

Ring-core current sensor SMCS-JW 1001

Ring-core current sensor SMCS/T-JW 1002, divisible

Ring-core current sensor GAE120/SENS-JW 1003 for earth-fault detection, divisible

Technical data

		SMCS-JW1001		SMCS/ T-JW1002	GAE120/ SENS-JW1003
Primary data					
Highest voltage for equipment U_n		0.72/3 kV		0.72/3 kV	0.72/3 kV
Rated current I_N		300 A [1]		300 A [1]	60 A
Rated short-time thermal current I_{th}		20 kA 1 s		20 kA 1 s	20 kA 1 s
Secondary data					
Output signal		225 mV		225 mV	225 mV
Measuring	Class	0.5; 1; 3		1; 3	–
	Overcurrent factor	–		–	–
Protection	Class	5P		5P	–
	Overcurrent factor	10	20	10; 20	–
Earth-fault detection	Class	–		–	1
	Angle error	–		–	± 120'
	Composite error e	–		–	≤ 10 % (at 0.4 A) ≤ 20 % (at 200 A)
Rated burden		≥ 20 kOhm		≥ 20 kOhm	≥ 20 kOhm
Dimensions and installation					
Overall height, depending on the overcurrent factor		28 mm	up to 56 mm	53 mm	130 mm (incl. mounting plate)
External dimensions in mm		128 × 106		111 × 106	242 × 226
Inside diameter in mm		82		55	120
Mounting location		Cable plug [2]		On the cable	On the cable
Usable for panel widths in mm		430, 500, 590	430, 500, 590	430, 500, 590	430, 500, 590

1) Usable up to 2 × I_n = 600 A (output signal 2 × 225 mV) at constant accuracy class and half overcurrent factor

2) Mounting location at the bushings around the screened cable plug

Common features

- According to IEC 60044-7 (low-power voltage transformers)
- Example for available secondary devices that can be connected:
  – SICAM FCM
  – 7SJ81

Voltage sensors
(make Zelisko)

The voltage sensors are resistor dividers which provide an output signal of 3.25 V/√3 at the rated primary voltage. The outgoing leads of the sensors are directly connected to the secondary device (SICAM FCM, 7SJ81).

Sensor SMVS-UW1001

Technical data

	Sensor SMVS-UW1001
Primary data	
Highest voltage for equipment U_m	1.2 × U_n
Rated voltage (8 h)	1.9 × U_n
Rated voltage U_r	36 kV
Operating voltage U_n	30 kV
Secondary data	
Rated voltage	3.25 V/√3
Class	0.5; 1; 3
Rated burden	200 kOhm ± 1 %
Installation	
Mounting location	On the screened cable plugs make Nexans type M400TB and M440TB

Features

- Access to the cable compartment only if the feeder has been disconnected and earthed
- Bushings according to DIN EN 50181 with outside cone and bolted connection M16 as interface type C, or plug-in contact as interface type B (option in transformer feeder).

Connection of

- Cable T-plugs with bolted contact M16 for 630 A
- Cable elbow plugs or cable T-plugs with plug-in contact for 400 A (option in transformer panel)
- Thermoplastic-insulated cables (1-core and 3-core cables).

Option

- Mounted cable clamps on cable bracket.

Cable plugs

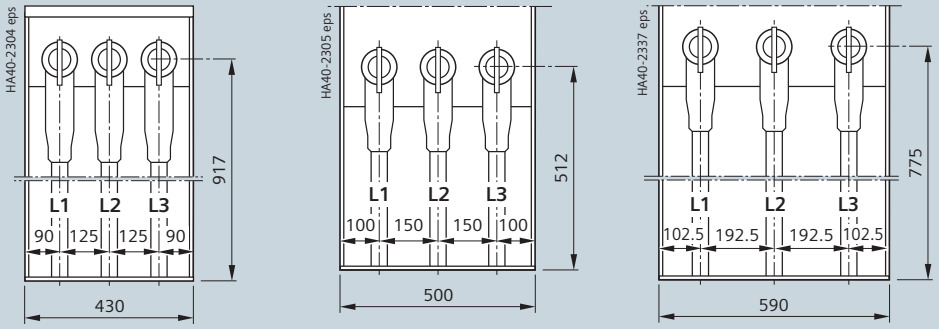
- As screened (semi-conductive) design independent of the site altitude.

Surge arresters

- Pluggable on cable T-plug or T-adapter
- The switchgear depth can be extended when surge arresters are mounted (depending on the make and type)
- Surge arresters recommended if, at the same time,

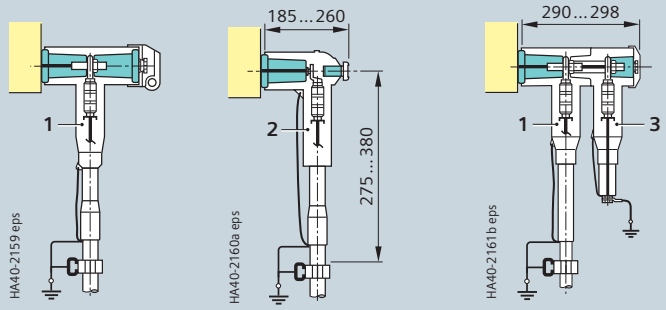
– the cable system is directly connected to the overhead line,
– the protection zone of the surge arrester at the end tower of the overhead line does not cover the switchgear.

Cable compartment

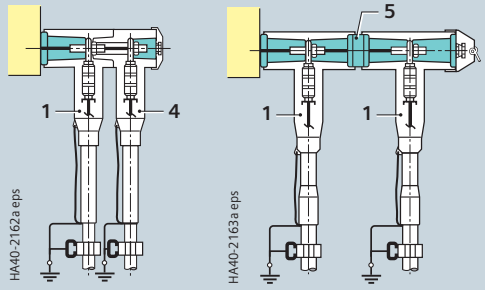


Panel width 430 mm (R) | Panel width 500 mm (T) | Panel width 590 mm (L)

Connection options



Single cable



Double cable

1 Cable T-plug
2 Cable elbow plug
3 Surge arrester
4 Coupling T-plug
5 Screw-type coupling insert

Cable plugs for single cable connection

Cable type	Cable T-plug / cable elbow plug			
	Make	Type	Cross-section mm²	Comment
Thermoplastic-insulated cables 36 kV according to IEC 60502-2 and VDE 0276 Part 620				
1-core cable, PE and XLPE-insulated N2YSY (Cu) and N2XSY (Cu) or NA2YSY (Al) and NA2XSY (Al)	Nexans	M400 LR/G [1)]	50 to 240	EPDM with semi-conductive layer
		M400 TE/G [1)]	50 to 240	EPDM with semi-conductive layer
		M400 TB/G	50 to 240	EPDM with semi-conductive layer
		M440 TB/G	300 to 630	EPDM with semi-conductive layer
		M430 TB/G	50 to 240	EPDM with semi-conductive layer
		M484 TB/G	50 to 630	EPDM with semi-conductive layer
		M480 TB/G	50 to 300	EPDM with semi-conductive layer
	Südkabel	SET 36-B [1)]	70 to 300	Silicone with semi-conductive layer (optionally with metal housing)
		SET 36	70 to 300	Silicone with semi-conductive layer (optionally with metal housing)
		SEHDT33	300 to 500	Silicone with semi-conductive layer (optionally with metal housing)
	nkt cables	CB36-400 [1)]	25 to 300	Silicone with semi-conductive layer
		CB36-630	25 to 300	Silicone with semi-conductive layer (optionally with metal housing)
		CB36-630 (1250)	400 to 630	Silicone with semi-conductive layer
	TE Connectivity	RSTI-68xx	25 to 300	Silicone with semi-conductive layer, with capacitive measuring point
		RSTI-69xx	300 to 630	Silicone with semi-conductive layer, with capacitive measuring point
	Prysmian	FMCT-400-X [1)]	25 to 300	EPDM with semi-conductive layer
		FMCTs-400-X	25 to 300	EPDM with semi-conductive layer
	Cooper Power Systems	DT436	25 to 240	EPDM with semi-conductive layer
	3 M Germany	94-EE 705-6/-XX	70 to 400	EPDM with semi-conductive layer
3-core cable, PE and XLPE-insulated N2YSY (Cu) and N2XSY (Cu) or NA2YSY (Al) and NA2XSY (Al)	Nexans	M400 TB/G	50 to 240	EPDM with semi-conductive layer, in combination with distribution kit
		M430 TB/G	50 to 240	EPDM with semi-conductive layer, in combination with distribution kit
	Südkabel	SET 36	70 to 300	Silicone with semi-conductive layer (optionally with metal housing), in combination with distribution kit
		SEHDT33	300 to 500	Silicone with semi-conductive layer (optionally with metal housing), in combination with distribution kit
	nkt cables	CB36-630	25 to 300	Silicone with semi-conductive layer (optionally with metal housing), in combination with distribution kit
	TE Connectivity	RSTI-68xx	25 to 300	Silicone with semi-conductive layer, with capacitive measuring point, in combination with distribution kit RSTI-TRF0x
	Prysmian	FMCTs-400-X	25 to 300	EPDM with semi-conductive layer, in combination with distribution kit
	Cooper Power Systems	DT436	25 to 240	EPDM with semi-conductive layer, in combination with distribution kit
	3 M Germany	94-EE 705-6/-XX	70 to 400	Silicone with semi-conductive layer, in combination with distribution kit

Larger cable cross-sections and other cable T-plugs or cable elbow plugs on request

1) Cable T-plug or cable elbow plug with plug-in contact for interface type B

Number of cables per panel and phase	Make	Conductor cross-section [1] mm²	Elbow connectors plugged in	Coupling inserts / coupling plugs plugged in	Surge arresters Arresters	Surge arresters Coupling unit	According to standard
• Transformer feeder with outside-cone interface type B							
1	Nexans	50 to 240	1 × M400LR/G	–	–	–	IEC

Number of cables per panel and phase	Make	Conductor cross-section [1] mm²	Cable T-plugs plugged in	Coupling inserts/ coupling plugs plugged in	Surge arresters Arresters	Surge arresters Coupling unit	According to standard
• Transformer feeder with outside-cone interface type B							
1	Nexans	50 to 240	1 × M400TE/G	–	–	–	IEC
	Südkabel	50 to 300	1 × SET 36-B	–	–	–	IEC
	nkt cables	25 to 300	1 × CB 36-400	–	–	–	IEC
	Prysmian	25 to 300	1 × FMCT-400	–	–	–	IEC

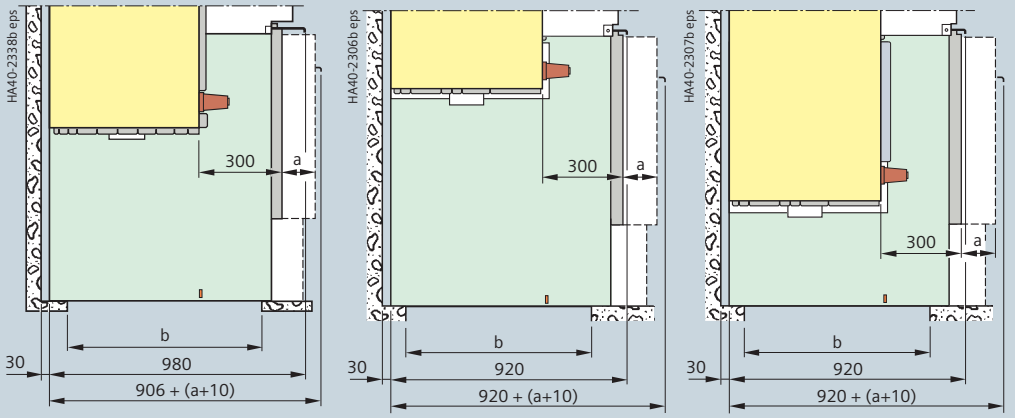
Number of cables per panel and phase	Make	Conductor cross-section [1] mm²	Cable T-plugs bolted	Coupling inserts/ coupling plugs bolted	Surge arresters Arresters	Surge arresters Coupling unit	According to standard
• Transformer feeder with outside-cone interface type C • Ring-main feeder • Circuit-breaker feeder • Cable feeder							
1	Nexans	50 to 240	1 × M400TB/G	–	400PB-10-SA-xxx [2]	–	IEC
		50 to 240	1 × M430TB/G	–	300SA-10-xxx	–	IEC
		50 to 300	1 × M480TB/G	–	800SA-10-xxx	–	IEC
		35 to 630	1 × M484TB/G	–	800SA-10-xxx	–	IEC
		300 to 630	1 × M440TB/G	–	400PB-10-SA-xxx [2]	–	IEC
	Südkabel	70 to 300	1 × SET 36	–	–	–	IEC
		300 to 500	1 × SEHDT 33		1 × MUT 33 [2]	1 × KU 33	IEC
	nkt cables	25 to 300	1 × CB 36-630	–	1 × CSA 36-10	–	IEC
		400 to 630	1 × CB 36-630 (1250)	–	1 × CSA 36-10	–	IEC
	TE Connectivity	50 to 300	1 × RSTI-68xx	–	1 × RSTI-CC-68SAxx10	–	IEC
		300 to 630	1 × RSTI-69xx	–	–	–	IEC
	Prysmian	25 to 300	1 × FMCTs-400-x	–	–	–	IEC
	Cooper Power Systems	25 to 240	1 × DT436-x-x	–	–	–	IEC
	3M	400 to 630	1 × 94-EE 705-6/xxx	–	–	–	IEC
2	Nexans	50 to 240	2 × M400TB/G [2]	1 × M400CP	–	–	IEC
		50 to 240	1 × M430TB/G	1 × M300PB/G	300SA-10-xxx [1]	–	IEC
		50 to 300	1 × M480TB/G	1 × M804PB/G	800SA-10-xxx	–	IEC
		35 to 630	1 × M484TB/G	1 × M804PB/G	800SA-10-xxx [1]	–	IEC
		300 to 630	2 × M440TB/G [2]	1 × M440CP	–	–	IEC
	Südkabel	300 to 500	2 × SEHDT33 [2]	1 × KU33	–	–	IEC
	nkt cables	25 to 300	1 × CB 36-630	1 × CC 36-630	1 × CSA 36-10 [2]	–	IEC
		400 to 630	1 × CB 36-630 (1250)	1 × CC 36-630 (1250)	1 × CSA 36-10 [2]	–	IEC
	TE Connectivity	50 to 300	1 × RSTI-68xx	1 × RSTI-CC-68xx	1 × RSTI-CC-68SAxx10 [2]	–	IEC
		300 to 630	1 × RSTI-69xx [1]	1 × RSTI-CC-69xx [1]	–	–	IEC

1) If this plug combination is used, or with a surge arrester, a 105 mm deeper cable compartment cover is necessary
2) If this plug combination is used, or with a surge arrester, a 250 mm deeper cable compartment cover is necessary

Deep cable compartment cover

To increase the mounting depth in the cable compartment, deep cable compartment covers can be ordered optionally. The assignment to selected types of cable plugs and cable plug / surge arrester combinations is given in the following tables.

For circuit-breaker panels with current transformer on the bushing and / or voltage transformer at the cable connection, the illustration on the following page applies.



Mounting depth at the panel connection
for type L for type R for type T

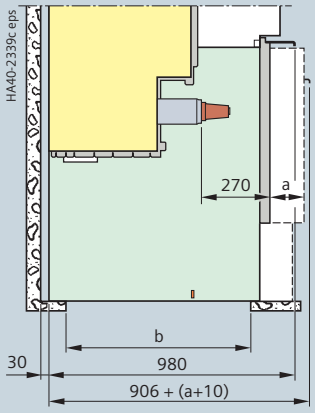
Cable plugs for double cable connection

Double cable connection			Connection combination			Deep cable compartment cover	
Make	Serial no.	Cable plug (type)	Design	Arrangement	Mounting depth (mm)	Deeper by **a** (mm)	Depth of floor opening **b** (mm)
Nexans	1	M430TB/G + M300PB/G	Screened	K + K	290	–	756
	2	2 × M400TB/G with coupling insert M400CP	Screened	K + K	505	250	1006
	3	M480TB/G + M804PB/G	Screened	K + K	290	–	756
	4	M484TB/G + M804PB/G	Screened	K + K	290	–	756
	5	2 × M440TB/G with coupling insert M440CP	Screened	K + K	505	250	1006
Südkabel	6	2 × SEHDT33 with coupling insert KU33	Screened	K + K	530	250	1006
nkt cables	7	CB 36-630 + CC 36-630	Screened	K + K	300	–	756
	8	CB 36-630(1250) + CC 36-630(1250)	Screened	K + K	300	–	756
TE Connectivity	9	RSTI-68xx + RSTI-CC-68xx	Screened	K + K	295	–	756
	10	RSTI-69xx + RSTI-CC-69xx	Screened	K + K	315	105	861
Cable plug + surge arrester			**Connection combination**			**Deep cable compartment cover**	
Make	Serial no.	Cable plug (type)	Design	Arrangement	Mounting depth (mm)	Deeper by **a** (mm)	Depth of floor opening **b** (mm)
Nexans	1	M430TB/G + 300SA	Screened	K + Ü	290	–	756
	2	M400TB/G + 400PB	Screened	K + Ü	410	250	1006
	3	M480TB/G + 800SA	Screened	K + Ü	290	–	756
	4	M484TB/G + 800SA	Screened	K + Ü	290	–	756
	5	M440TB/G + 400PB	Screened	K + Ü	410	250	1006
	6	M480TB/G + M804PB/G + 800SA	Screened	K + K + Ü	400	105	861
	7	M430TB/G + M300PB/G + 300SA	Screened	K + K + Ü	400	105	861
	8	M484TB/G + M804PB/G + 800SA	Screened	K + K + Ü	400	105	861
Südkabel	9	SEHDT33 + MUT 33 with coupling insert KU33	Screened	K + Ü	505	250	1006
nkt cables	10	CB 36-630 + CSA 36-10	Screened	K + Ü	300	–	756
	11	CB 36-630(1250) + CSA 36-10	Screened	K + Ü	300	–	756
	12	CB 36-630 + CC 36-630 + CSA 36-10	Screened	K + K + Ü	410	250	1006
	13	CB 36-630(1250) + CC 36-630(1250) + CSA 36-10	Screened	K + K + Ü	410	250	1006
TE Connectivity	14	RSTI-68xx + RSTI-CC-68SAxx	Screened	K + Ü	295	–	756
	15	RSTI-68xx + RSTI-CC-68xx + RSTI-CC-68SAxx	Screened	K + K + Ü	407	250	1006

K = Cable plug Ü = Surge arrester

Deep cable compartment cover

To increase the mounting depth in the cable compartment, deep cable compartment covers can be ordered optionally. The assignment to selected types of cable plugs and cable plug / surge arrester combinations is given in the following tables.



Mounting depth at the panel connection for type L

Cable plugs for double cable connection

Double cable connection			Connection combination			Deep cable compartment cover	
Make	Serial no.	Cable plug (type)	Design	Arrangement	Mounting depth (mm)	Deeper by **a** (mm)	Depth of floor opening **b** (mm)
Nexans	1	M430TB/G + M300PB/G	Screened	K + K	290	105	861
	2	2 × M400TB/G with coupling insert M400CP	Screened	K + K	505	250	1006
	3	M480TB/G + M804PB/G	Screened	K + K	290	105	861
	4	M484TB/G + M804PB/G	Screened	K + K	290	105	861
	5	2 × M440TB/G with coupling insert M440CP	Screened	K + K	505	250	1006
nkt cables	6	CB 36-630 + CC 36-630	Screened	K + K	300	105	861
	7	CB 36-630(1250) + CC 36-630(1250)	Screened	K + K	300	105	861
TE Connectivity	8	RSTI-68xx + RSTI-CC-68xx	Screened	K + K	295	105	861
	9	RSTI-69xx + RSTI-CC-69xx	Screened	K + K	315	105	861
Cable plug + surge arrester			**Connection combination**			**Deep cable compartment cover**	
Make	Serial no.	Cable plug (type)	Design	Arrangement	Mounting depth (mm)	Deeper by **a** (mm)	Depth of floor opening **b** (mm)
Nexans	1	M430TB/G + 300SA	Screened	K + Ü	290	105	861
	2	M400TB/G + 400PB	Screened	K + Ü	410	250	1006
	3	M480TB/G + 800SA	Screened	K + Ü	290	105	861
	4	M484TB/G + 800SA	Screened	K + Ü	290	105	861
	5	M440TB/G + 400PB	Screened	K + Ü	410	250	1006
	6	M480TB/G + M804PB/G + 800SA	Screened	K + K + Ü	400	250	1006
	7	M430TB/G + M300PB/G + 300SA	Screened	K + K + Ü	400	250	1006
	8	M484TB/G + M804PB/G + 800SA	Screened	K + K + Ü	400	250	861
Südkabel	9	SEHDT33 + MUT 33 with coupling insert KU33	Screened	K + Ü	505	250	1006
nkt cables	10	CB 36-630 + CSA 36-10	Screened	K + Ü	300	105	861
	11	CB 36-630(1250) + CSA 36-10	Screened	K + Ü	300	105	861
	12	CB 36-630 + CC 36-630 + CSA 36-10	Screened	K + K + Ü	410	250	1006
	13	CB 36-630(1250) + CC 36-630(1250) + CSA 36-10	Screened	K + K + Ü	410	250	1006
TE Connectivity	14	RSTI-68xx + RSTI-CC-68SAxx	Screened	K + Ü	295	105	861
	15	RSTI-68xx + RSTI-CC-68xx + RSTI-CC-68SAxx	Screened	K + K + Ü	407	250	1006

K = Cable plug Ü = Surge arrester

Cable testing

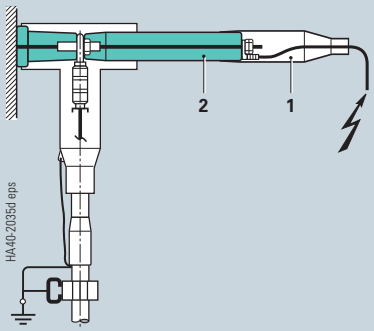
- For cable, ring-main cable and circuit-breaker feeders
- Disassembly of the switchgear cables not necessary
- Measuring bolts can be connected following the removal of the protective cap and/or the end stopper of the cable plug
- The switchgear is suitable for the following cable test voltages:

Rated voltage of switchgear	Cable test voltage [1]		
U_r kV	U_{ct} (DC) kV	U_{ct} (AC) kV	VLF 0.1 Hz [2] kV
36	72	57	57
Test duration	15 min	60 min	60 min

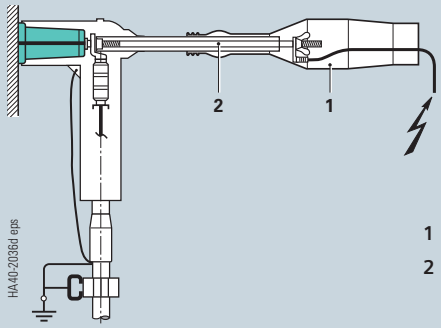
- Additional important data for cable testing are included
  - In the installation and operating instructions for the 8DJH 36 switchgear
  - In the standards IEC/EN 62271-200/VDE 0671-200, HD 620 S2/VDE 0276-620, HD 621 S1/VDE 0276-621
  - In the cable and cable plug manufacturer information.

1) Further values on request
2) VLF = Very low frequency

Cable testing



Cable testing at the cable T-plug (example)



1 Insulating cap
2 Measuring bolt

Cable testing at the cable elbow plug (example)

Standard interlocks

- Three-position switch: Disconnecting function against earthing function
- Access to cable compartment is generally only possible if
– the feeder is isolated
and
– the feeder is earthed (“EARTHED” position).

For ring-main feeders

- Option: Closing lockout
Prevents switching the three-position switch-disconnector from “OPEN” position to “CLOSED” position when the cable compartment cover is removed.

For transformer feeders

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

For circuit-breaker feeders

- Option: Closing lockout:
Prevents switching the three-position disconnector from “OPEN” position to “CLOSED” position when the cable compartment cover is removed
- Option: De-earthing lockout:
Prevents switching the three-position disconnector from “EARTHED” position to “OPEN” position when the cable compartment cover is removed.

Locking device for padlock

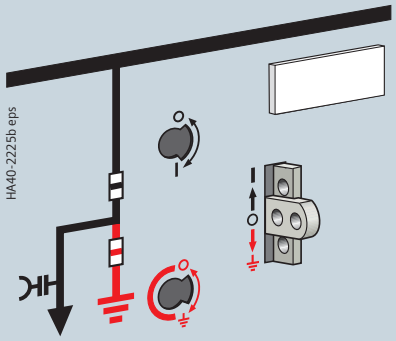
- Shackle diameter 12 mm
- Standard for transformer feeders (stored-energy mechanisms)
- Option for ring-main feeders (spring-operated mechanisms)
- Three-position switch-disconnector lockable at the operating mechanism in any desired switch position.

Key-operated interlock (option)

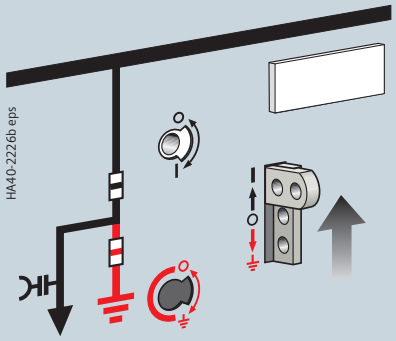
- With cylinder locks from selected manufacturers
- For the basic functionalities:
– Switch disconnector/disconnector
KF 1 Key free in OPEN
Key trapped in CLOSED
– Earthing switch
KF 2 Key free in OPEN
Key trapped in EARTHED
KF 3 Key free in EARTHED
Key trapped in OPEN.

These basic functionalities can be combined at will. Furthermore it is possible to integrate cylinder locks, e.g. of doors to transformer rooms, or external key boxes.

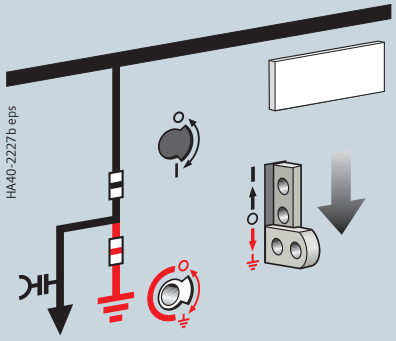
Interlocking of three-position switch
(option: locking device)



Initial situation

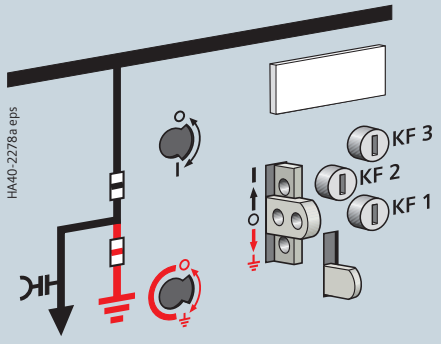


Release for disconnector operation



Release for earthing switch operation

Interlocking of three-position switch
(option: key-operated interlock)



Ready-for-service indicator

Features

- Self-monitoring; easy to read
- Independent of temperature and pressure variations
- Independent of the site altitude
- Only responds to changes in gas density
- Option: Alarm switch “1 NO + 1 NC” for remote electrical indication.

Mode of operation

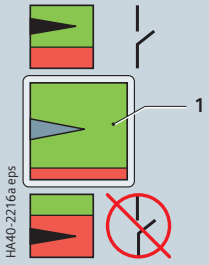
For the ready-for-service indicator, a gas-tight measurement box is installed inside the switchgear vessel.

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

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

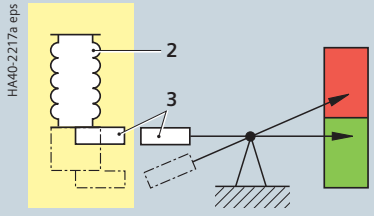
The temperature effect is compensated via the same pressure change in both gas volumes.

Gas monitoring



Indicator on control board:
1 Indication
green: ready for service
red: not ready for service
2 Measurement box
3 Magnetic coupling

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



Stainless-steel vessel filled with SF_6 gas

Ready-for-service indicator

Voltage detecting systems according to IEC 61243-5 or VDE 0682-415

- For verification of safe isolation from supply
- HR or LRM detecting systems with plug-in indicator
- LRM detecting systems with integrated indicator type VOIS+, VOIS R+, CAPDIS-S1+, CAPDIS-S2+, WEGA 1.2 C, WEGA 2.2 C or WEGA 3.

Plug-in voltage indicator

- Verification of safe isolation from supply phase by phase
- Indicator suitable for continuous operation
- Measuring system and voltage indicator can be tested, repeat test according to local specifications and standards
- Voltage indicator flashes if high voltage is present.

VOIS+, VOIS R+

- Without auxiliary power
- Display indication "A1" to "A3" (see legend)
- Repeat test according to local specifications and standards
- With integrated 3-phase LRM test socket for phase comparison
- With integrated signaling relay (only VOIS R+).

Common features of CAPDIS-Sx+

- Without auxiliary power
- Integrated repeat test of the interfaces (self-monitoring)
- With integrated function test (without auxiliary power) by pressing the "Test" button
- Adjustable for different operating voltages (adjustable capacitance C2)
- With integrated 3-phase LRM test socket for phase comparison
- With connectable signal-lead test
- With overvoltage monitoring and signaling (1.2 times operating voltage).

CAPDIS-S1+

- Without auxiliary power
- Display indication "A1" to "A7" (see legend)
- Without ready-for-service monitoring
- Without signaling relay (without auxiliary contacts).

CAPDIS-S2+

- Display indication "A0" to "A8" (see legend)
- Only by pressing the "Test" pushbutton: "ERROR" indication (A8), e.g. in case of missing auxiliary voltage
- With ready-for-service monitoring (auxiliary power required)
- With integrated signaling relay for signals (auxiliary power required).

Indicators and detecting systems

R-HA40-103 psd

Plug-in voltage indicator
per phase at the panel front

R-HA41-VOIS tif

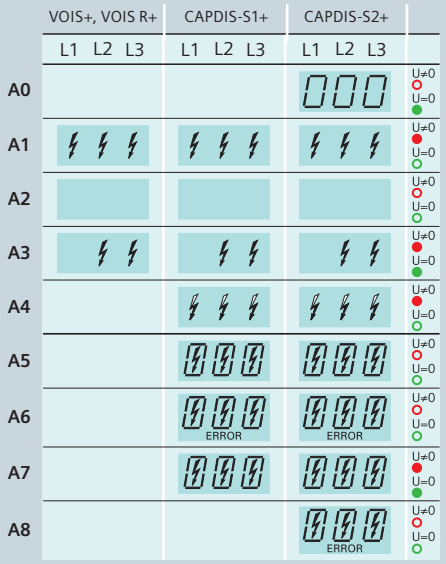
Integrated voltage indicator VOIS+, VOIS R+

R-HA41-CAPDIS-S1.tif

R-HA41-CAPDIS-S2.tif

Integrated voltage detecting system CAPDIS-S1+, -S2+

Symbols shown



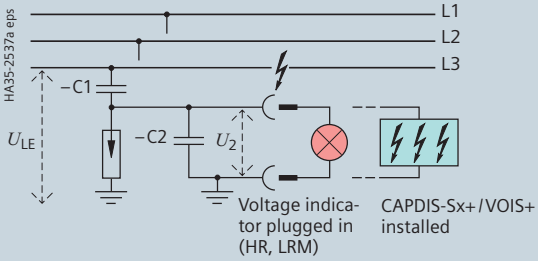
CAPDIS S2+: The red and green LEDs show the state of the relay contacts

- LED doesn't light up
- LED lights up

U = Operating voltage

A0 CAPDIS-S2+: Operating voltage not present
A1 Operating voltage present
A2 – Operating voltage not present
– For CAPDIS-S2+: Auxiliary power not present
A3 Failure in phase L1, operating voltage at L2 and L3 (for CAPDIS-Sx+ also earth-fault indication)
A4 Voltage (not operating voltage) present
A5 Indication "Test" passed (lights up shortly)
A6 Indication "Test" not passed (lights up shortly)
A7 Overvoltage present (lights up permanently)
A8 "ERROR" indication, e.g. in case of missing auxiliary voltage

HA35-2537a eps



Voltage indication
via capacitive voltage divider (principle)

– C1 Capacitance integrated into bushing
– C2 Capacitance of the connection leads and the voltage indicator to earth
$U_{LE} = U_N / \sqrt{3}$ during rated operation in the three-phase system
$U_2 = U_A$ = Voltage at the capacitive interface of the switchgear or at the voltage indicator

WEGA 3

- Display indication “A1” to “A5”
- Integrated repeat test of the interface (self-monitoring)
- With integrated 3-phase LRM test socket for phase comparison.

WEGA 1.2 C

- Display indication “A1” to “A6” (see legend)
- Integrated repeat test of the interface (self-monitoring)
- With integrated function test (without auxiliary power) by pressing the “Display Test” button
- With integrated 3-phase LRM test socket for phase comparison.

WEGA 2.2 C

- Display indication “A0” to “A7” (see legend)
- Integrated repeat test of the interface (self-monitoring)
- With integrated function test (without auxiliary power) by pressing the “Display Test” button
- With integrated 3-phase LRM test socket for phase comparison
- With two integrated signaling relays (auxiliary power required *)).

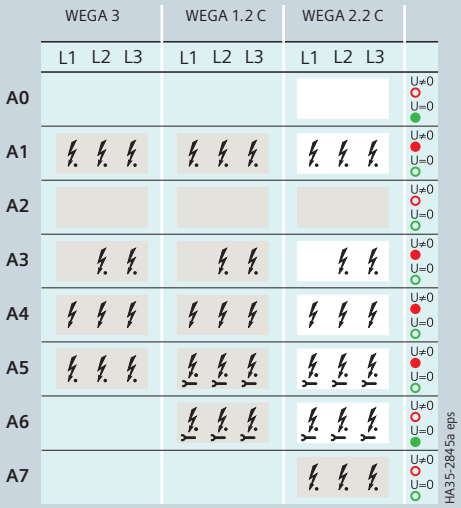
*) Shows the function of the relay via the LED indications (U=0, U≠0)

Integrated voltage indicator WEGA 3

Integrated voltage indicator WEGA 1.2 C

Integrated voltage indicator WEGA 2.2 C

Symbols shown



LC display gray: not illuminated

LC display white: illuminated

WEGA 2.2 C: The red and green LEDs show the state of the relay contacts

○○ LED doesn’t light up

●● LED lights up

U = Operating voltage

A0 For WEGA 2.2 C:
Operating voltage not present, auxiliary power present, LCD illuminated

A1 Operating voltage present
For WEGA 2.2 C: Auxiliary power present, LCD illuminated

A2 Operating voltage not present
For WEGA 2.2 C: Auxiliary power not present, LCD not illuminated

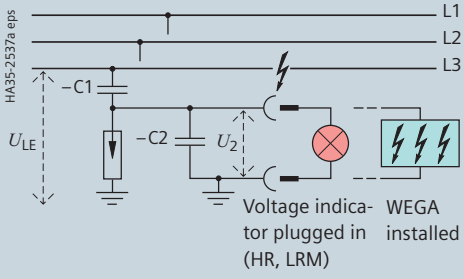
A3 Failure in phase L1, operating voltage at L2 and L3
For WEGA 2.2 C: Auxiliary power present, LCD illuminated

A4 Voltage present, current monitoring of coupling section below limit value
For WEGA 2.2 C: Auxiliary power present, LCD illuminated

A5 Indication “Display-Test” passed
For WEGA 2.2 C: Auxiliary power present, LCD illuminated

A6 Indication “Display Test” passed
For WEGA 2.2 C:
Auxiliary power present

A7 For WEGA 2.2 C: LCD for missing auxiliary voltage is not illuminated



Voltage indication
via capacitive voltage divider (principle)

– C1 Capacitance integrated into bushing
– C2 Capacitance of the connection leads and the voltage indicator to earth
$U_{LE} = U_N/\sqrt{3}$ during rated operation in the three-phase system
$U_2 = U_A$ = Voltage at the capacitive interface of the switchgear or at the voltage indicator

Verification of correct terminal-phase connections

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

Phase comparison test units according to IEC 61243-5 or VDE 0682-415

R-HA41-EPV.eps

Phase comparison test unit make Pfisterer, type EPV
as combined test unit (HR and LRM) for:
– Voltage detection
– Phase comparison
– Interface test
– Integrated self-test
– Indication via LED.

R-HA41-CAP-Phase.eps

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

R-HA41-ORION-3-1.tif

Phase comparison test unit make Horstmann, type ORION 3.1
as combined test unit (HR and LRM) for:
– Phase comparison
– Interface testing at the switchgear
– Voltage detection
– Integrated self-test
– Indication via LED and acoustic alarm
– Phase sequence indication.

R-HA41-ORION-M-1.tif

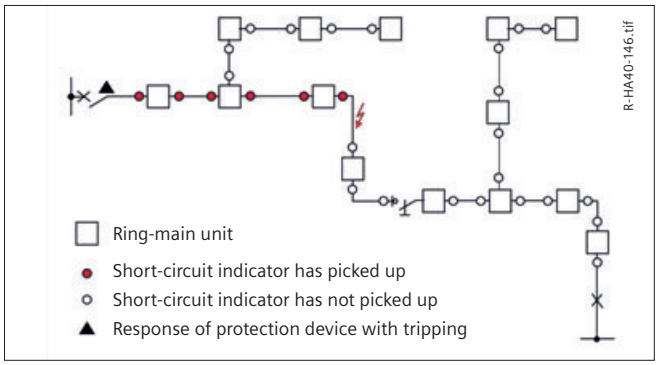
Phase comparison test unit make Horstmann, type ORION M1
as combined test unit (HR and LRM) for:
– Voltage detection
– Phase comparison
– Interface testing at the switchgear
– Integrated self-test
– Indication via display and acoustic alarm
– Phase sequence indication and status LED
– Measurement of interface current up to 25 µA
– Measurement of phase angle from –180° to +180°
– Measurement of harmonics up to 40th harmonic
– Securing the measured values via PC software (ORION explorer) and USB.

Short-circuit/earth-fault indicators make Horstmann

Short-circuit/earth-fault indicator (option)

Ring-main, cable and circuit-breaker feeders can optionally be equipped with short-circuit or earth-fault indicators in different designs. The equipment features are shown in the table on page 47.

Short-circuit and earth-fault indicators reduce the downtimes of a power system by delimiting the fault locations in medium-voltage systems.



Short-circuit/earth-fault indicators can be used in all kinds of power systems. In impedance-earthed and solidly earthed systems, as well as in isolated and compensated (resonant-earthed) systems, earth-fault detection is also possible.

SIGMA 2.0 with basic functions

- Adjustable pickup values
- Phase-selective fault indication
- Reset of the fault indication: manually, automatically, from remote
- Earth-fault detection in impedance-earthed or solidly earthed systems
- Remote indication with relay contacts.

SIGMA D++ with directional function

- Directional short-circuit indication
- Directional earth-fault indication for all types of neutral treatment
- Unambiguous indication of the fault direction
- Monitoring with "SIGMA Explorer" software.

ComPass B 2.0 with monitoring

- Voltage detection via WEGA voltage detecting system and resistive sensor system for up to 4 devices
- High-precision current and voltage measurement up to 0.5 %
- Monitoring of the values: U, I, f, P, Q, S, E, cos φ, load flow direction, power meter with direction
- Temperature measurement with PT100
- Limit value recording for U, I, P, Q, T
- Transfer of measured values, fault indications and events via RS485/MODBUS.

ComPass Bs 2.0 with control function

- Remote control of a switch-disconnector or circuit-breaker
- Freely programmable logic to define the switching conditions
- 6 binary inputs for recording relevant state information from the switchgear/substation.

EARTH ZERO

ALPHA E

SIGMA 2.0

SIGMA D++

ComPass B 2.0

All indicators (except ALPHA) use the same phase current sensors.

Short-circuit/ earth-fault indicators Horstmann	ALPHA M ALPHA E	SIGMA 2.0 SIGMA 2.0 AC / DC	SIGMA F+E 2.0 SIGMA F+E 2.0 AC / DC	SIGMA F+E 3 2.0 SIGMA F+E 3 2.0 AC / DC	SIGMA D	SIGMA D+	SIGMA D++	ComPass A 2.0	ComPass B 2.0	ComPass Bs 2.0	Earth Zero-EarthZeroFlag
Function											
Short circuit / earth fault	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	– / ■
Direction indication	–	–	–	–	■	■	■	–	■	■	–
Monitoring: U, I, f, P, Q, S, E, cos φ, load flow direction	–	–	–	–	–	–	–	■	■	■	–
Control of a CB or SD	–	–	–	–	–	–	–	–	–	■	–
Logic	–	–	–	–	–	–	–	–	–	■	–
Applicable for the following neutral treatments											
Impedance earthed	■	■	■	■	■	■	■	■	■	■	■
Solidly earthed	■	■	■	■	■	■	■	■	■	■	■
Isolated	■	■	■	■	■	■	■	■	■	■	–
Compensated	■	■	■	■	■	■	■	■	■	■	–
Short-circuit pickup values											
I>> Short-circuit current	400, 600, 800, 1000 A	200, 300, 400, 600, 800, 1000, 2000 A, self-adjustment			DIP: 200, 300, 400, 600, 800, 2000 A, self-adjustment Software (SW): 50 – 2000 A			20 – 2000 A			–
tI>> Pickup delay	100 ms	40, 80 ms		40, 80, 200, 300 ms	DIP: 40, 80 ms, Software (SW): 40 ms – 60 s			40 ms – 60 s			–
Earth-fault pickup values											
IES> Short-circuit-to-earth current	–	–	20, 40, 60, 80, 100, 120 or 160 A		DIP: off, 20, 40, 60, 80, 100, 120, 160 A, Software (SW): 20 – 1000 A			20 – 1000 A			25, 50, 75, 100 A
IET> Transient earth fault	–	–	–	–	–	10 – 100 A	10 – 500 A	–	10 – 500 A		–
IEP> Active residual current cos φ	–	–	–	–	–	5 – 200 A	5 – 200 A	–	1 – 200 A		–
IEQ> Reactive current sin ϕ	–	–	–	–	–	5 – 200 A	5 – 200 A	–	1 – 200 A		–
UNE> Permanent earth fault	–	–	–	–	–	–	–	–	1 – 100%		–
ΔIE> Pulse location (pulse amplitude)	–	–	–	■	–	1 – 100 A	1 – 100 A	1 – 200 A			–
Pickup delay	–	–	80, 200 ms	60, 80, 200, 300 ms	DIP: 80, 160 ms, Software (SW): 40 ms – 60 s			40 ms – 60 s			80, 160 ms
Reset											
Manually / from remote	■ / – (M) ■ / ■ (E)	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / –
Auto. time reset	■ (E)	■	■	■	■	■	■	■	■	■	■
Current / voltage recovery	–	–	–	■ / –	■ / ■	■ / ■	■ / ■	■ / –	■ / ■	■ / ■	– / ■
Test											
Manually / from remote	■ / –	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■	■	■ / –
Communication											
Relay contact	1	1	2	3	4	4	4	4	4	4	1
Maintained / passing contact	adjustable	adjustable			adjustable			adjustable			adjustable
RS485 / MODBUS-RTU	–	–	–	–	–	–	–	■	■	■	–
USB connection	–	–		–	■	■	■	■	■	■	–
Parameterizing											
Manually / from remote	■ / –	■ / –	■ / –	■ / –	■ / –	■ / –	■ / –	■ / ■	■ / ■	■ / ■	■ / –
Supply											
Lithium cell, ≥ 20 years	■ (E)	■/Capacitor (AC/DC)			■	■	■	■	■	■	■
Current-transformer operated	■	■	■	■	■	■	■ (not IET>)	–	–	–	■
External auxiliary voltage	–	24 – 230 V AC / DC (only AC / DC versions)		24 – 230 V AC / DC (SIGMA F+E3 2.0 optional)	–	24 V AC, 24 – 60 V DC (possible)	24 – 230 V AC / DC (for IET>)	24 – 230 V AC / DC			–
Binary inputs											
Number	2	2	2	2	2	2	2	2	2	6	–
Current inputs											
Phase current	3	3	3	3	3	3	3	3	3 or 2		0
Summation current	0	0	0	0	0	0 or 1	0 or 1	0	0 or 1		1
Voltage inputs											
Capacitive	–	–	–	–	■	■	■	–	■	■	–
Resistive	–	–	–	–	–	–	–	–	■	■	–

Short-circuit / short-circuit-to-earth and earth-fault indicators, make Kries

Ring-main, cable and circuit-breaker feeders can optionally be equipped with short-circuit or earth-fault indicators in different designs. The equipment features are shown in the table on the next page. The three most common types of faults in medium-voltage systems are earth faults in cables and switchgear, faults and overloads of distribution transformers, as well as short circuits in cables and switchgear. For fast fault location and minimization of downtimes, electronic fault indicators are used:

- Selective fault detection, and thus minimization of downtimes
- Reliable fault detection through electronic measured-value acquisition
- Remote indication of fault events and measured values.

Short-circuit and short-circuit-to-earth indicator IKI-20

– Universally adjustable
– Current-transformer supported battery version or auxiliary voltage versions available
– Extended commissioning and testing functions.

Short-circuit and earth-fault indicator IKI-20PULS

– Short-circuit detection same as IKI-20
– Earth-fault detection via pulse location in compensated systems.

Short-circuit and earth-fault indicator IKI-20C(PULS)

– Current-transformer operated (No battery, no auxiliary voltage)
– Optionally with pulse location for earth-fault detection in compensated systems.

Directional short-circuit and earth-fault indicator IKI-22

– Directional fault detection for all system types
– Directional detection combined with the voltage detecting system CAPDIS-Sx+.

Grid-Inspector IKI-50

– Directional measured-value acquisition
– Monitoring of values U, I, f, P, Q, S, E, cos φ, power factor, load flow direction (momentary value, mean value and min/max value, directional)
– Directional fault detection for all system types
– Switchgear control or automation through an integrated, programmable logic component
– Directional detection combined with the voltage detecting system CAPDIS-Sx+.

Options:

– One device controls two cable panels and the load flow total
– Directional detection combined with resistor dividers (accuracy 1.0 %)
– Early fault detection and detection of intermittent earth faults
– Telecontrol interface according to IEC 60870-5-104.

Short-circuit-to-earth indicator IKI-10light

– Earth-fault detection in systems with impedance-earthed neutral or temporarily impedance-earthed neutral
– Adjustable.

R-HA41-IKI-20.tif

IKI-20

R-HA41-IKI-20CPULS.tif

IKI-20CPULS

R-HA41-IKI-22.tif

IKI-22

R-HA41-IKI-50.tif

IKI-50

R-HA41-IKI-10light.tif

IKI-10light

Short-circuit/ earth-fault indicators Kries	IKI-20B	IKI-20T	IKI-20U	IKI-20PULS	IKI-20C	IKI-20CPULS	IKI-22	IKI-50_1F	IKI-50_1F_EW_PULS	IKI-50_2F	IKI-50_2F_EW_PULS	IKI-10-light-P
Function												
Short-circuit indication	■	■	■	■	■	■	■	■	■	■	■	
Earth-fault indication				■		■	■	■	■	■	■	
Short-circuit-to-earth indication [5]	■	■	■		■		■	■	■	■	■	■
Direction indication							■	■	■	■	■	
Applicable for the following neutral earthing options												
Impedance	■	■	■		■		■	■	■	■	■	■
Solid	■	■	■		■		■	■	■	■	■	■
Isolated	■	■	■		■	■	■	■	■	■	■	
Compensated	■	■	■	■	■		■	■	■	■	■	
Pickup current												
Short-circuit current	100, 200, 400, 600, 800, 1000, 2000 A				400, 600, 800, 1000 A		100, 200, 300, 400, 600, 800, 1000, 2000 A	100 ... 1000 A (steps of 100 A)				
Earth-fault current							Transient fault detection	4 ... 30 A (steps of 1 A)				
Short-circuit-to-earth current [5]	40, 80, 100, 150 A						40, 80, 100, 200 A	40 ... 200 A (steps of 10 A)				20, 40, 60, 80 A
Pulse location				■		■			■		■	
Pickup time												
Short-circuit current	60, 80, 150, 200 ms				100 ms		60, 80, 150, 200 ms	60 – 1600 ms				
Short-circuit-to-earth current [5]	60, 80, 150, 200 ms				100 ms		60, 80, 150, 200 ms	60 – 1600 ms				70, 250 ms
Earth-fault current				Pulse location		Pulse location	Transient fault detection	400 – 3000 ms				
Reset												
Manual	■	■	■	■	■	■	■	■	■	■	■	■
Automatic	■	■	■	■	■	■	■	■	■	■	■	■
From remote	■	■	■	■			■	■	■	■	■	■
Remote indication												
Passing contact	adjustable				■	■	■	adjustable				
Maintained contact	adjustable							adjustable				
Interface												
RS485/MODBUS								■	■	■	■	
IEC 60870-5-104 (option)								■	■	■	■	
Power supply												
Lithium battery	■						■					■
External auxiliary voltage		■	■	■			Only for transient fault detection	Buffered for 6 h by internal capacitor				■
Current inputs												
Phase current	3	3	3	3	3	3	3	3	3	6	6	–
Summation current	1	1	1	1		1		1 [1]	0 [2]	0 [2]	0 [2]	1
Voltage inputs												
Capacitive							3	3	3	6	6	–
Resistive (option)							–	3	3	6	6	–
Release outputs												
Potential-free	1 – 3	1 – 3	1 – 3	1 – 3	2	2	4	4	4	4	4	1
Supplied by internal capacitor (option)								2 [3]	2 [3]	2 [3]	2 [3]	
Binary inputs												
Number	2 (test + reset)						2 (test + reset)	4	4	4	4	–

1) Optional for wattmetric detection of earth-fault direction
2) Creation of sum signal via 3 transformers mounted around the conductor
3) 0.1 Ws, 24 V DC
4) Momentary value, mean value and min/max value, directional
5) Short-circuit to earth = Earth fault in impedance-earthed system

Components

On request: Indicating and measuring equipment

Short-circuit / earth-fault indicator Siemens	SICAM FCM	SICAM FPI
Function		
Short-circuit indication	■	■
Earth-fault indication	■	■
Earth-fault function (impedance-earthed system)	■	■
Indication of direction, short-circuit / earth-fault	■	–
Undervoltage and overvoltage indication	■	–
Applicable for the following neutral earthing options		
Impedance	■	■
Solid	■	■
Isolated	■	■
Compensated	■	■
Pickup current		
Short-circuit current	50 ... 2000 A (steps of 1 A)	Type 1: 200 – 1200 A, type 2: 200 – 800 A (in 7 steps each)
Earth-fault current	1 ... 1000 A (steps of 1 A)	Type 1: 10 – 100 A, type 2: 40 – 300 A (in 7 steps each)
Pulse location	–	–
Pickup time		
Short-circuit current	40 ms < t < 60 s	< 500 ms adjustable
Earth-fault current	40 ms < t < 60 s	< 500 ms adjustable
Reset		
Manual	■	■
Automatic	■	■
From remote	■	■
Remote indication		
Passing contact	adjustable	–
Maintained contact	adjustable	2 binary outputs
Interface		
RS485 / MODBUS	■	–
Power supply		
Lithium battery	■	■
External auxiliary voltage	■	–
Current inputs		
Phase current	3 (2) [1]	3 optical
Summation current	0 (1) [1]	1 optical
Voltage inputs		
Via resistor divider	3	–
Via integrated capacitive voltage indicator (optional)	3	–
Relay outputs		
Potential-free	2 [2]	2
Binary inputs		
Number	1	–

SICAM FCM

SICAM FCM

The short-circuit and earth-fault indicator SICAM FCM (Feeder Condition Monitor) with direction indication enables fast and precise fault location, thus reducing the downtimes in the power system. The possibility to determine and telecommunicate the values U, I, f, P, Q, S, E, cos φ and load flow direction supports efficient operational management and network planning.

- Usable in earthed, isolated and resonance-earthed systems
- Directional short-circuit and earth-fault detection
- Selective fault information with direction indication as a basis for "self-healing" applications
- Usable with current and voltage sensors according to IEC 60044 for precise measurement without calibration and adjustment to the primary values
- Alternatively usable with an integrated capacitive voltage detecting system
- Flexible earth-current detection as from 0.4 A
- Integrated MODBUS-RTU interface:
- Remote parameterization via SICAM A8000 and MODBUS
- Self-test function of the communication connection.

SICAM FPI (Fault Passage Indicator)

- Detection of short circuits and earth faults
- Indication of phase and earth faults via 4 separate LEDs
- Enhanced diagnostics, self and sensor cable diagnostics is supported
- Configurable binary outputs, for remote indication to SCADA via RTU for faults and for diagnostics.

SICAM FPI

1) Measuring sensor 3+0 (summation current is calculated), measuring sensor 2+1 (phase L2 is calculated)
2) Optional

Transformer monitor IKI-30 (make Kries)

Application with vacuum circuit-breaker

Protection of distribution transformers with ratings that cannot or should not be protected with HV HRC fuses:

- Tripping of the circuit-breaker in case of overload (delayed)
- Tripping of the circuit-breaker when the short-circuit current arises.

Transformer monitor IKI-30

Application area

The transformer monitor IKI-30 is suitable for the following transformer ratings:

- Operating voltage 25 ... 35 kV: ≥ 400 kVA.

Features

- Current-transformer operated, alternatively auxiliary voltage 24 ... 230 V AC/DC
- Instrument transformers
  - Special cable-type current transformers
  - No direction-dependent installation required
  - No earthing of a transformer pole required
  - No short-circuit terminals required for maintenance
- C.t.-operated release (0.1 Ws)
- Optional shunt release for auxiliary voltage supply
- Mounting location
  - In the front operating mechanism box of the feeder panel
  - In the low-voltage compartment (option) of the circuit-breaker feeder
- Response performance
  - Definite-time overcurrent characteristic
  - Definite-time overcurrent characteristic for earth-fault protection
  - Inverse time-overcurrent characteristic
    - extremely inverse
    - normal inverse
  - Externally undelayed instantaneous tripping
- Self-test function
  - Display test LED (red)
  - Battery test (under load), LED (green)
  - Primary current test with tripping and with primary current injection into the instrument transformers
- Indication
  - LED indication for tripping (single flash: starting; double flash: tripping)
  - Reset after 2 h or automatically (after return of power) or manually with reset pushbutton
- Outputs
  - Tripping signal: 1 floating relay output (NC contact) for telecommunication as passing contact
  - Starting signal: 1 floating relay output (NC contact) – is activated as long as the starting criterion is reached, e.g. to block an upstream primary protection
  - 1 watchdog (relay)
  - 1 external tripping output for control of an existing release, e.g. via capacitor
  - Tripping output designed as impulse output for direct control of the c.t.-operated release
- Input
  - Remote tripping signal, control via floating external contact
  - Instantaneous tripping.

Simple protection systems

As a simple protection for distribution transformers and circuit-breaker feeders, standard protection systems are available, consisting of:

- Current-transformer operated protection device with c.t.-operated release (low-energy 0.1 Ws)
  – Siemens SIPROTEC 7SJ45
  – Woodward/SEG WIC 1-2P, WIC 1-3P, WIP-1
- Protection device with auxiliary voltage supply with shunt release (f)
  – Siemens SIPROTEC 7SJ46
- Instrument transformer as
  – Cable-type current transformer (standard).

Mounting location
- In 200-mm-high top low-voltage unit (option) of the circuit-breaker feeder.

Multifunction protection (selection)

Application of simple protection systems

Operating voltage (kV)	Transformer rating (kVA)	
	7SJ45/7SJ46	**WIC 1-2P**
25	≥ 630 kVA	≥ 630 kVA
30	≥ 800 kVA	≥ 800 kVA
35	≥ 1000 kVA	≥ 1000 kVA

SIPROTEC Compact series, overcurrent protection SIPROTEC 7SJ80

- 9 programmable function keys
- 6-line display
- USB front port
- 2 additional communication ports
- IEC 61850 with integrated redundancy (electrical or optical)

SIPROTEC 5 series, overcurrent protection SIPROTEC 7SJ82

- Directional and non-directional time-overcurrent protection with additional functions
- Time optimization of the tripping times by directional comparison and protection data communication
- Frequency protection and rate-of-frequency-change protection for load shedding applications
- Overvoltage and undervoltage protection in all required variations
- Power protection, configurable as active or reactive power protection
- Control, synchrocheck and switchgear interlocking system
- Firmly integrated, electrical Ethernet port J for DIGSI
- Complete IEC 61850 (Reporting and GOOSE) via integrated port J
- Two optional, pluggable communication modules usable for different and redundant protocols (IEC 61850, IEC 60870-5-103, DNP3 (serial+TCP), Modbus RTU Slave, protection data communication).

SIPROTEC 7SJ45

SIPROTEC 7SJ80

SIPROTEC 7SJ82

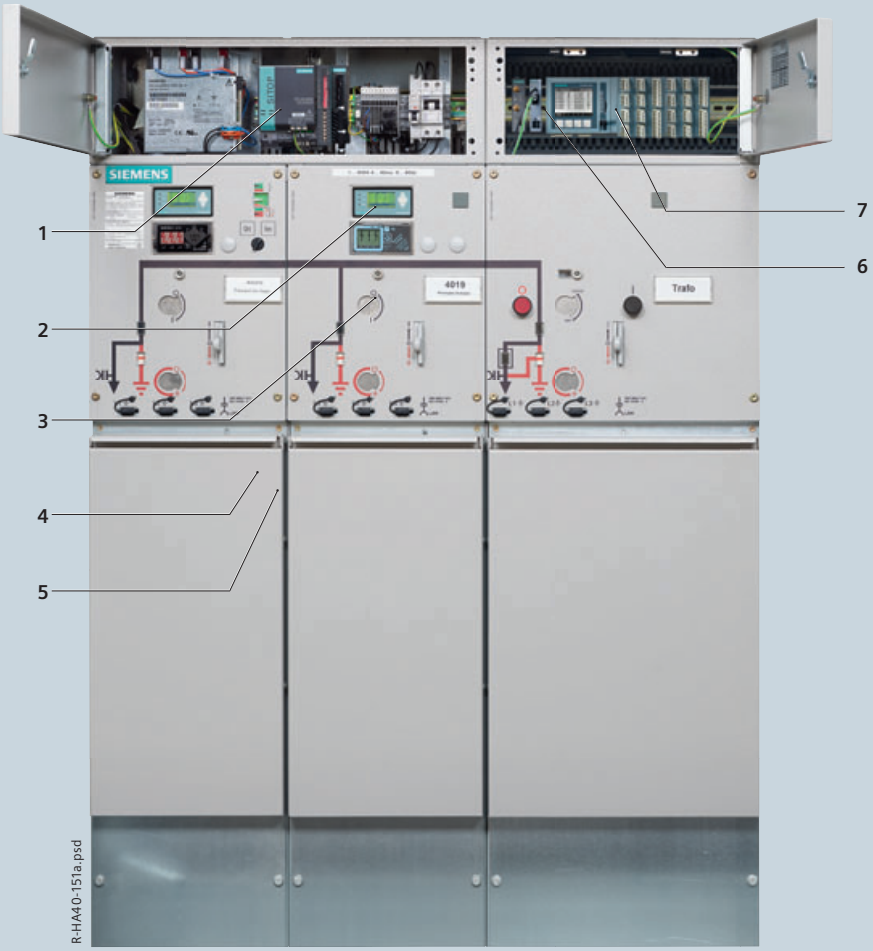
Other types and makes on request

Mounting location
- In the 400 mm or 600 mm high low-voltage compartment (option) of the feeders.

Equipment examples for the switchgear

8DJH 36 switchgear can be equipped with motor operating mechanisms, voltage detecting and measuring devices, short-circuit indicators, and further detection systems.
RTUs (Remote Terminal Units) can be optionally integrated inside the switchgear, in additional low-voltage compartments, or in a separate wall cubicle via a plug connection.
In this way, the switchgear fulfills all preconditions for integration in an intelligent network infrastructure. Depending on the purpose, different components for monitoring and control are used: These components can also be easily and quickly retrofitted at a later time. An equipment example for the switchgear is illustrated here.

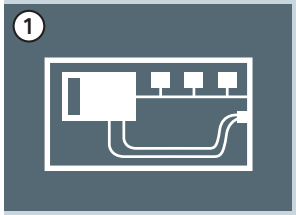
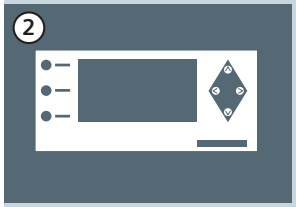
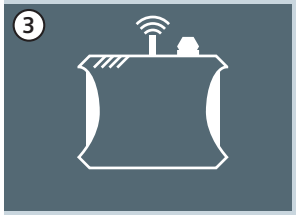
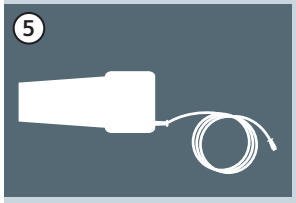
The integration



1 Uninterruptible power supply (UPS)
2 Intelligent SC indicators
3 Remotely controllable operating mechanisms
4 Current sensors
5 Voltage sensors
6 Communication modem
7 Remote terminal unit

Components

Intelligent transformer substation

	Components	Function
	**Uninterruptible power supply (UPS)** Depending on the requested bridging time in case of power failures, an uninterruptible power supply based on battery or capacitor modules is used.	The task of the UPS is to continue to ensure the communication and/or the possibility to telecontrol the transformer substation in case of power failure.
	**Intelligent SC indicators** Intelligent short-circuit and ground fault indicators with or without direction indication can be used in all grid types. For communication with the RTU, a Modbus RTU interface is available.	Intelligent short-circuit/ground fault direction indicators report short-circuits or ground faults in the medium-voltage distribution grid. Relevant measured values are acquired, allowing for an active load management in the distribution grid.
	**Remotely controllable operating mechanisms** Motor operating mechanisms inside the ring-main unit are available in original equipment manufacturer quality. If required, retrofitting is easily possible.	In order to reduce the reclosing times in case of fault, the switch-disconnectors or circuit-breakers are equipped with motor operating mechanisms for remote control.
	**Current sensors** Current sensors with low-power transformer technology are available as closed or divisible ring cores.	The current signal serves to detect short-circuits and ground faults, and can be used as a measured value for load flow control or for optimal utilization of the grid capacity.
	**Voltage sensors** Voltage sensors as resistor dividers are available as cast-resin plugs for insertion into the cable T-plug.	The voltage signal serves to detect the direction of the short-circuit or ground fault, and can be used as a measured value for load flow control or voltage regulation.
	**Communication modem** The selection of the communication modem to be used is determined by the selected or available telecommunication technology.	Communication modems are employed for safe data transmission from the remote terminal unit to the network control center using the selected telecommunication technology.
	**Remote terminal unit** The remote terminal unit (RTU) is equipped with binary inputs and outputs, various communication interfaces, and freely programmable user programs.	Inside the intelligent transformer substation, the RTU serves as a connecting element to the network control center. It collects all relevant signals and receives control commands, or works autonomously according to predetermined control or regulation algorithms.

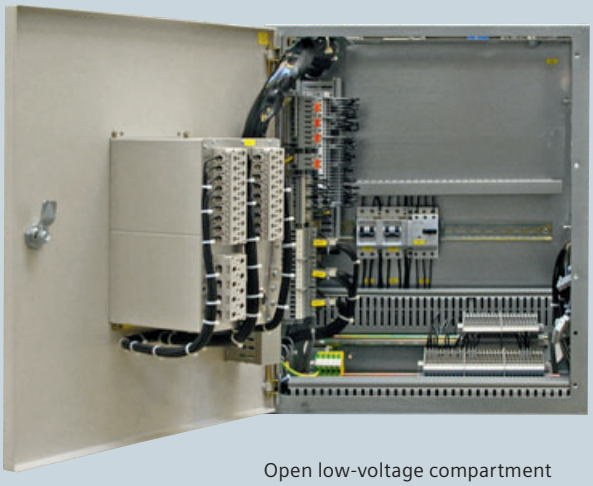
Features

- Overall heights
  – 200 mm, 400 mm, 600 mm
  – Option: Cover
- Partitioned safe-to-touch from the high-voltage part of the panel
- Installation on the panel
  – Possible per feeder
  – Option for all panel types, depending on the scope of the secondary equipment
- Customer-specific equipment
  For accommodation of protection, control, measuring and metering equipment
- Separate wiring duct on the switchgear beside the low-voltage compartment (option)
- Door with hinge on the left (standard for heights of 200, 400 and 600 mm).

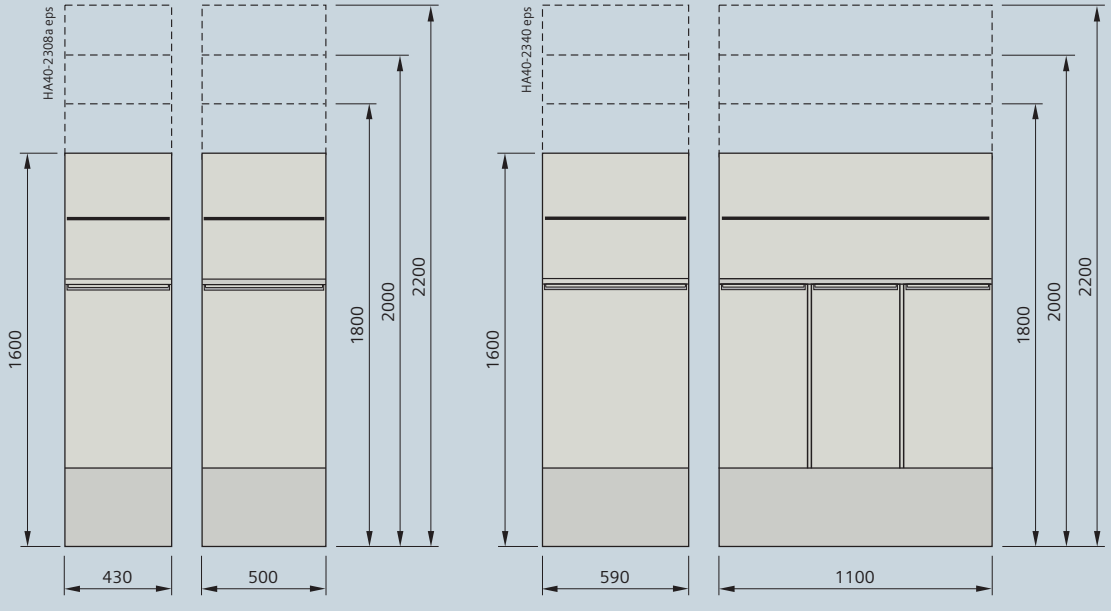
Low-voltage cables

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

Low-voltage compartment (example 500 × 600 mm)



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



Switchgear height
1600 mm

Dimensions

Room planning

Please observe the following for room planning and switchgear installation:

Switchgear installation

Wall-standing arrangement
– 1 row
– 2 rows (for face-to-face arrangement)
  A wall distance of ≥ 30 mm applies to the metering panel in switchgear with billing metering panels, as well as in switchgear with pressure relief downwards and in switchgear with pressure relief duct. Then, the wall distance of the other panel types increases to ≥ 90 mm. In switchgear with pressure relief to the rear/upwards, billing metering panels have a wall distance of 90 mm. All other panel types have a wall distance of 150 mm.

Option: Free-standing arrangement

Pressure relief

The type of pressure relief selected has an effect on the switchgear depth, and places requirements on the size of the cable basement and/or the room height. In case of pressure relief upwards, the room heights reproduced in the type test are decisive for the internal arc classification acc. to IEC/EN 62271-200/VDE 0671-200.

Door dimensions

The door dimensions have an influence on the size of the transport units (see page 63) and the factory assembly of panel groups, low-voltage compartments and pressure absorber systems. If required, this installation work can also be performed on site by the customer.

Switchgear fixing

- For floor openings and fixing points of the switchgear, see pages 60 to 62
- Foundations:
– Steel girder construction
– Reinforced-concrete floor.

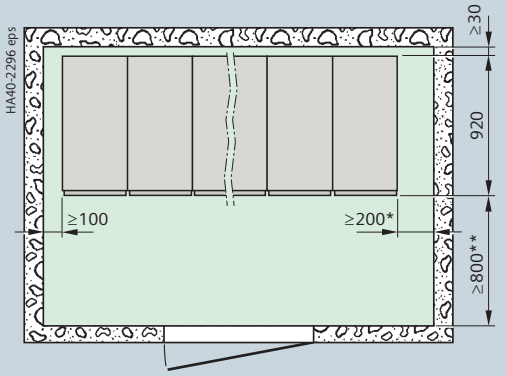
Panel dimensions

See page 56 and 57.

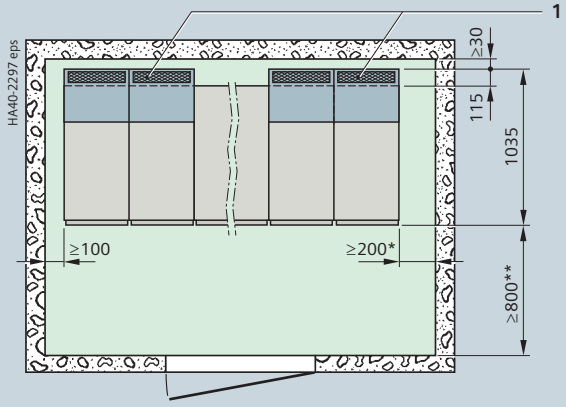
Weight

For data, see page 64.

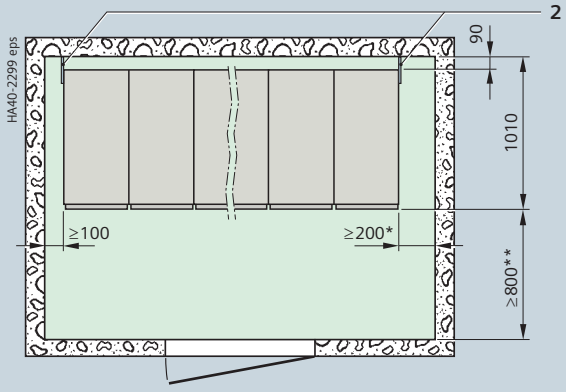
Local regulations and guidelines



Top view: Switchgear installation with pressure relief downwards



Top view: Switchgear installation with pressure relief duct and optional absorber



Top view: Switchgear installation with pressure relief to the rear/upwards

1 Pressure relief duct

2 End cover

* For lined up switchgear

** Depending on national requirements.
For extension or panel replacement, a control aisle of at least 1000 mm is recommended.

Pressure relief

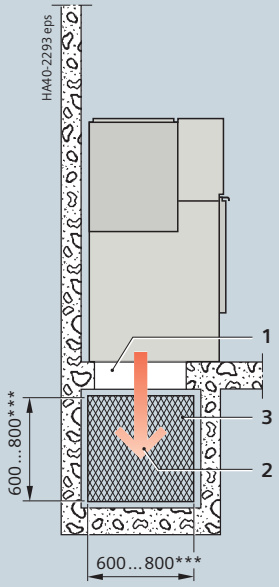
The following type-tested versions of the pressure relief system are available for 8DJH 36 switchgear:

- Downwards into the cable basement (for individual panels and panel blocks, internal arc classification up to IAC A FL 20 kA / 1 s or IAC A FLR 20 kA / 1 s)
- To the rear / upwards (for individual panels and panel blocks, internal arc classification up to IAC A FL 20 kA / 1 s)
- Upwards through rear pressure relief duct (for individual panels and panel blocks, internal arc classification up to IAC A FL 20 kA / 1 s or IAC A FLR 20 kA / 1 s)
- Upwards through rear pressure relief duct and additional absorber (for individual panels – except billing metering panels – and for panel blocks, internal arc classification up to IAC A FL 20 kA / 1 s or IAC A FLR 20 kA / 1 s).

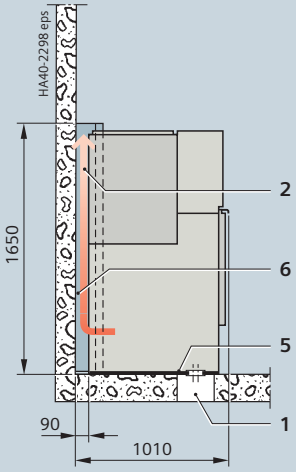
Room heights

- Minimum room heights according to the table below
- As a difference to the minimum room heights according to the table, a minimum room height of 2200 mm applies to all pressure relief versions in circuit-breaker panels with busbar voltage transformers
- For billing metering panels with pressure relief to the rear / upwards and with rear duct, a minimum room height of 2400 is required.

Switchgear installation with pressure relief downwards (standard)



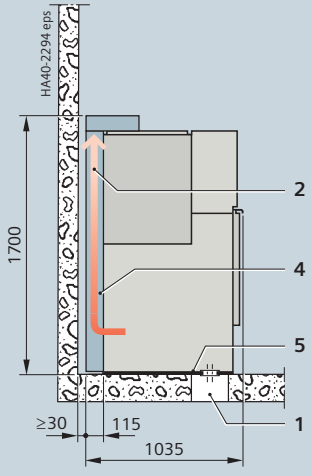
Switchgear installation with pressure relief to the rear / upwards (option)



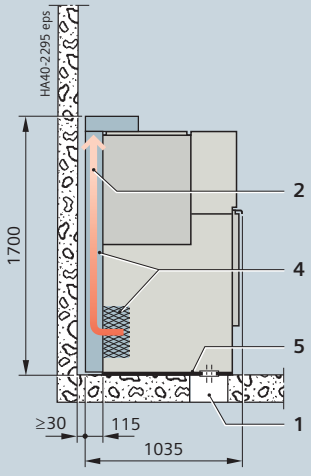
1 Floor opening
2 Direction of pressure relief
3 Expanded metal
4 Pressure relief with and without absorber and pressure relief duct directed upwards at the rear
5 Divided floor cover for cable insertion, installation on site
6 Termination plate

*** Total opening minimum 0.48 m²

Switchgear installation with pressure relief duct (option)



Switchgear installation with pressure relief duct and absorber (option)



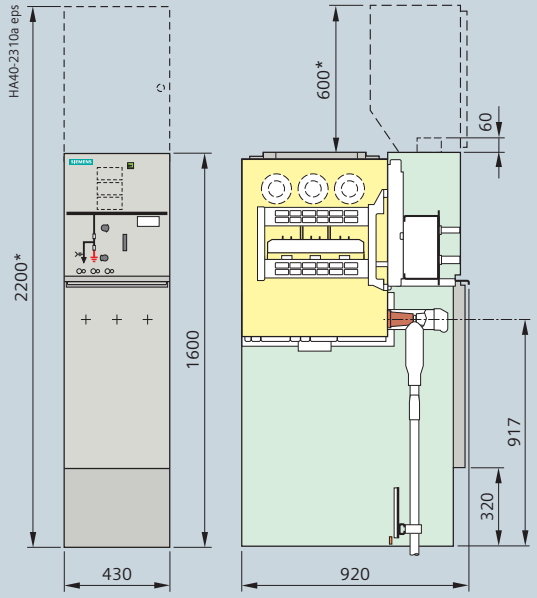
Room heights for pressure relief to the rear / upwards and for switchgear with rear pressure relief duct

Switchgear height	Room height
1650 mm	≥ 2000 mm
1700 mm	≥ 2000 mm

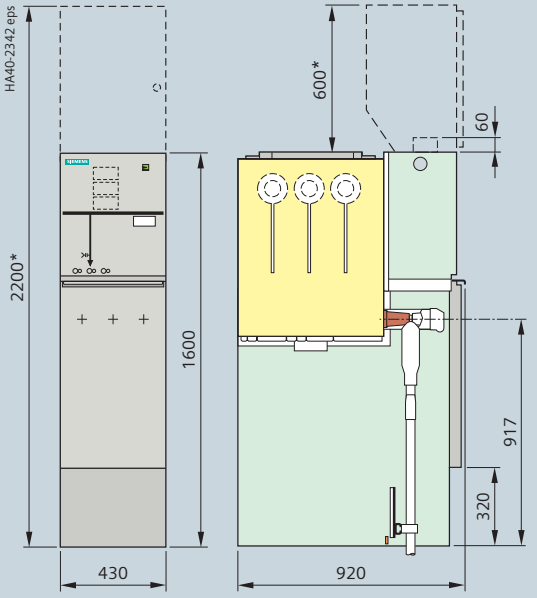
Dimensions

Individual panels and modules

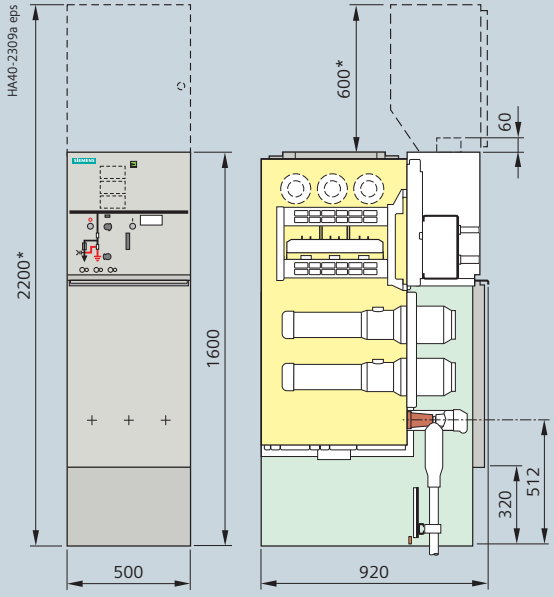
Ring-main feeder type R



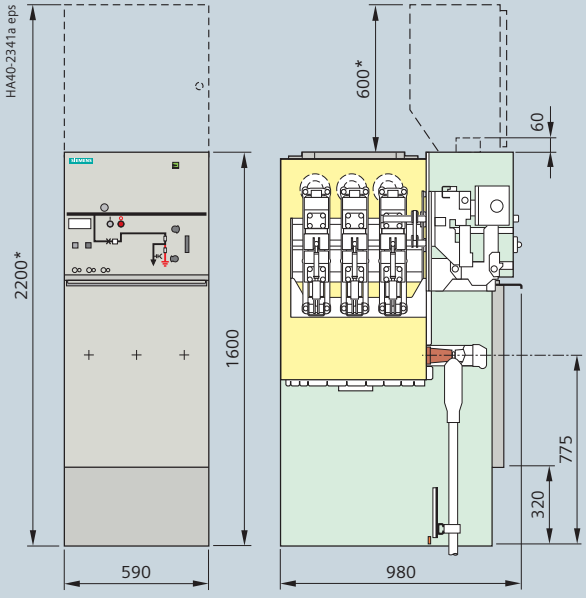
Cable feeder type K



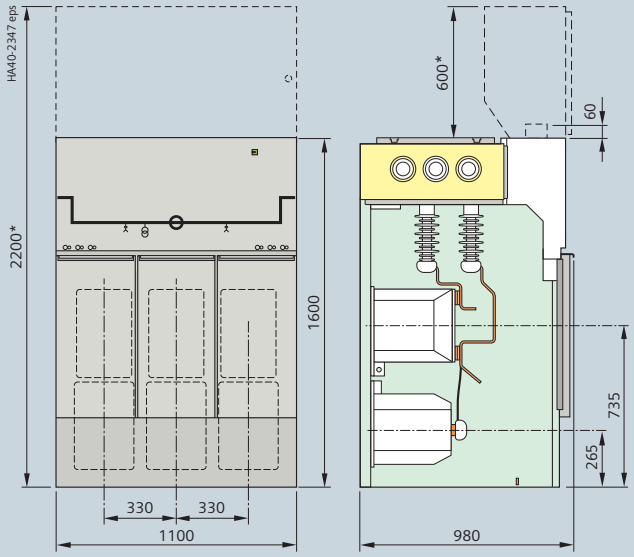
Transformer feeder type T



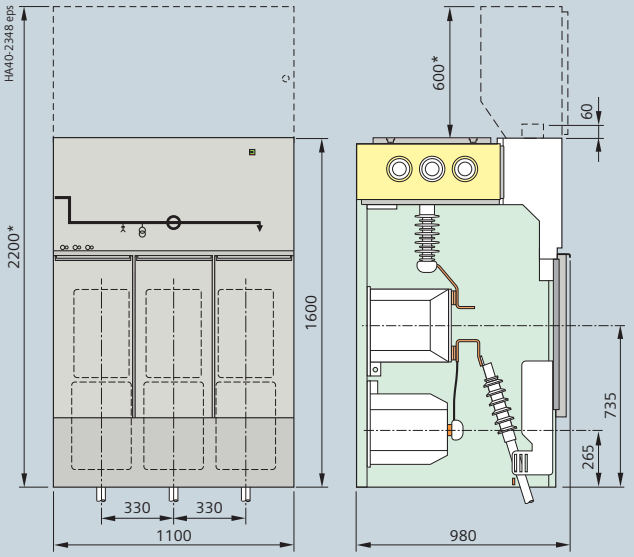
Circuit-breaker feeder type L



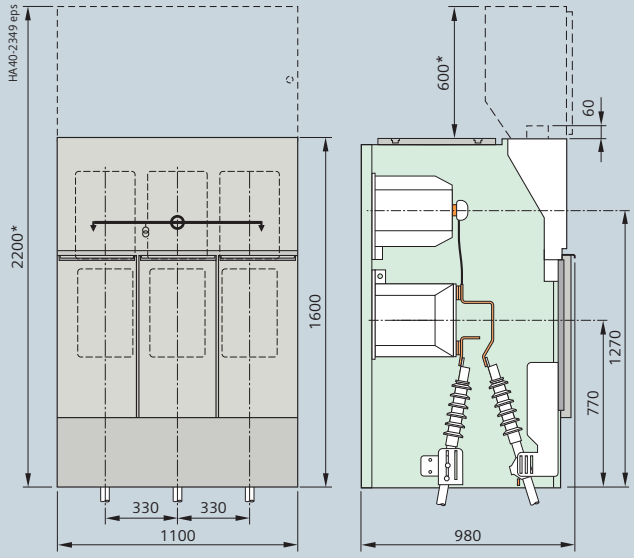
* Option: With low-voltage compartment



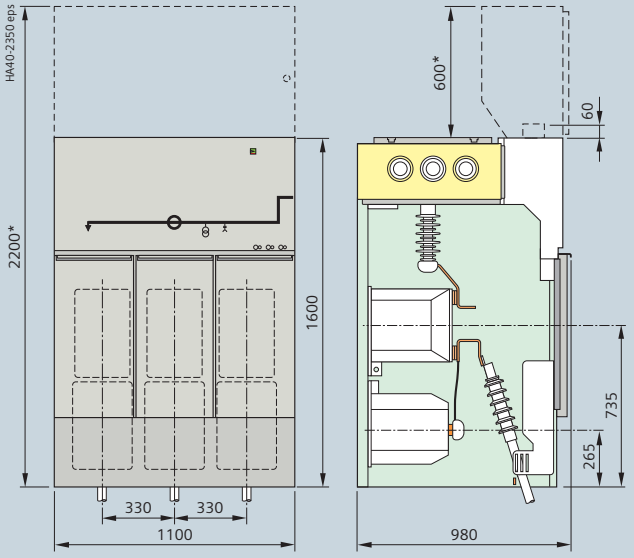
Connection: busbar – busbar



Connection: busbar on the left – cable on the right



Connection: cable – cable



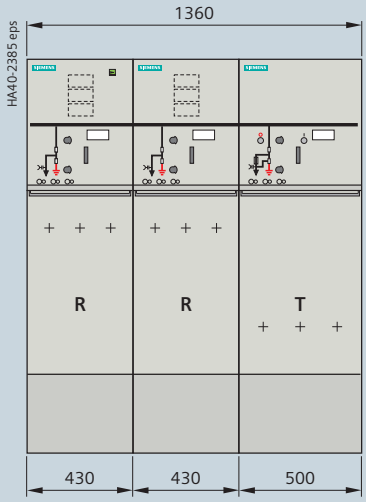
Connection: cable on the left – busbar on the right

* Option: With low-voltage compartment

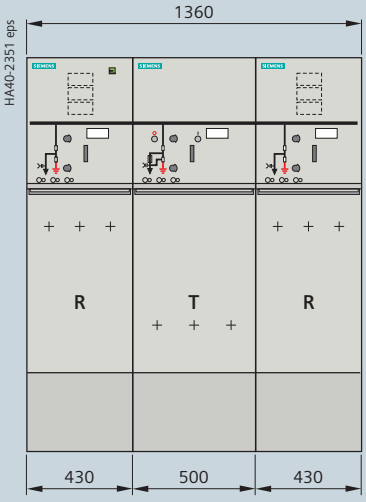
Dimensions

Panel blocks

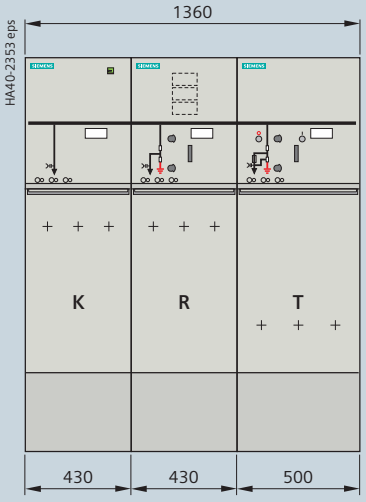
Versions with transformer feeders



Panel block **RRT**

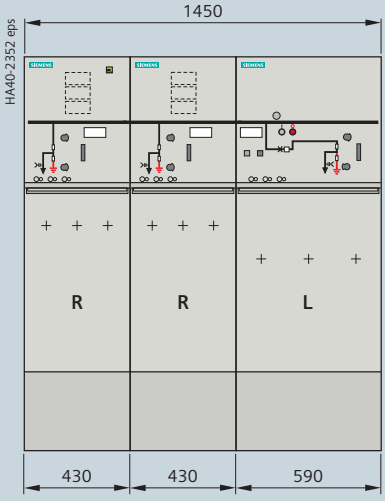


Panel block **RTR**

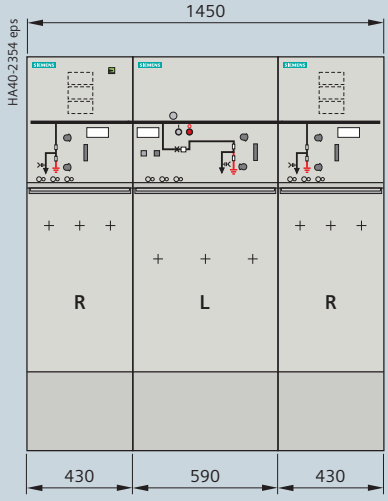


Panel block **KRT**

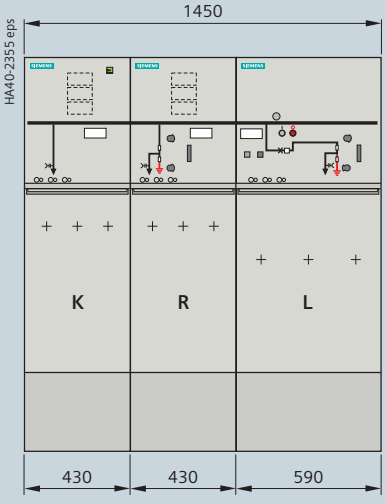
Versions with circuit-breaker feeders



Panel block **RRL**



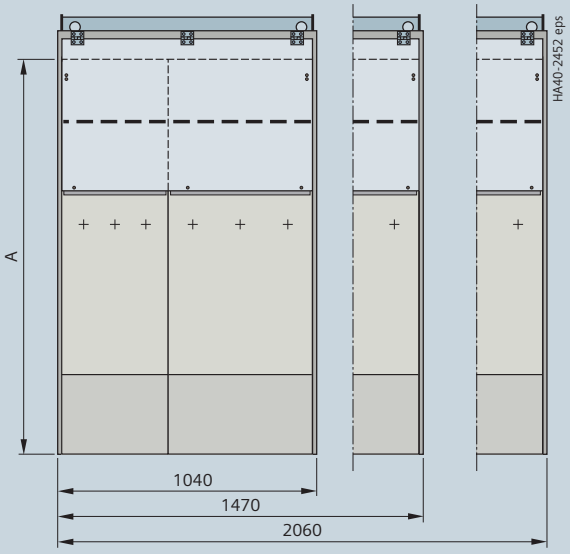
Panel block **RLR**



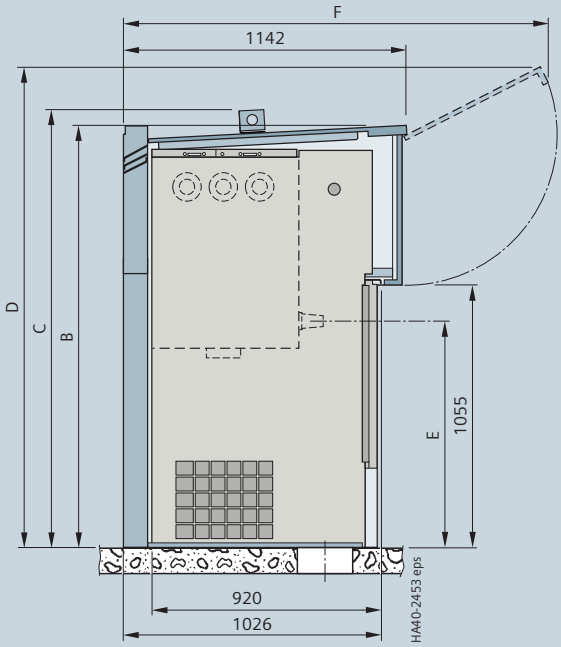
Panel block **KRL**

For further dimension data,
see individual panels and modules on page 11.

For floor openings and fixing points,
see page 60.



Outdoor enclosure with pressure relief upwards



Outdoor enclosure with pressure relief upwards

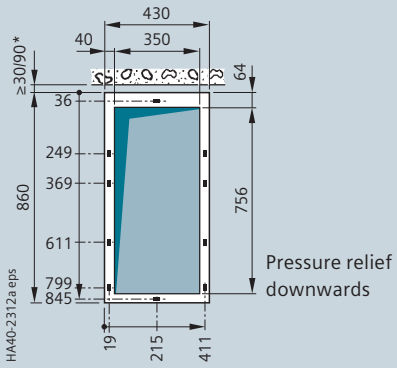
Switchgear height	without low-voltage compartment	A	1600			
	with low-voltage compartment 1)		–	1800	2000	2200
Low-voltage compartment 1)		–	–	200	400	600
Enclosure height	without crane profile	B	1700	1875	2275	2275
	with crane profile (removable)	C	1760	1935	2335	2335
	Door open	D	1000	1000	1200	1400
Cable connection	Typical K, R	E	917			
	Typical T		512			
	Typical L		775			
Enclosure depth (roof level, with pressure relief duct)	Door while opening / closing	F	1725	1725	1925	2125

1) Option: With low-voltage compartment
Note: Maximum switchgear width = Enclosure width – 20 mm

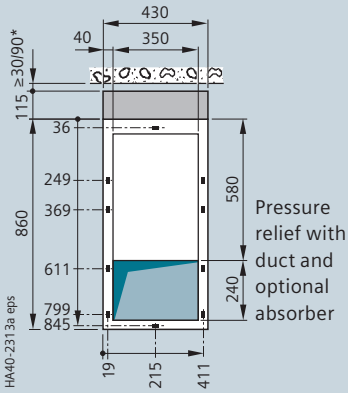
Dimensions

Floor openings and fixing points

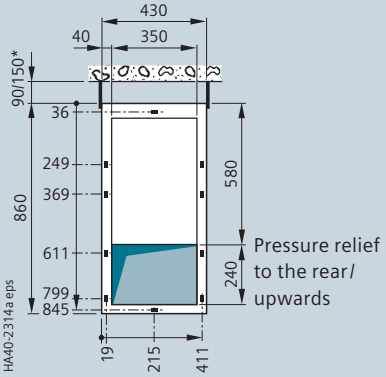
Ring-main panel/cable panel



Pressure relief downwards

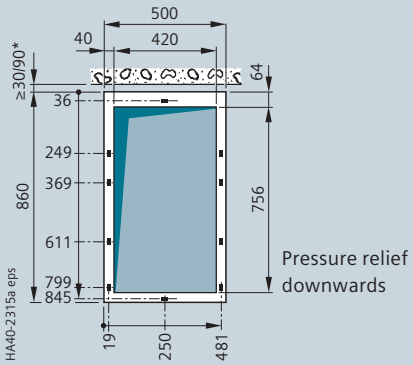


Pressure relief with duct and optional absorber

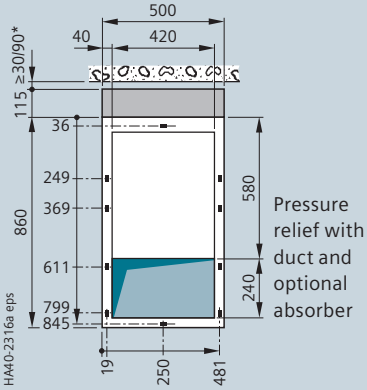


Pressure relief to the rear/ upwards

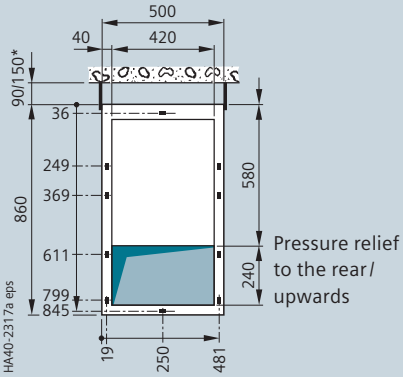
Transformer panel



Pressure relief downwards

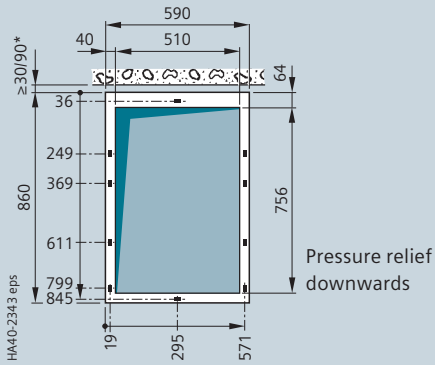


Pressure relief with duct and optional absorber

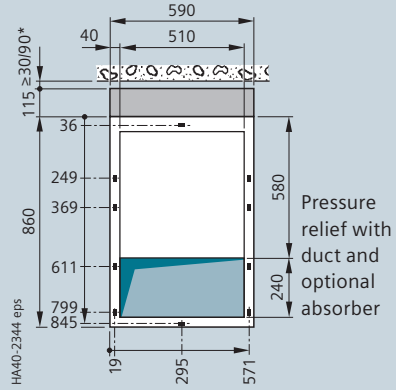


Pressure relief to the rear/ upwards

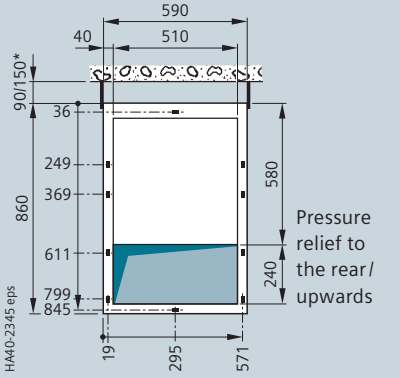
Circuit-breaker panel



Pressure relief downwards

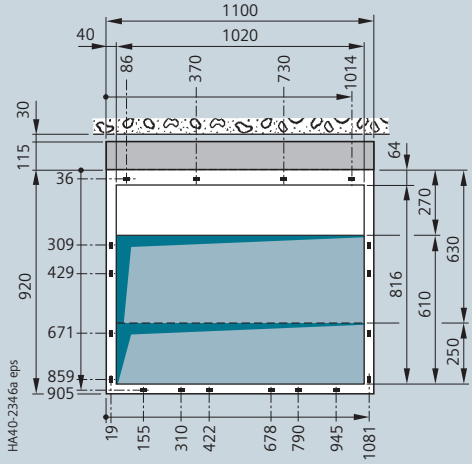


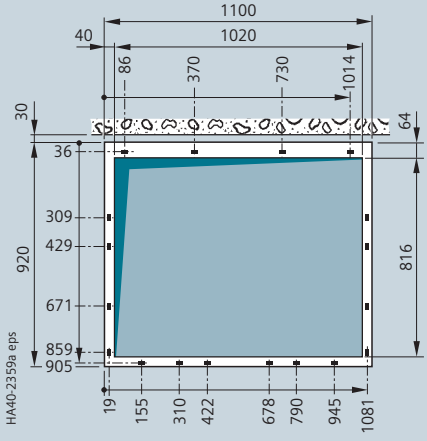
Pressure relief with duct and optional absorber



Pressure relief to the rear/ upwards

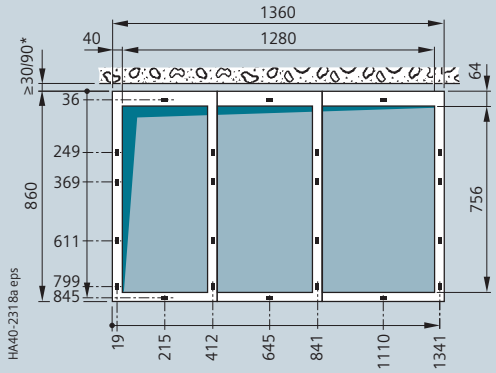
Billing metering panel



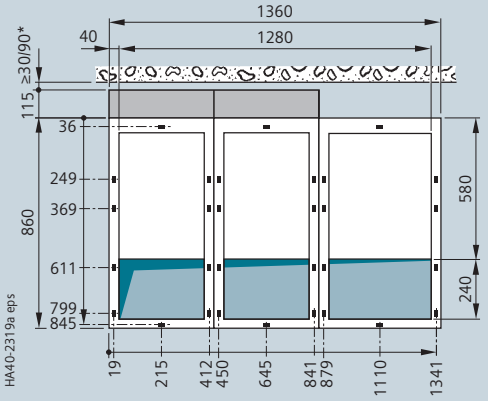


*) For switchgear with billing metering panels, all panel types except the billing metering panel have a wall distance of 90 mm.

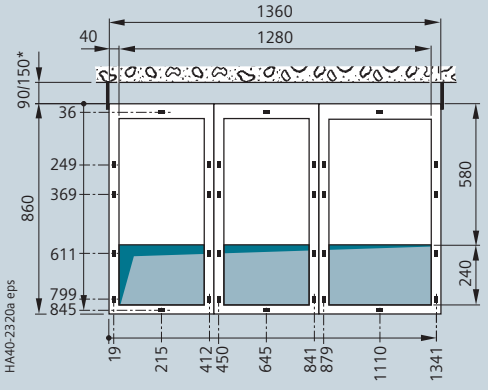
RRT and KRT block



Pressure relief downwards

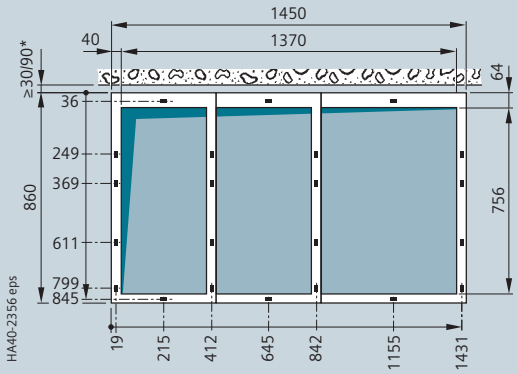


Pressure relief with duct and optional absorber

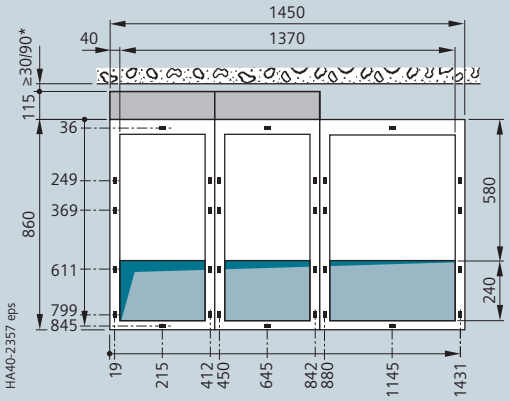


Pressure relief to the rear / upwards

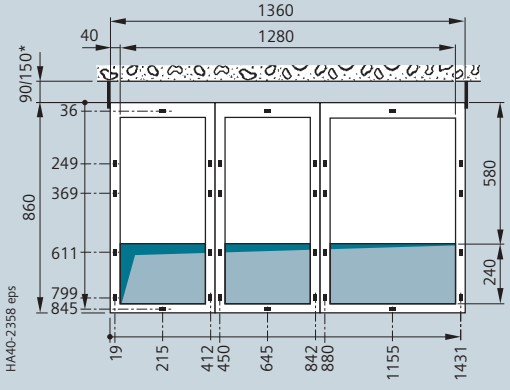
RRL and KRL block



Pressure relief downwards



Pressure relief with duct and optional absorber

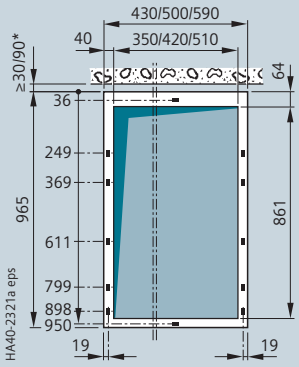


Pressure relief to the rear / upwards

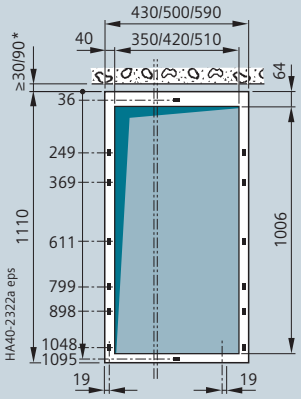
*) For switchgear with billing metering panels, all panel types except the billing metering panel have a wall distance of 90 mm.

Dimensions

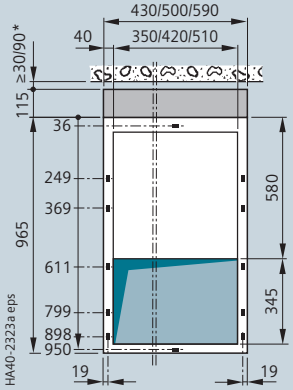
Floor openings and fixing points



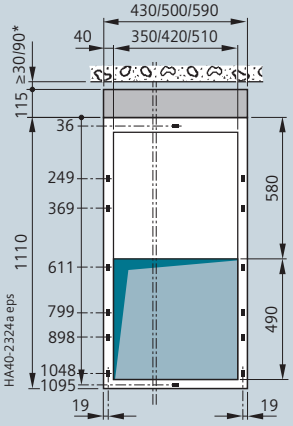
Pressure relief downwards with 105 mm deeper cable compartment cover



Pressure relief downwards with 250 mm deeper cable compartment cover



Pressure relief with duct and optional absorber, and with 105 mm deeper cable compartment cover



Pressure relief with duct and optional absorber, and with 250 mm deeper cable compartment cover

*) For switchgear with billing metering panels, all panel types except the billing metering panel have a wall distance of 90 mm.

Packing types (examples)

For size and weight of the transport units, see the following tables.

Means of transport	Examples for packing
Rail and truck	Type: Open PE protective foil pulled over the switchgear, with wooden base
Seafreight	Type: Open (for container transport) PE protective foil pulled over the switchgear, with wooden base
	Type: Seaworthy crate (for piece goods transport) Welded PE protective foil, with closed wooden crate, with desiccant bag
Airfreight	Type: Open PE protective foil pulled over the switchgear, with wooden base and lattice or cardboard cover

Transport

8DJH 36 switchgear is completely delivered in transport units. Please observe the following:

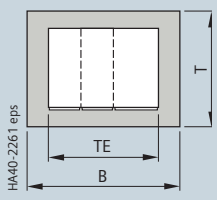
- Transport facilities on site
- Transport dimensions and weights
- Size of door openings in building
- Switchgear with low-voltage compartment: Please observe other transport dimensions and weights.

Transport dimensions

for Europe and overseas

Max. width of switchgear unit TE	Transport dimensions				
		Truck / rail / container		Seaworthy crate / airfreight	
	Width B	Height	Depth T	Height	Depth T
mm	m	m	m	m	m
860	1.10	A + 0.20	1.10 / 1.40 *)	A + 0.4 min. 2.00	1.15 / 1.45 *)
1200	1.40				
1600	1.80				
1910	2.05				

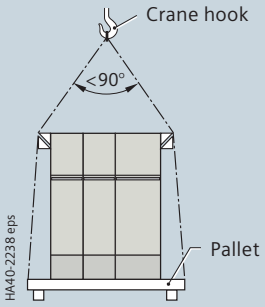
A = Switchgear height with or without low-voltage compartment



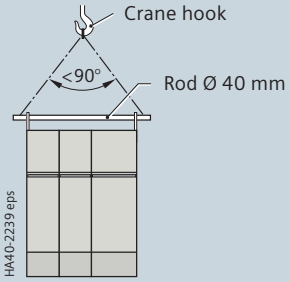
Transport units for shipping
(top view)

*) For switchgear with deep cable compartment cover, as well as for switchgear with pressure relief duct and pressure relief to the rear / upwards

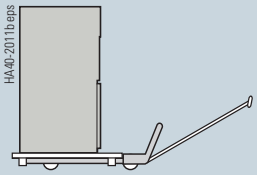
Types of transport (examples)



Crane transport with pallet

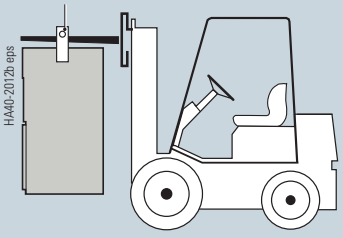


Crane transport with rod

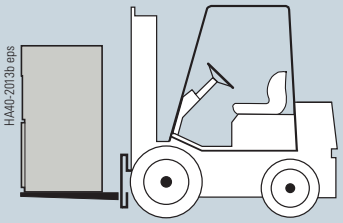


Transport with lifting truck
with or without pallet

Rod Ø 40 mm
(observe switchgear weight)



Transport with fork-lift truck, suspended



Transport with fork-lift truck, standing

Transport weights

The transport weight results from the switchgear weight per transport unit and the packing weight. The packing weight results from the transport dimensions and the type of transport.

Packing weights

Max. width of switchgear unit	Packing weight Truck / rail / container		Packing weight Seaworthy crate / airfreight	
Depth	1100 mm	1400 * mm	1100 mm	1400 * mm
mm	approx. kg		approx. kg	
860	30	40	90	120
1200	40	50	120	160
1600	50	65	150	200
1910	60	80	180	235

Switchgear weights

The weight of the switchgear unit results from the sum of the weights per functional unit. Depending on the design and the degree to which it is equipped (e.g. current transformers, motor operating mechanism, low-voltage compartment), different values will result. The table shows typical values.

Panel type	Width	Gross weight	LV compartment
		1600 mm	600 mm
	mm	approx. kg	approx. kg
R	430	180	50
K	430	180	50
T	500	300	60
L without voltage transformer 4MU1	590	400	70
L with voltage transformer 4MU1 on the busbar or at the cable connection	590	550	70
L with voltage transformer 4MU1 on the busbar and at the cable connection	590	700	70
M (BC/BB/CB)	1100	740	80
M (CC)	1100	680	80

Panel block	Width	Gross weight
		1600 mm
	mm	approx. kg
RRT	1360	650
KRT	1360	650
RTR	1360	650
RRL	1450	750
KRL	1450	750
RLR	1450	750

Additional weights for pressure absorber

For switchgear blocks with IAC A FL / FLR up to 20 kA / 1 s
Basic switchgear height 1600 mm

Additional element	Weight / kg
Cooler	30
Duct	60
Floor cover per panel	approx. 5
Example RRT with IAC A FL / FLR	105

Additional weights for outdoor enclosure

Width mm	1040			1470			2060		
Height mm	1040	1875	2275	1700	1875	2275	1700	1875	2275
Weight approx. kg	160	170	185	195	195	225	225	235	300

* For switchgear with deep cable compartment cover, as well as for switchgear with pressure relief duct and pressure relief to the rear / upwards

Type of service location

8DJH 36 switchgear can be used as indoor installation according to IEC 61936 (Power Installations exceeding AC 1 kV) and VDE 0101.

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

Terms and definitions

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

Dielectric strength

- The dielectric strength is verified by testing the switchgear with rated values of short-duration power-frequency withstand voltage and lightning impulse withstand voltage according to IEC 62271-1/VDE 0671-1 (see table "Dielectric strength").
- The rated values are referred to sea level and to normal atmospheric conditions (1013 hPa, 20 °C, 11g/m3 humidity according to IEC 60071 and VDE 0111)
- The dielectric strength decreases with increasing altitude. For site altitudes above 1000 m (above sea level) the standards do not provide any guidelines for the insulation rating, but leave this to the scope of special agreements.

The gas insulation at a relative gas pressure of 50 kPa permits switchgear installation at any desired altitude above sea level without the dielectric strength being adversely affected. This also applies to the cable connection when plug-in sealing ends are used.

A decrease (reduction) of the dielectric strength with increasing site altitude must only be considered for panels with HV HRC fuses as well as for air-insulated metering panels and a site altitude of 1000 m (above sea level).

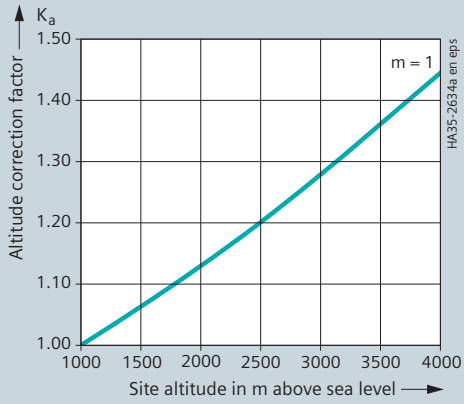
Standards

8DJH 36 switchgear complies with the relevant standards and specifications applicable at the time of type tests. In accordance with the harmonization agreement reached by the countries of the European Union, their national specifications conform to the IEC standard.

Table – Dielectric strength

Rated voltage (r.m.s. value)	kV	**36**
Rated short-duration power-frequency withstand voltage (r.m.s. value)		
– Between phases and to earth	kV	70
– Across isolating distances	kV	80
Rated lightning impulse withstand voltage (peak value)		
– Between phases and to earth	kV	170
– Across isolating distances	kV	195

Altitude correction factor K_a for panels with HV HRC fuses or for metering panels type M



(Only for panels with HV HRC fuses and metering panels type M)

For site altitudes above 1000 m, the altitude correction factor K_a is recommended, depending on the site altitude above sea level. Curve m=1 for rated short-duration power-frequency withstand voltage and rated lightning impulse withstand voltage according to IEC 62271-1

Overview of standards (June 2017)

		IEC standard	VDE standard	EN standard
Switchgear	8DJH 36	IEC 62271-1	VDE 0671-1	EN 62271-1
		IEC 62271-200	VDE 0671-200	EN 62271-200
		IEC 62271-304	–	eLC/TS 62271-304
Devices	Circuit-breakers	IEC 62271-100	VDE 0671-100	EN 62271-100
	Disconnectors and earthing switches	IEC 62271-102	VDE 0671-102	EN 62271-102
	Switch-disconnectors	IEC 60271-103	VDE 0671-103	EN 60271-103
	Switch-disconnector/ fuse combination	IEC 62271-105	VDE 0671-105	EN 62271-105
	HV HRC fuses	IEC 60282-1	VDE 0670-4	IEC 60282-1
	Voltage detecting systems	IEC 61243-5	VDE 0682-415	EN 61243-5
Degree of protection	IP code	IEC 60529	VDE 0470-1	EN 60529
	IK code	IEC 62262	VDE 0470-100	EN 50102
Insulation	–	IEC 60071	VDE 0111	EN 60071
Instrument transformers	Current transformers	IEC 61869-2	VDE 0414-9-2	EN 61869-2
	Voltage transformers	IEC 61869-3	VDE 0414-9-3	EN 61869-3
Installation, erection	–	IEC 61936-1	VDE 0101	–
Insulating gas SF_6	Specification for new SF_6	IEC 60376	VDE 0373-1	EN 60376

Current carrying capacity

- According to IEC 62271-200 or IEC 62271-1, VDE 0671-200 or VDE 0671-1, the rated normal current refers to the following ambient air temperatures:
  - Maximum of 24-hour mean + 35 °C
  - Maximum + 40 °C
- The current carrying capacity of the panels and busbars depends on the ambient air temperature outside the enclosure.

Appearance of internal faults

In gas-insulated switchgear 8DJH 36, faults leading to internal arcing are widely excluded by the construction due to the following measures:

- Use of gas-filled switchgear compartments
- Use of suitable switching devices such as three-position switches with make-proof earthing switch
- Logical mechanical interlocks
- Use of metal-enclosed voltage transformers, and current transformers as ring-core transformers (exception: air-insulated billing metering panel)
- There are no effects due to external influences, such as
  - Pollution layers
  - Humidity
  - Small animals and foreign objects
- Maloperation is practically excluded due to logical arrangement of operating elements
- Short-circuit-proof feeder earthing by means of the three-position switch-disconnector.

In the event of an arc fault at the cable connection or in the unlikely case inside the switchgear vessel, pressure relief is effected downwards into the cable basement.

For the use in substation buildings without internal arcing test, such as "old substations", the switchgear can be designed with a modified pressure relief system with absorbers (option).

As a "special cooling system", this maintenance-free pressure absorber system reduces the pressure-dependent and thermal effects of internal arcing in switchgear vessels and cable compartments, and thus protects people and buildings.

The closed system is suitable for both wall-standing and free-standing arrangement.

Internal arcing test (design option)

- Protection of operating personnel by means of tests for verifying the internal arc classification
- Internal arcing tests must be performed in accordance with IEC/EN 62271-200/VDE 0671-200 for **IAC** (internal arc classification)

- Definition of criteria:
  - Criterion 1
    Correctly secured doors and covers do not open, limited deformations are accepted
  - Criterion 2
    No fragmentation of the enclosure, no projection of small parts above 60 g
  - Criterion 3
    No holes in accessible sides up to a height of 2 m
  - Criterion 4
    No ignition of indicators due to hot gases
  - Criterion 5
    The enclosure remains connected to its earthing point.

Optionally, 8DJH 36 switchgear can be designed with internal arc classification.

Color of the panel front

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

Climate and environmental influences

All parts of the primary circuit of the 8DJH 36 switchgear which are subjected to high voltage are completely enclosed and insensitive to climatic influences.

- All medium-voltage devices (except for HV HRC fuses) are installed in a gas-tight, welded stainless-steel switchgear vessel which is filled with SF_6 gas
- Live parts outside the switchgear vessel are provided with single-pole enclosure
- At no point can creepage currents flow from high-voltage potentials to earth
- Operating mechanism parts which are functionally important are made of corrosion-resistant materials
- Bearings in the operating mechanism are designed as dry-type bearings and do not require lubrication.

The 8DJH 36 switchgear is suitable for application in indoor installations under normal operating conditions as defined in the standard IEC 62271-1.

Furthermore, the high-voltage part of 8DJH 36 switchgear can be used in environmental conditions of the climatic category 3C2 according to the standard IEC 60721-3-3.

8DJH 36 has been subjected to a climatic test according to IEC 60932, Level 2, and is suitable for operating conditions according to "Design Class 2".
These tests also meet the requirements of IEC 62271-304 for "Design Class 2".

Protection against solid foreign objects, electric shock and water

8DJH 36 switchgear fulfills according to the standards

IEC 62271-1	VDE 0671-1, EN 62271-1
IEC 62271-200	VDE 0671-200, EN 62271-200
IEC 60529	VDE 0470-1, EN 60529
IEC 62262	VDE 0470-100, EN 50102

the following degrees of protection:

Degree of protection IP	Type of protection
IP 65	for parts of the primary circuit under high voltage
IP2X	for switchgear enclosure
IP3X	for switchgear enclosure (optional)

Degree of protection IK	Type of protection
IK 07	for switchgear enclosure

Recycling

The switchgear can be recycled in ecological manner in compliance with existing legislation. Auxiliary devices such as short-circuit indicators have to be recycled as electronic scrap. Batteries have to be recycled professionally. Insulating gas SF_6 has to be evacuated professionally as a reusable material and recycled (SF_6 must not be released into the environment).

Published by
Siemens AG 2017

Energy Management
Medium Voltage & Systems
Mozartstraße 31 C
91052 Erlangen, Germany

For further information please contact
our Customer Support Center
Phone: +49 180 524 70 00
Fax: +49 180 524 24 71
E-mail: support.energy@siemens.com
siemens.com/medium-voltage-switchgear
siemens.com/8DJH36

Article No. EMMS-K1440-A311-A3-7600
Printed in Germany
Dispo 40401
PU 002926 KG 08.17 1.0

2017

SIEMENS

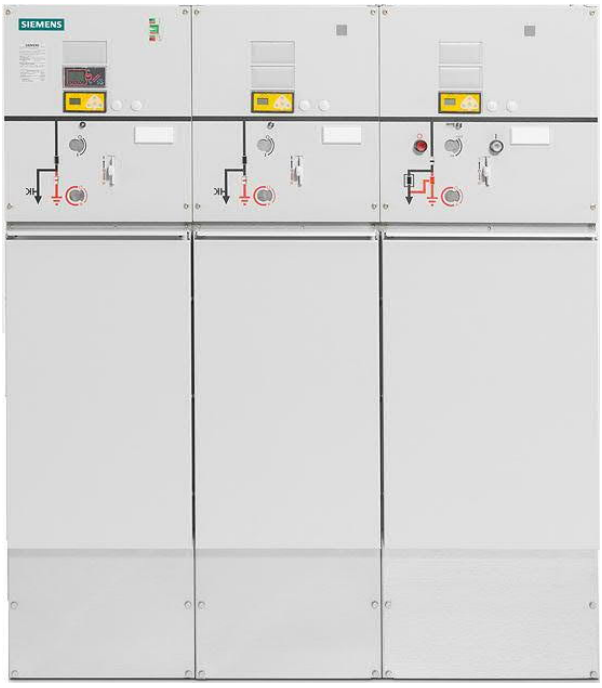
Customer: BelEnergia
Project: PV Skid 8DJH36 RRL
Reference: 0004

Specification for medium-voltage switchgear
8DJH 36
8DJH36

8DJH 36

Gas-Insulated, Metal-Enclosed

Medium-Voltage Switchgear



Technical Description

Contents

1. Switchgear description 3
1.1 General 3
1.2 Design of individual panels and panel blocks 3
1.3 Switching devices 4
1.4 Current and voltage transformers 5
1.5 Operation 5
1.6 Earthing 5
1.7 Capacitive voltage detecting system 5
1.8 Outdoor enclosure 6

2. Standards 7

3. Technical data 8

4. Scope of supply 10

5. Documentation (switchgear) 18

1. Switchgear description

1.1 General

8DJH 36 switchgear is a factory-assembled, type-tested and maintenance-free medium-voltage switchgear with single-busbar system. It is three-pole metal-enclosed and gas-insulated. The switchgear conforms to the stipulations of IEC 62271-200.

The scope of supply comprises individual panels and panel blocks. The functional offer is conceived for manifold possibilities of application. Simple ring-main units, customer transfer substations, comprehensive industrial switchgear with circuit-breaker feeders are just some of the multiple application examples.

The switchgear vessel of gas-insulated switchgear 8DJH 36 is classified according to IEC as "sealed pressure system". It is gas-tight for life.

1.2 Design of individual panels and panel blocks

Individual panels and panel blocks consist of the following functional components:

- Base frame with uniform operating front covered with steel sheets
- Switchgear vessel for accommodation of the switching devices and the busbar system
- Cable compartment

1.2.1 Switchgear vessel

The switchgear vessel is made of corrosion-resistant stainless steel. Vessel walls and bushings for electrical connections and operating mechanisms are joined by means of modern welding procedures, thus forming a sealed pressure system. The switching devices and busbars located in the switchgear vessel are protected against external influences such as humidity, pollution, dust, aggressive gases and small animals. The a.m. reasons make the switchgear also suitable for application in extreme climates or under aggressive ambient conditions.

Each individual panel has its own switchgear vessel. In panel blocks, the switching devices of several panels share one switchgear vessel.

The vessel is filled with sulfur hexafluoride (SF6) at the factory. This gas is non-toxic, chemically inert, and features a high dielectric strength. Gas work on site is not required. Even in operation it is not necessary to check the gas condition or refill.

To monitor the gas density, every switchgear vessel is equipped with a ready-for-service indicator at the operating front. This is a mechanical red/green indicator, self-monitoring and independent of temperature and variations of the ambient air pressure.

1.2.2 Busbar system

The busbar is three-pole enclosed in the switchgear vessel. For individual panels and optionally also for panel blocks, it can be interconnected on the sides with the busbars of adjacent panels by means of solid-insulated couplings in order to build a continuous busbar system. No gas work is required for assembly or for possible later extensions of the switchgear.

1.2.3 Cable compartment

In all ring-main, cable, transformer and circuit-breaker feeders, cables are connected via cast-resin bushings leading into the switchgear vessel. The bushings are designed as outside-cone system according to DIN EN 50181.

The cable compartment is accessible from the front. A mechanical interlock ensures that the cable compartment cover can only be removed when the three-position switch is in EARTHED position.

Further interlocks are optionally available: The closing lockout in ring-main and circuit-breaker feeders prevents the three-position switch from being switched to CLOSED position when the cable compartment cover is open. De-earthing for cable tests is thus still possible. In transformer feeders, the de-earthing lockout ensures that the EARTHED position remains connected as long as the cable compartment cover is open.

The bushings in ring-main, cable and circuit-breaker feeders correspond to the interface type C (DIN EN 50181). They are suitable for connection of cables with solid-insulated cable plugs at the bolted contact M16.

Cable testing can be done directly at the termination when suitable cable T-plugs are used. A separate test socket can therefore be omitted.

In the standard version, transformer feeders are equipped with bushings of interface type C with bolted contact. Bushings of interface type B are also optionally available.

The available mounting depth in the cable compartment enables the connection of double cables and single cables with surge arresters for all panel types and when using up-to-date plug-in systems.

1.3 Switching devices

1.3.1 Circuit-breaker

The circuit-breakers of 8DJH 36 switchgear operate based on modern vacuum switching technology. The vacuum interrupter unit is installed in the switchgear vessel together with the three-position switch, and is thus protected from environmental influences. The operating mechanisms of the circuit-breakers are located outside the vessel. Both the interrupters and the operating mechanisms are maintenance-free.

The circuit-breakers include the following basic equipment:

- Maintenance-free operating mechanism for the circuit-breaker
- Position indicator
- Mechanical CLOSE and OPEN operation with pushbuttons
- Operations counter
- Trip-free mechanism according to IEC

The vacuum circuit-breaker type CB 2 is designed for 6 breaking operations at rated short-circuit breaking current (20 breaking operations as an option). Its rated operating sequence is O-3 min-CO-3 min-CO.

1.3.2 Three-position switch

The three-position switch combines the DISCONNECTING and EARTHING functions in one switching device. The number of components is reduced considerably; interlocking between the functions results automatically for constructional reasons.

The switch poles are installed in the switchgear vessel; the operating mechanism, however, is located outside in the front operating mechanism box. Operation takes place via two separate actuating openings at the operating front, which enable a clear selection of the DISCONNECTING and EARTHING functions.

The three-position switch is available with the following equipment features:

- Maintenance-free spring-operated mechanism

- Manual operation of the spring-operated mechanisms for DISCONNECTING and EARTHING via rotary lever, only one operating direction according to VDN/VDEW recommendation (motor operating mechanism for DISCONNECTING as an option)
- Mechanical position indicators for the DISCONNECTING and EARTHING functions
- Locking device (option) to prevent unauthorized or involuntary operation
- Auxiliary switch (option) with 2 changeover + 1 NO + 1 NC contacts for the DISCONNECTING function, and also 2 changeover + 1 NO + 1 NC contacts for the EARTHING function

In circuit-breaker feeders with the circuit-breaker types CB 1 and 2, three-position switches are used that are adequate for no-load disconnection. The normal current is interrupted by the circuit-breaker. The EARTHING function is make-proof.

1.4 Current and voltage transformers

The current transformers at the feeders are designed as ring-core transformers. They are fitted outside the switchgear vessel at earth potential. Thus, there is no dielectric stress.

The current and voltage transformers in the air-insulated billing metering panel are designed as cast-resin insulated block-type transformers. The voltage transformers are connected to the primary circuit via flexible cable leads.

1.5 Operation

8DJH 36 switchgear has a standardized operating concept, i.e. the type of control actions and the control instruments for a specific function are the same in every panel. Furthermore, the complete mechanical and - depending on the design - electrical interlocking concept offers a maximum degree of personal and operational safety.

All control instruments are easily accessible and are ergonomically arranged at the panel front.

1.6 Earthing

For effective earthing of the switchgear and its integral parts, the points of connection in the cable compartments of the panels are conductively interconnected with the earthing system of the substation. Earthing of the primary circuits of the cable feeders can be established as follows, taking the Five Safety Rules into account:

- In ring-main, transformer and circuit-breaker feeders with the three-position switch in EARTHED position

In air-insulated metering panels, fixed earthing points are optionally available, which are suitable for connection of earthing accessories.

1.7 Capacitive voltage detecting system

To verify safe isolation from supply, 8DJH 36 switchgear offers different capacitive voltage detecting systems. The cable feeders of the ring-main, cable and circuit-breaker feeders are generally equipped with such a system, and this is optionally available for transformer feeders. Voltage detecting systems for the busbars can be installed on free busbar extensions in the end panels of the switchgear.

The voltage detecting systems used in the switchgear are described hereafter.

1.7.1 LRM system for pluggable indicators

The LRM system is a low-resistance interface for capacitive indicators. The pluggable indicators (accessories) can be connected with the system and read via sockets at the operating front. Voltage detection takes place separately for each phase.

The system requires regular repeat and function tests (IEC 61243-5). The test intervals are defined by national standards.

1.8 Outdoor enclosure

The switchgear is delivered with outdoor enclosure. The outdoor enclosure has the following features:

- Outdoor applications on company ground
- Enclosure attached to standard indoor panels
- Internal arc classification IAC A FL or FLR to 25 kA/ 1 s according to IEC 62271-200
- Pressure release back/upwards through relief duct on the rear
- Degree of protection IP 54

2. Standards

		IEC standard	VDE standard
Switchgear	8DJH 36	IEC 62 271-1	VDE 0671-1
		IEC 62 271-200	VDE 0671-200
Devices	Circuit-breakers	IEC 62 271-100	VDE 0671-100
	Disconnectors and earthing switches	IEC 62 271-102	VDE 0671-102
	Switch-disconnectors	IEC 62 271-103	VDE 0671-103
	Switch-fuse combination	IEC 62 271-105	VDE 0671-105
	HV HRC fuses	IEC 60 282-1	VDE 0670-4
	Voltage detecting systems	IEC 61 243-5	VDE 0682-415
Degree of protection	-	IEC 60 529	VDE 0470-1
Insulation	-	IEC 60 071	VDE 0111
		IEC 61869-1	VDE 0414-9-1
Instrument transformers	Current transformers	IEC 61869-2	VDE 0414-9-2
	Voltage transformers	IEC 61869-3	VDE 0414-9-3
Installation, erection	-	IEC 61 936-1/HD 637-S1	VDE 0101

3. Technical data

Voltages

Rated voltage ..... 36.0 kV
Test voltage..... 36.0 kV
Operating voltage ..... 30.0 kV
Rated short-duration power-frequency withstand voltage ..... 70.0 kV
Rated lightning impulse withstand voltage.....170.0 kV
Rated frequency ..... 50 Hz

Short-circuit ratings

Rated short-time withstand current I_k ..... 20.0 kA
Rated duration of short circuit .....3 s
Rated peak withstand current I_p ..... 50.0 kA

Current ratings

Rated normal current of the busbar..... 630 A

Dimensions

Switchgear height (without pressure absorber, low-voltage compartment).....1600 mm
Panel depth (standard) .....920 mm
Depending on the associated typical and its cable connection versions, the panel depth can be >920 mm; for dimensions, see the associated typicals
Lateral wall distance .....≥ 50 mm
Lateral wall distance for lined up panels.....≥ 200 mm
Rear wall distance for wall-standing arrangement .....≥ 30 mm
Width of control aisle (depending on national specifications)

- Recommended for Germany.....≥ 800 mm
- Recommended for extension or panel replacement.....≥ 1000 mm

Depth of cable basement or cable trench (according to cable bending radius).....≥ 600 mm

Dimensions of the outdoor enclosue

Height .....2275 mm
Width row "A" .....1470 mm
Depth .....1160 mm

Switchgear enclosure

Partition class..... PM
Internal arc classification ..... IAC A FLR 20 kA/1 s
Degree of protection of gas-insulated panels (primary part).....IP 2X
Degree of protection of the switchgear vessel IP65
Degree of protection of the low-voltage compartment.....IP 3X

Loss of service continuity

Loss of service continuity category: LSC
Panels with switching device (type R, T and L) .....LSC 2

Operating conditions (according to IEC 62271-1)

Site altitude ..... ≤ 1000 m
Ambient air temperature for operation min./max. ..... -5 °C / +55 °C
Ambient air temperature for storage and transport min./max. ..... -25 °C / 70 °C
The temperature range depends on the secondary equipment and low-voltage devices used and their operating conditions.
The rated currents apply to an ambient air temperature of 40° C
(24-hour mean value max. 35° C)

Insulation

Rated filling level (absolute) for insulation p_{re} ..... 150 kPa
Minimum filling level (absolute) for insulation p_{re} ..... 130 kPa

Endurance classes of the switching devices

Circuit-breaker CB 2 (IEC 62271-100)
- Breaking, mechanically (IEC 62271-100) M1
- Breaking, electrically (IEC 62271-100) E2
- Breaking, capacitively (IEC 62271-100) C2

Three-position switch-disconnector
- Disconnecting, mechanically (IEC 62271-102) M0
- Load breaking, mechanically (IEC 62271-103) M1
- Load breaking, electrically (IEC 62271-103) E3
- Earthing, mechanically (IEC 62271-102) M0
- Earthing, electrically (IEC 62271-102) E2

Three-position disconnector
- Disconnecting, mechanically (IEC 62271-102) M0
- Earthing, electrically (IEC 62271-102) E2

4. Scope of supply

A complete gas-insulated medium-voltage switchgear assembly 8DJH 36 is delivered. The panel arrangement and panel-related equipment features are described in Table 4.1.

Quantity	Typical No.	Typical Name	Busbar extension left/right
+H01	=HZ01	Ring-main feeder (430 mm)	
+H02	=HZ01	Ring-main feeder (430 mm)	
+H03	=HZ02	Circuit-breaker feeder with circuit-breaker L2 (590 mm)	left
+H01,+H02, +H03		8DJH36 Block	

Table 4.1: List of 8DJH 36 switchgear panels

The delivery comprises the following additional features and supplies:

- Design for free-standing arrangement
- Outdoor enclosure (painted, RAL7035)
- Pressure release back/upwards through relief duct on the rear
- Assembly of pressure absorber system at the delivering factory
- Painting of switchgear enclosure in color RAL 7035 Light grey
- Type plate in English
- Wiring duct on top of the switchgear, for LV wiring
- Doors of low-voltage compartments with cutouts according to the devices in the component list of the secondary part, or according to customer specifications
- Delivery of low-voltage compartments mounted on the panels
- Assembly of panel interconnections per transport unit at the delivering factory
- Truck packing (wooden base and wrapped PE protective foil)

Item No.	Quantity	Description	Typical No.
4.1	2	**Ring-main feeder (430 mm)** Panel width: 430 mm Rated feeder current: 630 A equipped with the following components	**=HZ01**
4.1.1		**Three-position switch-disconnector** Switching device for disconnecting and earthing the feeder (disconnecting function with load breaking capacity, make-proof earthing function) Mode of operation for switch-disconnector: with manual operating mechanism for DISCONNECTING function (CLOSE-OPEN) Mode of operation for the make-proof earthing switch: with manual operating mechanism Design of operating mechanism: Spring-operated mechanism Functions (for manual or motor operation): Spring-operated CLOSE-OPEN With locking device: for cylinder lock With auxiliary switch Design of auxiliary switch: DISCONNECTING (CLOSED-OPEN): 1 NC + 1 NO + 2 CH, EARTHING (CLOSED-OPEN): 1 NC + 1 NO + 2 CH Release:	
4.1.2		**Panel connection** Possibility of connection for solid-insulated cable plugs at the vessel bushings in the connection compartment Connection compartment provided for leading out - per phase - 2 cables downwards Connection to bushing (outside cone system): Interface type C (EN 50181) with bolted contact M16 (630 A) Cable compartment cover: standard Available mounting depth for cable plugs: 300 mm Panel depth 920 mm Cable fixing: with 1 cable bracket and C-profile Pre-assembled cable clamps with, D=36-52 mm With cable duct 113 mm x 10 mm in the cable compartment for customer specific secondary wiring The cable compartment is prepared for installation of the cable plug. Make: Euromold Cable plug: 1x M484TB/G-400§§ Coupling plug: 1x M804PB/G-400§§ Coupling insert: - Cable cross-section: 400 mm2	
4.1.3		**Capacitive voltage detecting system at the feeder** Design: LRM system (low-resistance modified), for plug-in indicator for the selected operating voltage	

Item No.	Quantity	Description	Typical No.
4.2	1	**Circuit-breaker feeder with circuit-breaker L2 (590 mm)** Panel width: 590 mm Rated feeder current: 630 A equipped with the following components	**=HZ02**
4.2.1		**Three-position disconnector** Switching device for disconnecting and earthing the feeder (make-proof earthing function) Mode of operation for the disconnector: with manual operating mechanism for DISCONNECTING function (CLOSE-OPEN) Mode of operation for the make-proof earthing switch: with manual operating mechanism Design of operating mechanism: Spring-operated mechanism Functions (for manual or motor operation): Spring-operated CLOSE-OPEN With locking device: for cylinder lock With auxiliary switch Design of auxiliary switch: DISCONNECTING (CLOSED-OPEN): 1 NC + 1 NO + 2 CH, EARTHING (CLOSED-OPEN): 1 NC + 1 NO + 2 CH	
4.2.2		**Vacuum circuit-breaker** Type LS 2 Rated voltage: 36.0 kV Rated normal current : 630 A Rated operating sequence:: O-3 min-CO-3 min-CO Rated short-circuit breaking current Isc: 20.0 kA Number of operating cycles for rated short-circuit breaking current Isc: 6 With operations counter Type of circuit-breaker operating mechanism: manual operating stored-energy mechanism Rated supply voltage for closing solenoid: DC 110 V With mechanical "spring charged" indication Equipped with 1st release: shunt release Rated supply voltage for 1st release: DC 110 V With interlocking between three-position disconnector and circuit-breaker Free contacts of auxiliary switch: 2 NO + 3 NC + 2 CH Closing and opening the circuit-breaker: mechanically With routine test certificate	
4.2.3		**Panel connection** Possibility of connection for solid-insulated cable plugs at the vessel bushings in the connection compartment Connection compartment provided for leading out - per phase - 2 cables downwards Connection to bushing (outside cone system): Interface type C (EN 50181) with bolted contact M16 (630 A) Cable compartment cover:	

standard
Available mounting depth for cable plugs:
270 mm
Panel depth 920 mm
Cable fixing:
with 1 cable bracket and C-profile
Pre-assembled cable clamps with, D=36-52 mm
With cable duct 113 mm x 10 mm in the cable compartment for customer specific secondary wiring
The cable compartment is designed with the standard equipment version for the panel connection. Depending on the cable or cable plug used, retrofitting may be required.

4.2.4 **Capacitive voltage detecting system at the feeder**
Design:
LRM system (low-resistance modified), for plug-in indicator for the selected operating voltage

4.2.5 **Current transformers on the bushing**
Current transformer type:
Designed as a ring-core current transformer, inductive type, climate-independent, secondary connection via terminal strip in the low-voltage compartment of the panel, designed as a three-phase current transformer.
Arranged outside the primary enclosure (switching-device vessel)
Current transformer installation:
Inside diameter: 106 mm
Number and assignment of current transformer cores::
3 x 1 core in L1/L2/L3
Primary current, core 1: 100 A
Secondary current, core 1: 1 A
Rating, class and overcurrent factor
of core 1: 2.5 VA / Cl. 5 P / 20
Wiring: with

4.2.6 **Zero-sequence current transformer for earth-fault detection**
Current transformer type: 4MC9672
Designed as a ring-core current transformer, single-pole, inductive type, climate-independent, secondary connection via terminal strip.
Arranged outside the primary enclosure (switching-device vessel)
Current transformer installation:
in the cable basement
for switchgear: 8DJH36
Rated short-time withstand current:

4.2.7 **Low-voltage compartment**
H=400 mm, D=400 mm
Degree of protection for LV compartment: IP 3X
for accommodation of the following devices:

1 7SR1002-1JA10-2CA0
argus non-direct. overcurrent relay
size 4 molded casing, 4 ct, 10 leds, 3 BI/3 binary outputs

	measuring input: 1/5A, 50/60Hz auxiliary voltage: 24 to 60 v dc, binary input threshold 19 v dc standard version - no cover communication: front port: USB . front fascia: w. breaker control pushbuttons protection function: standard version
1	6ED1052-1FB08-0BA0 logo! 230rce,logic module, display ps/i/o: 115V/230V/relay, 8DI/4 do, memory 400 blocks, modular expandable, Ethernet, integr. web server, data log, user-defined web pages, standard microsd card for logo! soft comfort v8 or higher, older projects executable
2	3RH2140-1AP00 Contactor relay, 4 NO, 230 V AC, 50 / 60 Hz, Size S00, screw terminal
2	3RT2916-1BD00 Surge suppressor, varistor, 127 ... 240 V AC 150 ... 250 V DC for contactor relays and motor contactors Size S00
1	3RH2422-1AP00 Contactor relay, latched, 2 NO + 2 NC, 230 V AC, 50 / 60 Hz, Size S00, screw terminal
1	3RT2916-1BD00 Surge suppressor, varistor, 127 ... 240 V AC 150 ... 250 V DC for contactor relays and motor contactors Size S00
2	3SU1500-0AA10-0AA0 Holder for 3 modules, plastic, Minimum order quantity 5 or a multiple thereof
1	3SU1401-1BH40-1AA0 LED module with integrated LED, 24-240 V AC/DC, green, screw terminal, for front plate mounting
1	3SU1401-1BH20-1AA0 LED module with integrated LED, 24-240 V AC/DC, red, screw terminal, for front plate mounting
1	3SU1001-6AA20-0AA0 Indicator lights, 22 mm, round,

		plastic, red, lens, smooth
1		3SU1100-0AB20-1FA0 Pushbutton, 22 mm, round, plastic, red, pushbutton, flat, momentary contact type, with holder 1 NO+1 NC, screw terminal,
1		3SU1100-0AB40-1FA0 Pushbutton, 22 mm, round, plastic, green, pushbutton, flat, momentary contact type, with holder 1 NO+1 NC, screw terminal,
3		3SU1001-6AA40-0AA0 Indicator lights, 22 mm, round, plastic, green, lens, smooth
1		3SU1002-2BF10-0AA0 Illuminable selector switch, 22 mm, round, plastic, black, Selector switch short, 2 switch positions O-I, latching, actuating angle 90°, 10:30h/13:30h
1		3SU1400-1AA10-1FA0 Contact module with 2 contact elements, 1 NO+1 NC, screw terminal, for front plate mounting
2		5SY6106-7 miniat.circ.-breaker 230V/400V, 6KA, C character., 1-pole, 6A T=70mm
2		5SY4103-7 miniat.circ.-breaker 230V/400V, 10KA, C character., 1-pole, 3A T=70mm

Accessories

Item No.	Quantity	Description	Typical No.
	1	Operating lever (bk) for rotary lever mechanism (DISCONNECTING/EARTHING, CB)	
	1	Switchgear key for low-voltage compartment	
	1	Operating instructions 8DJH 36, English	
	1	Operating instructions - 1st copy free of charge	

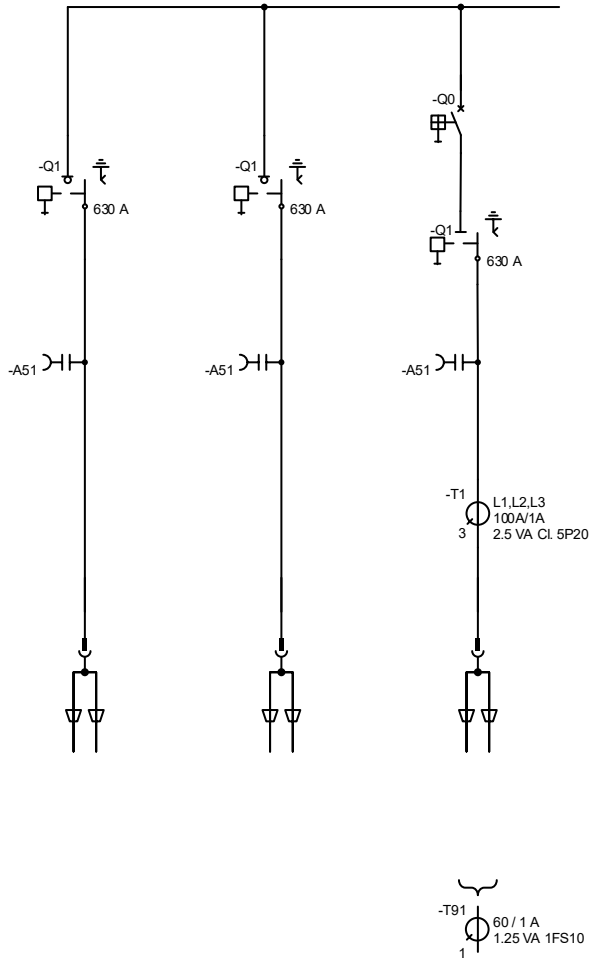
5. Documentation (switchgear)

5.1 Single-line diagram

5.2 Panel arrangement diagram

5.3 Constructional data

=H01	=H02	=H03
+H01	+H02	+H03
=HZ01	=HZ01	=HZ02

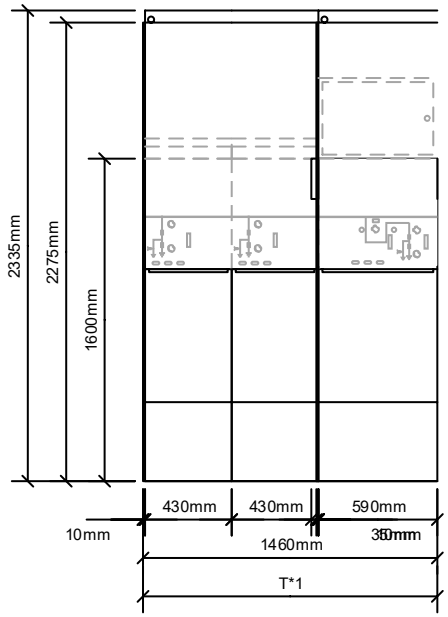


System/rated frequency	Operating voltage	Rated voltage	Rated short-time withst. curr.	Rated normal current
3~50 Hz	30.0 kV	36.0 kV	20.0 kA (3 s)	630 A

				Printout	15.05.2021	MARSEGLIA GROUP SPA (MONOPOLI) PV Skid 8DJH36 RRL	SIEMENS	8DJH36 8DJH36 8DJH36-30927	0004	=H00	
				Created by	BINASCHI					+H00	B01
				Checked by							Sh.No 01-
Issue	Revision	Date	Name	Standard		Orig. / Repl. f. / Repl. by		Single-line diagram			1

FRONT VIEW

=H01	=H02	=H03
+H01	+H02	+H03
=HZ01	=HZ01	=HZ02



LOAD DATA AND MINIMUM DISTANCES

1.) PERMANENT LOADS
VERTICAL SINGLE LOAD G_V
PANEL WIDTH 430 mm ≤ 1.80 kN
PANEL WIDTH 500 mm ≤ 3.00 kN
PANEL WIDTH 590 mm
without vt's ≤ 4.70 kN
with vt's ≤ 7.70 kN
PANEL WIDTH 1100 mm ≤ 7.40 kN

2.) NONPERMANENT LOADS
LIVE LOAD q_k 12 kN/m²

3.) MINIMUM DISTANCES
WALL DISTANCE ON THE REAR ≥ 30 mm
WALL DISTANCE ON THE LEFT / RIGHT ≥ 100 mm
WITH EXTENSION ≥ 200 mm

4.) HEIGHT OF CEILING
SWITCHGEAR HEIGHT 1600 mm * ≥ 2000 mm
SWITCHGEAR HEIGHT 2000 mm ≥ 2200 mm
SWITCHGEAR HEIGHT 2200 mm ≥ 2400 mm

5.) MINIMUM DOOR OPENING
SWITCHGEAR HEIGHT ≤ 1700 mm * 1000 mm x 2000 mm
SWITCHGEAR HEIGHT 2000 mm 1000 mm x 2200 mm
SWITCHGEAR HEIGHT 2200 mm 1000 mm x 2400 mm
* WITHOUT CABLE DUCT OR LV-CABINET

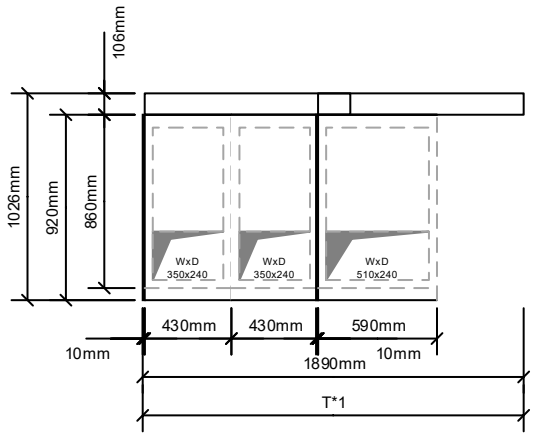
THE LOCATION AND DETAIL DIAGRAMS DO HAVE SYMBOLIC CHARACTER AND DO NOT SHOW THE ACTUAL SCOPE OF SUPPLY.

System/rated frequency	Operating voltage	Rated voltage	Rated short-time withst. curr.	Rated normal current
3~50 Hz	30.0 kV	36.0 kV	20.0 kA (3 s)	630 A

				Printout	15.05.2021	MARSEGLIA GROUP SPA (MONOPOLI)	SIEMENS	8DJH36	0004	=H00	
				Created by	BINASCHI			8DJH36		+H00	B01
				Checked by		PV Skid 8DJH36 RRL		8DJH36-30927			Sh.No 01-
Issue	Revision	Date	Name	Standard		Orig. / Repl. f. / Repl. by		Arrangement diagram			1

PLAN VIEW

=H01	=H02	=H03
+H01	+H02	+H03
=HZ01	=HZ01	=HZ02



LOAD DATA AND MINIMUM DISTANCES

1.) PERMANENT LOADS
VERTICAL SINGLE LOAD G_v
PANEL WIDTH 430 mm ≤ 1.80 kN
PANEL WIDTH 500 mm ≤ 3.00 kN
PANEL WIDTH 590 mm
without vt's ≤ 4.70 kN
with vt's ≤ 7.70 kN
PANEL WIDTH 1100 mm ≤ 7.40 kN

2.) NONPERMANENT LOADS
LIVE LOAD q_k 12 kN/m²

3.) MINIMUM DISTANCES
WALL DISTANCE ON THE REAR ≥ 30 mm
WALL DISTANCE ON THE LEFT / RIGHT ≥ 100 mm
WITH EXTENSION ≥ 200 mm

4.) HEIGHT OF CEILING
SWITCHGEAR HEIGHT 1600 mm * ≥ 2000 mm
SWITCHGEAR HEIGHT 2000 mm ≥ 2200 mm
SWITCHGEAR HEIGHT 2200 mm ≥ 2400 mm

5.) MINIMUM DOOR OPENING
SWITCHGEAR HEIGHT ≤ 1700 mm * 1000 mm x 2000 mm
SWITCHGEAR HEIGHT 2000 mm 1000 mm x 2200 mm
SWITCHGEAR HEIGHT 2200 mm 1000 mm x 2400 mm
* WITHOUT CABLE DUCT OR LV-CABINET

THESE CONSTRUCTIONAL DATA OF SIEMENS AG ARE NOT BINDING FOR CONSTRUCTION. THEY ARE ONLY VALID AS A BASE FOR PRODUCTION OF BINDING CONSTRUCTIONAL DRAWINGS. FURTHER INFORMATION ACCORDING CONSTRUCTIONAL DATA CAN BE FOUND IN THE RELATED OPERATING AND INSTRUCTION MANUAL.

System/rated frequency	Operating voltage	Rated voltage	Rated short-time withst. curr.	Rated normal current
3~50 Hz	30.0 kV	36.0 kV	20.0 kA (3 s)	630 A

				Printout	15.05.2021				=H00	
				Created by	BINASCHI	MARSEGLIA GROUP SPA (MONOPOLI)	SIEMENS	8DJH36	0004	+H00 B01
				Checked by		PV Skid 8DJH36 RRL		8DJH36		Sh.No 01-
Issue	Revision	Date	Name	Standard		Orig. / Repl. f. / Repl. by		8DJH36-30927 Constructional data		1

GamesaElectric

Gamesa Electric
Proteus PV Inverters

Maximum energy and versatility for utility-scale projects

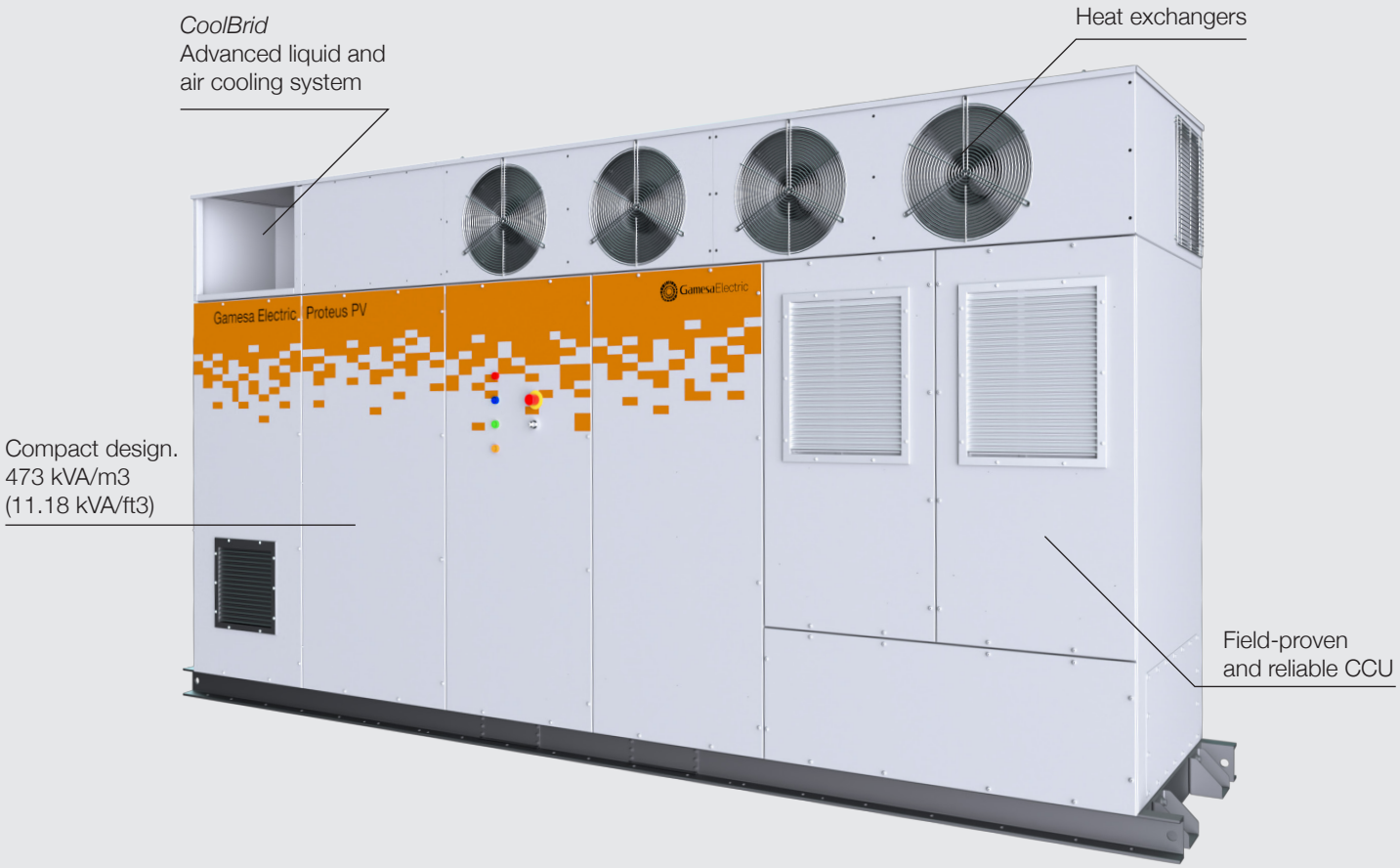
2023 | Datasheet

Up to 200% DC/AC ratio

THDI <1%

MPPT efficiency 99.9%

Outdoor solution



Gamesa Electric
Proteus PV Inverters

Better LCoE

Largest single inverter power block in the market with 4,700 KVA

Fewer inverters per project thus lower Capex and Opex

DC/AC ratio of up to 200%

Higher yield

Market-leading efficiency with 99.45%

THDi < 1% which reduces losses

Enhanced temperature derating: keeping full power up to 40ºC [104ºF]

Built to last

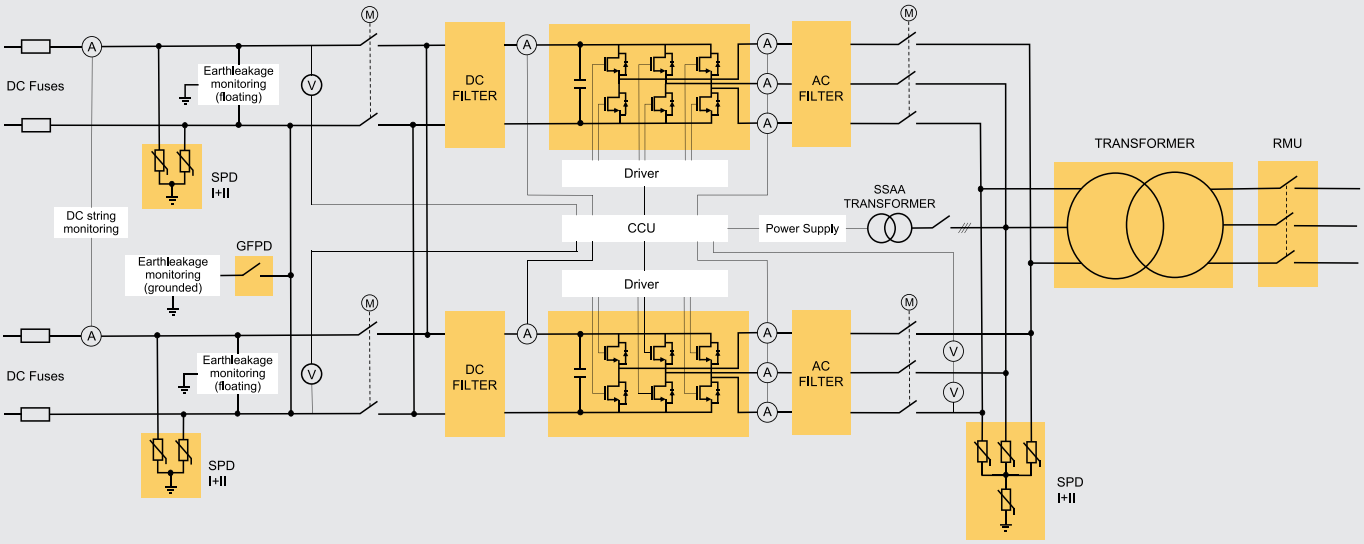
Designed and manufactured for a 30 year life span

CoolBrid: Smart hybrid cooling system that allows critical components to work far below the temperature limit

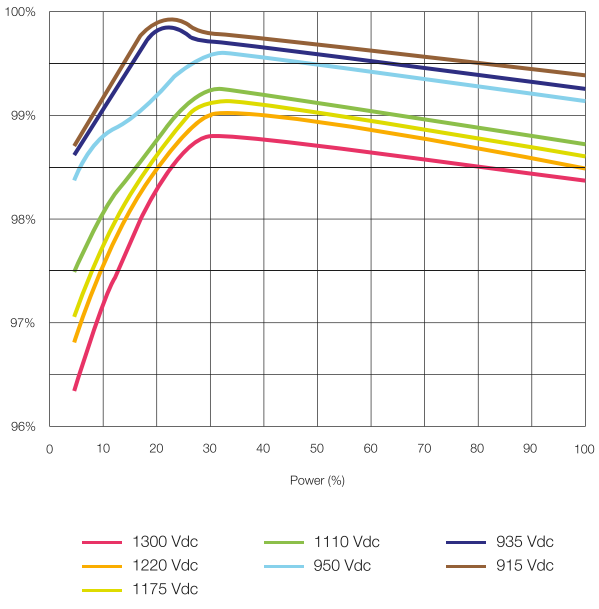
Lowest THDi in the market helps to extend power transformers lifespan

The Gamesa Electric Proteus PV Inverters combine high power with maximum versatility for PV plants LCoE reduction.

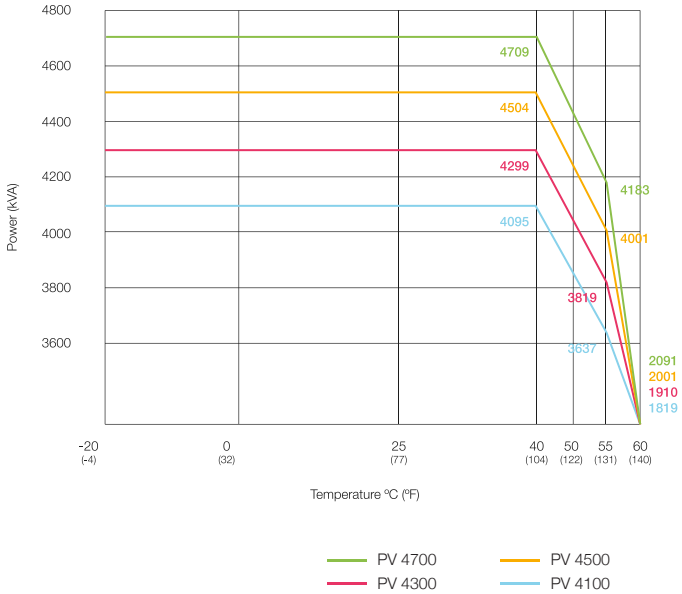
Different product configurations available to optimize performance in demanding environments as well as different voltage levels to fit customers' needs.



Efficiency



Configurations
Up to 4700 kVA



	Gamesa Electric **Proteus PV 4100**	Gamesa Electric **Proteus PV 4300**	Gamesa Electric **Proteus PV 4500**	Gamesa Electric **Proteus PV 4700**
DC Input				
DC Voltage Range[1]	835 - 1500 V	875 - 1500 V	915 - 1500 V	955 - 1500 V
DC Voltage Range MPPT[1]	835 - 1300 V	875 - 1300 V	915 - 1300 V	955 - 1300 V
Number of Power Modules	2, not galvanically isolated, 1 MPPT			
Max. DC Current @40ºC [104ºF]	2 x 2500 A			
Max. DC Current @50ºC [122ºF]	2 x 2313 A			
Max. DC Current @55ºC [131ºF]	2 x 2220 A			
Max. DC Current @60ºC [140ºF]	2 x 1110 A			
Maximum Short-circuit Current, I_{sc} PV	Up to 9000 A			
Nr of DC Ports[1]	max 24 fuse +/- monitored max 36 fuse + monitored			
Fuse Dimensions	125 A to 500 A			
Max. Wire Cross Section per DC Input	2 x 400 mm^2 - 800 AWG			
Energy Production from	0.5% Pn approx.			

AC Output				
Number of phases	Three-phase			
Nominal AC Power Total @40ºC [104ºF]	4095 kVA	4299 kVA	4504 kVA	4709 kVA
Nominal AC Power Total @50ºC [122ºF]	3790 kVA	3979 kVA	4169 kVA	4358 kVA
Nominal AC Power Total @55ºC [131ºF]	3637 kVA	3819 kVA	4001 kVA	4183 kVA
Nominal AC Power Total @60ºC [140ºF]	1819 kVA	1910 kVA	2001 kVA	2091 kVA
Maximum AC Current @40ºC [104ºF]	3940 Arms			
Nominal AC Voltage[1]	600 Vrms	630 Vrms	660 Vrms	690 Vrms
Nominal Voltage Allowance Range[1]	+/-15%			
Frequency Range[1]	47.5 - 53/57 - 63 Hz			
THD of AC Current	< 1% @Sn			
Power Factor Range	0 (inductive)-1-0 (capacitive)			

Performance				
Max. Efficiency	99.45%			
Euro Efficiency	99.24%			
CEC Efficiency	99.02%	99.07%	99.11%	99.14%
Stand-by Power Consumption	< 200 W			

General Data	
Temperature Range - Operation[2]	-20°C / +60°C [-4°F / +140°F]
Maximum Altitude[3]	< 2,000 m [6,561 ft] (w/o derating)
Cooling System	Liquid & forced air
Relative Humidity	4% – 100% (w/o condensation)
Seismic[1]	Zone 4 IBC 2012
Max. wind speed[1]	288 km/h (179 mph)
Snow load[1]	2.5 kN/m2
Protection Class	IP55 class 1, NEMA3R
Dimensions (W/H/D)	4,325 x 2,250 x 1,022 mm [170.3” x 88.5” x 40.2”]
Weight	4,535 kg [10,000 lb]

AC Protections	
AC Side Disconnection & Short-circuit Current Protection	Two motorized AC circuit breakers - one per each power module
AC Overvoltage Protection	Type 1 + 2 SPD
Anti-islanding	Included (SW)
Grid Voltage Fluctuations (LVRT, HVRT)(1)	Included (SW)
Frequency Failure	Included (SW)

Other Protections
Over-temperature Protection
Emergency Push Button

DC Protections	
DC Disconnection	Two motorized DC switches (on-load) - one per each power module
DC Short-circuit Protection	DC fuses
DC Over-voltage Protection	Type 1 + 2 SPD
Reverse Polarity Detection	Included
DC Ground Fault and Insulation Detection	Included

Optional
Low Temperature Kit up to -30°C [-22°F]
Enhanced corrosion protection

Communications	
Control[1]	Modbus TCP/IP
Monitoring[1]	Modbus TCP/IP
Webserver	Included

Standards/Directives[4]			
IEC 62109-1	IEC 62920	IEC 60529	NEC 2020
IEC 62109-2	EN 50530	IEC 61727	CEA 2007
IEC 61000-6-2/4	IEC 62116	NTS 631 v1.1 SENP, v2.1 SEPE	Rule 14, Rule 21
IEEE 1547	IEC 61683	UL 1741-SA	PRC 024
EN 55011	IEEE 519	CSA C22.2	UL 62109-1

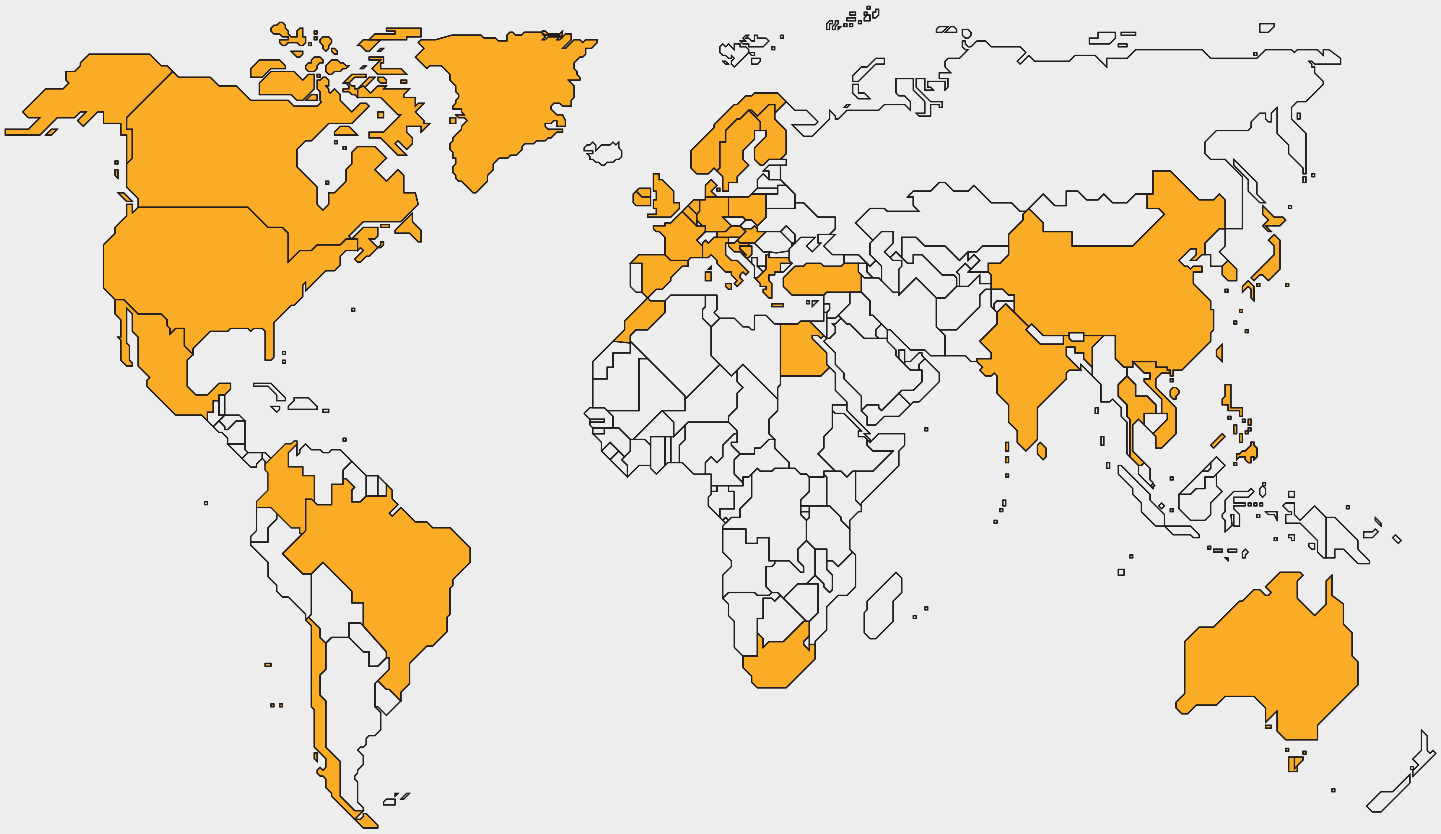
[1] Consult Gamesa Electric for a specific configuration
[2] With derating from 40°C [104°F]
[3] Up to 4,000m [13,123 ft] with derating as optional
[4] Consult Gamesa Electric for other Standards/Directives

GamesaElectric | Shaping New Energy

+5 GW
SOLAR ENERGY

+127 GW
WIND POWER

+90
COUNTRIES



Worldwide presence

Australia
Austria
Belgium
Brazil
Canadá
Thailand

Chile
China
Croatia
Denmark
Egypt
Turkey

France
Germany
Greece
Hong Kong
Hungary
UK

India
Ireland
Italy
Japan
Korea
USA

Mexico
Morocco
Netherlands
Norway
Philippines
Colombia

Poland
Singapore
South Africa
Sri Lanka
Sweden

Bosnia and herzegovina

gamesaelectric@gamesacorp.com
www.gamesaelectric.com

January 2023

Product Certificate Number	**21702-CER**
Applicant	Gamesa Electric c/ Mar Mediterráneo 14-16 28830 San Fernando de Henares, Madrid, Spain
Series	PV 3X Proteus PV
Models	See pages 2 and 3
Type of generating unit	Three-phase Solar Inverter
Technical Data	See pages 2 and 3
Software version	FIP 1027 2.0.0
Network connection code	**Allegato A.68**; Guida Tecnica: Centrali Fotovoltaiche Condizioni generali di connessione alle reti AT Sistemi di protezione regolazione e controllo. Rev. 03 - Dicembre 2019

Having assessed the report number: 20764-7-TR and 20764-10-TR performed by CERE, based on the requirements of the EN ISO/IEC 17025: 2017.

The above-mentioned generating unit complies with the requirements of the:

Allegato A.68; Guida Tecnica: Centrali Fotovoltaiche Condizioni generali di connessione alle reti AT Sistemi di protezione regolazione e controllo. Rev. 03 - Dicembre 2019.

This certification is according to the CERE internal process PET-CERE-09 Rev 34, that defines the certification scheme, based on the requirements of the EN ISO/IEC 17065:2012. For this certification process the conformity assessment activities were based on:

- Testing of production samples selected by CERE.
- Audit of quality system according to ISO 9001 with certificate number: 01 100 115165 issued by a certification body accredited according EN ISO/IEC 17021.
- Inspection of the manufacturing process.

This certificate cancels and supersedes the certificate 20764-7-CER issued on November 25, 2021.

Madrid, December 22, 2022. This certificate is valid until November 25, 2026.

Esther Ortega
Head of Certification department

Technical data

	PV3400 STD	PV3600 STD	PV3750 STD	PV3900 STD
DC INPUT				
Max. DC Current @25ºC	2 x 2100 A			
Max. DC Current @50ºC	2 x 1990 A			
DC Voltage range ***	835 - 1500 V	875 - 1500 V	915 - 1500 V	955 - 1500 V
DC Voltage Range MPPT ***	835 - 1300 V	875 - 1300 V	915 - 1300 V	955 - 1300 V
Nr of DC ports	max 24 fuse +/- monitored max 36 fuse + monitored			
Max. short-circuit current. Isc PV	6400 A (9000 A option)			
MPPT	1			
AC OUTPUT				
Nominal AC Power @25ºC	3409 kVA	3579 kVA	3750 kVA	3920 kVA
Nominal AC Power @50ºC	3273 kVA	3436 kVA	3600 kVA	3764 kVA
Maximum output current	3280 Arms			
Nominal AC Voltage	600 Vrms (± 15%)	630 Vrms (± 15%)	660 Vrms (± 15%)	690 Vrms (± 15%)
Maximum output fault current (time)	5,1 kA (<1 ms)			
AC power frequency	50/60 Hz (± 6%)			

	PV3400 HTD	PV3600 HTD	PV3750 HTD	PV3900 HTD
DC INPUT				
Max. DC Current @25ºC	2 x 2100 A			
Max. DC Current @50ºC	2 x 2100 A			
DC Voltage range ***	835 - 1500 V	875 - 1500 V	915 - 1500 V	955 - 1500 V
DC Voltage Range MPPT ***	835 - 1300 V	875 - 1300 V	915 - 1300 V	955 - 1300 V
Nr of DC ports	max 24 fuse +/- monitored max 36 fuse + monitored			
Max. short-circuit current. Isc PV	6400 A (9000 A option)			
MPPT	1			
AC OUTPUT				
Nominal AC Power @25ºC	3409 kVA	3579 kVA	3750 kVA	3920 kVA
Nominal AC Power @50ºC	3409 kVA	3579 kVA	3750 kVA	3920 kVA
Maximum output current	3280 Arms			
Nominal AC Voltage	600 Vrms (± 15%)	630 Vrms (± 15%)	660 Vrms (± 15%)	690 Vrms (± 15%)
Maximum output fault current (time)	5,1 kA (<1 ms)			
AC power frequency	50/60 Hz (± 6%)			

	PV3800 AEP	PV4000 AEP	PV4200 AEP	PV4400 AEP
DC INPUT				
Max. DC Current @25ºC	2 x 2362 A			
Max. DC Current @50ºC	2 x 2100 A			
DC Voltage range ***	835 - 1500 V	875 - 1500 V	915 - 1500 V	955 - 1500 V
DC Voltage Range MPPT ***	835 - 1300 V	875 - 1300 V	915 - 1300 V	955 - 1300 V
Nr of DC ports	max 24 fuse +/- monitored max 36 fuse + monitored			
Max. short-circuit current. Isc PV	6400 A (9000 A option)			
MPPT	1			
AC OUTPUT				
Nominal AC Power @25ºC	3837 kVA	4029 kVA	4221 kVA	4412 kVA
Nominal AC Power @50ºC	3409 kVA	3579 kVA	3750 kVA	3920 kVA
Maximum output current	3692 Arms			
Nominal AC Voltage	600 Vrms (± 15%)	630 Vrms (± 15%)	660 Vrms (± 15%)	690 Vrms (± 15%)
Maximum output fault current (time)	5,8 kA (<1 ms)			
AC power frequency	50/60 Hz (± 6%)			

	PROTEUS PV4100	PROTEUS PV4300	PROTEUS PV4500	PROTEUS PV4700
DC INPUT				
Max. DC Current @25ºC	2 x 2500 A			
Max. DC Current @50ºC	2 x 2310 A			
DC Voltage range ***	835 - 1500 V	875 - 1500 V	915 - 1500 V	955 - 1500 V
DC Voltage Range MPPT ***	835 - 1300 V	875 - 1300 V	915 - 1300 V	955 - 1300 V
Nr of DC ports	max 24 fuse +/- monitored max 36 fuse + monitored			
Max. short-circuit current. Isc PV	Up to 9000 A			
MPPT	1			
AC OUTPUT				
Nominal AC Power @25ºC	4095 kVA	4299 kVA	4504 kVA	4709 kVA
Nominal AC Power @50ºC	3790 kVA	3979 kVA	4169 kVA	4358 kVA
Maximum output current	3940 Arms			
Nominal AC Voltage	600 Vrms (± 15%)	630 Vrms (± 15%)	660 Vrms (± 15%)	690 Vrms (± 15%)
Maximum output fault current (time)	6,2 kA (<1 ms)			
AC power frequency	50/60 Hz (± 6%)			

The sample selected to test was representative of the production. The sample was selected in:	Gamesa Electric c/ Mar Mediterráneo 14-16. 28830. San Fernando de Henares. Madrid, Spain
Sample Report Number:	20764-TM
The inspection of manufacturing process was performed in: On May 19, 2022	Gamesa Electric c/ Mar Mediterráneo 14-16. 28830. San Fernando de Henares. Madrid, Spain
Inspection Report Number:	21459-22-1-IF
The inspection of manufacturing process was performed in: On July 27, 2022	Siemens Gamesa Renewable Private Limited KSEZ Premises, Racharlapadu (Village & Post) Adjacent to NH-5 524319, Nellore, Andhra Pradesh, India.
Inspection Report Number:	21527-22-1-IF

RECORD OF CHANGES

Revision	Reason of the modification	Modification	Date
0	Initial version/update of certificate 20764-7-CER	Update of standard version (page 1) and factory inspection report (page 4)	22/12/2022

Westrafo S.r.l. - Via della Meccanica 4, 36100 - Vicenza (Italy)
Tel. +39 0444 1831601 / Fax. +39 0444 1831602
VAT 03912090242 / REA 364385/VI / Share capital: 90.000 €

WESTRAFO

POWER TRANSFORMERS

TECHNICAL DATASHEET	Central Inverter Transformer single inverter option (Dy11)-ECO-50Hz - 4500 kVA	**REV.**	00	**TYPE**	Preliminary offer	**DATE**	29/12/2022

AUTHOR:	J. Avogaro	**APPROVED BY**	R. Bordacchini

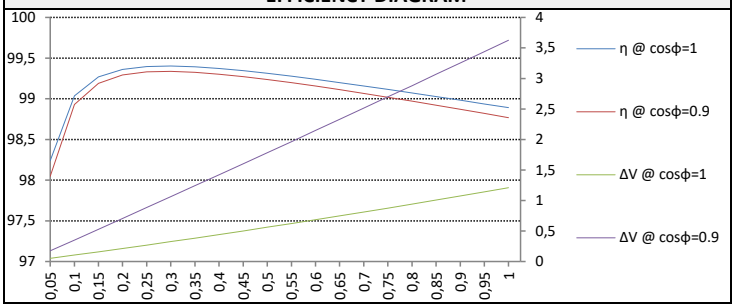
Three phase power transformer immersed in dielectric fluid with the following features:

Reference norms:	IEC 60076 & EU regulation 548/2014 Tier 2 - PEI ≥ 99,54
Type of load:	Inverter (THDi < 3%) 4500kVA @40°C; 4337kVA @45°C; 4169kVA @50°C; 4001kVA @55°C; 2001kVA @60°C
Mechanical construction type	Sealed type transformer
Type of cooling	KNAN

EFFICIENCY (KNAN)				
	100%	75%	50%	25%
cos Ø = 1	99,15	99,32	99,47	99,54
cos Ø = 0,9	99,06	99,25	99,42	99,49
cos Ø = 0,8	98,94	99,16	99,34	99,42

VOLTAGE DROP (KNAN)				
	100%	75%	50%	25%
cos Ø = 1	1,03	0,73	0,45	0,21
cos Ø = 0,9	3,92	2,90	1,91	0,95
cos Ø = 0,8	4,93	3,68	2,43	1,21

EFFICIENCY DIAGRAM



ELECTRICAL DATA				
	HV SIDE		**LV SIDE**	
	KNAN	**KNAF**	**KNAN**	**KNAF**
Rated power [kVA]	4500		4500	
Rated voltage [V]	30000		660	
Rated current [A]	86,60		3936,48	
Insulation level [kV]	Um 36 / LI 170 / AC 70		Um 3,6 / AC 10	
Winding material	AL		AL	
Tap changer	Off Load			
Taps	±2 x 2,5%			
Connection type	D		y	
Number of bushings	3		3	
Type of bushings	Plug in interface "C"		Busbar	
Bushings electrical features [kV/A]	36/630		3,6/5000	
Bushings exit position	Top cover		Lateral short side	
Cable exit protection degree	IP00		IP00	
Screen between windings	Yes			

	KNAN	**KNAF**	**TOLERANCES (%)**	**REFERENCE NORM**
Frequency [Hz]	50			
Vector group	Dy11			
Impedance value at 105°C [%]	7		IEC	IEC 60076-1
No load losses [W]	3000		IEC	IEC 60076-1
Load losses at 105°C [W]	35500		IEC	IEC 60076-1
Total losses [W]	38500		IEC	IEC 60076-1

MECHANICAL AND SITE DATA		
Type of core	Step lap core with high permeability magnetic steel	
Design temperature [°C]	-25	+40
Overtemperature oil/windings [°C]	80	85
Max Installation altitude [m]	1000	
Paint corrosivity category (ISO 12944)	C3H	180 µm
Painting color	RAL7033	
Type of fluid	FR3	
Trolley dimensions [mm]	1070x1070	
Wheels [mm]	No wheels	
Transformer dimensions (LxWxH) [	2550 x 1450 H= 2200	
FR3 mass [kg]	1720	
Total mass [kg]	8700	

Westrafo S.r.l. - Via della Meccanica 4, 36100 - Vicenza (Italy)
Tel. +39 0444 1831601 / Fax. +39 0444 1831602
VAT 03912090242 / REA 364385/VI / Share capital: 90.000 €

WESTRAFO

POWER TRANSFORMERS

TECHNICAL DATASHEET	Central Inverter Transformer single inverter option (Dy11)-ECO-50Hz - 4500 kVA	**REV.**	00	**TYPE**	Preliminary offer	**DATE**	29/12/2022

AUTHOR:	J. Avogaro	**APPROVED BY**	R. Bordacchini

Three phase power transformer immersed in dielectric fluid with the following features:

Reference norms:	IEC 60076 & EU regulation 548/2014 Tier 2 - PEI ≥ 99,54
Type of load:	Inverter (THDi < 3%) 4500kVA @40°C; 4337kVA @45°C; 4169kVA @50°C; 4001kVA @55°C; 20
Mechanical construction type	Sealed type transformer
Type of cooling	KNAN

ACCESSORIES INCLUDED	
Quantity	**Description**
1	Off load tap changer on MV side
2	Earthing therminals
1	Set of lifting lugs
1	Set of pull hooks
1	Name plate
1	Oil drain valve
1	DMCR
1	thermometer pocket
1	electrostatic screen
1	Safety valve

TESTS INCLUDED	
Quantity	**Description**
1	SET OF ROUTINE TESTS

NOTES

Painting: Applied following the corrosivity category specified in datasheet on all external parts. Internal parts (ex. Inside of cable box) treated with protective coating.

Wheels: The colour of wheels, if present, is not matching the specified RAL but according to supplier's choice.

Dimension & weight: All dimensions and weights in the preliminary phase are approximate and not binding.