
Catalog
HA 40.5 ·
2024

MEDIUM-VOLTAGE SWITCHGEAR

# Switchgear Type 8DJH 12 – blue GIS

for Secondary Distribution Systems up to 12 kV, Gas-Insulated

siemens.com/8DJH12

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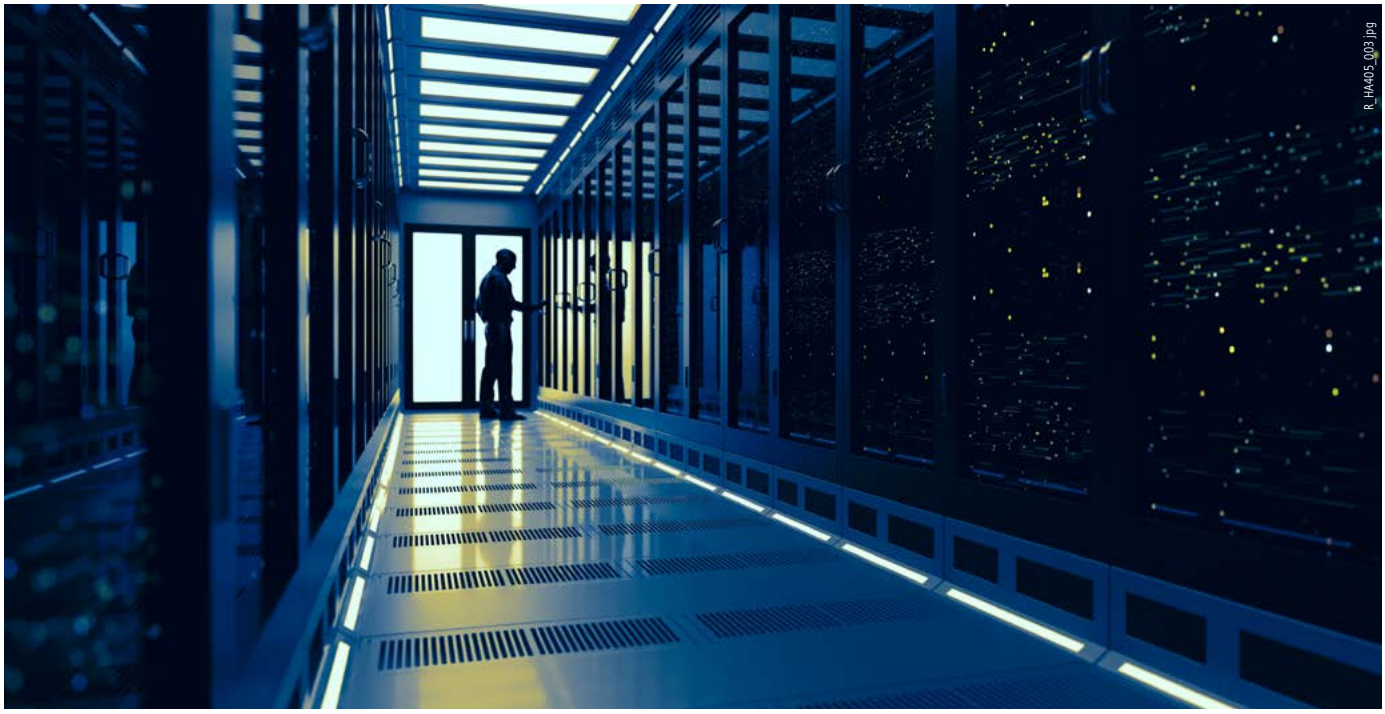
# Application

Typical uses


**Application in public and industrial energy systems**



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siemens.com/medium-voltage-switchgear

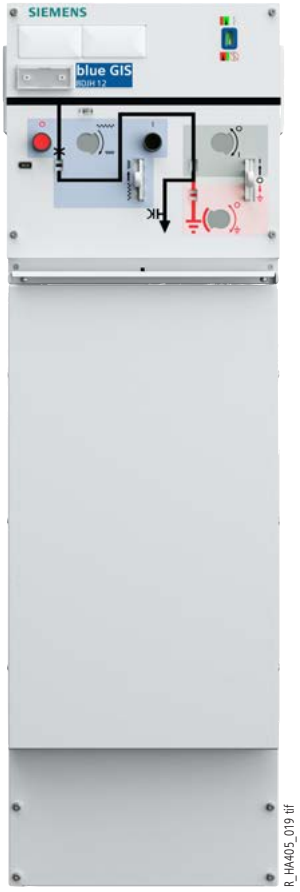
## Contents



**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

Versions




Circuit-breaker panel


RRL block


Cable feeder panel

# Application

Typical uses, ratings, standards

8DJH 12 switchgear is a factory-assembled, type-tested, 3-pole metal-enclosed single-busbar switchgear for indoor installation.

8DJH 12 switchgear is used in public and industrial energy systems of the secondary distribution level, e.g. in

- Secondary transformer substations of power supply system operators
- Utilities transfer substations for business enterprises
- Installations of building supply technologies
- Water and sewage treatment plants
- Underground railway stations, railway stations, airports
- Charging stations for electric vehicles
- Generating plants for renewable energies (biomass, hydro power, wind turbines, solar parks).

**Electrical data (maximum values) and dimensions**

| | | | |
|---|---|---|---|
| Rated voltage | kV | **7.2** | **12** |
| Rated frequency | Hz | 50 | 50 |
| Rated short-duration power-frequency withstand voltage | kV | 20 | 28 |
| Rated lightning impulse withstand voltage | kV | 60 | 75 |
| Rated peak withstand current | kA | 52.5 | 52.5 |
| Rated short-time withstand current 3 s | kA | 20/21 | 20/21 |
| Rated short-time withstand current 1 s | kA | 20/21 | 20/21 |
| Rated continuous current of the busbar | A | 630 | 630 |
| Rated continuous current of feeders | A | 630 | 630 |
| Width (feeders) | mm | 310 / 430 / 500 | |
| Depth<br>– without pressure relief duct<br>– with pressure relief duct | <br>mm<br>mm | <br>775<br>890 | <br>775<br>890 |
| Height without low-voltage compartment and pressure relief duct | mm | optionally 1200 / 1400 | |

**Standards**

| | | **IEC standard / EN standard** |
|---|---|---|
| Switchgear | | 62271-1 |
| | | 62271-200 |
| Switching devices | Circuit-breakers | 62271-100 |
| | Disconnectors and earthing switches | 62271-102 |
| | Switch-disconnectors | 62271-103 |
| | Switch-fuse combination | 62271-105 |
| Voltage detecting systems | | 62271-213 |
| Degree of protection | | 60529 |
| | | 62262 |
| Insulation | | 60071 |
| Instrument transformers | General requirements | 61869-1 |
| | Current transformers | 61869-2 |
| | Inductive voltage transformers | 61869-3 |
| | Low-power current transformers | 61869-6<br>61869-10 |
| | Low-power voltage transformers | 61869-6<br>61869-11 |
| Insulating gas | | 62271-4 |
| Installation | | 61936-1 / EN 50522 |
| Environmental conditions | | 60721-3-3 |
| Operation | | EN 50110 |

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

**Compact design**
Thanks to the use of an insulation of natural gases (Clean Air), 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
- 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 service conditions, the expected service life of gas-insulated switchgear 8DJH 12 is at least 40 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 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 IP65 for all high-voltage parts in the switchgear vessel, at least IP2X for the switchgear enclosure according to IEC 60529
- All high-voltage parts including the cable terminations, busbars and voltage transformers are metal-enclosed and/or provided with earthed layers
- Panels tested for resistance to internal faults up to 21 kA
- Capacitive voltage detecting system to verify safe isolation from supply
- Logical mechanical interlocks prevent maloperation
- Feeder earthing via make-proof earthing switches.

**Security of operation**
- Hermetically sealed primary enclosure independent of environmental effects (pollution, humidity and small animals)
- Welded switchgear vessels, sealed for life
- Maintenance-free in an indoor environment (IEC 62271-1)
- Operating mechanisms of switching devices and auxiliary switches accessible outside the primary enclosure (switchgear vessel)
- Metal-coated, plug-in inductive voltage transformers mounted outside the switchgear vessel
- Current transformers as ring-core current transformers mounted outside the switchgear vessel
- Complete switchgear interlocking system with logical interlocks
- Mechanical position indicators integrated in the mimic diagram
- Minimum fire load
- Option: Resistance against earthquakes.

**Reliability**
- Type and routine-tested
- Standardized and manufactured using numerically controlled machines
- Quality assurance in accordance with DIN EN ISO 9001
- More than 1,500,000 switchgear panels of Siemens in operation worldwide for many years.

**General**
- Panels 3-pole metal-enclosed
- High-voltage compartments with metal partitions
- Hermetically tight, welded switchgear vessel made of stainless steel, with welded-in bushings for electrical connections and mechanical components
- Frame made of sendzimir-galvanized sheet steel
- Front covers and doors of low-voltage compartments powder-coated in color RAL 7035 (light gray)
- Functions as individual panels or combined in a panel block with up to 3 functions in a common switchgear vessel
- Switching devices 3-pole, fixed-mounted, depending on the function
  – Three-position switch-disconnector
  – Vacuum circuit-breaker with three-position disconnector
- Cable connection with outside-cone plug-in system according to DIN EN 50181 in ring-main and circuit-breaker feeders with bolted contact (M16)
- Wall-standing or free-standing arrangement
- Pressure relief downwards, optionally upwards via pressure absorber systems.

**Interlocks**
- According to IEC 62271-200
- 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 under voltage
- Impermissible and undesired operations can be prevented by means of locking devices provided at the switching devices.

**Modular design**
- Individual panels and panel blocks can be lined up and optionally extended – without gas work on site
- Option: Low-voltage compartment available in 4 overall heights. Installation and removal possible on site, wiring to the panel via plug connections.

**Instrument transformers**
- Ring-core current transformers not subjected to dielectric stress
- Metal-coated voltage transformers, plug-in type
- In the air-insulated metering panel:
  Cast-resin insulated block-type current and voltage transformers (narrow design according to DIN 42600 Part 8 or Part 9)
- Replacement of instrument transformers without gas work, as they are located outside the switchgear vessel.

**Sensors**
- Current sensor as inductive current transformer in combination with precision shunt (voltage signal)
- Voltage sensor as resistor divider
- In combination with secondary devices such as
  – SICAM FCM
  – 7SJ81.

**Vacuum circuit-breaker**
- Maintenance-free under normal ambient conditions according to IEC 62271-1
- No relubrication or readjustment
- 2000 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.

# Digitalization, condition monitoring

Siemens Xcelerator, available monitoring functionalities

## Siemens Xcelerator

Siemens Xcelerator is an open digital business platform that enables customers to accelerate their digital transformation more easily, quickly, and at scale.

### Addressing key challenges in the energy sector and beyond

**Maintaining grid stability –** Increasing energy demands often clash with fluctuating generation. Balancing both is crucial for tomorrow's grid stability.

Our smart energy solutions simplify management, align OT and IT, and ensure a resilient, scalable, and adaptable grid.

**Maximizing cyber and asset security –** Power grids can be a target for cyberattacks, which may cause power outages and unpredictable results.

Our solutions incorporate security measures to remove vulnerabilities in IT components, control devices, as well as transformer substation and switchgear systems.

**Reducing expenditures –** Our solutions enhance competitiveness through optimized CAPEX and OPEX with asset optimization, digital planning, simulation, and flexible financing options.

**Integrating distributed energy resources (DERs) –** DERs are at the heart of a clean and resilient energy future. Nevertheless, a greater system flexibility is needed to consistently balance supply and demand.

Our solution offering covers the entire spectrum: from consulting through technical applications and services to tailored financing and business models.

## Available monitoring functionalities for gas-insulated switchgear

### Condition monitoring

Condition monitoring serves to continuously improve the resilience, reliability, and availability of maintenance-free, gas-insulated medium-voltage switchgear with an expected service life of 40 years. These values are based on the design and empirical data for switchgear assemblies, as well as on the intended use of the switchgear under normal service conditions according to IEC 62271-1.
To protect the investment (CAPEX) and reduce operational expenditures (OPEX), the extension of switchgear functions with a condition monitoring system is the appropriate way for early indication of irregularities at the switchgear and its peripheral components. This is the premise for condition-based inspection.

### Temperature monitoring of the cable connections

Temperature monitoring of the cable connections ensures that the maximum permissible thermal service conditions of the gas-insulated switchgear and the cable connection set are not exceeded during operation. With the help of an intelligent correlation between the ambient air temperature, the cable connection temperature, and the switchgear utilization, anomalies can already be detected and indicated before the limit temperature is reached, based also on low-load scenarios.

### Temperature and humidity monitoring of the environment (dew-point monitoring)

Ongoing condensation would lead to corrosion at the switchgear, and reduce its service life. Specific countermeasures after strong humidity at the switchgear assembly, as well as the prevention of further condensation, can remedy the situation.

### Partial discharge monitoring

Partial discharges arise if the electrical insulation is damaged or insufficient. Partial discharge monitoring offers a pre-alarming in case of a possibly insufficient electrical insulation. In most cases, partial discharges are a long-term effect of thermal overstressing or of defective or incorrectly installed peripheral components.

### Digital gas density monitoring

For perfect operation of a gas-insulated switchgear, the correct gas density inside the switchgear vessel is crucial. To maintain the full scope of functions of the switchgear, immediate action is required if the gas density falls below the necessary values.

### Circuit-breaker monitoring

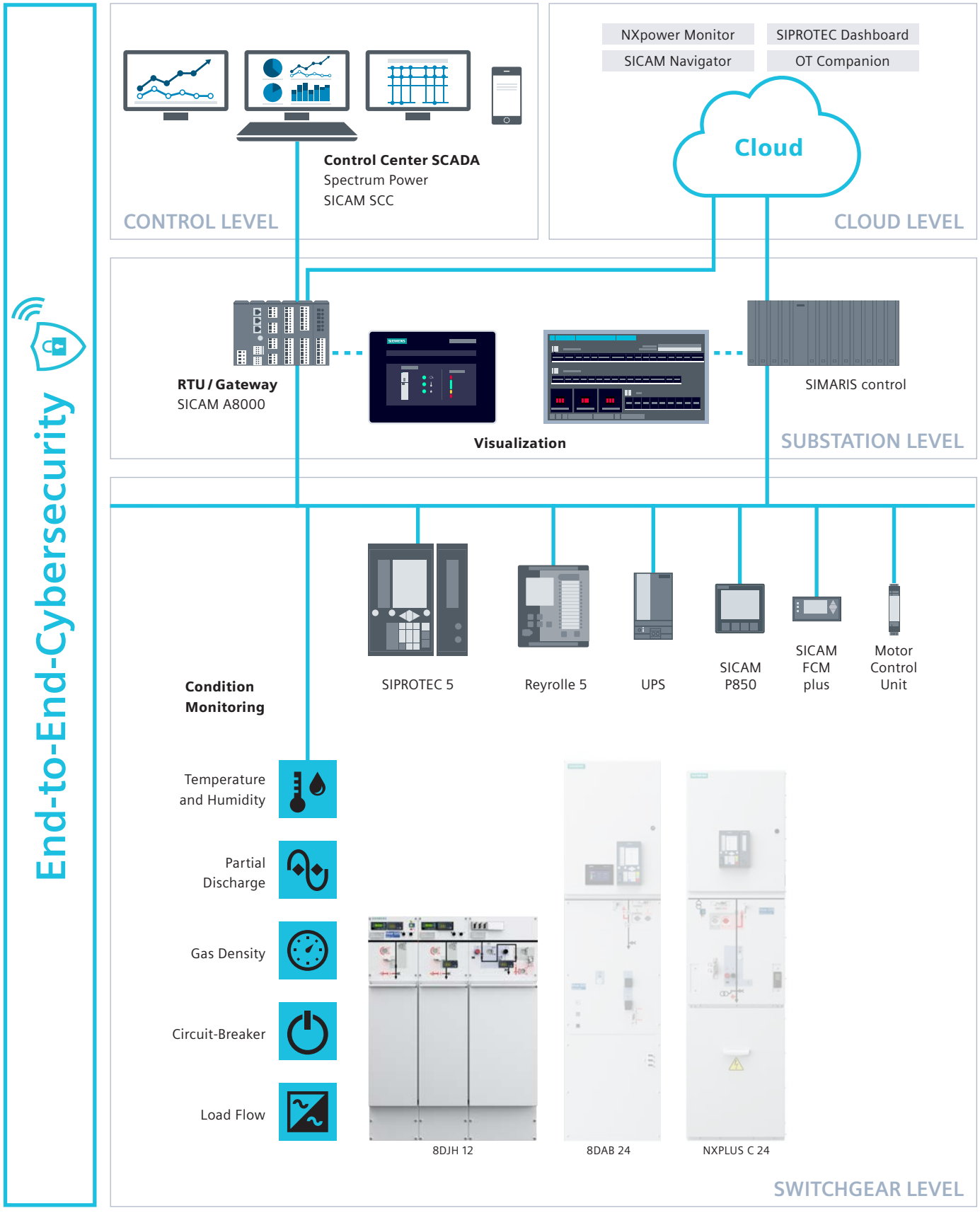
Continuous monitoring of circuit-breaker functions enables an evaluation of the actual health status of the circuit-breaker, based on both mechanical and electrical parameters. The evaluation of performed mechanical and electrical switching operations, as well as the monitoring of other components, allows to indicate at an early stage if servicing work is necessary, or if a suitable replacement switchgear should be procured.

### Load flow monitoring

An increasing number of distributed energy resources and the growing share of e-mobility lead to ever more volatile load flows in the distribution grids. Capturing this data is an important element for identifying hotspots in the grid, and it offers planning security for the operator.

# Digitalization, condition monitoring

Digitalization solutions from a single source



# Sustainability

**Our contribution to a sustainable and cleaner planet**
At Siemens, sustainability is not just a commitment, but a core strategy deeply ingrained in our operations. Our DEGREE framework, representing **Decarbonization**, **Ethics**, **Governance**, **Resource Efficiency**, **Equity,** and **Employability**, guides our journey towards a sustainable future. It constitutes a 360-degree approach for all stakeholders – our customers, our suppliers, our investors, our people, the societies we serve, and our planet.

Siemens aims to limit global warming to 1.5 degrees Celsius and takes action across its operations, targeting various ESG (Environmental, Social, and Governance) topics. We further contribute to decarbonization by helping our customers reduce emissions, and aim to lower our own operational emissions significantly by 2030. Additionally, we promote resource efficiency through recycling and a circular economy, incorporating sustainable design criteria into our products and increasing the use of secondary materials. Siemens focuses on sustainable materials, energy sources, and product service life optimization to minimize resource consumption and waste. Ultimately, we strive to create a better future by achieving sustainability goals and minimizing environmental impacts.

Siemens gas-insulated switchgear (GIS) systems have played a key role over the last 40 years for a reliable and safe power distribution. The new Siemens blue GIS portfolio reflects our commitment to 100% sustainable innovation, which integrates both Clean Air as an insulating medium and an eco-efficient design that reduces its CO2 footprint throughout the entire life cycle. With a wide range of products covering all the needs, our blue GIS will be the core of a sustainable energy transition. The following innovative solutions offer a remarkable CO2 footprint reduction:

**F-gas-free insulation:** Clean Air consists of natural-origin gases with a GWP < 1, which means it has virtually no negative impact on the environment or climate change during the entire life cycle. It can even be released into the atmosphere after reaching its end of life.

**Space efficiency:** Like the traditional GIS design, Siemens blue GIS also offer very compact solutions that save valuable space and additionally decrease the environmental impact of electrical infrastructure installations.

**Material efficiency:** blue GIS products are designed to have a very low $CO_2$ footprint. A prime example is SIBushing, a non-conventional instrument transformer that reduces the use of raw materials, energy consumption, and landfill waste.

**Energy efficiency:** An optimized main current path with a low ohmic resistance reduces the power loss during operation of the switchgear considerably, and thus increases the energy efficiency.

**Long service life:** With the right material selection and an innovative design, blue GIS have an expected service life of 40 years, thus extending the re-investment cycle and further diminishing the $CO_2$ footprint.

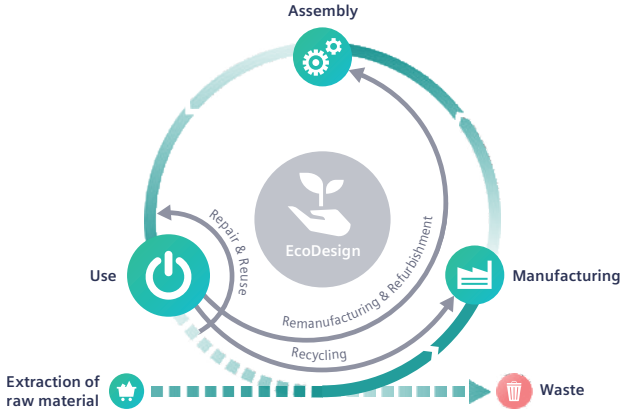
**Maintenance-free design:** No additional maintenance is necessary, and the $CO_2$ footprint can be reduced further by avoiding site visits during the operational phase of the switchgear.

**Sustainable services:** The $CO_2$ footprint can be diminished thanks to services from predictive maintenance to condition monitoring, remote FAT, $CO_2$ monitoring via NXpower monitor, the Totally Integrated Power planning tools, and paperless documentation.

### The complete life cycle that counts

In view of the global climate crisis and the necessity to reduce carbon emissions and preserve natural resources, Siemens aims to decrease the environmental footprint of its own business operations as well as that of its customers and supply chains. With internationally standardized approaches, we provide transparency regarding the environmental impacts of our products, systems, solutions, and services.

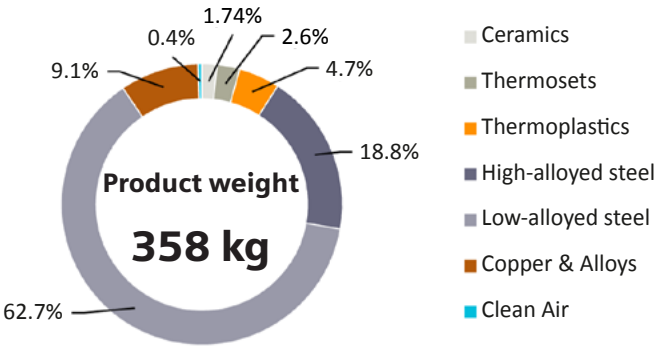
**Robust Eco Design:** Our blue GIS panels are designed as a part of the Eco Efficiency @ Siemens program, where the environmental impacts to be expected in each of the product's life cycle phases are addressed right from the design phase. The switchgear is designed not only to minimize its $CO_2$ footprint, but also to prioritize resource efficiency and circular economy.




The Siemens Environmental Product Declaration (EPD) adheres to ISO 14021 standards for environmental labels and declarations. It is based on a comprehensive Life Cycle Assessment (LCA) study conducted in accordance with ISO 14040/44, incorporating Product Category Rules (PCR) specified in EN 50693 for electronic and electrotechnical products and systems.

| Product | 8DJH 12 – secondary distribution blue GIS |
|---|---|
| Technical data | $U_r$ = 12 kV, $I_k$ = 21 kA, $I_r$ = 630 A |
| Product description | 8DJH 12 is an F-gas-free gas-insulated load-break switchgear with Clean Air insulation for secondary distribution grids, and available as ring-main feeder (R), circuit-breaker feeder (L), cable feeder (K), and metering panel (M); as individual panels and in panel blocks |
| Functional unit | Reference 8DJH 12 – RRL block – secondary distribution blue GIS, primary part, type-tested according to IEC 62271-200. Maintenance-free, operating 24 h, 365 days/a with an expected service life of 40 years |

### Material composition




### Resource efficiency

The end-of-life phase of an 8DJH 12 – RRL block blue GIS was modeled with the LCA tool GaBi 9.5 by first dismantling the equipment, followed by a shredding, sorting, and material separation process, resulting in:

- An overall product recyclability of up to 90.9% mainly thanks to high metal content
- An energy recoverability of up to 7.3% from plastic materials
- A minimum disposal rate of 1.8%

The exact final values depend on the used recycling processes.

### Use of environmentally safe materials

At Siemens, we are committed to the development and production of environmentally friendly and sustainably produced equipment. This includes avoiding hazardous substances in our products without compromising their benefits for our customers. Please visit the following website* to learn more about how we comply with product-related environmental regulations like RoHS, REACh and others.

* https://www.siemens.com/global/en/products/energy/ecotransparency/ecotransparency-downloads.html

# Technical data

Switchgear

**Electrical data of the switchgear**

| | | | | | | |
|---|---|---|---|---|---|---|
| Rated insulation level | | Rated voltage $U_r$ | | | **kV** | **7.2** | **12** |
| | | Rated short-duration power-frequency withstand voltage $U_d$: | | | | | |
| | | – phase-to-phase, phase-to-earth, open contact gap | | | kV | 20 | 28 |
| | | – across the isolating distance | | | kV | 23 | 32 |
| | | Rated lightning impulse withstand voltage $U_p$: | | | | | |
| | | – phase-to-phase, phase-to-earth, open contact gap | | | kV | 60 | 75 |
| | | – across the isolating distance | | | kV | 70 | 85 |
| Rated frequency $f_r$ | | | | | Hz | 50 | 50 |
| Rated continuous current $I_r$ [2] | | for busbar | | | A | 630 | 630 |
| | | for ring-main and cable feeders | | | A | 630 | 630 |
| | | for circuit-breaker feeders | | | A | 630 | 630 |
| 50 Hz | Rated short-time withstand current $I_k$ | for switchgear with $t_k$ = 1 s | | | up to kA | 21 | 21 |
| | | for switchgear with $t_k$ = 3 s [1] | | | up to kA | 21 | 21 |
| | Rated peak withstand current $I_p$ | | | | up to kA | 52.5 | 52.5 |
| Filling level (pressure values at 20 °C) | | Rated filling level $p_{re}$ (absolute) | | | kPa | 1.6 | 1.6 |
| | | Minimum functional level $p_{me}$ (absolute) | | | kPa | 1.5 | 1.5 |
| Ambient air temperature $T$ [3] | | Operation | standard | | °C | –25 to +55 | –25 to +55 |
| | | | on request | | °C | –40 to +70 | –40 to +70 |
| | | Storage/transport | standard | | °C | –25 to +55 | –25 to +55 |
| | | | on request | | °C | –40 to +70 | –40 to +70 |
| Degree of protection | | for gas-filled switchgear vessel | | | | IP65 | IP65 |
| | | for switchgear enclosure | | | | IP2X / IP3X [1] | IP2X / IP3X [1] |
| | | for low-voltage compartment | | | | IP3X / IP4X [1] | IP3X / IP4X [1] |
| Partition class | | | | | | PM | PM |
| Loss of service continuity category | | Feeder panels with (switch-)disconnector | | | | LSC2 | LSC2 |
| | | Billing metering panel M, cable feeder K | | | | LSC1 | LSC1 |
| Accessibility to compartments (enclosure) | | Busbar compartment | | | | Non-accessible → | |
| | | Switching-device compartment | | | | Non-accessible → | |
| | | Cable compartment | | | | | |
| | | – Feeder panels with switching device | | | | Interlock-controlled → | |
| | | – Billing metering panel M, cable feeder K | | | | Tool-based → | |
| Internal arc classification [4] (option) | | IAC A | | | | | |
| | | Accessibility FL or FLR | | | | | |
| | | Arc test current $I_A$ | | | up to kA | 21 | 21 |
| | | Test duration $t_A$ | | | s | 1 | 1 |

1) Design option
2) The rated continuous currents apply to ambient air temperatures of max. 40 °C.
The 24-hour mean value is max. 35 °C (according to IEC 62271-1)
3) Minimum and maximum permissible ambient air temperature depending on the secondary equipment used
4) Description of the design options as of page 34

**Three-position switch-disconnector**

| **Rated voltage $U_r$** | | | **kV** | **7.2** | **12** |
|---|---|---|---|---|---|
| General-purpose switch function | Rated mainly active load breaking current $I_{load}$ | | A | 630 | 630 |
| | Rated short-circuit making current $I_{ma}$ | 50 Hz | up to kA | 52.5 | 52.5 |
| | Electrical endurance | | Class | E3 | E3 |
| | Number of electrical operating cycles with $I_{load}$ | | n | 100 | 100 |
| | Number of short-circuit making operations with $I_{ma}$ | | n | 5 | 5 |
| | Capacitive switching | | Class | C2 | C2 |
| | Mechanical endurance | | Class | M1 | M1 |
| | Number of mechanical operating cycles | | n | 1000 | 1000 |
| Disconnector function | Mechanical endurance | | Class | M0 | M0 |
| | Number of mechanical operating cycles | | n | 1000 | 1000 |
| Make-proof earthing switch function | Rated short-circuit making current $I_{ma}$ | 50 Hz | up to kA | 52.5 | 52.5 |
| | Electrical endurance | | Class | E2 | E2 |
| | Number of short-circuit making operations with $I_{ma}$ | | n | 5 | 5 |
| | Mechanical endurance | | Class | M0 | M0 |
| | Number of mechanical operating cycles | | n | 1000 | 1000 |

**Vacuum circuit-breaker with three-position disconnector**

| **Rated voltage $U_r$** | | | **kV** | **7.2** | **12** |
|---|---|---|---|---|---|
| Circuit-breaker type 2 function | Rated operating sequence | | | O – 3 min – CO – 3 min – CO | |
| | Rated short-circuit breaking current $I_{sc}$ | | up to kA | 21 | 21 |
| | Electrical endurance | | Class | E2 | E2 |
| | Number of short-circuit breaking operations with $I_{sc}$ | | n | up to 20 | up to 20 |
| | Capacitive switching | | Class | C2 | C2 |
| | Switching of cable systems | | Class | S1 | S1 |
| | Mechanical endurance | | Class | M1 | M1 |
| | Number of mechanical operating cycles | | n | 2000 | 2000 |
| Disconnector function | Mechanical endurance | | Class | M0 | M0 |
| | Number of mechanical operating cycles | | n | 1000 | 1000 |
| Make-proof earthing switch function | Rated short-circuit making current $I_{ma}$ | 50 Hz | up to kA | 52.5 | 52.5 |
| | Electrical endurance | | Class | E2 | E2 |
| | Number of short-circuit making operations with $I_{ma}$ | | n | 5 | 5 |
| | Mechanical endurance | | Class | M0 | M0 |
| | Number of mechanical operating cycles | | n | 1000 | 1000 |

# Product range

Individual panels

Three-position disconnector

Vacuum circuit-breaker

Three-position switch-disconnector

Capacitive voltage detecting system

Surge arrester or limiter

Cable-type current transformer

Voltage transformer

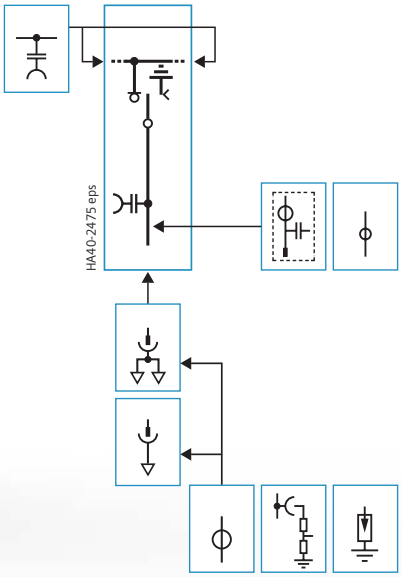
Voltage sensor

Current sensor

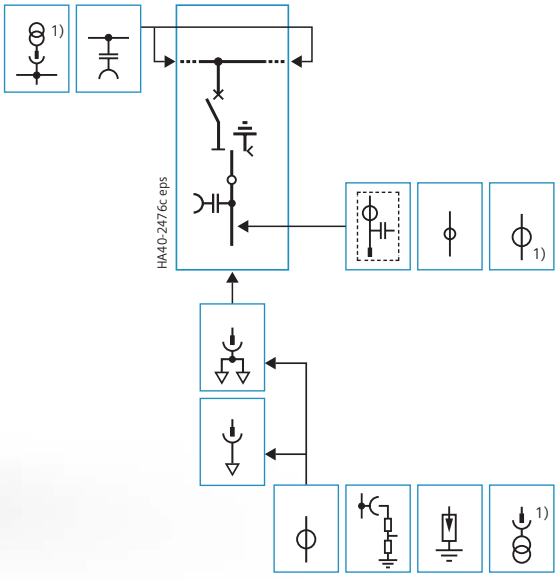
Cable connection with outside cone (not included in scope of supply)

SIBushing (integrated measurement of current, voltage, and temperature)

## Ring-main feeder (R)

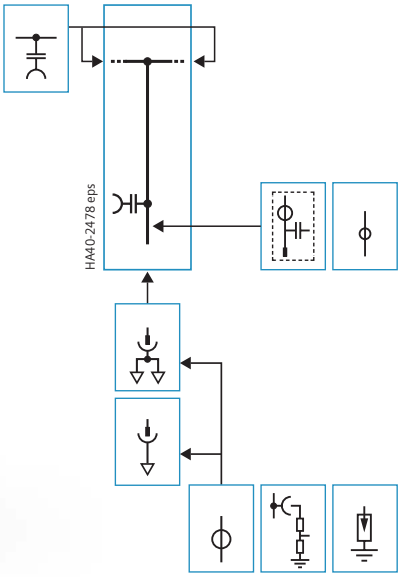

## Circuit-breaker feeder (L)


1) Only for panels with a width of 500 mm

All dimensions in mm.

## Cable feeder (K)


Capacitive voltage detecting system

Surge arrester or limiter

Cable-type current transformer

Voltage sensor

Current sensor

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

SIBushing (integrated measurement of current, voltage, and temperature)

All dimensions in mm.

# Product range

Air-insulated billing metering panels type M, 840 mm wide

Current transformer, cast-resin insulated

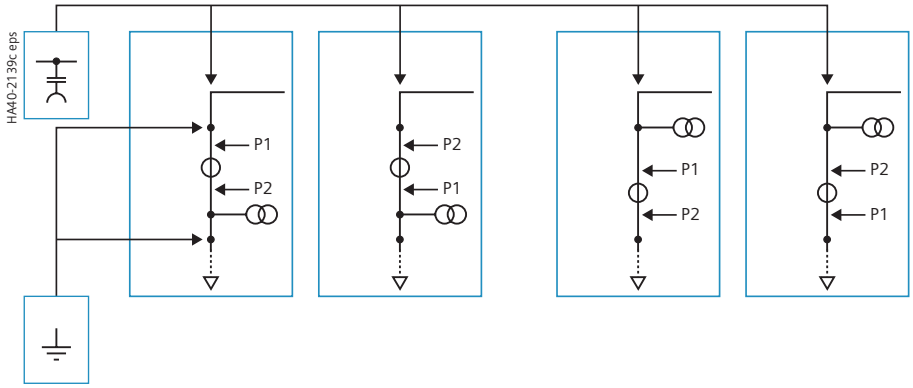
Voltage transformer, cast-resin insulated

Capacitive voltage detecting system

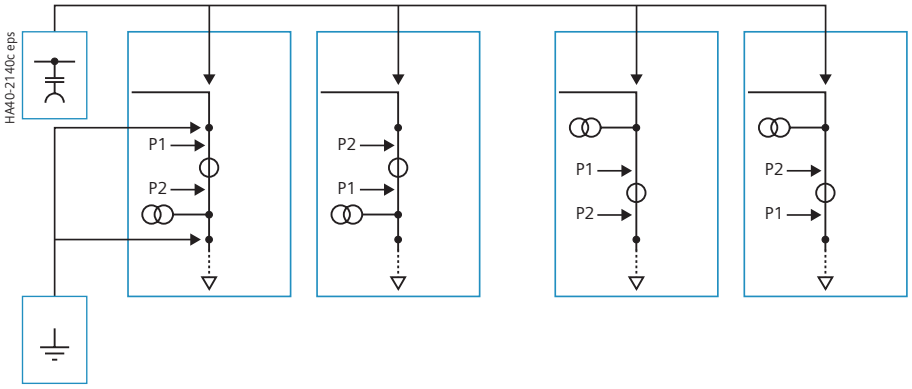
Fixed earthing points for busbar earthing

P1 and P2 are terminal designations of the current transformer

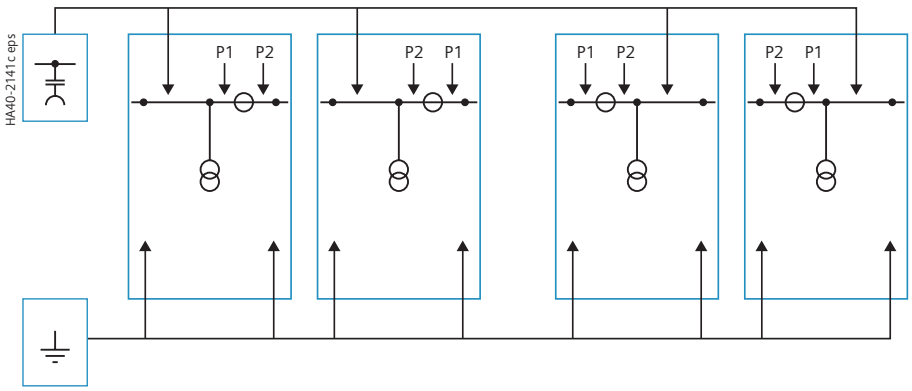
## Billing metering panels with cable connection on the left



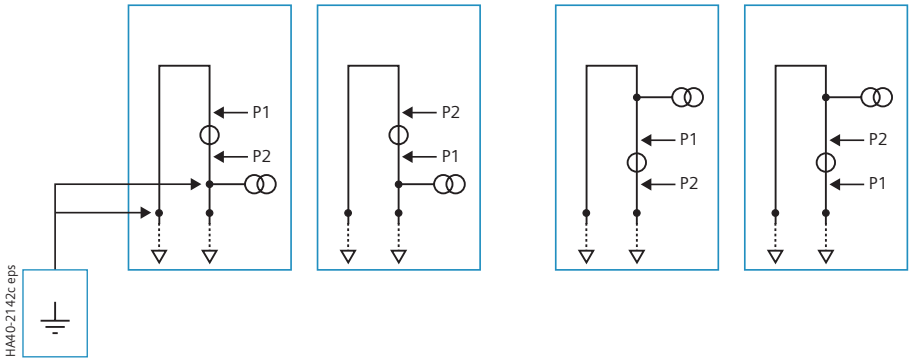

## Billing metering panels with cable connection on the right



## 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

# Product range

Panel blocks

Three-position disconnector

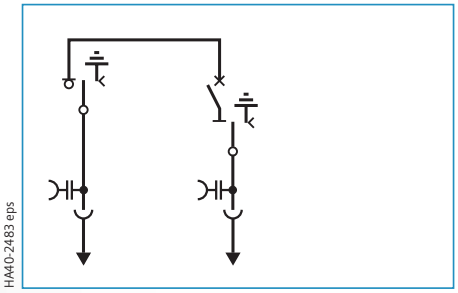
Vacuum circuit-breaker

Three-position switch-disconnector

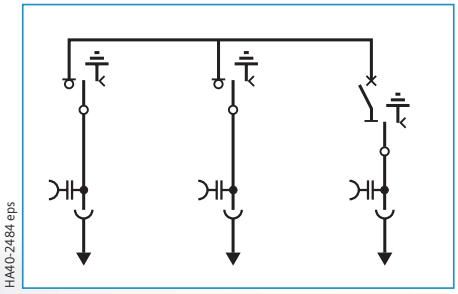
Capacitive voltage detecting system

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

## RL 1 ring-main feeder, 1 circuit-breaker feeder

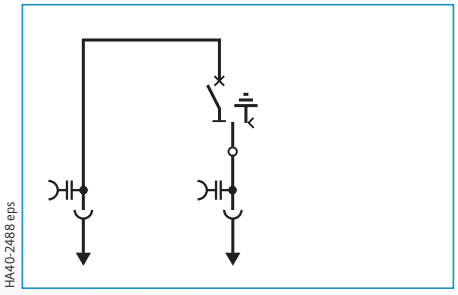




## RRL 2 ring-main feeders, 1 circuit-breaker feeder

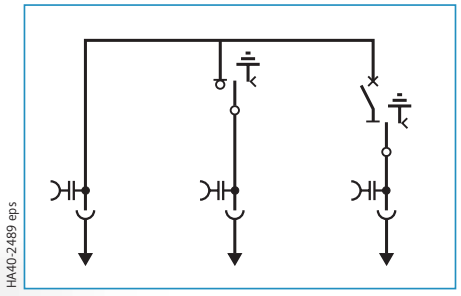




All dimensions in mm.

## KL 1 cable feeder, 1 circuit-breaker feeder


## KRL 1 cable feeder, 1 ring-main feeder, 1 circuit-breaker feeder


Three-position disconnector

Vacuum circuit-breaker

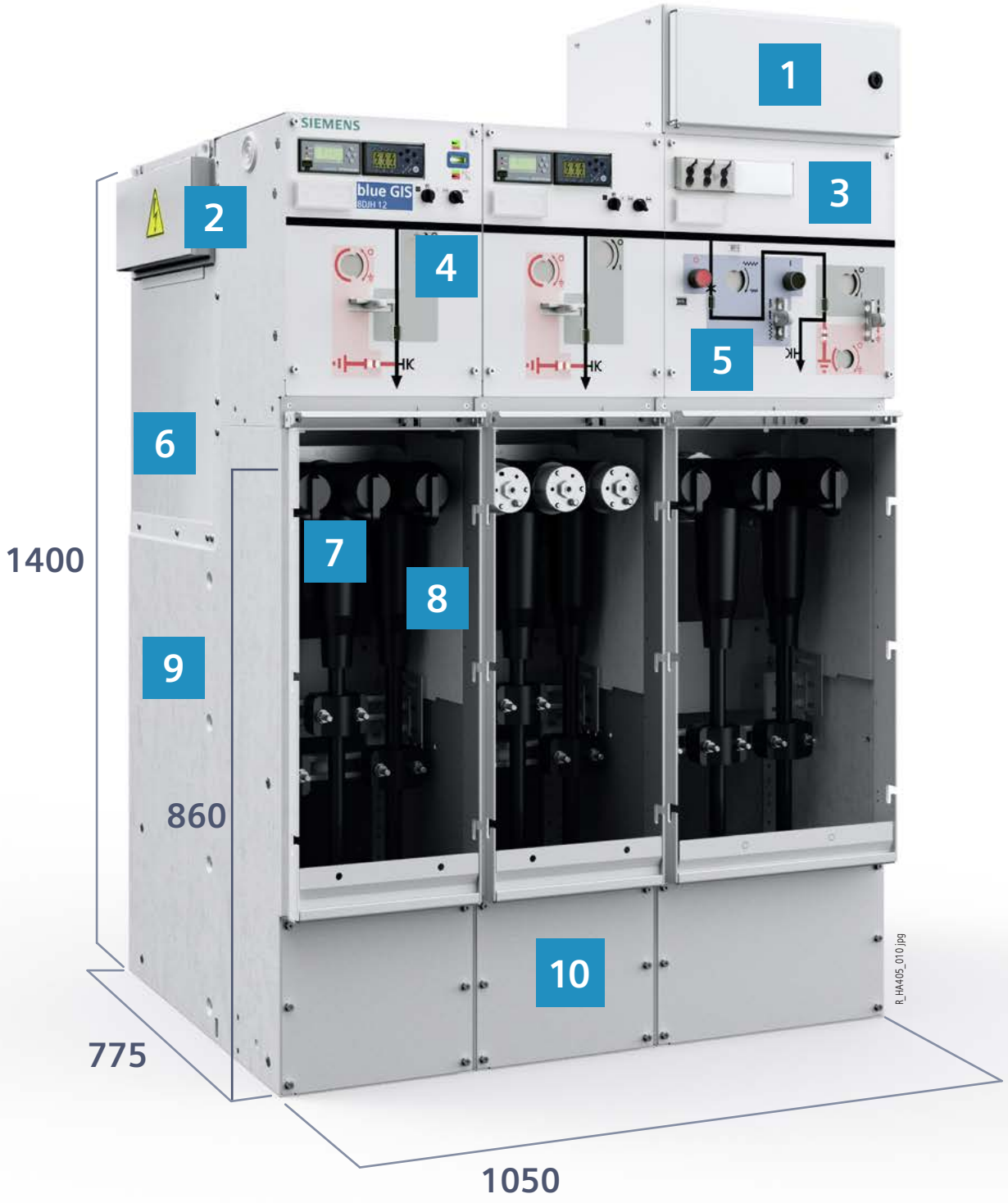
Three-position switch-disconnector

Capacitive voltage detecting system

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

All dimensions in mm.

# Design
Overview



### 1 Low-voltage compartment
- Low-voltage compartments (option) in different heights of 200 mm, 400 mm, 600 mm or 900 mm for customer-specific secondary equipment

### 2 Busbar extension, modularity
- Busbar extension as an ordering option
- Plug-in unit consisting of contact coupling and screened silicone coupling
- Insensitive to pollution and condensation
- Switchgear installation, extension, or panel replacement without gas work

### 3 Indicators
- Voltage detecting systems, short-circuit/earth-fault indicators, and transformer monitors from various manufacturers

### 4 Three-position switch-disconnector
- Switching functions as general-purpose switch-disconnector according to IEC 62271-103 and IEC 62271-102
- Designed as a three-position switch incorporating the functions of a switch-disconnector and a make-proof earthing switch
- Switch positions: CLOSED – OPEN – EARTHED
- Manual operating mechanism, optionally motor operating mechanism

### 5 Vacuum circuit-breaker
- Consisting of a vacuum switching unit according to IEC/EN 62271-100 with an integrated three-position disconnector according to IEC/EN 62271-102 and associated operating mechanisms
- Manual operating mechanism, optionally motor operating mechanism
- Options: Closing solenoid, shunt release, c.t.-operated release, low-energy magnetic release, undervoltage release, circuit-breaker tripping signal, varistor module, position switch, and operations counter

### 6 Enclosure
- Hermetically tight, welded switchgear vessel made of stainless steel
- Enclosure made of sendzimir-galvanized sheet steel, switchgear front powder-coated

### 7 SIBushing
- Outside-cone bushing type C with integrated measurement of current, voltage and temperature

### 8 Cable compartment
- Bushings according to DIN EN 50181 with outside cone and bolted connection M16 as interface type C (standard in cable, ring-main, and circuit-breaker feeders) or with outside cone and plug-in contact as interface type A (standard in transformer feeders)
- Adjustable cable bracket with C-rail, optionally with plastic cable clamps pre-assembled at the factory

**Connection of:**
- Cable elbow plugs or cable T-plugs
- Thermoplastic-insulated cables (1- and 3-core cables)
- Ring-core current transformers according to IEC 61869-1 and -2, around the cables
- Current sensors according to IEC 61869-10, around the cable plugs or around the cables
- Voltage sensors (resistor divider) according to IEC 61869-11, mounted on the cable plugs
- Surge arresters

### 9 Dimension options
- Switchgear heights 1200 mm, 1400 mm
- Deep cable compartment cover in 105 mm and 250 mm

### 10 Pressure relief
- Pressure relief downwards (up to 21 kA/1 s)
- To the rear and upwards with duct (up to 16 kA/1 s)
- To the rear and upwards with base and duct (up to 21 kA/1 s)

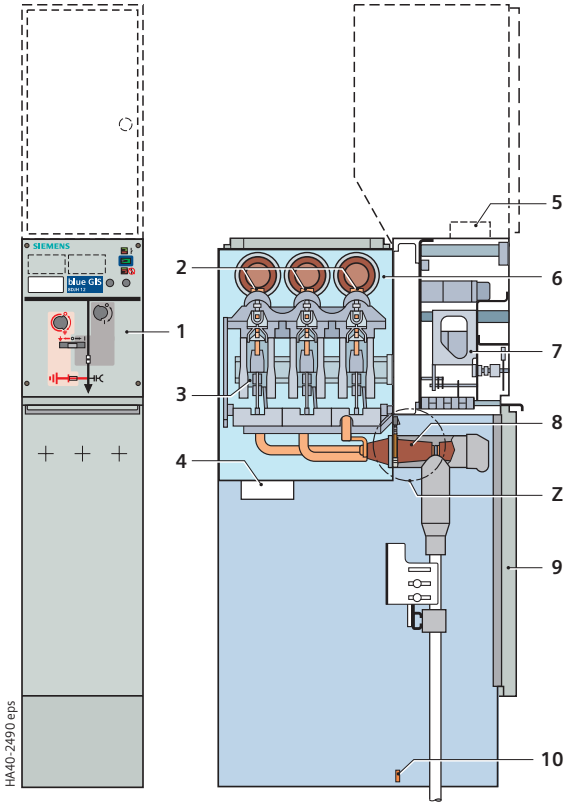
Note: More information on SIBushing, current sensor, voltage sensor can be found in the chapter “Digitalization, condition monitoring” on page 8.

# Design

Panel design (examples)

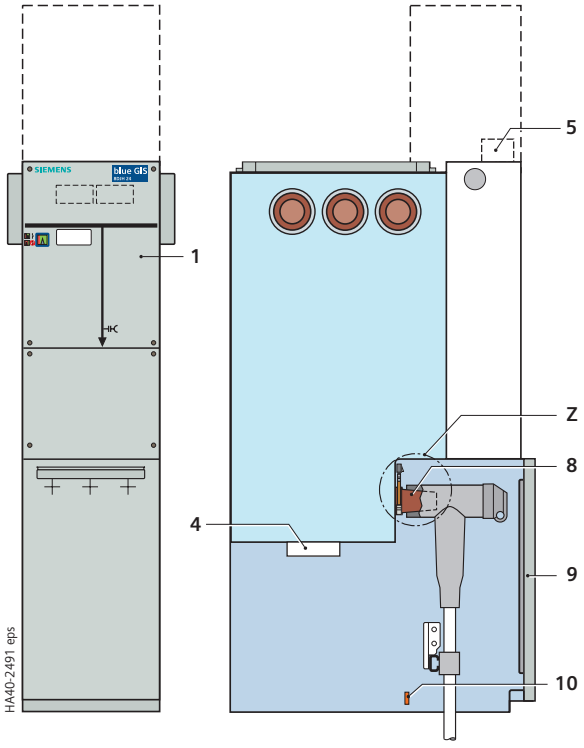
## Ring-main feeder

**Type R** Section



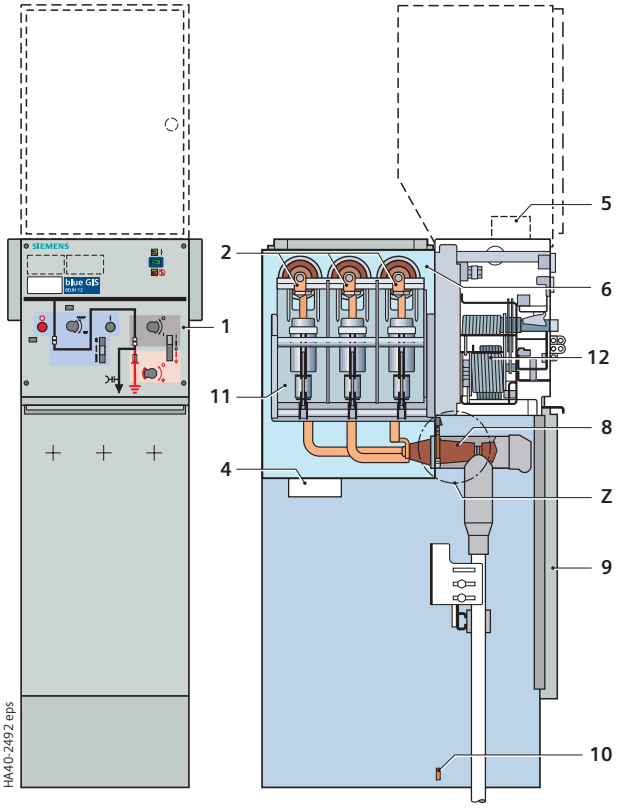

## Cable feeder

**Type K** Section

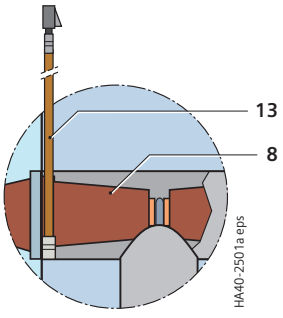



## Circuit-breaker feeder

**Type L** (Type 2) Section



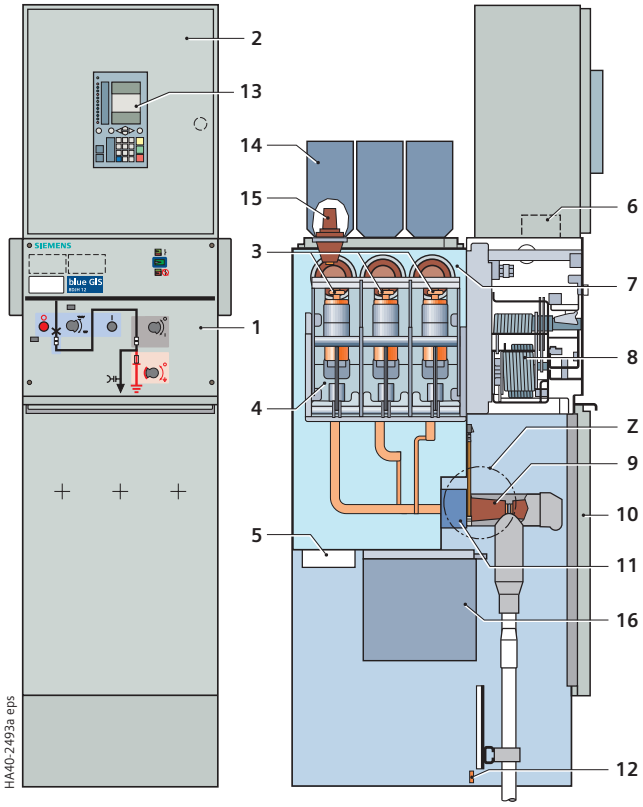

**Detail Z**



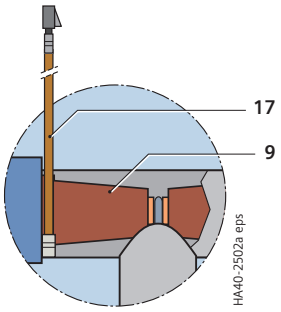

1 Control board
2 Busbar arrangement
3 Three-position switch-disconnector
4 Pressure relief device
5 Wiring duct, removable, for protection cables and/or bus wires
6 Switchgear vessel, filled with gas
7 Operating mechanism of switching device
8 Bushing for cable plug with bolted contact (M16), optionally as SIBushing (detail Z)
9 Cable compartment cover
10 Earthing busbar with earthing connection (design option)
11 Vacuum circuit-breaker
12 Circuit-breaker operating mechanism, operating mechanism for three-position disconnector
13 Connection of SIBushing

## Circuit-breaker feeder

**Type L(500)** (Type 2) Section




**Detail Z**




1 Control board
2 Low-voltage compartment (standard)
3 Busbar arrangement
4 Vacuum circuit-breaker
5 Pressure relief device
6 Wiring duct, removable, for protection cables and/or bus wires
7 Switchgear vessel, filled with gas
8 Operating mechanism of switching device
9 Bushing for cable plug with bolted contact (M16), optionally as SIBushing (detail Z)
10 Cable compartment cover
11 Option: Three-phase current transformer (protection transformer)
12 Earthing busbar with earthing connection (design option)
13 Option: SIPROTEC bay controller
14 Option: Plug-in voltage transformer 4MT3 on the busbar
15 Bushing for connection of plug-in voltage transformers
16 Option: Plug-in voltage transformer 4MT3 at the cable connection and voltage transformer earthing device
17 Connection of SIBushing

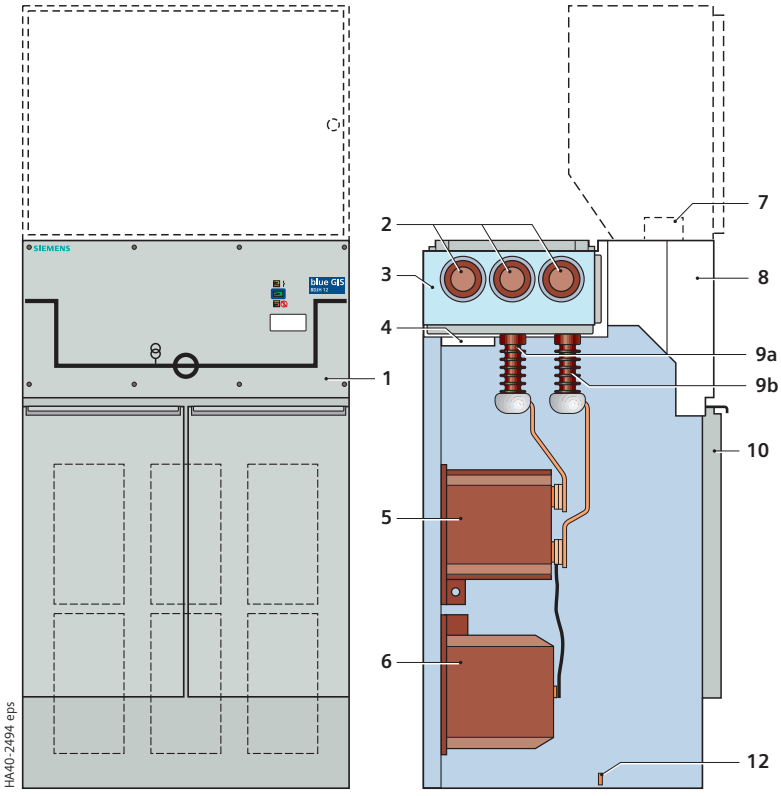
# Design

Panel design (examples)

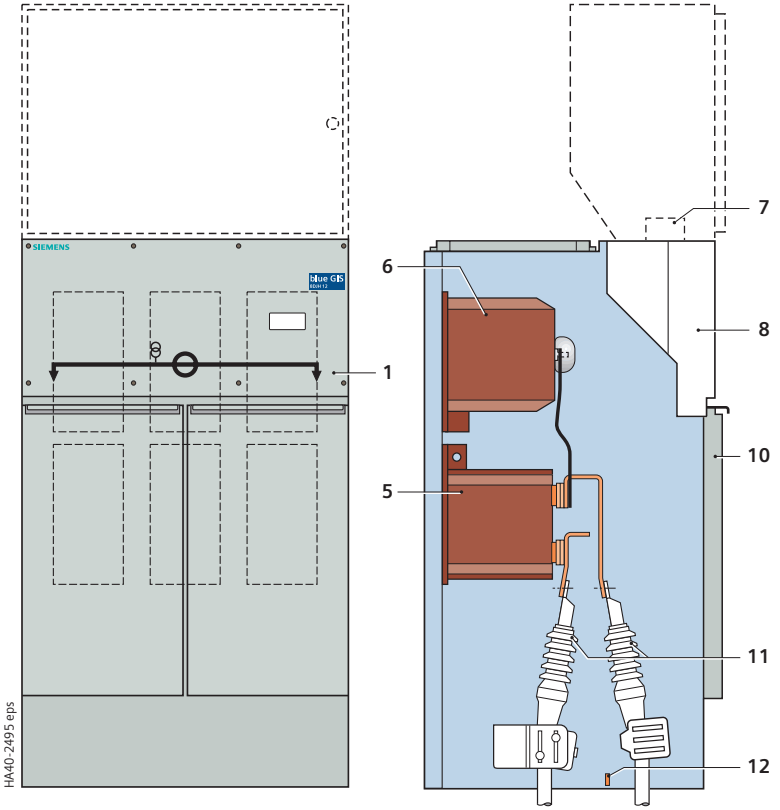
## Billing metering panel

**Type M**, air-insulated

Section



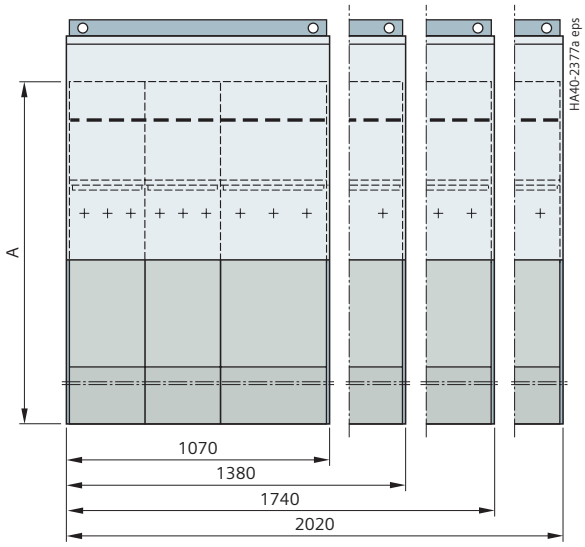

Connection: busbar – busbar



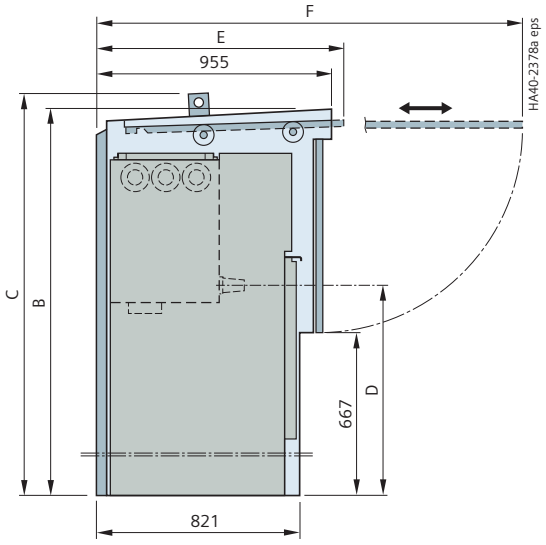

Connection: cable – cable

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 cables and/or bus wires
8 Niche for customer-side low-voltage equipment, screwed cover
9 Bushings for connection of transformer bars, connected with busbar extension on the right **9a,** and on the left **9b**
10 Instrument transformer compartment cover
11 Cable connection
12 Earthing busbar with earthing connection

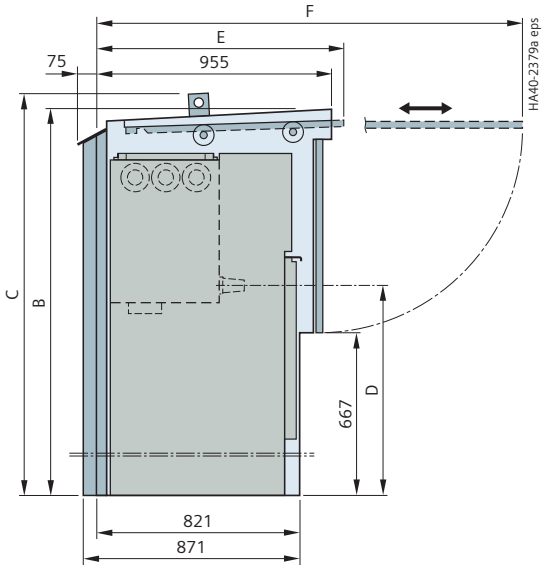
### Outdoor enclosure with pressure relief downwards or to the rear




### Outdoor enclosure with pressure relief downwards or to the rear




### Outdoor enclosure with pressure relief upwards





**Outdoor enclosure**
(front open)


**Outdoor enclosure**
(front closed)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Switchgear height | without low-voltage compartment | A | 1200 | | | | 1400 | | |
| | with low-voltage compartment | A | – | 1400 | 1600 | 1800 | – | | |
| Low-voltage compartment | | – | – | 200 | 400 | 600 | – | 1600 | 1800 |
| Enclosure height | without crane profile | B | 1575 | 1575 | 1775 | 1975 | 1575 | 1775 | 1975 |
| | with crane profile (removable) | C | 1640 | 1640 | 1840 | 2040 | 1640 | 1840 | 2040 |
| Cable connection | Typical R, L | D | 660 | 660 | 660 | 660 | 860 | 860 | 860 |
| Enclosure depth (roof level, without pressure relief duct) | Door open | E | 1000 | 1000 | 1200 | 1400 | 1000 | 1200 | 1400 |
| | Door while opening/closing | F | 1725 | 1725 | 1925 | 2125 | 1725 | 1925 | 2125 |

# Components

Busbar extension, modularity

**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 without gas work.

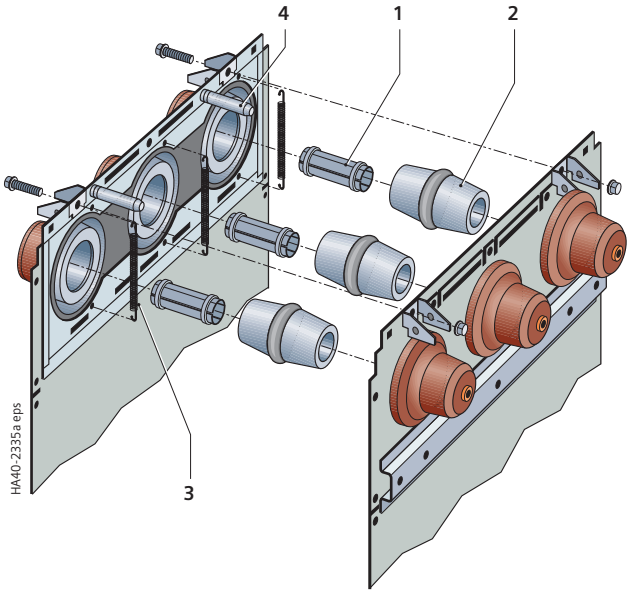
Every panel block and every individual panel is optionally available with busbar extension on the right, on the left, or on both sides. This offers a high flexibility for the creation of switchgear configurations whose functional units can be lined up in any order. Local installation and lining up is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

Lining up takes place as follows:

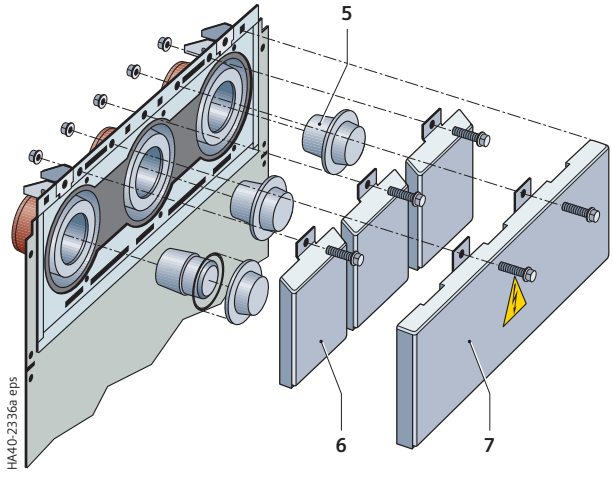
- By the busbar couplings on the medium-voltage side. Tolerances between adjacent panels are compensated by spherical fixed contacts and the movable contact coupling with degrees of freedom in all axis directions.
- By safe dielectric sealing with screened silicone couplings that are externally earthed 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 for contact pieces and silicone couplings.

Switchgear installation, extension, or the 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
- 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.

Connection of
- Thermoplastic-insulated cables (1- or 3-core cables) via cable elbow plug or cable T-plug
- Paper-insulated mass-impregnated cables via customary adapters.

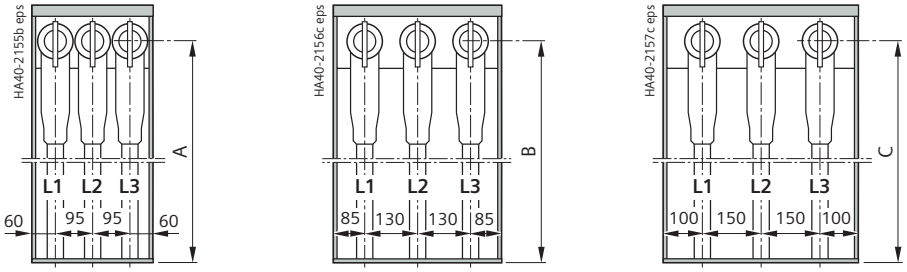
Option
- Mounted cable clamps on cable bracket
- Connection of two 1-core cables per phase
- Deep cable compartment cover for a larger available mounting depth (possibly required depending on the plug or arrester combinations).

### Cable plugs
- Numerous cable plug types from different manufacturers can be used
- Screened cable plugs (with conductive, earthed layer) particularly suitable, even in harsh ambient conditions (e.g. pollution, humidity, high site altitude)
- Use of insulated cable plugs (without conductive layer) on request.

### Surge arresters
- Connected directly at the cable T-plug
- Compatible arrester types from the cable manufacturers' product range can be used
- 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.

### Surge limiters
- Connected directly at the cable T-plug
- Suitable cable plug / limiter combinations on request
- Surge limiters recommended when motors with starting currents < 600 A are connected.

### Cable compartment

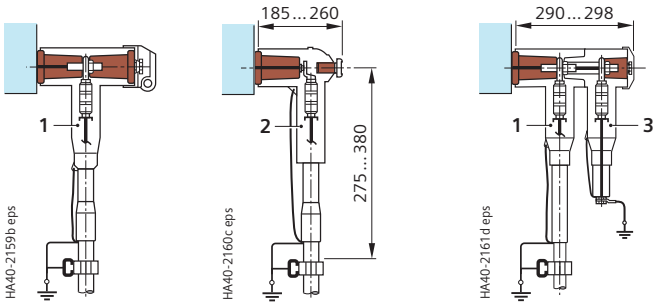



Panel width 310 mm | Panel width 430 mm | Panel width 500 mm

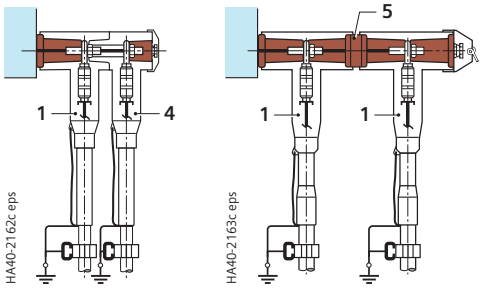
| | Switchgear height without low-voltage compartment [1] | | 1200 | 1400 without absorber base frame | 1400 with absorber base frame |
|---|---|---|---|---|---|
| Panel width 310 mm | Typical K, R | A | 660 | 860 | 1160 |
| | Typical R | | – | 200 | 500 |
| Panel width 430 mm | Typical L | B | 660 | 860 | 1160 |
| Panel width 500 mm | Typical L(500) | C | 510 | 710 | 1010 |

1) Option: With low-voltage compartment

### Connection options




Single cable




Double cable

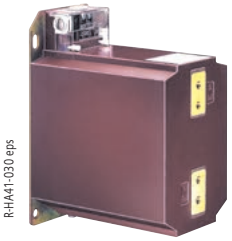
**1** Cable T-plug
**2** Cable elbow plug
**3** Surge arrester
**4** Coupling T-plug
**5** Screw-type coupling insert

# Components

Current transformers, voltage transformers

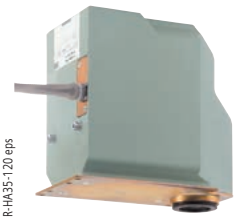
## Current transformers according to IEC/EN 61869-1 and -2




| Type | Cable-type current transformers 4MC7033 and 4MC7031 (1-pole) | Three-phase current transformer 4MC63 (3-pole) | Cable-type current transformer 4MC7032 (1-pole) | Block-type current transformer 4MA7 (1-pole) |
|---|---|---|---|---|
| Features | • Ring-core current transformer<br>• Inductive type<br>• Enclosure free of dielectric stress<br>• Insulation class E<br>• Secondary connection by means of cast-in wires or screw-type terminals (for 4MC7031) | | | • Dimensions according to DIN 42600-8 (narrow design)<br>• Inductive type<br>• Cast-resin insulated<br>• Insulation class E<br>• Secondary connection by means of screw-type terminals |
| Installation | • As current transformer at the feeder (for a panel width of 430 mm and 500 mm, for 4MC7031 also 310 mm): Below the switchgear vessel, on current transformer mounting plates in the cable compartment, around the cables<br>• Installation on the cables on site<br>Note: Depending on the design option of the panel and the overall height of the current transformer, the current transformers may protrude from the cable compartment downwards | • As current transformer at the feeder (for a panel width of 500 mm): Below the switchgear vessel, around the feeder bushings in the cable compartment<br>• Factory-assembled | • As current transformer at the busbar: Below the switchgear vessel, around the screened busbars that are led out per section (option) in the instrument transformer compartment, factory-assembled<br>• As current transformer at the feeder (for a panel width of 310 mm): Below the switchgear vessel, on current transformer mounting plates in the cable compartment, around the cables; installation on the cables on site<br>Note: Depending on the design option of the panel and the overall height of the current transformer, the current transformers may protrude from the cable compartment downwards | • In the air-insulated metering panel<br>• Factory-assembled<br>• Option: Installation on site |

## Voltage transformers according to IEC/EN 61869-1 and -3





| Type | 4MT3 (1-pole) | 4MR (1-pole or 2-pole) |
|---|---|---|
| Features | • Plug-in voltage transformer for outside-cone bushing type A<br>• Inductive type<br>• Enclosure metal-coated or metal-enclosed (option) and earthed<br>• Insulation class E<br>• Secondary connection by means of system plug | • Dimensions according to DIN 42600-9 (narrow design)<br>• Inductive type<br>• Cast-resin insulated<br>• Insulation class E<br>• Secondary connection by means of screw-type terminals |
| Installation | • As voltage transformer at the busbar or in the busbar voltage metering panel M(430): Above the switchgear vessel at separate outside-cone bushings<br>• As voltage transformer at the feeder: Below the switchgear vessel, in the cable compartment, on separate outside-cone bushings<br>• Factory-assembled | • In the air-insulated metering panel<br>• Factory-assembled<br>• Option: Installation on site |

### 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. Suitable secondary devices with low-signal inputs can process the sensor signal directly.

| | | | | |
|---|---|---|---|---|
| | R_HA40-147.tif  | R_HA40-152.tif  | R-HA40-148.tif  | R_HA40-151.tif  |
| **Type** | **Ring-core current sensor SMCS-JW 1001** | **Ring-core current sensor SMCS/T-JW 1002, divisible** | **Three-phase ring-core current sensor SMCS3-JW1004, optionally with integrated earth-fault detection sensor** | **Ring-core current sensor GAE120/SENS-JW 1003 for earth-fault detection, divisible** |
| Features | Example for available secondary devices that can be connected:<br>• SICAM FCM<br>• 7SJ81 (SIPROTEC Compact)<br>• 7SY82 | | | |
| Installation | • As current sensor at the feeder: Below the switchgear vessel, in the cable compartment, around the cables or cable plugs<br>• Installation on the cables or cable plugs on site | • As current sensor at the feeder (particularly for retrofitting): Below the switchgear vessel, in the cable compartment, around the cables<br>• Installation on the cables on site | • As current sensor at the feeder (for a panel width of 310 mm): Below the switchgear vessel, around the feeder bushings in the cable compartment<br>• Factory-assembled | • As summation current sensor at the feeder: Below the switchgear vessel, in the cable compartment, around the cables<br>• Installation on the cables on site |

### Voltage sensors (make Zelisko)

The voltage sensors are resistor dividers that provide an output signal of 3.25 V / √3 at the rated primary voltage.
Suitable secondary devices with low-signal inputs can process the sensor signal directly.

| | R_HA40-153.tif  | R-HA3541-194.tif  |
|---|---|---|
| **Type** | **Voltage sensor SMVS-UW1001** | **Voltage sensor SMVS-UW1002** |
| Features | Example for available secondary devices that can be connected:<br>• SICAM FCM<br>• 7SJ81 (SIPROTEC Compact)<br>• 7SY82 | |
| Installation | • As voltage sensor at the feeder: Below the switchgear vessel, in the cable compartment, mounted on the cable plugs<br>• Installation on the cable plugs on site<br>Note: Voltage sensors of different design options can be selected, matching with the corresponding cable plug type | |

# Components
SIBushing

### SIBushing

As an alternative to the conventional cable connection bushings, the bushing type SIBushing from Siemens is available for cable, ring-main and circuit-breaker feeders. It delivers current and voltage values in low-signal technology, as well as values for temperature measurement directly from the cable connection to modern protection devices and indicators.


Type C1 630 A

| Type | | SIBushing |
|---|---|---|
| Panel types | | K, R, L |
| Cable connection | | Outside cone type C according to EN 50181, welded into the switchgear vessel |
| Voltage detecting and indicating systems | | Connection for capacitive voltage detecting and indicating systems according to IEC 62271-213 |
| Current measuring | Standard | IEC 61869-10 |
| | Sensor principle | Rogowski coil |
| | Output signal | 22.5 mV (at 50 A / 50 Hz) |
| | Class | 0.5 |
| Voltage measuring | Standard | IEC 61869-11 |
| | Sensor principle | Capacitive divider |
| | Ratio | 10000/1 |
| | Class | 0.5 |
| Temperature measuring | Sensor principle | Measuring resistor |
| | Resistor type | Pt100 |
| Features | | Examples for available secondary devices that can be connected:<br>• SICAM FCM Plus<br>• 7SY82 |

**Features**
- Separate selection possible for every panel (depending on the panel type and the extent of the secondary equipment)
- Available overall heights 200 mm, 400 mm, 600 mm and 900 mm
- Mounted on the panel. Installation/removal possible on site
- Customer-specific equipping with protection, control, measuring and metering devices
- Door with hinge on the left (standard for heights of 400 mm, 600 mm and 900 mm)
- Door powder-coated (same color as the switchgear front), with hinge on the left, optionally with hinge on the right, closure with rotary lock
  – Option: (for an overall height of 200 mm) Bolted front cover for narrow spaces, e.g. in substations without control aisle, powder-coated (same color as the switchgear front).

**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 niche**
- Integrated in the panel front of the billing metering panels type M
- With bolted front cover
- For accommodation of options, e.g.:
  – Voltage transformer m.c.b.s
  – Small distribution fuse-box and fuse-links type DIAZED or NEOZED.

**Wiring duct**
- Metallic duct, mounted on the panel
- Overall height 60 mm
- For panel-overlapping wiring
- Can be selected for panels without low-voltage compartment.

**Top cover**
- Cover made of powder-coated sheet-metal (same color as the switchgear front), mounted on the panel
- Overall height 200 mm, 400 mm, 600 mm or 900 mm
- For height adjustment of the panel front
- Can be selected for panels without low-voltage compartment.

**Low-voltage compartment** (design example)


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

**Low-voltage niche**


Low-voltage niche of a billing metering panel type M, open cover

**1** Low-voltage niche

**2** Built-in equipment (option)

# Dimensions

Room planning

### Switchgear installation

Wall-standing arrangement

– 1 row
– 2 rows (for face-to-face arrangement)

Option: Free-standing arrangement.

### Pressure relief

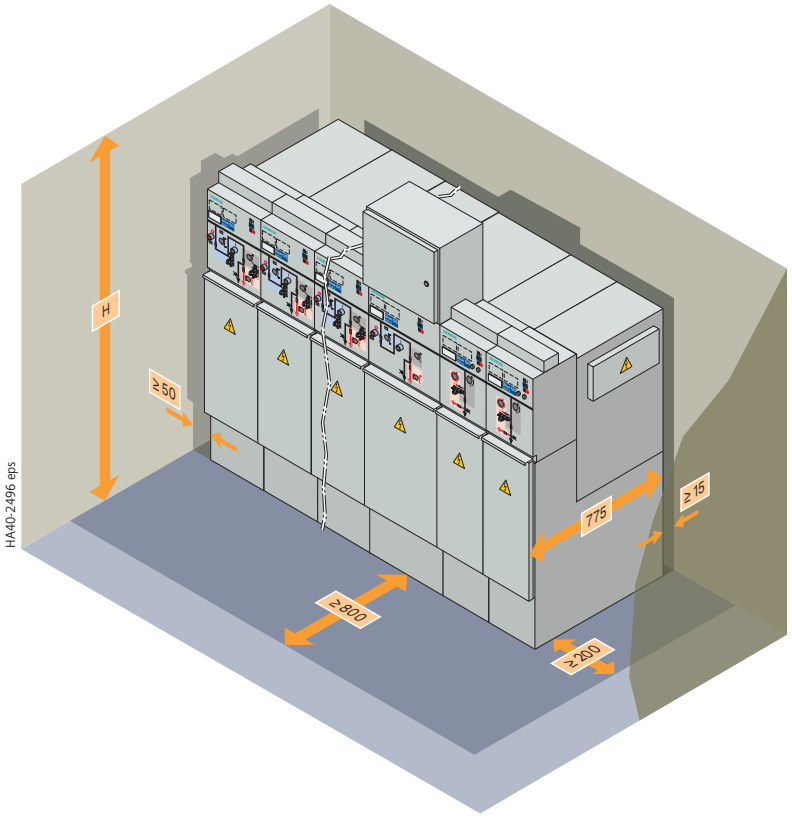
The type of pressure relief selected has an effect on the switchgear depth, and places requirements on the size of the cable basement and/or the room height. In case of pressure relief upwards, the room heights reproduced in the type test are decisive for the internal arc classification according to IEC 62271-200 (see table on page 34).

### Switchgear extension or panel replacement

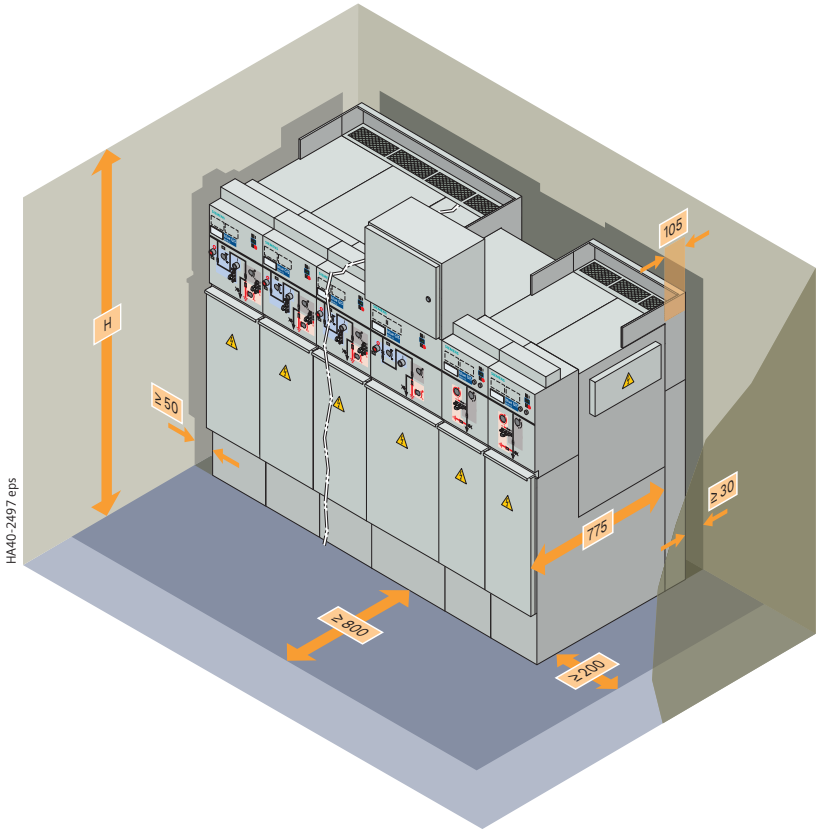
For switchgear extension or for panel replacement, a control aisle of at least 1000 mm is recommended in front of the switchgear. For panel replacement of lined up panels, there must be a wall distance of at least 200 mm on one side.

Control aisle

In front of the switchgear, a control aisle of at least 800 mm is required according to IEC 62271-200.

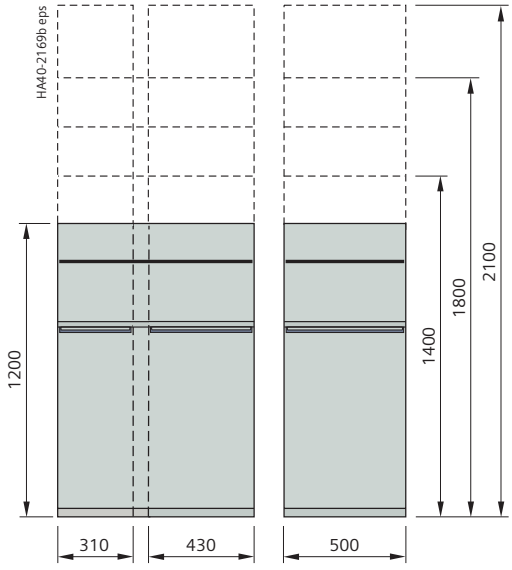



Switchgear without rear pressure relief duct

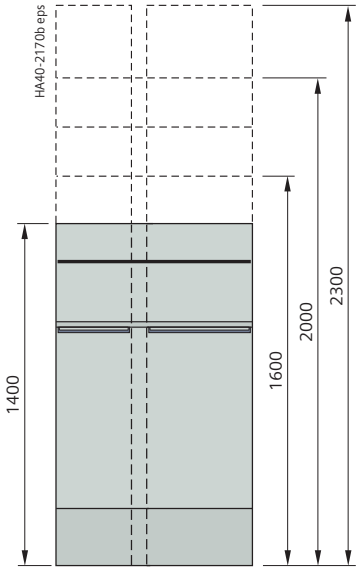



Switchgear with rear pressure relief duct

## Switchgear height




1200 mm




1400 mm

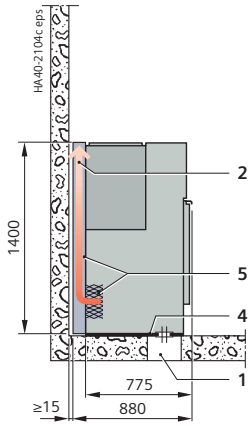
# Dimensions

Pressure relief

The following type-tested versions of the pressure relief system are available for 8DJH 12 switchgear:

- Downwards into the cable basement (for individual panels and panel blocks, internal arc classification up to IAC A FL 21 kA / 1 s or IAC A FLR 21 kA / 1 s, minimum cross-section of the cable basement according to the illustration below)
- Upwards through rear pressure relief duct (for extendable and non-extendable panel blocks, internal arc classification up to IAC A FL 16 kA / 1 s, minimum room heights according to the table below), with pressure absorber system
- Upwards through base frame and rear pressure relief duct (for individual panels and panel blocks, internal arc classification up to IAC A FL 21 kA / 1 s and IAC A FLR 21 kA / 1 s, minimum room heights according to the table below), with pressure absorber system.

**Switchgear installation with rear pressure relief duct** (option) **for panel blocks with IAC A FL or FLR up to 16 kA / 1 s**



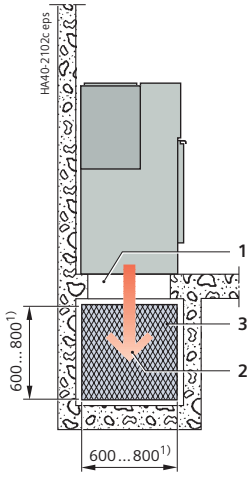

Side view

**1** Floor opening
**2** Direction of pressure relief
**3** Expanded metal (supplied by site)
**4** Floor cover (divided plate for comfortable working at the cable connection)
**5** Pressure absorber system with pressure relief duct

**Room heights for switchgear installation with rear pressure relief duct**
(design with or without base frame)

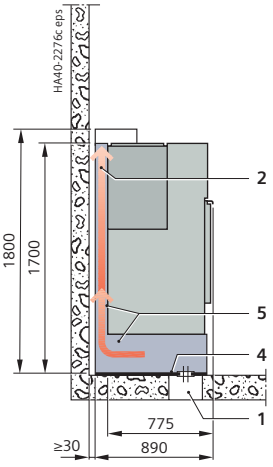
| Switchgear height | Room height |
|---|---|
| 1400 mm | ≥ 2000 mm |
| 1700, 1800 mm | ≥ 2200 mm |
| 2300 mm | ≥ 2400 mm |

**Switchgear installation with pressure relief downwards** (standard)

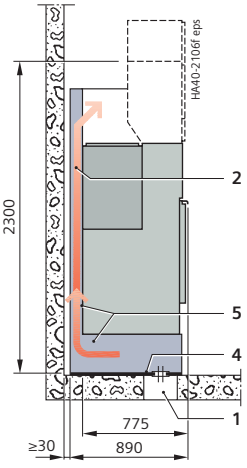



Side view

**Switchgear installation with base frame and rear pressure relief duct** (option) **for switchgear with IAC A FL or FLR up to 21 kA / 1 s**




Side view, wall-standing arrangement without metering panel




Side view, free-standing arrangement, also metering panel for wall-standing arrangement

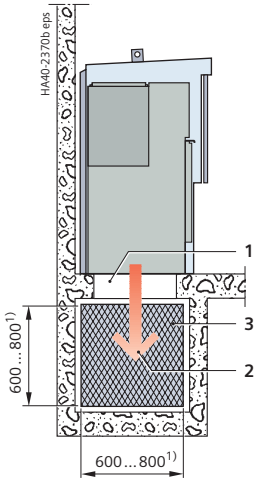
1) Total opening minimum 0.48 m²

For 8DJH 12 with outdoor enclosure (option), the direction of the pressure relief can be selected as follows:

- Downwards into the cable basement (internal arc classification up to IAC A FL or FLR 21 kA / 1 s, minimum cross-section of the cable basement according to the illustration below)
- To the rear (internal arc classification up to IAC A FL 21 kA / 1 s; for wall-standing arrangement, a rear pressure relief outlet with a minimum cross-section of 1 $m^2$ is required and must be supplied by the site)
- Upwards through rear pressure relief duct (internal arc classification up to IAC A FL or FLR 21 kA / 1 s, free space above the switchgear 600 mm as a minimum).

The dimensions for wall distances, control aisles, and cable basements correspond to those of the 8DJH 12.
The outdoor enclosure is conceived for application on company grounds.

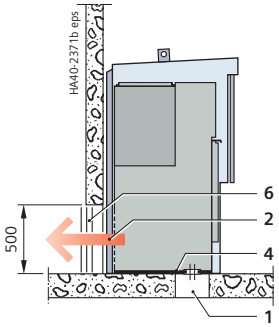
### Switchgear installation for outdoor enclosure with pressure relief downwards



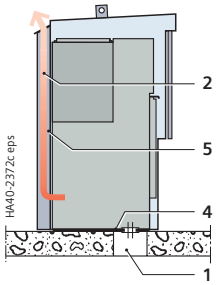

Side view

1 Floor opening
2 Direction of pressure relief
3 Expanded metal (supplied by site)
4 Floor cover (divided plate for comfortable working at the cable connection)
5 Pressure absorber system with pressure relief duct

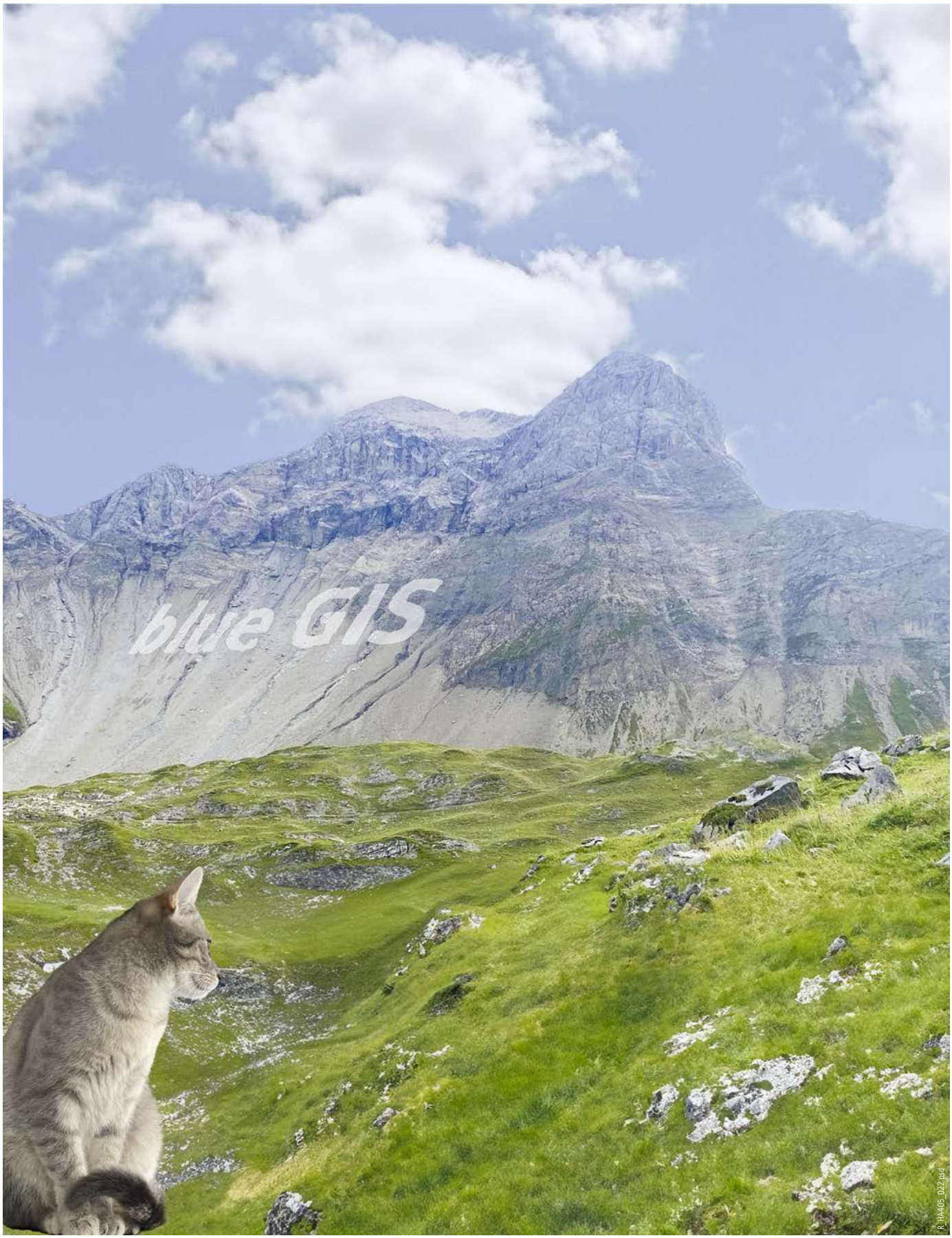
### Switchgear installation for outdoor enclosure with pressure relief to the rear or upwards through rear duct




Side view




Side view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Smart Infrastructure
Electrification & Automation
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

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