2017 Catalog

GMA

Up to 24 kV - 2500 A – 31.5 kA
Gas-insulated switchgear

Medium Voltage Distribution

schneider-electric.com

Life Is On Schneider Electric

Contents

Your requirements

Safe

Efficient

Reliable

Our solutions

- Safety is not an option. All GMA cubicles are, as standard, Internal Arc Classified AFL 25 kA or 31.5 kA for 1 s (as option AFLR)
- Mechanical and electrical interlock embedded to ensure maximum operator safety
- Fault mitigation thanks to gas and solid insulation of all MV parts

- Our Brand mark: clear guided operation with ergonomic operator interface
- Real space savings thanks to extremely compact design, e.g. 450 mm wide feeders up to 800 A
- All operations from the front, allowing installation against the wall
- Affordable

- GIS technology provides maximum service continuity: MV parts are maintenance free and not affected by environmental conditions
- No gas handling on-site during installation, extension or replacement
- Disconnectable voltage transformers for quicker commissioning and testing

Peace of Mind for your business

More than 50,000 first-generation GMA cubicles installed worldwide

PM1062S3

GMA - the perfect fit to your needs

Tradition and innovation: Schneider Electric has been developing and manufacturing primary gas insulated switchgear for more than 30 years, with an installed base of several tens of thousands of cubicles. Based on this experience, the GMA provides optimized, affordable and customized solutions to suit every need.

PM106264

Safe - Efficient - Reliable

While keeping capital and operating expenditure to a minimum, GMA satisfies customers' requirements thanks to its compact design, long service life and extremely high power availability. GMA is ready for the IoT, as it can be easily integrated in the Smart Grid, and provides flexible options for remote monitoring.

- Safety is not an option.
  All our cubicles are Internal Arc compliant to IAC AFL 1 s. as standard.
- Efficiency pushed to its limits
  with compact design to optimize room dimensions
- Reliability is our Brandmark:
  Clear operating interface, embedded mechnical interlocks & disconnectable VTs

PM106265

Overview

Overview

Field of application

GMA is the optimum solution for switching substations and transformer substations up to 24 kV

GMA gas-insulated switchgear and controlgear with vacuum circuit-breaker has been designed for the various operating requirements in public and industrial medium-voltage distribution systems.

PM106266

PM106267

PM106268

PM106269

Field of application

Power supply companies

- Transformer substations
- Switching substations
- Consumer substations
- Distributed power generation

Industry

- Oil and gas industry
- Chemical industry
- Automotive industry
- Metallurgy
- Process engineering

Infrastructure

- Airports
- Railway stations and traction power supply systems
- Tower blocks
- Open-cast mining and deep mining

Wind power and photovoltaics

- Wind turbines
- Solar power stations
- Network supply substations
- Power transformer substations

Safe

High degree of operational safety

PM103148

Maximum operator safety

- Maximum protection against accidental contact due to complete metal enclosure of all switchgear components
- The highest available operator safety is achieved by remote switchgear operation
- GMA, equipped with a digital bay controller, provides maximum operator safety for control, monitoring and complete automation of the switchgear from a remote control room and/or a central control station. The staff need not access the switchgear room, for example, for switching and monitoring processes during normal operation
- For safety reasons, the switchgear cubicle can only be operated with the enclosure closed and the operator facing the front
- As protection against operating errors, the GMA features a logically designed, continuous mechanical and electrical interlock system
- Capacitive voltage testing system for zero voltage verification
- Voltage test of the high-voltage cables via the switchgear front
- GMA has been tested for the internal arc classification IAC in accordance with IEC/EN 62271-200, taking the actual short-circuit currents into account, both with earthed neutral and in isolated medium-voltage distribution systems

High operating safety and reliability

- The live high-voltage components are located in hermetically enclosed, gas-filled compartments. The high-voltage components are designed for a constant, ideal climate during their entire service lives. Thus, they are insensitive to:
  - Dirt and dust
  - Moisture
  - Vermin
  - Harsh atmospheres
- All high-voltage components outside of the gas-filled compartment are:
  - Single-pole
  - Potential-controlled and externally grounded
  - Fully shrouded
  - Free from external ambient influences such as dust, moisture and vermin
- IP 65 protection of the gas-filled compartments with live components
- The rugged, reliable insulating gas system ensures a constant dielectric status during the switchgear's entire service life
- The term "sealed pressure system" in relation to the GMA means:
  - No inspection and no replenishing of the insulating gas required over the entire service life
  - Internal insulating gas in the gas-filled compartments prevents contact oxidation and provides protection against any switchgear fires
- Straightforward and robust drive mechanism
- Potential dielectric sources of danger are avoided, for example by the following design measures:
  - The current transformers are not subject to dielectric stress due to high voltage
  - The single-pole, isolated, inductive voltage transformers are arranged outside the gas-filled compartments within the internal-arc-tested cable connection compartment
  - The busbar voltage transformers are also factory-fitted. They are designed for arrangement within the metal-enclosed switchgear cubicles outgoing feeder compartment and thus are independent of the busbar kit assembly
  - No need to remove switchgear and controlgear components during high-voltage tests of the switchgear and controlgear and the cables (voltage transformer with disconnecting device)

DM102026

Improper contact

Vermin

Solar radiation

Dirt and dust

Harsh gas atmospheres

Safe

Occupational Health and Safety Management

The Occupational Health and Safety Management system for the development, production, distribution and servicing of GMA has been certified based on OHSAS 18001:2007.

We are committed to health

In line with our principles, Schneider Electric has undertaken to promote a program for maintaining good health which combines responsibility with economic efficiency.

- We cannot accept any risks regarding the health of our staff at work
- As a company, we aim to be a standard-bearer in terms of in-house protection of occupational health and safety
- Each area of the company strives to continuously improve in-house occupational health and safety by introducing a protection program
- Our company policy and improvements are defined uniformly worldwide, transformed into a local context and implemented
- All our members of staff and business associates must benefit from maximum adherence to occupational health and safety standards

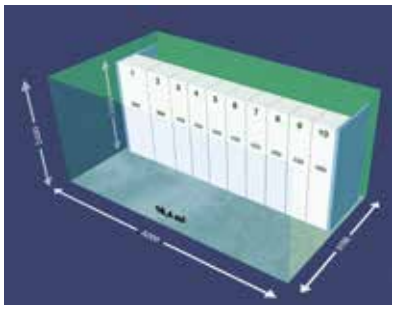
These goals are secured over the long term, verified and continuously improved by a certified environmental management system for development, production, sales and service.

Efficient

Compact and powerful

GMA is a ground-breaking switchgear and controlgear concept with high operating reliability, economic efficiency and versatility. The switchgear and controlgear ensures a high degree of reliability and safety of your medium-voltage distribution network system.

DM102.023



GMA: Smaller footprint

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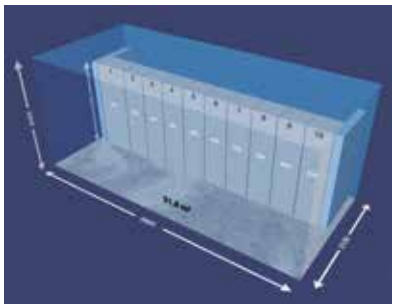

GMA: Less volume

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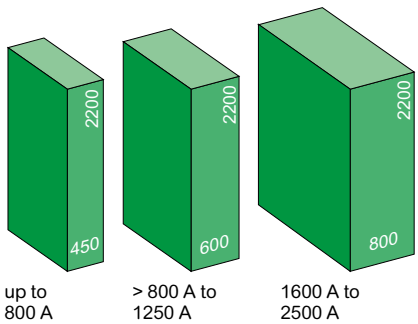


up to 800 A | > 800 A to 1250 A | 1600 A to 2500 A

Main dimensions of an outgoing switchgear cubicle

Efficient, compact and powerful

- GMA switchgear and controlgear take up 25% less floor space and 30% less volume than existing gas-insulated switchgear and controlgear in the same performance class
- Outgoing switchgear cubicles with currents up to 800 A can be designed with a module width of just 450 mm
- Incoming switchgear cubicles with currents of 1600 A to 2500 A are only 800 mm wide
- The bus sectionalizer with vacuum circuit-breakers of 1600 A to 2500 A and integrated busbar have a module width of only 1000 mm, and corresponding bus sectionalizer up to 1250 A of only 800 mm
- Switchgear cubicles with outgoing feeder rated currents of 2500 A are designed without artificial forced ventilation
- Switchgear cubicles with output currents of 1250 A with/without voltage transformers are only 600 mm wide
- Busbar currents up to 2500 A are possible for all cubicle widths and outgoing rated currents
- Existing switching rooms with old air-insulated switchgear and controlgear can be utilized efficiently via GMA.
  These rooms can normally accommodate twice the former number of conventional cubicles: thus, double the former power can be transmitted, for example, in an existing building
- Minimization of the switchgear room volume thanks to cable basements with low ceilings:
  - All cable end boxes are integrated in the GMA cubicle – also for rated currents of 1600 A to 2500 A
  - Only the bending radius of the power cables determines the height of the cable basement
- The depth of the switching room can be optimized thanks to GMA:
  - GMA switchgear and controlgear with output currents up to 1250 A (medium transmission performance) have been designed with 20% to 30% reduced depth – compared to models with output currents of 1600 to 2500 A (IAC AFL design)
- All GMA switchgear cubicles are accessible from the front

Efficient

Optimum Design throughout the life cycle

DM102.102

Schneider Electric Service is at your side during the switchgear's entire service life

Specification

We support you in the detailed definition of your projects: selection and project engineering lists, pressure calculations for the switchgear room, technical support, consultation.

Implementation

We implement and monitor local assembly and commissioning of your switchgear: design, cost optimization, guaranteed performance and reliability, commissioning, tests.

Operation

We support safe operation of your switchgear: maintenance agreement, technical support, provision of spare parts, troubleshooting and preventive maintenance, training for operation and maintenance.

Modernization

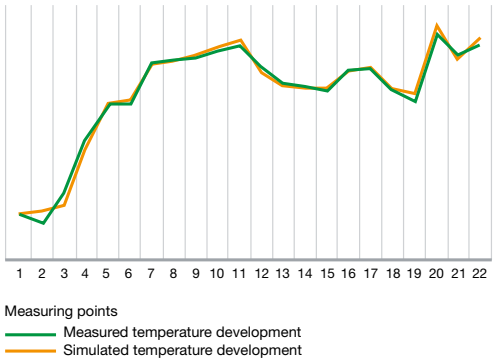
We keep your switchgear functions up to date:

inspection, diagnostics, adaptation, modification, expansion

Dismantling

We dismantle your complete switchgear at the end of its service life: disassembly, material data sheets, environmentally-compatible recycling.

DM102.103



Temperature development in GMA switchgear cubicle

Optimum design thanks to simulation

Comprehensive computer-assisted simulations support the design process and the construction of GMA.

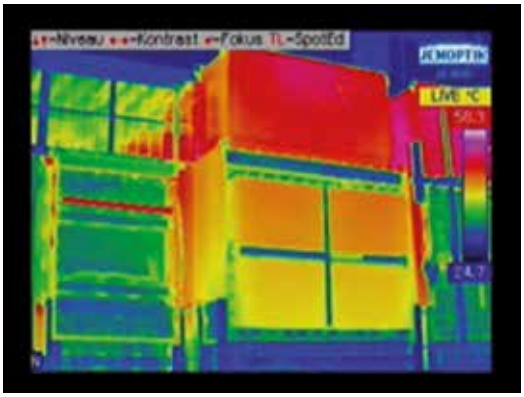
For determination of the best detailed design solution

- The temperature curves in the GMA switchgear and controlgear are simulated comprehensively using the Thermal Network Analysis (TNA) process
- The dielectric fields are calculated and optimized using computerized models
- The dynamic pressure development in the gas-insulated compartments is calculated
- The pressure relief equipment is located outside the switchgear cubicles

The computerized simulations and calculations correspond closely to the specific results of the type tests on the real objects.

The pressure load of the switchgear room in the event of internal arc faults and determination of the necessary pressure relief devices can also be defined by Schneider Electric via simulation and calculation software.

PM103.073

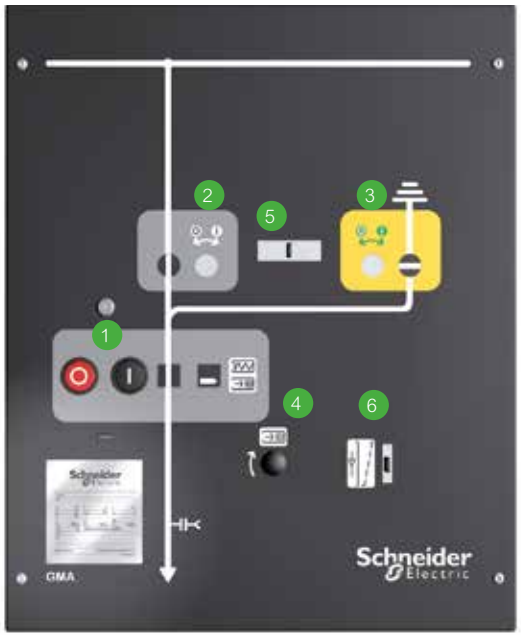


Thermography 2500 A GMA switchgear cubicle

Reliable

Best in class ergonomics - Systematic Testing

PM103.071



Control panel

1 Circuit-breaker (CB): mechanical ON/OFF buttons, position indicators, charged/released status of stored energy spring-mechanism
2 Disconnector: manual ON/OFF actuation, position indicator
3 Earthing switch: manual ON/OFF actuation, position indicator
4 Manual charging of stored energy spring-mechanism
5 Mechanical interlock system plug-in opening of disconnector and earthing switch
6 Mechanical interlock - cable compartment shutter with earthing switch position (optional)

Straightforward

- The architecture of the GMA switchgear cubicles and the arrangement of their components:
  - Is very clear
  - Minimizes project handling costs and times
  - Ensures straightforward handling during set up on site and problem-free cable connection
  - Facilitates operation
  - Ensures uncomplicated operation
  - Permits good accessibility
  - Offers step-by-step expansion and simple extension options
- "Intuitive operation" is our hallmark:
  - Optically-enhanced mechanical control panel on each GMA switchgear cubicle
  - Logical arrangement of control elements and switch position indicators within the clearly arranged mimic diagram
  - Ergonomic operating levels both regarding the mechanical control panels and the digital bay computers
  - All control elements and indicators in the control panel are mechanical, i.e. independent of the auxiliary supply
  - Integrated mechanical panel interlocks (optional in the case of digital bay computers or remote control of all switching devices)
  - Optionally padlocking provision can be provided

PM103.152

High voltage test

Safety by type tests

The electrical and mechanical ratings of the GMA switchgear and controlgear have been proven successfully by comprehensive type tests.

The type tests were performed in independent and accredited test laboratories in accordance with international norms and standards. The results are recorded in the appropriate test records and are made available on request.

Consistent and systematic checks

Each GMA functional unit undergoes a systematic routine test during production to verify conformity with the relevant norms and standards and the specified quality. To this effect, the leak-tightness of the panels is checked by an integral leakage test in order to satisfy maximum quality criteria.

The results achieved are documented and confirmed by the Quality Assurance Department in the form of a routine test record. This ensures traceability at the place of manufacture.

EcoStruxture™ ready solutions

What is EcoStruxure™?

450 000

EcoStruxure™ systems deployed since 2007 with the support of our 9 000 system integrators.

EcoStruxure™ ready

Efficient asset management

Greater efficiency with **predictive** maintenance helping to reduce downtime.

24/7 connectivity

Real-time data **everywhere anytime** to make better informed decisions.

Increased safety

Proven design and experience combined with fast **embedded arc detection** to enhance people's and equipment's safety.

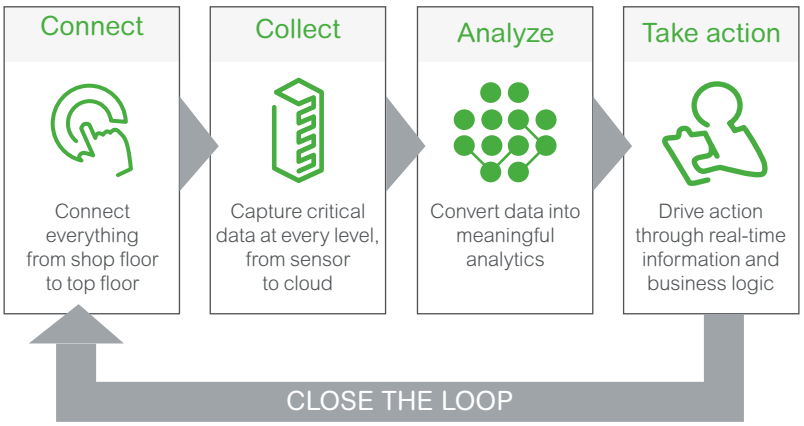
EcoStruxure™ architecture and interoperable technology platform bring together energy, automation, and software. It provides enhanced value around safety, reliability, efficiency, sustainability, and connectivity.

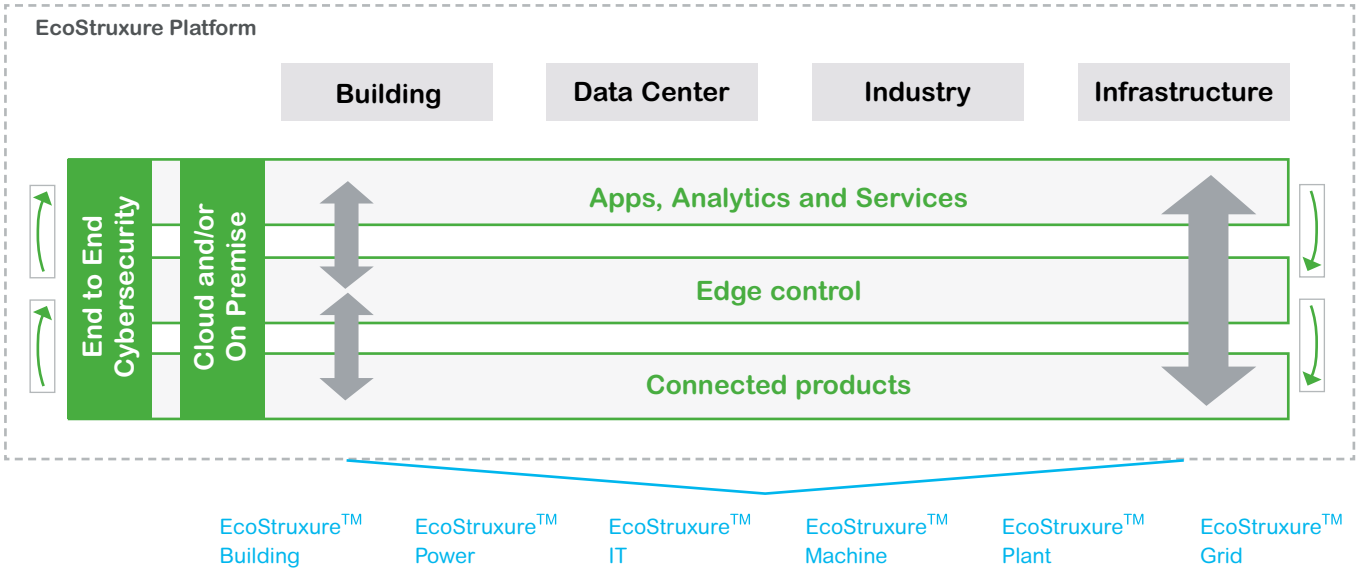
Turn data into action

EcoStruxure™ architecture lets customers maximize the value of data.

Specifically, it helps them:

- Translate data into actionable intelligence and better business decisions
- Take informed decisions to secure uptime & operational efficiency thanks to real-time control platforms
- Get visibility to their electrical distribution by measuring, collecting, aggregating and communicating data





EcoStruxure™ ready solutions

Core technologies for embedded connectivity and intelligence

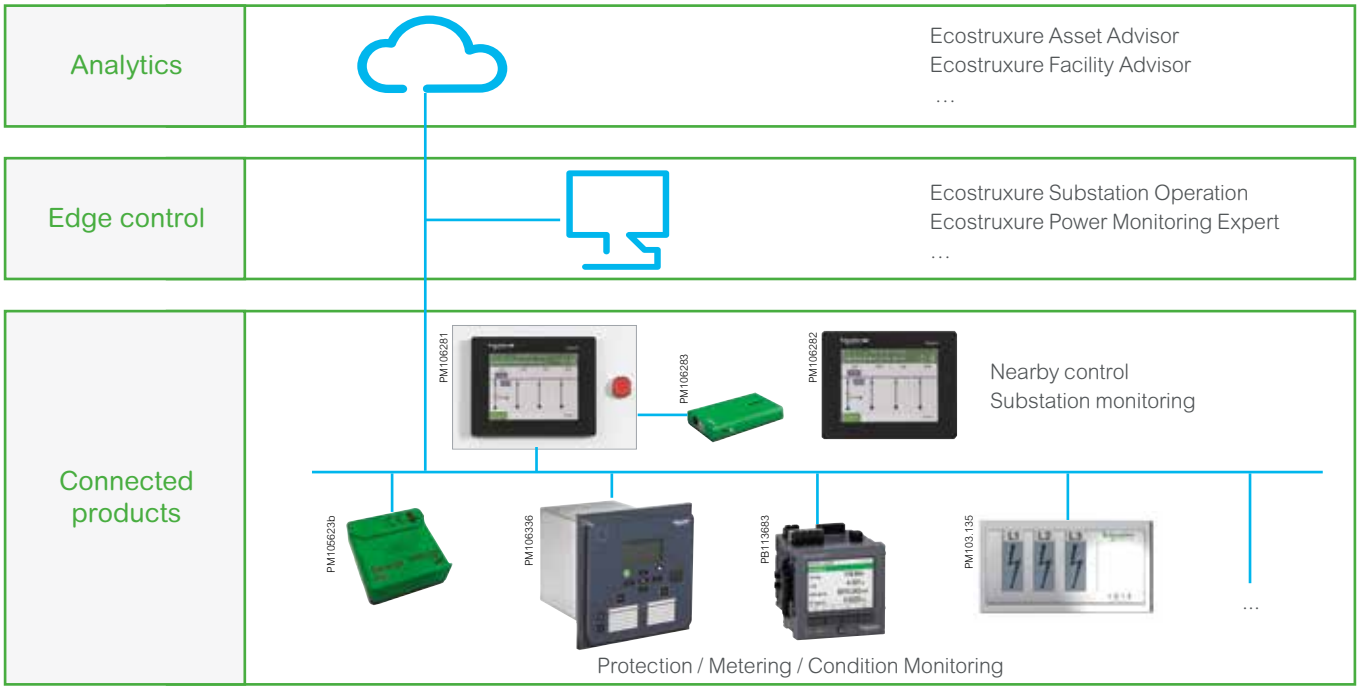
Enable nearby control, ensure safety and uptime

All the Schneider protection, metering and control devices can be connected to our Substation monitoring device.

The HMI can be installed anywhere within the substation to allow local control and monitoring, independant of any external systems.

The moniroting information and control functions can be scaled to the needs of each customer.

Optionaly the Magelis control and monitoring functions can be mirrored on a tablet through Wifi connection thanks to our Vijeo Design Air application. The technician can operate at a safe distance the switchgear, while keeping visual contact with it.



EcoStruxture™ ready solutions

Smart protection for distribution networks

Easergy P3

Easergy P3 feeder manager has been developed to cover standard protection needs for industrial and commercial building applications. Thanks to its cost-effective and flexible design, Easergy P3 provides an excellent alternative for various protection applications.

User-friendliness has always been a value of Schneider Electric products, and the Easergy P3 is not an exception, with the unique possibility to operate though your smartphone or tablet with “Easergy SmartApp”.

The rapid setting is achieved with the unique “eSetup Easergy Pro” setting software which dramatically improves usability.

Easergy P3Ux0
Standard applications


PM106284


PM106336

I & U

P3U10/20/30 = Universal protection

- Feeder and Transformer
- Motor
- Voltage
- Frequency
- Capacitor

Easergy P3x3x
Advanced applications with arc fault mitigation


PM106284


PM106340

I & U

- **P3F30** Feeder and Transformer
- **P3M30** Motor
- **P3G30** Generator
- **P3L30** Line differential and Distance
- **P3T32** Transformer diofferential
- **P3M32** Motor differential
- **P3G32** Generatot differential

Easergy Sepam

Easergy Sepam series digital protection relays take full advantage of Schneider Electric’s experience in electrical network protection.


PE60300

Easergy Sepam range

They provide all the necessary functions:

- Effective fault diagnosis and protection planning
- Accurate measurements and detailed diagnosis
- Integral equipment control
- Local or remote indication and operation
- Easy upgrading: communication, digital I/O, analog outputs, or temperature acquisition systems can be added, due to its modular design

Easergy MiCOM

Offers scalable levels of functionality and hardware options to best suit your protection requirements, and allows you to choose the most cost-effective solution for your application.


PM102898

Easergy MiCOM range

The versatile hardware and common relay management software (Easergy MiCOM S1 Studio) allows simple configuration and installation in different applications.

A standard and simple user interface across the entire range makes Easergy MiCOM ideal in any environment, from the more complex bay level control with mimic, to the most simple LCD display with menu interrogation.

EcoStruxture™ ready solutions

Extend the safety with the arc fault mitigation relays

Modern society heavily depends on an uninterrupted supply of electric power. Prolonged power outages may cause irreversible damages, causing potential human loss and interruption of service continuity.

An arc flash protection unit is a protective device used to enhance the safety of the installation, protecting life and equipements.

Schneider Electric's range covers a wide range of application, from stand alone protection to a complete system.

Integrated

Protection relay with arc interface

Easergy P3

- Integrated arc detection in 1-box solution with protection relay
- Openess to SCADA via the protection relay
- Less foot-print

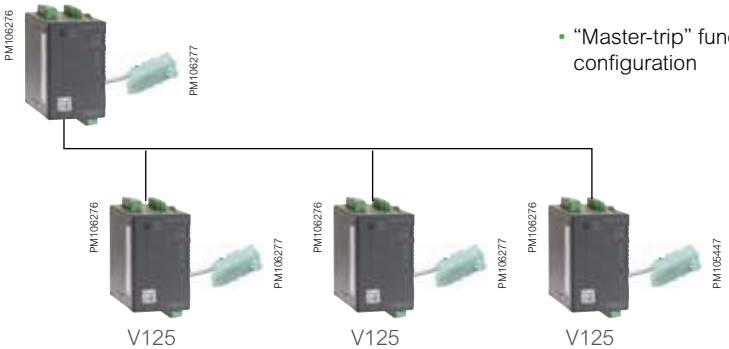
Standalone

V125

- Single stand-alone VAMP125 unit, protects busbar connection, circuit-breaker, CTs

Simple system

V125



V125 V125 V125

- "Master-trip" function, to allow simple selectivity in arc detection without strong configuration

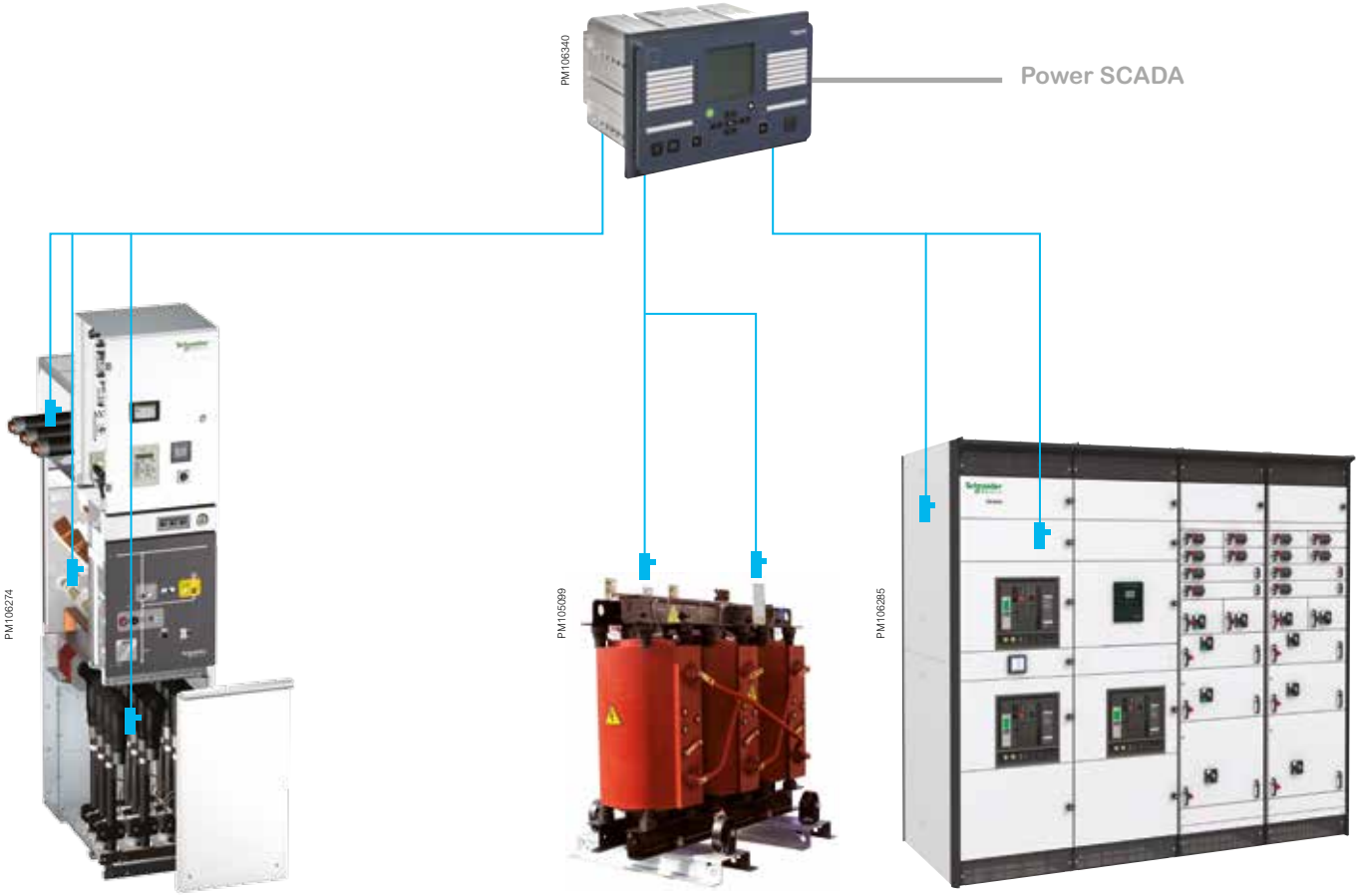
High-end system

- Scalable and Customized Arc Detection system tailored to your needs
- Extended possibilities (number of inputs/outputs, logics, selectivity, etc.)
- Openess to several serial & Ethernet communication protocols, including IEC 61850
- Multiple technologies (point sensors, loop sensors, fiber optic, etc.)

EcoStruxture™ ready solutions

Extend protection to the entire substation

- Possible to retrofit non-arc-restistant installations
- Integration in all products for new projects
- Connected to upper levels or totally stand alone system



MV Distribution

MV/LV Transformer

Easy retrofit!

MLV Distribution

Easy retrofit!

EcoStruxture™ ready solutions

Real-time condition monitoring to optimize assets availability

Easergy CL110 ambient monitoring

Schneider Electric ambient monitoring system will continuosly:

- Help maintenance manager to avoid deterioration of the MV switchgear due to moisture and pollution
- By automatically calculating the condensation cycle, and combining it with the declared mission profil conditions, the system will recommend maintenance and cleaning frequency adjustment in order to maintain the switchgear in its nominal status

Easergy TH110 thermal monitoring

Easergy TH110 is part of the new generation of wireless smart sensors ensuring the continuous thermal monitoring of all the critical connections made on field allowing to:

- Prevent unscheduled downtimes
- Increase operators and equipments safety
- Optimize and predictive maintenance

Thanks to its very compact footprint and its wireless communication, Easergy TH110 allows an easy and widespread installation in every possible critical points without impacting the performance of the MV Switchgears.

By using Zigbee Green Power communication protocol, Easergy Th110 ensure a reliable and robust communication that can be used to create interoperable solutions evolving in the Industrial Internet of Things (IIoT) age.

Easergy TH110 is self powered by the network current and it can ensure high performances providing accurate thermal monitoring.

Characteristics	
Power supply	Self powered. Energy harvested from power circuit.
Accuracy	+/- 1°C
Range	-25 °C / +115°C
Wireless communication	ZigBee Green Power 2,4 GHz
Dimension - Weight	31 x 31 x 13 mm - 15 g

Protecting the environment

GMA – a comprehensive solution

The Environmental Management System for development, production, sales and servicing of GMA has been certified in conformity with the requirements in accordance with ISO 14001:2009.

Protected environment

Schneider Electric's environmental policy has the following aims for all production sites:

- Reduction of the environmental footprint of our products and solutions throughout their service life by optimizing the consumption of resources and energy and by developing recycling solutions
- Provision of services which both meet environmental requirements and help our customers optimize their energy consumption
- Minimization of the environmental burden caused by our factories and plants by reducing the consumption of natural resources, avoiding waste and emissions, and utilization of the latest technologies
- Integration of all our members of staff, suppliers and partners in a process of continuous improvement together with our customers, to meet the company's requirements even better

These goals are secured over the long term, verified and continuously improved by a certified environmental management system for development, production, sales and service.

GMA switchgear and controlgear is a product which fully satisfies the requirements of environmental compatibility through:

- Minimized environmental impact during operation due to extremely low inspection and maintenance requirements. This is achieved by:
  - Vacuum circuit-breakers with a high number of mechanical and electrical switching cycles
  - Low-maintenance drives
  - Zero-maintenance compartments designed as a sealed pressure system
- Use of recyclable materials to ensure maximum re-use at the end of their useful life
- No gas handling on the construction site during installation, extensions, dismantling or replacement of switchgear cubicles in the switchgear assembly
- Closed SF6 gas circulation from production through to the end of the switchgear's service life
  - Re-use concept: the used SF6 gas is recycled.
    The SF6 gas is contained in a sealed pressure vessel. The quantity of SF6 is stated on each individual nameplate on the equipment
  - The gas is recovered via self-sealing valves integrated in the GMA
  - The gas service unit is connected to the GMA for SF6 recovery via commercially-available coupling adapters. No special cutting devices or tools are needed to connect the coupling adapters
  - The GMA contains SF6 gas, which has a global warming potential of 22800 compared to CO_2 (according to the 4th IPC assessment report and Annex I of the EU regulation on fluorinated gases S17/2014)

Quality assurance

Quality certified to ISO 9001

The Quality Management System for development, production, sales and servicing of GMA has been certified in conformity with the requirements in accordance with ISO 9001:2008.

Certified quality: ISO 9001

At Schneider Electric, customer satisfaction is the Number One priority for everybody:

- We undertake to find the ideal solution for each of our customers
- We are enthusiastic about our customers; our thinking and actions are clearly customer-oriented
- We encourage and empower our staff to always meet quality requirements

Each Schneider Electric production site has an established functional organization which ensures, monitors and continuously improves quality in line with norms and standards.

This process is:

- Uniform across all sites
- Acknowledged by many customers and recognized organizations

Above all, there is a stringent Quality Management System which is audited on a regular basis by the international independent certification company Bureau Veritas Certification.

Schneider Electric services

Peace of mind throughout your installation life cycle

How can you cut costs and improve performance at the same time?

When it comes to your electrical distribution infrastructure, the answer is straightforward: get professional expertise.

Life Cycle Services

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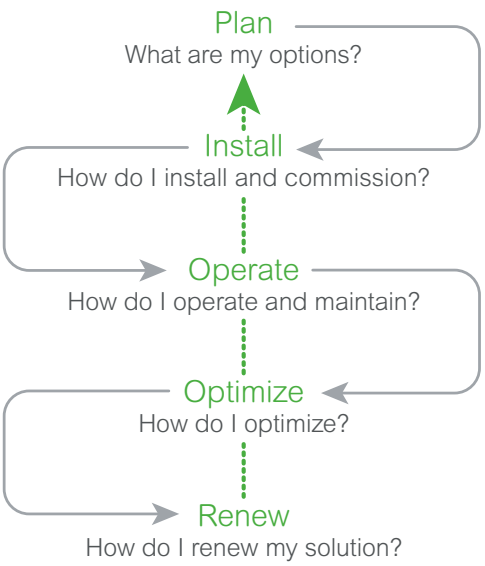


When it comes to your electrical distribution installation, we can help you:

- Increase productivity, reliability, and safety
- Mitigate risk and limit downtime
- Keep equipment up to date and extend lifespan
- Cut cost and increase savings
- Improve your return on investment

CONTACT US!

www.schneider-electric.com/b2b/en/services/

Plan

Schneider Electric helps you plan the full design and execution of your solution, looking at how to secure your process and optimize your time:

- **Technical feasibility studies:** Design a solution in your environment
- **Preliminary design:** Accelerate turnaround time to reach a final solution design

Install

Schneider Electric will help you to install efficient, reliable and safe solutions based on your plans.

- **Project management:** Complete your projects on time and within budget
- **Commissioning:** Ensure your actual performance matches the design, through on-site testing and commissioning, and tools and procedures

Operate

Schneider Electric helps you maximize your installation uptime and control your capital expenditure through its service offer.

- **Asset operation solutions:** Provide the information you need to increase safety, enhance installation performance, and optimize asset maintenance and investment
- **Advantage service plans:** Customize service plans that cover preventive, predictive and corrective maintenance
- **On-site maintenance services:** Deliver extensive knowledge and experience in electrical distribution maintenance
- **Spare parts management:** Ensure spare parts availability and optimized maintenance budget of your spare parts
- **Technical training:** Build the necessary skills and competencies to properly and safely operate your installations

Optimize

Schneider Electric can make recommendations for improved safety, availability, reliability and quality.

- **MP4 electrical assessment:** Define an improvement and risk management program

Renew

Schneider Electric extends the life of your system while providing upgrades.

We offer to take full responsibility for the end-of-life processing of old electrical equipment.

- **ECOFIT™:** Keep up to date and improve the performance of your electrical installations (LV, MV, protection relays, etc.)
- **MV product end of life:** Recycle and recover outdated equipment with end-of-life services

Notes

GMA range

GMA range

General ratings

Main functions

PM103149

Range of products

With the switchgear cubicle features listed below, GMA fulfils the various requirements for circuit-breaker switchgear and controlgear within the medium-voltage distribution network.

For details, please refer to the chapter “Switchgear cubicle variants”.

Switchgear cubicle functions	Type
Circuit-breaker cubicle	**CB**
Bus riser panel with cable connection	**DI**
Earthing and short-circuiting	**E**
Make-proof earthing switch	**ES**
Disconnector	**D**
Bus sectionalizer with circuit-breaker	**BC-CB**
Busbar voltage transformer	**BB-VT**
Busbar voltage transformer with high-voltage disconnecting device	**BB-VTS**
Busbar current transformer	**BB-CT**
Busbar connection	**BB-Con**
Busbar surge arrester	**BB-SA**
Switch-fuse combination	**T1**

General ratings

Technical ratings

GMA switchgear and controlgear ratings

The following data apply to normal operating and ambient conditions for indoor switchgear and controlgear in accordance with IEC/EN 62271-1 at rated pressure.

Other values on request.

Rated voltage	Ur	kV	12	15/17.5	24
Rated short-duration power frequency withstand voltage					
Between phases, phase to earth	U_d	kV	28	38 (42*)	50
Across the isolation distance	U_d	kV	32	45 (48*)	60
Rated lightning impulse withstand voltage					
Between phases, phase to earth (peak value)	U_p	kV	75	95	125
Across the isolation distance (peak value)	U_p	kV	85	110	145
Number of phases			3		
Rated frequency	f_r	Hz	50; 60		
Rated normal currents at 50 Hz *					
Busbars	I_r	A	1250; 1600; 2000; 2500		
Incomer, Feeder	I_r	A	630; 800; 1250; 1600; 2000; 2500		
Busbar sectionalizer	I_r	A	1250; 1600; 2000; 2500		
Switch-fuse combination	I_r	A	50		
Rated short-time withstand current	I_k	kA	16; 20; 25; 31.5		
Rated duration of short circuit	t_k	s	1; 3		
Rated peak withstand current	I_p	kA	40; 50; 63; 80		
Rated making current	I_{ma}	kA	40; 50; 63; 80		
Rated short-circuit breaking current	I_{sc}	kA	16; 20; 25; 31.5		
Insulation gas			Sulfur hexafluoride - SF6		
Rated filling pressure at +20 °C	P_{re}	MPa	0.03		
Minimum functional pressure at +20 °C	P_{me}	MPa	0.02		
Alarm pressure at +20 °C	P_{am}	MPa	0.02 (1st Warning level); 0.01 (2nd Warning level)		
Internal arc classification			IAC AFL (optional: IAC AFLR)		
Rated arc fault current	I_A	kA	16; 20; 25; 31.5		
Rated arc fault duration	t_A	s	1		
Rated supply voltage					
Direct current voltage D.C.	U_a	V	24; 48, 60, 110, 125, 220		
Alternating current voltage A.C.	U_a	V	120, 230		

* Increased values on request

General overview

PM103.079

1 Low-voltage cabinet

2 Busbar system with optional metal housing

3 3-position switch

4 Vacuum circuit-breaker

5 Current transformer, outside the gas-filled compartment

6 High-voltage disconnecting device for voltage transformers

7 Contact-proof voltage transformers, outside the gas-filled compartment

8 Instrument recess

9 Mechanical control and display panel

10 Detachable cover for cable compartment

11 Cable compartment with outer cone-type connection elements

12 Earthing bus

GMA circuit-breaker switchgear cubicle with voltage transformer, cubicle width 600 mm (example)

Design

Circuit-breaker switchgear cubicles

The prefabricated, type-tested GMA is gas-insulated indoor switchgear with vacuum circuit-breaker technology and a single busbar system.

- The service life of the vacuum circuit-breaker is 100 switching operations at rated short-circuit breaking current and 10,000 mechanical and electrical switching operations at rated current
- The gas-filled compartments are sealed pressure systems in accordance with IEC/EN 62271-1
- Maintenance-free and leakproof throughout its service life
- Gas-filled compartments made of chromium-nickel-steel
- During the expected service life, no maintenance work and no replenishing of insulating gas required (under normal ambient conditions)
- No gas handling and no intervention in the gas-filled compartment on site during
  - Installation
  - Extension
  - Replacement of switchgear cubicles
  - Dismantling of the switchgear
- Robust, self-supporting and riveted composite switchgear cubicle structure
- Straightforward extension at both ends of the switchgear possible without gas handling

Function compartments

The GMA circuit-breaker switchgear cubicle is structured into the following function compartments:

- Gas-filled compartment with
  - Vacuum circuit-breaker
  - 3-position disconnector and
  - Appropriate bus links to the gas-tight bushings
  - High-voltage disconnecting device for the voltage transformer (optional).
- Earthed, single-ended contact-proof busbar system.
- Cable connection compartment with
  - Outer cone-type plug-in type bushings for cable terminals
  - Toroidal core current transformer as low-voltage transformer
  - Cable screw-type connectors and, if applicable, additional surge arresters
  - Cable supports
  - Earthed and contact-proof single-pole voltage transformer (optional)
  - Control mechanism for high-voltage disconnecting device of the voltage transformers (optional)
  - Earth bus
- Low-voltage cabinet with all the required operating equipment and interfaces for grid protection, control and monitoring
- Instrument recess for integrated or pluggable voltage testing system, optionally for additional gas monitoring pressure gauge

Low-voltage compartment

PM103.080

Ergonomic design of the control devices

PM103.081

Low-voltage cabinet

Low-voltage cabinet

The spacious low-voltage cabinet is arranged on top of the GMA switchgear cubicle. As an autonomous functional unit, it is fully shrouded and encased in metal and is thus isolated from the high-voltage section and from the drive unit.

Low-voltage devices for control, monitoring and grid protection are normally installed in the rugged door of the low-voltage cabinet.

- Ergonomic design: The preferred installation height for control and monitoring devices is in the very easily accessible area between 1660 mm and 1800 mm, measured from the switchgear cubicle bottom edge (depending, amongst other things, on the amount of equipment and the cubicle width)
- The low-voltage cabinet can be mounted on the GMA switchgear cubicle either at the manufacturer's or on site
- The low-voltage cabinet can easily be assembled/disassembled: The preassembled connection lines between the low-voltage cabinet and the GMA basic switchgear cubicle, and the intra-panel switchgear-specific low-voltage ring mains between adjacent switchgear cubicles are plugged
- The external low-voltage lines are routed upwards from the bottom of the front right-hand cubicle into the low-voltage cabinet
  - These lines are routed in a separate metal duct with removable covers
  - The external lines are connected to a terminal block in the low-voltage cabinet of each GMA switchgear cubicle
- A specific cable laying system ensures optimum utilization of the inner arrangement of the low-voltage cabinet
- The height of the low-voltage cabinet is 700 mm (cubicle height 2200 mm)
- An 850 mm high low-voltage cabinet is also available as an option (cubicle height 2350 mm) for larger capacity requirements

Low-voltage instrument recess

Arranged below the low-voltage cabinet, the following items are installed there or are accessible via the removable front cover:

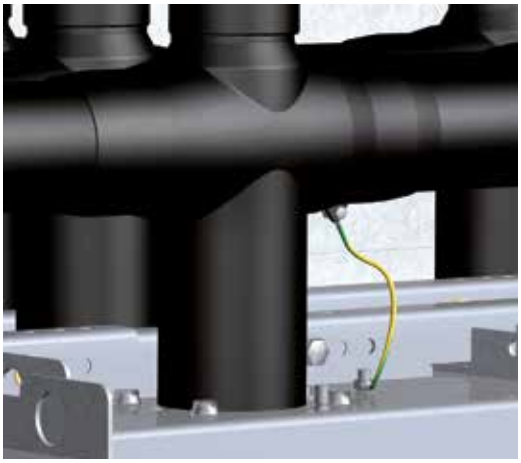
- Devices for voltage monitoring and testing via the capacitive voltage dividers
- Analog indicators for gas monitoring
- Valve for gas recovery at the end of the switchgear's service life

Busbar compartment

PM103.093

Single-pole busbar system

PM103.094



Busbar: earthing of the external conductive layer

Busbar system

The three-phase GMA busbar system is arranged on top of the switchgear cubicle. It is a potential-controlled circular conductor system with insulation made of silicone rubber. The extremely simply designed busbar connections of the GMA switchgear cubicle are:

- Single-pole design
- Contact-proof due to an external conductive layer connected to the earth potential (integral part of the switchgear earthing system)
- Insensitive to condensation and soiling
- Installation, extension, replacement and dismantling of switchgear cubicle without SF6 gas handling
- The system design with only one busbar per conductor permits straighforward and fast assembly on site, including rated currents > 1600 A.
- Busbar sections mechanically divided by panels
- No parallel busbars per conductor with rated currents > 1250 A
- Assembly very similar to the screw-type cable connectors in the outgoing feeder
- Plugged-in and screw-fastened
- System-compatible, cubicle-controlled and earthed cross-wise adapters and end adapters for screw fastening on the standardized busbar bushings of the switchgear cubicle
- Standardized busbar outer cone-type bushings in accordance with EN 50181, type C2 to 1250 A and type F for > 1250 A to 2500 A
- Assembly of the busbar system from the front/above
  - Thanks to the plug-in technology used, the low-voltage cabinets can easily be disassembled/assembled, if required
- No assembly aisle required behind the switchgear
- Should it be necessary to replace cubicles within the switchgear assembly, the gap thus created can be bridged temporarily using the busbar system, and the switchgear and controlgear recommissioned, if necessary
- As a protection against mechanical damage and penetration of large foreign matter, an additional mechanical housing can be supplied for the busbar system (optional)

Direct attachments to the busbar system

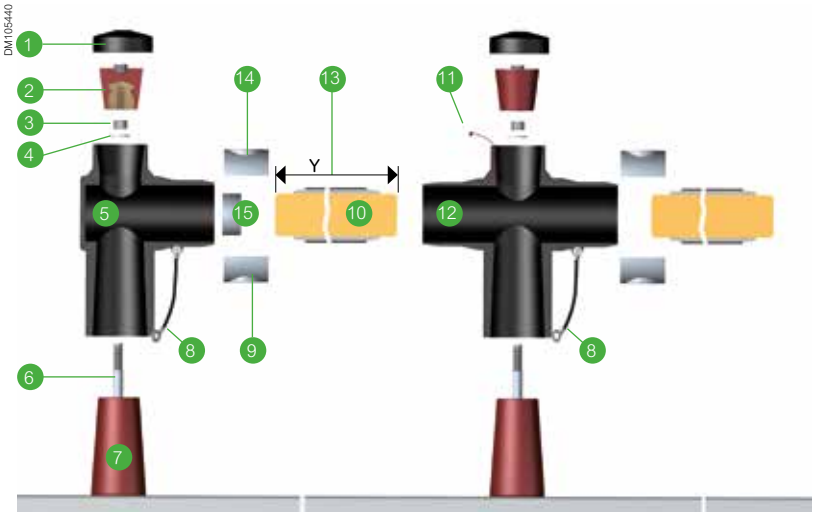
- Current transformer
- System-compatible supplementary modules for the outer cone-type standard system
  - Surge arrester
  - Cable connection screw-type plug
  - Fully insulated conductor bars

Busbar compartment

1 Cap
2 Threaded insert
3 Nut
4 Spring washer
5 End adapter
6 Threaded pin
7 Bushinhg on the panel
8 Earth terminal on the adapter
9 Contact shell
10 Busbar
11 Cable clamp for bleeding
12 Crossover adapter
13 Observe busbar length Y
14 Contact shell
15 Fitting part for end adapter

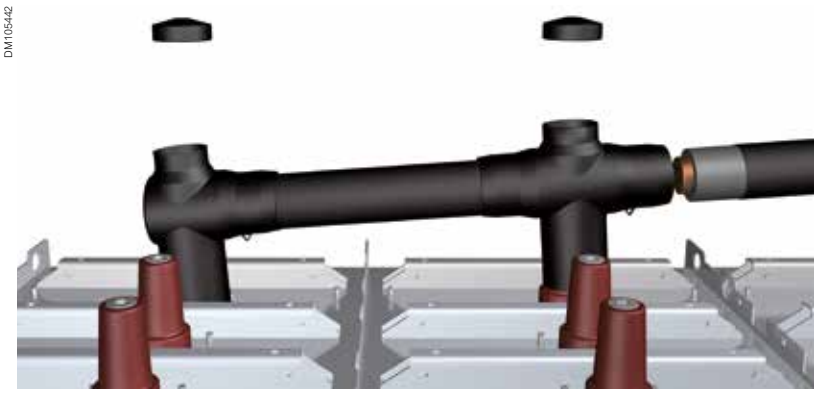
Individual parts of the complete busbar system

For final installation the busbar end section for 1250 A or 2500 A also includes additionally caps, threaded inserts and fixing parts.



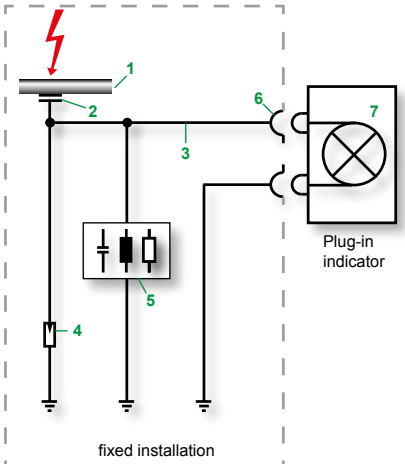
Final installation of busbar end section for 1250 A or 2500 A with earthed screen for each busbar section.

Busbar installation: Feeder by feeder.
Middle or end feeder can be removed.



Gas compartment - Capacitive voltage dividers

DM102.104



Non-integrated pluggable system

1 Live high-voltage conductor
2 Coupling capacitance: electrode in bushing
3 Internal connecting cable
4 Voltage-limiting predetermined break point
5 Measurement protection circuit
6 Standard sockets
7 Plug-in voltage indicator/test unit

Voltage detection system (schematic diagram)

Capacitive voltage dividers

- Capacitive voltage dividers are installed in the outer cone-type standard bushings
  - On the outgoing feeder cable
  - On the busbar sections
  - For all three conductors L1-L2-L3
- They are an integral part of the testing, display and monitoring systems described separately, as for example:
  - Verification of safe isolation from supply
  - Digital display of the voltage values
  - Voltage monitoring/grid quality
  - Fault detection in the electrical distribution grid; earth fault in isolated/compensated systems

Clearly arranged gas compartment technology

The gas-filled compartments are sealed pressure systems in accordance with IEC/EN 62271-1.

- Maintenance-free
- Gas-filled compartments made of chromium-nickel-steel
- Leakproof throughout their service life
- During the expected service life, no maintenance work and no replenishing of insulating gas required (under normal ambient conditions)
- No gas handling and no intervention in the gas-filled compartment on site during
  - Installation
  - Extansion
  - Replacement of switchgear cubicles
  - Dismantling of the switchgear

PM103.091

Pressure relief of the gas-filled compartment

- Each gas-filled compartment is equipped with one or two pressure relief devices
  - Open pressure relief device protected against ejection
  - Pressure relief in the event of excess pressure in the lower cubicle area behind the cable connection area
  - Pressure relief area metallically segregated from the cable connection area

Cable compartment

PM103.082

- Cubicle width 450 mm,
- Cable connection up to 800 A

PM103.083

- Cubicle width 600 mm
- Cable connection up to 1250 A

PM103.084

- Cubicle width 800 mm
- Cable connection > 1250 A up to 2500 A

Cable tests

- A high-voltage cable test can be performed from the front of the GMA switchgear
  - By means of a suitable test adapter, matching the types of the cable screw-type plugs used
  - With the cable connected and during operation of the busbar and all adjacent switchgear cubicles
- To locate defects on the cable shield, the appropriate screw-type connection on the cable support or the isolated earth bar can be disconnected

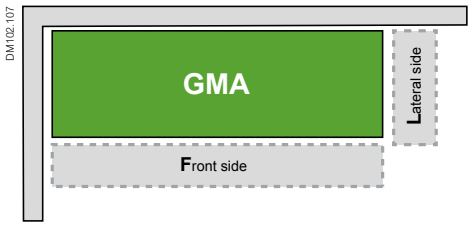
Spacious cable compartment

The spacious cable compartment is metal-enclosed and easily accessible. The cables are connected from the front of the switchgear and controlgear.

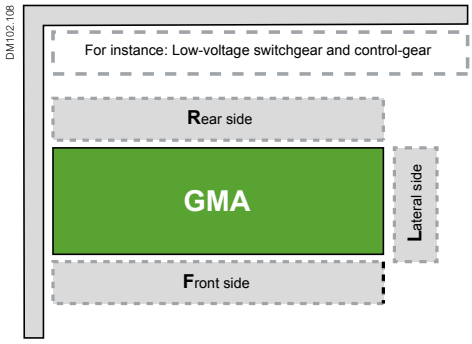
- All cable connections of the GMA circuit-breaker switchgear cubicles are equipped with bushings in accordance with EN 50181:2010:
  - In accordance with the “outer cone“ standard system
  - Terminal type C
  - Rated current 1250 A with screw-type connection, inner thread M-16x2 for the cable lugs for the screw terminals
- Circuit-breaker switchgear cubicles, module width 450 mm with output currents ≤ 800 A:
  - 1x bushing, terminal type C1 or C2 per conductor
  - For up to 3 cable terminals with max. cross-sections of 630 mm² * per conductor
- Circuit-breaker switchgear cubicles, module width 600 mm with output currents ≤ 1250 A:
  - 1x bushing, terminal type C1 or C2 per conductor
  - For up to 4 cable terminals with max. cross-sections of 300 mm² per conductor or
  - For up to 3 cable terminals with max. cross-sections of 630 mm² */conductor
- Circuit-breaker switchgear cubicles, module width 800 mm with output currents > 1250 A to ≤ 2500 A:
  - 2x bushings, terminal type C2 per conductor
  - Cable terminals with max. cross-sections for 2 x 3 = 6 630 mm² * per conductor
- An identical number of cable connectors and identical cable types and cable cross-sections must always be mounted on both plug-in type bushings. (For other options, please consult the manufacturer)
- In the case of output currents > 630 A, the required current-carrying capacity must be ensured when selecting appropriate cable connector combinations
- Instead of a cable screw-type plug, a suitable surge arrester can also be used in each case
- Compliance with the cable connector and surge arrester manufacturer specifications as well as the additional selection lists for the use of cable connectors in GMA is mandatory for selection and assembly
- The cable compartment cover can be removed easily for access to the cable compartment from the front of the switchgear and controlgear:
  - Secured by two screws to prevent accidental opening of the connection compartment
  - Additional interlock between the switch position “outgoing feeder, earthed“ and the cable compartment cover (optional)
- An additional floor unit is (available as an option) including rubber seals to ensure the metal is protected against accidental contact with the cable compartment from below
- The plastic clamps required for fastening cables to the metal supports in the cable compartment can be provided on request
- The cable shields and earth cables from the cable connectors are connected to the earthed metal supports
- An isolated earth bar is also (optionally) available

* Larger cross-sections available on request

Internal Arc classification



Internal arc classification IAC: accessible sides FL



Internal arc classification IAC: accessible sides FLR

IAC	**I**nternal **A**rc **C**lassification
A	Accessibility **A** Restricted to authorized personnel only
F	For **f**ront side
L	For **l**ateral side
R	For **r**ear side
31.5 kA	Arc fault current **31.5 kA**
1s	Arc fault duration **1 s**

Example of GMA with internal arc classification IAC

Internal faults causing internal arcs

- Due to its design, the GMA switchgear and controlgear features very low probability of errors:
  - No sources of interference due to external influence during operation
  - In accordance with IEC/EN 62271-200, avoiding internal arcs has top priority
  - The IEC/EN 62271-200, Table 102, recommendations include the use of gas-insulated switchgear as a preventive measure to avoid faults due to dirt, moisture, dust, vermin etc.
- The operating company is free to select a switchgear unit with internal arc classification IAC according to the applicable standards. According to IEC/EN 62271-200, switchgear cubicles with internal arc classification should only be used if the operating company considers it essential to prevent the risk of danger to life due to internal arcs.

Internal arc classification

- The internal arc classification IAC provides a verified level of operator safety in the immediate vicinity of the switchgear under normal operating conditions
- The internal arc classification is an option in accordance with IEC 62271-200 and EN 62271-200. It refers to the effect of internal excess pressure on covers, doors, inspection ports, vents etc. Moreover, the thermal effects of the internal arc and its roots on the enclosure and escaping hot gases or incandescent particles are taken into account.
- Metal-enclosed switchgear and controlgear are granted Internal Arc Classification if all the following criteria are met:
  - Criterion No 1: Correctly secured doors and covers do not open
  - Criterion No 2: No fragmentation of the enclosure occurs during the arc fault duration
  - Criterion No 3: Arcing does not cause holes by burning through the classified sides up to a height of 2000 mm
  - Criterion No 4: Indicators do not ignite due to the effect of hot gases
  - Criterion No 5: The enclosure remains connected to the earthing point
- Internal arc classification IAC has been conducted successfully for GMA
- As all operating and test procedures are performed on the front of the GMA, access via the front and the side walls is standard (IAC A FL)
  - The switching compartment depth can be minimized by wall-mounting the switchgear
  - In this design, the GMA switchgear and controlgear does not require a rear assembly aisle. Access, for example, to the cable compartment or the low-voltage cabinet, is only possible via the front
- If the GMA needs to be installed in the switchgear room with access to the switchgear via the rear side, the switchgear can be provided with additional elements for internal arc classification IAC AFLR (optional)

Loss of service continuity

Partition Class

- Partition class PM
  - Segregation of the high-voltage compartments with continuous metallic partitions

Loss of service continuity category

The loss of service continuity category LSC according to IEC /EN 62271-200 defines the possibility to keep either high-voltage compartments and/or functional units energized when opening an accessible high-voltage compartement.

- The loss of service continuity category for GMA with circuit-breaker is LSC2, as the air-insulated compartments are accessible
- The gas-filled compartments of GMA are non-accessible compartments, according to section 8.103.2 of IEC/EN 62271-200
  - No user access is provided to these compartments
  - And opening may destroy the integrity of these compartments
- The busbar system on single-busbar switchgear and controlgear is out of range of the definition for the LSC category, according to section 3.131.1.1 of IEC/EN 62271-200

Installation conditions

Standards

PM103.150

GMA in an accessible concrete substation

Installation and operating conditions

Those parts of GMA that conduct high voltage are entirely enclosed and unaffected by external ambient conditions.

- All high-voltage switchgear and controlgear is installed in sealed gas-filled compartments
- Switchgear components subject to high voltage outside the gas-filled compartments are:
  - Provided with a single-pole enclosure
  - Potential-controlled and earthed

Important functional parts which are not subject to high voltage such as drives, devices fulfilling control, protection, metering and monitoring functions can only be installed outside the gas-filled compartment or the single-pole enclosure.

For safe long-term operation, the normal operating conditions for indoor installation in accordance with IEC 62271-1 must be complied with (other conditions available on request).

- Ambient temperatures:
  - The ambient temperature does not exceed 40 °C
  - Its mean value over 24 hours does not exceed 35 °C
  - Minimum ambient temperature -5 °C
- Installation altitudes:
  - Max. 1000 m above sea level
  - Higher installation altitudes are in principle possible for GMA gas-insulated switchgear. Please enquire, stating the actual requirements
- Relative humidity

  The following conditions apply regarding relative humidity:
  - The mean value of the relative humidity measured over 24 hrs does not exceed 95%
  - The mean value of the water vapor pressure measured over 24 hrs does not exceed 2.2 kPa
  - The mean value of the relative humidity measured over one month does not exceed 90%
  - The mean value of the water vapor pressure measured over one month does not exceed 1.8 kPa

Norms and standards

GMA switchgear cubicles correspond to the current norms and specifications in force at the time of type testing according to the table below.

The international IEC standards have been accepted by CENELEC as European EN standards. The European standards EN have been transposed by the CENELEC members into national standards without any changes to their contents.

Applicable standards

PM103.151

Degree of protection against hazardous parts and ingress of foreign objects

The metal-enclosed switchgear and controlgear type GMA meets the requirements for degrees of protection according to IEC/EN 62271-1, IEC/EN 50529 and IEC/EN 62262:

- Degree of protection provided by the enclosure for high-voltage live parts: IP 65
- Degree of protection provided by the enclosure against access to hazardous parts:
  - Front side of low-voltage compartment: IP4X, optional IP52
  - Front side of cable compartment: IP4X *
  - Front of the mechanical operating panel: IP2X *

* Other degrees of protection available on request

IEC/EN 62271-1 and IEC/EN 62271-200

Protection of persons against contact with hazardous parts and protection of equipment against penetration of solid foreign matter (IP code)

Degree of protection	Protection against ingress of solid foreign bodies	Protection against access to hazardous parts
IP2X	Objects of 12.5 mm diameter or more	Access with a finger (test-finger 12 mm diameter, 80 mm long)
IP3X	Objects of 2.5 mm diameter or more	Access with a tool (test-rod 2.5 mm diameter, 100 mm long)
IP4X	Objects of 1 mm diameter or more	Access with a wire (wire-test 1.0 mm diameter, 100 mm long)
IP5X	Dust: The ingress of dust is not totally prevented but does not penetrate in a quantity or at a location such that it can interfere with the satisfactory operation of apparatus or to impair safety	Access with a wire (wire-test 1.0 mm diameter, 100 mm long)

Applicable standards

Standard	IEC	EN	Title
Switchgear and controlgear type GMA	**62271-1**	**62271-1**	High voltage switchgear and controlgear - Part 1: Common specification
	62271-200	**62271-200**	High voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
Circuit-breakers	**62271-100**	**62271-100**	High voltage switchgear and controlgear - Part 100: High-voltage alternating-current circuit-breakers
Disconnectors and earthing switches	**62271-102**	**62271-102**	High voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches
Switch-fuse combination	**62271-105**	**62271-105**	High-voltage switchgear and controlgear; part 105: Alternating current switch-fuse combinations
Voltage detecting systems	**61243-5**	**61243-5**	Live working - Voltage detectors - Part 5: Voltage detecting systems (VDS)
Plug-in type bushings for cable connections and busbar system	**-**	**50181**	Plug-in type bushings above 1 kV up to 52 kV and from 250 A to 2,50 kA for equipment other than liquid filled transformers
Type of enclosure			
IP code	**60529**	**60529**	Degrees of protection provided by enclosures (IP Code)
IK code	**62262**	**62262**	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)
Current transformer	**61869-2**	**61869-2**	Instrument transformers - Part 1: Current transformers
Voltage transformers	**61869-3**	**61869-3**	Instrument transformers - Part 2: Inductive voltage transformers
Sulfur hexafluoride (SF6)	**60376**	**60376**	Specification of technical grade sulfur hexafluoride (SF6) for use in electrical equipment
	62271-4	**62271-4**	High-voltage switchgear and controlgear - Part 303: Use and handling of sulphur hexafluoride (SF6)
Installation and erection	**61936-1**	**61936-1**	Power installations exceeding 1 kV a.c. Part 1: Common rules

Notes

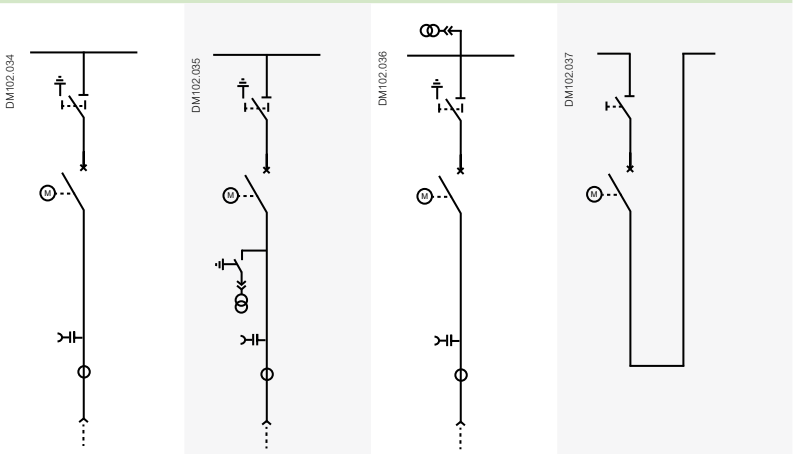
Functions and characteristics

Functions and characteristics

Functional overview and main dimensions

Function

Circuit-breaker switchgear cubicles	Busbar sectionalizer
CB6, CB8, CB12, CB16, CB20, CB25	BC-CB16/R, -CB20/R, -CB25/R



Un [kV]	Ik [kA]	Ir [A]	Cubicle dimensions Height [1] [mm]	Depth [2] (IAC AFL) [mm]	Depth [2] (IAC AFLR) [mm]	Cubicle widths [mm]	Cubicle widths [mm]	Cubicle widths [mm]	Cubicle widths [mm]
12 - 17.5 - 24	16 - 31.5	630	2200	875	1125	450	---	---	---
		630	2200	875 or 1005	1125	600	600	600	800
		800							
		1250							
		1600	2200	1280	1400	800	800	---	1000
		2000							
		2500							

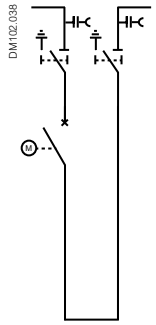
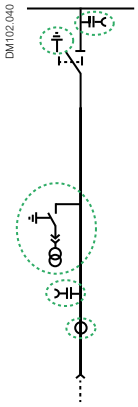
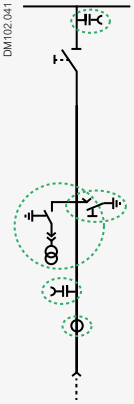
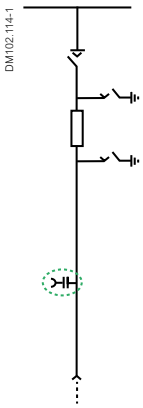
[1] Height with 700 mm high low-voltage cabinet
[2] The deepest cubicle within the switchgear determines the overall depth

Type	Function of switchgear cubicle
CB	**C**ircuit-**b**reaker cubicle
DI	**D**irect **I**ncomer
E	**E**arthing
ES	**E**arthing **S**witch (make-proofed)
D	**D**isconnector
T1	Switch-fuse combination
BC-CB	**B**us **C**oupler (Sectionalizer) with Circuit-breaker
BB-VT	Bus Bar - Voltage Transformer
BB-VTS	Bus Bar - Voltage Transformer with Switch device
BB-CT	Bus Bar - Current Transformer
BB-Con	Bus Bar - Connection
BB-SA	Bus Bar - Surge Arrester

Type	Function of switchgear cubicle
6	630 A
8	800 A
12	1250 A
16	1600 A
20	2000 A
25	2500 A

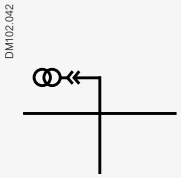
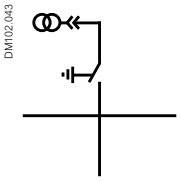
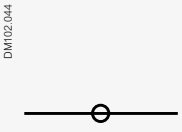
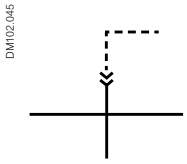
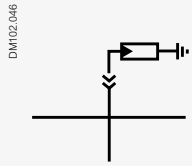
Functional overview and main dimensions

Function

Bus sectionalizer	Bus riser with cable connection			Switch-fuse combination
BC-CB16/RDE, -CB20/RDE, -CB25 RDE	DI	DID(E)(M)	DI(D)(ES)(M)	T1
				
Cubicle widths [mm]	Cubicle widths [mm]	Cubicle widths [mm]	Cubicle widths [mm]	Cubicle widths [mm]
---	450	450	450	450 [3]
800	---	---	---	---
	---	---	---	---
	600	600	600	---
1000	800	800	800	---

[3] Current limited to 50 A

Extensions

Busbar voltage transformer	Busbar voltage transformer with disconnecting device	Busbar current transformer	Busbar connection	Busbar surge arrester
BB-VT	BB-VTS	BB-CT	BB-Con	BB-SA
				

Feeder with circuit-breaker

Switchgear cubicle
Types CB6 and CB8

450 mm switchgear cubicle, equipped with 3 cables/conductors and surge arrester.

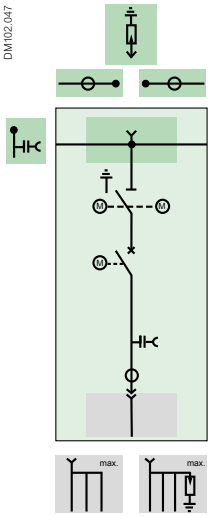
Illustration: up to 800 A.

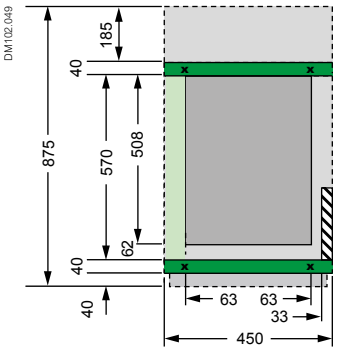
Main options

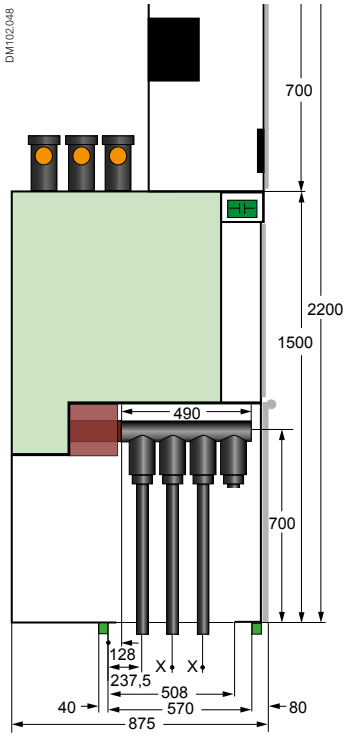
- Earthing switch and disconnector, motorized
- Current transformers on the busbar system
- Surge arresters on the busbar sytem
- Capacitive voltage detection system on the busbar system

Circuit-breaker switchgear cubicle 450 mm (width)				
Cubicle type			**CB6**	**CB8**
Rated current feeder		A	630	800
Dimensions *	Height	mm	2200/2350	
	Width	mm	450	
	Depth	mm	875	
Weight with all components fitted		kg	380	400

* Dimensions in accordance with IAC AFL, height depending on low-voltage cabinet







Feeder with circuit-breaker

Panel type CB6 25 kA
without voltage transformer

Feeder panel
600 mm 25 kA, without
voltage transformer,
3 cables/conductors
and surge arrester

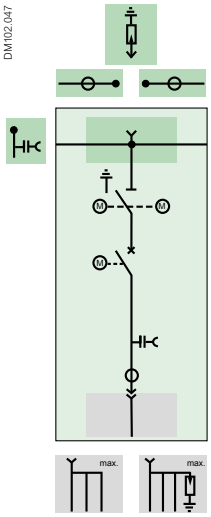
Illustration:
up to 630 A.

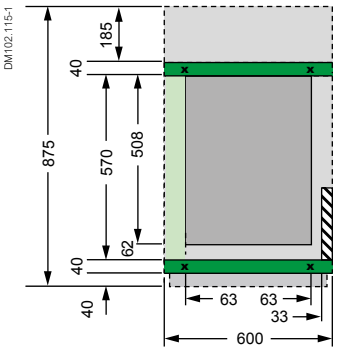
Main options

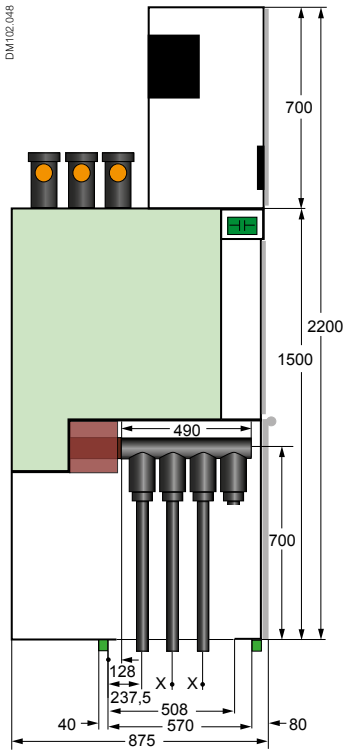
- Earthing switch and disconnector, motorized
- Current transformers on the busbar system
- Surge arresters on the busbar sytem
- Capacitive voltage detection system on the busbar system

Circuit-breaker switchgear cubicle 600 mm (width)			
Cubicle type			**CB6**
Rated current feeder		A	630
Dimensions *	Height	mm	2200 / 2350
	Width	mm	600
	Depth	mm	875
Weight with all components fitted		kg	650

* Dimensions in accordance with IAC AFL, height depending on low-voltage cabinet







Feeder with circuit-breaker

Switchgear cubicle
Types CB6, CB8, CB12

600 mm switchgear cubicle, equipped with voltage transformer, 3 cables/conductors and surge arrester

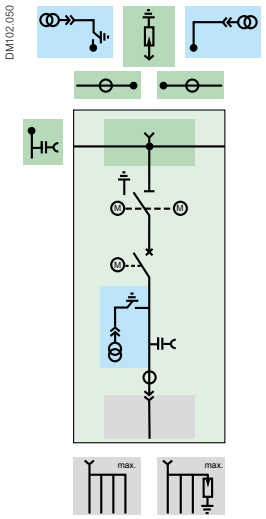
Illustration: up to 1250 A

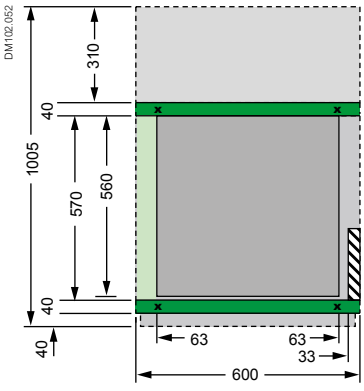
Main options

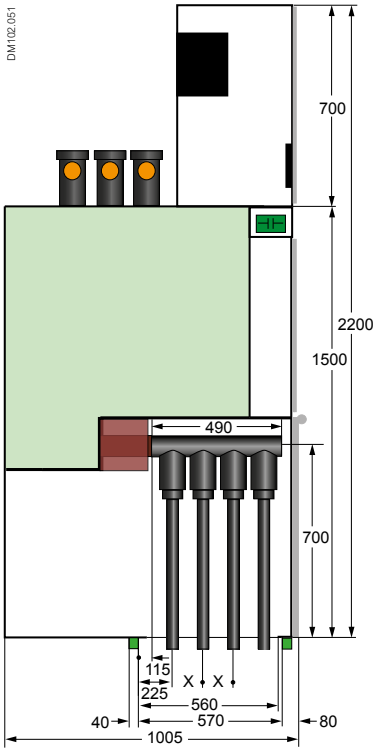
- Earthing switch and disconnector, motorized
- Alternatively: voltage transformer as outgoing voltage transformer or busbar transformer
- Current transformers on the busbar system
- Surge arresters on the busbar system
- Capacitive voltage detection system on the busbar system

Circuit-breaker switchgear cubicle 600 mm (width)					
Cubicle type			**CB6**	**CB8**	**CB12**
Rated current feeder		A	630	800	1250
Dimensions *	Height	mm	2200/2350		
	Width	mm	600		
	Depth	mm	1005		
Weight with all components fitted, without voltage transformer set		kg	650	690	720
Weight with all components fitted, with voltage transformer set		kg	770	810	840

* Dimensions in accordance with IAC AFL, height depending on low-voltage cabinet







Feeder with circuit-breaker

Switchgear cubicle
Types CB16, CB20, CB25

800 mm switchgear cubicle, equipped with voltage transformer, 4 cables/conductors (double cone) and surge arrester

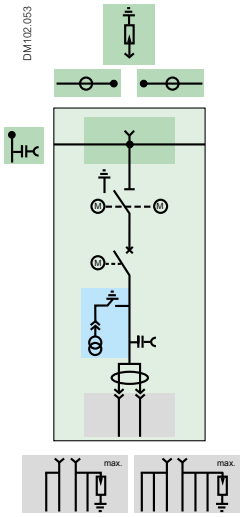
Illustration: up to 2000 A

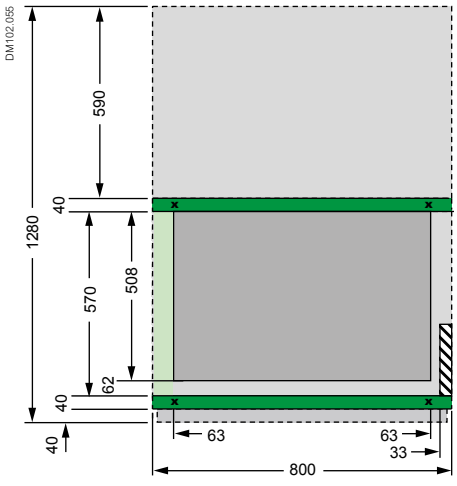
Main options

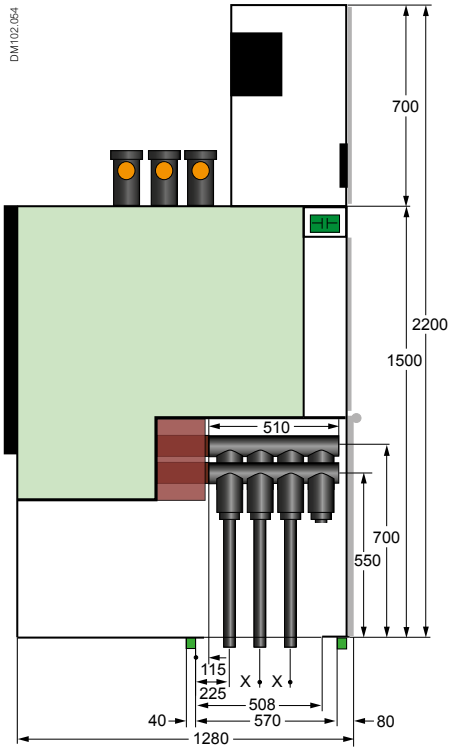
- Earthing switch and disconnector, motorized
- Alternatively: Voltage transformer as outgoing voltage transformer
- Current transformers on the busbar system
- Surge arresters on the busbar system
- Capacitive voltage detection system on the busbar system

Circuit-breaker switchgear cubicle 800 mm (width)					
Cubicle type			CB16	CB20	CB25
Rated current feeder		A	1600	2000	2500
Dimensions *	Height	mm	2200/2350		
	Width	mm	800		
	Depth	mm	1280		
Weight with all components fitted, without voltage transformer set		kg	850	850	900
Weight with all components fitted, with voltage transformer set		kg	960	970	1020

* Dimensions in accordance with IAC AFL, height depending on low-voltage cabinet







Busbar sectionalizer

With circuit-breaker
Types BC-CB16, BC-CB20, BC-CB25

1000 mm busbar sectionalizer,
with integrated busbar earthing

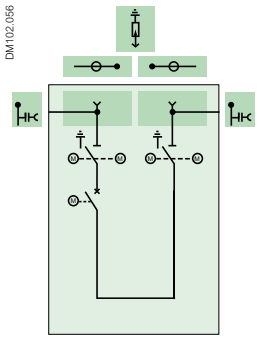
Illustration:
up to 2000 A

Main options

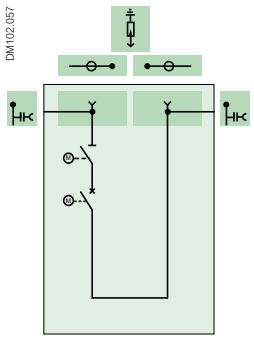
- Earthing switch and disconnector, motorized
- Current transformers on the busbar system
- Surge arresters on the busbar system
- Capacitive voltage detection systems on the busbar system

Busbar sectionalizer with circuit-breaker 1000 mm (width)					
Cubicle type			BC-CB16	BC-CB20	BC-CB25
Rated current feeder		A	1600	2000	2500
Dimensions *	Height	mm	2200/2350		
	Width	mm	1000		
	Depth	mm	1280		
Weight with all components fitted, with voltage transformer set		kg	850	870	920

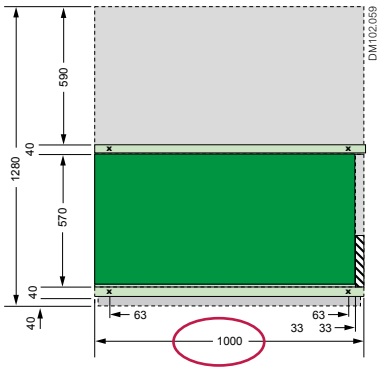
* Dimensions in accordance with IAC AFL, height depending on low-voltage cabinet

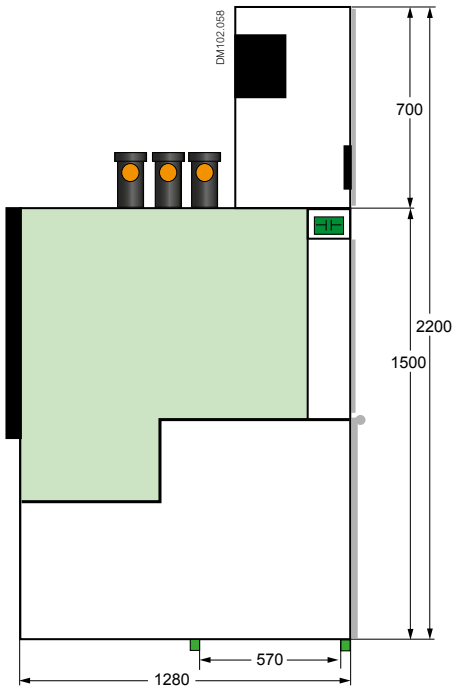


Busbar
sectionalizer with
busbar earthing
BC-CBxx/RDE



Busbar
sectionalizer
BC-CBxx/R





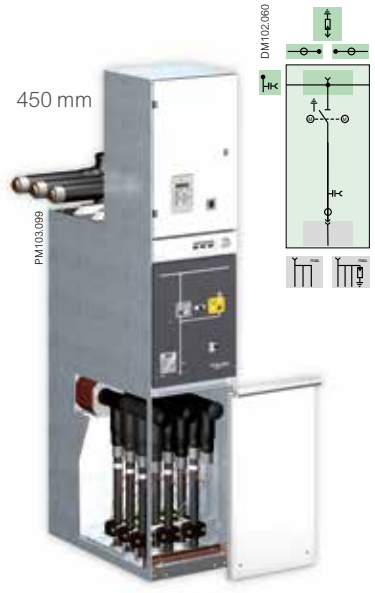
Circuit-breaker switchgear cubicles CB / Bus risers with cable connection / Type DI(DE)6 to DI(DE)25

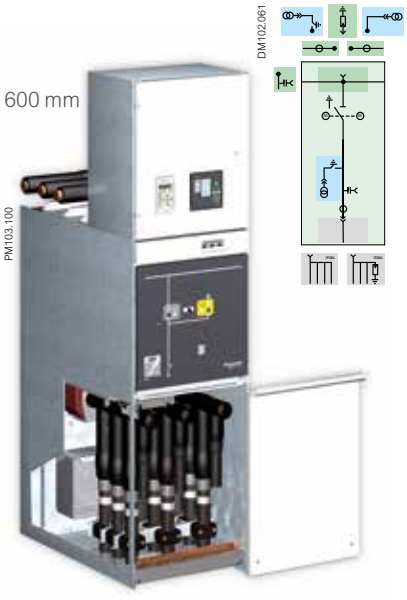
Main options

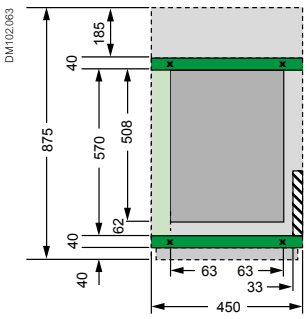
- Bus riser with or without 3-position switch (DE)
- Earthing switch and disconnector, motorized
- Alternatively: Voltage transformer as outgoing voltage transformer or busbar transformer
- Current transformers on the busbar system
- Surge arresters on the busbar system
- Capacitive voltage detection system on the busbar system

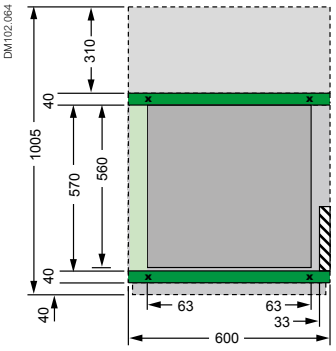
Bus riser with cable connection							
Switchgear cubicle type		DI(DE)6	DI(DE)8	DI(DE)12	DI(DE)16	DI(DE)20	DI(DE)25
Rated current feeder	A	630	800	1250	1600	2000	2500
Dimensions * Height	mm	2200/2350					
Width	mm	450		600	800		
Depth	mm	875		1005	1280		
Weight with all components fitted, without voltage transformer set	kg	390	400	480	720	740	790
Weight with all components fitted, with voltage transformer set	kg	-	-	600	850	870	910

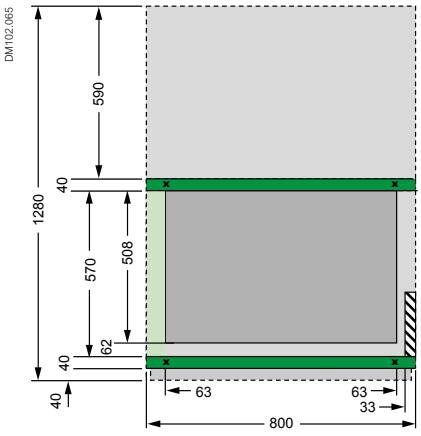
* Dimensions in accordance with IAC AFL, height depending on low-voltage cabinet











Switch-fuse combination

Switchgear cubicle T1

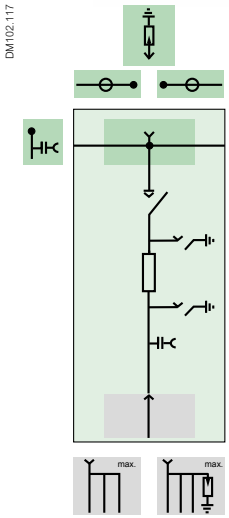
Switch-fuse combination
450 mm

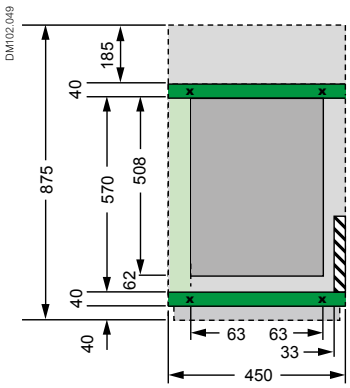
Main options

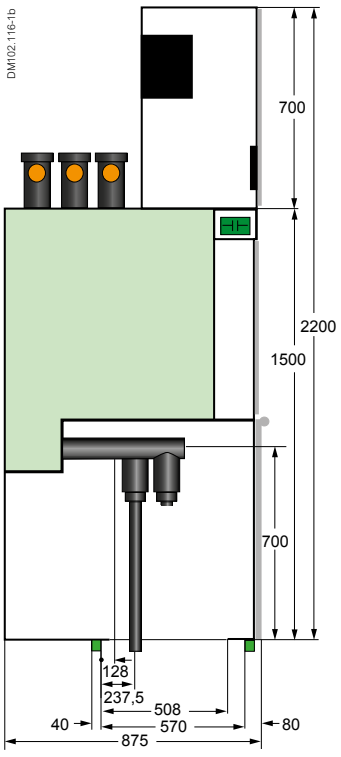
- Current transformers on the busbar system
- Surge arresters on the busbar system
- Capacitive voltage detection systems on the busbar system

T1 switchgear cubicle - 450 mm (width)		
Cubicle type		**T1**
Rated current feeder	A	50
Dimensions * Height	mm	2200/2350
Width	mm	450
Depth	mm	875
Weight with all components fitted	kg	380

* Dimensions in accordance with IAC AFL, height depending on low-voltage cabinet







Notes

Components

Components

Switches

Vacuum circuit-breaker

Switching devices integrated in GMA

All live switchgear components of the switching devices and appropriate conductors between the operating equipment and components are fixed installations in the gas-filled compartment of the GMA switchgear cubicles. If the relevant operating instructions are adhered to, they are maintenance-free.

Appropriate drive units are arranged outside the gas-filled compartment and are easily accessible from the front of the switchgear.

The following switching devices are located in the GMA's gas-filled compartment:

- Vacuum circuit-breaker
- 3-position disconnector

Vacuum circuit-breaker technology

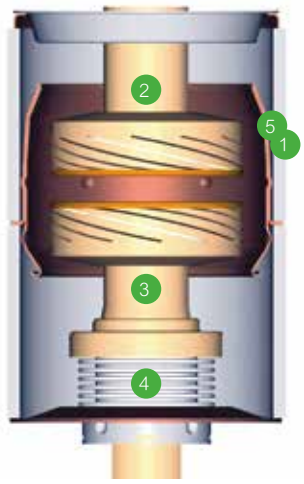
Within GMA, all operating and fault currents are switched via the innovative vacuum circuit-breaker technology. Here, currents are switched independently of the gas medium.

In GMA circuit-breaker switchgear cubicles, SF6 gas is used as an insulating gas and not for interrupting electric arcs.

Using vacuum circuit-breaker technology, the requirements in the various medium-voltage distribution networks can be satisfied.

- Switching of cables, overhead lines, transformers, capacitors, generators and motors
- High number of mechanical and electrical switching operations without maintenance
  - 10 000x mechanical switching operations
  - 10 000x at rated current
  - 100x at rated short-circuit breaking current
- Straightforward design of the vacuum interrupter chambers
  - Few single parts
  - Straightforward mechanical workflows
  - Relatively small switching strokes of 8 to 10 mm between the contacts
  - Switching contacts in a high vacuum are unaffected by negative environmental influences and do not produce decomposition products
  - Long service life

DM102.089



1 Ceramic cylinder
2 Fixed contact
3 Movable contact
4 Metal bellows
5 Shield

Vacuum interrupter design

Vacuum interrupter chambers

As long as 70 years ago, Schneider Electric conducted research into the possibilities of switching and breaking currents in a vacuum.

In the 1970s, Schneider Electric was the first to apply for a patent for the use of contact material based on chromium alloys. This alloy is still used successfully in vacuum interrupter chambers today.

Back in the 1980s, Schneider Electric started manufacturing ever-increasing numbers of vacuum interrupter chambers for use in medium-voltage circuit-breakers.

The vacuum interrupter chamber consists of a ceramic insulator, the fixed and movable contact and the metal bellows sealing the movable contact against the ultra-high vacuum in the interrupter chamber. A concentric screen prevents condensation of metal vapors on the ceramic interior. This metal vapor can be created especially on switching OFF higher currents from the contact surfaces.

As soon as the closed contact elements are separated in the vacuum interrupter chambers by the drive mechanism, the electric arc (metal vapor arc) is generated in the ultra-high vacuum (< 10-7 hPa). This electric arc remains, as a rule, until the current reaches its zero crossing threshold, and extinguishes within microseconds in an ultra-high vacuum.

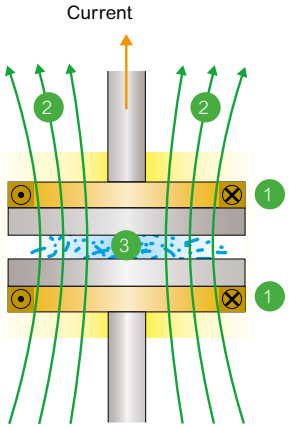
After contact separation, melting points are formed on the contact surface until extinction of the electric arc. This results in metal vapor.

In its vacuum interrupter chambers, Schneider Electric has been using Axial Magnetic Field (AMF) technology with great success for over 20 years. This technology provides a very good short-circuit breaking capacity with currents up to 63,000 A and optimum control of the electric arc via minimum contact erosion during interruption of the short-circuit currents.

Switches

Vacuum circuit-breaker

DE60164



1 AMF contacts

2 Axial Magnetic Field (AMF)

3 Arc plasma

Principle of the Axial Magnetic Field (AMF)

Axial Magnetic Field (AMF) technology:

At low breaking currents, the electric arc in the vacuum interrupter chamber burns with uniform distribution over the contact surface. Contact erosion is negligible and the number of possible current interruptions is very high.

- If the breaking current rises, exceeding at least the rated current, the so-called Hall effect occurs. The arc changes from diffuse state to a concentrated electric arc. As the current rises, the electric arc is increasingly constricted, forming a limited column.
  - High temperatures and consequently high thermal loads occur on the relevant areas of the switching contacts. This negative stress, however, is avoided thanks to the "rotating electric arc"
  - Because of the specific geometric shape of the switching contacts, a Radial Magnetic Field (RMF) forms due to the high arc current. This electromagnetic force with tangential effect sets the electric arc into very quick rotation on the contact surfaces
- Schneider Electric uses the more recent and improved Axial Magnetic Field (AMF) technology in their vacuum interrupter chambers.
  - AMF involves the application of an axial magnetic field parallel to the axis of the two switching contacts
  - AMF ensures the diffuse shape of the electric arc is uniformly distributed over the contact surface - even at very high short-circuit breaking currents. A very large contact surface is utilized for the thermal stress imposed by the electric arc.
  - Thus, overheating and erosion at fixed points on the contact surface is optimized and consequently minimized

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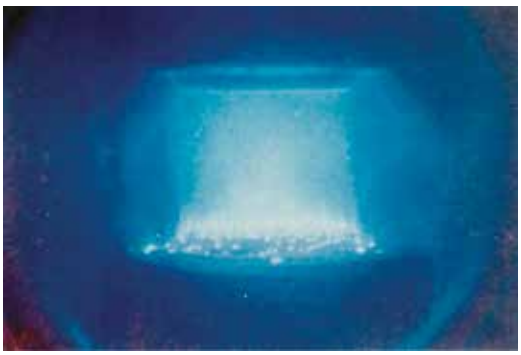


Diffuse electric arc burning between open AMF contacts

Description		
Circuit-breaker (CB)	Rated time constant τ	45 ms
	Percentage value of DC component	32% - 35%
	Rated operating sequence[1]; electrical class CB	O-3 min-CO-3 min-CO; E2
	Capacitive switching capacity, cable charging breaking current, I_c	12 kV - 25 A, 17.5 kV and 24 kV - 31.5 A
	Opening time T_{op}	38 ms - 48 ms
	Closing time	50 ms - 70 ms
	Arc duration (max.) t_{arc}	≤ 12 ms
Number of mechanical operations without inspection	Mechanical operations, class	CB 10,000; M2 D 2000; M1 E 1000; M0
Number of electrical operations without inspection, class	CB with rated (normal) current	10,000
	CB with rated short-circuit breaking current	100
Command time	ON	20 ms
	OFF	20 ms

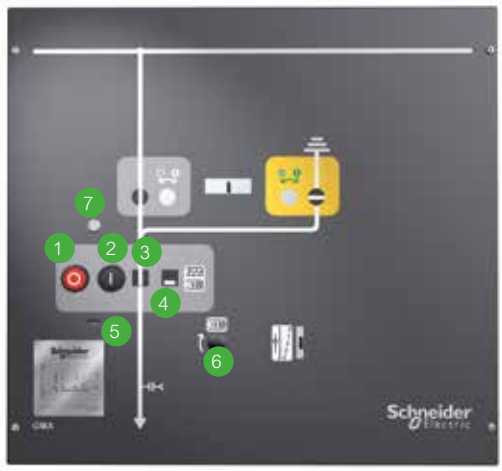
[1] others available on request
D = Disconnector
E = Earthing switch

Switches

Operating interface

Circuit-breaker

PM103.137



1 Mechanical "OFF" pushbutton

2 Mechanical "ON" pushbutton

3 Mechanical indicator "Circuit-breaker ON"/ "Circuit-breaker OFF"

4 Mechanical indicator "Closing spring charged"/"Closing spring discharged"

5 Mechanical operations counter

6 Coupling of crank handle for manual charging of the stored energy spring-mechanism

7 Key-actuated switch

Mechanical control panel – operating area
Vacuum circuit-breaker

Vacuum circuit-breaker drive

The three vacuum interrupter chambers are arranged vertically in a row within the gas-filled compartment. They are actuated from the circuit-breaker drive via a common actuating shaft.

The position of the individual elements in the mechanical control panel has been optimized according to their function, i.e. according to their allocation to the corresponding device functions. The elements which form part of a switchgear device are visually linked by a specific pattern and integrated in a mimic diagram.

- Arranged outside the gas-filled compartment
- Easily accessible from the front of the switchgear
- Mechanical stored energy spring-mechanism for 10,000 mechanical switching operations
  - For auto-reclose operating sequences
  - Synchronization and quick change over
- Trip-free
- Charging the stored energy spring-mechanism using an integrated motor
  - Manual emergency charging of the stored energy spring-mechanism is possible e.g. on commissioning or in the event of failure of the auxiliary voltage on the front-mounted mechanical control panel
- Comprehensive equipment for control and monitoring (see separate list)

Closing procedure (ON):

The stored energy spring-mechanism is latched in the charged position. The mechanical indicator "Spring energy accumulator charged" appears. Closing is either performed via the mechanical ON button in the control panel or via magnetic shunt closing releases.

After switching ON, the stored energy spring-mechanism is recharged automatically (in the case of the motor drive mechanism).

Opening procedure (OFF):

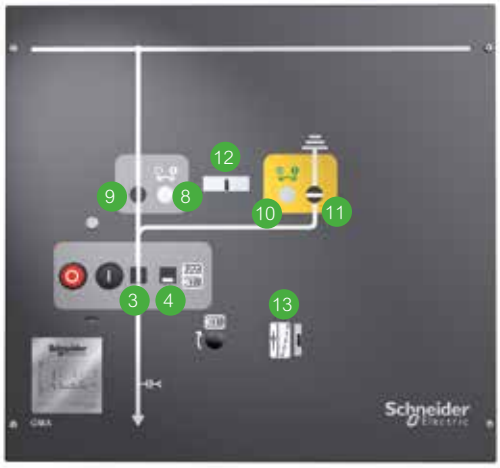
The vacuum circuit-breaker is switched OFF either via the mechanical OFF button in the control panel or via magnetic shunt opening releases.

Switches

Operating interface

3-position disconnector

PM103.138



8 Insertion opening for crank handle "Disconnector ON-OFF"

9 Mechanical indicator for "Disconnector ON"/ "Disconnector OFF"

10 Insertion opening for crank handle "Earthing switch ON-OFF"

11 Mechanical indicator for "Earthing switch ON"/ "Earthing switch OFF"

12 Mechanical interlock for crank handle insertion openings for disconnector and earthing switch

13 Mechanical interlock between cable compartment cover and the earthing switch position (optional)

Mechanical control panel – operating area
3-position disconnector

In conjunction with outgoing feeder earthing via the vacuum circuit-breaker:

10 Insertion opening for crank handle "Earthing switch ON-OFF"

11 Mechanical indicator for "Earthing switch ON"/ "Earthing switch OFF"

Mechanical control panel – operating area
Vacuum circuit-breaker

3-position disconnector

The 3-position disconnector is used for:

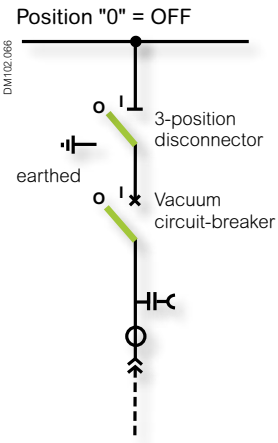
- Connection to/disconnection from the busbar system
- Earthing and short-circuiting the outgoing feeder – together with the vacuum circuit-breaker
- The isolating distance conditions for safe working on the outgoing feeder are also established by means of the 3-position disconnector

Drives for 3-position disconnectors

Although the 3-position disconnector is designed as a switchgear device on the high-voltage side, mechanical operation and remote actuation are performed via separate drive mechanisms with their own switch position indicators for the "Disconnector ON-OFF" and "Earthing switch ON-OFF" functions.

- These functions can also be equipped with separate motor drives, auxiliary switches, blocking coils, etc.
- Operation on the switchgear cubicle and via remote access uses a disconnected earthing switch in the outgoing feeder, as with conventional switchgear.
- The two separate drives increase the user-friendliness and operating safety of the GMA switchgear
- GMA can be integrated into a SCADA system just like conventional switchgear with installed disconnector + circuit-breaker + disconnected earthing switch:

DM102.066



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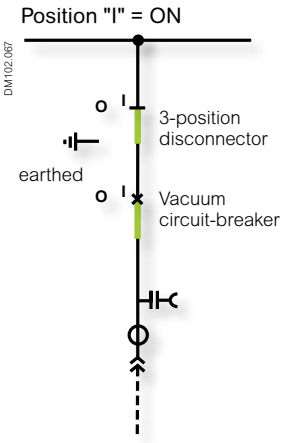

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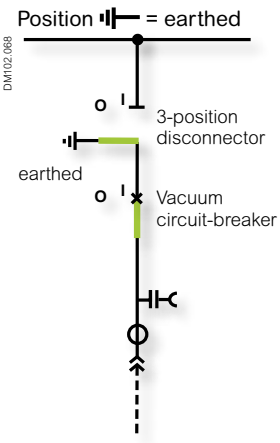


Integral outgoing feeder earthing

The outgoing feeder is earthed and short-circuited by means of the 3-position disconnector in combination with the vacuum circuit-breaker.

Switches

Operating interface

Bus sectionalizer

PM103139

1 Mechanical "OFF" pushbutton

2 Mechanical "ON" pushbutton

3 Mechanical indicator "Circuit-breaker ON"/ "Circuit-breaker OFF"

4 Mechanical indicator "Closing spring charged"/"Closing spring discharged"

5 Mechanical operations counter

6 Coupling of crank handle for manual charging of the stored energy spring-mechanism

7 Key-actuated switch

8 Insertion opening for crank handle "Disconnector ON-OFF"

9 Mechanical indicator for "Disconnector ON"/ "Disconnector OFF"- SSA

10 Insertion opening for crank handle "Earthing switch ON-OFF"

11 Mechanical indicator for "Earthing switch ON"/ "Earthing switch OFF"

12 Mechanical interlock for crank handle insertion openings for disconnector and earthing switch

Mechanical control panel - busbar sectionalizer with circuit-breaker and bus riser

To this effect, GMA provides a very reliable and operator-friendly solution:

- Earthing and short-circuiting are performed with the 3-position disconnector in the "Earthing" position and also with the vacuum circuit-breaker – so-called integral earthing
- Switching ON is possible during the "Earthing and short-circuiting" process using the high making capacity of the vacuum circuit-breaker
- Mechanical actuation on the switchgear cubicle's control panel is possible in the same way as on conventional switchgear and controlgear, with a separate earthing switch
- Earthing and short-circuiting as well as de-earthing require only a single operation each
- After the 3-position disconnector has safely reached the "Earthing" position, the vacuum circuit-breaker is switched ON automatically during actuation by a mechanical intertripping circuit
- With an earthed outgoing feeder, accidental "De-earthing", e.g. by switching OFF the vacuum circuit-breaker, is prevented. The integrated mechanical drive interlock does not require additional locking with mechanical locks
- "De-earthing" is also performed via one common operation only for the vacuum circuit-breaker and the 3-position disconnector
- At the beginning of the "De-earthing" process, the vacuum circuit-breaker is first switched OFF via a mechanism. Subsequently, during operation, the 3-position switch is moved from the "Earthing" position to the "Earthing OFF/Disconnecting OFF" position
- Switching ON "Earthing and short-circuiting" is only possible if the stored spring energy-mechanism of the vacuum circuit-breaker is charged

Busbar sectionalizer

- Two variants of the busbar sectionalizer with vacuum circuit-breaker can be executed:
  - Busbar sectionalizer with circuit-breaker and bus riser
  - Busbar sectionalizer with circuit-breaker and integrated busbar earthing and bus riser

Work on the busbar system is normally only required in the event of expansion of the GMA switchgear. In such cases, the busbar system can be earthed by a manually-operated earthing device. This maintenance earthing switch is connected to the cross-wise or end adapters of the busbar system via a connecting piece.

Busbar sectionalizer with circuit-breaker and bus riser

The standard version of the busbar sectionalizer with vacuum circuit-breaker is designed as follows:

- With one 3-position disconnector and vacuum circuit-breaker and busbar riser
- Within a switchgear row with one GMA cubicle width (single-row installation) or
- Divided between two GMA single cubicles, e.g. in the case of face-to-face installation of two rows of cubicles

Switches

Operating interface

Bus sectionalizer

PM103.140

1 Mechanical "OFF" pushbutton
2 Mechanical "ON" pushbutton
3 Mechanical indicator "Circuit-breaker ON"/ "Circuit-breaker OFF"
4 Mechanical indicator "Closing spring charged"/ "Closing spring discharged"
5 Mechanical counter for operating cycles
6 Coupling of crank handle for manual charging of the stored energy spring-mechanism
7 Key-actuated switch

Left-hand busbar section A - BBA

8 Insertion opening for crank handle "Disconnector ON-OFF" - BBA
9 Mechanical indicator for "Disconnector ON"/ "Disconnector OFF" - BBA
10 Insertion opening for crank handle "Earthing switch ON-OFF" - BBA
11 Mechanical indicator for "Earthing switch ON"/ "Earthing switch OFF" - BBA
12 Mechanical interlock for crank handle insertion openings for disconnector and earthing switch - BBA

Right-hand busbar section B – BBB

13 Insertion opening for crank handle "Disconnector ON-OFF" - BBB
14 Mechanical indicator for "Disconnector ON"/ "Disconnector OFF" - BBB
15 Insertion opening for crank handle "Earthing switch ON-OFF" - BBB
16 Mechanical indicator for "Earthing switch ON"/ "Earthing switch OFF" - BBB
17 Mechanical interlock for crank handle insertion openings for disconnector and earthing switch - BBB

Mechanical control panel – busbar sectionalizer with integrated busbar earthing

Busbar sectionalizer with circuit-breaker and integrated busbar section earthing

As an option, the GMA busbar sectionalizer can be designed with integrated earthing of the busbar sections. With this solution, only a single busbar section is earthed at any one time, not both busbar sections together.

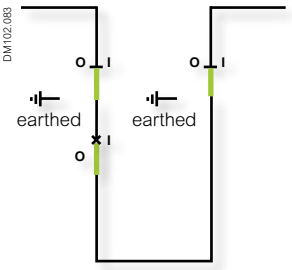
Design with:

- Two 3-position disconnectors and one vacuum circuit-breaker
- Including the possibility of earthing one busbar section at any one time.
- Both the above-mentioned variants can be executed:
- Within a switchgear row with one GMA cubicle width (single-row installation) or
- Divided between two GMA single cubicles, e.g. in the case of face-to-face installation of two rows of cubicles

The “cross-wise” busbar earthing operating method is shown, presenting the busbar sectionalizer in one cubicle width as an example.

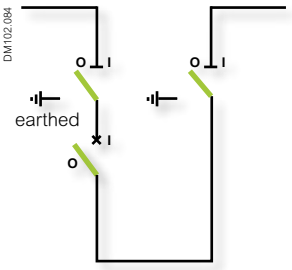
Busbar sectionalizer ON

DM102.083



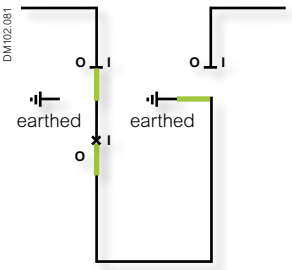
Busbar sectionalizer OFF

DM102.084



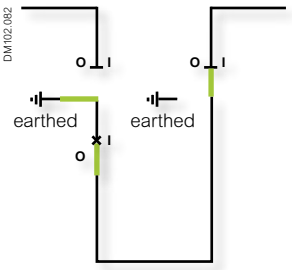
Left-hand busbar section earthed

DM102.081



Right-hand busbar section earthed

DM102.082



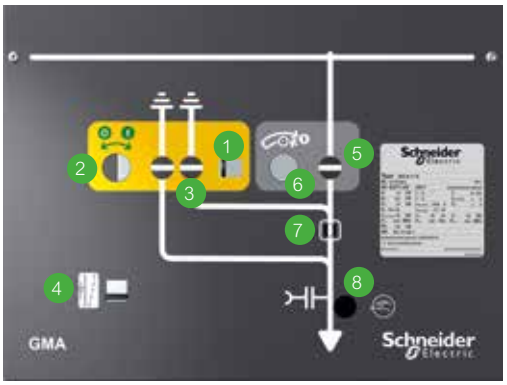
Busbar sectionalizer with integrated busbar earthing

Switches

Operating interface

Switch-fuse combination

PM103.159



1 Mechanical interrogation lock for crank of disconnector and earthing switch

2 Opening for crank “Earthing switch ON-OFF“

3 Mechanical indicator for ”Earthing switch ON/OFF“

4 Mechanical interrogation lock between cable compartment cover and earthing switch position (optional)

5 Mechanical indicator for ”Switch disconnector ON-OFF”

6 Opening for crank “Switch disconnector ON-OFF“

7 Fuse status indicator – Green: Fuse OK – Red: Fuse tripped

8 Key switch “Operation enabled” (optional)

Mechanical control panel – Switch disconnector with fuses with integrated earthing switches

Switch-fuse combination T1

The functional unit consists of the combination of a switch disconnector with gas-tight receivers for the HVHRC fuse links, the receivers being installed in the gas-filled compartment. One earthing switch each is located upstream and downstream of the fuse receiver. These switching devices are coupled mechanically for actuation. The switch disconnector features an ON snap-action drive and an OFF stored-energy mechanism. Once a fuse is tripped, the switch disconnector is switched OFF on all poles mechanically via the tripping pin of the HVHRC fuse link and a tripping linkage.

Special features

- Extremely high operator safety thanks to separate earthing switches upstream and downstream of the fuse receivers
- Fuse replacement possible by hand, without insulating tools
- Systematic integration of the fuse receivers in the gas-filled compartments. The dielectric fields are located essentially within the gas-filled compartment and not outside of the gas tank in an air atmosphere
- The HVHRC fuse links can be replaced very easily using only a double-bit key
- No deposits of conductive layers (e.g. industrial or maritime atmosphere) can form on the insulating surface of the fuse attachment
- Mechanical indication for “HVHRC fuse link tripped” – is integrated in the control and display area
- The continuous mechanical interlocks between the switch disconnector - earthing switch – mechanical cover in front of the fuse receivers permit user-controlled and extremely straighforward replacement of the HVHRC fuse links

Switches

Interlocking systems

Mechanical locks

PM103.141

Mechanical locks

Mechanical key-locks preventing unintended mechanical actuation on the control panel are designed as locks. They prevent insertion of the operating crank for manual actuation of the disconnector and/or the earthing switch. A lock-type mechanical lockout does not ensure a logic interlocking sequence.

Mechanical key-locks are used primarily:

- With motorized disconnectors/earthing switches
- In the event of mechanical actuation on the control panel, to ensure that switching operations are only performed by authorized staff

Interlocking system

The GMA's interlocking system takes account of the various operating modes demanded of the switchgear. The system has a modular design and essentially distinguishes models for:

- Automated GMA
  - Remote-controlled
  - Interlocks by means of digital bay computers or I&C switchgear and controlgear
- Performing switching operations on the mechanical control panel of the GMA switchgear cubicles
  - With interlocks to prevent operating errors

Automated GMA switchgear

If digital bay computers and automated GMA switchgear are used, the standard model interlocks are designed using the I&C switchgear and controlgear and its digital components.

In the highly unlikely event of total failure of the auxiliary supply, the control, monitoring and grid protection systems are inoperative. In this case, mechanical operation of switchgear cubicle's control panel is a manual emergency operation.

The actuating concept of automated GMA switchgear envisages that the main aim of manual emergency operation in the event of total failure of the auxiliary supply is to earth individual outgoing feeders and/or feeders in this exceptional case.

No other switching used in standard operation is performed. This type of switching must only be performed by specifically trained specialists.

The insertion openings for manual emergency actuation are not accessible during normal operation due to the mechanical locks. When releasing the insertion opening for the crank handle, operators must be aware that in this exceptional case, non-interlocked switching operations are performed.

Switching operations on the switchgear cubicle's operating panel during operation

GMA switchgear without automation or integrated I&C switchgear is normally switched via the mechanical control panel of the switchgear cubicles. Internal interlocks within the cubicle ensure a logical workflow and prevent operating errors.

For actuation on the control panel, interlocks within the cubicle can be designed as follows so as to prevent operating errors:

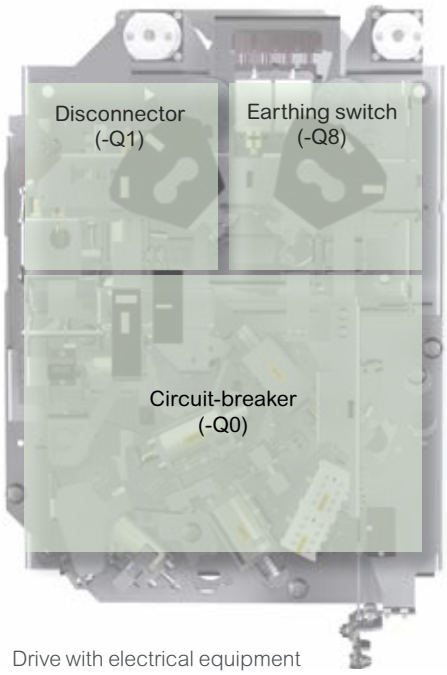
- Mechanical
- Electrical/electromagnetic using blocking coils with fail safe philosophy
- The interlocks have a modular design and can be selected specifically for the project in question (see detailed information in the following section "Drive")

Switches

Drive mechanism

Function and equipment

PM103.102



Drive with electrical equipment
Modular design

PM103.103

Key switch

PM103.104

ON/OFF button

PM103.105

Counter for operating cycles

GMA drive mechanism with electrical equipment

The mechanical drive mechanism with its integrated mechanical interlocks and electrical equipment features a strictly modular design.
This permits straightforward access to all installed components with just a few operations.
Disconnectors and earthing switches are designed as 3-position switches.
The circuit-breaker is equipped with a stored energy spring-mechanism which ensures quick operating sequences and an auto-reclosing feature.
The individual switchgear drive mechanisms can be completely automated and remote-controlled.
Three separate permanent magnet motors are used for automation:

- Of the circuit-breaker to charge the spring mechanism
- Of the disconnector for direct switching ON and OFF
- And of the earthing switch for direct switching ON and OFF

The drive mechanism can be equipped with the mechanical "Earthing switch intertripping circuit" as a special feature. To this effect, the circuit-breaker is switched ON or OFF automatically during mechanical or electrical switching of the earthing switch. The "Earthing ON" and "Earthing OFF" operations are performed by a single operation both for the earthing switch and the vacuum circuit-breaker. Additional actuation of the vacuum circuit-breaker is not required for these operations.
In the earthed condition, the circuit-breaker switching OFF operation is blocked both for local mechanical control and electrical control.
Mechanical interlocks can be replaced by electrical interlocks to enable free electrical interlocking, for example.

Mechanical equipment:

- Position indication of all switchgear and controlgear
- Manual operation of disconnector/earthing switch via crank
- Manual stored energy spring-mechanism for the circuit-breaker
- ON/OFF pushbutton for circuit-breaker
- Operating cycle counter
- Auto-reclosing feature
- Intertripping circuit "Earthing switch – circuit-breaker" including integrated mechanical lock-in for circuit-breaker (optional)
- Key switch for mechanical interlocking of certain operating functions and/or interruption of remote control (optional)
  - Interlocking between the switch position of the earthing switch and the cable compartment cover (optional)

Electrical equipment:

The electrical operating equipment within the mechanical drive is selected according to the rated supply voltage available.

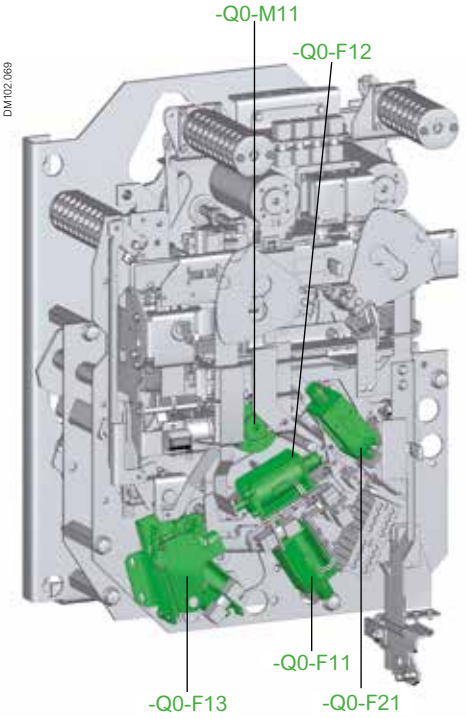
Overview of rated supply voltages						
Direct voltage DC [V]	24	48	60	110	125	220
Alternating voltage AC [V]		120			230	

Switches

Drive mechanism

Circuit-breaker/Motors and releases

DM102.069



Electrical operating equipment

- Motor drive mechanism on circuit-breaker (-Q0-M11)
- Permanent magnet motor, power consumption 200 W
- The motor-drive mechanism charges the stored energy spring-mechanism
- 1st shunt tripping coil (-Q0-F11)
  Power consumption 160 W
- 2nd shunt tripping coil (-Q0-F12)
  Power consumption 160 W (optional)
- Shunt opening releases switch the circuit-breaker OFF and operate according to the open-circuit principle
- Shunt-closing release (-Q0-F21)
- The shunt closing release switches the circuit-breaker ON and operates according to the open-circuit principle
- Undervoltage release (-Q0-F13)
  Power consumption 12 W (optional)
- The undervoltage release switches the circuit-breaker OFF when de-energized (control voltage) and operates according to the closed-circuit principle

PM103.106

Motor
Q0-M11

PM103.107

Shunt release
Q0-F11, -F12, -F21

PM103.108

Module
Q0-F13

Power consumption, solenoids								
Rated supply voltage [V]	DC						AC	
	24	48	60	110	125	220	120	230
Shunt closing release (-Q0-F21)	160 W						160 VA	
Shunt opening release (-Q0-F11,-Q0-F12)	160 W						160 VA	
Undervoltage release (-F13)	12 W						12 VA	

Switches

Drive mechanism

Circuit-breaker/Motors and releases

Voltage limits with safe operation of the tripping coils			
		Direct voltage	Alternating voltage, 50/60 Hz
Shunt opening release without/with auxiliary spring energy accumulator		70 to 110% Un	85 to 110% Un
Shunt closing release		85 to 110% Un	85 to 110% Un
Undervoltage release	automatic opening	< 35% [Un]	< 35% [Un]
	no automatic opening	> 70% [Un]	> 70% [Un]
	closing possible	≥ 85% [Un]	≥ 85% [Un]
	closing not possible	< 35% [Un]	< 35% [Un]

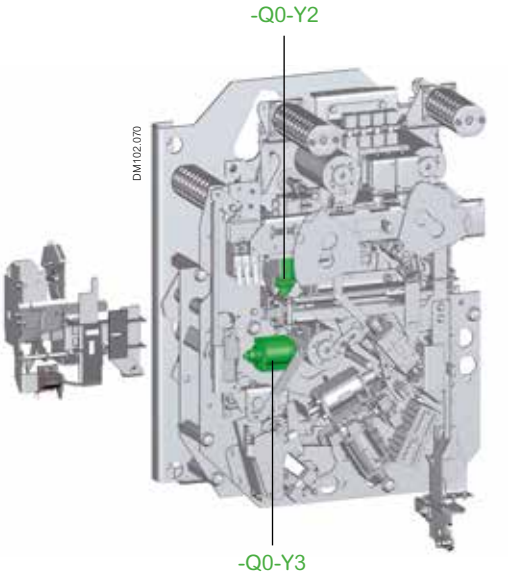
Impulse and charging durations for tripping coils and motor drives		
Minimum command time "ON" electrical tripping [V]	[ms]	20
Minimum command time "OFF" electrical tripping [V]	[ms]	20
Motor charging time for circuit-breaker, spring mechanism	[s]	ca. 7

Rated supply voltages for the drive mechanism [V]										
		DC						AC		
		24	48	60	110	125	220	120	230	
Switching capacity	[A]	8	4	3	2	1.7	1	10	10	
Time factor T=L/R	[ms]	≤ 20								
Rated short-time current		100 A for a duration of 30 ms								
Rated continuous current	[A]	10								
Minimum switching capacity		24 [V]; 15 [mA]								

Switches

Drive mechanism

Circuit-breaker/Blocking coil and circuit diagram



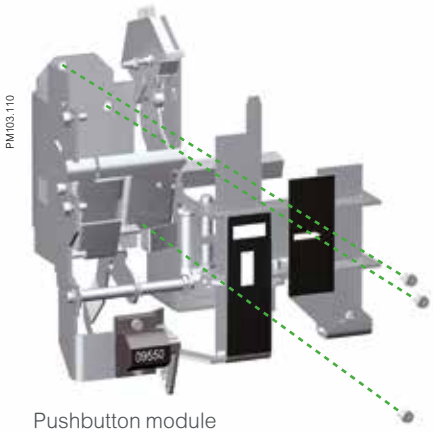
Blocking coils -Q0-Y2 and -Y3

- Blocking coil on ON pushbutton (-Q0-Y2)
  - Power consumption 10.2 W (optional)
  - In de-energized state, the blocking coil blocks actuation of the mechanical ON pushbutton
- Blocking coil on OFF pushbutton (-Q0-Y3)
  - Power consumption 10.2 W (optional)
  - In de-energized state, the blocking coil blocks actuation of the mechanical OFF pushbutton

Power consumption - Blocking coils (-Q0-Y2, -Q0-Y3, -Q1-Y1, -Q8-Y1, -Q11-Y1, -Q12-Y1, -Q15-Y1, -Q16-Y1)

Rated supply voltage [V]

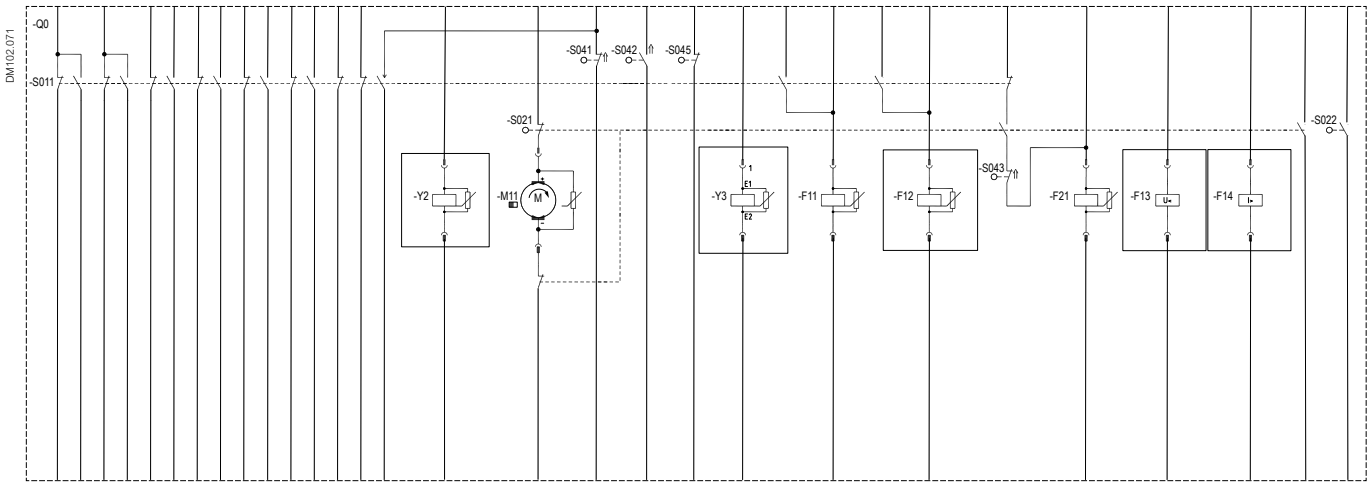
DC						AC	
24	48	60	110	125	220	120	230
10.2 W						10.2 VA	



Pushbutton module

Direct access to the blocking coils –Y2 and –Y3 is possible by releasing the pushbutton module which is secured by means of three screws.

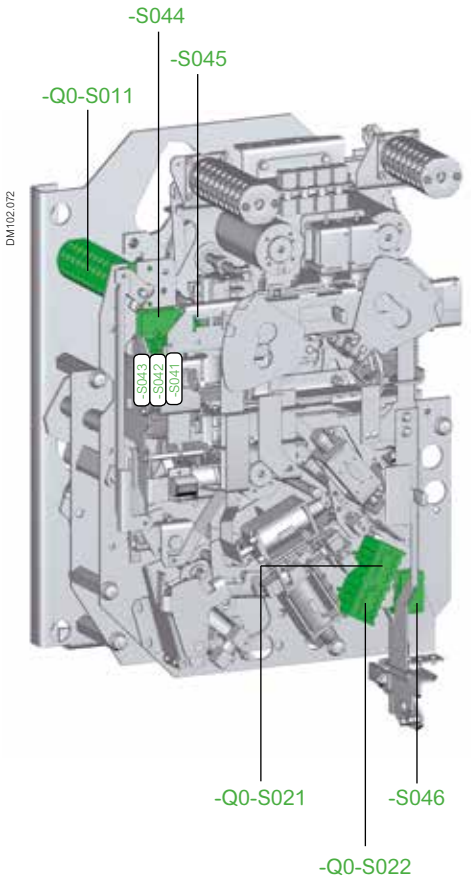
Circuit diagram, circuit-breaker (-Q0)



Switches

Drive mechanism

Circuit-breaker/Auxiliary switches



DM102.072

Auxiliary switches and auxiliary contacts

Auxiliary switches for indicating switch positions are always actuated directly by the switch shaft via a connecting rod. Their position always corresponds to that of the main circuit-breaker contacts. The switching functions have been designed in the factory in accordance with the circuit diagram.

- Auxiliary switch, switch position, 18 contact elements (-Q0-S011)
- Auxiliary contact on stored energy spring-mechanism for motor control, 4 contact elements (-Q0-S021)
- The auxiliary switch on the energy accumulator is actuated with the spring of the energy-storing device charged
- 1st auxiliary contact on the ON/OFF pushbutton (-Q0-S041)
- 2nd auxiliary contact on the ON/OFF pushbutton (-Q0-S042)
- 3rd auxiliary contact on the ON/OFF pushbutton (-Q0-S045)

The auxiliary contacts on the mechanical ON/OFF pushbutton are actuated via the two pushbuttons:

- Auxiliary contact on the OFF pushbutton (-Q0-S043)
- The auxiliary contact on the mechanical OFF pushbutton is actuated by the OFF push button. The auxiliary contact prevents electrical closing in the event of mechanically-actuated switching OFF.

Special auxiliary contacts

- Auxiliary contact on the mechanical lock-out (+S2-S044, optional).
  The auxiliary contact (NO contact) is actuated if the crank insertion opening "Disconnector/ earthing switch" and/or the pushbutton for the circuit-breaker is locked mechanically via the key switch.
- Auxiliary contact on the cable compartment cover interlock (+S2-S046, optional).
  Auxiliary contact (NC contact) on the cable compartment cover interlock is actuated when the cable compartment cover is unlocked or has been removed.


PM103.112

Auxiliary switches -Q0-S011


PM103.113

Auxiliary switch block -Q0-S021 and -S022

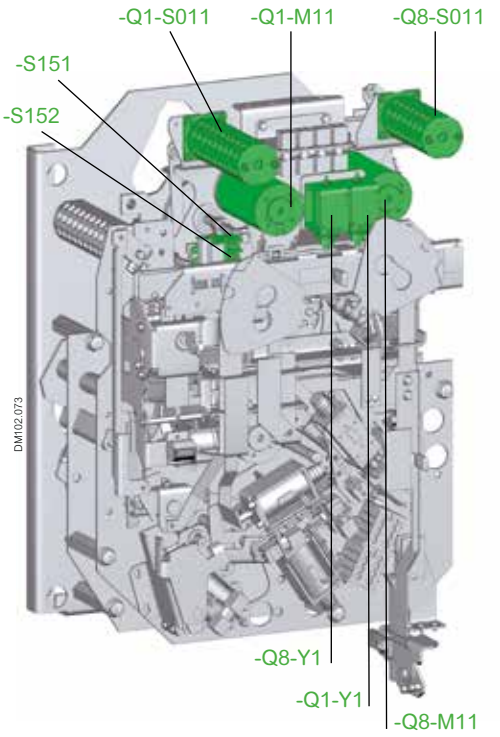

PM103.114

Auxiliary contacts -Q0-S041-S043

Switches

Drive mechanism

Disconnector and earthing switch



- Motor on disconnector (-Q1-M11, recommended basic equipment)
  - Permanent magnet motor, power consumption 200 W
  - The motor drive switches the disconnector ON and OFF (left-hand/right-hand rotation)
- Auxiliary switch, switch position, 14 contact elements (-Q1-S011)
  - Auxiliary switch depending on the position of the main contacts of the disconnector
- Blocking coil insertion opening (-Q1-Y1)
  - Power consumption 10.2 W (optional)
  - A blocking coil blocks the insertion opening for the mechanical disconnector drive mechanism (when in de-energized state)
- Motor on earthing switch (-Q8-M11)
  - Permanent magnet motor, power consumption 200 W
  - The motor drive switches the earthing switch ON and OFF (left-hand/right-hand rotation)
- Auxiliary switch, switch position, 14 contact elements (-Q8-S011)
  - Auxiliary switch depending on the position of the main earthing switch contacts
- Blocking coil insertion opening (-Q8-Y1)
  - Power consumption 10.2 W (optional)
  - A blocking coil blocks the insertion opening for the mechanical earthing switch drive mechanism (when in de-energized state)
- Auxiliary contact on the mechanical interrogating lever for the disconnector/earthing switch (-S151, optional)
  - The auxiliary contact is actuated if the crank insertion opening for the disconnector or the earthing switch is open
- Auxiliary contact on the mechanical interrogating lever for the disconnector/earthing switch (-S152) – description as above, optional

PM103.115

Motor -Q1-M11,-Q8-M11

PM103.116

Blocking coil -Q1-Y1, -Q8-Y1

PM103.117

Attachment of auxiliary contact -S151,-S152

Power consumption and LV circuit-breakers for driving motors of disconnectors, earthing switches and circuit-breakers

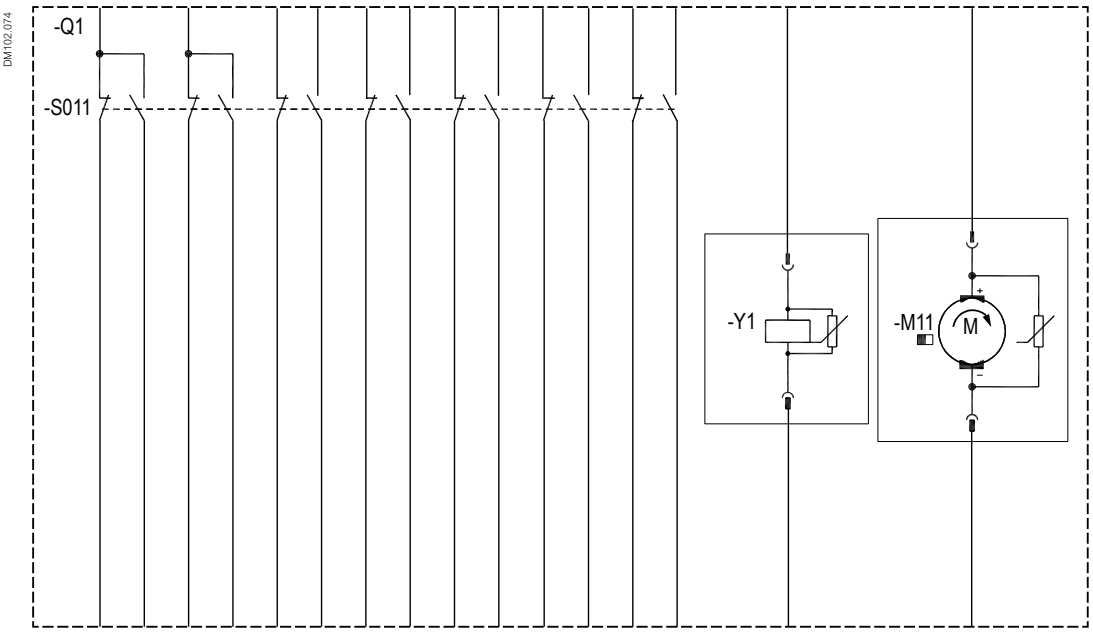
Rated supply voltage [V]								
DC						AC	
24	48	60	110	125	220	120	230
200 W	200 W		200 W		200 W	200 VA	200 VA
Suitable automatic circuit-breaker (tripping characteristic/nominal current)							
C 4 A	C 2 A	C 2 A	C 1 A		C 0.5 A	C 1 A	C 0.5 A

Switches

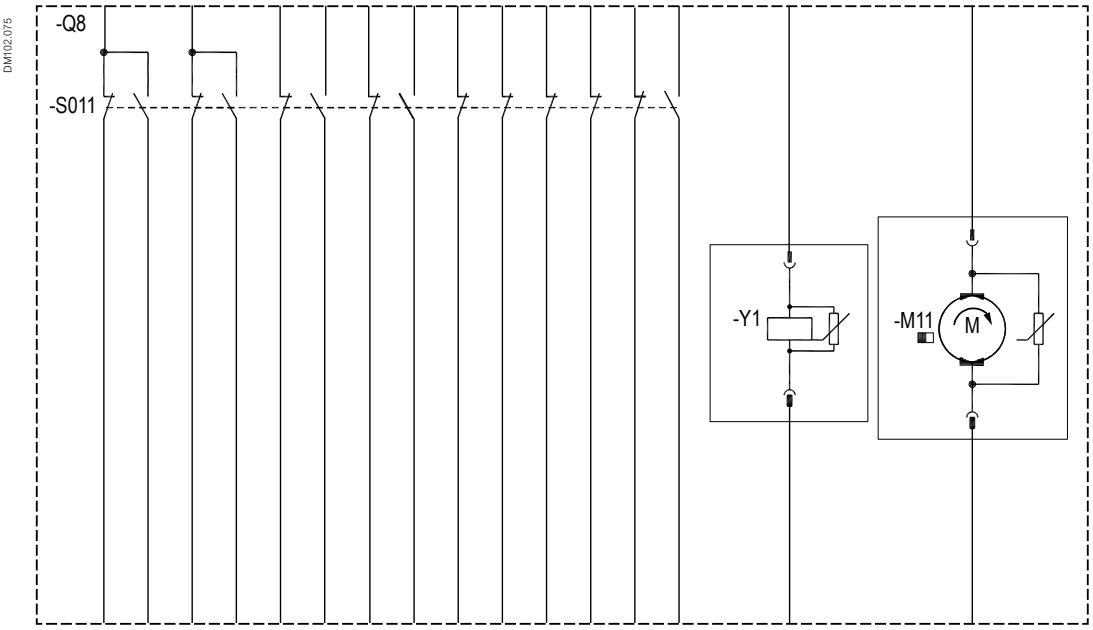
Drive mechanism

Disconnector and earthing switch

Circuit diagram, disconnector (-Q1)



Circuit diagram, earthing switch (-Q8)



Protection and control solutions

Protection relays

MiCOM and Sepam protection systems

PE60300

Sepam range

GMA switchgear integrates Schneider Electric's proven Sepam & MiCOM systems for advanced protection, control and monitoring.

Sepam & MiCOM offer comprehensive protection schemes and advanced control functions for even the most demanding applications.

For more basic applications such as cable and transformer feeders, the range also includes a lower specification device that offers communication and fault recording capabilities coupled with overcurrent and earth fault protection.

Full integration achieves the highest level of system protection at a substantially reduced overall cost.

Main characteristics

- Protection, metering, control, monitoring and annunciation functions
- Trip circuit supervision, logic discrimination, circuit-breaker fail protection, intertripping and circuit-breaker lockout
- Local indication of phase currents, maximum demand, line voltages, power factor, active and reactive power
- Integral analog and digital disturbance recorder
- High level of electromagnetic compatibility
- High reliability from advanced self-supervision systems
- Indication of phase and earth fault values at the time of tripping to aid fault analysis
- Simple to set and maintenance-free, helping to cut costs
- Some relays can be supplied with Ethernet, to allow a full IEC 61850 solution for the substation

Sepam is a self-contained unit and brings many advanced features

- **Sepam Series 20** is suitable for common applications and offers simple solutions based on current or voltage metering
- **Sepam Series 40** with its current and voltage metering capabilities offers high-performing solutions for more demanding applications
- **Easergy Sepam Series 60** is even better suited to demanding applications with more inputs/ outputs (up to 28 binary inputs and 16 outputs) and optional mimic-based display units to view a portion of single-line and phasor diagrams
- **Easergy Sepam Series 80** is specially designed for demanding customers on large industrial sites

PM1102898

MiCOM range

MiCOM offers varying levels of functionality and hardware

- **MiCOM Series 10** is designed for universal overcurrent protection for the primary or back up protection on LV or MV systems
- **MiCOM Series 20** fulfills the basic requirements of industrial, utility and building applications, providing simplicity and ease of use in a wide range of installations
- **Easergy MiCOM Series 30** is designed to meet the rigorous requirements of MV & HV applications with particular focus on feeder and transformer protection and control
- **Easergy MiCOM Series 40** fulfills the protection requirements for a wide market of utility and industrial systems and offers a complete range of protection functions

Protection and control solutions

Protection relays

Easergy P3 protection system

PM106336

Easergy P3U30

PE91025

Multipurpose feeder and motor protection relay

The Easergy P3 protection relay family is based on proven technology concepts developed in close cooperation with customers. Easergy products have been designed around user-friendliness, a feature which is proven in our customer feedback day after day.

The Easergy P3 feeder manager has been developed to cover basic protection needs for OEMs, utilities and industrial applications. Thanks to its cost-effective and flexible design, the Easergy P3 provides an excellent alternative for various protection applications.

Easergy P3 combines further protection functions such as directional earth fault for feeder and motor protection.

Robust hardware

- User-selectable Ethernet or RS485 based communication interface
- Designed for demanding industrial conditions
- Common technology for cost efficiency
- Powerful CPU supporting IEC 61850
- Thanks to four setting groups, adaptation to various protection schemes is convenient

User-friendly and high functionality

- Common firmware platform with other Easergy range protection devices
- Standard USB connection (type B) for setting software (VAMPSET)

Modern Human Machine Interface (HMI)

- Clear LCD display for alarms and events
- Single-line mimic diagram with control, indication and live measurements
- Programmable function keys and LEDs
- Circuit-breaker ON/OFF control

Ease of use

User-friendliness has always been a feature of Easergy products, and the Easergy P3 is no exception.

A great deal of effort has gone into designing the operational aspects of the new products. Setting and download/upload are much faster thanks to the unique eSetup Easergy Pro setting software which dramatically improves usability.

Unicode support allows the menu text and settings to be translated into various international languages including, for example, Russian and Chinese.

The informative human machine interface shows the information the user needs, with the support of customized legend texts.

Enhanced usability

The Easergy P3 protection relay concept has been extended with a number of features that make installation and testing of the relays even more efficient and user-friendly.

Protection and control solutions

Control & Measurement units and arc detection systems

PE57123

Energy management and grid measuring system

The universal PowerLogic metering equipment replaces the functions of many individual analog metering devices. These low-cost, high-performance universal metering devices offer a comprehensive range of functions for recording and indicating the appropriate rms values within the distribution network.

The PowerLogic series 3000/4000 are designed as network analyzers for sensitive operating equipment and demanding energy consumers. They provide reliable information for the continuously changing requirements in the current climate of power system deregulation. They can be adapted to almost any utilization period and real-time rate as regards recording.

The PowerLogic system covers all steps for sustained improvement of energy efficiency:

- Recording of metered data
- Transfer and processing of information to be further analyzed by the various views of the individual company divisions and departments: production, maintenance, monitoring, management
- Plant optimization and verification of efficiency are enhanced after implementation of the improvement measures

PM106276

VAMP125

VAMP arc fault protection relay

The VAMP arc protection unit detects an arc flash in an installation and trips the feeder breaker. The unique arc fault protection functionality enhances the safety of both people and property and has made VAMP a leading global brand in arc protection relays.

PM103.142

Operating unit, variant 1

PM103.143

Operating unit, variant 2

GemControl

Gem Control has been functionally designed for the specific requirements for medium-voltage switchgear in the distribution system.

GemControl provides each GMA switchgear cubicle with a central digital unit for control, monitoring and communication, thus permitting intelligent switchgear management.

GemControl's focus on the control, monitoring and communication functions – without integration of the grid protection functions – has the following advantages:

- High flexibility at all project stages: in planning, handling, configuration, commissioning, operation and further development of control and monitoring functions
- Extremely straightforward parameter setting using prepared switchgear cubicle configurations
- High degree of reliability
- Scalable and expandable to meet future requirements
- Comprehensive service packages
- The basic GemControl unit is suitable for communication with all standard forms of communication, such as IEC-protocols
  - (IEC 60870-5-101, -103 and -104; IEC 61850) as well as Profibus-DP, Modbus-RTU and -TPC
- Serial or Ethernet connection

PM103.144

Basic unit

PM103.145

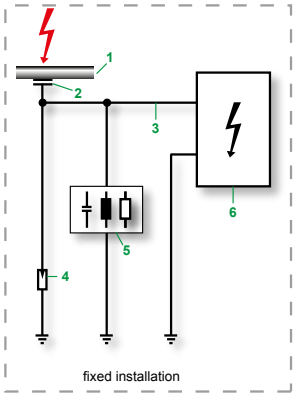
Expansion modules

Protection, monitoring & control

Auxiliary devices

Voltage detection system

DM102.112



Integrated testing system

1 Live high-voltage conductor
2 Coupling capacitance: electrode in bushing
3 Internal connecting cable
4 Voltage-limiting predetermined break point
5 Measurement protection circuit
6 Display indication

Capacitive voltage divider – application example: integrated voltage detecting system (schematic diagram)

PM103.132

Non-integrated plug-in voltage detecting system - three-phase edge connector

PM103.133

Non-integrated plug-in voltage detecting system – three plug-in indicators

Capacitive voltage dividers for indicators and testing equipment

Devices can be connected to the capacitive voltage dividers in the bushings on the outgoing feeder cable and on the busbar sections for:

- Verification of safe isolation from the supply
- Digital display of the voltage values
- Voltage monitoring and analysis of the grid quality
- Fault detection in the electrical distribution system; e.g. earth fault in isolated/ compensated systems

The systems connected to the capacitive voltage dividers must be designed for the operating voltage of the power supply system, not for the max. rated voltage of the GMA switchgear and controlgear.

Voltage detection system

Testing for zero voltage and phase comparison is performed via three-phase voltage detection systems (VDS) in accordance with IEC 61243-5/EN 61253-5. The following systems are installed in GMA:

- Non-integrated plug-in voltage detection system
- Integrated voltage detection system with integrated repeat testing

Non-integrated voltage detection system

Verification of zero voltage is performed, with the non-integrated system, via plug-in indicators with flashing LED display.

The appropriate fixed terminal strip is located in the low-voltage recess of the GMA switchgear cubicle, directly above the control panel.

The essential characteristics of the non-integrated voltage detection system are:

- Standard HR (high-resistance) system:
  - 19 mm spacing for the socket contacts on the standardized interface to the plug-in indicators
- The plug-in indicator LED flashes if high voltage is present
- No additional auxiliary voltage required for indication
- Repeat tests must be performed in accordance with IEC 61243-5/EN 61243-5 on the interfaces of the non-integrated voltage detection system, for the fixed part as well as for the plug-in indicators
  - Mobile test units are (optionally) available
  - 3 plug-in indicators are provided per switchgear as accessories (optionally: larger quantities)

Protection, monitoring & control

Auxiliary devices

Voltage detection system

PM103.134

Integrated voltage detecting system IVIS – "zero voltage" indication

PM103.135

Three-phase indication "Voltage present" on the IVIS display

IVIS Integrated Voltage Detection System

IVIS – integrated voltage detection system – can be installed optionally in any GMA switchgear cubicle with a capacitive voltage divider.

IVIS – integrated voltage detection system – is used to ascertain:

- The presence of operating voltage
- Isolation from the power supply
- Phase comparison

A display with LCDs indicates on the IVIS the capacitive decoupled voltage of the primary conductor for each phase. IVIS continuously checks that the following conditions in accordance with the relevant standard IEC/EN 61243-5 are satisfied:

- The response conditions for unambiguous indication of "Voltage present/absent" and
- The conditions for repeat testing of integrated voltage indication systems

Only when both these two conditions exist the IVIS displays a continous lightning for each phase.

The system monitors the test circuit continuously according to the above-mentioned criteria and indicates non-compliance with the conditions for the repeat test by a dashed lightning. In this case, the system must be checked.

The IVIS system has been designed for maximum operating reliability:

- Maintenance-free
  - Weather proof encapsulated electronics
  - No repeat tests required using mobile equipment
- No auxiliary voltage required
- Continuous integrated repeat testing of the interfaces in the entire circuit for zero voltage verification

Protection, monitoring & control

Auxiliary devices

Gas monitoring

With its ample application options, GMA provides an efficient solution for control, monitoring and protection within the electrical distribution network.

Thanks to the integrated devices, GMA can easily be interfaced with monitoring and control systems, substation and power system control.

Know-how and management – two increasingly important "musts"– for all medium-voltage distribution systems

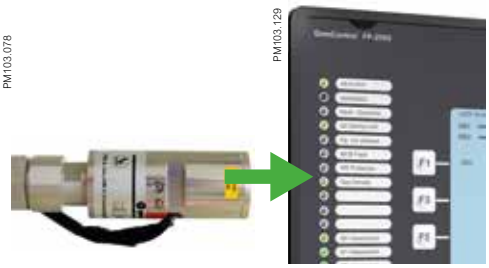
With demand for decentralized generation of electrical power on the increase and requirements for power system adaptability becoming ever more stringent, grid operators are looking for more flexible, responsive and scalable solutions which are easy to reconfigure (“Smart Grid" and “Smart Systems“).

For the operating companies, know-how, understanding and acting correctly are fundamental.

- The current operating status of the distribution system and the switchgear cubicles must always be apparent
- Actions required for power system operation must be derived specifically from the current status and performed without involving any risk

PM103.078

PM103.129



Gas monitoring

Monitoring the insulating gas

The insulating gas pressure of each gas-filled compartment is monitored in the following versions:

Option 1

The combination of the temperature-compensated gas-density switch is implemented together with LED indicators in a digital bay computer such as GemControl or other suitable digital device.

Each of the auxiliary switches on the gas density switch features two-level LED indicators:

- 1st level "Warning" and
- 2nd level "Alarm"

The above-mentioned signalling levels can be transferred remotely, if required, by implementation in the digital bay computer.

PM103.130

Pressure gauge indicating readiness for operation

Option 2

Pressure gauge indicating readiness for operation using colored display segments. This indicator signals readiness for operation directly above the switchgear cubicle's operating panel via the pointer position in the segments:

- "Green" segment = ready for operation
- "Yellow" segment = warning
- "Red" segment = alarm

Protection, monitoring & control

Auxiliary devices

Gas monitoring

PM103.131

Pressure gauge with auxiliary contacts

Option 3

Pressure gauge indicating readiness for operation using coloured segments plus auxiliary contacts. This indicator signals readiness for operation directly above the switchgear cubicle's operating panel via the pointer position in the segments:

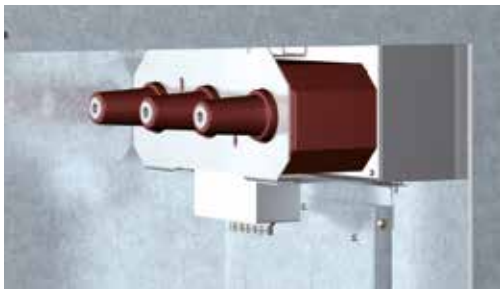
- "Green" segment = ready for operation
- "Yellow" segment with 1 auxiliary contact = warning
- "Red" segment with 1 auxiliary contact = alarm

The auxiliary contacts are used to transmit the alarm or warning level electrically.

Only one of the above-mentioned variants can be implemented for gas monitoring at any one time.

Current transformers

PM103.085



Current transformer block on bushings, cubicle width 450 mm

Current transformer

In GMA, inductive low-voltage toroidal-core current transformers are used. The switchgear-specific conductors form the primary conductor of the current transformers.

- The current transformers are not subject to dielectric stress on the high-voltage side
- They are always installed outside the gas-filled compartment
- The secondary lines integrated in the transformer block are routed through the low-voltage cabinet without intermediate terminals

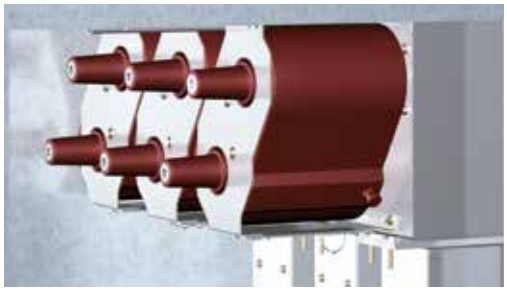
PM103.086

Current transformer block on bushings with optional supplementary core, cubicle width 600 mm

Current transformer in outgoing feeder block

- Based on the extended and earthed cone-type plug-in type bushings for cable connection
- Straightforward retrofitting or replacement of the current transformers is possible without interfering with the gas-filled compartment
- Cubicle width 450 mm and 600 mm with 1 outer cone-type plug-in type bushing per conductor:
  - The toroidal cores for the conductors L1-L2-L3 are combined mechanically to form a common block structure.
- Supplementary transformer in switchgear cubicle width 600 mm with 1 outer cone-type plug-in type bushing per conductor:
  - Supplementary core for highly sophisticated electrical transformer design
  - One common transformer block via the conductors L1–L2-L3 overlaps the area of the outer cone-type cable bushing
- Cubicle width 800 mm with 2 outer cone-type plug-in type bushings per conductor:
  - One common oval transformer block each over the 2 bushings of one conductor

PM103.087

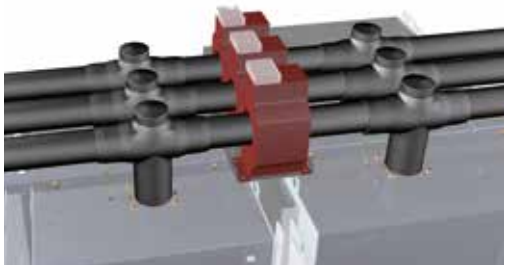


Current transformer blocks on both bushings, cubicle width 800 mm

Busbar current transformer

- Attachment possible to each busbar section
- Single-pole low-voltage winding type transformer on the earthed busbar
- Fastened via an adapter structure between 2 GMA basic switchgear cubicles
- Current transformer cores for billing metering
  A measuring core can be implemented in a calibratable or calibrated design for billing metering.

PM103.088



Busbar current transformer

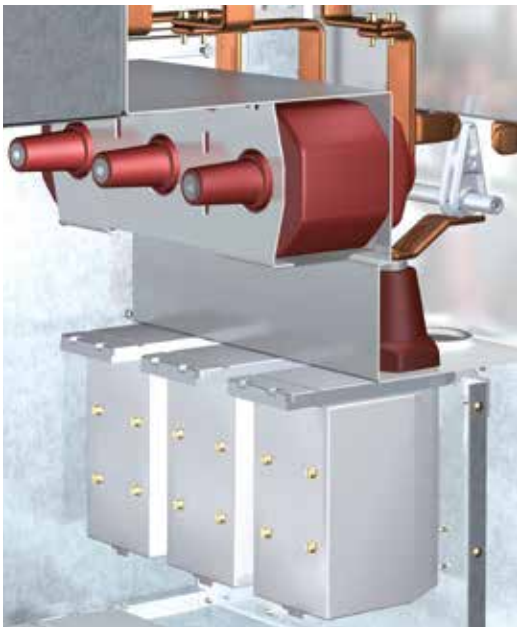
Current transformers

Technical data* for GMA current transformers		
Maximum voltage		0.72 kV
Rated short-time power frequency withstand voltage (winding test)		3 kV
Rated frequency		50/60 Hz
Primary rated current		50 A to 2500 A
Secondary rated current		1 A or 5 A
Thermal rated continuous current intensity		1.0 x primary rated current intensity 1.2 x primary rated current intensity (optional)
Number of cores (for outgoing feeder block)		max. 3
Data of current transformer cores (depending on primary currents)		
Measuring cores *	Power	2.5 to 10 VA
	Class	0.2 to 1
	Overcurrent factor	FS10
Protection cores *	Power	2.5 to 30 VA
	Class	5P or 10 P
	Overcurrent factor	10 to 30
Thermal rated short-time current intensity		max. 31.5 kA, 3 s
Standards		IEC/EN 61869-2

* Other values on request

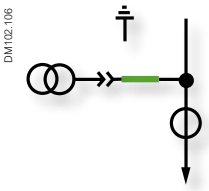
Voltage transformers

PM103.089



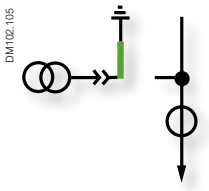
Voltage transformer in cable compartment with disconnecting device (illustration: gas-filled compartment open)

DM102.106



Voltage transformer "ON"

DM102.105



Voltage transformer "OFF"

Voltage transformers

The inductive voltage transformers are

- Single-pole isolated voltage transformers
- Fully shrouded and earthed in accordance with the system
- In addition to the main winding, an additional auxiliary winding is possible for earth fault detection (optional)
  - Design with one tap in the main winding for switchability to two different rated voltages of the high-voltage system (optional)
  - Separate windings in calibratable or calibrated design for billing metering (optional)
- Available with integrated high-voltage fuses (optional)

Attachment of the voltage transformers

- Excellent operator safety thanks to integration of the voltage transformers in a metal-enclosed GMA cable compartment, also for busbar voltage transformers.
- Disconnecting device (optional) possible on high-voltage side
  - High-voltage cable test without removal of the voltage transformers
  - Speedy recommissioning of a GMA switchgear cubicle in the unlikely event of a fault on the voltage transformer
  - Very safe working conditions and short downtimes should the voltage transformers need to be replaced
  - Disconnecting devices in gas-filled compartment with switching positions ”ON“ and “OFF – transformer earthed“
- The voltage transformers are already assembled, connected ready for operation and tested in the factory
- Installed outside the gas-filled compartment
- Adaptation on the high-voltage side and mechanically via inner cone-type bushings
- Removable without intervention in the gas-filled compartment
- No additional cubicle width required for voltage transformers
- Actuation on the front of the switchgear and controlgear
- Control mechanism and indication of the switch position on the front of the switchgear
  - Installed directly behind the removable cable compartment cover
  - Accessible after removal of the cable compartment cover
  - Together for all three conductors
  - Locking knob in the defined end positions
  - Possibility of attaching a padlock
  - Identical design and handling for outgoing feeder and busbar voltage transformers

Voltage transformer

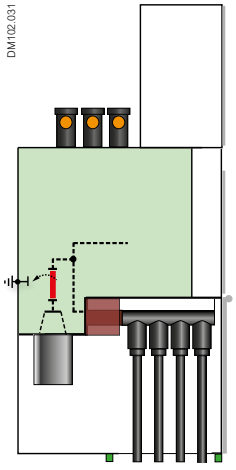
PM103.090

Voltage transformer (schematic diagram) for feeder measurement

DM102.109

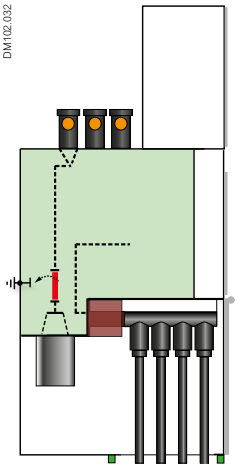
DM102.110

DM102.031



Voltage transformer (schematic diagram) for feeder measurement

DM102.032



Voltage transformer (schematic diagram) for busbar measurement

Outgoing feeder voltage transformer

- Installation in cubicle widths:
  - 600 mm and
  - 800 mm
- Always with disconnecting device on high-voltage side

Busbar voltage transformer

- Connection in gas-filled compartment on high-voltage side, with tap below the busbar bushing
- Installation in cubicle width 600 mm in GMA switchgear cubicles without outgoing feeder voltage transformer
- Independent of on-site assembly of the busbar sections
  - Mounted, wired and tested in the factory within the metal-enclosed connection compartment
  - No assembly work for busbar voltage transformers on site
- Disconnecting device on high-voltage side (optional for busbar voltage transformers)

Technical data* for GMA voltage transformers

High-voltage windings

Rated voltage		12	15/17.5	24
Rated short-time power frequency withstand voltage	KV	20	38	50
Rated lightning impulse withstand voltage	kV	60	95	125
Service voltages		3.3/√3 to 11/√3	11/√3 to 15/√3	17.5√3/ to 23/√3
Rated voltage factor		U_n/8 hrs = 1.9; U_n permanent = 1.2		
Secondary winding				
Service voltage of measuring winding	V	100/√3; 110/√3; 120/√3		
Auxiliary winding	V	100/3; 110/3; 120/3		
Thermal limit current of measuring winding	A	6		
Rated continuous current 8 hrs	A	4		
Power at accuracy class *		class 0.2: up to 20 VA class 0.5: up to 60 VA class 1: up to 120 VA		
Standards		IEC/EN 61869-3		

* Other values on request

HVHRC fuse links

Data for HVHRC fuse links

For the protection of distribution transformers, only HVHRC backup fuse links with integrated thermal cut-outs may be used for gas-insulated GMA switchgear.

Due to the thermal cut-outs, the event of:

- overload of the HVHRC fuse links in the presence of inadmissible overload currents
- previously-damaged HVHRC fuse links, there will be a shut-off triggered by the switch disconnector.

This prevents thermal overloading of the fuse receiver.

The following data must be specified in the Purchase Order:

- Transformer rated power
- Transformer operating voltage
- Rated current of the selected HVHRC fuse links.

Selection lists of approved suppliers for HVHRC fuses can be provided as required. These selection lists take the following standards and regulations into account:

- Protection of distribution transformers in accordance with IEC 60787, VDE 0670, part 402
- Fuse links in acc. with IEC 60282-1 or DIN 43625 (striker type “medium” with max. initial tripping force of 80 N)
- Specifications of IEC 62271-105
- Max. ambient temperature for switchgear: 40 °C according to IEC 62271-1, identical with max. ambient temperature for the switchgear within the housing of a packaged substation in accordance with IEC 62271-202
- No transformer operation during an overload condition
- Temperature rise limits within the switchgear enclosure

Approved suppliers for HVHRC fuse links

The following series of HVHRC fuse links offering integrated striker tripping with a thermal cut-out feature is available from the stated supplier:

Series	Supplier
HVHRC backup fuses	SIBA max. 50 A

Other suppliers may be chosen subject to consultation with the manufacturer.

HVHRC fuse links

Recommendation for use to protect mains transformers with SIBA HVHRC fuses in switch-fuse combinations with GMA in accordance with IEC 62271-105

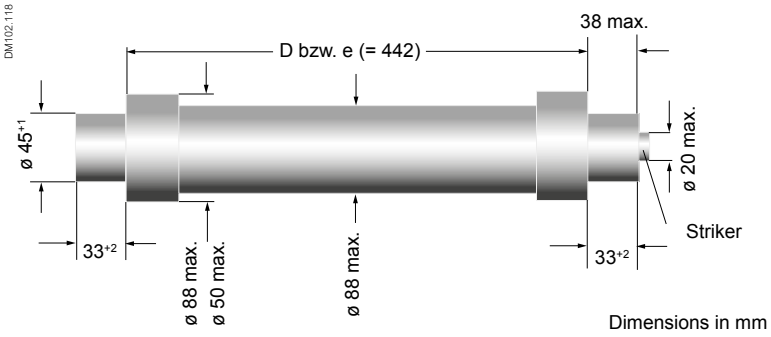
		SIBA	Application recommendation for protection of mains transformers, SIBA HH-Fuses in switch-fuse combination with GMA -T1 according to IEC 62271-105												
		Transformer power [kVA]													
		100	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500
Voltage		uk = 4%							uk = 4% uk = 6%	uk= 6%					
Rated voltage [kV]	Service voltage [kV]	Rated current of HH fuses [A]													
3/7.2	6	20	31,5	40	50	63	80	80	100	-	-	-	-	-	-
										-	-	-	-	-	-
6/12	10	16	20	25	31,5	40	50	50	63	63	80	-	-	-	-
												-	-	-	-
10/17.5	15	10	16	20	20	25	25	31.5	40	50	50	63	80	-	-
		442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	-	-
10/24	20	10	16	16	20	20	25	25	31.5	40	50	50	63	100 ssk	-
		442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	442 mm	442 mm SSK	-

- Concept of overload protection of transformers without NH-fuse on the low-voltage side; each feeder is protected with a SIBA NH-fuse in operating class gG/gL
- Inrush current = 12 x transformer rated current for transformer power up to 1000 kV, for higher power inrush current = 10 x transformer rated current
- Maximum overload current = 150% of the transformer rated current
- u_K = 4% for transformer power up to 630 kVA, for higher power u_K = 6%
- *) Transfer current > current on primary side in secondary short-circuit
- Applications with different conditions should be considered separately

Dimensions for fuse links

The GMA switch disconnector panel with fuses has been designed for the following fuse link dimensions “D” or “e”:

Type designation	Gauge “D” or “e” in mm
GMA/12-2/... with 17.5 kV adapter	292
GMA 24/...	442



Should the company operating the switchgear use fuse links not defined in the selection lists, they willl be solely responsible for the use of such fuse links.

General-purpose fuses are recommended for the exceptional case in which the switch disconnector is to be equipped with a snap-action drive SFU (instead of stored-energy mechanism SF), so that all-pole fuse tripping is impossible.

Installation & Connection

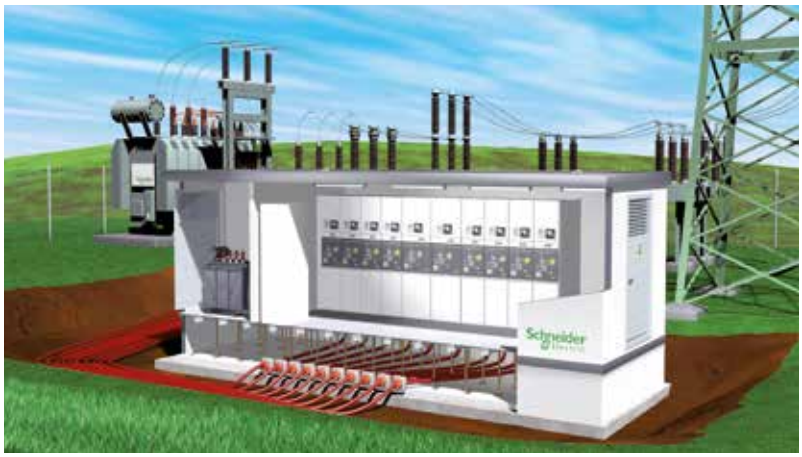
Installation & Connection

Overview

Room planning - 3 installation options

Ceiling height 2.4 m

PM106271



GMA up to 24 kV-31.5 kA/3 s - 2500 A, next to wall installation, IAC AFL 31.5 kA with ceiling height of 2400 mm

GMA up to 24 kV-31.5 kA/3 s - 2500 A, free-standing

PM106272

Free-standing, with back side pressure duct, pressure relief inside the room, IAC AFLR 31.5 kA-1 s

PM106273

Free-standing, with pressure channel, pressure relief outside the room, IAC AFLR 31.5 kA-1 s

Room planning

Back-to-the-wall installation - IAC AFL

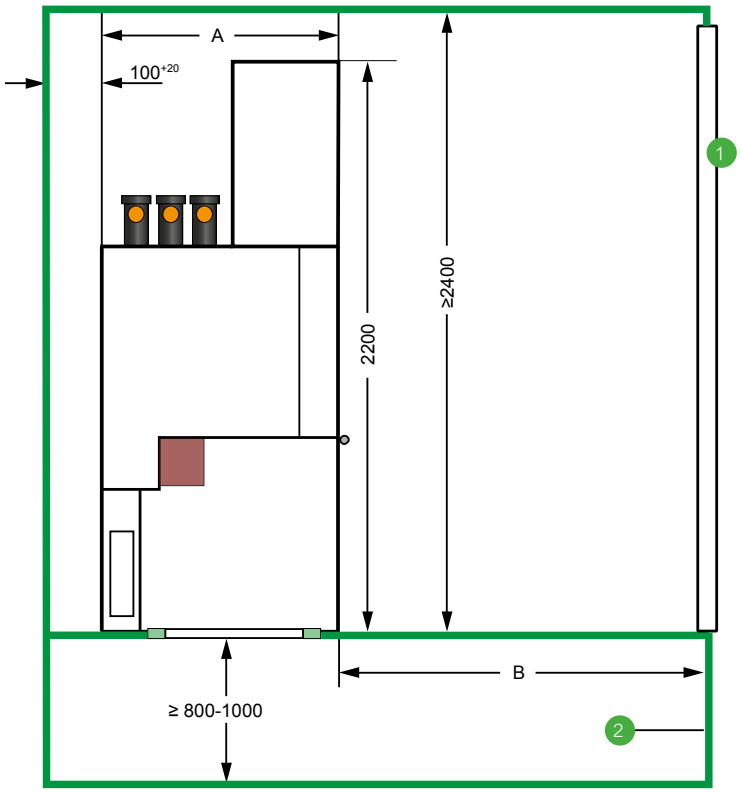
Installation of GMA switchgear and controlgear

IEC/EN 62271-200 requires "minimum permissible conditions" for installation of switchgear and controlgear with internal arc classification IAC.

The instructions and information regarding minimum room heights and wall clearances for the GMA switchgear and controlgear must be observed and compliance with these is mandatory.

These are the "minimum conditions" in accordance with the above standard. Any installation condition which is not as strict and/or provides for more space, is deemed, in accordance with IEC DIN EN 62271-200, to have been covered by the test for internal arc classification IAC.

DM102.076



Design data

Minimum dimensions within the building
Examples in accordance with IEC 62271-200, internal arc classification IAC AFL with minimum room height

1 Opening for placement
- Width ≥ 1100 mm (if this measurement is not possible, please ask for the minimum width of the opening for transport)
- Height ≥ 2400 mm (if this measurement is not possible, please ask for the height of opening without low-voltage cabinet)

2 Dimensions of cable duct or basement depending on the permissible minimum bending radius of the high-voltage cables
- Dimension A = cubicle depth
- Dimension B = aisle width, also possible for replacement of switchgear cubicles
- Smaller dimensions available on request

Note:
The maximum cubicle depth (dimension A) within the switchgear configuration determines the total width of the switchgear and controlgear and the minimum dimensions in the building.

Main dimensions with internal arc classification IAC AFL

Cubicle type	Rated current feeder	Cubicle width	Dimension A	Dimension B
	A	mm	mm	mm
CB, DI, T1	630-800	450	875	1300
CB, DI	630-1250	600	1005*	1300
BC-CB	-1250	800	1005	1300
CB, DI	1600 A-2500 A	800	1280	1750
BC-CB	≥ 1250 A	1000	1280	1750

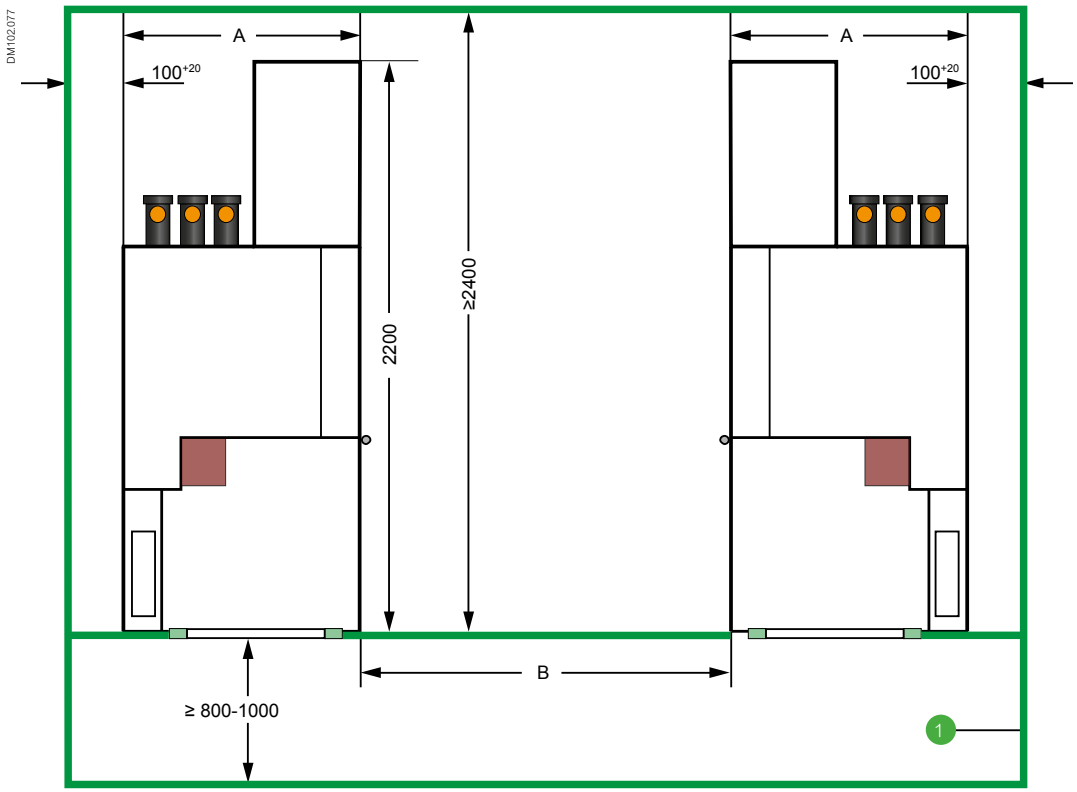
* 875 for 630 A, 25 kA without voltage transformer

Room planning

Face-to-Face and Back-to-the-wall installation - IAC AFL

Design data

Minimum dimensions within the building. Examples in accordance with IEC 62271-200, internal arc classification IAC AFL with minimum room height



1 Dimensions of cable duct or basement depending on the permissible minimum bending radius of the high-voltage cables
- Dimension A = cubicle depth
- Dimension B = aisle width, also possible for replacement of cubicle
- Smaller dimensions available on request

Note:
The maximum cubicle depth (dimension A) within the switchgear configuration determines the total width of the switchgear and controlgear and the minimum dimensions in the building.

Main dimensions with internal arc classification IAC AFL

Cubicle type	Rated current feeder	Cubicle width	Dimension A	Dimension B
	A	mm	mm	mm
CB, DI, T1	630-800	450	875	1300
CB, DI	630-1250	600	1005*	1300
BC-CB	-1250	800	1005	1300
CB, DI	1600 A-2500 A	800	1280	1750
BC-CB	≥ 1250 A	1000	1280	1750

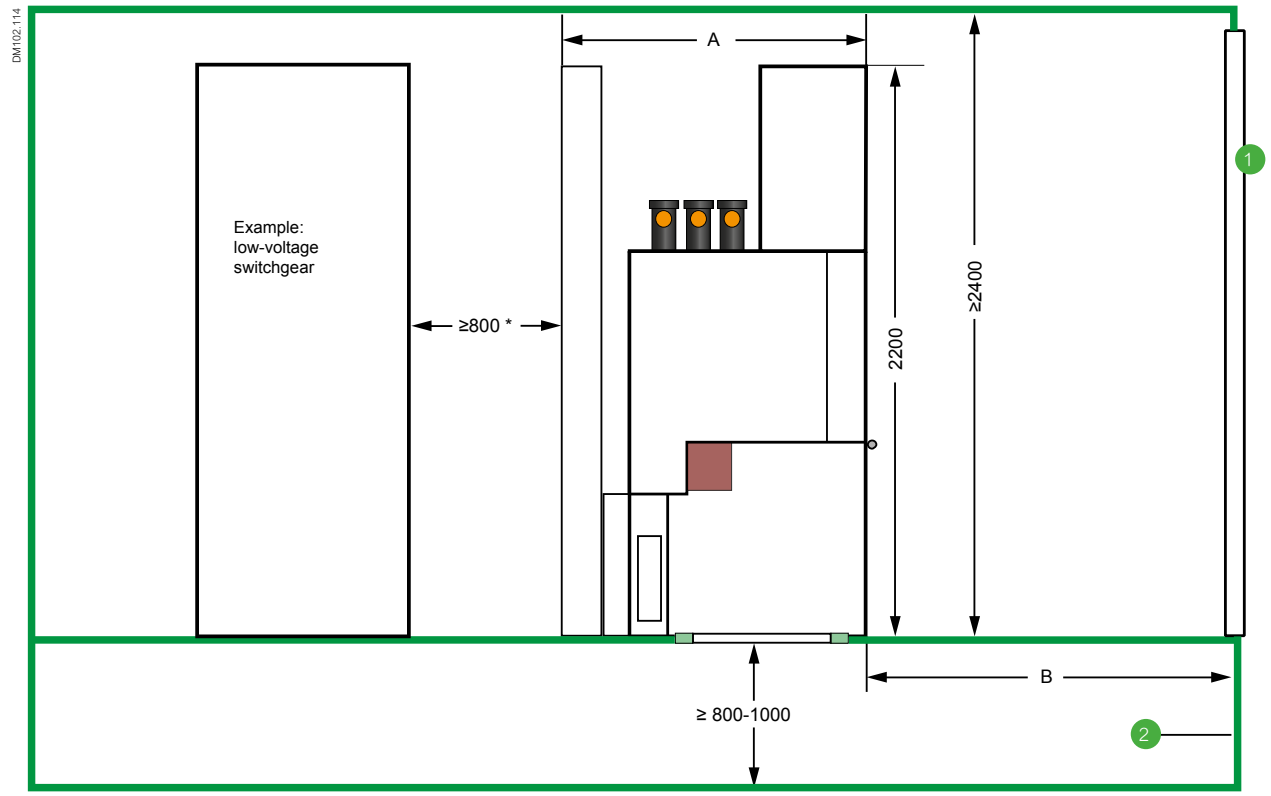
* 875 for 630 A, 25 kA without voltage transformer

Room planning

Free-standing installation - IAC AFLR

Design data

Minimum dimensions in the building, free-standing installation. Examples in accordance with IEC 62271-200, internal arc classification IAC AFLR with minimum room height



1 Opening for placement:
- Width ≥ 1100 mm (if this measure can not be realized: please ask for the minimum width of the opening for transport)
- Height ≥ 2400 mm (if this measure can not be realized: please ask for the height of of opening without low voltage cabinet)

2 Dimensions of cable duct or basement depending on the permissible minimum bending radius of the high-voltage cables
- Dimension A = cubicle depth
- Dimension B = aisle width, also possible for replacement of cubicle
- Smaller dimensions available on request

* Reduction possible to as little as 100 mm

Main dimensions with internal arc classification IAC AFLR

Cubicle type	Rated current feeder	Cubicle width	Dimension A	Dimension B
	A	mm	mm	mm
CB, DI, T1	630-800	450	1125	1400
CB, DI	630-1250	600	1125	1400
BC-CB	-1250	800	1125	1400
CB, DI	1600 A-2500 A	800	1400	1800
BC-CB	≥ 1250 A	1000	1400	1800

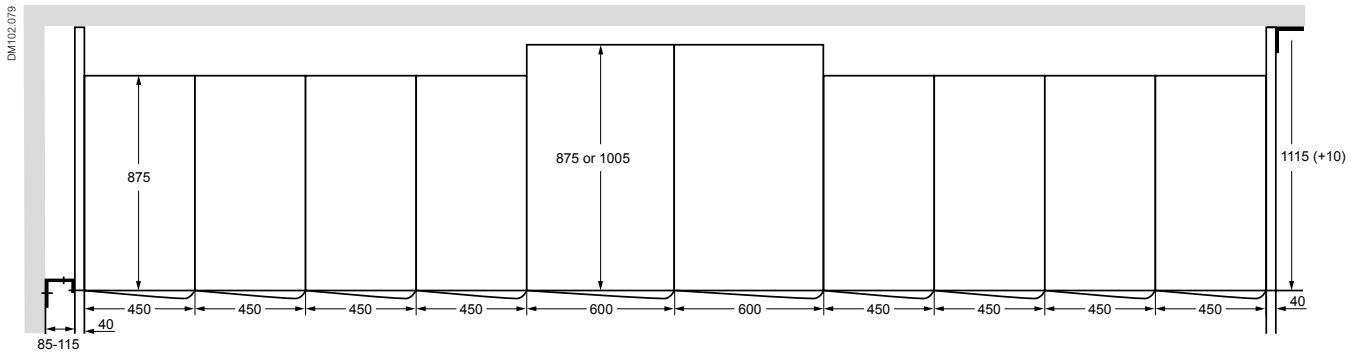
Note:
The maximum cubicle depth (dimension A) within the switchgear configuration determines the total width of the switchgear and controlgear and the minimum dimensions in the building.
Pressure relief duct for pressure relief outside the building available on request.

Layout

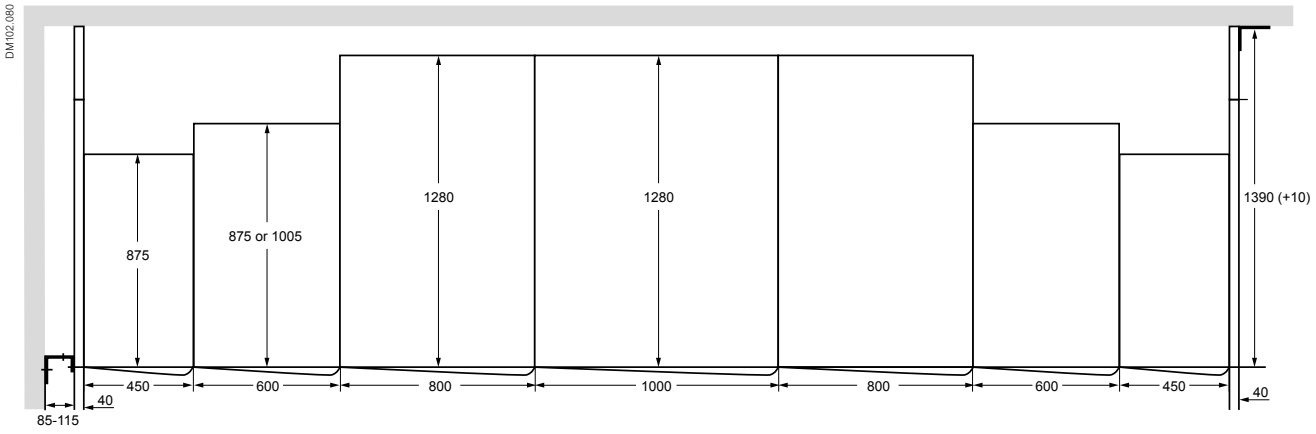
Back-to-the-wall installation - IAC AFL

Space allocation plan

Installation example of GMA with 2 feeders up to 1250 A, taking account of standard IEC 62271-200 with internal arc classification IAC AFL



Installation example of GMA with 2 feeders and busbar sectionalizer > 1250 A to 2500 A, taking account of standard IEC 62271-200 with internal arc classification IAC AFL



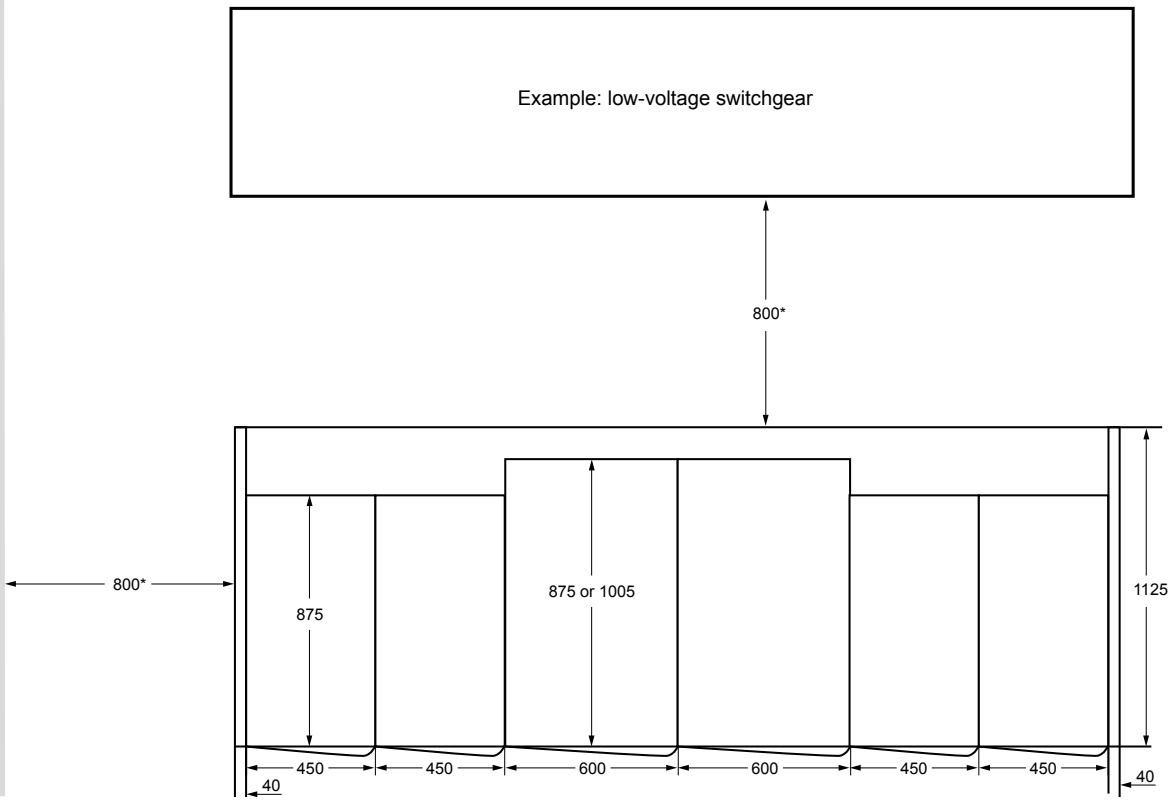
Layout

Free-standing installation - IAC AFLR
Busbar ≤ 1250 A

Space allocation plan

Free-standing installation of GMA with pressure relief duct, example with 2 feeders up to 1250 A taking account of standard IEC 62271-200, with internal arc classification IAC AFLR

DM102.115



* Clearances can be reduced to as little as 100 mm.

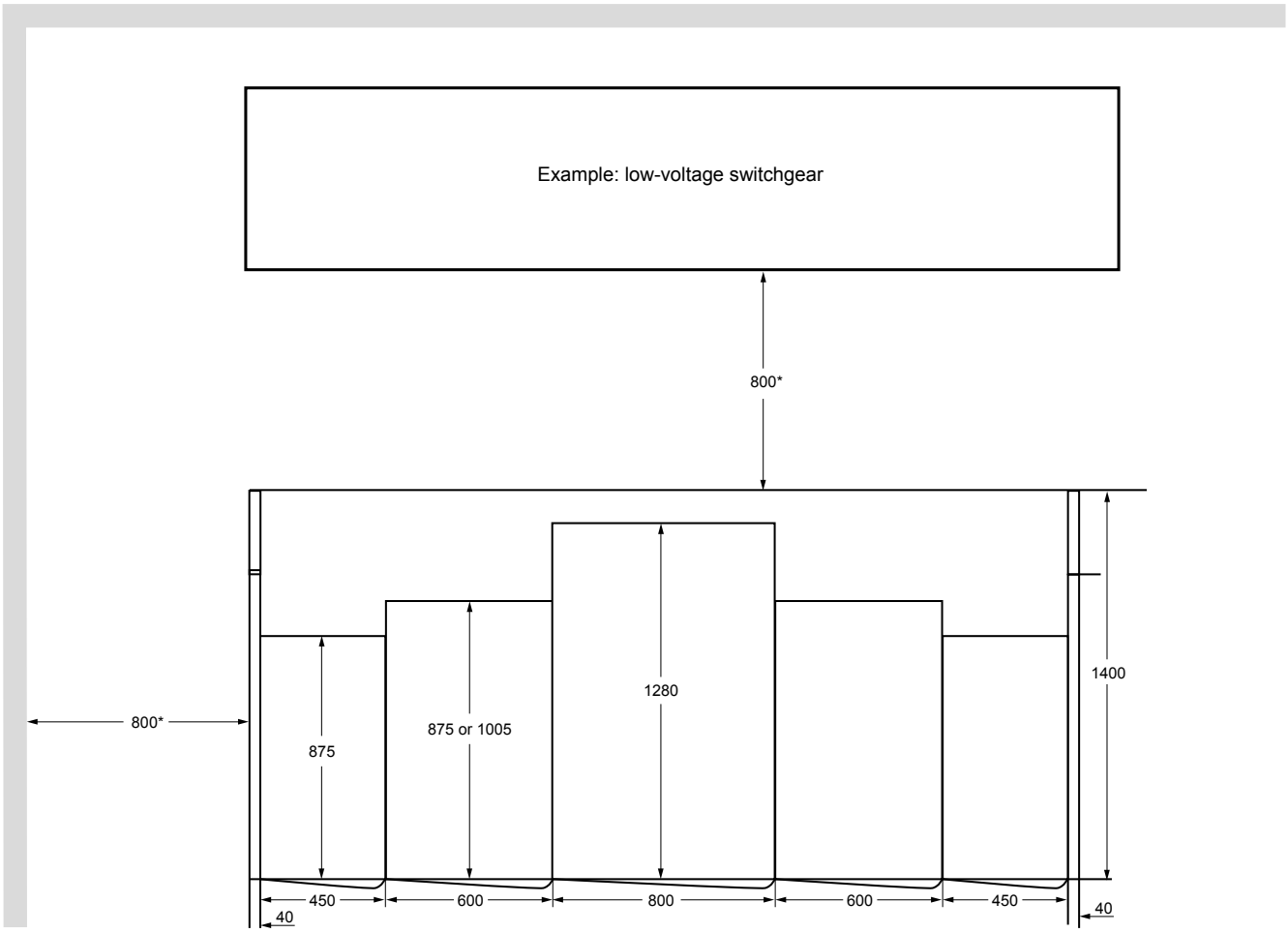
Layout

Free-standing installation - IAC AFLR
1250 A < Busbar ≤ 2500 A

Space allocation plan

Free-standing installation of GMA with pressure relief duct, example with 1 feeder > 1250 A to 2500 A, taking account of standard IEC 62271-200, with internal arc classification IAC AFLR

DM102 116

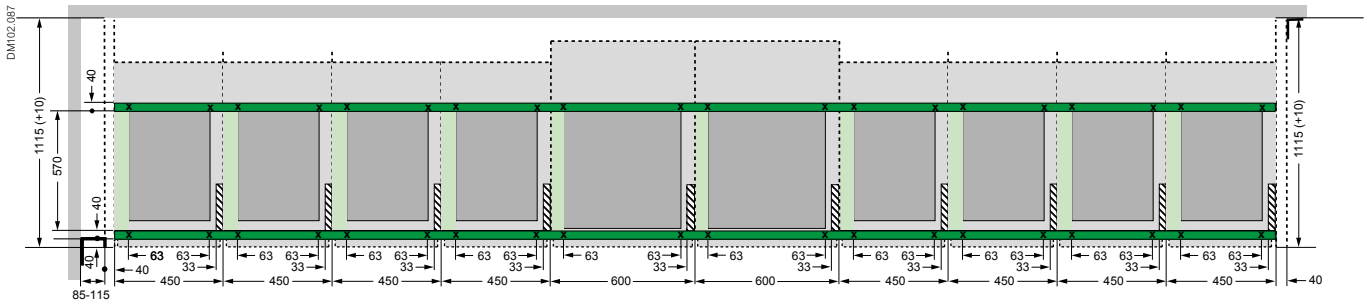


* Clearances can be reduced to as little as 100 mm.

Site configuration

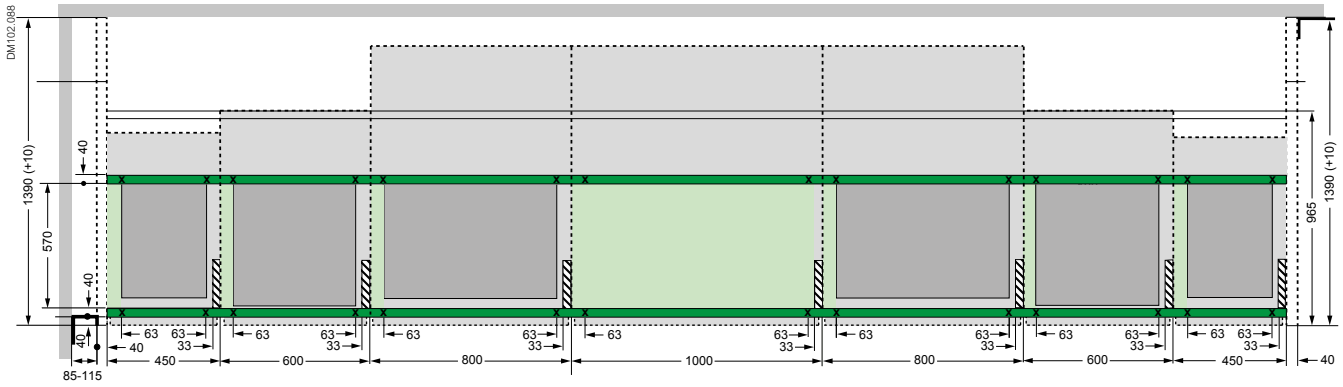
Arrangement of base frame

Example shown with 2 feeders up to 1250 A, taking account of standard IEC 62271-200 with internal arc classification IAC AFL

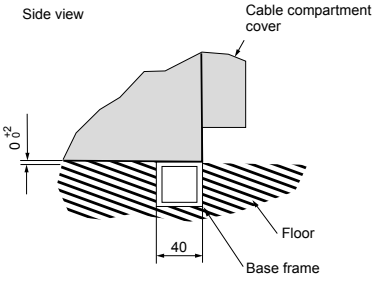


Operator side

Example shown with 2 feeders and busbar sectionalizer > 1250 A to 2500 A, taking account of standard IEC 62271-200 iwith internal arc classification IAC AFL



Operator side



Steel base frame, 40 x 40 x 4 mm
Upper edge of floor = upper edge of base frame

Cross bracings may be inserted between the switchgear cubicles (e.g. 20 x 40 x 2 mm)
Cross bracings are required e.g. in the case of false floors, to ensure reinforcement.
Infeed of external low-voltage cables
x Switchgear cubicle fastening (provided with drill holes during assembly)

Steel base frame, 40 x 40 x 4 mm; a 3rd base frame to support the panels is required in the case of a busbar rated current > 1250 A.
Base frames are only used to support these panels and are not screw-fastened to the panels.

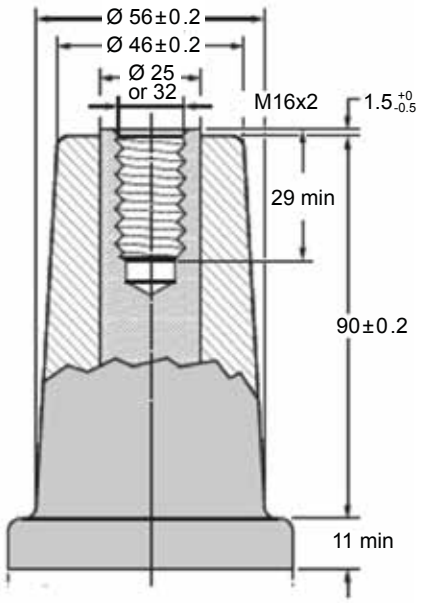
Cable connection

Outer cone system

PM103146

Cable connection and fastening; example: cubicle width 600 mm, without cable

DM102119



Connector dimensions in accordance with EN 50181

Cable connection system: outer cone-type

All cable terminals on the GMA circuit-breaker cubicles are equipped with outer cone-type bushings.

The geometric dimensions correspond to standard EN 50181:2010 for plug-in type bushings above 1 kV to 52 kV and from 250 to 2.50 kA for equipment other than liquid-filled transformers in the following configurations:

- Outer cone-type bushing
- Terminal type C
- Rated current Ir = 1250 A
- Screw-type contact with M16 internal thread
- Nominal diameter of conductor pin d5 = 25 or 32 mm
- Contact material of conductor pin: Copper (Cu)
- Contact surface to cable lug: copper, metallic

The bushing in the GMA cable compartment, for Circuit Breaker and Fuse-switch combination functions, are arranged as follow:

- Cubicle width 450 mm, with max. 800 A: 1 type C bushing per phase
- Cubicle width 600 mm, with max. 1250 A: 1 type C bushing per phase
- Cubicle width 800 mm, >1250 A to max. 2500 A: 2 type C bushings per phase

Selection of cable screw-type connectors

The cable screw-type connectors must match the above-mentioned outer cone-type bushings.

For connection to the GMA switchgear cubicles, we recommend the brands and types of cable screw-type connectors, system-compatible surge arresters and accessories specified in the following selection lists.

Compliance with the data and information in the separate mounting instructions for GMA switchgear and controlgear and the manufacturer's information regarding selection/assembly of the cable screw-type connectors and surge arresters, including accessories, is mandatory.

In the case of currents > 630 A, the required current-carrying capacity must be ensured and coordinated with the supplier when selecting appropriate cable screw-type connector combinations.

Switchgear cubicles with 2x outer cone-type bushings per conductor must be provided with the same number of cables of identical types and cross-sections on both parts of the connection. For other options, please consult Schneider Electric.

Cable connection

Cable fastening

PM103.083

Cable connection and fastening, example: cubicle width 600 mm

PM103.147

Cable clamp, example: id-technik

Cable fastening

Each high-voltage cable must be fastened to the cable supports in the GMA connection compartment. The cable supports are included in the scope of supply of the GMA switchgear cubicles. The number of cables to be installed per conductor in each cubicle must be specified in the switchgear order.

For cable-cross sections > 500 mm^2, the cables should be also be fastened below the panel. In this case, the cable supports must be ordered as optional equipment.

The special clamps made of glass-fibre reinforced polyamide for high-voltage power cables are very well suited to or short-circuit protected cable fastening in GMA switchgear cubicles.

The features of these cable clamps include the necessary short-circuit protected fastening, plus:

- Straightforward and speedy assembly without special tools
- Compact design, especially for multiple cable connection in GMA switchgear cubicles
- Extremely high temperature stability
- They are corrosion-free
- Completely recyclable

On special request, cable clamps suitable for high-voltage cables can be supplied.

Accessories for cable connections

Manufacturers of cable screw-type connectors and surge arresters can supply additional accessories, e.g. adaptors for:

- Connection of equipment for high-voltage cable tests
- Connection of a manually-actuated earthing device (maintenance earthing switch)
- Primary current testing of the master relays
- Voltage-proof termination of non-assigned outer cone-type bushings

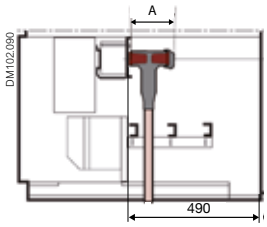
Cable connection

Selection list

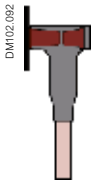
Cubicle widths 450 mm & 600 mm, 1x outer cone-type

Combination of cable screw-type connectors and surge arresters

- Outer cone-type bushings in accordance with EN50181, type C
- Screw-type contact for use with internal thread M16x2
- Cubicle widths 450 mm and 600 mm



<1250
1 outer cone per conductor



No.	Number of cables per conductor [2]	Rated voltage kV	Supplier	Conductor cross-section mm²	Insulation	T-connectors per conductor	Compact T-connectors per conductor
1	1	<=12	Euromold/Nexans	25-300	EPDM	-	430TB/G or 480TB/G
2	1	<=12	Euromold/Nexans	400-630	EPDM	-	484TB/G
3	1	<=24	Euromold/Nexans	25-300	EPDM	-	K430TB/G or K480TB/G
4	1	<=24	Euromold/Nexans	400-630	EPDM	-	K484TB/G
5	2	<=12	Euromold/Nexans	25-300	EPDM	-	1x 430TB/G or 1x 480TB/G
6	2	<=12	Euromold/Nexans	400-630	EPDM	-	1x 484TB/G
7	2	<=24	Euromold/Nexans	25-300	EPDM	-	1x K430TB/G or 1x K480TB/G
8	2	<=24	Euromold/Nexans	400-630	EPDM	-	1x K484TB/G
9	3	<=12	Euromold/Nexans	25-300	EPDM	-	1x 430TB/G or 1x K480TB/G
10	3	<=12	Euromold/Nexans	400-630	EPDM	-	1x K484TB/G
11	3	<=24	Euromold/Nexans	25-300	EPDM	-	1x K430TB/G or 1x K480TB/G
12	3	<=24	Euromold/Nexans	400-630	EPDM	-	1x K484TB/G
13	1	<=12	nkt cables	25-300	Silicone	-	1x CB 12-630
14	1	<=24	nkt cables	25-300	Silicone	-	1x CB 24-630
15	1	<=12	nkt cables	185-500	Silicone	-	1x CB 24-1250/2
16	1	<=24	nkt cables	95-500	Silicone	-	1x CB 24-1250/2
17	1	<=24	nkt cables	400-630	Silicone	-	1x CB 36-630 (1250)
18	2	<=12	nkt cables	25-300	Silicone	-	1x CB 12-630
19	2	<=12	nkt cables	185-500	Silicone	-	1x CB 24-1250/2
20	2	<=12	nkt cables	25-300	Silicone	-	2x CB 12-630
21	2	<=24	nkt cables	25-300	Silicone	-	1x CB 24-630
22	2	<=24	nkt cables	95-500	Silicone	-	1x CB 24-1250/2
23	2	<=24	nkt cables	25-300	Silicone	-	2x CB 24-630
24	2	<=24	nkt cables	400-630/800AI RE	Silicone	-	2x CB 36-630 (1250)
25	2	<=24	nkt cables	400-630/800AI RE	Silicone	-	1x CB 36-630 (1250)
26	3	<=12	nkt cables	25-300	Silicone	-	1x CB 12-630
27	3	<=12	nkt cables	185-500	Silicone	-	1x CB 24-1250/2
28	3	<=24	nkt cables	25-300	Silicone	-	1x CB 24-630
29	3	<=24	nkt cables	95-500	Silicone	-	1x CB 24-1250/2
30	3	<=24	nkt cables	400-630/800AI RE	Silicone	-	1x CB 36-630 (1250)

1) Detailed clarification of the electrical data for the surge arresters is required on a project-specific basis, depending on the grid earthing and the grid configuration.
2) Available on request for three-wire plastic cables (connection via screw-type connector with accessories depending on the three-wire cable design).
3) 4 cables in 600 mm width panel on request.
4) For conductor cross-sections ≥ 500 mm², a second cable fastening arrangement below the panels is required. Not included in Schneider Electric's scope of supply.

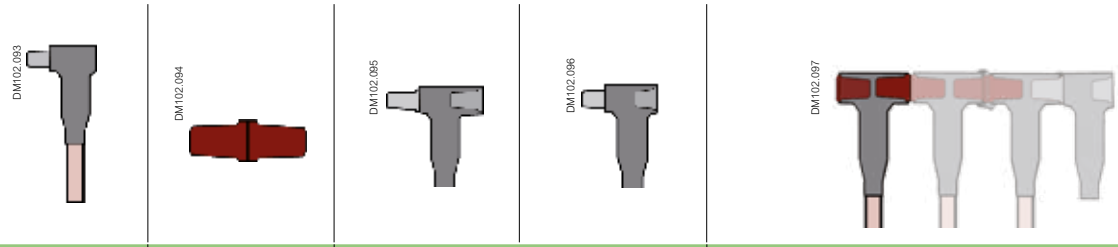
Cable connection

Selection list

Cubicle widths 450 mm & 600 mm, 1x outer cone-type

Combination of cable screw-type connectors and surge arresters

- Outer cone-type bushings in accordance with EN50181, type C
- Screw-type contact for use with internal thread M16x2
- Cubicle widths 450 mm and 600 mm



No.	Coupling plugs per conductor	Couplers per conductor	Surge arresters [1] per conductor		Length A max. 490 mm		
			Version 1	Version 2	without surge arrester	Version 1	Version 2
1		-	-	300SA or 800SA	185	-	290
2		-	-	800SA	185	-	290
3		-	-	300SA or 800SA	185	-	290
4		-	-	800SA	185	-	290
5	1x 300PB/G or 1x 800PB/G	-	-	300SA or 800SA	290	-	395
6	1x 804PB/G	-	-	800SA	290	-	400
7	1x K300PB/G or 1x K800PB/G	-	-	300SA or 800SA	290	-	395
8	1x K804PB/G	-	-	800SA	290	-	400
9	2x 300PB/G or 2x 800PB/G	-	-	-	395	-	-
10	2x 804PB/G	-	-	-	400	-	-
11	2x K300PB/G or 2x K800PB/G	-	-	-	395	-	-
12	2x K804PB/G	-	-	-	400	-	-
13	-	-	CSA 12	-	190	290	-
14	-	-	CSA 24	-	190	290	-
15	-	-	CSA 12	-	190	290	-
16	-	-	CSA 24	-	190	290	-
17	-	-	CSA 24	-	190	290	-
18	1x CC 12-630	-	CSA 12	-	290	390	-
19	1x CC 24-1250/2		CSA 12		300	410	
20	-	1x CP1250-C	CSA 12	-	370	470	-
21	1x CC 24-630	-	CSA 24	-	290	390	-
22	1x CC 24-1250/2	-	CSA 24		300	410	
23	-	1x CP1250-C	CSA 24	-	370	470	-
24	-	1x CP1250-M16	CSA 24	-	370	470	-
25	1x CC36-630 (1250)	-	CSA 24	-	300	400	-
26	2x CC 12-630	-	-	-	390	-	-
27	2 x CC 24-1250/2	-	CSA 12	-	300	410	-
28	2x CC 24-630	-	-	-	390	-	-
29	2 x CC 24-1250/2	-	CSA 24	-	300	410	-
30	2x CC36-630 (1250)	-	-	-	410	-	-

1) Detailed clarification of the electrical data for the surge arresters is required on a project-specific basis, depending on the grid earthing and the grid configuration.
2) Available on request for three-wire plastic cables (connection via screw-type connector with accessories depending on the three-wire cable design).
3) 4 cables in 600 mm width panel on request.
4) For conductor cross-sections ≥ 500 mm^2, a second cable fastening arrangement below the panels is required. Not included in Schneider Electric's scope of supply.

Cable connection

Selection list

Cubicle widths 450 mm & 600 mm, 1x outer cone-type

Combination of cable screw-type connectors and surge arresters

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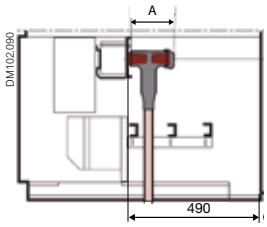
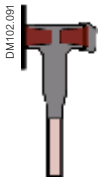
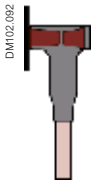
- Screw-type contact for use with internal thread M16x2
- Cubicle widths 450 mm and 600 mm



<1250
1 outer cone per conductor





No.	Number of cables per conductor 2)	Rated voltage kV	Supplier	Conductor cross-section mm²	Insulation	T-connectors per conductor	Compact T-connectors per conductor
31	1	<=12	Pfisterer	25-300	EPDM	-	DTS 636
32	1	<=12	Pfisterer	400-800	EPDM	-	DTS 1242
33	1	<=24	Pfisterer	25-300	EPDM	-	DTS 636
34	1	<=24	Pfisterer	400-800	EPDM	-	DTS 1242
35	2	<=12	Pfisterer	25-300	EPDM	-	1x DTS 636
36	2	<=12	Pfisterer	400-800	EPDM	-	1x DTS 1242
37	2	<=24	Pfisterer	25-300	EPDM	-	1x DTS 636
38	2	<=24	Pfisterer	400-800	EPDM	-	1x DTS 1242
39	3	<=12	Pfisterer	25-300	EPDM	-	1x DTS 636
40	3	<=12	Pfisterer	400-800	EPDM	-	1x DTS 1242
41	3	<=24	Pfisterer	25-300	EPDM	-	1x DTS 636
42	3	<=24	Pfisterer	400-800	EPDM	-	1x DTS 1242
43	1	<=12	Südkabel	50-300	Silicone		1x SET 12
44	1	<=12	Südkabel	185-500	Silicone	1x SEHDT 13	-
45	1	<=24	Südkabel	25-240	Silicone	-	1x SET 24
46	1	<=24	Südkabel	300	Silicone	-	1x SEHDT 23.1
47	1	<=24	Südkabel	120-300	Silicone	-	1x SAT 24
48	1	<=24	Südkabel	185-630	Silicone	1x SEHDT 23	-
49	2	<=12	Südkabel	50-300	Silicone	-	2x SET 12
50	2	<=12	Südkabel	50-300	Silicone	-	1x SET 12
51	2	<=24	Südkabel	25-240	Silicone	-	2x SET 24
52	2	<=24	Südkabel	50-240	Silicone	-	1x SET 24
53	2	<=24	Südkabel	120-300	Silicone	-	2x SAT 24
54	3	<=12	Südkabel	50-300	Silicone	-	2x SET 12
55	3	<=12	Südkabel	50-300	Silicone	-	1x SET 12
56	3	<=24	Südkabel	25-240	Silicone	-	2x SET 24-
57	3	<=24	Südkabel	25-240	Silicone	-	1x SET 24
58	1	<=12	tyco	25-300	Silicone	-	RSTI 58XX
59	1	<=12	tyco	400-800	Silicone	-	RSTI 395X
60	1	<=24	tyco	25-300	Silicone	-	RSTI 58XX
61	1	<=24	tyco	400-800	Silicone	-	RSTI 595X
62	2	<=12	tyco	25-300	Silicone	-	1 x RSTI 58XX
63	2	<=12	tyco	400-800	Silicone	-	1 x RSTI 395X
64	2	<=24	tyco	25-300	Silicone	-	1 x RSTI 58XX
65	2	<=24	tyco	400-800	Silicone	-	1 x RSTI 595X
66	3	<=12	tyco	25-300	Silicone	-	1 x RSTI 58XX
67	3	<=12	tyco	400-800	Silicone	-	1 x RSTI 395X
68	3	<=24	tyco	25-300	Silicone	-	1 x RSTI 58XX
69	3	<=24	tyco	400-800	Silicone	-	1 x RSTI 595X

1) Detailed clarification of the electrical data for the surge arresters is required on a project-specific basis, depending on the grid earthing and the grid configuration.
2) Available on request for three-wire plastic cables (connection via screw-type connector with accessories depending on the three-wire cable design).
3) 4 cables in 600 mm width panel on request.
4) For conductor cross-sections ≥ 500 mm², a second cable fastening arrangement below the panels is required. Not included in Schneider Electric's scope of supply.

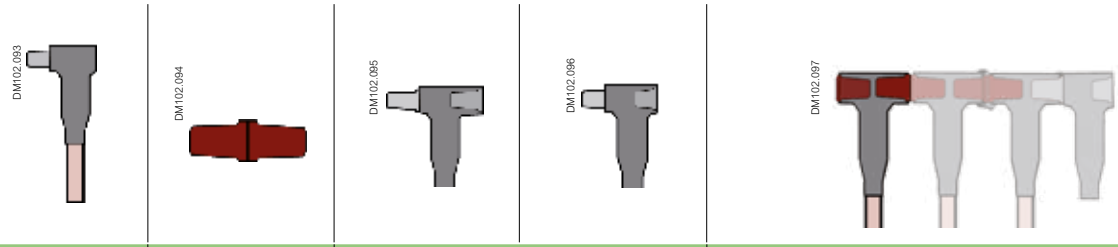
Cable connection

Selection list

Cubicle widths 450 mm & 600 mm, 1x outer cone-type

Combination of cable screw-type connectors and surge arresters

- Outer cone-type bushings in accordance with EN50181, type C
- Screw-type contact for use with internal thread M16x2
- Cubicle widths 450 mm and 600 mm



No.	Coupling plugs per conductor	Couplers per conductor	Surge arresters [1] per conductor		Length A max. 490 mm		
			Version 1	Version 2	without surge arrester	Version 1	Version 2
31	-	-	-	DAI 630	183	-	317
32	-	-	-	DAI 1250	205	-	343
33	-	-	-	DAI 630	183	-	317
34	-	-	-	DAI 1250	205	-	343
35	1x DTB 636	-	-	DAI 630	298	-	432
36	1x DTB 1242	-	-	DAI 1250	342	-	480
37	1x DTB 636	-	-	DAI 630	298	-	432
38	1x DTB 1242	-	-	DAI 1250	342	-	480
39	2x DTB 636	-	-	-	413	-	-
40	2x DTB 1242	-	-	-	480	-	-
41	2x DTB 636	-	-	-	413	-	-
42	2x DTB 1242	-	-	-	480	-	-
43	-	-	1x MUT 23.1	-	189	290	-
44	-	-	-	-	260	-	-
45	-	-	1x MUT 23.1	-	189	290	-
46	-	-	1x MUT 23.1	-	189	290	-
47	-	-	1x MUT 23.1	-	189	290	-
48	-	-	-	-	260	-	-
49	-	1x KU 23.2/23	1x MUT 23.1	-	362	464	-
50	1x SEHDK 13.1	-	1x MUT 23.1	-	290	391	-
51	-	1x KU 23.2/23	1x MUT 23.1	-	362	464	-
52	1x SEHDK 23.1	-	1x MUT 23.1	-	290	391	-
53		1x KU 33.1	1x MUT 23.1		362	464	-
54	1x SEHDK 13.1	1x KU 23.2/23	-	-	463	-	-
55	2x SEHDK 13.1	-	-	-	390	-	-
56	1x SEHDK 23.1	1x KU 23.2/23	-	-	463	-	-
57	2x SEHDK 23.1	-	-	-	390	-	-
58	-	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	180	285	292
59	-	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	196	295	302
60	-	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	180	285	292
61	-	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	196	295	302
62	1 x RSTI-CC-58XX	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	285	390	397
63	1 x RSTI-CC-395X	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	315	420	427
64	1 x RSTI-CC-58XX	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	285	390	397
65	1 x RSTI-CC-595X	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	315	420	427
66	2 x RSTI-CC-58XX	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	390	-	-
67	2 x RSTI-CC-395X	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	440	-	-
68	2 x RSTI-CC-58XX	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	390	-	-
69	2 x RSTI-CC-595X	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	440	-	-

1) Detailed clarification of the electrical data for the surge arresters is required on a project-specific basis, depending on the grid earthing and the grid configuration.
2) Available on request for three-wire plastic cables (connection via screw-type connector with accessories depending on the three-wire cable design).
3) 4 cables in 600 mm width panel on request.
4) For conductor cross-sections ≥ 500 mm^2, a second cable fastening arrangement below the panels is required. Not included in Schneider Electric's scope of supply.

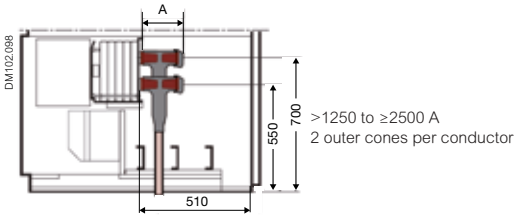
Cable connection

Selection list

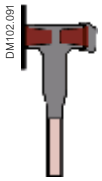
Cubicle widths 800 mm , 2x outer cone-type

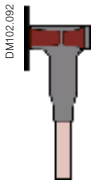
Combination of cable screw-type connectors and surge arresters

- 2x outer cone-type bushings in accordance with EN50181, type C
- Screw-type contact for use with internal thread M16x2
- Cubicle width 800 mm



>1250 to ≥2500 A
2 outer cones per conductor





No.	Number of cables per conductor [2]	Rated voltage kV	Supplier	Conductor cross-section mm²	Insulation	T-connectors per conductor	Compact T-connectors per conductor
1	2	<=12	Euromold/Nexans	25-300	EPDM	-	2x 430TB or 2x 480TB/G
2	2	<=12	Euromold/Nexans	400-630	EPDM	-	2x 484TB
3	2	<=24	Euromold/Nexans	25-300	EPDM	-	2x K430TB or 2x K480TB/G
4	2	<=24	Euromold/Nexans	400-630	EPDM	-	2x K484TB
5	4	<=12	Euromold/Nexans	25-300	EPDM	-	2x 430TB/G or 2x 480TB/G
6	4	<=12	Euromold/Nexans	400-630	EPDM	-	2x 484TB/G
7	4	<=24	Euromold/Nexans	25-300	EPDM	-	2x K430TB/G or 2x K480TB/G
8	4	<=24	Euromold/Nexans	400-630	EPDM	-	2x K484TB
9	6	<=12	Euromold/Nexans	25-300	EPDM	-	2x 430TB/G or 2x 480TB/G
10	6	<=24	Euromold/Nexans	25-300	EPDM	-	2x K430TB/G or 2x K480TB/G
11	6	<=12	Euromo ld/Nexans	400-630	EPDM		2x 484TB/G
12	6	<=24	Euromold/Nexans	400-630	EPDM		2x K484TB/G
13	2	<=12	nkt cables	25-300	Silicone	-	2x CB 12-630
14	2	<=12	nkt cables	185-500	Silicone	-	2x CB 24- 1250/2
15	2	<=24	nkt cables	25-300	Silicone	-	2x CB 24-630
16	2	<=24	nkt cables	95-500	Silicone	-	2x CB 24- 1250/2
17	2	<=24	nkt cables	400-630/800Al RE	Silicone	-	2x CB 36-630 (1250)
18	4	<=12	nkt cables	25-300	Silicone	-	4x CB 12-630
19	4	<=12	nkt cables	25-300	Silicone	-	2x CB 12-630
20	4	<=12	nkt cables	185-500	Silicone	-	2x CB 24- 1250/2
21	4	<=24	nkt cables	25-300	Silicone	-	4x CB 24-630
22	4	<=24	nkt cables	25-300	Silicone	-	2x CB 24-630
23	4	<=24	nkt cables	95-500	Silicone	-	2x CB 24- 1250/2
24	4	<=24	nkt cables	400-630/800Al RE	Silicone	-	2x CB 36-630 (1250)
25	4	<=24	nkt cables	400-630/800Al RE	Silicone	-	4x CB 36-630 (1250)
26	6	<=12	nkt cables	25-300	Silicone	-	2x CB 12-630
27	6	<=12	nkt cables	185-500	Silicone	-	2x CB 24- 1250/2
28	6	<=24	nkt cables	95-500	Silicone	-	2x CB 24- 1250/2
29	6	<=24	nkt cables	400-630/800Al RE	Silicone	-	2x CB 36-630 (1250)
30	6	<=24	nkt cables	400-630/800Al RE	Silicone	-	6x CB 36-630 (1250)

1) Detailed clarification of the electrical data for the surge arresters is required on a project-specific basis, depending on the grid earthing and the grid configuration.
2) Available on request for three-wire plastic cables (connection via screw-type connector with accessories depending on the three-wire cable design)
3) For conductor cross-sections ≥ 500 mm², a second cable fastening arrangement below the panels is required. Not included in Schneider Electric's scope of supply.

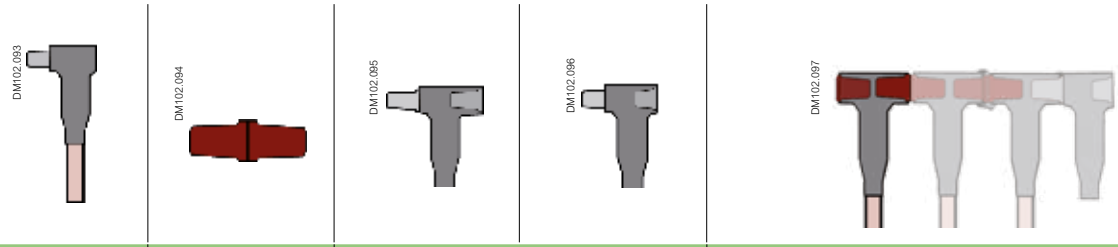
Cable connection

Selection list

Cubicle widths 800 mm , 2x outer cone-type

Combination of cable screw-type connectors and surge arresters

- 2x outer cone-type bushings in accordance with EN50181, type C
- Screw-type contact for use with internal thread M16x2
- Cubicle width 800 mm



No.	Coupling plugs per conductor	Couplers per conductor	Surge arresters [1] per conductor		Length A max. 490 mm		
			Version 1	Version 2	without surge arrester	Version 1	Version 2
1	-	-	-	300SA or 800SA	185	-	290
2	-	-	-	800SA	185	-	290
3	-	-	-	300SA or 800SA	185	-	290
4	-	-	-	800SA	185	-	290
5	2x 300PB/G or 2x 800PB/G	-	-	300SA or 800SA	290	-	395
6	2x 804PB/G	-	-	800SA	290	-	400
7	2x K300PB/G or 2x K800PB/G	-	-	300SA or 800SA	290	-	395
8	2x K804PB/G	-	-	800SA	290	-	400
9	4x 300PB/G or 4x 800PB/G	-	-	-	395	-	-
10	4x K300PB/G or 4x K800PB	-	-	-	395	-	-
11	4x 804TB/G	-	-	-	400		-
12	4x K804TB/G	-	-	-	400		-
13	-	-	CSA 12	-	190	290	-
14	-	-	CSA 12	-	190	300	
15	-	-	CSA 24	-	190	290	
16	-	-	CSA 24	-	190	300	
17	-	-	CSA 36	-	190	300	-
18	-	2x CP 1250C	CSA 12	-	370	470	-
19	2x CC 24-630	-	CSA 12	-	290	390	-
20	2x CC 24-1250/2	-	CSA 12	-	300	410	-
21	-	2x CP 1250-C	CSA 24	-	370	470	-
22	2x CC 24-630		CSA 24	-	290	390	-
23	2x CC 24-1250/2	-	CSA 24	-	300	410	-
24	2x CC36-630 (1250)	-	CSA 24	-	300	400	-
25	-	2x CP 630-M16	CSA 12	-	390	490	-
26	4x CC 12-630	-	-	-	390	490	-
27	4x CC 24-1250/2	-	CSA 12	-	300	410	-
28	4x CC 24-1250/2	-	CSA 24	-	300	410	-
29	4x CC36-630 (1250)	-	-	-	410	-	-
30	-	2x CP 630-M16	-	-	470	-	-

1) Detailed clarification of the electrical data for the surge arresters is required on a project-specific basis, depending on the grid earthing and the grid configuration.
2) Available on request for three-wire plastic cables (connection via screw-type connector with accessories depending on the three-wire cable design)
3) For conductor cross-sections ≥ 500 mm^2, a second cable fastening arrangement below the panels is required. Not included in Schneider Electric's scope of supply.

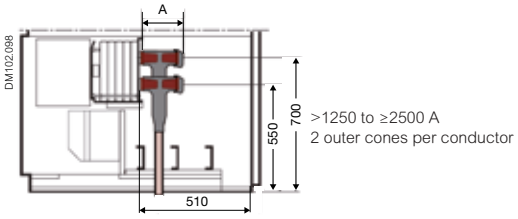
Cable connection

Selection list

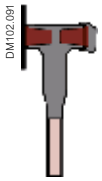
Cubicle widths 800 mm , 2x outer cone-type

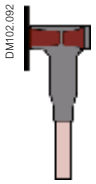
Combination of cable screw-type connectors and surge arresters

- 2x outer cone-type bushings in accordance with EN50181, type C
- Screw-type contact for use with internal thread M16x2
- Cubicle width 800 mm



>1250 to ≥2500 A
2 outer cones per conductor





No.	Number of cables per conductor [2]	Rated voltage kV	Supplier	Conductor cross-section mm²	Insulation	T-connectors per conductor	Compact T-connectors per conductor
31	2	<=12	Pfisterer	25-300	EPDM	-	2x DTS 636
32	2	<=12	Pfisterer	400-800	EPDM	-	2x DTS 1242
33	2	<=24	Pfisterer	25-300	EPDM	-	2x DTS 636
34	2	<=24	Pfisterer	400-800	EPDM	-	2x DTS 1242
35	2	<=12	Pfisterer	25-300	EPDM	-	2x DTS 636
36	2	<=12	Pfisterer	400-800	EPDM	-	2x DTS 1242
37	2	<=24	Pfisterer	25-300	EPDM	-	2x DTS 636
38	2	<=24	Pfisterer	400-800	EPDM	-	2x DTS 1242
39	2	<=12	Pfisterer	25-300	EPDM	-	2x DTS 636
40	2	<=12	Pfisterer	400-800	EPDM	-	2x DTS 1242
41	2	<=24	Pfisterer	25-300	EPDM	-	2x DTS 636
42	2	<=24	Pfisterer	400-800	EPDM	-	2x DTS 1242
43	2	<=12	Südkabel	50-300	Silicone	-	2x SET 12
44	2	<=12	Südkabel	185-500	Silicone	2x SEHDT 13	
45	2	<=24	Südkabel	25-240	Silicone	-	2x SET 24
46	2	<=24	Südkabel	300	Silicone	-	2x SEHDT 23.1
47	2	<=24	Südkabel	120-300	Silicone	-	2x SAT 24
48	2	<=24	Südkabel	185-630	Silicone	2x SEHDT 23	
49	4	<=12	Südkabel	50-300	Silicone	-	2x SET 12
50	4	<=12	Südkabel	50-300	Silicone	-	2x SET 12
51	4	<=24	Südkabel	25-240	Silicone	-	4x SET 24
52	4	<=24	Südkabel	50-240	Silicone	-	2x SET 24
53	4	<=24	Südkabel	120-300	Silicone	-	4x SAT 24
54	6	<=12	Südkabel	50-300	Silicone	-	4x SET 12
55	6	<=12	Südkabel	50-300	Silicone	-	2x SET 12
56	6	<=24	Südkabel	25-240	Silicone	-	4x SET 24
57	6	<=24	Südkabel	25-240	Silicone	-	2x SET 24
58	2	<= 12	tyco	25-300	Silicone	-	2x RSTI 58XX
59	2	<= 12	tyco	400-800	Silicone	-	2x RSTI 395X
60	2	<= 24	tyco	25-300	Silicone	-	2x RSTI 58XX
61	2	<= 24	tyco	400-800	Silicone	-	2x RSTI 595X
62	4	<= 12	tyco	25-300	Silicone	-	2x RSTI 58XX
63	4	<= 12	tyco	400-800	Silicone	-	2x RSTI 395X
64	4	<= 24	tyco	25-300	Silicone	-	2x RSTI 58XX
65	4	<= 24	tyco	400-800	Silicone	-	2x RSTI 595X
66	6	<= 12	tyco	25-300	Silicone	-	2x RSTI 58XX
67	6	<= 12	tyco	400-800	Silicone	-	2x RSTI 395X
68	6	<= 24	tyco	25-300	Silicone	-	2x RSTI 58XX
69	6	<= 24	tyco	400-800	Silicone	-	2x RSTI 595X

1) Detailed clarification of the electrical data for the surge arresters is required on a project-specific basis, depending on the grid earthing and the grid configuration.
2) Available on request for three-wire plastic cables (connection via screw-type connector with accessories depending on the three-wire cable design)
3) For conductor cross-sections ≥ 500 mm², a second cable fastening arrangement below the panels is required. Not included in Schneider Electric's scope of supply.

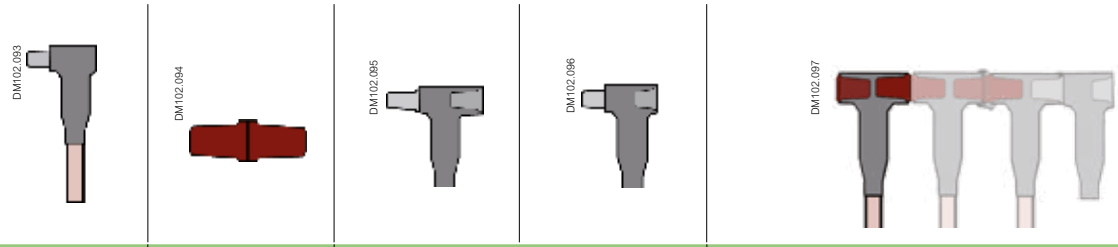
Cable connection

Selection list

Cubicle widths 800 mm , 2x outer cone-type

Combination of cable screw-type connectors and surge arresters

- 2x outer cone-type bushings in accordance with EN50181, type C
- Screw-type contact for use with internal thread M16x2
- Cubicle width 800 mm



No.	Coupling plugs per conductor	Couplers per conductor	Surge arresters [1] per conductor		Length A max. 490 mm		
			Version 1	Version 2	without surge arrester	Version 1	Version 2
31	-	-	-	DAI 630	183	-	317
32	-	-	-	DAI 1250	205	-	343
33	-	-	-	DAI 630	183	-	317
34	-	-	-	DAI 1250	205	-	343
35	2x DTB 636	-	-	DAI 630	298	-	432
36	2x DTB 1242	-	-	DAI 1250	342	-	480
37	2x DTB 636	-	-	DAI 630	298	-	432
38	2x DTB 1242	-	-	DAI 1250	342	-	480
39	4x DTB 636	-	-	-	413	-	-
40	4x DTB 1242	-	-	-	480	-	-
41	4x DTB 636	-	-	-	413	-	-
42	4x DTB 1242	-	-	-	480	-	-
43	-	-	2x MUT 23.1	-	189	290	-
44	-	-	-	-	260	-	-
45	-	-	2x MUT 23.1	-	189	290	-
46	-	-	2x MUT 23.1	-	189	290	-
47	-	-	2x MUT 23.1	-	189	290	-
48	-	-	-	-	260	-	-
49	-	2x KU 23.2/23	2x MUT 23.1	-	362	464	-
50	2x SEHDK 13.1	-	2x MUT 23.1	-	290	391	-
51	-	2x KU 23.2/23	´2x MUT 23.1	-	362	464	-
52	2x SEHDK 23.1	-	2x MUT 23.1	-	290	391	-
53	-	2x KU 33.1	2x MUT 23.1		362	464	-
54	2x SEHDK 13.1	2x KU 23.2/23	-	-	463	-	-
55	4x SEHDK 13.1	-	-	-	390	-	-
56	2x SEHDK 23.1	2x KU 23.2/23	-	-	463	-	-
57	4x SEHDK 23.1	-	-	-	390	-	-
58	-	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	180	285	292
59	-	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	196	295	302
60	-	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	180	285	292
61	-	-	RSTI-CC-68SAXX10		196	302	-
62	2x RSTI-CC-58XX	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	285	390	397
63	2x RSTI-CC-395X	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	315	420	427
64	2x RSTI-CC-58XX	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	285	390	397
65	2x RSTI-CC-595X	-	RSTI-CC-58SAXX05	RSTI-CC-68SAXX10	315	420	427
66	4x RSTI-CC-58XX	-	-	-	390	-	-
67	4x RSTI-CC-395X	-	-	-	440	-	-
68	4x RSTI-CC-58XX	-	-	-	390	-	-
69	4x RSTI-CC-595X	-	-	-	440	-	-

1) Detailed clarification of the electrical data for the surge arresters is required on a project-specific basis, depending on the grid earthing and the grid configuration.
2) Available on request for three-wire plastic cables (connection via screw-type connector with accessories depending on the three-wire cable design)
3) For conductor cross-sections ≥ 500 mm^2, a second cable fastening arrangement below the panels is required. Not included in Schneider Electric's scope of supply.

Accessory boards

Fixed and mobile accessory boards

Accessory boards

A fixed accessory board is available for central storage of the most important accessories. A mobile version is also available.

Both versions can accommodate an operating crank handle kit when provided for maximum equipment.


PM103.118


PM103.119


PM103.120

Basic equipment fitted for circuit-breaker switchgear cubicles:

- Crank for operation of the 3-position switch
- Emergency crank handle for charging the stored energy spring-mechanism of the circuit-breaker
- Double-bit key, e.g. for access to the low-voltage cabinet

Basic equipment for T1 panels

- Motorized operating crank
- Detachable lever, switch disconnector
- Detachable lever, earthing switch
- Double-bit key
- Extension tube for 12 kV


PM103.128

Fixed accessory board

The fixed accessory board is suitable for wall-mounting and can accommodate the following equipment:

- Crank for 3-position switch
- Emergency crank handle for charging the stored energy spring-mechanism of the circuit-breaker
- Double-bit key
- Kit of plug-in voltage indicators (3 each)

Accessory boards

Fixed and mobile accessory boards

Mobile accessory board

The mobile accessory board can be suspended centrally on a wall of the switchgear room via 2 securing bolts, and can be removed if required.

A handle ensures safe transport.

A mobile accessory board can accommodate the following elements:

- Crank for 3-position switch
- Emergency crank handle for charging the stored energy spring-mechanism of the circuit-breaker
- Double-bit key
- Kit of plug-in voltage indicators (3 each)
- Switchgear documentation (DIN A4)

PM103.126

PM103.127

Mobile accessory board, suspended in the fascia strip of the cable compartment cover

Appendices

Appendices

Project engineering data

Project engineering aids

The tabular project engineering aids are intended to help ensure optimum design of a project incorporating gas-insulated GMA switchgear.

Two concepts are available for the GMA's equipment details:

1. The "Smart Grid" solution, especially efficient in economic terms
2. The individual solution

Project engineering aid 2

The individual solution

This project engineering aid helps you select the detailed switchgear equipment in a highly individual fashion. Here, all the necessary specific components and devices can be defined individually.

Please specify your equipment requirements so that we can offer you an appropriate concept with the GMA switchgear and controlgear.

We recommend including a general circuit diagram with both project engineering aids to cover the following data:

- Sequence of installation
- Number of switchgear cubicle types
- Switchgear cubicle primary equipment for the transformer function
- Transformer data and protection relay requirements

Project engineering aid 1

Especially flexible solution, efficient in economic terms

This concept is especially efficient in economic terms and flexible as regards the investment and operation period.

It is based on an intelligent solution with standardized components in the low-voltage cabinet and motorization of each switching device.

Requirements concerning operation within grids are implemented via configuration and parameter setting of the digital bay computers. Digital devices not only provide protection features, but also control, monitoring and switchgear cubicle interlocking.

Digital monitoring and control units help implement all switching operations, the internal cubicle interlocks and overlapping interlocks in the switchgear and controlgear, messages and measurements in a straightforward fashion by electrical means.

Thus, data can be exchanged between the GMA switchgear and controlgear and a higher-level I&C system (SCADA) without problems.

With automated switchgear, manual emergency actuation can be performed mechanically in the event of emergency for the switching devices on the GMA's control panel. As a rule, this is only necessary in a highly unlikely event: total failure of the auxiliary supply. In such an exceptional situation, it is intended that trained staff should earth the outgoing feeders – if required – via unlocked manual emergency actuation. Complete mechanical interlocking is still possible as an option.

If the function can be designed for grid protection as well as for monitoring and control, each with separate digital units, GemControl provides you with a solution in conformity with Schneider Electric systems. Thanks to its modular, replaceable components, GemControl offers a very reasonably-priced solution as a separate unit for control, monitoring, metering and data communication tasks.

Moreover, the digital monitoring and control system provides the advantages of standardized, prefabricated and verified modules matching the appropriate function on the GMA switchgear cubicle.

This concept is extremely flexible and forward-looking, as appropriate parameter setting and flexible fitting of input/output components and open communication enable practically every requirement of the GMA within the electrical distribution network to be satisfied and even adapted subsequently.

Moreover, an automated remote-controlled switchgear unit provides an extremely high degree of operator safety, as the switching and monitoring procedures required during switchgear operation are performed from a control room and no person entitled to perform switchgear operations need be present in the switchgear room.

Project support forms

Project engineering type 1

Project engineering aid 1:

The “Smart Grid” solution, especially efficient in economic terms

Description

GMA gas-insulated switchgear for indoor installation.

Switchgear cubicles with vacuum circuit-breaker and supplementary cubicles.

- Prefabricated, type-tested switchgear in accordance with IEC 62271-1
- Internal arc classification in accordance with IEC 62271-200
- Gas tank closed for the switchgear’s entire service life in accordance with IEC as "Sealed Pressure System"
- No gas handling and no replenishing of insulating gas required for the switchgear’s entire service life
- Gas tank made of stainless chromium-nickel steel
- IP65 degree of protection of medium-voltage live parts in gas-filled compartments
- Current and voltage transformer outside gas-filled compartment
- Environmental conditions in accordance with IEC 62271-1 (1)
  - Ambient temperature min. -5 °C, max. +40 °C, mean value over 24 hours: +35 °C
  - Relative humidity < 95%, installation altitude above sea level < 1000 m

General design features						
Rated voltage	☐ 12 kV	☐ 17.5 kV	☐ 24 kV			
Rated lightning impulse withstand voltage	☐ 75 kV	☐ 95 kV	☐ 125 kV			
Rated power frequency withstand voltage	☐ 28 kV	☐ 38 kV	☐ 50 kV			
		☐ 42 kV				
Rated frequency	☐ 50 Hz	☐ 60 Hz				
Rated short-time current	☐ 16 kA	☐ 20 kA	☐ 25 kA	☐ 31.5 kA		
Rated time for short-time current	☐ 1s	☐ 3s				
Rated peak withstand current	☐ 40 kA	☐ 50 kA	☐ 63 kA	☐ 80 kA		
Rated current, busbar	☐ ≤ 1250 A	☐ 1600 A	☐ 2000 A	☐ 2500 A		
Busbar enclosure (metal)	☐ Yes	☐ No				
Auxiliary voltage	☐ 24 VDC	☐ 60 VDC	☐ 110 VDC	☐ 220 VDC	☐ 120 VAC	☐ 230 VAC
Installation	☐ free-standing		☐ wall-mounting			
Internal arc classification in accordance with IEC 62271-200	☐ no requirement		☐ IAC AFL	☐ IAC AFLR		
Pressure relief device	☐ in the room	☐ outside the building				
Existing room height	☐ ≥ 2400 mm	☐ ≥ 2800 mm				
Gas monitoring per gas-filled compartment	☐ integrated in digital monitoring			☐ with pressure gauge		
Low-voltage cabinet with double-bit lock	☐ 700 mm	☐ 850 mm (total height 2350 mm)				
Voltage detection system, 3-phase, IEC 61243-5	☐ Plug-in type system		☐ IVIS, integrated system without repeat test			

Project support forms

Project engineering type 1

	Cubicle types					
	Feeder cubicles with circuit-breaker (CB)			Busbar sectionalizer with CB and riser		Risers
	CB6, CB8	CB6, CB8, CB12	CB16, CB20, CB25	BC-CB6/R to BC-CB25/R	BC-CB6/RDE to BC-CB25/RDE	DI(D)(E)
Cubicle width [mm]	450	600	800	800/1000	800/1000	450 - 800
Switchgear cubicle equipment						
Integrated vacuum circuit-breaker	●	●	●	●	●	–
Motor drive for spring-charging mechanism (-M11)	●	●	●	●	●	–
Emergency mode: manual spring-charging mechanism with crank	●	●	●	●	●	–
Auxiliary switch extension, 18-pole (-S011)	●	●	●	●	●	–
Mechanical operations counter	●	●	●	●	●	–
Mechanical ON and OFF pushbutton	●	●	●	●	●	–
Release ON (-F21)	●	●	●	●	●	–
1st release OFF (-F11)	●	●	●	●	●	–
2nd release OFF (-F12)	○	○	○	○	○	–
Undervoltage release (-F13)	○	○	○	○	○	–
Integrated 3-position switch	●	●	τ	●	τ	○
Disconnector with manual drive	●	●	τ	●	τ	○
Disconnector, motor drive (-M11)	●	●	τ	●	τ	●
Disconnector, auxiliary switch, 14-pole (-S011)	●	●	τ	●	τ	○
Earthing switch with manual drive	●	●	τ	–	τ	○
Earthing switch, motor drive (-M11)	●	●	τ	●	τ	●
Earthing switch, auxiliary switch, 14-pole (-S011)	●	●	τ	–	τ	○
Operator interface						
Degree of protection IP2X [1]	●	●	●	●	●	●
Mechanical operation and position indicators	●	●	●	●	●	●
Intertripping circuit “Earthing switch – CB“	●	●	●	–	–	–
Lock for mechanical “operation enabled”	●	●	●	●	●	●
Mechanical operation: As emergency operation, or	○	○	○	○	–	–
Mechanical operation: With continuous mechanical interlock	○	○	○	○	–	–
Cable compartment cover secured by 2 bolts (LSC 2B)	●	●	●	●	●	●
Mechanical interlock between cable compartment cover - position of earthing switch (LSC 2A)	○	○	○	–	–	–
Auxiliary contact of cable compartment cover (-S046) [2]	–	–	–	–	–	–
Cable clamps	○	○	○	○	○	○
Attachment of padlock in front of operating elements	○	○	○	○	○	○

● Standard equipment; ○ Optional equipment; [1] Other requirements on request

Project support forms

Project engineering type 1

	Cubicle types					
	Feeder cubicles with circuit-breaker (CB)			Busbar sectionalizer with CB and riser		Risers
	CB6, CB8	CB6, CB8, CB12	CB16, CB20, CB25	BC-CB6/R to BC-CB25/R	BC-CB6/RDE to BC-CB25/RDE	DI(D)(E)
Cubicle width [mm]	450	600	800	800/1000	800/1000	450 - 800
Switchgear cubicle equipment						
Outgoing feeder cable area						
Degree of protection IP4X [1]	●	●	●	●	●	●
Secondary cables metallically covered	●	●	●	●	●	●
Copper earthing bar CU	●	●	●	●	●	●
1 x outer cone-type bushing, type C	●	●	–	–	–	○
2 x outer cone-type bushing, type C	–	–	●	–	–	○
1st cable support	●	●	●	–	–	●
2nd cable support	○	○	●	–	–	○
3rd cable support	○	○	○	–	–	○
Surge arrester extension	○	○	○	–	–	○
Current transformer installation 1 to 3 cores	●	●	●	○	○	○
Voltage transformer set, outgoing feeder or	–	○	○	–	–	–
Voltage transformer set, busbar	–	○	–	–	–	○
Voltage transformer with disconnecting device	–	○	○	–	–	○
Voltage transformer with primary fuses	–	○	○	–	–	○
Damping resistor extension	–	○	○	–	–	○
Low-voltage cabinet equipment						
Degree of protection IP4X [1]	●	●	●	○	○	○
Digital monitoring and control	●	●	●	○	○	○
Electrical interlock-system inside cubicles and in switchgear and controlgear	●	●	●	○	○	○
Protection relay functions separate from monitoring and control	○	○	○	○	○	○
Protection relay functions combined with monitoring and control	○	○	○	○	○	○
Data transmission to grid central station (SCADA)	○	○	○	○	○	○
Messages and metering functions integrated into digital monitoring and control	○	○	○	○	○	○
Schneider Electric PLCs	●	●	●	○	○	○
Ring mains and panel wirings plugged	●	●	●	○	○	○
Terminal model, type PIT, made by Phoenix	●	●	●	○	○	○
Low-voltage cabinet lighting cabinet via door contact	○	○	○	○	○	○
Low-voltage cabinet heating via thermostat	○	○	○	○	○	○

● Standard equipment; τ○ Optional equipment; [1] Other requirements on request; [2] Design depending on operating concept
Switch-fuse combination panel available on request

Project support forms

Project engineering type 2

Project engineering aid 2:

The individual solution

Description

GMA gas-insulated switchgear for indoor installation.
Switchgear cubicles with vacuum circuit-breaker and supplementary cubicles.

- Prefabricated, type-tested switchgear in accordance with IEC 62271-1
- Internal arc classification in accordance with IEC 62271-200
- Gas tank closed for the switchgear's service life in accordance with IEC as "Sealed Pressure System"
- No gas handling and no replenishing of insulating gas required for the switchgear's service life
- Gas tank made of stainless chromium-nickel steel
- IP65 degree of protection of medium-voltage live-parts in gas-filled compartments
- Current and voltage transformer outside gas-filled compartment
- Environmental conditions in accordance with IEC 62271-1 (1)
  - Ambient temperature min. -5 °C, max. +40 °C, mean value over 24 hours: +35 °C
  - Relative humidity < 95%, installation altitude above sea level < 1000 m

General design features						
Rated voltage	☐ 12 kV	☐ 17.5 kV	☐ 24 kV			
Rated lightning impulse withstand voltage	☐ 75 kV	☐ 95 kV	☐ 125 kV			
Rated power frequency withstand voltage	☐ 28 kV	☐ 38 kV	☐ 50 kV			
		☐ 42 kV				
Rated frequency	☐ 50 Hz	☐ 60 Hz				
Rated short-time current	☐ 16 kA	☐ 20 kA	☐ 25 kA	☐ 31.5 kA		
Rated time for short-time current	☐ 1s	☐ 3s				
Rated peak withstand current	☐ 40 kA	☐ 50 kA	☐ 63 kA	☐ 80 kA		
Rated current, busbar	☐ ≤ 1250 A	☐ 1600 A	☐ 2000 A	☐ 2500 A		
Busbar enclosure (metal)	☐ Yes	☐ No				
Auxiliary voltage	☐ 24 VDC ☐ 48 VDC	☐ 60 VDC	☐ 110 VDC	☐ 220 VDC	☐ 120 VAC	☐ 230 VAC
Installation	☐ free-standing	☐ wall-mounting				
Internal arc classification in accordance with IEC 62271-200	☐ no requirement	☐ IAC AFL		☐ IAC AFLR		
Pressure relief device	☐ in the room	☐ outside the building				
Existing room height	☐ ≥ 2400 mm	☐ ≥ 2800 mm				
Gas monitoring per gas-filled compartment	☐ integrated in digital monitoring			☐ with pressure gauge		
Low-voltage cabinet with double-bit lock	☐ 700 mm	☐ 850 mm (total height 2350 mm)				
Voltage detection system, 3-phase, IEC 61243-5	☐ Plug-in type system	☐ IVIS, integrated system without repeat test				

Project support forms

Project engineering type 2

	Cubicle types					
	Feeder cubicles with circuit-breaker (CB)			Busbar sectionalizer with CB and riser		Risers
	CB6, CB8	CB6, CB8, CB12	CB16, CB20, CB25	BC-CB6/R to BC-CB25/R	BC-CB6/RDE to BC-CB25/RDE	DI(D)(E)
Cubicle width [mm]	450	600	800	800/1000	800/1000	450 - 800
Switchgear cubicle equipment						
Integrated vacuum circuit-breaker	●	●	●	●	●	–
Motor drive for spring-charging mechanism (-M11)	●	●	●	●	●	–
Emergency mode: manual spring-charging mechanism with crank	●	●	●	●	●	–
Auxiliary switch extension, 18-pole (-S011)	●	●	●	●	●	–
Mechanical operations counter	●	●	●	●	●	–
Mechanical ON and OFF pushbutton	●	●	●	●	●	–
Blocking coil on ON pushbutton (-Y2)	○	○	○	○	○	–
Blocking coil on OFF pushbutton (-Y3)	○	○	○	○	○	–
Release ON (-F21)	●	●	●	●	●	
1st release OFF (-F11)	●	●	●	●	●	
2nd release OFF (-F12)	○	○	○	○	○	
Undervoltage release (-F13)	○	○	○	○	○	–
Integrated 3-position switch	●	●	●	●	●	○
Disconnector with manual drive	●	●	●	●	●	○
Disconnector, motor drive (-M11)	○	○	○	○	○	○
Disconnector, auxiliary switch, 14-pole (-S011)	●	●	●	●	●	○
Blocking coil on disconnector (-Y1)	○	○	○	○	○	○
Earthing switch with manual drive	●	●	●	–	●	○
Earthing switch, motor drive (-M11)	○	○	○	–	○	○
Earthing switch, auxiliary switch, 14-pole (-S011)	●	●	●	–	●	○
Blocking coil on earthing switch (-Y1)	○	○	○	–	○	○
1st auxiliary contact, interrogation D/E (-S151) [2]	–	–	–	–	–	–
2nd auxiliary contact, interrogation D/E (-S152) [2]	–	–	–	–	–	–
Operator interface						
Degree of protection IP2 [1]	●	●	●	●	●	●
Mechanical operation and position indicators	●	●	●	●	●	●
Intertripping circuit “Earthing switch – CB“	●	●	●	–	–	–
Lock for mechanical “operation enabled”	○	○	○	○	○	○
Cable compartment cover secured by 2 bolts (LSC 2B)	●	●	●	●	●	●
Mechanical interlock between cable compartment cover and earthing switch position (LSC 2A)	○	○	○	–	–	–
Auxiliary contact of cable compartment cover (-S046) [2]	–	–	–	–	–	–
Auxiliary contact, crank insertion opening (-S044)	○	○	○	○	○	○
Cable clamps	○	○	○	○	○	○
Attachment of padlock in front of operating elements	○	○	○	○	○	○

● Standard equipment; ○ Optional equipment; [1] Other requirements on request; [2] Design depending on operating concept

Project support forms

Project engineering type 2

	Cubicle types					
	Feeder cubicles with circuit-breaker (CB)			Busbar sectionalizer with CB and riser		Risers
	CB6, CB8	CB6, CB8, CB12	CB16, CB20, CB25	BC-CB6/R to BC-CB25/R	BC-CB6/RDE to BC-CB25/RDE	DI(D)(E)
Cubicle width [mm]	450	600	800	800/1000	800/1000	450 - 800
Switchgear cubicle equipment						
Outgoing feeder cable area						
Degree of protection IP4X [1]	●	●	●	●	●	●
Secondary cables metallically covered	●	●	●	●	●	●
Copper earthing bar CU	●	●	●	●	●	●
1 x outer cone-type bushing, type C	●	●	–	–	–	○
2 x outer cone-type bushing, type C	–	–	●	–	–	○
1st cable support	●	●	●	–	–	●
2nd cable support	○	○	●	–	–	○
3rd cable support	○	○	○	–	–	○
Surge arrester extension	○	○	○	–	–	○
Current transformer installation 1 to 3 cores	●	●	●	⊙	⊙	⊙
Voltage transformer set, outgoing feeder or	–	○	○	–	–	–
Voltage transformer set, busbar	–	–	○	–	–	○
Voltage transformer with disconnecting device	–	○	○	–	–	○
Voltage transformer with primary fuses	–	○	○	–	–	○
Damping resistor extension	–	○	○	–	–	○
Low-voltage cabinet equipment						
Degree of protection IP4X [1]	●	●	●	●	●	●
Monitoring and control via GemControl plus MiCOM or SEPAM protection relay	○	○	○	○	○	○
Multi-protection relay with integrated monitoring and control, type MiCOM Px39 or	○	○	○	○	○	○
Specific digital protection with/without digital monitoring and control	○	○	○	○	○	○
Conventional monitoring and control	○	○	○	○	○	○
Data transmission to grid central station (SCADA)	○	○	○	○	○	○
Additional signal lamps	○	○	○	○	○	○
Additional metering devices	○	○	○	○	○	○
Schneider Electric PLCs	●	●	●	●	●	●
Ring mains and panel wirings plugged	●	●	●	●	●	●
Terminal model, type PIT, made by Phoenix	●	●	●	●	●	●
Low-voltage cabinet lighting via door contact	○	○	○	○	○	○
Low-voltage cabinet heating via thermostat	○	○	○	○	○	○
Other equipment	○	○	○	○	○	○

● Standard equipment; τ○ Optional equipment; [1] Other requirements on request; [2] Design depending on operating concept
Switch-fuse combination panel available on request

TOOLS

schneider-electric.com

This international web-site allows you to access all the Schneider Electric solutions and product information via:

- Comprehensive descriptions
- Range datasheets
- A download area
- Product selectors

You can also access information dedicated to your business and contact your Schneider Electric country support.

PM103687

Web selector

This site allows you to access the Schneider Electric products in just two clicks via a comprehensive range of datasheets, with direct links to:

- Complete libraries: technical documents, catalogs, FAQs, brochures
- Selection guides from the e-catalog
- Product discovery sites and their animations

You will also find illustrated overviews, news to which you can subscribe, and a list of country contacts.

Training

Training allows you to acquire the expertise (installation design, working with the power on, etc.) to increase efficiency and improve customer service.

The training catalog includes beginner's courses in electrical distribution, knowledge of MV and LV switchgear, operation and maintenance of installations, and design of LV installations, to give a few examples.

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26, October, 2017
NRJED311328EN