EcoStruxure™
Innovation At Every Level

Set series

CBGS-0

Catalog 2021

Primary Distribution Switchgear
up to 36/38 kV

se.com

Life Is On | Schneider Electric

Same technology, same offer, simpler names

We're making it easier for you to navigate across the wide range of our world-class digital products and select the offers that are right for you and your needs with confidence.

EcoStruxure Architecture

To enable brand consistency, relevance and impact, we are reinforcing our EcoStruxure™ architecture and digital customer lifecycle tools to help ensure a seamless experience from the CAPEX to OPEX phases of each project, bridging our entire ecosystem of partners, services providers and end users.

EcoStruxure is our IoT-enabled open and interoperable system architecture and platform. EcoStruxure delivers enhanced values around safety, reliability, efficiency, sustainability and connectivity for our customers. EcoStruxure leverages advancements in IoT, mobility, sensing, cloud, analytics, and cybersecurity technologies to deliver Innovation At Every Level from Connected Products, Edge Control, Apps, and Analytics & Services: our IoT technology Levels.

Old names	New names
Ecodial	EcoStruxure Power Design
Ecoreal	EcoStruxure Power Build
Ecoreach	EcoStruxure Power Commission
MasterPact MTZ mobile App/Easergy mobile App	EcoStruxure Power Device App

Set Series

Featuring outstanding Medium Voltage (MV) and Low Voltage (LV) switchboards, motor control centers and power distribution solutions for high-performance power applications, Schneider Electric's Set Series is best-in-class solutions based on high levels of safety and an optimized footprint. Built on a modular architecture and incorporating smart connected devices for maximum safety, reliability, performance and energy efficiency, the Set Series is delivered to customers directly from our Schneider Electric plants or via a global network of licensed partner panel builders, who are trained and audited to provide quality equipment and support.

Old names	New names
Premset	PremSet
Compact	ComPact
Masterpact	MasterPact
Transferpact	TransferPact
Fupact	FuPact

General contents

Overview	8
CBGS-0 Range	22
CBGS-0 IEC Functions and characteristics	28
CBGS-0 ANSI Functions and characteristics	36
CBGS-0 Rail Functions and characteristics	42
CBGS-0 Components	46
Protection, metering and feeder automation	62
Civil work and installation	76

Your requirements

Service continuity

Peace of mind

Economical

Our solution

- Live parts encapsulated in sealed for life enclosures or with solid insulation:
  - not affected by environmental condition, vermin or dust
  - Fault mitigation due to gas and solid insulation of all components
- Maintenance free on MV parts:
  - no shutdowns
  - eliminated human failure sources
- Factory gas-filled and tested:
  - reduced risk of leakage and contamination of gas
  - easy monitoring of insulation (1 tank, 1 manometer)
- Low panel replacement time, even in the middle of the swtichboard

- Arrives on site ready to connect
- No gas-handling along lifetime of the switchgear under normal operations (installation, commissioning, operations, extension, replacement)
- Schneider electric supervision of installation
- Front access only
- Easy operations with ergonomic and guided operator interface

- Expected lifetime of 40 years
- Increased availability and reduced downtimes
- Maintenance-free Medium Voltage parts
- Less civil work
- Reduced space requirements for real savings on the building cost in dense urban areas

CBGS-0

more than 25,000 units in operation over a period of 20 years in more than 60 countries .

The right fit, simply affordable.

The CBGS-0 range gives you the choice of already standardized switchgears for different applications.

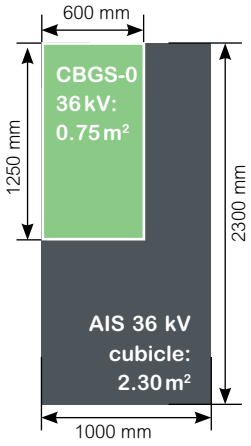
The flexibility of the design of CBGS-0 will likely accomodate specific requirements.

Maximum safety with minimum space

Investment optimization - Space savings

Space and civil works savings

- The compact design, thanks to the SF_6 insulation of the main circuit, provides extremely reduced dimensions, in order to achieve important space savings
- CBGS-0 requires only front access and can consequently be installed against the wall



Installation savings

The modularity of design, the simplicity of the connection system and the fact that there is no need to manipulate SF_6 on site permits an extremely quick installation.

Overview

Field of application	10
EcoStruxure™ ready solutions	12
Protecting the environment	19
Quality assurance	20
Schneider Electric Services	21

Field of application

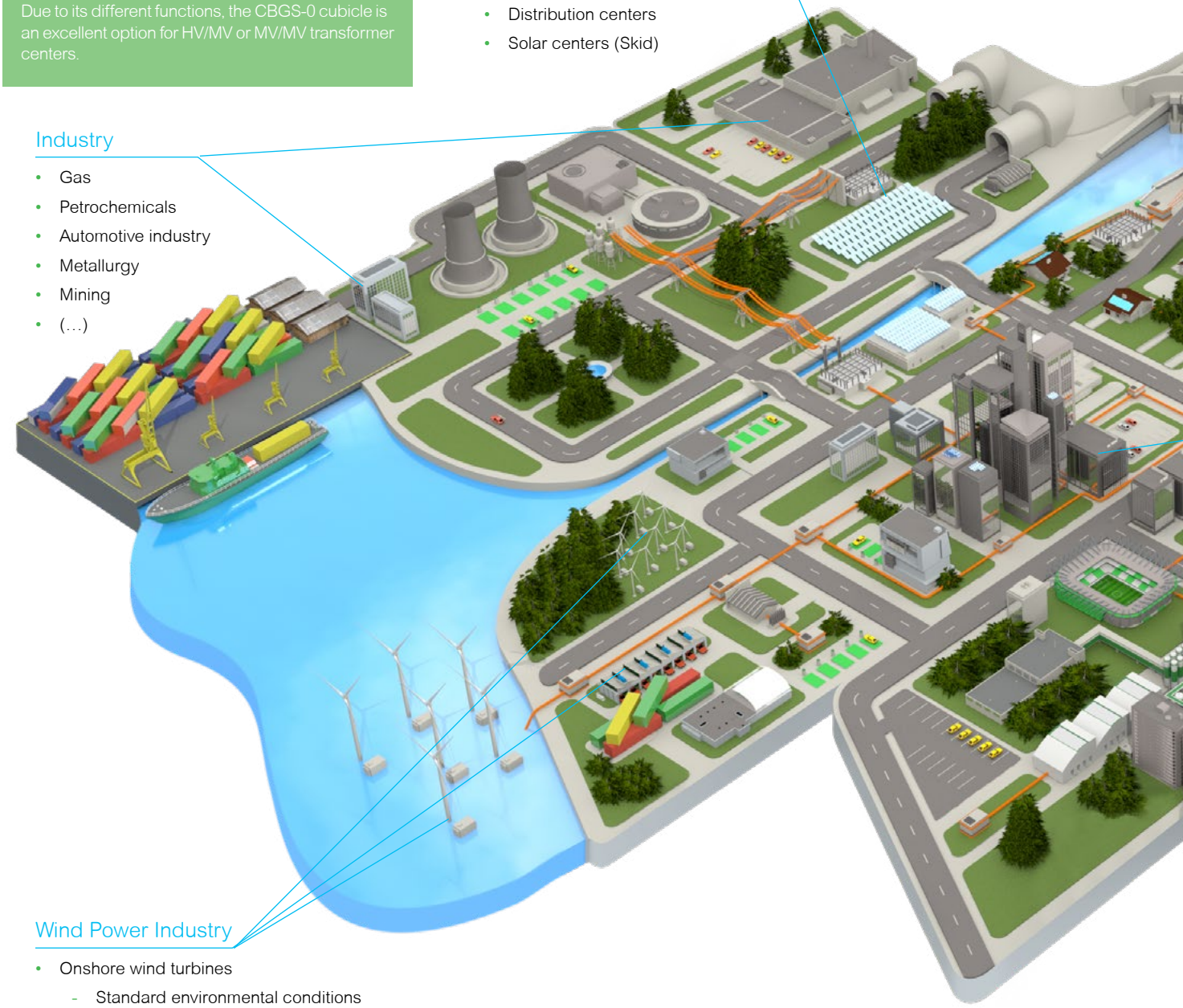
The CBGS-0 is a gas-insulated cubicle. This technology provides the necessary reliability for your installations with a minimum space requirement.
Due to its different functions, the CBGS-0 cubicle is an excellent option for HV/MV or MV/MV transformer centers.

Solar

- Ehouse
- Transformer substations
- Distribution centers
- Solar centers (Skid)

Industry

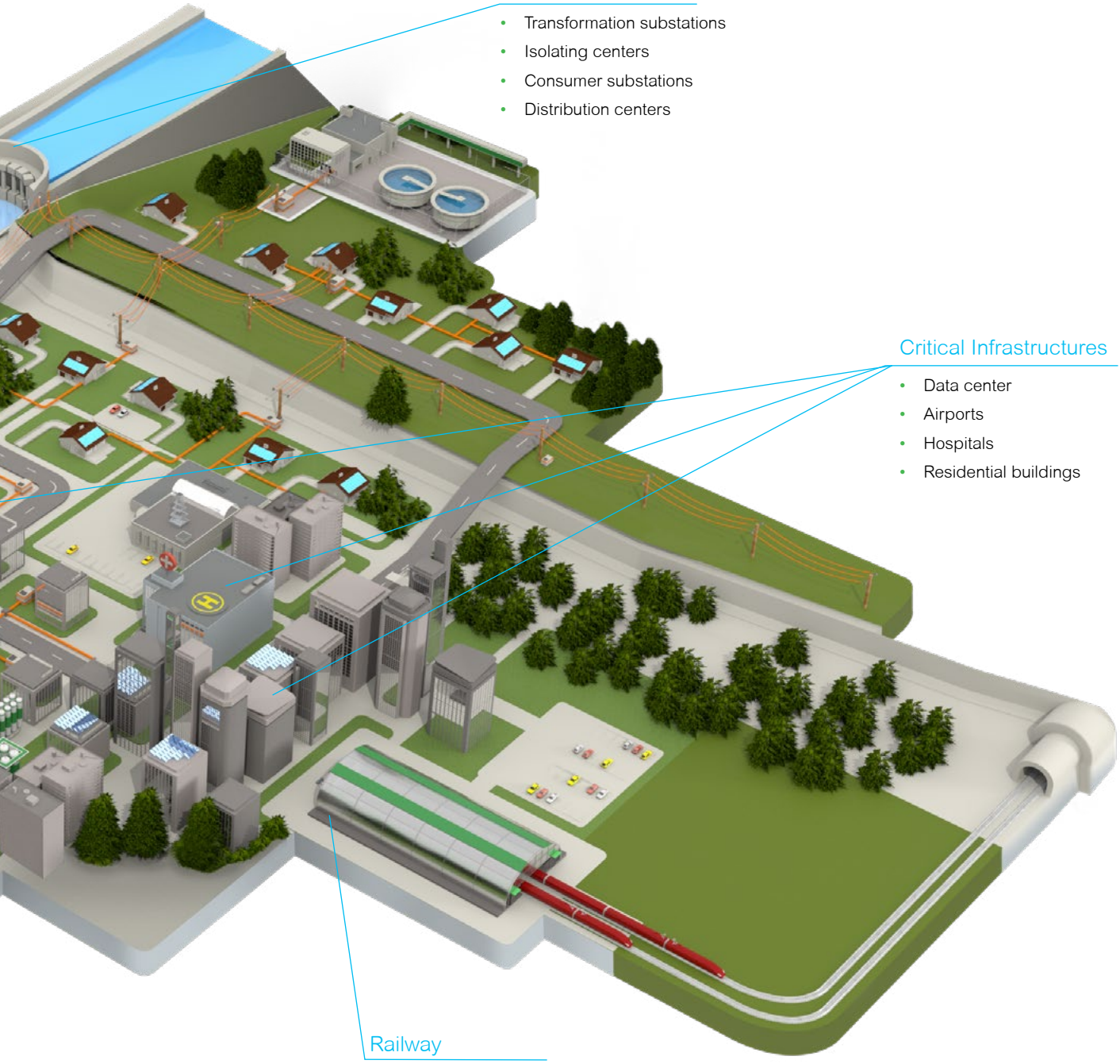
- Gas
- Petrochemicals
- Automotive industry
- Metallurgy
- Mining
- (…)



Wind Power Industry

- Onshore wind turbines
  - Standard environmental conditions
  - Severe environmental conditions
- Offshore wind turbines
- Mains supply substations
- Transformer substations
- Ehouse

Field of application



Electric Companies

- Transformation substations
- Isolating centers
- Consumer substations
- Distribution centers

Critical Infrastructures

- Data center
- Airports
- Hospitals
- Residential buildings

Railway

- Traction substations
- FFCC
- High-speed train
- Metro
- Tramway

EcoStruxure™ ready solutions

What is EcoStruxure™?

500 000

EcoStruxure™ systems deployed since 2007 with the support of our 9000 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 protection

Proven design and experience combined with **internal arc designs** to enhance people and equipment protection.

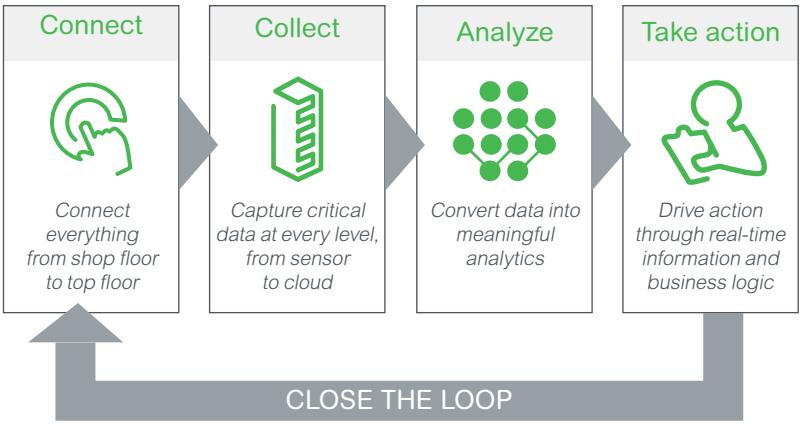
The EcoStruxure™ architecture and interoperable technology platform bring together energy, automation, and software. It provides enhanced value around safety, reliability, efficiency, sustainability and connectivity.

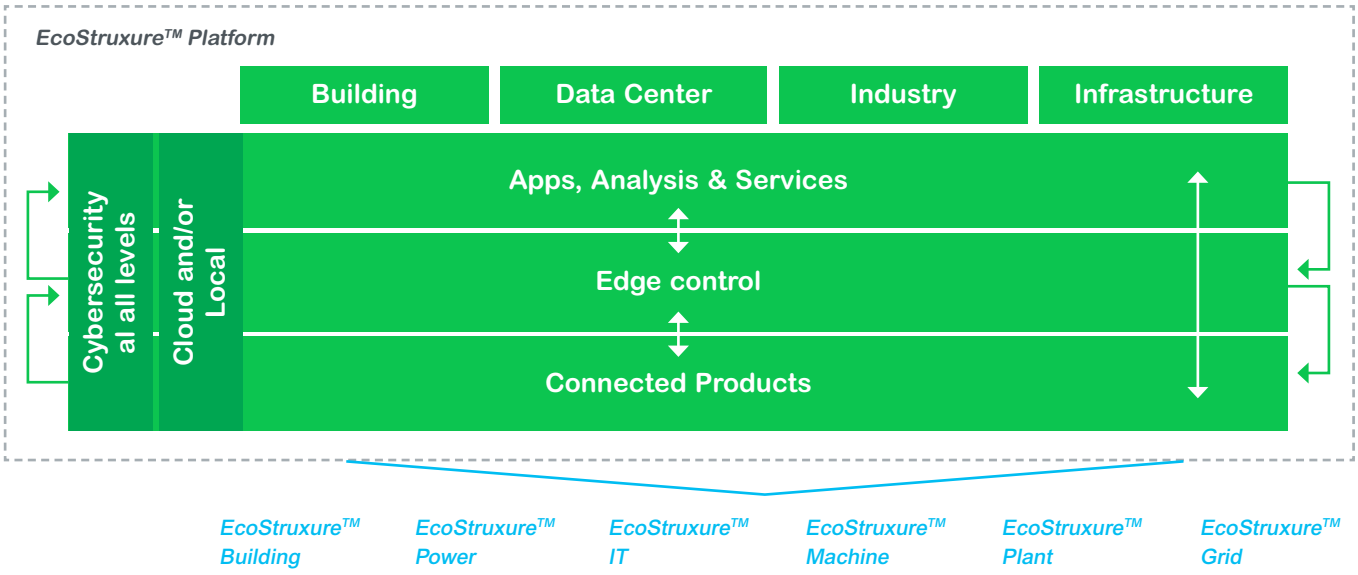
Turn data into action

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 of their electrical distribution by measuring, collecting, aggregating and communicating data





EcoStruxure™ ready solutions

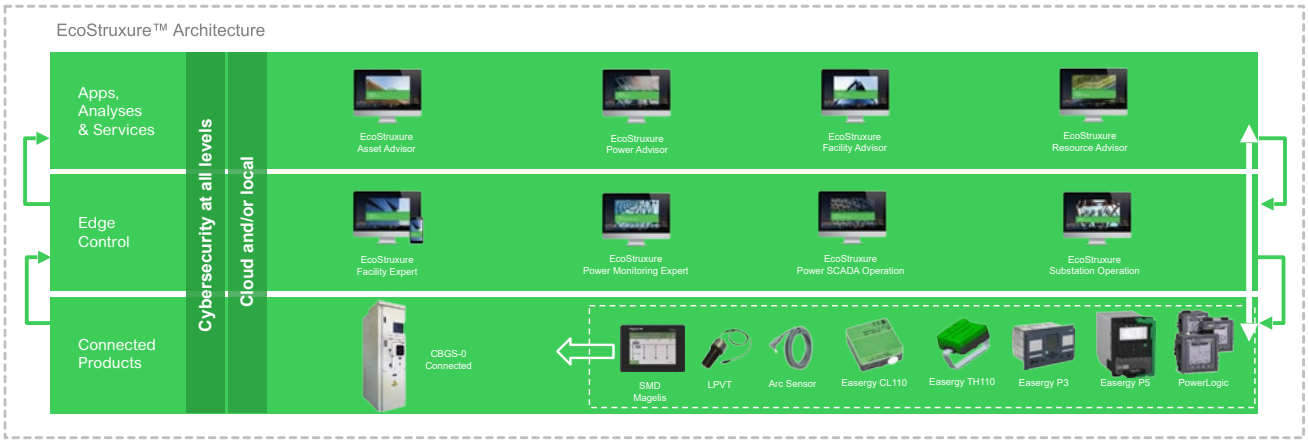
CBGS-0 Connected

In the Connected Products layer, CBGS-0 Connected is a fundamental component of our architecture.

Currently CBGS-0 comes with a best digital experience in its class, in order to help you confront new challenges and meet the Industry 4.0 objectives.

With its new connected features, CBGS-0 is the perfect choice for intelligent distribution systems providing you:

- Increased operator and equipment safety
- 24/7 connectivity, with remote alarm and real-time data for better decision making
- Constant solution in our MV range, both for new and modernization projects
- Integration into any existing SCADA system



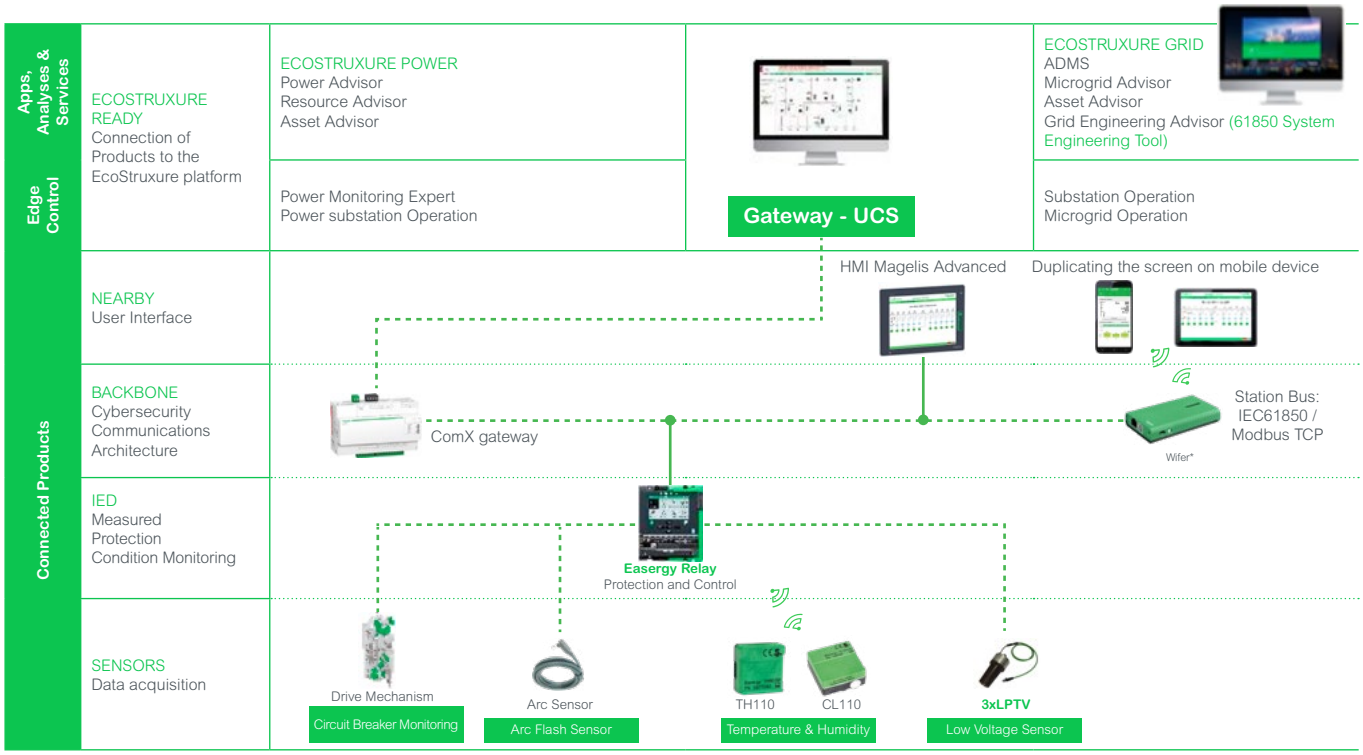
EcoStruxure™ ready solutions

Key technology for integrated and intelligent connectivity

CBGS-0 Connected is MV security in the digital age

The CBGS-0 connected, integrated into substations and MV centers with EcoStruxure™ ready, will be your diagnostic tool. You will have in everything timing of center monitoring information, hot spot temperature, conditions of the humidity and condensation environment, operations carried out in short circuits ... both in real time and their accumulated history, which will allow you to know the aging status of your installations and determine both maintenance periods as well as future plans for the renovation of your installations.

You will have all this information through local devices (in situ with a Human Machine interface (HMI) screen, through your mobile devices, tablets or smartphones, or remotely, with the possibility of uploading the data to the Cloud.



EcoStruxure™ ready solutions

Intelligent protection for distribution networks

Easergy P3U 10/20/30

- Feeder and transformer
- Motor
- Voltage
- Frequency
- Condenser

PM106572

PM106362

Easergy P3 SmartApp

Easergy P3: Universal protection relays

The Easergy P3 protection relay family has been developed to meet the standard requirements of protection for simple power supply or distribution applications, even with high connectivity. Due to its advantageous and flexible design, Easergy P3 provides an excellent alternative for various protection applications, such as Protection of Feeders, Motors, Transformers and of Generation.

Integrates the latest communication protocols with serial or Ethernet links. Ease of use has always been a core value for Schneider Electric products, and the Easergy P3 is no exception, with the unique option of operating via your smartphone or tablet with the “Easergy SmartApp”.

Quick setup is achieved using the unique “eSetup Easergy Pro” parameter-setting software that improves usability.

Easergy P5 provides access to an extended warranty program when users register their product using the QR code and follow a simple process with the mySchneider app.

Easergy 10 years Warranty

Easergy P5: Removable protection relays for demanding applications

The modern digital functions of the Easergy P5 provide a unique combination of services designed to increase operational efficiency and user safety.
Medium Voltage protection relays with a focus on security and cybersecurity.
Easy to use by panel builders, system integrators and end users. From overcurrent protection to differential protection with arc flash protection, the latest communication protocols on redundant serial links or Ethernet and IEC 61850 and a backup memory for quick and easy replacement.

PM104085

PM108232

Easergy P5 SmartApp

PE63300

Arc Flash Sensor

Voltage sensors

The Low-Power Voltage Transformer (LPVT) is a voltage sensor based on resistance dividers for digital measurement and protection devices. LPVTs provide a Low Voltage output signal compatible with Easergy P5 protection relays.

Protection relay with integrated arc sensor

- Maximum reduction of the effects of an unlikely internal defect
- Quick detection and action by mean of light and current
- Arc detection integrated in 1 box solution with protection relay
- Opening to SCADA through the protection relay
- Less footprint

Unmatched Efficiency

- Simplified configuration with the new eSetup Easergy Pro Configuration Tool
- Totally modular and configurable for adapting to current needs and allowing future updates

Better Connectivity

- Simpler operation and maintenance with the Easergy SmartApp
- 9 communication protocols in one box, including IEC 61850
- Higher number of inputs and outputs for more options

Enhanced Security

- Enhanced Security
- Built-in arc protection
- Safe replacement due to removability.
- Safe operation with intelligent applications and Web-HMI
- Built-in virtual injection test
- Complies with the international standards. (i.e., IEC 60255-1)

EcoStruxure™ ready solutions

Intelligent protection for distribution networks

PE60300

Sepam range

Sepam

Easergy Sepam Series 60 is a range of protection relays for complex applications with simplicity and dependable protection functions. It offers a platform of protection relays for substation incomers, feeders, busbars, motors, transformers, generators and capacitor banks:

PM1102898

MiCOM range

MiCOM

MiCOM relays provide the user with different solutions at optimized costs for specific protection requirements within the power distribution mains.

The MiCOM series of relays provides complete solutions with protection functions for all power systems, as well as for the various stages of the functional and hardware project.

PB107500

ION8650

ION8800

Mains Analyzers and Meters

Used for supervising networks of electric power providers and service substations.

The PM series (PM5560, PM8240) and ION series (ion7400, ION8650, ION8800) meters are ideal for cogeneration applications that require accurate bi-directional measurement of power in both generation and standby mode.

Applications:

- Compliance Supervision
- Power quality analysis
- Power factor demand and control
- Load Insufficiency
- Power pulses and totalization

SAITEL DR

SAITEL Remote Terminal Unit

SAITEL RTUs IEC 61850 functionalities for both client and server. Therefore, it the ideal solution for multiple applications:

- As a gateway for the IEC 61850 station bus interface, through a variety of communication protocols, with the different control centers.
- As a Bay Control Unit for the control and monitoring of the disconnectors and switches of the cubicles, transformers and other equipment or devices of the substations.
- For integrating different inputs and outputs in the IEC 61850 station bus
- For connecting IEDs in series with the IEC 61850 station bus
- GOOSE support for high-speed data exchange with other IEC 61850 devices

EcoStruxure™ ready solutions

A new generation of intelligent electronic equipment and sensors

Key benefits:

- No battery
- Wireless communication
- High performance
- Measuring point in contact
- Easy installation
- Compact footprint
- Remote monitoring and alarms

Characteristics	
Power supply source	Self-powered. Derives power directly from the circuit
Minimum activation current	5 A
Accuracy	+/- 1 ºC
Range	-25 ºC / +115 ºC
Wireless communication	ZigBee Green Power 2,4 GHz
Dimensions	31 x 31 x 13 mm
Weight	15 g
Continuous monitoring and supervision cost reduction	

Easergy TH110


Easergy CL110

Advantages:

- Prevention of unscheduled downtime.
- Improved operator and equipment safety.
- Optimization of maintenance and transition to predictive maintenance

The CBGS-0 Connected is equipped with our new generation of wireless intelligent sensors, using the Zigbee Green Power communication protocol, in order to ensure reliable and secure data transmission.

Continuous thermal monitoring

Power supply connections in Medium Voltage (MV) cubicles are one of the most critical points in substations, especially for those made in:

- Power Cable Connections
- Removable CB connections

Loose and faulty connections cause increased resistance at localized points that will lead to thermal runaway until the connections fail completely.

Preventive maintenance can be complicated under severe operating conditions also due to limited accessibility and visibility of the contacts. Continuous thermal monitoring is the most appropriate way to detect early an affected connection.

Easergy TH110: Thermal monitoring sensors

Easergy TH110 sensors ensure continuous thermal monitoring for detecting potential hot spots in all critical connections made in the field.

It is the best alternative to conventional infrared measurement equipment due to:

- Continuous health status information and hence greater reliability
- Transformer dielectric strength remains intact
- Reduces supervision costs compared to infrared

Easergy TH110 sensors are self-powered from the mains current (a minimum of 5A is required).

Easergy CL110: Environmental monitoring sensors

Easergy CL110 sensors measure the temperature of the contact surface and the relative humidity. These are designed for:

- Detecting humidity conditions that are excessive for proper operation
- Calculating transformer aging

The Easergy CL110 sensor is equipped with a battery (life > 15 years)

Substation Monitoring Device (SMD)

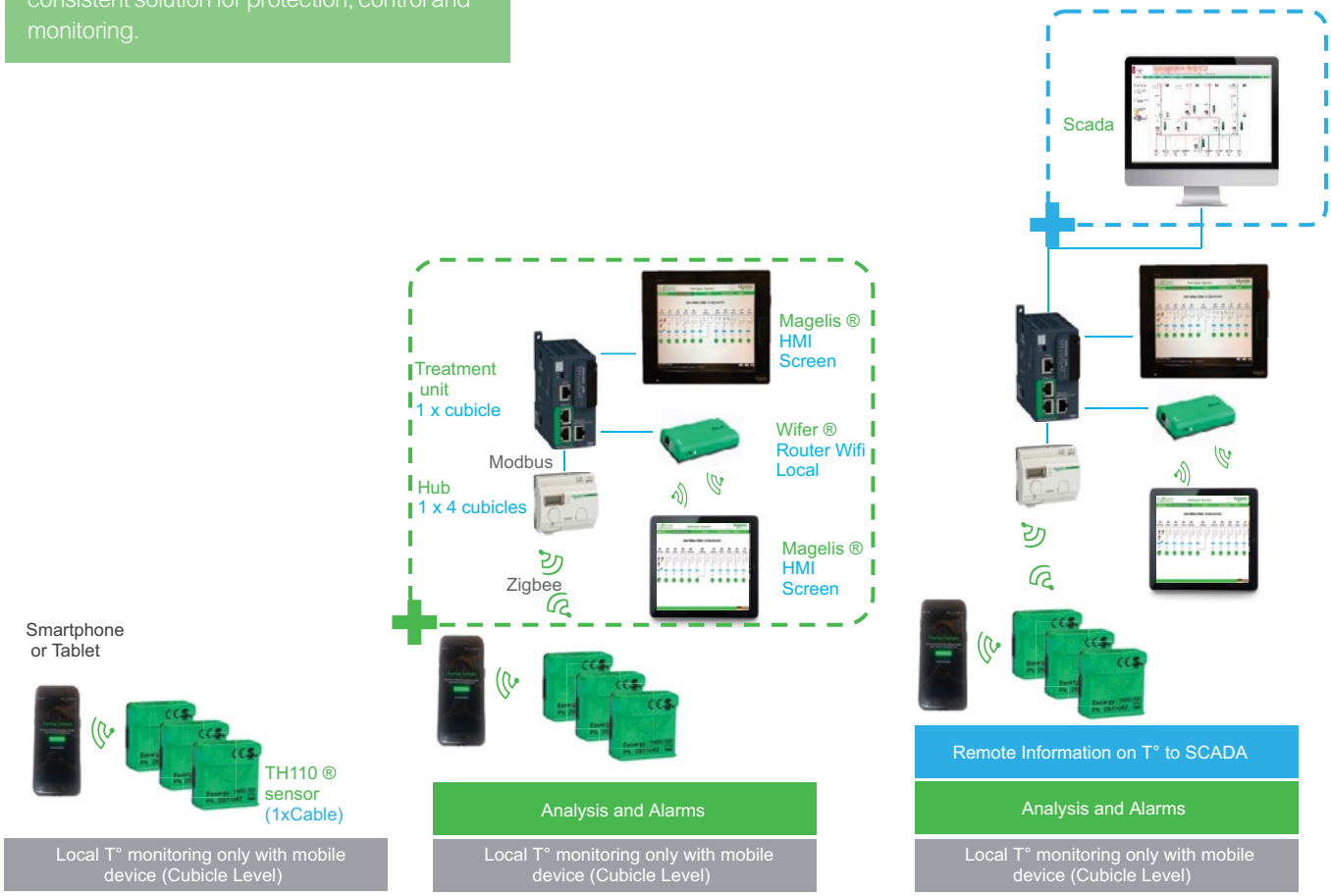
Easergy TH110 is connected to the Substation Monitoring Device (SMD) that collects the data for local signaling, data analysis and close-up visualization. Specific monitoring algorithms allow detecting deviations from the threshold as a function of specific installation characteristics also with respect to variable loads or abnormal behaviors emerging from the comparison of phases.

EcoStruxure™ ready solutions

Scalable architecture

The product portfolios of Schneider Electric include a wide range of multifunction relays for use along with CBGS-0 cubicles to create a consistent solution for protection, control and monitoring.

CBGS-0 Connected offers various levels of connectivity in order to better suit the requirements of customer.



Protecting the environment

Schneider Electric's recycling service for SF_6 products is part of a rigorous management process.

Environmental performance

Schneider Electric is committed to a long-term environmental approach.

All necessary measures have been taken in conjunction with our services, suppliers and subcontractors to ensure that the materials used in the composition of the equipment do not contain any substances prohibited by regulations and directives.

Schneider Electric's ambition is to reduce the environmental impact of its products throughout their whole life cycle, by offering end-of-life SF_6 recycling solutions Up to 98% of its equipment can be recycled for re-use.

Our Gas Insulated Switchgear is designed with environmental protection in mind:

- The materials used, insulators and conductors are identified, easily separable and recyclable.
- The SF_6 can be recovered at the end of the equipment's life and reused after Treatment.
- The environmental management system adopted by Schneider Electric's production sites for the manufacture of our Gas Insulated Switchgear has been assessed and recognised as conforming to the requirements of the ISO 14001 standard.

PM105657

PM105658

ISO 14001

CBGS-0 switchgears have been designed with the aim of preserving the environment.

The materials used are clearly identified for easy separation and recycling.In addition, the gas can be collected and reused after an appropriate processing

The environmental management system followed by Schneider Electric is certified according to the established requirements of the ISO 14001 standard and is RoHS compliant.

Quality assurance

Quality certified to ISO 9001

PM105396

PM105661

A major advantage

Schneider Electric has integrated a functional organisation into each of its units. The main mission of this organisation is to check the quality and the compliance with standards.

This procedure is:

- Uniform throughout all departments
- Recognised by many customers and approved organisations.

The quality system for the design and manufacture of CBGS-0 units has been certified in conformity with the requirements of the ISO 9001: 2000 quality assurance model.

PM105659

Factory assembled and tested

Guarantees the highest level of quality. Material used (stainless steel) all assembled, leakage tested, gas fill and tightness test done in factory in an environment constantly under control (moisture, dust, etc.)

PM105660

Supervision of installation

Installation and commissioning, exclusively intended for specialist electricians who have been certified for the CBGS-0 series (training certificate).

Schneider Electric Services

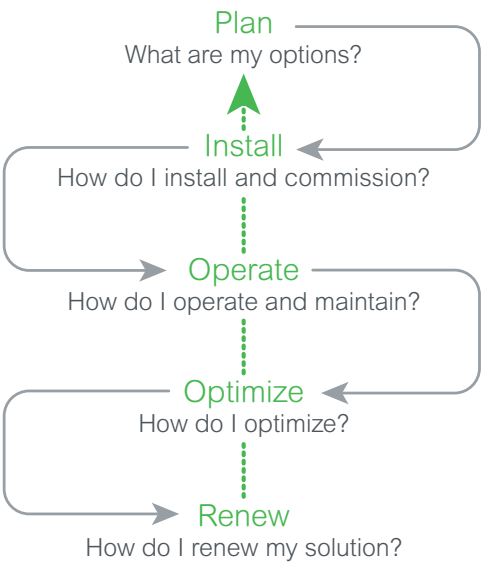
Peace of mind throughout your installation life cycle

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

DB408843



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 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 versus design, through on-site testing and commissioning, and tools and procedures

Operate

Schneider Electric helps you maximize your installation uptime and control your capital expenditures through its services offering.

- **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 necessary skills and competencies to properly and safely operate your installations

Optimize

Schneider Electric proposes 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 equipments.

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

CBGS-0 range

Description 24

Operating conditions and standards 26

Description

CBGS-0 range

Each CBGS-0 assembly comprises several functional units (cubicles) assembled together.

Each functional unit contains all the elements necessary for carrying out its function.

The different cubicles (functional units) are interconnected with the help of a busbar system with solid shielded insulation on the outside of the SF_6 tank. The trays of the Low Voltage (LV) internal connecting cables are located in the upper part of the cubicle, above the Low Voltage compartment.

			IEC		ANSI	
Nominal Voltage		**(kV)**	**24**	**36**	**27**	**38**
Insulation level	At industrial frequency, 50 Hz	(kV rms)	50	70	60	80
	For lightning shock wave	(kV peak)	125	170	125	170
Rated current	Busbar	(A)	1250 / 1600 / 2000		1200 / 2000	
	Incoming/outgoing	(A)	630 / 1250 / 1600 / 2000		600 / 1200 / 2000	
Short circuit breaking current		(kA)	25 / 31.5			
Short circuit making current		(kA peak)	65 / 82			
Short time withstand current		(kA-3 s)	Max 25 / 31.5			
Internal arc withstand	(AFL & AFLR) IEC 62271-200 ANSI C.37.20.07 Type 2B	(kA -1 s)	31.5			
Relative nominal pressure of SF_6 gas at 20°C		(bar)	0.30			
Degree of protection	HV compartment		IP65			
	LV compartment		IP3X - IP41			

3 switchgear variants (IEC, RAIL, ANSI)

PM105662

PM105662

PM105663

CBGS-0 cubicle structure

Each cubicle is a set of panels (RAL 9002), sheets and metal frames. All are grounded according to the definition of «metal enclosure» and comply with the requirements of the standard IEC 62271-200.

- **The low voltage compartment**, separated from the Medium Voltage (MV) zone, is located in the upper part of the cubicle and contains relays and the rest of the Low Voltage (LV) auxiliary protection and control elements.
- **The silicone-insulated**, shielded and grounded main busbar is located at the upper rear part of the cubicle, outside the SF_6 compartment.
- **The circuit breaker compartment (SF_6 tank)** is located in the central part of the cubicle. The power cables and the busbar system are connected to it by bushing.
- **The medium voltage cable connection compartment** is located in the lower part of the cubicle, with access from the front side

Description

GENERAL BUSBAR

Pluggable, with single-pole solid insulation and grounded external shield

General bar compartment enclosure

Voltage transformers (optional) pluggable into the general busbar

Toroidal current transformers (optional) on the general busbar

Gas evacuation channel (optional)

SF_6 TANK

Metal tank sealed for life (stainless steel) filled with SF_6

Gas three-position disconnector

Circuit breaker

Gas discharge flapper

POWER CABLE COMPARTMENT

Voltage transformers with optional disconnector

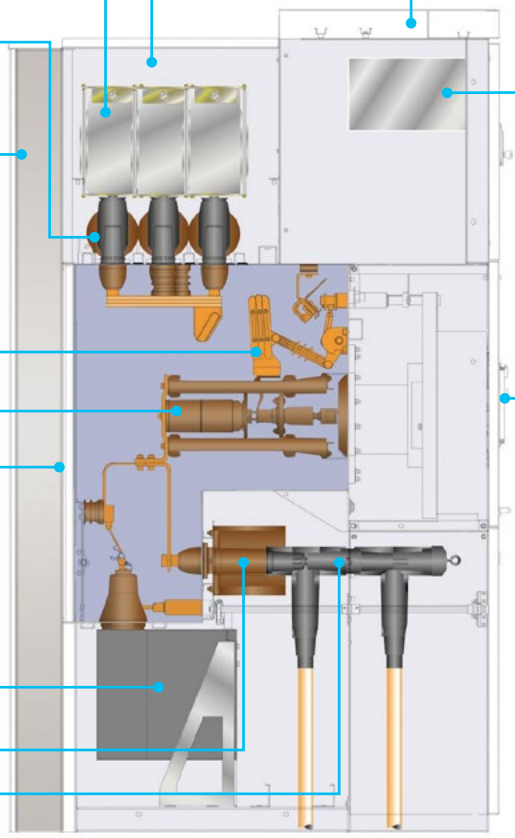
Current transformers (optional) power cable

Connectors

LOW VOLTAGE COMPARTMENT

Easergy series or similar protection and control relays (optional)

LV cable tray



Three-position disconnector operating mechanism

Position indicators

Disconnector indicator: open/closed

Earth indicator: open/closed

Three position disconnector

Disconnector operating mechanism selector

Three-position disconnector operating mechanism

Disconnector actuating shaft: open/closed

Ready to earth actuating shaft: open/ready

Capacitive voltage indicators per phase

Pressure gauge for SF_6 pressure indication inside the tank

Front view of the operator interface

Circuit-breaker opening and closing pushbuttons

Operation counter

Closing pushbutton

Opening pushbutton

Position (open/closed)

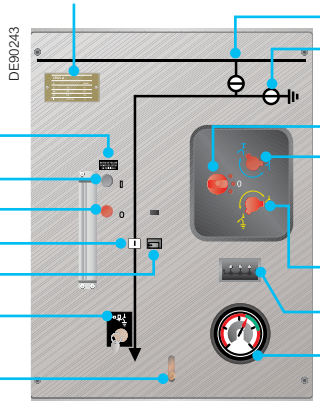
Spring charging indication

Power cables compartment operating panel

Earthed cables key lock (optional)

Mechanical interlock cable compartment shutter

Characteristics nameplate



Operating conditions and standards

Environmental and operating conditions

CBGS-0 cubicles can function as indoor cubicles under normal operating conditions in accordance with the standard IEC 62271-1.

Operation under conditions other than those indicated is only permissible after prior consultation and with the consent of the manufacturer.

Ambient air temperature

- Less than or equal to +40°C (contact us for temperatures up to +55°C)
- Less than or equal to +35°C on average over a 24-hour period
- Greater than or equal to - 5°C (contact us for temperatures up to -25°C)

For other temperatures, please contact us.

Altitude up to 2000 m

- ≤ 2000 m above sea level. For higher altitudes, contact us

Severe conditions for higher altitudes

- Altitudes higher than 2000 m above sea level, upon request

Humidity

- Average relative humidity over a period of 24 hours: 95%
- Average relative humidity over a period of 1 month: 90%
- Average vapor pressure over a 24-hour period: 2,2 kPa
- Average vapor pressure over a period of 1 month: 1,8 kPa

Seismic Conditions

- Cubicles with optional seismic certification

Severe conditions with vibrations (optional):

- According to IEEE 693-2005 2) (Required high response spectrum)
- AC 156/ICC-ES (IBC - International Building Code - replaces UBC) 3)
- Sds = 2.109 g > with unevenness z/h = 0
- Sds = 1.389 g > with unevenness z/h = 1

Extreme ambient conditions

Range of extreme ambient conditions (optional):

- Up to IP51 in mechanisms and LV compartment
- Tested with severity level of 6 according to IEC 60068-2-52
- Worst case salty and dry atmosphere

Application criteria:

- Dielectric test at 36 kV
- SF_6 leak test
- Mechanical/electrical operation of the system of circuit breaker, disconnector and interlock
- Low Voltage (LV) electrical test
- VT and CT electrical test
- Visual appearance

Operating conditions and standards

IEC standards

CBGS-0 cubicles have been designed and certified in accordance with the following standards:

Standard	Specification
Standard	Specification
IEC 62271-1	High-Voltage Switchgear
IEC 62271-100	Alternating current circuit breakers
IEC 62271-102	Alternating current disconnectors and ground disconnectors
IEC 62271-200	Alternating-current metal-enclosed switchgear for rated voltages higher than 1 kV and less than or equal to 52 kV
IEC 62271-103	Switches for rated voltages higher than 1 kV and less than or equal to 52 kV
IEC 60529	Degrees of protection provided by the enclosures (IP code)

ANSI, IEEE standards

CBGS-0 cubicles have been certified by UL (Underwriters Laboratories):

Standard	Specification
IEEE C37.06-2000	Guide for High-Voltage Circuit Breakers Rated on Symmetrical Current Basis Designated SESA161269Definite Purpose for Fast Transient Recovery Voltage Rise Times.
IEEE C37.09-1999	Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
IEEE C37.010-1999	(R 2005), IEEE Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
IEEE C37.20.7	Guide for testing switchgear up to 52KV for Internal arcing faults
ANSI C37.54-2002	Indoor Alternating Current High-Voltage Circuit Breakers Applied as Removable Elements in Metal-enclosed Switchgear – Conformance Test Procedures
IEEE C37.20.3-2001	Metal-Enclosed Interrupter Switchgear
IEEE C37.20.4-2001	Indoor AC Switches (1 kV–38 kV) for Use in Metal - Enclosed Switchgear.
C37.57-2003 NEMA	Switchgear -Metal-Enclosed Interrupter Switchgear Assemblies - Conformance Testing.
C37.58-2003 NEMA	Switchgear -Indoor AC. Medium Voltage Switches for Use in Metal-Enclosed Switchgear - Conformance Test Procedures
IEEE 1247-1998	Interrupter Switches for Alternating Current, Rated Above 1000 V
NFPA 70-2005	National Electrical Code (NEC)

CSA standards

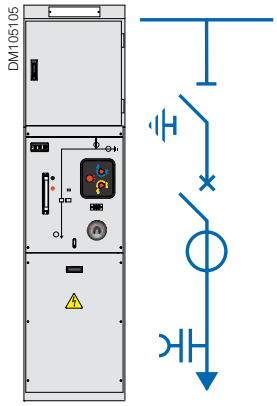
Standard	Specification
C22.2 No. 31-04	Switchgear Assemblies
C22.2 NO. 58-M1989	High Voltage Isolating Switches
C22.2 No. 193-M1983 Reaffirmed 2004	High Voltage Full-Load Interrupter Switches

CBGS-0 IEC:
Functions and characteristics

Overview: choice of functional units	30
Incomer/Feeder	31
Coupler Riser	32
Disconnector	33
Load break switch	34
Load break switch with fuse	35

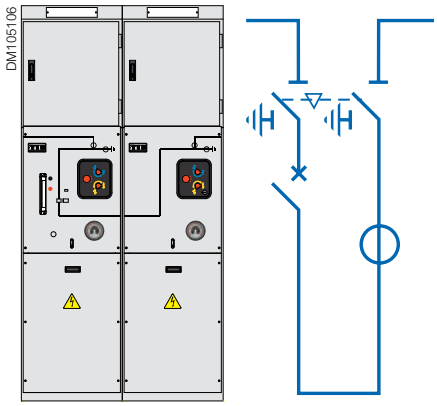
Overview:
Choice of functional units

Incomer/Feeder



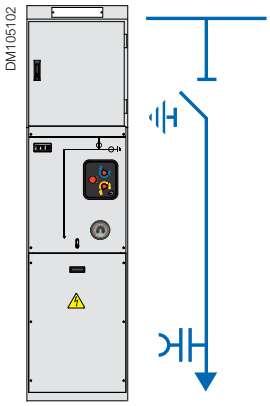
Rated voltage (kV)	24 / 36
Rated current (busbar) (A)	1250 / 1600 / 2000
Incoming/outgoing rated current (A)	630 / 1250 / 1600 / 2000
Short-time withstand current 3 s (kA)	25 - 31.5

Coupler Riser



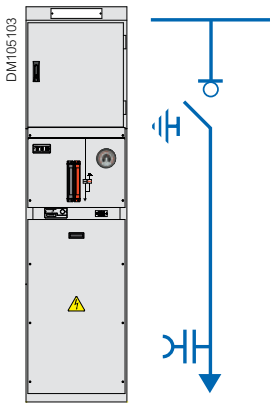
Rated voltage (kV)	24 / 36
Rated current (busbar) (A)	1250 / 1600 / 2000
Incoming/outgoing rated current (A)	1250 / 1600 / 2000
Short-time withstand current 3 s (kA)	25 - 31.5

Disconnector



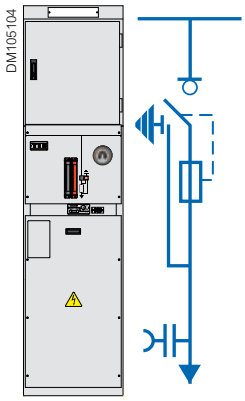
Rated voltage (kV)	24 / 36
Rated current (busbar) (A)	1250 / 1600 / 2000
Incoming/outgoing rated current (A)	630 / 1250 / 1600 / 2000
Short-time withstand current 3 s (kA)	25 - 31.5

Load break switch



Rated voltage (kV)	24 / 36
Rated current (busbar) (A)	1250 / 1600 / 2000
Incoming/outgoing rated current (A)	630
Short-time withstand current 3 s (kA)	25

Load break switch with fuse

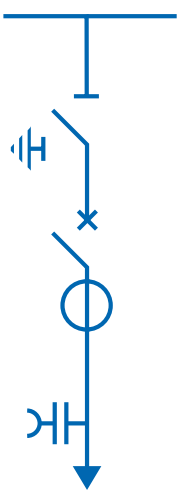


Rated voltage (kV)	24 / 36
Rated current (busbar) (A)	1250 / 1600 / 2000
Incoming/outgoing rated current (A)	200 (limited by the fuse)
Short-time withstand current 3 s (kA)	Limited by the fuse

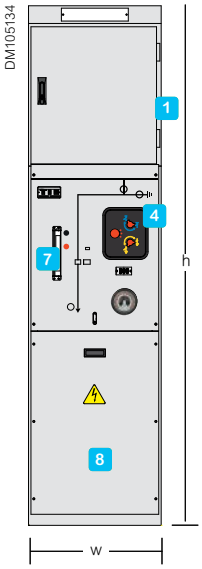
Transformer/line protection

1 Low voltage compartment
2 Main busbar
3 Three-position disconnector (Closed-Open-Ready to Ground)
4 Disconnector operating mechanism
5 Main tank (stainless steel) filled with SF_6 gas, sealed for life
6 Circuit breaker
7 Circuit breaker operating mechanism
8 Power cables compartment
9 Current transformers (optional)
10 Voltage transformers (optional)

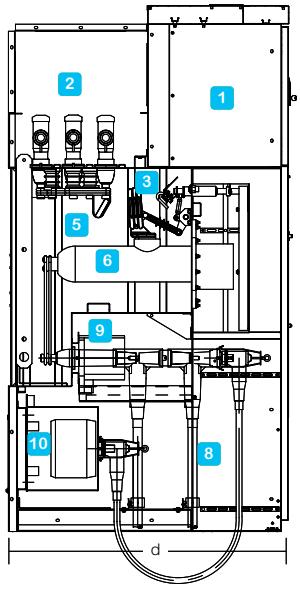
DM105107



DM105134

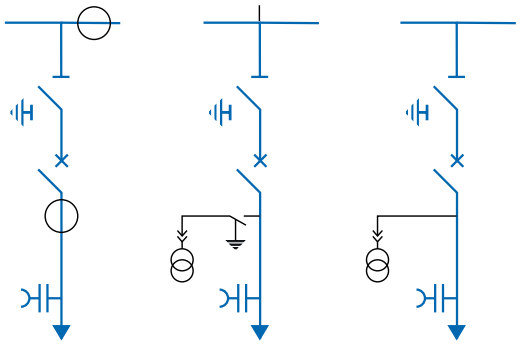


DE90222



Measuring transformers (optional)

DM105109



Current Transformer

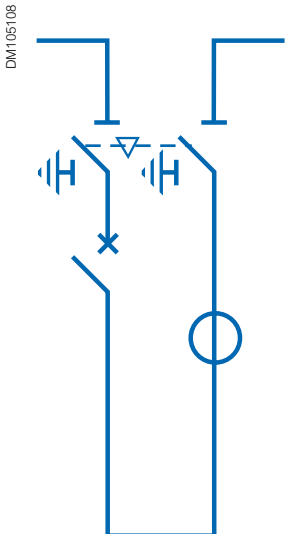
Voltage Transformer with Disconnector (3)

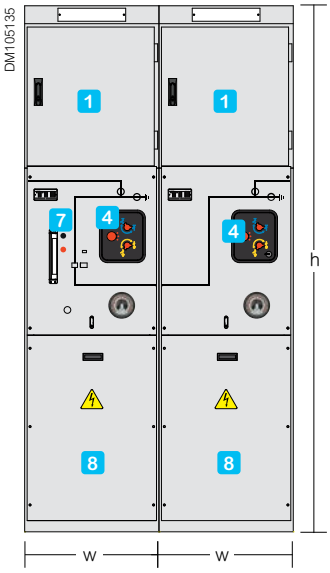
Voltage Transformer without Disconnector

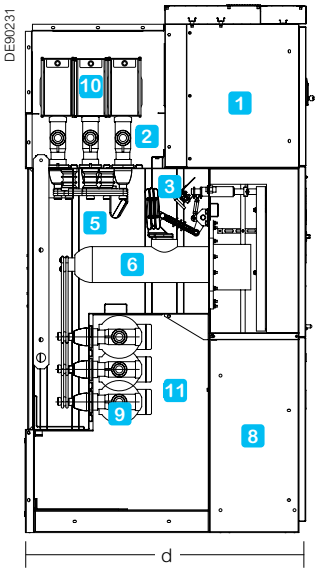
			IX-S	
Rated voltage	kV		24	36
Rated insulation level	kV rms - 1 min		50	70
	kV pulse 1.2/50 ms		125	170
Rated current (busbar)	A	1250	●	●
		1600	●	●
		2000	●	●
Rated current (incoming/outgoing)	A	630	●	●
		1250	●	●
		1600	●	●
		2000	●	●
Interrupting capacity	kA		25 / 31.5	
Short-time withstand current	kA 3s		25 / 31.5	
(W) Width	mm		600 (1)	
(H) Height	mm		2350 (2)	
(D) Depth	mm		1400 (AFLR)	
Approximate weight for 1250 A	kg		725	
Approximate weight for 2000 A	kg		1020	

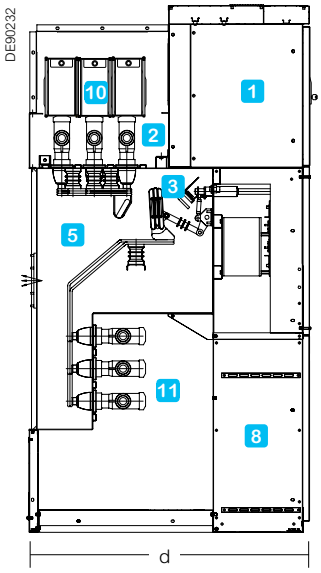
(1) 1200 mm wide for 2000 A cubicles
(2) 2380 mm approx. with voltage transformers for 2000 A busbar
(3) Please contact us

Coupler Riser







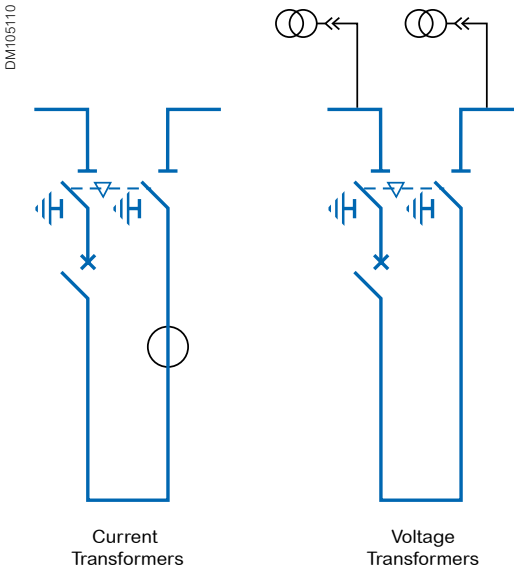


1 Low voltage compartment
2 General busbar system
3 Three position disconnector (Closed-Open-Ready to Ground)
4 Disconnector operating mechanism
5 Main tank (stainless steel) filled with SF_6 gas, sealed for life
6 Circuit breaker
7 Circuit breaker operating mechanism
8 Power cables compartment
9 Current transformers (optional)
10 Voltage transformers (optional)
11 Lower busbar system

			BR	
Rated voltage	kV		24	36
Rated insulation level	kV rms - 1 min		50	70
	kV pulse 1.2/50 ms		125	170
Rated current (busbar)	A	1250	●	●
		1600	●	●
		2000	●	●
Rated current (incoming/outgoing)	A	1250	●	●
		1600	●	●
		2000	●	●
Interrupting capacity	kA		25 / 31.5	
Short-time withstand current	kA 3s		25 / 31.5	
(W) Width	mm		600 (1)	
(H) Height	mm		2350 (2)	
(D) Depth	mm		1400 (AFLR)	
Approximate weight for 1250 A	kg		Coupler 725 / Riser 480	
Approximate weight for 2000 A	kg		Coupler 1020 / Riser 930	

(1) 1200 mm wide for 2000 A
(2) 2380 mm approx. with Voltage Transformers for 2000 A busbar

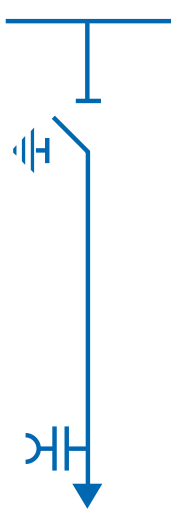
Measuring Transformers



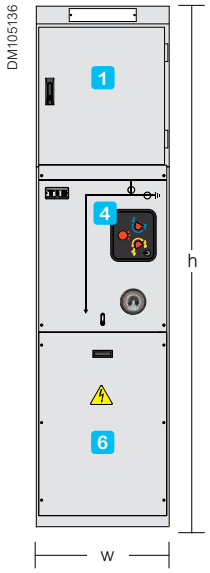
Disconnector

1 Low voltage compartment
2 General busbar systems
3 Three-position disconnector (Closed-Open-Ready to Ground)
4 Disconnector operating mechanism
5 Main tank (stainless steel) filled with SF_6 gas, sealed for life
6 Power cables compartment
7 Current Transformers (optional)

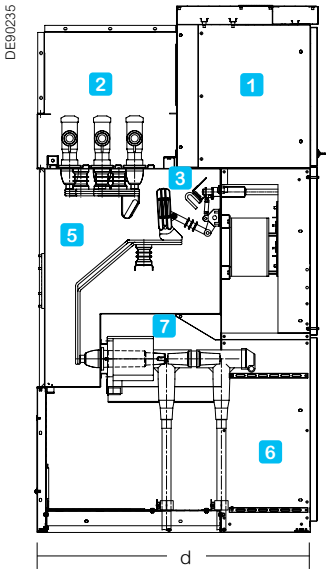
DM105111



DM105136

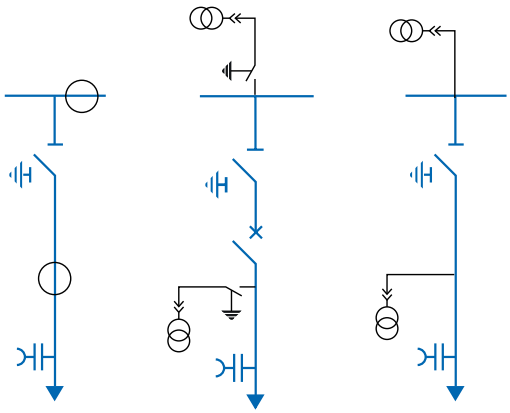


DE90235



Measuring Transformers

DM105113



Current Transformers

Voltage Transformer with Disconnector (3)

Voltage Transformer without Disconnector

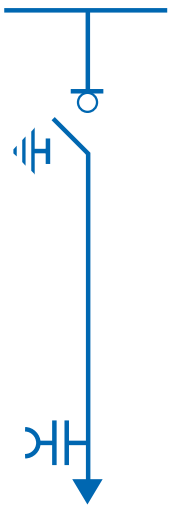
			BR	
Rated voltage	kV		24	36
Rated insulation level	kV rms - 1 min		50	70
	kV impulso 1.2/50 *ms*		125	170
Rated current (busbar)	A	1250	●	●
		1600	●	●
		2000	●	●
Rated current (incoming/outgoing)	A	630	●	●
		1250	●	●
		1600	●	●
		2000	●	●
Short-time withstand current	kA 3s		25 / 31.5	
(W) Width	mm		600 (1)	
(H) Height	mm		2350 (2)	
(D) Depth	mm		1400 (AFLR)	
Approximate weight for 1250 A	kg		480	
Approximate weight for 2000 A	kg		930	

(1) 1200 mm wide for 2000 A cubicles
(2) 2380 mm approx. with Voltage Transformers for 2000 A busbar

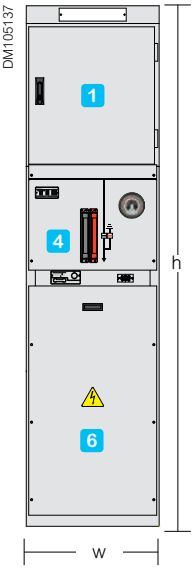
Load break switch

1 Low voltage compartment
2 General busbar system
3 Three-position disconnector switch (Closed-Open-Ready to Ground)
4 Disconnector operating mechanism
5 Main tank (stainless steel) filled with SF_6 gas, sealed for life
6 Power cables compartment

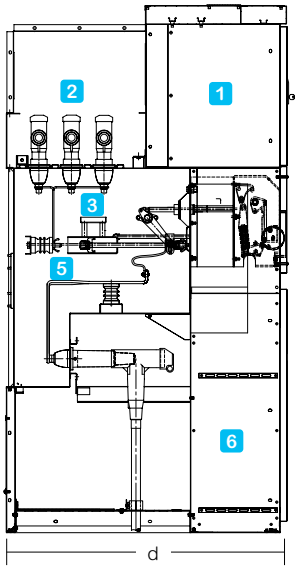
DM105112



DM105137

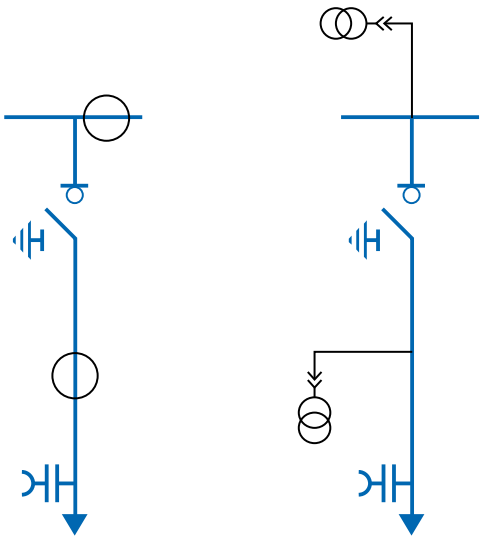


DE90238



Measuring Transformers

DM105114



Current Transformers

Voltage Transformers without switch

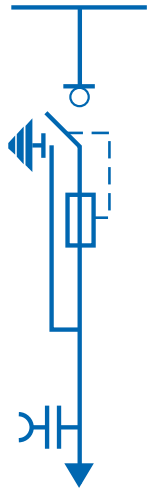
			BM-S	
Rated voltage	kV		24	36
Rated insulation level	kV rms - 1 min		50	70
	kV pulse 1.2/50 *ms*		125	170
Rated current (busbar)	A	1250	●	●
		1600	●	●
		2000	●	●
Rated current (incoming/outgoing)	A	630	●	●
Interrupting capacity	A		630	
Short-time withstand current	kA 1s		25 (1)	
(W) Width	mm		600	
(H) Height	mm		2350 (2)	
(D) Depth	mm		1400 (AFLR)	
Approximate weight	kg		480	

(1) Peak current 50 kA
(2) 2380 mm approx. with Voltage Transformers for 2000 A busbar

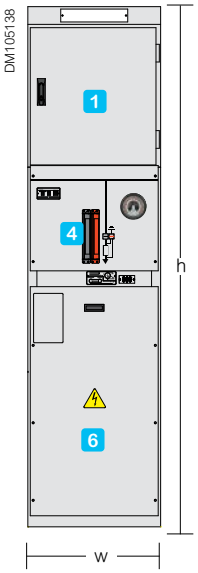
Load break switch with fuses

1 Low voltage compartment
2 General busbar system
3 Three-position disconnector switch (Closed-Open-Ready to Ground)
4 Disconnector operating mechanism
5 Main tank (stainless steel) filled with SF_6 gas, sealed for life
6 Power cables compartment
7 Fuse holders

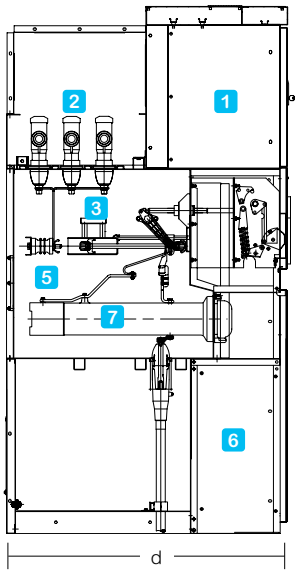
DM105115



DM105138

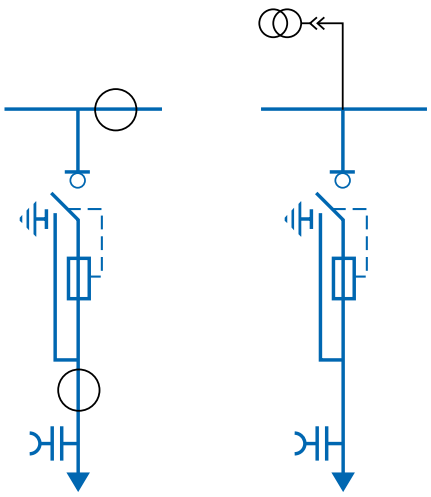


DE90241



Measuring Transformers

DM105116



Current Transformers

Voltage Transformers without switch

			AS-S	
Rated voltage	kV		24	36
Rated insulation level	kV rms - 1 min		50	70
	kV pulse 1.2/50 ms		125	170
Rated current (busbar)	A	1250	●	●
		1600	●	●
		2000	●	●
Rated current (incoming/outgoing)	A		Acc. to fuse	
Interrupting capacity	kA		Acc. to fuse	
Short-time withstand current	kA 3s		Acc. to fuse	
(W) Width	mm		600	
(H) Height	mm		2350 (1)	
(D) Depth	mm		1250	
Approximate weight	kg		420	

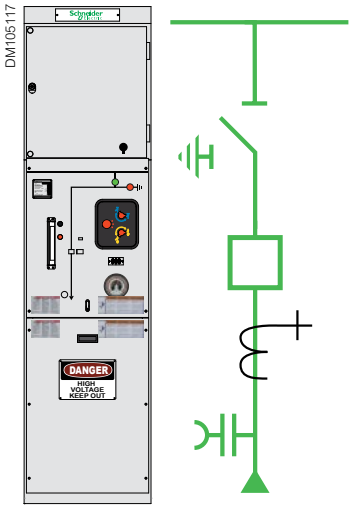
(1) 2380 mm approx. with Voltage Transformers for 2000 A busbar

CBGS-0 ANSI:
Functions and characteristics

Overview: choice of funcional units	38
Circuit breaker	39
Bus coupler	40
Disconnector	41

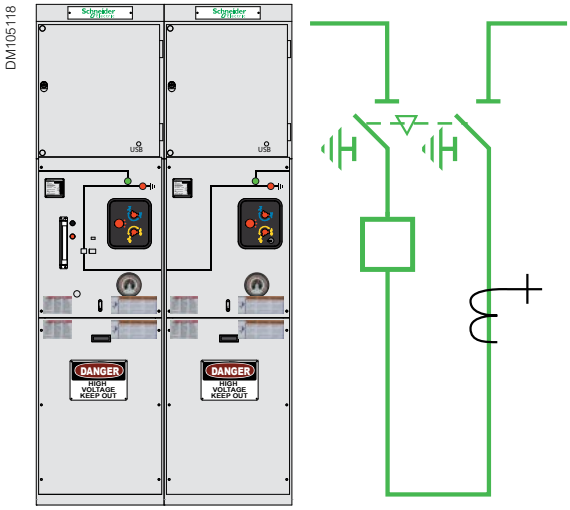
Overview:
Choice of functional units

Circuit breaker



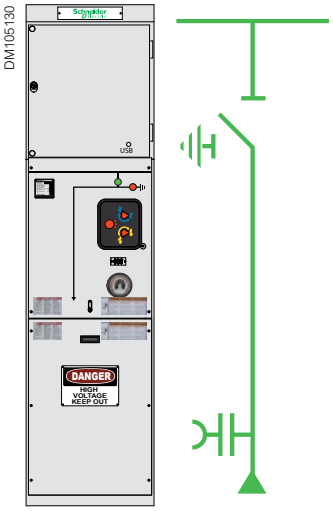
Rated voltage (kV)	27/38
Busbar system rated current (A)	1200 / 2000
Outgoing rated current (A)	1200 / 2000
Short time withstand current 2s (kA)	25 - 31.5

Bus coupler



Rated voltage (kV)	27/38
Busbar system rated current (A)	1200 / 2000
Outgoing rated current (A)	1200 / 2000
Short time withstand current 2s (kA)	25 - 31.5

Disconnector

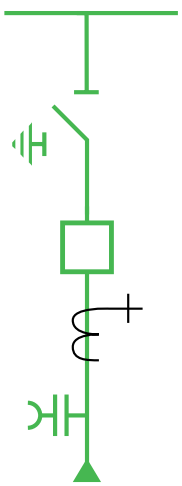


Rated voltage (kV)	27/38
Busbar system rated current (A)	1200 / 2000
Outgoing rated current (A)	1200 / 2000
Short time withstand current 2s (kA)	25 - 31.5

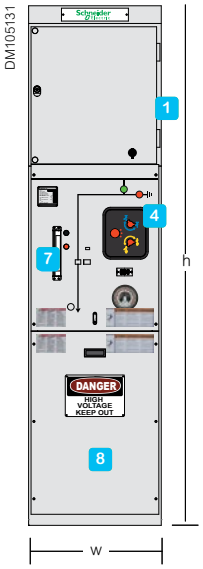
Circuit breaker

1 Low Voltage cabinet
2 General busbar system
3 Three position disconnector (Closed-Open-Ready to earth)
4 Disconnector operating mechanism.
5 Main tank (2.5 mm stainless steel) filled with SF6 gas, sealed for life
6 Circuit breaker
7 Circuit breaker operating mechanism
8 Power cables compartment
9 Current transformers (optional)
10 Voltage transformers (optional)

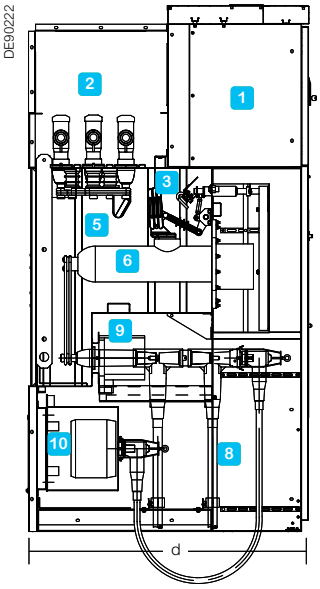
DM105119



DM105131

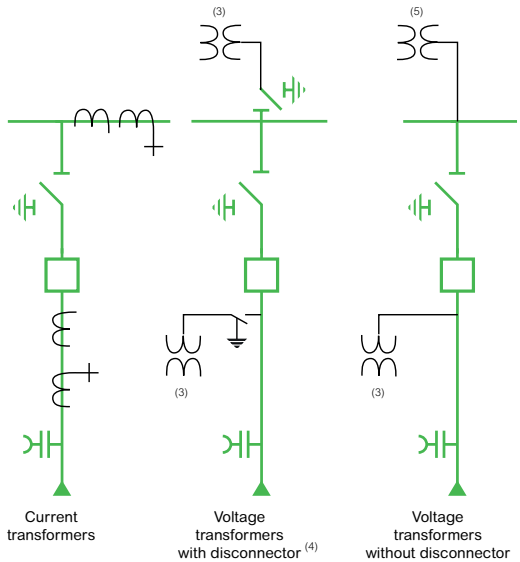


DE90222



Instrument transfomers

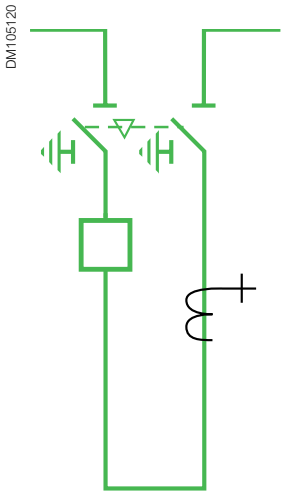
DM105121

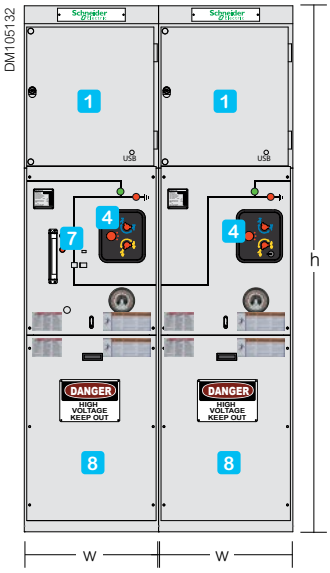


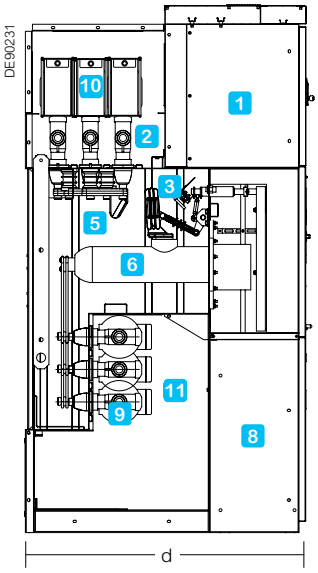
			IX-S	
Rated voltage	kV		27	38
Rated insulation level	kV rms - 1 min		60	70
	kV impulse 1.2/50 *ms*		125	150
Rated normal current (Busbar system)	A	1200	●	●
		2000	●	●
Rated normal current (incoming/outgoing)	A	1200	●	●
		2000	●	●
Breaking capacity	kA		25/31.5	
Short time withstand current	kA 3s		25/31.5	
(w) Width	mm		600 (2)	
(h) Height	mm		2350 (1)	
(d) Depth	mm		1400 (AFLR)	
Approximative weight 1200 A	kg		650	
Approximative weight 2000 A	kg		1250	

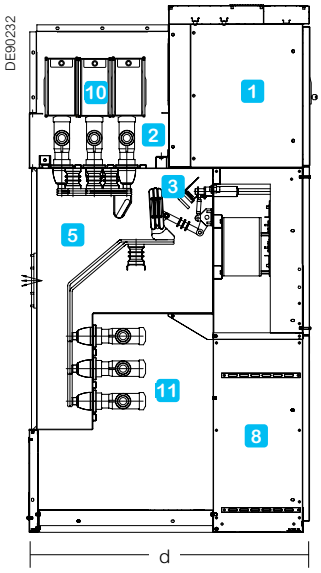
(1) 2500 mm with voltage transformers for 2000 A busbar
(2) 1200 mm width for panels >1200 A
(3) Primary-fused VT
(4) On special request only
(5) Please consult us

Bus coupler







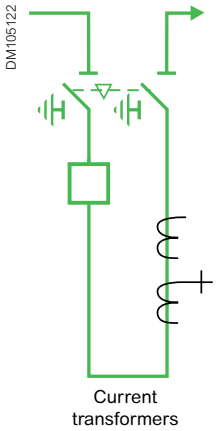


1 Low Voltage cabinet
2 General busbar system
3 Three position disconnector (Closed-Open-Ready to earth)
4 Disconnector operating mechanism
5 Main tank (2.5 mm stainless steel) filled with SF_6 gas, sealed for life
6 Circuit breaker
7 Circuit breaker operating mechanism
8 Power cables compartment
9 Current transformers (optional)
10 Voltage transformers (optional)
11 Lower busbar system

			BR	
Rated voltage	kV		27	38
Rated insulation level	kV rms - 1 min		60	70
	kV impulse 1.2/50 *ms*		125	150
Rated normal current (Busbar system)	A	1200	●	●
		2000	●	●
Rated normal current (incoming/outgoing)	A	1200	●	●
		2000	●	●
Breaking capacity	kA		25/31.5	
Short time withstand current	kA 3s		25/31.5	
(w) Width	mm		1200 (1)	
(h) Height	mm		2350 (2)	
(d) Depth	mm		1400 (AFLR)	
Approximative weight 1200 A	kg		1100	
Approximative weight 2000 A	kg		2050	

(1) 2400 mm width for panel > 1200 A
(2) 2500 mm with voltage transformers for 2000 A busbar

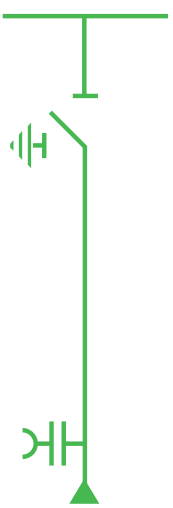
Instrument transfomers



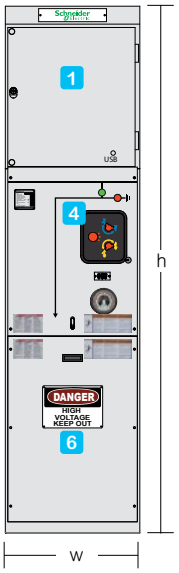
Disconnector

1 Low Voltage cabinet
2 General busbar system
3 Three position disconnector (Closed-Open-Ready to earth)
4 Disconnector operating mechanism
5 Main tank (2.5 mm stainless steel) filled with SF_6 gas, sealed for life
6 Power cables compartment
7 Current transformers (optional)

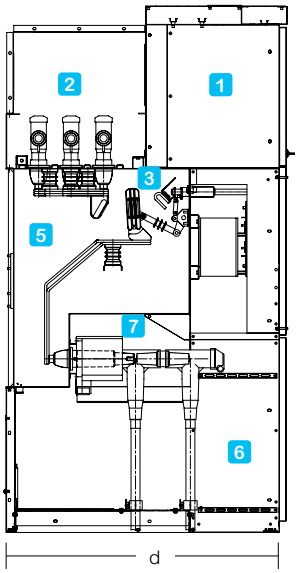
DM105111



DM105133

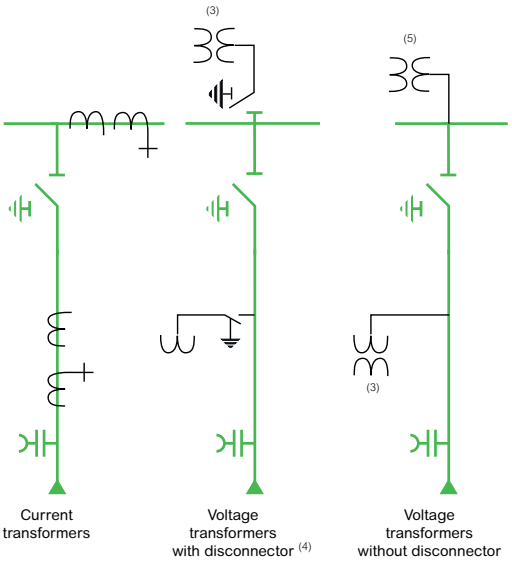


DE90235



Instrument transfomers

DM105123



			BR	
Rated voltage	kV		27	38
Rated insulation level	kV rms - 1 min		60	70
	kV impulse 1.2/50 *ms*		125	150
Rated normal current (Busbar system)	A	1200	●	●
		2000	●	●
Rated normal current (incoming/outgoing)	A	1200	●	●
		2000	●	●
Breaking capacity	kA		25/31.5	
(w) Width	mm		600 (1)	
(h) Height	mm		2350 (2)	
(d) Depth	mm		1400 (AFLR)	
Approximative weight 1200 A	kg		450	
Approximative weight 2000 A	kg		800	

(1) 1200 mm width, for panels >1200A
(2) 2500 mm with voltage transformers for 2000 A busbar
(3) Primary-fused VT
(4) On special request only
(5) Please consult us

CBGS-0 Rail:
Functions and characteristics

Applications 44

Traction substation equipment 45

Applications

AC electrification High speed and long distance

Equipment for traction substations

The connection of electrification sections to the electrical mains is carried out in traction substations

- Single-phase GIS cubicle
- High-Voltage disconnectors up to 420 kV
- Gantry feeder disconnectors, 2 x 27.5 kV

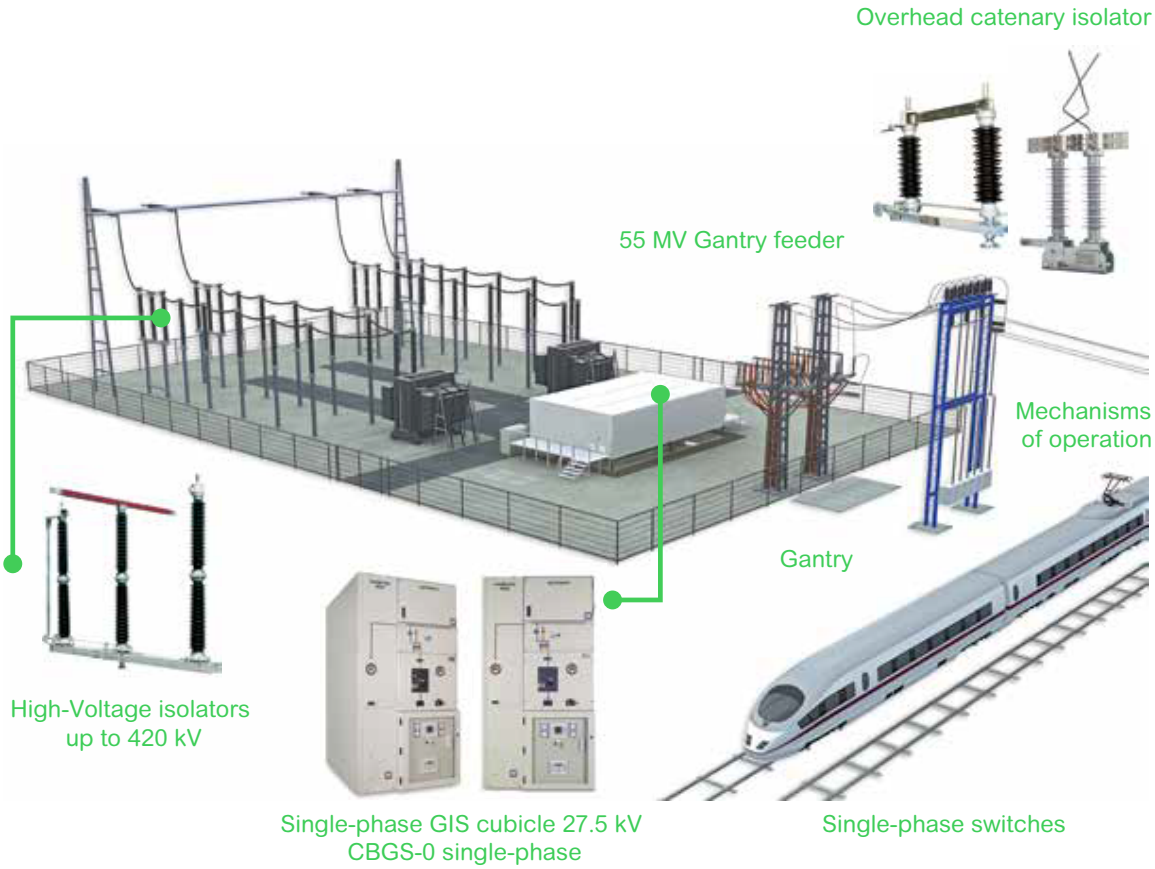
Equipment for catenary

- Catenary disconnectors, 1 x 27.5 kV
- 2 x 27.5 kV with electrical operation

Auxiliary services equipment

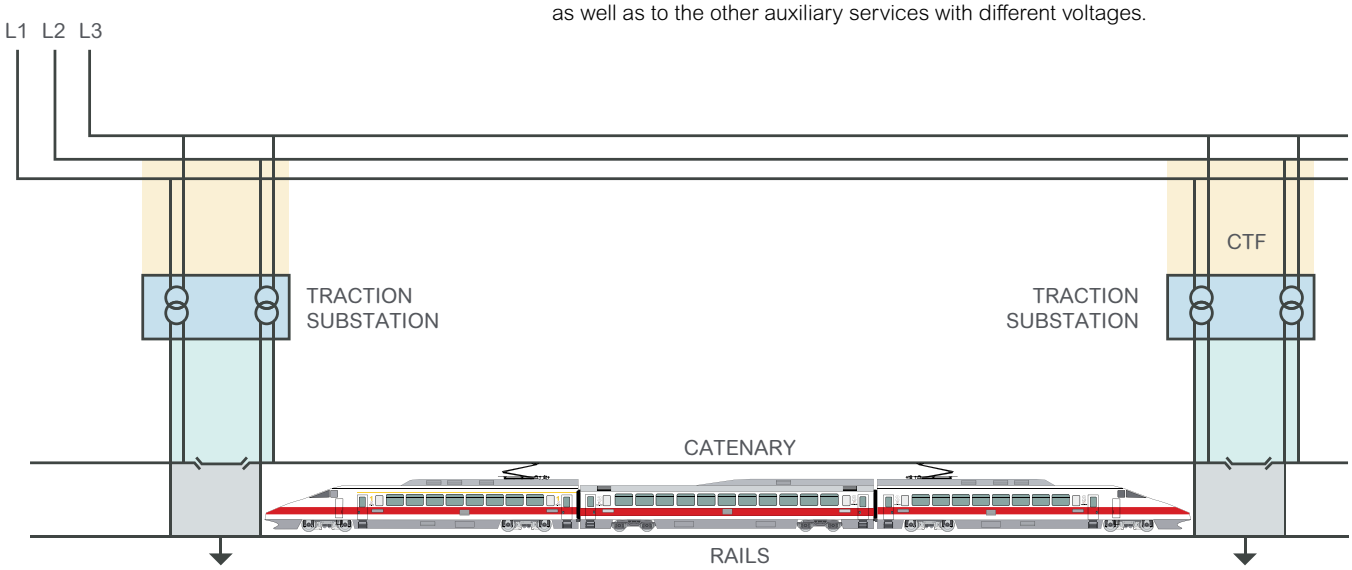
Essential for safe and reliable operation, as they guarantee the quality and continuity of supply and complement the primary services.

- Systems dependent on the traction substation
  - Single-phase GIS cubicle, 1 x 27.5 kV
- Systems Independent of the traction substation
  - Three-phase GIS cubicle for primary and secondary distribution



Traction substation equipment

The traction substations supply power to the 25 kV overhead catenary line system, as well as to the other auxiliary services with different voltages.



Single-phase GIS switchgear

The Medium Voltage (MV) switchgears are located in the control building of the traction substation.

Single-phase cubicle, 1 x 27.5

		CBGS-0
Rated voltage	kV	1x27.5
Rated insulation level_Power frequency withstand voltage, 50 Hz	kV rms	70
Rated Insulation Level_Lightning impulse withstand voltage	kV peak	170
Short-time withstand current (3 s)	kA	25/31.5
Short-circuit withstand capacity	kA	63/80
Internal arc withstand (AFL-AFLR)	kA/1s	25/31.5
Rated busbar current	A	…2500
Rated line current	A	…2500
Relative gas pressure (SF_6), 20°C	bar	0.3
(W) Width	mm	600
(H) Height	mm	2350
(D) Depth	mm	1250
Medium voltage degree of protection		IP65
LV degree of protection		IP3X-IP41

CBGS-0 Components

CBGS-0 components 48

Circuit breaker 48

Circuit breaker operating mechanisms 49

Circuit breaker technology selection 51

3-position disconnector 52

Load break switch 53

Load break switch with fuses 54

Fuses selection 55

Busbar system 56

Current Transformers 57

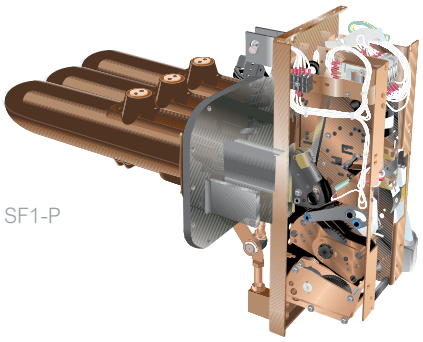
Voltage Transformers 59

CBGS-0

Circuit breaker

CBGS-0 offers two options of circuit breakers: SF_6 and Vacuum.

PM105664



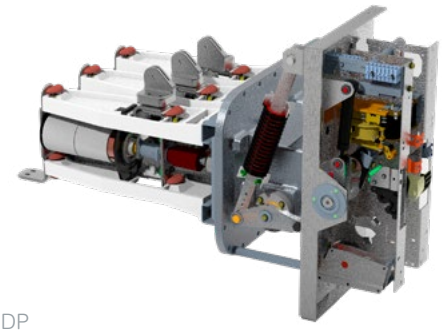
SF1-P

SF1-P & SF1-G: SF_6 circuit breakers

The circuit breaker is placed inside the intermediate SF_6 compartment in a fixed configuration.

They work on the basis of the "puffer" type principle in SF_6, which is used as a breaking and insulating medium.

- Each of the 3 poles has an independent insulating enclosure which forms a filled pressure system in compliance with IEC standard 62271-100
- No filling is required during the life of the equipment
- Each SF_6 circuit breaker is equipped with a pressure switch in order to continuously control the SF_6 pressure. In the very improbable event of a pressure falling underneath the established working threshold, 2 alarms are automatically released



DP

DP: Vacuum circuit breaker

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

In circuit breaker switchgear cubicles with vacuum circuit breaker, SF_6 gas is used as an insulating medium and not for interrupting electric arcs.

The vacuum circuit breaker can meet all requirements for any type of application:

- Switching of cables, overhead lines, transformers, capacitors, generators and motors
- High number of mechanical and electrical switching operations without maintenance

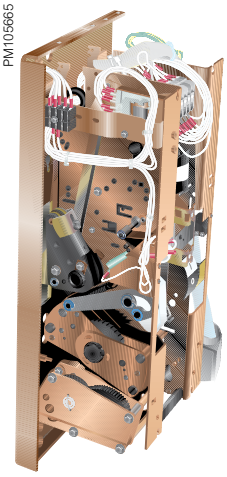
Circuit breaker type			SF_6 CB		Vacuum CB
			SF1-P	SF1-G	DP
Rated voltage	kV		15/24/27	15/24/27/36/38	15/24/27/36/38
Rated insulation level	kV rms 50Hz - 1 min		50 / 60	70 / 80	50 / 70 / 80
	kV impulse 1.2/50 *ms*		125	170	125 / 170
Rated normal current (Ir)	A	1250	●	-	●
		2500	-	●	●
Breaking capacity (Isc)	kA rms		25	25 / 31.5	25 / 31.5
Making capacity	kA peak		65	65 / 82	65 / 82
Short time withstand current	kA rms 3s		25	25 / 31.5	25 / 31.5
Rated operating sequence	O-3 min-CO-3 min-CO		●	●	●
	O-0.3 s-CO-3 min-CO		●	●	●
	O-0.3 s-CO-15 s-CO		●	-	-
Electrical endurance classification			E2	E2	E2
Mechanical endurance classification			M2	M2	M2

* Only applicable to IEC

CBGS-0

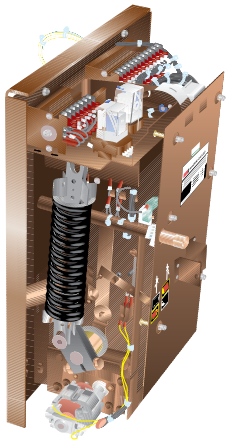
Circuit breaker operating mechanisms

PM105665



RI

PM105666



GMH

Depending on the circuit breaker used in the switchgear and the requirements of the customer, two operating mechanisms are available.

Circuit- breaker	Circuit breaker type	Operating mechanism
SF1-P	SF_6	RI
SF1-G	SF_6	GMH
DP	Vacuum	RI

Operating mechanism

The opening and closing speed of the circuit breaker contacts used for CBGS-0 switchgears are independent of the operator's action. This electrically operated mechanism, which is always motorized to perform remote control functions, allows fast re-closing cycles.

In CBGS-0 type switchgears, all of the operating mechanisms are arranged outside the SF_6 tank.

Furthermore, maintenance in this type of operating mechanisms is quite reduced, as self-lubricating components are used.

The operating mechanism includes:

- A spring system that stores the necessary energy to open and close the circuit breaker
- A manual spring charging system
- An electrical motor spring charging device that automatically recharges the springs in less than 10 seconds after the main contacts close
- A mechanical pushbutton padlockable on the front panel to open
- A mechanical pushbutton padlockable on the front panel to close
- An electrical closing system including:
  - A closing release for remote control and an anti-pumping relay
- An electrical opening system including:
  - Single or double (optional) tripping coil
- Operation counter
- A spring charging indication contact
- An end of charging indication contact
- An open/closed mechanical position indicator
- A charged/uncharged mechanical position indicator
- An optional key lock to interlock the circuit breaker in open position

Auxiliary contacts

The operating mechanism is equipped with a block of at least 14 auxiliary contacts.

The number of available contacts depends on the composition of the operating mechanism and the options chosen. In any case, at least 3 O/C spare contacts are available on the LV terminal block for external signalisation.

Technical characteristics		
Rated current		10 A
Rated insulation level	AC - 220 V ($\cos \varphi \geq 0,3$)	10 A
	DC - 110 or 220 V ($L/R \leq 0.01s$)	1.5 A

CBGS-0

Circuit breaker operating mechanisms

RI operating mechanism

Circuit breakers are actuated by an RI operating mechanism that ensures a switching device closing and opening rate that is independent of the operator. This operating mechanism enables remote and fast closing cycles.

Type of auxiliary			Spring Charging Motor	Closing Coil	Opening Release		Contact Quantity	
					Single	Double	NC	NO
Supply voltage	AC (V)	50 Hz	48 / 110 / 127 / 220					
		60 Hz	120 / 240					
	DC (V)		24 / 48 / 60 / 110 / 125 /220					
Consumption	AC (VA)		360	160	160	320		
	DC (W)		360	50	50	100		
Auxiliary contacts*			●	●	●	●	7	7

* Free contacts to be detailed during advanced engineering stage. Minimum 3 NC / 3 NO.

GMH operating mechanism

SF1-G circuit breakers are actuated by an GMH operating mechanism that ensures a switching device closing and opening rate that is independent of the operator. This operating mechanism enables remote and fast closing cycles.

Type of auxiliary			Spring Charging Motor	Closing Coil	Opening Release		Contact Quantity	
					Single	Double	NC	NO
Supply voltage	AC (V)	50 Hz	48 / 110 / 127 / 220					
		60 Hz	120 / 240					
	DC (V)		24 / 48 / 60 / 110 / 125 / 220					
Consumption	AC (VA)		700	120	120	240		
	DC (W)		570	70	70	140		
Auxiliary contacts*			●	●	●	●	9	10

* Free contacts to be detailed during advanced engineering stage. Minimum 3 NC / 3 NO.

CBGS-0

Circuit breaker technology selection

A circuit breaker for every need

Experience over thirty years in the development, manufacture and marketing of medium voltage vacuum and SF_6 circuit-breakers around the world has shown that neither technology is better than the other, and especially that they are complementary from the point of view of application. Economic factors, user preferences, local "traditions", knowledge and special switching requirements play a role in deciding in favor of one or the other technology.

The need for "frequent switching" or "soft switching" may be another factor that influences the choice.

Switching overvoltages

The switching voltages generated by circuit-breakers using either of the two technologies are found to be within limits and do not represent a hazard to connected equipment or installations.

Due to their intrinsic soft-interrupting characteristics, SF_6 circuit breakers offer this level of performance without the need for additional devices. Vacuum circuit breakers that use modern contact materials also provide low interrupting currents; however, in exceptional cases, and depending on the characteristics of the specific installation, it may be necessary to study in detail the system parameters, in order to determine whether specific voltage limiting devices are required.

Specific switching applications

Overhead lines and cables

Both technologies offer adequate margins beyond the maximum required by the relevant standards and under normal operating conditions..

Transformers

For example, when vacuum circuit breakers are used to switch dry-type transformers in industrial installations, it is recommended to use transient overvoltage limiters.

Motors

The target limit for overvoltages less than 2.5 power units can be obtained with both technologies. The use of vacuum circuit breakers to switch small motors (starting currents below 600 A) may require measures to limit overvoltages due to multiple restarts; however, the probability of this phenomenon occurring is low.

Capacitor banks

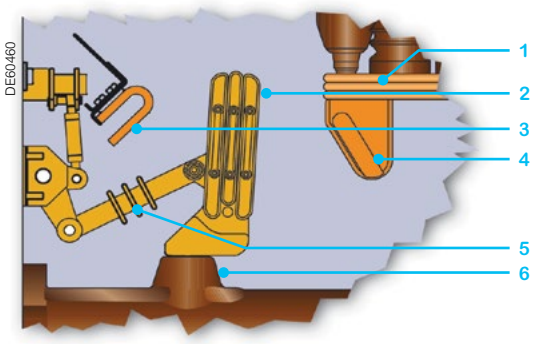
Both technologies are suitable for switching of capacitor banks without restarting. SF_6 is especially recommended for applications with rated voltages higher than 27 kV.

Shunt inductances

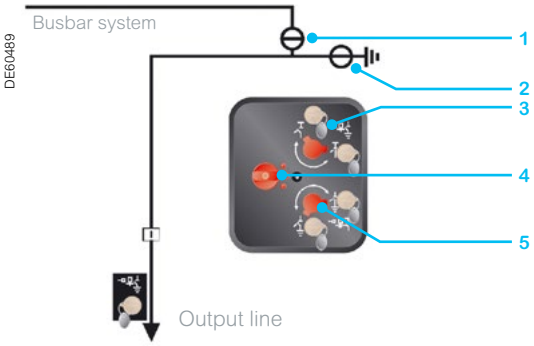
SF_6 circuit breakers are suitable for switching overvoltages of less than 2.5 power units. When using vacuum circuit breakers, in some cases it may be necessary to take additional measures to limit overvoltages.

CBGS-0

3-position disconnector



1 Upper inner busbar
2 Moving finger contacts
3 Fixed contact «disconnector to ground»
4 Fixed contact «disconnector closed»
5 Insulation rod
6 Support



Position indicators

1 Disconnector
2 Ground disconnector

Actuating shafts operated by handle

3 Disconnector (open and close)
4 Function selector.
Disconnector actuation/neutral/ground disconnector
5 Ground-to-ground disconnector

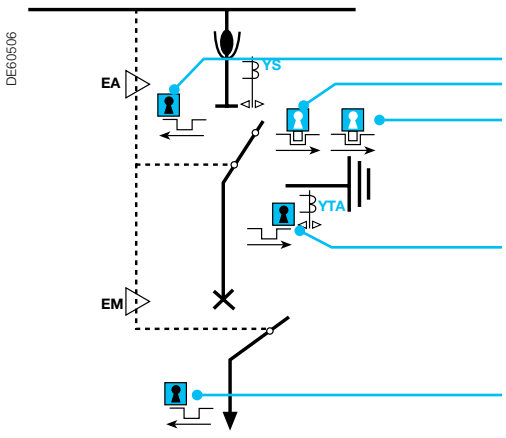
Characteristics of the 3-phase disconnector positions

Complies with the requirements of the standard IEC 62271-102 on disconnectors and ground disconnectors.

- Making capacity with short-circuit current (disconnector and ground disconnector) through the circuit breaker
- Compact design and small size
- Highly reliable position indicator (without transmission connecting rods)
- Independent lever axes for the disconnector and “Ready to Ground” function
- Single rotation/transmission point for disconnector and ground disconnector

Operation and interlocks

- Operation by actuating lever.
- Selection of the function (permissible operation) by means of a selector.
- The design of the flag-type selector allows inserting the actuating lever only at the actuation point corresponding to the function selected.
- The actuating lever cannot be removed from actuating shaft until the disconnector’s operation ends.
- The circuit breaker cannot be closed until after the return of the function selector to neutral position.
- The three-position disconnector can only be actuated when the circuit breaker is in the open position.
- Special interlocks, such as locks, can be included as an option



Locks (free key) for:

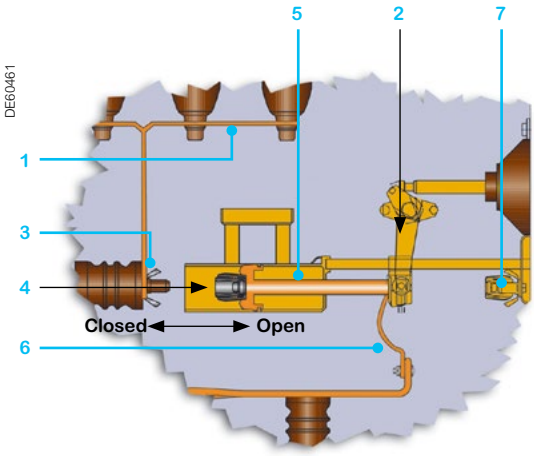
Disconnector in closed position
Disconnector in open position
Ground disconnector in open position
Ground disconnector in closed position
Ground cable

Electromagnetic locks for:

YS Disconnector
YTA Ground disconnector

CBGS-0

Load break switch



1 Upper inner busbar
2 Transmission
3 Fixed contact «switch closed»
4 Mobile contact fingers
5 Switch chamber
6 Flexible connection
7 Fixed contact «grounding closed»

Characteristics of the switch disconnector

The architecture of the switch disconnectors used for CBGS-0 switchgears is the 3 position type: closed / open / earthed, which has been designed to prevent malfunction.

The breaking system uses the autopneumatic "puffer" technique. This flow of gas onto the contacts separation area takes place only as a consequence of the horizontal and high speed movement of the switch chamber inside the gas tank, without having any additional gas contribution.

It complies with the requirements of IEC 62271-103 and IEC 62271-102 standards for switch disconnectors and disconnectors.

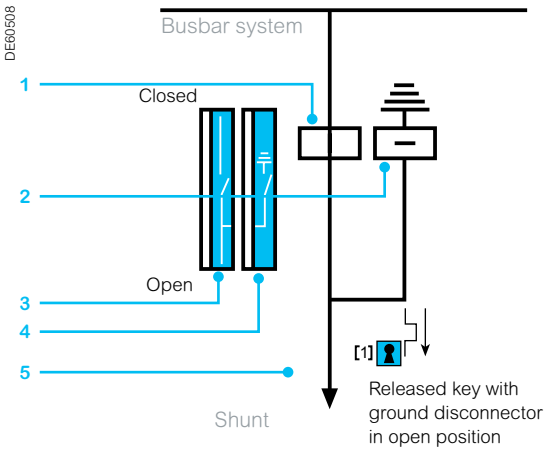
Switch function

- Class: E3 / M0
- Breaking capacity: 630 A
- Short time withstand current: 25 kA/1s

Earthing switch function

- Short time withstand current: 25 kA/1s

This sort of switch disconnectors are optionally motorized.



Position indicators

1 Switch disconnector
2 Earthing switch

Actuating shafts

3 Switch disconnector
4 Earthing switch
5 Key lock interlocking

Operation and interlocks

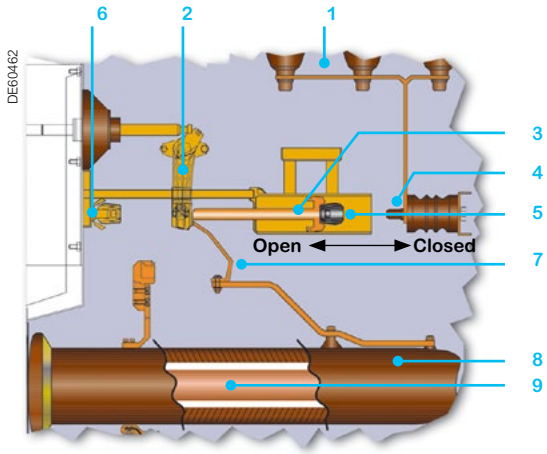
All the opening/closing operations (always tripolar) can be performed by means of a handle, the speed being always independent of the operator's action (except for the earthing switch opening).

For the switch disconnector and earthing switch operations, the operating handle cannot be removed until the operation is completed.

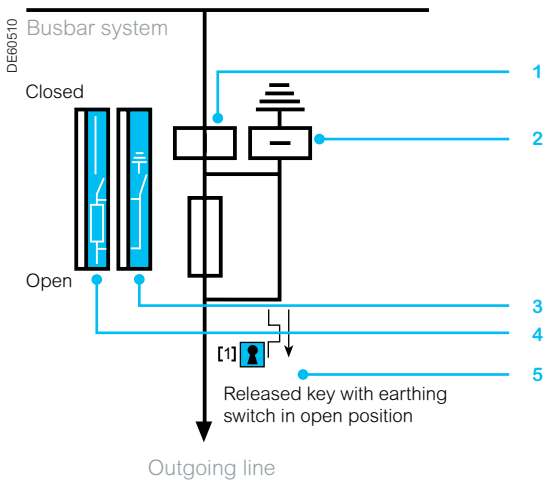
The earthed position of the earthing switch is always interlocked with access to the cable compartment, so that the cover of this compartment cannot be opened until the earthed position is closed. In this situation, also, the key of the interlocking lock is released.

CBGS-0

Load break switch with fuses



1 Upper internal busbar
2 Insulating rods
3 Switch chamber
4 Fixed contact "switch in closed position"
5 Mobile contact fingers
6 Fixed contact "earthing switch in closed position"
7 Flexible connection
8 Fuseholder
9 Fuse



Position indicators

1 Switch disconnector
2 Earthing switch

Actuating shafts

3 Earthing switch
4 Switch disconnector
5 Key lock interlocking

Fuse characteristics and arrangement

In CBGS-0 switchgears, the 3 individual fuseholders are arranged inside the gas tank in a horizontal position, all at the same height.

The fuses to be installed must comply with IEC 60282-2 standard. Fuses with a striker of the CF type striker (according to DIN standards) are advisable due to low heat dissipation.

As the fuseholder has been designed for 36 kV fuses, it is provided with an adaptor to be used with 24 kV.

For further details about the appropriate fuse in each case based on the network voltage and the power of the transformer to be protected, please refer to our specific catalogue for MV fuses.

Fuse replacement

If a failure in the network implies the blowing of one (or two) fuses, the characteristics of the apparently undamaged fuses are often affected by the action of the short circuit. A return to service in such conditions would entail the danger of a sudden blow for low overcurrents. Consequently, it is advisable to replace the three fuses according to the IEC 60282-2 requirements.

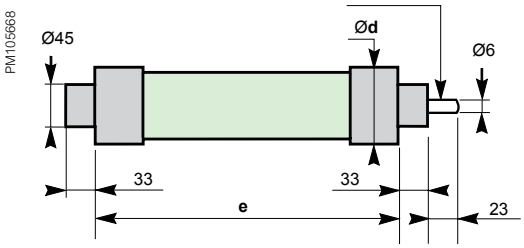
Operations and interlocks

The access to the fuse compartment (usually for replacement) is always interlocked. This interlocking permits the opening of the cover only when the earthing switch is in a closed position.

As an additional safety measure, the earthing is done on both fuse ends.

CBGS-0

Fuse selection



Fuse dimensions

The fuse ratings intended to protect the transformer depend, among other things, on the following factors:

- Operating voltage
- Transformer power
- Fuse heat dissipation
- Fuse technology (manufacturer)

It is recommended to use the Fusarc CF type, according to dimensional standards DIN 43.625, equipped with a thermal striker.

Range	Rated normal current (A)	Length (mm)	Diameter Ø (mm)	Weight (kg)
CF-24/...	6.3-10-16-20-25	442	50.5	1.6
CF-24/...	31.5-40	442	55	2.2
CF-24/...	50-63-80	442	76	4.1
CF-24/...	100	442	86	5.3
CF-36/...	6.3-10-16-20	537	50.5	1.9
CF-36/...	25	537	55	3.1
CF-36/...	31.5-40	537	76	5.4
CF-36/...	50-63	537	86	6.5

Fusarc CF fuse selection table for transformer protection

Ucc (S ≤ 630 kVA) = 4%

- Conform to IEC 62271-105
- Conform to IEC 60787

Admissible overload ≤ 20% and ambient temperature < 40°C.

		S_r(kVA)				
Ur(kV)	U_s(kV)	50	100	160	200	250
24	11	CF-24/10	CF-24/20	CF-24/25	CF-24/31,5	CF-24/31,5
	13,2	CF-24/6.3	CF-24/16	CF-24/25	CF-24/25	CF-24/31,5
	15	CF-24/6.3	CF-24/16	CF-24/20	CF-24/25	CF-24/25
	20	CF-24/6.3	CF-24/10	CF-24/16	CF-24/20	CF-24/25
36	25	CF-36/4	CF-36/6.3	CF-36/10	CF-36/16	CF-36/20
	30	CF-36/4	CF-36/6.3	CF-36/10	CF-36/16	CF-36/16
	33	CF-36/4	CF-36/6.3	CF-36/10	CF-36/10	CF-36/16

CBGS-0

Busbar system

Characteristics of the busbar system

The general busbar of the CBGS-0 cubicles has been designed to provide maximum safety and reliability in this type of cubicles, together with great ease of installation.

The possibility of failure in busbar is almost zero. However, as it is a single-pole configuration, a failure in one of the bars would not affect the rest.

The assembly consists of three or six independent copper conductive bars, insulated in silicone. The cubicles are interconnected by means of a bar and connectors in the form of a “T” (intermediate connector) or “L” (end connector).

The electric field is controlled with the help of semiconductor inserts in the silicone-rubber insulation, both inside and outside. The external shield is connected to the ground through the enclosure of the cubicle.

Although the entire assembly is sensitive to dirt and condensation, it is protected against discharges by an external metal cover.

Switchgear extension

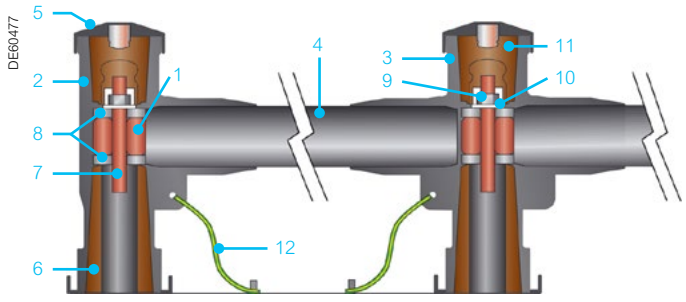
An assembly of CBGS-0 cubicles can be quickly and easily expanded, interrupting service for a very short period of time.

Switchgear replacement

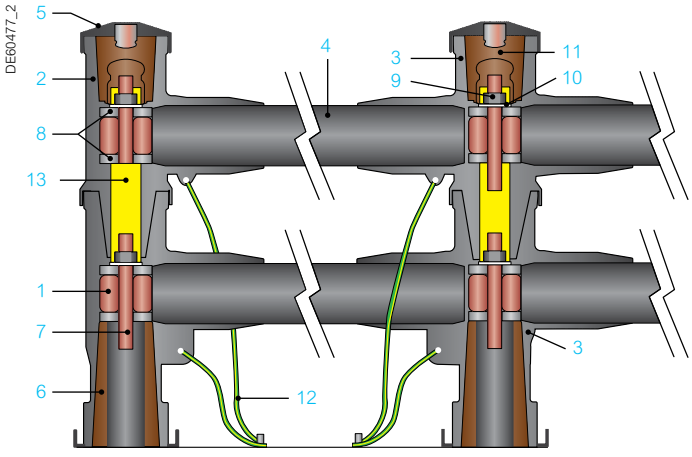
If it is necessary to take a cubicle out of service due to a breakdown, there is an optional specific kit to bypass between adjacent cubicles and provide continuity of service to the bar. This minimizes the scope of service interruption.

Detail of the shielded busbar system

1250-1600A



2000A



1 Busbar connection
2 End connector «L»
3 Intermediate connector «T»
4 Busbar
5 Covering cap
6 Bushing
7 Threaded stud
8 Contact shell
9 Nut
10 Washer
11 Insulating plug
12 Grounding cable
13 Intermediate connection

Current Transformers

Depending on the type of cubicle, application and the requirements of customer, the CBGS-0 provides various options for Current Transformers.

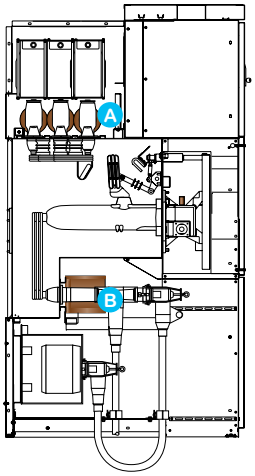
DE60517

Toroidal current transformer

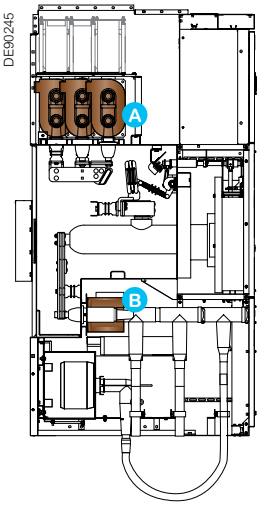
Toroidal Current Transformers

- Outside the SF_6 atmosphere
- No dielectric stress
- Conforms to the standard IEC 61869-2 (for other specific standards, such as ANSI, AS, BS or NBR, contact us)

DE90244



DE90245



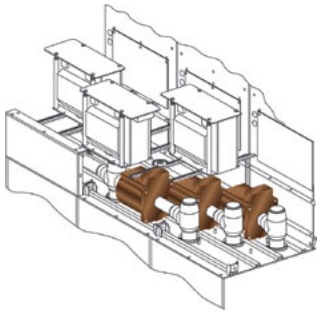
Características			A	B
Thermal current	Permanent (max. value)		1.2 x In	
Rated currents	Primary	A	25 to 2000	
	Secondary	A	1 to 5	
Possibility of switching in the secondary	From		25 - 50	
	To		1000 - 2000	
The core data depends on the primary current (max. 3 cores)			Measure-ment core	Protection core
Power		VA	2.5 to 25	0.5 to 30
Class			0.2 to 1	5 to 10
Overcurrent factor			FS5	P10 to P30
Dimensions (type A*)				
Internal diameter		mm	Min.: 60 - Max.: 205	
Maximum useful height		mm	Min.: 130 - Max.: 225	
Dimensions (type B**)				
Height x Width x Depth		mm	435 x 420 x 190	
Ambient temperature of operation		° C	- 5 °C / + 40 °C	
Insulation class			E	

* Located on the busbar. The space required in the busbar for the installation of a complete assembly of 3 Current Transformers corresponds to the width of 2 CBGS-0 cubicles.
** On the incoming/outgoing bushings

.

Current Transformers

DE60515



PM105667

Low-power toroidal current transformer

Low-power toroidal current transformers

Reasons for developing these applications:

- Avoiding the use of high precision powers (unnecessary for solid-state electronic relays)
- Combining precision powers and accuracies of combined classes (measurement + protection)
- Electronic relays generally have 1 CT input for measurement and protection)
- **Primary not connected**
  - No thermal stress
  - LV -> No dielectric strength
  - Conforms to the standard IEC 61869-2 (for other specific standards, such as ANSI, AS, BS or NBR, contact us)

Rated voltage		N.C. (Low voltage)
Possible transformation ratios		2 x primary current*
		1 x secondary current
Precision powers	VA	0.5
Accuracies		Cl 1/5P20 (combined)
		Cl 0.5/5P20 (combined for various cases)
Ratios	A	100
		150
		600
		200 - 400
		250 - 500
		300 - 600
		400 - 800
		500 - 1000

* The number of cores depends on the customer's requirements.

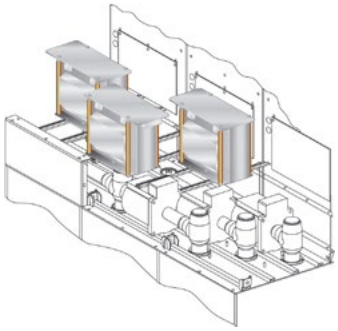
Voltage Transformers

These voltage transformers supply power to:

- Measurement and monitoring devices
- Relays or protection devices

DE60520

DE60218



General characteristics

- Inductive principle
- Architecture
  - Can be connected directly to busbar
  - connection via cable
- Can be touched safely due to a shielded metal casing
- Encapsulated in molded resin
- Conforms to the standard IEC 61869-3
  (for other specific standards: ANSI, AS, BS, NBR, etc., contact us)

Características			Busbar VT	MV cable VT
Normal voltage (UN)		kV	> 3.6 up to 36/38	
Normal alternating voltage in the primary			1.2 x U_N	
Normal voltage factor (UN / 8h)			1.9	
Secondary voltage		V	100 / √3 V	
			110 / √3 V	
			100 / 3 V	
			110 / 3 V	
			120 / 3 V	
Thermal current limit (measuring winding)		A	8	
Normal long-time current (8 h)		A	8	
Power available depending on the precision class	Clase 0.2	VA	20, 25, 30	25
	Clase 0.5	VA	30, 50, 60	50
	Clase 1	VA	50, 60, 100	100
Fuse in the primary of the TT Optional				

LPVT

Voltage Sensors

The Low Power Voltage Transformer (LPVT) is a voltage sensor based on resistance dividers for digital measurement and protection devices. LPVTs provide a Low Voltage output signal compatible with Easergy P5 protection relays.

LPVTs allow users to move from conventional instrument transformers to better low-power sensor technology, providing a variety of benefits at every stage of the project and throughout the life cycle of the installation.

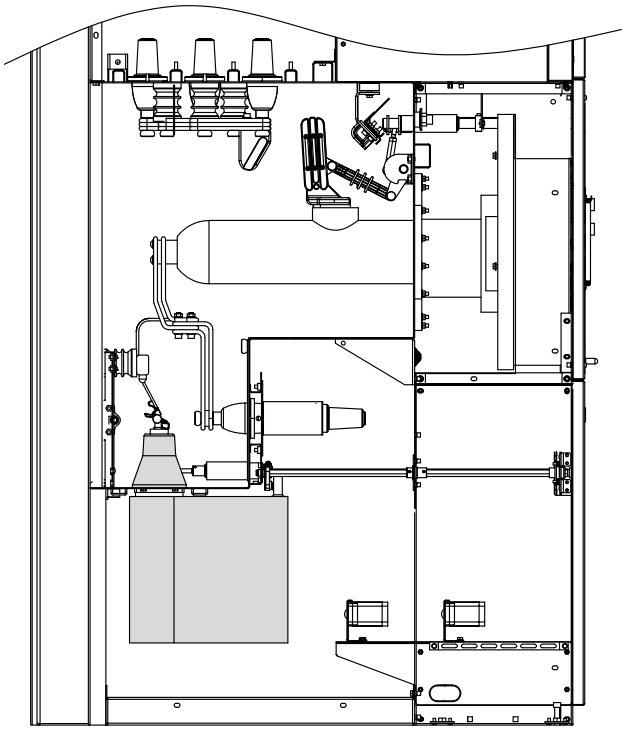
Voltage Transformer

Disconnectable voltage transformers

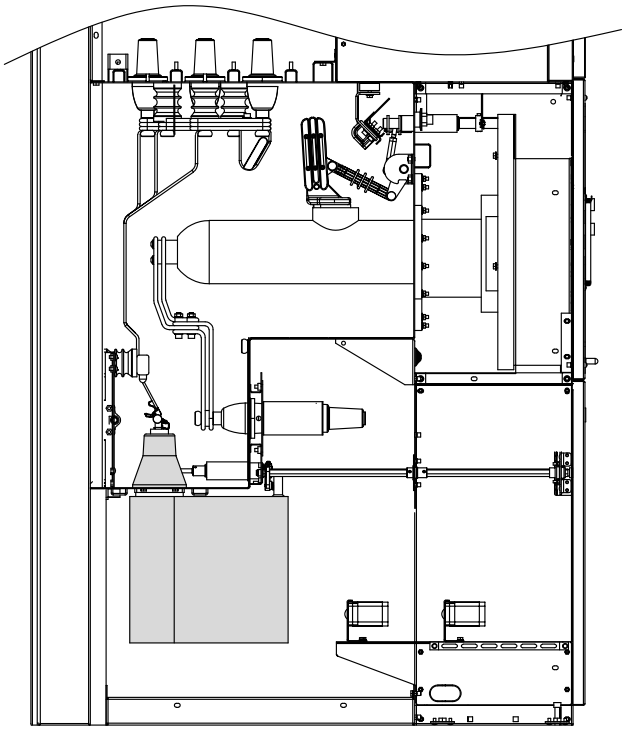
As an option, the possibility (less in 2000 A cubicles) of introducing VTs with detachable primary (Closed - Grounded) is included in the offer.

This function is available for VTs connected to the line part as well as for VTs connected to the busbar and can be isolated, without the need of an additional cubicle (A line cubicle would be used).

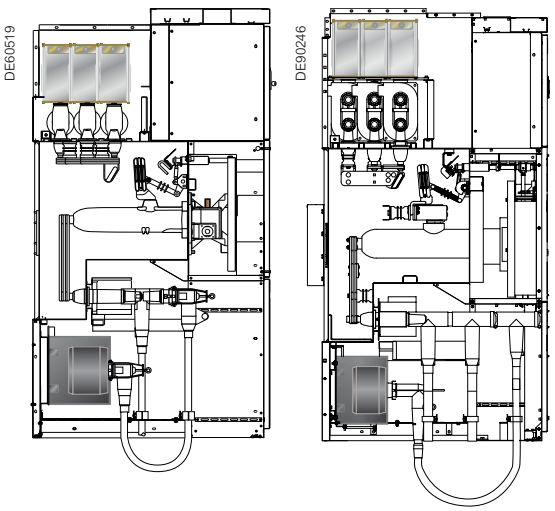
Disconnectable VTs can also have fuses in their primary.



Disconnectable VTs from Line



Disconnectable VTs from Busbar



Possibilities and types of assembly

- Can be connected via Medium Voltage (MV) cable, with optional disconnector
- Can be connected directly to the busbar, with optional disconnector

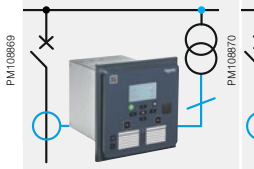
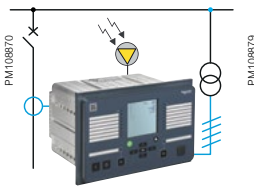
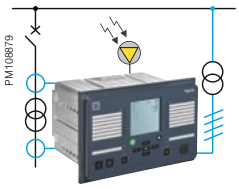
Notes

Protection, Metering and Feeder Automation

Protection relays	64
Arc fault detection and protection	68
MV-LV substation remote control and monitoring	70
Substation power supply	72
Voltage presence relay	73
Energy management and control	74

Protection relays

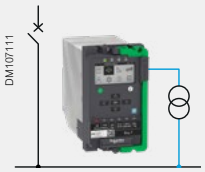
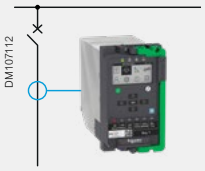
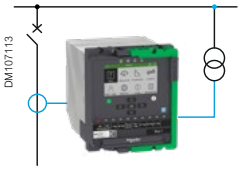
Easergy P3 Range

		Easergy P3 Standard			Easergy P3 Advanced	
Application						
Feeder		P3U10	P3U20	P3U30 with directional O/C with voltage protection	P3F30 with directional P3L30 line diff. & distance	-
Transformer					-	P3T32 with differencial
Motor					P3M30	P3M32 with differencial
Generator					P3G30	P3G32 with differencial
Characteristics						
Measuring inputs	Phase current	1/5A CT or LPCT (x3) (5)			1/5A CT (x3) or LPCT (5)	1/5A CT (x6)
	Residual current	1/5A CT or 0.2/1A CT			(1/5A+0.2/1A) CT	2 x (1/5A+0.2/1A), 1/5A CT
	Voltage	VT (x1)		VT (x4) or LPVT (x4) (5)	VT (x4)	VT (x4)
Arc-flash sensor input		-		-	Loop sensor: 1 Point sensor: 2, 4 or 6 (1) (2)	Loop sensor: 1 Point sensor: 2, 4 or 6 (1)
Digital	Input	2	8/10	14/16	6 to 36	6 to 16
	Output	5 + SF	5/8 + SF	11/8 + SF	10 to 21 + SF	10 to 13 + SF
Analogue	Input	-		0 or 4 (1)	0 or 4 (1)	
	Output	-		0 or 4 (1)	0 or 4 (1)	
Temperature sensor input		-		0 or 8 or 12 (1)	0 or 8 or 12 (1)	
Front port		USB type B			USB type B	
Nominal power supply		24V dc or 24–48V dc or 48-230V ac/dc (4)			24 to 48V dc or 110-240V ac/dc	
Ambient temperature, in service		-40 to 60°C (-40 to 140°F)			-40 to 60°C (-40 to 140°F)	
Communication						
Rear ports RS232, IRIG/B, RS485, Ethernet		-	●	●	●	●
Protocols	IEC61850 ed1 & ed2	-	●	●	●	●
	IEC 60870-5-101 & 103	-	●	●	●	●
	DNP3 over Ethernet	-	●	●	●	●
	DNP3 serial	-	●	●	●	●
	Modbus serial	-	●	●	●	●
	Modbus over Ethernet	-	●	●	●	●
	Ethernet IP (6)	-	●	●	●	●
	DeviceNet	-	●	●	●	●
	Profibus DP	-	●	●	●	●
	SPAbus	-	●	●	●	●
Redundancy protocols (RSTP/PRP)		-	●	●	●	●
Others						
Control		1 object 1 display	4 objects 4 display	4 objects 8 display	5-6 objects 3-8 display	
Logic (Matrix + Logic equation)		●			●	
Withdrawable CT connector with shorting		●			-	
Remote HMI		-			●	
Hardware dimensions (W/H/D)		171 x 176 x 214(3) mm / 6.73 x 6.93 x 8.43 in			264 x 177 x 208 mm / 10.39 x 6.97 x 8.19 in	

(1) Depends on optional module
(2) P3L30 can have 1 loop or 2 point sensors only
(3) 226 mm (8.90 in) with ring-lug connectors
(4) Check the available power supply range from the device's serial number label
(5) LPCT for P3U30, P3F30 and P3M30 relays only. Consult us for other models
(6) Consult us for availability

Protection relays

Easergy P5 range

		Easergy P5x20		Easergy P5x30
				
Application				
Voltage		P5V20	-	-
Feeder		-	P5U20 with directional in LPCT/LPVT version	P5F30 with directional
Transformer		-		-
Motor		-		P5M30 with directional
Characteristics				
Measuring inputs	Phase current	-	1/5A CT (x3) or LPCT (x3) (1)	1/5A CT (x3) or LPCT (x3)
	Residual current	-	1/5A CT & 1A CT or CSH core balance CT	1/5A CT & 1A CT or CSH core balance CT
	Voltage	VT (x4)	LPVT (x4) (1)	VT (x4) or LPVT (x4)
Arc-flash sensor inputs		-		0 to 6 point sensors
Digital	Inputs	4 to 16		4 to 40
	Outputs	3 to 8 + Watchdog (WD)		3 to 18 + Watchdog (WD)
Temperature sensor input		-	0 to 16 (external modules)	0 to 16 (external modules)
Front ports		1 USB for configuration 1 USB for USB key		1 USB for configuration 1 USB for USB key
Power supply		24-250 VDC ; 100-230 VAC		24 - 48 VDC or 48-250 VDC ; 100-230 VAC
Ambient temperature, in service		-40 to 70°C (-40 to 158°F)		-40 to 70°C (-40 to 158°F)
Communication				
Hardware modules	Extension(2) + Backup memory	●		●
	Serial	●		●
	Ethernet	●		●
	2nd Ethernet	-		●
Protocols	IEC 61850 Ed.1 & Ed.2	●		●
	IEC 60870-5-103 & 101	●		●
	DNP3 Ethernet	●		●
	DNP3 serial	●		●
	Modbus Ethernet	●		●
	Modbus serial	●		●
	EtherNet IP	●		●
Redundancy protocols	RSTP	●		●
	PRP / HSR	●		●
Time synchronization	Pulse, IRIG-B(3)	●		●
	SNTP, PTP IEEE 1588 v2(4)	●		●
Others				
Control		6 controlled + 2 monitored objects Mimic		6 controlled + 2 monitored objects Mimic
Logic (Matrix + Logic Equations)		●		●
Cybersecurity		●		●
Draw-out device (withdrawability)		●		●
Hardware dimensions (H/W/D)		102 / 176 / 219 mm 4.01 / 6.93 / 8.62 in		152 / 176 / 219 mm 6.0 / 6.93 / 8.62 in

(1) In case P5U20 is choosen for cooperation with low power sensors, it contains LPCT (x3) and LPVT (x4) channels
(2) for connection of RTD module and IRIG-B module
(3) IRIG-B module is a separate accessory
(4) PTP IEEE 1588 v2 is availaible with HSR/PRP communication board

Protection relays

VIP, Easergy & MiCOM ranges

		VIP Relays VIP40/45 VIP400/410	Easergy (1) P1F/P1V	MiCOM (2) P111	MiCOM P115 / P116
			 PM107253	 PM105561	 PE90624
Application					
Feeder	Phase and earth-fault	•	•	•	•
	With directional				
	With line differential				
	With distance				
Voltage	Voltage and frequency		•	•	
Transformer	Phase and earth-fault		•	•	•
	With transformer differential				
Motor	Phase and earth-fault				
	With voltage				
	With machine differential				
Generator	Phase and earth-fault				
	With directional				
	With machine differential				
Busbar	With busbar differential				
Capacitor bank					
Sensors		CSH (0.2 A to 2 In) LPCT	CT (1 or 5 A) or VT	CT (1 or 5 A) or VT	CT (1 or 5 A)
Display		VIP 40/45: 4 digits display VIP 400/410: Gaphical LCD	Graphical LCD	16 characters LCD 2 lines	16 characters LCD 2 lines
Other characteristics		Self/Dual Powered			Withdrawable hardware Self/Dual Powered
Input/Output (up to)		1/3	8/6	8/7	6/6
I/O terminals		Screw type	Screw type	Screw type	Screw type
Temp. sensors (up to)					
Communication protocol		• Modbus RTU-RS485 (plug and play with T300) • IEC 60870-5-104 • IEC 60850 • DNP3	• Modbus RTU • IEC 60870-5-103	• Modbus RTU • IEC 60870-5-103	• Modbus RTU • IEC 60870-5-103
Logic equations					
Standards			IEC, EAC, UKSA	IEC, EAC	IEC, EAC

(1) Available on January 2021

(2) End of life: June 2021

Protection relays

Sepam & Easergy MiCOM ranges

Sepam series 60	Sepam series 80	Easergy MiCOM P30	Easergy MiCOM P40
 PM105661	 PM105662	 PM108873	 8297098
●	●	●	●
●	●	●	●
		●	●
		●	●
●	●	●	●
●	●	●	●
	●	●	●
●	●	●	●
●	●	●	●
	●		●
●	●		●
●	●		●
	●		●
			●
●	●		
• CT (1 or 5 A) or LPCT • VT	• CT (1 or 5 A) or LPCT • VT	• CT (1 or 5 A) • VT	• CT (1 or 5 A) • VT
• Standard UMI • Remote UMI • Mimic based UMI	• Standard UMI • Remote UMI • Mimic based UMI	• Large color LCD type display with single-line diagram (mimic) • Remote UMI	• Standard UMI
Removable S/W cartridge	Removable S/W cartridge	• Multifunction; integrated Bay controller • High firmware/hardware variability	
28/16	42/23	80/45	32/32
• Screw type • Ring lug	• Screw type • Ring lug	• Screw type • Ring lug	Ring lug
8 to 16	8 to 16	10	10
• Modbus RTU • IEC 60870-5-103 • DNP3 • Modbus TCP/IP • IEC 61850 with GOOSE • RSTP	• Modbus RTU • IEC 60870-5-103 • DNP3 • Modbus TCP/IP • IEC 61850 with GOOSE • RSTP	• Modbus RTU • IEC 60870-5-101/103 • DNP3 • IEC 61850 with GOOSE • RSTP • PRP / HSR / DUAL-IP • IEC 6870-5-104	• Modbus RTU • IEC 60870-5-103 • DNP3 serial/DNP3oE • IEC 61850 with GOOSE • RSTP/SHP/DHP • HSR/PRP
Comprehensive logic equations	Control logic by ladder diagram	Comprehensive logic equations	Comprehensive logic equations
UL, CSA, EAC, ATEX	IEC 61508-SIL2, UL, CSA, EAC, ATEX	• Cyber security • IEC, EAC, ATEX	• Cyber security (IEC 62351) • IEC, UL, CSA, EAC, ATEX

Arc fault detection and protection

Easergy Arc protection range

Function	Easergy Arc V125	Easergy Arc V121
The arc protection unit detects an arc flash in an installation and trips the feeding breaker. An arc flash protection maximizes personnel safety and minimizes material damage caused by arc faults.	 PM106411	 PM105563
System features	Stand-alone arc flash protection light detection for typical configurations: • 4 Arc inputs (point sensors) • Integrated 24…230Vac/dc power supply • High speed trip output (1 to 2 ms operation time) • 1 self supervision output • D-rail or flush mounting • Master trip I/O for simple arc selectivity • Direct installation with basic comissioning • Front status LEDs	• Operation on light only • Up to 10 sensors arc or smoke sensors • Single trip contact • Straight-forward installation • Typical operation time 9 ms (including the output relay) • Cost efficient solution • Self-supervision • Binary input for blocking or resetting (programmable) the unit • Possibility for double arc channel activation trip criteria • BIO light transfer possibility to other Vamp device
Sensors		
Point sensor - Surface	• Arc detection from compartments • Self-monitored • 6 m and 20 m cable lenghts available, shielded or not shielded	• Arc detection from compartments • Self-monitored • 6 m and 20 m cable lengths available
Point sensor - pipe	• Self-monitored • 6 m and 20 m cable lenghts available, shielded or not shielded	• Self-monitored • 6 m and 20 m cable lengths available
Portable sensor		• Snap-in connection to I/O unit • Enhanced work safety
Loop sensor (fibre)		
Standards	IEC, UL, Marine	IEC
Benefits		
	• Personnel safety • Reduces production losses • Extended switchgear life cycle • Reduced insurance costs • Low investment costs and fast installation • Reliable operation	

Arc fault detection and protection

Easergy Arc protection range

Easergy Arc V221 (+ I/O units)*	Easergy Arc V321 (+ I/O units)*
	
• Current and light tripping criteria (possibility of tripping by light only) • Typical operation time 7 ms (electromechanical contact) • Accurate location of arc fault utilizing point sensors • Four selective protection zones per system • Self-supervision of the entire system • Up to 160 sensors (with I/O modules) • Easy interconnect using VX001 cables • Phase current measuring • Earth fault current measuring • Personal portable sensor option • Panel or rail mount I/0 units • Circuit breaker fail protection (CBFP)	• Three phase current, zero sequence voltage and current • Event logs, disturbance recording and real time clock • Operation on simultaneous current and light or light only • Informative display LCD (single line diagram) • Up to four fast trip contacts • Direct light sensors and fiber optic up • Support up to 170 arc flash point sensors (with I/O modules) • One normally open and one change over alarm contact • Typical operation time: less than 7 ms (including the output relay) • Optionally 2 ms typical operation time when semi-conductor outputs are used • Programmable operation zones • Continuous system self supervision • PC configurable • Communication ports supporting a wide range of communication protocols which are intended for a SCADA interface
• Arc detection from compartments • Self-monitored • 6 m and 20 m cable lengths available	• Arc detection from compartments • Self-monitored • 6 m and 20 m cable lengths available
• Self-monitored • 6 m and 20 m cable lengths available	• Self-monitored • 6 m and 20 m cable lengths available
• Snap-in connection to I/O unit • Enhanced work safety	• Snap-in connection to I/O unit • Enhanced work safety
• Monitors various compartments • Small bending radius for easy installation	• Monitors various compartments • Small bending radius for easy installation
IEC	IEC

- Personnel safety
- Reduces production losses
- Large scale installation like substation
- Reduced insurance costs
- Low investment costs and fast installation
- Reliable operation

* I/0 units: 4 ref. available (VAM 3L, VAM 10L/LD, VAM 12L/LD, VAM 4C/CD).
The choice is to be made according to the needs of type and number of sensors. Please contact us.

MV-LV substation remote control & monitoring

Easergy T300

Advanced Supervision and Control of MV-LV Distribution system

Easergy T300: A modular RTU solution for any kind of applications

The Easergy T300 Feeder RTU is compliant with IEC 62351 and IEEE 1686 standards. It offers SCADA communication security and a role-based access control (RBAC) system to help protect your electrical infrastructure from cyber attacks.

Main functions	MV network remote control of All UG and OH equipment : Fault Location Isolation system and restoration for all neutral system - centralized and decentralized network management	
	• LV switchboard monitoring • Voltvar optimisation support	• MV and LV power and quality measurement • Thermal monitoring and asset management
Main modules	• HU250 - Head unit communication/gateway • SC150 - MV Switch controller	• LV150 - Transformer and LV monitoring • PS100/PS50 - Wide range of backup power supply
Protocols	• IEC 60870-5-101/104 slave and master (standard and secure) • DNP3 serial and TCP slave and master	• Modbus serial and TCP slave and master (standard and secure) • IEC 61850 slave and master
Transmission system	• Two flexible communication ports accommodated with modem boxes: - RS232/RS485 modem box for WAN or LAN communication - 2G/3G modem box for WAN communication - 3G/4G modem box for WAN communication • Two Ethernet ports (for WAN and LAN communication) - 1 Ethernet port for WAN communication - 1 Ethernet port for LAN communication with third party devices • 1 serial RS232/RS485 for Modbus LAN communication • Zigbee Modem for communication with thermal sensors • Secure WiFi for local connection	
Standards	IEC	

Benefits

- Easergy T300 adress the follow customer challenges :
  - Evolve with the grid : manage bidirectional and intermittent power flow
  - Increase availibility : improve SAIDI and optimise MV networks
  - Maintain power quality
  - Manage the costs : reduce installation, operation and maintenance expenditures
  - Deliver efficiency : optimise network to manage growing consumption
  - Improve Cybersecurity : help defend against malicious software and unauthorised access
- Easergy T300 is a modular FRTU platform, hardware, firmware and an application building block for Medium Voltage and Low Voltage public distribution network management
- Modular approach ensures T300 will be configurable to your exact needs e.g. packaged solutions, embedded solutions, open solutions
- This open architecture supports different applications, from a single communication gateway to large substation management
- Built-in web server for commissioning and maintenance with local and remote access, compatible with PC, tablet and smartphone devices
- High availability back up power supplies range PS100/50/25 for control and monitoring applications

MV-LV substation remote control & monitoring

Easergy T300

Easergy HU250
Head unit communication - Gateway

Functions

- Flexible communication to control centre and other customers' IT applications
- Open peer-to-peer communication for self-healing applications*
- Open to third-party devices with many protocol capabilities
- Embedded IEC 601131-3 PLC for automation design
- Cyber security management:
  Compliance to the security standards/regulations (IEC 62351/IEEE 1686)
- Configurable Sequence of Events (SOE) for data logs
- Software integrity with firmware signature on all modules:
  - Secure communication between Easergy T300 and associated webserver tool with local or remote conn ections using HTTPS, SSH, SFTP
  - User identification and authentication according to IEC 62351-8
  - User access management according to IEC 62351-8
  - Communication authentication according to IEC62351-5 when using DNP3 and IEC60870-5-104 protocols
  - Port hardening management.
  - IP communication filter
  - Security events log storage and transmission according to Syslog protocol

Easergy SC150
MV Switch controller

Functions

- Controlling and monitoring of all switchgear type
- Advanced fault Passage Indicator (FPI) algorithms:
  - P-P, P-E, O/C, 50/51, 50/51N
  - Directional P-P, P-E, O/C, 67/67N
- Broken conductor detection 47BC
- MV Network monitoring : Current, Voltage and Power measurements according to IEC61557-12
- Power quality according to IEC 61000-4-30, Class S
- Large voltage and current measurement capabilities:
  Standard CT, VT, LPVT, VDS, VPIS and capacitor interface for voltage

* Consult us for availability

Easergy LV150
Transformer and LV monitoring

Functions

- Current and voltage measurements according to IEC 61557-12
- Broken conductor detection 47BC
- Power quality according to IEC 61000-4-30, Class S
- Transformer temperature monitoring

Substation power supply

Easergy PS100 and PS50

	Easergy PS100 Control & Monitoring	Easergy PS50 Monitoring
	 PM100615	 PM104366
Functions	The Easergy PS100/PS50 power supplies, associated with a backup battery, are designed to maintain control and monitoring of the entire MV substation during long power supply interruptions (up to 48 hours). They are designed to supply: • MV switchgear motor mechanism and circuit-breaker coils • Transmission equipment (e.g. radio) • Electronic modules of T300 • All other devices in MV/LV substations (Protection relays, Fault Passage Indicators or others IEDs, low voltage breakers, PLC concentrators, etc.)	
Power supply outputs	• 12 VDC, 18 W permanent and 100 W/20 s (for modem, radio, RTU, etc.) • 48 VDC or 24 VDC 90 W permanent (for protection relays, electronic devices, etc.) and 300 W/1min. (for switchgear operating mechanism motors)	• 12 VDC, 18 W permanent for telecom equipment • 12 VDC, 36 W permanent for IEDs • 48 VDC or 24 VDC 10 W permanent (for protection relays, electronic devices, etc.) and 300 W/1min (for switchgear operating mechanism motors).
Protocols	Modbus RS485	Modbus RS485
Standards	IEC 60255-5 (10 kV level)	IEC 60255-5 (10 kV level)
Benefits		
	• High availability due to the separate voltage output for telecom and motor	• High availability due to the separate voltage output for IEDs, telecom and motor
	• High efficiency and high energy backup autonomy • Designed for severe environment with higher insulation (10 kV) • Easy maintenance with only one battery, 24 Ah or 38 Ah robust life span (> 10 years) • Modbus communication for battery monitoring to allow optimised maintenance operations	
	• Battery charging and monitoring for longer battery life • Battery end-of-life monitoring and anticipated maintenance • Designed for long outage time	

Voltage presence relay

Easergy VD23

	Easergy VD23
	 PM105571
Functions	• Indicates presence or absence of voltage through 1 or 2 relays • For MV networks from 3 kV to 36 kV • Associated with VPIS-VO V2 (see next page)
Technical specifications	• Self-adapted to network voltage • Displays the voltage in % of nominal • Output contacts behaviour configurable according to various combinations of phase and unbalance voltage status • DIN format • Allows to address various applications: - Automatic transfer systems - Alarms on voltage loss - Automation on voltage loss - Earth locking on voltage presence - Alarms on voltage presence
Reference numbers	• Voltage presence relay (VD23): ref. EMS58421 • Combined voltage presence relay + Fault Passage Indicator (Flair 23DM): ref. EMS58355
Standards	IEC

Benefits

- Fits all MV network neutral systems
- Compact (DIN format)
- Output contact behavior highly configurable according to application needs

Energy management and control

Basic and advanced meters

	Basic panel meters	Basic energy meters	Basic panel meters	Advanced meters
	AMP/VLT	**IEM3000 series**	**PM5100/5300/ 5500**	**PM8000**
	 PB101118	 PB115488	 PB111776	 PB113683
Function		kW/h meters • IEC 62053-22 Class 0.5S • IEC 62053-21 Class 1 • IEC 62053-23 Class 2 • IEC 61557-12 • EN 50470-1/3	Metering and sub-metering • IEC 62053-22 Class 0.5S • IEC 62053-22 Class 0.2S (PM55xx) • IEC 62053-23 Class 2 • IEC 61557-12 • EN 50470-1/3	Energy and intermediate power quality meter • IEC 61557-12 • IEC 62053-22 Class 0.2S • IEC 61000-4-30 Class S • IEC 62856-1 • ANSI C12.20 Class 0.2 • PMD /Sx/K70/0.2
Applications				
Panel instrumentation	I/U	I, U, F, P, Q, S, PF, E alarm, I/O, enegy	I, U, F, P, Q, S, PF, E min/max, harm., alarm, I/O (I, U, unbalance, demand, clock/cal)	I, U, F, P, Q, S, PF, E, THD min/max, harm., alarm, I/O (I, U, unbalance, demand, clock/cal)
Energy efficiency and cost				
Sub-billing & cost allocation	•	•	•	•
Demand and load management				•
Billing analysis				•
Power availability and reliability				
Harmonics			•	•
Dip/swell, transient				•
Compliance monitoring				•
Revenue metering				
Characteristics				
Measurement accuracy (active energy)	• Class 1.5	• Class 0.5S/Class 1	• Class 0.2S (PM55xx) • Class 0.5S	• IEC 61053-22 Class 0.2S • ANSI 12.20 Class 0.2S
Installation	• Flush mounted 72 x 72 mm 96 x 96 mm	• DIN rail 5 or 7 x 18 mm modules	• Flush mounted 96 x 96 mm. Remode display option in PM55xx	• Flush & DIN rail mounted 96 x 96 mm
Voltage measurement	VLT: 500 VAC direct or external VT	• 50 V to 330 V (Ph-N) • 80 V to 570 V (Ph-Ph) • Up to 1 MVAC (ext VT)	• 20V L-N/35V L-L to 400V L-N/ 690V L-L • Up to 1 MVAC (ext VT)	• 57-400 VAC L-N 3P (100-690 VAC L-L)
Current measurement	• AMP: external CT	• External CT	• External CT	• External CT
Communication ports		• Modbus serial • BACnet IP • M-bus • LON works	• Modbus serial • Modbus TCP/IP • Ethernet IP • BACnet IP • DNP 3.0	• Modbus RTU • Modbus TCP • ION • DNP 3.0 • HTTPS • SFTP
Inputs/Outputs		• 2 I/O	• 4 I/O, Relay Option • 6 I/O (PM55xx)	• Up to 27 DI, 9 DO • Up to 16 AI, 8 AO
Memory capacity			256 kB & 1.1 MB (PM55xx)	512 MB

Energy management and control

Advanced and utility meters

Advanced meters | Utility meters

ION7400	ION9000	ION8650 A/B/C	ION8800 A/B/C
 PB115151	 PB115917/PB115914	 PB107500	 PE86145
Energy and basic power quality meter • IEC 61557-12 • IEC 62053-22 • IEC 61000-4-30 Class S • ANSI C12.20 Class 0.2 • PMD /Sx/K70/0.2	Energy and advanced quality meter • IEC 61557-12 • IEC 62053-22 Class 0.1S • IEC 61000-4-30 Class A • IEC 62856-1 / IEC 62856-2 - PQI class A • ANSI C12.20 Class 0.1 • PMD /Sx/K70/0.2	Energy and power quality meter • IEC 62052-11 • IEC 62053-22/23 Class 0.2S • IEC 61000-4-30 Class A • ANSI C12.20 Class 0.1	Energy and power quality meter • IEC 62052-11 • IEC 62053-22/23 Class 0.2S • IEC 61000-4-30 Class A
I, U, F, P, Q, S, PF, E, THD min/max, harm., alarm, I/O (I, U, unbalance, demand, clock/cal, flicker)	I, U, F, P, Q, S, PF, E, THD min/max, harm., alarm, I/O (I, U, unbalance, demand, clock/cal)	I, U, F, P, Q, S, PF, E (demand, min/max values, unbalance, flicker, transient, sag/swell)	I, U, F, P, Q, S, PF, E (demand, min/max values, unbalance, flicker, transient, sag/swell)
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•		•	•
• IEC 62053-22 Class 0.2S • ANSI 12.20 Class 0.2S	• IEC 61053-22 Class 0.1S • ANSI 12.20 Class 0.1S	• IEC 62053-22 Class 0.2S • ANSI 12.20 Class 0.1	• Class 0.2S
• Flush & DIN rail mounted 96 x 96 mm	• DIN rail mounted	• ANSI socket mounting 9S, 35S, 36S, 39S and 76S • FT21 switchboard case	• DIN 43862 rack
• 57-400 VAC L-N 3P (100-690 VAC L-L)	• 57-400 VAC L-N 3P (100-690 VAC L-L)	• 57-277 V L-N AC (9S, 36S); 100-480 V L-L AC (35S)	• 57-288 V L-N AC or 99-500 V L-L AC
• External CT	• External CT	• External CT	• External CT
• Modbus RTU • Modbus TCP • ION • DNP 3.0 • DLMS • HTTPS • SFTP	• Modbus RTU • Modbus TCP • ION • DNP 3.0 • DLMS • HTTPS • SFTP	• Modbus RTU • Modbus TCP • ION • DNP 3.0 • DLMS • SFTP • HTTP	• Modbus RTU • Modbus TCP • ION • DNP 3.0 • DLMS • FTP • HTTP
• Up to 27 DI, 9 DO • Up to 16 AI, 8 AO	• Up to 32 DI, 4 DO, 10 RO • Up to 16 AI, 8 AO	• Up to 22 I/O	• Up to 16 I/O
512 MB	2 GB	A: 128 MB B: 64 MB C: 32 MB	• Up to 10 MB

Civil work and installation

Civil engineering	78
Power House	79
Up to 1600A general arrangement	80
Up to 2000A general arrangement	81
Cable connections	82

Civil engineering

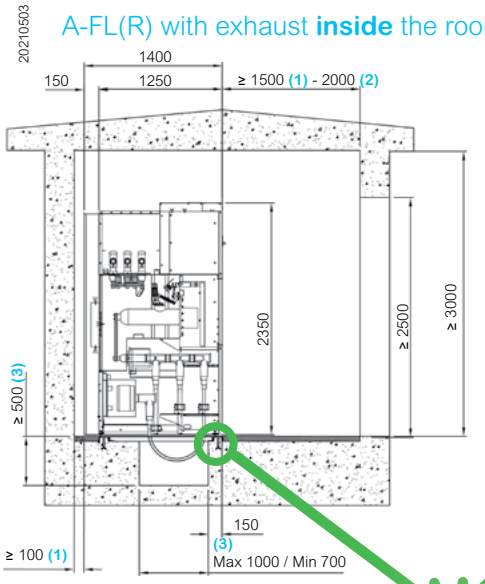
The use of CBGS-0 switchgears implies a maximum optimization of the necessary space. Space saving is about 50% (24 kV) and 70% (36 kV), compared to the traditional air-insulated solutions.

- Weight per cubicle: from 450 up to 650 kg.
- All the given numbers are minimum values.
- Dimensions in mm.

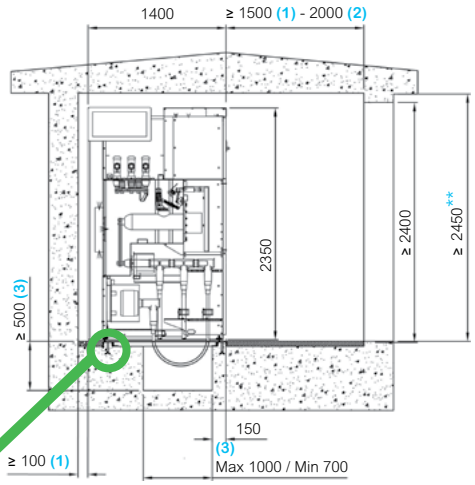
For more information, see the Instruction Manual.

Switchgear positionning in the substation

A-FL(R) with exhaust **inside** the room*



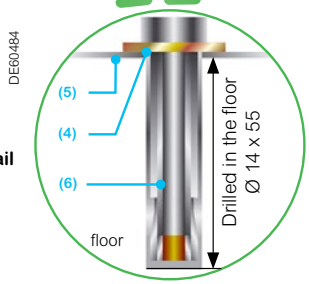
A-FL(R) with exhaust **outside** the room*



1 Minimum distance required for operation
2 Distance required to remove the functional unit from the cubicle without moving the rest of the units
3 Dimensions of the trench according to the characteristics of the cables used (minimum bend radius of the cable)
4 Washer
5 Base plate of the cubicle
6 Expansion screw

Note:
This is a general guide, please consult us for specific project drawings for civil works design.

Switchboard fixing detail

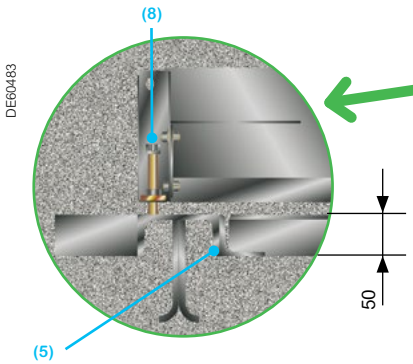


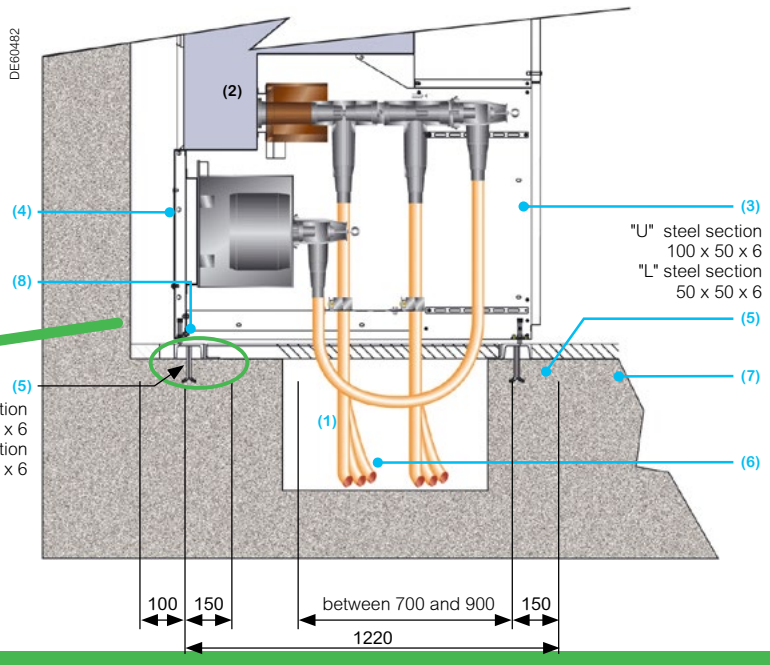
* *to comply with the IAC qualification in accordance with IEC/EN 62 271-200*

** *Height of the ceiling does not affect the IAC behaviour in this option. Only ergonomy/ installation/replacement criteria to be taken into account.*

Cubicle leveling detail

1 Continuous trench
2 Cubicle
3 Minimum aisle required for maneuvering (1500 mm)
4 Relief area for gas (100 mm)
5 Support frame (profile) and front fixation
6 MV cables outgoing area
7 Floor
8 M12 x 75 DIN 912 Allen screw for switchgear level adjustment





Power House

Prefabricated and transportable substations

CIAT type: metal structure module

CIMT type: concrete module

Modular substations in prefabricated buildings are supplied fully tested and finished, so that a very significant reduction is achieved in the project execution time by eliminating a large part of the field work.

The small size of the CBGS cubicles makes it possible to optimize the dimensions of the buildings even in double bar and 52 kV configurations.

Once the transport and unloading at destination has been carried out, be it a substation with all its services or a building-cubicles combination, it is only necessary to make the external interconnections to the modules, and the substation would be ready for power-up.

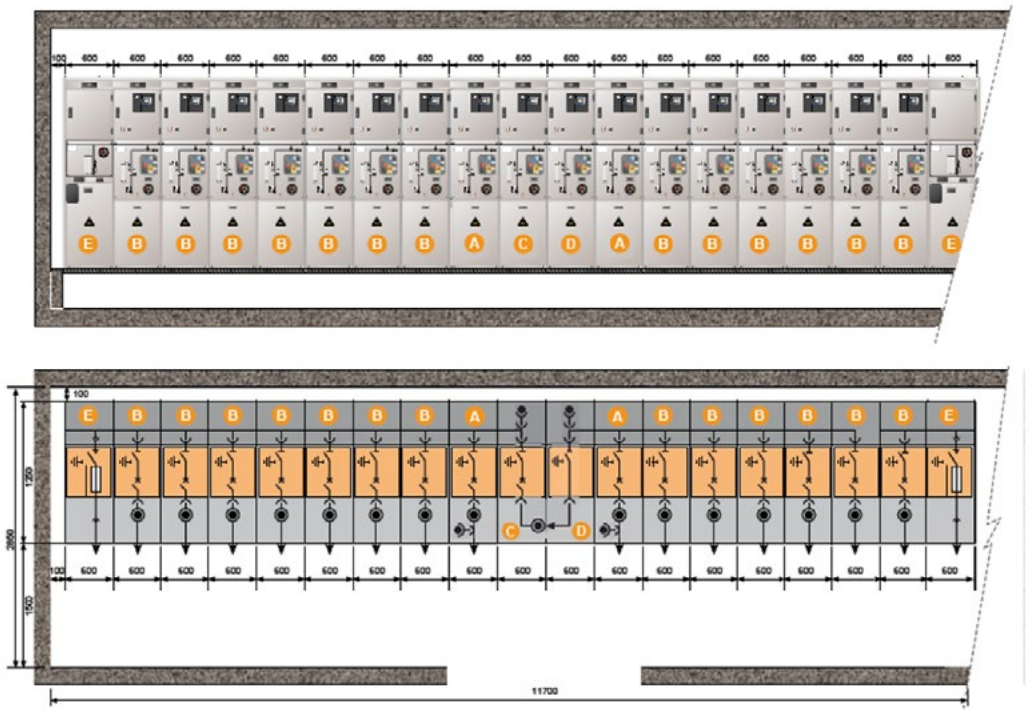
Prefabricated buildings can be made of concrete or metal depending on the requirements of the project. In both cases, the benefits for the end user are the same:

- Less time required for the execution of the project.
- Better quality in installation and testing, as it is carried out in an industrial environment at the origin.
- Greatly simplified project management

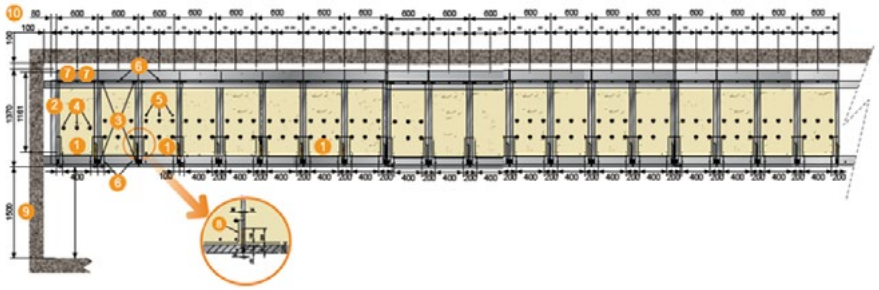
All this results in a reduction in CAPEX, and a greater capacity to execute projects by the user.

*For more information contact your sales support.

Up to 1600A general arrangement

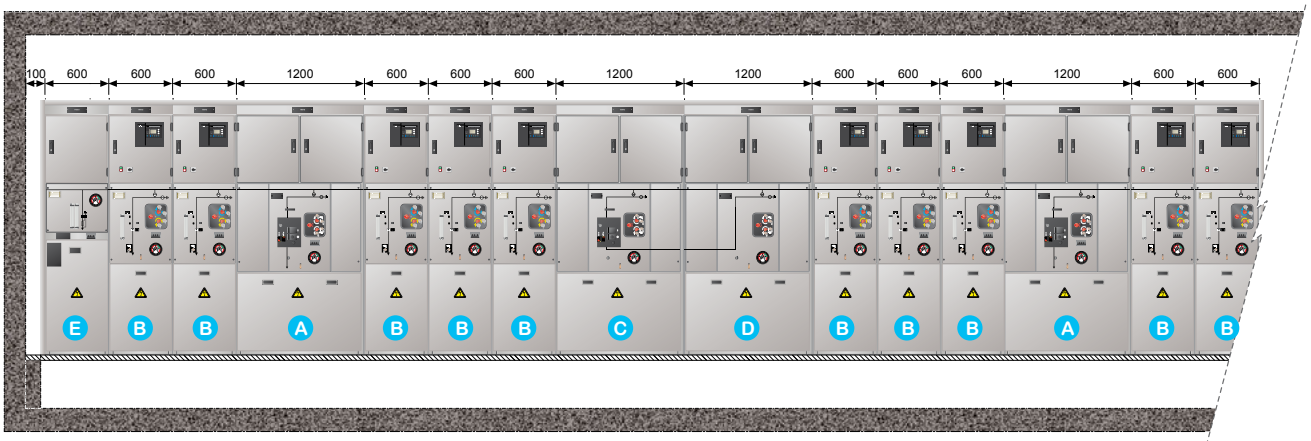


A Incomer **B** Feeder **C** Coupler **D** Riser **E** Auxiliary services

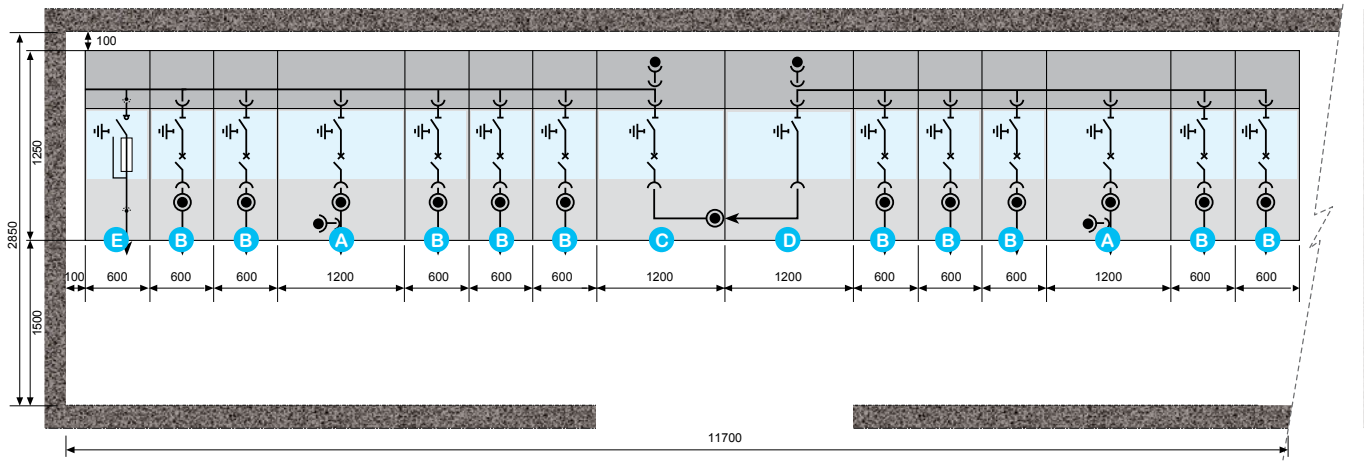


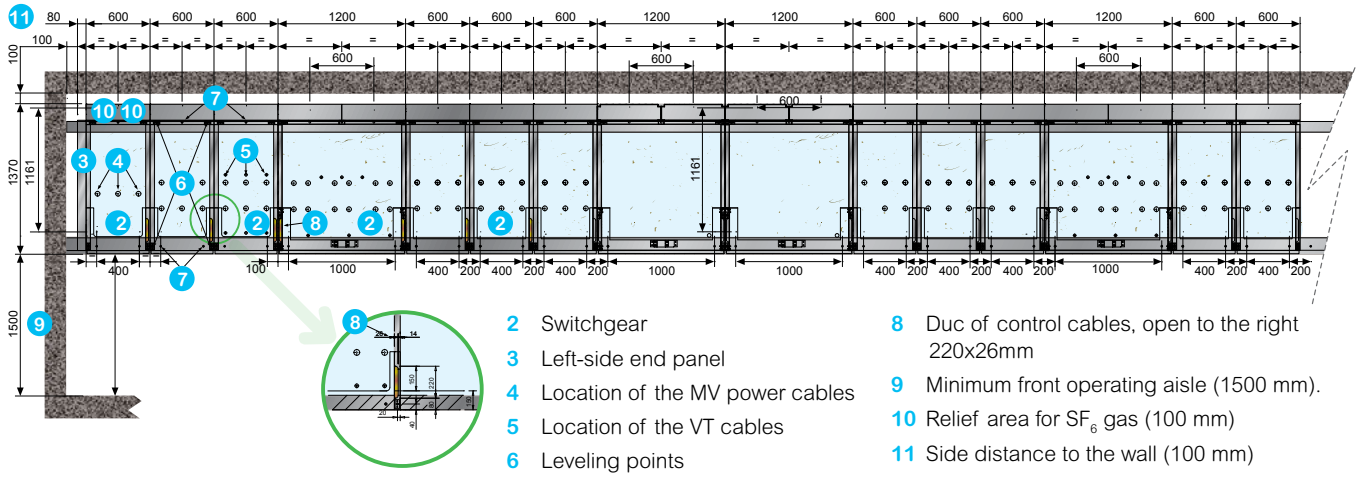
1 Switchgear
2 End panel
3 Leveling points
4 Position of the MV power cables
5 Position of the VT cables
6 Anchoring points
7 Relief zone in case of overpressure of SF_6 (100mm)
8 Control cable duct (220 x 26 mm open to the right)
9 Minimum aisle required for maneuvering (1500 mm)
10 Side distance to the wall (100 mm)

Up to 2000 A general arrangement



A Incomer **B** Feeder **C** Coupler **D** Riser **E** Auxiliary Services

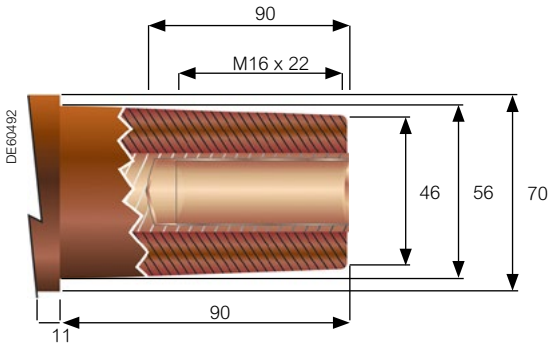




- **2** Switchgear
- **3** Left-side end panel
- **4** Location of the MV power cables
- **5** Location of the VT cables
- **6** Leveling points
- **7** Fixing points
- **8** Duc of control cables, open to the right 220x26mm
- **9** Minimum front operating aisle (1500 mm).
- **10** Relief area for SF_6 gas (100 mm)
- **11** Side distance to the wall (100 mm)

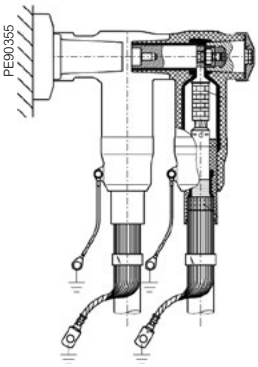
Cable connections

Detail of a standardized type C bushing according to the requirements of the standard EN 50181 for power connectors.

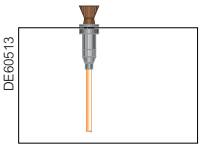


Dimensions in mm.

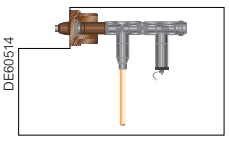
Reduced connectors



* Same installation possibilities as normal connectors



1 cable per phase (auxiliary services)

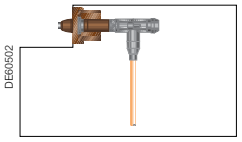


Transient overvoltage limiters

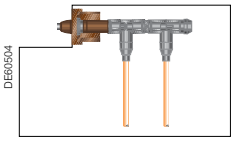
Pluggable connectors for the incoming/outgoing cables

The connectors used for the input cables in all CBGS-0 24/36 kV cubicles (1) are pluggable, “T” type, threaded (M16) and shielded in accordance with the standard EN 50181.

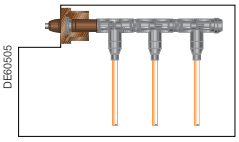
The manufacturer of each connector provides the maximum cross section (≤630 mm^2) and characteristics of the cables that can be connected to the CBGS-0 cubicles using connectors such as those described. For more information on the characteristics of the different connectors, contact the main manufacturers. The power cable compartment supports a maximum of three cables per phase



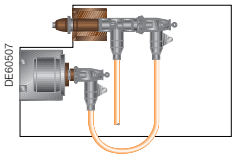
1 cable per phase



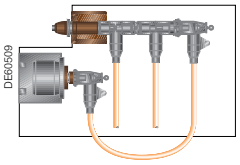
2 cables per phase



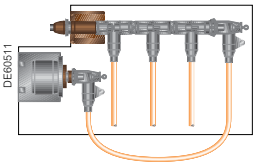
3 cables per phase



1 cable per phase + VT



2 cables per phase + VT



3 cables per phase + VT (up to 24kV 1600A or 36kV 1250A)

(1) The connectors used for the MV connection bridges in the Voltage Transformers are pluggable, L-shaped, without thread and shielded, for 250 A (24 kV) and 400 A (36 kV).

Outgoing connectors for auxiliary service switchgears

CBGS-0 24/36 kV cubicles with load switch combined with fuses require connectors of the following type: pluggable, straight, without thread, shielded and always 36 kV and 400 A.

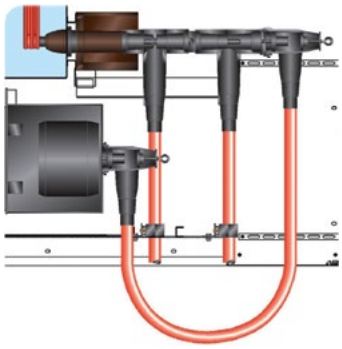
Installation of Surge Arrestors

Surge arrestors can be installed in the cable compartment. Transient overvoltage limiters must be suitable for type C bushings, according to EN 50181 (same space as a connector).

*For direct connection of cables to the upper bushings, contact your local sales support.

.

Cable connections



Each manufacturer must indicate the maximum section and the characteristics of the cables that can be connected with each connector type.

See the examples for 24 kV and 36 kV.

Options for installation of connectors

	CONNECTORS	Cubicle width (mm)		600						1200						1200 TT SECC						Manufacturer	Reference
		No. of cables per cubicle and phase		1	2	3	1 + aux	2 + aux	3 + aux	1	2	3	1 + aux	2 + aux	3 + aux	1	2	3	1 + aux	2 + aux	3 + aux		
		Cross Section (mm^2)	Diameter (mm)																				
24 kV	ASYMMETRIC	25 - 630	12,7 - 56	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■			TYCO	RSTI
				■						■						■						PRYSMIAN	MSCEA-630A
				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		NKT	CB24
				■	■	■	■	■		■	■	■	■	■		■	■		■			EUROMOLD	K***
		400 - 1000	34 - 59	■	■		■			■	■	■	■	■	■	■	■		■			TYCO	RSTI
		630 - 1200	40 - 68																			PRYSMIAN	MSCEA-630A
																						NKT	CB24
				■	■	■	■	■	■	■	■	■	■	■	■	■	■		■			EUROMOLD	K***
	SYMMETRICAL	25 - 630	12,7 - 56																			TYCO	RSTI
				■	■		■		■	■	■		■		■	■						PRYSMIAN	MSCT - 630
																						NKT	CB24
				■	■	■	■	■		■	■	■	■	■		■	■		■			EUROMOLD	K***
up to 36 kV	ASYMMETRIC	35 - 630	12 - 59	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■			TYCO	RSTI
				■						■						■						PRYSMIAN	MSCT -630
				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		NKT	CB36
				■	■	■	■	■	■	■	■	■	■	■	■	■	■		■			EUROMOLD	M***
		400 - 800	34 - 59	■	■		■			■	■	■	■	■	■	■	■		■			TYCO	RSTI
		630 - 1200	40 - 68																			PRYSMIAN	MSCT-630
																						NKT	CB36
				■	■	■	■	■	■	■	■	■	■	■	■	■	■		■			EUROMOLD	M***
	SYMMETRICAL	35 - 630	12 - 59																			TYCO	RSTI
				■	■		■			■	■		■			■						PRYSMIAN	MSCT -630
																						NKT	CB36
				■	■	■	■	■		■	■	■	■	■		■	■		■			EUROMOLD	M***
up to 38 kV	ASYMMETRIC	35 - 630	12 - 59	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■			TYCO	RSTI
				■	■	■	■	■	■	■	■	■	■	■	■	■	■		■			EUROMOLD	P***
		400 - 800	34 - 59	■	■		■			■	■	■	■	■	■	■	■		■			TYCO	RSTI
		630 - 1200	40 - 68	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■			EUROMOLD	P***

*For more information, consult the Manufacturer's catalog

Life Is On | Schneider Electric™

Green Premium™ ecolabel product - Sustainable performance, by design

Schneider Electric Industries SAS
35, rue Joseph Monier - CS 30323
F92506 Rueil-Malmaison Cedex

NRJED316738EN - 29th September 2021