2018 Catalog

SM6 modular units

Air insulated switchgear up to 36kV

Medium Voltage Distribution

schneider-electric.com

Life Is On Schneider Electric

General Contents

Your concerns

Safety

Reliability

Flexibility

Connectivity

Our solutions

- Enclosures able to withstand internal arcing
  3 or 4 sides internal arc protection IAC: A-FL and A-FLR.
  Internal arc withstand: 12.5 kA 1s, 16 kA 1s and 20 kA 1s
- Mechanical and electrical interlocks, to help to prevent incorrect operations

- 1 700 000 functions installed world-wide
- 100% factory-tested without the need for further tests on site

- Easy upgraded to meet your need and adapted to the extension of your installations
- Integration in factory-built outdoor substations for which the SM6 is particularly well designed

- Intelligent, connectable components like SC110, CL110 and TH110 provide continuous information about the state of your electrical installations, enabling asset management optimization through preventive maintenance

PM105626

SM6,

a truly professional **solution!**
More than **1 700 000** cubicles installed **world-wide.**

Our solutions

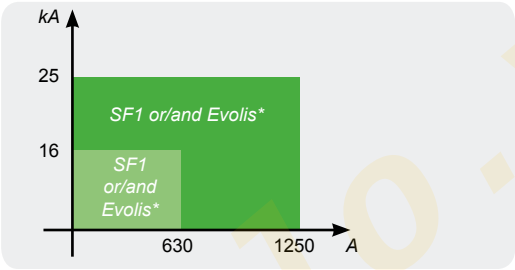
PM105627

Schneider Electric has developed protection, monitoring and control solutions specifically dedicated to Medium Voltage networks for over 40 years.

SM6 switchgear has been specifically designed on the basis of that extensive experience.

It also incorporates some very new solutions, giving the best in terms of continuity of service and operators' safety.

High-performance breaking devices



(*) Not available at 36 kV.

A comprehensive solution

SM6 switchgear is fully compatible with

- PowerMeter metering units.
- Easergy P3 relay and Sepam multi-function protection relays
  - Protection
  - Measurements and diagnosis.
- VIP protection self powered relay for protection.
  SM6 swithchboards can thus be easily integrated into any monitoring
  and control system.
  - Local & remote indication and operation.

PM105628

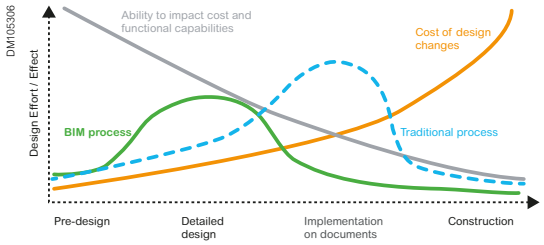
Enclosures able to withstand internal arcing

Internal Arc Classification: A-FL and A-FLR.

- 3-sides internal arc protection IAC: A-FL,
  12.5 kA 1 s, 16 kA 1 s and 20 kA 1s for SM6-24 and 16 kA 1 s for SM6-36.
- 4-sides internal arc protection IAC: A-FLR,
  12.5 kA 1s, 16 kA 1 s and 20 kA 1 s for SM6-24.
- Choice of exhaust:
  - downwards exhaust
  - upwards exhaust for SM6-24.

BIM models

A unique opportunity to improve the key driver of the Building market
Still Interoperability is a challenge



What is BIM

- BIM is an evolution of the Computer Aided Design (CAD) and modeling software market and key to digitization
- It improves on traditional CAD drawings by not only including geometry, but also information that helps in technical and budget calculations
- BIM also refers broadly to the collaborative processes between and or within companies to leverage the value of the models throughout the building design & lifecycle
- Helps create, construct, manage and operate projects more economically and with less environmental impact

Customer requirements

Business

- High value business

Efficiency

- Reduce time and effort required for work.
- Pain: disconnected tools and incapability to share and interact with each other

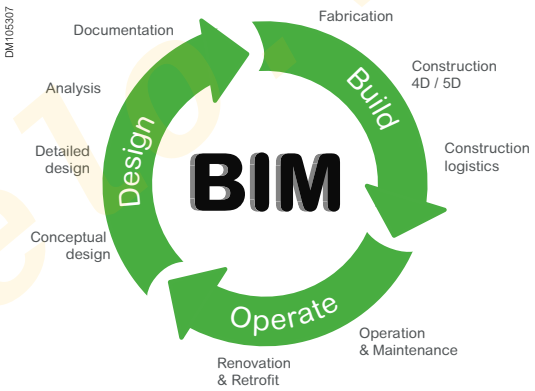
Collaboration

- Project management across multiple design environment, colleagues and stakeholders is inefficient and not productive.
- Pain: no collaborative platform to support seamless experience for electrical industry to perform electrical tasks and share across companies and geographies.

Benefits of BIM

- Save time on designs
- Decrease project costs
- Improves co-ordination and collaboration
- Minimizes risk
- Helps to easily maintain building lifecycle

BIM and the Building Lifecycle



SM6 24 & SM6 36 BIM repositories

- BIM Object SM6 24 :
  http://bimobject.com/fr/schneider/product/sm6-24
- BIM Object SM6 36 :
  https://bimobject.com/en/schneider/product/sm6-36

SM6 3D drawing

- **Objective** :
  3D drawings are useful for the our partners (contractor & panel builders) for simulating the installation conditions (fixation points, connection points etc) in a 3D environment.
- **Customer values:**
  Reduction of design time. Reduce chances of mistake at installation site.

TracePartOnline application

TracePartsOnline is an accessible component library that includes free 2D CAD drawings & 3D models from Schneider Electric's SM6 offering.

The components are available in different standard formats (ISO, DIN, ANSI, etc.) and also in all formats compatible with native CAD software including PTC Creo Parametric, SolidWorks, CATIA, Pro / Engineer, Inventor, Solid Edge, TopSolid, thinkdesign, Unigraphics, Alibre Design, ACIS, STEP, IGES, DWG, DXF, ...

This platform allows engineers and designers to download and use the CAD files of this offer directly.

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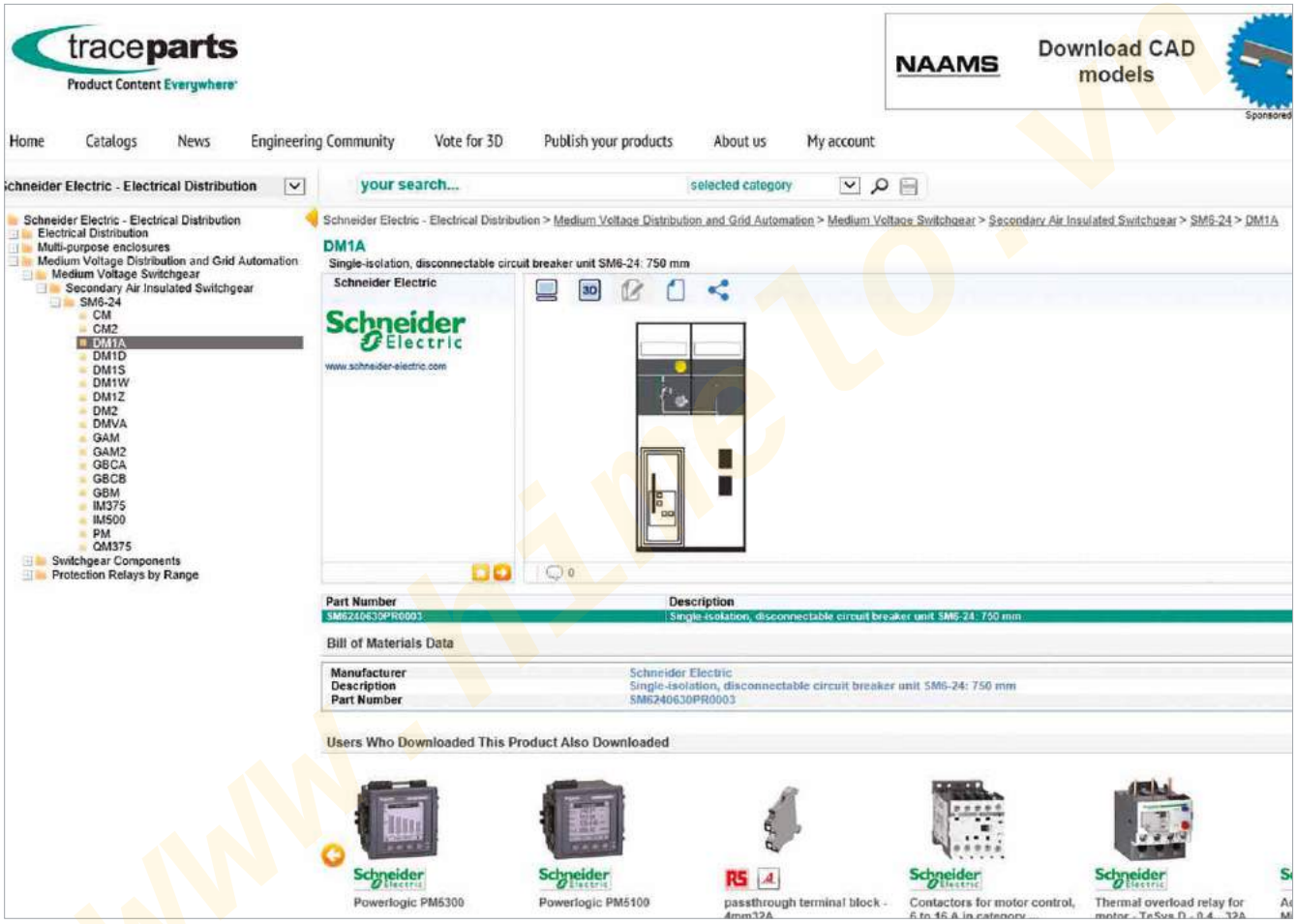


Presentation

Presentation

Contents

The experience of a world leader

The Schneider Electric experience's extends over forty years in factory-built cubicles and over thirty years in SF6 breaking technology for Medium Voltage switchgear.

This experience means that today Schneider Electric can propose a complementary range: vacuum type circuit breaker cubicles up to 24 kV and standard or enhanced internal arc withstand cubicles to reinforce the safety of people according to the IEC standard.

This gives you the advantage of unique experience, that of a world leader, with over 2,500 000 SF6 Medium Voltage units installed throughout the world.

Putting this experience at your service and remaining attentive to your requirements is the spirit of active partnership that we want to develop in offering you the SM6.

The modular SM6 is a range of harmonised cubicles equipped with SF6 or vacuum breaking technology switchgear with 30 years life span.

These cubicles allow you to produce all your Medium Voltage substation requirements up to 36 kV by superposing their various functions.
The result of in-depth analysis of your requirements, both now and in the future, SM6 cubicles mean that you can take advantage of all the features of both a modern and proven technology.

PM105325

1975 - Innovation:

Sulphur hexafluoride (SF6) is first used in an MV switch for an MV/LV transformer substation, with the VM6.

1989 - Experience:

Over 300,000 VM6 cubicles equipped networks throughout the world.

1991 - Innovation and Experience:

Cumulated with the second generation of SM6 modular SF6 cubicles.

2015 - A leading position:

With over 1,500 000 SM6 cubicles installed around the world, Schneider Electric consolidates its position as uncontested leader in the Medium Voltage field.

The references of a leader

SM6, a world-wide product

Asia/Middle East

- Canal Electrical Distribution Company, Egypt
- General Motors Holden, Australia
- Pasteur Institute, Cambodia
- Tian he City, China
- Sanya Airport, China
- Bank of China, Beijing, Jv Yanta, China
- Plaza Hotel, Jakarta, Indonesia
- Bali Airport, Indonesia
- Wakasa Control Center, Japan
- Otaru Shopping center, Japan
- New City of Muang, Thong Than, Kanjanapas, Thailand
- Danang and Quinhon Airport, Vanad, Vietnam
- British Embassy, Oman
- KBF Palace Riyadh, Saudi Arabia
- Raka Stadium, Saudi Arabia
- Bilkent University, Turkey
- TADCO, BABOIL development, United Arab Emirates
- Melbourne Tunnel City Link, Australia
- Campus KSU Qassim Riyad, Saudi Arabia

Africa

- ONAFEX, Hilton Hotel, Algeria
- Yaounde University, Cameroon
- Karoua Airport, Cameroon
- Libreville Airport, Gabon
- Ivarto Hospital, CORIF, Madagascar
- Central Bank of Abuja, ADEFEMI, Nigeria
- OCI Dakar, Oger international, CGE, Senegal
- Bamburi cement Ltd, Kenya
- Ivory Electricity Company, Ivory Coast
- Exxon, New Headquarters, Angola

South America/Pacific

- Lamentin Airport, CCIM, Martinique
- Space Centre, Kourou, Guyana
- Mexico City Underground System, Mexico
- Santiago Underground System, Chile
- Cohiba Hotel, Havana, Cuba
- Iberostar Hotel, Bavaro, Dominican Republic
- Aluminio Argentino Saic SA, Argentina
- Michelin Campo Grande, Rio de Janeiro, Brazil
- TIM Data Center, São Paulo, Brazil
- Light Rio de Janeiro, Brazil
- Hospital Oswaldo Cruz, São Paulo, Brazil

Europe

- Stade de France, Paris, France
- EDF, France
- Eurotunnel, France
- Nestlé company headquarters, France
- TLM Terminal , Folkestone, Great Britain
- Zaventem Airport, Belgium
- Krediebank Computer Centre, Belgium
- Bucarest Pumping station, Romania
- Prague Airport, Czech Republic
- Philipp Morris St Petersburg, Russia
- Kremlin Moscow, Russia
- Madrid airport, Spain
- Dacia Renault, Romania
- Lafarge cement Cirkovic, Czech Republic
- Caterpillar St Petersburg, Russia
- Ikea Kazan, Russia
- Barajas airport, Spain
- Coca-cola Zurich, Switzerland

The range's advantages

Ease and safe to operate

SM6, a proven range

- A three position switch to block incorrect switching
- The earthing disconnector has full closing capacity
- Positive breaking of position indicators
- Internal arc withstand in the cable and connection compartments
- Clear and animated display diagrams
- Switching lever with an "anti-reflex" function
- Compartmented cubicles.

SM6: a range designed with control and monitoring in mind

SM6 switchgear is perfectly adapted to control and monitoring applications. Motorised, either when installed or at a later date on-site without any interruption in service, SM6 combines with the Easergy T200 remote control interface. You therefore benefit from a ready-to connect unit that is easy to incorporate providing guaranteed switchgear operation.

Compactness

SM6, an optimised range

- Compact units, with low increment cubicles
- Rationalised space requirement for switchboard installation
- Reduction of civil works costs
- Easy integration in factory-built outdoor substations for which the SM6 is particularly well designed.

Upgradability

SM6, a comprehensive range

- A comprehensive offer covering your present and future requirements
- A design adapted to the extension of your installations
- A catalogue of functions for all your applications
- A product designed to be in compliance with standards constraints
- Options to anticipate the control and monitoring of your installations.

Maintenance

SM6, a range with reduced maintenance

- The active parts (breaking and earthing) are integrated in an SF6-filled, "sealed for life" unit
- The control mechanisms, are intented to function with reduced maintenance under normal operating conditions
- Enhanced electrical endurance when breaking.

EcoStruxure™ ready solutions

What is EcoStruxure™?

450 000

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

EcoStruxure™ ready

Efficient asset management

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

24/7 connectivity

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

Increased protection

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

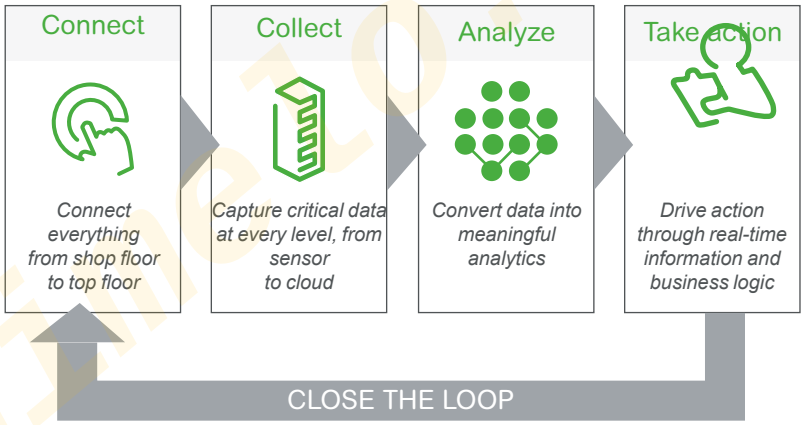
The EcoStruxure™ architecture and interoperable technology platform bring together energy, automation, and software. It provides enhanced value around safety, reliability, efficiency, sustainability, and connectivity.

Turn data into action

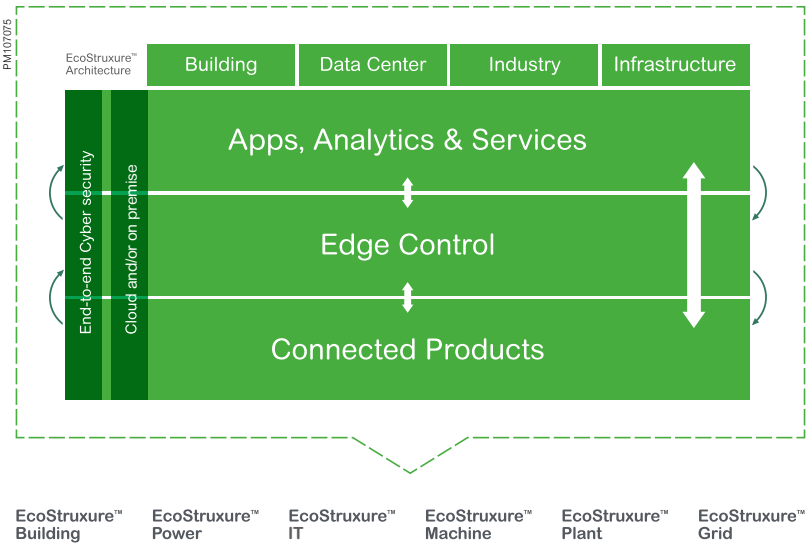
EcoStruxure™ architecture lets customers maximize the value of data.

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™
Innovation At Every Level



EcoStruxure™ ready solutions

EcoStruxure Power

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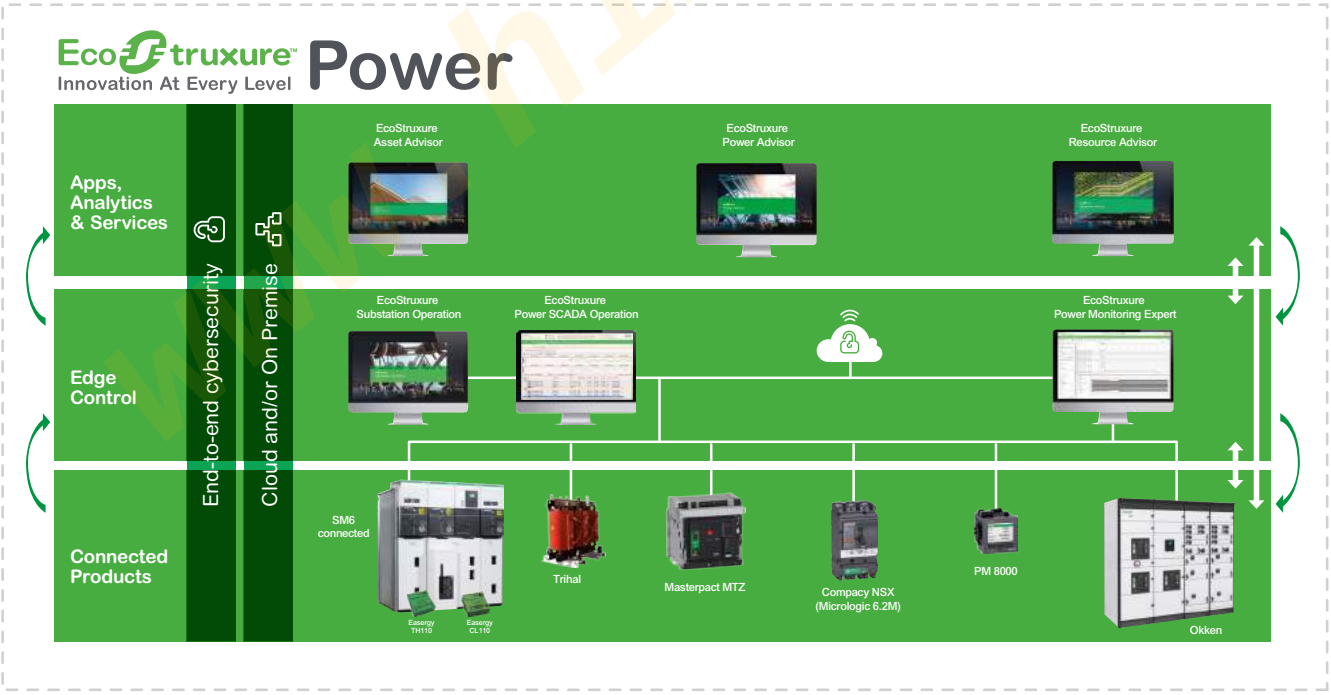


EcoStruxture™ ready solutions

EcoStruxure™ Asset Advisor

PM106675

Asset Advisor Dashboard

PM106676

Asset Health Matrix

Schneider Electric approach cybersecurity as a group...

- Data collected through secured gateways
- Secured data transport to prevent data access or manipulation
- Your data are hosted in Schneider Electric Data Center
- Results displayed on secured dashboard (reports, diagnostics, notifications...
- You remain the owner of your data.

Click **here** to download the free version of

EcoStruxure Asset Advisor

Apps, analytics & services to improve operational efficiency

Imagine having access to key data about your electrical distribution equipment whenever you need it. And experienced professionals who can help you make better informed decisions.

That's what you get with EcoStruxure Asset Advisor from the Schneider Electric connected service.

You know exactly which assets need to be serviced or replaced. So you can better plan your expenses.

Are you...

- Planning to introduce Condition Base Maintenance (beyond corrective and regular maintenance) with benefits associated with reduced time to address an issue?
- Looking for innovative solutions to scale their corporate reliability programs? Mostly started on rotary machines before.
- Striving to dive into IoT complexity with actionable deliverables (not operational alarming)? Or get them defined by the manufacturer.

Our EcoStruxure Asset Advisor solution

- Support your journey into predictive maintenance
- Designed for risk of failure mitigation and maintenance optimization
- Turning your data into short term actions and long-term decisions
- Our platform is ready-to-use by plug-in connectable electrical assets under our flexible model.
- EcoStruxure Asset Advisor brings tangible benefits on failure risk mitigation and maintenance optimization.

Operational Performance

- Lower unscheduled downtimes
- Increased asset useful life
- Reduce time to fix
- Better compliance with regulations

Financial Efficiency

- Lower Total cost of Ownership (TCO)
- Decreased failure cost
- Decreased average maintenance cost/fix

Safety

- Reduced personal risk through:
  - Maintenance expertise and continuity in high turnover environment
  - Early warming of impending equipment failures

Peace of Mind

- New asset ecosystem insights
- Consistent on-site experience
- Right people at the right time

Protecting the environment

Schneider Electric's recycling service for SF6 products is part of a rigorous management process.

Environmental performance

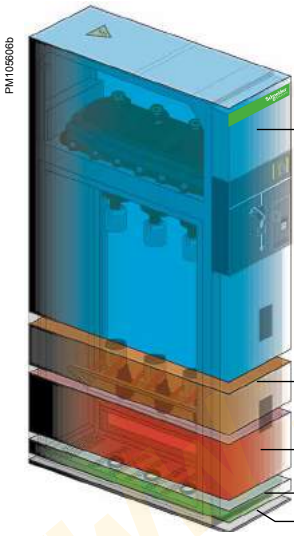
Schneider Electric is committed to a long-term environmental approach.

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 SF6 recycling solutions. Up to 98% of its equipment can be recycled for re-use.

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

- The materials used, insulators and conductors are identified, easily separable and recyclable
- The SF6 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 Air Insulated Switchgear has been assessed and recognised as conforming to the requirements of the ISO 14001 standard.



	24 kV		36 kV	
	Switch unit	Circuit breaker unit	Switch unit	Circuit breaker unit
Ferrous metal	**84%**	**65%**	**74%**	**82 %**
Non-ferrous metal	**4%**	**10.6%**	**8%**	**7.8 %**
Thermohardening	**9.5%**	**22%**	**15%**	**8 %**
Thermoplastics	**2.35%**	**2.3%**	**2%**	**2 %**
Fluid	**0.15%**	**0.1%**	**1%**	**0.2 %**

The environmental management system adopted by Schneider Electric production sites that produce the SM6 have been assessed and judged to be in conformity with requirements in the ISO 14001 standard.

Quality assurance

Quality certified to ISO 9001

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.

But it is above all its strict application that has enabled recognition to be obtained by an independent organisation:
The **F**rench **Q**uality **A**ssurance **A**ssociation (**FQAA**).

The quality system for the design and manufacture of SM6 units has been certified in conformity with the requirements of the ISO 9001: 2000 quality assurance model.

PM105608

Meticulous and systematic controls

During manufacture, each SM6 is subject to systematic routine testing which aims to check the quality and conformity:

- Sealing testing
- Filling pressure testing
- Opening and closing rate testing
- Switching torque measurement
- Dielectric testing
- Conformity with drawings and plans.

The results obtained are written and reported on the test certificate for each device by the quality control department.

PM105607

Mean Operating Time To Failure (MTTF)

As result of Schneider Electric quality assurance system, SM6 has negligible "Mean Down Time (MDT)" in comparison to the "Mean Up Time (MUT)", thus "Mean Operating Time Between Failures (MTBF)" is as similar as to the MTTF.

- MTTF (cumulative) = 3890 years for SM6-24
- MTTF (cumulative) = 6259 years for SM6-36.

Schneider Electric Services

Peace of mind throughout your installation life cycle

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

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

Life Cycle Services

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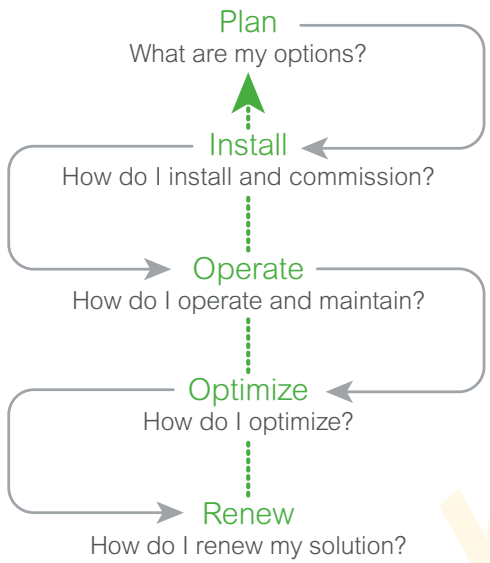

When it comes to your electrical distribution installation, we can help you:

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

CONTACT US!

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

Plan

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

- **Technical feasibility studies:** Accompany customer to design solution in his given environment.
- **Preliminary design:** Accelerate turn around time to come to a final solution design.

Install

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

- **Project Management:** Designed to help you complete your projects on time and within budget.
- **Commissioning:** Ensures your actual performance versus design, through on site testing & commissioning, tools & procedures.

Operate

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

- **Asset Operation Solutions:** The information you need to increase safety, enhance installation training performance, and optimise asset maintenance and investment.
- **Advantage Service Plans:** Customised services plans which cover preventive, predictive and corrective maintenance.
- **On site Maintenance services:** Extensive knowledge and experience in electrical distribution maintenance. For Diagnosis services see on pages from F1 to F3.
- **Spare parts management:** Ensure spare parts availability and optimised maintenance budget of your spare parts.
- **Technical Training**: To build up necessary skills and competencies in order to properly operate your installations in safety.

Optimise

Schneider Electric propose recommendations for improved safety, availability, reliability & quality.

- **MP4 Electrical Assessment:** Define improvement & risk management program.

Renew

Schneider Electric extends the life of your system while providing upgrades. Schneider Electric offers to take full responsibility for the end-of-life processing of old electrical equipments.

- **ECOFIT™:** Keep up to date & improve performances of your electrical installations (LV,MV, Protection Relays…).
- **MV product End of life:** recycle & recover outdated equipment with end of life services.

Frequency of maintenance intervention

Schneider Electric equipment manufacturers recommend a schedule for maintenance activities to extend Electrical Distribution equipment performance over time. Frequencies under normal/healthy operation (minor equipment criticality and optimal environmental conditions) can be generally defined as follows:

Maintenance	Minimal frequency (1) (every)	Who		
		Manufacturer	Certified Partner	End user
Exclusive	4 years	☒		
Advanced	2 years	☒	☒	
Light	1 years	☒	☒	☒

(1) Recommended under normal operating conditions (minor equipment criticality and optimal environmental conditions).However, this recommended frequency should increased according to: a) the level of criticality (low, major, critical) b) the severity of environment conditions (i.e. corrosive, naval, offshore) following recommendations of Manufacturer's services.

QRcode for SM6 functions

SM6 24 kV cubicle		SM6 36 kV cubicle	
circuit breaker function	DM105311	circuit breaker function	DM105315
switch function	DM105312	switch function	DM105316
fuse-switch function	DM105313	fuse-switch function	DM105317
other functions	DM105314	other functions	DM105318

General characteristics

General characteristics

Contents

Field of application

The SM6 is made up of modular units containing fixed, disconnectable or withdrawable metal-enclosed switchgear, using sulphur hexafluoride (SF6) or vacuum:

- Switch-disconnector
- SF1, SFset or Evolis circuit breaker
- Vacuum contactor
- Disconnector.

SM6 units are used for the MV section in MV/LV transformer substations in public distribution systems and MV consumer or distribution substations up to 36 kV.

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PM103309

PM102377

MV/LV transformer substations

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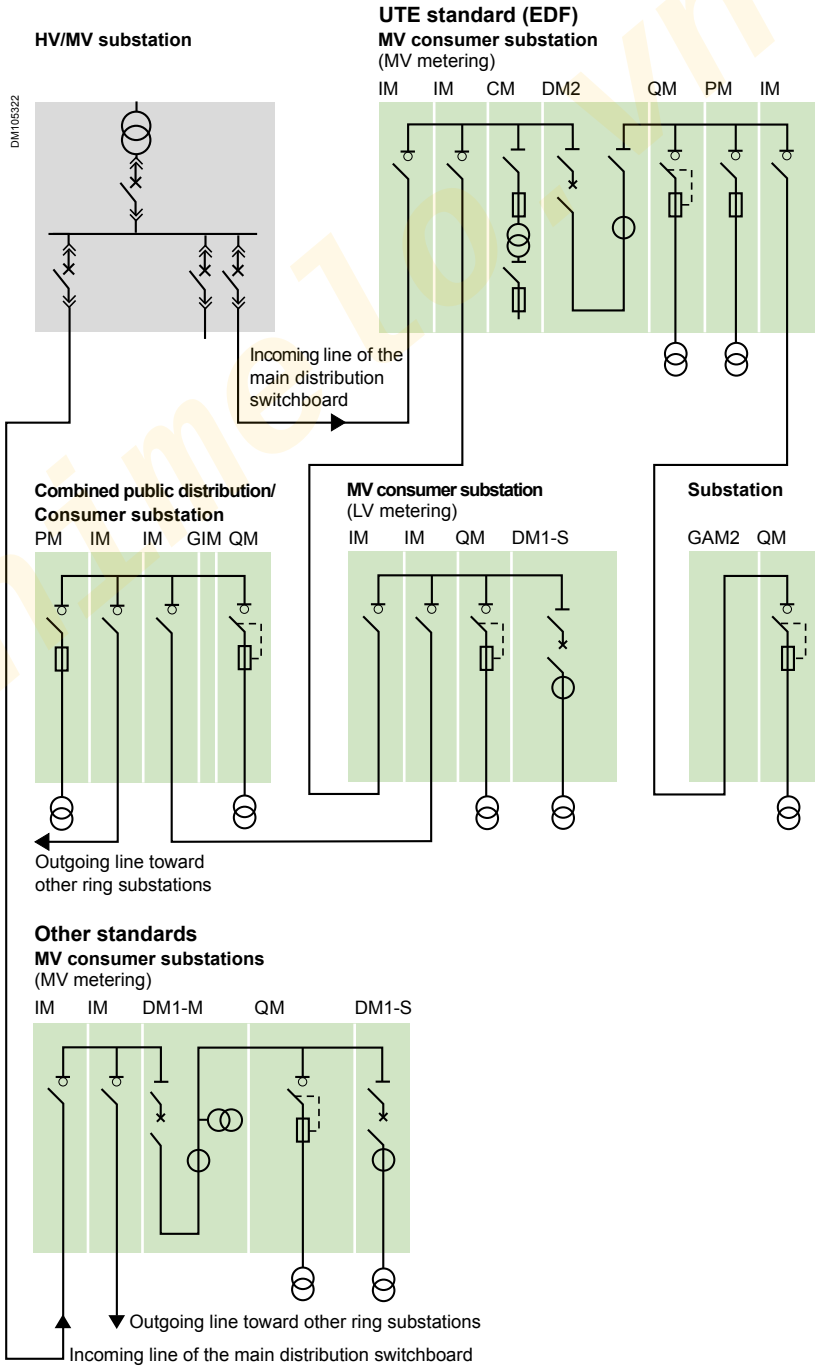

Field of application

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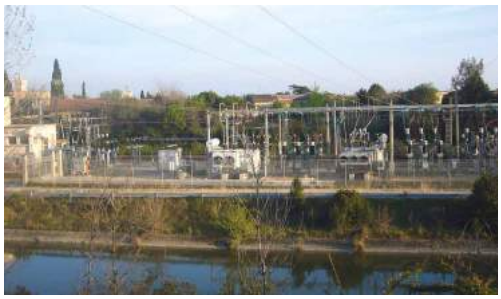

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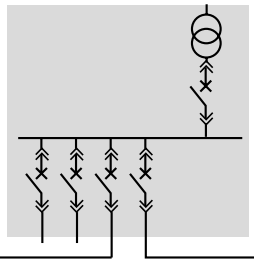
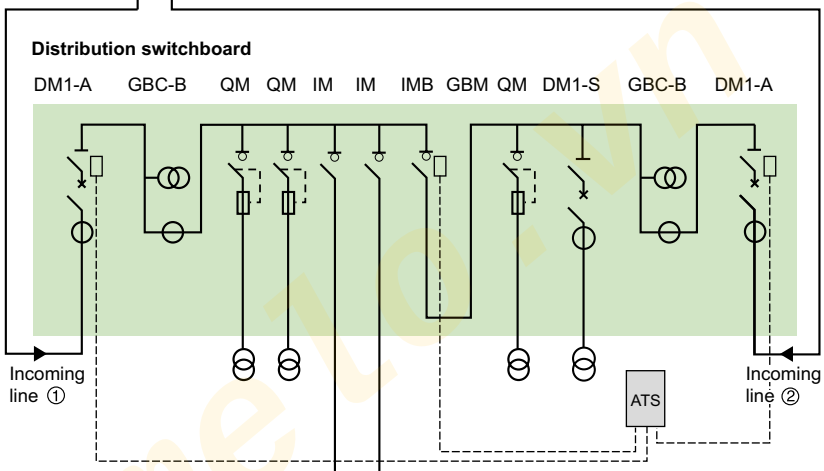
Industrial distribution substations

HV/MV substation

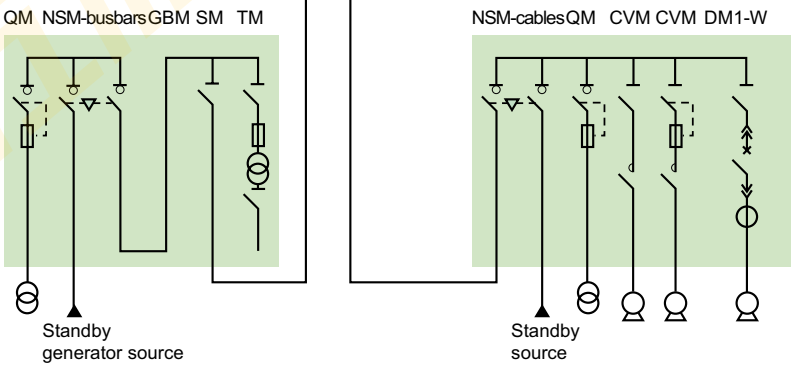
DE59200EN-LG



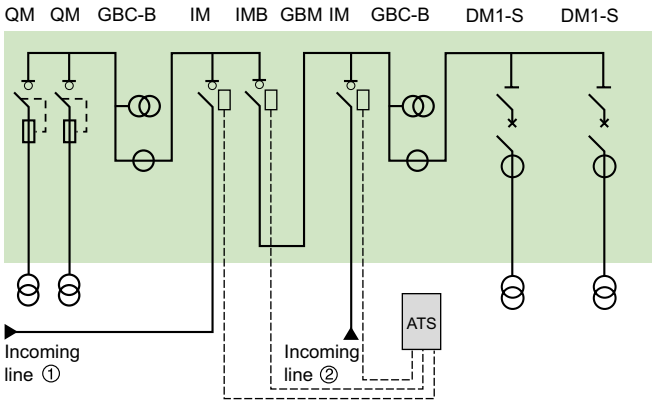
Distribution switchboard



MV/LV transformer substations



Distribution switchboard



ATS: Automatic Transfer System

Unit definitions

Below is the list of SM6 units used in MV/LV transformer substations and industrial distribution substations:

- **IM, IMC, IMB, IMM** switch
- **PM** fused switch
- **QM, QMC, QMB** fuse-switch combination
- **CVM** contactor and contactor with fuses
- **DM1-M, DM1-A, DM1-D, DM1-S** single-isolation disconnectable SF6 type circuit breaker
- **DMV-A, DMV-D,** single-isolation vacuum type circuit breaker frontal
- **DMVL-A, DMVL-D** single-isolation disconnectable vacuum type circuit breaker lateral
- **DM1-W, DM1-Z** withdrawable single-isolation SF6 type circuit breaker for SM6-24
- **DM2** double-isolation disconnectable SF6 type circuit breaker
- **CM, CM2** voltage transformers
- **GBC-A, GBC-B** current and/or voltage measurements
- **NSM-cables** for main incoming and standby
- **NSM-busbars** for main incoming and cables for standby
- **GIM** intermediate bus unit
- **GEM** extension unit
- **GBM** connection unit
- **GAM2, GAM** incoming cable connection unit
- **SM** disconnector
- **TM** MV/LV transformer unit for auxiliaries
- Other units, consult us
- Special function **EMB** busbar earthing only for SM6-24.

Units for switching function

Switching

New!

See in details on page

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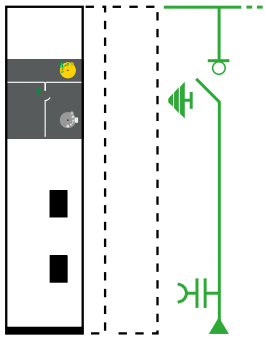

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IM
Switch unit
SM6-24: 375 or 500 mm
SM6-36: 750 mm

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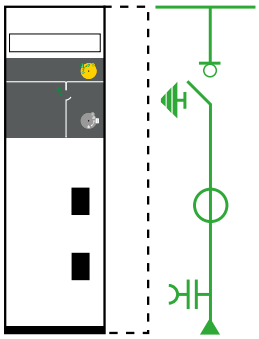
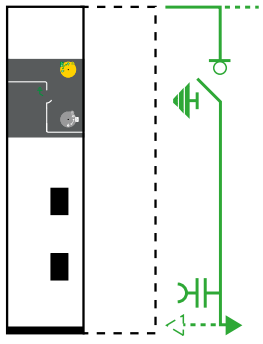


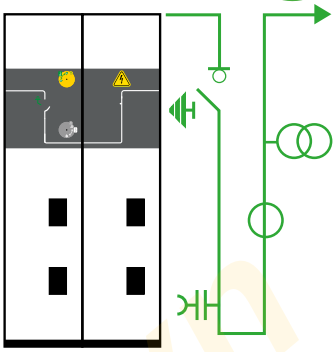
IMC
Switch unit
SM6-24: 500 mm
SM6-36: 750 mm

DM105329



IMB
Switch unit
with earthing disconnector
right or left outgoing line
SM6-24: 375 mm
SM6-36: 750 mm

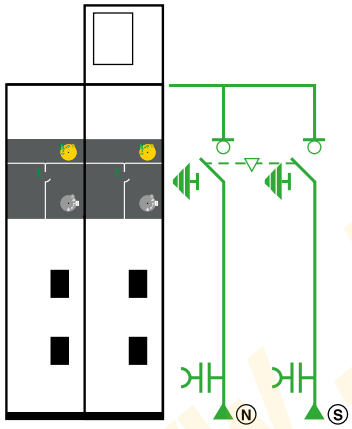
DM105330



IMM
Switch and measurement unit,
right or left outgoing line
SM6-24: 750 mm

Automatic transfer system

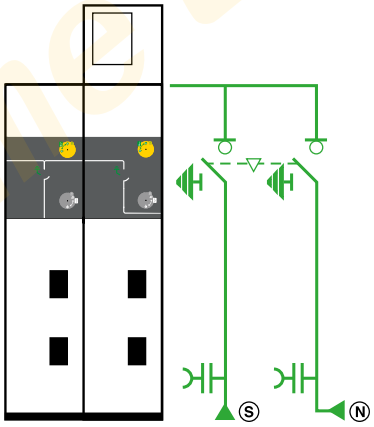
DM105331



45

NSM-cables
Cables power supply
for main incoming line
and standby line
SM6-24: 750 mm

DM105332



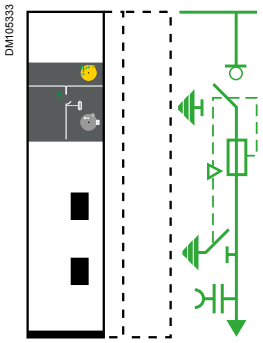
NSM-busbars
Busbars power supply
for main incoming line on right or left
and cables for standby line
SM6-24: 750 mm

New! NOTE: the new feature is serviced for SM6-24

Units for protection function

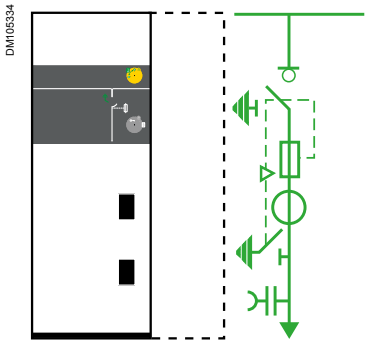
Fuse-switch

See in details on page

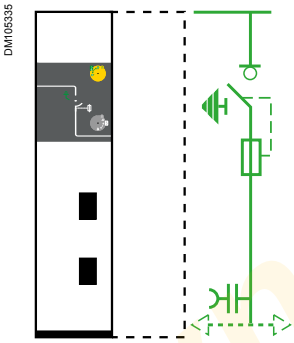


46

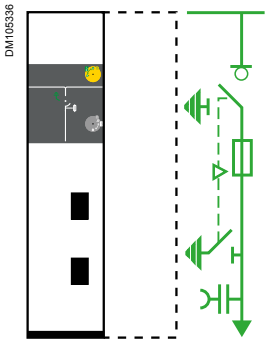
QM
Fuse-switch combination unit
SM6-24: 375 or 500 mm
SM6-36: 750 mm



QMC
Fuse-switch combination unit
SM6-24: 625 mm
SM6-36: 1000 mm



QMB
Fuse-switch combination unit
right or left outgoing line
SM6-24: 375 mm
SM6-36: 750 mm

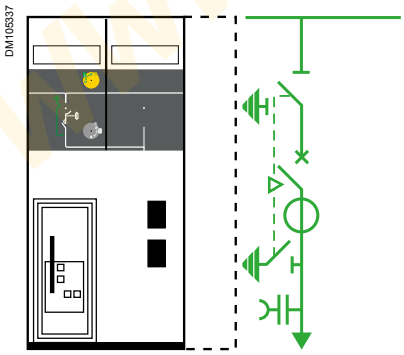


47

PM
Fuse-switch unit
SM6-24: 375 mm
SM6-36: 750 mm

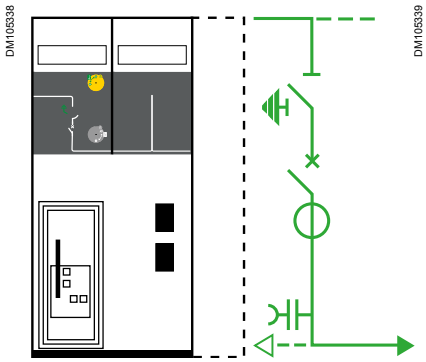
SF6 circuit-breaker

New!

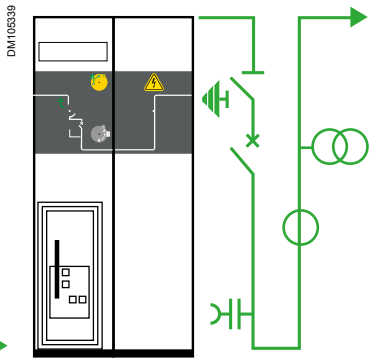


48

DM1-A
Single-isolation, disconnectable circuit breaker unit
SM6-24: 750 mm
SM6-36: 1000 mm



DM1-D
Single-isolation, disconnectable circuit breaker unit
right or left outgoing line
SM6-24: 750 mm
SM6-36: 1000 mm

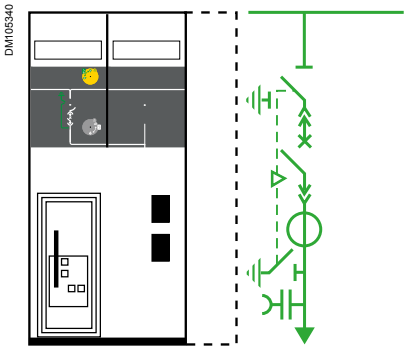


DM1-M
Single-isolation,disconnectable circuit breaker and measurement unit
right outgoing line
SM6-24: 750 mm

Units for protection function

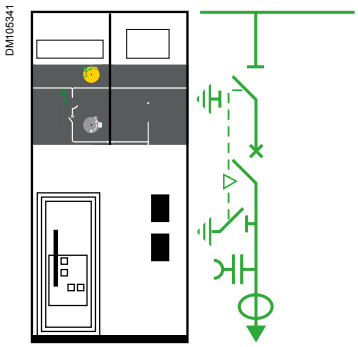
SF6 circuit-breaker

See in details on page

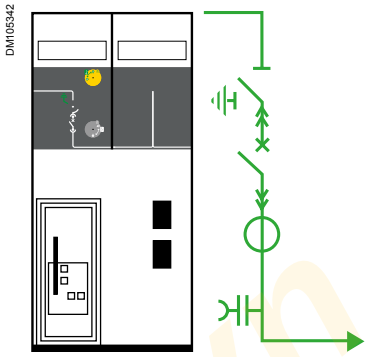


49
50

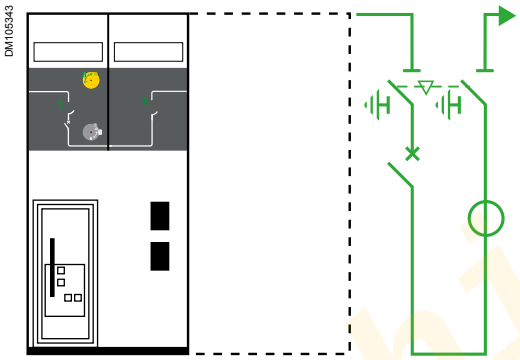
DM1-W
Withdrawable single-isolation circuit breaker unit
SM6-24: 750 mm



DM1-S
Single-isolation, disconnectable circuit breaker unit with autonomous protection
SM6-24: 750 mm



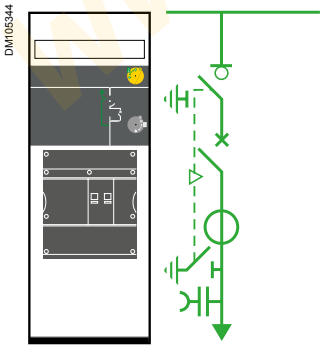
DM1-Z
Withdrawable single-isolation circuit breaker unit right outgoing line
SM6-24: 750 mm



49

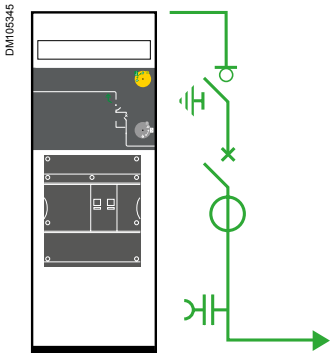
DM2
Double-isolation, disconnectable circuit breaker unit right or left outgoing line
SM6-24: 750 mm
SM6-36: 1500 mm

Vacuum circuit-breaker



51

DMV-A
Single-isolation circuit breaker unit
SM6-24: 625 mm



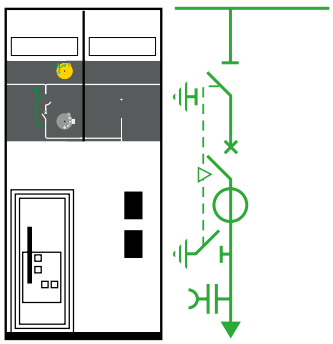
DMV-D
Single-isolation circuit breaker unit right outgoing line
SM6-24: 625 mm

Units for protection function

Vacuum circuit-breaker

See in details on page

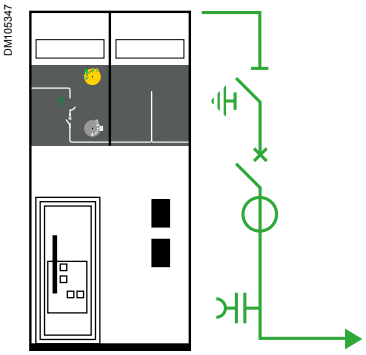
DM105346



52

DMVL-A
Single-isolation, disconnectable circuit breaker unit
SM6-24: 750 mm

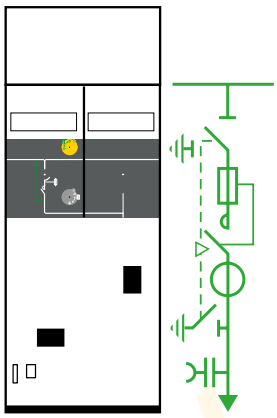
DM105347



DMVL-D
Single-isolation, disconnectable circuit breaker unit right outgoing line
SM6-24: 750 mm

Vacuum contactor (Direct Motor Starter)

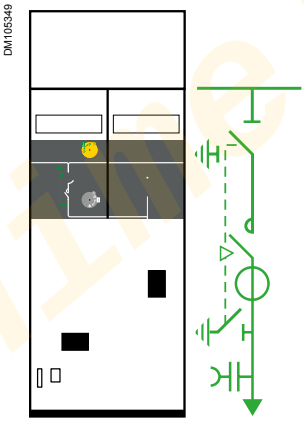
DM105348



53

CVM
Fuse-contactor unit
SM6-24: 750 mm

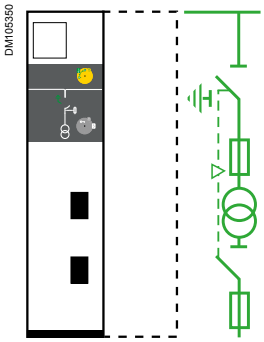
DM105349



CVM
Contactor unit
SM6-24: 750 mm

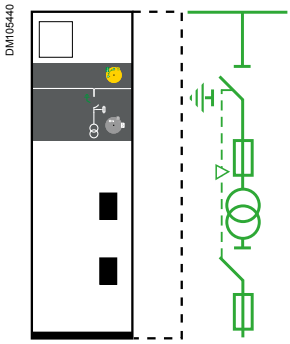
Units for metering function

See in details on page

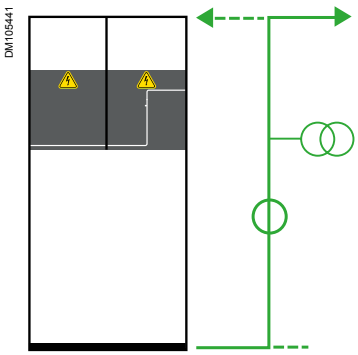


54

CM
Voltage transformers for mains with earthed neutral system
SM6-24: 375 mm
SM6-36: 750 mm



CM2
Voltage transformers for mains with insulated neutral system
SM6-24: 500 mm
SM6-36: 750 mm



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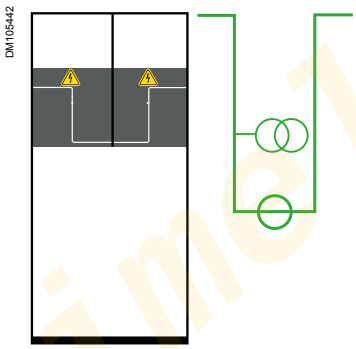
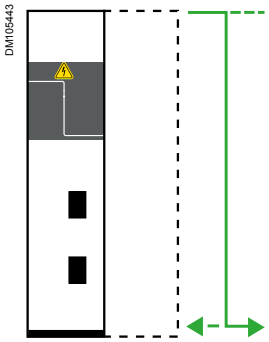
GBC-A
Current and/or voltage measurement unit right or left outgoing line
SM6-24: 750 mm
SM6-36: 750 mm



GBC-B
Current and/or voltage measurement unit
SM6-24: 750 mm
SM6-36: 750 mm

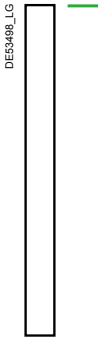
Units for other functions

See in details on page

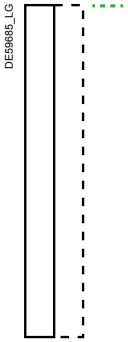


56

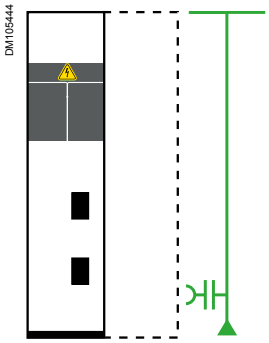
GBM
Connection unit right or left outgoing line
SM6-24: 375 mm
SM6-36: 750 mm



GEM
Extension unit VM6/SM6
SM6-24: 125 mm



GIM
Intermediate bus unit
SM6-24: 125 mm
SM6-36: 250 mm



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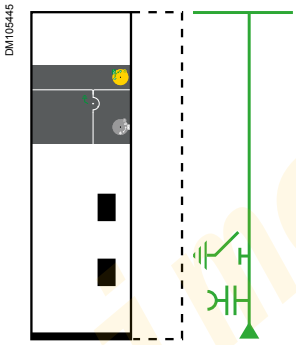
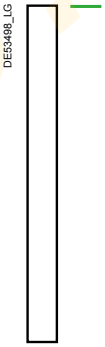
GAM2
Incoming cable-connection unit
SM6-24: 375 mm
SM6-36: 750 mm

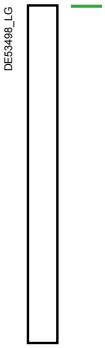


GAM
Incoming cable-connection unit with earthing
SM6-24: 500 mm
SM6-36: 750 mm

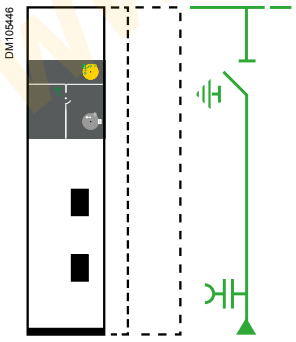
GFM
Extension unit Fluokit M24/M24+ /M9/SM6-24
SM6-24: 125 mm
Fluokit M36/SM6-36
SM6-36: 250 mm



GMM
Extension unit Modularc/ SM6-36
SM6-36: 250 mm



GUM
Extension unit Unifluorc/ SM6-24
SM6-24: 125 mm



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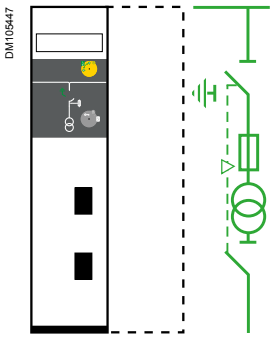
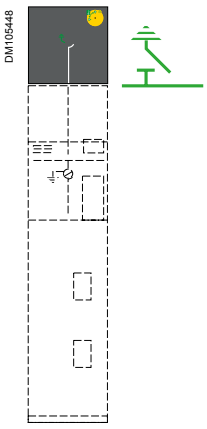
SM
Disconnector unit
SM6-24: 375 mm or 500 (1) mm
SM6-36: 750 mm
(1) only for 1250 A units.



TM
MV/LV transformer unit for auxiliaries
SM6-24: 375 mm
SM6-36: 750 mm



EMB
Busbar earthing enclosure
SM6-24: 375 mm

Operating conditions

In addition to its technical characteristics, SM6 meets requirements concerning safety of life and property as well as ease of installation, operation and protecting the environment.

SM6 units are designed for indoor installations.
Their compact dimensions are:
- 375 to 1500 mm width
- 1600 to 2250 mm height
- 840 to 1400 mm depth…

… this makes for easy installation in small rooms or prefabricated substations.
Cables are connected via the front.

All control functions are centralised on a front plate, thus simplifying operation.
The units may be equipped with a number of accessories (relays, toroids, instrument transformers, surge arrester, control and monitoring, etc.).

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Normal operating conditions

- **Ambient air temperature:**

1) less than or equal to 40°C
2) less than or equal to 35°C on average over 24 hours
3) greater or equal to –5°C.

- **Altitude**

1) less than or equal to 1000 m
2) above 1000 m, a derating coefficient is applied (please consult us).

- **Solar radiation**

1) no solar radiation influence is permitted.

- **Ambient air pollution**

1) no significant pollution by dust, smoke, corrosive and/or flammable gases, vapours or salt.

- **Humidity**

1) average relative humidity over a 24 hour period, less than or equal to 95%
2) average relative humidity over a 1 month period, less than or equal to 90%
3) average vapor pressure over a 24 hour period, less than or equal to 2.2 kPa
4) average vapor pressure over a 1 month period, less than or equal to 1.8 kPa.

For these conditions, condensation may occasionally occur. Condensation can be expected where sudden temperature changes occur in periods of high humidity.

To withstand the effects of high humidity and condensation, such as breakdown of insulation, please pay attention on Civil Engineering recommendations for design of the building or housing, by suitable ventilation and installation.

- **Seismic (for 24 Kv and 36 kV):**

1) Up to 0.5 g (horizontal) and 0.4 g (vertical)
2) Class 2 for 24 kV and Class 1 for 36kV
3) According to standards IEEE-693/2005 and EN 60068-3/1993 for the 24 kV and 36 kV

Severe operating conditions (please consult us).

Standards

SM6 units meet all the following standards and specifications:

- IEC standards
- UTE standards for SM6-24
- EDF specifications for SM6-24
- SEISMIC standards for 24 kV

IEC standards

62271-200	High-voltage switchgear and controlgear - Part 200: A.C. metal-enclosed switchgear and controlgear for rated voltage above 1 kV and up to and including 52 kV.
62271-1	High-voltage switchgear and controlgear - Part 1: Common specifications.
62271-103	High voltage switches - Part 1: switches for rated voltages above 1 kV and less or equal to 52 kV.
62271-105	High-voltage switchgear and controlgear - Part 105: High voltage alternating current switch-fuse combinations.
60255	Electrical relays.
62271-100	High-voltage switchgear and controlgear - Part 100: High-voltage alternating current circuit breakers.
62271-102	High-voltage switchgear and controlgear - Part 102: High-voltage alternating current disconnectors and earthing switches.
61869-2	Instrument transformers - Part 1: Current transformers.
61869-3	Instrument transformers - Part 2: Voltage transformers.
60044-8	Instrument transformers - Part 8: Low Power Current Transducers.
62271-206	High-voltage prefabricated switchgear and controlgear assemblies - Voltage presence indicating systems.
62271-304	High-voltage switchgear and controlgear - Part 304: Design classes for indoor enclosed switchgear and controlgear for rated voltages above 1 kV up to and including 52 kV to be used in severe climatic conditions.

SEISMIC standards for 24kV

IEE-693	2005 IEEE Recommended Practice for Seismic Design of Substations
EN600068-3-3	1993 Environmental testing-Part 3: guidance, Seismic test methods for equipments

UTE standards for 24 kV

NFC 13.100	Consumer substation installed inside a building and fed by a second category voltage public distribution system.
NFC 13.200	High voltage electrical installations requirements.
NFC 64.130	High voltage switches for rated voltage above 1 kV and less than 52 kV.
NFC 64.160.	Alternating current disconnectors and earthing switches

Main characteristics

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The hereunder values are for working temperatures from -5°C up to +40°C and for a setting up at an altitude below 1000 m.

Electrical characteristics

Rated voltage	Ur	kV		7.2	12	17.5	24	36
Insulation level								
Insulation	Ud	50/60 Hz, 1 min (kV rms)		20	28	38	50	70
Isolation	Ud	50/60 Hz, 1 min (kV rms)		23	32	45	60	80
Insulation	Up	1.2/50 µs (kV peak)		60	75	95	125	170
Isolation	Up	1.2/50 µs (kV peak)		70	85	110	145	195
Breaking capacity								
Transformer off load		A		16				
Cables off load		A		31.5				50
Rated current	Ir	A		400 - 630 -1250				630-1250
Short-time withstand current	Ik/tk (1)	kA/1 s	25	630 - 1250				1250
			20 (2)	630 - 1250				
			16	630 - 1250				
			12.5	400 - 630 - 1250				630-1250
Making capacity (50 Hz)	Ima	kA	62.5	630		NA		
			50	630				
			40	630				
			31.25	400 - 630				630
Maximum breaking capacity (Isc)								
Units IM, IMC, IMB, IMM (4)		A		630 - 800 (3)				630
NSM-cables, NSM-busbars		A		630 - 800 (3)				NA
QM, QMC, QMB		kA		25		20		20
PM		kA		25				20
CVM		kA		6.3	NA			
CVM with fuses		kA		25	NA			
SF6 circuit breaker range								
DM1-A, DM1-D, DM1-W (4), DM1-M (4)		kA	25	630-1250				1250
			20	630-1250				
DM1-S		kA	25	630				NA
DM1-Z			25	1250				NA
DM2		kA	20	630				
			25	630				1250
Vacuum circuit breaker range								
DMV-A, DMV-D		kA	25	630-1250			NA	
DMVL-A		kA	20	630				NA
DMVL-D		kA	25	630				NA

NA: Non Available
***(1)** 3 phases*
***(2)** In 20 kA/3 s for SM6-24 only, consult us*
***(3)** In 800 A, consult us.*
***(4)** NA for SM6-36*

Main characteristics

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Protection index:
- Classes: PI (insulating partition)
- Loss of service continuity classes: LSC2A (LSC1 for metering GAM/GBM functions)
- Units in switchboard: IP3X
- Between compartments: IP2X for SM6-24, IP2XC for SM6-36
- Cubicle: IK08 for SM6-24, IK07 for SM6-36.

Electro-magnetic compatibility:
- Relays: 4 kV withstand capacity, as per recommendation IEC 60801.4
- Compartments:

□ electrical field:
- 40 dB attenuation at 100 MHz
- 20 dB attenuation at 200 MHz

□ magnetic field: 20 dB attenuation below 30 MHz.

3) According to standards IEEE-693/2005 and EN 60068-3/1993

□ **for 36 kV** (please contact us).

Temperatures:

The cubicles must be stored and installed in a dry area free from dust and with limited temperature variations.
- For stocking: from -40°C to +70°C
- For working: from -5°C to +40°C
- Other temperatures, consult us.
- **Seismic:**

□ **for 24 kV** (option):

1) Up to 0.5 g (horizontal) and 0.4 g (vertical)

2) Class 2

Endurance

Units		Mechanical endurance	Electrical endurance
IM, IMC, IMB, IMM , PM, QM [5], QMC [5], QMB [5], NSM-cables, NSM-busbars		IEC 62271-103 1 000 operations class M1	IEC 62271-103 100 breaks at Ir, p.f. = 0.7, class E3
CVM	Disconnector	IEC 62271-102 1 000 operations	
	Vacuum contactor	IEC 60470 2 500 000 operations 250 000 with mechanical latching	IEC 60470 250 000 breaks at Ir
SF6 circuit breaker range			
DM1-A, DM1-D, DM1-M, DM1-W, DM1-Z, DM1-S, DM2	Disconnector	IEC 62271-102 1 000 operations	
	SF circuit breaker	IEC 62271-100 10 000 operations class M2	IEC 62271-100 30 breaks at 12.5 kA for SM6-24 25 breaks at 25 kA for SM6-24 40 breaks at 16 kA for SM6-36 15 breaks at 25 kA for SM6-36 10 000 breaks at Ir, p.f. = 0.7, class E2
		Operating sequence	O - 0.3 s - CO - 15 s - CO O - 0.3 s - CO - 3 mn O - 3 mn - CO - 3 mn - CO
Vacuum circuit breaker range			
DMV-A, DMV-D	Switch	IEC 62271-103 1 000 operations class M1	IEC 62271-103 100 breaks at Ir, p.f. = 0.7, class E3
	Evolis circuit breaker	IEC 62271-100 10 000 operations class M2	IEC 62271-100 100 breaks at 25kA for SM6-24 10 000 breaks at Ir, p.f. = 0.7, class E2
DMVL-A DMVL-D	Disconnector	IEC 62271-102 1 000 operations	
	Evolis circuit breaker	IEC 62271-100 10 000 operations class M2	IEC 62271-100 100 breaks at 16kA for SM6-24 100 breaks at 25kA for SM6-24 10 000 breaks at Ir, p.f. = 0.7, class E2

***(5)** As per recommendation IEC 62271-105, three breakings at p.f. = 0.2*

800 A under 36 kV; 1400 A under 24 kV; 1730 A under 12 kV; 2600 A under 5.5 kV.

Internal arc withstand (in accordance with IEC 62271-200):

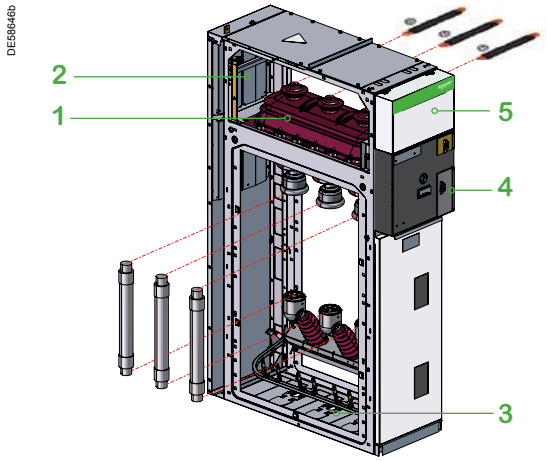
- SM6-24:

Basic	□ 12.5 kA 1 s, IAC: A-FL
Advance	□ 12.5 kA 1 s, IAC: A-FLR
	□ 16 kA 1 s, IAC: A-FLR & IAC: A-FL
	□ 20 kA 1 s, IAC: A-FLR & IAC: A-FL

- SM6-36: □ 16 kA 1 s, IAC: A-FL

Factory-built cubicles description

Switch and fuse protection cubicles



1 switchgear: switch-disconnector and earthing switch in an enclosure filled with SF6 and satisfying "sealed pressure system" requirements.

2 busbars: all in the same horizontal plane, thus enabling later switchboard extensions and connection to existing equipment.

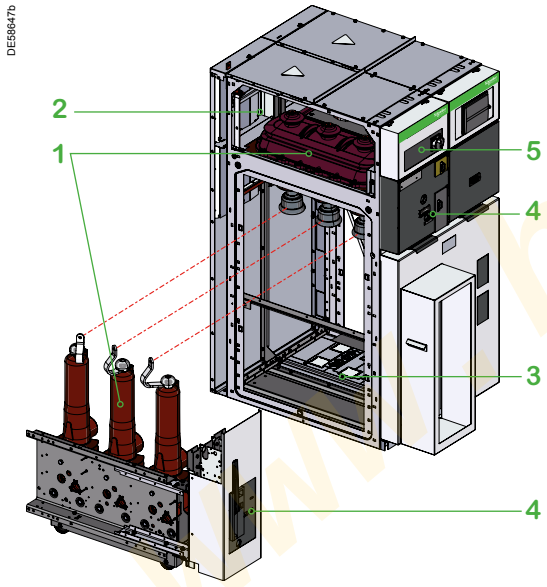
3 connection: accessible through front, connection to the lower switch-disconnector and earthing switch terminals (IM cubicles) or the lower fuse-holders (PM and QM cubicles). This compartment is also equipped with an earthing switch downstream from the MV fuses for the protection units.

4 operating mechanism: contains the elements used to operate the switch-disconnector and earthing switch and actuate the corresponding indications (positive break).

5 low voltage: installation of a terminal block (if motor option installed), LV fuses and compact relay devices.
If more space is required, an additional enclosure may be added on top of the cubicle.

Options: please, refer to the chapter "Characteristics of the functional units".

SF6 circuit breaker cubicles



1 switchgear: disconnector(s) and earthing switch(es), in enclosures filled with SF6 and satisfying "sealed pressure system" requirements.

2 busbars: all in the same horizontal plane, thus enabling later switchboard extensions and connection to existing equipment.

3 connection and switchgear: accessible through front, connection to the downstream terminals of the circuit breaker.
Two circuit breaker offers are possible:
- SF1: combined with an electronic relay and standard sensors (with or without an auxiliary power supply
- SFset: autonomous set equipped with an electronic protection system and special sensors (requiring no auxiliary power supply).

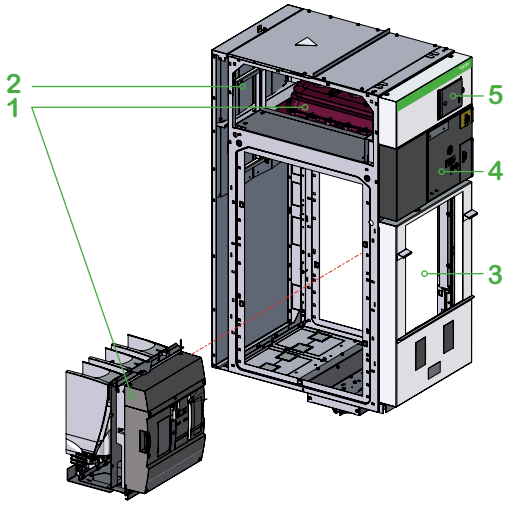
4 operating mechanism: contains the elements used to operate the disconnector(s), the circuit breaker and the earthing switch and actuate the corresponding indications.

5 low voltage: installation of compact relay devices (Statimax) and test terminal boxes. If more space is required, an additional enclosure may be added on top of the cubicle.

Options: please, refer to the chapter "Characteristics of the functional units".

Factory-built cubicles description

DE58648b



Frontal vacuum type circuit breaker cubicles

1 switchgear: load break switch and earthing switch(es), in enclosure filled with SF6 and satisfying and one vacuum circuit breaker, "sealed pressure system" requirements.

2 busbars: all in the same horizontal plane, thus enabling later switchboard extensions and connection to existing equipment.

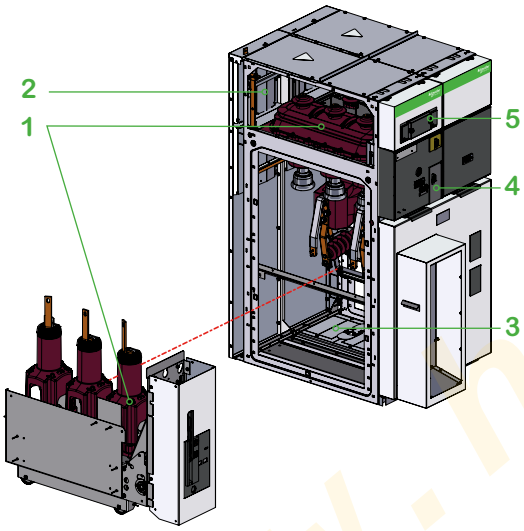
3 connection and switchgear: accessible through front, connection to the downstream terminals of the circuit breaker.
- Evolis: device associated with an electronic relay and standard sensors (with or without auxiliary source).

4 operating mechanism: contains the elements used to operate the disconnector(s), the circuit breaker and the earthing switch and actuate the corresponding indications.

5 low voltage: installation of compact relay devices (VIP) and test terminal boxes. If more space is required, an additional enclosure may be added on top of the cubicle.

Options: please, refer to the chapter "Characteristics of the functional units".

DE58649b



Lateral vacuum type circuit breaker cubicles

1 switchgear: disconnector(s) and earthing switch(es), in enclosure filled with SF6 and satisfying and one vacuum circuit breaker, "sealed pressure system" requirements.

2 busbars: all in the same horizontal plane, thus enabling later switchboard extensions and connection to existing equipment.

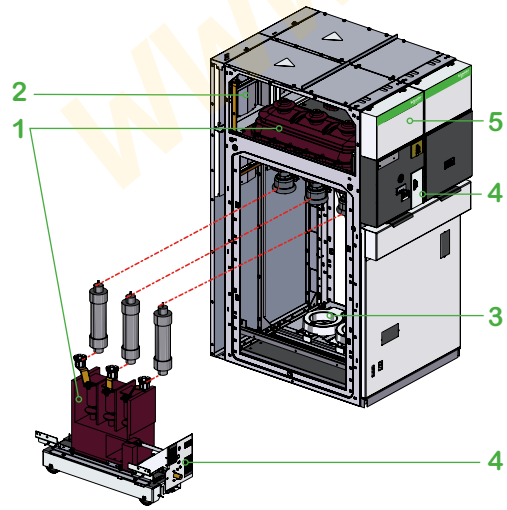
3 connection and switchgear: accessible through front, connection to the downstream terminals of the circuit breaker.
- Evolis: device associated with an electronic relay and standard sensors (with or without auxiliary source).

4 operating mechanism: contains the elements used to operate the disconnector(s), the circuit breaker and the earthing switch and actuate the corresponding indications.

5 low voltage: installation of compact relay devices (VIP) and test terminal boxes. If more space is required, an additional enclosure may be added on top of the cubicle.

Options: please, refer to the chapter "Characteristics of the functional units".

DE58650b



Contactor cubicles

1 switchgear: disconnector and earthing switch and contactor in enclosures filled with SF6 and satisfying "sealed pressure system" requirements.

2 busbars: all in the same horizontal plane, thus enabling later switchboard extensions and connection to existing equipment.

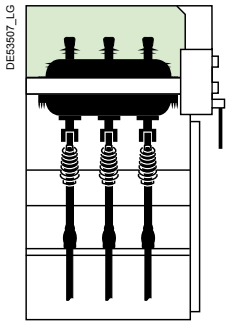
3 connection and switchgear: accessible through front.
It is also equipped with an earthing switch downstream. The contactor may be equipped with fuses. 2 types may be used:
- Vacuum with magnetic holding
- Vacuum with mechanical latching.

4 operating mechanism: contains the elements used to operate the disconnector(s), the contactor and the earthing switch and actuate the corresponding indications.

5 low voltage: installation of compact relay devices and test terminal boxes. With basic equipment, an additional enclosure is added on top of the cubicle.

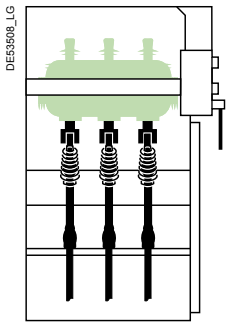
Options: please, refer to the chapter "Characteristics of the functional units".

Compartments and devices description



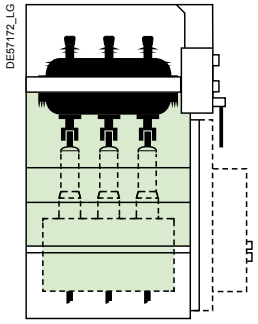
Busbar compartment

The three insulated busbars are parallel-mounted. Connection is made to the upper pads of the enclosure using a field distributor with integrated captive screws.
Ratings 400 (for SM6-24 only) - 630 - 1250 A.

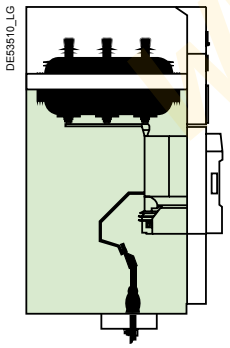


Switching device

This device is separated from the busbar compartment and the connection compartment by the enclosure surrounding the switch, the disconnector and the earthing switch.



SF6 and vacuum lateral type circuit breaker



Frontal vacuum type circuit breaker

Connection compartment

The network cables are connected:

- To the terminals of the switch
- To the lower fuse holders
- Or to the connection pads of the circuit breaker.

Cables may have either:

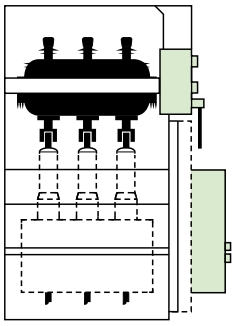
- Cold fitted cable end for dry-type

With basic equipment, the maximum allowable cross-section for cable is:

- 630 mm^2 or 2 x 400 mm^2 for 1250 A incoming or outgoing units
- 240 mm^2 or 2 x 240 mm^2 for incoming or outgoing units 400 - 630 A
- 95 mm^2 for transformer protection cubicles incorporating fuses.

See in functional units characteristics chapter for each unit allowable section.
The earthing switch must be closed before the cubicle may be accessed.
The reduced depth of the cubicle makes for easy connection of all phases.
A stud incorporated in the field distributor makes it possible to position and secure the cable-end lug with a single hand.

Compartments and devices description


DE57173_LG


PM105636

Operating-mechanism cover

These covers contain the various operating functions for the:
- switch and earthing switch
- disconnector(s)
- circuit breaker
- contactor

and the voltage presence indicator.
The operating-mechanism cover may be accessed with the cables and busbars energised and without isolating the substation.
It also enables easy installation of padlocks, locks and standard LV accessories (auxiliary contacts, trip units, motors, etc.).


PM105633

A	B1	B2	C
LV cover	LV wiring duct	LV wiring duct	LV control cabinet
Height (mm):			
1600	1690	1840	2050
	Low Voltage option		
	90	240	450

Low-voltage monitoring control cabinet for SM6-24

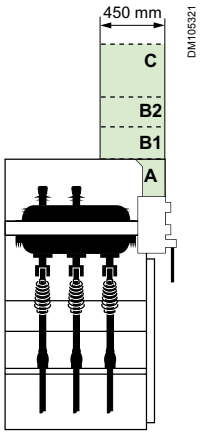
It enables the cubicle to be equipped with low voltage switchgear providing protection, control, status indication and data transmission.
According to the volume, it is available in 3 versions: cover, wiring duct and cabinet.

A - LV cover: enables a very simple low voltage section to be installed such as indication buttons, push buttons or protection relays.

B1 - LV wiring duct and cabinet: enables a large majority of low voltage configurations to be installed. It also takes the Sepam series 20 or series 40.

B2 - LV wiring duct and cabinet (240mm): enables a large majority of low voltage to be installed. It also takes the thermal monitoring, VAMP121.

C - LV control cabinet: this is only used for larger low voltage accessories or those with a depth greater than 100 mm or complex equipment, such as Sepam series 60 or series 80, converters, control and monitoring units, regulating transformers or dual secondary transformers.



DM105321

In all cases, these volumes are accessible, with cables and busbars energised, without de-energising the substation.


PE58270

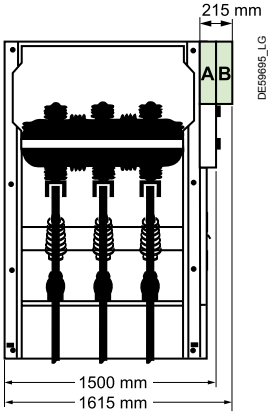
A / B LV cover
h (mm): 2250

Low-voltage monitoring control cabinet for SM6-36

A - LV cover: enables a very simple low voltage section to be installed such as indication buttons, push buttons or protection relays.
The total height of the cubicle is then 2250 mm.

B - LV control cabinet: this can be used for larger low voltage accessories or those with a depth greater than 100 mm or complex equipment, such as Sepam series 60 or series 80, converters, control and monitoring units, regulating transformers or dual secondary transformers.

In all cases, these volumes are accessible, with cables and busbars energised, without de-energising the substation.



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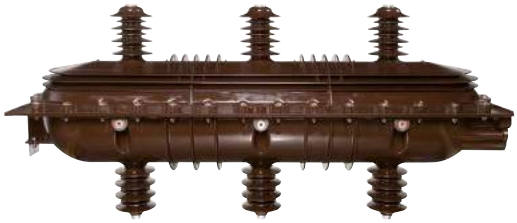
Safety of people

By switchgear

PM105611

Switch-disconnector for 24 kV

PE57226



Switch-disconnector for 36 kV

Switch or disconnector and earthing switch

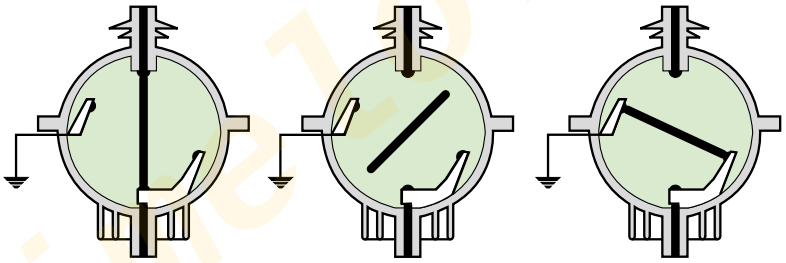
- **Gas tightness**

The three rotating contacts are placed in an enclosure filled with gas to a relative pressure of 0.4 bar (400 hPa) for SM6-24 and 1 bar (1000 hPa) for SM6-36.
It satisfies "sealed pressure system" requirements and seal tightness is always factory checked, and leakage rate is less than 0.1% for 30 years life span.

- **Operating safety**

- the switch may be in one of three positions: "closed", "open", or "earthed", representing a natural interlocking system that prevents incorrect operation. Moving-contact rotation is driven by a fast-acting mechanism that is independent of the action of the operator.
- the device combines the breaking and disconnection functions.
- the earthing switch placed in the SF6 has a short-circuit making capacity, in compliance with standards.
- any accidental over-pressures are eliminated by the opening of the safety membrane, in which case the gas is directed toward the back of the unit, away from the operator.

MT20184_LG



Closed position *Open position* *Earth position*

- **Insensitivity to the environment**

- parts are designed in order to obtain optimum electrical field distribution.
- the metallic structure of cubicles is designed to withstand and aggressive environment and to make it impossible to access any energised part when in operation.

Safety of people

By switchgear

SF1 circuit breaker

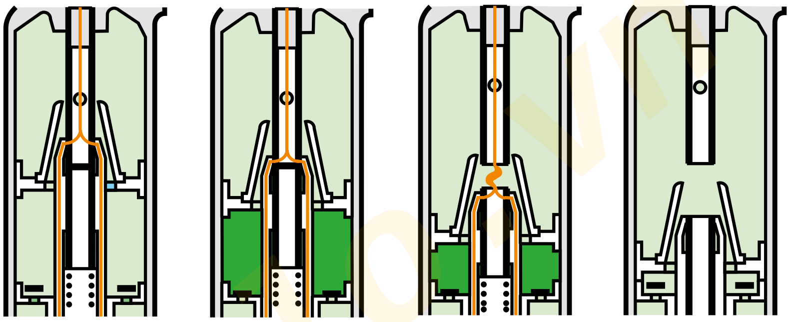
SF6 circuit breaker: SF1

- **Gas tightness**

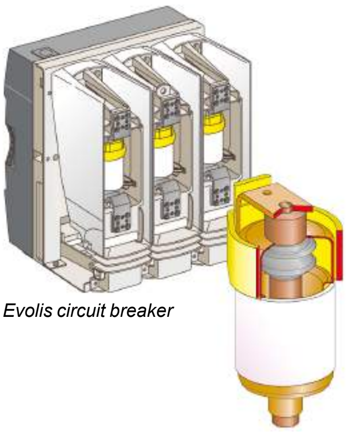
The SF1 circuit breaker is made up of three separate poles mounted on a structure supporting the operating mechanism. Each pole-unit houses the active elements in an insulating enclosure filled with gas to a relative pressure of 1.5 bar (0,15 mPa) for 630 A to 20 kA and 2 bar (0,2 mPa) for 1250 A and 630 A/25 kA. It satisfies "sealed pressure system" requirements and seal tightness is always checked in the factory.

- **Operating safety**

Accidental over-pressures are eliminated by the opening of the safety membrane.



Contacts closed *Precompression* *Arcing period* *Contacts open*



Evolis circuit breaker

Vacuum type circuit breaker: Evolis

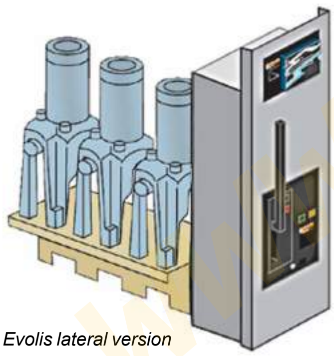
- **Vacuum tightness**

The Evolis circuit breaker comprises three separate pole units fixed on a structure supporting the control mechanism. Each pole encloses all of the active parts in an insulating enclosure, under vacuum, and its vacuum tightness is systematically checked in the factory.

- **Operating safety**

The magnetic field is applied along the contact axis of the vacuum type circuit breaker. This process diffuses the arc in a regular manner with high currents.
It ensures optimum distribution of the energy along the compact surface so as to avoid local hot spots.

- **The advantages of this technique:**
  - a simplified vacuum type circuit breaker which is consequently very reliable,
  - low dissipation of arcing energy in the circuit breaker,
  - highly efficient contacts which do not distort during repeated breaking,
  - significant reduction in control energy.



Evolis lateral version

Vacuum type contactor

- **Vacuum tightness**

Vacuum contactor comprises three separate poles fixed on a structure supporting the control mechanism. Each pole encloses all of the active parts in an insulating enclosure under vacuum and its vacuum tightness is checked in the factory.

Vacuum type contactor

Safety of people

By operating mechanism safety

PM105634

Visibility of main contacts

PM105635

Reliable operating mechanism

- **Switchgear status indicator:**

Fitted directly to the drive shaft, these give a definite indication of the contact's position. (appendix A of standard IEC 62271-102).

- **Operating lever:**

This is designed with an anti-reflex device that stops any attempt to re-open the device immediately after closing the switch or the earthing disconnector.

- **Locking device:**

Between one and three padlocks enable the following to be locked:

- access to the switching shaft of the switch or the circuit breaker,
- access to the switching shaft of the earthing disconnector,
- operating of the opening release push-button.

Simple and effortless switching

Mechanical and electrical controls are side by side on the front fascia, on a panel including the schematic diagram indicating the device's status (closed, open, earthed):

- **Closed:** the drive shaft is operated via a quick acting mechanism, independent of the operator. No energy is stored in the switch, apart from when switching operations are taking place.
  For combined switch fuses, the opening mechanism is armed at the same time as the contacts are closed.
- **Opening:** the switch is opened using the same quick acting mechanism, operated in the opposite direction.
  For circuit breakers and the combined switch fuses, opening is controlled by:
  - a push-button,
  - a fault.
- **Earthing**: a specific control shaft enables the opening or closing of the earthing contacts. Access to this shaft is blocked by a cover that can be slid back if the switch is open but which remains locked in place if it is closed.

Visibility of main contacts (option)

The position of main contacts is clearly visible from the front of the cubicle through the window.

PE57166

Gas pressure indicator (option)

Despite SM6 switch is sealed pressure system and has open and close capacity on rated current at 0 bar relative pressure SF6, to insure you about the internal pressure, we propose on request before sale or on site by after-sales either a pressure switch or an analog manometer on the switch.
These devices are both fitted without any alteration on the switch, they are temperature compensated and compatible with visibility of main contacts if requested.

PE56366

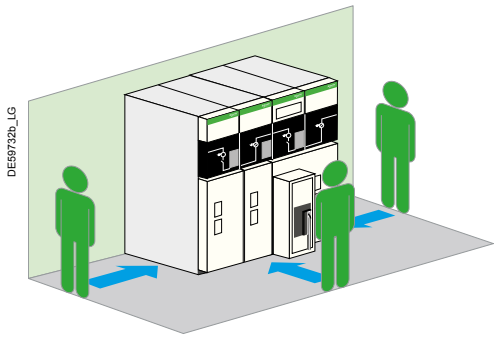
Voltage Presence Indicating System

VPIS complies with 62271-206 standard allowing to indicate the voltage presence on each phase with LEDs. Designed for severe environments so that to guarantee high reliability in MV/LV substations worldwide.
Exits in Voltage Output version to provide voltage presence information to VD23 voltage presence relay.

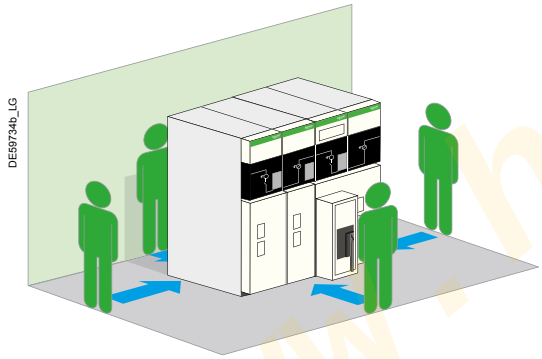
Safety of people

By internal arc protection

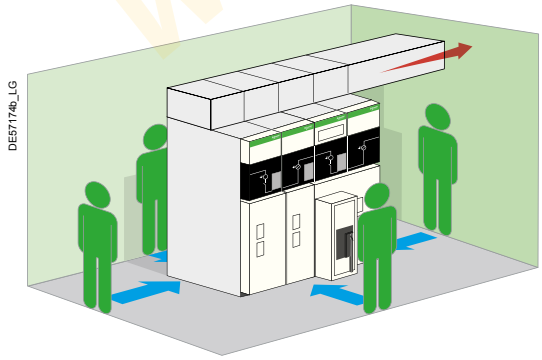
Standard IEC 62271-200 appendix A indicates a method for testing switchgear in metal enclosures under internal arc conditions. The aim of this test is to show that an operator situated in front of a switchboard would be protected against the effects of an internal fault.



Example of installation of an SM6 switchboard installed against the wall downwards exhaust 12.5 kA 1 s and 16 kA 1 s, IAC: A-FL: 3-sides internal arc protection



Example of installation of an SM6-24 switchboard installed in the middle of a room downwards exhaust 16 kA 1 s, IAC: A-FLR: 4-sides internal arc protection



Example of installation of an SM6-24 switchboard installed in the middle of a room upwards exhaust 16 kA 1 s and 20 kA 1 s, IAC: A-FLR: 4-sides internal arc protection

To enhance the safety of people, it is desirable to provide as high a degree of protection as possible by evacuating the effects of internal arc using:
- Evacuation systems which direct gases towards the top or the bottom of the switchboard enabling over pressure to be limited in the case of an internal fault in the compartments
- Channelling and evacuating hot gases towards an external area, which is not hazardous for the operator
- Materials which are non-inflammable in the cubicles
- Reinforced panels.

Consequently:

The SM6 is designed to offer a good level of safety

- **Control of the architecture:**
  - compartment type enclosure.
- **Technological control:**
  - electrotechnical: modelling of electrical fields,
  - mechanical: parts produced using CAD systems.
- **Use of reliable components:**
  - choice of materials,
  - earthing switch with closing capacity.
- **Devices for operating safety:**
  - voltage presence indicator on the front face,
  - natural reliable interlocking,
  - locking using keys or padlocks.

Internal arc withstand
(in conformity with IEC 62271-200)

- **3 versions are available for SM6-24:**

Basic:
- 12.5 kA 1 s, IAC: A-FL

Advance:
- 12.5 kA 1 s, IAC: A-FLR
- 16 kA 1 s, IAC: A-FL & IAC: A-FLR
- 20 kA 1 s, IAC: A-FL & IAC: A-FR

- **1 version is available for SM6-36:**
  - 16 kA 1 s, IAC: A-FL.

SM6 internal arc
(in conformity with IEC 62271-200 appendix A)

In all internal arc versions, the SM6 has successfully passed all of the type testing relative to standard IEC 62271-200 (5 acceptance criteria).
The materials used meet the constraints for which the SM6 is designed.
The thermal and mechanical forces that an internal arc can produce are perfectly absorbed by the enclosure.
An operator situated in front of the SM6 switchboard during an internal fault will not be exposed to the effects of arcing.

SM6 proposes several options to install a standard internal arc withstand switchboard

- **3-sides internal arc protection IAC: A-FL**,
  12,5 kA 1 s, 16 kA 1 s and 20 kA 1s for SM6-24 and 16 kA 1 s for SM6-36.
SM6 switchboard positioned against the wall, access to the rear of the cubicles is impossible, internal arc protection on three sides is sufficient.
- **4-sides internal arc protection IAC: A-FLR**,
  12,5 kA 1s, 16 kA 1 s and 20 kA 1 s for SM6-24.
  For SM6 switchboards installed in the middle of a room, 4-sides internal arc protection is necessary in order to protect an operator moving around the switchboard.
- **Choice of exhaust:**

(Installation requirements manual to be considered)
- **downwards exhaust**

Civil engineering with an adequate volume is necessary.
- **upwards exhaust for SM6-24**

A ceiling height greater or equal than 2 150 mm is necessary, duct at the right or left side of the cubicle (not supplied).

Characteristics of the functional units

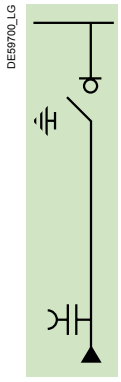
Characteristics of the functional units

Contents

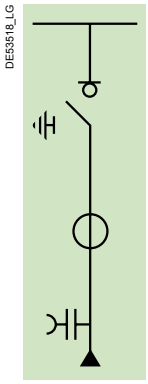
Functional units selection

Switching

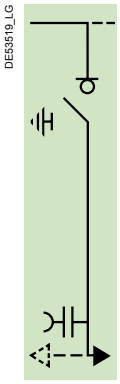
IM
Switch unit



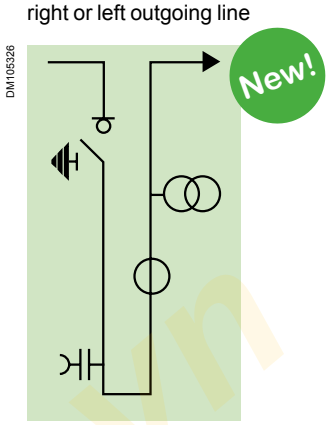
IMC
Switch unit



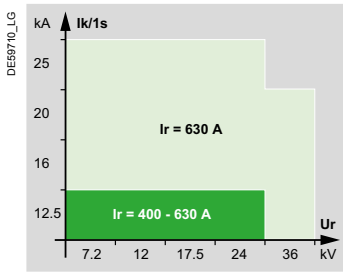
IMB
Switch unit **with** earthing switch, right or left outgoing

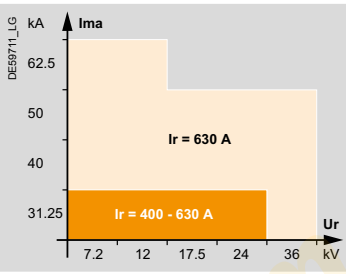


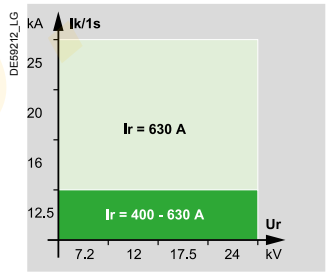
IMM
Switch and measurement unit, right or left outgoing line



Electrical characteristics







Basic equipment:

- switch and earthing switch
- three-phase busbars
- CIT operating mechanism
- voltage presence indicator
- 150 W heating element for SM6-36
- LSC2A
- connection pads for dry-type cables
- three-phase bottom busbars for outgoing lines (right or left)
- one to three CTs for SM6-24
- three CTs for SM6-36
- Three CT's

Versions:

- CI2 operating mechanism
- CI1 operating mechanism
- CI1 operating mechanism for SM6-36
- CI1 operating mechanism
- in 800 A version for SM6-24, consult us

Option:

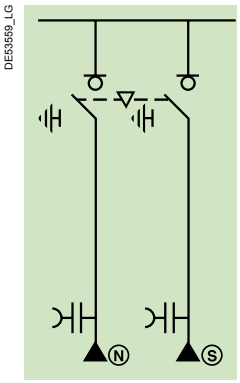
- motor for operating mechanism
- motor with severe and communication
- auxiliary contacts
- key-type interlocks
- release units (coil)
- operation counter
- 1250 A three-phase upper busbars
- 630 A three-phase upper busbars for severe operating conditions for SM6-24
- visibility of main contacts
- pressure indicator device
- enlarged low-voltage control cabinet for SM6-24
- 50 W heating element for SM6-24
- 630 A cable connection by the top (no internal arc withstand if selected) protection using Sepam programmable electronic unit
- three voltage transformers
- key-type interllocks
- earth fault indicators
- connection pads for two dry-type single-core cables for 36 kV
- digital ammeter
- surge arresters (for SM6-36 and for SM6-24 in 500 mm width cubicle)
- 630 A busbars earthing switch cabinet for SM6-24 (not available for internal arc IEC62271-200)
- arc detection
- thermal monitoring
- ambient monitoring (only IM cubicle)
- arc detection
- thermal monitoring
- arc detection

Functional units selection

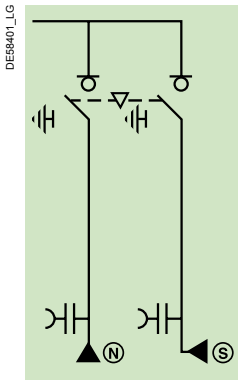
Switching

Automatic Transfer System for SM6-24

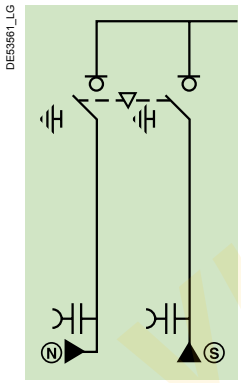
NSM-cables
Cables power supply for
main incoming line (N)
and standby line (S)



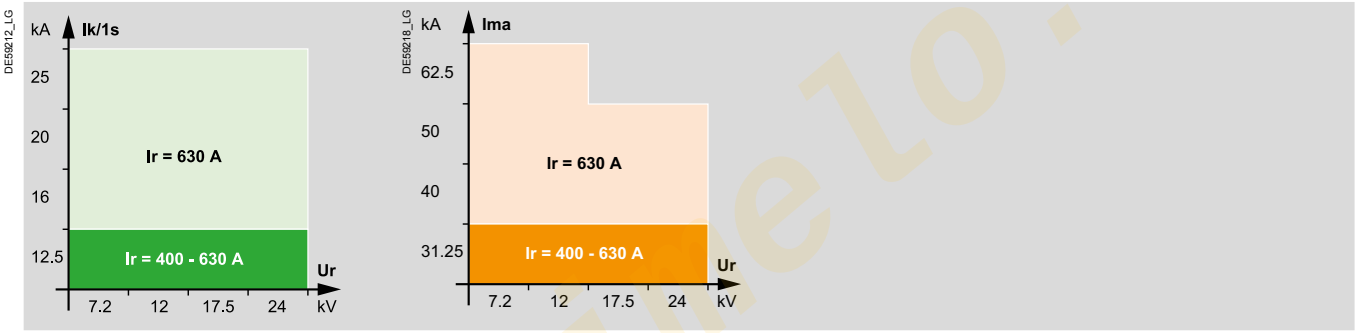
NSM-busbars
Cables power supply for
main incoming line on left (N) and
busbars for standby line (S) on right



NSM-busbars
Busbars power supply for
main incoming line on left (N) and
cables for standby line (S) on right



Electrical characteristics



Basic equipment:

- switches and earthing switches
- three-phase busbars
- connection pads for dry-type cables
- voltage presence indicator
- mechanical interlocking
- motorised operating mechanism CI2 with open/close coils
- additional enclosure
- automatic-control equipment (T200 S)
- LSC2A

Option:

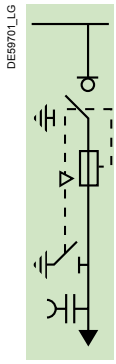
- auxiliary contacts
- key-type interlocks
- 50 W heating element
- control and monitoring
- visibility of main contacts
- pressure indicator device
- 1250 A three-phase upper busbars
- 630 A three-phase upper busbars for severe operating conditions

Functional units selection

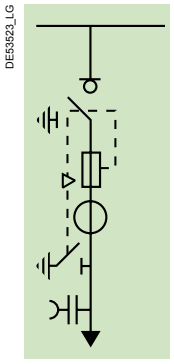
Protection

Fuse-switch

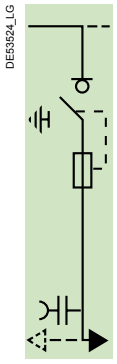
QM
Fuse-switch combination unit



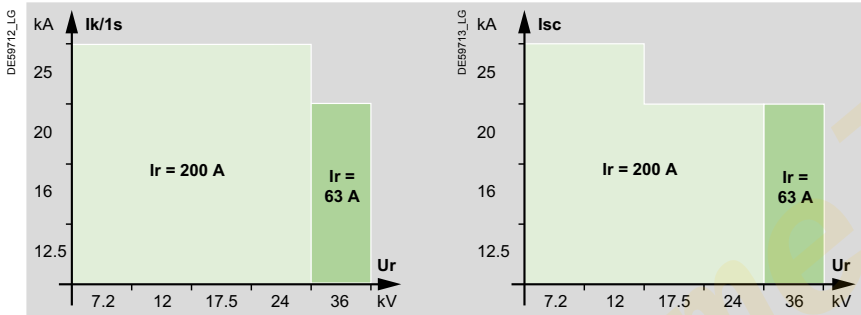
QMC
Fuse-switch combination unit



QMB
Fuse-switch combination unit
Outgoing line right or left



Electrical characteristics



Basic equipment:

- switch and earthing switch
- three-phase busbars
- CI1 operating mechanism
- voltage presence indicator
- equipment for three DIN striker fuses
- mechanical indication system for blown fuses
- 150 W heating element for SM6-36
- LSC2A

- connection pads for dry-type cables
- downstream earthing switch 2 kA rms making capacity

- three-phase bottom busbars for outgoing lines (right or left)

- one to three CTs for SM6-24
- three CTs for SM6-36

Version:

- equipment for three UTE striker fuses for SM6-24

- CI2 operating mechanism

- CI2 operating mechanism for SM6-36

Option:

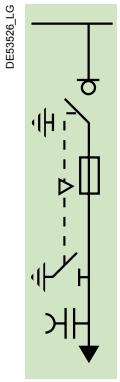
- motor for operating mechanism
- motor with severe and communication
- auxiliary contacts
- key-type interlocks
- auxiliary contact for blown fuses
- DIN striker fuses
- release units (coil)
- digital ammeter
- thermal monitoring
- arc detection
- ambient monitoring (only QM)
- 1250 A three-phase upper busbars
- 630 A cable connection by the top (no internal arc withstand if selected)
- visibility of main contacts
- pressure indicator device
- 630 A three-phase upper busbars for severe operating conditions for SM6-24
- enlarged low-voltage control cabinet for SM6-24
- 50 W heating element for SM6-24

Functional units selection

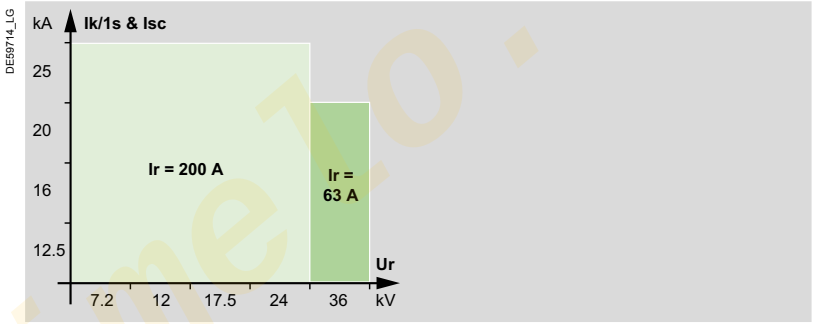
Protection

Fuse-switch

PM
Fused-switch unit



Electrical characteristics



Basic equipment:

- switch and earthing switch
- three-phase busbars
- CIT operating mechanism
- voltage presence indicator
- connection pads for dry-type cables
- downstream earthing switch 2 kA rms making capacity
- equipment for three UTE (for SM6-24) or DIN striker fuses
- 150 W heating element for SM6-36
- LSC2A

Version:

- CI1 operating mechanism
- CI2 operating mechanism for SM6-36

Option:

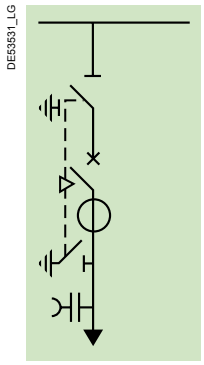
- motor for operating mechanism
- motor option with severe and communication
- auxiliary contacts
- digital ammeter
- key-type interlocks
- mechanical indication system for blown fuses
- 1250 A three-phase upper busbars
- 630 A cable connection by the top (no internal arc withstand if selected)
- UTE (for SM6-24) or DIN striker fuses
- visibility of main contacts
- pressure indicator device
- 630 A three-phase upper busbars for severe operating conditions for SM6-24
- enlarged low-voltage control cabinet for SM6-24
- 50 W heating element for SM6-24
- release units for SM6-36
- thermal monitoring
- arc detection

Functional units selection

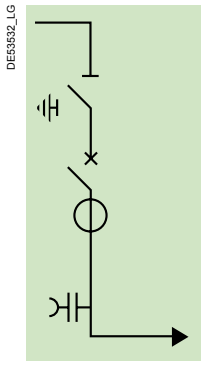
Protection

SF6 type circuit breaker

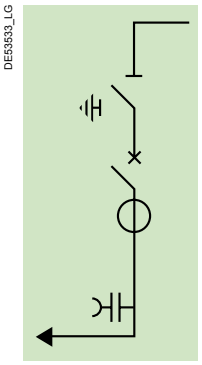
DM1-A
Single-isolation
disconnectable CB unit



DM1-D
Single-isolation
disconnectable CB unit
Outgoing line on right

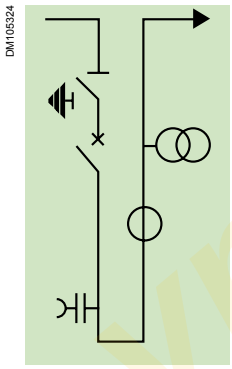


DM1-D
Single-isolation
disconnectable CB unit
Outgoing line on left

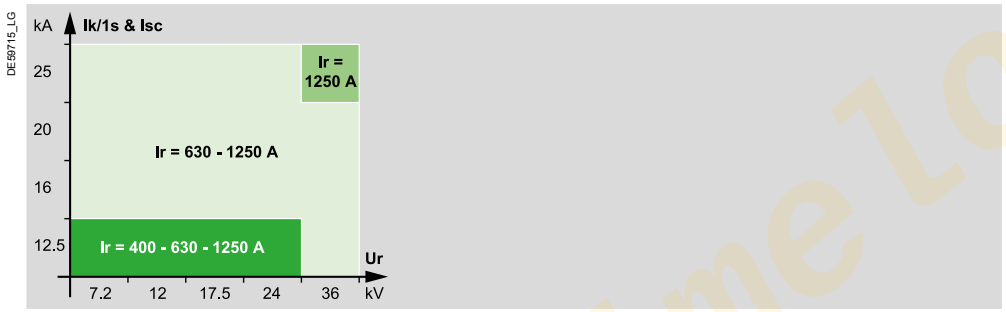


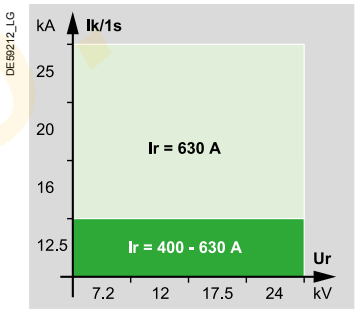
DM1-M
Single-isolation,disconnectable
CB and measurement unit
Outgoing line on right

New!



Electrical characteristics





Basic equipment:

- SF1 disconnectable circuit breaker
- disconnector and earthing switch
- three-phase busbars
- circuit breaker operating mechanism RI
- disconnector operating mechanism CS
- voltage presence indicator
- three CTs (DM1-M: please consult us)
- auxiliary contacts on circuit breaker
- mechanical interlocking between circuit breaker and disconnector
- 150 W heating element for SM6-36
- LSC2A

- connection pads for dry-type cables
- downstream earthing switch 2 kA rms making capacity at 630 A and 25 kA rms making capacity at 1250 A

- three-phase bottom busbars

Version:

- LPCT (only with Sepam series 20, 40, 60, 80)

- SFset circuit breaker disconnectable (only for 400-630 A performances and SM6-24)

- SF1 circuit breaker disconnectable (only for 400-630 A performances and SM6-24)

Option:

- **cubicle:**
  - auxiliary contacts on the disconnector
  - protection using Sepam and Easergy P3 relay programmable electronic units
  - three voltage transformers
  - key-type interlocks
  - surge arresters
- 1250 A three-phase upper busbars at Ir 630 A
- 630 A cable connection by the top (no internal arc withstand if selected)
- 630 A three-phase upper busbars for severe operating conditions for SM6-24
- enlarged low-voltage control cabinet for SM6-24
- 50 W heating element for SM6-24

- connection pads for two dry-type single-core cables for SM6-36

- 630 A busbars earthing switch cabinet for SM6-24 (not available for internal arc IEC62271-200)
- arc detection
- thermal monitoring
- ambient monitoring

- arc detection
- thermal monitoring

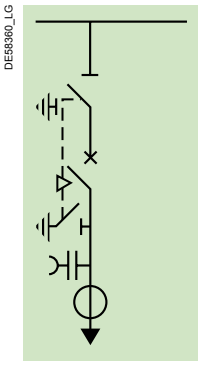
- arc detection
- thermal monitoring

Functional units selection

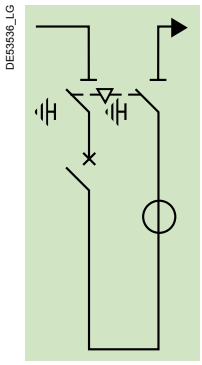
Protection

SF6 type circuit breaker

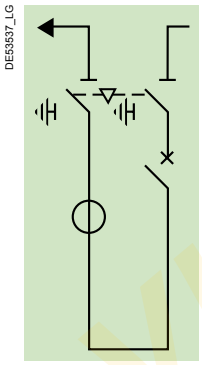
DM1-S
Single-isolation
disconnectable CB unit
with independent protection



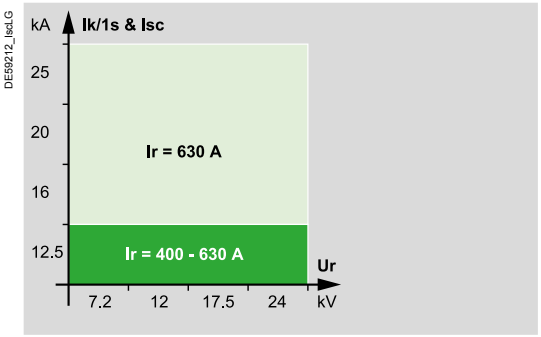
DM2
Double-isolation
disconnectable CB unit
Outgoing line on right

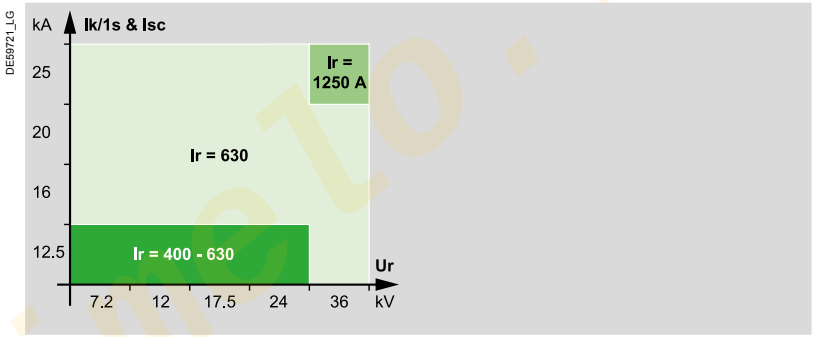


DM2
Double-isolation
disconnectable CB unit
Outgoing line on left



Electrical characteristics





Basic equipment:

- SF1 disconnectable circuit breaker
- disconnector and earthing switch
- three-phase busbars
- circuit breaker operating mechanism RI
- disconnector operating mechanism CS
- auxiliary contacts on circuit breaker
- mechanical interlocking between circuit breaker and disconnector
- LSC2A

- VIP relay
- three CR sensors for VIP relay protection
- voltage presence indicator
- connection pads for dry-type cables
- downstream earthing switch 2 kA rms making capacity

- three CTs
- 150 W heating element for SM6-36

Version:

Option:

- **cubicle:**
  - key-type interlocks
  - arc detection
  - ambient monitoring (only for DM1S cubicle)

- **cubicle:**
  - protection using Sepam and Esergy P3 relay programmable electronic units
  - auxiliary contacts on disconnectors
  - 2 voltage transformers phase-to-phase or 3 voltage transformers phase-to-earth
  - arc detection for DM2

- 1250 A three-phase upper busbars at Ir 630 A
- 630 A three-phase upper busbars for severe operating conditions for SM6-24
- enlarged low-voltage control cabinet for SM6-24

- 630 A cable connection by the top (no internal arc withstand if selected)
- 50 W heating element for SM6-24
- thermal monitoring

- **circuit breaker:**
  - motor for operating mechanism
  - release units (coil)
  - operation counter on manual operating mechanism

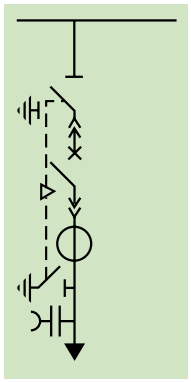
Functional units selection

Protection

SF6 type circuit breaker

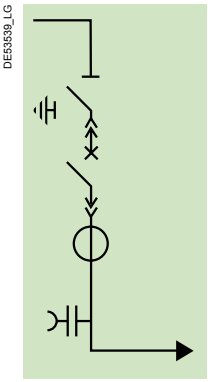
DM1-W
Withdrawable single-isolation
circuit breaker unit

DE53538_LG



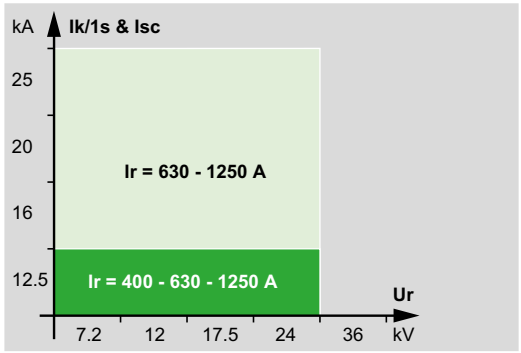
DM1-Z
Withdrawable single-isolation CB unit
Outgoing line on right

DE53539_LG

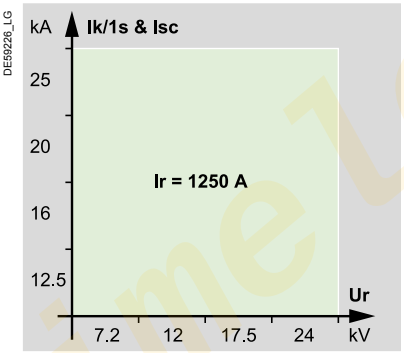


Electrical characteristics

DE59715_2-LG



DE59226_LG



Basic equipment:

- SF1 withdrawable circuit breaker
- disconnector and earthing switch
- three-phase busbars
- circuit breaker operating mechanism RI
- disconnector operating mechanism CS
- voltage presence indicator
- three CTs
- auxiliary contacts on circuit breaker
- LSC2A

- mechanical interlocking between circuit breaker and disconnector

- earthing switch operating mechanism CC
- connection pads for dry-type cables
- downstream earthing switch 25 kA rms making capacity

- three-phase busbars

Version:

- LPCT (only with Sepam series 20, 40, 60 and 80)

Option:

- **cubicle:**
- auxiliary contacts on the disconnector
- protection using Sepam and Easergy P3 relay programmable electronic units
- key-type interlocks
- three voltage transformers for SM6-24
- connection enclosure for cabling from above for SM6-24
- 50 W heating element for SM6-24
- enlarged low-voltage control cabinet for SM6-24
- thermal monitoring
- ambient monitoring (only for DM1W cubicle)

- **circuit breaker:**
- motor for operating mechanism
- release units (coil)
- operation counter on manual operating mechanism
- arc detection

- 1250 A three-phase upper busbars at Ir 630 A
- 630 A three-phase upper busbars for severe operating conditions for SM6-24
- surge arresters (only for 630 A and SM6-24)

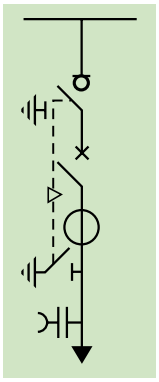
Functional units selection

Protection

Vacuum type circuit breaker

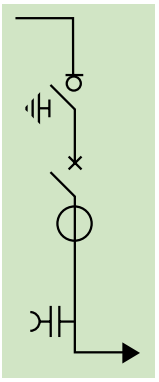
DMV-A
Single-isolation
circuit breaker unit

DE53541_LG



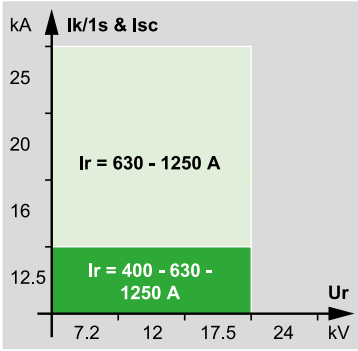
DMV-D
Single-isolation circuit breaker unit
Outgoing line on right

DE53542_LG



Electrical characteristics

DE59227_LG



Basic equipment:

- Evolis circuit breaker frontal
- switch and earthing switch for 400 - 630 A
- disconnector and earthing switch for 1250 A
- three-phase busbars
- circuit breaker operating mechanism P2
- disconnector and switch operating mechanism CIT
- voltage presence indicator
- auxiliary contacts on circuit breaker
- LSC2A

- three CTs
- Sepam series 20 programmable electronic unit
- Easergy P3 relay

- connection pads for dry-type cables
- downstream earthing switch 25 kA rms making capacity

Option:

- **cubicle:**
  - auxiliary contacts on the disconnector
  - three voltage transformers
  - key-type interlocks
  - 50 W heating element
  - 1250 A three-phase upper busbars at Ir 630 A
  - 630 A three-phase upper busbars for severe operating conditions
  - enlarged low-voltage control cabinet
  - thermal monitoring
  - arc detection
- **circuit breaker:**
  - motor for operating mechanism
  - release units (coil)
  - operation counter on manual operating mechanism
- **other**
  - Sepam relays
  - Easergy P3 relay

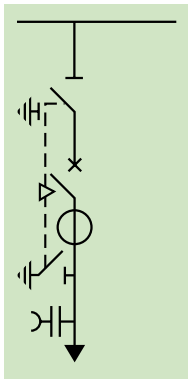
Functional units selection

Protection

Vacuum type circuit breaker

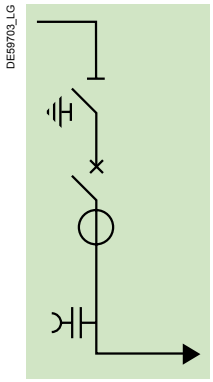
DMVL-A
Single-isolation disconnectable circuit breaker unit

DE53535_LG



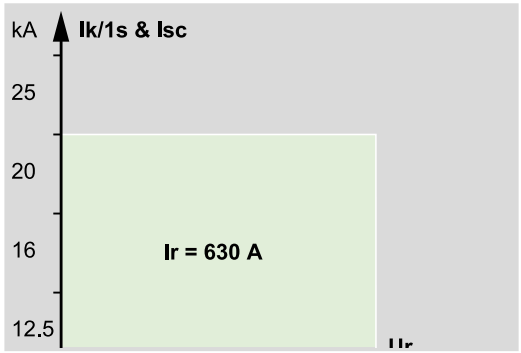
DMVL-D
Single-isolation disconnectable circuit breaker unit
Outgoing line on right

DE59703_LG

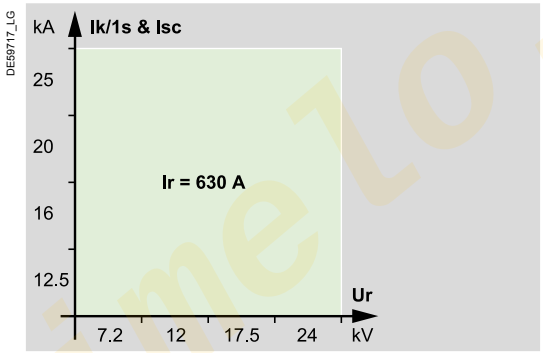


Electrical characteristics

DE59228_LG



DE59717_LG



Basic equipment:

- Evolis circuit breaker lateral disconnectable
- disconnector and earthing switch
- mechanical interlocking between circuit breaker and disconnector
- three-phase busbars
- circuit breaker operating mechanism RI
- disconnector operating mechanism CS
- voltage presence indicator
- auxiliary contacts on circuit breakerr
- 3 CTs
- connection pads for dry-type cables
- LSC2A

- downstream earthing switch 2 kA rms making capacity

Option:

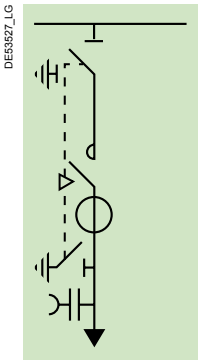
- **cubicle:**
  - auxiliary contacts on the disconnector
  - three voltage transformers
  - key-type interlocks
  - 50 W heating element
- **circuit breaker:**
  - motor for operating mechanism
  - release units (coil)
  - operation counter on manual operating mechanism
- 1250 A three-phase upper busbars at Ir 630 A
- 630 A three-phase upper busbars for severe operating conditions
- enlarged low-voltage control cabinet
- Sepam relay protection
- Easergy P3 relay
- surge arresters
- thermal monitoring
- arc detection

Functional units selection

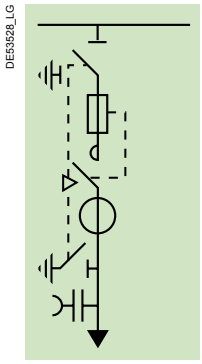
Protection

Contactor (Direct Motor Starter) for SM6-24

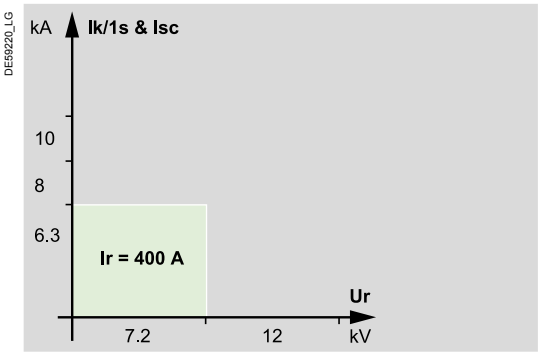
CVM
Disconnectable contactor unit

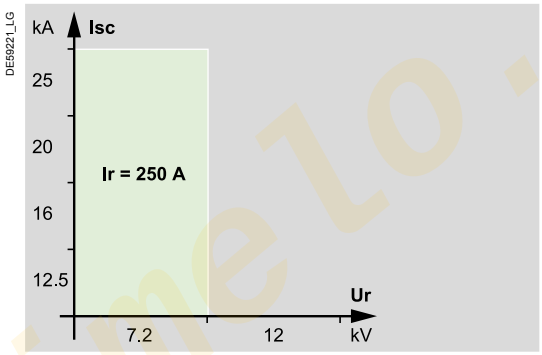


CVM
Disconnectable contactor unit with fuses



Electrical characteristics





Basic equipment:

- vacuum contactor
- disconnector and earthing switch
- three-phase busbars
- contactor operating mechanism with magnetic holding or contactor with mechanical latching
- disconnector operating mechanism CS
- one to three current transformers
- auxiliary contacts on contactor
- connection pads for dry-type cables
- voltage presence indicator
- downstream earthing switch 2 kA rms making capacity
- operation counter on contactor
- enlarged low-voltage control cabinet
- mechanical interlocking between contactor and disconnector/earthing switch
- LSC2A

- equipment for three DIN striker fuses
- mechanical indication system for blown fuses
- auxiliary contact for blown fuses

Version:

- LPCT (only with Sepam series 20, 40, 60, 80)

Option:

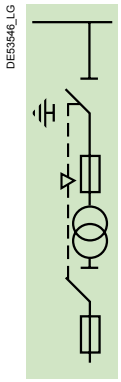
- **cubicle:**
  - auxiliary contacts on the disconnector
  - protection using Sepam programmable electronic unit
  - one to three voltage transformers
  - key-type interlocks
  - 50 W heating element
  - 1250 A three-phase upper busbars
  - 630 A three-phase upper busbars for severe operating conditions
- **contactor:**
  - mechanical interlocking
  - thermal monitoring
  - arc detection

- DIN striker fuses

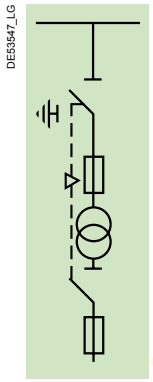
Functional units selection

Metering

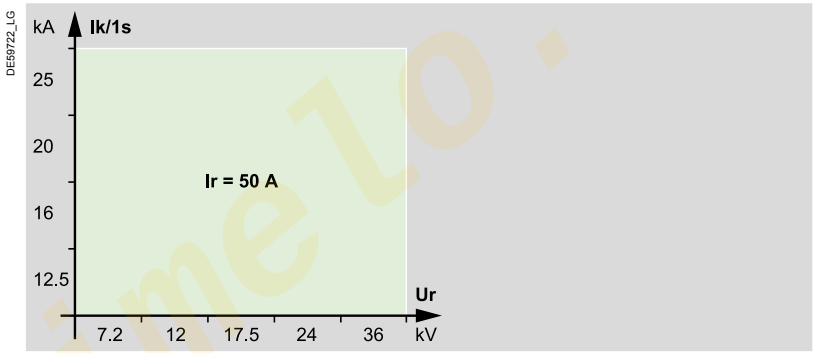
CM
Voltage transformers unit for network with earthed neutral system



CM2
Voltage transformers unit for network with insulated neutral system



Electrical characteristics



Basic equipment:

- disconnector and earthing switch
- three-phase busbars
- operating mechanism CS
- LV circuit isolation switch
- LV fuses
- three 6.3 A UTE or DIN type fuses
- 150 W heating element for SM6-36
- LSC2A

- three-voltage transformers (phase-to-earth)

- two voltage transformers (phase-to-phase)

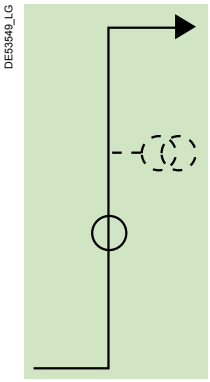
Option:

- auxiliary contacts
- mechanical signalling for blown fuses
- auxiliary contact for blown fuses for SM6-24
- 1250 A three-phase upper busbars
- 630 A cable connection by the top (no internal arc withstand if selected)
- 50 W heating element for SM6-24
- 630 A three-phase upper busbars for severe operating conditions for SM6-24
- enlarged low-voltage control cabinet for SM6-24
- arc detection

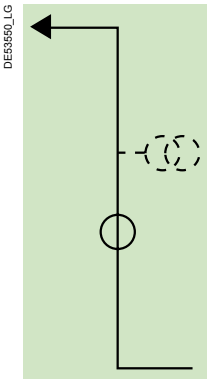
Functional units selection

Metering

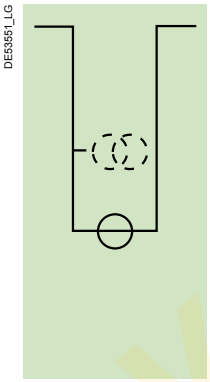
GBC-A
Current and/or voltage measurements unit
Outgoing line on right



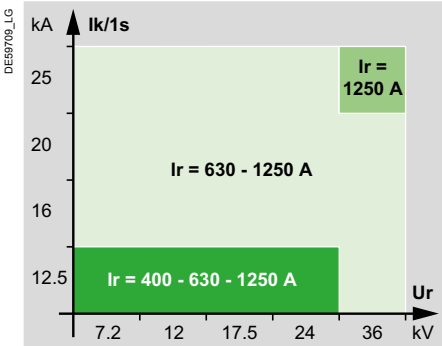
GBC-A
Current and/or voltage measurements unit
Outgoing line on left



GBC-B
Current and/or voltage measurements unit



Electrical characteristics



Basic equipment:

- one to three CTs for SM6-24
- three CTs for SM6-36
- connection bars
- three-phase busbars
- 150 W heating element for SM6-36
- LSC1

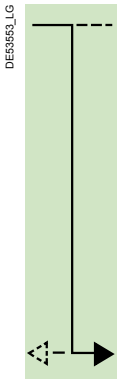
Option:

- 1250 A three-phase upper busbars at Ir 630 A for SM6-24
- enlarged low-voltage control cabinet for SM6-24
- three voltage transformers (phase-to-earth) or two voltage transformers (phase-to-phase) for SM6-24
- 50 W heating element for SM6-24
- 630 A cable connection by the top for SM6-36 (no internal arc withstand if selected)
- arc detection

Functional units selection

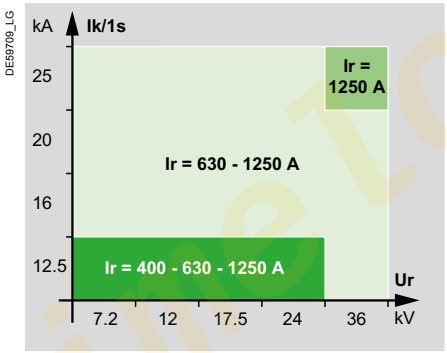
Other functions

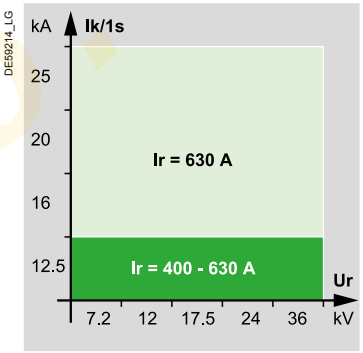
GBM
Connection unit
Outgoing line right or left



GIM
Intermediate bus unit

Electrical characteristics





Basic equipment:

- connection bars
- three-phase busbars for outgoing lines right or left
- 150 W heating element for SM6-36
- LSC1

- metallic envelop

Option:

- 1250 A three-phase upper busbars at Ir 630 A
- enlarged low-voltage control cabinet for SM6-24
- 630 A cable connection by the top for SM6-36 (no internal arc withstand if selected)
- arc detection

Functional units selection

Other functions (extension unit)

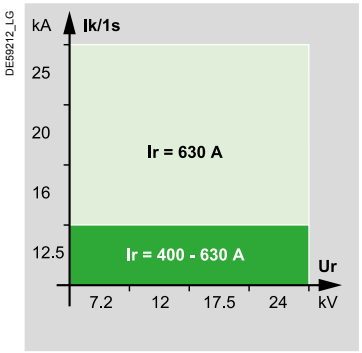
GEM
Extension unit
VM6/SM6 -24

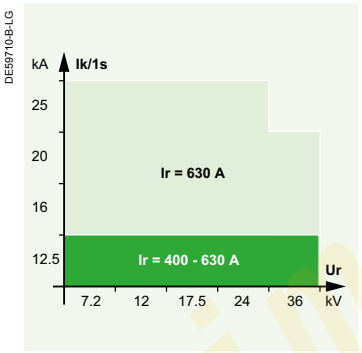
GFM
Extension unit
Fluokit SM6 -24 up to 36kV

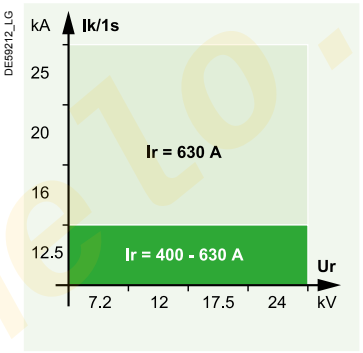
GUM
Extension unit
Unifluorc/SM6 -24

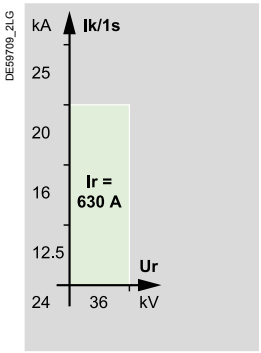
GMM
Extension unit
Modularc/SM6 -36

Electrical characteristics









Basic equipment:

- metallic envelop
- three-phase busbars

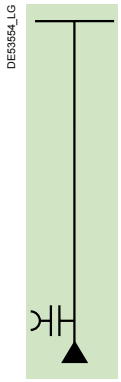
Option:

- LV-continuity

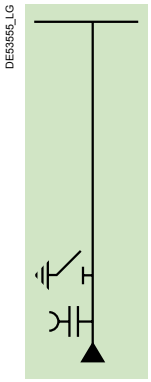
Functional units selection

Other functions

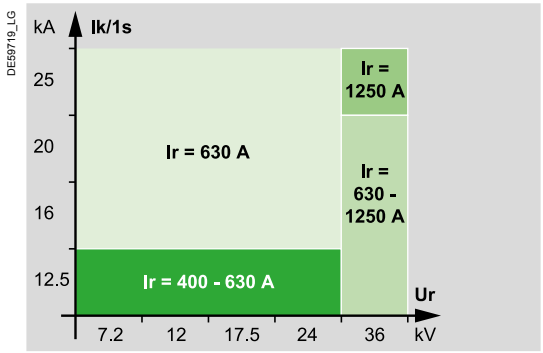
GAM2
Incoming-cable-connection unit

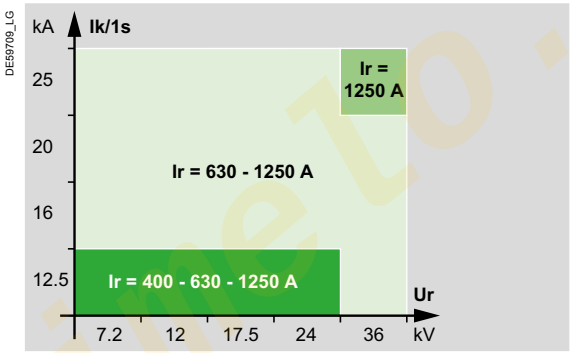


GAM
Incoming-cable-connection unit



Electrical characteristics





Basic equipment:

- three-phase busbars
- voltage presence indicator
- connection pads for dry-type cables
- connection bars
- 150 W heating element for SM6-36
- LSC1

- downstream earthing switch 25 kA rms making capacity
- operating mechanism CC for SM6-24
- operating mechanism CS for SM6-36

Option:

- earth fault indicator
- digital ammeter
- 1250 A three-phase upper busbars at Ir 630 A
- enlarged low-voltage control cabinet for SM6-24
- 630 A cable connection by the top (no internal arc withstand if selected)
- 50 W heating element for SM6-24
- arc detection
- thermal monitoring

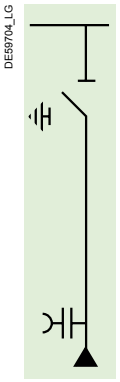
- surge arresters for SM6-36

- auxiliary contacts
- key-type interlocks
- surge arresters for SM6-24

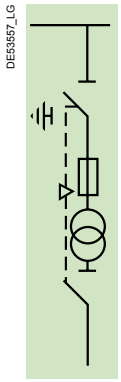
Functional units selection

Other functions

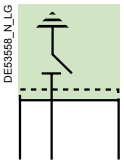
SM
Disconnector unit



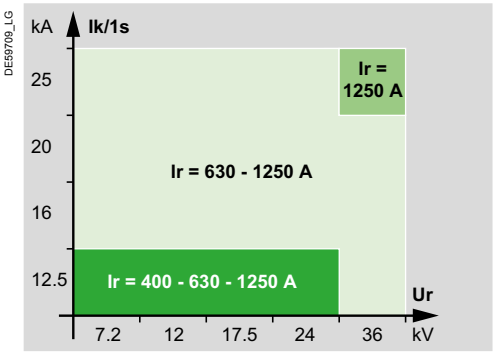
TM
MV/LV transformer unit
for auxiliaries

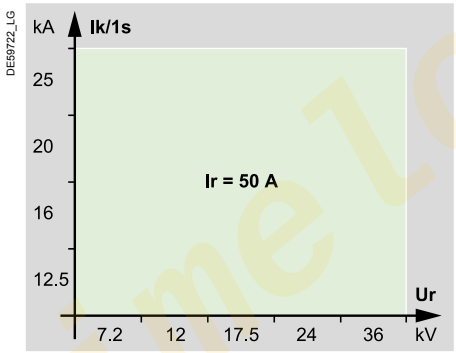


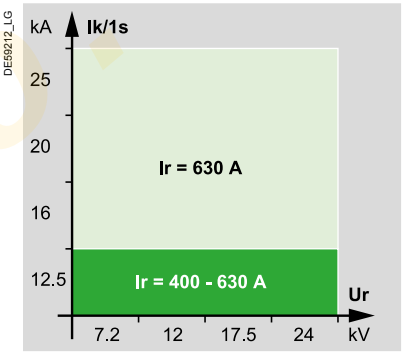
EMB
Busbars earthing switch
enclosure



Electrical characteristics







Basic equipment:

- disconnector and earthing switch
- three-phase busbars
- operating mechanism CS
- 150 W heating element for SM6-36
- LSC2A

- connection pads for dry-type cables
- voltage presence indicator

- two 6.3 A fuses, UTE (for SM6-24) or DIN type
- LV circuit isolating switch
- one voltage transformer (phase-to-phase)

- earthing switch
- connection bars three phase
- operating mechanism CIT
- installation on 630 A IM 375 mm or DM1-A units (not available for internal arc IEC 62271-200)
- require a key-type interlocks adapted to the switchboard network

Option:

- auxiliary contacts
- key-type interlocks
- 1250 A three-phase upper busbars at Ir 630 A
- 630 A cable connection by the top (no internal arc withstand if selected)
- enlarged low-voltage control cabinet for SM6-24
- 50 W heating element for SM6-24
- 630 A three-phase upper busbars for severe operating conditions for SM6-24
- arc detection

- digital ammeter for SM6-24
- surge arrester for SM6-36
- thermal monitoring

- mechanical signalling for blown fuses
- auxiliary contact for blown fuses for SM6-24
- ambient monitoring for SM6-36

- auxiliary contacts

Operating mechanisms

The control devices required for the unit operating mechanisms are centralised on the front panel. The different types of operating mechanism are presented in the table opposite.

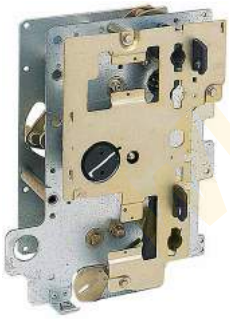
Operating speeds do not depend on the operator, except for the CS.

Units	Type of operating mechanism						
	Switch/disconnector / downstream earthing switch					Circuit breaker	
	CIT	CI1	CI2	CS	CC	RI	P2
IM, IMB, IMM	■	□	□				
IMC	■	□	□				
PM	■	□	□ (1)				
QM		■	□				
QMC, QMB		■	□				
CM, CM2, CVM				■			
DM1-A, DM1-D, DM1-M, DM1-S, DM1-Z, DM2, DMVL-A, DMVL-D				■		■	
DM1-A (2), DM1-W				■	■	■	
DMV-A, DMV-D	■						■
NSM-cables, NSM-busbars			■				
GAM 24 kV					■		
SM, TM, GAM 36 kV				■			
EMB	■						

■ *Provided as standard*
□ *Other possibility*
(1) Only SM6-36
(2) 1250 A version

Operating mechanism types	CIT		CI1		CI2			CS	
Unit applications	Load-break switch Fused switch		Load-break switch Fuse switch combination		Load-break switch Fuse switch combination			Disconnector	
Main circuit switch	Closing	Opening	Closing	Opening	Mechanism charging	Closing	Opening	Closing	Opening
Manual operating mode	Hand lever	Hand lever	Hand lever	Push button	Hand lever	Push button	Push button	Hand lever	Hand lever
Electrical operating mode (option)	Motor	Motor	Motor	Coil	Motor	Coil	Coil	N/A	N/A
Speed of operation	1 to 2 s	1 to 2 s	4 to 7 s	35 ms	4 to 7 s	55 ms	35 ms	N/A	N/A
Network applications	Remote control network management		Remote control transformer protection		Remote control network management, need of quick reconfiguration (generator source, loop)			N/A	
Earthing switch	Closing	Opening	Closing	Opening	N/A	Closing	Opening	Closing	Opening
Manual operating mode	Hand lever	Hand lever	Hand lever	Hand lever	Hand lever	Hand lever	Hand lever	Hand lever	Hand lever

PM105614



Double-function operating mechanism CIT

- **Switch function**

Independent-operation opening or closing by lever or motor.

- **Earthing-switch function**

Independent-operation opening or closing by lever.
Operating energy is provided by a compressed spring which, when released, causes the contacts to open or close.

- **Auxiliary contacts**

- switch (2 O + 2 C)*,
- switch (2 O + 3 C) and earthing switch (1 O + 1 C),
- switch (1 C) and earthing switch (1 O + 1 C) if motor option.

- **Mechanical indications**

Fuses blown in unit PM.

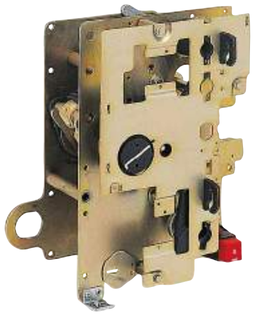
- **Motor option**

- motor severe environment and communication

(*) Included with the motor option

Operating mechanisms

PM105615



Double-function operating mechanism CI1

- **Switch function**
- independent-operation closing by lever or motor.

Operating energy is provided by a compressed spring which, when released, causes the contacts to open or close.

- independent-operation opening by push-button (O) or trip units.
- **Earthing-switch function**

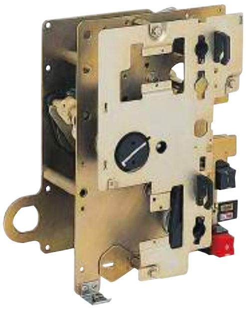
Independent-operation closing and opening by lever.
Operating energy is provided by a compressed spring which, when released, causes the contacts to open or close.

- **Auxiliary contacts**
- switch (2 O + 2 C)*,
- switch (2 O + 3 C) and earthing switch (1 O + 1 C),
- switch (1 C) and earthing switch (1 O + 1 C) if motor option,
- fuses blown (1 C).
- **Mechanical indications**

Fuses blown in units QM.

- **Opening releases**
- shunt trip.
- **Motor option**
- standard or severe environment and communication

PM105616



Double-function operating mechanism CI2

- **Switch function**
- independent-operation closing in two steps:

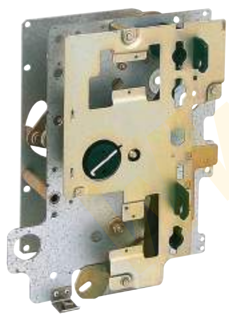
1 - operating mechanism recharging by lever or motor,
2 - stored energy released by push-button (I) or trip unit.

- independent-operation opening by push-button (O) or trip unit.
- **Earthing-switch function**

Independent-operation closing and opening by lever.
Operating energy is provided by a compressed spring which, when released, causes the contacts to open or close.

- **Auxiliary contacts**
- switch (2 O + 2 C)*,
- switch (2 O + 3 C) and earthing switch (1 O + 1 C),
- switch (1 C) and earthing switch (1 O + 1 C) if motor option.
- **Opening release shunt trip**
- **Closing release shunt trip**
- **Motor option**
- standard or severe environment and communication

PM105617



Double-function operating mechanism CS

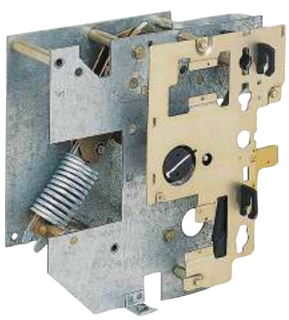
- **Disconnector and earth switch functions**

Dependent-operation opening and closing by lever.

- **Auxiliary contacts**
- disconnector (2 O + 2 C) for units DM1-A, DM1-D, DM1-W, DM2, DMVL-A, DMVL-D, CVM,
- disconnector (2 O + 3 C) and earthing switch (1 O + 1 C) for units DM1-A, DM1-D, DM1-W, DM2, DMVL-A, DMVL-D, CVM,
- disconnector (1 O + 2 C) for units CM, CM2, TM, DM1-A, DM1-D, DM2, DMVL-A, DMVL-D, CVM.
- **Mechanical indications**

Fuses blown in units CM, CM2 and TM.

PM105618



Single-function operating mechanism CC

- **Earthing switch function**

Independent-operation opening and closing by lever.
Operating energy is provided by a compressed spring which, when released, provokes opening or closing of the contacts.

- **Auxiliary contacts**

Earthing switch (1 O + 1 C).

(*) Included with the motor option.

Operating mechanisms

PE57163

Single-function operating mechanism for the SF circuit breakers 24 kV and 36 kV and Evolis 24 kV lateral

- **Circuit-breaker function**
- independent-operation closing in two steps.

First operating mechanism recharge by motor or lever, then release of the stored energy by push-button (I) or trip unit.

- independent-operation opening by push-button (O) or trip units.

- **Auxiliary contacts**
- circuit breaker (4 O + 4 C),
- mechanism charged (1 C).

- **Mechanical indications**

Operation counter.

- **Opening releases**
- Mitop (low energy),
- shunt trip,
- undervoltage.

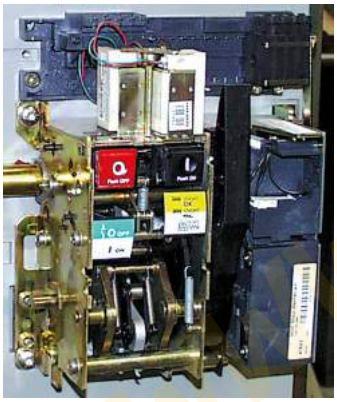
- **Closing release**
- shunt trip

- **Motor option** (option and installation at a later date possible).

Possible combinations between opening releases

	SF1						SFset			
Release type	**Combinations**						**Combinations**			
	1	2	3	4	5	6	1	2	3	4
Mitop (low energy)	■	■	■				■	■	■	
Shunt trip		■		■	■			■		
Undervoltage			■		■	■				■

PM105619



P2 stored energy operating mechanism for the Evolis circuit breaker 17.5 kV frontal

- **Circuit-breaker function**
- independent-switching operating closing in two steps.

First operating mechanism recharge by motor or lever, then release of the stored energy by push-button (I) or trip unit.

- independent-operation opening by push-button (O) or trip units.
- spring energy release.

- **Auxiliary contacts**
- circuit breaker (4 O + 4 C),
- mechanism charged (1 C).

- **Mechanical indications**

Operation counter.

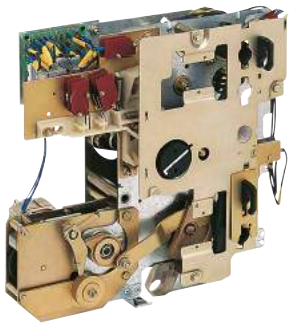
- **Opening releases**
- Mitop (low energy),
- shunt trip.

- **Closing release**
- shunt trip

- **Motor option** (option and installation at a later date possible).

Auxiliaries

PM105620



Motor option and releases for switch-units

The operating mechanisms CIT, CI1 and CI2 may be motorised.

Un		DC					AC (50 Hz)*	
Power supply	(V)	24	48	110	125	220	120	230
Motor option								
	(W)	200						
	(VA)						200	
Operating time for CIT		1 to 2 (s)					1 to 2 (s)	
Charging time for CI1, CI2		4 to 7 (s)					4 to 7 (s)	
Opening releases								
Shunt trip	(W)	200	250	300	300	300		
	(VA)						400	750
Response time	(ms)	35					35	
Undervoltage								
Pick-up	(W)	160						
	(VA)						280	550
Hold	(W)	4						
	(VA)						50	40
Response time	(ms)	45					45	
Closing release								
Shunt trip	(W)	200	250	300	300	300		
	(VA)						400	750
Response time	(ms)	55					55	

** Please consult us for other frequencies.*

PE57164

Motor option and releases for SF6 type circuit breakers and Evolis 24 kV lateral

Operating mechanism RI may be equipped with the motor option for the recharging function.

Un		DC					AC (50 Hz)*	
Power supply	(V)	24	48	110	125	220	120	230
Motor option								
	(W)	300						
	(VA)							380
Charging time	(s)	15					15	
Opening releases								
Mitop (low energy)	(W)	3						
Response time	(ms)	30					30	
Shunt trip	(W)	85						
	(VA)							180
Response time	(ms)	45					45	
Undervoltage								
Pick-up	(W)	160						
	(VA)						280	550
Hold	(W)	10						
	(VA)						50	40
Response time	(ms)	55					55	
Closing release								
Shunt trip	(W)	85						
	(VA)							180
Response time	(ms)	65					65	

** Please consult us for other frequencies.*

Auxiliaries

PM105619

Motor option and releases for Evolis circuit breakers 17.5 kV frontal

Charging motor and associated mechanism (P2)					
Power supply	(Vac 50/60 Hz)		48/60	100/130	200/240
	(Vdc)	24/30	48/60	100/125	200/250
Threshold		0.85 to 1.1 Ur			
Consumption	(VA or W)	180			
Motor overcurrent		2 to 3 Ir during 0.1 s			
Charging time		6 s max.			
Switching rate		3 cycles per minute max.			
CH contact		10 A 240 V			
Opening release (MITOP low energy)					
Power supply		Direct current			
Threshold		0.6 A < I < 3 A			
Response time to the circuit breaker at Ur		50 ms (protection relay setting)			
Opening release (MX)					
Power supply	(Vac 50/60 Hz)	24	48	100/130	200/250
	(Vdc)	24/30	48/60	100/130	200/250
Threshold		0.7 to 1.1 Ur			
Consumption	(VA or W)	Pick-up: 200 (during 200 ms)			
		Hold: 4.5			
Response time to the circuit breaker at Ur		50 ms ± 10			
Closing release (XF)					
Power supply	(Vac 50/60 Hz)	24	48	100/130	200/250
	(Vdc)	24/30	48/60	100/130	200/250
Threshold		0.85 to 1.1 Ur			
Consumption	(VA or W)	Pick-up: 200 (during 200 ms)			
		Hold: 4.5			

PE57842

Auxiliary contacts for vacuum contactor

The auxiliary contacts are of the changeover type with a common point.
The following are available:
- 3 NO + 3 NC for the electrically held version (option 3 NO & 3 NC additional auxiliary contacts),
- 5 NO + 6 NC for the mechanically latched version as standard.

Characteristics		
Operating voltage	Minimum	48 V
	Maximum	480 V
Rated current		10 A
Breaking capacity	Vdc	60 W (L/R 150 ms)
	Vac	700 VA (power factor 0.35)

Open release characteristics			
Power supply (Vdc)	48	125	250
Consumption (W)	470	680	640
Response time (ms)	20-40	20-41	20-40

Current transformers for SM6-24

Synthesis table by unit

Units	QMC	CVM	DM1-A	DM1-D DMVL-D DM1M	DM1-W	DM2	GBC-A GBC-B	DMVL-A	DMV-A DMV-D	IMC	DM1-A DM1-D	DM1-W DM1-Z	GBC-A GBC-B	DMV-A DMV-D
			630 A								1250 A			
TC														
ARJP1	■	■												
ARM3			■	■	■	■	■	■						
ARJP2									■	■				
ARJP3											■	■	■	■
CLP2				■										
TLP130		■	■		■									
ARM4			(*)				(*)							

PE60539

ARJP1

Transformer ARJP1/N2F
- characteristics according to IEC standard 61869-2
- single primary winding
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

I1n (A)		10	20	30	50	75	100	150	200
Ith (kA)		1.2	2.4	3.6	6	10	10	10	10
t (s)		1							
Measurement and protection	5 A	15 VA - class 0.5							
	5 A	2.5 VA - 5P20							

PE60539

ARJP1

Transformer ARJP1/N2F
- characteristics according to IEC standard 61869-2
- single primary winding
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

I1n (A)		50	100	150	200
Ith (kA)		6	10		
t (s)		1			
Measurement and protection	5 A	15 VA - class 0.5			
	5 A	2.5 VA - 5P20			

Note: *please consult us for other characteristics.*

PE60536

ARM3

Transformer ARM3/N2F
- characteristics according to IEC standard 61869-2
- double primary winding
- single secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

I1n (A)		10/20	20/40	50/100	100/200	200/400	300/600
Ith (kA)		5	12.5	12.5/21*	12.5/25*	12.5/25*	25
t (s)		1	0.8	1			
Measurement and protection	5 A	7.5 VA - class 0.5					
	1 A	1 VA - 10P30					
	5 A	5 VA - 5P10		5 VA - 5P15			

** For 5 A protection*

- characteristics according to IEC standard 61869-2
- double primary winding
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

I1n (A)		50/100		100/200	200/400	300/600
Ith (kA)		14.5		25	25	25
t (s)		1				
Measurement and protection	5 A	30 VA - class 0.5				
	5 A	5 VA - 5P15		7.5 VA - 5P15		
	5 A	7.5 VA - 5P10		15 VA - 5P10		

PE60535

ARM4

Transformer ARM4
- characteristics according to IEC standard 61869-2
- single or double primary winding
- up to 3 secondary windings (for measure and/or for protection)
- rated highest voltage 7,2 - 12 - 17,5 - 24kV
- rated primary current up to 630A (for SM6 cubicles)
- secondary currents 5A or 1A
- version with one secondary winding: ARM4/N1F
- version with two secondary windings: ARM4/N2F
- version with three secondary windings: ARM4/N3F (*)

(*) Consult us

Current transformers for SM6-24

PE60538

ARJP2

Transformer ARJP2/N2F

- characteristics according to IEC standard 61869-2
- single primary winding
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

I1n (A)		50	100	200	400	600
Ith (kA)		25				
t (s)		1				
Measurement and protection	5 A	10 VA class 0.5	15 VA class 0.5	15 VA class 0.5	15 VA class 0.5	20 VA class 0.5
	5 A	2.5 VA 5P20	2.5 VA 5P20	5 VA 5P20	5 VA 5P20	7.5 VA 5P20

PE60537

ARJP3

Transformer ARJP3/N2F

- characteristics according to IEC standard 61869-2
- single primary winding
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

I1n (A)		1000	1250
Ith (kA)		25	
t (s)		1	
Measurement and protection	1 A	30 VA - class 0.5	
	1 A	10 VA - 5P20	
Measurement and protection	5 A	30 VA - class 0.5	
	5 A	10 VA - 5P20	

PE55661

Low Power Current Transformer (LPCT) CLP2

- characteristics according to IEC standard 60044-8
- large primary current range
- direct output voltage for measurement and protection
- RJ45-8 pts secondary connector
- insulation level 24 kV.

Minimum rated primary current	5 A
Rated nominal primary current	100 A
Rated extended primary current	1250 A
Rated nominal secondary output	22.5 mV
Accuracy class for measurement	0.5
Accuracy class for protection	5P
Accuracy limit factor	400
Rated short time thermal current	40 kA 1 s
Highest voltage (Um)	24 kV
Rated power-frequency withstand	50 kV

PE57162

Low Power Current Transformer (LPCT) TLP130

- characteristics according to IEC standard 60044-8
- large primary current range
- direct output voltage for measurement and protection
- RJ45-8 pts secondary connector
- insulation level 0.72 kV
- internal diameter 130 mm.

Minimum rated primary current	5 A
Rated nominal primary current	100 A
Rated extended primary current	1250 A
Rated nominal secondary output	22.5 mV
Accuracy class for measurement	0.5
Accuracy class for protection	5P
Accuracy limit factor	250
Rated short time thermal current	25 kA 1 s
Highest voltage (Um)	0.72 kV
Rated power-frequency withstand	3 kV

Current transformers for SM6-36

PE57222

Current transformer ARM6T

For units DM1-A, DM1-D, SM6-36, DM2, IMC, GBC-A, GBC-B

Transformer ARM6T/N1 or N2

- characteristics according to IEC standard 61869-2
- double primary winding
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

I1n (A)		50-100	75-150	100-200	150-300	200-400	300/600	1000/1250
Ith (kA)		16 - 20						25
t (s)		1						1
Measurement and protection	5 A	7.5 VA - 15 VA - class 0.5						30 VA - class 0.5
	5 A	2.5 VA - 5 VA - 5P20						10 VA - 5P20

PE58391

Current transformer ARM9T

For units DM1-A, DM1-D, DM2

Transformer ARM9T

- characteristics according to IEC standard 61869-2
- double primary winding
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

I1n (A)		1000/1250
Ith (kA)		40
t (s)		1
Measurement and protection	5 A	30 VA - class 0.5 - Fs < 10
	5 A	10 VA - 5P20

PE57162

LPCT

Low Power Current Transformer (LPCT) for units DM1-A, SM6-36

Transformer TLP 130, TLP 190

- characteristics according to IEC standard 60044-8
- large primary current range
- direct output voltage for measurement and protection
- RJ45-8 pts secondary connector
- insulation level 0.72 kV
- internal diameter 130 or 190 mm
- in SM6-36, TLP 130 can be used for 630 A, TLP 190 can be used up to 1250 A.

	TLP 130	**TLP 190**
Minimum rated primary current	5 A	5 A
Rated extended primary current	1250 A	2500 A
Secondary output	22.5 mV - 100 A	22.5 mV - 100 A
Accuracy class for measurement	0.5	0.5
Accuracy class for protection	5P	5P
Accuracy limit factor	250	400
Rated short time thermal current	25 kA 1 s	40 kA 1 s
Highest voltage (Um)	0.72 kV	0.72 kV
Rated power-frequency withstand	3 kV	3 kV

Voltage transformers for SM6-24

Synthesis table by unit

Units / VTs	CM	CVM	DM1-A	DM1-D DMVL-D	DM1-W	DM2	GBC-A DM1M	GBC-B	DMVL-A	DMV-A	DMV-D	CM2	TM
VRQ2-n/S1	■		■	■	■	■	■	■	■				
VRFR-n/S1		■								■	■		
VRC2/S1							■	■				■	
VRM3-n/S2							■	■					
VCT24													■
VRC1/S1		■											

PE60526

VRQ2

Transformer VRQ2n/S1 (phase-to-earth) 50 or 60 Hz

- characteristics according to IEC standard 61869-3.

Rated voltage (kV)	24			
Primary voltage (kV)	$10/\sqrt{3}$	$15/\sqrt{3}$	$15\text{-}20/\sqrt{3}$	$20/\sqrt{3}$
Secondary voltage (V)	$100/\sqrt{3}$			
Thermal power (VA)	250			
Accuracy class	0.5			
Rated output for single primary winding (VA)	30	30		30
Rated output for double primary winding (VA)			30-50	

Transformer VRFR-n/S1 (phase-to-earth) 50 or 60 Hz

- characteristics according to IEC standard 61869-3.

Rated voltage (kV)	17.5	
Primary voltage (kV)	$10/\sqrt{3}$	$15/\sqrt{3}$
Secondary voltage (V)	$100/\sqrt{3}$	
Thermal power (VA)	250	
Accuracy class	0.5	
Rated output for single primary winding (VA)	30	

PE60527

VRC2

Transformer VRC2/S1 (phase-to-phase) 50 or 60 Hz

- characteristics according to IEC standard 61869-3.

Rated voltage (kV)	24		
Primary voltage (kV)	10	15	20
Secondary voltage (V)	100		
Thermal power (VA)	500		
Accuracy class	0.5		
Rated output for single primary winding (VA)	50		

Voltage transformers for SM6-24

PE55648

PE60528

VRC1

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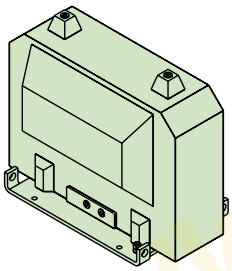

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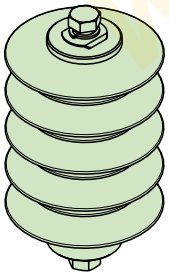

Transformer VRM3-n/S2 (phase-to-earth and protected by fuses 0.3 A) 50 or 60 Hz

- characteristics according to IEC standard 61869-3.

	Rated voltage (kV)	12	17.5	24
	Primary voltage (kV)	$10/\sqrt{3}$	$15/\sqrt{3}$	$20/\sqrt{3}$
	Secondary voltage (V)	$100/\sqrt{3}$ - 100/3		
First secondary	Thermal power (VA)	200		
	Accuracy class	0.5		
	Rated output for single primary (VA)	30-50		
Second secondary	Thermal power (VA)	100		
	Accuracy class	3P		
	Rated output	50		

Transformer VRC1/S1 (phase-to-phase) 50 or 60 Hz

- characteristics according to IEC standard 61869-3.

Rated voltage (kV)	7.2				
Primary voltage (kV)	3.3	5	5.5	6	6.6
Secondary voltage (V)	110	100	110	100	110
Thermal power (VA)	300				
Accuracy class	0.5				
Rated output for single primary winding (VA)	100				

Transformer VCT24 (phase-to-phase) 50 or 60 Hz

Rated voltage (kV)	24		
Primary voltage (kV)	10	15	20
Secondary voltage (V)	220		
Output (VA)	2500	2500	2500
		4000	4000

Note: *the above mentioned voltage transformers are grounded neutral.*
For other characteristics, please consult us.

Surge arresters

For units IM500, DM1-A, DM1-W, GAM, DMV-A*, DMVL-A

In (A)	400/630				
Un (kV)	7.2	10	12	17.5	24

Note: *the rated voltage of the surge arrester is according to unit's rated voltage.*
(*) limited up to 17.5 kV for DMV-A circuit breaker cubicles.

Voltage transformers for SM6-36

PE57223

Voltage transformer VRF3

PE57224

Voltage transformer VRC3

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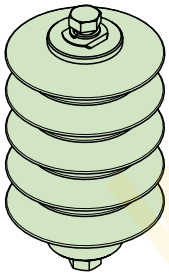


For units CM, GBC-A, GBC-B

Transformer VRF3n/S2 (phase-to-earth)
- single primary winding
- single secondary
- characteristics according to IEC standard 61869-3

Rated voltage (kV)	36	
Primary voltage (kV)	$30\sqrt{3}$	$33\sqrt{3}$
Secondary voltage (V)	$100\sqrt{3}$	$100\sqrt{3}$ or $110\sqrt{3}$
Thermal power (VA)	450	
Accuracy class	0.5	3P
Rated output for single primary winding (VA)	30-50	30

For units CM2

Transformer VRC3/S1 (phase-to-phase)
- single primary winding
- single secondary
- characteristics according to IEC standard 61869-3

Rated voltage (kV)	36	
Primary voltage (kV)	30	33
Secondary voltage (V)	100	100 or 110
Thermal power (VA)	700	
Accuracy class	0.5	
Rated output for single primary winding (VA)	50-100	

For units TM

Transformer VRC3/S1 (phase-to-phase)
- single primary winding
- single secondary
- characteristics according to IEC standard 61869-3

Rated voltage (kV)	36
Primary voltage (kV)	30
Secondary voltage (V)	220
Thermal power (VA)	1000

Surge arresters

For units IM, DM1-A, SM, GAM2

In (A)	630
Un (kV)	36

Motors protection units

The current rating of fuses installed in units depends on:
- motor current rating In
- starting current Id
- frequency of starts.

The fuses rating is calculated such that a current equal to twice the starting current does not blow the fuse within period equal to the starting time.
The adjacent table indicated the ratings which should be used, based on the following assumptions:
- direct on-line startup
- Id/In ⩽ 6
- pf = 0.8 (P ⩽ 500 kW) or 0.9 (P > 500 kW)
- η = 0.9 (P ⩽ 500 kW) or 0.94 (P > 500 kW).

The indicated values are for Fusarc fuses (to DIN standard 43-625).

Example:
Consider a 950 kW motor at 5 kV.

$$In = \frac{P}{\sqrt{3} \cdot U \cdot \eta \cdot pf} = 130\ A$$

Id = 6 x In = 780 A

Then select the next higher value, i.e. 790 A.
For six 5-second starts per hour, select fuses rated 200 A.

Note: *the same motor could not be protected for 12 starts per hour since the maximum service voltage for the required 250 A rated fuses is 3.3 kV.*

Selection of fuses for CVM units

Service voltage (kV)	Starting current (A)	Rated operational current (continous duty) (A)	Starting time (s) 5		10		30	
			Number of starts per hour					
	Id = 6 x Ie	**Ie**	**3**	**6**	**3**	**6**	**3**	**6**
3.3	1100	183	250	250	250			
	942	157	250	250	250	250	250	250
	785	131	200	200	200	200	200	250
6.6	628	105	160	160	160	200	200	200
	565	94	160	160	160	160	160	160
	502	84	125	160	160	160	160	160
	439	73	125	125	125	160	160	160
	377	63	100	125	100	125	125	160
	314	52	100	100	100	100	100	125
	251	42	100	100	100	100	100	100
	188	31	80	100	100	100	100	100
	126	21	50	50	63	80	80	80

Fuse selection method:
- if Id ⩾ 6 x Ie, use Id to select the fuses
- if Id < 6 x Ie, use Ie to select the fuses.

Note:
Fuses are 292 mm long (Fusarc fuses).
Fuses are only for short circuit protection.
For 250 A fuses, it is necessary to delay the opening of the contactor.

Protection of transformers

Transformer protection by fuse-switches

PE57161

Fuse ratings for SM6 protection units such as PM, QM, QMB and QMC depend, among other things, on the following criteria:

- service voltage
- transformer rating
- fuse technology (manufacturer)

Different types of fuses with medium loaded striker may be installed:

- Solefuse fuses as per standard UTE NCF 64.210
- Fusarc CF fuses as per IEC 60.282.1 recommendation and dimensions are related to DIN 43.625 standard.

For fuse-switch combination unit type QM, QMB, QMC, refer only to the selection table and reference list of fuses. For all other type of fuses, consult us.

Example: for the protection of a 400 kVA transformer at 10 kV, select either Solefuse fuses rated 43 A or Fusarc CF fuses rated 50 A.

Fuse selection table

The color code is linked to the rated voltage of the fuse
Rating in A - no overload at –5°C < t < 40°C, ≤1000 m altitude.
⚠ Please consult us for overloads and operation over 40°C for France Transfo oil immersed type transformers.

Type of fuse	Service voltage (kV)	Transformer rating (kVA) 25	50	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	Rated voltage (kV)
Solefuse (UTE NFC standards 13.100. 64.210)																			
	5.5	6.3	16	31.5	31.5	63	63	63	63	63									**7.2**
	10	6.3	6.3	16	16	31.5	31.5	31.5	63	63	63	63							
	15	6.3	6.3	16	16	16	16	16	43	43	43	43	43	63					
	20	6.3	6.3	6.3	6.3	16	16	16	16	43	43	43	43	43	63				**24**
Solefuse (general case, UTE NFC standard 13.200)																			
	3.3	16	16	31.5	31.5	31.5	63	63	100	100									**7.2**
	5.5	6.3	16	16	31.5	31.5	63	63	63	80	80	100	125						
	6.6	6.3	16	16	16	31.5	31.5	43	43	63	80	100	125	125					
	10	6.3	6.3	16	16	16	31.5	31.5	31.5	43	43	63	80	80	100				**12**
	13.8	6.3	6.3	6.3	16	16	16	16	31.5	31.5	31.5	43	63	63	80				**17.5**
	15	6.3	6.3	16	16	16	16	16	31.5	31.5	31.5	43	43	63	80				
	20	6.3	6.3	6.3	6.3	16	16	16	16	31.5	31.5	31.5	43	43	63				**24**
	22	6.3	6.3	6.3	6.3	16	16	16	16	16	31.5	31.5	31.5	43	43	63			
Fusarc CF and SIBA (1) (general case for QM, QMB and QMC cubicle according to IEC 62271-105)																			
	3.3	16	25	40	50	50	80	80	100	125	125	160(1)	200(1)						**7.2**
	5	10	16	31.5	40	40	50	63	80	80	125	125	160(1)						
	5.5	10	16	31.5	31.5	40	50	50	63	80	100	125	125	160(1)	160(1)				
	6	10	16	25	31.5	40	50	50	63	80	80	125	125	160(1)	160(1)				
	6.6	10	16	25	31.5	40	50	50	63	80	80	100	125	125	160(1)				
	10	6.3	10	16	20	25	31.5	40	50	50	63	80	80	100	100	125(1)	200(1)		**12**
	11	6.3	10	16	20	25	25	31.5	40	50	50	63	80	100	100	125(1)	160(1)		
	13.8	6.3	10	16	16	20	25	31.5	31.5	40	50	50	63	80	80	100(1)	125(1)	125(1)	**17.5**
	15	6.3	10	10	16	16	20	25	31.5	40	50	50	63	80	80	100(1)	125(1)	125(1)	
	20	6.3	6.3	10	10	16	16	25	25	31.5	40	40	50	50	63	80	100(1)	125(1)	**24**
	22	6.3	6.3	10	10	10	16	20	25	25	31.5	40	40	50	50	80	80	100(1)	
Fusarc CF for dry type transformers (2)																			
	30					10		10	16	20	25	31.5	31.5	50	50	63	63		**36**
	31.5					10		10	16	20	25	25	31.5	50	50	63	63		
	33					6.3		10	16	20	25	25	31.5	40	50	50	63		
	34.5					6.3		10	16	20	25	25	31.5	40	50	50	63		
Fusarc CF oil immersed type transformers (2)																			
	30					10		10	16	20	25	31.5	31.5	40	40	50	63		**36**
	31.5					10		10	16	20	25	31.5	31.5	40	40	50	63		
	33					10		10	16	20	25	25	31.5	31.5	40	40	50		
	34.5					10		10	16	20	25	25	31.5	31.5	40	40	50		

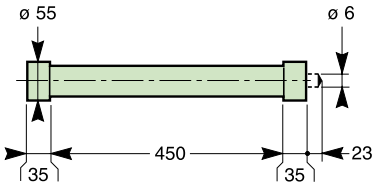
(1) SIBA fuses
(2) This selection table has been prepared according to the technical characteristics of France Transfo. The characteristics of transformers and fuses may change according to manufactures and standards.

Protection of transformers

Transformer protection by fuse-switches

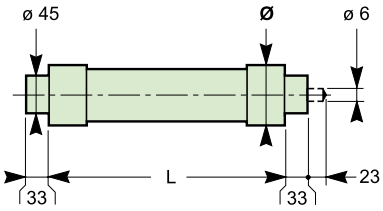
Fuses dimensions

Solefuse (UTE standards)



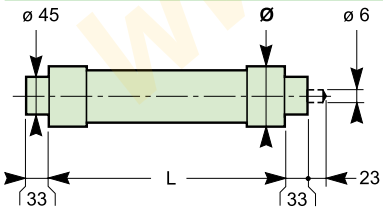
Ur (kV)	Ir (A)	L (mm)	Ø (mm)	Weight (kg)
7.2	6.3 to 125	450	55	2
12	100	450	55	2
17.5	80	450	55	2
24	6.3 to 63	450	55	2

Fusarc CF (DIN standards)



Ur (kV)	Ir (A)	L (mm)	Ø (mm)	Weight (kg)
7.2	125	292	86	3.3
12	6.3	292	50.5	1.2
	10	292	50.5	1.2
	16	292	50.5	1.2
	20	292	50.5	1.2
	25	292	57	1.5
	31.5	292	57	1.5
	40	292	57	1.5
	50	292	78.5	2.8
	63	292	78.5	2.8
	80	292	78.5	2.8
	100	292	78.5	2.8
24	6.3	442	50.5	1.6
	10	442	50.5	1.6
	16	442	50.5	1.6
	20	442	50.5	1.6
	25	442	57	2.2
	31.5	442	57	2.2
	40	442	57	2.2
	50	442	78.5	4.1
	63	442	78.5	4.1
	80	442	86	5.3
36	10	537	50.5	1.8
	16	537	50.5	1.8
	25	537	57	2.6
	31.5	537	78.5	4.7
	40	537	78.5	4.7
	50	537	86	6.4
	63	537	86	6.4

SIBA



Ur (kV)	Ir (A)	L (mm)	Ø (mm)	Weight (kg)
7.2	160	292	85	3.8
	200	292	85	5.4
12	125	292	67	2
	160	292	85	3.8
	200	292	85	3.8
17.5	125	442	85	5.4
24	100	442	85	5.4
	125	442	85	5.4

Interlocks

Switch units
- **the switch can be closed** only if the earthing switch is open and the access panel is in position.
- **the earthing switch can be closed** only if the switch is open.
- **the access panel for connections can be opened** only if the earthing switch is closed.
- **the switch is locked** in the open position when the access panel is removed. The earthing switch may be operated for tests.

Circuit-breaker units
- **the disconnector(s) can be closed** only if the circuit breaker is open and the front panel is locked (interlock type 50).
- **the earth switch(es) can be closed** only if the disconnector(s) is/are open.
- **the access panel for connections can be opened** only if:
- the circuit breaker is locked open,
- the disconnector(s) is/are open,
- the earth switch(es) is/are closed.

***Note:** it is possible to lock the disconnector(s) in the open position for no-load operations with the circuit breaker.*

Functional interlocks

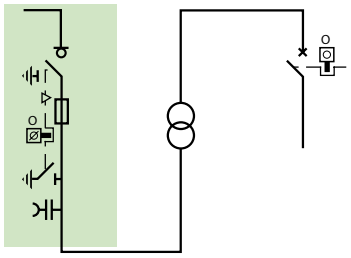
These comply with IEC recommendation 62271-200 and EDF specification HN 64-S-41 (for 24 kV).
In addition to the functional interlocks, each disconnector and switch include:
- **built-in padlocking** capacities (padlocks not supplied)
- **four knock-outs** that may be used for keylocks (supplied on request) for mechanism locking functions.

Unit interlock

Units	Interlock											
	A1	C1	C4	A3	A4	A5	50	52	P1	P2	P3	P5
IM, IMB, IMC, IMM				■	■				■			
PM, QM, QMB, QMC,	■	■	■									
DM1-A, DM1-D, DM1-W, DM1-Z, DM1-S, DMV-A, DMV-D, DMVL-A, DMVL-D	■	■	■				■					
CVM		■						■				
NSM				■					■			
GAM				■		■						■
SM										■	■	
DM2							■					
DM1-M							■					

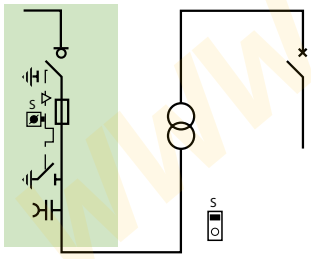
DE53565_LG

A1 type



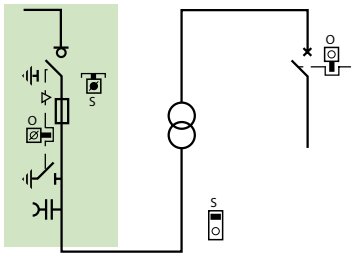
DE53566_LG

C1 type



DE53567_LG

C4 type



Key-type interlocks

Outgoing units

Aim:
- to prevent the closing of the earthing switch on a transformer protection unit unless the LV circuit breaker is locked in "open" or "disconnected" position.

- to prevent the access to the transformer if the earthing switch for transformer protection has not first been closed.

- to prevent the closing of the earthing switch on a transformer protection unit unless the LV circuit breaker is locked in "open" or "disconnected" position.
- to prevent the access to the transformer if the earthing switch for transformer protection has not first been closed.

MT20240EN

Legend for key-type interlocks:

no key | free key | captive key | panel or door

Interlocks

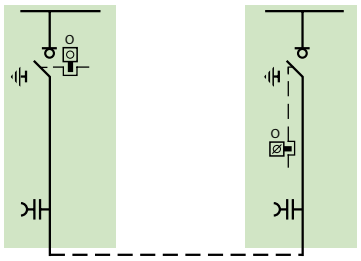
Ring units

Aim:

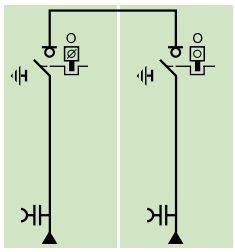
- to prevent the closing of the earthing switch of a load-side cubicle unless the line-side switch is locked "open".

DE53568_LG

A3 type



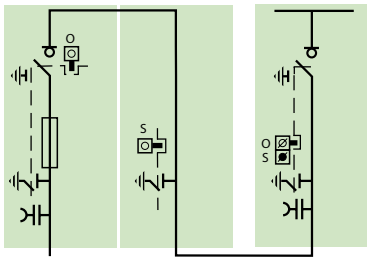
A4 type



- to prevent the simultaneous closing of two switches.

DE53570_LG

A5 type



- to prevent the closing of the earthing switch of the casing unit unless the downstream and the upstream switches are locked in the "open" position.

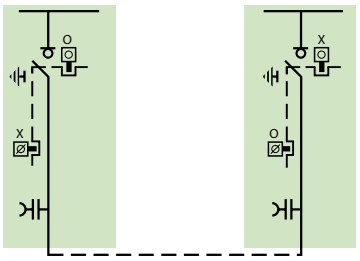
MT20240EN

Legend for key-type interlocks:

no key | free key | captive key | panel or door

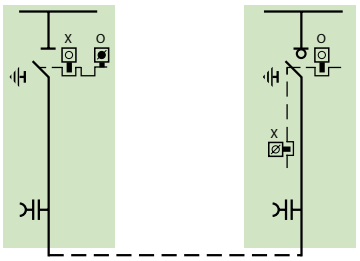
Interlocks

DE53572_LG **P1 type**



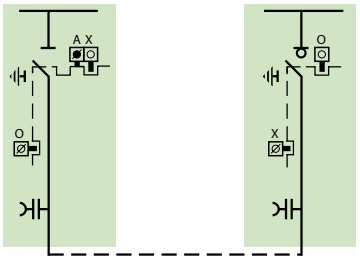
- to prevent the closing of an earthing switch if the switch of the other unit has not been locked in the "open" position.

DE53573_LG **P2 type**



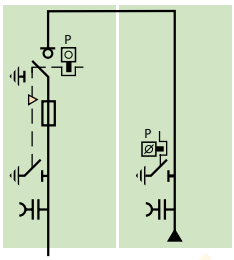
- to prevent on-load operation of the disconnector unless the switch is locked "open"
- to prevent the closing of the earthing switches unless the disconnector and the switch are locked "open".

DE53574_LG **P3 type**



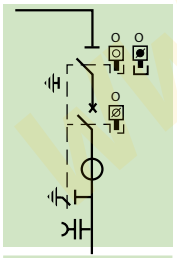
- to prevent on-load operation of the disconnector unless the switch is locked "open"
- to prevent the closing of the earthing switches with the unit energised, unless the disconnector and the switch are locked "open"
- to allow off-load operation of the switch.

DE53575_LG **P5 type**

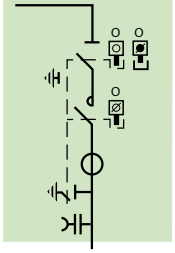


- to prevent the closing of the earthing switch of the incoming unit unless the disconnector and the switch is locked "open".

DE53571_LG **50 type**



DE59203_LG **Type 52**



Functional interlocks

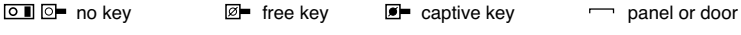
Prevents
- on-load switching of the disconnectors.

Allows
- off-load operation of the circuit breaker with the disconnectors open (double isolation).
- off-load operation of the circuit breaker with the disconnector open (single isolation).

Prevents
- on-load switching of the disconnectors.

Allows
- off-load operation of the contactor with the disconnectors open (double isolation).
- off-load operation of the contactor with the disconnector open (single isolation).

MT20240EN **Legend for key-type interlocks:**



Protection, monitoring and control

Protection, monitoring and control

Contents

Protection

Easergy P3 relay

Easergy P3 standard
Universal applications

PM106284

PM106572

P3U10/20/30 = Universal protection

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

PM106637

Solid protection meets unparralleled eficiency

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

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

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

Unparralleled efficiency

- Simple selection and ordering with EcoReal MV
- Faster delivery with on-the-shelf availability of standard configurations
- Simplified configuration with the new eSetup Easergy Pro setting tool

Better Connectivity

- Simpler operation and maintenancewith the Easergy P3 SmartApp
- All communication protocols included natively, including IEC 61850
- Possibility to use two active communication protocols in the same time
- Increased number of inputs and outputs for more possibilities

Enhanced safety

- Embedded arc protection
- Built-in virtual injection testing
- Compliant to international standards (i.e. IEC 60255-1)

Ease of use

User-friendliness is a key benefit of Easergy P3, made to save time at every step of the project's life-cycle.

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

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

Enhanced usability

The Easergy P3 protection relay concept has been extended with a number of features that make installation and testing of the relays even more efficient and user-friendly, like the virtual injection testing accessible with eSetup Easergy Pro setting software.

Protection

Sepam selection guide

The Sepam range of protection and metering is designed for the operation of machines and electrical distribution networks of industrial installations and utility substations for all levels of voltage.

It consists of complete, simple and reliable solutions, suited to following four families: Sepam series 20, 40, 60 and 80.

A range adapted at your application

- Protection of substation (incoming, outgoing line and busbars).
- Protection of transformers.
- Protection of motors, and generators.

Simplicity

Easy to install

- Light, compact base unit.
- Optional modules fitted on a DIN rail, connected using prefabricated cords.
- User friendly and powerful PC parameter and protection setting software to utilize all of Sepam's possibilities.

User-friendly

- Intuitive User Machine Interface, with direct data access.
- Local operating data in the user's language.

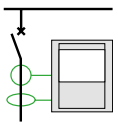
Accurate measurement and detailed diagnosis

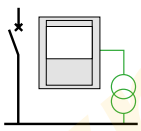
- Measuring all necessary electrical values.
- Monitoring switchgear status: sensors and trip circuit, mechanical switchgear status.
- Disturbance recording.
- Sepam self-diagnosis and watchdog.

Flexibility and evolutivity

- Enhanced by optional modules to evolve in step with your installation.
- Possible to add optional modules at any time.
- Simple to connect and commission via a parameter setting procedure.

Series 20





Protections		
Current	■ ■	
Voltage		■ ■
Frequency		■ ■
Specifics	Breaker failure	Disconnection by rate of change of frequency
Applications		
Substation	**S20 S24**	
Busbar		**B21 B22**
Transformer	**T20 T24**	
Motor	**M20**	
Generator		
Capacitor		
Characteristics		
Logic inputs	0 to 10	0 to 10
Logic outputs	4 to 8	4 to 8
Temperature sensors	0 to 8	0 to 8
Channel		
Current	3 I + Io	
Voltage		3V + Vo
LPCT (1)	■	
Communication ports	1 to 2	1 to 2
IEC61850 Protocol	■	■
Control		
Matrix (2)	■	■
Logic equation editor		
Logipam (3)		
Other		
Backup battery		
Front memory cartridge with settings		

(1) LPCT: low-power current transformer complying with standard IEC 60044-8.

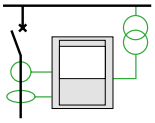
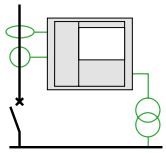
(2) Control matrix for simple assignment of information from the protection, control and monitoring functions.

(3) Logipam ladder language (PC programming environment) to make full use of Sepam series 80 functions.

(4) Standard lithium battery 1/2 AA format, 3.6 V, front face exchangeable.

Protection

Easergy Sepam selection guide

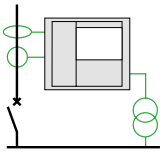
	Series 40			Series 60		
	 			 		
Protections						
Current	■	■	■	■	■	■
Voltage	■	■	■	■	■	■
Frequency	■	■	■	■	■	■
Specifics		Directional earth fault	Directional earth fault and phase overcurrent		Directional earth fault	Directional earth fault and phase overcurrent
Applications						
Substation	**S40**	**S41, S43**	**S42**	**S60**		**S62**
Busbar						
Transformer	**T40**		**T42**	**T60**		**T62**
Motor		**M41**			**M61**	
Generator	**G40**			**G60**		**G62**
Capacitor				**C60**		
Characteristics						
Logic inputs	0 to 10			0 to 28		
Logic outputs	4 to 8			4 to 16		
Temperature sensors	0 to 16			0 to 16		
Channel						
Current	3 I + Io			3 I + Io		
Voltage	3V, 2U + Vo			3V, 2U + Vo or Vnt		
LPCT (1)	■			■		
Communication ports	1 to 2			1 to 2		
IEC61850 Protocol	■			■		
Control						
Matrix (2)	■			■		
Logic equation editor	■			■		
Logipam (3)						
Other						
Backup battery	48 hours			Lithium battery (4)		
Front memory cartridge with settings				■		

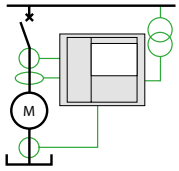
(1) LPCT: low-power current transformer complying with standard IEC 60044-8.
(2) Control matrix for simple assignment of information from the protection, control and monitoring functions.
(3) Logipam ladder language (PC programming environment) to make full use of Sepam series 80 functions.
(4) Standard lithium battery 1/2 AA format, 3.6 V, front face exchangeable.

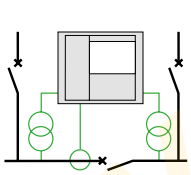
Protection

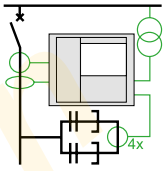
Easergy Sepam selection guide

Series 80









Protections								
Current	■	■	■	■	■	■	■	■
Voltage	■	■	■	■	■	■	■	■
Frequency	■	■	■	■	■	■	■	■
Specifics		Directional earth fault	Directional earth fault and phase overcurrent	Disconnection by rate of change of frequency	Transformer & transformer-machine unit differential	Machine differential	Voltage and frequency protection for 2 sets of busbars	Capacitor-bank unbalance
Applications								
Substation	**S80**	**S81**	**S82**	**S84**				
Busbar	**B80**						**B83**	
Transformer		**T81**	**T82**		**T87**			
Motor		**M81**			**M88**	**M87**		
Generator			**G82**		**G88**	**G87**		
Capacitor								**C86**
Characteristics								
Logic inputs	0 to 42				0 to 42		0 to 42	0 to 42
Logic outputs	5 to 23				5 to 23		5 to 23	5 to 23
Temperature sensors	0 to 16				0 to 16		0 to 16	0 to 16
Channel								
Current	3 I + 2 x Io				2 x 3 I + 2 x Io		3 I + Io	2 x 3 I + 2 x Io
Voltage	3V + Vo				3V + Vo		2 x 3V + 2 x Vo	3V + Vo
LPCT (1)	■				■		■	■
Communication ports	2 to 4				2 to 4		2 to 4	2 to 4
IEC61850 Protocol	■				■		■	■
Control								
Matrix (2)	■				■		■	■
Logic equation editor	■				■		■	■
Logipam (3)	■				■		■	■
Other								
Backup battery	Lithium battery (4)				Lithium battery (4)		Lithium battery (4)	Lithium battery (4)
Front memory cartridge with settings	■				■		■	■

(1) LPCT: low-power current transformer complying with standard IEC 60044-8.
(2) Control matrix for simple assignment of information from the protection, control and monitoring functions.
(3) Logipam ladder language (PC programming environment) to make full use of Sepam series 80 functions.
(4) Standard lithium battery 1/2 AA format, 3.6 V, front face exchangeable.

Protection

VIP 40 and VIP 45 relays

New!

Schneider Electric recommends circuit breakers for transformer protection instead of fuses.

They offer the following advantages:

- Easy to set
- Better discrimination with other MV and LV protection devices
- Improved protection performance for inrush currents, overloads, low magnitude phase faults and earth faults
- Greater severe climate withstand
- Reduced maintenance and spare parts
- Availability of additional functions such as measurement, diagnostics and remote monitoring

And with the recent development of less expensive circuit breakers and self-powered relays, life time costs are now equivalent to those of traditional MV switch fuse solutions

PM100574

Application

- Entry level MV/LV transformer protection
- Dependent-time phase overcurrent tripping curve dedicated to MV/LV transformer protection
- Definite-time earth fault protection
- Phase current and peak demand current measurement

Main features

Self-powered operation

- Energised by the CTs: no auxiliary power needed

Complete pre-tested protection system

- Functional block ready to be integrated

Designed for SM6 to protect transformers

- Designed for D02N 200 A and D01N 100 A circuit breakers to replace fuse-switch solutions
- Setting is as simple as fuse selection
- Maximum setting possibilities consistent with circuit breaker characteristics

Phase overcurrent protection

- Tripping curve optimised for MV/LV transformer protection
- Protection against overloads and secondary and primary short-circuits
- Second harmonic restraint filtering
- Only one setting (I>)
- Discrimination with LV circuit breakers or LV fuses
- Compliant with TFL (Time Fuse Link) operating criteria

Earth fault protection

- Definite-time tripping curve
- Settings: Io> (phase current sum method) and to >
- Second harmonic restraint element

Measurement

- Load current on each phase
- Peak demand current.

Front panel and settings

- Current measurements displayed on a 3 digit LCD
- Settings with 3 dials (I>, Io>, to>) protected by a lead-sealable cover
- Trip indication powered by dedicated integrated battery with reset by pushbutton or automatically

Protection

VIP 400 and VIP410 relays

New!

- VIP 400 is a self-powered relay energised by the CTs; it does not require an auxiliary power supply to operate

PM100580

Applications

- MV distribution substation incomer or feeder protection relay
- MV/LV transformer protection.

Main features

VIP 400: Self-powered protection relay

This version is energised by the current transformers (CTs). It does not require an auxiliary power supply to operate.

- Overcurrent and earth fault protection
- Thermal overload protection
- Current measurement functions

VIP 410

In addition, the VIP 410 offers enhanced sensitivity to low earth-fault currents and provides additional diagnostics with time-stamped logs thanks to a dual power supply and a communication port.

Protection and sensor for VIP 40/45/400/410

- New sensor dedicated for VIP 40/45/400/410

Rated voltage	Ur	0.72 kV
Insulation voltage	Ud	3 kV - 1 min.
Rated short-time withstand current	Ith (kA)	25
Withstand time	t (s)	3
Rated primary current	I1n	CGA: 0-200 A CGB: 0-630 A
Secondary voltage	Vs	22.5 mV at 100 A
Rated burden		< 2 kΩ
Measurement protection	Accuracy class	CI 1.0 5P30

Protection

Protection and sensor selection table

General common selection of protection units

Protection type	Code	Protection units						
		Easergy	Sepam				VIP	
		P3	series 20	series 40	series 60	series 80	40/45	400
Three-phase overcurrent	50 - 51	■	■	■	■	■	■ (2)	■ (1)
Zero-sequence overcurrent	50N - 51N	■	■	■	■	■	■ (3)	■ (1)
Directional zero-sequence current	67N			■	■	■		
Undervoltage	27			■	■	■		
Overvoltage	59			■	■	■		
Thermal image	49	■	■	■	■	■		
Zero-sequence overvoltage	59N			■	■	■		
Negative sequence overcurrent	46	■	■	■	■	■		
Long start-up and rotor blocking	51LR	■	■	■	■	■		
Maximum number of start-ups	66	■	■	■	■	■		
Single-phase undercurrent	37	■	■	■	■	■		
Communication		■	■	■	■	■		

(1) *DT, EI, SI, VI and RI trip curves.*
(2) *Inverse curve suited to transformer protection.*
(3) *DT trip curve.*

Protection
LPCT protection chain

Standard applications

PE88012

Sepam series 20

Demanding applications

PE88011

Sepam series 40

Custom applications

PE88010

Sepam series 60 and 80

TLP130, TLP190, CLP2 sensors for Sepam series 20, 40, 60, 80 protection units

LPCT sensors are voltage-output current sensors (Low Power Current Transformer) compliant with the IEC 60044-8 standard.
These sensors are designed to measure rated current between 5 A and 630 A, with a ratio of 100 A / 22.5 mV.

Sepam series 20, 40, 60 and 80 protection units are at the heart of the LPCT protection chain.
Sepam series 20, 40, 60 and 80 performs the following functions:
- acquisition of phase currents measured by the LPCT sensors
- utilization of measurements by the protection functions
- tripping of the breaking device in case of fault detection.

Advantages

- **Consistent protection chain with the same sensor measures phase currents from 5 A to 630 A**
- Simple to install and implement:
  - installation of LPCT sensors
    TLP130 and TLP190 are installed around MV cable
    CLP2 is installed on the MV circuit
  - LPCT connected directly to Sepam series 20, 40, 60 and 80
  - accessories available to test the LPCT protection chain by secondary current injection.
- LPCTs range of use

LPCT measuring and protection function guaranteeing the accuracy up to the short-time current.
Following the range of use of LPCT:
- from 5 A up to 1250 A respecting the error limits imposed by the accuracy class 0.5
- from 1250 A up to 50 kA respecting the error limits imposed by the accuracy class 5P.

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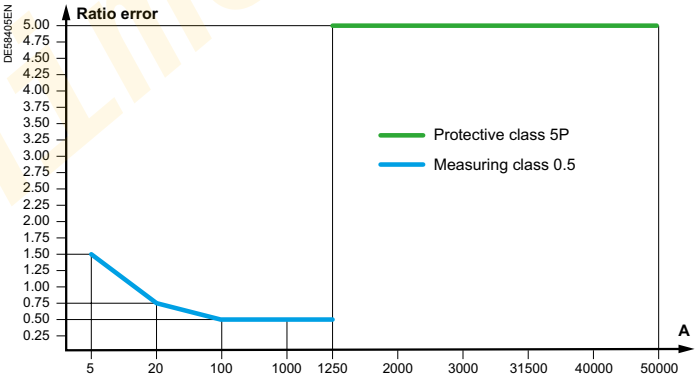


- **Optimized integration of functions:**
  - measurement of phase rated currents as of 25 A that is set by micro-switch
  - monitoring of LPCT sensor by Sepam series 20, 40, 60 and 80 (detection of phase loss).

Connections

1 LPCT sensor, equipped with a shielded cable fitted with an RJ45 connector to be connected directly to the card **3**

2 Sepam series 20, 40, 60 and 80 protection unit

3 Card interface that adapts the voltage delivered by the LPCT sensors, with microswitch setting of rated current.
- CCA671 card for series 60 and 80
- CCA670 card for series 20 and 40.

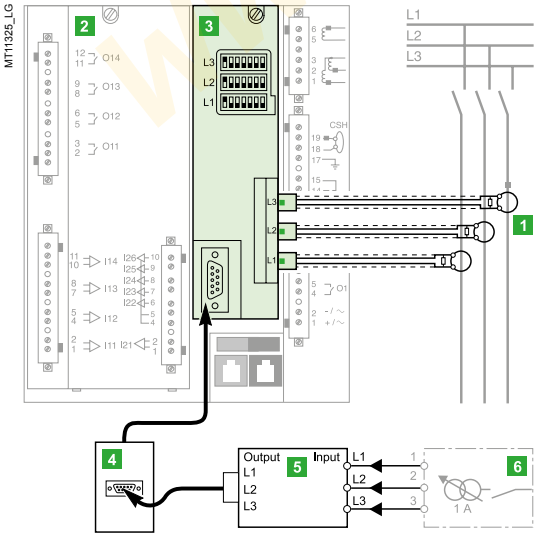
Testing and injection

4 CCA613 remote test plug, flush-mounted in front panel of cubicle, equipped with a 3-m cord to be connected to the CCA670 connector test socket (9-pin Sub D)

5 ACE917 injection interface, used to test the LPCT protection chain with a standard injection box

6 Standard 1A injection box.

MT11325_LG



Fault passage indicators

Flair 21D, 22D and 23DM

Flair 21D, 22D, 23DM is a family of DIN format fault passage indicators. They are small in size, self-powered and adapt automatically to the network.

These devices use cutting-edge technology to detect earth faults on underground MV networks with isolated, resistor-earthed or directly earthed neutral and overcurrents on all networks.

- Self-powered, the fault current passage detection and indication system operates continuously
- Adjustment-free, they are immediately operational (numerous manual adjustments are however possible)
- Compact, their DIN format easily fits in MV cubicles
- Smart, they offer an ammeter/digital maximeter function
- Comprehensive, the Flair 23DM version incorporates a highly sophisticated voltage presence/absence relay function with RJ45 Modbus communication

PE57783

PE57784

EMS58355

Applications and main features

The Flair range increases your power availability by providing indicators suitable for fault locating and MV network load management.

- Indication of phase-phase and phase-earth faults
- Display of settings
- Indication of the faulty phase
- Display of the load current including peak demand and frequency
- Fault passage indication and voltage detection combination (Flair 23DM)
- RJ45 communication (Flair 23DM only).

These fault passage indicators are reliable and easy to use.

- Automatic setting on the site
- Fault indication with LED or outdoor lamp
- 15-year battery life for Flair 22D
- More accurate fault detection if Flair 22D or 23DM is connected to voltage
- presence indication system (VPIS) voltage output
- Can be factory-mounted in SM6 cubicles or added on the site
- Easy on-site addition without removing MV cables using split-type current sensor.

Fault detection functions

Overcurrent detection

- Automatic mode for adjustment-free calibration of detection thresholds
- Manual mode for special override settings:
- Flair 21D: 4 detection thresholds from 200 A to 800 A, in 200 A increments,
- selectable via microswitches
- Flair 22D and Flair 23DM: 8 detection thresholds from 100 A to 800 A, in 50 A
- increments, configurable via the front panel keypad.
- Fault acknowledge time:
- Flair 21D: 40 ms
- Flair 22D and Flair 23DM (configurable via the front panel keypad):
  Type A from 40 to 100 ms in 20 ms increments
  Type B from 100 to 300 ms in 50 ms increments.

Earth fault detection

The detector checks the 3 phases for current variations (di/dt).
A time delay of 70 s is applied for fault confirmation by the upstream protective device.

- Automatic mode for adjustment-free calibration of detection thresholds
- Manual mode for special override settings:
- Flair 21D: 6 detection thresholds from 40 to 160 A, via microswitches
- Flair 22D and Flair 23DM (configurable via the front panel keypad):
  Type A from 20 to 200 A, in 10 A increments
  Type B from 5 to 30 A in 5 A increments and 30 to 200 A in 10 A.
- Inrush function: prevents unnecessary detection in the event of load switch-on.

Incorporates a 3 s time delay for fault filtering at network power up.
The Inrush function can be disabled via configuration on Flair 22D and 23DM.

Fault indication function

Signalling

As soon as a fault is confirmed, the indication device is activated.

- Fault indication via a red LED on the front panel
- Indication of the faulty phase (earth fault) on LCD display
- Optional remoting of indication to external flashing lamp
- Activation of a contact for retransmission to the SCADA system.

Indication reset

- Automatic reset upon load current recovery (configurable time delay on Flair 22D and Flair 23DM)
- Manual reset via front panel button
- Reset via external Reset input
- Reset by time delay: fixed (4 hr) for Flair 21D and adjustable using front panel keypad (2 hr to 16 hr) for Flair 22D and Flair 23DM.

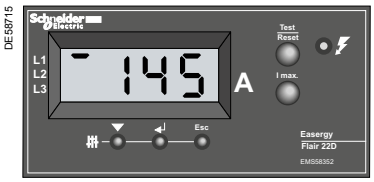
Fault passage indicators

Flair 21D, 22D and 23DM

The Flair 21D, 22D, 23DM range uses an integrated detection system composed of indicators and dedicated CTs. Integrated sensors are normally placed around the bushings. Split CTs can be placed around cables for retrofit purposes.

Display principle

- The load current is displayed continuously
- When a fault is detected, the faulty phase is indicated
- Use the buttons on the front panel to scroll through settings and measurements.

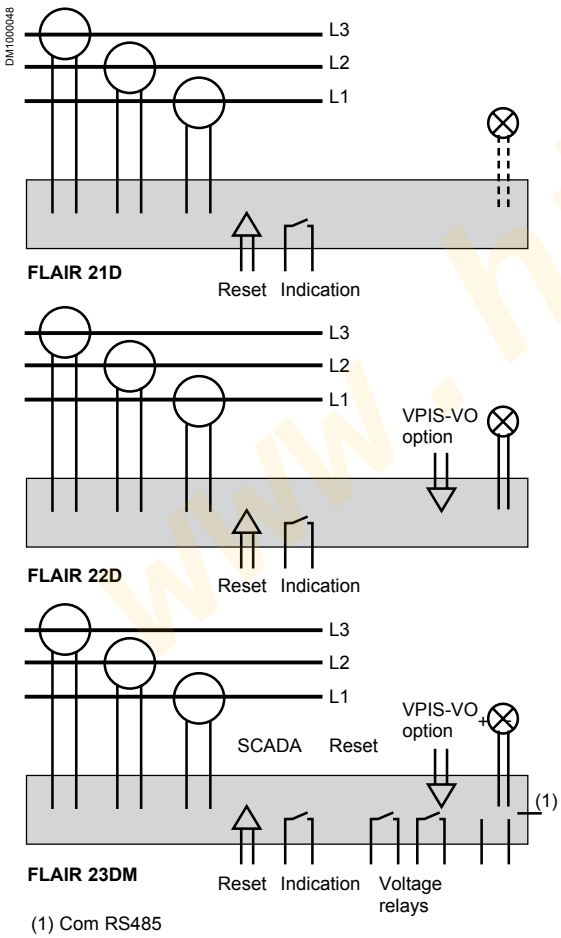


Selection table

		Flair		
		Flair 21D	Flair 22D	Flair 23DM
Power supply	Self-powered	■	■	■
	Dual-powered		■ (1)	■
Detection	Overcurrent		■	■
	Earth-fault		■	■
Display (4 digit LCD)	Ammeter		■	■
	Maximeter		■	■
	SCADA interface (relay)		■	■
	External lamp		■	■
	External reset		■	■
	Extended setting (keypad)		■	■
Communication	2-voltage output relays			■
	Serial communication port			■

(1) By lithium battery

Connection diagrams



(1) Com RS485

Characteristics per product

Model	Description
Fault passage indicator with single power supply (self-powered)	
Flair 21D	Detector with autonomous power supply
	External indicator lamp output powered by battery (BVP)
Fault passage indicator with dual power supply	
Flair 22D	Detector with autonomous power supply and lithium battery
	External indicator lamp output powered by the Flair (BVE)
	Zero sequence CT option (type B setup)
	Interface with VPIS-VO possible to confirm the fault by voltage absence
Fault passage indicator with dual power supply and voltage presence/absence	
Flair 23DM	Detector with 24-48 Vdc external and autonomous power supply
	External indicator lamp output powered by the Flair (BVE)
	Zero sequence CT option (type B or C setup)
	Voltage presence and absence detector (same as for VD23)
	Interface with VPIS-VO needed for the voltage presence

Standard applications

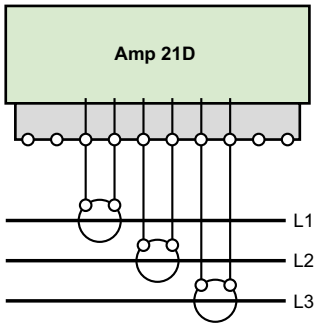
Flair 21D	Maintenance-free, adjustment-free fault detector
Flair 22D	Fault detector for networks with very low load current (< 2 A) with possibility of manual adjustments
Flair 23DM	Adapted to Feeder Automation. Forwarding of current measurement, fault passage indication and voltage outage information to the SCADA via a serial communication port. Combination fault passage indicator and voltage detector, ideal for use with an Automatic Transfer System

Ammeter

- At the leading edge of technology, Amp 21D is suitable for Medium Voltage network load management.
- Self-powered, it ensures a permanent display of currents.
- Compact and in DIN format, it fits naturally into MV cubicles.
- Cost efficient, it uses the CT optimised for Fault Passage Indicator.
- Performant, it displays phase current and maximum of current

PE57786

DE58404_LG



PM105637

The SM6 can integrate ammeter Amp 21D on all incoming cubicles and the fuse-switch cubicles

Functions

- Display of 3 phase current: I1 , I2 , I3. Range: 3 A to 630 A
- Display of 3 phase current maximeter: I1 , I2 , I3. Range: 3 to 630 A.

Display principle

- Load currents are permanently displayed
- continuous scrolling of L1, then L2, then L3.
- Maximeter
- access to maximeter display by pressing a dedicated push button
- continuous scrolling of M1, then M2, then M3
- reset of all maximeter by pressing a combination of two push buttons.

Connections, assembly

Small size enclosure
- DIN format: 93 x 45 mm
- Secured, extraction-proff mounting
- Terminal connections.

Current sensors
- Split core CT for mounting on MV cables.

Technical data

Application		
Frequency		50 Hz and 60 Hz
Load current	Minimum current	≥ 3 A
Measurement		
Range	Phase current	3 to 630 A (resolution 1 A)
	Accuracy (I < 630 A)	± (2% + 2 digit)
Reset of maximeter	Manual from device	Yes
Power supply		
Self power	From the current sensors	I load ≥ 3 A
Battery		No
Auxiliary supply		No
Display		
	Display	4 digits LCD
	Current per phase	Yes (resolution 1 A)
	Maximeter per phase	Yes
Sensors		
	Phase CTs	3 split core CT
Miscellaneous		
	Test	Yes

Arc fault detectors Easergy Vamp

New!

Function

The arc protection unit detects an arc flash in an installation and trips the feeding breaker.

An arc flash protection reduces the risk of personal injury and/ or material damage caused by arc faults.

Easergy Vamp 121

System features

- Operation on light only
- Up to 10 arc or smoke sensors
- Single trip contact
- Straightforward installation
- Operation time 9 ms (including the output relay)
- Cost efficient solution
- Self-supervision
- Binary input for blocking or resetting the unit (programmable)
- Possibility for double arc channel activation trip criteria
- BIO light transfer possibility to other Easergy Vamp device

Sensors

Point sensor - Surface	• Arc detection from two compartments simultaneously • Self-monitored • Cable length adjustable from 6 m to 20 m down
Point sensor - pipe	• Self-monitored • Cable length adjustable from 6 m to 20 m down
Portable sensor	• Snap-in connection to I/0 unit

Benefits

- Increases protection of personal and property
- Extended switchgear life cycle
- May reduce insurance bill
- Low investment costs and fast installation

Control
Motorization control

New!

The SC110 is an intelligent electronic device designed to control and monitor all the components involved in the remote control of core units.

It integrates all the necessary functions for reliable remote control:

- Electrical interlocking
- Remote control supervision
- Front panel interface for local operation
- Built-in Modbus communication and "Plug and play" design makes the SC110 and the remote control facility:
  - easy to use
  - easy to upgrade.

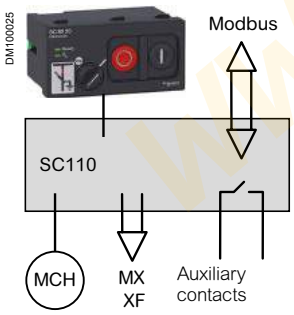
PM100043

SC110A 3 RJ45 Modbus plugs

PM100038

SC-MI control panel

DM100025



The SC110 is installed in the Low Voltage cabinet of the functional unit. It controls and monitors all the auxiliary contacts needed for electrical operation.

SC110 universal intelligent controller

SC110 is a compact device with digital inputs and outputs to monitor all the components associated with the electrical operation of the core unit: MCH, MX, XF, auxiliary contacts.
It can be associated with a control panel (SC-MI).

Switchgear control functions

- Coil and motor operation
- Information on switch status: main switch, earthing switch
- Built-in electrical interlocks: anti-pumping and anti-reflex functions
- External interlocking feature
- Lockout of electrical operation after tripping (option)
- Modbus communication for remote control via data transmission

Switchgear monitoring

- Diagnosis information: motor consumption, etc.
- Switch auxiliary contacts status
- Logging of time-stamped events
- Modbus communication for remote indication of monitoring information

SC110 types	SC110-A	SC110-E
24-60 Vdc	●	
110 Vdc/Vac - 240Vac/250Vdc		●
Network communication	●	●

SC-MI control panels	SC-MI 10	SC-MI 20
On/Off pushbuttons	●	●
Remote/local switch		●

Control

Thermal monitoring Easergy TH110

New!

PM105638

Continuous Thermal Monitoring

The power connections in the Medium Voltage products are one of the most critical points of the substations especially for those made on site like:

- MV Cable connections

Loose and faulty connections cause an increase of resistance in localized points that will lead to thermal runaway until the complete failure of the connections.

Preventive maintenance can be complicated in severe operating conditions also due to limited accessibility and visibility of the contacts.

The continuous thermal monitoring is the most appropriate way to early detect a compromised connection.

Easergy TH110 Thermal Sensor

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

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

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

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

Easergy TH110 is **self powered** by the network current and it can ensure **high performances** providing accurate thermal monitoring being in **direct contact** with the measured point.

PM105623

Easergy TH110

PM106288

Easergy CL110

Easergy CL110 ambient monitoring

Schneider Electric ambient monitoring system will continuosly: ·

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

Control

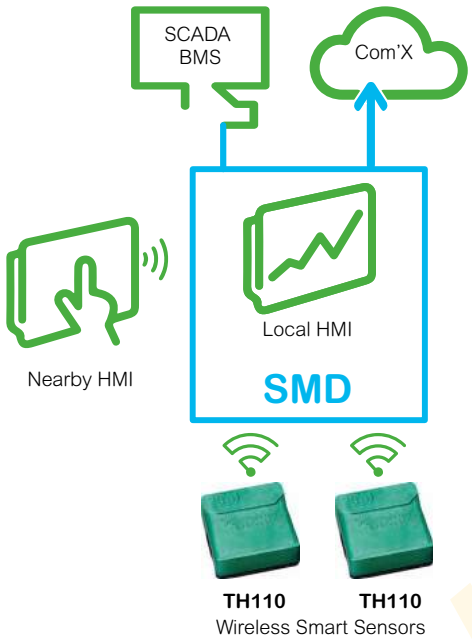
Thermal monitoring Easergy TH110

New!

Key benefits

- Battery free
- Wireless communications
- In contact measuring point
- Easy installation
- Compact footprint
- Remote monitoring and alarming

DM105320b



Substation Monitoring Device

Easergy TH110 is **connected** to the Substation Monitoring Device (SMD) that harvest the data for local signaling, data analyses and nearby control.

Specific **monitoring algorithms** allow to detect drifts from the threshold based on the specific installation characteristics also in regards of the variable loads or abnormal behaviors coming from phases comparison.

The **remote monitoring and alarming** ensure 24/7 monitoring thanks to remote connection for SCADA or Services, access to Cloud-based Apps and digital services and alarming through SMS.

Characteristics

Power supply	Self powered. Energy harvested from power circuit.
Minimum activation current	5 A
Accuracy	+/- 1°C
Range	-25 °C / +115°C
Wireless communication	ZigBee Green Power 2,4 GHz
Dimension - Weight	31 x 31 x 13 mm - 15 g

Control
Easergy T200 S for SM6-24

PE15074

Easergy T200 S for SM6-24: remote control interface in LV control cabinet

Easergy T200 S for NSM cubicle

Easergy T200 S is a simplified MV substation control unit for secondary distribution networks enabling remote control of one or two MV substation switches.
T200 S, a version of the T200 unit, is integrated in the SM6 cubicle LV control cabinet.
It is limited to control 2 switches. It is intended for remote control applications for source transfer switching and back up generator set switching in NSM cubicle.

Easergy T200 S a multifunctional "plug and play" interface which integrates all functions required for remote monitoring and control of MV substations:
- Acquisition of various data types: switch position, fault detectors, current values, etc.
- Transmission of opening and closing orders to the switches
- Exchange with the control center.

Particularly used during network incidents, Easergy T200 S has proven its reliability and availability to be able to operate the switchgear at all times. It is easy to implement and operate.

PE56421

Control command

PE56423

Back up power supply

PE15078

Split core CTs

Functional unit dedicated to Medium Voltage applications

Easergy T200 S is installed in the low voltage control cabinet of NSM cubicles for remote control of one or two switches.
Easergy notably enables source transfer switching between two switches.
It has a simple panel for local operation to manage electrical controls (local/remote switch) and to display switchgear status information.
It integrates a fault current detector (overcurrent and zero sequence current) with detection thresholds configurable channel by channel (threshold and fault duration).

"Plug and play" and secure

Integrated in the low voltage control cabinet of an MV-equipped cubicle, it is ready to connect to the data transmission system.
Easergy T200 S has been subject to severe tests on its resistance to MV electrical constraints. A back-up power supply guarantees several hours continuity of service for the electronic devices, motorization and MV switchgear.
Current transformers are of split core type for easier installation.

Compatible with all SCADA remote control systems

Easergy T200 S supplies the following standard protocols:
- Modbus serial and IP
- DPN3 serial and IP
- IEC 870-5-101 / 104.

Data transmission system standards are: RS232, RS485, PSTN, FSK, FFSK, GSM/GPRS.
Other systems are available on request, the radio frequency emitter/receiver is not supplied.

Control
Easergy T200 I

PE56311

PE56421

Local information and control

PE56422

Monitoring and control

PE56423

Back up power supply

PE56824

Polarized connectors

PE57787

VD23

Easergy T200 I: an interface designed for control and monitoring of MV networks

Easergy T200 I is a "plug and play" or multifunction interface that integrates all the functional units necessary for remote supervision and control of the SM6:
- Acquisition of the different types of information: switch position, fault detectors, current values...
- Transmission of switch open/close orders
- Exchanges with the control center.

Required particularly during outages in the network, Easergy T200 I is of proven reliability and availability, being able to ensure switchgear operation at any moment. It is simple to set up and to operate.

Functional unit designed for the Medium Voltage network

- Easergy T200 I is designed to be connected directly to the MV switchgear, without requiring a special converter.
- It has a simple front plate for local operation, which allows management of electrical rating mechanisms (local/remote switch) and display of information concerning switchgear status.
- It has an integrated MV network fault current detection system (overcurrent and zero sequence) with detection set points that can be configured channel by channel (current value and fault current duration).

Medium Voltage switchgear operating guarantee

- Easergy T200 I has undergone severe MV electrical stress withstand tests.
- It is a backed up power supply which guarantees continuity of service for several hours in case of loss of the auxiliary source, and supplies power to the Easergy T200 I and the MV switchgear motor mechanisms.
- **Ready to plug**

- Easergy T200 I is delivered with a kit that makes it easy to connect the motor mechanisms and collect measurements.
- the connectors are polarized to avoid any errors during installation or maintenance interventions.
- current measurement acquisition sensors are of the split type, to facilitate their installation.
- works with 24 Vdc and 48 Vdc motor units.

Compatible with all SCADA remote control systems

Easergy T200 I supplies the following standard protocols:
- Modbus serial and IP
- DPN3 serial and IP
- IEC 870-5-101 / 104.

Data transmission system standards are: RS232, RS485, PSTN, FSK, FFSK, GSM/GPRS.
Other systems are available on request, the radio frequency emitter/receiver is not supplied.

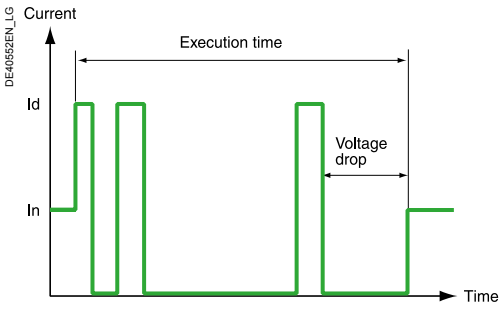
Voltage detection relay

VD23 provides accurate information of presence or absence of voltage. Associated with VPIS-Voltage Output, VD23 is typically used in critical power and safety applications.

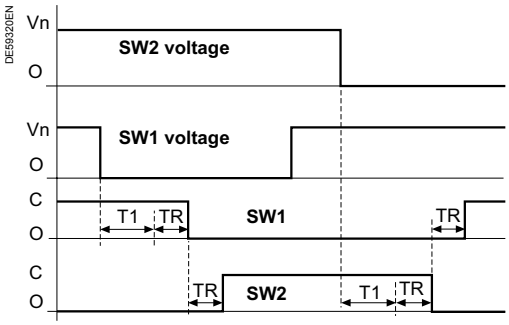
Various combinations of voltage detection are possible:
- 3 Ph-N and residual voltage: V1 + V2 + V3 + V0
- 3 Ph-N or Ph-Ph voltage: V1 + V2 + V3 or U12 + U13 + U23
- 1 Ph-N or Ph-Ph or residual voltage: V1, V2, V3, U12, U13, U23, V0.

VD23 can display the MV network voltage (in % of service voltage), activate the relay output R1 to monitor a loss of voltage on 1 phase at least and active the relay output R2 to monitor a presence of voltage on 1 phase at least.
- Auxiliary power supply: from 24 to 48 Vdc
- Assembly: compact DIN format, mounted in the same place as fault passage indicator (format DIN, integrated in switchgear), terminal connexion fitted with VPIS-Voltage Output
- **Compatible with all neutral earthing systems**.

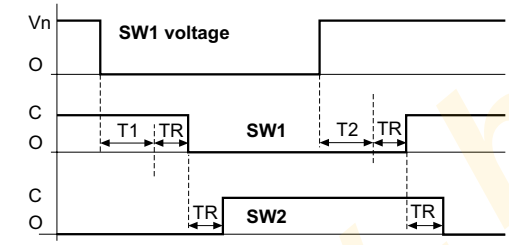
Control
Automation systems



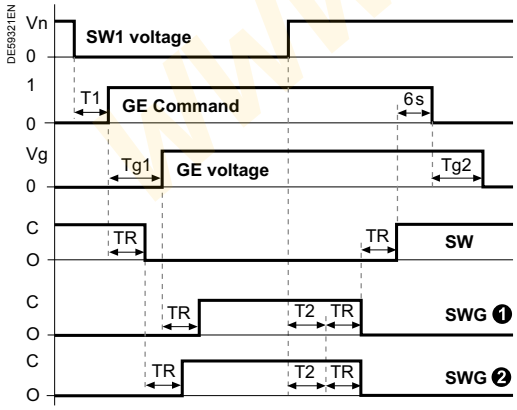
■ Configurable parameters:
□ Number of faults: from 1 to 4
□ Execution time: from 20 s to 4 mins configurable in 5 s steps
□ Automation system valid/invalid.



Network ATS - Semi-Auto Mode
(without paralleling upon automatic return)
TR: switch response time



Network ATS - Auto Mode SW1
(with paralleling upon automatic return)
TR: switch response time



Generator ATS - Auto SW mode
(Without paralleling upon Auto return)
TR: Switch response time
Tg1: Generator starting time (maximum 60 s)
Tg2: Generator stopping time
Case ❶: Generator channel closing after Generator power on (configurable option)
Case ❷: Generator channel closing after Generator start-up command (configurable option)

Easergy T200 automation systems are factory predefined. No on-site programming is required.
• The automation systems can be switched on and off from the local operator panel and disabled using the configurator.
• Switches can be controlled manually in the following circumstances:
- automation system switched off
- switch in local mode.

Sectionaliser (SEC)

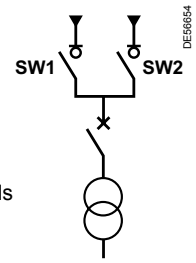
The sectionaliser automation system opens the switch after a predefined number of faults (1 to 4) during the voltage dip in the reclosing cycle of the top circuit breaker.
• The automation system counts the number of times a fault current followed by a voltage loss is detected. It sends an open order if:
- the switch is closed
- the fault has disappeared
- the MV supply is absent.

■ The automation system is reset at the end of the execution time delay.

ATS automatic transfer system (source changeover)

The automatic transfer system performs automatic control and management of sources in the MV secondary distribution network.

Two possible versions for ATS:



Network ATS version: control of two MV network channels. The network ATS automatic transfer system requires use of the VD23 relay for detection of voltage presence/absence.

Generator ATS version: control of one network channel and one generating set channel (not available on T200 E).

Note: ATS automatic transfer system is available only on channels 1 and 2 of each CONTROL module. Generator ATS automatic transfer system is available only on the first CONTROL module (channels 1 to 4).

Operating modes

The operating mode is selected from the T200 Web server.

Mode SW1➞SW2 or SW2➞SW1 (or SW➞SWG if Generator ATS):
Automatic transfer system executes only one changeover from the priority channel to the backup channel. Automatic transfer system then remains on that channel.

Semi-Auto mode SW1⇻SW2 (or SW⇻SWG if Generator ATS):
In the event of a voltage loss on the active channel, automatic transfer system switches to the other channel after a time delay T1. Automatic transfer system executes no return, except in case of voltage loss on the new active channel.

Auto SW1 or Auto SW2 mode (or Auto SW if Generator ATS):
After a changeover, return to the priority channel occurs if the MV voltage on that channel is restored. The channel that has priority can be defined according to the state of a dedicated digital input.

Changeover sequences:

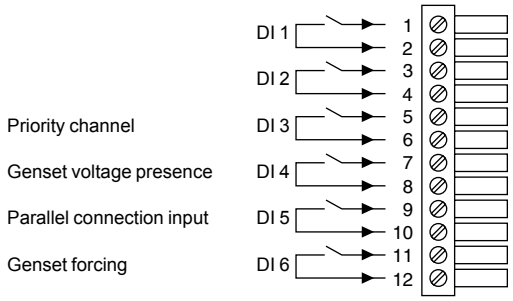
Network ATS: in the event of voltage loss on the normal channel, changeover involves opening the normal channel after time delay T1 and then closing the backup channel.
Note: in "Auto" mode, the sequence of return to the normal channel depends on configuration of the "Paralleling upon auto return" option (see below).

Generator ATS: in the event of voltage loss on the network channel, changeover involves sending the order for opening the network channel and at the same time the Generator start-up order, after time delay T1.
The remainder of the changeover sequence depends on the management of Generator channel closing (configurable option):
• Case of Generator channel closing after start-up order:
After the Generator start-up order, the closing order is given to the Generator channel, without waiting until the Generator is actually started.
• Case of Generator closing after Generator power on:
The Generator channel closing order is sent only when Generator voltage is detected.

Control
Automation systems

Configurable parameters:
- Automatic transfer system ON/OFF
- Operating mode: Semi-Auto, Auto SW1, Auto SW2, SW1 –> SW2, SW2 –> SW1
- T1: 0 ms to 2 min. in increments of 100 ms
- T2: 0 s to 30 min. in increments of 5 s
- Disabling/enabling transfer upon fault detection:
- Choice of voltage presence detection: DI4 or VD23
- Channel connected to generator: SW1 or SW2
- Type of automatic transfer system: Network ATS or Generator ATS
- Manual control enabled/disabled if ATS in operation
- Paralleling enabled/disabled in auto and/or manual mode
- Choice of type of changeover to Generator: immediately or after detection of Generator power on

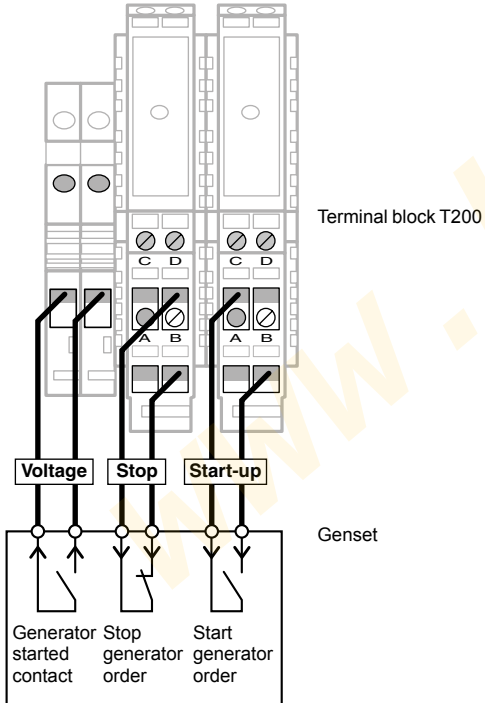
DE59175



The DIs can be assigned for ATS automation (configurable options)

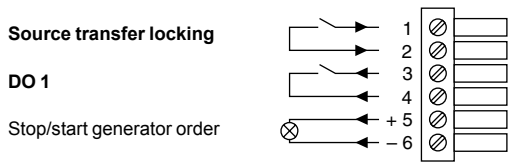
Digital Input connection ("J2" or "J10" terminal block)

DE56806



Interface with the generating set

DE59173



Lock connection ("J1" terminal block on the 4-ways interface or "J9" on the 2-ways interface)

Paralleling upon Auto return

A software-configurable option allows the automatic transfer system to disable or enable paralleling of the channels upon automatic return to the main channel (in "Auto" mode).
Enabling of paralleling must be confirmed by the activation of a dedicated digital input.

Paralleling disabled: Auto return to the priority channel involves opening the backup channel and, when it is open, closing the priority channel.

Paralleling enabled: Auto return to the priority channel involves first closing the priority channel and, when it is closed, opening the backup channel.

Changeover conditions

Changeover takes place if the following conditions are met:
- Automatic transfer system in operation
- SW1 open and SW2 closed or SW1 closed and SW2 open
- Absence of fault current on the two channels (only if locking by fault detection option activated)
- "Transfer locking" absent
- "Earthing switch" absent on the two channels
- MV voltage absent on the active channel
- MV voltage present on the other channel.

Return to the main channel for the "Auto" modes occurs if:
- The priority channel is open
- The MV voltage on the priority channel is present during time delay T2.

Generating set connections

Relays are installed in factory in the T200 enclosure to provide interfacing with the generating set (Generator ATS version only). Connection should be performed as follows (see diagram opposite):
- **Voltage:** contact closed if Generator started, to be wired on the two available terminals (do not wire if detection of power on is performed by a relay VD23)
- **Start-up:** Generator start-up order, to be wired on terminals **C** and **B**
- **Stop:** Generator stoppage order, to be wired on terminals **D** and **B**.

Detection of voltage presence

Voltage presence on a channel managing the Generator can be executed by two processes:
- Either by a dedicated "Voltage" digital input
- Or by voltage relay VD23 (via cubicle cable).

Override setting on generator (Generator ATS only)

For routine test or reduced pricing requirements, it is possible to perform override setting of operation on the generator manually, remotely (from the supervisor) or locally (activation by a dedicated digital input).
When the override setting is terminated, the automatic transfer system places itself back in the initial mode, i.e. in the mode that was active before the override setting (ON or OFF). During override setting, the automatic transfer system is set to "ON" for channels 1 and 2.

Source transfer locking

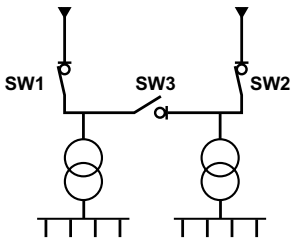
A dedicated digital input allows changeover to be locked if a problem occurs on one of the devices related to the changeover. This input is generally connected to the downstream circuit breaker. Local and remote controls are no longer possible in this case.

Specific Generator-related management

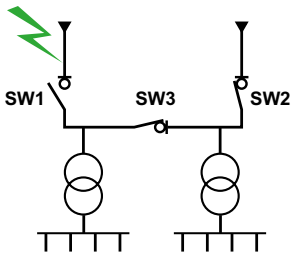
- Upon transfer to the Generator, if the latter doesn't start, the automatic transfer system waits for a period of 60 s at most before stopping changeover, then:
  - in SW –> SWG mode: the automatic transfer system is locked and must be reset (on the Control panel) to restart the device.
  - in SW <–> SWG mode or in Auto mode: the automatic transfer system remains operational.
    If voltage returns to the network channel, the automatic transfer system requests return to the network channel.
- When the automatic transfer system is configured with auto return on the network channel, Generator stoppage is requested 6 s after the changeover sequence is completed.

Control
Automation systems

DE56655_LG

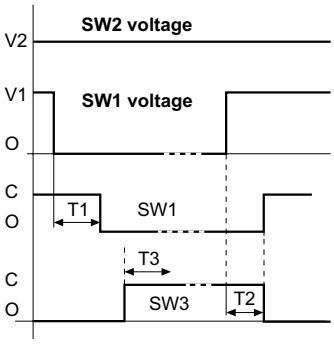


"Normal" position



Active coupling

DE59322EN



Configurable parameters:

- Operating mode:

Standard/locking upon voltage loss
- Automatic return: SW1/SW2
- Automation system: on/off
- Delay before switching

T1: 100 ms to 60 s in 100 ms steps
- Delay before return
- T2: 5 s to 300 s in 1 s steps
- Interlock delay on voltage loss

T3: 100 ms to 3 s in 100 ms steps
- Motorisation type: command time
- Manual control: enabled/disabled in local and remote modes if automation system in operation
- Paralleling: enabled/disabled in auto and (or) manual modes
- Transfer locking upon fault detection.

Bus tie coupling (BTA) with T200 I

The BTA (Bus Tie Automatism) is an automation system for switching sources between two incoming lines (SW1 and SW2) and a busbar coupling switch (SW3). It must be used in conjunction with VD23 type voltage presence detectors and the fault current detection function on the busbar incoming lines.

Operating mode

Two operating modes can be configured:
- Standard mode:

If the voltage is lost on one busbar, the automation system opens the incoming line (SW1 or SW2) and closes the coupling switch SW3. Coupling is conditional upon the absence of a fault current on the main source.
- Interlock on loss of voltage after switching mode:

After execution of the automation system in standard mode, the voltage presence is checked for a configurable period. If the voltage is lost during this period, the coupling switch SW3 is opened and the automation system interlocked.

Coupling sequence

- Coupling takes place if the following conditions are met:
  - the automation system is switched on
  - the switches on incoming channels SW1 and SW2 are closed
  - the earthing switches SW1, SW2 and SW3 are open
  - there is no voltage on an incoming line SW1 or SW2
  - there is no fault current detection on SW1 and SW2
  - there is no transfer interlock
  - voltage is present on the other incoming line.
- The coupling sequence in standard mode is as follows:
  - opening of the de-energised incoming line switch after a delay T1
  - closing of the coupling switch SW3.
- The coupling sequence in "Interlock on loss of voltage after coupling" mode is completed as follows:
  - monitoring of the voltage stability for a delay T3
  - opening of the coupling switch SW3 if this condition is not met
  - locking of BTA automation system.
- The system returns to standard mode after coupling if:
  - the "return to SW1 or SW2" option is activated
  - voltage on the channel has been normal for a delay T2
  - the automation system is activated
  - the automation system is not locked
  - there is no coupling interlock.

Coupling interlock

A dedicated digital input allows changeover to be locked if a problem occurs on one of the devices related to the changeover. This input is generally connected to the downstream circuit breaker. Local and remote controls are no longer possible in this case.

Locking the automation system

The BTA automation system is locked if one of the following conditions is met during the coupling process:
- Failure of a command to open or close a switch
- Indication that an earthing switch has closed
- Appearance of a fault current
- Switch power supply fault
- Appearance of the coupling interlock
- Manual or remote ON/OFF command from the automation system.

Paralleling upon Auto return

A software-configurable option allows the automation system to disable or enable paralleling of the channels upon automatic return to the main channel (in "Auto" mode). Enabling of paralleling must be confirmed by the activation of a dedicated digital input.

If paralleling is disabled: Auto return to the normal channel involves opening the coupling channel (SW3) and, when it is open, closing the normal channel.

If paralleling is enabled: Auto return to the normal channel involves first closing the normal channel and, when it is closed, opening the coupling channel (SW3).

Control

PS100 high-availability power supply

Backup solution for MV switchgear power needs in the event of micro outages and power interruptions.

- Easy maintenance with only one battery
- Remote battery monitoring
- High level of insulation to protect the electronic devices in severe MV environments
- End-of-life alarm possible via Modbus communication
- Compliant with standards IEC 60255-5 (10 kV level).

PM100592

PS100

PS100 backup power supply for MV substations

Applications

The power supply unit supplies backup operating power for:
- MV switchgear motor mechanisms and circuit breaker coils
- Transmission equipment (e.g. radio)
- Control units such as RTU or Automatic Transfer System
- Protection relays, Fault Passage Indicators and others electronic devices.

High availabilty power supply

A battery ensures uninterrupted operation of the whole substation in the event of loss of the main supply. The backup power supply unit:
- Includes a regulated and temperature-compensated charger
- Stops the battery before deep discharge
- Carries out a battery check every 12 hours
- Measures battery ageing
- Forwards monitoring information via a Modbus communication port and output relays.

Benefits

Only one battery

Traditional backup power supplies require a set of 2 or 4 batteries to produce 24 V or 48 V, with complicated replacement and adjustment of the battery pack.

The PS100 needs only one battery, simplifying replacement.

The battery is a standard sealed lead-acid 12 V battery with a 10-year service. It can be purchased easily, anywhere in the world.

Improved availability of MV/LV substations

The PS100 is designed to ride through power network interruptions of up to 48 hours. It is associated with a battery selected to meet the required backup time.

The PS100 protects and optimises the battery with state-of-the-art monitoring. A Modbus communication port forwards monitoring data to allow optimised maintenance operations. Perfect integration with the Easergy range to control and monitor your distribution network.

Additional energy backup

The PS100 stops supplying power and reserves an "additional energy backup" to restart the installation after an extended power interruption.

The "additional energy backup" can be enabled with a local pushbutton to provide energy for restarting the protection relays and operating the MV switchgear.

Withstands severe substation environments

The PS100 includes 10 kV insulation, electronic protection against overvoltage and overloads, and automatic restart after a fault.

Main features

- DIN rail mounting for easy integration in any LV cabinet or MV/LV substation
- 2 power supply outputs:
- 12 Vdc - 18 W continuous - 100 W 20 s (for modem, radio, RTU, etc.)
- 48 Vdc or 24 Vdc - 300 W /1 minute (for switchgear operating mechanism motors) and 90 W / continuous for protection relays, electronic devices, etc.
- RJ45 Modbus communication port
- 2 output relays (AC supply ON, Battery ON)
- Diagnosis with LEDs
- 1 sealed lead-acid 12 V battery with a 10-year service life (from 7 Ah to 40 Ah)
- Power supply paralleling available with a 2nd PS100
- -40°C to +70°C operating temperature.

Range

- PS100-48V — 48 Vdc power supply and battery charger
- PS100-24V — 24 Vdc power supply and battery charger
- Bat24AH — 24 Ah long life battery
- Bat38AH — 38 Ah long life battery.

Connections

Connections

Contents

Connections with dry-type cables for SM6-24

Selection table

PE57840

The ageing resistance of the equipment in an MV/LV substation depends on three key factors:

- **the need to make connections correctly**

New cold fitted connection technologies offer ease of installation that favours resistance over time. Their design enables operation in polluted environments under severe conditions.

- **the impact of the relative humidity factor**

The inclusion of a heating element is essential in climates with high humidity levels and with high temperature differentials.

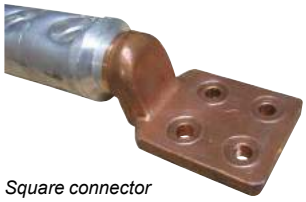
- **ventilation control**

The dimension of the grills must be appropriate for the power dissipated in the substation. They must only traverse the transformer area.

PE50775

Round connector

PE50776



Square connector

Network cables are connected:

- on the switch terminals
- on the lower fuse holders
- on the circuit breaker's connectors.

The bimetallic cable end terminals are:

- round connection and shank for cables ⩽ 240 mm^2
- square connection round shank for cables > 240 mm^2 only.

Crimping of cable end terminals to cables must be carried out by stamping.

The end connectors are of cold fitted type

Schneider Electric's experience has led it to favour this technology wherever possible for better resistance over time.

The maximum admissible cable cross section:

- 630 mm^2 for 1250 A incomer and feeder cubicles
- 240 mm^2 for 400-630 A incomer and feeder cubicles
- 120 mm^2 for contactor cubicles
- 95 mm^2 for transformer protection cubicles with fuses.

Access to the compartment is interlocked with the closing of the earthing disconnector.
The reduced cubicle depth makes it easier to connect all phases.
A 12 mm Ø pin integrated with the field distributor enables the cable end terminal to be positioned and attached with one hand. Use a torque wrench set to 50 mN.

Dry-type single-core cable

Short inner end, cold fitted

Performance	Cable end terminal type	X-section mm2	Supplier	Number of cables	Comments
3 to 24 kV 400 A - 630 A	Round connector	50 to 240 mm^2	All cold fitted cable end suppliers: Silec, 3M, Pirelli, Raychem, etc.	1 or 2 per phase	For larger x-sections, more cables and other types of cable end terminals, please consult us
3 to 24 kV 1250 A	Round connector	50 to 630 mm^2	All cold fitted cable end suppliers: Silec, 3M, Pirelli, Raychem, etc.	1 or 2 per phase ⩽ 400 mm^2	For larger x-sections, more cables and other types of cable end terminals, please consult us
	Square connector	> 300 mm^2 admissible		400 < 1 ⩽ 630 mm^2 per phase	

Three core, dry cable

Short inner end, cold fitted

Performance	Cable end terminal type	X-section mm2	Supplier	Number of cables	Comments
3 to 24 kV 400 A - 630 A	Round connector	50 to 240 mm^2	All cold fitted cable end suppliers: Silec, 3M, Pirelli, Raychem, etc.	1 per phase	For larger x-sections, more cables and other types of cable end terminals, please consult us
3 to 24 kV 1250 A	Round connector	50 to 630 mm^2	All cold fitted cable end suppliers: Silec, 3M, Pirelli, Raychem, etc.	1 per phase	For larger x-sections, more cables and other types of cable end terminals, please consult us

Note:

- *The cable end terminals, covered by a field distributor, can be square,*
- *PM/QM type cubicle, round end connections Ø 30 mm max.*

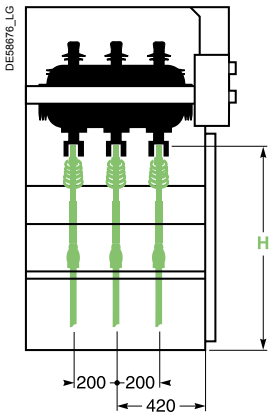
Cable-connection from below for SM6-24

Cable positions

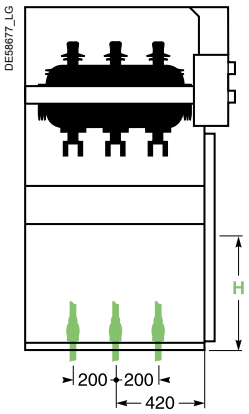
Cable-connection height H measured from floor (mm)

	630 A	1250 A
IM, NSM-cables, NSM-busbars	945	
SM	945	945
IMC	400	
PM, QM	400	
QMC	400	
CVM	430	
DM1-A	430	320
DMVL-A	430	
DM1-W	370	320
GAM2	760	
GAM	470	620
DMV-A	320	313
DM1-S	543	

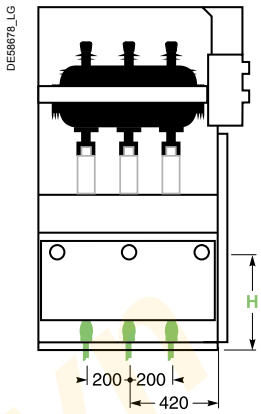
IM, NSM-cables, NSM-busbars, SM



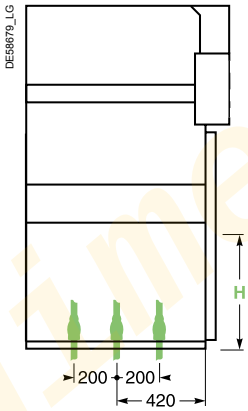
IMC, PM, QM, QMC



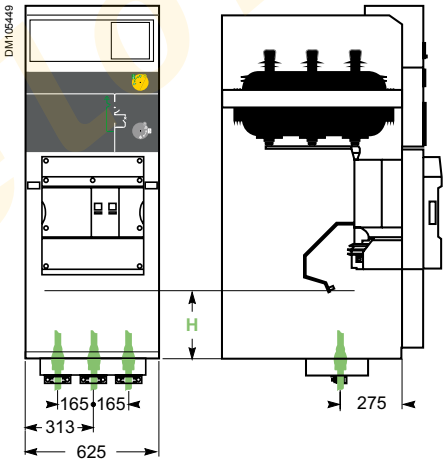
CVM



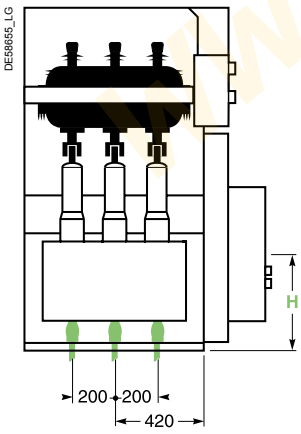
GAM, GAM2



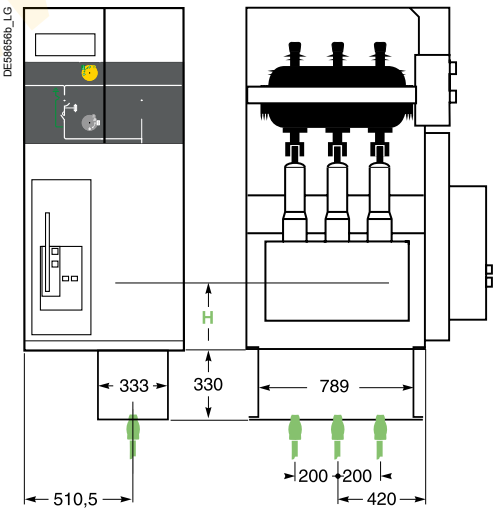
DMV-A (630 A)



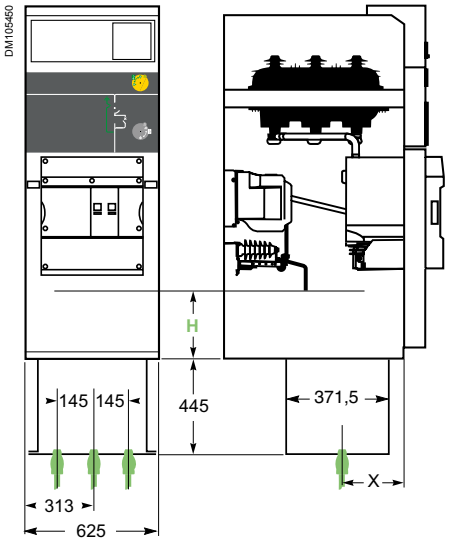
DM1-A, DM1-S, DMVL-A
DM1-W (630 A)



DM1-A, DM1-W (1250 A)



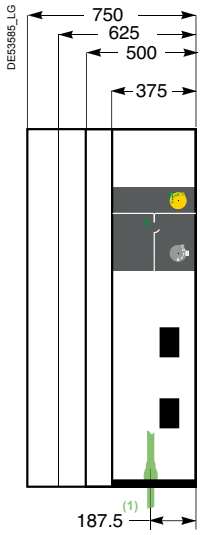
DMV-A (1250 A)



X = 330 : 1 single-core cable
X = 268 : 2 single-core cables
X = 299 : Three core cable

Cable-connection from below for SM6-24

Trenches depth



For internal arc 12.5 kA 1s, IAC: A-FL

Cabling from below

- **Through trenches:** the trench depth **P** is given in the table opposite for commonly used dry single-core cables type (for tri-core cables consult us).
- **With stands:** to reduce **P** or eliminate trenches altogether by placing the units on 400 mm concrete footings.
- **With floor void:** the trench depth **P** is given in the table opposite for commonly used types of cables.

Single-core cables		Units until 630 A					1250 A units		
Cable x-section (mm^2)	Bending radius (mm)	IM, SM, NSM-cables, NSM-busbars	IMC, DM1-A, DM1-W, DM1-S, DMVL-A, GAM	CRM CVM	DMV-A,	PM, QM, QMC (1)	SM, GAM	DM1-A (2) DM1-W (2)	DMV-A (3)
		Depth **P** (mm) all orientations							
		P1	**P2**	**P2**	**P2**	**P3**	**P4**	**P5**	**P6**
50	370	140	400	400	500	350			
70	400	150	430	430	530	350			
95	440	160	470	470	570	350			
120	470	200	500	500	600				
150	500	220	550		650				
185	540	270	670		770				
240	590	330	730		830				
400	800						1000	1350	1450
630	940						1000	1350	1450

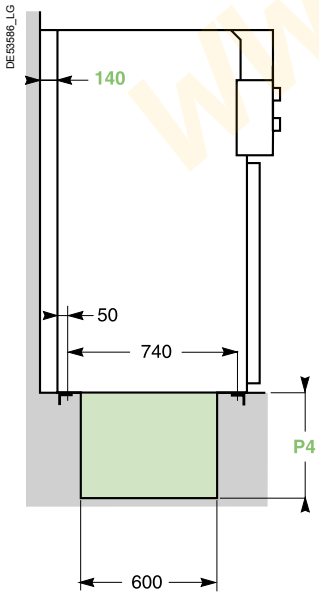
(1) Must be installed with a 100 mm depth metal pan.
(2) Must be installed with a 350 mm depth metal pan, in a floor void.
(3) Mounting with a 445 mm depth metal pan compulsory in a floor void.

***Note:** the unit and the cables requiring the greatest depth must be taken into account when determining the depth **P** or single-trench installations.*
*In double-trench installations, depth **P** must be taken into account for each type of unit and cable orientations.*

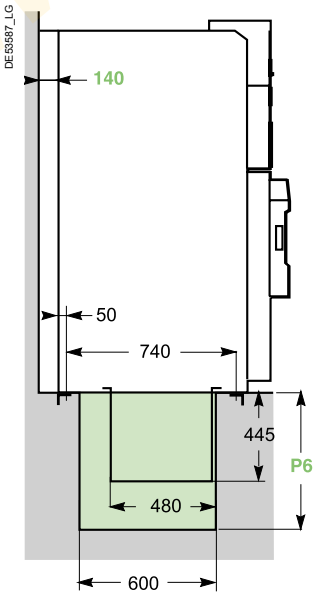
Cable trench drawings

1250 A units (represented without switchboard side panels)

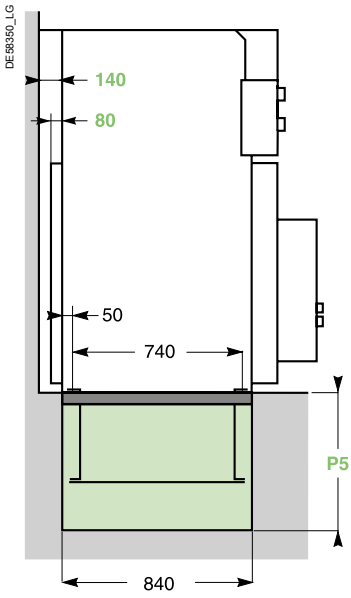
SM, GAM
For single and tri-core cables



DMV-A
For single and tri-core cables

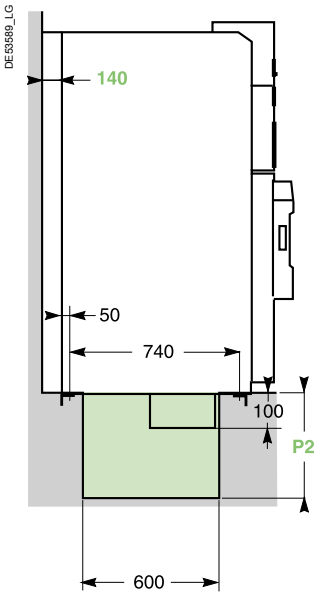


DM1-A, DM1-W
For single-core cables



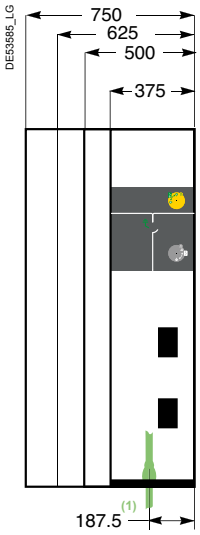
630 A units

DMV-A
For single cables



Cable-connection from below for SM6-24

Trenches depth



(1) Except DMV-A

For internal arc 12.5 kA 1s, IAC: A-FLR, 16 and 20 kA 1s, IAC: A-FL/A-FLR

Cabling from below

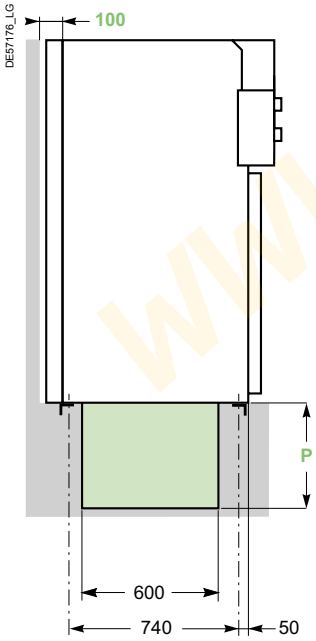
- **Through trenches:** the trench depth **P** is given in the following table for usual dry single-core cables type (for tri-core cables consult us).
- **With stands:** to reduce depth **P** or avoid trenches, by placing the units on 400 mm concrete footings.
- **With floor void:** the trench depth is given in the following table for usual types of cables.

	630 A							1250 A	
	All cubicles except:		Other cubicles						
			DMVA	CVM		DM1A, DM1S, DM1W, DMVLA		SM, GAM	DM1A, DMV-A, DM1-W
IAC	12.5 kA/1s	16 kA/1s	12-16 kA/1s	12.5 kA/1s	16 kA/1s	12.5 kA/1s	16 kA/1s	12-16 kA/1s	12-16 kA/1s
Cable section (mm^2)	**Depth P (mm)**								
S < 120	330	550	550	330	550	330	550	–	–
120 < S < 240	330	550	800	–	–	330; cables coming other side of the circuit breaker	450; cables coming under the circuit breaker	550	–	–
S > 400	–	–	–	–	–	–	–	–	1000	1400

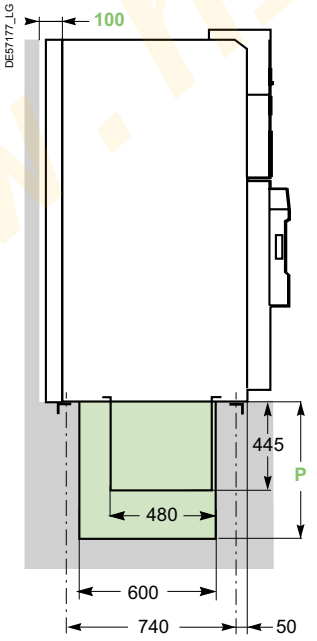
Cable trench drawings

1250 A units (represented without switchboard side panels)

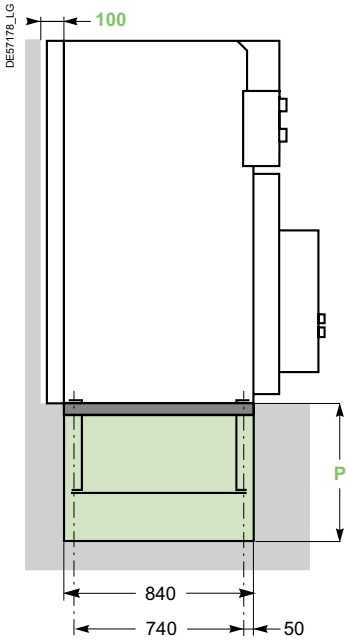
SM, GAM
For single and tri-core cables



DMV-A
For single and tri-core cables

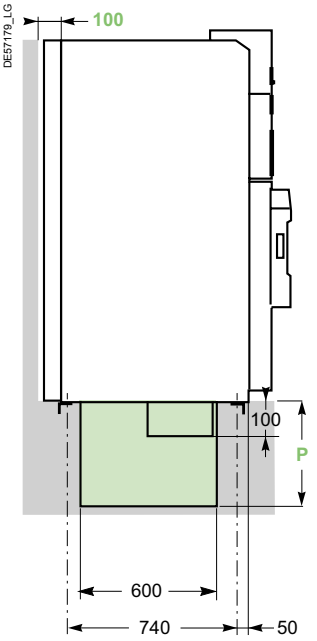


DM1-A, DM1-W
For single-core cables



630 A units

DMV-A
For single cables



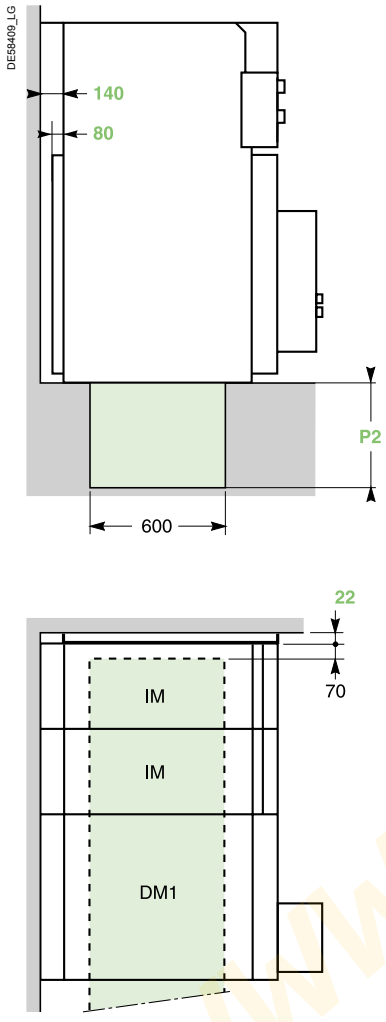
Cable-connection from below for SM6-24

Trench diagrams example

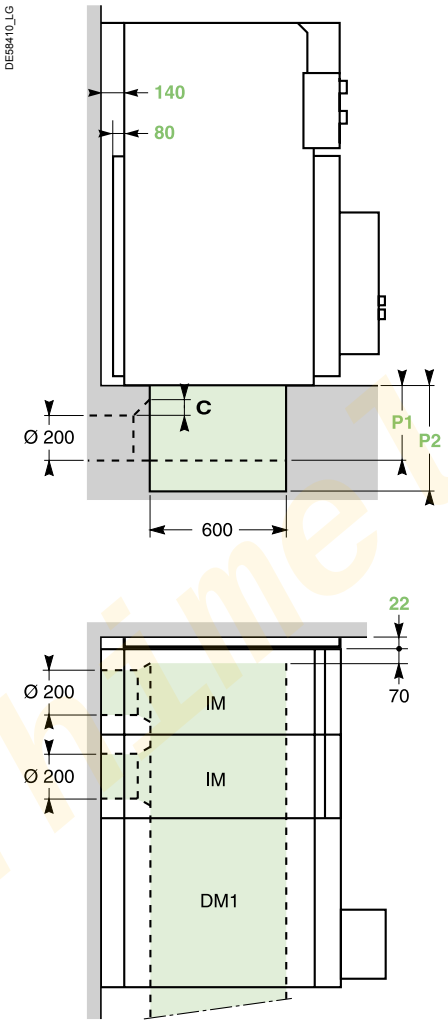
For internal arc 12.5 kA 1s, IAC: A-FL

Units represented without switchboard side panels

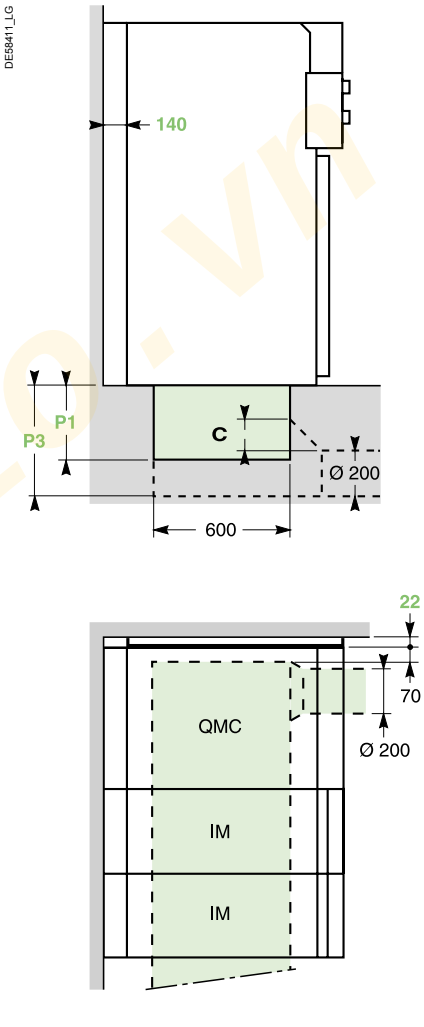
630 A units
Cable entry or exit through right or left side



630 A units
Rear entry or exit with conduits



630 A units
Front entry or exit with conduits



Required dimensions (mm)

Note 1: *for connection with conduits, the bevel (C) must correspond to the following trench dimensions: P1 = 75 mm or P2/P3 = 150 mm.*
Note 2: *please refer to chapter "Layout examples" for a site application.*

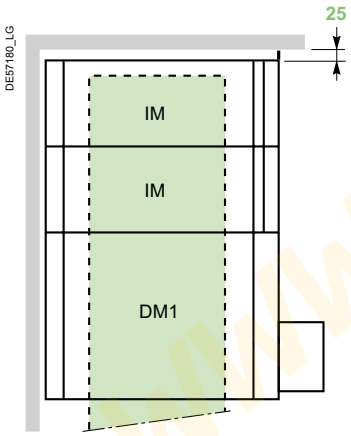
Cable-connection from below for SM6-24

Trench diagrams example

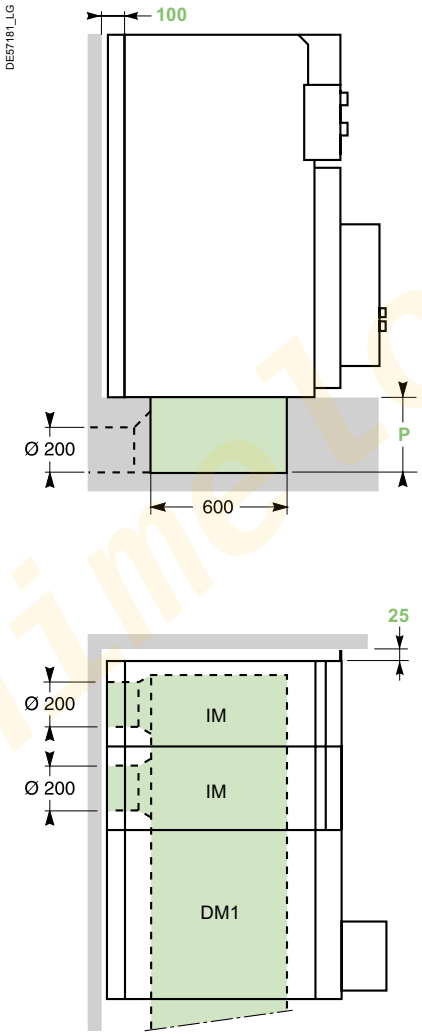
For internal arc 12.5 kA 1s, IAC: A-FLR, 16 and 20 kA 1s, IAC: A-FL/A-FLR

Units represented without switchboard side panels

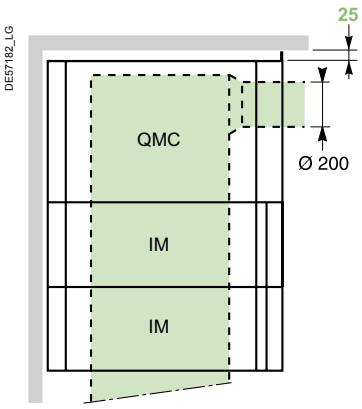
630 A units
Cable entry or exit
through right or left side



630 A units
Rear entry or exit
with conduits



630 A units
Front entry or exit
with conduits



Required dimensions (mm)

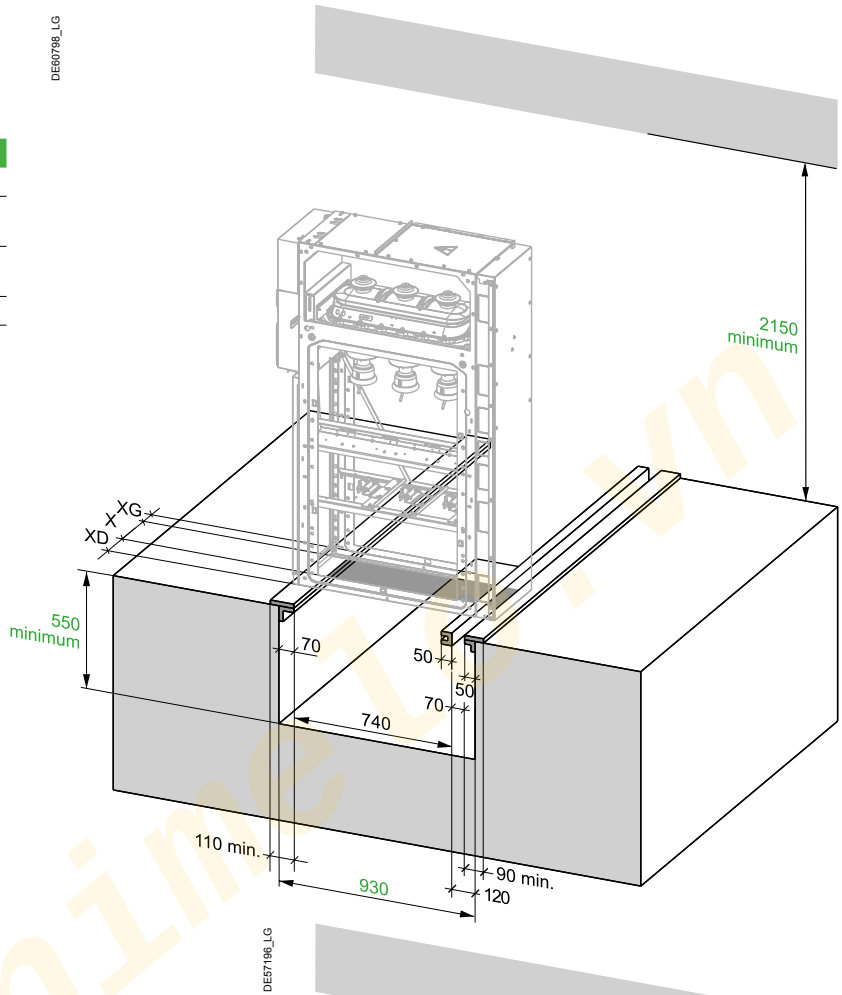
Cable-connection from below for SM6-24

Trench diagrams and floor void drawings example

Installation with floor void for 16 kA 1 s downwards exhaust

- Area free of obstructions:

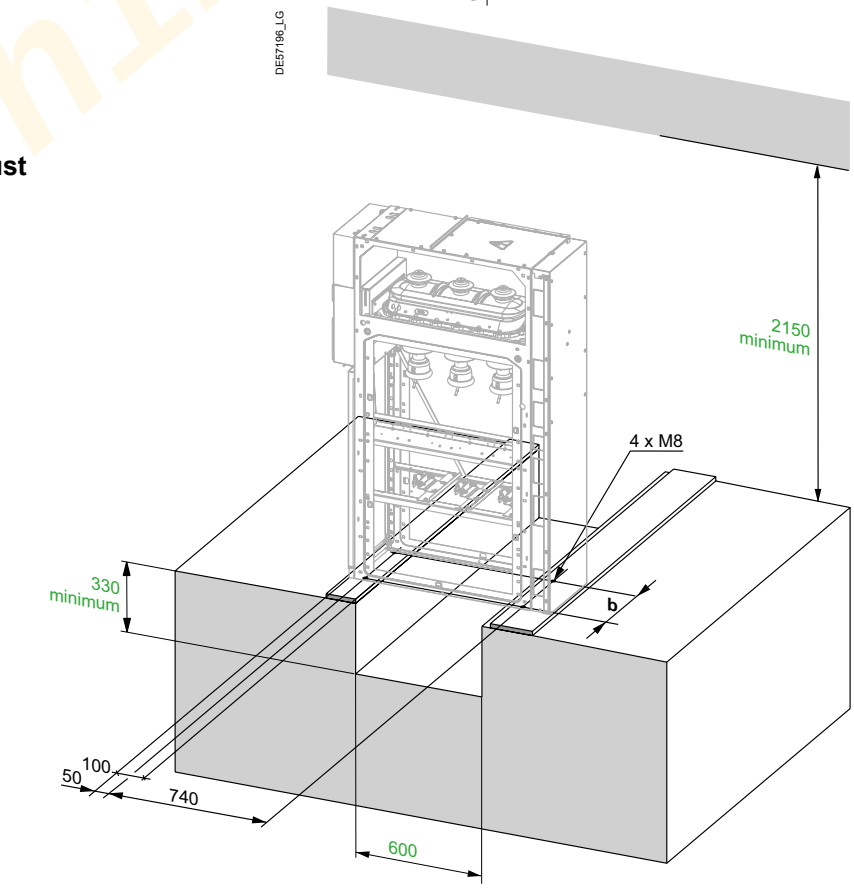
Width	Cubicles	XG (mm)	X (mm)	XD (mm)
375	All	57.5	260	57.5
500	GAM	57.5	260	182.5
	Other	182.5	260	57.5
625	QMC	307.5	260	57.5
	Other	57.5	510	57.5
750	All	432.5	260	57.5



Installation with cable trench for basic 12.5 kA 1 s downwards exhaust for advance 16 kA 1 s and 20 kA 1 s upwards exhaust

- Position of fixing holes **b** depends on the width of the unit:

Cubicle width (mm)	b (mm)
125	95
375	345
500	470
625	595
750	720



Connections with dry-type cables for SM6-36

Selection table

Single-core cables		Units 630 A	
Cable-section (mm^2)	Bending radius (mm)	IM, IMC, QM, CM, CM2, PM, DM1-A, GAM, GAM2, SM, TM	
		Depth **P** (mm)	
		P1	**P2**
1 x 35	525	350	550
1 x 50	555	380	580
1 x 70	585	410	610
1 x 95	600	425	625
1 x 120	630	455	655
1 x 150	645	470	670
1 x 185	675	500	700
1 x 240	705	530	730

***Note:** the unit and the cables requiring the greatest depth must be taken into account when determining the depth P for single-trench installations. In double-trench installations must be taken into account to each type of unit and cable orientations.*

The ageing resistance of the equipment in an MV/LV substation depends on three key factors:

- **the need to make connections correctly**

New cold fitted connection technologies offer ease of installation that favours resistance over time. Their design enables operation in polluted environments under severe conditions.

- **the impact of the relative humidity factor**

The inclusion of a heating element is essential in climates with high humidity levels and with high temperature differentials.

- **ventilation control**

The dimension of the grills must be appropriate for the power dissipated in the substation. They must only traverse the transformer area.

Network cables are connected:
- on the switch terminals
- on the lower fuse holders
- on the circuit breaker's connectors.

The bimetallic cable end terminals are:
- round connection and shank for cables ⩽ 240 mm^2.

Crimping of cable lugs to cables must be carried out by stamping.

The end connectors are of cold fitted type

Schneider Electric's experience has led it to favour this technology wherever possible for better resistance over time.

The maximum admissible copper(*) cable cross section:
- 2 x (1 x 240 mm^2 per phase) for 1250 A incomer and feeder cubicles
- 240 mm^2 for 630 A incomer and feeder cubicles
- 95 mm^2 for transformer protection cubicles with fuses.

Access to the compartment is interlocked with the closing of the earthing disconnector.
The reduced cubicle depth makes it easier to connect all phases.
A 12 mm Ø pin integrated with the field distributor enables the cable end terminal to be positioned and attached with one hand. Use a torque wrench set to 50 mN.

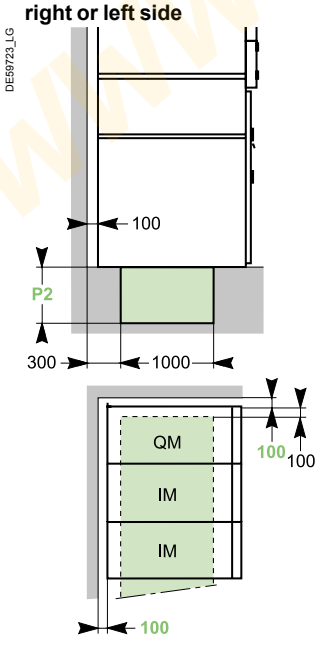
(*) Consult us for alu cable cross sections

Cabling from below

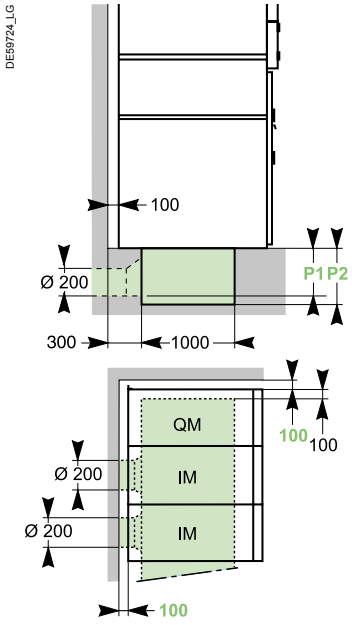
All units through trenches
- the trench depth P is given in the table opposite for commonly used types of cables.

Trench diagrams

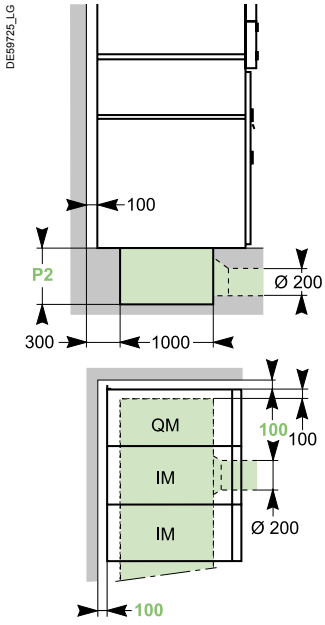
Cable entry or exit through right or left side



Rear entry or exit with conduits



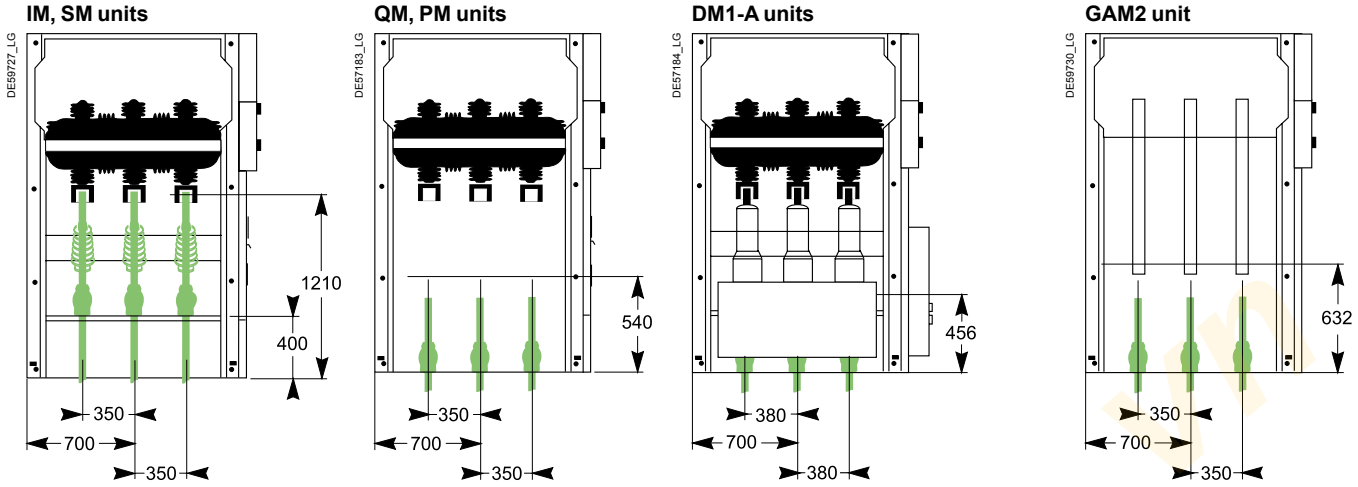
Front entry or exit with conduits



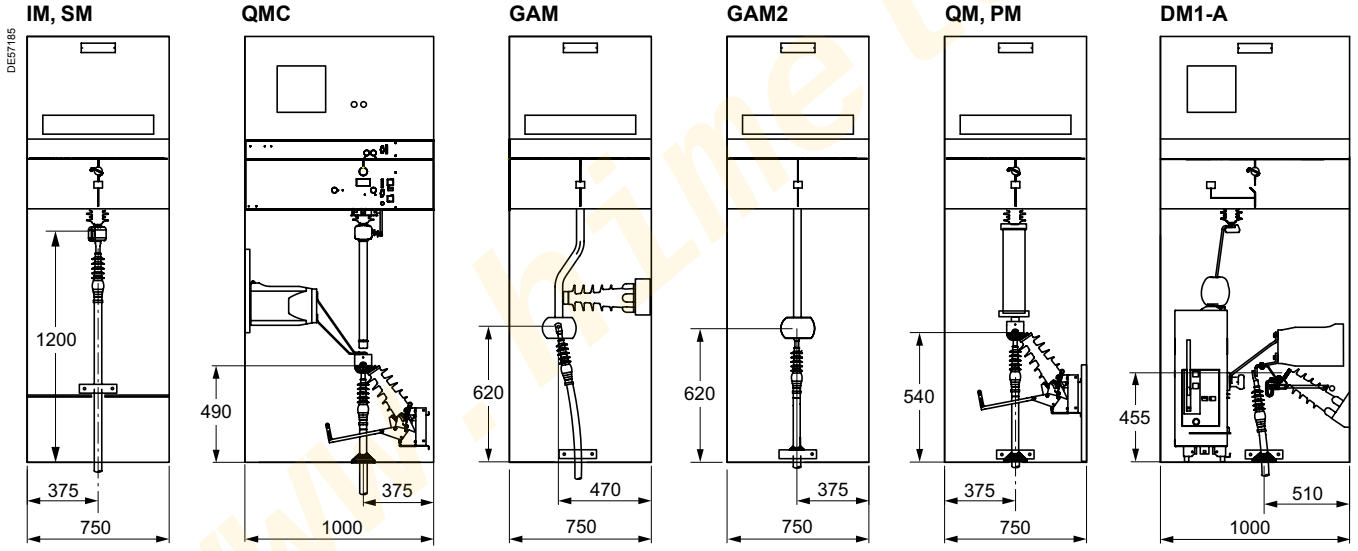
Cable-connection from below for SM6-36

Cable positions

Side view

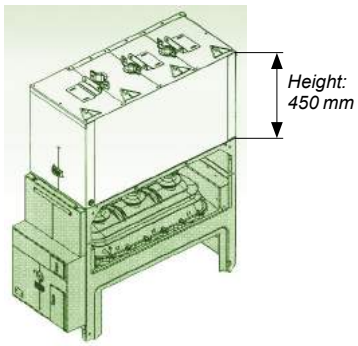


Front view



Cabling from above for SM6-24 and SM6-36

PE50797_G



Cabling from above

On each 630 A unit of the range, except those including a low-voltage control cabinet and EMB enclosure, the connection is made with dry-type and single-core cables.

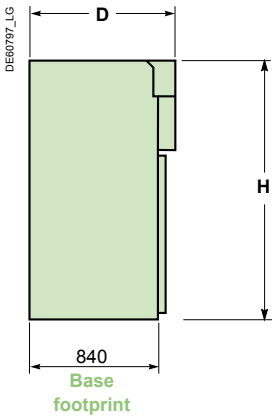
Remarks:
- *Not available for internal arc IEC 62271-200.*
- *Not available in 1250 A.*

Installation

Installation

Contents

Dimensions and weights for SM6-24

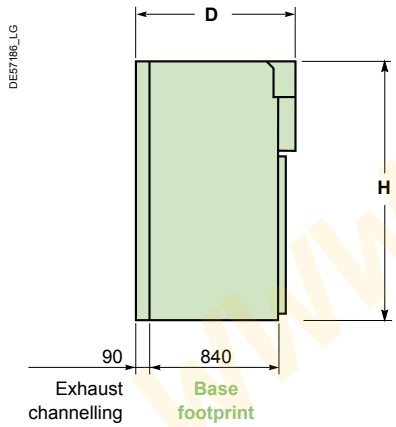


Basic internal arc 12.5 kA 1s, IAC: A-FL

Dimensions and weights

Unit type	Height	Width	Depth	Weight
	H (mm)	(mm)	D (mm)	(kg)
IM,IMB	1600 (1)	375/500	940	120/130
IMM	1600	750	940	340
IMC	1600 (1)	500	940	200
PM, QM, QMB	1600 (1)	375/500	940	130/150
QMC	1600 (1)	625	940	180
CRM, CVM	2050	750	940	390
DM1-A, DM1-D, DM1-W, DM2, DMVL-A, DMVL-D, DM1-M	1600 (1)	750	1220	400
DM1-S	1600 (1)	750	1220	340
DMV-A, DMV-D	1695 (1)	625	940	340
CM	1600 (1)	375	940	190
CM2	1600 (1)	500	940	210
GBC-A, GBC-B	1600	750	1020	290
NSM-cables, NSM-busbars	2050	750	940	260
GIM	1600	125	840	30
GEM (2)	1600	125	920/1060 (2)	30/35 (2)
GBM	1600	375	940	120
GAM2	1600	375	940	120
GAM	1600	500	1020	160
SM	1600 (1)	375/500 (3)	940	120/150 (3)
TM	1600	375	940	200
DM1-A, DM1-D, DM1-W, DM1-Z (1250 A)	1600	750	1220	420

Add to height:
(1) 450 mm for low-voltage enclosures for control/monitoring and protection functions.
To ensure uniform presentation, all units (except GIM and GEM) may be equipped with low-voltage enclosures.
(2) depending on the busbar configuration in the VM6 unit, two types of extension units may be used:
■ to extend a VM6 DM12 or DM23 unit, use an extension unit with a depth of 1060 mm
■ for all other VM6 units, a depth of 920 mm is required.
(3) for the 1250 A unit.



Advance internal arc 12.5 kA 1s, IAC: A-FLR 16 and 20 kA 1s, IAC: A-FL/A-FLR

Dimensions and weights

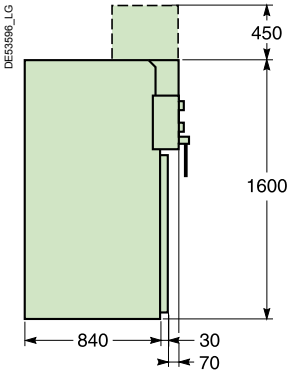
Unit type	Height	Width	Depth	Weight
	H (mm)	(mm)	D (mm)	(kg)
IM,IMB	1600 (1)	375/500	1030	130/140
IMM	1600	750	1030	340
IMC	1600 (1)	500	1030	210
PM, QM, QMB	1600 (1)	375/500	1030	140/160
QMC	1600 (1)	625	1030	190
CVM	2050	750	1030	400
DM1-A, DM1-D, DM1-W, DM2, DMVL-A, DMVL-D, DM1-M	1600 (1)	750	1230	410
DM1-S	1600 (1)	750	1230	350
DMV-A, DMV-D	1695 (1)	625	1115	350
CM	1600 (1)	375	1030	200
CM2	1600 (1)	500	1030	220
GBC-A, GBC-B	1600 (1)	750	1030	300
NSM-cables, NSM-busbars	2050	750	1030	270
GIM	1600	125	930	40
GEM (2)	1600	125	930/1060 (2)	40/45
GBM	1600	375	1030	130
GAM2	1600	375	1030	130
GAM	1600	500	1030	170
SM	1600 (1)	375/500 (3)	1030	130/160
TM	1600	375	1030	210
DM1-A, DM1-D, DM1-W, DM1-Z (1250 A)	1600 (1)	750	1230	430

(1) Add to height 450 mm for low-voltage enclosures for control/monitoring and protection functions. To ensure uniform presentation, all units (except GIM and GEM) may be equipped with low-voltage enclosures.
(2) Depending on the busbar configuration in the VM6 unit, two types of extension units may be used:
■ to extend a VM6 DM12 or DM23 unit, use an extension unit with a depth of 1060 mm
■ for all other VM6 units, a depth of 930 mm is required.
(3) For the 1250 A unit.

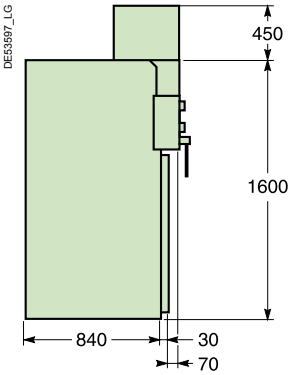
Units dimensions for SM6-24

Basic internal arc
12.5 kA 1s, IAC: A-FL

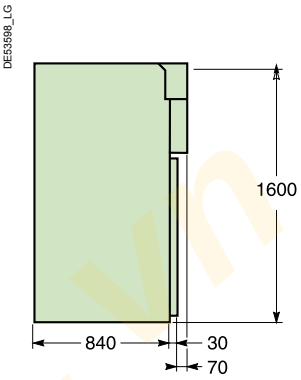
IM, IMB, PM, QM, QMB, SM, IMC, QMC, CM, CM2



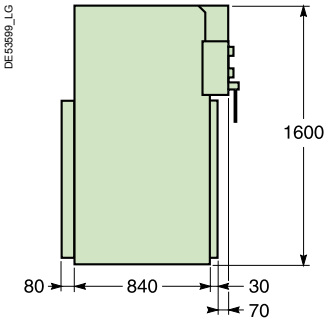
NSM-cables, NSM-busbars, CRM, CVM



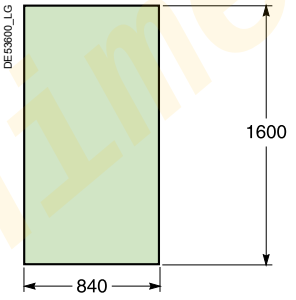
GBM, GAM2



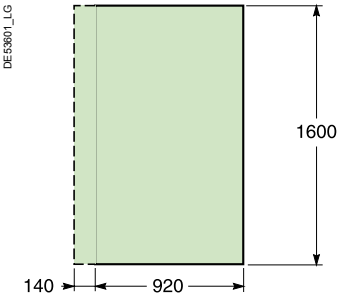
GAM



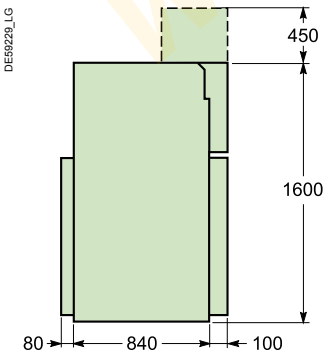
GIM



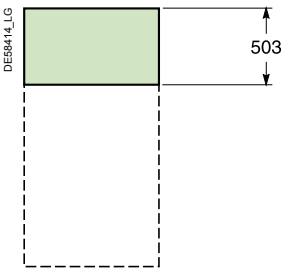
GEM



GBC-A, GBC-B, IMM



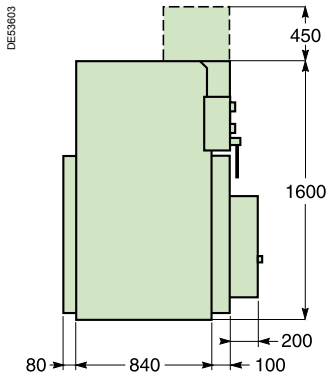
EMB



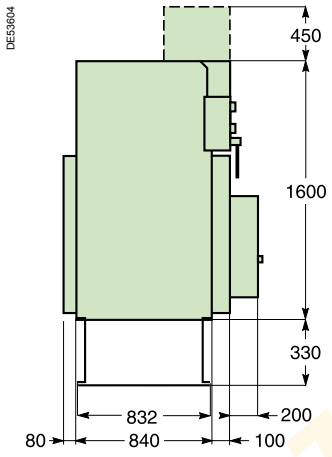
Units dimensions for SM6-24

Basic internal arc
12.5 kA 1s, IAC: A-FL

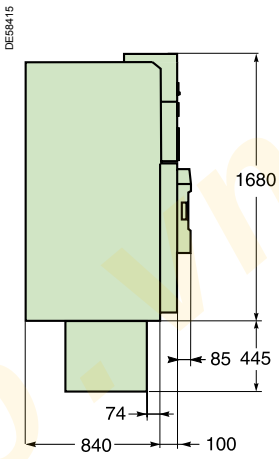
DMVL-A, DMVL-D, DM1-A, DM1-D, DM1-W, DM1-Z, DM1-S, DM2 630 A, DM1-M



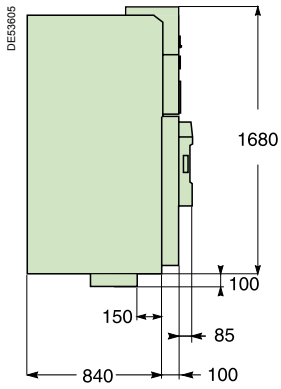
DM1-A, DM1-W 1250 A



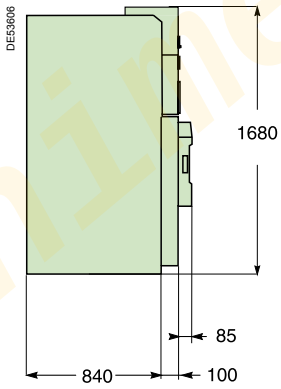
DMV-A 1250 A



DMV-A 630 A



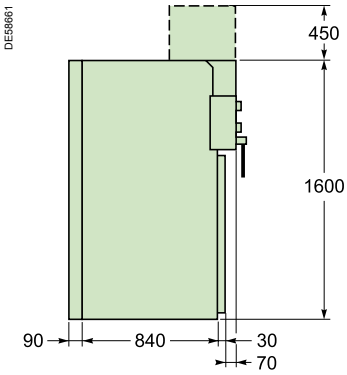
DMV-D



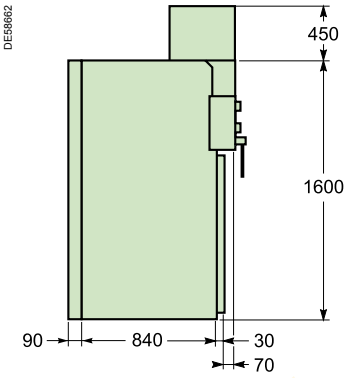
Units dimensions for SM6-24

Advance internal arc
12.5 kA 1s, IAC: A-FLR, 16 and 20 kA 1s, IAC: A-FL/A-FLR

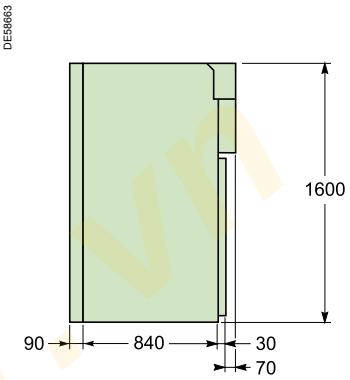
IM, IMB, PM, QM, QMB, SM, IMC, QMC, CM, CM2



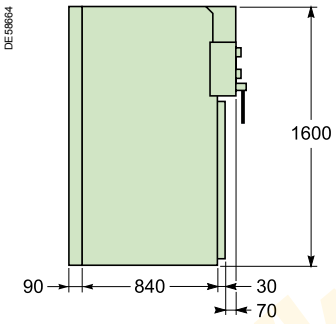
NSM-cables, NSM-busbars, CVM



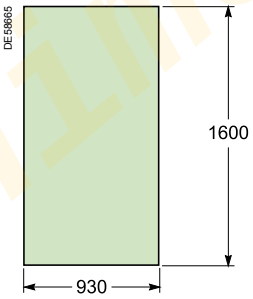
GBM, GAM2



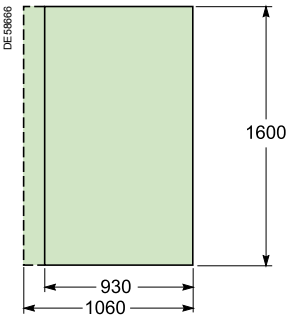
GAM



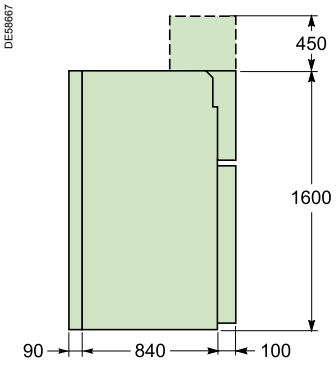
GIM



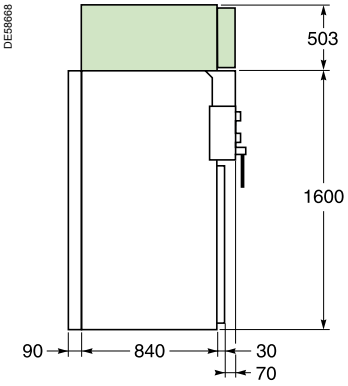
GEM



GBC-A, GBC-B, IMM



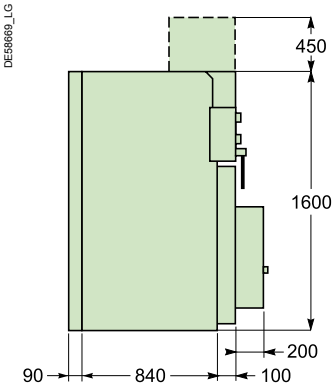
IM with EMB option



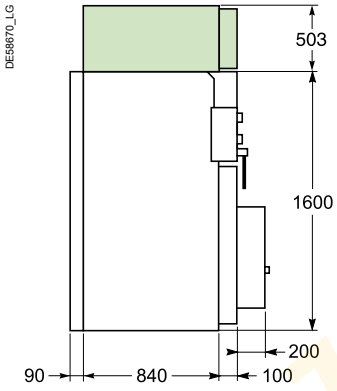
Units dimensions for SM6-24

Advance internal arc
12.5 kA 1s, IAC: A-FLR,
16 and 20 kA 1s, IAC: A-FL/A-FLR

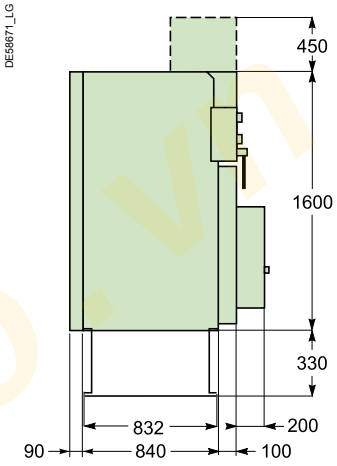
DMVL-A, DMVL-D, DM1-A, DM1-D, DM1-W, DM1-Z, DM1-S, DM2 630 A, DM1-M



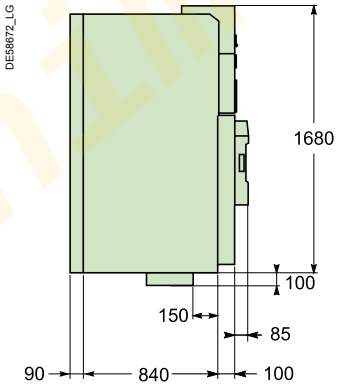
DM1-A 630 A with EMB option



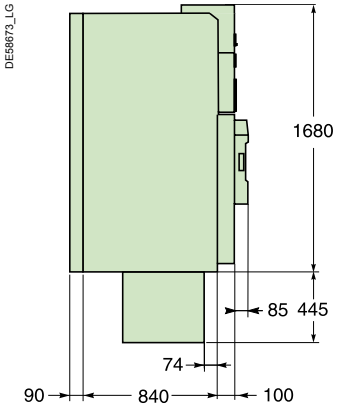
DM1-A, DM1-W 1250 A



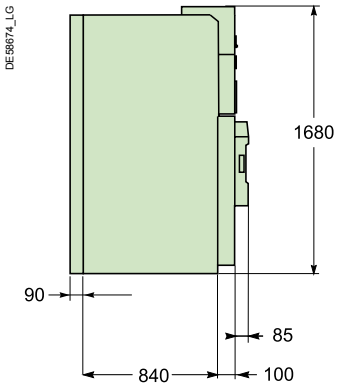
DMV-A 630 A



DMV-A 1250 A



DMV-D



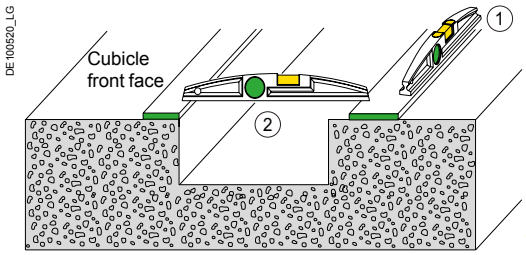
Civil engineering for SM6-24

Ground preparation

To obtain the internal arc performance, ground implementation must comply with the following requirements:

- Straightness: 2 mm / 3 m (Rep.1)
- Flatness: 3 mm maximum (Rep.2)

All the elements allowing the evacuation of the gas (duct, casing, etc.) must be able to bear a load of 250 kg/m^2.



Fixing of units

With each other

The units are simply bolted together to form the MV switchboard (bolts supplied). Busbar connections are made using a torque wrench set to 28 mN.

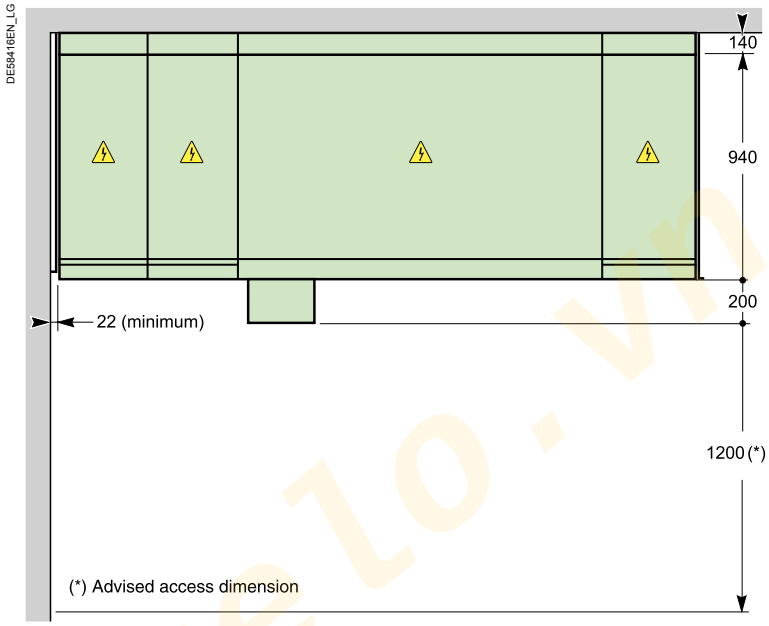
On the ground

- For switchboards comprising up to three units, the four corners of the switchboard must be secured to the ground with using:
  - M8 bolts (not supplied) screwed into nuts set into the ground using a sealing pistol
  - screw rods grouted into the ground.
- For switchboards comprising more than three units, each unit may be fixed to the ground
- In circuit-breaker or contactor units, fixing devices are installed on the opposite side of the switchgear.

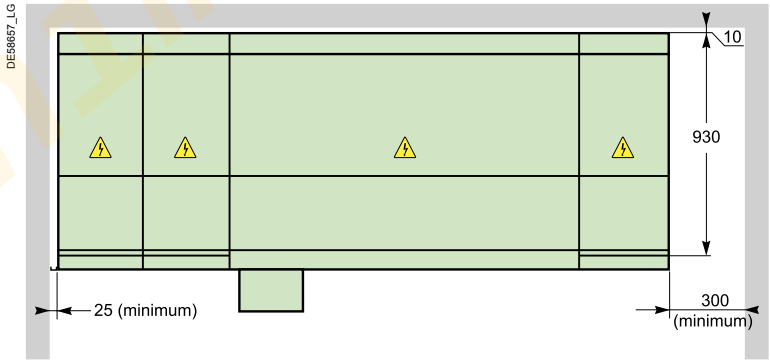
Layout examples for SM6-24

Position of cubicles in a substation

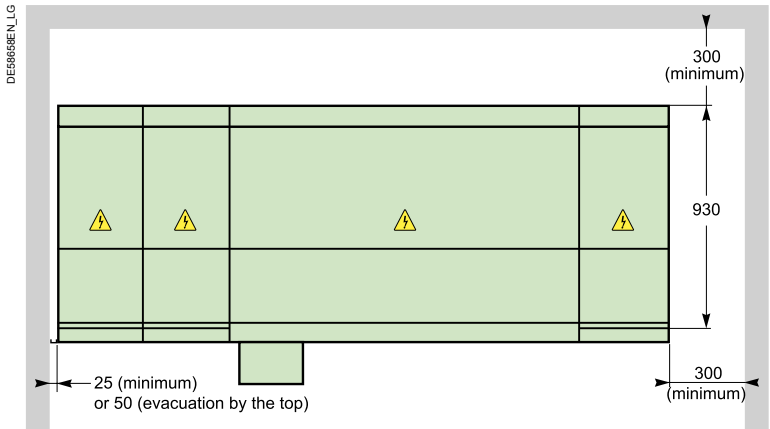
Installation of a switchboard classified IAC 12.5 kA 1s: A-FL Conventional substation (Masonery)



Installation of a switchboard classified IAC 16/20 kA 1s: A-FL with downwards exhaust



Installation of a switchboard classified IAC: A-FLR with downwards exhaust



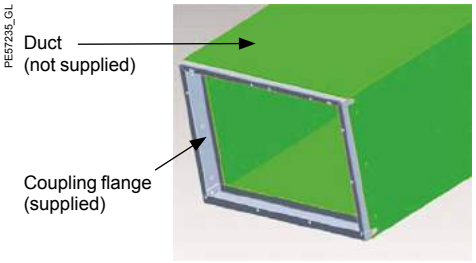
Layout examples for SM6-24

Evacuation duct

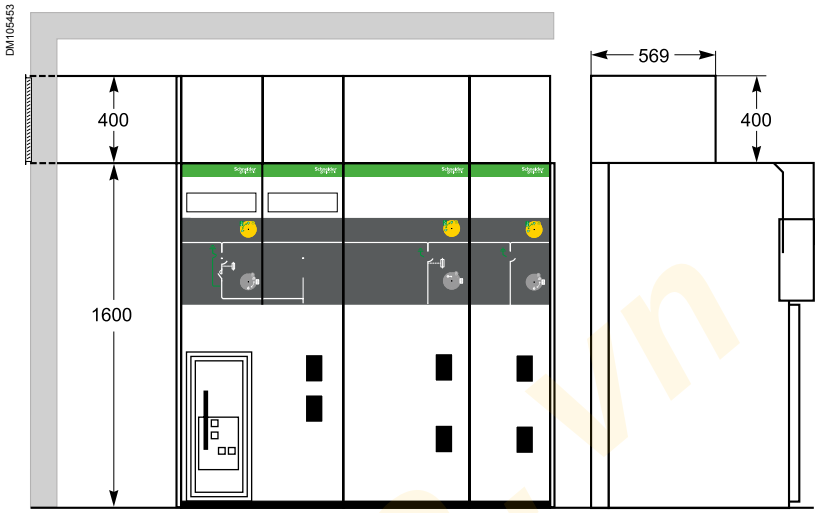
To enable the evacuation of gases by the top, users must install a conduit fixed to the coupling flange at right or left of the switchboard. For IP3X protection performance, a flap must be installed with this coupling flange on the lateral side of the cubicle duct. The end of the duct must block water, dust, moisture, animals, etc. from entering and at the same time enable the evacuation of gases into a dedicated area through a device situated at the outer end of the duct (not supplied).

Evacuation duct example

The evacuation duct must be made of metal sheet of sufficient thickness to withstand pressure and hot gases.



Installation of a switchboard classified IAC: A-FL & A-FLR with upwards exhaust left side (ceiling height ≥ 2150 mm)



Dimensions and weights for SM6-36

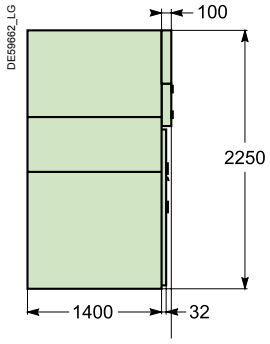
Dimensions and weights

Unit type	Height	Width	Depth (1)	Weight
	(mm)	(mm)	(mm)	(kg)
IM, SM	2250	750	1400 (3)	310
IMC, IMB	2250	750	1400 (2)	420
QM, PM, QMB	2250	750	1400 (3)	330
QMC	2250	1000	1400 (3)	420
DM1-A	2250	1000	1400 (2)	600
DM1-D	2250	1000	1400 (2)	560
GIM	2250	250	1400	90
DM2	2250	1500	1400 (2)	900
CM, CM2	2250	750	1400 (2)	460
GBC-A, GBC-B	2250	750	1400 (3)	420
GBM	2250	750	1400 (3)	260
GAM2	2250	750	1400 (3)	250
GAM	2250	750	1400 (3)	295
GFM	2250	250	1400	100

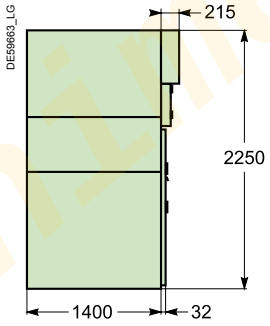
(1) The depth measures are given for the floor surface.
(2) The depth in these units are 1615 mm with the enlarged low voltage compartment.
(3) The depth in these units are 1500 mm with the standard low voltage compartment.

Dimensions

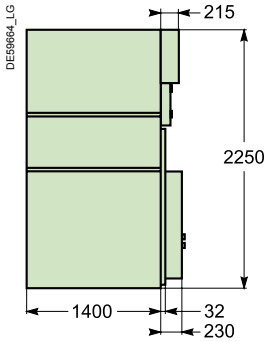
IM, SM, IMC, QM, PM, IMB, GBM, GAM, GAM2, GBC-A,GBC-B QMB, QMC units



CM, CM2 units



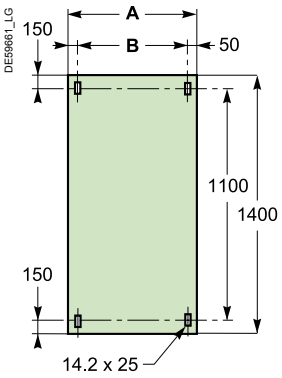
DM1-A, DM1-D, DM2 units



Civil engineering for SM6-36

Ground preparation

Units may be installed on ordinary concrete grounds, with or without trenches depending on the type and cross-section of cables.
Required civil works are identical for all units.



Fixing of units

With each other
The units are simply bolted together to form the MV switchboard (bolts supplied).
Busbar connections are made using a torque wrench set to 28 mN.

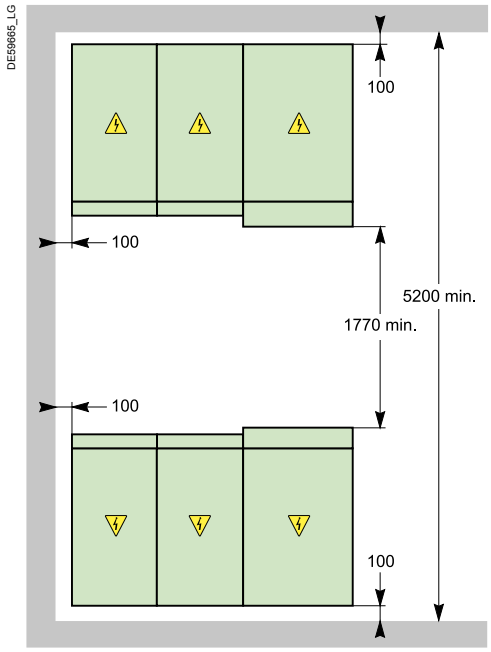
On the ground
- for switchboards comprising up to three units, the four corners of the switchboard must be secured to the ground using:
  - bolts (not supplied) screwed into nuts set into the ground using a sealing pistol
  - screw rods grouted into the ground
- for switchboards comprising more than three units, the number and position of fixing points depends on local criteria (earthquake withstand capacities, etc.)
- position of fixing holes depends on the width of units.

Unit type	A (mm)	B (mm)
IM, IMC, IMB, QM, PM, SM, CM, CM2, TM GBC-A, GBC-B, GBM, GAM2, IMB, GAM, QMB	750	650
DM1-A, DM1-D, QMC	1000	900
DM2	1500	1400
GIM	250	150

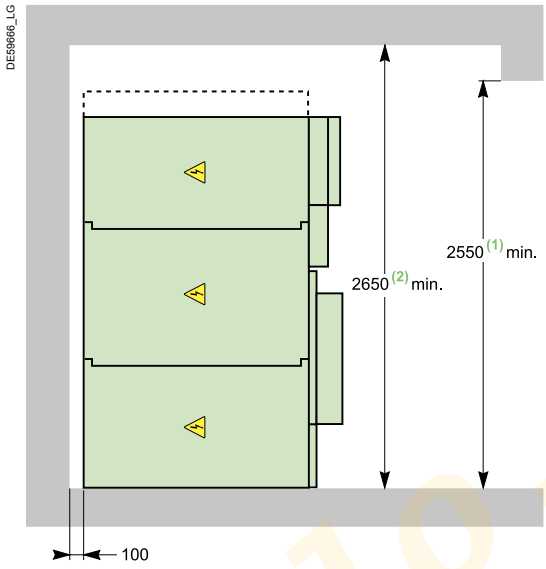
Layout examples for SM6-36

Conventional substation (Masonery)

Top view

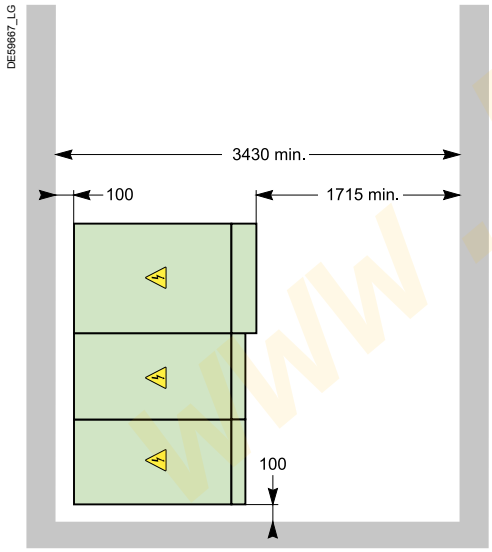


Side view



Minimum required dimensions (mm)
(1) In case of upper incoming option: it must be 2730 mm (no internal arc withstand performance available)
(2) In case of upper incoming option: it must be 2830 mm (no internal arc withstand performance available)

Top view



Schneider Electric services

Schneider Electric services

Contents

ProDiag Breaker

Diagnosis of MV and LV Circuit Breakers

PE60531

What is ProDiag Breaker?

ProDiag Breaker is a Schneider Electric diagnosis tool.
ProDiag Breaker compares the mechanical and electrical parameters measured during the full operation of circuit breakers with the data collected from our production facilities. This allows detecting possible failure in advance. It measures, records and displays on a screen the key electrical parameters in MV and LV circuit breakers, relating to opening, closing and springloading operations.
All this data is automatically compared with the criteria for the circuit breaker designated in the software, which indicates which values are within the acceptable range, which are on the limit and which are outside it.
Two tests are always performed on each circuit breakers, one at minimum voltage and one at nominal voltage. A written report is generated and provided by Schneider Electric so that the customer can use it as a tool to define the necessary corrective action (maintenance, repair or replacement).

ProDiag Breaker is part is part of ProDiag preventive maintenance plan

Evaluation of circuit breakers using ProDiag Breaker includes:
- Evaluation of the operating mechanism.
- Measurement and comparison of the actual contact resistance with that specified by the manufacturer.
- Measurement and comparison of the insulation resistance.
- Evaluation of the general circuit breaker conditions based on the captured data.

Moreover, analysis of the ProDiag Breaker time/ travel curve combined with the current curve of the coil and phase contact detects possible faults, such as:
- Worn out latches and operating mechanisms.
- Faulty coils.
- Mechanical wear and tear and hardening of lubricating grease.
- Defective shock absorbers.
- Defective simultaneous contact operation (opening/closing).

Some maintenance programmes involve dismantling the circuit breaker mechanism to check its condition. ProDiag Breaker using signals captured from the circuit breaker operation, reduces maintenance costs compared with programs which check the circuit breakers manually.

Where can ProDiag Breaker reduce costs?

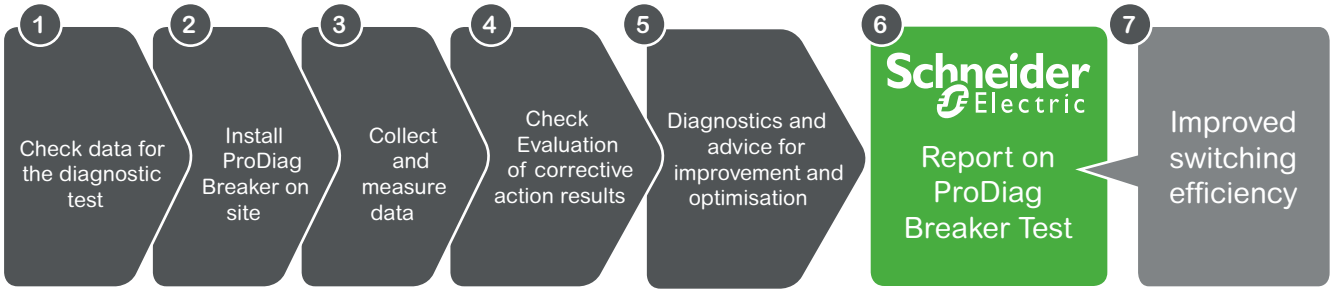
- ProDiag Breaker significantly reduces the time taken to identify potential faults in a circuit breaker, using operational analysis rather than inspection and mechanical re-sets.
- The software analyses the captured data and identifies the specific problem area.
- A device's normal operating life is increased by timely diagnostics of when and what repairs are necessary.
- The tool comprises both hardware and software, resulting in a highly efficient predictive maintenance program.

Results

ProDiag Breaker provides a report of the complete nature of the circuit breaker, detailing: closing / opening time, contact simultaneity, bounce and resistance, mechanical closing and opening forces.
This report enables any required maintenance to be targeted and time in order to optimize the customer's maintenance plan.

ProDiag Breaker Objectives

Your priority is to enhance the reliability of your installation:
- to ensure its continuity of service,
- to minimize the time for maintenance & repair
- to perform maintenance
- Only on the equipment requiring it and only when necessary (conditional preventive maintenance)

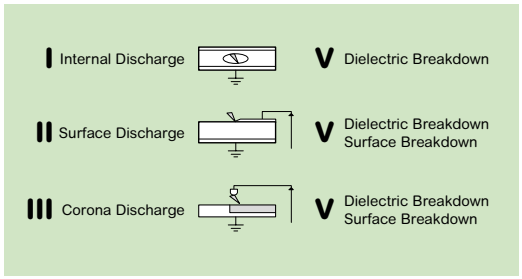


ProDiag Corona

Diagnostics of partial discharges

PE60530

DE60799



ProDiag Corona objectives

Your priority is to have fast Electrical equipment inspection without shutdown

Safety (Human Life and asset)

- Enhance the reliability of your installation
- Optimisation of installation life duration & costs

Risks prevention from:

- Partial discharges and internal arc
- Dielectric degradation
- Electrical Fire

What is ProDiag Corona?

ProDiag Corona is a Schneider Electric diagnosis tool.
ProDiag Corona detects partial discharges in Medium Voltage cubicles.

- Partial Discharge occurs across part of the insulation between two conducting electrodes, without completely bridging the gap.
- Partial discharge can happen under normal working conditions as a result of insulation breakdown due to premature aging caused by thermal or electrical over-stressing of the high voltage system.

ProDiag Corona analyses the primary electrical signal through VIS (Voltage Indicator System) fixed on the switchboards. Measurements are taken by an electronic sensor and the data is transmitted to the ProDiag Corona software in order to evaluate the level of criticality of the controlled equipment.
A written report is generated, which will be handed over by Schneider Electric so that the customer can use it as a tool to define the necessary corrective action, whether maintenance, repair or replacement.
ProDiag Corona is not a certification tool.
ProDiag Corona executes the assessment of the energized equipment, without any shutdown and then without disruption for the users.
This system allows you to control all types of the most common partial discharges:

- Internal partial discharges
- Surface partial discharge
- Corona effect

ProDiag Corona diagnostic can be realized on most Medium Voltage equipment on the market equipped with VIS.

Where can ProDiag Corona reduce costs?

ProDiag Corona significantly reduces the time taken to identify potential faults in a switch, without electrical shutdown.
A device's normal operating life is increased by timely diagnostics of when and what repairs are necessary. **ProDiag Corona** is a trouble shooting anticipation tool which can avoid internal arc risks and untimely tripping.

- The tool comprises both hardware and software, resulting in a highly efficient preventive maintenance program.

Results

ProDiag Corona provides a report of the complete electrical room, detailing: ventilation, air filtration, due point calculation, level of criticability of each set of equipment, constructor recommendations on any potential maintenance, repair & rehabilitation.
This report enables any required maintenance to be targeted and timed to optimize the customer's maintenance plan.
ProDiag Corona is performed thanks to XDP2 testing equipment from NDB technology.

ProDiag Fuse

Proprietary and standards diagnostics tools

PE60532

PE60533

Customer needs

Electrical power installations protected by MV switchgear with fuse protection should be regularly checked (for correct assembly, electrical parameters, etc.) to confirm that their characteristics correspond to the original specification. Regular diagnosis of fuse performance (electrical parameters, resistance) according to the manufacturer's recommendations is necessary to secure
the ED installation and its service continuity, which are important for customers.
The ProDiag Fuse diagnostic solution can be used on MV switchgear protected by fuses that have not received any maintenance intervention
in the last four years (under normal operating conditions, and less if operating in severe environments or depending on their criticality in the installation).

The purpose of ProDiag Fuse (a proprietary hardware-software solution)
is to mitigate the risks on MV switchgear and equipment by fuses of faults or drifts causing unwanted effects. The result of fuse ageing is the destruction of filaments that can lead to thermal runaway, partial damage, complete destruction of MV switchgear and equipment, or even destruction
of the electrical room.

Customer benefits

ProDiag Fuse helps customers visualise, discover, and understand MV switchgear fuse ageing and wear and tear as compared to the original fuse manufacturers' technical specification.

ProDiag Fuse monitors the performance of MV switchgear fuses.
Thanks to ProDiag Fuse, maintenance managers can implement, manage, and enrich their maintenance plans. Schneider Electric FSRs conclude their on-site interventions with an exhaustive report on the MV switchgear fuses conformity/non-conformity. If a MV fuse is declared non-conforming, Schneider Electric suggests a corrective plan that includes fuse replacement to regain original performance in safety and service continuity.

Customers can augment their preventive maintenance plans with this corrective action at the most convenient time for each ED device.

"Unique value for customer vs standard market tools"

Electrical parameter measurements (resistance, etc.) on MV switchgear fuses at customer sites are taken by a test tool and transmitted to the Schneider Electric FSRs' ProDiag Fuse software. Data are compared to those of a fuse manufacturers' technical database.

The aim is to determine whether recorded measurements are within the acceptable range, at the limit, or fall outside it, as criteria for MV switchgear fuse conformity.

As an ED equipment manufacturer, Schneider Electric is uniquely positioned to develop and invest in specific tests tools, proprietary software, and testing methodology to collect reliable measurements from MV switchgears fuses.

ProDiag Fuse measures a larger number of parameters than standard market tools. It delivers best-in-class MV switchgear fuse diagnostics.

Schneider Electric scope: Schneider Electric fuses and main market fuses players.

Appendices & Order Form

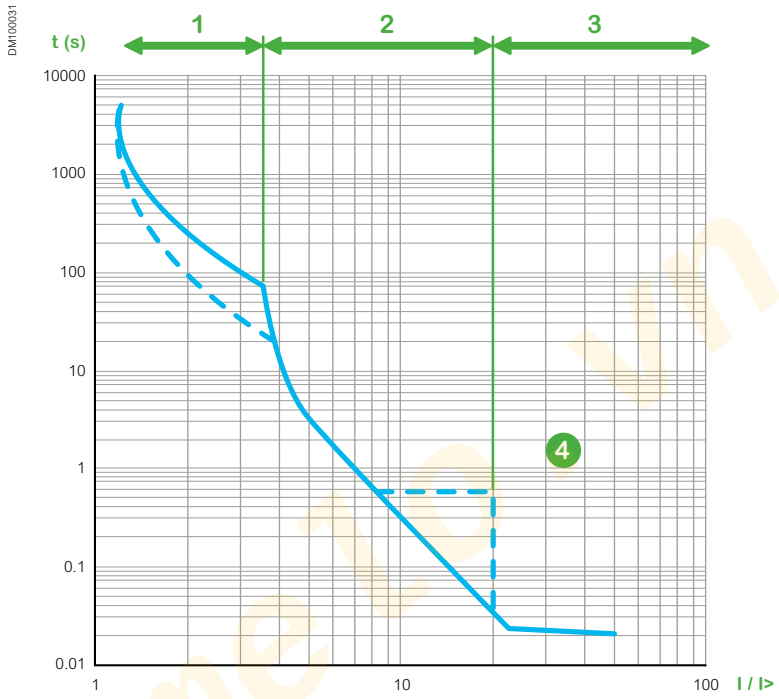
Appendices & Order form

Contents

VIP tripping curves

VIP 40 and VIP 45 tripping curve

Phase overcurrent protection (ANSI 50-51)

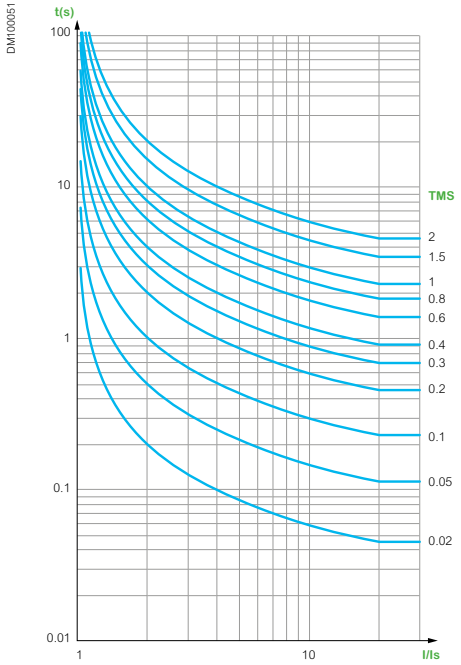


1. Overload
2. Secondary short-circuit
3. Primary short-circuit
4. Activation of discrimination with a Low Voltage circuit breaker

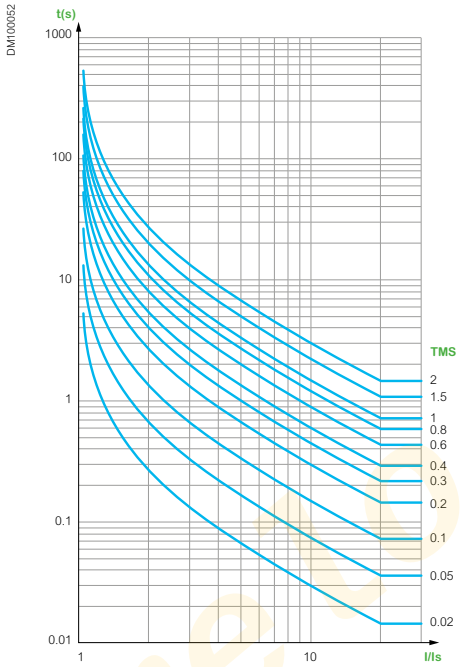
VIP tripping curves

VIP 400 tripping curves

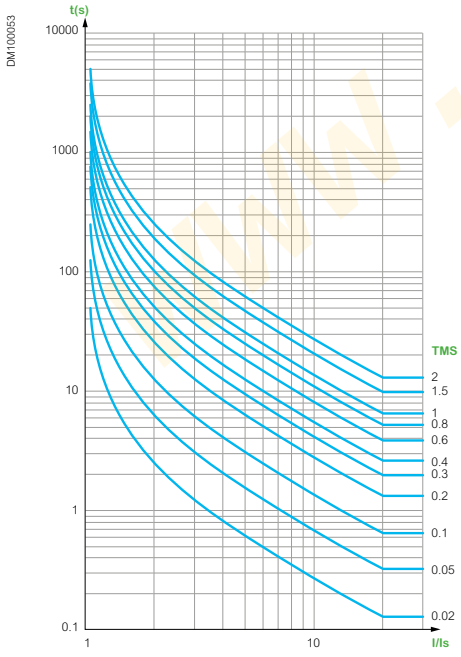
IEC Standard Inverse Time Curve (IEC/SIT or IEC/A)



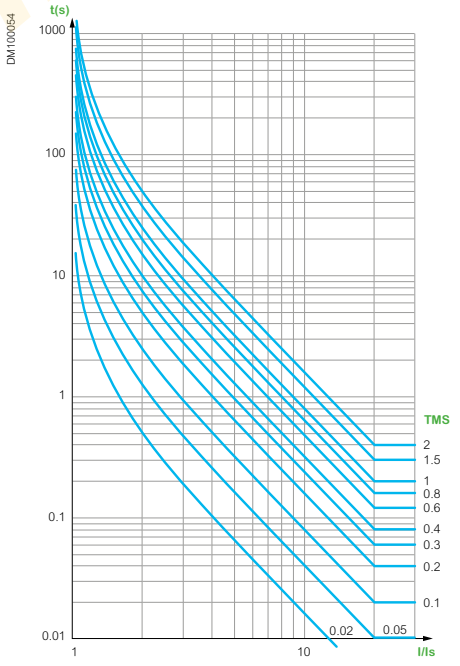
IEC Very Inverse Time Curve (IEC/VIT or IEC/B)



IEC Long Time Inverse Curve (IEC/LTI)



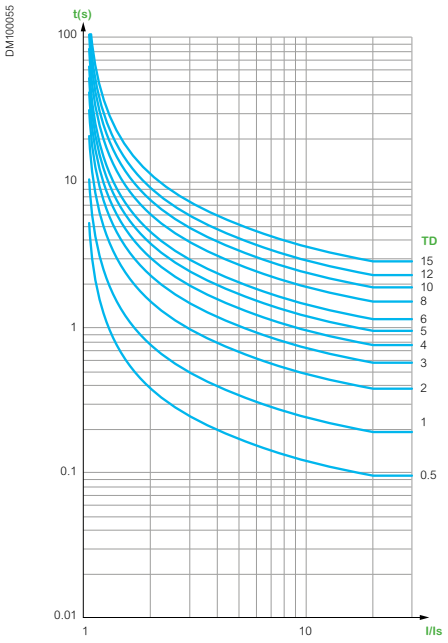
IEC Extremely Inverse Time Curve (IEC/EIT or IEC/C)



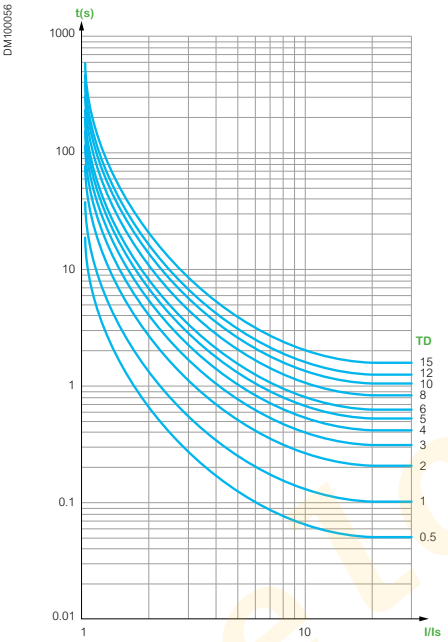
VIP tripping curves

VIP 400 tripping curves

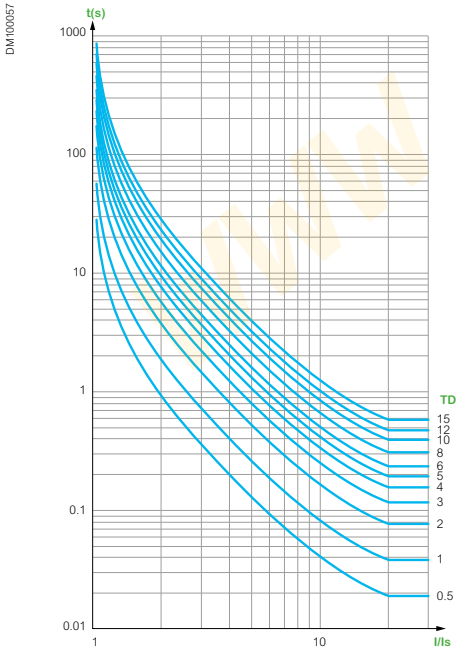
IEEE Moderately Inverse Curve (IEEE/MI or IEC/D)



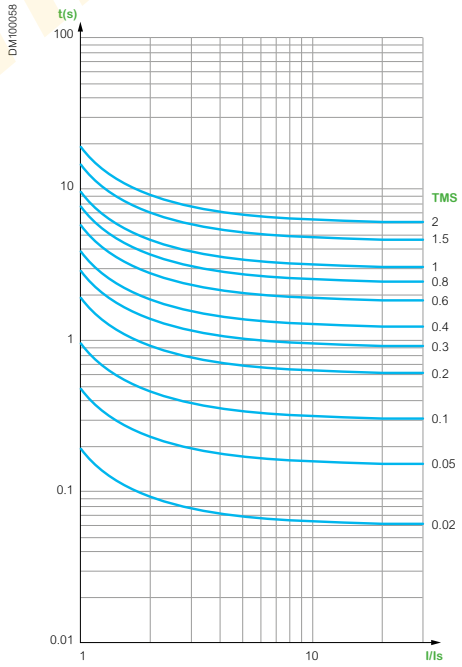
IEEE Very Inverse Curve (IEEE/VI or IEC/E)



IEEE Extremely Inverse Curve (IEEE/EI or IEC/F)



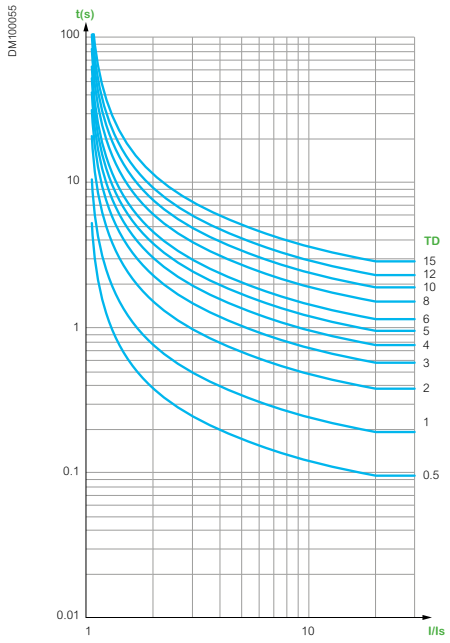
RI Curve



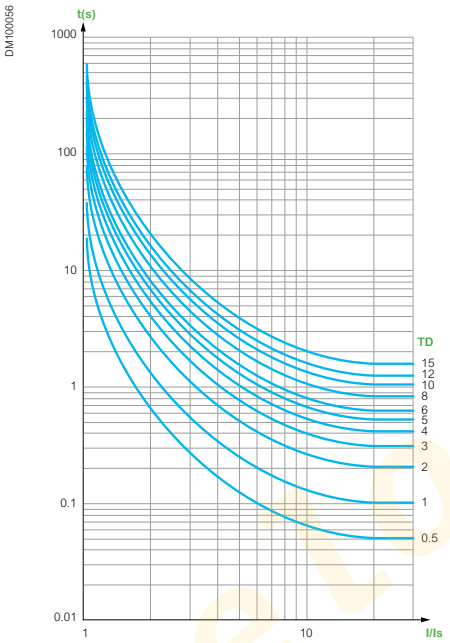
VIP tripping curves

VIP 410 tripping curves

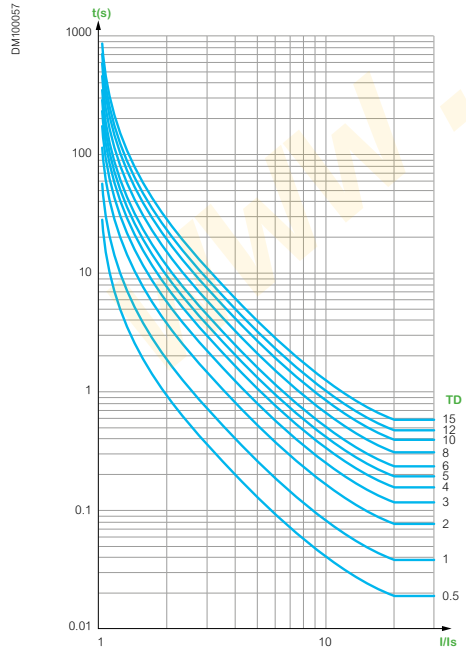
IEEE Moderately Inverse Curve (IEEE/MI or IEC/D)



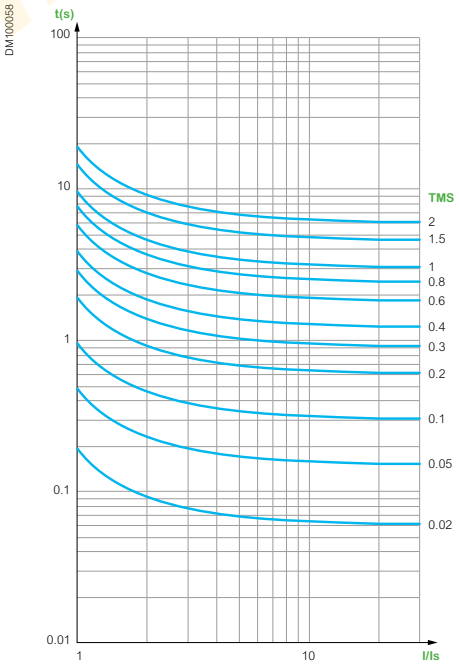
IEEE Very Inverse Curve (IEEE/VI or IEC/E)



IEEE Extremely Inverse Curve (IEEE/EI or IEC/F)



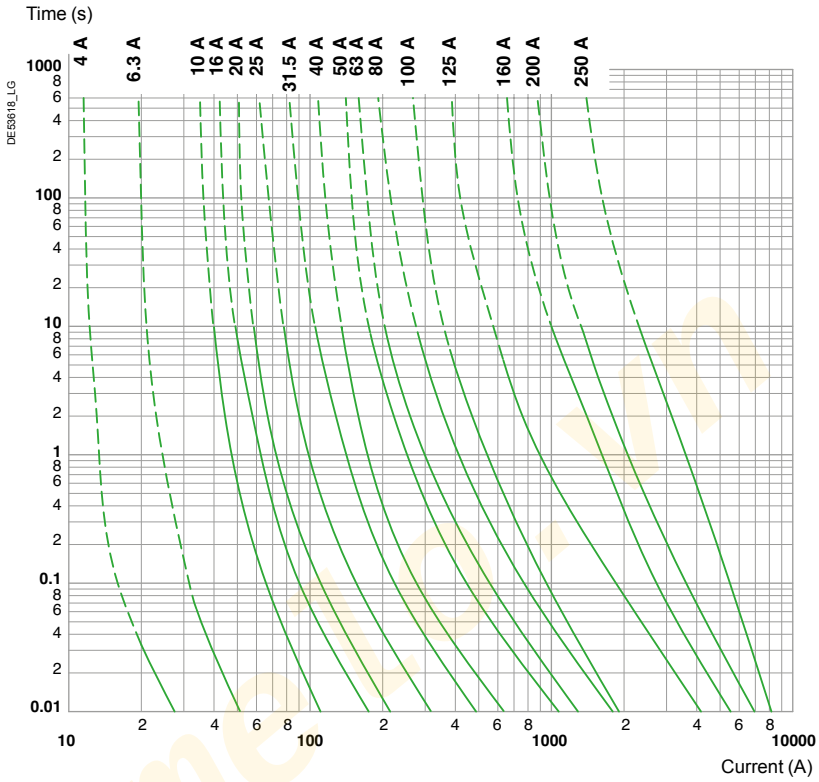
RI Curve



Fusarc CF fuses

Fuse and limitation curves

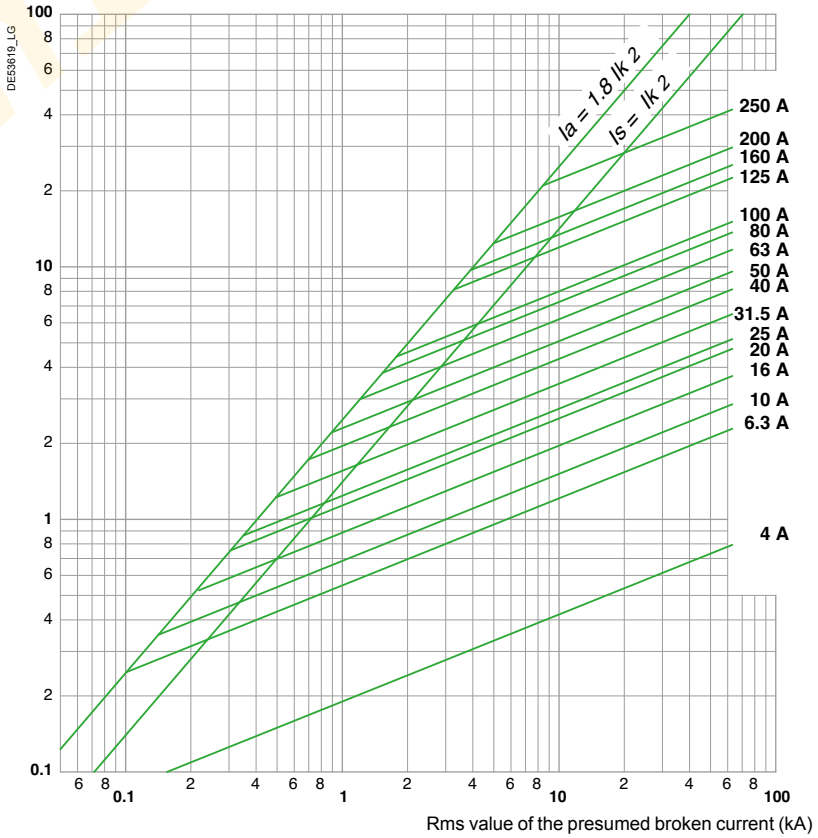
Fuse curve 3.6 - 7.2 - 12 - 17.5 - 24 - 36 kV



Limitation curve 3.6 - 7.2 - 12 - 17.5 - 24 - 36 kV

Maximum value of the limited broken current (kA peak)

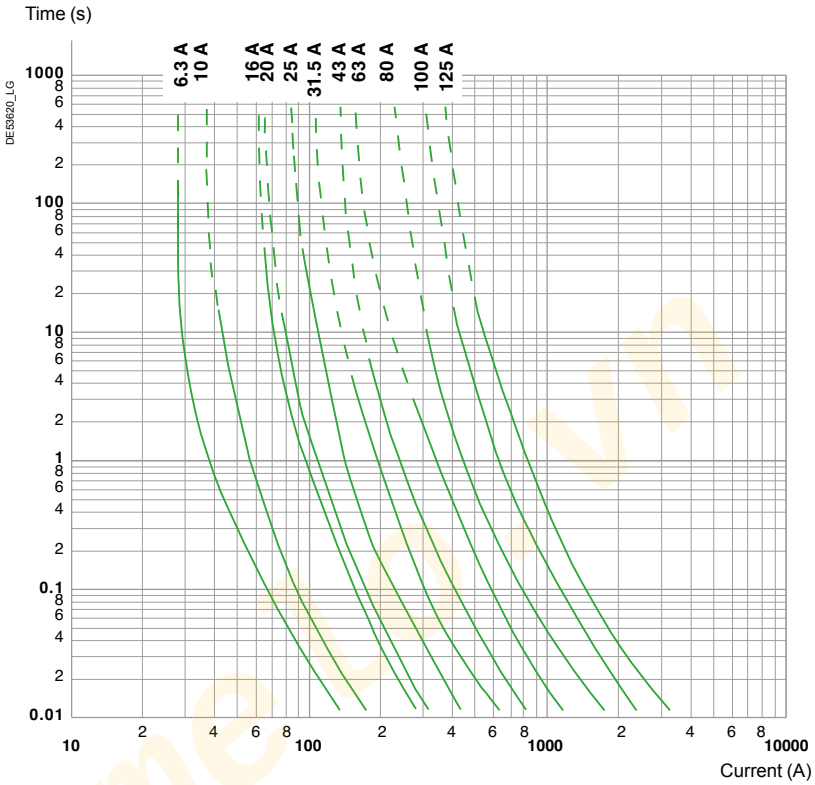
The diagram shows the maximum limited broken current value as a function of the rms current value which could have occured in the absence of a fuse.



Solefuse fuses

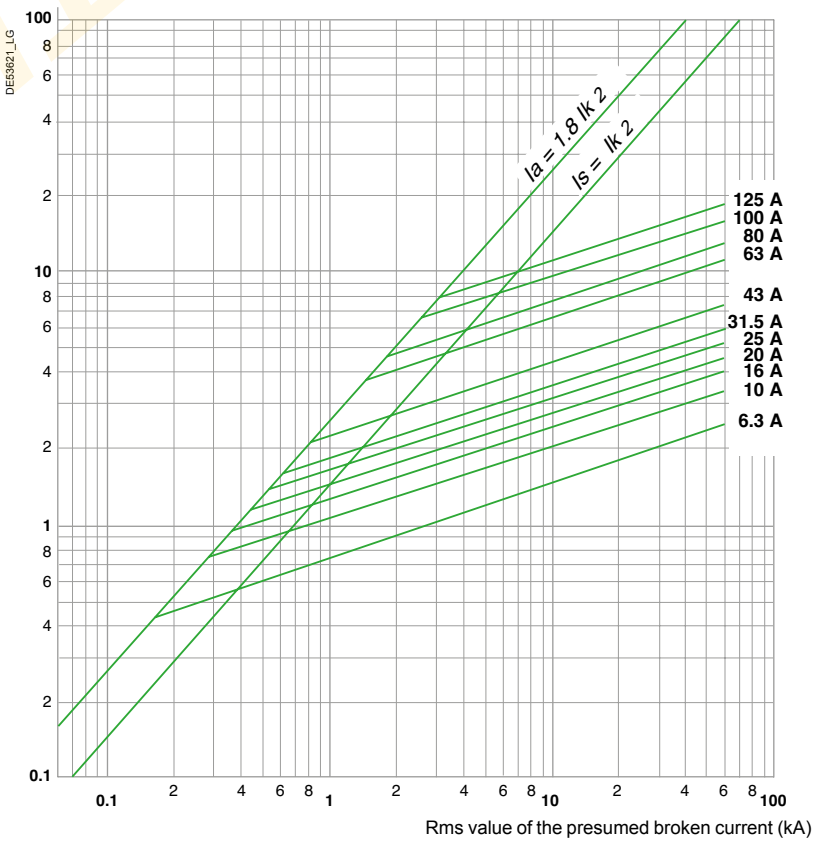
Fuse and limitation curves

Fuse curve 7.2 - 12 - 17.5 - 24 kV



Limitation curve 7.2 - 12 - 17.5 - 24 kV

The diagram shows the maximum limited broken current value as a function of the rms current value which could have occured in the absence of a fuse.



SM6
Switching

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.

Basic cubicle — Quantity [ ]

Rated voltage Ur				**(kV)** [ ]
Service voltage				**(kV)** [ ]
Short-circuit current Isc				**(kA)** [ ]
Rated current Ir				**(A)** [ ]
Internal arc withstand	12.5 kA 1s for SM6-24 [ ]			16 kA 1s for SM6-36 [ ]
Internal arc classification				A-FL
Gaz exhaust direction				Downwards
Type of cubicle				
24 kV	SM 375 [ ]	IM 375 [ ]	IMC 500 [ ]	IMB 375 [ ]
	SM 500 (for 1250 A) [ ]	IM 500 [ ]	IMM [ ]	
36 kV	SM 750 [ ]	IM 750 [ ]	IMC 750 [ ]	IMB 750 [ ]
Position in the switchboard	First on left [ ]		Middle [ ]	Last on right [ ]
Direction of lower busbars for IMB				
	Left (impossible as first cubicle of switchboard) [ ]			Right [ ]
Cable connection by the bottom (1x single core, cable maxi 240 mm²)				36 kV [ ]

Options

Common options

Replacement of CIT by		CI1 [ ]	CI2 [ ]
Motorization		Standard [ ]	SM-24 Severe and communication [ ]
Ambient monitoring			SM-24 [ ]
Arc detection			IM cubicle [ ]
Electrical driving motorization and/or coil voltage (not applicable on SM cubicle)	24 Vdc [ ]	110 Vdc [ ]	120/127 Vac (50 Hz) [ ]
	32 Vdc [ ]	120-125 Vdc [ ]	220/230 Vac (50 Hz) [ ]
	48 Vdc [ ]	137 Vdc [ ]	120/127 Vac (60 Hz) [ ]
	60 Vdc [ ]	220 Vdc [ ]	220/230 Vac (60 Hz) [ ]
Signalling contact	1 C on SW and 1 O & 1 C on ES (not applicable on SM cubicle) [ ]		
	2 O & 2 C on SW [ ]	2 O & 3 C on SW and 1 O & 1 C on ES [ ]	
Interlocking		Tubular key type [ ]	Flat key type [ ]
	For all cubicle (except SM) A4 [ ]	A3 SM6-SM6 [ ]	P1 SM6-SM6 [ ]
	Localisation of 2nd lock for A3	On switch [ ]	On earthing switch [ ]
	Localisation of 2nd lock for A4		Cubicle no. [ ]
	SM cubicle only	P2 SM6-SM6 [ ]	P3 SM6-SM6 [ ]
Replacement of 630 A upper busbar by 1250 A (not possible for IMB)			[ ]
Digital ammeter or fault current indicator	AMP 21D [ ]		Flair 23DV zero sequence [ ]
	Flair 21D [ ]	Flair 22D [ ]	Flair 23DM [ ]
Visibility of main contacts			[ ]
Pressure indicator device	Analogic manometer **without** visibility of main contacts [ ]		
Pressure switch [ ]	Analogic manometer **with** visibility of main contacts [ ]		

SM6
Switching

Only one of the boxes (ticked ☒ or filled ☐ by the needed value) have to be considered between each horizontal line.

Options

SM6-24 options

Remote control signalling
2 lights ☐ | 2 lights and 2 PB ☐ | 2 lights and 2 PB + 1 switch ☐

Voltage of the lights (must be the same than electrical driving mechanism)
24 V ☐ | 48 V ☐ | 110/125 V ☐ | 220 V ☐

Roof configuration (A, B or C only one choice possible)
A - Cable connection by the top (cable maxi 240 mm^2 with VPIS)
Single core ☐ | 2 x single core ☐
B - Low voltage control cabinet (h = 450 mm) | With unpunched door ☐
C - Wiring duct ☐

Cable connection by the bottom (not applicable on IMB, cable maxi 240 mm^2)
Three core ☐ | Single core ☐ | 2 x single core ☐

50 W heating element ☐

Surge arresters for IM 500
7.2 kV ☐ | 10 kV ☐ | 12 kV ☐ | 17.5 kV ☐ | 24 kV ☐

Operation counter ☐

CTs for IMC (quantity) 1 ☐ | 2 ☐ | 3 ☐

Busbar field distributors for severe conditions (only for 630 A) ☐

Internal arc version (not possible with "top incomer" option) 16 kA 1 s ☐ | 20 kA 1 s ☐

Internal arc classification A-FLR ☐

Gaz exhaust direction Upwards ☐

Thermal monitoring ☐

Arc detection ☐

Seismic performance ☐

Ambient monitoring QM cubicle only ☐

SM6-36 options

Cable connection by the top
(single core cable maxi 240 mm^2 with VPIS) ☐

Cable connection by the bottom
(2 x single core, cable maxi 240 mm^2, not applicable on IMC) ☐

Surge arresters
(not applicable on IMB, IMC cubicles) 36 kV ☐

SM6
Switching
Automatic Transfer System

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.

Basic cubicle — Quantity [ ]

Rated voltage Ur (kV) [ ]

Service voltage (kV) [ ]

Short-circuit current Isc (kA) [ ]

Rated current Ir (A) [ ]

Internal arc withstand 12.5 kA 1s for SM6-24 [ ] 16 kA 1s for SM6-36 [ ]

Internal arc classification A-FL

Gaz exhaust direction Downwards

Type of cubicle/upper busbar for 24 kV

Ir = 630 A, Ir busbar = 400 A	NSM busbar [ ]	NSM cable [ ]
Ir = 630 A, Ir busbar = 630 A	NSM busbar [ ]	NSM cable [ ]
Ir = 630 A, Ir busbar = 1250 A		NSM cable [ ]

Position in the switchboard First on left [ ] Middle [ ] Last on right [ ]

Direction of lower busbars for GBC-A **(see page 151)**

Direction of lower busbar for IMM Left [ ] Right [ ]

Incoming bottom busbar for NSM busbar Left [ ] Right [ ]

Cable connection by the bottom (cable maxi 240 mm^2) **for NSM cable**
Three core on both [ ] Single core on both [ ] 2 x single core on both [ ]

Stand by source Generator without paralleling [ ]
Utility with paralleling [ ] Utility without paralleling [ ]

Control unit HMI language
French [ ] English [ ] Spanish [ ] Portuguese [ ] Chinese [ ]

Options

Common options

Signalling contact 1 C on SW and 1 O & 1C on ES [ ]

Operation counter [ ]

Interlocking SM6-SM6 Tubular key type [ ] Flat key type [ ]

1 x P1	Right cubicle [ ]	Left cubicle [ ]	
2 x P1		Right and left cubicle [ ]	
1 x A3	Right cubicle [ ]	Left cubicle [ ]	
	On switch [ ]	On earthing switch [ ]	
2 x A3 Right cubicle	On switch [ ]	On earthing switch [ ]	
Left cubicle	On switch [ ]	On earthing switch [ ]	

Control and monitoring [ ]

Protocol type	DNP3 [ ]	IEC 101/204 [ ]	Modbus (by default) [ ]
Modem type	FFSK [ ]	RS485 [ ]	RS232 (by default) [ ]
	PSTN [ ]	GSM [ ]	FSK [ ]

SM6-24 options

2 heating elements [ ]

Busbar field distributors for severe conditions (only for 630 A) [ ]

Internal arc version (not possible with "top incomer" option) 16 kA 1 s [ ] 20 kA 1 s [ ]

Internal arc classification A-FLR [ ]

Gaz exhaust direction Upwards [ ]

Arc detection [ ]

Thermal monitoring [ ]

SM6
Protection
Circuit breaker

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.

Basic cubicle — Quantity [ ]

Common 24/36 kV

Rated voltage Ur (kV) [ ]

Service voltage (kV) [ ]

Short-circuit current Isc (kA) [ ]

Rated current Ir (A) [ ]

Internal arc withstand 12.5 kA 1s for SM6-24 [ ] 16 kA 1s for SM6-36 [ ]

Internal arc classification A-FL

Gaz exhaust direction Downwards

24 kV For **SF1** circuit breaker
- DM1-A 750 [ ] DM1-D left 750 [ ] DM1-D right 750 [ ]
- DM1-S 750 [ ] DM1-Z 750 [ ] DM1-W 750 [ ]
- DM1-M right [ ] DM2 left 750 [ ] DM2 right 750 [ ]

For **SFset** circuit breaker: DM1-D left 750 [ ] DM1-D right 750 [ ]

For **Evolis** frontal 630 A CB: DMV-A [ ] DMV-D right [ ]

For **Evolis** lateral 630 A CB: DMVL-A [ ] DMVL-D [ ]

36 kV For **SF1** circuit breaker: DM1-A 1000 [ ] DM1-D left 1000 [ ] DM1-D right 1000 [ ] DM2 left 1500 [ ] DM2 right 1500 [ ]

Position in the switchboard First on left [ ] Middle [ ] Last on right [ ]

Circuit breaker See specific order form

Current transformers (CT) and LPCTs See specific order form

Protection relay (see specific order form) Sepam relay [ ] Easergy P3 relay [ ]

Cable connection by the bottom (1x single core, cable maxi 240 mm²) 36 kV [ ]

Basic SM6-24

Busbar (Ir ≥ Ir cubicle)
- For DM1-M: 630 A [ ]
- For DM1-A, DM1-S, DM1-W, DMVL-A, DMVL-D ,DM1-D, DM2: 400 A [ ] 630 A [ ] 1250 A [ ]
- For DM1-A, DM1-D, DM1-W, DM1-Z: 1250 A [ ]
- For DMV-A, DMV-D: 630 A [ ] 1250 A [ ]

Protection
- For DM1-S: VIP45 [ ] VIP410 only D1S [ ] VIP400 [ ] VIP400 with CGas [ ] VIP400 with CGbs [ ]
- For DMV-A, DMV-D: Easergy P3 relay [ ] Sepam series 20/40 [ ]

Control for DMV-A and DMV-D
- **Local** (shunt trip coil compulsory) [ ]
- **Remote** (opening coil and closing coil compulsory) [ ]
- **Local and remote** (opening coil and closing compulsory) [ ]
- Voltage of the auxiliaries: 48/60 Vdc [ ] 110/125 or 220/250 Vdc [ ] 110/130 or 220/240 Vac (50 Hz) [ ]
- Voltage of signalling: 48/60 Vdc [ ] 110/125 Vdc [ ] 220/250 Vdc [ ] 110/130 Vac (50 Hz) [ ] 220/240 Vac (50 Hz) [ ]

Cable connection by the bottom
- For DM1-A, DM1-W, DMVL-A: 3 x single core cable maxi 240 mm² [ ] 6 x single core cable maxi 240 mm² [ ]

Current sensors CT [ ] LPCT ring type for DM1-A 630 A [ ] LPCT MV type for DM1-D [ ]

Basic SM6-36

Current sensors CT [ ] LPCT ring type for DM1-A 630 A [ ]

Options — See following page

SM6

Protection

Circuit breaker

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.

Options

Common options

Interlocking	Tubular key type ☐		Flat key type ☐	
Not applicable on DM2	A1 ☐		C1 ☐	C4 ☐
Signalling contact	2 O & 2 C on SW (not applicable with VTs) ☐			
	2 O & 3 C on SW and 1 O & 1 C on ES (not applicable with VTs) ☐			
	1 O & 2 C on SW (available only on cubicle with VTs) ☐			
VTs (not applicable for DM1-S)	See specific order form			

SM6-24 options

Roof configuration (not applicable on DMV-A, DMV-D)

(A, B or C only one choice possible)

A - Cable connection by the top (cable maxi 240 mm² with VPIS)			
		Single core ☐	2 x single core ☐
	DM2	1 set ☐	2 sets ☐
B - Low voltage control cabinet			
	DM2	1 cabinet ☐	2 cabinets ☐
C - Wiring duct	**DM2**	1 set ☐	2 sets ☐
	Other cubicles	1 set ☐	

Surge arrester			☐
50 W heating element			☐
Replacement of 630 A upper busbars 400-630 A by 1250 A			☐
Busbar field distributors for severe conditions (only for 630 A)			☐
Internal arc version (not possible with "top incomer" option)	16 kA 1 s ☐	20 kA 1 s ☐	
Internal arc classification		A-FLR	☐
Gaz exhaust direction		Upwards	☐
DM1-A without LPCT, DM1-S, DM1-W, DM1-M		**Thermal monitoring**	☐
Arc detection			☐
Seismic performance			☐
Ambient monitoring		only DM1A	☐

SM6-36 options

Cable connection by the top (single core cable maxi 240 mm² with VPIS)		☐
Cable connection by the bottom (for DM1-A only)		
	3 x 2 x single core cable maxi 240 mm²	☐
Surge arrester	36 kV	☐
Sepam relay protection	See specific order form	
Easergy P3 relay	See specific order form	

SM6
Protection
Fuse switch

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.

Basic cubicle				Quantity
Rated voltage Ur				**(kV)**
Service voltage				**(kV)**
Short-circuit current Isc				**(kA)**
Rated current Ir				**(A)**
Internal arc withstand	12.5 kA 1s for SM6-24 ☐		16 kA 1s for SM6-36 ☐	
Internal arc classification				A-FL
Gaz exhaust direction				Downwards
Type of cubicle				
SM6-24	QM 375 ☐ QM 500 ☐	QMB 375 ☐	QMC 625 ☐	PM 375 ☐
SM6-36	QM 750 ☐	QMB 750 ☐	QMC 1000 ☐	PM 750 ☐
Position in the switchboard	First on left ☐	Middle ☐	Last on right ☐	
Current transformers for QMC 24 kV (to see price structure)				
Quantity of CTs	1 ☐	2 ☐	3 ☐	
Direction of lower busbars for QMB		Left ☐	Right ☐	
Cable connection by the bottom (1x single core, cable maxi 240 mm²)			36 kV ☐	

Options

Common options

Fuses (see fuse price structure)			Service voltage ⩽ 12 kV ☐
Replacement of mechanism			CIT by CI1 (only for PM) ☐
Motorization		Standard ☐	Severe and communication ☐
Electrical driving motorization	24 Vdc ☐	110 Vdc ☐	120/127 Vac (50 Hz) ☐
	32 Vdc ☐	120-125 Vdc ☐	220/230 Vac (50 Hz) ☐
	48 Vdc ☐	137 Vdc ☐	120/127 Vac (60 Hz) ☐
	60 Vdc ☐	220 Vdc ☐	220/230 Vac (60 Hz) ☐
Shunt trip	Opening (on CI1) ☐		Closing and opening (on CI2) ☐
	24 Vdc ☐	110 Vdc ☐	120/127 Vac (50 Hz) ☐
	32 Vdc ☐	120-125 Vdc ☐	220/230 Vac (50 Hz) ☐
	48 Vdc ☐	137 Vdc ☐	120/127 Vac (60 Hz) ☐
	60 Vdc ☐	220 Vdc ☐	220/230 Vac (60 Hz) ☐
			380 Vac (50/60 Hz) ☐
Auxiliary contact signalling			1 C on SW and 1 O & 1 C on ES ☐
	2 O & 2 C on SW ☐		2 O & 3 C on SW and 1 O & 1 C on ES ☐
Interlocking	A1 ☐ C1 ☐ C4 ☐	Tubular key type ☐	Flat key type ☐
Replacement of 630 A upper busbar by 1250 A (not possible for QMB)			☐
Blown fuse signalling contact (for QM, QMB, QMC)			☐
Visibility of main contacts			☐
Pressure indicator device		Analogic manometer **without** visibility of main contacts	☐
	Pressure switch ☐	Analogic manometer **with** visibility of main contacts	☐

SM6

Protection

Fuse switch

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.

Options

SM6-24 options

Replacement of mechanism CI1 by CI2 (only for QM) ☐

Remote control signalling (for QM only)
2 lights ☐ 2 lights and 2 PB ☐ 2 lights and 2 PB + 1 switch ☐

Voltage of the lights (must be the same than electrical driving mechanism)
24 V ☐ 48 V ☐ 110/125 V ☐ 220 V ☐

Blown fuse signalling contact (mechanical indication PM, electrical for the other cubicles) ☐

Roof configuration (A, B or C only one choice possible)

A - Cable connection by the top (cable maxi 240 mm^2 with VPIS)
Single core ☐ 2 x single core ☐

B - Low voltage control cabinet (h = 450 mm) With unpunched door ☐

C - Wiring duct ☐

50 W heating element ☐

Operation counter ☐

Digital ammeter (not applicable for QMB) AMP21D ☐

Busbar field distributors for severe conditions (only for 630 A) ☐

Internal arc version (not possible with "top incomer" option) 16 kA 1 s ☐ 20 kA 1 s ☐

Internal arc classification A-FLR ☐

Gaz exhaust direction Upwards ☐

QM, QMC, PM **Thermal monitoring** ☐

Arc detection ☐

Seismic performance ☐

Ambient monitoring QM cubicle only ☐

SM6-36 options

Replacement of mechanism
CIT by CI2 (only for PM) ☐

Cable connection by the top
(single core cable maxi 240 mm^2 with VPIS) ☐

SM6

Protection

Vacuum contactor (Direct Motor Starter) for SM6-24

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.

Basic cubicle				Quantity
Rated voltage Ur				(kV) 7.2
Service voltage				(kV)
Short-circuit current Isc (6.3 kA without fuse)				(kA)
Rated current Ir (max. 400 A without fuse)				(A)
Internal arc withstand	12.5 kA 1s for SM6-24 ☐		16 kA 1s for SM6-36 ☐	
Internal arc classification			A-FL	
Gaz exhaust direction			Downwards	
Thermal monitoring			☐	
Arc detection			☐	
Position in the switchboard	First on left ☐	Middle ☐	Last on right ☐	
Busbar Ir	400 A ☐	630 A ☐	1250 A ☐	
Phase current sensors	1 CT ☐	2 CT ☐	3 CT ☐	
			3 LPCT ring type ☐	
Key interlockings for 52 type	Tubular key type ☐		Flat key type ☐	

Options

MV fuses	25 A ☐	31.5 A ☐	40 A ☐	50 A ☐	63 A ☐
	80 A ☐	100 A ☐	125 A ☐	160 A ☐	200 A ☐	250 A ☐
Busbar field distributors for severe conditions (only for 630 A)					☐
Key interlockings for C1 type	Tubular key type ☐			Flat key type ☐	
Voltage transformer (quantity)	1 ☐		2 ☐	3 ☐	
Internal arc version (not possible with "top incomer" option)			16 kA 1 s ☐	20 kA 1 s ☐	
Internal arc classification				A-FLR ☐	
Gaz exhaust direction				Upwards ☐	

Contactor				
Vacuum contactor	Magnetic hold ☐		Mechanical latching ☐	
Open release	48 Vdc ☐	125 Vdc ☐	250 Vdc ☐	
Closing coil	110 Vac/dc ☐	120 Vac/dc ☐	125 Vac/dc ☐	
	220 Vac/dc ☐	240 Vac/dc ☐	250 Vac/dc ☐	

SM6
Metering

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.

Basic cubicle — Quantity

Common SM6-24/SM6-36

Rated voltage Ur (kV)

Service voltage (kV)

Short-circuit current Isc (kA)

Rated current Ir (A)

Internal arc withstand 12.5 kA 1s for SM6-24 ☐ 16 kA 1s for SM6-36 ☐

Internal arc classification A-FL

Gaz exhaust direction Downwards

Type of cubicle/upper busbar for SM6-24

Ir = 630 A, Ir busbar = 400 A	CM ☐	CM2 ☐	TM ☐	GBC-A ☐	GBC-B ☐
Ir = 630 A, Ir busbar = 630 A	CM ☐	CM2 ☐	TM ☐	GBC-A ☐	GBC-B ☐
Ir = 630 A, Ir busbar = 1250 A	CM ☐	CM2 ☐	TM ☐	GBC-A ☐	GBC-B ☐
Ir = 1250 A, Ir busbar = 1250 A				GBC-A ☐	GBC-B ☐

Type of cubicle for SM6-36

CM 750 ☐	CM2 750 ☐		GBC-A 750 ☐
	TM 750 ☐		GBC-B 750 ☐

Position in the switchboard First on left ☐ Middle ☐ Last on right ☐

Direction of lower busbars for GBC-A Left ☐ Right ☐

Signalling contact (for CM, CM2 and TM only) 1 O and 1 C on SW ☐

Fuses (for CM, CM2 and TM only)

Cable connection by the bottom (1x single core, cable maxi 240 mm²) SM6-36 ☐

Basic SM6-24

VTs for GBC (to see price structure) Phase/phase ☐ Phase/earth ☐

CTs for GBC (to see price structure) Quantity 1 ☐ 2 ☐ 3 ☐

Ratio choice for GBC

Protections	1 secondary ☐	1 high secondary ☐
	2 secondaries ☐	1 low secondary ☐

Basic SM6-36

Voltage transformers See specific order form

Options

SM6-24 options

Roof configuration (A, B or C only one choice possible)

A - Cable connection by the top (cable maxi 240 mm² with VPIS) Single core ☐ 2 x single core ☐

B - Low voltage control cabinet (h = 450 mm) ☐ With unpunched door ☐

C - Wiring duct ☐

50 W heating element for CM, CM2, TM ☐

Busbar field distributors for severe conditions (only for 630 A and CM, CM2 and TM cubicles) ☐

Blown fuse auxiliary contact (for CM, CM2 and TM only) 1 O and 1 C ☐

Internal arc version (not possible with "top incomer" option) 16 kA 1 s ☐ 20 kA 1 s ☐

Internal arc classification A-FLR ☐

Gaz exhaust direction Upwards ☐

Thermal monitoring ☐

Arc detection ☐

SM6-36 options

Current transformers and voltage transformers for GBC See specific order form

Cable connection by the top (single core cable maxi 240 mm² with VPIS) ☐

Replacement of 630 A busbar by 1250 A (for CM, CM2 and TM only) ☐

SM6
Other functions

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.

Basic cubicle — Quantity

Rated voltage Ur (kV)

Service voltage (kV)

Short-circuit current Isc (kA)

Rated current Ir (A)

Internal arc withstand 12.5 kA 1s for SM6-24 ☐ 16 kA 1s for SM6-36 ☐

Internal arc classification A-FL

Gaz exhaust direction Downwards

Type of cubicle/upper busbar for SM6-24

Ir = 630 A, Ir busbar = 400 A	GAM 500 ☐	GAM2 375 ☐	GBM 375 ☐
Ir = 630 A, Ir busbar = 630 A	GAM 500 ☐	GAM2 375 ☐	GBM 375 ☐
Ir = 1250 A, Ir busbar = 1250 A	GAM 500 ☐		GBM 375 ☐

Type of cubicle for SM6-36 GAM 750 ☐ GAM2 750 ☐ GBM 750 ☐

Position in the switchboard First on left ☐ Middle ☐ Last on right ☐

Direction of lower busbars for GBM
Left (impossible on the first cubicle of the switchboard) ☐ Right ☐

Cable connection by the bottom (1x single core, cable maxi 240 mm²)
SM6-36 ☐

Options

SM6-24 options

Roof configuration (A, B or C only one choice possible)

A - Cable connection by the top (cable maxi 240 mm² with VPIS)
Single core ☐ 2 x single core ☐

B - Low voltage control cabinet (h = 450 mm) With unpunched door ☐

C - Wiring duct ☐

Wiring duct for GBM ☐

ES auxiliary contact (only on GAM 500) 1 O and 1 C ☐

Surge arresters for GAM 500, 630 A
7.2 kV ☐ 10 kV ☐ 12 kV ☐ 17.5 kV ☐ SM6-24 ☐

Interlocking on GAM 500
Tubular key type ☐ Flat key type ☐
A3 SM6-SM6 ☐

Heating element (on GAM 500 630 A and on GAM2) ☐

Digital ammeter or Fault current indicator
AMP 21D (except GBM) ☐ Flair 23DV zero sequence ☐
Flair 21D ☐ Flair 22D ☐ Flair 23DV ☐

Internal arc version (not possible with "top incomer" option) 16 kA 1 s ☐ 20 kA 1 s ☐

Internal arc classification A-FLR ☐

Gaz exhaust direction Upwards ☐

Thermal monitoring ☐

Arc detection ☐

SM6-36 options

Cable connection by the top (single core cable maxi 240 mm² with VPIS) ☐

Replacement of 630 A busbar by 1250 A (for GAM2 only) ☐

Surge arresters for GAM2 ☐

SF1 lateral / frontal fixed
Order Form

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.
Green box [X] corresponds to none priced functions.

Basic fixed circuit breaker

					Quantity
Rated voltage Ur					(kV)
Impulse voltage Up					(kVbil)
Short-circuit current Isc					(kA)
Rated current Ir					(A)
Frequency	50 Hz			60 Hz	
Operating mechanism position	A1		B1	C1	

Color for push buttons and indicators

Push buttons open/close:

IEC Red/Black | IEC Red/Green | ANSI Red/Green | ANSI Red/Black

Indicator open/close:

IEC Black/White | ANSI Red/Green

Operating mechanism charged/discharged:

IEC White/Yellow | ANSI Charged/Discharged

Circuit breaker options

1st opening release (see possible choices in combination table below)

Shunt opening release YO1

24 Vdc	60 Vdc	220 Vdc	220 Vac (50 Hz)
30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (60 Hz)
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)

Undervoltage release YM

24 Vdc	60 Vdc	220 Vdc	220 Vac (50 Hz)
30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (60 Hz)
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)

Mitop: Without contact | With contact

2nd opening release (see possible choices in combination table below)

Shunt opening release YO2

24 Vdc	60 Vdc	220 Vdc	220 Vac (50 Hz)
30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (60 Hz)
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)

Undervoltage release YM

24 Vdc	60 Vdc	220 Vdc	220 Vac (50 Hz)
30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (60 Hz)
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)

Mitop: Without contact | With contact

Remote control

Electrical motor M: 24…32 Vdc | 110…127 Vdc/ac | 48…60 Vdc/ac | 220…250 Vdc/ac

Shunt closing release YF

24 Vdc	60 Vdc	220 Vdc	220 Vac (50 Hz)
30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (60 Hz)
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)

Low voltage wiring connection	Male plug (1.2 m)	Female socket (2 m)
Locking C.B. in open position	Flat	Tubular
Support frame	Low (560 mm)	High (775 mm)
Leaflets language	French	English
Pressure switch		

SFset lateral / frontal fixed
Order Form

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.
Green box [X] corresponds to none priced functions.

Basic fixed circuit breaker

					Quantity
Rated voltage Ur					(kV)
Impulse voltage Up					(kVbil)
Short-circuit current Isc					(kA)
Rated current Ir					(A)
Frequency	50 Hz			60 Hz	
Operating mechanism position	A1		B1	C1	

Color for push buttons and indicators

Push buttons open/close:

IEC Red/Black | IEC Red/Green | ANSI Red/Green | ANSI Red/Black

Indicator open/close:

IEC Black/White | ANSI Red/Green

Operating mechanism charged/discharged:

IEC White/Yellow | ANSI Charged/Discharged

Control unit and sensors

VIP 400 (not available for all electrical characteristics)	CSa4 200A CSb4 630A
VIP410A	CSa4 200A
VIP410E	CSb4 630A

Circuit breaker options

2nd opening release (see possible choices in combination table below)

Shunt opening release YO2

24 Vdc	60 Vdc	220 Vdc	220 Vac (50 Hz)
30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (60 Hz)
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)

Undervoltage release YM

24 Vdc	60 Vdc	220 Vdc	220 Vac (50 Hz)
30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (60 Hz)
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)

Remote control

Electrical motor M

24…32 Vdc	110…127 Vdc/ac
48…60 Vdc/ac	220…250 Vdc/ac

Shunt closing release YF

24 Vdc	60 Vdc	220 Vdc	220 Vac (50 Hz)
30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (60 Hz)
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)

Low voltage wiring connection	Male plug (1.2 m)	Female socket (2 m)
Locking C.B. in open position	Flat	Tubular
Support frame	Low (560 mm)	High (775 mm)
Pocket battery		
Leaflets language	French	English
Pressure switch		

SFset

Lateral disconnectable for SM6-24

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.

Basic circuit breaker — Quantity [ ]

Rated voltage Ur		**(kV)** [ ]
Service voltage		**(kV)** [ ]
Impulse voltage Up		**(kVbil)** [ ]
Short-circuit current Isc		**(kA)** [ ]
Rated current Ir		**630 A maximum**
Frequency	60 Hz [ ]	50 Hz [ ]
Mechanism position	A1 [ ]	B1 [ ]

Colour for push buttons and indicators
Push buttons open/close: Red/black
Indicator open/close: Black/white
Operating mechanism charged/discharged: White/yellow

Control unit and sensors

VIP400	[ ]
CSa4 200A	[ ]
CSb4 630A	[ ]

Circuit breaker options

2nd opening release (see possible choices combination table below)

Shunt opening release **YO2**

24 Vdc [ ]	60 Vdc [ ]	220 Vdc [ ]	220 Vac (50 Hz) [ ]
30 Vdc [ ]	110 Vdc [ ]	48 Vac (50 Hz) [ ]	120 Vac (60 Hz) [ ]
48 Vdc [ ]	125 Vdc [ ]	110 Vac (50 Hz) [ ]	240 Vac (60 Hz) [ ]

Undervoltage release **YM**

24 Vdc [ ]	60 Vdc [ ]	220 Vdc [ ]	220 Vac (50 Hz) [ ]
30 Vdc [ ]	110 Vdc [ ]	48 Vac (50 Hz) [ ]	120 Vac (60 Hz) [ ]
48 Vdc [ ]	125 Vdc [ ]	110 Vac (50 Hz) [ ]	240 Vac (60 Hz) [ ]

Remote control

Electrical motor **M**

24…32 Vdc [ ]	110…127 Vdc/ac [ ]
48…60 Vdc/ac [ ]	220…250 Vdc/ac [ ]

Shunt closing release **YF**

24 Vdc [ ]	60 Vdc [ ]	220 Vdc [ ]	220 Vac (50 Hz) [ ]
30 Vdc [ ]	110 Vdc [ ]	48 Vac (50 Hz) [ ]	120 Vac (60 Hz) [ ]
48 Vdc [ ]	125 Vdc [ ]	110 Vac (50 Hz) [ ]	240 Vac (60 Hz) [ ]

Pocket battery module		
Leaflets language	French [ ]	English [ ]

Different releases combinations

Mitop	1	1	1
Shunt opening release **YO2**		1	
Undervoltage release **YM**			1

Evolis

Frontal fixed version for SM6-24 (up to 17.5 kV)

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.

Basic fixed circuit breaker — Quantity [ ]

Rated voltage Ur (kV)	**12** [ ]	**17.5** [ ]
Service voltage		**(kV)** [ ]
Short-circuit current Isc		**25 kA**
Rated normal current Ir (A)	**630** [ ]	**1250** [ ]
Phase distance		**185 mm**

Circuit breaker options

Opening release (see possible choices in combination table below)

Shunt opening release **MX**

24 Vac [ ]	24…30 Vdc [ ]	100…130 Vdc/ac [ ]
48 Vac [ ]	48…60 Vdc [ ]	200…250 Vdc/ac [ ]

Low energy release **Mitop**

1 AC fault signalling SDE and reset 200...250 Vac are included [ ]

Remote control (operation counter already included)

Electrical motor **MCH**

24…30 Vdc [ ]	100…125 Vdc [ ]	200…250 Vdc [ ]
48…60 Vdc/ac [ ]	100…130 Vac [ ]	200…240 Vac [ ]

Shunt closing release **XF**

24 Vac [ ]	24…30 Vdc [ ]	100…130 Vdc/ac [ ]
48 Vac [ ]	48…60 Vdc [ ]	200…250 Vdc/ac [ ]

Operation counter CDM			[ ]
Additional auxiliary contacts OF (4 AC)	1 [ ]	2 [ ]	
Ready to close contact PF (1 AC)			[ ]
Locking of the circuit breaker in the open position			
By padlock [ ]			
or by locks and keys	Tubular key type [ ]	Flat key type [ ]	
If locks	1 lock [ ]	2 identical locks [ ]	2 different locks [ ]
Disabling of O/C circuit breaker push buttons			[ ]

Different releases combinations

Shunt opening release **MX**	1		1
Mitop		1	1

Evolis

Lateral disconnectable version for SM6-24 (up to 24 kV)

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.

Basic circuit breaker

Quantity [ ]

Rated voltage Ur	**24 (kV)**
Service voltage	**(kV)** [ ]
Impulse voltage Up	**(kVbil)** [ ]
Rated normal current Ir	**630 A maximum**
Phase distance	**250 mm**
Mechanism position	**B1**

Colour for push buttons and indicators
Push buttons open/close: Red/black
Indicator open/close: Black/white
Operating mechanism charged/discharged: White/yellow

Circuit breaker options

1st opening release (see possible choices combination table below)

Shunt opening release **YO1**

24 Vdc [ ]	110 Vdc [ ]	110 Vac (50 Hz) [ ]
48 Vdc [ ]	125-127 Vdc [ ]	220-230 Vac (50 Hz) [ ]
	220 Vdc [ ]	120 Vac (60 Hz) [ ]

Undervoltage release **YM**

24 Vdc [ ]	110 Vdc [ ]	110 Vac (50 Hz) [ ]
48 Vdc [ ]	125-127 Vdc [ ]	220-230 Vac (50 Hz) [ ]
	220 Vdc [ ]	120 Vac (60 Hz) [ ]

2nd opening release (see possible choices combination table below)

Shunt opening release **YO2**

24 Vdc [ ]	110 Vdc [ ]	110 Vac (50 Hz) [ ]
48 Vdc [ ]	125-127 Vdc [ ]	220-230 Vac (50 Hz) [ ]
	220 Vdc [ ]	120 Vac (60 Hz) [ ]

Undervoltage release **YM**

24 Vdc [ ]	110 Vdc [ ]	110 Vac (50 Hz) [ ]
48 Vdc [ ]	125-127 Vdc [ ]	220-230 Vac (50 Hz) [ ]
	220 Vdc [ ]	120 Vac (60 Hz) [ ]

Low energy release **Mitop** [ ]

Remote control (operation counter already included)

Electrical motor **M**

24…32 Vdc [ ]	110…127 Vdc/ac [ ]
48…60 Vdc/ac [ ]	220…250 Vdc/ac [ ]

Shunt closing release **YF**

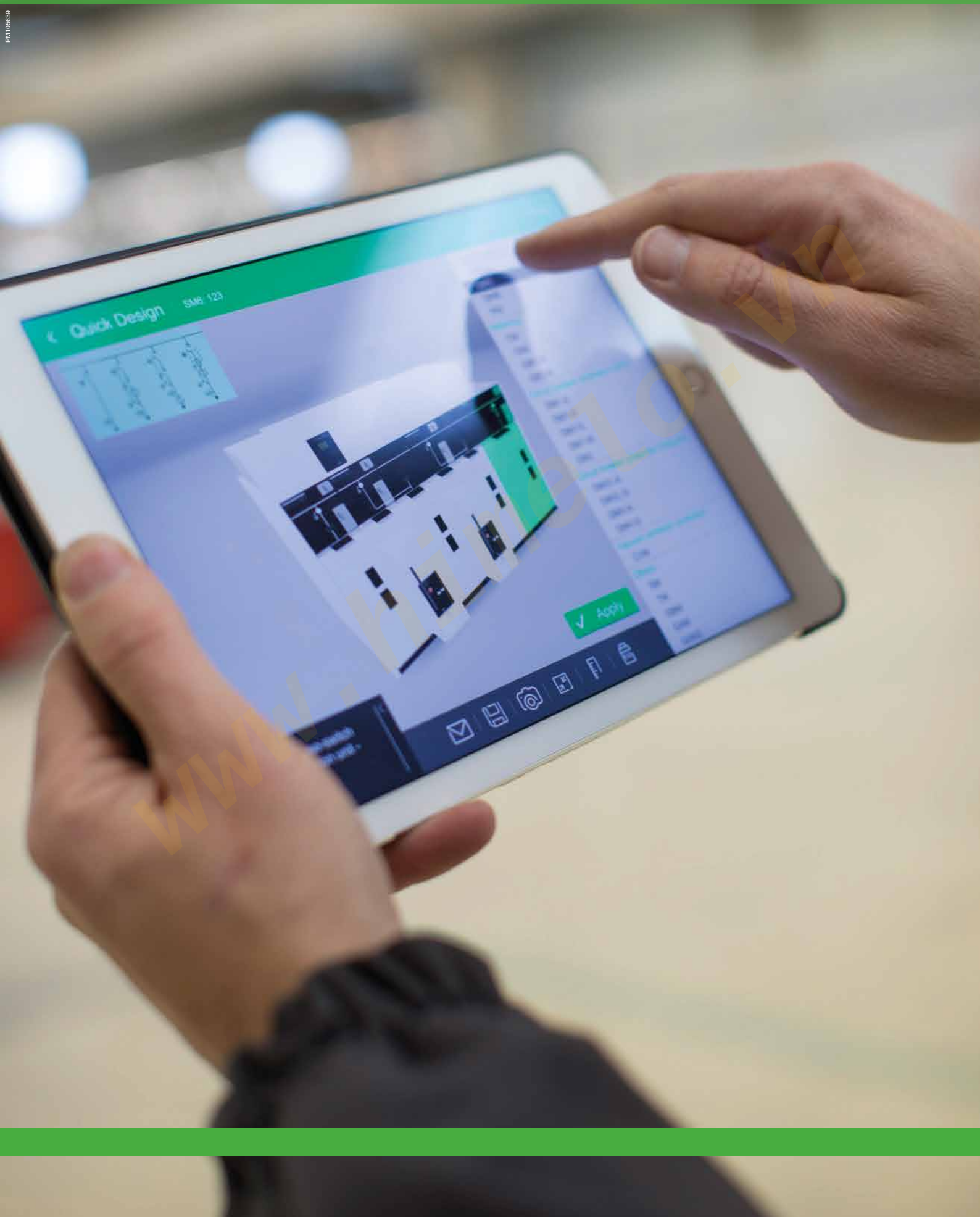
24 Vdc [ ]	110 Vdc [ ]	110 Vac (50 Hz) [ ]
48 Vdc [ ]	125-127 Vdc [ ]	220-230 Vac (50 Hz) [ ]
	220 Vdc [ ]	120 Vac (60 Hz) [ ]

Operation counter (already included if remote control supplied) [ ]

Different releases combinations

Shunt opening releases **YO1**	1		1	1	1		
Shunt opening releases **YO2**			1				
Undervoltage release **YM**		1		1		1	
Mitop					1	1	1

SM6 all-in-one



PM105839

TOOLS

schneider-electric.com

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

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

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

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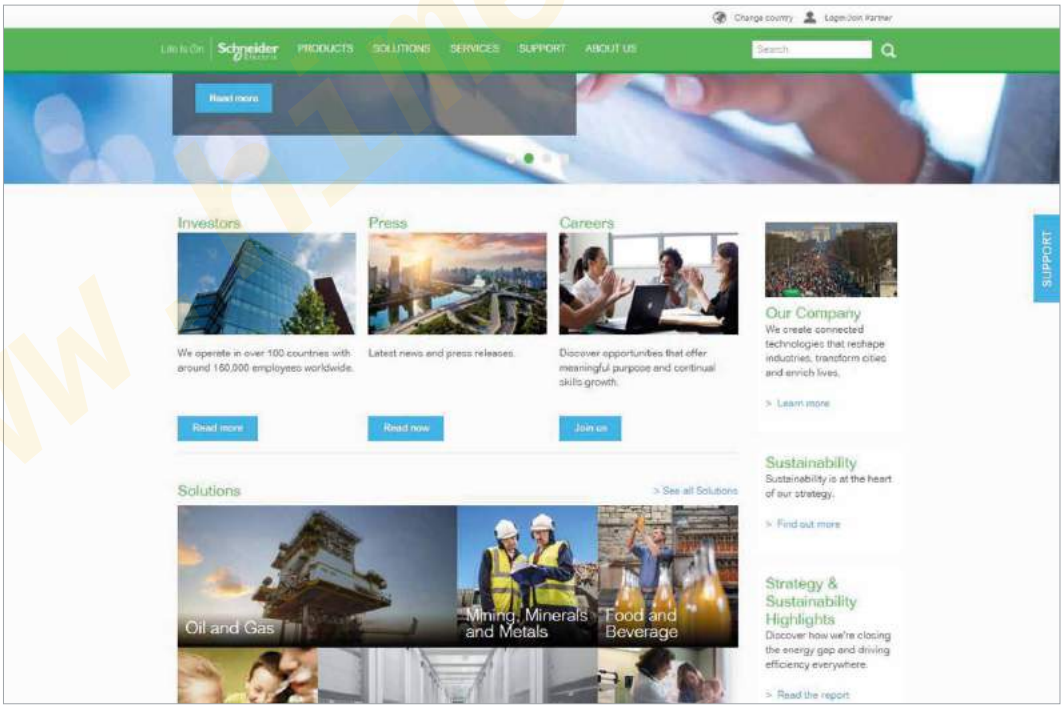

TOOLS

Web selector

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

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

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

Training

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

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

Notes

Notes

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