Medium Voltage Distribution
Catalogue | 2011

SM6

Modular units

Air insulated switchgear up to 36 kV

Schneider Electric

General contents

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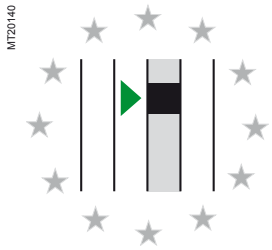
The experience of a world leader

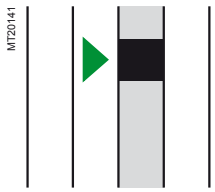


The Schneider Electric experience's extends over forty years in factory-built cubicles and over thirty years in SF6 breaking technology for Medium Voltage switchgear.

This experience means that today Schneider Electric can propose a complementary range: vacuum type circuit breaker cubicles up to 36 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 2,000 000 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.

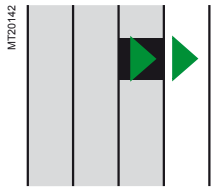
1975: innovation
Sulphur hexafluoride (SF6) is first used in an MV switch for an MV/LV transformer substation, with the VM6.

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.

2010: a leading position
■ with over 1,000,000 SM6 cubicles installed around the world, Schneider Electric consolidates its position as uncontested leader in the Medium Voltage field.

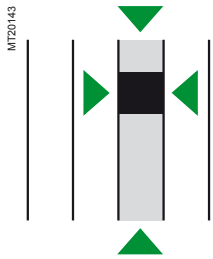
The range's advantages



Upgradability

SM6, a comprehensive range

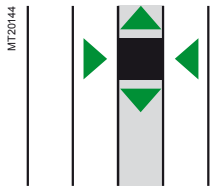
- a comprehensive offer covering your present and future requirements
- a design adapted to the extension of your installations
- a catalogue of functions for all your applications
- a product designed to be in compliance with standards constraints
- options to anticipate the telecontrol of your installations.



Compactness

SM6, an optimised range

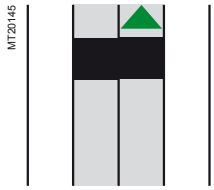
- compact units, with low increment cubicles
- rationalised space requirement for switchboard installation
- reduction of civil works costs
- easy integration in factory-built outdoor substations for which the SM6 is particularly well designed.



Maintenance

SM6, a range with reduced maintenance

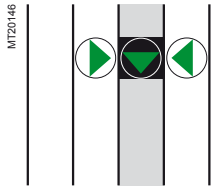
- the active parts (breaking and earthing) are integrated in an SF6-filled, "sealed for life" unit
- the control mechanisms, are intented to function with reduced maintenance under normal operating conditions
- enhanced electrical endurance when breaking.



Ease of installation

SM6, a simple range to incorporate

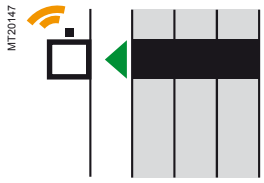
- reduced dimensions and weights
- only one civil works layout
- a solution adapted to cable connection
- simplified switchboard busbar design.



Ease and safe to operate

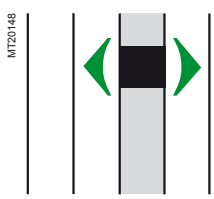
SM6, a proven range

- 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 switchgear compartments
- clear and animated display diagrams
- switching lever with an "anti-reflex" function
- compartmented cubicles.



SM6: a range designed with telecontrol in mind

SM6 switchgear is perfectly adapted to telecontrol 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.



SM6: a range with adapted protection devices

With the SM6, Schneider Electric proposes solutions for network management; the Sepam and VIP or relay ranges protect installations, providing continuity of electrical supply and reducing downtime.

Protecting the environment

Product environmental profile & recycling service

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

61051N

Schneider Electric is committed to a long term environmental approach.
As part of this, the SM6 has been designed to be environmentally friendly, notably in terms of the product's recycleability.

The materials used, both conductors and insulators, are identified in product environmental profile analysis and easily separable.
It was performed in conformity with ISO 14040 "Environmental management: life cycle assessment - principle and framework".

At the end of its life, SM6 can be processed, recycled and its materials recovered in conformity with the draft European regulations on the end-of-life of electronic and electrical products, and in particular withoutany gas being released to the atmosphere nor any polluting fluids being discharged.

SM6 is compliant with the RoHS directive.
RoHS restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment.

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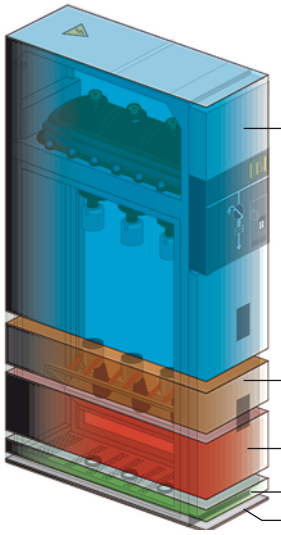


	24 kV		36 kV
	Switch unit	Circuit breaker unit	Switch unit
Ferrous metal	**84%**	**65%**	**74%**
Non-ferrous metal	**4%**	**10.6%**	**8%**
Thermohardening	**9.5%**	**22%**	**15%**
Thermoplastics	**2.35%**	**2.3%**	**2%**
Fluid	**0.15%**	**0.1%**	**1%**

MT55145

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.

A full range of services

61052N

Schneider Electric is capable of offering a full range of services either associated or not with the supply of the SM6 unit.

To improve the quality of your electrical power:
- network study, harmonics study, etc.
- reactive energy compensation
- consumption monitoring
- optimisation of your electrical power supply contracts.

To accompany the purchase and installation of your SM6 equipment:
- adaptation of our equipment to provide a better response to your requirements
- on site assembly, testing and commissioning of your equipment
- customised financing solutions
- warranty extension
- operator training.

To accompany your installation throughout its life and upgrading your equipment:
- upgrading your existing equipment: functional adaptation, control motorisation, renovation of protections units, etc.
- on site work
- supply of replacement parts
- maintenance contracts
- end of life recycling.

Fore more information on all the services proposed by Schneider Electric, please contact your Schneider Electric Sales Office.

PE57151

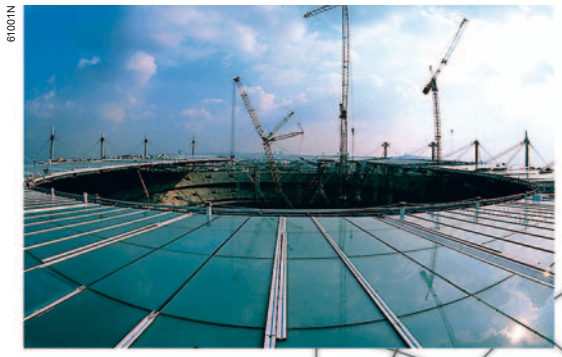
The references of a leader
SM6, a world-wide product

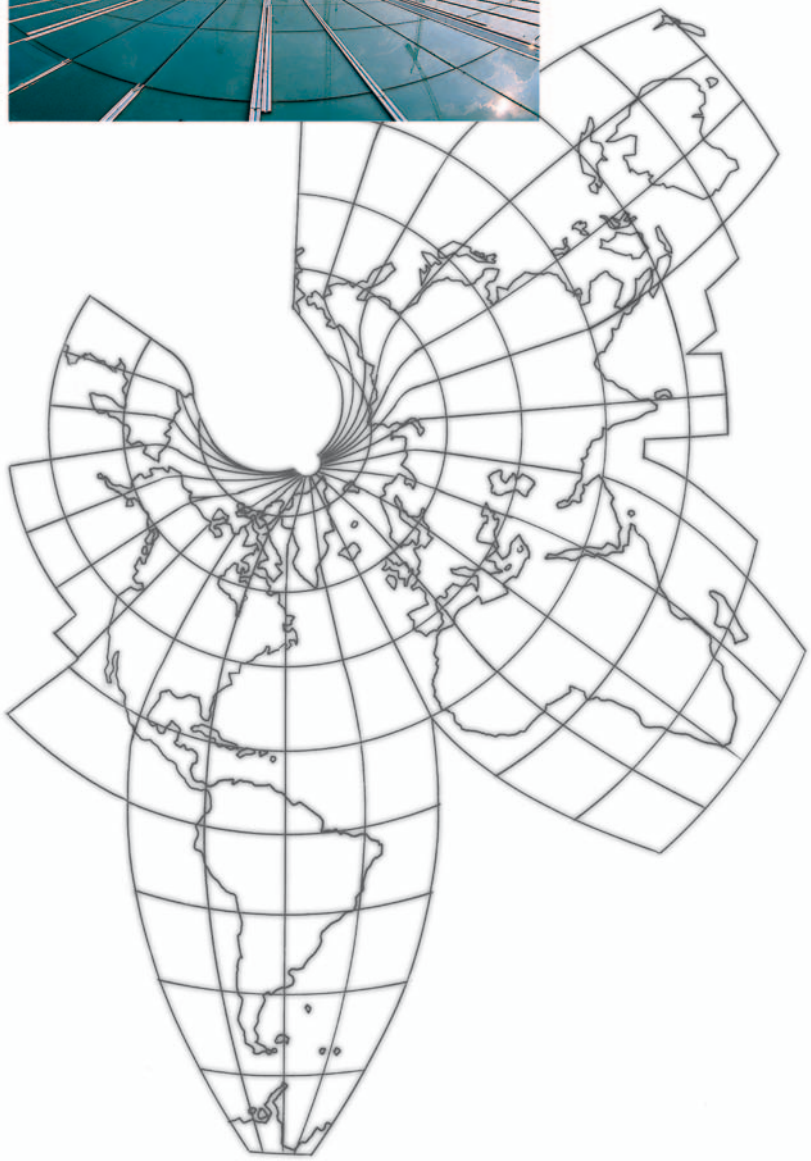
Asia/Middle East
- Canal Electrical Distribution Company, Egypt
- General Motors Holden, Australia
- Pasteur Institute, Cambodia
- Tian he City, China
- Sanya Airport, China
- Bank of China, Beijing, Jv Yanta, China
- Plaza Hotel, Jakarta, Indonesia
- Bali Airport, Indonesia
- Wakasa Control Center, 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





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.

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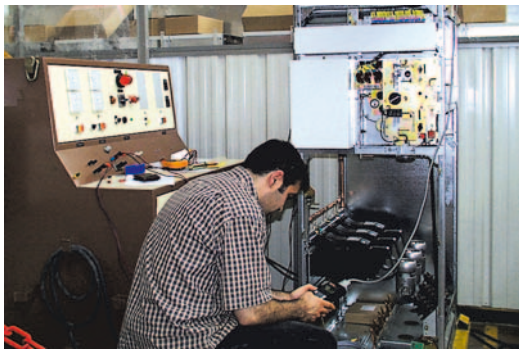
AFAQ ISO 9001

MT55055

AFAQ ISO 9002

61002N



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.

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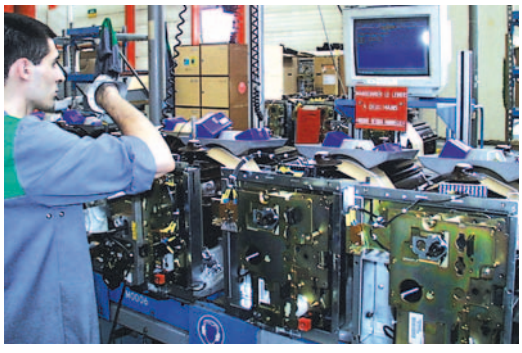

Mean Operating Time To Failure (MTTF)

As result of Schneider Electric quality assurance system, SM6 24 kV 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.

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
- Rollarc 400 or 400 D contactor, or 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.

MV/LV transformer substations

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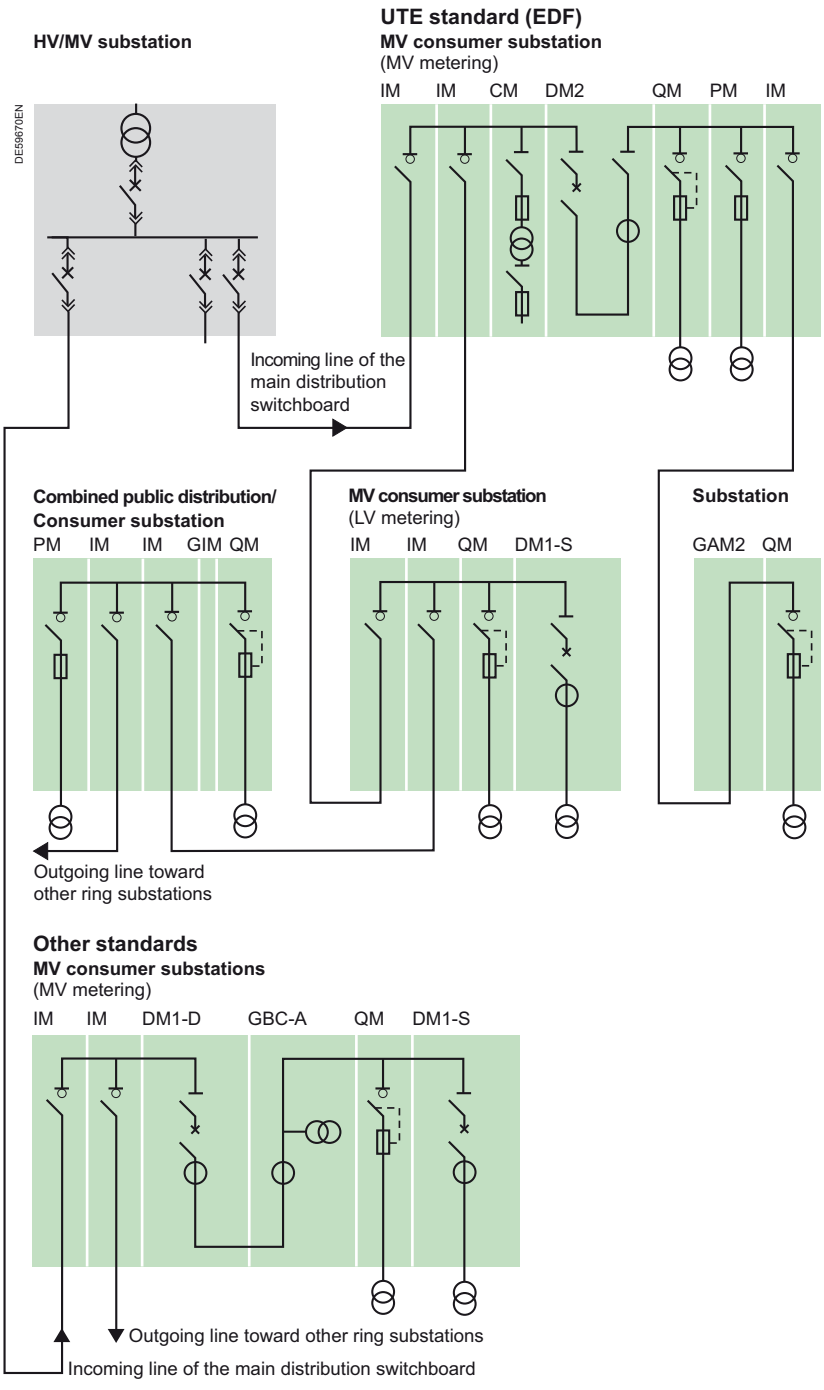
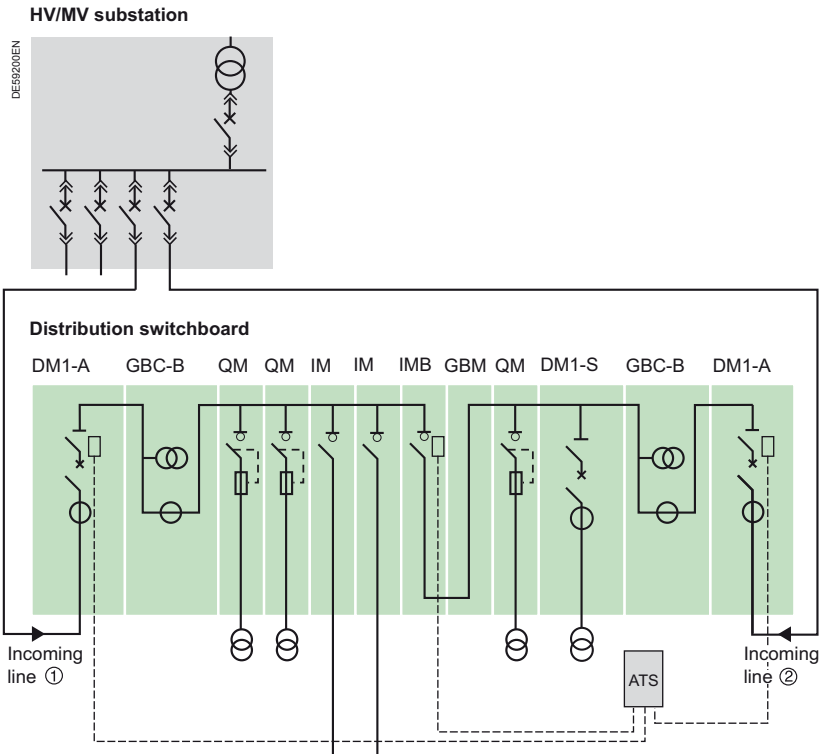
MT55147

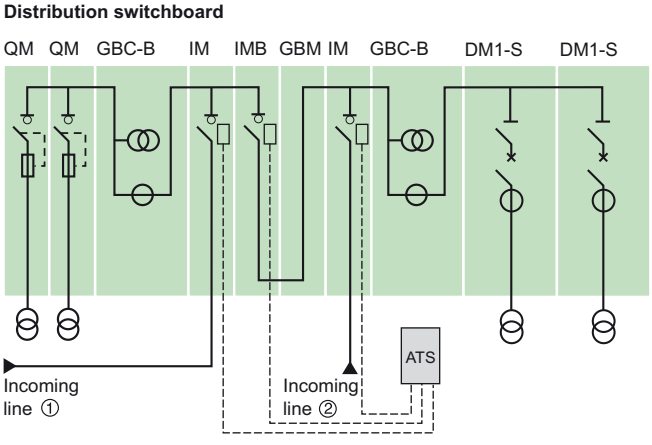
MT55146



Field of application

Industrial distribution substations





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** switch
- **PM** fused switch
- **QM, QMC, QMB** fuse-switch combination
- **CRM, CVM** contactor and contactor with fuses
- **DM1-A, DM1-D, DM1-S** single-isolation disconnectable SF6 type circuit breaker
- **DMV-A, DMV-D, DMV-S** 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
- **DM2** double-isolation disconnectable SF6 type circuit breaker
- **DM2-W** withdrawable double-isolation SF6 type circuit breaker only for 36 kV
- **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 24 kV.

Units for all functions

Connection to the networks

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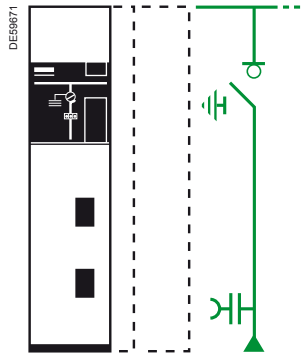

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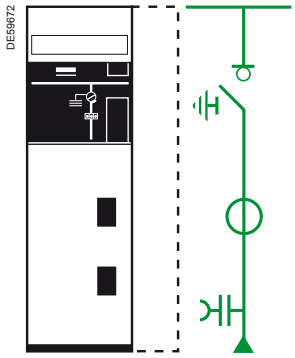
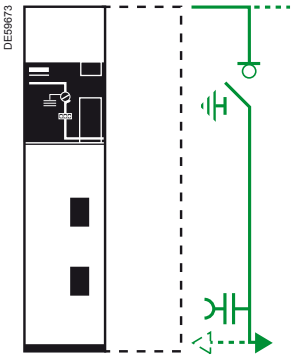
IM
Switch unit
24 kV: 375 or 500 mm
36 kV: 750 mm

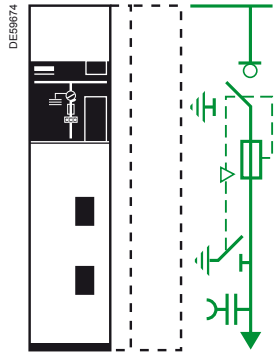


IMC
Switch unit
24 kV: 500 mm
36 kV: 750 mm



IMB
Switch unit with or without earthing disconnector right or left outgoing line
24 kV: 375 mm
36 kV: 750 mm

Fuse-switch protection



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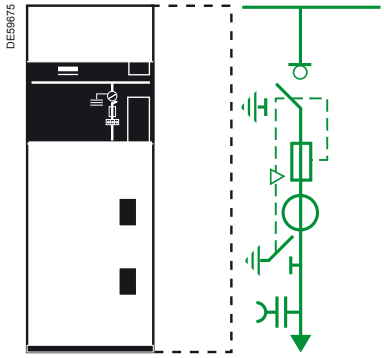
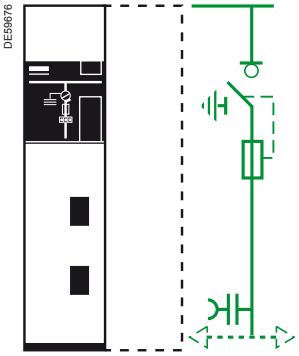
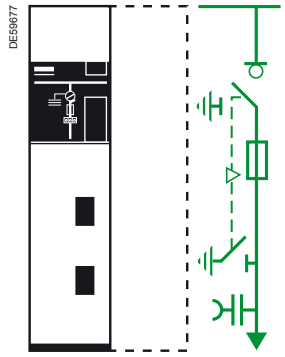
QM
Fuse-switch combination unit
24 kV: 375 or 500 mm
36 kV: 750 mm



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



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



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

Units for all functions

Motor starter

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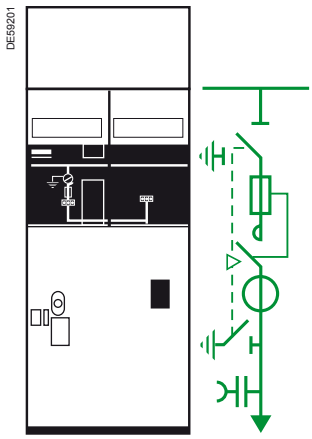

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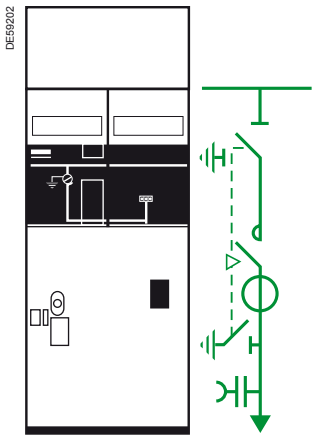
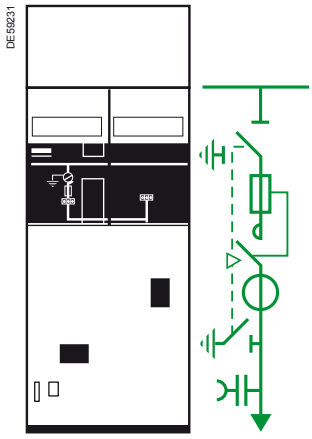
CRM
Fuse-contactor unit
24 kV: 750 mm



CRM
Contactor unit
24 kV: 750 mm



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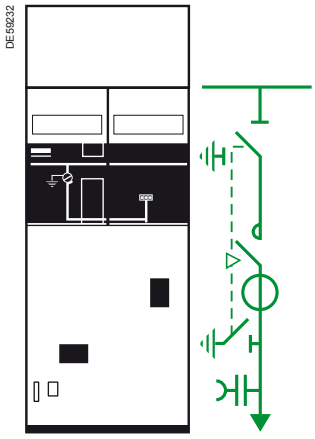
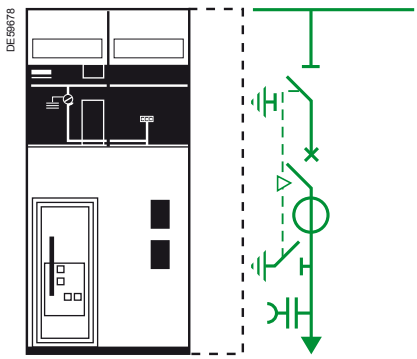
CVM
Fuse-contactor unit
24 kV: 750 mm



CVM
Contactor unit
24 kV: 750 mm

SF6 circuit-breaker protection



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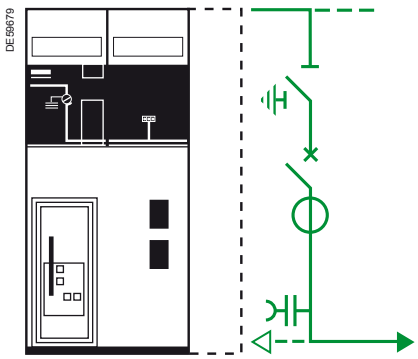
DM1-A
Single-isolation, disconnectable circuit breaker unit
24 kV: 750 mm
36 kV: 1000 mm



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

Units for all functions

SF6 circuit-breaker protection

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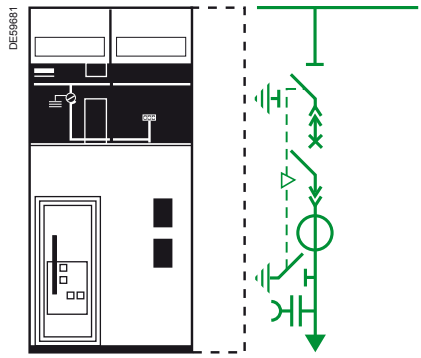

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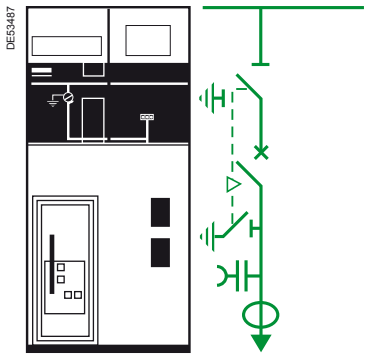
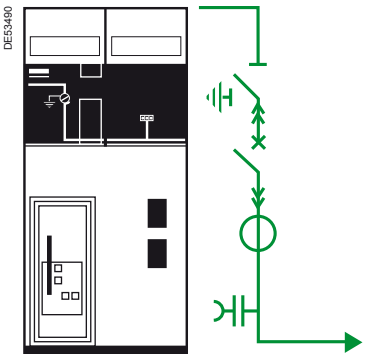
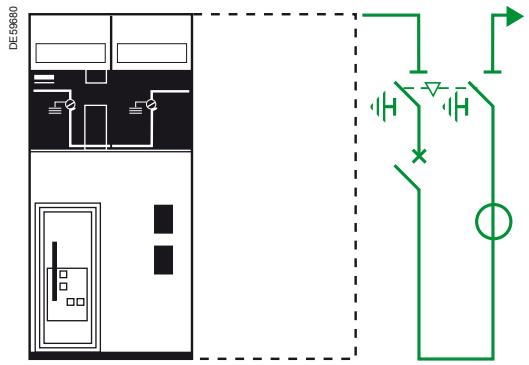
DM1-W
Withdrawable single-isolation circuit breaker unit
24 kV: 750 mm
36 kV: 1000 mm



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



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



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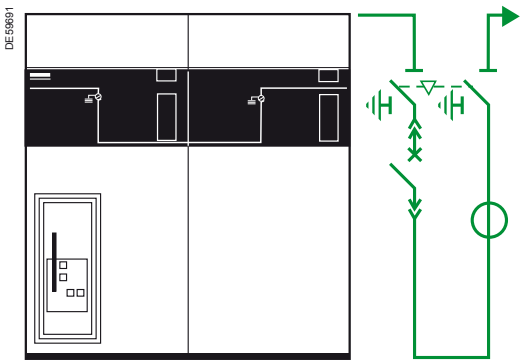
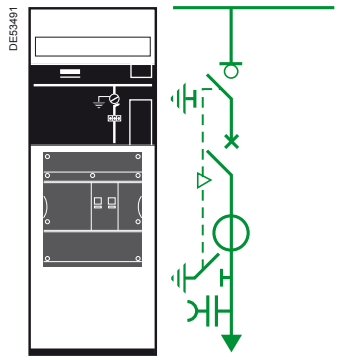
DM2
Double-isolation, disconnectable circuit breaker unit right or left outgoing line
24 kV: 750 mm
36 kV: 1500 mm



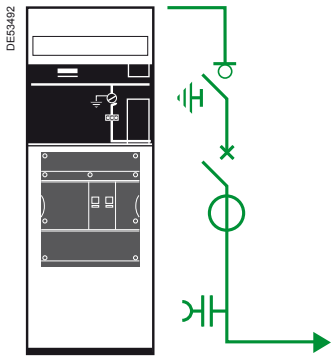
DM2-W
Withdrawable double-isolation circuit breaker unit right outgoing line
36 kV: 1500 mm

Vacuum circuit-breaker protection

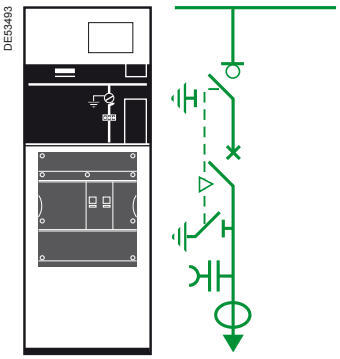


53

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



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



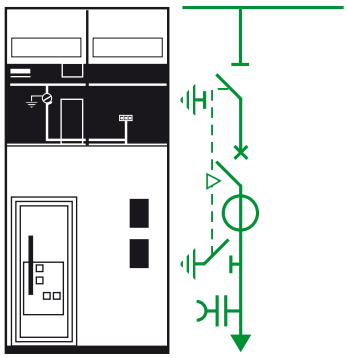
DMV-S
Single-isolation circuit breaker unit with autonomous protection
24 kV: 625 mm

Units for all functions

Vacuum circuit-breaker protection

page

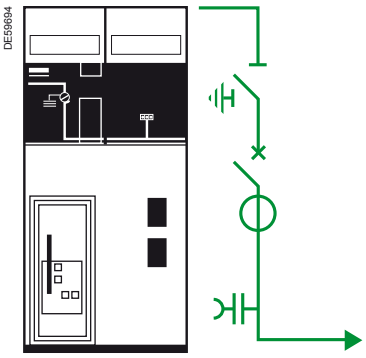
DE53485



54

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

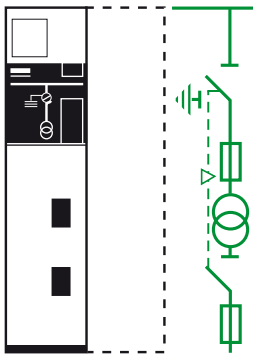
DE59694



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

MV metering

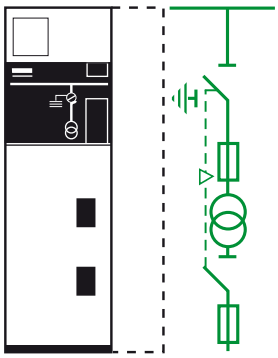
DE59863



55

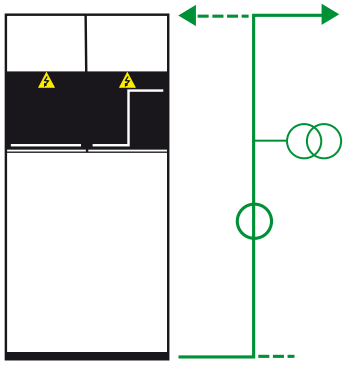
CM
Voltage transformers for mains with earthed neutral system
24 kV: 375 mm
36 kV: 750 mm

DE59684



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

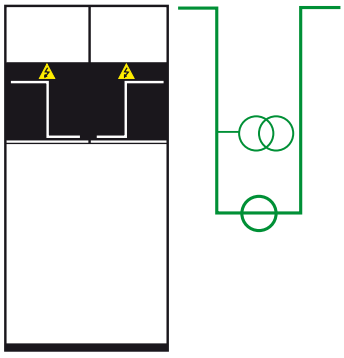
DE53496



56

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

DE53497

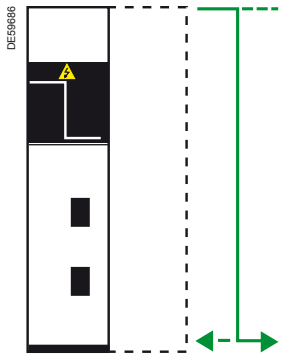


GBC-B
Current and/or voltage measurement unit
24 and 36 kV: 750 mm

Units for all functions

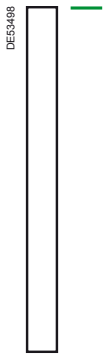
Casings

page

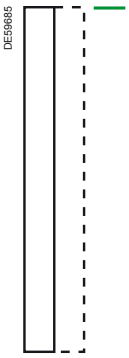


57

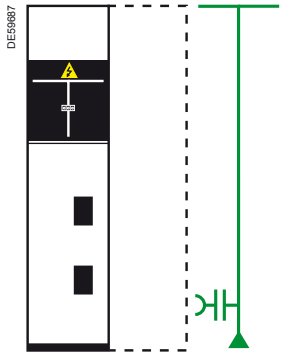
GBM
Connection unit
right or left outgoing line
24 kV: 375 mm
36 kV: 750 mm



GEM
Extension unit VM6/SM6
24 kV: 125 mm

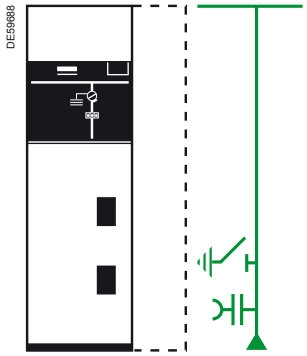


GIM
Intermediate bus unit
24 kV: 125 mm
36 kV: 250 mm



58

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

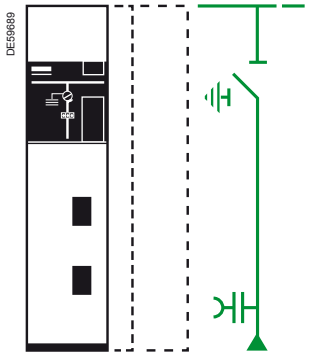


GAM
Incoming cable-connection unit
with earthing
24 kV: 500 mm
36 kV: 750 mm

Units for all functions

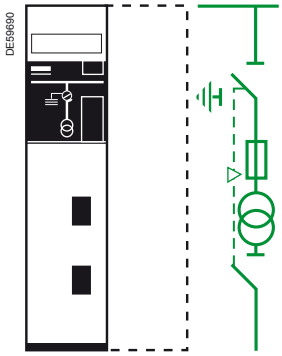
Other functions

page

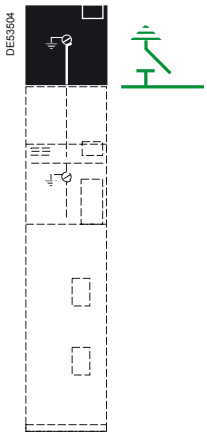


59

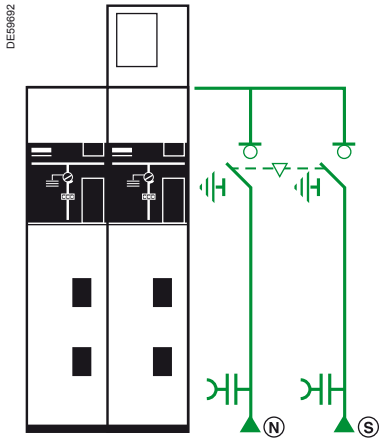
SM
Disconnector unit
24 kV: 375 mm or 500 (1) mm
36 kV: 750 mm
(1) only for 1250 A units.



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

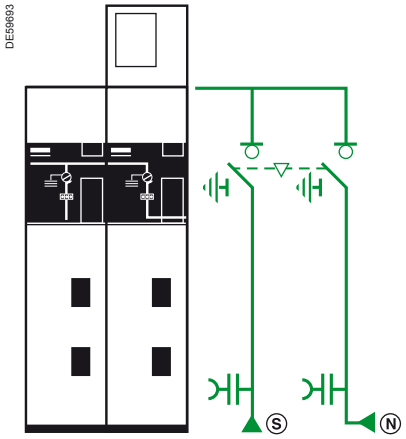


EMB
Busbar earthing compartment
24 kV: 375 mm

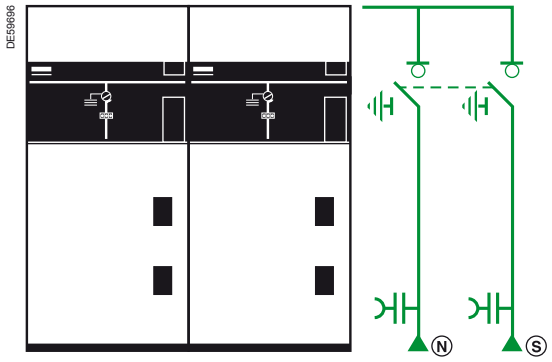


60

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

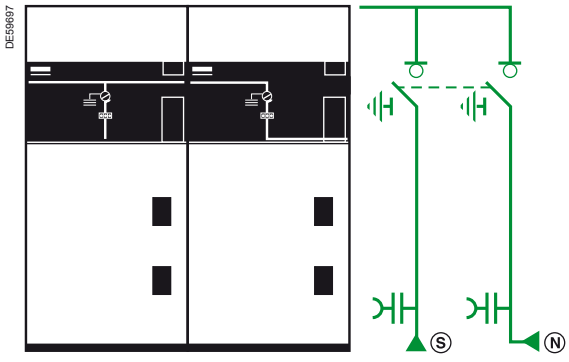


NSM-busbars
Busbars power supply
for main incoming line on right or left
and cables for standby line
24 kV: 750 mm



62

NSM-cables
Cables power supply
for main incoming line
and standby line
36 kV: 1500 mm



NSM-busbars
Busbars power supply
for main incoming line on right or left
and cables for standby line
36 kV: 1500 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.

PE57152

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.).

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.

Severe operating conditions (please consult us).

Standards

SM6 units meet all the following standards and specifications:

■ 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.
60265-1	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.
60044-1	Instrument transformers - Part 1: Current transformers.
60044-2	Instrument transformers - Part 2: Voltage transformers.
60044-8	Instrument transformers - Part 8: Low Power Current Transducers.
61958	High-voltage prefabricated switchgear and controlgear assemblies - Voltage presence indicating systems.

■ 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

EDF specifications for 24 kV

HN 64-S-41	A.C. metal-enclosed swichgear and controlgear for rated voltages above 1 kV and up to and including 24 kV.
HN 64-S-43	Electrical independent-operating mechanism for switch 24 kV - 400 A.

Main characteristics

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.


PE57150

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 (1)	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 (2)	kA/1 s	25	630 - 1250				1250
			20 (3)	630 - 1250				
			16	630 - 1250				
			12.5	400 - 630 - 1250				630-1250
Making capacity (50 Hz)	Ima	kA	62.5	630		NA		
			50	630				630
			40	630				630
			31.25	400 - 630				630
Maximum breaking capacity (Isc)								
Units IM, IMC, IMB, NSM-cables, NSM-busbars		A		630 - 800 (4)				630
QM, QMC, QMB		kA		25		20		20
PM		kA		25				20
CRM		kA		10	8	NA		
CRM with fuses		kA		25		NA		
CVM		kA		6.3	NA			
CVM with fuses		kA		25	NA			
SF6 circuit breaker range								
DM1-A, DM1-D, DM1-W, DM2		kA	25	630-1250				1250
			20	630-1250				
DM1-S		kA	25	630				NA
DM1-Z			25	1250				NA
DM2-W		kA	25	NA				1250
			20	NA				630
Vacuum circuit breaker range								
DMV-A, DMV-D, DMV-S		kA	25	630-1250			NA	
DMVL-A		kA	20	630				NA
DMVL-D		kA	25	630				NA

NA: Non Available
(1) 60 kV peak for the CRM unit
(2) 3 phases
(3) In 20 kA/3 s, consult us
(4) In 800 A, consult us.

Main characteristics

Endurance

Units		Mechanical endurance	Electrical endurance
Units IM, IMC, IMB, PM, QM (5), QMC (5), QMB (5), NSM-cables, NSM-busbars		IEC 60265 1 000 operations class M1	IEC 60265-1 100 breaks at Ir, p.f. = 0.7, class E3
CRM	Disconnector	IEC 62271-102 1 000 operations	
	Rollarc 400	IEC 60470 300 000 operations	IEC 60470 100 000 breaks at 320 A 300 000 breaks at 250 A
	Rollarc 400D	100 000 operations	100 000 breaks at 200 A
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-W, DM1-Z, DM1-S, DM2 DM2-W	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 24 kV 25 breaks at 25 kA for 24 kV 40 breaks at 16 kA for 36 kV 15 breaks at 25 kA for 36 kV 10 000 breaks at Ir, p.f. = 0.7, class E2
Vacuum circuit breaker range			
DMV-A, DMV-D, DMV-S	Switch	IEC 60265 1 000 operations class M1	IEC 60265 100 breaks at Ir, p.f. = 0.7, class E3
	Evolis circuit breaker	IEC 62271-100 10 000 operations class M2	IEC 62271-100 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 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 kV:
  - □ standard: 12.5 kA 1 s, IAC: A-FL
  - □ enhanced: 16 kA 1 s, IAC: A-FLR & IAC: A-FL
- ■ SM6 36 kV:
  - □ standard: 16 kA 1 s, IAC: A-FL.

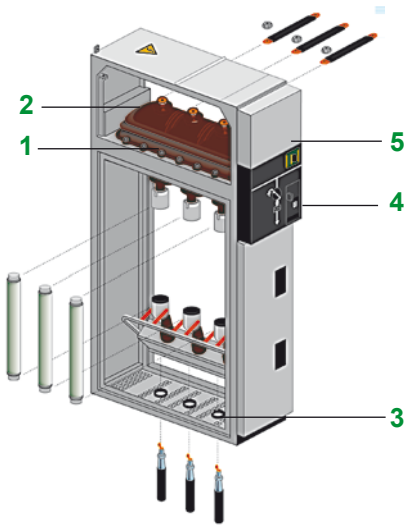
Protection index:
- ■ classes: PI (insulating partition)
- ■ loss of service continuity classes: LSC2A
- ■ units in switchboard: IP3X
- ■ between compartments: IP2XC
- ■ Cubicle: IK08.

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.

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.

Factory-built cubicles description

PE50780



Cubicles are made up of 3 (*) compartments and 2 cabinets that are separated by metal or insulating partitions.

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.

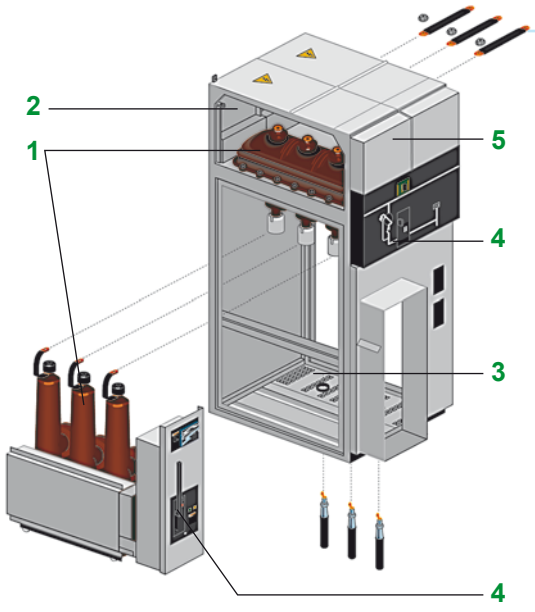
4 operating mechanism: contains the elements used to operate the switch-disconnector and earthing switch and actuate the corresponding indications (positive break).

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”.

(*) 2 compartments for 36 kV

PE50781



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).

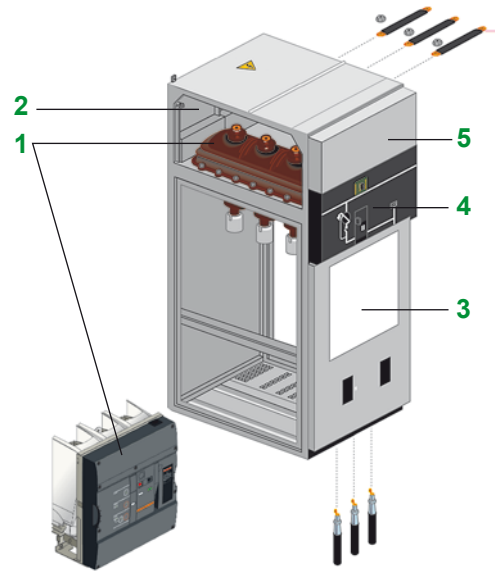
4 operating mechanism: contains the elements used to operate the disconnector(s), the circuit breaker and the earthing switch and actuate the corresponding indications.

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

PE50782



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.

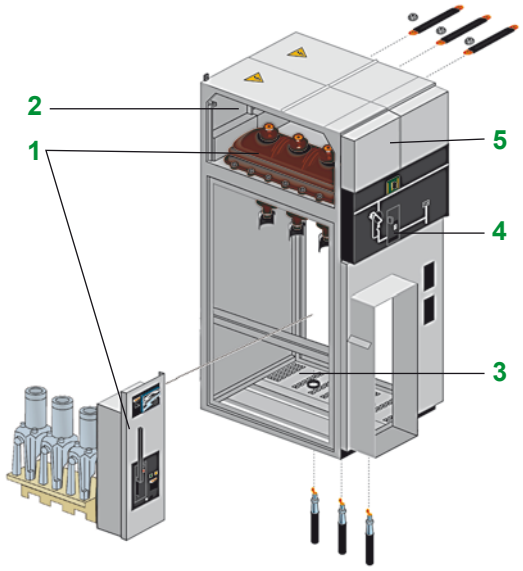
3 connection and switchgear: accessible through front, connection to the downstream terminals of the circuit breaker.
- Evolis: device associated with an electronic relay and standard sensors (with or without auxiliary source).

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”.

PE50783



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.

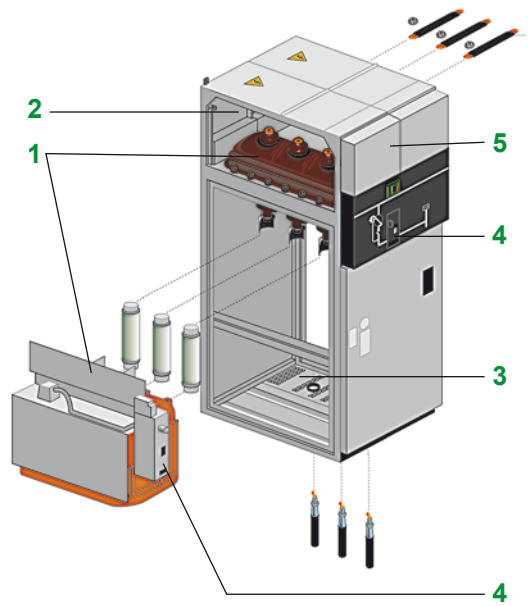
3 connection and switchgear: accessible through front, connection to the downstream terminals of the circuit breaker.
- Evolis: device associated with an electronic relay and standard sensors (with or without auxiliary source).

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”.

PE50784



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.
This compartment is also equipped with an earthing switch downstream.
The contactor may be equipped with fuses.
4 types may be used:
- R400 with magnetic holding
- R400D with mechanical latching
- Vacuum with magnetic holding
- Vacuum with mechanical latching.

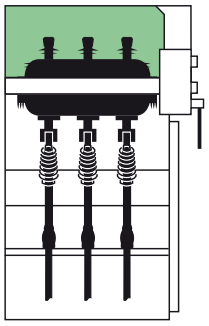
4 operating mechanism: contains the elements used to operate the disconnector(s), the contactor and the earthing switch and actuate the corresponding indications.

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 description

DE53507

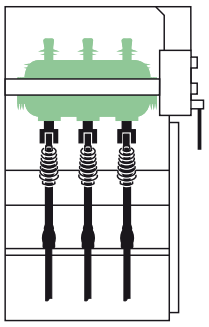


61007N

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 - 630 - 1250 A.

DE53508

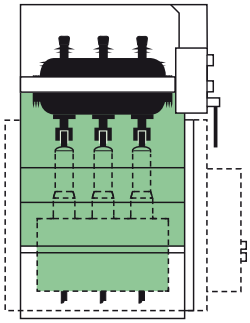


61006N

Switch compartment for 24 kV

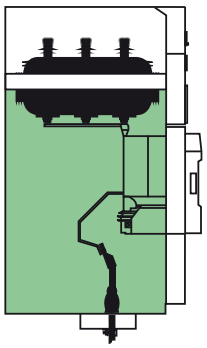
This compartment is separated from the busbar compartment and the connection compartment by the enclosure surrounding the switch, the disconnector and the earthing switch.

DE53509



SF6 and vacuum lateral type circuit breaker

DE53510



Frontal vacuum type circuit breaker

Connection and switch compartment

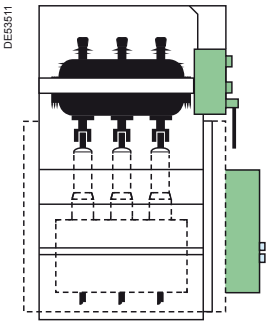
The network cables are connected:
- to the terminals of the switch
- to the lower fuse holders
- or to the connection pads of the circuit breaker.

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 fonctional 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 description



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.).

A - LV cover h = 1600 mm **B** - LV wiring duct h = 1690 mm **C** - LV control cabinet h = 2050 mm

Low-voltage monitoring control cabinet for 24 kV

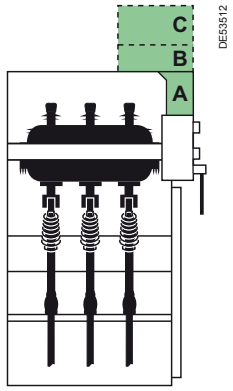
It enables the cubicle to be equipped with low voltage switchgear providing protection, control, status indication and data transmission.
According to the volume, it is available in 3 versions: cover, wiring duct and cabinet.

A - LV cover: enables a very simple low voltage section to be installed such as indication buttons, push buttons or protection relays.
The total height of the cubicle is then 1600 mm.

B - 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.
The total cubicle height is then 1690 mm.

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 80, converters, changeover and telecontrol units, regulating transformers or dual secondary transformers.
The total height of the cubicle then becomes 2050 mm.

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



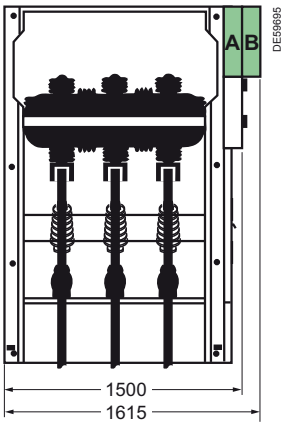
A - LV cover h = 2250 mm

Low-voltage monitoring control cabinet for 36 kV

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 is only used for larger low voltage accessories or those with a depth greater than 100 mm or complex equipment, such as Sepam series 80, converters, changeover and telecontrol units, regulating transformers or dual secondary transformers.

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

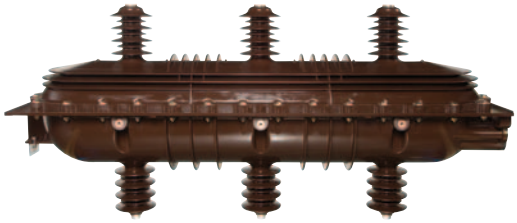


Safety of people
By switchgear

61010N

Switch-disconnector for 24 kV

PE57226



Switch-disconnector for 36 kV

Switch or disconnector and earthing switch

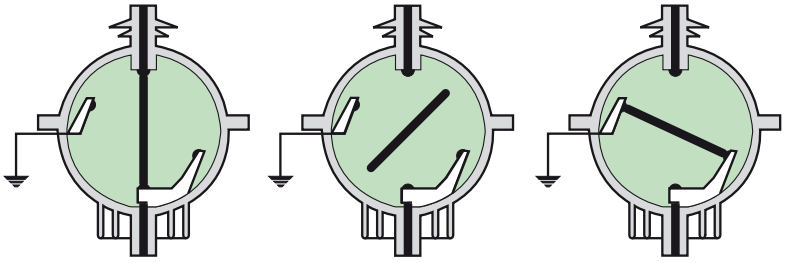
■ **Gas tightness**

The three rotating contacts are placed in an enclosure filled with gas to a relative pressure of 0.4 bar (400 hPa) for 24 kV and 1 bar (1000 hPa) for 36 kV. 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

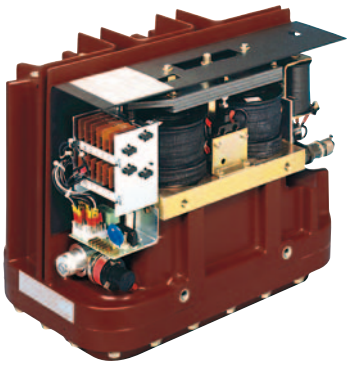


Closed position *Open position* *Earth position*

■ **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.

61011N



Rollarc contactor

Rollarc 400 and 400D contactor

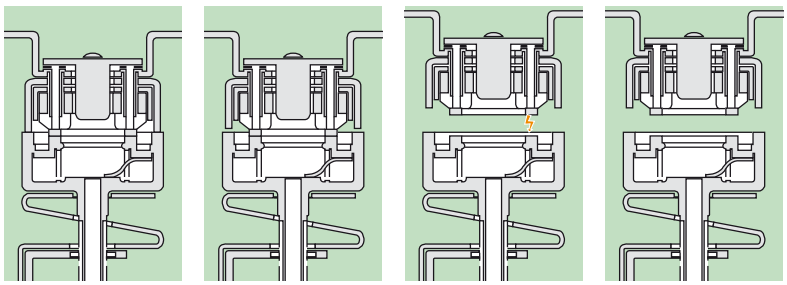
■ **Gas tightness**

The three phases are placed in an enclosure filled with SF6 gas to a relative pressure of 2.5 bars (2500 hPa). 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.

DE53513



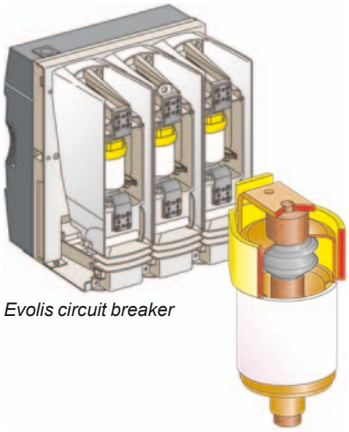
Contacts closed *Main contacts separated* *Arcing period* *Contacts open*

Safety of people
By switchgear

61012N

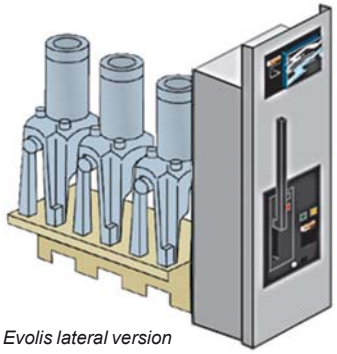
SF1 circuit breaker

61058N



Evolis circuit breaker

PE50798



Evolis lateral version

PE57841

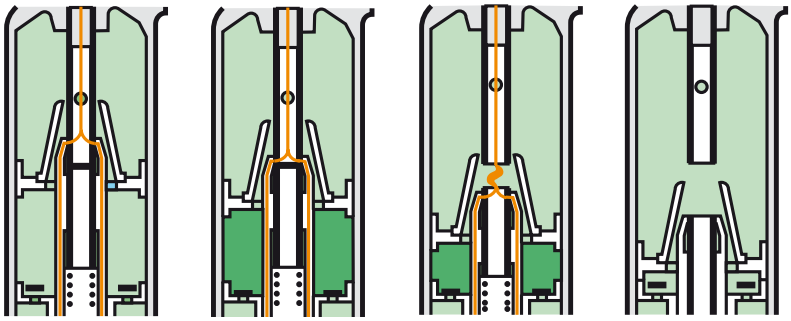
Vacuum type contactor

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 all the active elements in an insulating enclosure filled with gas to a relative pressure of 0.5 bar (500 hPa) for 24 kV and 2 bar (2000 hPa) for 36 kV. 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.

DE53514



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

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.

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.

Safety of people
By operating mechanism safety

61013N

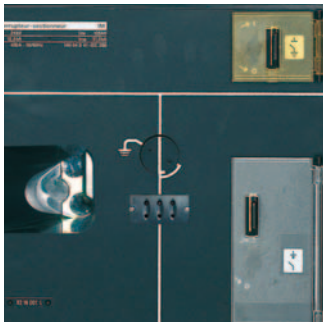
Reliable operating mechanism

■ **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.

PE50796



Visibility of main contacts (option)

Visibility of main contacts (option for 24 kV)

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

PE57166

Gas pressure indicator (option for 24 kV)

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.

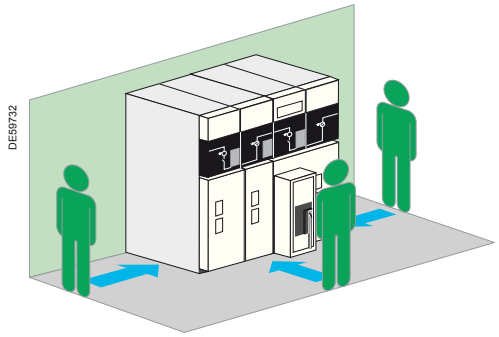
PE56366

Voltage presence indicator

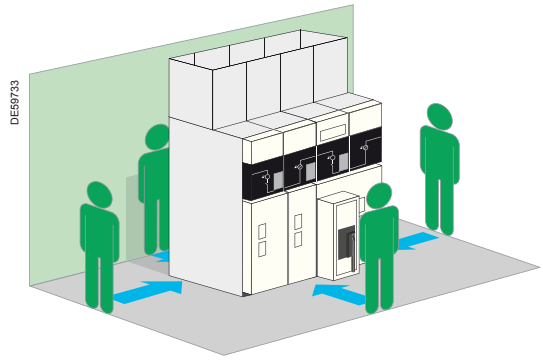
This device has integrated VPIS (Voltage Presence Indicating System) type lights, in conformity with IEC standard 61958, enabling the presence (or absence) of voltage to be checked on the cables.

Safety of people
By internal arc protection

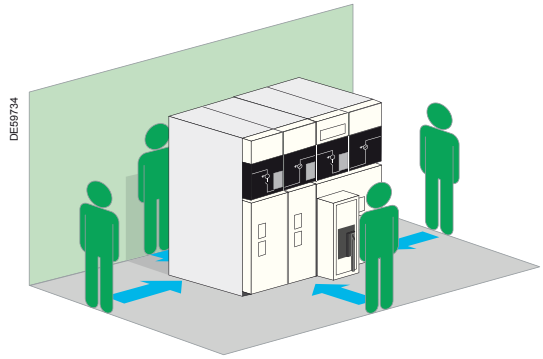
Standard IEC 62271-200 appendix A indicates a method for testing switchgear in metal enclosures under internal arc conditions. The aim of this test is to show that an operator situated in front of a switchboard would be protected against the effects of an internal fault.



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



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



Installation of an SM6 24 kV switchboard installed in the middle of a room downwards exhaust 16 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 total operating safety:**
  - voltage presence indicator on the front face,
  - natural reliable interlocking,
  - locking using keys or padlocks.

Internal arc withstand of the cubicles

- **2 versions are available for 24 kV:**
  - basic version: 12.5 kA 1 s, IAC: A-FL
  - enhanced internal arc withstand: 16 kA 1 s, IAC: A-FL or IAC: A-FLR.
- **1 version is available for 36 kV:**
  - 16 kA 1 s, IAC: A-FL.

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

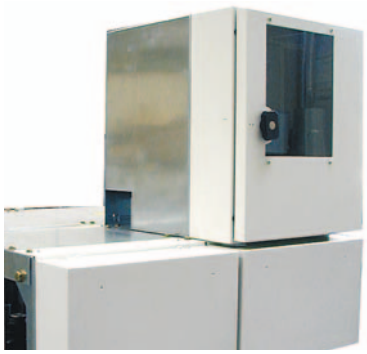
In its internal arc version, the SM6 has successfully passed all of the type testing relative to standard IEC 62271-200 (5 acceptance criteria).
The materials used meet the constraints for which the SM6 is designed.
The thermal and mechanical forces that an internal arc can produce are perfectly absorbed by the enclosure.
An operator situated in the 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 or enhanced internal arc withstand switchboard

- **For 24 and 36 kV 3-sides internal arc protection IAC: A-FL**, 12,5 kA 1 s, 16 kA 1 s
SM6 switchboard positioned against the wall, access to the rear of the cubicles is impossible, internal arc protection on three sides is sufficient.
- **For 24 kV 4-sides internal arc protection IAC: A-FLR**, 16 kA 1 s
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:**
(civil engineering document for internal arc protected cubicles to be considered)
  - **For 24 kV upwards exhaust**
A ceiling height greater or equal than 2800 mm is necessary.
  - **For 24 kV downwards exhaust**
Civil engineering with an adequate volume is necessary.
  - **For 36 kV downwards exhaust**
Civil engineering with an adequate volume is necessary.

MV electrical network management

PE15074



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

Easergy T200 S

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 I 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.

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).

61017N

Control command

PE15079

Back up power supply

"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.

PE15078

Split core CTs

Compatible with all SCADA remote control systems

Easergy T200 S supplies the following standard protocols:
Modbus, DPN3.0 level 2 and IEC 870-5-101.
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 for NSM function

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), active 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.
- Auxilary 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**.

PE57787

VD23

MV electrical network management

PE56311

Easergy T200 I: an interface designed for telecontrol 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.

PE56421

Local information and control

PE56422

Monitoring and control

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).

PE56423

Back up power supply

PE56824

Polarized connectors

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 telecontrol cabinet 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.

Fault indicators

Easergy Flair is a comprehensive range of underground network fault current indicators

Easergy MV underground network fault current passage indicators are a range of products adapted to all neutral earthing systems: insulated, impedant and direct earthing.

■ Easergy Flair 21D-22D-23DV, are self-powered with a liquid crystal display, with DIN dimensions for MV cubicle installation.

■ Easergy Flair 279 and 219, have a wall-mounted case for the MV cubicles substation or LV compartment and anexternal power supply which can be backed up.

■ Easergy Flair 200C (communicative) has advanced measurement functions and long distance communication features (radio, GSM, RTC, etc.).

PE57154

PE57922

PE57921

Easergy Flair	21D - 22D - 23DV	279 - 219	200C
Usage	Underground MV networks, open loop, insulated, impedant and direct neutral earthing systems.		
Installation	Flush fitted	Casing	Casing
Power supply	Self-powered or dual power	230 Vac or battery	230 Vac
Fault detection	Phase-phase and phase-earth for all 3 ranges		
Indication	LCD display	Indicator light	Indicator light (option)
Measurement	Current, frequency		Current, voltage, power
Communication	SCADA interface by dry contact	SCADA interface by dry contact	Long distance (radio, PSTN, GSM, etc.)

PE57155

Easergy Flair 21D - 22D - 23DV

SM6 integrates Flair 21D, Flair 22D and Flair 23DV on every incoming cubicles.

■ **High performance indicators**
- □ indication of phase-phase and phase-earth faults,
- □ faulty phase indication,
- □ compatible with HV/MV substation protection devices.

■ **Clear and comprehensive display**
- □ displaying the faulty phase for earth fault,
- □ displaying settings,
- □ displaying the load current including peak demand and frequency meter.

■ **Maintenance free.**

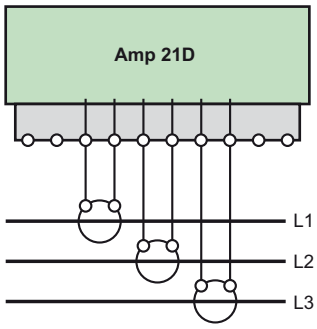
	Flair 21D	Flair 22D	Flair 23DV
Power supply			
Self-powered	■	■	■
Dual power supply		■ (battery)	■ (external)
Display of settings			
Short-circuit fault thresholds	■	■	■
Earth fault thresholds	■	■	■
Validation (no current)	■	■	■
Reset upon return of current	■	■	■
Reset timer		■	■
Faulty phase and measurements			
Faulty phase	L1-L2-L3	L1-L2-L3	L1-L2-L3
Load current	■	■	■
MV network frequency		50/60 Hz	50/60 Hz
Peak demand current		■	■
Residual current		■	■

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.

PE56822

DE58404



PE57169

The SM6 integrates 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 800 A
■ Display of 3 phase current maximeter: I1 , I2 , I3. Range: 3 to 800 A.

Display principle

■ Load curents 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.

Assembly

Small size enclosure

■ DIN format : 93 x 45 mm
■ Secured, extraction-proof mounting
■ Terminal connections.

Technical data

Application		
Frequency		50 Hz and 60 Hz
Load current	Minimum current	> 3 A
Measurement		
Range	Phase current	3 to 800 A
	Accuracy (I < 630 A)	±5%, ±2 A
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
Characteristics		
Dielectric	IEC 60255-5	
Electromagnetic	IEC 61000-4-4 (level 4) IEC 61000-4-12	Insulation 10 kV Shock wave 20 kV
Climatic	Operating temperature Storage temperature Salt fog	– 25°C to + 70°C – 40°C to + 85°C 200 h
Mechanical	IEC 60068-2-6 IEC 60068-2-29	Vibrations 10 to 500 Hz: 2 g Protection IP23

Description of the control/ monitoring & protection functions

Sepam selection guide for all applications

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 10,
- Sepam series 20,
- Sepam series 40,
- Sepam series 80.

A range adapted at your application

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

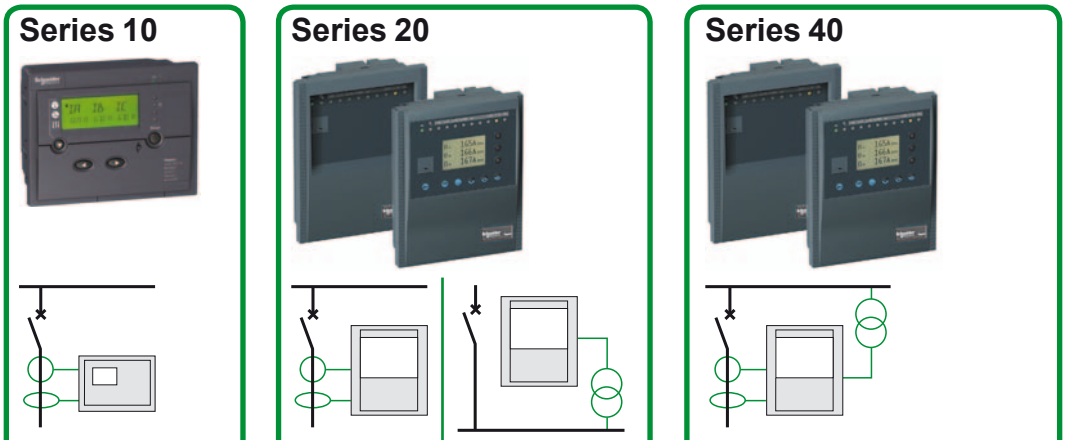
Simplicity

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.



		Series 10	Series 20			Series 40		
Protections								
Current		■	■	■		■	■	■
Voltage					■ ■	■	■	■
Frequency					■ ■	■	■	■
Specifics		Phase and earth fault overcurrent		Breaker failure	Disconnection by rate of change of frequency		Directional earth fault	Directional earth fault and phase overcurrent
Applications								
Substation		**10A, 10B**	**S20**	**S24**		**S40**	**S41, S43**	**S42**
Busbar					**B21 B22**			
Transformer		**10A, 10B**	**T20**	**T24**		**T40**		**T42**
Motor			**M20**				**M41**	
Generator						**G40**		
Capacitor								
Characteristics								
Logic inputs		4	0 to 10		0 to 10	0 to 10		
Logic outputs		7	4 to 8		4 to 8	4 to 8		
Temperature sensors			0 to 8		0 to 8	0 to 16		
Channel	Current	3 I + Io	3 I + Io			3 I + Io		
	Voltage				3V + Vo	3V, 2U + Vo		
	LPCT (1)		■			■		
Communication ports		1	1 to 2		1 to 2	1 to 2		
IEC61850 Protocol			■		■	■		
Control	Matrix (2)		■		■	■		
	Logic equation editor					■		
	Logipam (3)							
Other	Memory cartridge with settings							
	Backup battery	Lithium battery				48 hours		

(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.

Description of the control/ monitoring & protection functions

Sepam selection guide for all applications

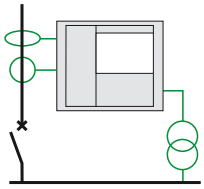
Accurate measurement and detailed diagnosis

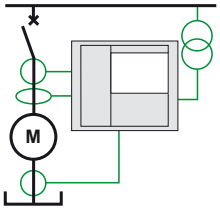
- Measuring all necessary electrical values.
- Monitoring switchgear status: sensors and trip circuit, mechanical switchgear status.
- Disturbance recording.
- Sepam self-diagnosis and watchdog.

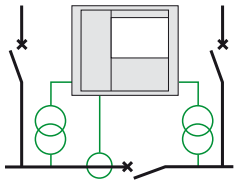
Flexibility and evolutivity

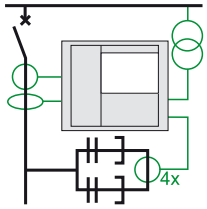
- Enhanced by optional modules to evolve in step with your installation.
- Possible to add optional modules at any time.
- Simple to connect and commission via a parameter setting procedure.

Series 80









■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■
	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
S80	**S81**	**S82**	**S84**				
B80						**B83**	
	T81	**T82**		**T87**			
	M81			**M88**	**M87**		
		G82		**G88**	**G87**		
							C86
0 to 42				0 to 42		0 to 42	0 to 42
5 to 23				5 to 23		5 to 23	5 to 23
0 to 16				0 to 16		0 to 16	0 to 16
3 I + 2 x Io				2 x 3 I + 2 x Io		3 I + Io	2 x 3 I + 2 x Io
3V + Vo				3V + Vo		2 x 3V + 2 x Vo	3V + Vo
■				■		■	■
2 to 4				2 to 4		2 to 4	2 to 4
■				■		■	■
■				■		■	■
■				■		■	■
■				■		■	■
■				■		■	■
Lithium battery				Lithium battery		Lithium battery	Lithium battery

Description of the control/ monitoring & protection functions

PE57159

VIP 35

VIP 35 relay for transformer protection

Integrated in the DM1-S and DMV-S cubicles for SM6 24 kV
The VIP 35 is an independent relay without an auxiliary power supply, powered by the current sensors, and actuating a Mitop release unit.
VIP 35 provides protection against phase-to-phase faults and against earthing faults.

Phase protection
■ phase protection is achieved by a definite time threshold which functions from 1.2 times the operating current (Is).

Earthing protection
■ earthing fault protection functions with the residual current measurement taken from the sum of the secondary currents in the sensors. This is taken via a CRc, 8 A to 80 A gauge.
■ earthing protection is inverse definite time: its threshold and time delay can be set.

Setting the VIP 35 relays
Is: the phase operating current is adjusted directly in accordance with the transformer rating and the operating voltage.
Io: the earth current threshold is adjusted according to the network characteristics.

Setting values of the Is phase operating current for VIP 35

Operating voltage (kV)	Transformer rating (kVA)																				
	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300
3	10	15	20	25	36	45	55	68	80	115	140	170	200								
3.3	10	15	18	22	28	36	45	56	70	90	115	140	200								
4.2	8	12	15	18	22	28	36	45	55	70	90	115	140	200							
5.5	8*	8	12	15	18	22	28	36	45	55	68	90	115	140	170						
6	8*	8*	10	12	18	20	25	36	45	55	68	80	115	140	170	200					
6.6	8*	8*	10	12	15	18	22	28	36	45	56	70	90	115	140	200					
10	8*	8*	8*	8	10	12	15	20	25	30	37	55	68	80	115	140	170	200			
11	8*	8*	8*	8*	10	12	15	18	22	28	36	45	55	68	90	115	140	170			
13.8	8*	8*	8*	8*	8	10	12	15	18	22	28	36	45	55	68	90	115	140	170		
15	8*	8*	8*	8*	8*	8	10	15	18	20	25	36	45	55	68	80	115	140	170	200	
20	8*	8*	8*	8*	8*	8*	8	10	12	15	20	25	30	37	55	68	80	115	140	170	200
22	8*	8*	8*	8*	8*	8*	8	10	12	15	18	22	28	36	45	55	68	90	115	140	170

** Short-circuit protection, no over-load protection*

PE57160

VIP 300 LL

VIP 300 LL protection relay

Integrated in the DM1-S and DMV-S cubicles for SM6 24 kV
VIP 300 provides protection against phase-to-phase and phase-to-earth faults.
A choice of trip curves and the large number of possible settings mean that it can be used in a large variety of selectivity layouts.
VIP 300 is an independent relay powered by the current sensors; it does not require an auxiliary power supply. It actuates a release unit.

Phase protection
■ phase protection is via two independently adjustable thresholds:
□ the lower threshold can be chosen to be inverse definite time or definite time.
The definite time curves are in conformity with IEC standard 60255-3.
They are either of inverse, very inverse or extremely inverse type.
□ the upper threshold is inverse definite time.

Earthing protection
■ protection against phase-to-earth faults uses the residual current measurement, taken from the sum of the secondary currents in the sensors. This is taken via a CRa X1 gauge: 10 to 50 A and X4: 40 to 200 A or via a CRb X1 gauge: 63 to 312 A and X4: 250 A to 1250 A.
■ as for phase protection, phase-to-earth protection had two thresholds that can be independently set.

Signalling
■ two indicators show the origin of the trip operation (phase or earth). They remain in position after the relay power supply has been cut.
two led indicators (phase and earth) show that the lower threshold has been exceeded and that its time delay is currently in progress.

Description of the control/ monitoring & protection functions

Sepam series 10

Sepam series 10 with CRa/CRb sensors for transformer protection

Integrated in the DM1-S cubicle for SM6 24 kV with CRa and CRb sensors and DM1-A cubicle for SM6 36 kV with normal CT's

Sepam series 10 monitors phase and/or earth-fault currents.
Two models meet a wide range of different needs:

- **10B**: Sepam series 10B protects against overloads, phase-to-phase faults and earth faults.
- **10A**: Sepam series 10A provides the same functions as model B, but with a communication port, more inputs and outputs, and additional protection and monitoring functions.

Setting of Sepam series 10 for DM1-S 24 kV
Is: the phase operating current is adjusted directly in accordance with the transformer rating and the operating voltage.
Io: the earth current threshold is adjusted according to the network characteristics.

Setting values of the Is phase operating current

Operating voltage (kV)	Transformer rating (kVA)																		
	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3000	3500
3			19	24	31	38	48	61	77	96	121	154	192	241	308	385	481	577	
3.3				22	28	35	44	55	70	87	110	140	175	219	280	350	437	525	
4.2					22	27	34	43	55	69	87	110	137	172	220	275	344	412	481
5.5						21	26	33	42	52	66	84	105	131	168	210	262	315	367
6						19	24	30	38	48	61	77	96	120	154	192	241	289	337
6.6							22	28	35	44	55	70	87	109	140	175	219	262	306
10									23	29	36	46	58	72	92	115	144	173	202
11									21	26	33	42	52	66	84	105	131	157	184
13.8										21	26	33	42	52	67	84	105	126	146
15										19	24	31	38	48	62	77	96	115	135
20												23	29	36	46	58	72	87	101
22												21	26	33	42	52	66	79	92

Sensors types legend
CRa 200/1 CRb 1250/1

Description of the control/ monitoring & protection functions

Current sensor for VIP 35 and VIP 300LL and Sepam series 10 for 24 kV

Type	Dimensions (mm) External Ø	Internal Ø	Thickness (without fastening)	Weight (kg)	Ratio of transformation	Class of precision		VIP 35	VIP 300LL	Sepam 10
CRa	143.5	81	37.5	2.18	1/200	± 2% from 10 A to 100 A ± 1% from 100 A to 1600 A	On load 5.7 Ω (cal. x 1)		■	■
						± 1% from 10 A to 10 kA	On load 0.67 Ω (cal. x 4)			
CRb	143.5	81	37.5	1.26	1/1250	± 1% from 10 A to 11 kA	On load 5.7 Ω (cal. x 1)		■	■
						± 1 % from 10 A to 25 kA	On load 0.67 Ω (cal. x 4)			
CRc	143.5	81	37.5	2	S1-S2: 1/200 S1-S3: 1/500	S1-S2: ± 5% from 10 A to 80 A ± 2.5 % from 80 A to 600 A S1-S3: ± 2% from 20 A to 2200 A	On load 0.6 Ω	■		

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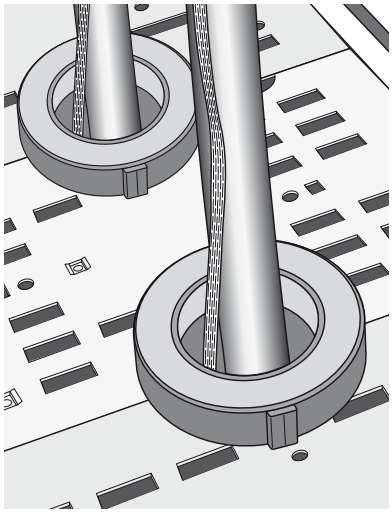

CRa, CRb, CRc current sensor

General common selection of protection units

Protection type	Code	Protection units					
		Sepam				VIP	
		series 10	series 20	series 40	series 80	35	300
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.

LPCT protection chain

TLP130, CLP2 sensors and Sepam series 20, series 40, series 80 protection units

PE57172

PE88012

Standard applications

Sepam series 20

PE88011

Demanding applications

Sepam series 40

PE88010

Custom applications

Sepam series 80

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, series 40, series 80 protection units are at the heart of the LPCT protection chain.
Sepam series 20, series 40, series 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, TLP160 and TLP190 are installed around MV cable
    - CLP2 is installed on the MV circuit
  - LPCT connected directly to Sepam series 20, series 40, series 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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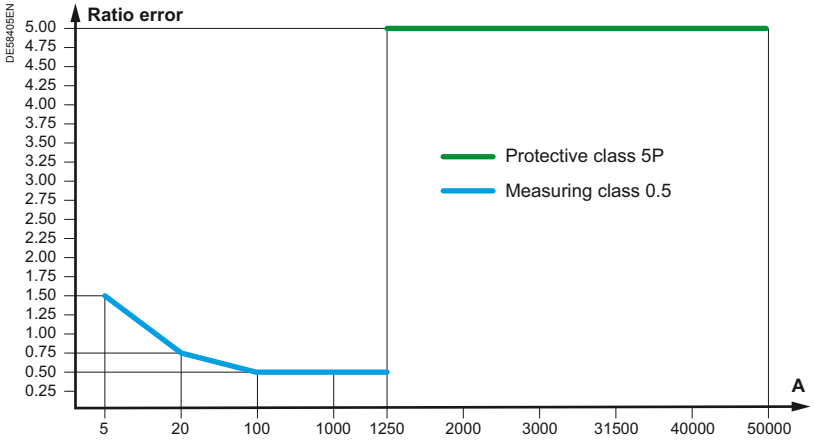
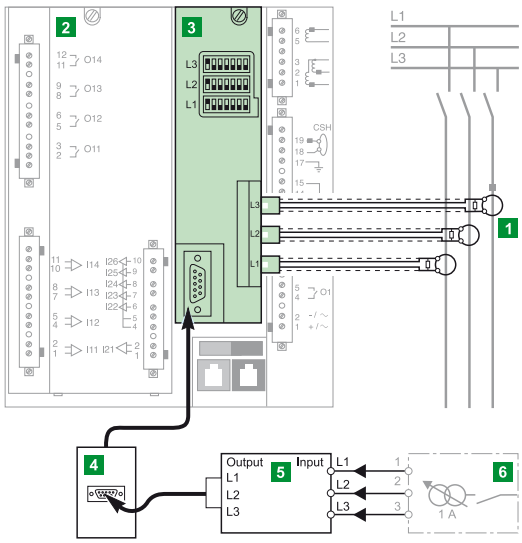


- **Optimized integration of functions:**
  - measurement of phase rated currents as of 25 A that is set by micro-switch
  - monitoring of LPCT sensor by Sepam series 20, series 40, series 80 (detection of phase loss).

MT11325



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, series 40, series 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 80
- CCA670 card for series 20 and 40.

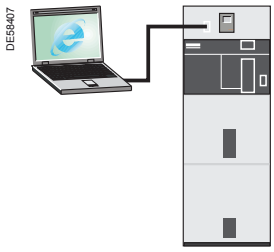
Testing and injection

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.

Web Remote Monitoring



SM6 Web Remote Monitoring with front face Intranet connector

Description

■ The EGX300 is an Ethernet-based device providing a simple transparent interface between Ethernet-based networks and field devices as protective relays (Sepam).
■ The EGX300 has the ability to be used as a simple web based monitoring solution providing real-time data views, on-board data logging/trending, and simple control for field devices.
■ The DM range of circuit breakers cubicles with Sepam ranges and one EGX300 per switchboard for remote monitoring via the Intranet
■ An RJ45 Ethernet connector on the front of the switchboard, directly accessible from the front panel (option).
For other SM6 configurations (with other devices or other Sepam product ranges), it is possible to integrate Web Remote Monitoring capability, consult your local Schneider Electric correspondent.

Functionalities provided

Instantaneous readings
Displays automatically updated meter values

Circuit summary
Displays the RMS current 3-phase average (A), the real power (kW), the power factor, the circuit breaker status (if applicable), etc.

Load current summary
Displays the current RMS value for each phase (A), for all circuits

Demand current summary
Displays the average demand current value for each phase (A), for all circuits

Power summary
Displays the present demand (kW), the peak demand (kW) and the times and dates of the records

Energy summary
Displays the energy (kWh) the reactive energy (kvarh), and the times and dates of the records

Instantaneous readings, all devices
Basic historical data logging, energy and trending
Displays automatically updated meter values for all the communicating devices in the equipment

Log displays
Displays data as time curves, or tables

Export of data tables
Allows data tables to be exported in a standard Windows format

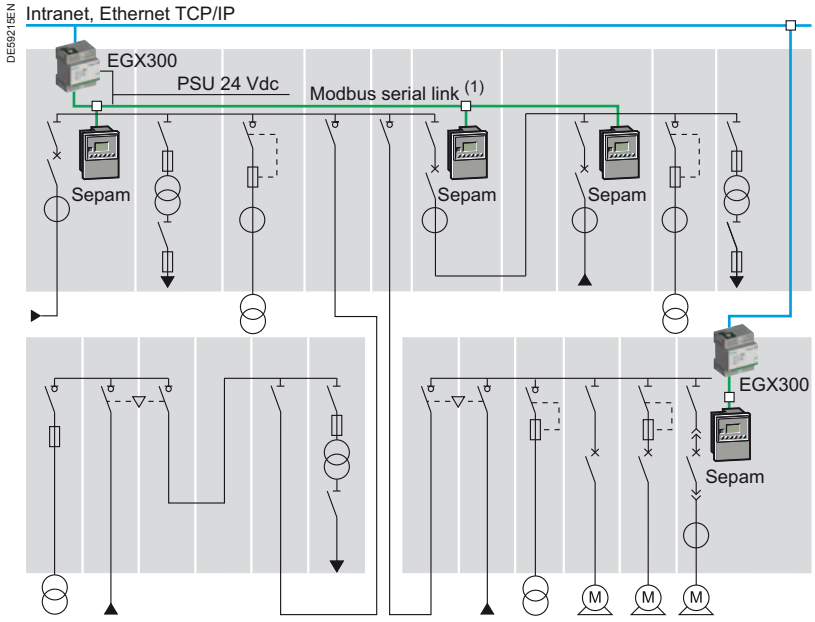
Range selection

This chart presents the different SM6 24 kV cubicles proposed with an industrialised Web Remote Monitoring system.

Description	Type of units
Single-isolation circuit breaker unit	DM1-A, DMVL-A
Single-isolation circuit breaker unit, right or left outgoing line	DM1-D
Withdrawable single-isolation circuit breaker unit	DM1-W
Withdrawable single-isolation circuit breaker unit, right outgoing line	DM1-Z
Double-isolation circuit breaker unit, right or left outgoing line	DM2

Typical design

You need to have a Web server in only one CB unit to monitor the whole switchboard.

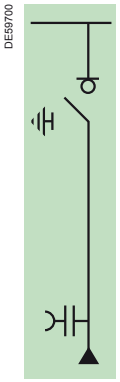


(1) Same cable CCR301 for RS 485 and PSU 24 V DC

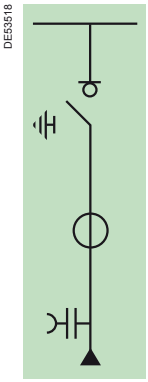
Contents

Functional units selection
Network connection

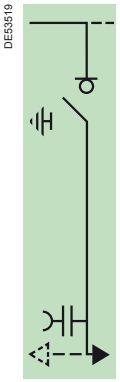
IM
Switch unit



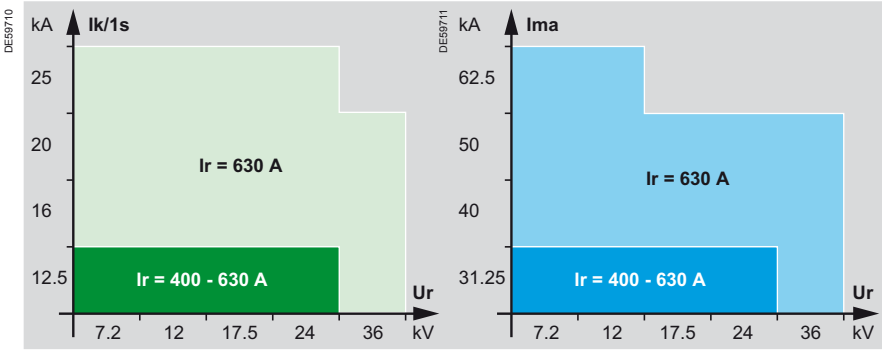
IMC
Switch unit



IMB
Switch unit **with** earthing switch
Right or left outgoing



Electrical characteristics



Basic equipment:

- switch and earthing switch
- three-phase busbars
- CIT operating mechanism
- voltage presence indicator
- 150 W heating element for 36 kV

- connection pads for dry-type cables

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

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

Versions:

- CI2 operating mechanism

- CI1 operating mechanism

- CI1 operating mechanism for 36 kV

- CI1 operating mechanism

- in 800 A version for 24 kV, consult us

Optional accessories:

- motor for operating mechanism
- auxiliary contacts
- key-type interlocks
- release units (coil)
- operation counter
- 1250 A three-phase upper busbars

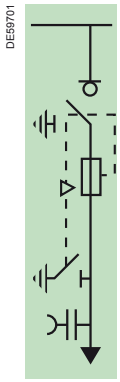
- 630 A three-phase upper busbars for severe operating conditions for 24 kV
- visibility of main contacts for 24 kV
- pressure indicator device for 24 kV
- enlarged low-voltage control cabinet for 24 kV
- 50 W heating element for 24 kV
- cable connection by the top for 24 kV (no internal arc withstand if selected)

- fault indicators
- Connection pads for two dry-type single-core cables for 36 kV

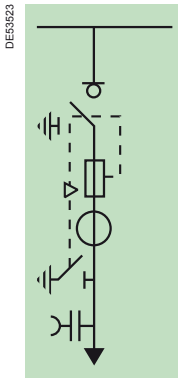
- digital ammeter
- surge arresters (for 36 kV and for 24 kV in 500 mm wide cubicle)

Functional units selection
Fuse-switch protection

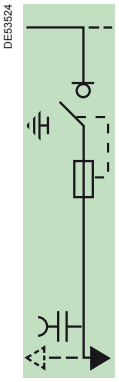
QM
Fuse-switch combination unit



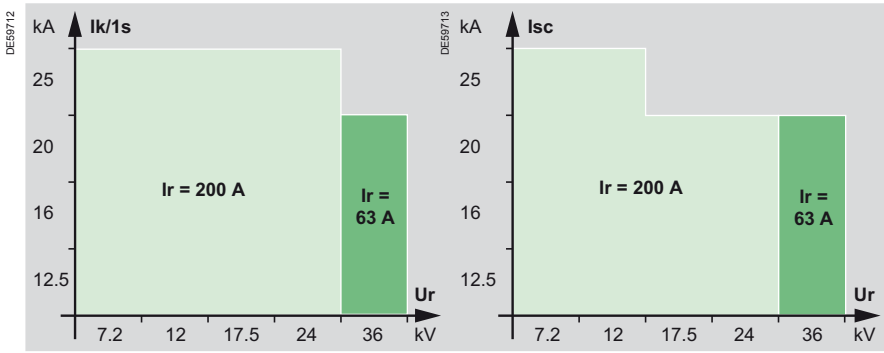
QMC
Fuse-switch combination unit



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 36 kV

- 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 24 kV
- three CTs for 36 kV

Version:

- equipment for three UTE striker fuses for 24 kV

- CI2 operating mechanism

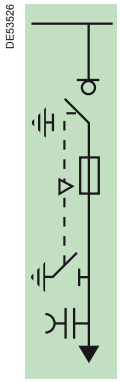
- CI2 operating mechanism for 36 kV

Optional accessories:

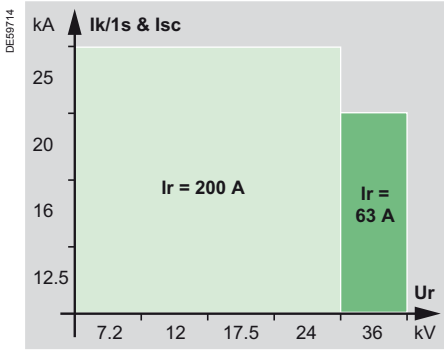
- motor for operating mechanism
- auxiliary contacts
- key-type interlocks
- auxiliary contact for blown fuses
- DIN striker fuses
- release units (coil)
- digital ammeter
- 1250 A three-phase upper busbars
- cable connection by the top for 24 kV (no internal arc withstand if selected)
- visibility of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

Functional units selection
Fuse-switch protection

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 24 kV) or DIN striker fuses
- 150 W heating element for 36 kV

Version:

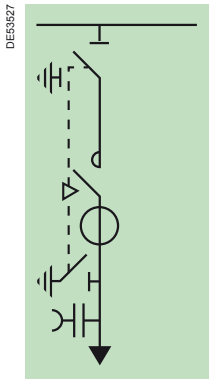
- CI1 operating mechanism
- CI2 operating mechanism for 36 kV

Optional accessories:

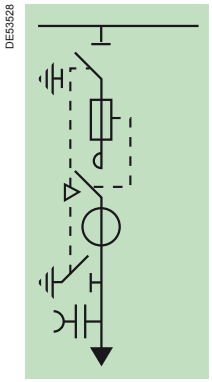
- motor for operating mechanism
- auxiliary contacts
- digital ammeter
- key-type interlocks
- mechanical indication system for blown fuses
- 1250 A three-phase upper busbars
- cable connection by the top for 24 kV (no internal arc withstand if selected)
- UTE (for 24 kV) or DIN striker fuses
- visibility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

Functional units selection
Contactor protection

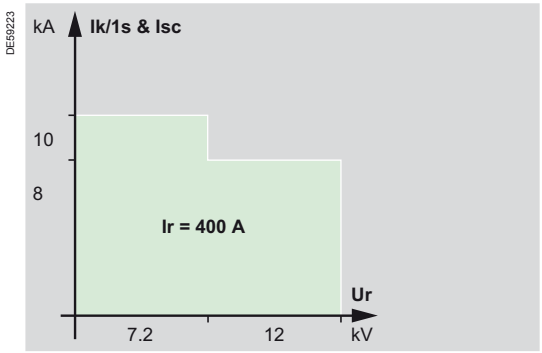
CRM
Contactor unit

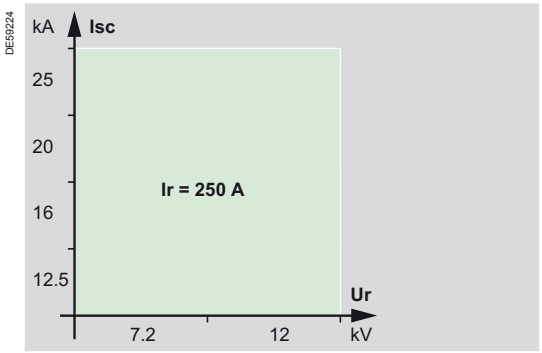


CRM
Contactor unit with fuses



Electrical characteristics





Basic equipment:

- SF6 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

- equipment for three DIN striker fuses

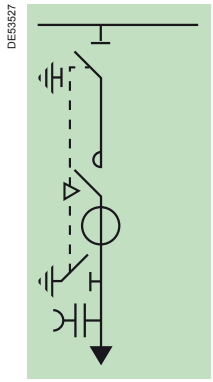
Optional accessories:

- **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

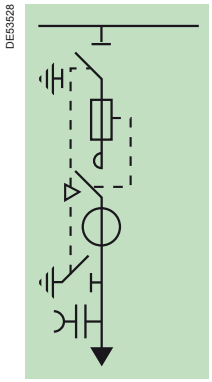
- DIN striker fuses

Functional units selection
Contactor protection

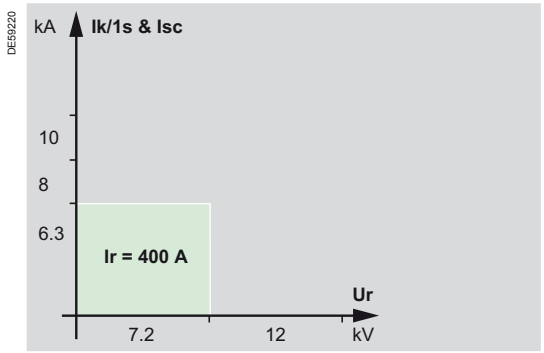
CVM
Disconnectable contactor unit

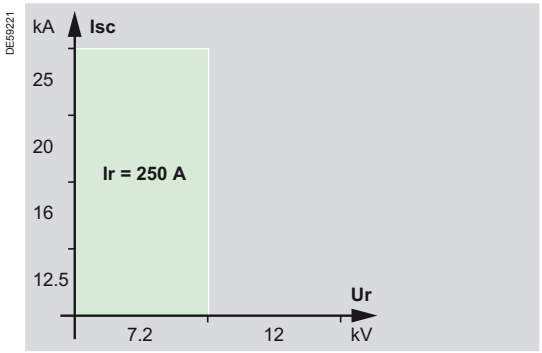


CVM
Disconnectable contactor unit with fuses



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

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

Version:

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

Optional accessories:

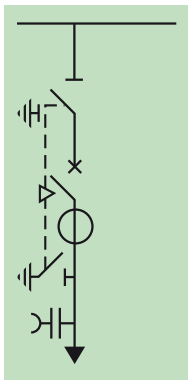
- **cubicle:**
  - auxiliary contacts on the disconnector
  - protection using Sepam programmable electronic unit
  - one to three voltage transformers
  - key-type interlocks
  - 50 W heating element
  - 1250 A three-phase upper busbars
  - 630 A three-phase upper busbars for severe operating conditions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

- DIN striker fuses

Functional units selection
SF6 type circuit breaker protection

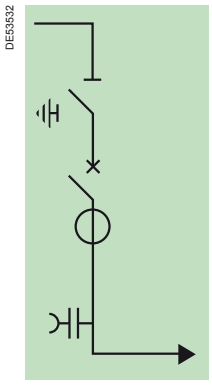
DM1-A
Single-isolation
disconnectable CB unit

DE53531



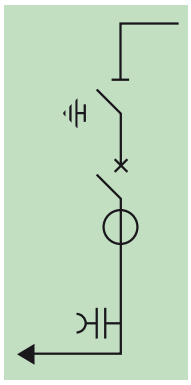
DM1-D
Single-isolation
disconnectable CB unit
Outgoing line on right

DE53532



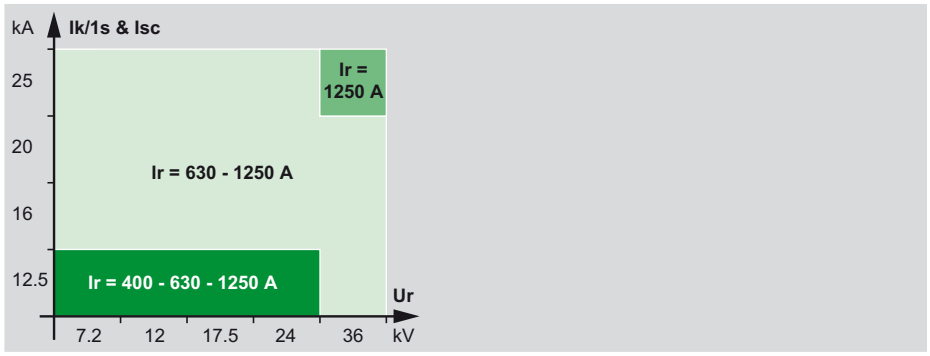
DM1-D
Single-isolation
disconnectable CB unit
Outgoing line on left

DE53533

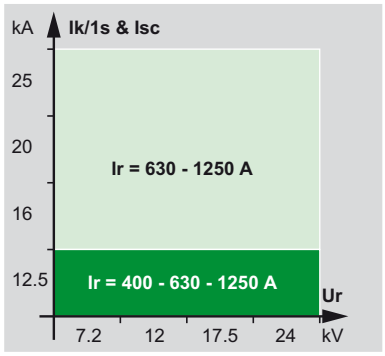


Electrical characteristics

DE59715



DE59213



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
- auxiliary contacts on circuit breaker
- mechanical interlocking between circuit breaker and disconnector
- 150 W heating element for 36 kV

- 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, series 40, series 80)

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

Optional accessories:

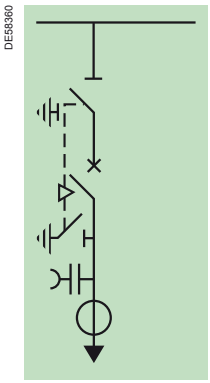
- **cubicle:**
- ☐ auxiliary contacts on the disconnector
- ☐ protection using Sepam programmable electronic unit
- ☐ three voltage transformers
- ☐ key-type interlocks
- ☐ 1250 A three-phase upper busbars at Ir 630 A
- ☐ cable connection by the top for 24 kV (no internal arc withstand if selected)

- ☐ 630 A three-phase upper busbars for severe operating conditions for 24 kV
- ☐ enlarged low-voltage control cabinet for 24 kV
- ☐ 50 W heating element for 24 kV
- ☐ Connection pads for two dry-type single-core cables for 36 kV

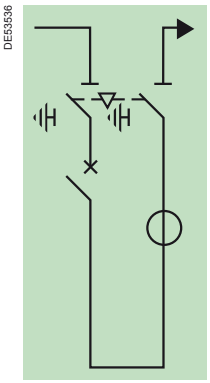
- ☐ surge arresters

Functional units selection
SF6 type circuit breaker protection

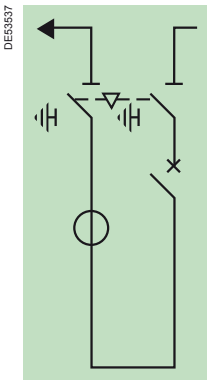
DM1-S
Single-isolation
disconnectable CB unit
with independent protection



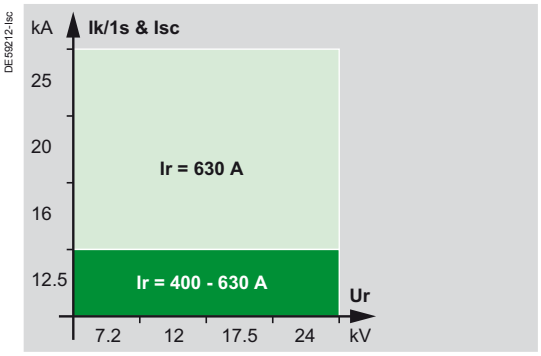
DM2
Double-isolation
disconnectable CB unit
Outgoing line on right

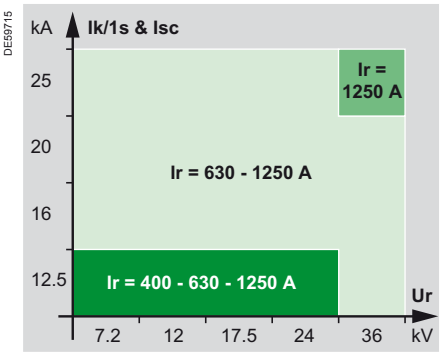


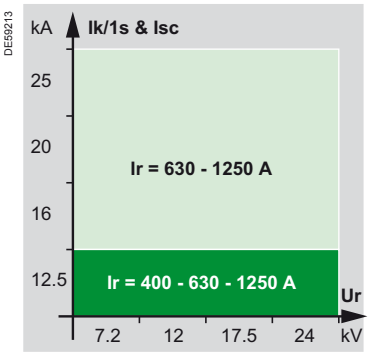
DM2
Double-isolation
disconnectable CB unit
Outgoing line on left



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

- 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 36 kV

Version:

- Sepam series 10 with auxiliary supply and three CR sensors

Optional accessories:

- **cubicle:**
  - ☐ three voltage transformers
  - ☐ key-type interlocks

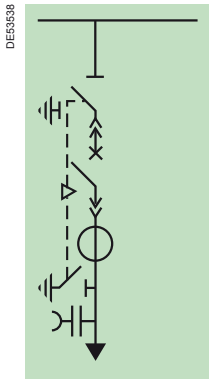
- **cubicle:**
  - ☐ protection using Sepam programmable electronic unit
  - ☐ auxiliary contacts on disconnectors
  - ☐ 2 voltage transformers phase-to-phase or 3 voltage transformers phase-to-earth

- ☐ 1250 A three-phase upper busbars at Ir 630 A
- ☐ 630 A three-phase upper busbars for severe operating conditions for 24 kV
- ☐ enlarged low-voltage control cabinet for 24 kV
- ☐ connection enclosure for cabling from above for 24 kV
- ☐ 50 W heating element for 24 kV

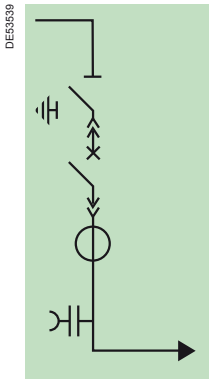
- **circuit breaker:**
  - ☐ motor for operating mechanism
  - ☐ release units (coil)
  - ☐ operation counter on manual operating mechanism

Functional units selection
SF6 type circuit breaker protection

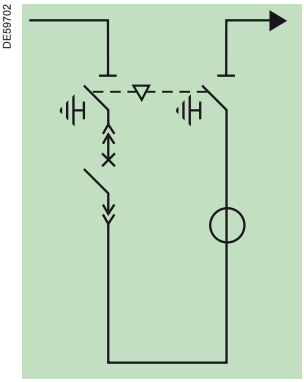
DM1-W
Withdrawable single-isolation circuit breaker unit



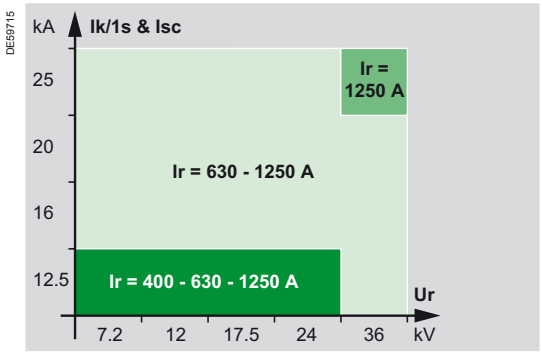
DM1-Z
Withdrawable single-isolation CB unit
Outgoing line on right

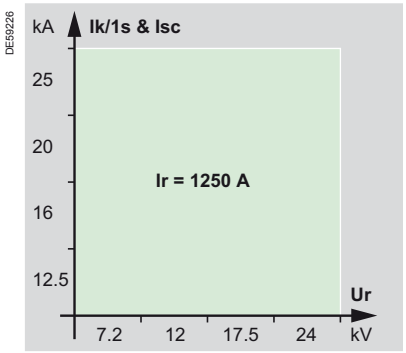


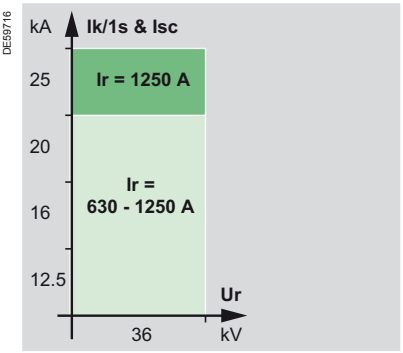
DM2-W
Withdrawable double-isolation CB unit
Outgoing line on right



Electrical characteristics







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
- 150 W heating element for 36 kV

- 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 and 80)

Optional accessories:

- **cubicle:**
  - ☐ auxiliary contacts on the disconnector
  - ☐ protection using Sepam programmable electronic unit
  - ☐ three voltage transformers
  - ☐ key-type interlocks
  - ☐ connection enclosure for cabling from above for 24 kV
  - ☐ 50 W heating element for 24 kV
  - ☐ enlarged low-voltage control cabinet for 24 kV
- **circuit breaker:**
  - ☐ motor for operating mechanism
  - ☐ release units (coil)
  - ☐ operation counter on manual operating mechanism

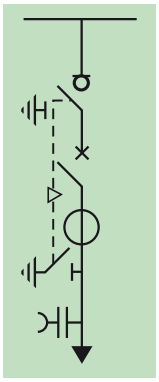
- ☐ 1250 A three-phase upper busbars at Ir 630 A
- ☐ 630 A three-phase upper busbars for severe operating conditions for 24 kV
- ☐ surge arresters (only for 630 A and 24 kV)

- **cubicle:**
  - ☐ auxiliary contacts on the disconnector
  - ☐ key-type interlocks
  - ☐ protection using Sepam programmable electronic unit
- **circuit breaker:**
  - ☐ motor for operating mechanism
  - ☐ operation counter on manual operating mechanism
  - ☐ opening and closing shunt trips

Functional units selection
Vacuum type circuit breaker protection

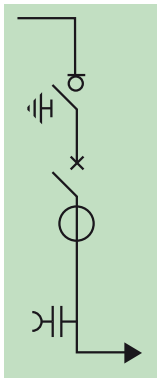
DMV-A
Single-isolation
circuit breaker unit

DE53541



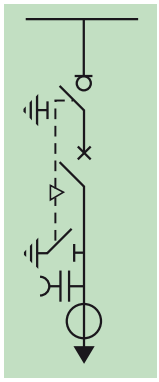
DMV-D
Single-isolation circuit breaker unit
Outgoing line on right

DE53542



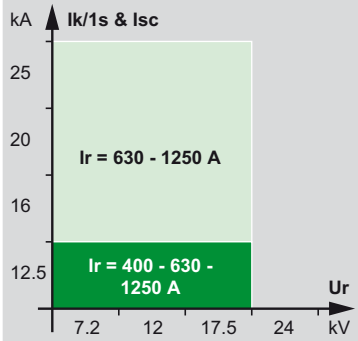
DMV-S
Single-isolation circuit breaker unit
with independent protection

DE53543



Electrical characteristics

DE59227



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

- three CTs
- Sepam series 20 programmable electronic unit

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

- 3 CR sensors for VIP relay
- VIP protection relay
- connection pads for dry-type cables
- downstream earthing switch
25 kA rms making capacity

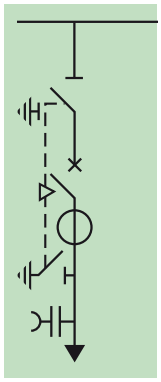
Optional accessories:

- **cubicle:**
  - ☐ auxiliary contacts on the disconnector
  - ☐ three voltage transformers
  - ☐ key-type interlocks
  - ☐ 50 W heating element
  - ☐ connection enclosure for cabling from above
  - ☐ 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
- **circuit breaker:**
  - ☐ motor for operating mechanism
  - ☐ release units (coil)
  - ☐ operation counter on manual operating mechanism

Functional units selection
Vacuum type circuit breaker protection

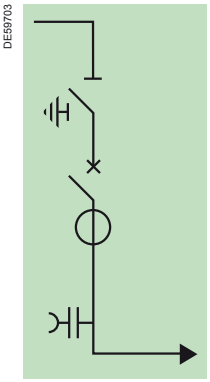
DMVL-A
Single-isolation disconnectable circuit breaker unit

DE53535



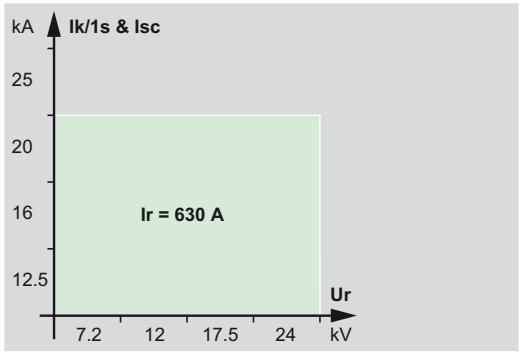
DMVL-D
Single-isolation disconnectable circuit breaker unit
Outgoing line on right

DE59703

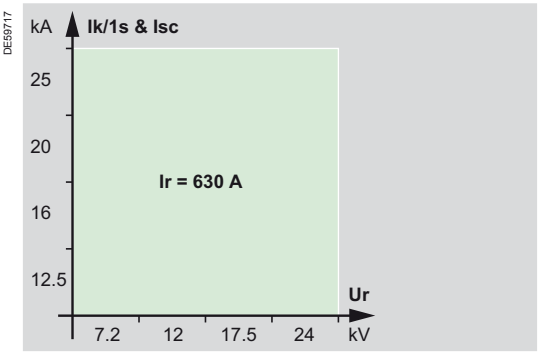


Electrical characteristics

DE59228



DE59717



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 breaker
- 3 CTs
- connection pads for dry-type cables

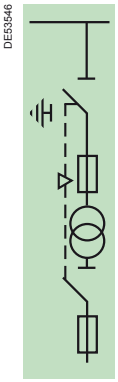
- downstream earthing switch 2 kA rms making capacity

Optional accessories:

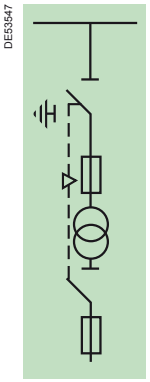
- **cubicle:**
  - auxiliary contacts on the disconnector
  - three voltage transformers
  - key-type interlocks
  - 50 W heating element
  - connection enclosure for cabling from above
  - 1250 A three-phase upper busbars at Ir 630 A
  - 630 A three-phase upper busbars for severe operating conditions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

Functional units selection
MV metering

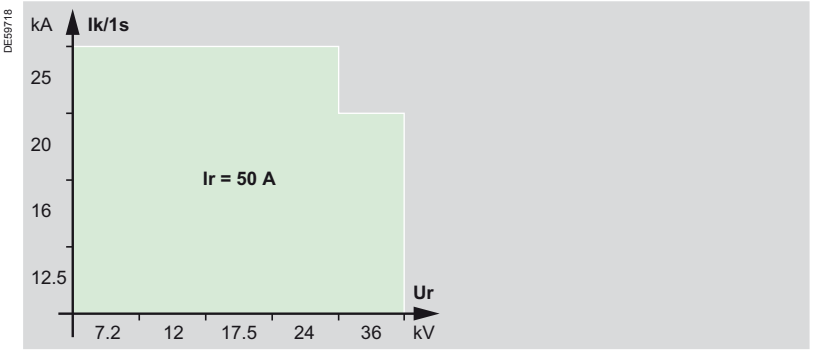
CM
Voltage transformers unit for network with earthed neutral system



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 36 kV

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

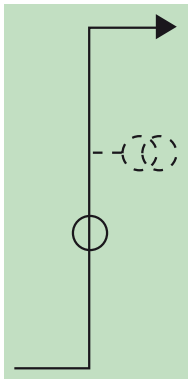
Optional accessories:

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

Functional units selection
MV metering

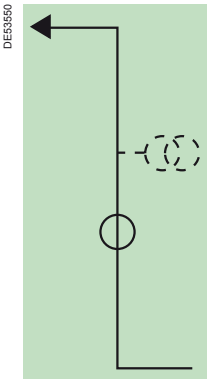
GBC-A
Current and/or voltage measurements unit
Outgoing line on right

DE53549



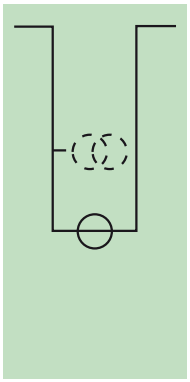
GBC-A
Current and/or voltage measurements unit
Outgoing line on left

DE53550



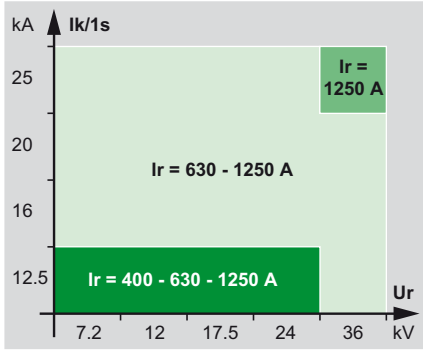
GBC-B
Current and/or voltage measurements unit

DE53551



Electrical characteristics

DE59709



Basic equipment:

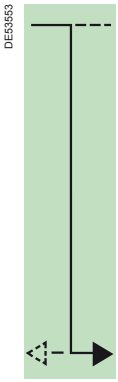
- one to three CTs for 24 kV
- three CTs for 36 kV
- connection bars
- three-phase busbars
- 150 W heating element for 36 kV

Optional accessories:

- 1250 A three-phase upper busbars at Ir 630 A
- enlarged low-voltage control cabinet for 24 kV
- three voltage transformers (phase-to-earth) or two voltage transformers (phase-to-phase) for 24 kV
- 50 W heating element for 24 kV

Functional units selection
Casings

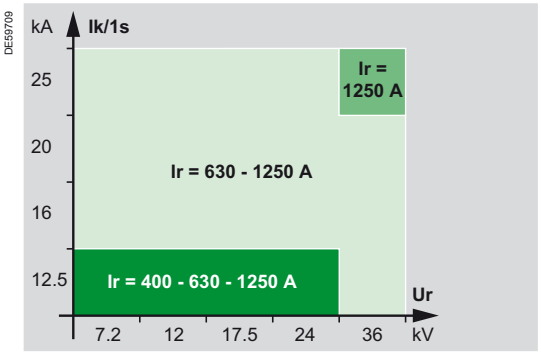
GBM
Connection unit
Outgoing line right or left

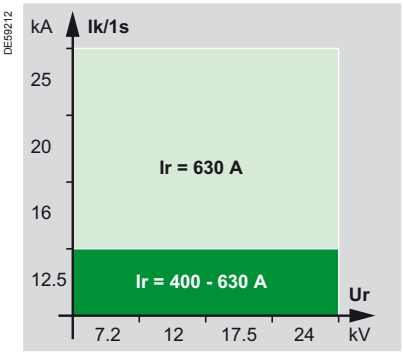


GEM
Extension unit VM6/SM6

GIM
Intermediate bus unit

Electrical characteristics





Basic equipment:

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

- three-phase busbars

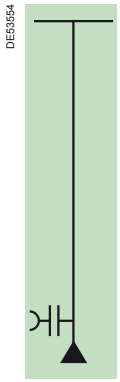
- metallic envelop
- three-phase busbars for 36 kV

Optional accessories:

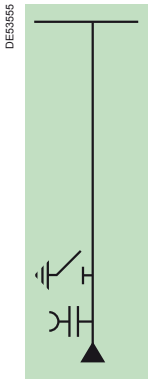
- 1250 A three-phase upper busbars at Ir 630 A
- enlarged low-voltage control cabinet for 24 kV
- cable connection by the top for 36 kV (no internal arc withstand if selected)

Functional units selection
Casings

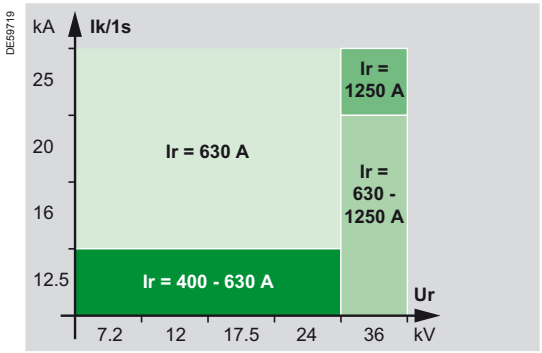
GAM2
Incoming-cable-connection unit

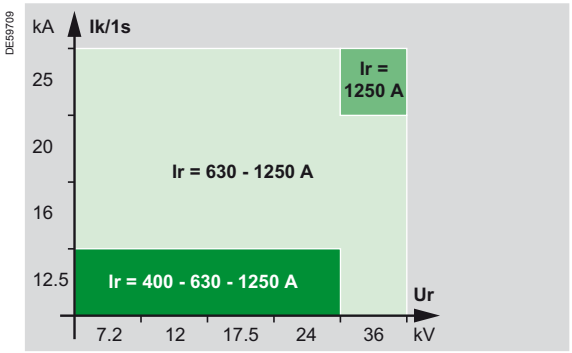


GAM
Incoming-cable-connection unit



Electrical characteristics





Basic equipment:

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

- downstream earthing switch 25 kA rms making capacity
- operating mechanism CC for 24 kV
- operating mechanism CS1 for 36 kV

Optional accessories:

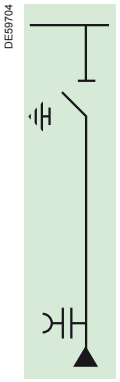
- fault indicator
- digital ammeter
- 1250 A three-phase upper busbars at Ir 630 A
- enlarged low-voltage control cabinet for 24 kV
- cable connection by the top for 24 kV (no internal arc withstand if selected)
- 50 W heating element for 24 kV

- surge arresters for 36 kV

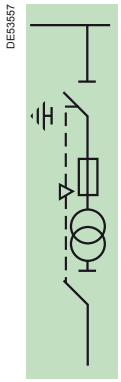
- auxiliary contacts
- key-type interlocks
- surge arresters for 24 kV

Functional units selection
Other functions

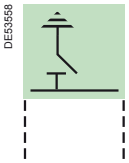
SM
Disconnector unit



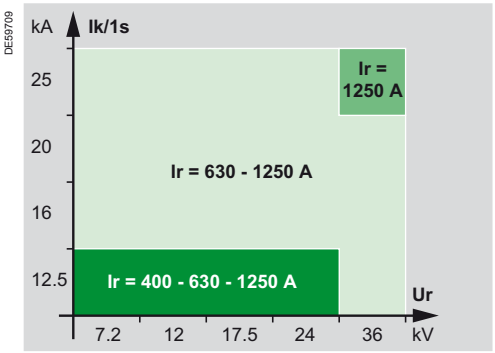
TM
MV/LV transformer unit
for auxiliaries

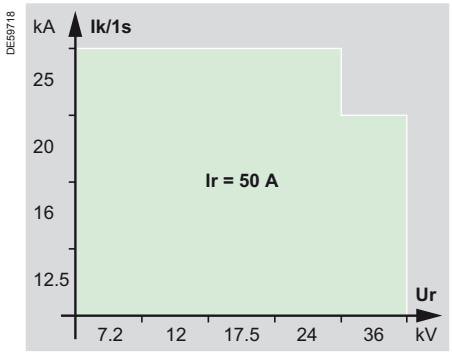


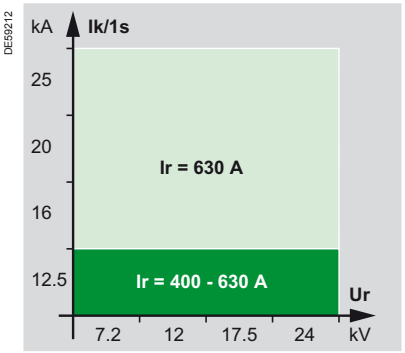
EMB
Busbars earthing
compartment unit



Electrical characteristics







Basic equipment:

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

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

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

- earthing switch
- connection bars
- operating mechanism CIT
- installation on 630 A IM 375 mm or DM1-A units (except additional enclosure or connection enclosure for cabling from above)
- require an key-type interlocks adapted to the switchboard network

Optional accessories:

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

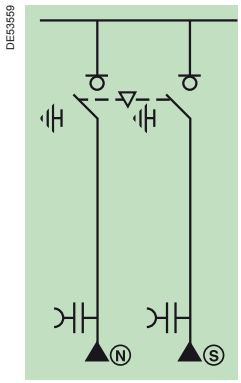
- digital ammeter for 24 kV

- mechanical indication system and auxiliary contacts for blown fuses

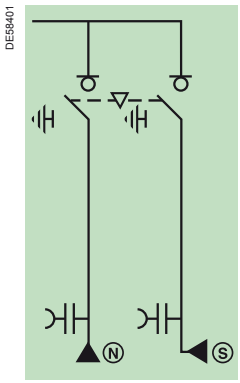
- auxiliary contacts

Functional units selection
Automatic Transfer System for 24 kV

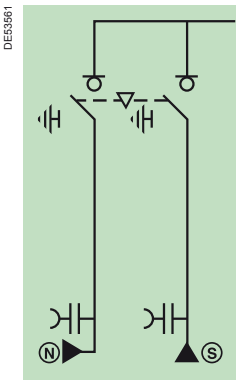
NSM-cables
Cables power supply for
main incoming line (N)
and standby line (S)



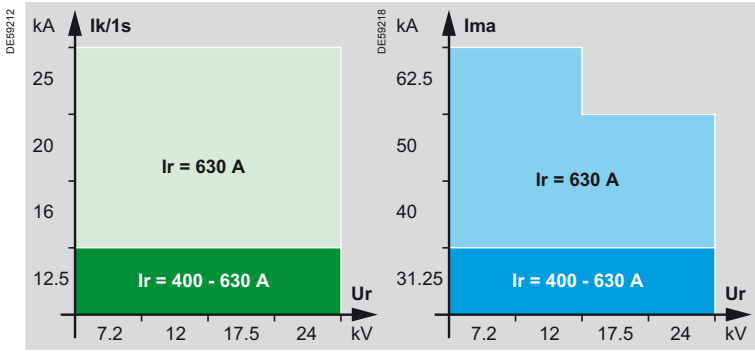
NSM-busbars
Cables power supply for
main incoming line on left (N) and
busbars for standby line (S) on right



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



Electrical characteristics



Basic equipment:

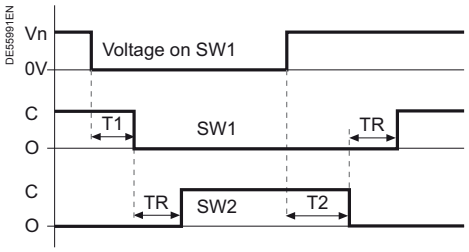
- switches and earthing switches
- three-phase busbars
- connection pads for dry-type cables
- voltage presence indicator
- mechanical interlocking
- motorised operating mechanism CI2 with open/close coils
- additional enclosure
- automatic-control equipment (T200 S)

Optional accessories:

- 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

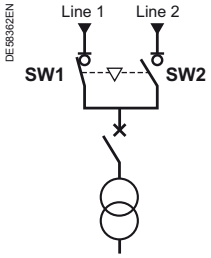
Automatic Transfer System
With NSM unit for 24 kV

Network back up



TR: transfer switch response time (< 180 ms - depending on switchgear).
■ Setting of time delay before switching: configurable from 0.1 s to **2 s** (T1) with step of 100 ms.
■ Setting of time delay for return to the initial state: configurable from 5 s to **120 s** (T2) with step of 5 s.
■ Transfer switch configurable with SW1➡SW2 or SW2➡SW1.

Note: **in bold** = default configuration.



Transfer switch (ACO 1/2)

ACO: Automatic Change-Over

The transfer switch automatic control system gives automatic control and management of sources in the MV secondary distribution network with voltage presence detectors.

Operating modes

Operating mode is selected using the Easergy T200 S configuration tool.

■ **Semi-Auto mode, SW1 ⟷ SW2**

When the voltage disappears on the channel in service, the automatic control switches to the other channel after a time delay T1. The automatic control does not switch back, unless there is a voltage break on the new channel in service.

■ **Mode SW1 ➡ SW2, (SW2 ➡ SW1)**

The automatic control only switches once from channel 1 or 2 to the back up channel.

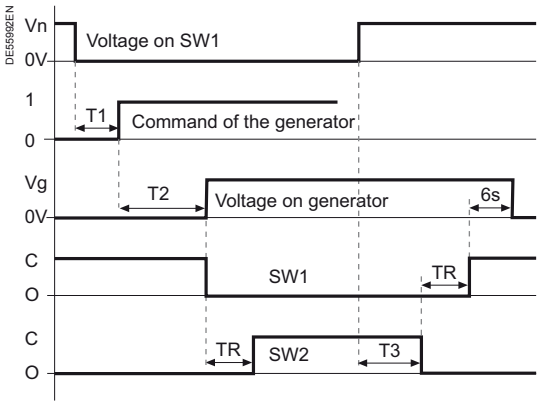
■ **Mode Auto-SW1 or Auto-SW2**

Channel 1 or 2 is priority if its MV voltage is OK. After switching to the back up channel, the mode switches back to the priority channel if the MV voltage on this channel is OK for a period T2.

■ **Transfer time SW1 ➡ SW2 for all modes**

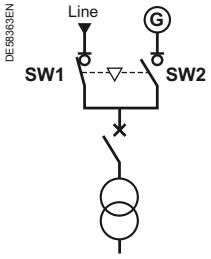
It is between 0.34 s to 2.24 s depending on the set values.

Generator back up



TR: transfer switch response time (< 180 ms - depending on switchgear).
■ Setting of time delay before switching to the generator: configurable from 1 s to **15 s** (T1) with step of 1 s.
■ Start up of the generator (T2), depending on kind of generator, not configurable (time max. to wait: 30 s).
■ Switching when the generator voltage is present.
■ Setting of time delay for return to the initial state: configurable from 60 s to **120 s** with step of 5 s (T3).
■ Stopping the generator 6 s after switching.

Note: **in bold** = default configuration.



Switching sequence

■ **Switching takes place if the following conditions are fulfilled:**
□ automatic control on
□ SW1 open/SW2 closed or SW1 closed/SW2 open
□ “transfer locking” off
□ “earthing switch” on both channels off
□ MV voltage on the channel in service is absent
□ MV voltage on the other channel is present
□ no fault current.

■ **Switching back to the main channel in “AUTO” modes is executed if:**
□ the priority channel is open
□ the MV voltage on the priority channel is OK for a time period of T2.

The closing order on the back up channel is given after confirming the opening of the channel in service.

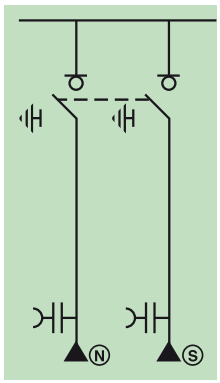
Source transfer locking

A digital input prohibits orders from the local control panel, the automatic control systems and the remote control supervisor.
This input is generally connected to the downstream circuit breaker.

Functional units selection
Automatic Transfer System for 36 kV

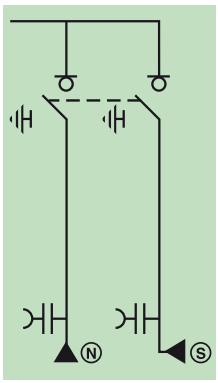
NSM-cables
Cables power supply for
main incoming line (N)
and standby line (S)

DE59706



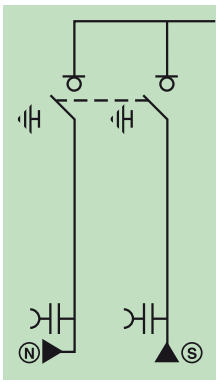
NSM-busbars
Cables power supply for
main incoming line on left (N) and
busbars for standby line (S) on right

DE59707



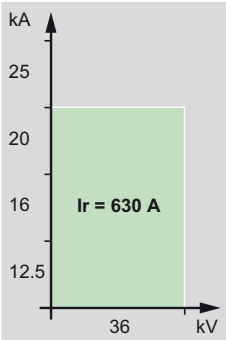
NSM-busbars
Busbars power supply for
main incoming line on left (N) and
cables for standby line (S) on right

DE59708



Electrical characteristics

DE59720



Basic equipment:

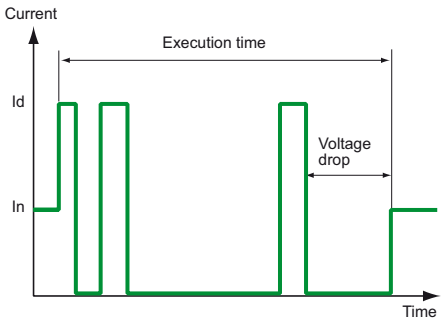
- switches and earthing switches
- three-phase busbars 630 A
- connection pads for dry-type cables
- voltage presence indicator
- mechanical interlocking
- motorised operating mechanism CI2 with shunt trips
- additional enclosure
- automatic-control equipment
- 150 W heating element

Optional accessories:

- auxiliary contacts
- key-type interlocks
- telecontrol

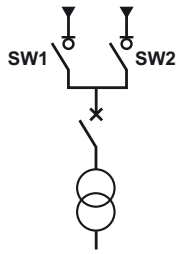
Automatic Transfer System
With NSM unit for 36 kV

DE59726EN

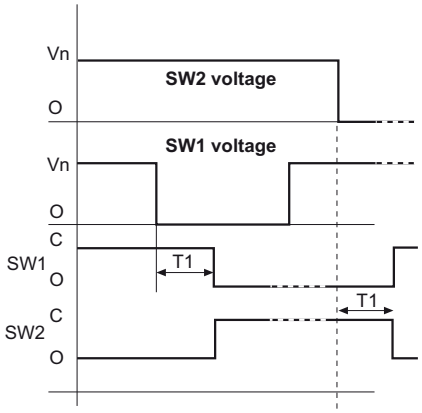


■ Configurable parameters:
□ Number of faults: from 1 to 4
□ Execution time: from 20 s to 4 mins configurable in 5 s steps
□ Automation system valid/invalid.

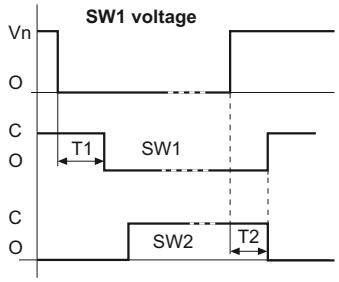
DE56654



MT10013EN



Semi-auto operating mode



Auto-SW1 operating mode

Configurable parameters:
■ Operating mode: semi-auto, auto SW1, auto SW2
■ T1: 1 to 60 s in 1 s steps
■ T2: 10 to 60 s in 1 s steps
■ Automation system valid/invalid
■ Motorisation type:
□ Standard (command time 2.2 s)
□ CI2 (command time 100 ms).

Easergy T200 I 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.

Transfer switch (ACO 1/2)

ACO: Automatic Change-Over

The transfer switch automation system allows for the automatic control and management of power supply sources in the MV secondary distribution network. It is linked to voltage presence detectors **VD23**.

Operating modes

The operating mode is selected via the Easergy T200 I configurator.

Semi-auto mode, SW1 < > SW2
When the voltage is lost on the channel that is in use, the automation system switches to the other channel after a time delay T1. The automation system returns no data unless there is a loss of voltage on the new channel.

Semi-auto mode SW1 > SW2, (SW2 > SW1)
The automation system only switches from channel 1 or 2 to the back-up channel.

Auto-SW1 or Auto-SW2 mode
After switching channels, the automation system switches back to the priority channel if the MV supply on that channel is restored.

Switching sequence

Switching takes place if the following conditions are met:
■ Automation system switched on
■ SW1 open/SW2 closed or SW1 closed/SW2 open
■ No “transfer interlock”
■ No “earthing switch” on the 2 channels
■ MV supply lost on the channel in use
■ MV supply present on the other channel
■ No fault current.

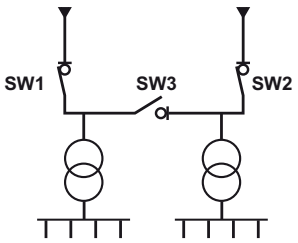
The automation system switches back to the main channel in “AUTO” mode if:
■ The priority channel is open
■ The MV supply on the priority channel is correct for the time delay T2.
The close order on the back-up channel is given once the opening of the channel in use is reported.

Source transfer interlock

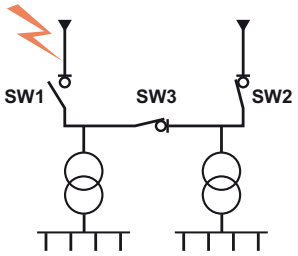
A digital input can be used to prohibit the issuing of orders from the local operator panel, the automation system and the remote control supervisor.
This input is generally connected to the downstream circuit breaker.

Automatic Transfer System
Bus tie coupling (BTA 2/3)
for 24 kV and 36 kV

DE56655

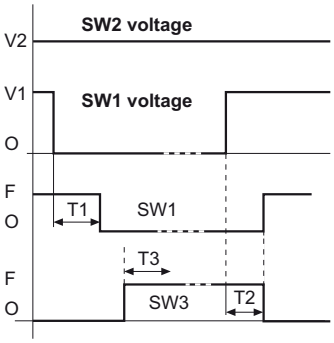


"Normal" position



Active coupling

DE56656EN



Configurable parameters:
- Operating mode
- 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.

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 voltage presence detectors and the fault current detection function on the busbar incoming lines.

Operating mode

Operating mode is selected using Easergy T200 I configuration tool.

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 digital input can be used to prohibit the issuing of orders from the local operator panel, the automation system and the remote control supervisor.
This input is generally connected to the downstream circuit breaker.

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.

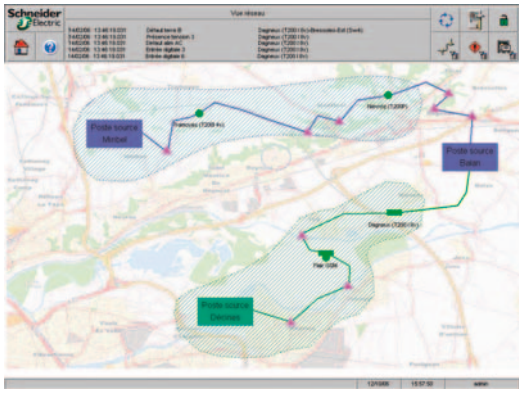
Network remote control and monitoring

Continuity of service guaranteed by an overall telecontrol offer

Schneider Electric offers you a complete solution, including:

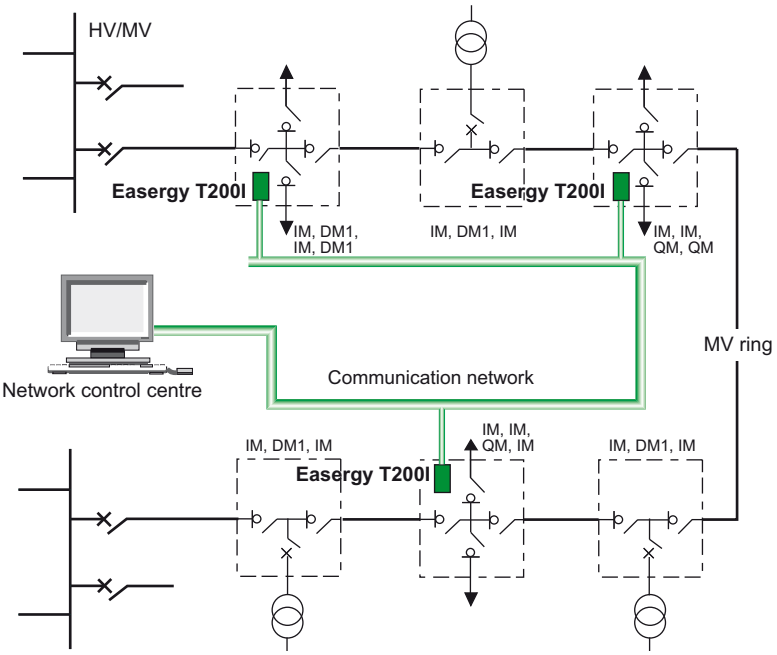
- the Easergy T200 I telecontrol interface,
- SM6 switchgear that is adapted for telecontrol,
- the Easergy L500 SCADA system.

PE56312

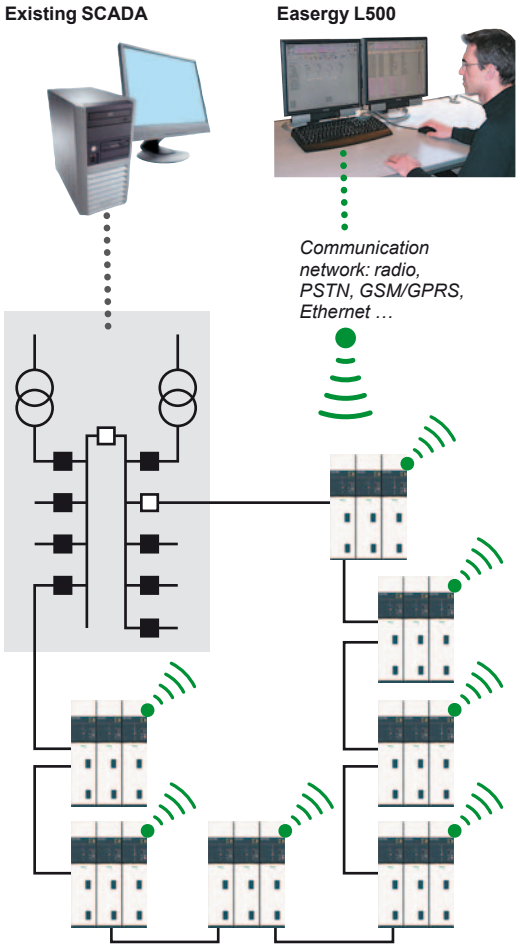


L500 network monitoring screen

DE53729EN



DE58403



SM6 range, more than ready

SM6 switchgear is perfectly adapted to the telecontrol context, thanks to options such as:

- LV control cabinet including T200 I,
- motorized operating mechanism,
- auxiliary fault and position indication contacts,
- current sensors for fault detection.

Easergy L500, a low cost solution to immediately improve your SAIDI*

** SAIDI: system average interruption duration index*

Easergy L500 is a SCADA providing all the functions needed to operate the MV network in real time

- Pre-configured with Easergy range products for monitoring and control of MV networks:
  - MV/LV substations equipped with T200 I or Flair 200C
  - overhead LBS equipped with T200 P
  - overhead line equipped with Flite 116/G200
- Broad range of transmission supports: Radio, GSM, GPRS, PSTN, LL, FO.

Advantages

- Simple implementation:
  - one to two weeks only for 20 MV/LV units
  - configuration, training and handling within a few days
- Simple and fast evolutions by operations managers
- Short return on investment
- Service quality and operations rapidly improved.

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					Circuit breaker	
	CIT	CI1	CI2	CS	CC	RI	P2
IM, IMB	■	□	□				
IMC	■		□				
PM	■						
QM		■	□				
QMC, QMB		■					
CM, CM2, CRM, CVM				■			
DM1-A, DM1-D, DM1-S, DM1-Z, DM2, DMVL-A, DMVL-D				■		■	
DM1-A(*), DM1-W, DM2-W				■	■	■	
DMV-A, DMV-D, DMV-S	■						■
NSM-cables, NSM-busbars			■				
GAM					■		
SM, TM				■			
EMB	■						

■ Provided as standard
□ Other possibility
(*) 1250 A version

Operating mechanism types	CIT		CI1		CI2			CS1	
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

61029N

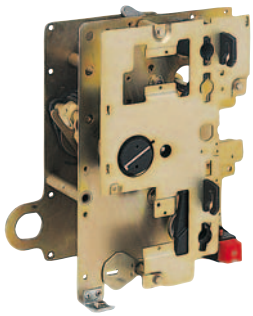
Double-function operating mechanism CIT

■ **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**

(*) Included with the motor option

Operating mechanisms

61030N

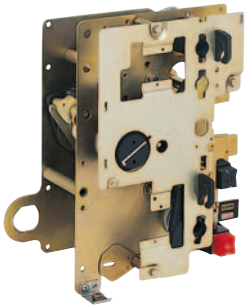


Double-function operating mechanism CI1

■ **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 to 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,
□ undervoltage for unit QM.
■ **Motor option**

(*) Included with the motor option.

61031N

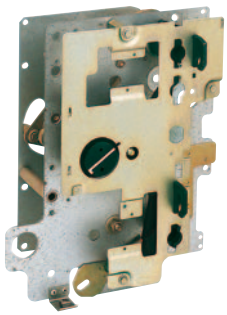


Double-function operating mechanism CI2

■ **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**

(*) Included with the motor option.

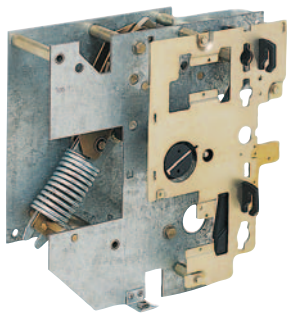
61032N



Double-function operating mechanism CS

■ **Switch 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 and CRM without VT,
□ 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 and CRM without VT,
□ disconnector (1 O + 2 C) for units CM, CM2, TM, DM1-A, DM1-D, DM2, DMVL-A, DMVL-D, CVM and CRM with VT.
■ **Mechanical indications**
Fuses blown in units CM, CM2 and TM.

61033N



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).

Operating mechanisms

PE57163

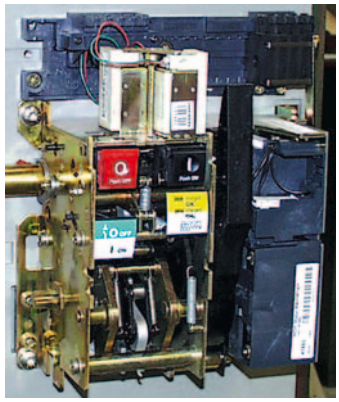
Single-function operating mechanism for the SF circuit breakers 24 kV and 36 kV and Evolis 24 kV lateral

■ **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

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

61035N

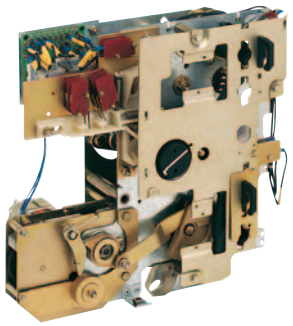


P2 stored energy operating mechanism for the Evolis circuit breaker 17.5 kV frontal

■ **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,
□ undervoltage.
■ **Closing release**
□ shunt trip
■ **Motor option** (option and installation at a later date possible).

Auxiliaries

61038N



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

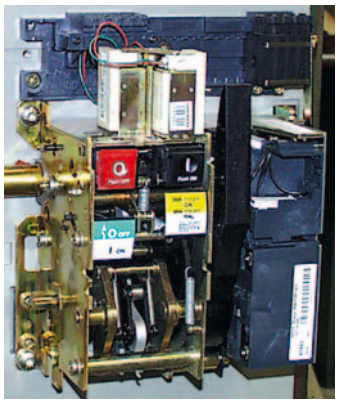
Operating mechanism RI may be equipped with the motor option for the recharging function.

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

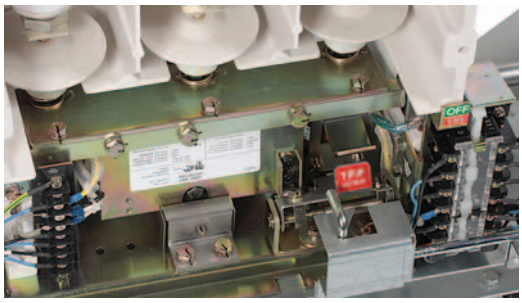
61035N



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



Auxiliaires 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 (optional 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 24 kV

Synthesis table by unit

Units	QMC	CRM	CVM	DM1-A	DM1-D DMVL-D	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			■	■		■									

61040N

Transformer ARJP1/N2F

- characteristics according to IEC standard 60044-1
- 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							

61040N

Transformer ARJP1/N2F

- characteristics according to IEC standard 60044-1
- 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.*

61041N

Transformer ARM3/N2F

- characteristics according to IEC standard 60044-1
- 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 60044-1
- 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		

Current transformers for 24 kV

61042N

Transformer ARJP2/N2F

- characteristics according to IEC standard 60044-1
- 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

61044N

Transformer ARJP3/N2F

- characteristics according to IEC standard 60044-1
- 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 36 kV

PE57222

Current transformer ARM6T

For units DM1-A, DM1-D, DM1-W, DM2, DM2-W, IMC, GBC-A, GBC-B

Transformer ARM6T/N1 or N2

- double primary
- 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

PE57162

Low Power Current Transformer (LPCT)

For units DM1-A, DM1-W

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 24 kV

Synthesis table by unit

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

61045N

Transformer VRQ2-n/S1 (phase-to-earth) 50 or 60 Hz
■ characteristics according to IEC standard 60044-2.

Rated voltage (kV)	24			
Primary voltage (kV)	10/√3	15/√3	15-20/√3	20/√3
Secondary voltage (V)	100/√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 60044-2.

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

61046N

Transformer VRC2/S1 (phase-to-phase) 50 or 60 Hz
■ characteristics according to IEC standard 60044-2.

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		

PE55648

Transformer VRM3-n/S2 (phase-to-earth and protected by fuses 0.3 A) 50 or 60 Hz
■ characteristics according to IEC standard 60044-2.

	Rated voltage (kV)	12	17.5	24
	Primary voltage (kV)	10/√3	15/√3	20/√3
	Secondary voltage (V)	100/√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		

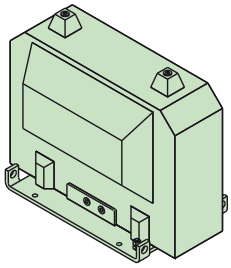
Voltage transformers for 24 kV

DE52402

Transformer VRC1/S1 (phase-to-phase) 50 or 60 Hz
■ characteristics according to IEC standard 60044-2.

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				

DE53562

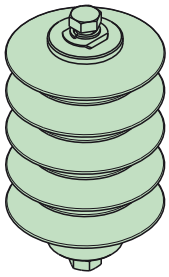


Transformer VCT24 (phase-to-phase) 50 or 60 Hz

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.

DE58408



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 36 kV

PE57223

Voltage transformer VRF3

PE57224

Voltage transformer VRC3

For units CM, GBC-A, GBC-B

Transformer VRF3n/S2 (phase-to-earth)

- single primary winding
- single secondary

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

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	

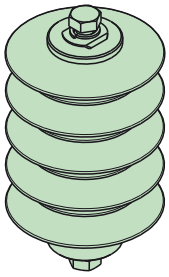
For units TM

Transformer VRC3/S1 (phase-to-phase)

- single primary winding
- single secondary

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

DE58408



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 CRM units

The color code is linked to the rated voltage of the fuse.

Starting current (A) Id/In = 6	Starting time (s) 5		10		20		Maximum service voltage (kV)
	Number of starts per hour 6	12	6	12	6	12	
1410	250						
1290	250	250	250				
1140	250	250	250	250	250		
1030	250	250	250	250	250	250	3.3
890	250	250	250	250	250	250	
790	200	250	250	250	250	250	
710	200	200	200	250	250	250	
640	200	200	200	200	200	250	
610	200	200	200	200	200	200	6.6
540	160	200	200	200	200	200	
480	160	160	160	200	200	200	
440	160	160	160	160	160	200	
310	160	160	160	160	160	160	
280	125	160	160	160	160	160	
250	125	125	125	160	160	160	
240	125	125	125	125	125	160	
230	125	125	125	125	125	125	
210	100	125	125	125	125	125	
180	100	100	100	100	100	125	
170	100	100	100	100	100	100	11

Selection of fuses for CVM units

Service voltage (kV)	Starting current (A) Id = 6 x Ie	Rated operational current (continous duty) (A) Ie	Starting time (s) 5		10		30	
			Number of starts per hour 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


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.
Please consult us for overloads and operation over 40°C for France Transfo oil immersed type transformers.

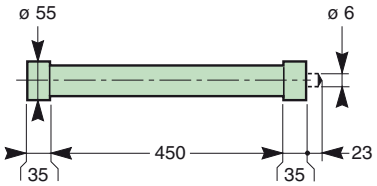
Type of fuse	Service voltage (kV)	Transformer rating (kVA) 25	50	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	Rated voltage (kV)
Solefuse (UTE NFC standards 13.100. 64.210)																			
	5.5	6.3	16	31.5	31.5	63	63	63	63	63									**7.2**
	10	6.3	6.3	16	16	31.5	31.5	31.5	63	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.

Fuses dimensions

Solefuse (UTE standards)

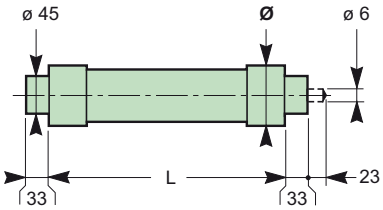
DE53563



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)

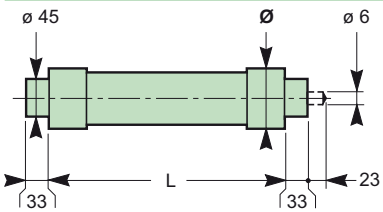
DE57467



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

DE57467



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.*

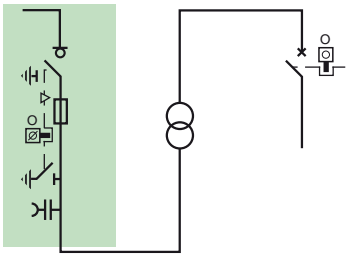
Functional interlocks

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				■	■				■			
PM, QM, QMB, QMC, DM1-A, DM1-D, DM1-W, DM1-Z, DM1-S, DMV-A, DMV-D, DMV-S, DMVL-A, DMVL-D	■	■	■				■					
CRM, CVM		■						■				
NSM				■					■			
GAM						■	■					■
SM										■	■	
DM2, DM2-W							■					

DE53565
A1 type

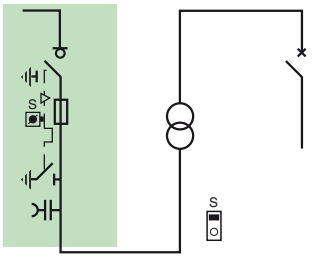


Key-type interlocks

Outgoing units

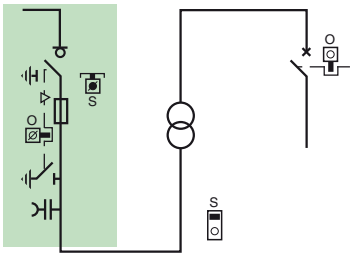
Aim:
■ to prevent the closing of the earthing switch on a transformer protection unit unless the LV circuit breaker is locked in “open” or “disconnected” position.

DE53566
C1 type



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

DE53567
C4 type



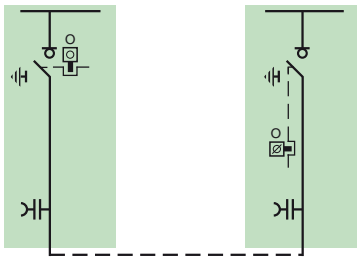
■ to prevent the closing of the earthing switch on a transformer protection unit unless the LV circuit breaker is locked in “open” or “disconnected” position.
■ to prevent the access to the transformer if the earthing switch for transformer protection has not first been closed.

MT20240EN
Legend for key-type interlocks:

Interlocks

DE53568

A3 type



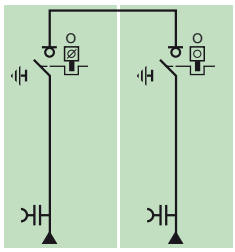
Ring units

Aim:

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

DE53569

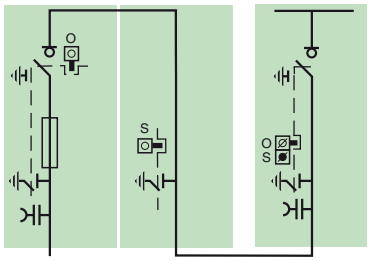
A4 type



■ to prevent the simultaneous closing of two switches.

DE53570

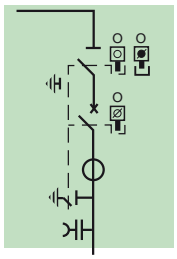
A5 type



■ 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.

DE53571

50 type



Prevents

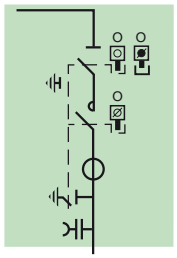
■ on-load switching of the disconnectors.

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).

DE59203

Type 52



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

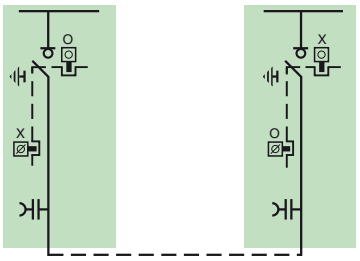
Legend for key-type interlocks:

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

Interlocks

DE53572

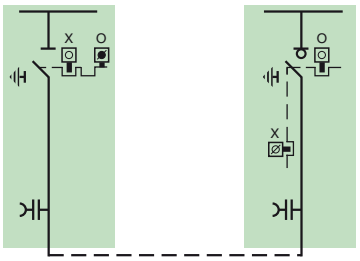
P1 type



■ to prevent the closing of an earthing switch if the switch of the other unit has not been locked in the “open” position.

DE53573

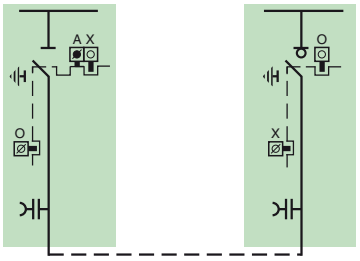
P2 type



■ 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

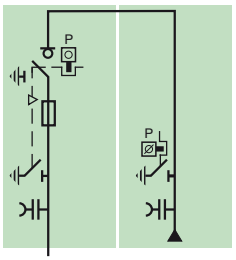
P3 type



■ 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

P5 type



■ to prevent the closing of the earthing switch of the incoming unit unless the disconnector and the switch is locked “open”.

MT20240EN

Legend for key-type interlocks:

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

Contents

Connections with dry-type cables for 24 kV
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.

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.

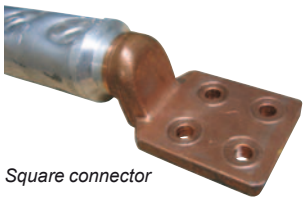
The maximum admissible cable cross section:
- 630 mm^2 for 1250 A incomer and feeder cubicles
- 240 mm^2 for 400-630 A incomer and feeder cubicles
- 120 mm^2 for contactor cubicles
- 95 mm^2 for transformer protection cubicles with fuses.

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.

PE50775

Round connector

PE50776



Square connector

Dry-type single-core cable

Short inner end, cold fitted

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

Three core, dry cable

Short inner end, cold fitted

Performance	Cable end terminal type	X-section mm^2	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.*

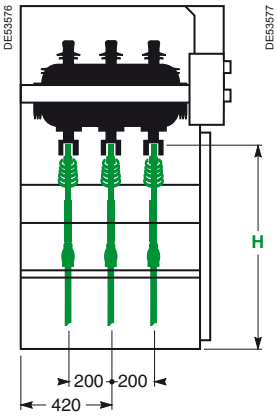
Cable-connection from below for 24 kV

Cable positions

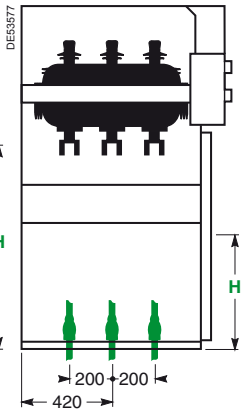
Cable-connection height H measured from floor (mm)

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

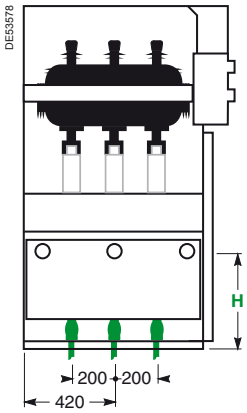
IM, NSM-cables, NSM-busbars, SM



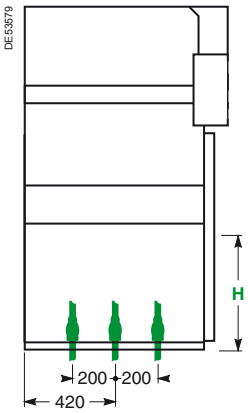
IMC, PM, QM, QMC



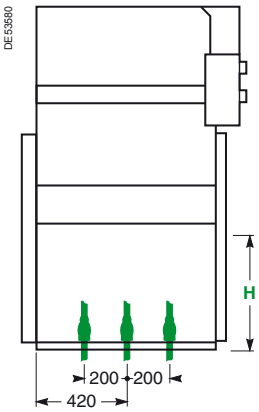
CRM, CVM



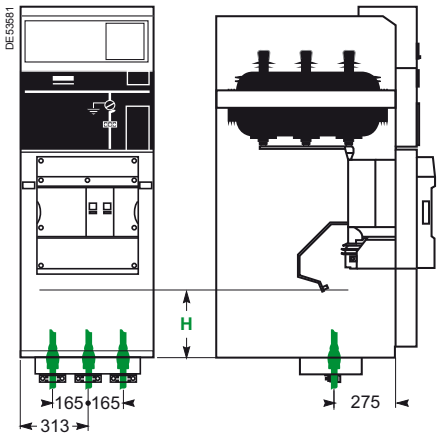
GAM2



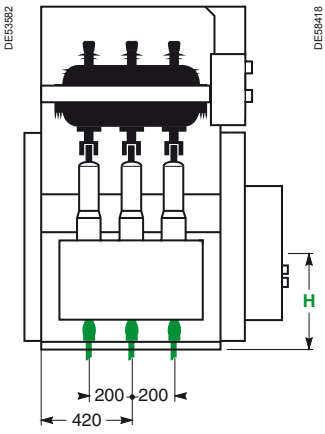
GAM



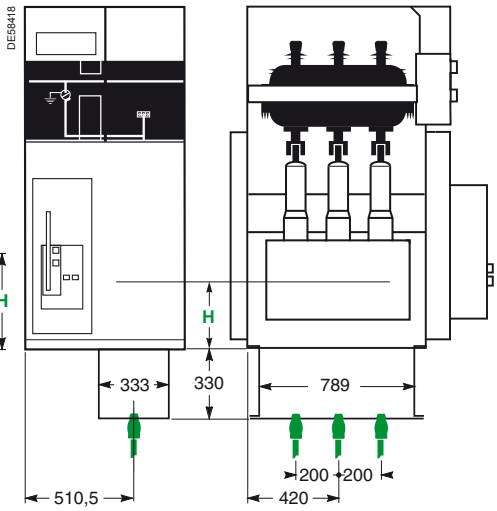
DMV-A, DMV-S (630 A)



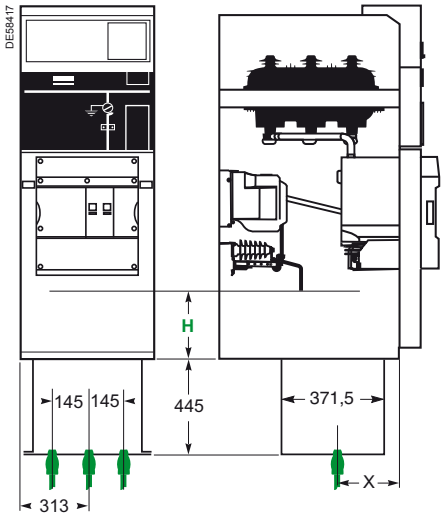
DM1-A, DM1-S, DMVL-A DM1-W (630 A)



DM1-A, DM1-W (1250 A)



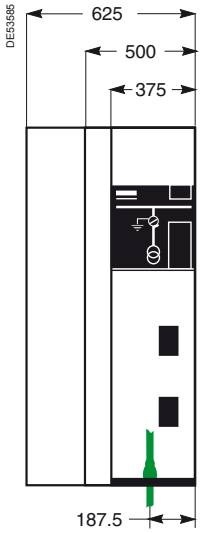
DMV-A (1250 A)



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

Cable-connection from below for 24 kV

Trenches depth



Cabling from below (all units)

■ **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, DMV-S	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

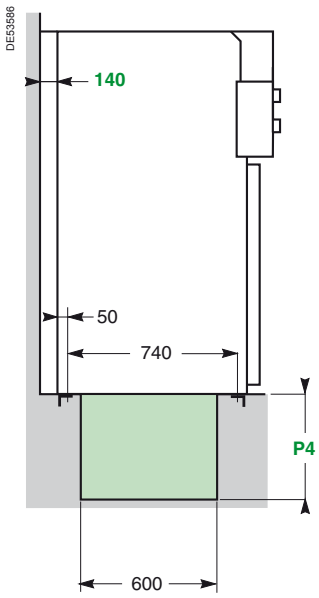
(1) Must be installed with a 100 mm depth metal pan.
(2) Must be installed with a 350 mm depth metal pan, in a floor void.
(3) Mounting with a 445 mm depth metal pan compulsory in a floor void.

***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.*

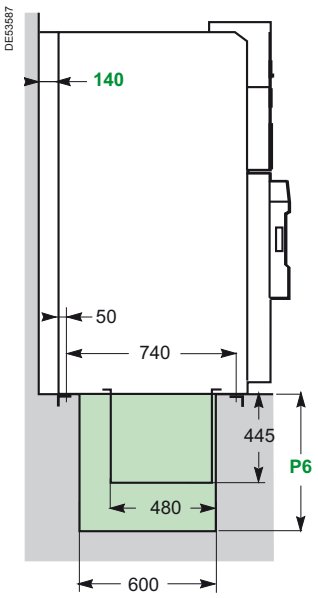
Cable trench drawings

1250 A units (represented without switchboard side panels)

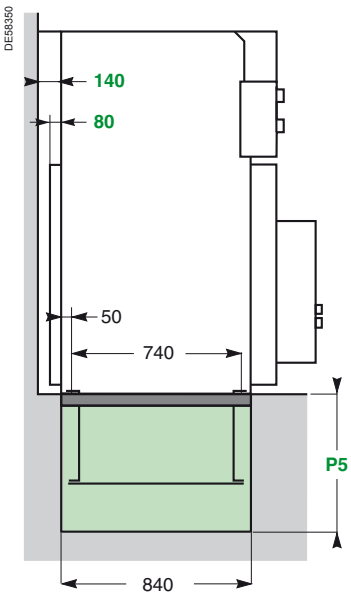
SM, GAM
For single and tri-core cables



DMV-A
For single and tri-core cables

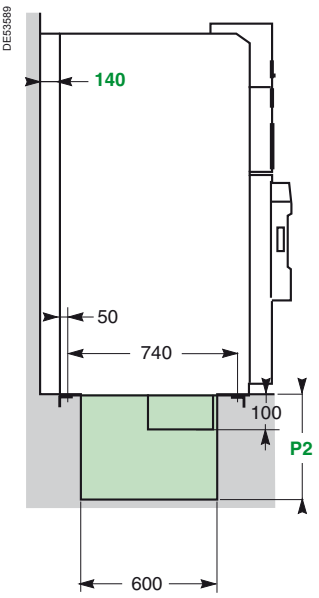


DM1-A, DM1-W
For single-core cables



630 A units

DMV-A, DMV-S
For single cables

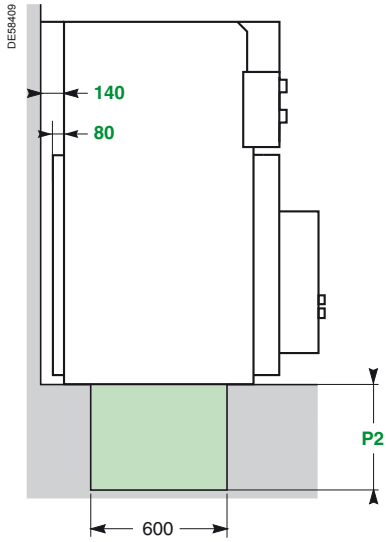


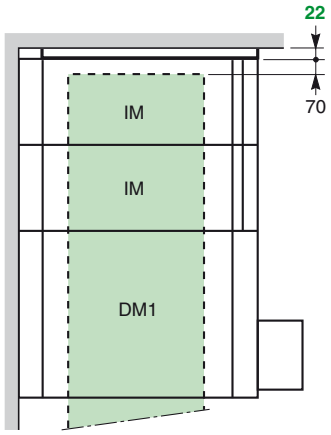
Cable-connection from below for 24 kV

Trench diagrams example

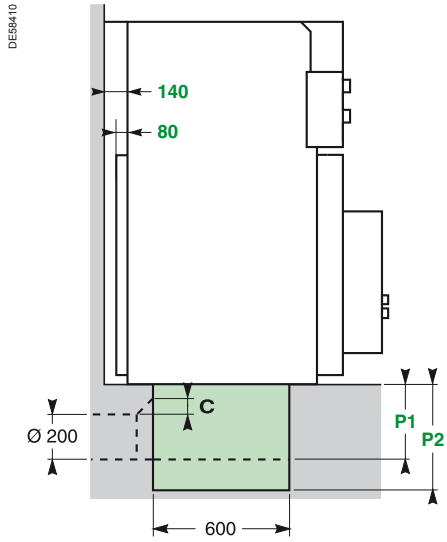
Units represented without switchboard side panels

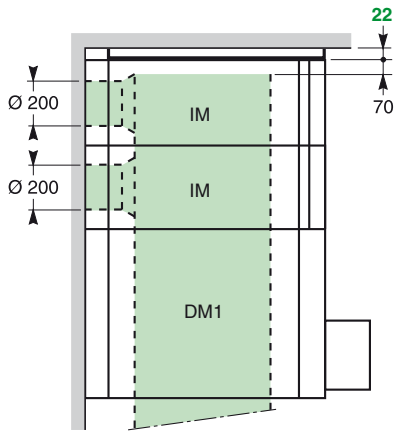
630 A units
Cable entry or exit
through right or left side



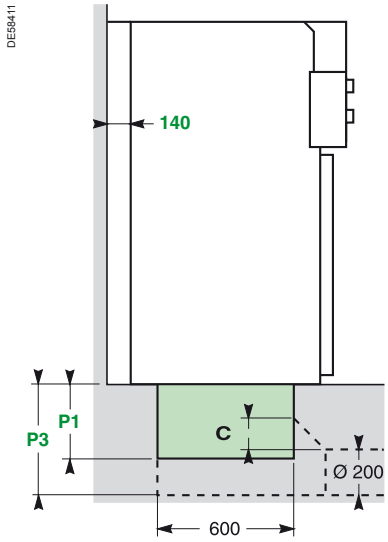


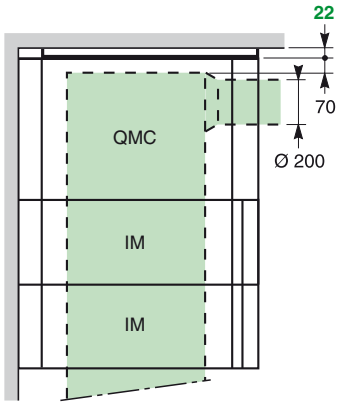
630 A units
Rear entry or exit
with conduits





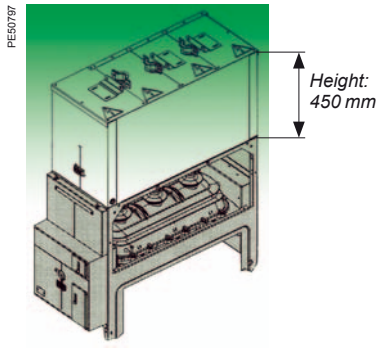
630 A units
Front entry or exit
with conduits





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.*



Cabling from above

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

Remark : *not available for internal arc IEC 62271-200 in busbar compartment.*

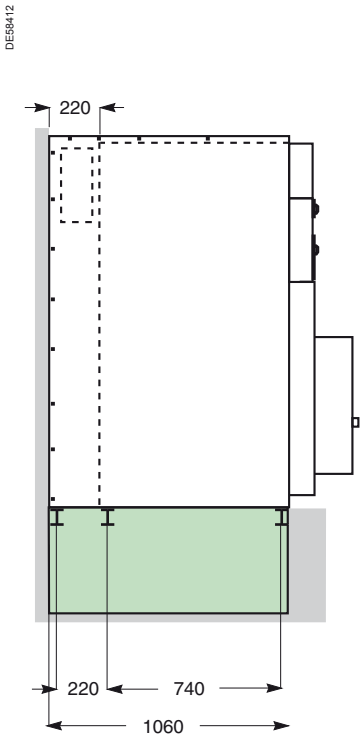
Cable-connection from below for 24 kV

Trench diagrams and floor void drawings enhanced example

For enhanced internal arc 16 kA 1 s cubicles

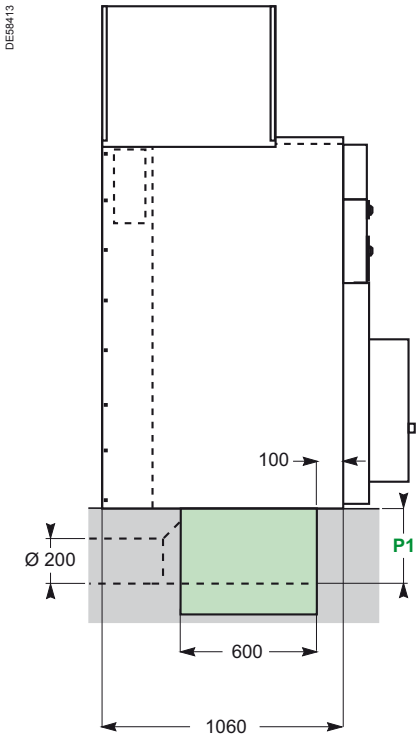
Installation with floor void

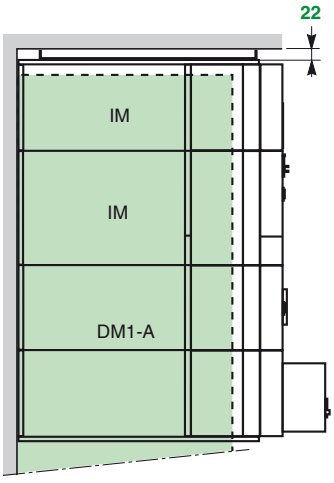
Downwards exhaust

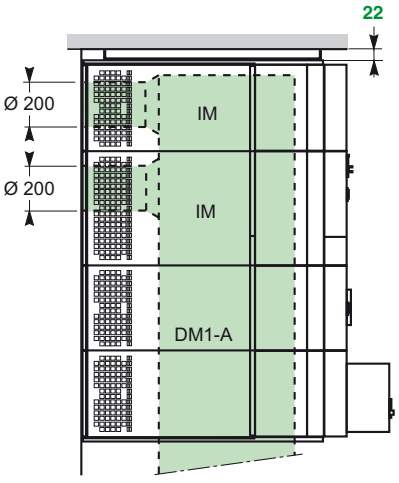


Installation with trench

Upwards exhaust







Note: *to evacuate gases through the bottom, the floor void volume must be over or equal to 2 m^3.*

Connections with dry-type cables for 36 kV
Selection table

Single-core cables		Units 630 A	
Cable-section (mm^2)	Bending radius (mm)	IM, IMC, QM, CM, CM2, PM, DM1-A, DM1-W, GAM, GAM2, SM, TM, NSM	
		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 400-630 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.

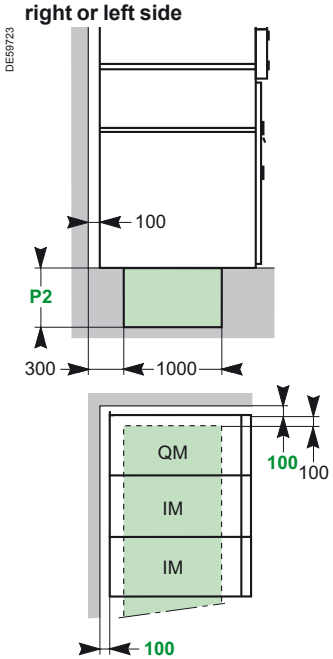
(*) Consult us for alu cable cross sections

Cabling from below

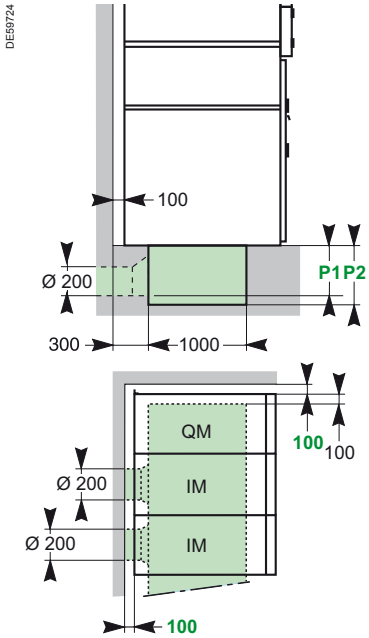
All units through trenches
■ the trench depth P is given in the table opposite for commonly used types of cables.

Trench diagrams

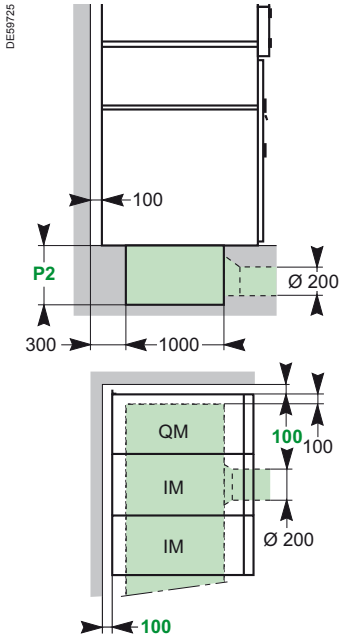
Cable entry or exit through right or left side



Rear entry or exit with conduits



Front entry or exit with conduits

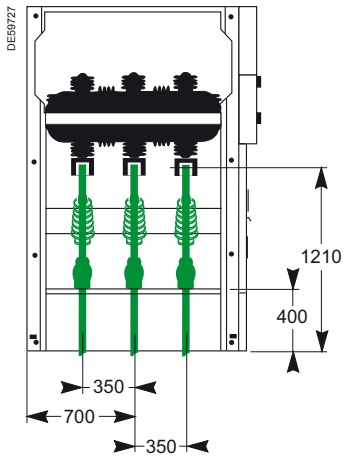


Cable-connection from below for 36 kV

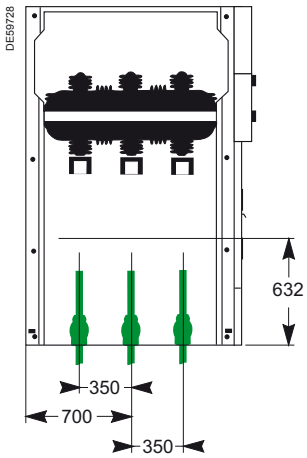
Cable positions

Side view

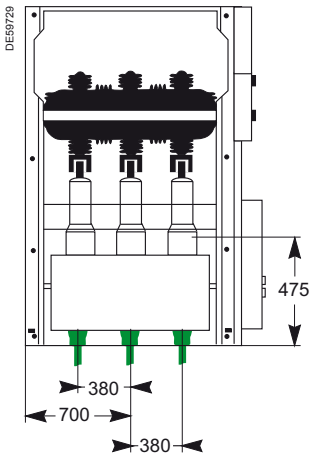
IM, SM units



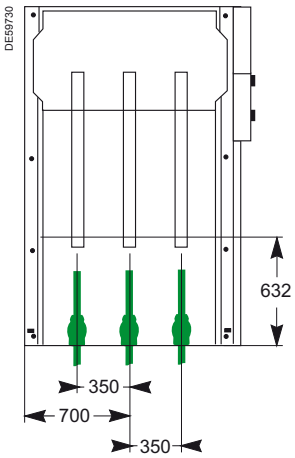
QM, PM units



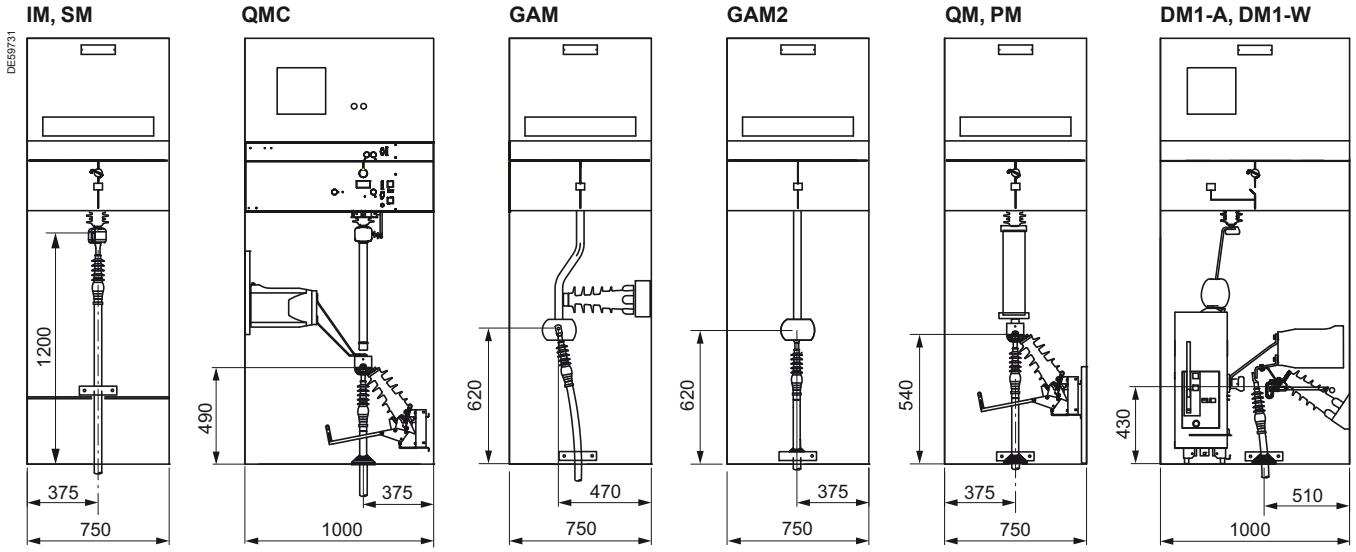
DM1-A, DM1-W units



GAM2 unit



Front view



Contents

Dimensions and weights for 24 kV

Dimensions and weights

Unit type	Height (mm)	Width (mm)	Depth (mm)	Weight (kg)
IM,IMB	1600 (1)	375/500	940	120/130
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	1600 (1)	750	1220	400
DM1-S	1600 (1)	750	1220	340
DMV-A, DMV-D	1695 (1)	625	940	340
DMV-S	1600 (1)	625	940	260
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:

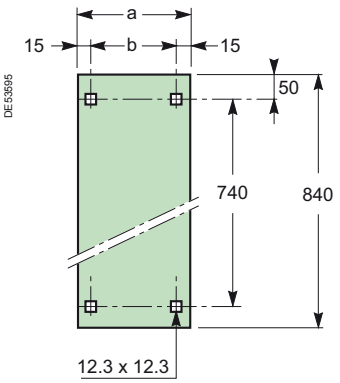
(1) 450 mm for low-voltage enclosures for control/monitoring and protection functions. To ensure uniform presentation, all units (except GIM and GEM) may be equipped with low-voltage enclosures.

(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.

Ground preparation

Units may be installed on ordinary concrete ground, with or without trenches depending on the type and cross-section of cables.



***Note:** in circuit-breaker or contactor units, fixing devices are installed on the side opposite the switchgear*

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.

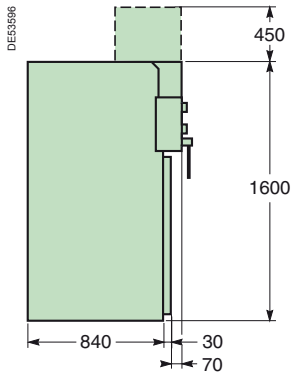
On the ground

- 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 as necessary.
- position of fixing holes b depends on the width a of units:

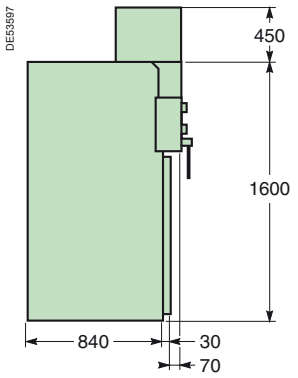
a (mm)	125	375	500	625	750
b (mm)	95	345	470	595	720

Units dimensions for 24 kV

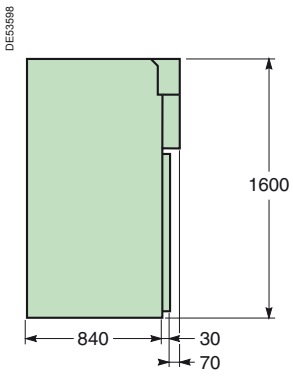
IM, IMB, PM, QM, QMB, SM, IMC, QMC, CM, CM2



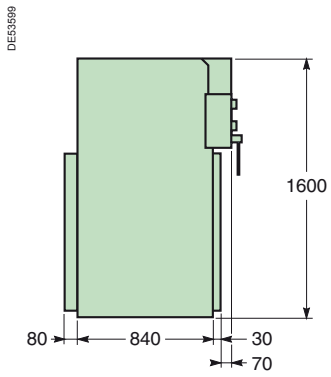
NSM-cables, NSM-busbars, CRM, CVM



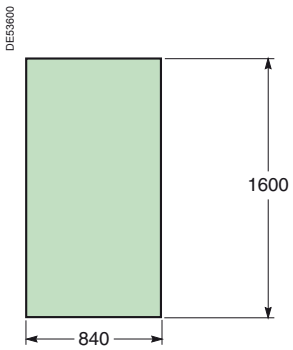
GBM, GAM2



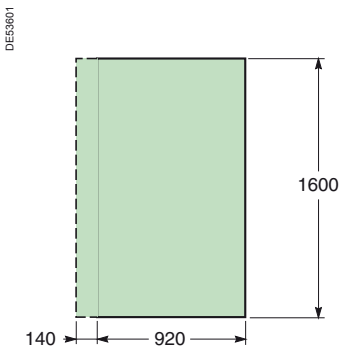
GAM



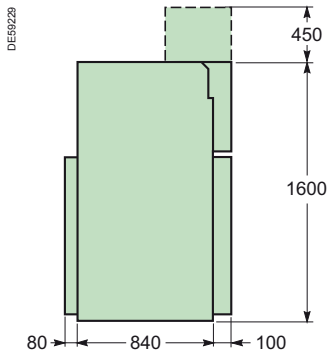
GIM



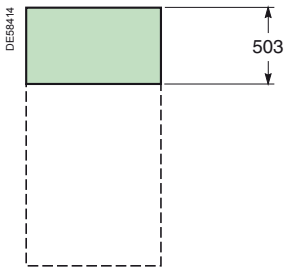
GEM



GBC-A, GBC-B

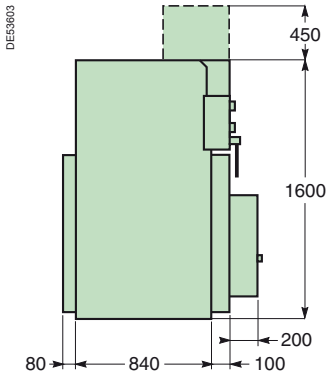


EMB

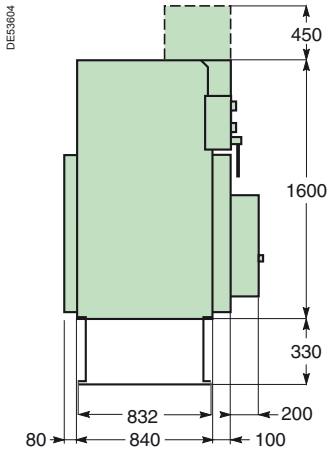


Units dimensions for 24 kV

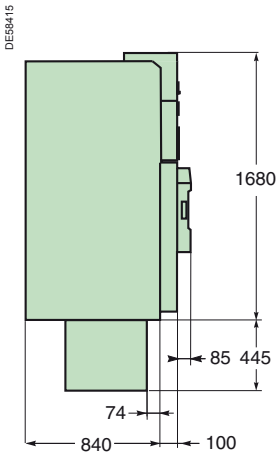
DMVL-A, DMVL-D, DM1-A, DM1-D, DM1-W, DM1-Z, DM1-S, DM2 630 A



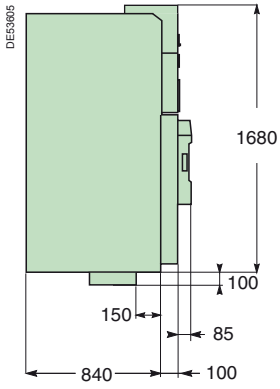
DM1-A, DM1-W 1250 A



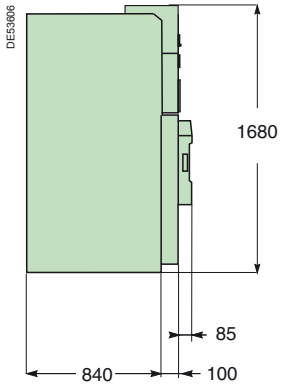
DMV-A 1250 A



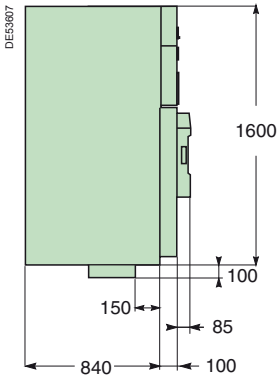
DMV-A 630 A



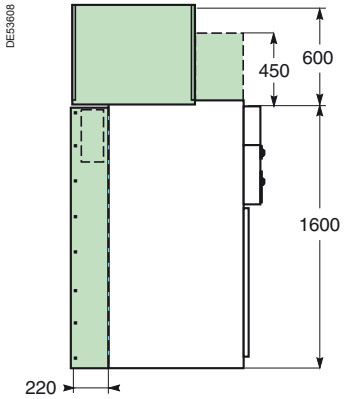
DMV-D



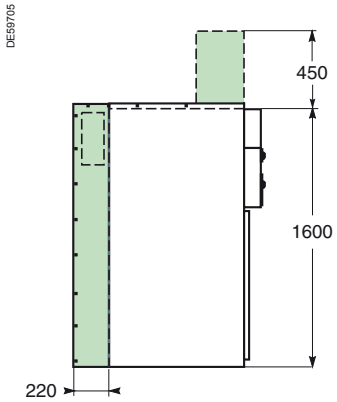
DMV-S



Internal arc enhanced cubicles upwards exhaust



Internal arc enhanced cubicles downwards exhaust



Layout examples for 24 kV

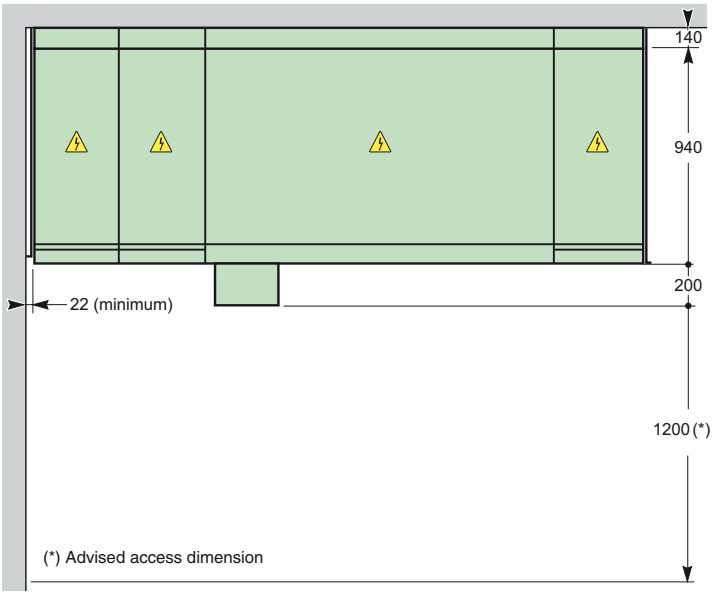
Prefabricated substation (Kiosk)

PE57168

Conventional substation (Masonery)

Internal arc cubicles 12.5 kA 1 s

DE58416EN

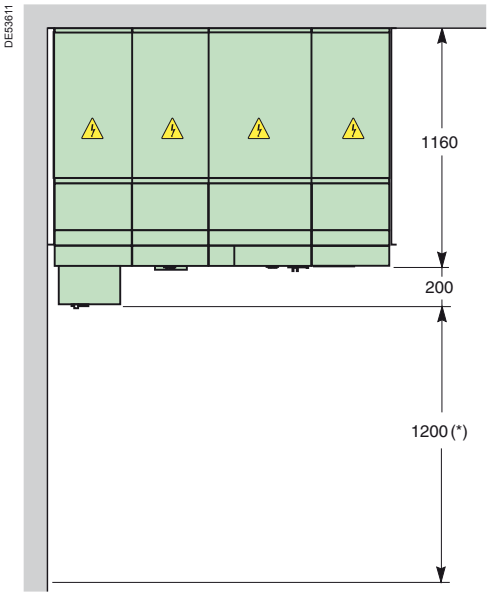


Switchboard extension example

Internal arc cubicles 16 kA 1 s

Installed against a wall for downwards and upwards exhaust

DE53611

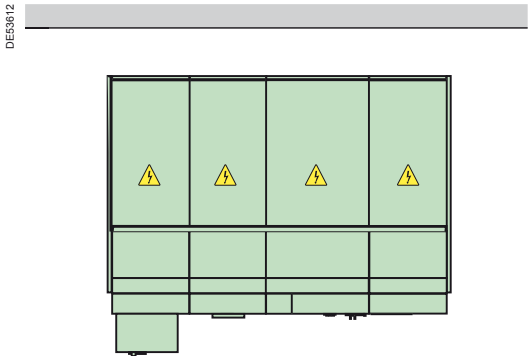


(*) Advised acess dimension

Internal arc cubicles 16 kA 1 s

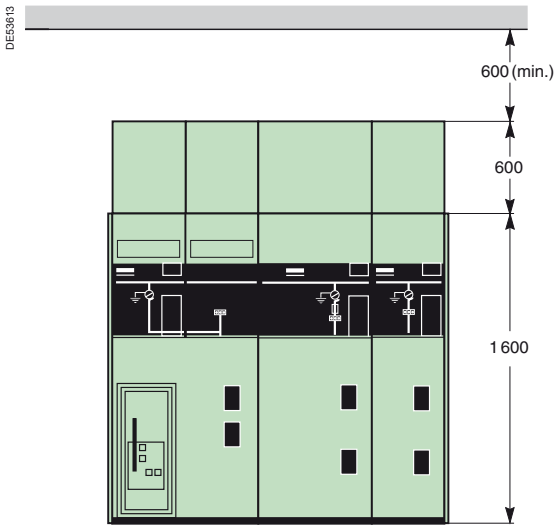
With rear corridor downwards and upwards exhaust

DE53612



For upwards exhaust (ceiling height ≥ 2800 mm)

DE53613



Dimensions and weights for 36 kV

Dimensions and weights

Unit type	Height (mm)	Width (mm)	Depth (1) (mm)	Weight (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
DM1-W	2250	1000	1400 (2)	660
NSM	2250	1500	1400 (2)	620
GIM	2250	250	1400	90
DM2	2250	1500	1400 (2)	900
DM2-W	2250	1500	1400 (2)	920
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

(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.

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.

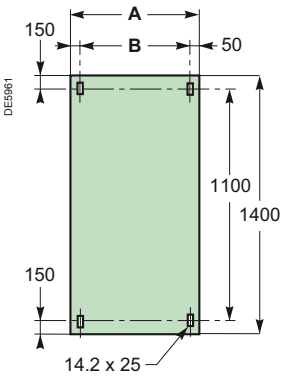
Fixing of units

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

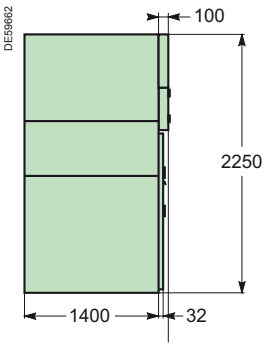
- for switchboards comprising up to three units, the four corners of the switchboard must be secured to the ground using:
  - bolts (not supplied) screwed into nuts set into the ground using a sealing pistol
  - screw rods grouted into the ground
- for switchboards comprising more than three units, the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



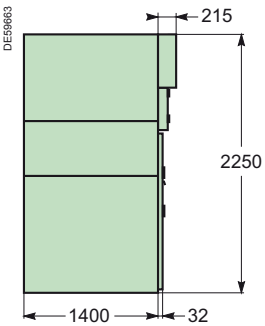
Unit type	A (mm)	B (mm)
IM, IMC, IMB, QM, PM, SM, CM, CM2, TM GBC-A, GBC-B, GBM, GAM2, IMB, GAM, QMB	750	650
DM1-A, DM1-D, DM1-W, QMC	1000	900
DM2, NSM, DM2-W	1500	1400
GIM	250	150

Dimensions

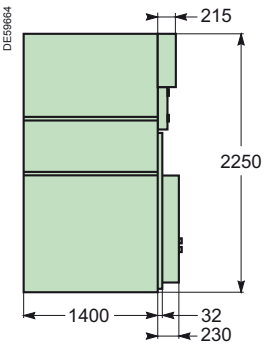
IM, SM, IMC, QM, PM, IMB, GBM, GAM, GAM2, GBC-A,GBC-B QMB, QMC units



CM, CM2, NSM units



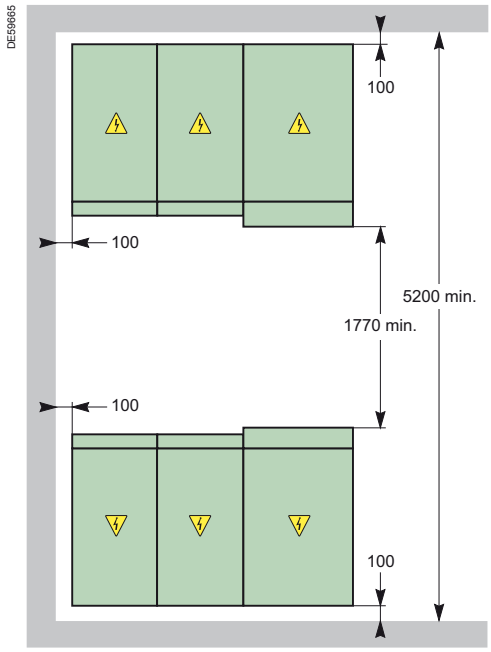
DM1-A, DM1-D, DM2, DM1-W, DM2-W units



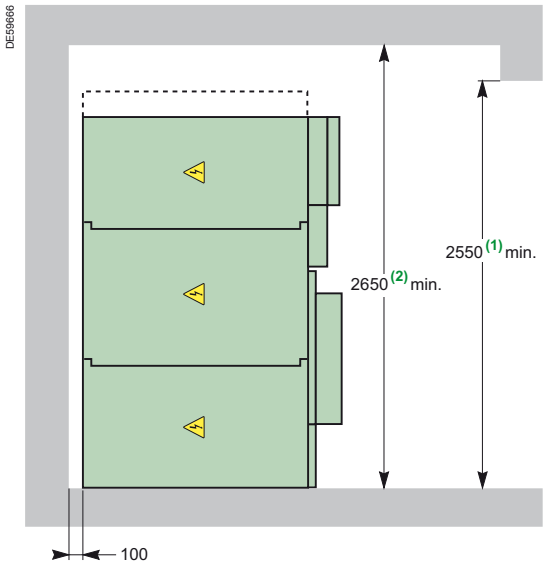
Layout examples for 36 kV

Conventional substation (Masonery)

Top view

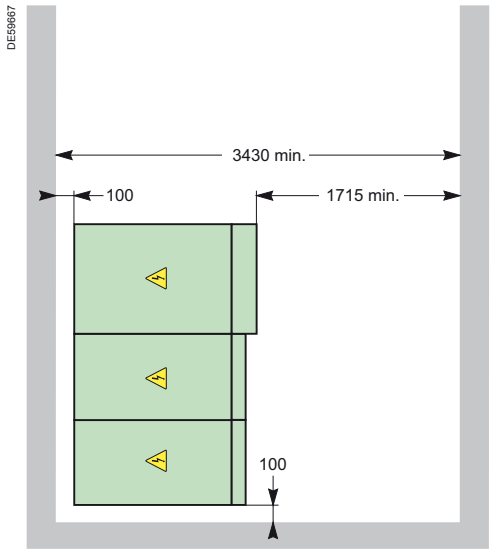


Side view



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

Top view

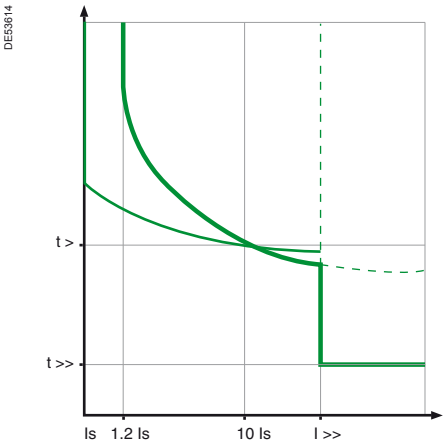


Contents

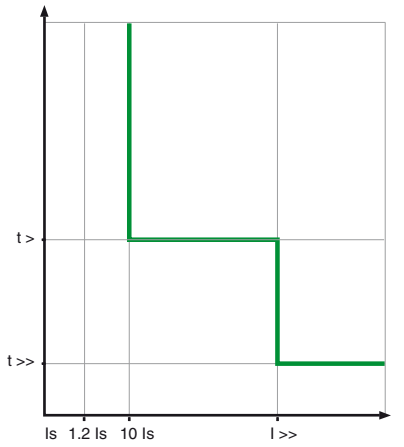
Appendices

Order form

Trip curves for VIP 300 LL or LH relays



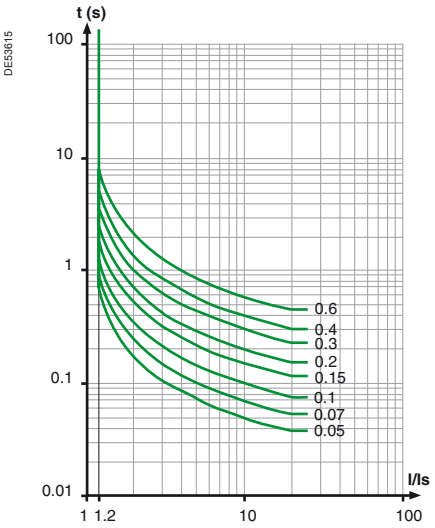
With lower definite time threshold



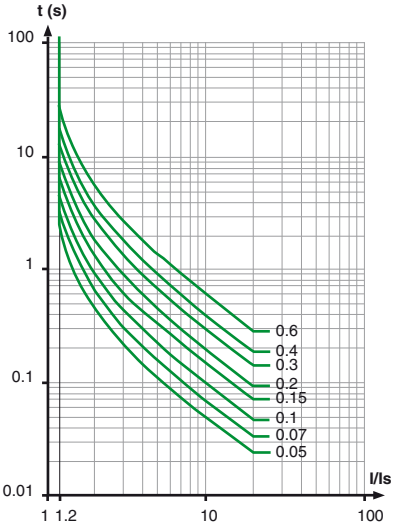
With lower inverse definite time threshold

Definite time tripping curves

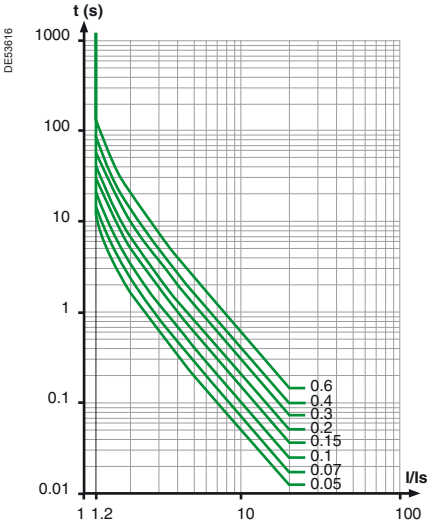
SI curve



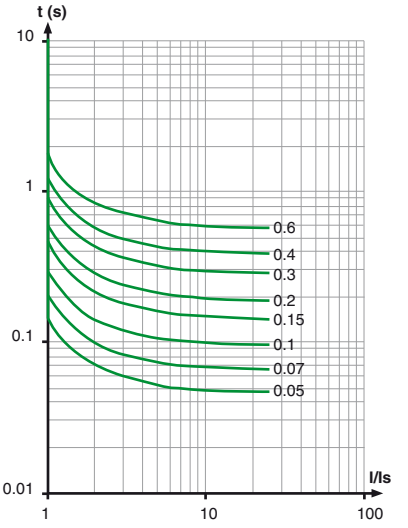
VI curve



EI curve

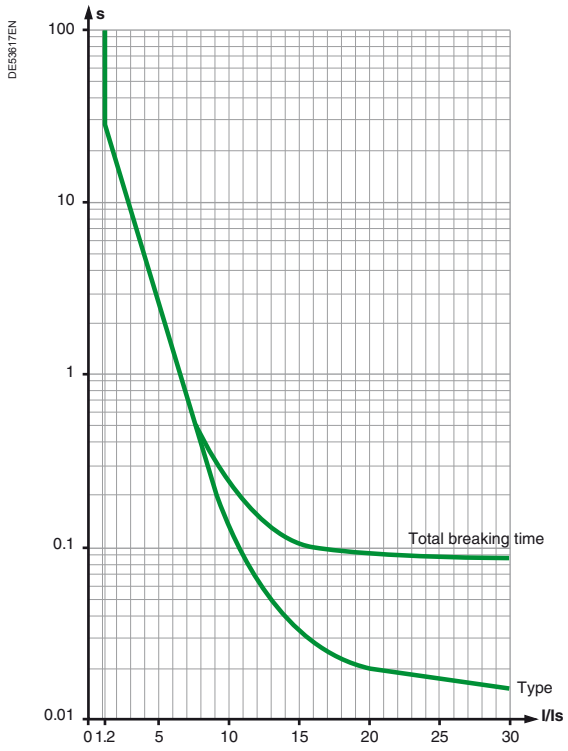


RI curve



Trip curves for VIP 35 relays

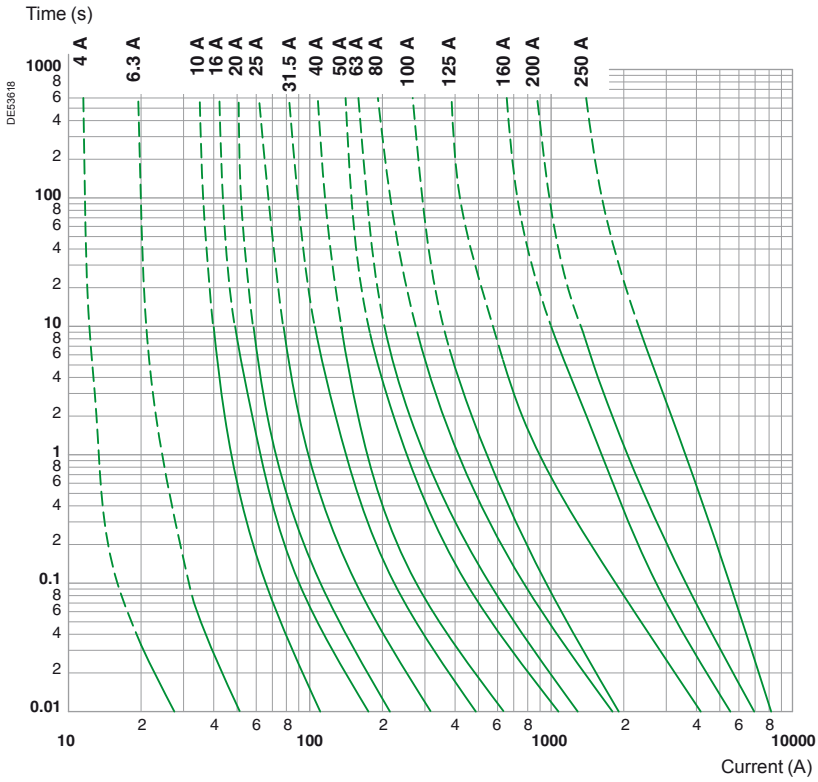
Phase protection curve



The trip curve shows the time before the relay acts, to which must be added 70 ms to obtain the breaking time.

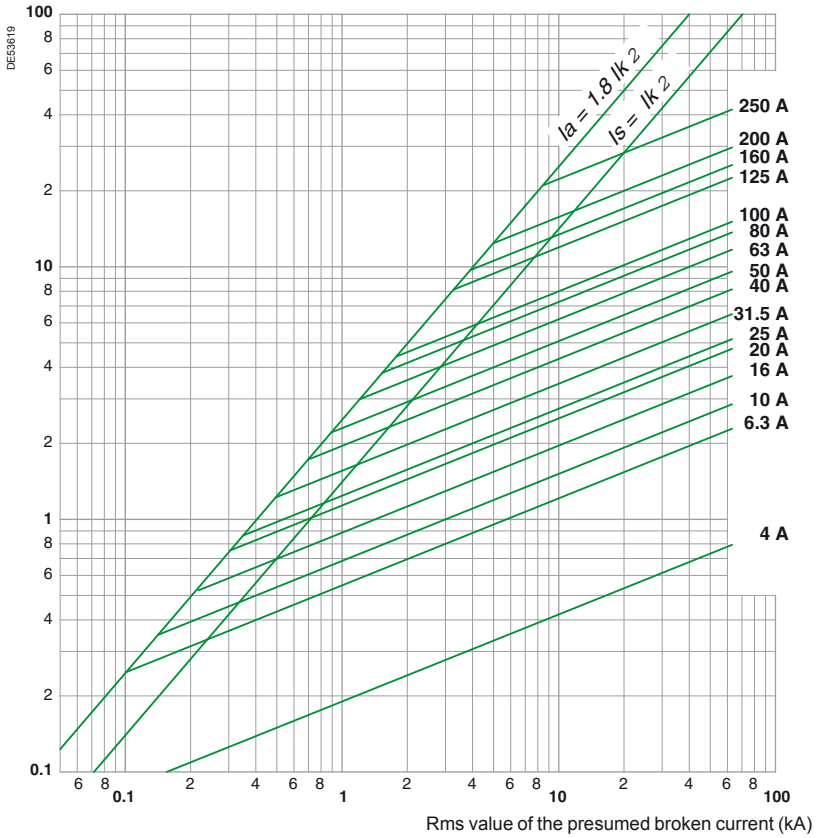
Fusarc CF fuses
Fuse and limitation curves

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



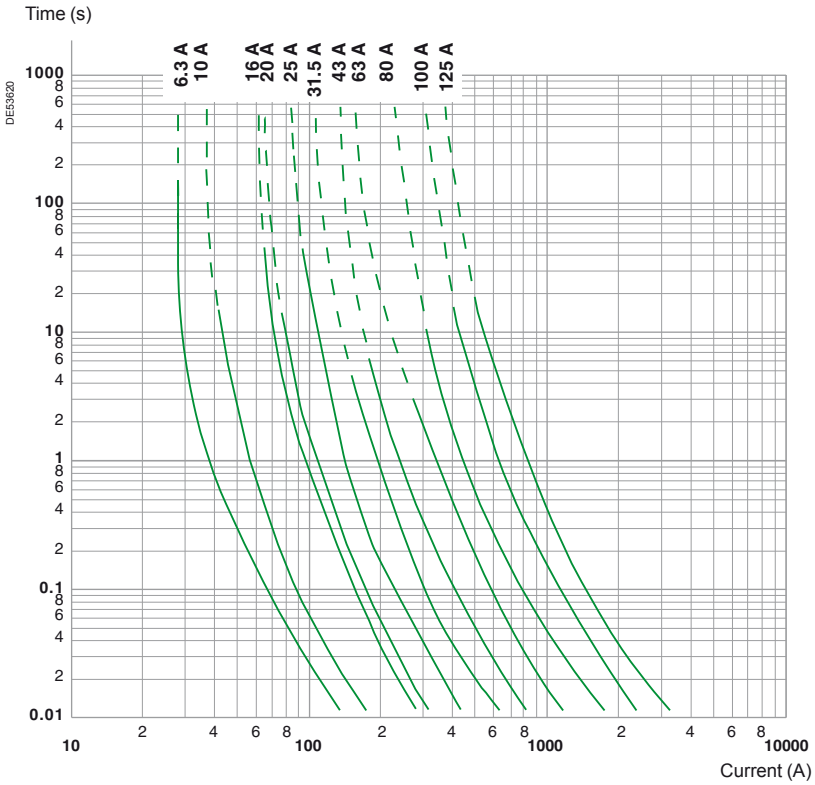
Limitation curve 3.6 - 7.2 - 12 - 17.5 - 24 - 36 kV

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

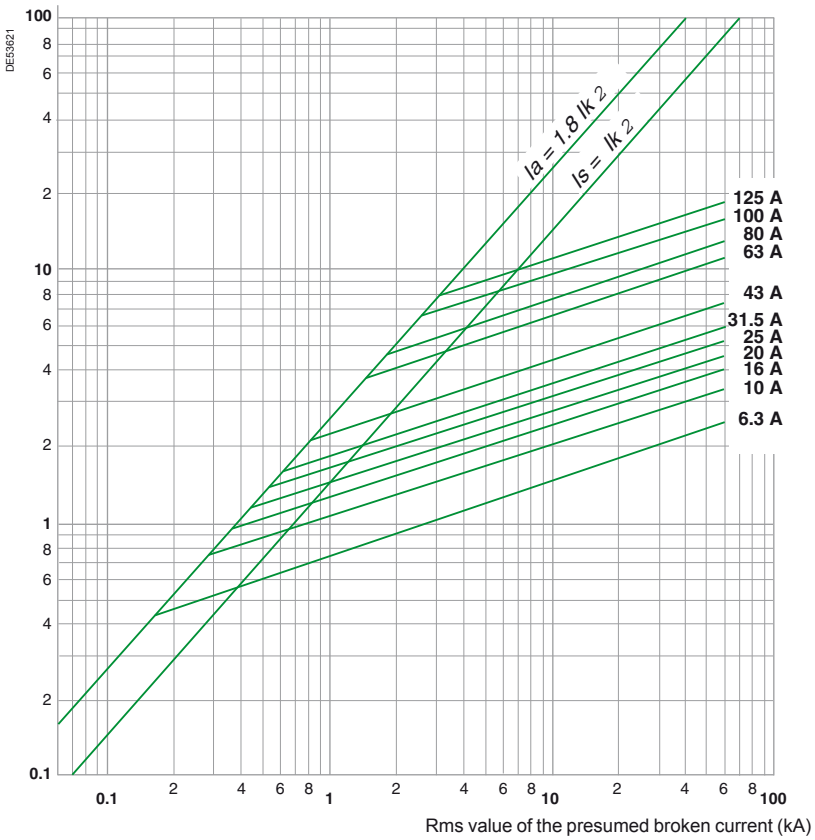
Fuse curve 7.2 - 12 - 17.5 - 24 kV



Limitation curve 7.2 - 12 - 17.5 - 24 kV

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.



SM6
Connection to the network

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 cubicle

Quantity

Rated voltage Ur (kV)

Service voltage (kV)

Short-circuit current Isc (kA)

Rated current Ir (A)

Type of cubicle

24 kV SM 375 ☐ IM 375 ☐ IMC 500 ☐ IMB 375 ☐
SM 500 (for 1250 A) ☐ IM 500 ☐

36 kV SM 750 ☐ IM 750 ☐ IMC 750 ☐ IMB 750 ☐

Position number in the switchboard (from left to right)

Direction of lower busbars for IMB
Left (impossible as first cubicle of switchboard) ☐ Right ☐

Options

Common options

Replacement of CIT by CI1 ☐ CI2 ☐

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
Standard key type ☐ Round 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) ☐

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

Digital ammeter or fault current indicator

AMP 21D ☐		Flair 23DV zero sequence ☐
Flair 21D ☐	Flair 22D ☐	Flair 23DV ☐

24 kV 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 mm² 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 mm²)
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 ☐

Visibility of main contacts ☐

Pressure indicator device
Analogic manometer **without** visibility of main contacts ☐
Pressure switch ☐ Analogic manometer **with** visibility of main contacts ☐

Upper field distributor for severe conditions (only for 630 A) ☐

36 kV options

Electrical driving mechanism (with O/C coils and AC contacts) ☐

O/C coils without electrical driving mechanism ☐

Cable connection by the top (single core cable maxi 240 mm² with VPIS) ☐

Cable connection by the bottom (2 x single core, cable maxi 240 mm², not applicable on IMC) ☐

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

SM6
Fuse switch protection

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 cubicle

Quantity

Rated voltage Ur (kV)

Service voltage (kV)

Short-circuit current Isc (kA)

Rated current Ir (A)

Type of cubicle

24 kV QM 375 ☐ QMB 375 ☐ QMC 625 ☐ PM 375 ☐
QM 500 ☐

36 kV QM 750 ☐ QMB 750 ☐ QMC 1000 ☐ PM 750 ☐

Position number in the switchboard (from left to 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 ☐

Options

Common options

Fuses (see fuse price structure) Service voltage ≤ 12 kV ☐

Replacement of mechanism CIT by CI1 (only for PM) ☐

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 ☐ Standard key type ☐ Round key type ☐

Replacement of 630 A upper busbar by 1250 A (not possible for QMB) ☐

Blown fuse signalling contact (for QM, QMB, QMC) ☐

24 kV 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 ☐

Visibility of main contacts ☐

Pressure indicator device Analogic manometer **without** visibility of main contacts ☐

Pressure switch ☐ Analogic manometer **with** visibility of main contacts ☐

Field distributor for severe conditions (only for 630 A) ☐

Internal arc version 16 kA 1 s (not possible with “top incomer” option) ☐

36 kV 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
Circuit breaker protection

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 cubicle

Quantity

Common 24/36 kV

Rated voltage Ur (kV)

Service voltage (kV)

Short-circuit current Isc (kA)

Rated current Ir (A)

Type of cubicle

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 ☐
- 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-S ☐ | 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 ☐
- DM1-W 1000 ☐ | DM2 left 1500 ☐ | DM2 right 1500 ☐
- DM2-W right 1500 ☐

Position number in the switchboard (from left to right)

Circuit breaker See specific order form

Current transformers (CT) and LPCTs See specific order form

Basic 24 kV

Busbar (Ir ⩾ Ir cubicle)

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 ☐

For DMV-S
- 630 A ☐

Protection

For DM1-S, DMV-S
- VIP35 with CRc ☐ | VIP300LL with CRa ☐
- VIP300LL with CRb ☐

For DM1-S
- Sepam series 10 with CRa ☐ | Sepam series 10 with CRb ☐

For DMV-A, DMV-D
- Sepam series 20/40 ☐

For DM2, DM1-Z, DM1-W
- Statimax 5A, 2s ☐ | Statimax 1A, 2s ☐

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 mm^2 ☐ | 6 x single core cable maxi 240 mm^2 ☐

Current sensors
- MV type CT ☐ | LPCT ring type for DM1-A 630 A ☐
- LPCT MV type for DM1-D,DM1-W 630 A ☐

Basic 36 kV

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) ☐

Options

See following page

SM6
Circuit breaker protection (cont.)

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.

Options

Common options

Interlocking
Standard key type ☐ Round 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, DMV-S) — See specific order form

24 kV options

Roof configuration (not applicable on DMV-A, DMV-S, DMV-D)
(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 ☐
	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 ☐
Field distributor for severe conditions (only for 630 A) ☐
Internal arc version 16 kA 1 s (not possible with “top incomer” option) ☐

36 kV options

Cable connection by the top (single core cable maxi 240 mm^2 with VPIS) ☐
Cable connection by the bottom (for DM1-A and DM1-W only)
3 x 2 x single core cable maxi 240 mm^2 ☐
Surge arrester 36 kV ☐
Sepam relay protection — See specific order form

SM6
MV metering

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 cubicle

Quantity

Common 24/36 kV

Rated voltage Ur (kV)

Service voltage (kV)

Short-circuit current Isc (kA)

Rated current Ir (A)

Type of cubicle/upper busbar for 24 kV

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 36 kV

CM 750	CM2 750	GBC-A 750
	TM 750	GBC-B 750

Position number in the switchboard (from left to 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) See fuse price structure

Basic 24 kV

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 36 kV

Voltage transformers See specific order form

Options

24 kV options

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 for CM, CM2, TM

Field distributor 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 16 kA 1 s (not possible with “top incomer” option)

36 kV options

Current transformers and voltage transformers for GBC See specific order form

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

Replacement of 630 A busbar by 1250 A (for CM, CM2 and TM only)

SM6
Casing

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 cubicle

Quantity

Rated voltage Ur (kV)

Service voltage (kV)

Short-circuit current Isc (kA)

Rated current Ir (A)

Type of cubicle/upper busbar for 24 kV

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 36 kV GAM 750 ☐ GAM2 750 ☐ GBM 750 ☐

Position number in the switchboard (from left to right)

Direction of lower busbars for GBM

Left (impossible on the first cubicle of the switchboard) ☐ Right ☐

Options

24 kV options

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 ☐

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 ☐ 24 kV ☐

Interlocking on GAM 500
Standard key type ☐ Round key type ☐
A3 SM6-SM6 ☐ P5 SM6-SM6 ☐
Localisation of 2nd lock for P5 Cubicle no.

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 16 kA 1 s (not possible with “top incomer” option) ☐

36 kV options

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

Replacement of 630 A busbar by 1250 A (for GAM2 only) ☐

Surge arresters for GAM2 ☐

SM6
Automatic Transfer System

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 cubicle

Quantity

Rated voltage Ur (kV)

Service voltage (kV)

Short-circuit current Isc (kA)

Rated current Ir (A)

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

Type of cubicle for 36 kV NSM busbar NSM cable

Position in the switchboard (from left to 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
Standard key type Round 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

Telecontrol

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

24 kV options

2 heating elements

Field distributor for severe conditions (only for 630 A busbar)

SM6

Vacuum contactor motor starter for SM6 24 kV

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 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)	
Position in the switchboard (from left to 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	Standard key type ☐	Round 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 ☐
Upper field distributor for severe conditions (only for 630 A busbar)					☐
Key interlockings for C1 type	Standard key type ☐	Round key type ☐			
Voltage transformer (quantity)	1 ☐	2 ☐	3 ☐		

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 ☐		

SF1
Lateral disconnectable or withdrawable

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 circuit breaker

Quantity

Rated voltage Ur			**(kV)**
Service voltage			**(kV)**
Impulse voltage Up			**(kVbil)**
Short-circuit current Isc			**(kA)**
Rated current Ir			**(A)**
Frequency		60 Hz	50 Hz
Mechanism position	Disconnectable	A1	B1
	Withdrawable		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	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 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)

Leaflets language	French		English				

Different releases combinations

Shunt opening releases **YO1/YO2**	1			2	1	1	
Undervoltage release **YM**			1		1		1
Mitop		1				1	1

SFset
Lateral disconnectable for SM6 24 kV

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 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

VIP 300P (not available for all electrical characteristics)	CSa 200/1	Is = 10 to 50 A ☐	Is = 40 to 200 A ☐
	CSb 1250/1	Is = 63 to 312 A ☐	Is = 250 to 1250 A ☐
VIP 300LL	CSa 200/1	Is = 10 to 50 A ☐	Is = 40 to 200 A ☐
	CSb 1250/1	Is = 63 to 312 A ☐	Is = 250 to 1250 A ☐

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) ☐

Test box (VAP 6)		☐
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 kV (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.
Green box [X] corresponds to none priced functions.

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 — Standard key type [ ] — Round 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 kV (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.
Green box [X] corresponds to none priced functions.

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

Notes

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