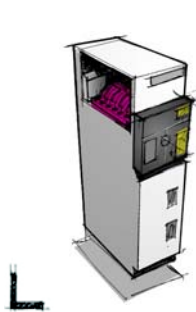


Modular units

SM6 Merlin Gerin 24 kV

Catalog
2003



Merlin Gerin

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MT20H0



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

This experience means that today Schneider Electric can propose a complementary range: DMV-A, DMV-D, DMV-S vacuum type circuit breaker cubicles and internal arc cubicles 16 kA. 1 s to reinforced the safety of people.

This gives you the advantage of unique experience, that of a world leader, with over half a million 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 range.

MT20H1



The modular SM6 range is a range of harmonised cubicles equipped with SF6 or vacuum air breaking technology switchgear.

These cubicles allow you to produce all your Medium Voltage substation requirements up to 24 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

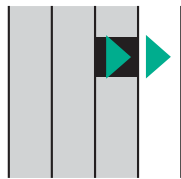
Cumulated with the second generation of SM6 modular SF6 cubicles.

2001: a leading position

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

■ development of the offer with the arrival of a range of vacuum type circuit breaker cubicles.

MT20142

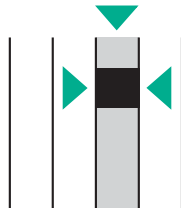


Upgradability

SM6, a comprehensive range

- a comprehensive offer covering your current 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.

MT20143

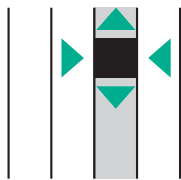


Compactness

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.

MT20144

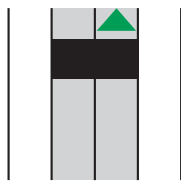


Maintenance

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 intended to function with reduced maintenance under normal operating conditions;
- enhanced electrical endurance when breaking.

MT20145

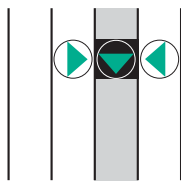


Ease of installation

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.

MT20146



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 arcing withstand in the cable and switchgear compartments;
- clear and animated display diagrams;
- switching lever with an "anti-reflex" function;
- compartmented cubicles.

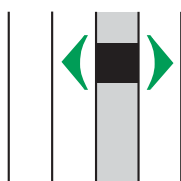
MT20147



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.

MT20148



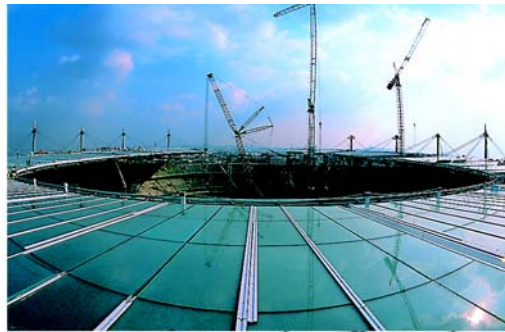
SM6 : a range with adapted protection devices

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

SM6, a world-wide product

Asia/Middle East

- Pasteur Institute, Cambodia
- Tian he City, China
- Sanya Airport, China
- Bank of China, Beijing, Jv Yanta, China
- Jing Guang Hotel, JGH, 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



Africa

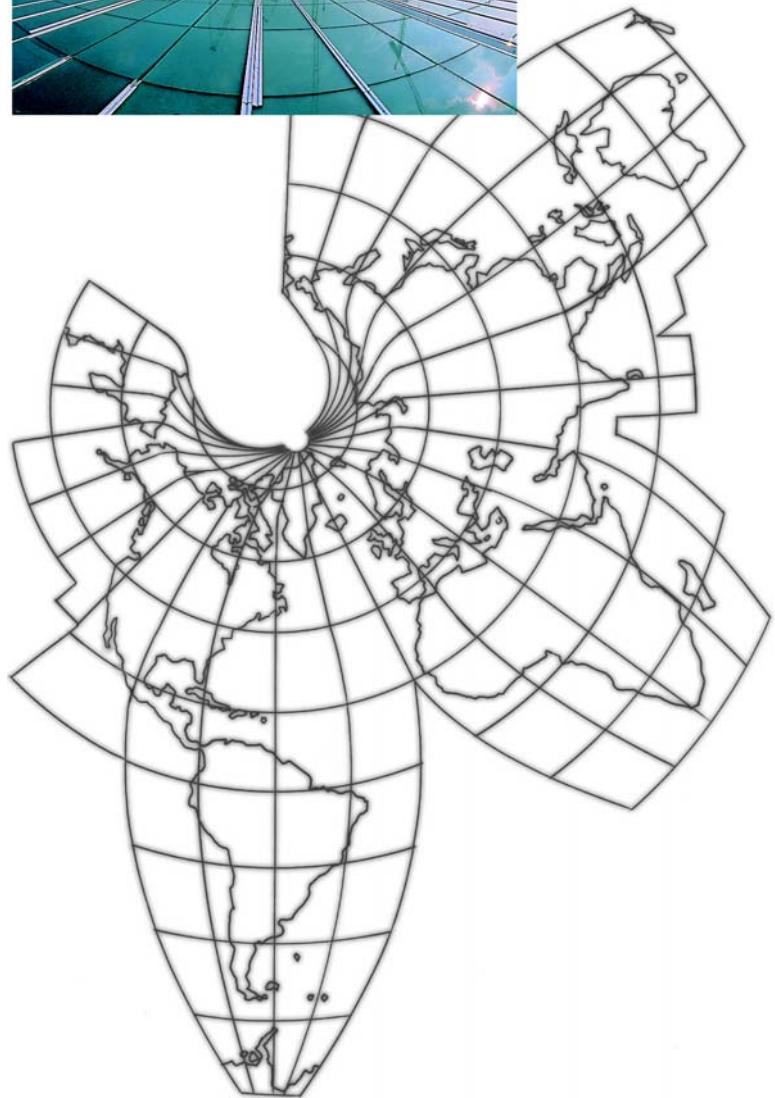
- ONAFEX, Hilton Hotel, Algeria
- Yaounde University, Cameroon
- Karoua Airport, Cameroon
- Libreville Airport, Gabon
- Ivarto Hospital, CORIF, Madagascar
- Central Bank of Abuja, ADEFEMI, Nigeria
- OCI Dakar, Oger international, CGE, Senegal
- Bamburi cement Ltd, Kenya
- Ivory Electricity Company, Ivory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

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

Europe

- EDF, France
- Eurotunnel, France
- Futuroscope, Poitiers, France
- François Mitterrand Library, France
- Nestlé company headquarters, France
- Stade de France, Paris, France
- Kronofrance, France
- TLM Terminal , Folkestone, Great Britain
- Zaventem Airport, Belgium
- Krediebank Computer Centre, Belgium
- Bucarest Pumping station, Rumania
- Prague Airport, Czech Republic
- Philipp Morris St Petersburg, Russia
- Ligget Ducatt Tobacco Factory, Russia
- Kremlin Moscow, Russia
- Allibert Tarazona, Spain



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 French Quality Assurance Association (FQAA).

The quality system for the design and manufacture of SM6 units has been certified in conformity with the requirements of the ISO 9001 quality and ISO 9002 quality assurance model.

M155064



M155085



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.



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.



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

- switch-disconnector;
- SF1, SFset or Evolis circuit breaker;
- Rollarc 400 or 400 D 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 24 kV.

MV/LV transformer substations



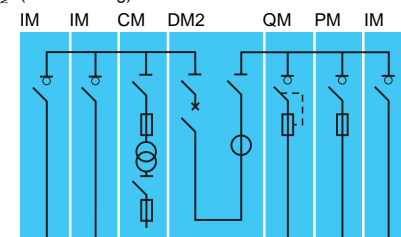
Unit definitions

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

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

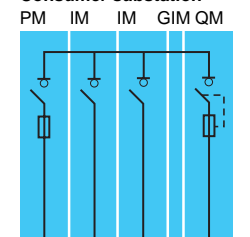
UTE standard

MV consumer substation (MV metering)



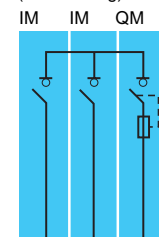
incoming line of the main distribution switchboard

Combined public distribution/ Consumer substation

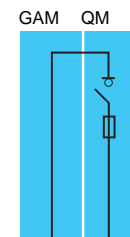


outgoing line toward other ring substations

MV consumer substation (LV metering)

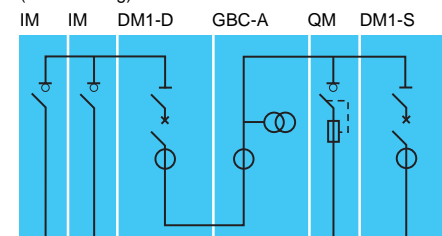


Substation



Other standards

MV consumer substations (MV metering)

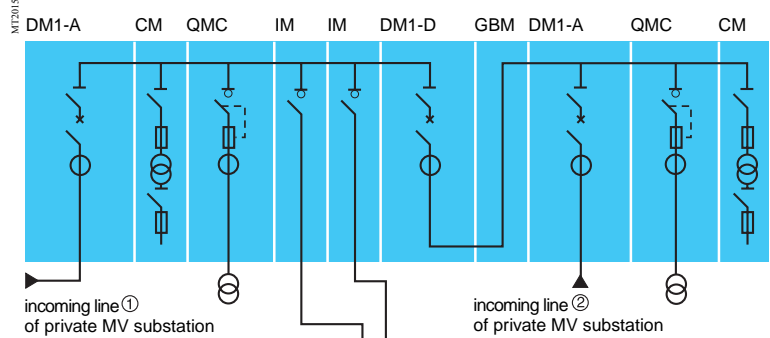


outgoing line toward other ring substations
incoming line of the main distribution switchboard

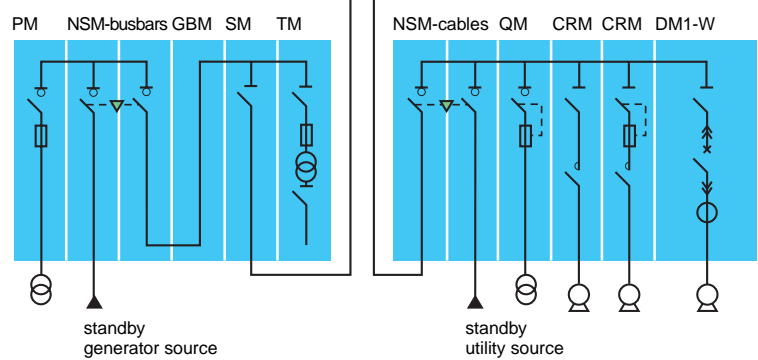
Industrial distribution substations

SM6 range

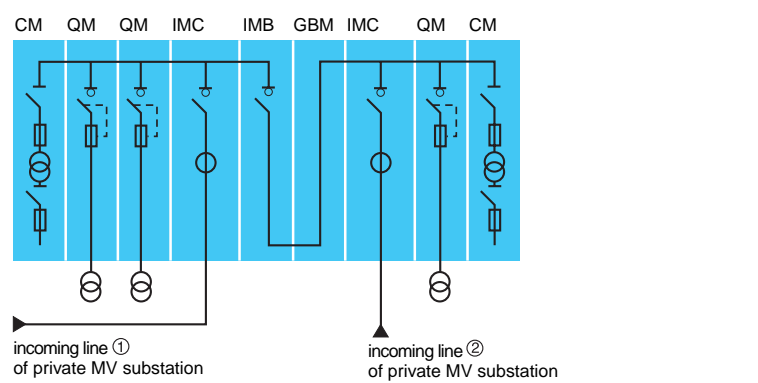
Distribution switchboard



MV/LV transformer substations

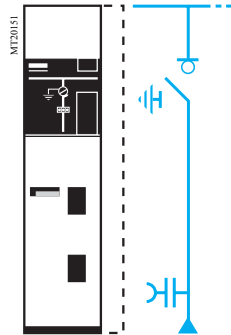


Distribution switchboard

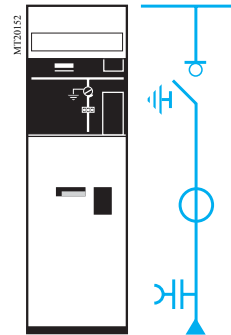


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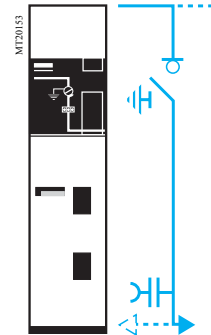
Connection to the networks



Switch unit
IM (375 or 500 mm)



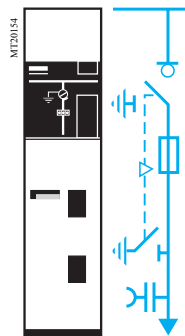
Switch unit
IMC (500 mm)



Switch unit
with or without
earthing disconnector
right or left outgoing line
IMB (375 mm)

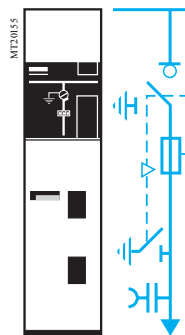
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Fuse-switch protection



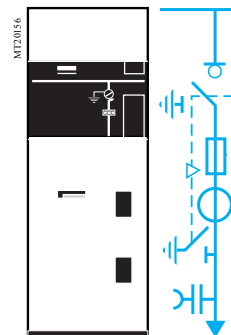
Fused-switch unit
PM (375 mm)

29

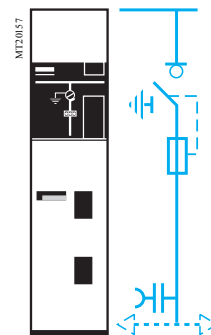


Fuse-switch
combination unit
QM (375 mm)

30



Fuse-switch
combination unit
QMC (625 mm)

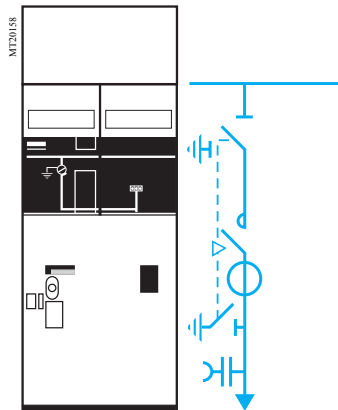


Fuse-switch
combination unit
right or left outgoing line
QMB (375 mm)

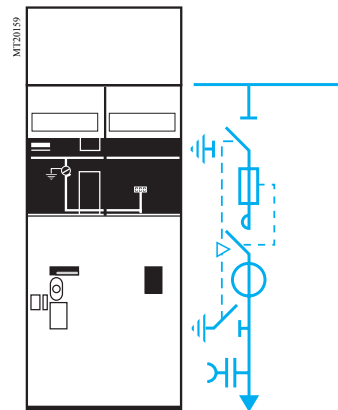
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Contactor protection



Contactor unit
CRM (750 mm)

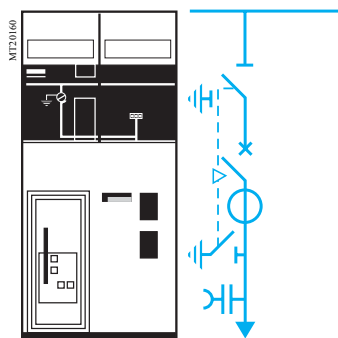


Fused-contactor unit
CRM (750 mm)

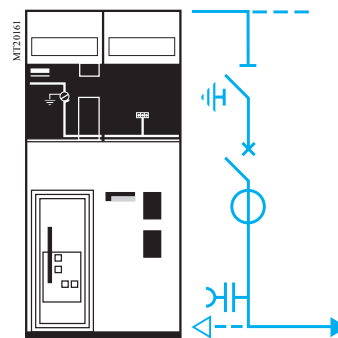
SM6 range

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SF6 circuit-breaker protection

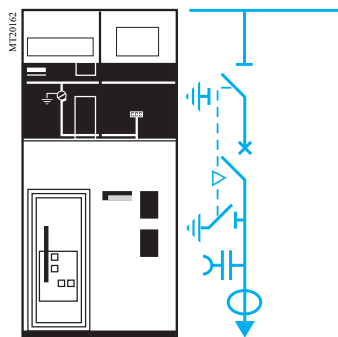


Single-isolation
circuit breaker unit
DM1-A (750 mm)

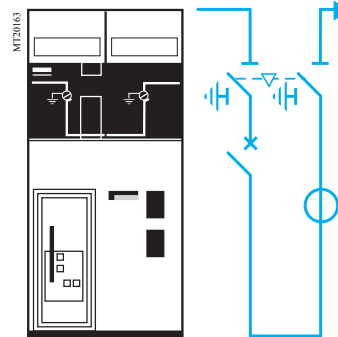


Single-isolation
circuit breaker unit
right or left outgoing line
DM1-D (750 mm)

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Single-isolation
circuit breaker unit with
autonomous protection
DM1-S (750 mm)

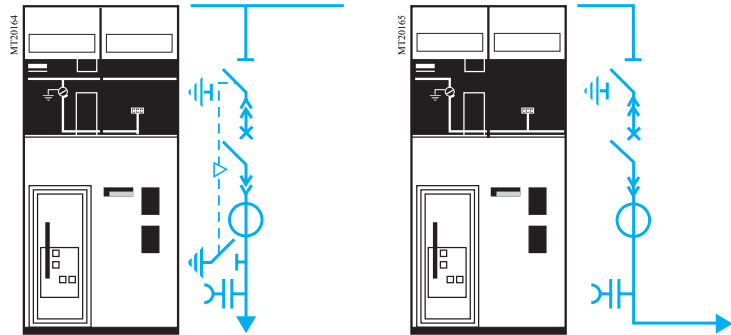


Double-isolation
circuit breaker unit
right or left outgoing line
DM2 (750 mm)

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SF6 circuit-breaker protection

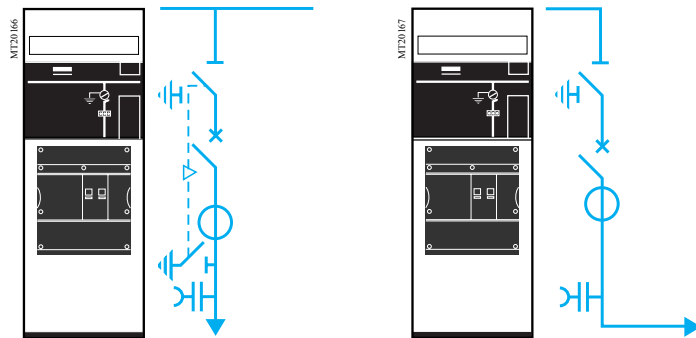


Withdrawable single-isolation circuit breaker unit DM1-W (750 mm)

Withdrawable single-isolation circuit breaker unit right outgoing line DM1-Z (750 mm)

35

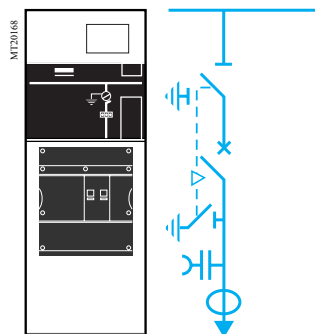
Vacuum circuit-breaker protection



Single-isolation circuit breaker unit DMV-A (625 mm)

Single-isolation circuit breaker unit right outgoing line DMV-D (625 mm)

36

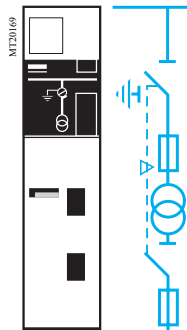


Single-isolation circuit breaker unit with autonomous protection DMV-S (625 mm)

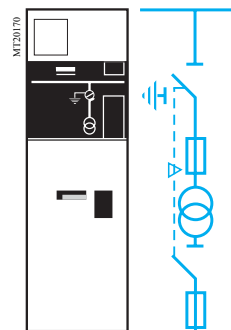
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MV metering

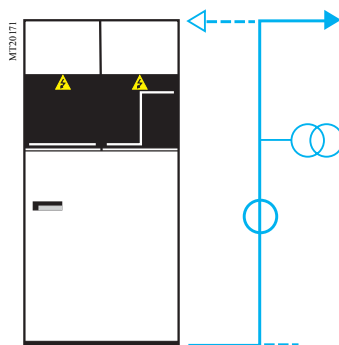


Voltage transformers for mains with earthed neutral system
CM (375 mm)

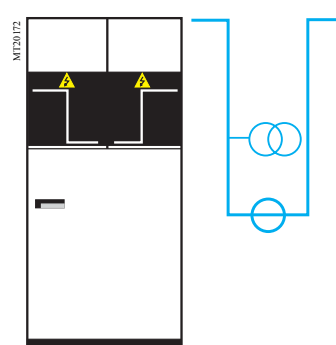


Voltage transformers for mains with insulated neutral system
CM2 (500 mm)

37



Current and/or voltage measurement unit right or left outgoing line
GBC-A (750 mm)

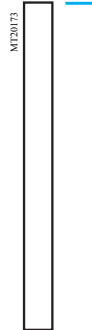


Current and/or voltage measurement unit
GBC-B (750 mm)

SM6 range

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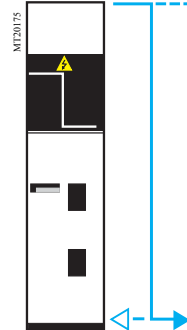
Casings



**Intermediate bus unit
GIM (125 mm)**

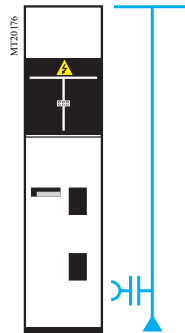


**Extension unit
VM6/SM6
GEM (125 mm)**

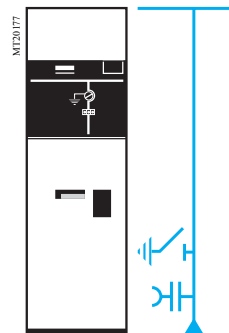


**Connection unit
right or left outgoing line
GBM (375 mm)**

38



**Incoming
cable-connection unit
GAM2 (375 mm)**



**Incoming
cable-connection unit
GAM (500 mm)**

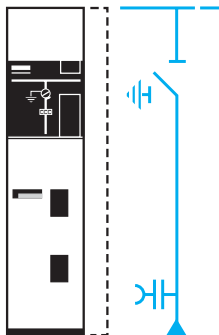
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Other functions

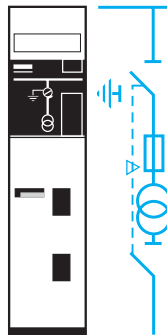
40

MT20178

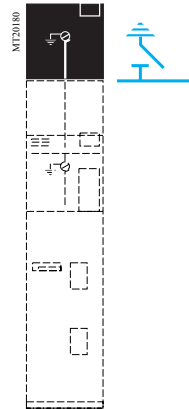


Disconnector unit
SM (375 or 500 mm)

MT20179



MV/LV transformer unit
for auxiliaries
TM (375 mm)

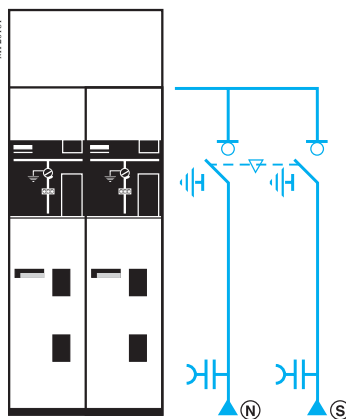


Busbar earthing
compartment
EMB (375 mm)

SM6 range

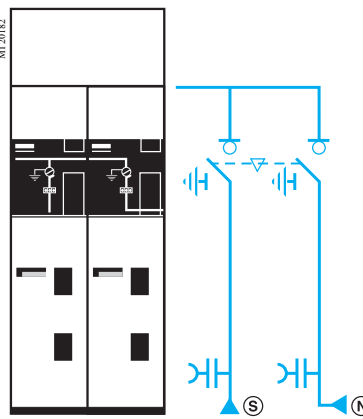
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MT20181



Cables power supply
for main incoming line
and standby line
NSM-cables (750 mm)

MT20182



Busbars power supply
for main incoming line
on right or left and cables
for standby line
NSM-busbars (750 mm)

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



SM6 units are designed for indoor installations (IP2XC).

Their compact dimensions are:

- 375 mm to 750 mm wide;
- 1600 mm high;
- 840 mm deep...

... 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, telecontrol, etc.).

Standards

SM6 units meet all the following recommendations, standards and specifications:

- recommendations IEC:

60694 : Common specifications for high-voltage switchgear and controlgear standards.

60298 : A.C. metal-enclosed switchgear and controlgear for rated voltage above 1kV and up to including 52kV.

60265 : High voltage switches for rated voltages of 52kV and above.

60420 : High voltage alternatatif current switch-fuse combinations.

60255 : Electrical relays.

62271-100 : High-voltage alternating current circuit breakers.

62271-102 : High-voltage alternating current disconnectors and earthing switches.

- UTE standards:

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 1kV and less than 52 kV.

NFC 64.160 : Alternating current disconnectors and earthing switches.

- EDF specifications:

HN 64-S-41 : A.C. metal-enclosed switchgear and controlgear for rated voltages above 1kV and up to and including 24 kV.

HN 64-S-43 : Electrical independent operating mechanism for switch 24kV - 400A.

Designation

SM6 units are identified by a code including:

- an indication of the function, i.e. the electrical diagram code: IM, QM, DM1, CM, DM2, etc.
- the rated current: 400 - 630 - 1250 A;
- the rated voltage: 7.2 - 12 - 17.5 - 24 kV;
- the maximum short-time withstand current values:
12.5 - 16 - 20 - 25 kA. 1 s;
- the colour is of RAL 9002 type (frosted satin white).

Example for a unit designated: **IM 400 - 24 - 12.5**

- IM indicates an "incoming" or "outgoing" unit;
- 400 indicates the rated current is 400 A;
- 24 indicates the rated voltage is 24 kV;
- 12.5 indicates the short-time withstand current is 12.5 kA. 1 s.

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.



Internal arc withstand:

- standard: 12.5 kA, 0.7 s;
- enhanced: 16 kA, 1 s.

Protection index:

- units: IP2XC;
- between compartments: IP2x.

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 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.

Rated voltage (kV)		7.2	12	17.5	24
Insulation level					
50 Hz, 1 mn (kV rms)	insulation	20	28	38	50
	isolation	23	32	45	60
1.2/50 μs (kV peak)	insulation	60	75*	95	125
	isolation	70	85	110	145
Breaking capacity					
transformer off load (A)		16			
cables off load (A)		25			
short-time withstand current (kA, 1 s)	25	630 - 1250 A			
	20	630 - 1250 A			
	16	630 - 1250 A			
	12.5	400 - 630 - 1250 A			

The making capacity is equal to 2.5 times the short-time withstand current.
* 60 kV peak for the CRM unit.

General characteristics

Maximum breaking capacity

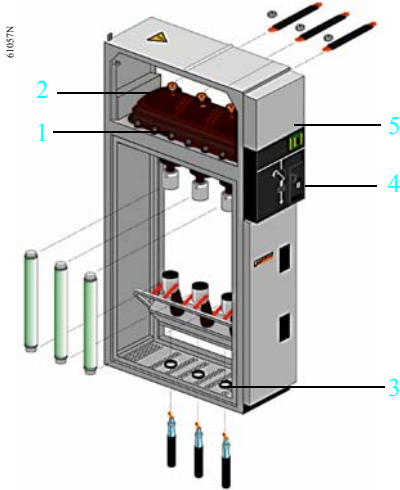
Rated voltage (kV)		7.2	12	17.5	24
Units					
IM, IMC, IMB, NSM-cables, NSM-busbars		630 A			
PM, QM, QMC, QMB		25 kA		20 kA	
CRM		10 kA	8 kA		
CRM with fuses		25 kA			
SF6 circuit breaker range:					
DM1-A, DM1-D, DM1-W, DM1-Z, DM1-S, DM2		25 kA		20 kA	
vacuum circuit breaker range:					
DMV-A, DMV-D, DMV-S		25 kA		20 kA	

Endurance

Units		mechanical endurance	electrical endurance
IM, IMC, IMB, PM, QM*, QMC*, QMB*, NSM-cables, NSM-busbars		IEC 60265 1000 operations class M1	IEC 60265 100 breaks at In, p.f. = 0.7 class E3
CRM	Disconnectors	IEC 62271-102 1000 operations	
	Rollarc 400	IEC 62470 300 000 operations	IEC 62470 100 000 breaks at 320 A 300 000 breaks at 250 A
	Rollarc 400D	100 000 operations	100 000 breaks at 200 A
SF6 circuit breaker range:			
DM1-A, DM1-D, DM1-W, DM1-Z, DM1-S, DM2	Disconnectors	IEC 62271-102 1000 operations	
	Circuit breaker SF	IEC 62271-100 10 000 operations	IEC 62271-100 40 breaks at 12.5 kA 10 000 breaks at In, cos w = 0.7
vacuum circuit breaker range:			
DMV-A, DMV-D, DMV-S	Disconnectors	IEC 62271-102	
	Circuit breaker Evolis	IEC 62271-100 10 000 operations	IEC 62271-100 100 breaks at In, cos w = 0,7

* as per recommendation IEC 60420, three breakings at p.f. = 0.2
 ■ 1730 A under 12 kV,
 ■ 1400 A under 24 kV,
 ■ 2600 A under 5.5 kV.

SM6 range



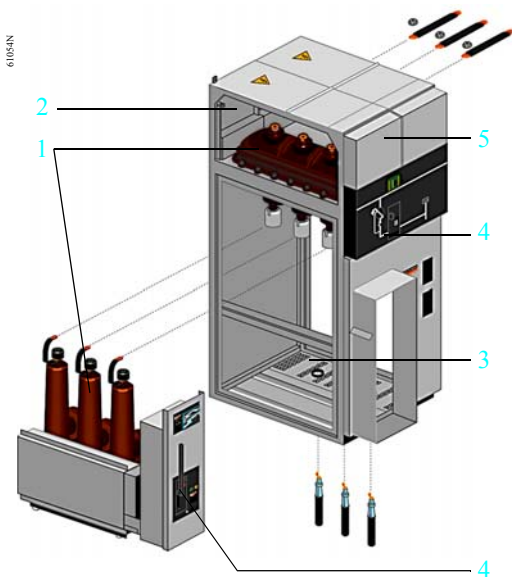
Switch and fuse protection cubicles

Cubicles are made up of five compartments separated by metal or insulating partitions.

- 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.

Optional, switch cubicles (IM) can also be fitted with:

- control motorisation;
- surge arrestors.

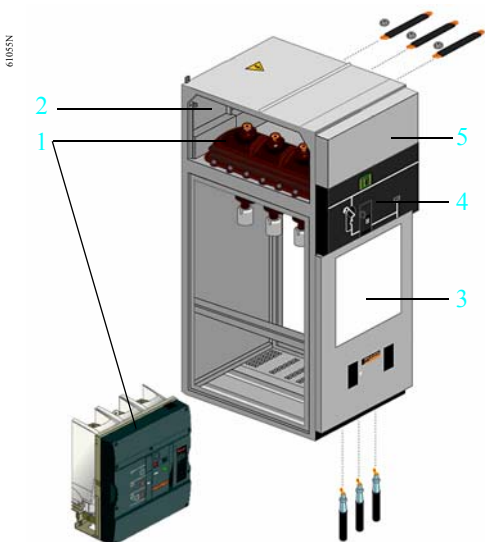


SF6 circuit breaker cubicles

- 1 switchgear:** disconnector(s) and earth 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.

Optional, cubicles may be fitted with:

- current and voltage transformers;
- circuit breaker control motorisation;
- surge arrestors.



Vacuum type circuit breaker cubicles

1 switchgear: disconnector(s) and earth switch(es), in enclosures 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.

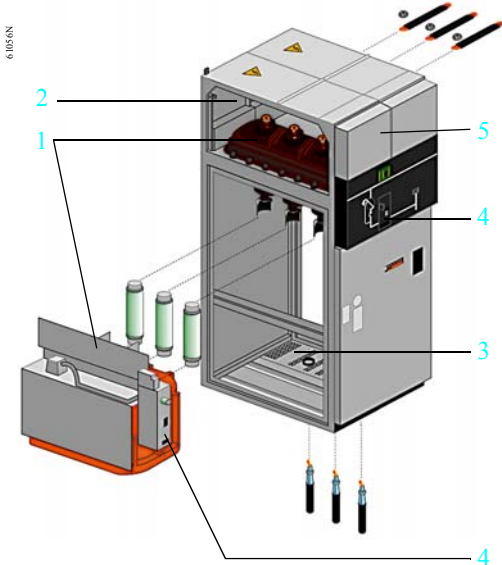
■ Evolis: device associated with an electronic relay and standard sensors (with or without auxiliary source);

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.

Optional, cubicles may be fitted with:

- current and voltage transformers;
- circuit breaker control motorisation;
- surge arrestors.



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 Rollarc contactor may be equipped with fuses.

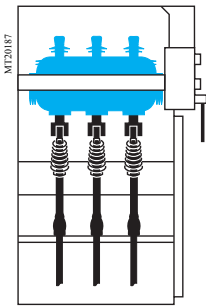
Two types may be used:

- R400 with magnetic holding;
- R400D with mechanical latching.

4 operating mechanism: contains the elements used to operate the disconnector(s), the contactor 400 or 400D and the earthing switch and actuate the corresponding indications.

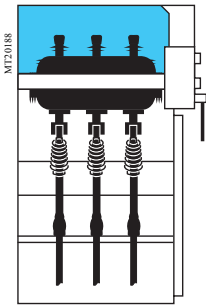
5 low voltage: installation of compact relay devices and test terminal boxes. With basic equipment, an additional enclosure is added on top of the cubicle.

Optional, cubicles may be fitted with current and voltage transformers.



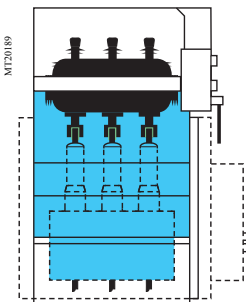
Switchgear compartment

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

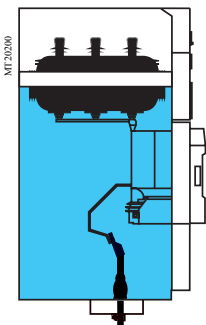


Busbar compartment

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.



SF6 type circuit breaker



Vacuum type circuit breaker

Connection and switchgear 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.

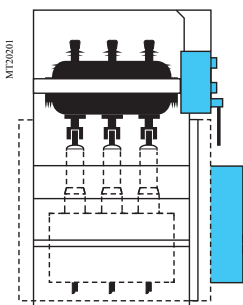
Cables may have either:

- cold fitted sheathing for dry-type or paper-insulated cables;
- With basic equipment, the maximum allowable cross-section for cable is:
- 630 mm² or 2 x 400 mm² for 1250 A incoming or outgoing units;
 - 300 mm² or 2 x 240 mm² for incoming or outgoing units 400 - 630 A;
 - 95 mm² for transformer protection cubicles incorporating fuses.

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.



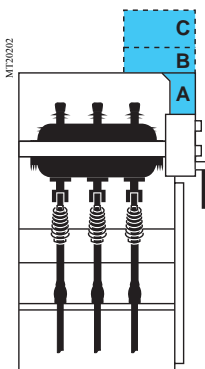
Operating-mechanism compartments

These compartments contain the various operating functions for the:

- switch and earthing switch;
- disconnector(s);
- circuit breaker;
- contactor;
- and the voltage indicators.

The operating-mechanism compartment 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.).



Low-voltage compartment

This compartment enables the cubicle to be equipped with low voltage switchgear providing protection, control, status indication and data transmission.

This compartment is available in 3 versions: cover, compartment and housing.

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

B - compartment: enables a large majority of low voltage configurations to be installed. It also takes the Sepam 1000. The total cubicle height is then 1690 mm.

C - housing: this is only used for larger low voltage accessories or those with a depth greater than 100 mm or complex equipment, such as Sepam 2000, Sepam 100, converters, regulating transformers or dual secondary transformers. The total height of the cubicle then becomes 2050 mm.

A - Cover
h = 1600 mm

B - Compartment
h = 1690 mm

C - Housing
h = 2050 mm

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



By switchgear

61010N



Switch-disconnector

Switch or disconnecter and earthing switch

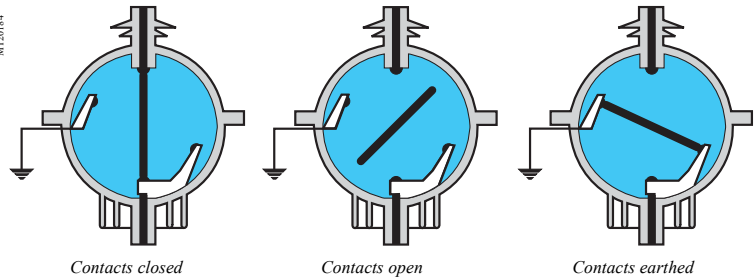
■ Gas tightness

The three rotating contacts are placed in an enclosure filled with gas to a relative pressure of 0.4 bar (400 hPa). It satisfies “sealed pressure system” requirements and seal tightness is always checked in the factory.

■ 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, thus avoiding projection or other related phenomena in front.

MT20184



61011N



Rollarc contactor

Rollarc 400 and 400D contactor

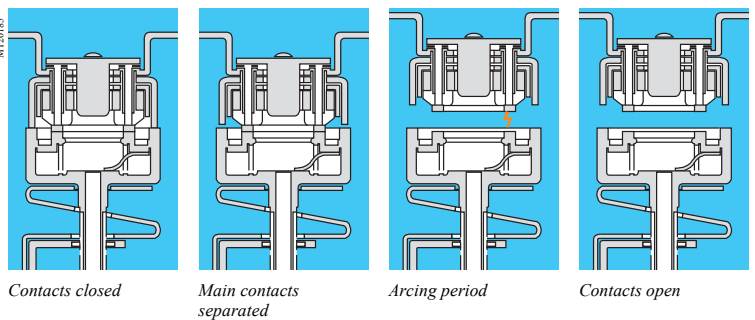
■ Gas tightness

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.

MT20185





61012N
SF1 circuit breaker

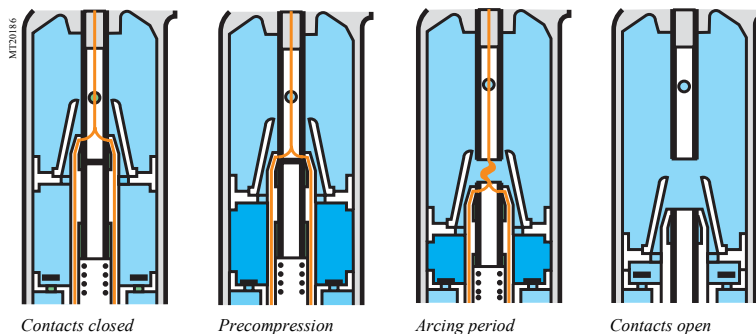
SF6 circuit breaker: SF1 or SFset

■ **Gas tightness**

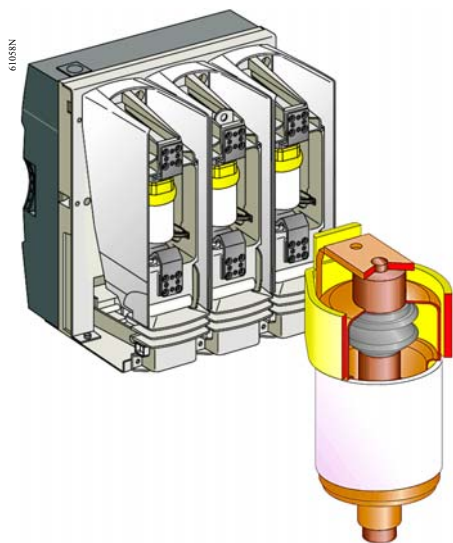
The SF1 or SFset circuit breaker is made up of three separate poles mounted on a structure supporting the operating mechanism. Each pole-unit houses all the active elements in an insulating enclosure filled with gas to a relative pressure of 0.5 bar (500 hPa). It satisfies “sealed pressure system” requirements and seal tightness is always checked in the factory.

■ **Operating safety**

As for switch-units, accidental over-pressures are eliminated by the opening of the safety membrane.



SM6 range



61058N
Evolis circuit breaker

Vacuum type circuit breaker: Evolis

■ **Gas 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 gas tightness is systematically checked in the factory.

■ **Operating safety**

□ the magnetic field is applied along the contact axis of the vacuum type circuit breaker.

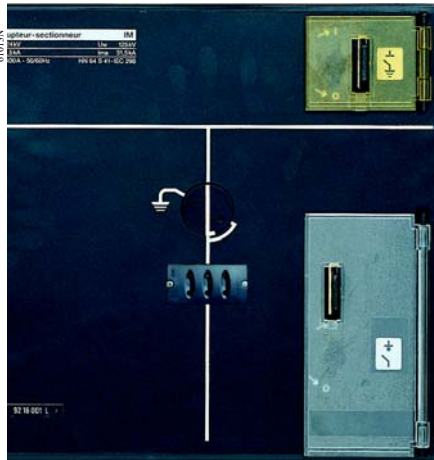
This process diffuses the arc in a regular manner with high currents. It ensures optimum distribution of the energy along the compact surface so as to avoid local hot spots.

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.

Safety of people

By operating mechanism safety



Reliable operating mechanism

■ **Switchgear status indicator:**

Fitted directly to the mobile equipment's shaft, these give a definite indication of the switchgear'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 mobile equipment 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.

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.



Insensitivity to the environment

■ An internal sealed **enclosure**, contains the active parts of the switchgear (switch, earthing disconnector). It is filled with SF6 in accordance with the definitions in IEC recommendation 60298 for "sealed pressure systems". Sealing is systematically checked in the factory.

■ 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.

By internal arc protection

Standard IEC 60298 appendix AA indicates a method for testing switchgear in metal enclosures under internal arcing conditions. The aim of this test is to show that an operator present in front of a switchboard would be protected against the effects of an internal fault.

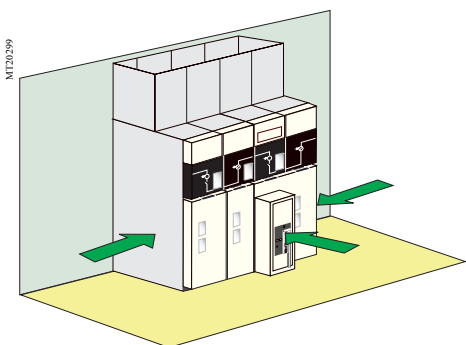
To enhance the safety of people, it is desirable to provide as high a degree of protection as possible by evacuating the effects of internal arcing using:

- 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 for the cubicle;
- reinforced panels.

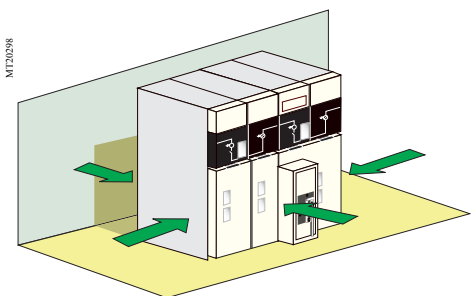
Consequently:

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.



Case of an SM6 switchboard installed against the wall upwards exhaust: 3-sides internal arc protection



Case of an SM6 switchboard installed in the middle of a room downwards exhaust: 4-sides internal arc protection

Internal arc withstand of the cubicles

- **2 versions are available:**
 - basic version: 12.5 kA. 0.7 s,
 - enhanced internal arcing withstand: 16 kA. 1 s.

SM6 internal arc (in conformity with IEC 60298 appendix AA)

In its internal arc version, the SM6 range has successfully passed all of the type testing relative to standard IEC 60298 (6 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 present 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 an internal arc enhanced switchboard

- **3-sides internal arc protection:**

Case of an SM6 switchboard positioned against the wall, access to the rear of the cubicles is impossible, internal arc protection on three sides is sufficient.
- **4-sides internal arc protection:**

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

The choice depends on the civil engineering:

- **Upwards exhaust:**

A ceiling height greater than 2200 mm is necessary.
- **Downwards exhaust:**

Civil engineering with an adequate volume is necessary.

Telecontrol of power distribution networks

SM6: an integrated range for telecontrol of MV networks.

SM6 switchgear is perfectly suited to a telecontrol environment due to options such as:

- Easergy T200 I telecontrol interface;
- independent power supply of electrical controls;
- auxiliary contacts for position and fault signalling;
- current sensors for fault detection.



Easergy T200 I: an interface designed for the telecontrol of MV networks

Easergy T200 I is an interface that is both “plug and play” and multifunctional. It integrates all the functional features required for the remote monitoring and controlling of SM6:

- acquisition of various types of data: switch position, fault detectors, current values, etc.
- transmission of switch opening and closing orders;
- exchange with the control centre.

Particularly called on during network incidents, Easergy T200 I has proven reliability and dependability in order to operate the switchgear whenever required. It is simple to install and to operate.

A functional unit dedicated to Medium Voltage networks

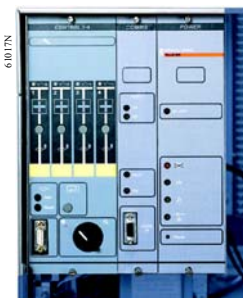
- Easergy T200 I is designed to be directly connected to MV switchgear, without any specific converter.
- it has a simple fascia layout for local operation, authorising management of electrical controls (local/remote switch) and enables visualisation of information on switchgear status.
- it integrates an MV network fault current detection system (overcurrent and zero sequence) with detection thresholds that are configurable channel by channel (current value and duration).

Guaranteeing Medium Voltage switchgear operation

- Easergy T200 I has been subjected to severe testing in terms of MV electrical constraints.
- a backup power supply guarantees continuity of service for several hours in the instance of any loss in auxiliary power supply providing power to the Easergy T200 I and MV switchgear motorization.

Ready to connect

- Easergy T200 I is delivered with a kit for easy connection to motorization and data acquisition terminals.
- the telecontrol unit connectors are foolproof to avoid any errors during installation or maintenance.
- data acquisition core balance CT's for current measurement are of the opening type for easier installation.



Control command



Foolproof connectors



Local information



Power unit



Opening core balance CT's

A range of FPIs for underground networks

A range for the tracking of permanent faults on MV underground networks.



Easergy F279 electronic detector unit

Bright outdoor

Split-core current transformer

The Easergy FPI range completes the expertise and leadership of Merlin Gerin in the MV field. It is the widest range available on the market place and covers all types of MV networks with their neutral grounding arrangements. Holding several key patents in this technology, Merlin Gerin's Easergy directional or ammeter FPIs are available for both overhead and underground MV lines, with various power supplies and packages. Backed by Schneider Electric international organization and experience of 40 years in Medium Voltage applications, Easergy puts its know how at the service of utilities striving for a better quality.

Usage

The Easergy range is designed for the tracking of permanent faults on MV cable networks. Thanks to an ammeter or directional fault detection scheme it covers the needs of all types of MV networks. Available in weatherproof or non-weatherproof enclosures, LV battery back, DC, or battery-only power supplies, the Easergy range is very versatile and offers more than 15 versions.

Benefits

Thanks to its programmability, the lineman is sure to be able to select the tripping parameters (current reset, timer reset, Low Voltage reset, manual reset) that match the one of the protection devices on a given feeder.

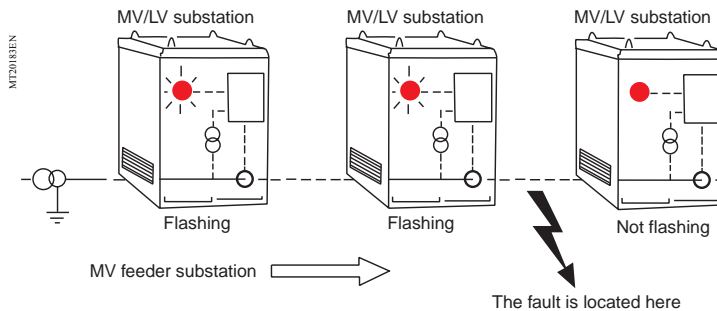
Easergy standard features:

- 16 3I_o, 4 I_{max} trip values;
- 8 timer reset values, (3 reset modes).

This is of paramount importance for tripping reliability.

MV telecontrol system

All members of the Easergy family come equipped with a dry contact output for connection to a Remote Terminal Unit as Easergy T200 I Merlin Gerin, capable of tele-signalling the passage of the fault current. In addition, a cost-effective tele-signalling device is available.



SM6 range

Description of the control/monitoring and protection functions



Range of multifunctional protection devices

Sepam

The Sepam range is made up of digital control/monitoring and protection units for MV distribution networks.

Their capacity is suited to all types of applications:

- protection;
- monitoring and control system;
- metering and signalling for MV distribution networks;
- communication;
- autodiagnosics system;
- generator.

Sepam is a complete range with digital displays to meet all needs:

- wide dynamic adjustment range;
- setting protection by password;
- compatible with all types of sensors;
- ease of use with logging of trip currents for each phase and display of true measurement values;
- operating reliability with continuous monitoring, and high level of immunity to electromagnetic interference;
- ModBus communication module.

Sepam 1000

The Sepam 1000 is suited to applications such as:

- substation;
- transformer;
- motor;
- busbar.

It allows measurement of current or voltage. It has a pre-programmed, settable control logic. As an option it has a ModBus communication module.

Sepam 2000

The Sepam 2000 is adapted to all types of applications:

- substation;
- transformer;
- motor;
- busbar;
- capacitor;
- generator.

It enables the measurement of current and voltage (and therefore power and energy).

It has a pre-programmed settable control logic which is entirely programmable (in ladder form) enabling all automatic control functions to be handled.



Definite time-delay autonomous

Statimax

General protection of MV consumer substations (MV metering). Statimax ensures, without an auxiliary source, against phase and zero-sequence faults.

Statimax is made up of an electronic setting device, three toroid voltage-matching transformers, a zero-sequence transformer and a regulation device that supplies the power for the electronics and the low-energy Mitop release.

Continuity of the electrical power supply

Source transfer switches

Designed for energy management and distribution applications, these electronic units automatically and safely switch between two different MV sources.

Note: these equipments (except VIP and Statimax) are set up in the low-voltage compartment of the concerning unit.



VIP 35



VIP 300 LL



VIP 200

VIP 35 protection relay

Integrated in the DMI-S and DMV-S cubicles

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.

VIP 300 LL protection relay

Integrated in the DMI-S and DMV-S cubicles

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.

VIP 200 and VIP 201 protection relay

Independent definite time protection device integrated with the SFset circuit breaker

Protection relay without an auxiliary power supply. Dedicated to the protection of transformers, this relay also enables very accurate selectivity to be obtained. VIP 200 and VIP 201 protection units in the Fluarc SFset circuit breaker, without an auxiliary power supply, protect against phase-to-phase and earth faults.

All these protection devices have wide settings ranges for their trip currents.

Selection table

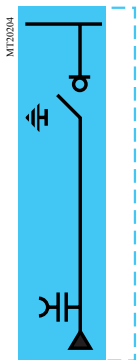
Protection type	Code	Protection units						
		Sepam 2000	1000+	Statimax	VIP			
					200	201	35	300
three-phase overcurrent	50 - 51	■	■	■	■ (1)	■ (1)	■ (2)	■ (1)
zero-sequence overcurrent	50N - 51N	■	■	■	■ (1)	■ (1)	■ (3)	■ (1)
directional zero-sequence current	67N	■						
undervoltage	27	■						
overvoltage	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	■	■					

(1) DT, EI, SI, VI and RI trip curves

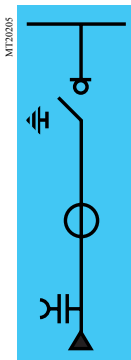
(2) Inverse curve suited to transformer protection

(3) DT trip curve

IM (375 or 500 mm)
Switch



IMC (500 mm)
Switch



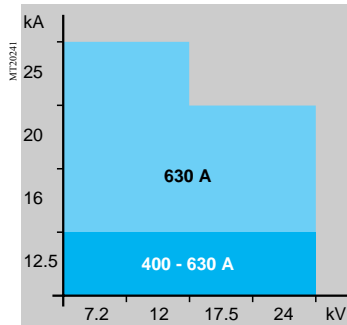
IMB (375 mm)
Switch
with earthing switch
Right or left outgoing



without earthing switch
Right or left outgoing



Electrical characteristics



Basic equipment:

- switch and earthing switch
- three-phase busbars
- CIT operating mechanism
- voltage indicators

■ connection pads for dry-type cables

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

■ one to three CTs

Versions:

- CI2 operating mechanism
- CI1 operating mechanism

■ 630 A or 1250 A three-phase busbars

Optional accessories:

- motor for operating mechanism
- auxiliary contacts
- additional enclosure or connection enclosure for cabling from above
- key-type interlocks
- 50 W heating element
- stands footing
- release units

■ phase comparator
■ fault indicators

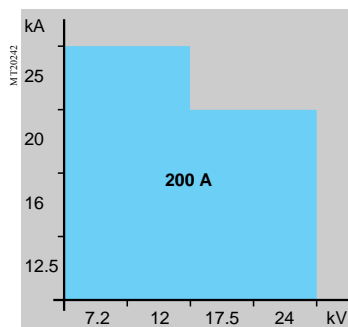
■ surge arrestors (for 500 mm cubicle)

Fuse-switch protection

PM (375 mm)
Fused-switch unit



Electrical characteristics



Characteristics of
the functional units

Basic equipment:

- switch and earthing switch
- three-phase busbars
- CIT operating mechanism
- voltage indicators
- connection pads for dry-type cables
- downstream earthing switch
- equipment for three UTE or DIN fuses

Versions:

- CII operating mechanism
- 630 A or 1250 A three-phase busbars

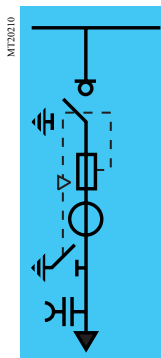
Optional accessories:

- motor for operating mechanism
- auxiliary contacts
- enlarged low-voltage compartment
- additional enclosure or connection enclosure for cabling from above
- key-type interlocks
- 50 W heating element
- stands footing
- mechanical indication system for blown fuses
- UTE or DIN fuses
- release units

QM (375 mm)
Fuse-switch
combination unit



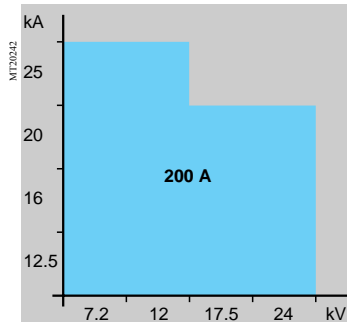
QMC (625 mm)
Fuse-switch
combination unit



QMB (750 mm)
Fuse-switch
combination unit
Outgoing line right or left



Electrical characteristics



Basic equipment:

- switch and earthing switch
- three-phase busbars
- CI1 operating mechanism
- voltage indicators
- equipment for three UTE or DIN striker fuses
- mechanical indication system for blown fuses

- connection pads for dry-type cables
- downstream earthing switch

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

- one to three CTs

Versions:

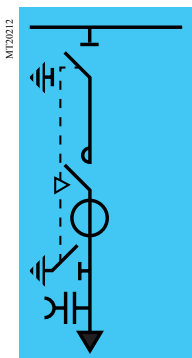
- 630 A or 1250 A three-phase busbars

- CI2 operating mechanism

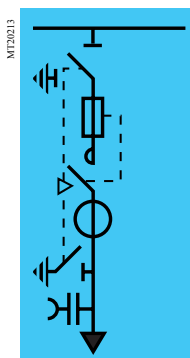
Optional accessories:

- motor for operating mechanism
- auxiliary contacts
- additional enclosure or connection enclosure for cabling from above
- key-type interlocks
- 50 W heating element
- stands footing
- indication contact for blown fuses
- UTE or DIN striker fuses
- release units

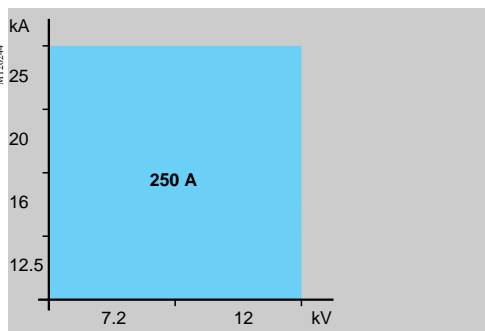
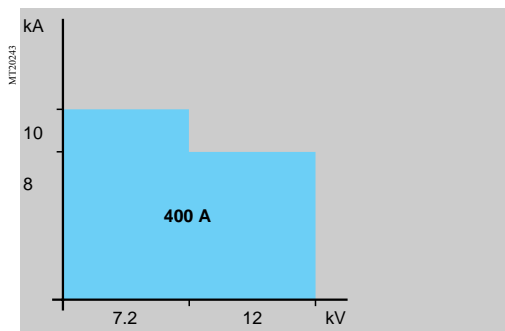
CRM (750 mm)
Contactor



CRM (750 mm)
Contactor with fuses



Electrical characteristics



Basic equipment:

- Rollarc 400 or 400D contactor
- disconnector and earthing switch
- three-phase busbars
- contactor operating mechanism R400 with magnetic holding or contactor R400D with mechanical latching
- disconnector operating mechanism CS
- one to three current transformers
- auxiliary contacts on contactor
- connection pads for dry-type cables
- voltage indicators
- downstream earthing switch
- additional enclosure
- operation counter

■ equipment for three DIN fuses

Version:

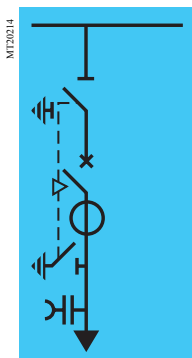
- 630 A or 1250 A three-phase busbars

Optional accessories:

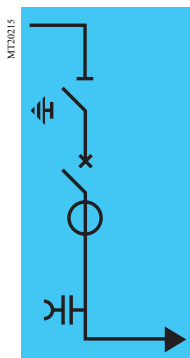
- **cubicle:**
 - auxiliary contacts on the disconnector
 - protection using Sepam programmable electronic unit
 - one to three voltage transformers
 - key-type interlocks
 - 50 W heating element
 - stands footing
- **contactor:**
 - mechanical interlocking

■ DIN fuses

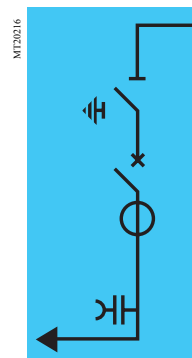
DM1-A (750 mm)
Single-isolation
circuit breaker



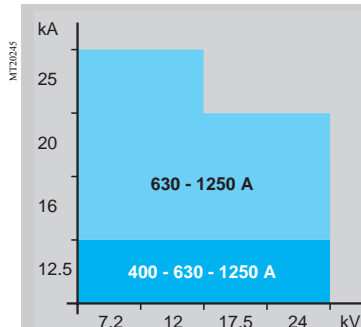
DM1-D (750 mm)
Single-isolation
circuit breaker
Outgoing line on right



DM1-D (750 mm)
Single-isolation
circuit breaker
Outgoing line on left



Electrical characteristics



Basic equipment:

- SF1 or SFset circuit breaker (only for the 400-630 A performances)
- disconnector and earthing switch
- three-phase busbars
- circuit breaker operating mechanism RI
- disconnector operating mechanism CS
- voltage indicators
- three CTs for SF1 circuit breaker
- auxiliary contacts on circuit breaker

- connection pads for dry-type cables
- downstream earthing switch

- three-phase bottom busbars

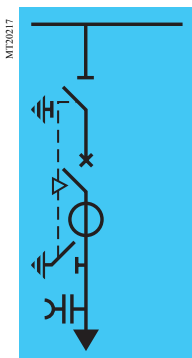
Version:

- 630 A or 1250 A three-phase busbars

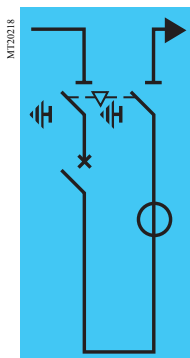
Optional accessories:

- **cabicle:**
 - auxiliary contacts on the disconnector
 - additional enclosure or connection enclosure for cabling from above
 - protection using Statimax relays, or Sepam programmable electronic unit for SF1 circuit breaker
 - three voltage transformers for SF1 circuit breaker
 - key-type interlocks
 - 50 W heating element
 - stands footing
 - surge arrestors
- **circuit breaker:**
 - motor for operating mechanism
 - release units
 - operation counter on manual operating mechanism

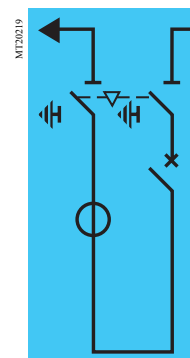
DM1-S (750 mm)
Single-isolation
circuit breaker
with independent protection



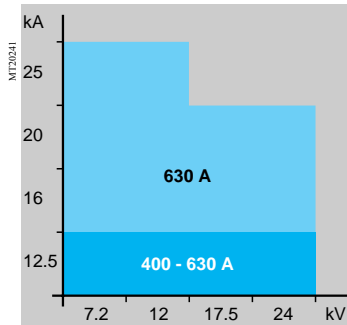
DM2 (750 mm)
Double-isolation
circuit breaker
Outgoing line on right



DM2 (750 mm)
Double-isolation
circuit breaker
Outgoing line on left



Electrical characteristics



Basic equipment:

- SF1 circuit breaker
- disconnector and earthing switch
- three-phase busbars
- circuit breaker operating mechanism RI
- disconnector operating mechanism CS
- auxiliary contacts on circuit breaker

- VIP relay protection
- three CR sensors for VIP relay protection
- voltage indicators
- connection pads for dry-type cables
- downstream earthing switch

- three CTs

Version:

- 630 A or 1250 A three-phase busbars

Optional accessories:

■ cubicle:

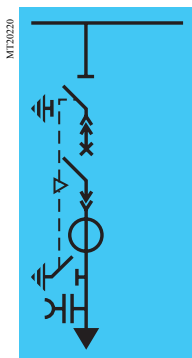
- auxiliary contacts on disconnectors
- additional enclosure or connection enclosure for cabling from above
- three voltage transformers
- key-type interlocks
- 50 W heating element
- stands footing

■ circuit breaker:

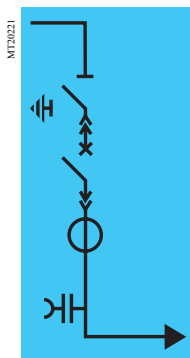
- motor for operating mechanism
- release units
- operation counter on manual operating mechanism

- protection using Statimax relays or Sepam programmable electronic unit

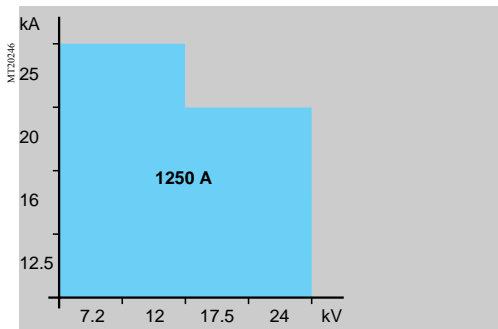
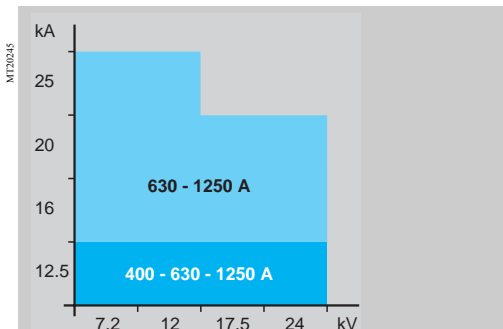
DM1-W (750 mm)
Withdrawable single-isolation
circuit breaker



DM1-Z (750 mm)
Withdrawable single-isolation
circuit breaker
Outgoing line on right



Electrical characteristics



Basic equipment:

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

- earthing switch operating mechanism CC
- connection pads for dry-type cables
- downstream earthing switch

- three-phase busbars

Version:

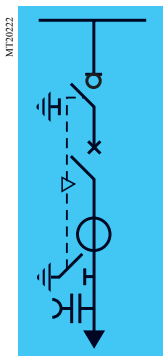
- 630 A or 1250 A three-phase busbars

Optional accessories:

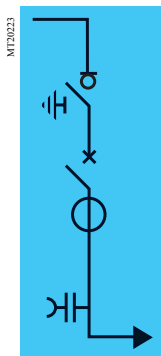
- **cabicle:**
 - auxiliary contacts on the disconnector
 - additional enclosure or connection enclosure for cabling from above
 - protection using Statimax relays or Sepam programmable electronic unit
 - three voltage transformers
 - key-type interlocks
 - 50 W heating element
 - stands footing
 - withdrawable circuit breaker cradle
- **circuit breaker:**
 - motor for operating mechanism
 - release units
 - operation counter on manual operating mechanism

- surge arrestors

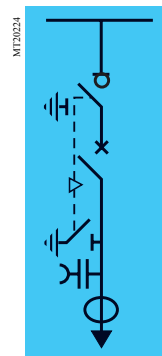
DMV-A (625 mm)
Single-isolation
circuit breaker



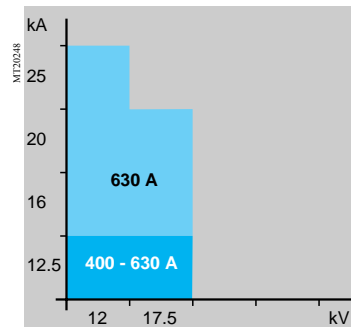
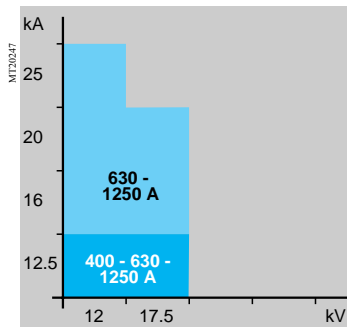
DMV-D (625 mm)
Single-isolation
circuit breaker
Outgoing line on right



DMV-S (625 mm)
Single-isolation
circuit breaker
with independent protection



Electrical characteristics



Characteristics of
the functional units

Basic equipment:

- Evolis circuit breaker
- disconnector and earthing switch for 400 - 630A
- disconnector and earthing switch for 1250A
- three-phase busbars
- circuit breaker operating mechanism Proxima
- disconnector operating mechanism CIT
- voltage indicators
- auxiliary contacts on circuit breaker

- three CT's
- Sepam programmable electronic unit

- connection pads for dry-type cables
- downstream earthing switch

- 3 Cr sensors for VIP relay protection
- protection by VIP relays

Version:

- 630 A or 1250 A three-phase busbars

- 630 A or 1250 A three-phase busbars

Optional accessories:

- **cubicle:**
 - auxiliary contacts on the disconnector
 - additional enclosure or connection enclosure for cabling from above
 - three voltage transformers
 - key-type interlocks
 - stands footing
- **circuit breaker:**
 - motor for operating mechanism
 - release units
 - operation counter on manual operating mechanism

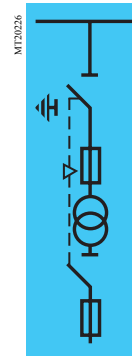
Functional units selection

MV metering

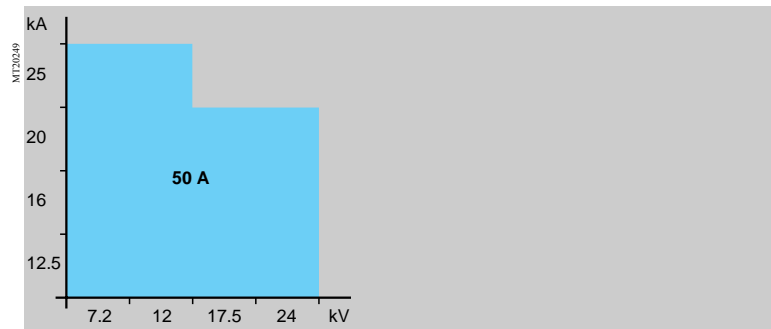
CM (375 mm)
Voltage transformers
for mains with earthed
neutral system



CM2 (500 mm)
Voltage transformers
for mains with insulated
neutral system



Electrical characteristics



Basic equipment:

- disconnecter and earthing switch
- three-phase busbars
- operating mechanism CS
- LV circuit isolation switch
- LV fuses
- three 6.3 A UTE or DIN type fuses

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

■ two voltage transformers
(phase-to-phase)

Version:

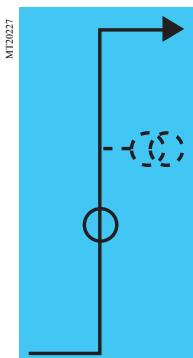
- 630 A or 1250 A three-phase busbars

Optional accessories:

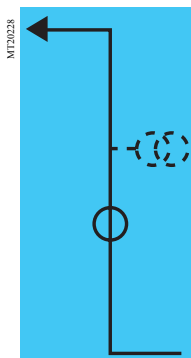
- auxiliary contacts
- additional enclosure or connection enclosure for cabling from above
- 50 W heating element
- stands footing
- indication contact for blown fuses

MV metering

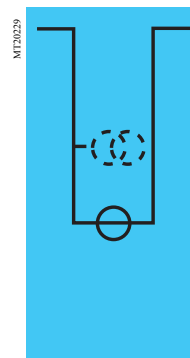
GBC-A (750 mm)
Current and/or voltage
measurements
Outgoing line on right



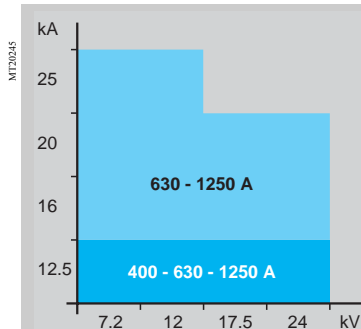
GBC-A (750 mm)
Current and/or voltage
measurements
Outgoing line on left



GBC-B (750 mm)
Current and/or voltage
measurements



Electrical characteristics



Characteristics of
the functional units

Basic equipment:

- one to three CTs
- connection bars
- three-phase busbars

Optional accessories:

- additional enclosure
- three voltage transformers (phase-to-earth), or two voltage transformers (phase-to-phase)
- stands footing

Casings

GEM (125 mm)
Extension unit VM6/SM6



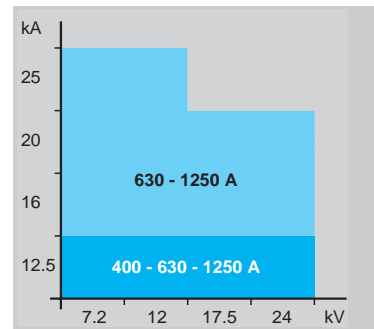
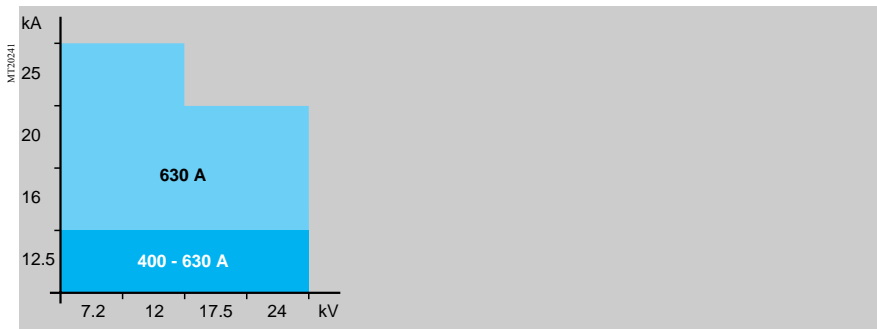
GIM (125 mm)
Intermediate bus unit



GBM (375 mm)
Connection unit
Outgoing line right or left



Electrical characteristics



Basic equipment:

■ three-phase busbars

■ three-phase busbars

■ connection bars
■ three-phase busbars for outgoing lines right or left

Optional accessories:

■ stands footing

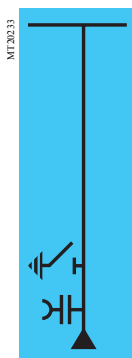
■ additional enclosure

Casings

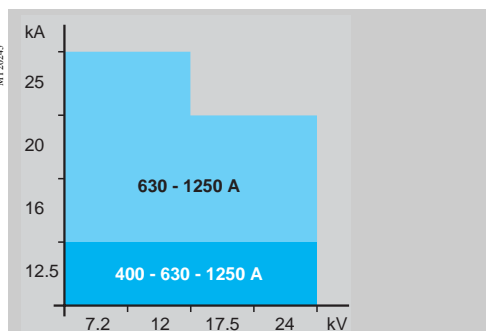
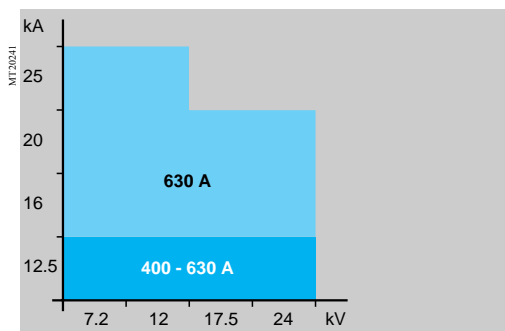
GAM2 (375 mm)
Incoming-cable-connection unit



GAM (500 mm)
Incoming-cable-connection unit



Electrical characteristics



Basic equipment:

- three-phase busbars
- voltage indicators
- connection pads for dry-type cables
- connection bars

- operating mechanism CC
- earthing switch

Optional accessories:

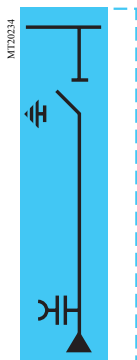
- enlarged low-voltage compartment
- stands footing
- 50 W heating element

- auxiliary contacts
- surge arrestors
- key-type interlocks

Characteristics of
the functional units

Other functions

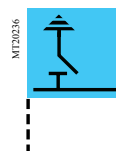
SM (375 ou 500⁽¹⁾ mm)
Disconnector unit



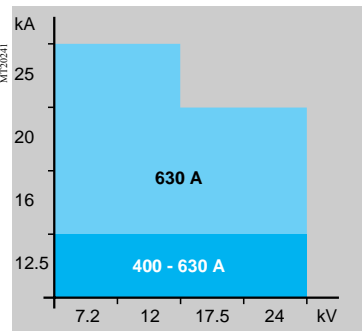
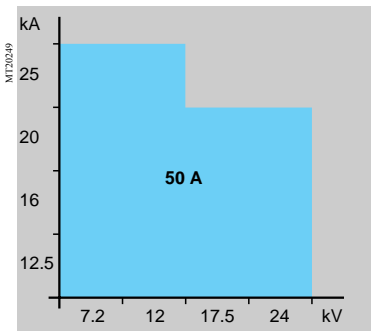
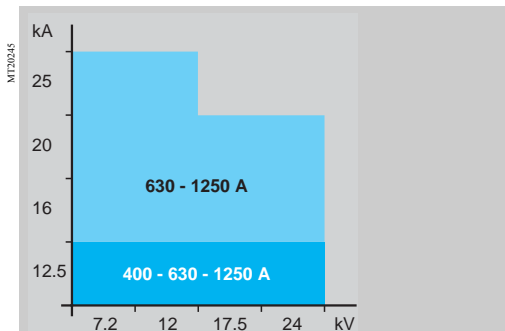
TM (375 mm)
MV/LV transformer unit
for auxiliaries



EMB (375 mm)^{(2) (3)}
Busbars earthing
compartment



Electrical characteristics



Basic equipment:

- disconnector and earthing switch
- three-phase busbars
- operating mechanism CS

- connection pads for dry-type cables
- voltage indicators

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

- disconnector and earthing switch
- connection bars
- operating mechanism CIT

Version:

- 630 A or 1250 A three-phase busbars

Optional accessories:

- auxiliary contacts
- additional enclosure
- key-type interlocks
- stands footing
- 50 W heating element

- connection enclosure for cabling from above

- mechanical indication system for blown fuses
- connection enclosure for cabling from above

- auxiliary contacts
- key-type interlocks

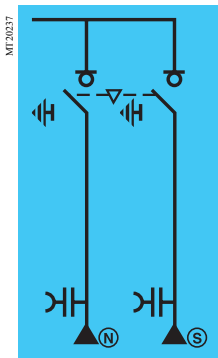
(1) only for 1250 A units.

(2) installation on 630 A IM 375 mm or DM1-A units (except additional enclosure or connection enclosure for cabling from above).

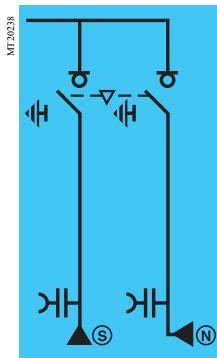
(3) require an key-type interlocks.

Other functions

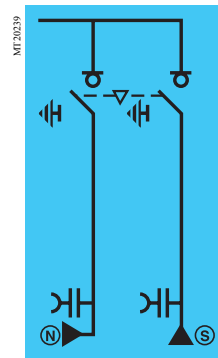
NSM-cables (750 mm)
Cables power supply for main incoming line (N) and standby line (S)



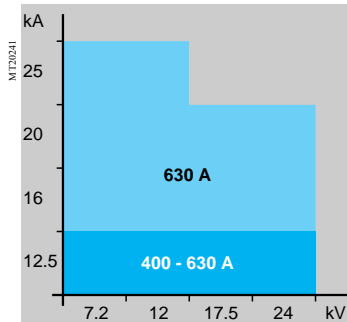
NSM-busbars (750 mm)
Busbars power supply for main incoming line on right and cables (N) for standby line (S)



NSM-busbars (750 mm)
Busbars power supply for main incoming line on left and cables (N) for standby line (S)



Electrical characteristics



Characteristics of
the functional units

Basic equipment:

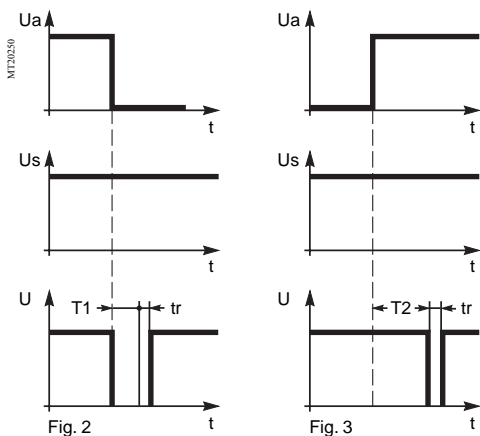
- automatic version:
- switches and earthing switches
- three-phase busbars
- connection pads for dry-type cables
- voltage indicators
- mechanical interlocking
- motorised operating mechanism CI2 with 24 Vdc shunt trips
- additional enclosure
- automatic-control equipment

Version:

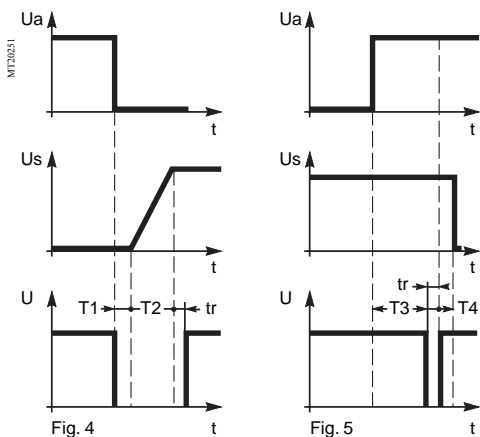
- 630 A or 1250 A three-phase busbars

Optional accessories:

- automatic version:
- auxiliary contacts
- key-type interlocks
- 50 W heating element
- stands footing



tr: transfer switch response time (70 to 80 ms)



tr: transfer switch response time (70 to 80 ms)

Transfer switch RCV 420

- locking function in the event of a fault
- possibility of parallel operation
- autonomous 24 Vdc supply for trip units and motor type:
 - $-10^{\circ}\text{C} < T < +40^{\circ}\text{C}$ or,
 - $0^{\circ}\text{C} < T < +60^{\circ}\text{C}$.
- terminal block for external orders for block transfer.

Operating sequences:

- transfer to standby source (Fig. 2)
 - 1 - voltage loss on main feeder U_a lasting for a time set to 0.1 - 0.2 - 0.4 - 0.6 - 0.8 - 1 - 1.5 - 2 s (T_1) and voltage present on standby feeder U_s ,
 - 2 - transfer.
- transfer back to main source (Fig. 3)
 - 1 - voltage present on main feeder U_a lasting for a time set to 5 - 10 - 20 - 40 - 80 - 100 - 120 s (T_2),
 - 2 - return transfer.

Transfer switch RNS 11

- locking function in the event of a fault
- autonomous 24 Vdc supply for trip units and motor type:
 - $-10^{\circ}\text{C} < T < +40^{\circ}\text{C}$ or,
 - $0^{\circ}\text{C} < T < +60^{\circ}\text{C}$.
- terminal block for external orders to block transfer.

Operating sequences:

- transfer to standby generator (Fig. 4)
 - 1 - voltage loss on main feeder U_a lasting for a time set from 1 to 15 s (T_1 is factory set),
 - 2 - generator start-up (T_2),
 - 3 - transfer when generator voltage U_s is present (external relay).
- transfer back to main source (Fig. 5)
 - 1 - voltage present on main feeder U_a lasting for a time set from 60 to 120 s (T_3 is factory set),
 - 2 - return transfer,
 - 3 - generator shutdown 6 seconds after return transfer (T_4).

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.

For the interlocks, consult the table pages 53/54 according to concerned cubicles.

Units	Type of operating mechanism						
	switch/disconnector					circuit breaker	
	CIT	CI1	CI2	CS	CC	RI	Proxima
IM, IMB, IMC	■	□	□				
PM	■	□	□				
QM, QMC, QMB		■	□				
CM, CM2, CRM				■			
DM1-A, DM1-D, DM1-S, DM1-Z, DM2				■		■	
DM1-A(*), DM1-W				■	■	■	
DMV-A, DMV-D, DMV-S	■						■
NSM-cables, NSM-busbars			■				
GAM					■		
SM, TM				■			
EMB	■						

■ provided as standard

□ other possibility

(*) 1250 A version

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, provokes closing or opening of the contacts.

■ Auxiliary contacts

□ switch (2 O + 2 C),

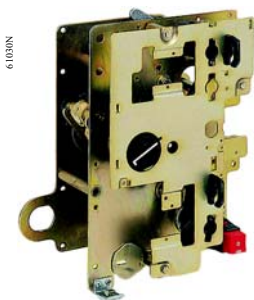
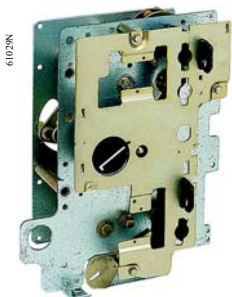
□ switch (2 O + 3 C) and earthing switch (1 O + 1 C),

□ switch (1 C) and earthing switch (1 O + 1 C) if motor option.

■ Mechanical indications

Fuses blown in unit PM.

■ Motor option



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, provokes closing of the contacts.

□ 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, provokes closing or opening of the contacts.

■ 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

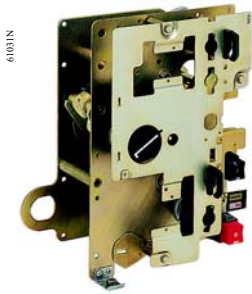
Fuses blown in units PM, QM.

■ Opening releases

□ shunt trip,

□ undervoltage for unit QM.

■ Motor option



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, provokes closing or opening of the contacts.

■ 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



Double-function operating mechanism CS

■ Switch and earth switch functions

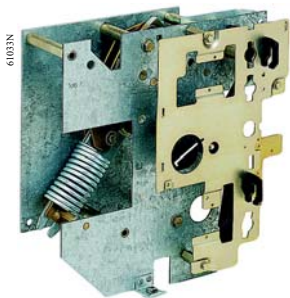
Dependent-operation opening and closing by lever.

■ Auxiliary contacts

- disconnector (2 O + 2 C) for units DM1-A, DM1-D, DM1-W, DM2 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 and CRM without VT,
- disconnector (1 O + 2 C) for units CM, CM2, TM, DM1-A, DM1-D, DM2 and CRM with VT.

■ Mechanical indications

Fuses blown in units CM, CM2 and TM.



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).



Single-function operating mechanism RI for the SF circuit breaker

■ 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			■		■	■					■



Proxima operating mechanism for the Evolis circuit breaker

■ 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.

■ Auxiliary contacts

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

■ Mechanical indications

Operation counter

■ Opening releases

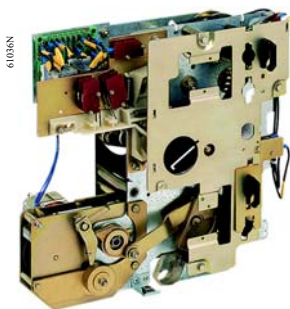
- Mitop (low energy),
- shunt trip,
- undervoltage.

■ Closing release

- shunt trip

■ Motor option (option and installation at a later date possible)

Characteristics of
the functional units



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	
arming time CIT		1 to 2 (s)					1 to 2 (s)	
or for working 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.

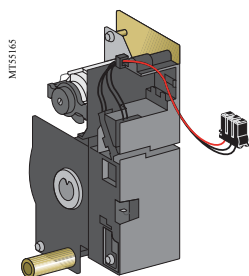


Motor option and releases for SF6 type circuit breakers

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	
arming 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.



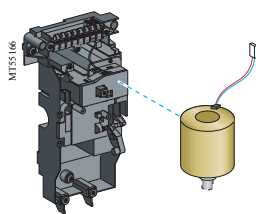
Charging motor and associated mechanism (MCH)

The MCH unit arms and rearms the energy storage springs as soon as the circuit breaker is closed. This enables instant reclosing of the device after opening. The arming lever is only used as back up control in the absence of an auxiliary voltage.

The MCH is equipped as standard with a CH limit switch.

This contact indicates the “armed” position of the mechanism (spring armed).

Characteristics				
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 Un			
consumption (VA or W)	180			
motor overcurrent	2 to 3 In during 0.1 s			
arming time	4 s max.			
switching rate	3 cycles per minute max.			
mechanical endurance	10000 remote controlled opening operations Evolis P1			
CH contact	10 A at 240 V			



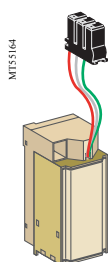
Low energy release (MITOP)

This specific coil actuates the opening mechanism of the poles to trip the circuit breaker. It comprises a low energy consumption electromagnet.

Characteristics	
power supply	direct current
threshold	0.6 A < I < 3 A
response time of the circuit breaker at Un	11 ms

Any tripping caused by the Mitop release is indicated momentarily by an SDE type changeover contact. This release unit also includes a coil enabling the remote rearming of the SDE contact.

Comment: to use the MITOP release requires the adjustment of a time delay to be set by the protection relay in order to ensure a circuit breaker operating time of 45-50 ms.



Shunt trip release (MX)

This causes instant opening of the circuit breaker when energised.

Permanent energising of the MX locks the circuit breaker in the “open” position.

Characteristics				
power supply	Vac 50/60 Hz	24/30	48/60	100/130 200/250
	Vdc	24/30	48/60	100/130 200/250
threshold	0.7 to 1.1 Un			
consumption (VA or W)	pick-up: 200			
	hold: 4.5			
response time of the circuit breaker at Un	50 ms ± 10			



6 0038N

For unit IMC

Transformer ARM2/N2F

- single primary winding;
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

I _n (A)	50	75	100	150	400	600
I _{th} (kA)	12.5	16	25	25	25	25
t (s)	1					
measurement and protection	5 A	7.5 VA - class 0.5				
	1 A	1 VA - 10P30				
	5 A	10 VA - 5P10				



6 0039N

For unit QMC

Transformer ARM1/N1F

- single primary winding;
- single secondary winding for measurement or protection.

Short-time withstand current Ith (kA)

I _n (A)	15	20	25	50	100	200
I _{th} (kA)	1.2	1.6	2	4	8	12.5
t (s)	1					
measurement or protection	5 A	15 VA - class 0.5				
	5 A	5 VA - 5P15				



6 0040N

For unit CRM

Transformer ARJP1/N2F

- single primary winding;
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

I _n (A)	50	100	150	200
I _{th} (kA)	4	10		
t (s)	1			
measurement and protection	5 A	7.5 VA - class 0.5		
	5 A	5 VA - 5P10		

Note: please consult us for other characteristics.



6 0041N

For 400 - 630 A units

DM1-A, DM1-D, DM1-W, DM2, GBC-A, GBC-B

Transformer ARM3/N2F

- double primary winding;
- single secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

I _n (A)	10/20	20/40	50/100	100/200	200/400	300/600
I _{th} (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*

- double primary winding;
- double secondary winding for measurement and protection.

Short-time withstand current Ith (kA)

I _n (A)	50/100	100/200	200/400	300/600
I _{th} (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	



For 630 A units DMV-A, DMV-D

Transformer ARJP2/N2F

- single primary winding;
- double secondary winding for measurement and protection.

Short-time withstand current I_{th} (kA)

I _n (A)	50	100	200	400	600	
I _{th} (kA)	25					
t (s)	1					
measurement and protection	1 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
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



For 1250 A units DM1-A, DM1-D, DM1-W, DM1-Z, GBC-A, GBC-B

Transformer ARJP2/N2F

- single primary winding;
- double secondary winding for measurement and protection.

Short-time withstand current I_{th} (kA)

I _n (A)	600	750
I _{th} (kA)	25	
t (s)	1	
measurement and protection	1 A	20 VA - class 0.5
	5 A	7.5 VA - 5P20
measurement and protection	5 A	20 VA - class 0.5
	5 A	7.5 VA - 5P20



For 1250 A units DM1-A, DM1-D, DM1-W, DM1-Z, GBC-A, GBC-B DMV-A, DMV-D

Transformer ARJP3/N2F

- single primary winding;
- double secondary winding for measurement and protection.

Short-time withstand current I_{th} (kA)

I _n (A)	1000	1250
I _{th} (kA)	25	
t (s)	1	
measurement and protection	1 A	30 VA - class 0.5
	5 A	10 VA - 5P20
measurement and protection	5 A	30 VA - class 0.5
	5 A	10 VA - 5P20

Characteristics of
the functional units

Voltage transformers



For units CM, DM1-A, DM1-D, DM2, GBC-A, GBC-B

Transformers VRQ2-n/S1 (phase-to-earth) 50 or 60 Hz

rated voltage (kV)	24			
primary voltage (kV)	$10/\sqrt{3}$	$15/\sqrt{3}$	$15-20/\sqrt{3}$	$20/\sqrt{3}$
secondary voltage (V)	$100/\sqrt{3}$			
thermal power (VA)	250			
accuracy class	0.5			
rated output for single primary winding (VA)	30	30		30
rated output for double primary winding (VA)			30-50	

For units DMV-A, DMV-D

Transformers VRQ2-n/S1 (phase-to-earth) 50 or 60 Hz

rated voltage (kV)	17.5	
primary voltage (kV)	$10/\sqrt{3}$	$15/\sqrt{3}$
secondary voltage (V)	$100/\sqrt{3}$	
thermal power (VA)	250	
accuracy class	0.5	
rated output for single primary winding (VA)	30	



For units CM2, GBC-A, GBC-B

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

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		

For units GBC-A, GBC-B

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

	rated voltage (kV)	12	17,5	24
	primary voltage (kV)	10/	15	20
	secondary voltage (V)	100		
First secondary	thermal power (VA)	200		
	accuracy class	0.5		
	rated output for single primary (VA)			
Second secondary	thermal power (VA)	100		
	accuracy class	3P		
	rated output	50		

61047N



For unit TM

Transformers RV9 (phase-to-phase) 50 or 60 Hz

rated voltage (kV)	24		
primary voltage (kV)	10	15	20
secondary voltage (V)	220		
output (VA)	2500	2500	2500
		4000	4000

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

Surge arrester

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

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

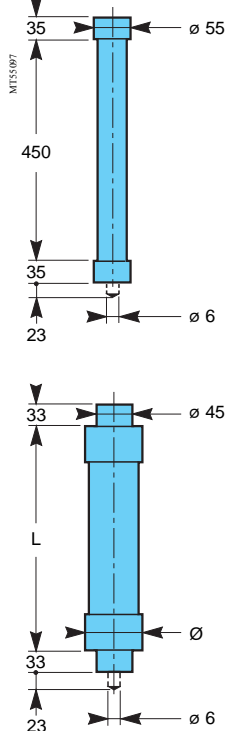
*Note: the rated voltage of the surge arrester is according to unit's rated voltage.
(* limited up to 17.5 kV for DMV-A and DMV-S circuit breaker cubicles.*

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 recommendation 60.282.1 and DIN dimensions 43.625.

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.

By fused switch



Solefuse (UTE standards)

rated voltage (kV)	rating (A)	L (mm)	Ø (mm)	weight (kg)
7.2	6.3 to 125	450	55	2
12	100			
17.5	80			
24	6.3 to 63			

Fusarc CF (DIN standards)

rated voltage (kV)	rating (A)	L (mm)	Ø (mm)	weight (kg)
7.2	125	292	86	3.3
12	6.3 to 20	292	50.5	1.2
	25 to 40	292	57	1.5
	50 to 100	292	78.5	2.8
24	6.3 to 20	442	50.5	1.6
	25 to 40	442	57	2.2
	50 to 63	442	78.5	4.1
	80	442	86	5.3

Others (DIN standards)

rated voltage (kV)	rating (A)	L (mm)	Ø (mm)	weight (kg)
7.2	160	292	85	3.8
	200	292	85	3.8
12	125	292	67	2
	160	292	85	3.8
	200	292	85	3.8
17.5	125	442	85	5.4
	200	442	85	5.4
24	100	442	85	5.4
	125	442	85	5.4

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.

Type of fuse	Service voltage (kV)	Transformer rating (kVA)														Rated voltage (kV)				
		25	50	100	125	160	200	250	315	400	500	630	800	1000	1250		1600	2000	2500	
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	16	31.5	31.5	31.5	43	43	63	80				
	20	6.3	6.3	6.3	6.3	16	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	63	63				
Fusarc CF (DIN standards)																				
	3.3	16	25	40	50	50	80	80	100	125	125	160	200*						7.2	
	5.5	10	16	31.5	31.5	40	50	50	63	80	100	125	125	160	160					
	6.6	10	16	25	31.5	40	50	50	63	80	80	100	125	125	160					
	10	6.3	10	16	20	25	31.5	40	50	50	63	80	80	100	100	125	200*		12	
	13.8	6.3	10	16	16	20	25	31.5	31.5	40	50	50	63	80	80	100	100	125*	125*	17.5
	15	6.3	10	10	16	16	20	25	31.5	40	50	50	63	80	80	100	125*	125*		
	20	6.3	6.3	10	10	16	16	25	25	31.5	40	40	50	50	63	80	100	125*	24	
	22	6.3	6.3	10	10	10	16	20	25	25	31.5	40	40	50	50	80	80	100		

* please consult us

The current rating of fuses installed in CRM units depends on:

- motor current rating I_n ;
- starting current I_d ;
- 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;
 - $I_d/I_n \delta 6$;
 - $pf = 0.8$ ($P \delta 500$ kW) or 0.9 ($P > 500$ kW);
 - $\eta = 0.9$ ($P \delta 500$ 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.

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

$$I_d = 6 \times I_n = 780 A$$

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

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

Starting current (A)	Starting time (s)						Maximum service voltage (kV)
	5		10		20		
	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

Maximum switchable power (kW)

(direct on-line startup, six 5 sec. starts per hour)

service voltage (kV)	3.3	4.16	5	5.5	6	6.6	10	11
without fuses	1550	1960	2360	2590	2830	3110	4710	5180
with fuses	100 A	140	180	215	240	260	285	435
	200 A	625	800	960	1060	1155	1270	
	250 A	1135						

Access to fuses

Access is via the front with the front panel removed.

Fuses may be removed without tools by simply pulling them forward.

The field deflector pivots and automatically returns to its position.

Replacement of fuses

When fault clearance results in one or two blown fuses, it is still common practice to replace only the blown fuses.

However, though the remaining fuse(s) may apparently be in good condition, their operating characteristics are generally reduced due to the short-circuit.

If non-blown fuses remain in service, they may blow even at very low over-current values.

In systems where continuity of service is of importance, it is recommended to **replace all three fuses**, in compliance with IEC recommendation 60282.1.

Please note: all three fuses must come from the same range:

Fusarc or Fusarc CF (they have different fusion curves).

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 disconnecter(s) can be closed only if the circuit breaker is open and the access panel is in position.
- the earth switch(es) can be closed only if the disconnecter(s) is/are open.
- the access panel for connections can be opened only if:
 - the circuit breaker is locked open,
 - the disconnecter(s) is/are open,
 - the earth switch(es) is/are closed.

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

Functional interlocks

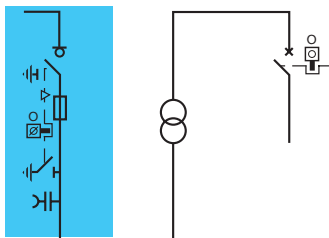
These comply with IEC recommendation 60298 and EDF specification HN 64-S-41.

- In addition to the functional interlocks, each disconnecter 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.

units	interlock								
	A1	A3	A4	C1	C4	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	■			■	■				
CRM				■					
NSM		■				■			
GAM									■
SM							■	■	

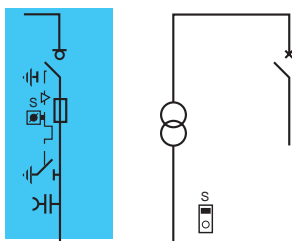
A1 type

MT20252



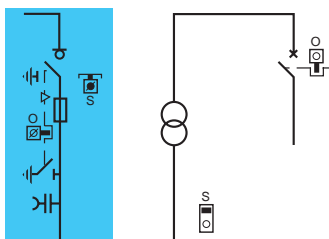
C1 type

MT20253



C4 type

MT20254



Key-type interlocks

Outgoing units

Aim:

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

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

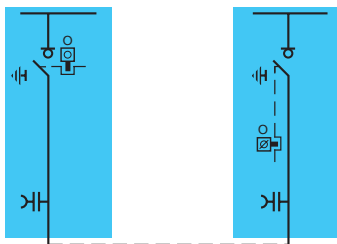
- to prevent the closing of the earthing switch on a transformer protection unit unless the LV circuit breaker is locked in "open" or "disconnected" position.
- to prevent the access to the transformer if the earthing switch for transformer protection has not first been closed.

Legend for key-type interlocks:

MT20240EN no key free key captive key panel or door

A3 type

MT20255



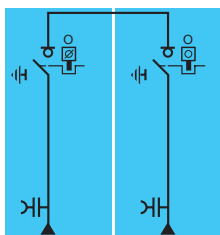
Ring units

Aim:

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

A4 type

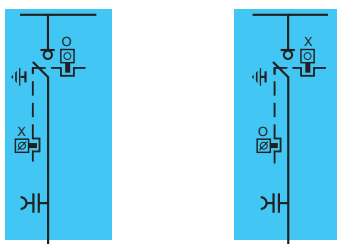
MT20256



- to prevent the simultaneous closing of two switches.

P1 type

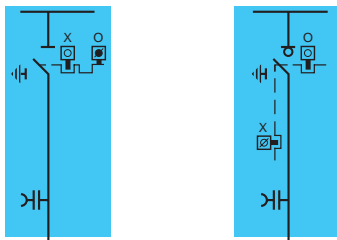
MT20257



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

P2 type

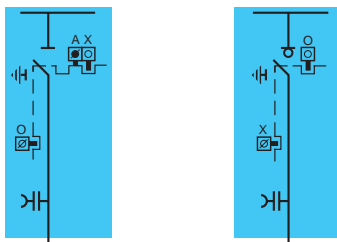
MT20258



- 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”.

P3 type

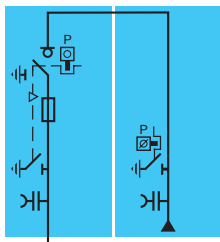
MT20259



- 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.

P5 type

MT20260



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

Legend for key-type interlocks:

MT20260EN

- no key
- free key
- captive key
- panel or door



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 lugs are:

- round connection and shank for cables δ 300 mm²;
 - square connection round shank for cables > 300 mm² only.
- Crimping of 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 cable cross section:

- 630 mm² for 1250 A incomer and feeder cables;
- 300 mm² for 400 - 630 A incomer and feeder cables ;
- 95 mm² 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 lug to be positioned and attached with one hand. Use a torque wrench set to 50 mN.

Dry-type single-core cable

Short inner end, cold fitted

Performance	Lug type	X-section mm ²	Supplier	Number of cables	Comments
3 to 24 kV 400 A - 630 A	round connector	50 to 300 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 lugs, please consult us
3 to 24 kV 1250 A	round connector square connector > 300 mm ² admissible	50 to 630 mm ²	all cold fitted cable end suppliers: Silec, 3M, Pirelli, Raychem, etc.	1 or 2 per phase δ 400 mm ² 400 < 1 δ 630 mm ² per phase	for larger x-sections, more cables and other types of lugs, please consult us

Three core, dry cable

Short inner end, cold fitted

Performance	Lug type	X-section mm ²	Supplier	Number of cables	Comments
3 to 24 kV 400 A - 630 A	round connector	50 to 300 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 lugs, 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 lugs, please consult us

Note:

- the lugs, covered by a field distributor, can be square;
- PM/QM type cubicle, round end connections Ø 30 mm max.

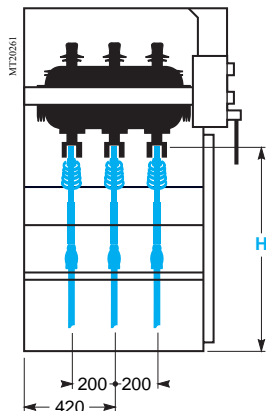
Cable-connection from below

Cable-connection height

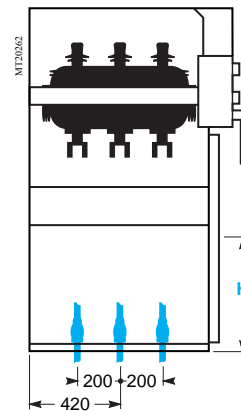
Cable-connection height H
measured from floor (mm)

	630 A	1250 A
IM,NSM-cables, NSM-busbars, SM	950	
SM	950	950
IMC	450	
PM, QM	400	
QMC	340	
CRM	430	
DM1-A SF1	370	650
DM1-A SFset, DM1-S	430	
DMV-A, DMV-S	324	324
DM1-W	360	650
GAM2	760	
GAM	470	620

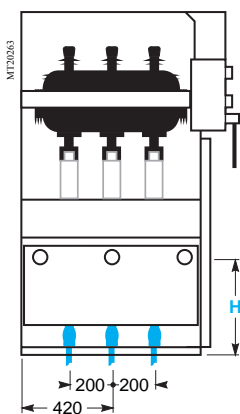
IM,NSM-cables, NSM-busbars, SM



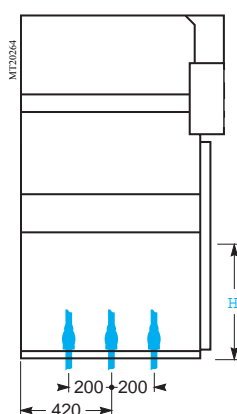
IMC, PM, QM, QMC



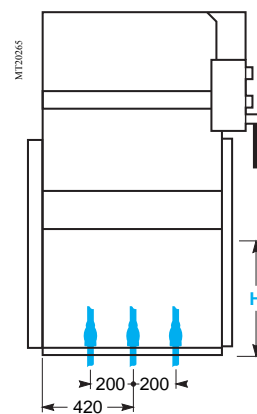
CRM



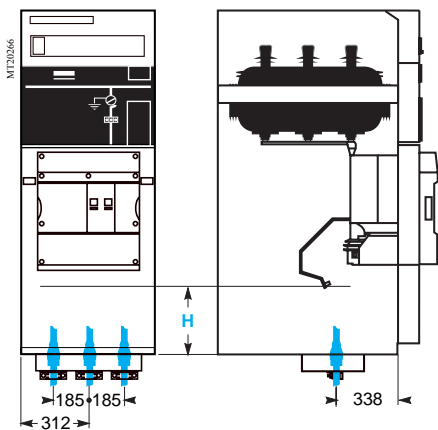
GAM2



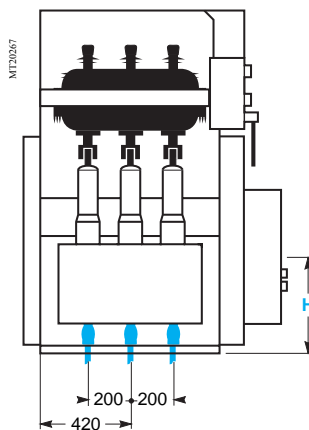
GAM



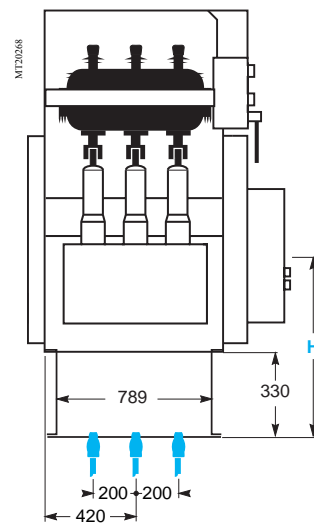
DMV-A, DMV-S 400 - 630 - 1250 A



DM1-A, DM1-S, DM1-W 400 - 630 A



DM1-A, DM1-W 1250 A



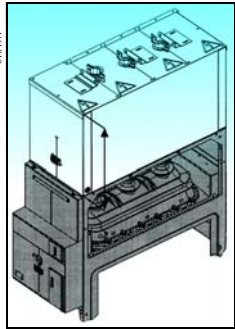
Connections

Cable-connection from below

Trenches depth

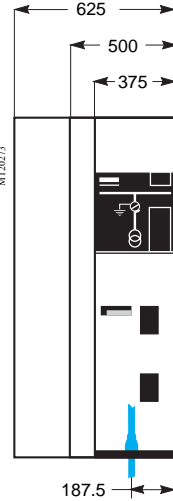
Cabling from above

On each unit of the range, except those including an enlarged low-voltage compartment, the connection is made with dry-type and single-core cables.



height : 450 mm

Cables position in front



400 - 630 - 1250 A units

Single-core cables cable x-section (mm ²)	bending radius (mm)	units until 630 A			1250 A units	
		IM, SM, NSM-cables, NSM-busbars	IMC, CRM, DM1-A, DM1-W, GAM, DM1-S	PM, QM, QMC ⁽²⁾	SM, GAM	DM1-A ⁽³⁾ DM1-W ⁽³⁾ DMV-A
depth P (mm) all orientations						
		P1	P2	P3	P4	P5
50	370	140	400	350		
70	400	150	430	350		
95	440	160	470	350		
120	470	200	500			
150	500	220	550			
185	540	270	670			
240	590	330	730			
400	800				1000	1350
630	940				1000	1350

(2) must be installed with a 100 mm deep pan.

(3) must be installed with a 350 mm deep pan, in a floor void.

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, depth P must be taken into account for each type of unit and cable orientations.

Cabling from below

All units:

■ **through trenches**

The trench depth P is given in the table opposite for commonly used types of cables.

■ **with stands**

To reduce P or eliminate trenches altogether by placing the units on 400 mm footings.

■ **with floor void**

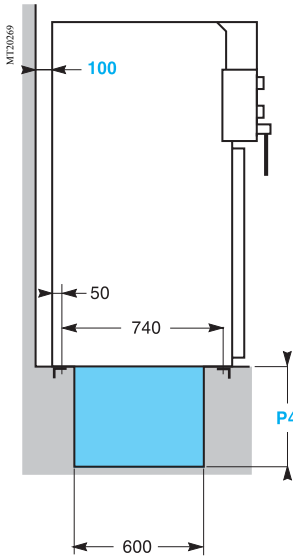
The trench depth P is given in the table opposite for commonly used types of cables.

Technical pit drawings

1250 A units

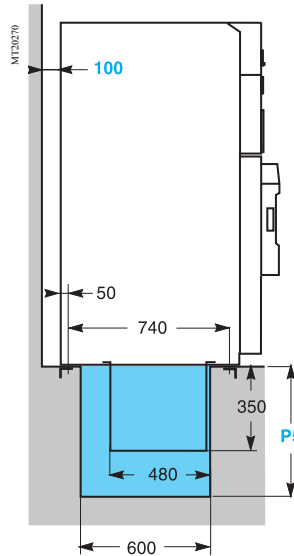
SM, GAM

for single and tri-core cables



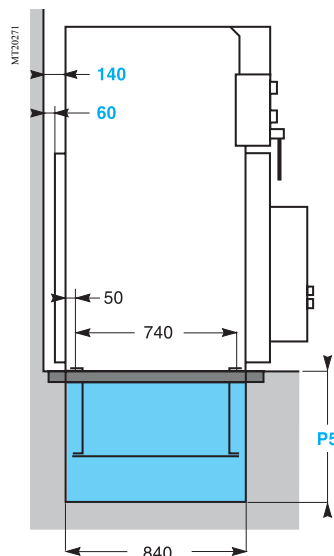
DMV-A

for single and tri-core cables



DM1-A, DM1-W

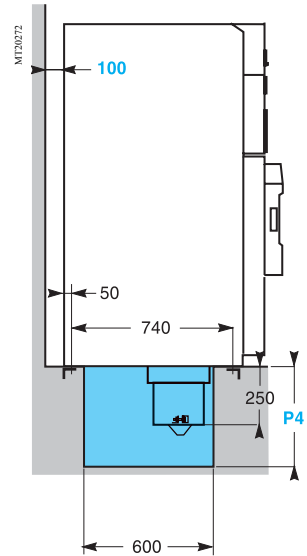
for single-core cables



630 A units

DMV-A, DMV-S

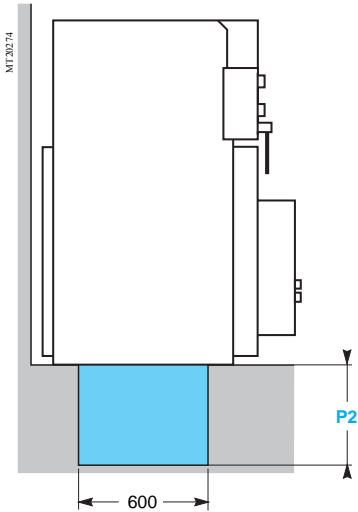
for single and tri-core cables



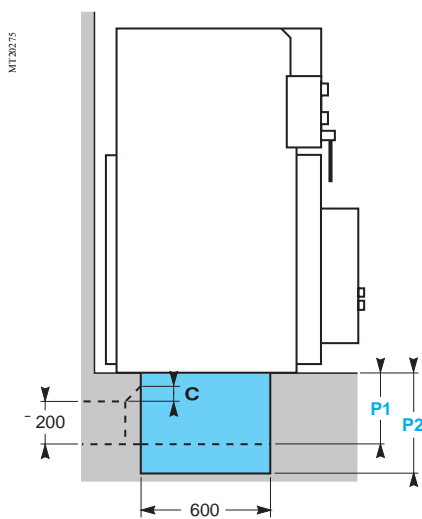
Cable-connection from below

Trench diagrams example

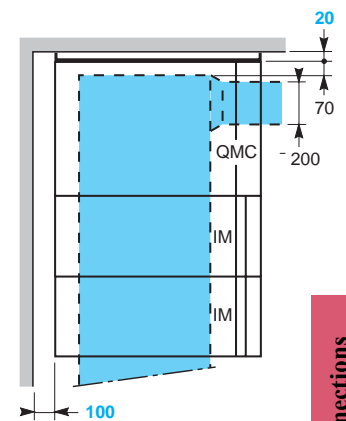
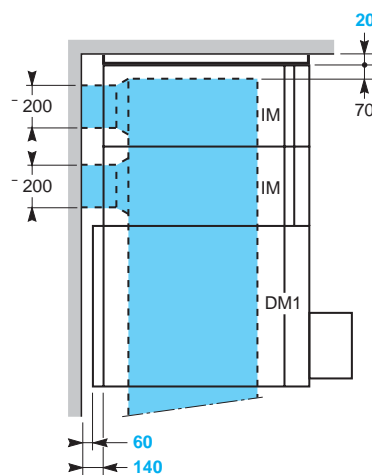
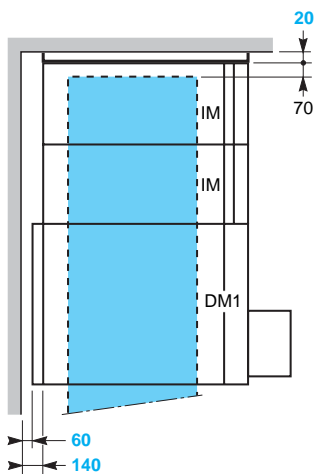
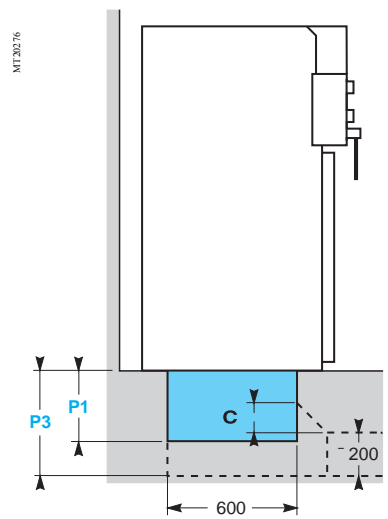
630 A units
cable entry or exit
through right or left side



630 A units
rear entry or exit
with conduits



630 A units
front entry or exit
with conduits



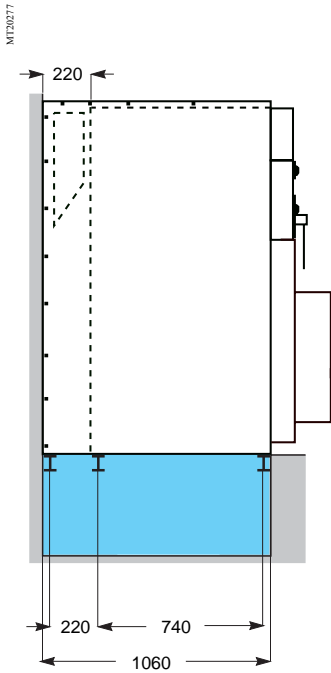
Required dimensions (mm)

Note: for connection with conduits, the bevel C must correspond to the following trench dimensions: P1 = 75 mm or P2/P3 = 150 mm.

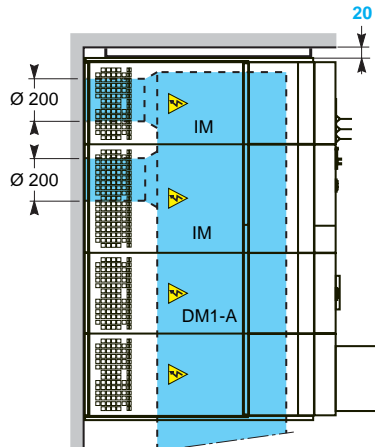
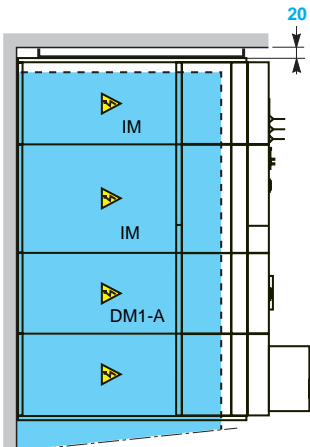
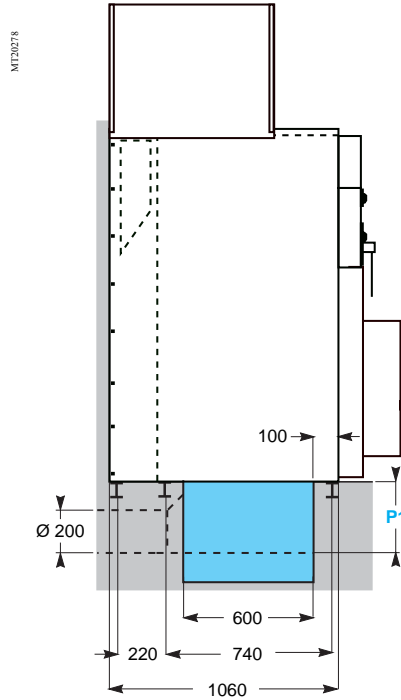
Cable-connection from below

Trench diagrams and technical pit drawings enhanced example

Installation with technical pit
Downwards exhaust



Installation with trench diagram
Upwards exhaust



Note: to evacuate gases through the bottom, the technical pit volume must be over or equal to 6 m³ for a switchboard width of 1125 mm minimum.

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.

Type of unit	height (mm)	width (mm)	depth (mm)	weight (kg)
IM,IMB	1600 ⁽¹⁾	375	940	120
IMC	1600 ⁽¹⁾	500	940	200
PM, QM, QMB	1600 ⁽¹⁾	375	940	130
QMC	1600 ⁽¹⁾	625	940	230
CRM	2050	750	940	390
DM1-A, DM1-D, DM1-W, DM1-Z, DM2	1600 ⁽¹⁾	750	1220	400
DM1-S	1600 ⁽¹⁾	750	1220	260
DMV-A, DMV-D	1600 ⁽¹⁾	625	940	320
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	30/35
GBM	1600	375	940	120
GAM2	1600	375	940	120
GAM	1600	500	1020	120
SM	1600 ⁽¹⁾	375/500 ⁽³⁾	940	120
TM	1600	375	940	190

Floor preparation

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

Required civil works are identical for all 400 - 630 A units.

To reduce the depth of trenches by 400 mm (for the 400 - 630 A units), which in many cases is sufficient to eliminate trenches altogether, units may be installed on a concrete footing prepared when pouring the floor.

Installation of 400 - 630 A units on a footing:

- enables installation in rooms where trenches are not possible;
- in no way affects substation switching operation;
- for the 1250 A units DM1-A and DM1-W, a floor void must be foreseen.

Fixing of units

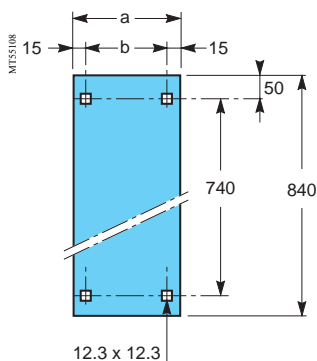
With each other

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 floor

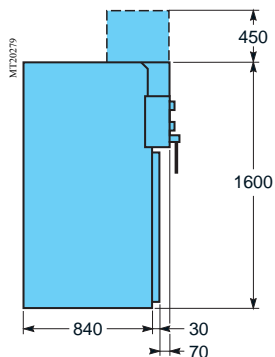
- for switchboards comprising up to three units, the four corners of the switchboard must be secured to the floor using:
 - M8 bolts (not supplied) screwed into nuts set into the floor using a sealing pistol,
 - screw rods grouted into the floor.
- for switchboards comprising more than three units, the number and position of fixing points depends on local criteria (earthquake withstand capacities, etc.), 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

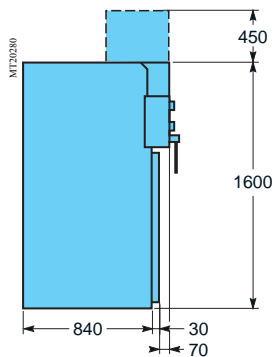


Note: in circuit-breaker or contactor units, fixing devices are installed on the side opposite the switchgear.

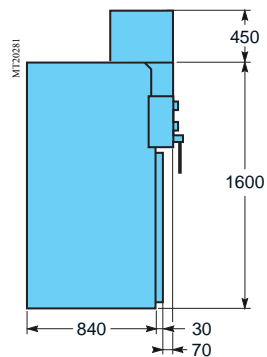
IM, IMB, PM, QM, QMB, SM



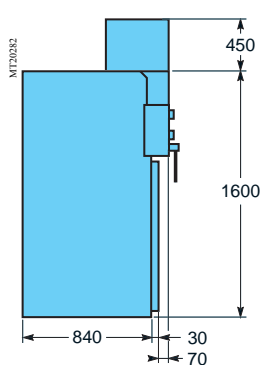
IMC, QMC, CM, CM2



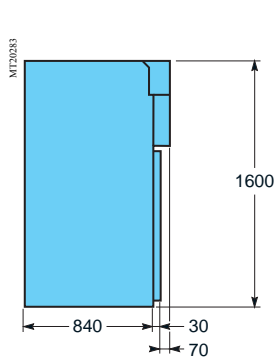
CRM



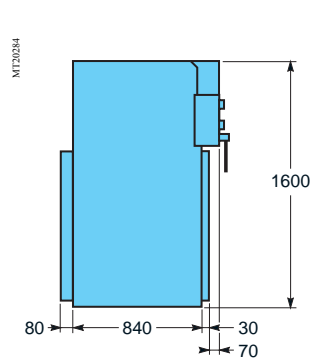
NSM-cables, NSM-busbars



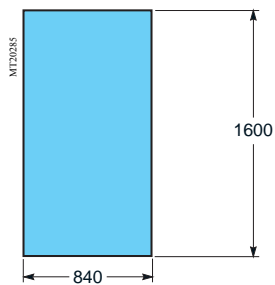
GBM, GAM2



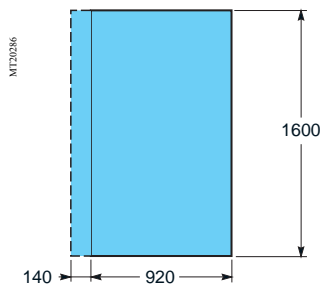
GAM



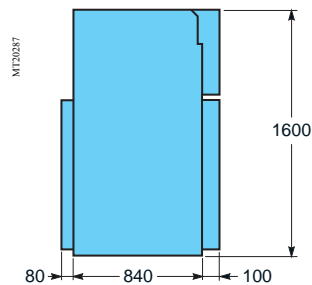
GIM



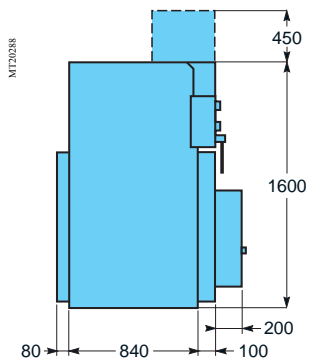
GEM



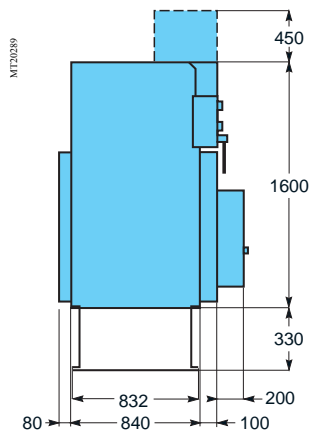
GBC-A, GBC-B



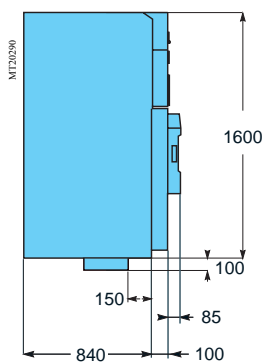
DM1-A, DM1-D, DM1-W, DM1-Z, DM1-S, DM2



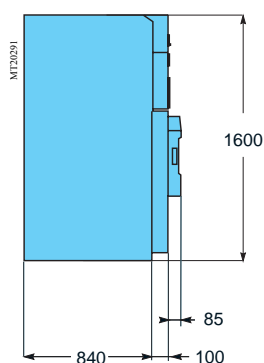
DM1-A, DM1-W 1250 A



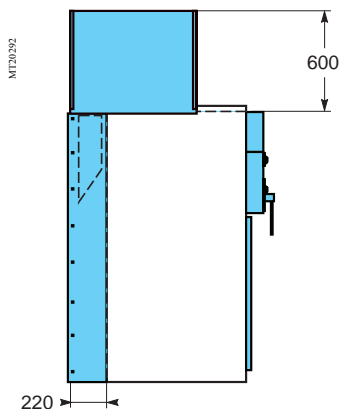
DMV-A, DMV-S



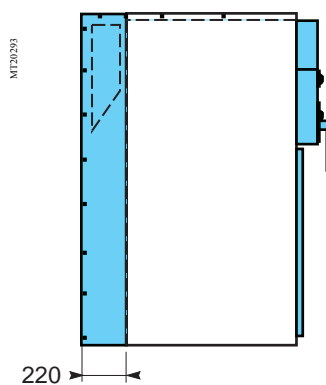
DMV-D



Internal arcing enhanced cubicles upwards exhaust



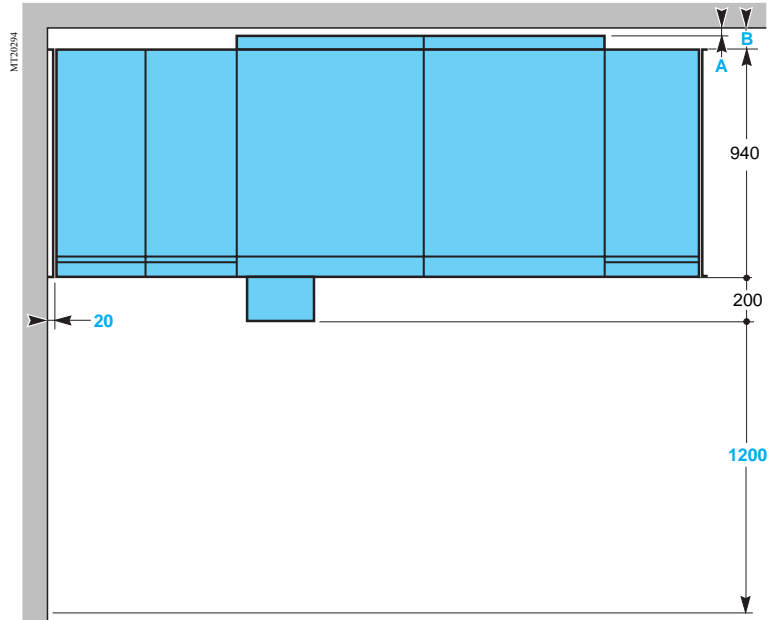
Internal arcing enhanced cubicles downwards exhaust



Biosco prefabricated substation



Conventional masonry substation

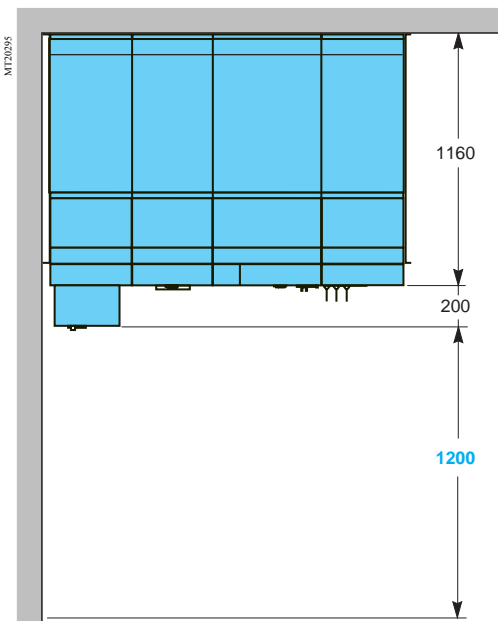


Required dimensions (mm)

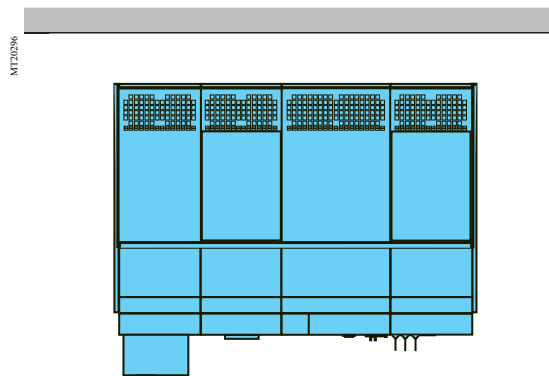
	without circuit breaker	with circuit breaker
Range	630/1250 A	630/1250 A
A		60
B	100	140

Switchboard extension example

Internal arcing cubicles 16 kA.1 s installed against a wall



Internal arcing cubicles 16 kA.1 s with rear corridor

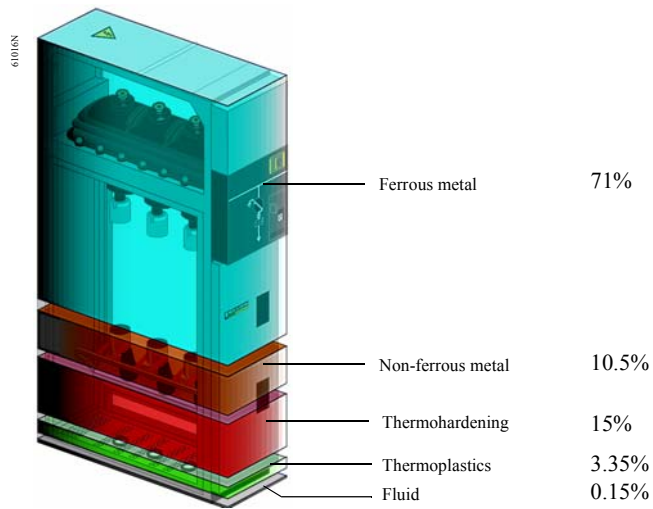


Schneider Electric's recycling service

Schneider Electric's recycling service for SF6 products is part of a rigorous management process which gives traceability of each device right through to its final destruction certificate.



Schneider Electric is committed to a long term environmental approach. As part of this, the SM6 range has been designed to be environmentally friendly, notably in terms of the product's recyclability. The materials used, both conductors and insulators, are identified and easily separable. 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 without any gas being released to the atmosphere nor any polluting fluids being discharged.



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.



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.

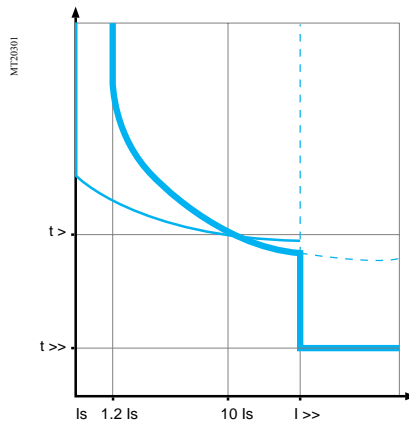
To accompany your installation throughout its life and upgrading your equipment:

- 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 processing.

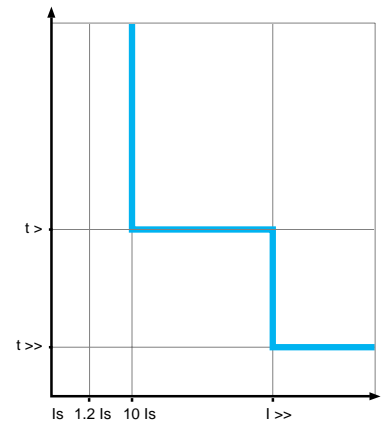
For more information on all the services proposed by Schneider Electric, please contact your Schneider Electric Sales Office.



Trip curves for VIP 300 LL or LH relays



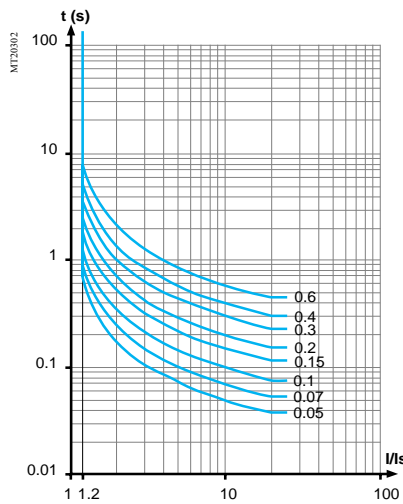
With lower definite time threshold



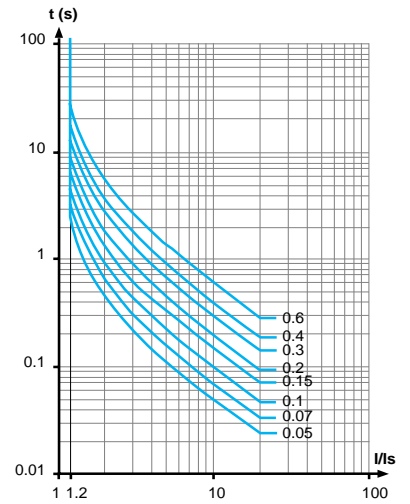
With lower inverse definite time threshold

Definite time tripping curves

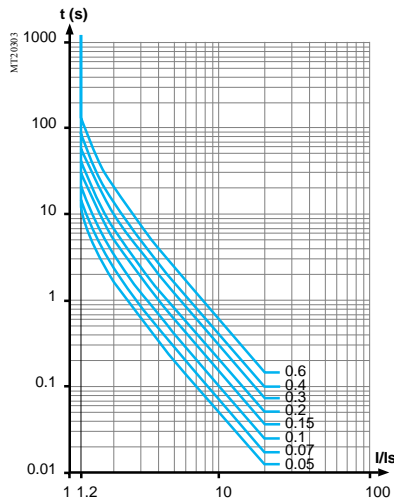
SI curve



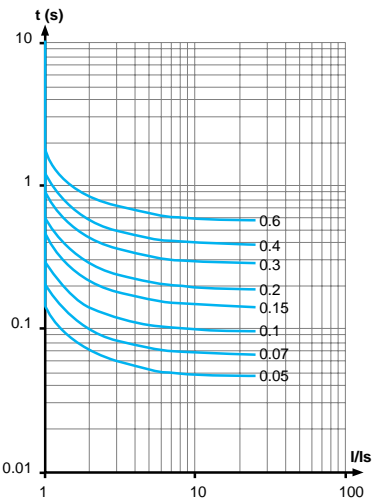
VI curve



EI curve

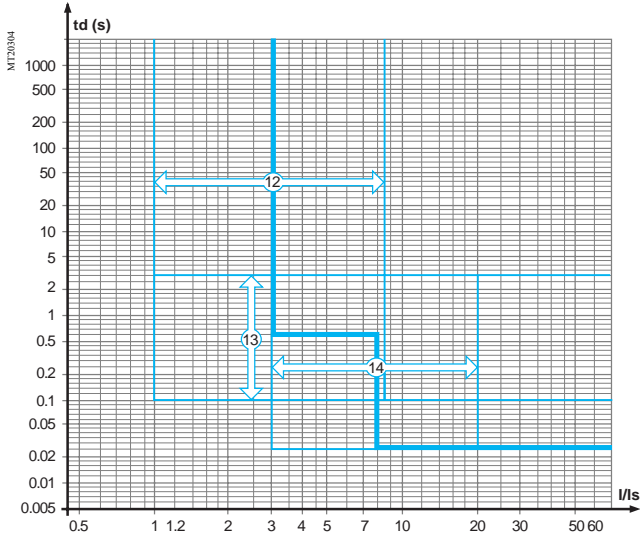


RI curve

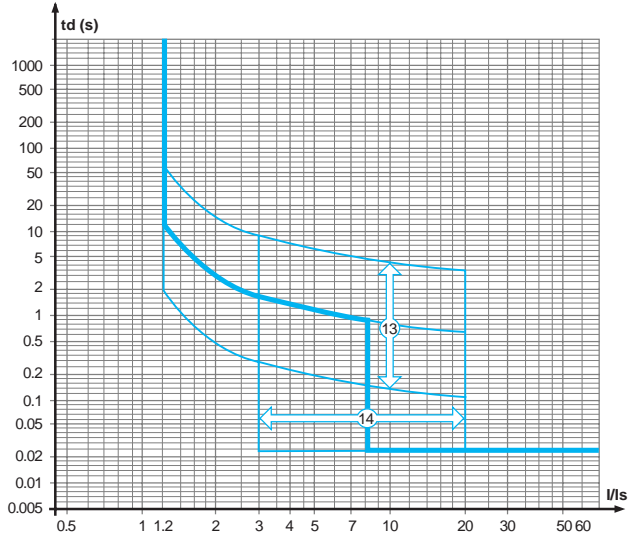


Trip curves for VIP 200 and VIP 201 relays for phase and earth faults

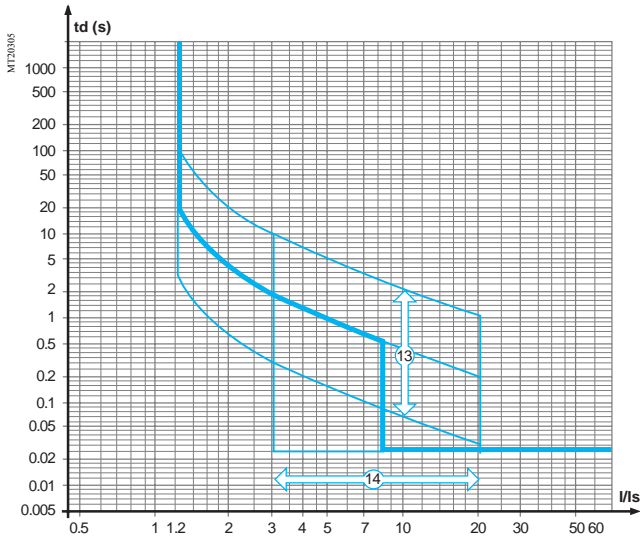
DT definite time curve



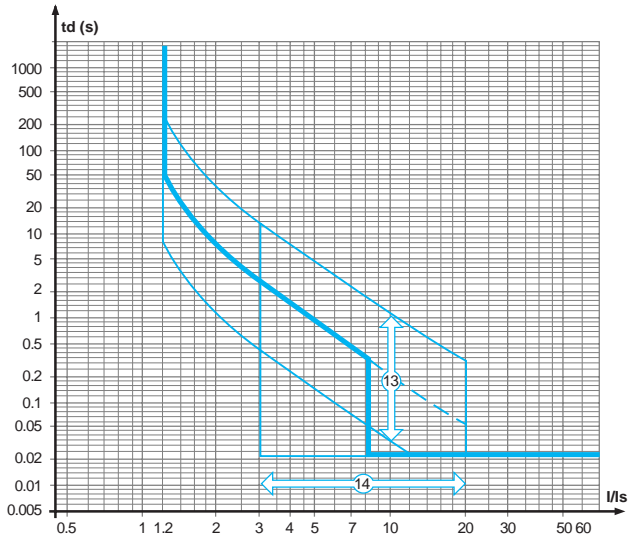
SI inverse definite time curve



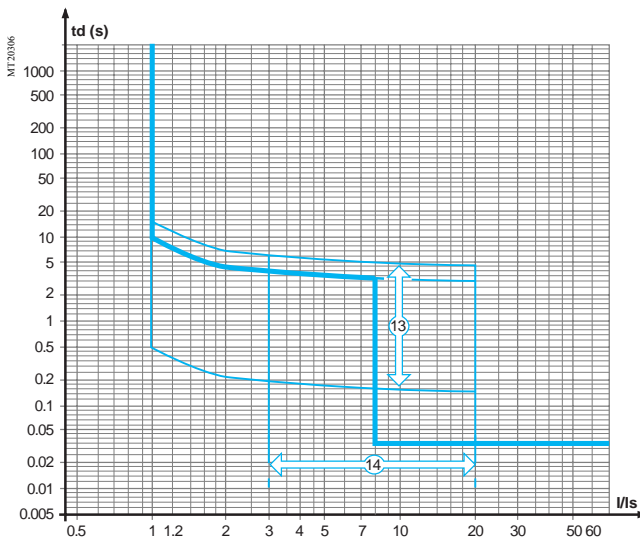
VI very inverse definite time curve

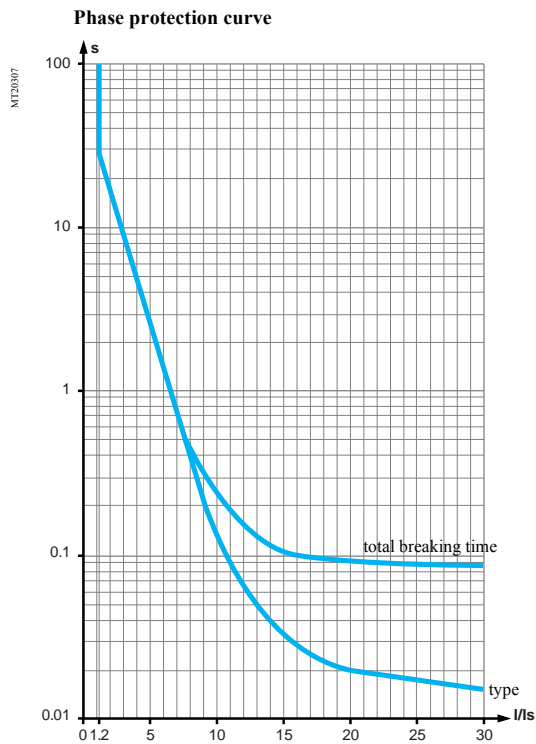


EI extremely inverse definite time curve



RI definite time curve



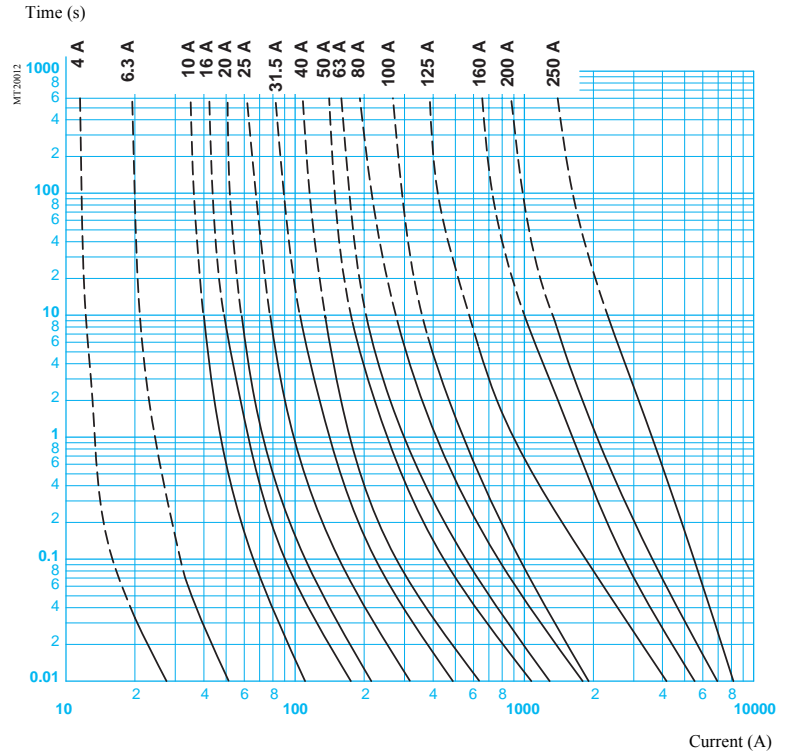


The trip curve shows the time before the relay acts, to which must be added 70 ms to obtain the breaking time.

Fusarc CF fuses

Fuse and limitation curves

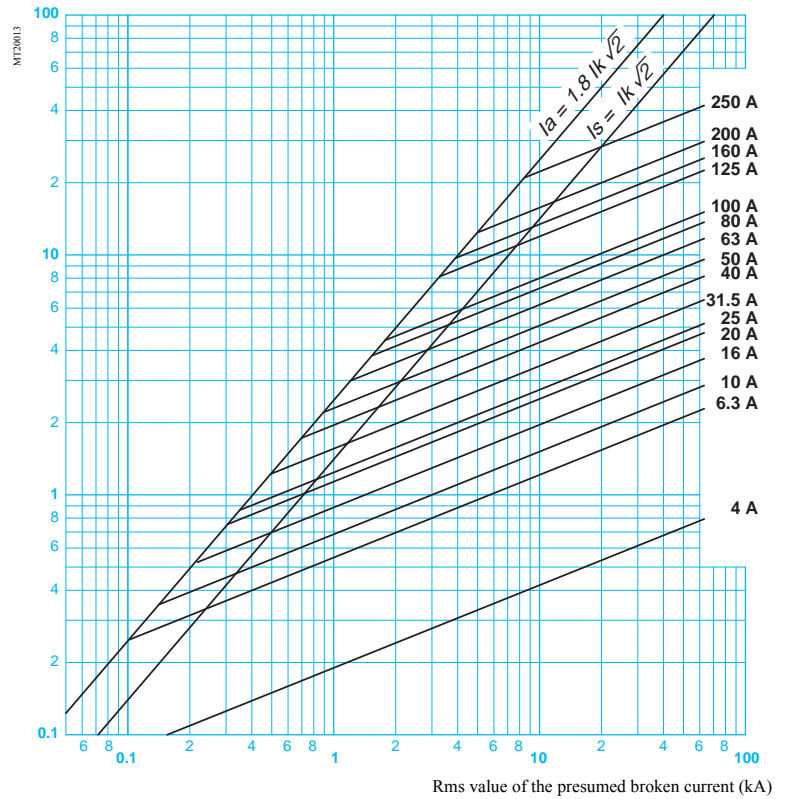
Fuse curve 3.6 - 7.2 - 12 - 17.5 - 24 kV



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

Maximum value of the limited broken current (kA peak)

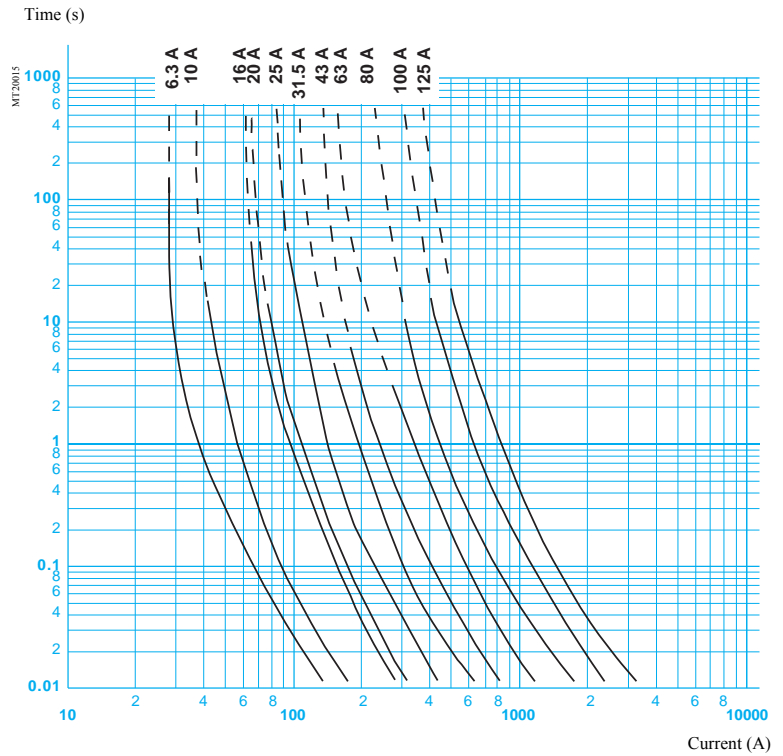
The diagram shows the maximum limited broken current value as a function of the rms current value which could have occurred in the absence of a fuse.



Solefuse fuses

Fuse and limitation curves

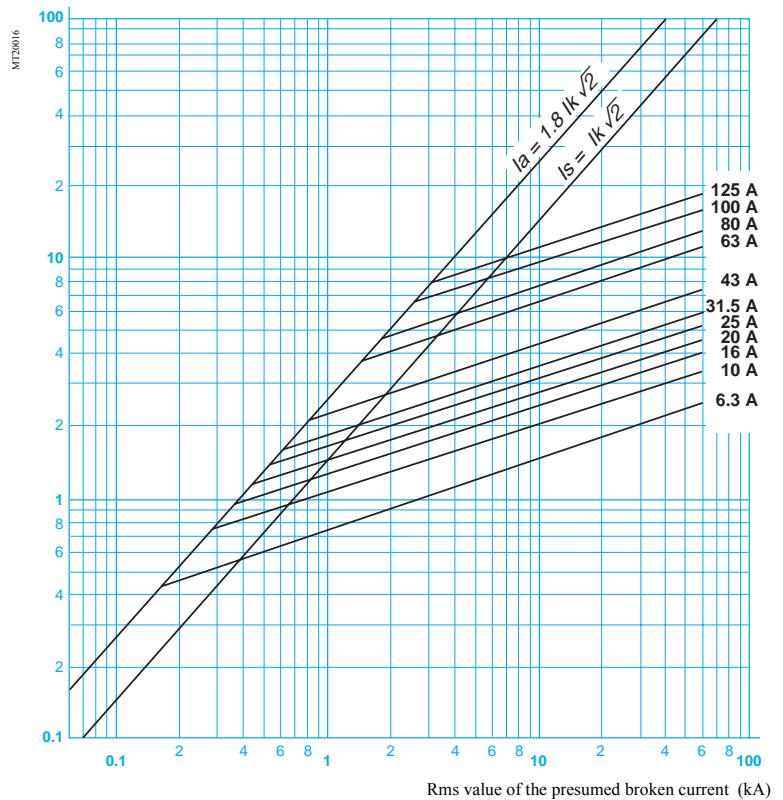
Fuse curve 7.2 - 12 - 17.5 - 24 kV



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 occurred in the absence of a fuse.



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

Blue box corresponds to none priced functions.

Basic withdrawable circuit breaker			Quantity
Rated voltage U _r	(kV)	<input type="checkbox"/>	<input type="checkbox"/>
Impulse voltage U _w	(kVbil)	<input type="checkbox"/>	<input type="checkbox"/>
Breaking current I _{sc}	(kA)	<input type="checkbox"/>	<input type="checkbox"/>
	Time current of short-circuit	1 s <input checked="" type="checkbox"/>	2 s <input checked="" type="checkbox"/>
Rated current I _r	(A)	<input type="checkbox"/>	<input type="checkbox"/>
Frequency	50 Hz <input checked="" type="checkbox"/>	60 Hz <input checked="" type="checkbox"/>	
Operating sequence	O-0.3s-CO-15s-CO <input checked="" type="checkbox"/>	O-0.3s-CO-3mn-CO <input checked="" type="checkbox"/>	O-3mn-CO-3mn-CO <input checked="" type="checkbox"/>
Installation	Fixed	A1 <input checked="" type="checkbox"/>	B1 <input checked="" type="checkbox"/>
	Withdrawable		B1 <input type="checkbox"/>
Colour for push buttons and indicators			
Push buttons open/close			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	red/black	red/green	green/red
			red/black (ansi)
Indicator open/close			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	black/white	black/white	green/red
			green/red
Operating mechanism indicator charged/discharged			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	white/yellow	white/yellow	charge/discharge
			charge/discharge
1st opening release * (see possible choice combination table)			
Shunt			
24 Vdc <input type="checkbox"/>	60 Vdc <input type="checkbox"/>	48 Vac (50 Hz) <input type="checkbox"/>	120 Vac (60 Hz) <input type="checkbox"/>
30 Vdc <input type="checkbox"/>	110 Vdc <input type="checkbox"/>	110 Vac (50 Hz) <input type="checkbox"/>	230 Vac (60 Hz) <input type="checkbox"/>
32 Vdc <input type="checkbox"/>	125 Vdc <input type="checkbox"/>	220 Vac (50 Hz) <input type="checkbox"/>	240 Vac (60 Hz) <input type="checkbox"/>
48 Vdc <input type="checkbox"/>	220 Vdc <input type="checkbox"/>	230 Vac (50 Hz) <input type="checkbox"/>	
Undervoltage			
24 Vdc <input type="checkbox"/>	60 Vdc <input type="checkbox"/>	220 Vdc <input type="checkbox"/>	220 Vac (50 Hz) <input type="checkbox"/>
30 Vdc <input type="checkbox"/>	110 Vdc <input type="checkbox"/>	48 Vac (50 Hz) <input type="checkbox"/>	120 Vac (60 Hz) <input type="checkbox"/>
48 Vdc <input type="checkbox"/>	125 Vdc <input type="checkbox"/>	110 Vac (50 Hz) <input type="checkbox"/>	240 Vac (60 Hz) <input type="checkbox"/>
Downstream supply (only AC)			
Mitop			
		without contact <input type="checkbox"/>	with contact <input type="checkbox"/>
Leaflets language	French <input checked="" type="checkbox"/>	English <input checked="" type="checkbox"/>	Spanish <input type="checkbox"/>

Options			
Electrical operating mechanism	24...32 Vdc <input type="checkbox"/>	110...127 Vdc/ac <input type="checkbox"/>	
	48...60 Vdc/ac <input type="checkbox"/>	220...250 Vdc/ac <input type="checkbox"/>	
Closing release	24 Vdc <input type="checkbox"/>	60 Vdc <input type="checkbox"/>	48 Vac (50 Hz) <input type="checkbox"/>
	30 Vdc <input type="checkbox"/>	110 Vdc <input type="checkbox"/>	110 Vac (50 Hz) <input type="checkbox"/>
	32 Vdc <input type="checkbox"/>	125 Vdc <input type="checkbox"/>	220 Vac (50 Hz) <input type="checkbox"/>
	48 Vdc <input type="checkbox"/>	220 Vdc <input type="checkbox"/>	230 Vac (50 Hz) <input type="checkbox"/>
2nd opening release * (see possible choice combination table)			
Shunt			
24 Vdc <input type="checkbox"/>	60 Vdc <input type="checkbox"/>	48 Vac (50 Hz) <input type="checkbox"/>	120 Vac (60 Hz) <input type="checkbox"/>
30 Vdc <input type="checkbox"/>	110 Vdc <input type="checkbox"/>	110 Vac (50 Hz) <input type="checkbox"/>	230 Vac (60 Hz) <input type="checkbox"/>
32 Vdc <input type="checkbox"/>	125 Vdc <input type="checkbox"/>	220 Vac (50 Hz) <input type="checkbox"/>	240 Vac (60 Hz) <input type="checkbox"/>
48 Vdc <input type="checkbox"/>	220 Vdc <input type="checkbox"/>	230 Vac (50 Hz) <input type="checkbox"/>	
Overcurrent 2 A <input type="checkbox"/>			
Overcurrent 5 A <input type="checkbox"/>			
Undervoltage			
24 Vdc <input type="checkbox"/>	60 Vdc <input type="checkbox"/>	220 Vdc <input type="checkbox"/>	220 Vac (50 Hz) <input type="checkbox"/>
30 Vdc <input type="checkbox"/>	110 Vdc <input type="checkbox"/>	48 Vac (50 Hz) <input type="checkbox"/>	120 Vac (60 Hz) <input type="checkbox"/>
48 Vdc <input type="checkbox"/>	125 Vdc <input type="checkbox"/>	110 Vac (50 Hz) <input type="checkbox"/>	240 Vac (60 Hz) <input type="checkbox"/>
Downstream supply (only AC)			
Mitop			
		without contact <input type="checkbox"/>	with contact <input type="checkbox"/>

(*) Different releases combinations

Shunt	1	<input type="checkbox"/>	<input type="checkbox"/>	2	1	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mitop	<input type="checkbox"/>	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	1	1	1	<input type="checkbox"/>	<input type="checkbox"/>
Undervoltage	<input type="checkbox"/>	<input type="checkbox"/>	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	1	<input type="checkbox"/>
Overcurrent 2 A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	<input type="checkbox"/>	<input type="checkbox"/>	1	<input type="checkbox"/>
Overcurrent 5 A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	<input type="checkbox"/>	<input type="checkbox"/>	1

Order form

SM6 24

Connection to the network

Only one of the boxes (ticked or filled) by the needed value) have to be considered between each horizontal line.
 Blue box corresponds to none priced functions.

Basic cubicle		Quantity	<input type="text"/>	
Rated voltage Ur		(kV)	<input type="text"/>	
Short-circuit current Isc		(kA)	<input type="text"/>	
Rated current Ir		(A)	<input type="text"/>	
Type of cubicle				
SM 375	<input type="checkbox"/>	IM 375	<input type="checkbox"/>	
SM 500	<input type="checkbox"/>	IM 500	<input type="checkbox"/>	
IMB 375	<input type="checkbox"/>	IMB 375 without E/S	<input type="checkbox"/>	
Position number in the switchboard (from left to right)			<input type="text"/>	
Direction of lower busbars for IMB				
left (impossible as first cubicle of switchboard)		<input checked="" type="checkbox"/>		
right		<input type="checkbox"/>		
Options				
Replacement of CIT by		C11	<input type="checkbox"/>	
		C12	<input type="checkbox"/>	
Electrical driving motorization	24 Vdc	<input type="checkbox"/>	110 Vdc	<input type="checkbox"/>
	32 Vdc	<input type="checkbox"/>	120-125 Vdc	<input type="checkbox"/>
	48 Vdc	<input type="checkbox"/>	137 Vdc	<input type="checkbox"/>
	60 Vdc	<input type="checkbox"/>	220 Vdc	<input type="checkbox"/>
			120/127 Vac (50 Hz)	<input type="checkbox"/>
			220/230 Vac (50 Hz)	<input type="checkbox"/>
			120/127 Vac (60 Hz)	<input type="checkbox"/>
			220/230 Vac (60 Hz)	<input type="checkbox"/>
Remote control signaling				
2 lights		<input type="checkbox"/>	2 lights and 2 PB	<input type="checkbox"/>
			2 lights and 2 PB + 1 switch	<input type="checkbox"/>
Voltage of the lights (must be the same than electrical driving mechanism)				
24 V		<input checked="" type="checkbox"/>	48 V	<input type="checkbox"/>
			110/125 V	<input type="checkbox"/>
			220 V	<input checked="" type="checkbox"/>
Signaling contact				
		1 C on SW and 1 O & 1 C on ES (not applicable on SM cubicle)		
2 O & 2 C on SW		<input type="checkbox"/>	2 O & 3C on SW and 1 O & 1C on ES	<input type="checkbox"/>
Roof configuration (A, B or C only one choice possible)				
A - Top incomer (cable maxi 240 mm ² with voltage indicator)				
3/7.2 kV		single core	<input type="checkbox"/>	
10/24 kV		single core	<input type="checkbox"/>	
			2 x single core	<input type="checkbox"/>
			2 x single core	<input type="checkbox"/>
B - Low voltage compartment (h = 450 mm) with unpunched door				
C - Wiring duct				
Cable connection by the bottom (not applicable on IMB, cable maxi 240 mm ²)				
three core		<input type="checkbox"/>	single core	<input checked="" type="checkbox"/>
			2 x single core	<input type="checkbox"/>
Heating element				
Interlocking (with key)				
Ronis		<input type="checkbox"/>	Profalux	<input type="checkbox"/>
For all cubicle (except SM)				
A4		<input type="checkbox"/>	A3 SM6-SM6	<input type="checkbox"/>
Localisation of 2nd lock for A3			on switch	<input type="checkbox"/>
Localisation of 2nd lock for A4			on earthing switch	<input type="checkbox"/>
SM cubicle only			cubicle no. <input type="text"/>	
			P2 SM6-SM6	<input type="checkbox"/>
			P3 SM6-SM6	<input type="checkbox"/>
ABB surge arrestors for IM 500				
7.2 kV		<input type="checkbox"/>	10 kV	<input type="checkbox"/>
			12 kV	<input type="checkbox"/>
			17.5 kV	<input type="checkbox"/>
			24 kV	<input type="checkbox"/>
Operating counter				
CT's for IMC (quantity)		1	<input type="checkbox"/>	
		2	<input type="checkbox"/>	
		3	<input type="checkbox"/>	
Replacement of 630 A busbar by 1250 A (not possible for IMB)				
Internal arc version 16 kA 1s (not possible with "top incomer" option)				

Order form

SM6 24

Fuse switch protection

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

Blue box corresponds to none priced functions.

Basic cubicle		Quantity	<input type="text"/>
Rated voltage U_r		(kV)	<input type="text"/>
Short-circuit current I_{sc}		(kA)	<input type="text"/>
Rated current I_r		(A)	<input type="text"/>
Type of cubicle			
QM 375		<input type="checkbox"/>	
QMB 375		<input type="checkbox"/>	
QMC 625		<input type="checkbox"/>	
PM 375		<input type="checkbox"/>	
Position number in the switchboard (from left to right)			
			<input checked="" type="checkbox"/>
CT's for QMC (to see price list)			
Quantity of CT's		1	<input checked="" type="checkbox"/>
		2	<input type="checkbox"/>
		3	<input type="checkbox"/>
Direction of lower busbars for QMB			
		left	<input type="checkbox"/>
		right	<input checked="" type="checkbox"/>
Options			
Fuses (see fuse price list)		service voltage δ 12kV <input checked="" type="checkbox"/>	
Replacement of mechanism			
CIT by C11 (only for PM)		<input type="checkbox"/>	
C11 by C12 (only for QM)		<input type="checkbox"/>	
Electrical driving motorization			
24 Vdc	<input type="checkbox"/>	110 Vdc	<input type="checkbox"/>
32 Vdc	<input type="checkbox"/>	120-125 Vdc	<input type="checkbox"/>
48 Vdc	<input type="checkbox"/>	137 Vdc	<input type="checkbox"/>
60 Vdc	<input type="checkbox"/>	220 Vdc	<input type="checkbox"/>
		120/127 Vac (50 Hz)	<input type="checkbox"/>
		220/230 Vac (50 Hz)	<input type="checkbox"/>
		120/127 Vac (60 Hz)	<input type="checkbox"/>
		220/230 Vac (60 Hz)	<input type="checkbox"/>
Shunt trip			
opening (on C11)		closing & opening (on C12)	
24 Vdc	<input type="checkbox"/>	110 Vdc	<input type="checkbox"/>
32 Vdc	<input type="checkbox"/>	120-125 Vdc	<input type="checkbox"/>
48 Vdc	<input type="checkbox"/>	137 Vdc	<input type="checkbox"/>
60 Vdc	<input type="checkbox"/>	220 Vdc	<input type="checkbox"/>
		120/127 Vac (50 Hz)	<input type="checkbox"/>
		220/230 Vac (50 Hz)	<input type="checkbox"/>
		120/127 Vac (60 Hz)	<input type="checkbox"/>
		220/230 Vac (60 Hz)	<input type="checkbox"/>
		380 Vac (50/60 Hz)	<input type="checkbox"/>
Remote control signaling (not applicable on PM, QMC and QMB)			
2 lights		<input type="checkbox"/>	
2 lights and 2 PB		<input type="checkbox"/>	
2 lights and 2 PB + 1 switch		<input type="checkbox"/>	
Voltage of the lights (must be the same than electrical driving mechanism)			
24 V	<input checked="" type="checkbox"/>	48 V	<input type="checkbox"/>
110/125 V	<input type="checkbox"/>	220 V	<input checked="" type="checkbox"/>
Auxiliary contact signaling			
		1 C on SW and 1 O & 1 C on ES	
2 O & 2 C on SW		<input type="checkbox"/>	
2 O & 3 C on SW and 1 O & 1C on ES		<input type="checkbox"/>	
Blown fuse signaling contact (mechanical indication PM, electrical for the other cubicles)			
<input type="checkbox"/>			
Roof configuration (A, B or C only one choice possible)			
A - Top incomer (cable maxi 240 mm ² with voltage indicator)			
3/7.2 kV	single core	<input type="checkbox"/>	2 x single core
10/24 kV	single core	<input type="checkbox"/>	2 x single core
B - Low voltage compartment (h = 450 mm)			
		with unpunched door	
C - Wiring duct			
<input type="checkbox"/>			
Interlocking			
Ronis	<input type="checkbox"/>	Profalux	<input type="checkbox"/>
		C4	<input type="checkbox"/>
		A1	<input type="checkbox"/>
		C1	<input type="checkbox"/>
Heating element			
<input type="checkbox"/>			
Operating counter			
<input type="checkbox"/>			
Replacement of 630 A busbar by 1250 A (not possible for QMB)			
<input type="checkbox"/>			
Internal arc version 16 kA 1s (not possible with "top incomer" option)			
<input type="checkbox"/>			

Order form

SM6 24

Circuit breaker protection

Only one of the boxes (ticked or filled) by the needed value) have to be considered between each horizontal line.
 Blue box corresponds to none priced functions.

Basic cubicle		Quantity	<input type="text"/>
Rated voltage U_r (maxi 17.5 kV for Evolis CB)		(kV)	<input type="text"/>
Short-circuit current I_{sc}		(kA)	<input type="text"/>
Rated current I_r		(A)	<input type="text"/>
Type of cubicle			
For SF1 circuit breaker	DM1-S 750 <input type="checkbox"/>	DM2 left 750 <input type="checkbox"/>	DM2 right 750 <input type="checkbox"/>
	DM1-W 750 <input type="checkbox"/>	DM1-Z 750 <input type="checkbox"/>	
For SFset circuit breaker	DM1-A 750 <input type="checkbox"/>	DM1-D left 750 <input type="checkbox"/>	DM1-D right 750 <input type="checkbox"/>
For Evolis circuit breaker	DMV-A <input type="checkbox"/>	DMV-S <input type="checkbox"/>	DMV-D right <input type="checkbox"/>
Position number in the switchboard (from left to right)			<input type="text"/>
Busbar (I_r \bar{S} I_r cubicle)			
For DM1-A, DM1-S, DM1-W	400 A <input type="checkbox"/>	630 A <input type="checkbox"/>	1250 A <input type="checkbox"/>
For DM1-D, DM2	400 A <input type="checkbox"/>	630 A <input type="checkbox"/>	
For DM1-A, DM1-D, DM1-W, DM1-Z			1250 A <input type="checkbox"/>
For DMV-A, DMV-D, DMV-S		630 A <input type="checkbox"/>	1250 A <input type="checkbox"/>
Protection			
For DM1-S, DMV-S	VIP35 with CRc <input type="checkbox"/>	VIP300LL with CRa <input type="checkbox"/>	VIP300LL with CRb <input type="checkbox"/>
For DM2, DM1-Z, DM1-W	Statimax 5 A, 2 s <input type="checkbox"/>	Statimax 1 A, 2 s <input type="checkbox"/>	
Control for DMV-A and DMV-D			
Local (shunt trip coil compulsory)			<input type="checkbox"/>
Remote (opening coil and closing coil compulsory)			<input type="checkbox"/>
Local and remote (opening coil and closing coil compulsory)			<input type="checkbox"/>
Voltage of the auxiliaries	48/60 Vdc <input type="checkbox"/>	110/125 or 220/250 Vdc <input type="checkbox"/>	110/130 or 220/240 Vac (50 Hz) <input type="checkbox"/>
Voltage of signaling	48/60 Vdc <input type="checkbox"/>	110/125 Vdc <input type="checkbox"/>	220/250 Vdc <input type="checkbox"/>
	110/130 Vac (50 Hz) <input type="checkbox"/>		220/240 Vac (50 Hz) <input type="checkbox"/>
Cable connection by the bottom			
For DM1-A, DM1-W	3 x single core cable maxi 240 mm ² <input type="checkbox"/>	6 x single core cable maxi 240 mm ² <input type="checkbox"/>	
Options			
Roof configuration (not applicable on DMV-A, DMV-S, DMV-D) (A, B or C only one choice possible)			
A - Top in comer (cable maxi 240 mm ² with voltage indicator)			
	3/7.2 kV	Single core <input type="checkbox"/>	2 x single core <input type="checkbox"/>
	10/24 kV	Single core <input type="checkbox"/>	2 x single core <input type="checkbox"/>
	DM2	1 set <input type="checkbox"/>	2 sets <input type="checkbox"/>
B - Low voltage compartment	DM2	1 compartment <input type="checkbox"/>	2 compartments <input type="checkbox"/>
C - Wiring duct	DM2	1 set <input type="checkbox"/>	2 sets <input type="checkbox"/>
	Other cubicles	1 set <input type="checkbox"/>	
Interlocking			
Not applicable on DM2	C4 <input type="checkbox"/>	Ronis A1 <input type="checkbox"/>	Profalux C1 <input type="checkbox"/>
CT's and VT's (not applicable for DM1-S, DMV-S)			See specific order form
Surge arrester (for DM1-W 630 A without VT's)			
Signaling contact			
		2 O & 2 C on SW (not applicable with VT's) <input type="checkbox"/>	
		2 O & 3 C on SW and 1 O & 1 C on ES (not applicable with VT's) <input type="checkbox"/>	
		1 O & 2 C on SW (available only on cubicle with VT's) <input type="checkbox"/>	
Heating element			
Circuit breaker			See specific order form

Order form

SM6 24

MV metering

Only one of the boxes (ticked or filled by the needed value) have to be considered between each horizontal line.
 Blue box corresponds to none priced functions.



Basic cubicle		Quantity	<input type="text"/>
Rated voltage Ur		(kV)	<input type="text"/>
Short-circuit current Isc		(kA)	<input type="text"/>
Rated current Ir		(A)	<input type="text"/>
Type of cubicle			
In = 630 A, In busbar = 400 A	CM	<input type="checkbox"/>	CM2 <input type="checkbox"/> TM <input type="checkbox"/> GBC-A <input type="checkbox"/> GBC-B <input type="checkbox"/>
In = 630 A, In busbar = 630 A	CM	<input type="checkbox"/>	CM2 <input type="checkbox"/> TM <input type="checkbox"/> GBC-A <input type="checkbox"/> GBC-B <input type="checkbox"/>
In = 630 A, In busbar = 1250 A	CM	<input type="checkbox"/>	CM2 <input type="checkbox"/> TM <input type="checkbox"/> GBC-A <input type="checkbox"/> GBC-B <input type="checkbox"/>
In = 1250 A, In busbar = 1250 A			GBC-A <input type="checkbox"/> GBC-B <input type="checkbox"/>
Direction of lower busbars for GBC-A			
	left	<input checked="" type="checkbox"/>	right <input type="checkbox"/>
VT's for GBC (to see price list)	phase/phase	<input type="checkbox"/>	phase/earth <input type="checkbox"/>
CT's for GBC (to see price list)	Quantity	1 <input type="checkbox"/>	2 <input type="checkbox"/> 3 <input type="checkbox"/>
Ratio choice for GBC			
Protections	1 secondary	<input checked="" type="checkbox"/>	1 high secondary <input checked="" type="checkbox"/>
	2 secondaries	<input checked="" type="checkbox"/>	1 low secondary <input checked="" type="checkbox"/>
Signaling contact		1 O and 1 C on SW (CM, CM2, TM)	<input checked="" type="checkbox"/>
		blown fuse mechanical indication (CM, CM2, TM)	<input type="checkbox"/>
Fuses for CM, CM2 and TM only (see fuse price list)			
Options			
Roof configuration (A, B or C only one choice possible)			
A - Top incomer (cable maxi 240 mm ² with voltage indicator)			
	3/7.2 kV	single core <input type="checkbox"/>	2 x single core <input type="checkbox"/>
	10/24 kV	single core <input type="checkbox"/>	2 x single core <input type="checkbox"/>
B - Low voltage compartment (h = 450 mm)		with unpunched door <input type="checkbox"/>	
C - Wiring duct		<input type="checkbox"/>	
Heating element for CM, CM2, TM			<input type="checkbox"/>

Order form

SM6 24

casing

Only one of the boxes (ticked or filled) by the needed value) have to be considered between each horizontal line.
 Blue box corresponds to none priced functions.

Basic cubicle			Quantity <input type="text"/>
Rated voltage Ur			(kV) <input type="text"/>
Short-circuit current Isc			(kA) <input type="text"/>
Rated current Ir			(A) <input type="text"/>
Type of cubicle			
In = 630 A, In busbar = 400 A	GAM 500 <input type="checkbox"/>	GAM2 375 <input type="checkbox"/>	GBM 375 <input type="checkbox"/>
In = 630 A, In busbar = 630 A	GAM 500 <input type="checkbox"/>	GAM2 375 <input type="checkbox"/>	GBM 375 <input type="checkbox"/>
In = 1250 A, In busbar = 1250 A	GAM 500 <input type="checkbox"/>		GBM 375 <input type="checkbox"/>
Position number in the switchboard (from left to right)			<input type="text"/>
Direction of lower busbars for GBM			
left (impossible on the first cubicle of the switchboard) 		<input checked="" type="checkbox"/>	right 
Options			
Roof configuration (A, B or C only one choice possible)			
A - Top incomer (cable maxi 240 mm ² with voltage indicator)			
	3/7.2 kV	single core <input type="checkbox"/>	2 x single core <input type="checkbox"/>
	10/24 kV	single core <input type="checkbox"/>	2 x single core <input type="checkbox"/>
B - Low voltage compartment (h = 450 mm)			with unpunched door <input type="checkbox"/>
C - Wiring duct <input type="checkbox"/>			
Wiring duct for GBM			<input checked="" type="checkbox"/>
ES auxiliary contact (only on GAM 500)			1 O and 1 C <input type="checkbox"/>
ABB surge arrestors for GAM 500, 630 A			
7.2 kV <input type="checkbox"/>	10 kV <input type="checkbox"/>	12 kV <input type="checkbox"/>	17.5 kV <input type="checkbox"/>
			24 kV <input type="checkbox"/>
Interlocking on GAM 500			
	Ronis <input type="checkbox"/>	Profalux <input type="checkbox"/>	
		A3 SM6-SM6 <input type="checkbox"/>	P5 SM6-SM6 <input type="checkbox"/>
Localisation of 2nd lock for P5			cubicle no. <input type="text"/>
Heating element (on GAM 500 630 A and on GAM2)			<input type="checkbox"/>



Order form

SM6 24

Power supply for main incoming line

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

Blue box corresponds to none priced functions.

Basic cubicle		Quantity	<input type="text"/>
Rated voltage U_r		(kV)	<input type="text"/>
Short-circuit current I_{sc}		(kA)	<input type="text"/>
Rated current I_r		(A)	<input type="text"/>
Type of cubicle			
In = 630 A, In busbar = 400 A	NSM busbar	<input type="checkbox"/>	NSM cable <input type="checkbox"/>
In = 630 A, In busbar = 630 A	NSM busbar	<input type="checkbox"/>	NSM cable <input type="checkbox"/>
In = 630 A, In busbar = 1250 A			NSM cable <input type="checkbox"/>
Position number in the switchboard (from left to right)			<input type="text"/>
Way of the busbars for NSM		left 	right 
	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Control unit with or without downstream fault			
RCV420	2 lights	<input type="checkbox"/>	2 lights setting in parallel <input type="checkbox"/>
RNS11 source main incoming line	on left	<input type="checkbox"/>	on right <input type="checkbox"/>
	on left with 2 lights	<input type="checkbox"/>	on right with 2 lights <input type="checkbox"/>
Cable connection by the bottom (cable maxi 240 mm²)			
	three core on both	<input type="checkbox"/>	single core on both <input type="checkbox"/>
			2 x single core on both <input type="checkbox"/>
	3 x single core on one cubicle and 2 x three core on the other one		<input type="checkbox"/>
Battery	0°C < T < +60°C	<input type="checkbox"/>	-10°C < T < +40°C <input type="checkbox"/>
Options			
Signaling contact on earthing switch		1 C on SW and 1 O & 1C on ES <input type="checkbox"/>	
operating counter		<input type="checkbox"/>	
Interlocking	SM6-SM6	Ronis	Profalux
	1 x P1	right cubicle <input type="checkbox"/>	left cubicle <input type="checkbox"/>
	2 x P1	right and left cubicle <input type="checkbox"/>	
	1 x A3	right cubicle <input type="checkbox"/>	left cubicle <input type="checkbox"/>
		on switch <input type="checkbox"/>	on earthing switch <input type="checkbox"/>
	2 x A3	right cubicle <input type="checkbox"/>	on earthing switch <input type="checkbox"/>
		left cubicle <input type="checkbox"/>	on earthing switch <input type="checkbox"/>
		on switch <input type="checkbox"/>	on earthing switch <input type="checkbox"/>
2 heating elements (set)		<input type="checkbox"/>	

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