Modular units





Catalogue 2006





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# The experience of a world leader



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 800,000 SF6 Medium Voltage units installed throughout the world.

Putting this experience at your service and remaining attentive to your requirements is the spirit of active partnership that we want to develop in offering you the SM6-24.

The modular SM6-24 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, SM6-24 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.

#### 2003: a leading position

■ with over 600,000 SM6-24 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.



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# The range's advantages











#### Upgradability

#### SM6-24, a comprehensive range

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

#### Compactness

#### SM6-24, 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 SM6-24 is particularly well designed.

#### Maintenance

#### SM6-24, a range with reduced maintenance

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

#### Ease of installation

#### SM6-24, a simple range to incorporate

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

#### Ease and safe to operate

#### SM6-24, 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.

#### SM6-24: a range designed with telecontrol in mind

SM6-24 switchgear is perfectly adapted to telecontrol applications. Motorised, either when installed or at a later date on-site without any interruption in service, SM6-24 combines with the Easergy T200 remote control interface. You therefore benefit from a ready-to connect unit that is easy to incorporate providing guaranteed switchgear operation.

#### SM6-24: a range with adapted protection devices

With the SM6-24, Schneider Electric proposes solutions for network management; the Sepam and VIP or relay ranges protect installations, providing continuity of electrical supply and reducing downtime.



### Presentation

# The references of a leader

# SM6-24, 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 assurance**

# Quality certified to ISO 9001

#### A major advantage

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

- This procedure is:
- uniform throughout all departments;
- recognised by many customers and approved organisations.

But it is above all its strict application that has enabled recognition to be obtained by an independent organisation:

The French Quality Assurance Association (FQAA).

The quality system for the design and manufacture of SM6-24 units has been certified in conformity with the requirements of the ISO 9001: 2000 quality assurance model.

T55055









#### Meticulous and systematic controls

During manufacture, each SM6-24 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 SM6-24 have been assessed and judged to be in conformity with requirements in the ISO 14001 standard.





# **Field of application**

The SM6-24 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

SM6-24 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 SM6-24 units used in MV/LV transformer substations and industrial distribution substations:

- IM, IMC, IMB switch;
- PM fused switch;
- QM, QMC, QMB fuse-switch combination;
- CRM 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;
- special function EMB busbar earthing.



outgoing line toward other ring substations

Other standards

MV consumer substations

(MV metering)



incoming line of the main distribution switchboard



#### Industrial distribution substations



#### Distribution switchboard



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# Units for all functions



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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)

#### **Fuse-switch protection**

E55807



Fuse-switch combination unit QM (375 or 500 mm)



Fuse-switch combination unit QMC (625 mm)



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



Fused-switch unit PM (375 mm)

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# Units for all functions



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# Units for all functions

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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)

#### 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)



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

# Units for all functions



# Units for all functions



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# Units for all functions

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#### **Other functions**



Disconnector unit SM (375 or 500 mm)



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



Busbar earthing compartment EMB (375 mm)



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



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

# **Operating conditions**

In addition to its technical characteristics, SM6-24 meets requirements concerning safety of life and property as well as ease of installation, operation and protecting the environment.



SM6-24 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 arrestor, telecontrol, etc.).

#### **Standards**

SM6-24 units meet all the following recommendations, standards and specifications: recommendations IEC:

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

62271-200: A.C. metal-enclosed switchgear and controlgear for rated voltage above 1 kV and up to including 52 kV.

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

62271-105: High voltage alternating 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 1 kV and less than 52 kV. NFC 64.160: Alternating current disconnectors and earthing switches.

EDF specifications:

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

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

#### Designation

SM6-24 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.

# **Main characteristics**

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



#### Internal arc withstand:

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

#### Protection index:

- classes: PI (insulating partition);
- loss of service continuity classes: LSC2A;
- units: IP2XC (IP3X consult us);
- 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 and installed in a dry area free from dust and with limited temperature variations.

- for stocking: from -40°C to +70°C,
- for working: from –5°C to +40°C,
- other temperatures, consult us.

Rated voltage (kV)			7.2	12	17.5	24	
Insulation lev	rel				·		
50 Hz, 1 mn	Insulation		20	28	38	50	
(kV rms)	Isolation		23	32	45	60	
1.2/50 μs	Insulation		60	75*	95	125	
(kV peak)	Isolation		70	85	110	145	
Breaking cap	acity						
Transformer o	ff load (A)		16				
Cables off load	(A)		31.5				
Short-time withstand 25			630 - 1250 A				
current (kA. 1 s) 20 16 12.5			630 - 1250 A				
			630 - 1250	A			
			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	7.2 12 17.5 24					
Units							
IM, IMC, IMB,	630 A - 80	0 A*					
NSM-cables, NSM-busbars							
PM, QM, QMC, QMB	25 kA	25 kA 20 kA					
CRM	10 kA	8 kA					
CRM with fuses	25 kA	25 kA					
SF6 circuit breaker range:							
DM1-A, DM1-D, DM1-W,	25 kA		20 kA				
DM1-Z, DM1-S, DM2							
Vacuum circuit breaker range:							
DMV-A, DMV-D, DMV-S	25 kA	25 kA 20 kA					

\* In 800 A consult us.

#### Endurance

Units		Mechanical	Electrical
		endurance	endurance
IM, IMC, IMB	,	IEC 60265	IEC 60265
PM,		1000 operations	100 breaks
QM*, QMC*, 0	QMB*,	class M1	at In, p.f. = 0.7
NSM-cables,	NSM-busbars		class E3
CRM	Disconnector	IEC 62271-102 1000 operations	
	Rollarc 400	IEC 62470	IEC 62470
		300 000 operations	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 br	eaker range:		
DM1-A,	Disconnector	IEC 62271-102	
DM1-D,		1000 operations	
DM1-W,	Circuit breaker SF	IEC 62271-100	IEC 62271-100
DM1-Z,		10 000 operations	40 breaks at 12.5 kA
DM1-S,			10 000 breaks at In,
DM2			p.f. = 0.7
Vacuum circu	it breaker range:		
DMV-A,	Disconnector	IEC 62271-102	
DMV-D,	Circuit breaker	IEC 62271-100	IEC 62271-100
DMV-S	Evolis	10 000 operations	100 breaks at In, p.f. = 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.

# **Factory-built cubicles description**



#### 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 switchdisconnector 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 earthing switch(es), in enclosures filled with SF6 and satisfying "sealed pressure system" requirements.

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

**3 connection and switchgear:** accessible through front, connection to the downstream terminals of the circuit breaker.

Two circuit breaker offers are possible:

■ SF1: combined with an electronic relay and standard sensors (with or without an auxiliary power supply;

■ SFset: autonomous set equipped with an electronic protection system and special sensors (requiring no auxiliary power supply).

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

**5 Iow 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.



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# Factory-built cubicles description



#### Vacuum type circuit breaker cubicles

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

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

**3** connection and switchgear: accessible through front, connection to the downstream terminals of the circuit breaker.

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

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

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

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 Iow 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.

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# **Compartments description**







#### **Busbar compartment**

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



#### Switch 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.



SF6 type circuit breaker



Vacuum type circuit breaker

#### **Connection and switch compartment**

- The network cables are connected:
- to the terminals of the switch;
- to the lower fuse holders;
- or to the connection pads of the circuit breaker.
- Cables may have either:
- cold fitted sheathing for dry-type or paper-insulated cables;
- With basic equipment, the maximum allowable cross-section for cable is:
- 630 mm<sup>2</sup> or 2 x 400 mm<sup>2</sup> for 1250 A incoming or outgoing units;
- 300 mm<sup>2</sup> or 2 x 240 mm<sup>2</sup> for incoming or outgoing units 400 630 A;
- 95 mm<sup>2</sup> for transformer protection cubicles incoporating 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.

# **Compartments description**





#### **Operating-mechanism covers**

These covers contain the various operating functions for the:

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

The operating-mechanism cover may be accessed with the cables and busbars energised and without isolating the substation.

It also enables easy installation of padlocks, locks and standard LV accessories (auxiliary contacts, trip units, motors, etc.).



#### Low-voltage monitoring control cabinet

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

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

**B - LV wiring duct:** enables a large majority of low voltage configurations to be installed. It also takes the Sepam series 20 or series 40. The total cubicle height is then 1690 mm.

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

The total height of the cubicle then becomes 2050 mm.



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

# By switchgear

Gas tightness



Switch-disconnector



and seal tightness is always factory checked.

□ the earthing switch placed in the SF6 has a short-circuit making capacity, in compliance with standards.

Switch or disconnector and earthing switch

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

□ any accidental over-pressures are eliminated by the opening of the safety membrane, in which case the gas is directed toward the back of the unit, away from the operator.



#### 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.





Main contacts

separated



Arcing period



Contacts open



Rollarc contactor

# By switchgear

■ Gas tightness



SF1 circuit breaker



SF6 circuit breaker: SF1 or SFset









SM6-24

Precompression A

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

Contacts open



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.

# By operating mechanism safety



Switchgear status indicator:

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

#### Operating lever:

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

#### Locking device:

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

□ access to the switching shaft of the switch or the circuit breaker,

□ access to the switching shaft of the earthing disconnector,

□ operating of the opening release push-button.

#### Simple and effortless switching

Mechanical and electrical controls are side by side on the front fascia, on a panel including the schematic diagram indicating the device's status (closed, open, earthed): **Closed:** the drive shaft is operated via a quick acting mechanism, independent of the operator. No energy is stored in the switch, apart from when switching operations are taking place.

For combined switch fuses, the opening mechanism is armed at the same time as the contacts are closed.

■ **Opening:** the switch is opened using the same quick acting mechanism, operated in the opposite direction.

For circuit breakers and the combined switch fuses, opening is controlled by: a push-button,

□ a fault.

■ Earthing: a specific control shaft enables the opening or closing of the earthing contacts. Access to this shaft is blocked by a cover that can be slid back if the switch is open but which remains locked in place if it is closed.

#### 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 62271-200 for "sealed pressure systems". Sealing is systematically factory checked.

■ 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.



SM6-24

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# 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.



Case of an SM6-24 switchboard installed against the wall downwards exhaust: 3-sides internal arc protection



Case of an SM6-24 switchboard installed in the middle of a room upwards exhaust: 4-sides internal arc protection

To enhance the safety of people, it is desirable to provide as high a degree of protection as possible by evacuating the effects of internal 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 SM6-24 is designed to offer a good level of safety Control of the architecture:

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

#### Internal arc withstand of the cubicles

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

# SM6-24 internal arc (in conformity with IEC 60298 appendix AA)

In its internal arc version, the SM6-24 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 SM6-24 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 SM6-24 switchboard during an internal fault will not be exposed to the effects of arcing.

SM6-24 proposes several options to install an internal arc enhanced switchboard

#### ■ 3-sides internal arc protection:

Case of an SM6-24 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 (upwards exhaust only):

For SM6-24 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 or equal than 2300 mm is necessary.
- Downwards exhaust:
- Civil engineering with an adequate volume is necessary.

# Remote control switch interface

\$1015N



SM6-24

Easergy T200 S: remote control interface in LV control cabinet

Easergy T200 S is a simplified MV substation control unit for secondary distribution networks enabling remote control of one or two MV substation switches. T200 S, a version of the T200 I unit, is integrated in the SM6-24 cubicle LV control cabinet.

It is limited to control 2 switches. It is intended for remote control applications for source transfer switching and back up generator set switching in NSM cubicle.

Easergy 200 S a multifunctional "plug and play" interface which integrates all functions required for remote monitoring and control of MV substations:

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

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

#### Functional unit dedicated to Medium Voltage applications

Easergy 200 S is installed in the low voltage control cabinet of IM and NSM cubicles for remote control of one or two switches. Easergy notably enables source transfer switching between two switches.

It has a simple panel for local operation to manage electrical controls (local/remote switch) and to display switchgear status information.

It integrates a fault current detector (overcurrent and zero sequence current) with detection thresholds configurable channel by channel (threshold and fault duration).

#### "Plug and play" and secure

Integrated in the low voltage control cabinet of an MV-equipped cubicle, it is ready to connect to the transmission system.

Easergy T200 S has been subject to severe tests on its resistance to MV electrical constraints. A back-up power supply guarantees several hours continuity of service for the electronic devices, motorization and MV switchgear. Current transformers are of split core type for easier installation.

#### Compatible with all SCADA remote control systems

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

Transmission system standards are: RS232, RS485, PSTN, FSK.

Other systems are available on request, the radio frequency emitter/receiver is not supplied.



Control command



Local information



Power unit



Split core CTs



Backup power supply

# **Fault indicators**

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

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

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

Easergy Flair 279 and 219, have a wall-mounted case for the MV cubicles

substation or LV compartment and anexternal power supply which can be backed up. ■ Easergy Flair 200C (communicative), has the same case as Flair 279 and 219, but has advanced measurement functions and long distance communication features (radio, GSM, RTC, etc.)



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



#### Easergy Flair 21D - 22D - 23D

SM6-24 integrates Flair 21D, Flair 21DT, Flair 22D and Flair 23D on every incoming cubicles.

#### ■ High performance indicators

- □ indication of phase-phase and phase-earth faults,
- □ faulty phase indication,
- □ adapted to all neutral earthing systems,
- □ compatible with HV/MV substation protection devices.

#### Clear and comprehensive display

- □ displaying the faulty phase for earth fault,
- □ displaying settings,
- □ displaying the load current including peak demand and frequency meter.
- Maintenance free.

		Flair 21D	Flair 21DT	Flair 22D	Flair 23D
Power supply					
	Self-powered				
	Dual power supply			<ul> <li>(battery)</li> </ul>	<ul> <li>(external)</li> </ul>
Display					
	Ammeter				
	Peak demand				
	Frequency meter				
Options					
	SCADA interface	<ul> <li>(transistor output)</li> </ul>			
	External light				
	External reset			•	
	Advanced settings (keypad)				

# Description of the control/monitoring and protection functions

The Sepam range of protection and metering is designed for the operation of machines and electrical distribution networks of industrial installations and utility substations for all levels of voltage. It consists of complete, simple and reliable solutions, suited to following 3 families:

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



#### Sepam protection relay

#### A range adapted at your application

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

#### Accurate measurement and detailed diagnosis

Measuring all necessary electrical values.

- Monitoring switchgear status: sensors and trip circuit, mechanical switchgear status.
- Disturbance recording.
- Sepam self-diagnosis and watchdog.

#### Simplicity

Easy to install

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

#### **User-friendly**

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

#### Flexibility and evolutivity

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

Sepam	Characteristics	Protections		Applications				
		Basi	c Specific	Substation	Transformer	Rotation	generator	Busbars
Sepam series 20 For common applications	■ 10 logic inputs and 8 relay outputs	Curre	ent protection	S20	T20	M20		
	Port a module communication port	Volta	ge and frequency protection					B21
			Loss of mains (ROCOF)					B22
Sepam series 40 For demanding applications	<ul> <li>10 logic inputs</li> <li>8 relay outputs</li> <li>1 Modbus communication</li> </ul>	Curre prote	ent voltage and frequency ction	S40	T40		G40	
	port ■ Logic equations editor		Directional earth fault	S41		M41		
			Directional earth fault and phase overcurrent	S42	T42			
Sepam series 80 For complete applications	■ 42 logic inputs and 23 relay outputs	Curre prote	ent voltage and frequency ction	S80				
	■ 2 Modbus communication port		Directional earth fault	S81	T81	M81		
	<ul> <li>Removal memory cartridge</li> <li>Battery to save event logging data</li> </ul>		Directional earth fault and phase overcurrent	S82	T82		G82	

# Description of the control/monitoring and protection functions



VIP 35



VIP 300 LL

#### VIP 35 protection relay

#### Integrated in the DM1-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 SFset and DM1-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.



# Description of the control/monitoring and protection functions



#### **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.

Statimax

#### **Selection table**

Protection type	Code	Protection units							
		Sepam				Statimax	VIP		
		2000	series 20	series 40	series 80		35	200	300
Three-phase overcurrent	50 - 51	•	•				(2)	(1)	(1)
Zero-sequence overcurrent	50N - 51N						(3)	(1)	(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.

# **Functional units selection**

### Network connection



- switch and earthing switch
- three-phase busbars
- CIT operating mechanism
- voltage indicators
- connection pads for dry-type cables

■ one to three CTs

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

#### ۷

/ersions:		
<ul> <li>CI2 operating mechanism</li> <li>CI1 operating mechanism</li> </ul>		
<ul> <li>■ 630 A or 1250 A three-phase busbars</li> <li>■ in 800 A version consult us</li> </ul>		
Optional accessories:		
<ul> <li>motor for operating mechanism</li> <li>auxiliary contacts</li> <li>additional enclosure or connection enclosure for cabling from key-type interlocks</li> <li>50 W heating element</li> <li>stands footing</li> <li>release units</li> </ul>	n above	
<ul> <li>phase comparator</li> <li>fault indicators</li> </ul>		
surge arrestors (for 500 mm cubicle)		

■ telecontrol

Characteristics of the functional units

# **Functional units selection**

### **Fuse-switch protection**



#### **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
- downstream eartning switch

■ one to three CTs

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

#### 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

# **Functional units selection**

### **Fuse-switch protection**

PM (375 mm) Fused-switch unit



#### **Electrical characteristics**



#### **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:

■ 630 A or 1250 A three-phase busbars

#### **Optional accessories:**

- motor for operating mechanism
- auxiliary contacts
- enlarged low-voltage control cabinet
- 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

# **Functional units selection**

# Contactor protection

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

# **Functional units selection**

SF6 type circuit breaker protection

#### **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:**

- SF1or 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

#### Version:

■ 630 A or 1250 A three-phase busbars

#### **Optional accessories:**

#### ■ cubicle:

- auxiliary contacts on the disconnector
- $\ensuremath{\square}$  additional enclosure or connection enclosure for cabling from above
- D 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

■ three-phase bottom busbars

# **Functional units selection**

SF6 type circuit breaker protection

#### **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:**

Characteristics of the functional units

- 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

#### Version:

#### **Optional accessories:**

#### ■ cubicle:

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- 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

■ three CTs

- □ operation counter on manual operating mechanism

#### cubicle:

- protection using Statimax relays or Sepam programmable electronic unit
- auxiliary contacts on disconnectors

# **Functional units selection**

SF6 type circuit breaker protection

**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 indicatorsthree CTs
- auxiliary contacts on circuit breaker
- earthing switch operating mechanism CC
   connection pads for dry-type cables
- connection pads for dry-type cab
   downstream earthing switch

#### Version:

■ 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
 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

#### □ surge arrestors



#### ■ three-phase busbars

■ circuit breaker: □ motor for operating mechanism □ release units

operation counter on manual operating mechanism
## **Functional units selection**

Vacuum type circuit breaker protection



#### **Electrical characteristics**



#### **Basic equipment:**

- Evolis circuit breaker
- switch and earthing switch for 400 630 A
- disconnector and earthing switch for 1250 A
- three-phase busbars
- circuit breaker operating mechanism Proxima
- disconnector operating mechanism CIT
- voltage indicators
- auxiliary contacts on circuit breaker
- three CTs
- Sepam programmable electronic unit
- connection pads for dry-type cables
- downstream earthing switch

#### Version:

#### **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



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#### ■ 630 A or 1250 A three-phase busbars

## **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:**

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

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
- mechanical signalling for blown fuses

## **Functional units selection**

## MV metering



#### **Electrical characteristics**



#### **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

## **Functional units selection**

## Casings



Merlin Gerin

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## **Functional units selection**

### Casings





GAM2 (375 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 control cabinet
- stands footing
- 50 W heating element

auxiliary contacts

- surge arrestors
- key-type interlocks

## **Functional units selection**

### Other functions







TM (375 mm)

EMB (375 mm) 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

auxiliary contacts

operating mechanism CIT ■ installation on 630 A IM 375 mm or

DM1-A units (except additional enclosure or connection enclosure for cabling from above) require an key-type interlocks adapted to the switchboard network

#### 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

(1) only for 1250 A units.

## **Functional units selection**

### Change over



#### **Electrical characteristics**



#### **Basic equipment:**

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

#### Version:

■ 630 A or 1250 A three-phase busbars

#### **Optional accessories:**

- auxiliary contacts
- key-type interlocks
- 50 W heating element
   stands footing
- stands lootin ■ telecontrol

Characteristics of the functional units

## Automatic switching controls

#### Network back up



TR: transfer switch response time (< 180 ms - depending on switchgear)

■ Setting of time delay before switching: configurable from 0.1 s to 2 s (T1) with step of 100 ms.

Setting of time delay for return to the initial state: configurable from 5 s to 120 s (T2) with step of 5 s. ■ Transfer switch configurable with SW1→SW2 or SW2→SW1.

Note: in bold = default configuration

#### Generator back up



TR: transfer switch response time (< 180 ms - depending on switchgear)

Setting of time delay before switching to the generator:

configurable from 1 s to 15 s (T1) with step of 1 s. Start up of the generator (T2), depending on kind of generator,

not configurable (time max. to wait: 30 s).

Switching when the generator voltage is present.
 Setting of time delay for return to the initial state: configurable from 60 s to 120 s with step of 5 s (T3).

■ Stopping the generator 6 s after switching.

Note: in bold = default configuration.

#### Transfer switch

The transfer switch automatic control system gives automatic control and management of sources in the MV secondary distribution network. It is associated with VD3H voltage presence detectors.

#### **Operating modes**

#### Operating mode is selected using the Easergy T200 S configuration tool. ■ Semi-Auto mode, SW1 ←→ SW2

When the voltage disappears on the channel in service, the automatic control switches to the other channel after a time delay T1. The automatic control does not switch back, unless there is a voltage break on the new channel in service. ■ Mode SW1  $\rightarrow$  SW2, (SW2  $\rightarrow$  SW1)

The automatic control only switches once from channel 1 or 2 to the back up channel. Mode Auto-SW1 or Auto-SW2

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

#### Switching sequence

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

Switching back to the main channel in "AUTO" modes is executed if: □ the priority channel is open

□ the MV voltage on the priority channel is OK for a time period of T2.

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

#### Source transfer locking

A digital input prohibits orders from the local control panel, the automatic control systems and the remote control supervisor.

This input is generally connected to the downstream circuit breaker.

## **Operating mechanisms**

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

Operating speeds do not depend on the operator, except for the CS. For the interlocks, consult the table pages 56 to 57 according to concerned cubicles.

Units	Type of operating mechanism							
	Swit	ch/dis	conne	ector		Circu	Circuit breaker	
	СІТ	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								

provided as stand 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, causes the contacts to open or close.

- Auxiliary contacts
- $\Box$  switch (2 O + 2 C)\*,

 $\square$  switch (2 O + 3 C) and earthing switch (1 O + 1 C),

 $\Box$  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 Cl1**

Switch function

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

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

#### Earthing-switch function

Independent-operation closing and opening by lever.

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

- Auxiliary contacts
- $\Box$  switch (2 O + 2 C)\*
- $\Box$  switch (2 O + 3 C) and earthing switch (1 O + 1 C),
- $\Box$  switch (1 C) and earthing switch (1 O + 1 C) if motor option,
- □ fuses blown (1 C).
- Mechanical indications
- Fuses blown in units QM.
- Opening releases
- □ shunt trip,
- □ undervoltage for unit QM.
- Motor option

(\*) Included with the motor option.



## **Operating mechanisms**





#### **Double-function operating mechanism Cl2**

#### 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.
- $\hfill\square$  independent-operation opening by push-button (O) or trip unit.

#### Earthing-switch function

Independent-operation closing and opening by lever.

Operating energy is provided by a compressed spring which, when released,

causes the contacts to open or close.

- Auxiliary contacts
- $\Box$  switch (2 O + 2 C)\*,
- $\Box$  switch (2 O + 3 C) and earthing switch (1 O + 1 C),
- $\Box$  switch (1 C) and earthing switch (1 O + 1 C) if motor option.
- Opening release shunt trip
- Closing release shunt trip
- Motor option

(\*) Included with the motor option.

#### **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).

## **Operating mechanisms**





#### 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

	SF	SF1 Combinations							SFset			
Release type	Cor								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.
- □ spring energy release.
- Auxiliary contacts
- □ circuit breaker (4 O + 4 C),
- □ mechanism charged (1 C).
- Mechanical indications
- Operation counter
- Opening releases
- □ Mitop (low energy),
- □ shunt trip,
- □ undervoltage
- Closing release
- □ shunt trip
- Motor option (option and installation at a later date possible)

## **Auxiliaries**





#### Motor option and releases for switch-units

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

Un		DC					AC (50 Hz)*		
Power supply	(V)	24	48	110	125	220	120	230	
Motor option									
	(W)	200							
	(VA)						200		
Operating time for CIT		1 to 2	2 (s)				1 to 2	2 (S)	
Charging time for CI1, CI2	2	4 to 7	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 (	AC (50 Hz)*		
Power supply	(V)	24	48	110	125	220	120	230		
Motor option				1						
	(W)	300								
	(VA)							380		
Charging time	(S)	15					15	•		
Opening releases										
Mitop (low energy)	(W)	3								
Response time	(ms)	30					30			
Shunt trip										
	(W)	85								
	(VA)							180		
Response time	(ms)	45					45			
Undervoltage										
Pick-up	(W)	160								
	(VA)						280	550		
Hold	(W)	10								
	(VA)						50	40		
Response time	(ms)	55					55			
Closing release										
Shunt trip										
	(W)	85								
	(VA)							180		
Response time	(ms)	65					65			

\* Please consult us for other frequencies.

## Motor option and releases for Evolis circuit breakers





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

enaraotoriotioo							
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						
Charging time	4 s max.						
Switching rate	3 cycles p	per minute ma	IX.				
Mechanical endurance	10000 rer	note controlled	d opening opera	tions Evolis P1			
CH contact	10 A at 24	0 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.

Cha	racte	ristics
-----	-------	---------

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.

Characteristic	s								
Power supply V	Vac 50/60 Hz	24/30	48/60	100/130	200/250				
Ň	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		50 ms ± 10							
of the circuit b	reaker at Un								



## **Current transformers**







#### For unit QMC

#### Transformer ARJP1/N2F

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

#### Short-time withstand current Ith (kA)

			•	,					
l1n (A)		10	20	30	50	75	100	150	200
Ith (kA)		1.2	2.4	3.6	6	10	10	10	10
t (s)		1	1						
measurement	5 A	15 VA -	15 VA - class 0.5						
and protection	5 A	2.5 VA	- 5P20						

#### For unit CRM

#### Transformer ARJP1/N2F

■ single primary winding;

■ double secondary winding for measurement and protection.

Short-time withstand current lth (kA)

l1n (A)		50	100	150	200
Ith (kA)		6	10		^
t (s)		1			
measurement	5 A	15 VA - cl	ass 0.5		
and protection	5 A	2.5 VA - 5	P20		

Note: please consult us for other characteristics.

#### 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)

l1n (A)		10/20	20/40	50/100	100/200	200/400	300/600
Ith (kA)		5	12.5	12.5/21*	12.5/25*	12.5/25*	25
t (s)		1	0.8	1			
measurement	5 A	7.5 VA - c	lass 0.5				
and protection	1 A	1 VA - 10	P30				
	5 A	5 VA - 5P	10	5 VA - 5P	15		

\* For 5 A protection

double primary winding;

■ double secondary winding for measurement and protection.

#### Short-time withstand current Ith (kA)

l1n (A)		50/100	200/400	300/600			
Ith (kA)		14.5 25 25 25					
t (s)		1					
measurement	5 A	30 VA - class 0.5					
and protection	5 A	5 VA - 5P15	7.5 VA - 5P15				
	5 A	7.5 VA - 5P10	15 VA - 5F	P10			

## **Current transformers**







#### For 630 A units DMV-A, DMV-D, IMC

#### Transformer ARJP2/N2F

#### ■ single primary winding;

■ double secondary winding for measurement and protection.

#### Short-time withstand current Ith (kA)

l1n (A)		50	100	200	400	600
Ith (kA)		25				
t (s)		1				
Measurement	5 A	10 VA	15 VA	15 VA	15 VA	20 VA
and protection		class 0.5				
	5 A	2.5 VA	2.5 VA	5 VA	5 VA	7.5 VA
		5P20	5P20	5P20	5P20	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 lth (kA)

•••			()				
l1n (A)		1000	1250				
Ith (kA)		25					
t (s)		1					
Measurement	1 A	30 VA - class 0.5					
and protection	1 A	10 VA - 5P2	0				
Measurement	5 A	30 VA - class 0.5					
and protection	5 A	10 VA - 5P2	0				

#### For 630 A units DM1-A, DM1-D, DM1-W

#### Low Power Current Transformer (LPCT) CLP2

■ characteristics according to IEC standard 60044-8;

- large primary current range;
- direct output voltage for measurement and protection;
- RJ45-8 pts secondary connector;
- insulation level 24 kV.

Minimum rated primary current (A)	5
Rated nominal primary current (A)	100
Rated extended primary current (A)	630
Rated nominal secondary output (mV)	22.5
Accuracy class for measurement	0.5 (100-630 A), 0.75 (20 A), 1.5 (5 A)
Accuracy class for protection	5P
Accuracy limit factor	400
Rated short time thermal current (kA/1 s)	40
Highest voltage (Um) (kV)	24
Rated power-frequency withstand (kV)	50



## 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/√3	15/√3	15-20/√3	20/√3
Secondary voltage (V)	100/√3			
Thermal power (VA)	250			
Accuracy class	0.5			
Rated output for single primary winding (VA)	30	30		30
Rated output for double primary winding (VA)			30-50	

#### For units DMV-A, DMV-D

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

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

#### 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	50			
single primary winding (VA)				

#### For units GBC-A, GBC-B

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

	Rated voltage (kV)	12	17.5	24		
	Primary voltage (kV)	10/√3	20/√3			
	Secondary voltage (V)	100/√3 - 1	100/√3 - 100/3			
	Thermal power (VA)	200				
First secondary	Accuracy class	0.5				
	Rated output for single primary (VA)	30-50				
	Thermal power (VA)	100				
Second secondary	Accuracy class	3P				
	Rated output	50				







## Voltage transformers



#### For unit TM

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

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

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

#### **Surge arrestor**

#### For units IM500, DM1-A, DM1-W, GAM, DMV-A\*

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

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

## **Protection of transformers**

Fuse ratings for SM6-24 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 maybe 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.

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

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

#### **Fuse selection table**

The color code is linked to the rated voltage of the fuse. Rating in A - no overload at  $-5^{\circ}C < t < 40^{\circ}C$ . Please consult us for overloads and operation over  $40^{\circ}C$  for France Transfo oil immersed type transformers.

Type of	Service	Tran	sform	er ratir	ng (kV/	4)													Rated
fuse	<b>voltage</b> (kV)	25	50	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	<b>voltage</b> (kV)
Solefuse	(UTE NFC st	tandar	ds 13.′	100, 64	.210)														
	5.5	6.3	16	31.5	31.5	63	63	63	63	63									7.2
	10	6.3	6.3	16	16	31.5	31.5	31.5	63	63	63	63							_
	15	6.3	6.3	16	16	16	16	16	43	43	43	43	43	63					_
	20	6.3	6.3	6.3	6.3	16	16	16	16	43	43	43	43	43	63				24
Solefuse (general case, UTE NFC standard 13.200)																			
	3.3	16	16	31.5	31.5	31.5	63	63	100	100									7.2
	5.5	6.3	16	16	31.5	31.5	63	63	63	80	80	100	125						_
	6.6	6.3	16	16	16	31.5	31.5	43	43	63	80	100	125	125					
	10	6.3	6.3	16	16	16	31.5	31.5	31.5	43	43	63	80	80	100				12
	13.8	6.3	6.3	6.3	16	16	16	16	31.5	31.5	31.5	43	63	63	80				17.5
	15	6.3	6.3	16	16	16	16	16	31.5	31.5	31.5	43	43	63	80				
	20	6.3	6.3	6.3	6.3	16	16	16	16	31.5	31.5	31.5	43	43	63				24
	22	6.3	6.3	6.3	6.3	16	16	16	16	16	31.5	31.5	31.5	43	63	63			
<b>Fusarc Cl</b>	F and SIBA <sup>(1</sup>	) (gene	eral cas	se for Q	M, QN	1B and	QMC	cubicl	e acco	rding t	o IEC (	62271-	105)						
	3.3	16	25	40	50	50	80	80	100	125	125	160(1)	200(1)						7.2
	5	10	16	31.5	40	40	50	63	80	80	125	125	160(1)						
	5.5	10	16	31.5	31.5	40	50	50	63	80	100	125	125	160(1)	160 <sup>(1)</sup>				
	6	10	16	25	31.5	40	50	50	63	80	80	125	125	160 <sup>(1)</sup>	160 <sup>(1)</sup>				-
	6.6	10	16	25	31.5	40	50	50	63	80	80	100	125	125	160(1)				
	10	6.3	10	16	20	25	31.5	40	50	50	63	80	80	100	100	125(1)	200(1)		12
	11	6.3	10	16	20	25	25	31.5	40	50	50	63	80	100	100	125(1)	160(1)		
	13.8	6.3	10	16	16	20	25	31.5	31.5	40	50	50	63	80	80	100(1)	125*	125*	17.5
	15	6.3	10	10	16	16	20	25	31.5	40	50	50	63	80	80	100	125(1)	125*	
	20	6.3	6.3	10	10	16	16	25	25	31.5	40	40	50	50	63	80	100(1)	125(1)	24
	22	6.3	6.3	10	10	10	16	20	25	25	31.5	40	40	50	50	80	80	100(1)	

\* Please consult us

(1) = SIBA fuses

Characteristics of the functional units

#### **Fuses dimensions**



125

442

85

5.4

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

- motor current rating In;
- starting current ld;
- frequency of starts.
- The fuses rating is calculated such that a current equal to twice the starting current does not blow the fuse
- within period equal to the starting time.

The adjacent table indicated the ratings which should be used, based on the following assumptions:

- direct on-line startup;
- Id/In ð 6;

pf = 0.8 (P δ 500 kW) or 0.9 (P > 500 kW); ■ η = 0.9 (P δ 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.

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

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)	Starti 5	Maximum service voltage (kV)					
	Numb	per of s	tarts p	er 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)

<b>`</b>			•	,					
service voltag	e (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	480
	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: Solefuse or Fusarc CF (they have different fusion curves).

## Interlocks

#### Switch units

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

#### **Circuit-breaker units**

■ the disconnector(s) can be closed only if the circuit breaker is open and the front panel is locked (interlock type 50).

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

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

#### **Functional interlocks**

These comply with IEC recommendation 62271-200 and EDF specification HN 64-S-41.

In addition to the functional interlocks, each disconnector and switch include:

■ built-in padlocking capacities (padlocks not supplied);

■ four knock-outs that may be used for keylocks (supplied on request) for mechanism locking functions.

Unit interlock											
Units	Inte	Interlock									
	A1	C1	C4	A3	A4	A5	50	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											



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

#### Legend for key-type interlocks: ਸ਼ੂ **੦**∎ **੦**= no key

free key

Characteristics of the functional units

DE55902

De55903







## Interlocks



Legend for key-type interlocks:

ਯੂ **⊙∎** no key

Ø- free key

panel or door

Merlin Gerin

VIT202

## Interlocks



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

■ 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".

■ 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.

■ 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:

Ø free key

🗄 💽 💽 no key

Captive key

### Connections

## **Connections selection table**

1048N



## 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 ð 300 mm<sup>2</sup>;

square connection round shank for cables > 300 mm<sup>2</sup> 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 mm<sup>2</sup> for 1250 A incomer and feeder cables;
- 300 mm<sup>2</sup> for 400 630 A incomer and feeder cables ;
- 95 mm<sup>2</sup> 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  $\emptyset$  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 <sup>2</sup>	Supplier	Number of cables	Comments
3 to 24 kV 400 A - 630 A	Round connector	50 to 300 mm <sup>2</sup>	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	50 to 630 mm <sup>2</sup>	All cold fitted cable end suppliers: Silec, 3M, Pirelli, Raychem, etc.	1 or 2 per phase ð 400 mm²	For larger x-sections, more cables and other types of lugs, please consult us
	Square connector	> 300 mm <sup>2</sup> admissible		400 < 1 ð 630 mm² per phase	

#### Three core, dry cable

#### Short inner end, cold fitted

Performance	Lug type	X-section mm <sup>2</sup>	Supplier	Number of cables	Comments
3 to 24 kV 400 A - 630 A	Round connector	50 to 300 mm <sup>2</sup>	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 <sup>2</sup>	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.

Connections

## **Cable-connection from below**

## Cable-connection height

#### Cable-connection height H measured from floor (mm)

	630 A	1250 A
IM,NSM-cables, NSM-busbars	950	
SM	950	950
IMC	400	
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





GAM

DE55919





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



DM1-A, DM1-W 1250 A

200+200

420 🔶





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





## **Cable-connection**

## Trenches depth

#### Cabling from below (all units)

■ Through trenches: the trench depth P is given in the table opposite for commonly used dry single-core cables type (for tri-core cables consult us).

■ With stands: to reduce P or eliminate trenches altogether by placing the units on 400 mm concrete footings.

**With floor void:** the trench depth **P** is given in the table opposite for commonly used types of cables.

Single-core cables		Units until 630	1250 A units					
Cable x-section (mm <sup>2</sup> )	Bending radius (mm)	IM, SM, NSM-cables, NSM-busbars	IMC, DM1-A, DM1-W, GAM, DM1-S	CRM	DMV-A, DMV-S	PM, QM, QMC <sup>(2)</sup>	SM, GAM	DM1-A <sup>(3)</sup> DM1-W <sup>(3)</sup> DMV-A
		Depth P (mm) al	I orientations					
		P1	P2	P2	P2	P3	P4	P5
50	370	140	400	400	500	350		
70	400	150	430	430	530	350		
95	440	160	470	470	570	350		
120	470	200	500	500	600			
150	500	220	550		650			
185	540	270	670		770			
240	590	330	730		830			
300	692	430	830		930			
400	800						1000	1350
630	940						1000	1350

625



Height: 450 mm

### and cable orientations.

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

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

Cabling from above

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

**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

#### **Technical pit drawings**

#### 1250 A units

**SM, GAM** for single and tri-core cables







630 A units DMV-A, DMV-S for single cables



## **Connections**

## **Cable-connection from below**

Trench diagrams example



## **Cable-connection from below**

Trench diagrams and technical pit drawings enhanced example



Note: to evacuate gases through the bottom, the technical pit volume must be over or equal to  $2 \text{ m}^3$ .

## **Dimensions and weights**

#### 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	width	depth	weight
	(mm)	(mm)	(mm)	(kg)
IM,IMB	1600 <sup>(1)</sup>	375	940	120
IMC	1600 <sup>(1)</sup>	500	940	200
PM, QM, QMB	1600 <sup>(1)</sup>	375	940	130
QMC	1600 <sup>(1)</sup>	625	940	230
CRM	2050	750	940	390
DM1-A, DM1-D, DM1-W, DM1-Z, DM2	1600 <sup>(1)</sup>	750	1220	400
DM1-S	1600 <sup>(1)</sup>	750	1220	260
DMV-A, DMV-D	1600 <sup>(1)</sup>	625	940	320
DMV-S	1600 <sup>(1)</sup>	625	940	260
СМ	1600 <sup>(1)</sup>	375	940	190
CM2	1600 <sup>(1)</sup>	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 <sup>(2)</sup>	1600	125	920/1060	30/35
GBM	1600	375	940	120
GAM2	1600	375	940	120
GAM	1600	500	1020	120
SM	1600 <sup>(1)</sup>	375/500 <sup>(3)</sup>	940	120
ТМ	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:

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



12.3 x 12.3

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

### Installation

## **Units dimensions**







NSM-cables, NSM-busbars

















## **Units dimensions**











DE55955



Internal arcing enhanced cubicles downwards exhaust



🖥 Merlin Gerin

## Layout examples





#### **Conventional substation**



#### (\*) Advised access dimension

#### Required dimensions (mm)

	Without circuit breaker	With circuit breaker
Range	630/1250 A	630/1250 A
Α		60
В	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



Installation

(\*) Advised access dimension

## **Protecting the environment**

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

### Schneider Electric's recycling service



Schneider Electric is committed to a long term environmental approach. As part of this, the SM6-24 has been designed to be environmentally friendly, notably in terms of the product's recycleability. The materials used, both conductors and insulators, are identified and easily separable. At the end of its life, SM6-24 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 SM6-24 have been assessed and judged to be in conformity with requirements in the ISO 14001 standard.



### Installation

## A full range of services



Schneider Electric is capable of offering a full range of services either associated or not with the supply of the SM6-24 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 SM6-24 equipment:
- adaptation of our equipment to provide a better response to your requirements;
- on site assembly, testing and commissioning
- of your equipment;
- customised financing solutions;
- warranty extension;
- operator training.

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

upgrading your existing equipment: functional adaptation, control motorisation, renovation of protections units, etc.;

- on site work;
- supply of replacement parts;
- maintenance contracts;
- end of life recycling.

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





## Trip curves for VIP 300 LL or LH relays





With lower definite time threshold













Appendices

Appendices

## Trip curves for VIP 35 relays



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



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





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

DE55978

# Solefuse fuses

#### Fuse and limitation curves



Limitation curve 7.2 - 12 - 17.5 - 24 kV

Maximum value of the limited broken current (kA peak)



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

DE55980

#### **Order form** SM6-24 Connection to the network

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

**Basic cubicle** Quantity Rated voltage Ur (kV) Short-circuit current lsc (kA) Rated current Ir (A) Type of cubicle SM 375 IM 375 IMB 375 IMB 375 without E/S IMC 500 IM 500 SM 500 Position number in the switchboard (from left to right) Direction of lower busbars for IMB 운 left (impossible as first cubicle of switchboard) riaht Options Replacement of CIT by CI1 CI2 Electrical driving motorization 24 Vdc 110 Vdc 120/127 Vac (50 Hz) 32 Vdc 120-125 Vdc 220/230 Vac (50 Hz) 48 Vdc 137 Vdc 120/127 Vac (60 Hz) 60 Vdc 220 Vdc 220/230 Vac (60 Hz) Remote control signalling 2 lights 2 lights and 2 PB 2 lights and 2 PB + 1 switch Voltage of the lights (must be the same than electrical driving mechanism) 24 V 48 V 110/125 V 220 V Signalling contact 1 C on SW and 1 O & 1 C on ES (not applicable on SM cubicle) 2 O & 2 C on SW 2 O & 3 C on SW and 1 O & 1 C on ES Roof configuration (A, B or C only one choice possible) A - Top incomer (cable maxi 240 mm<sup>2</sup> with voltage indicator) 3/7.2 kV 2 x single core single core 10/24 kV 2 x single core single core **B** - Low voltage control cabinet (h = 450 mm) with unpunched door C - Wiring duct Cable connection by the bottom (not applicable on IMB, cable maxi 240 mm<sup>2</sup>) three core single core 2 x single core Heating element Interlocking (with key) Ronis Profalux A3 SM6-SM6 P1 SM6-SM6 For all cubicle (except SM) A4 Localisation of 2nd lock for A3 on switch on earthing switch Localisation of 2nd lock for A4 cubicle no. SM cubicle only P2 SM6-SM6 P3 SM6-SM6 Surge arrestors for IM 500 7.2 kV 10 kV 12 kV 17.5 kV 24 kV Operating counter CTs for IMC (quantity) 3 1 2 Replacement of 630 A busbar by 1250 A (not possible for IMB) Internal arc version 16 kA 1 s (not possible with "top incomer" option) Telecontrol (48 Vdc electrical motorization compulsory) Cubicle with relay without relay Communication Modbus IEC DNP protocol RS485 Modem type RS232 Not for DNP PSTN GSM FSK 3 core balance current transformers

#### **Order form** SM6-24 Fuse switch protection

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

Basic cubicle Quantity								
Rated voltage Ur						(kV)		
Short-circuit current lsc						(kA)		
Rated current Ir						(A)		
Type of cubicle								
QM 500 QM 375		QMB 375		QMC 625		PN	M 375	
Position number in the sw	itchb	oard (from left t	to riç	ght)				
Current transformers for C	AWC (	to see price stru	uctu	re)				
Quantity of CTs		1		2			3	
Direction of lower busbars	for C	QMB		৾৽		-	⁻•∕ -	_
				left		right	4	
-								
Options								
Fuses (see fuse price struct	ure)				se	rvice voltage ð	12 kV	
Replacement of mechanism	n	_						
CIT	by Cl′	1 (only for PM)			CI1	by CI2 (only fo	r QM)	
Electrical driving motoriza	ation	24 Vdc		110 Vdc		120/127 Vac (5	50 Hz)	<u> </u>
Libblindar antring motoriza		32 Vdc	$\neg$	120-125 Vdc		220/230 Vac (5	50 Hz)	-
		48 Vdc	-	137 Vdc		120/127 Vac (6	50 Hz)	
		60 Vdc	-	220 Vdc		220/230 Vac (6	50 Hz)	_
			=				/	
Shunt trip	0	pening (on CI1)			clos	ing & opening (o	n Cl2)	
		24 Vdc		110 Vdc		120/127 Vac (5	50 Hz)	
	32 Vdc 120-125 Vdc 220/230 Vac (50 Hz)							
		48 Vdc		137 Vdc		120/127 Vac (6	30 Hz)	
	60 Vdc 220 Vdc 220/230 Vac (60 Hz)							
						380 Vac (50/6	30 Hz)	
Remote control signalling	(not a	applicable on Pl	M, C	MC and QMB)				_
2 lights		2 lights and	d 2 F	PB 2 li	ght	s and 2 PB + 1 s	witch	
Voltage of the lights (must	be the	e same than ele	ctric	cal driving mech	nani	sm)		_
24 V		48 V		110/125 V			220 V	
Auxiliary contact signallin	g		_	1 C on	SW	/ and 1 O & 1 C o	on ES	
<b>.</b>	20	0 & 2 C on SW		20&3C on	SW	and 10 & 10 c	on ES	
Blown fuse signalling con	tact (r	mechanical indi	catio	on PM, electrica	l for	the other cubicl	es)	
Roof configuration (A, B or	r C on	ly one choice p	ossi	ble)				
A - Top income	er (ca	ble maxi 240 m	m² v	vith voltage indi	cate	or)		
3/7.2 kV single core 2 x single core								
	10/24 kV single core 2 x single core							
B - Low voltag	e cor	itrol cabinet (h	= 4	50 mm)		with unpunched	door	
C - Wiring duc	t							
Interlocking				Ronis		Pro	ofalux	
		C4		A1			C1	-
Heating element						L	-	
Operation counter								
Replacement of 630 A bus	bar b	y 1250 A (not po	ossi	ble for QMB)				
Internal arc version 16 kA	Internal arc version 16 kA 1s (not possible with "top incomer" option)							

## Order form SM6-24 Circuit breaker protection

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

Orange box X corresponds to none priced functions.

Basic cubicle			Quantity		
Rated voltage Ur (maxi 17.5 kV for Evolis CB) (kV)					
Short-circuit current lsc			(kA)		
Rated current Ir			(A)		
Type of cubicle					
For SF1 circuit breaker	DM1-S 750	DM2 left 750	DM2 right 750		
	DM1-W 750	DM1-Z 750			
For SFset circuit breaker	DM1-A 750	DM1-D left 750	DM1-D right 750		
For Evolis circuit breaker	DMV-A	DMV-S	DMV-D right		
Position number in the switc	hboard (from left to rig				
Busbar (Ir Š Ir cubicle)					
For DM1-A DM1-S DM1-W	400 A	630 A	1250 A		
For DM1-D_DM2	400 A	630 A	120071		
For DM1-A DM1-D DM1-W		000 A	1250 A		
For DMV A DMV D DMV S	, DIVIT-Z	620 4	1250 A		
Protection		030 A	1250 A		
		,			
FOI DIVIT-S, DIVIV-S					
			VIP300LL with CRb		
For DMV-A, DMV-D		`	Sepam series 20/40		
For DM2, DM1-Z, DM1-W	Statin	nax 5 A, 2 s	Statimax 1 A, 2 s		
Control for DMV-A and DMV-I	)		_		
Local (shunt trip co	oil compulsory)		Ц		
Remote (opening of	coil and closing coil co	mpulsory)			
Local and remote	(opening coil and closi	ng coil compulsory)			
Voltage of the auxiliaries	48/60 Vdc	110/	125 or 220/250 Vdc		
		110/130 or 2	20/240 Vac (50 Hz)		
Voltage of signalling	48/60 Vdc	110/125 Vdc	220/250 Vdc		
11	0/130 Vac (50 Hz)	2	220/240 Vac (50 Hz)		
Cable connection by the bott	om				
For DM1-A, DM1-W					
3 x single core ca	ble maxi 240 mm²	6 x single core o	able maxi 240 mm <sup>2</sup>		
Options					
Roof configuration (not applic	able on DMV-A, DMV-	S. DMV-D)			
(A B or C only one choice poss	ible)	-, ,			
	able maxi 240 mm² wi	th voltage indicator)			
	3/7 2 kV		2 x single core		
	10/24 kV	single core	2 x single core		
	DM2	1 set	2 x oiligio coro		
B - Low voltage co	atrol cabinet	1 301	2 3013		
D-Low voltage col	DM2	1 cabinet	2 cabinets		
	DIVIZ	i cabinet	2 Cabinets		
C - Wiring duct	DM2	1 set	2 sets		
	Other cubicles	1 set			
Interio eking		Donio [			
Not oppliestles		RUIIIS			
Not applicable o		AI			
	0 A with a wh (Tr)				
Surge arrestor (for DM1-W 63	u A WITNOUT V IS)				
Signalling contact		20&20 on SW (no	t applicable with V Is)		
	2 U & 3 C on SW and	1 U & 1 C on ES (no	t applicable with V Is)		
	1 O & 2 C on	SW (available only o	on cubicle with VTs)		
Heating element					
Circuit breaker			See specific order form		
Internal arc version 16 kA 1 s					

## **Order form** SM6-24 MV metering

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

Basic cubicle Quantity										
Rated voltage Ur							(	kV)		
Short-circuit current lsc							(	kA)		
Rated current Ir								(A)		
Type of cubicle										
In = 630 A, In busbar = 400 A	CM		CM2		TM		GBC-A		GBC	с-в
In = 630 A, In busbar = 630 A	CM		CM2		ΤM		GBC-A		GBC	-в
In = 630 A, In busbar = 1250 A	СМ		CM2		ΤМ		GBC-A		GBC	с-в
In = 1250 A, In busbar = 1250 A							GBC-A		GBC	-в
Direction of lower busbars for	GBC-A			-	٦.					┍╾└─
			le	eft				righ	nt	
VTs for GBC (to see price struct	for GBC (to see price structure) phase/phase phase/			se/ea	rth					
CTs for GBC (to see price struct	ure)		Quantit	ty	1		2			3
Ratio choice for GBC					-				-	
Protections	1 secondary						1 high	se	conda	ary
	2 secondaries						1 low	se	cond	ary
Signalling contact			1	Оa	nd 1 C	C or	n SW (CM	, CI	M2, T	M)
	blow	n fu	ise mec	han	ical in	dic	ation (CM	, CI	M2, T	M)
Fuses for CM, CM2 and TM onl	<b>y</b> (see fuse pric	e st	ructure	)						
Ontions										
<b>Roof configuration</b> (A B or C o	nly one choice r	205	sihle)							
	hle maxi 240 m	m <sup>2</sup> 1	with volt	200	indic	oto	r)			
	3/7 2 kV		ein	aye		aiu	) 2 v	ein		
	3/7.2 KV									
B - Low voltage cor	trol cabinet (h	= 4	50 mm	igic i	core		with uppu	nch	ed de	oor
C - Wiring duct	in or cubinet (ii	_	55 mm	'			maranpu			
Heating element for CM, CM2, TM										
Internal arc version 16 kA 1 s										

#### **Order form** SM6-24 Casing

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

Quantity **Basic cubicle** Rated voltage Ur (kV) Short-circuit current lsc (kA) Rated current Ir (A) Type of cubicle In = 630 A, In busbar = 400 A GAM 500 GAM2 375 GBM 375 In = 630 A, In busbar = 630 A GAM 500 GAM2 375 GBM 375 In = 1250 A, In busbar = 1250 A GBM 375 GAM 500 Position number in the switchboard (from left to right) Direction of lower busbars for GBM left (impossible on the first cubicle of the switchboard) right Options Roof configuration (A, B or C only one choice possible) A - Top incomer (cable maxi 240 mm<sup>2</sup> with voltage indicator) 3/7.2 kV single core 2 x single core 10/24 kV single core 2 x single core B - Low voltage control cabinet (h = 450 mm) with unpunched door C - Wiring duct Wiring duct for GBM ES auxiliary contact (only on GAM 500) 1 O and 1 C Surge arrestors for GAM 500, 630 A 17.5 kV 7.2 kV 10 kV 12 kV 24 kV Interlocking on GAM 500 Ronis Profalux A3 SM6-SM6 P5 SM6-SM6 Localisation of 2nd lock for P5 cubicle no. Heating element (on GAM 500 630 A and on GAM2) Internal arc version 16 kA 1 s

Orange box **x** corresponds to none priced functions.

#### **Order form** SM6-24 Power supply for main incoming line

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

Quantity **Basic cubicle** Rated voltage Ur (kV) Short-circuit current lsc (kA) Rated current Ir (A) Type of cubicle In = 630 A, In busbar = 400 A NSM busbar NSM cable In = 630 A, In busbar = 630 A NSM busbar NSM cable In = 630 A, In busbar = 1250 A NSM cable Position number in the switchboard (from left to right) Way of the busbars for NSM left 🗅 ` right Cable connection by the bottom (cable maxi 240 mm<sup>2</sup>) three core on both single core on both 2 x single core on both 3 x single core on one cubicle and 2 x three core on the other one Stand by source generator Utility with paralleling without paralleling Options Signalling contact on earthing switch 1 C on SW and 1 O & 1 C on ES Operation counter Interlocking SM6-SM6 Ronis Profalux 1 x P1 right cubicle left cubicle 2 x P1 right and left cubicle 1 x A3 right cubicle left cubicle on switch on earthing switch 2 x A3 right cubicle on switch on earthing switch left cubicle on switch on earthing switch 2 heating elements (set) Telecontrol (only with utility stand by source) Communication Modbus IEC DNP protocol RS232 RS485 Modem type Not for DNP PSTN GSM FSK

#### SF6 circuit breaker

#### **Order form** SF1 lateral fixed or withdrawable for SM6-24

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

Basic circuit breaker Quantity					
Rated voltage Ur	ated voltage Ur (kV)				
Impulse voltage Up				(kVbil)	
Breaking current lsc				(kA)	
Rated current Ir				(A)	
Frequency		50 Hz		60 Hz	
Installation	Fixed	A1		B1	
	Withdrawable			B1	
Colour for push buttons ar	d indicators	IEC standard		ANSI standard	
Push buttons open/close		rec	d/black		
Indicator open/close		black/white		green/red	
Operating mechanism charg	white/yellow		charge/discharge		
Circuit breaker on	tions				
1st opening release * (s	ee nossible choi	ices combination ta	hle helov	W)	
Shunt opening	release			••)	
24 Vdc	60 Vdc	220 Vdc		220 Vac (50 Hz)	
30 Vdc	110 Vdc	48 Vac (50 Hz)		120 Vac (60 Hz)	
48 Vdc	125 Vdc	110 Vac (50 Hz)		240 Vac (60 Hz)	
Undervoltage r	elease				
24 Vdc	60 Vdc	220 Vdc		220 Vac (50 Hz)	
30 Vdc	110 Vdc	48 Vac (50 Hz)		120 Vac (60 Hz)	
48 Vdc	125 Vdc	110 Vac (50 Hz)		240 Vac (60 Hz)	
MITOP		without contact		with contact	

#### 2nd opening release \* (see possible choice combination table below)

Shunt opening	release		
24 Vdc	60 Vdc	220 Vdc	220 Vac (50 Hz)
30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (60 Hz)
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)
Undervoltage re	elease		
24 Vdc	60 Vdc	220 Vdc	220 Vac (50 Hz)
30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (60 Hz)
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)
MITOP		without contact	with contact
Remote control			
Electric motor -	МСН	2432 Vdc	110127 Vdc/ac
		4860 Vdc/ac	220250 Vdc/ac
Shunt closing re	lease		
24 Vdc	60 Vdc	220 Vdc	220 Vac (50 Hz)
30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (60 Hz)
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)

(*) Different releases con	mbin	atio	ns				
Shunt opening release	1			2	1	1	
Undervoltage release			1		1		1
MITOP		1				1	1

#### SF6 circuit breaker

#### **Order form** SFset lateral withdrawable for SM6-24

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

Basic circuit brea	Basic circuit breaker Quantity				
Rated voltage Ur			(kV)		
Impulse voltage Up			(kVbil)		
Breaking current lsc			(kA)		
Rated current Ir			(A)		
Frequency		50 Hz	60 Hz		
Mechanism position		A1	B1		
Colour for push buttons a	nd indicators	IEC standard	ANSI standard		
Push buttons open/close		red/b	lack		
Indicator open/close		black/white	green/red		
Operating mechanism char	ged/discharged	white/yellow	charge/discharge		
Control unit and a	oneore				
Until end of 2004	Belisuis				
VIP 13 (not available for all		Is = 10 to 100 A	Is = 62.5 to 630 A		
electrical characteristics)	00-000/4				
electrical characteristics)	CSa 200/1 CSb 1250/1	Is = 10 to 50 A	Is = 40 to 200 A Is = 250 to 1250 A		
VIP 300LL	CSa 200/1 CSb 1250/1	Is = 10  to  50  A Is = 63  to  312  A	Is = 40 to 200 A		
	000 1200,1				
Circuit breaker op	otions				
2nd opening release *	(see possible cho	pices combination tab	le below)		
Shunt opening re		220 V/dc			
24 Vuc 30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (50 Hz)		
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)		
Undervoltage rele	ase		240 Vac (00 Hz)		
24 Vdc	60 Vdc	220 Vdc	220 Vac (50 Hz)		
30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (60 Hz)		
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)		
Remote control					
Electric motor - M	СН	2432 Vdc	110127 Vdc/ac		
		4860 Vdc/ac	220250 Vdc/ac		
Shunt closing rele			1		
24 Vdc	60 Vdc	220 Vdc	220 Vac (50 Hz)		
30 Vdc	110 Vdc	48 Vac (50 Hz)	120 Vac (60 Hz)		
48 Vdc	125 Vdc	110 Vac (50 Hz)	240 Vac (60 Hz)		
Test box (VAP 6)		· · · · ·			
Leaflets language	French	English	Spanish		

(*) Different releases combinations				
MITOP	1	1	1	
Shunt opening release		1		
Undervoltage release			1	

#### Vacuum circuit breaker

#### **Order form** Evolis frontal fixed for SM6-24 up to 17.5 kV

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

Quantity **Basic fixed circuit breaker** 12 Rated voltage Ur (kV) 17.5 Rated short-circuit breaking current lsc 25 kA Rated normal current Ir (A) 630 1250 Phase distance 185 mm Rated voltage Ur (kV) IEC standard ANSI standard **Circuit breaker options** Opening release \* (see possible choices in combination table below) Shunt opening release - MX 24 Vac 24...30 Vdc 100...130 Vdc/ac 48 Vac 48...60 Vdc 200...250 Vdc/ac Low energy release MITOP 1 AC fault signalling SDE and reset 200...250 Vac are included Remote control (operation counter already included) Electric motor - MCH 24...30 Vdc 100...125 Vdc 200...250 Vdc 48...60 Vdc/ac 100...130 Vac 200...240 Vac Shunt closing release - XF 24 Vac 24...30 Vdc 100...130 Vdc/ac 48 Vac 48...60 Vdc 200...250 Vdc/ac **Operation counter CDM** Additional auxiliary contacts OF (4 AC) 1 2 Ready to close contact PF (1 AC) Locking of the circuit breaker in the open position By padlock or by locks and keys Profalux Ronis If locks 1 lock 2 identical locks 2 different locks Disabling of O/C circuit breaker push buttons

(*) Different releases combinations				
Shunt opening release 1				
MITOP		1		

## Easergy T200 S

#### **Order form** Kit for auto changeover and telecontrol

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

Basic unit	Quantity
Function	
Generator auto changeover Network a	auto changeover Telecontrol
Communication protocol module(generator auto	changeover is without communication)
IEC 870-5-101 Modbus	DNP3 Without
Transmission system	
RS485	RS232, not insulated
Except DNP3: Radio modem V23 FSK	PSTN GSM
Options	
Set of 3 split core current transformer	Quantity
Generator ACO: quantity = 1 Network ACO: quantity = 2 Telecontrol: quantity = 0 , 1 or 2	
Accessories	
Configurator and maintenance software kit	T200-CFG



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http://www.schneider-electric.com http://www.merlin-gerin.com As standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.

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