Modular units

SM6-24

Catalogue

2006
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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.
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 intended 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.
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, Jy 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, Kanjanapras, 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
- OCl Dakar, Oger international, CGE, Senegal
- Bamburi cement Ltd, Kenya
- Ivory Electricity Company, Ivory Coast

South America/Pacific
- Lamentin Airport, CCIM, Martinique
- Space Centre, Kourou, Guayana
- 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
- Francais Mitterrand Library, France
- Nestlė 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.

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.
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, Sfeas 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

#### UTE standard

**MV consumer substation**

<table>
<thead>
<tr>
<th>IM</th>
<th>IM</th>
<th>CM</th>
<th>DM2</th>
<th>QM</th>
<th>PM</th>
<th>IM</th>
</tr>
</thead>
</table>

**Combined public distribution/Consumer substation**

<table>
<thead>
<tr>
<th>PM</th>
<th>IM</th>
<th>IM</th>
<th>GIM</th>
<th>QM</th>
</tr>
</thead>
</table>

**MV consumer substation**

<table>
<thead>
<tr>
<th>IM</th>
<th>IM</th>
<th>QM</th>
</tr>
</thead>
</table>

**Substation**

<table>
<thead>
<tr>
<th>GAM</th>
<th>QM</th>
</tr>
</thead>
</table>

#### Other standards

**MV consumer substation**

<table>
<thead>
<tr>
<th>IM</th>
<th>IM</th>
<th>DM1-D</th>
<th>GBC-A</th>
<th>QM</th>
<th>DM1-S</th>
</tr>
</thead>
</table>

**Substation**

<table>
<thead>
<tr>
<th>GIM</th>
</tr>
</thead>
</table>

### 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.
Field of application

Industrial distribution substations

- **Distribution switchboard**
  - DM1-A
  - CM
  - QMC
  - IM
  - IM
  - DM1-D
  - GBM
  - DM1-A
  - QMC
  - CM

- **MV/LV transformer substations**
  - PM
  - NSM-busbars
  - GBM
  - SM
  - TM

- **Distribution switchboard**
  - CM
  - QM
  - QM
  - IMC
  - IMB
  - GBM
  - IMC
  - QM
  - CM

*incoming line of private MV substation*
*standby generator source*
*utility source*
*incoming line of private MV substation*
Units for all functions

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

- 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)
Units for all functions

Contactor protection
- Contactor unit CRM (750 mm)
- Fused-contactor unit CRM (750 mm)

SF6 circuit-breaker protection
- Single-isolation circuit breaker unit DM1-A (750 mm)
- Single-isolation circuit breaker unit right or left outgoing line DM1-D (750 mm)
- Single-isolation circuit breaker unit with autonomous protection DM1-S (750 mm)
- Double-isolation circuit breaker unit right or left outgoing line DM2 (750 mm)
Units for all functions

**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

**MV metering**

- Voltage transformers for mains with earthed neutral system CM (375 mm)
- Voltage transformers for mains with insulated neutral system CM2 (500 mm)

**Current and/or voltage measurement unit**

- Right or left outgoing line GBC-A (750 mm)
- Current and/or voltage measurement unit GBC-B (750 mm)
Units for all functions

Casings

- Intermediate bus unit GIM (125 mm)
- Extension unit VM6/SM6 GEM (125 mm)
- Connection unit right or left outgoing line GBM (375 mm)

- Incoming cable-connection unit GAM2 (375 mm)
- Incoming cable-connection unit GAM (500 mm)
Units for all functions

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)
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 arrester, 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.
  - 60255: Electrical relays.
  - 62271-100: High-voltage alternating current circuit breakers.
  - 62271-102: High-voltage alternating current disconnectors and earthing switches.

- **UTE standards:**
  - NFC 3.100: Consumer substation installed inside a building and fed by a second category voltage public distribution system.
  - NFC 3.200: High voltage electrical installations requirements.
  - NFC 64.30: High voltage switches for rated voltage above 1 kV and less than 52 kV.
  - NFC 64.60: Alternating current disconnectors and earthing switches.

- **EDF specifications:**
  - HN 64-S-4: A.C. metal-enclosed switchgear 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 6080.4;
- 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.

<table>
<thead>
<tr>
<th>Rated voltage (kV)</th>
<th>7.2</th>
<th>12</th>
<th>17.5</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 Hz, 1 mm (kV rms)</td>
<td>Insulation</td>
<td>20</td>
<td>28</td>
<td>38</td>
</tr>
<tr>
<td>1.2/50 μs (kV peak)</td>
<td>Insulation</td>
<td>60</td>
<td>75*</td>
<td>95</td>
</tr>
</tbody>
</table>

Breaking capacity

| Transformer off load (A) | 16 |
| Cables off load (A)      | 31.5 |
| Short-time withstand current (kA. 1 s) | 25 | 630 - 1250 A |
|                           | 20 | 630 - 1250 A |
|                           | 16 | 630 - 1250 A |
|                           | 12.5 | 400 - 630 - 1250 A |

Endurance

<table>
<thead>
<tr>
<th>Units</th>
<th>Mechanical endurance</th>
<th>Electrical endurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM, IMC, IMB, NSM-cables, NSM-busbars</td>
<td>IEC 60265</td>
<td>IEC 60265</td>
</tr>
<tr>
<td>PM, QM, QMC, QMB</td>
<td>1000 operations class M</td>
<td>100 breaks at In, p.f. = 0.7 class E3</td>
</tr>
<tr>
<td>CRM</td>
<td>IEC 6227-102</td>
<td>IEC 6227-100</td>
</tr>
<tr>
<td>CRM with fuses</td>
<td>1000 operations</td>
<td>100 000 breaks at 250 A</td>
</tr>
<tr>
<td>SF6 circuit breaker range:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1000 operations</td>
<td>100 breaks at 12.5 kA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 000 breaks at ln, p.f. = 0.7</td>
</tr>
<tr>
<td>Vacuum circuit breaker range:</td>
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<td></td>
</tr>
<tr>
<td>DMV-A, DMV-D, DMV-S</td>
<td>IEC 6227-102</td>
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<td></td>
<td></td>
<td>10 000 breaks at 250 A</td>
</tr>
</tbody>
</table>

* 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.

General characteristics

<table>
<thead>
<tr>
<th>Rated voltage (kV)</th>
<th>7.2</th>
<th>12</th>
<th>17.5</th>
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<tbody>
<tr>
<td>Units</td>
<td></td>
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<tr>
<td>IM, IMC, IMB, NSM-cables, NSM-busbars</td>
<td>630 A - 800 A*</td>
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<tr>
<td>PM, QM, QMC, QMB</td>
<td>25 kA</td>
<td>20 kA</td>
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<tr>
<td>CRM</td>
<td>10 kA</td>
<td>8 kA</td>
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<tr>
<td>CRM with fuses</td>
<td>25 kA</td>
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<td></td>
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<tr>
<td>SF6 circuit breaker range:</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DM1-A, DM1-D, DM1-W, DM1-Z, DM1-S, DM2</td>
<td>25 kA</td>
<td>20 kA</td>
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<td></td>
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<td>Vacuum circuit breaker range:</td>
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<td>25 kA</td>
<td>20 kA</td>
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</tbody>
</table>

* In 800 A consult us.

SM6-24

Rated voltage (kV) | 7.2 | 12 | 17.5 | 24 |
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Breaking capacity

| Transformer off load (A) | 16 |
| Cables off load (A)      | 31.5 |
| Short-time withstand current (kA. 1 s) | 25 | 630 - 1250 A |
|                           | 20 | 630 - 1250 A |
|                           | 16 | 630 - 1250 A |
|                           | 12.5 | 400 - 630 - 1250 A |

Endurance

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<td>IEC 60265</td>
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<td>PM, QM, QMC, QMB</td>
<td>1000 operations class M</td>
<td>100 breaks at In, p.f. = 0.7 class E3</td>
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* 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 switch-disconnector and earthing switch and actuate the corresponding indications (positive break).

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

Optional, switch cubicles (IM) can also be fitted with:
- control motorisation;
- surge arrestors.

**SF6 circuit breaker cubicles**

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

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

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

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

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

Optional, cubicles may be fitted with:
- current and voltage transformers;
- circuit breaker control motorisation;
- surge arrestors.
Vacuum type circuit breaker cubicles
1 switchgear: disconnector(s) and 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 low voltage: installation of compact relay devices and test terminal boxes.
   With basic equipment, an additional enclosure is added on top of the cubicle.

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

**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 mm² or 2 x 400 mm² for 1250 A incoming or outgoing units;
- 300 mm² or 2 x 240 mm² for incoming or outgoing units 400 - 630 A;
- 95 mm² for transformer protection cubicles incorporating fuses.

The earthing switch must be closed before the cubicle may be accessed. The reduced depth of the cubicle makes for easy connection of all phases. A stud incorporated in the field distributor makes it possible to position and secure the cable-end lug with a single hand.
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.
Safety of people

By switchgear

Switch or disconnector and earthing switch

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

Operating safety
- The switch may be in one of three positions: “closed”, “open”, or “earthed”, representing a natural interlocking system that prevents incorrect operation. Moving-contact rotation is driven by a fast-acting mechanism that is independent of the action of the operator.
- The device combines the breaking and disconnection functions.
- The earthing switch placed in the SF6 has a short-circuit making capacity, in compliance with standards.
- Any accidental overpressures 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.
Safety of people

By switchgear

**SF6 circuit breaker: SF1 or SFset**

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

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

![SF1 circuit breaker](image1)

**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.

![Evolis circuit breaker](image2)
Safety of people

By operating mechanism safety

Reliable operating mechanism

- **Switchgear status indicator:**
  Fitted directly to the drive shaft, these give a definite indication of the contact’s position. (appendix A of standard IEC 62271-102.)

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

- **Locking device:**
  Between one and three padlocks enable the following to be locked:
  - access to the switching shaft of the switch or the circuit breaker,
  - access to the switching shaft of the earthing disconnector,
  - operating of the opening release push-button.

Simple and effortless switching

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

- **Closed:** the drive shaft is operated via a quick acting mechanism, independent of the operator. No energy is stored in the switch, apart from when switching operations are taking place.

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

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

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

- **Earthling:** 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.
Safety of people  
By 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: 2.5 kA, 0.7 s,
  - enhanced internal arcing withstand: 6 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.
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.
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 an external 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.)

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

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.

<table>
<thead>
<tr>
<th>Power supply</th>
<th>Flair 21D</th>
<th>Flair 21DT</th>
<th>Flair 22D</th>
<th>Flair 23D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-powered</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Dual power supply (battery)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Display</td>
<td>Flair 21D</td>
<td>Flair 21DT</td>
<td>Flair 22D</td>
<td>Flair 23D</td>
</tr>
<tr>
<td>Ammeter</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Peak demand</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Frequency meter</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Options</td>
<td>Flair 21D</td>
<td>Flair 21DT</td>
<td>Flair 22D</td>
<td>Flair 23D</td>
</tr>
<tr>
<td>SCADA interface (transistor output)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>External light</td>
<td>■</td>
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<td>■</td>
<td>■</td>
</tr>
<tr>
<td>External reset</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Advanced settings (keypad)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Sepam</th>
<th>Characteristics</th>
<th>Protections</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basic</td>
<td>Specific</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Substation</td>
<td>Transformer</td>
<td>Rotation</td>
</tr>
<tr>
<td></td>
<td>Rotation</td>
<td>Rotation generator</td>
<td>generator</td>
</tr>
<tr>
<td></td>
<td>Busbars</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sepam series 20</td>
<td>For common applications</td>
<td>Current protection</td>
<td>S20 T20 M20</td>
</tr>
<tr>
<td></td>
<td>10 logic inputs and 8 relay outputs</td>
<td>Voltage and frequency protection</td>
<td>B21</td>
</tr>
<tr>
<td></td>
<td>1 Modbus communication port</td>
<td>Loss of mains (ROCOF)</td>
<td>B22</td>
</tr>
<tr>
<td>Sepam series 40</td>
<td>For demanding applications</td>
<td>Current voltage and frequency protection</td>
<td>S40 T40 G40</td>
</tr>
<tr>
<td></td>
<td>10 logic inputs</td>
<td>Directional earth fault</td>
<td>S41 M40</td>
</tr>
<tr>
<td></td>
<td>8 relay outputs</td>
<td>Directional earth fault and phase overcurrent</td>
<td>S42 T42</td>
</tr>
<tr>
<td></td>
<td>1 Modbus communication port</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Logic equations editor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sepam series 80</td>
<td>For complete applications</td>
<td>Current voltage and frequency protection</td>
<td>S80</td>
</tr>
<tr>
<td></td>
<td>42 logic inputs and 23 relay outputs</td>
<td>Directional earth fault</td>
<td>S81 T81 M81</td>
</tr>
<tr>
<td></td>
<td>2 Modbus communication port</td>
<td>Directional earth fault and phase overcurrent</td>
<td>S82 T82 G82</td>
</tr>
<tr>
<td></td>
<td>Logic equations editor</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Removal memory cartridge</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Battery to save event logging data</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Description of the control/monitoring and protection functions**

**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.

**Phase protection**
- The phase protection is achieved by a definite time threshold which functions from 1.2 times the operating current (Io).

**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**
- Earthing 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.

Selection table

<table>
<thead>
<tr>
<th>Protection type</th>
<th>Code</th>
<th>Sepam 2000</th>
<th>series 20</th>
<th>series 40</th>
<th>series 80</th>
<th>Statimax 35</th>
<th>VIP 200</th>
<th>VIP 300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-phase overcurrent</td>
<td>50 - 51</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Zero-sequence overcurrent</td>
<td>50N - 51N</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Directional zero-sequence current</td>
<td>67N</td>
<td>✔</td>
<td>✔</td>
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<td>✔</td>
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<tr>
<td>Undervoltage</td>
<td>27</td>
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<td>✔</td>
<td>✔</td>
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<tr>
<td>Overvoltage</td>
<td>59</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Thermal image</td>
<td>49</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Zero-sequence overvoltage</td>
<td>59N</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Negative sequence overcurrent</td>
<td>46</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Long start-up and rotor blocking</td>
<td>51LR</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Maximum number of start-ups</td>
<td>66</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Single-phase undercurrent</td>
<td>37</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

(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**

**Characteristics of the functional units**

<table>
<thead>
<tr>
<th>IM (375 or 500 mm)</th>
<th>IMC (500 mm)</th>
<th>IMB (375 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch with earthing switch</td>
<td>Switch with earthing switch</td>
<td>Switch with earthing switch</td>
</tr>
<tr>
<td>Right or left outgoing</td>
<td>Right or left outgoing</td>
<td>Right or left outgoing</td>
</tr>
</tbody>
</table>

**Electrical characteristics**

- Basic equipment:
  - switch and earthing switch
  - three-phase busbars
  - CIT operating mechanism
  - voltage indicators
  - connection pads for dry-type cables
  - three-phase bottom busbars for outgoing lines (right or left)
  - one to three CTs

- Versions:
  - CI2 operating mechanism
  - CI1 operating mechanism
  - 630 A or 1250 A three-phase busbars
  - in 800 A version consult us

- Optional accessories:
  - motor for operating mechanism
  - auxiliary contacts
  - additional enclosure or connection enclosure for cabling from above
  - key-type interlocks
  - 50 W heating element
  - stands footing
  - release units
  - phase comparator
  - fault indicators
  - surge arrestors (for 500 mm cubicle)
  - telecontrol
Characteristics of the functional units

Functional units selection

Fuse-switch protection

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

QMC (625 mm) Fuse-switch combination unit

QMB (375 mm) Fuse-switch combination unit

Outgoing line right or left

DE55987

DE55847

DE55848

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
- one to three CTs

Versions:

- 630 A or 1250 A three-phase busbars
- CI2 operating mechanism

Optional accessories:

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

Characteristics of the functional units

kA

200 A

7.2

12

17.5

24

kV

200 A

25

20

16

12.5
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

Characteristics of the functional units
Functional units selection

Contactor protection

Characteristics of the functional units

**CRM (750 mm)**
- Contactor

**CRM (750 mm)**
- Contactor with fuses

---

**Electrical characteristics**

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

- **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

- equipment for three DIN fuses

---

Characteristics of the functional units

- 400 A
  - 7.2 kV: 8 kA
  - 12 kV: 10 kA

- 250 A
  - 7.2 kV: 12.5 kA
  - 12 kV: 25 kA
**Functional units selection**

**SF6 type circuit breaker protection**

**Characteristics of the functional units**

**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**

![Electrical characteristics chart]

**Basic equipment:**
- SF or SFset circuit breaker (only for the 400-630 A performances)
- disconnector and earthing switch
- three-phase busbars
- circuit breaker operating mechanism RI
- disconnector operating mechanism CS
- voltage indicators
- three CTs for SF1 circuit breaker
- auxiliary contacts on circuit breaker
- connection pads for dry-type cables
- downstream earthing switch
- three-phase bottom busbars

**Version:**
- 630 A or 1250 A three-phase busbars

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

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:
- 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:
- 630 A or 1250 A three-phase busbars

Optional accessories:
- cubicle:
  - additional enclosure or connection
  - enclosure for cabling from above
  - three voltage transformers
  - key-type interlocks
  - 50 W heating element
  - stands footing

- circuit breaker:
  - motor for operating mechanism
  - release units
  - operation counter on manual operating mechanism

- cubicle:
  - protection using Statimax relays or Sepam programmable electronic unit
  - auxiliary contacts on disconnectors
Functional units selection

SF6 type circuit breaker protection

Characteristics of the functional units

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

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

### Electrical characteristics

<table>
<thead>
<tr>
<th>Current (A)</th>
<th>kA</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 - 630 - 1250 A</td>
<td>12.5</td>
</tr>
<tr>
<td>630 - 1250 A</td>
<td>16</td>
</tr>
<tr>
<td>1250 A</td>
<td>20</td>
</tr>
</tbody>
</table>

### Basic equipment:
- SF1 circuit breaker
- disconnector and earthing switch
- three-phase busbars
- circuit breaker operating mechanism RI
- disconnector operating mechanism CS
- voltage indicators
- three CTs
- auxiliary contacts on circuit breaker
- earthing switch operating mechanism CC
- connection pads for dry-type cables
- downstream earthing switch

### 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 Statimex relays
  - Sepam programmable electronic unit
  - three voltage transformers
  - key-type interlocks
  - 50 W heating element
  - stands footing
  - withdrawable circuit breaker cradle
- circuit breaker:
  - motor for operating mechanism
  - release units
  - operation counter on manual operating mechanism
- surge arrestors
## Functional units selection

**Vacuum type circuit breaker protection**

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

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

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

### Electrical characteristics

<table>
<thead>
<tr>
<th>Voltage (kV)</th>
<th>12</th>
<th>17.5</th>
<th>25</th>
<th>20</th>
<th>16</th>
<th>12.5</th>
<th>12</th>
<th>17.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current (A)</td>
<td>400-630</td>
<td>1250</td>
<td>25</td>
<td>20</td>
<td>16</td>
<td>12.5</td>
<td>12</td>
<td>17.5</td>
</tr>
<tr>
<td>Current (A)</td>
<td>630</td>
<td>1250</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Basic equipment:
- Evolis circuit breaker
- Switch and earthing switch for 400 - 630 A
- Disconnectors 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:
- 630 A or 1250 A three-phase busbars
- 630 A or 1250 A three-phase busbars

### Optional accessories:

#### Cubicle:
- Auxiliary contacts on the disconnector
- Additional enclosure or connection enclosure for cabling from above
- Three voltage transformers
- Key-type interlocks
- Stands footing

#### Circuit breaker:
- Motor for operating mechanism
- Release units
- Operation counter on manual operating mechanism

---

Characteristics of the functional units
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**

![Graph showing electrical characteristics](image)

**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

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

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

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

Electrical characteristics

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

Characteristics of the functional units
Functional units selection

Casings

### Characteristics of the functional units

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

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

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

### Electrical characteristics

#### Basic equipment:
- three-phase busbars
- three-phase busbars
- connection bars
- three-phase busbars for outgoing lines right or left

#### Optional accessories:
- stands footing
- additional enclosure

---

<table>
<thead>
<tr>
<th>kA</th>
<th>400 - 630 A</th>
<th>630 A</th>
<th>630 - 1250 A</th>
<th>400 - 630 - 1250 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

- 25 kA
- 20 kA
- 16 kA
- 12.5 kA
- 7.2 kA
- 12 kV
- 17.5 kV
- 24 kV

---
Functional units selection

Casings

**Characteristics of the functional units**

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

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

**Electrical characteristics**

**Basic equipment:**
- three-phase busbars
- voltage indicators
- connection pads for dry-type cables
- connection bars
- operating mechanism CC
- earthing switch

**Optional accessories:**
- enlarged low-voltage control cabinet
- stands footing
- 50 W heating element
- auxiliary contacts
- surge arrestors
- key-type interlocks
Characteristics of the functional units

**Functional units selection**

**Other functions**

<table>
<thead>
<tr>
<th>Functional unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM (375 or 500(^{(1)}) mm)</td>
<td>Disconnector unit</td>
</tr>
<tr>
<td>TM (375 mm)</td>
<td>MV/LV transformer unit for auxiliaries</td>
</tr>
<tr>
<td>EMB (375 mm)</td>
<td>Busbars earthing compartment</td>
</tr>
</tbody>
</table>

**Electrical characteristics**

- **Basic equipment:**
  - disconnector and earthing switch
  - three-phase busbars
  - operating mechanism CS
  - connection pads for dry-type cables
  - voltage indicators

- **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.
**Characteristics of the functional units**

**Functional units selection**

**Change over**

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

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

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

**Electrical characteristics**

**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
- telecontrol
**Automatic switching controls**

**Characteristics of the functional units**

### Network back up

- **Voltage on SW1**
- **SW1**
- **TR**
- **C**
- **O**
- **T1**

**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

- **Voltage on SW1**
- **SW1**
- **TR**
- **C**
- **O**
- **T1**

**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).

*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 → SW2, (SW2 → SW1)**
  - The automatic control only switches once from channel 1 or 2 to the back up channel.
- **Mode Auto-SW1 or Auto-SW2**
  - Channel 1 or 2 is priority if its MV voltage is OK. After switching to the back up channel, the mode switches back to the priority channel if the MV voltage on this channel is OK for a period T2.

### 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.
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.

<table>
<thead>
<tr>
<th>Units</th>
<th>Type of operating mechanism</th>
<th>Switch/disconnector</th>
<th>Circuit breaker</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CIT</td>
<td>CI1</td>
</tr>
<tr>
<td>IM, IMB, IMC</td>
<td></td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>PM</td>
<td></td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>QM, QMC, QMB</td>
<td></td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>CM, CM2, CRM</td>
<td></td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>DM1-A, DM1-D, DM1-S, DM1-Z, DM2</td>
<td></td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>DM1-A(*), DM1-W</td>
<td></td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>DMV-A, DMV-D, DMV-S</td>
<td></td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>NSM-cables, NSM-busbars</td>
<td></td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>GAM</td>
<td></td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>SM, TM</td>
<td></td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>EMB</td>
<td></td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

- provided as standard
- other possibility
- (*) 1250 A version

**Double-function operating mechanism CIT**

- **Switch function**
  Independent-operation opening or closing by lever or motor.

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

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

- **Mechanical indications**
  Fuses blown in unit PM.
  Motor option

**Double-function operating mechanism CI1**

- **Switch function**
  - independent-operation closing by lever or motor.
  Operating energy is provided by a compressed spring which, when released, causes the contacts to open or close.
  - independent-operation opening by push-button (O) or trip units.

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

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

- **Mechanical indications**
  Fuses blown in units QM.

- **Opening releases**
  - shunt trip,
  - undervoltage for unit QM.

- **Motor option**

(*) Included with the motor option.
Characteristics of the functional units

Operating mechanisms

Double-function operating mechanism CI2
- **Switch function**
  - independent-operation closing in two steps:
    1. operating mechanism recharging by lever or motor,
    2. stored energy released by push-button (I) or trip unit.
- **Earthing-switch function**
  - Independent-operation closing and opening by lever.
  - Operating energy is provided by a compressed spring which, when released, causes the contacts to open or close.
- **Auxiliary contacts**
  - switch (2 O + 2 C)*
  - switch (2 O + 3 C) and earthing switch (1 O + 1 C).
  - switch (1 C) and earthing switch (1 O + 1 C) if motor option.
- **Opening release shunt trip**
- **Closing release shunt trip**
- **Motor option**

(*) Included with the motor option.

Double-function operating mechanism CS
- **Switch and earth switch functions**
  - Dependent-operation opening and closing by lever.
- **Auxiliary contacts**
  - disconnector (2 O + 2 C) for units DM1-A, DM1-D, DM1-W, DM2 and CRM without VT,
  - disconnector (2 O + 3 C) and earthing switch (1 O + 1 C) for units DM1-A, DM1-D, DM1-W, DM2 and CRM without VT,
  - disconnector (1 O + 2 C) for units CM, CM2, TM, DM1-A, DM1-D, DM2 and CRM with VT.
- **Mechanical indications**
  - Fuses blown in units CM, CM2 and TM.

Single-function operating mechanism CC
- **Earthing switch function**
  - Independent-operation opening and closing by lever.
  - Operating energy is provided by a compressed spring which, when released, provokes opening or closing of the contacts.
- **Auxiliary contacts**
  - Earthing switch (1 O + 1 C).
Single-function operating mechanism RI for the SF circuit breaker

- Circuit-breaker function
  - independent-operation closing in two steps.
  - First operating mechanism recharge by motor or lever, then release of the stored energy by push-button (I) or trip unit.
  - independent-operation opening by push-button (O) or trip units.

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

- Mechanical indications
  - Operation counter.

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

- Closing release
  - shunt trip

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

<table>
<thead>
<tr>
<th>Release type</th>
<th>SF1 Combinations</th>
<th>SFset Combinations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Mitop (low energy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shunt trip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undervoltage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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)
Motor option and releases for switch-units

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

<table>
<thead>
<tr>
<th></th>
<th>V</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power supply</strong></td>
<td>DC 24</td>
<td>48</td>
<td>110</td>
<td>125</td>
<td>220</td>
<td>120</td>
</tr>
<tr>
<td><strong>Motor option</strong></td>
<td>200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operating time for CIT</strong></td>
<td>1 to 2 (s)</td>
<td>1 to 2 (s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Charging time for CI1, CI2</strong></td>
<td>4 to 7 (s)</td>
<td>4 to 7 (s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Opening releases

<table>
<thead>
<tr>
<th></th>
<th>V</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shunt trip</strong></td>
<td>200</td>
<td>250</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>400</td>
</tr>
<tr>
<td><strong>Response time</strong></td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>750</td>
</tr>
</tbody>
</table>

Undervoltage

<table>
<thead>
<tr>
<th></th>
<th>V</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pick-up</strong></td>
<td>160</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hold</strong></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Response time</strong></td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45</td>
</tr>
</tbody>
</table>

Closing release

<table>
<thead>
<tr>
<th></th>
<th>V</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shunt trip</strong></td>
<td>200</td>
<td>250</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>400</td>
</tr>
<tr>
<td><strong>Response time</strong></td>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>750</td>
</tr>
</tbody>
</table>

* 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.

<table>
<thead>
<tr>
<th></th>
<th>V</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power supply</strong></td>
<td>DC 24</td>
<td>48</td>
<td>110</td>
<td>125</td>
<td>220</td>
<td>120</td>
</tr>
<tr>
<td><strong>Motor option</strong></td>
<td>300</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>380</td>
</tr>
<tr>
<td><strong>Charging time</strong></td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

Opening releases

<table>
<thead>
<tr>
<th></th>
<th>V</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mitop (low energy)</strong></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
</tr>
<tr>
<td><strong>Response time</strong></td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>V</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shunt trip</strong></td>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>180</td>
</tr>
<tr>
<td><strong>Response time</strong></td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45</td>
</tr>
</tbody>
</table>

Undervoltage

<table>
<thead>
<tr>
<th></th>
<th>V</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pick-up</strong></td>
<td>160</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>280</td>
</tr>
<tr>
<td><strong>Hold</strong></td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td><strong>Response time</strong></td>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
</tbody>
</table>

Closing release

<table>
<thead>
<tr>
<th></th>
<th>V</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shunt trip</strong></td>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>180</td>
</tr>
<tr>
<td><strong>Response time</strong></td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>65</td>
</tr>
</tbody>
</table>

* Please consult us for other frequencies.
Motor option and releases for Evolis circuit breakers

Charging motor and associated mechanism (MCH)
The MCH unit arms and rearms the energy storage springs as soon as the circuit breaker is closed. This enables instant reclosing of the device after opening. The arming lever is only used as back up control in the absence of an auxiliary voltage.
The MCH is equipped as standard with a CH limit switch. This contact indicates the “armed” position of the mechanism (spring armed).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Power supply</th>
<th>Vac 50/60 Hz</th>
<th>48/60</th>
<th>100/130</th>
<th>200/240</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vdc</td>
<td>24/30</td>
<td>48/60</td>
<td>100/125</td>
<td>200/250</td>
</tr>
<tr>
<td>Threshold</td>
<td>0.85 to 1.1 Un</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumption (VA or W)</td>
<td>180</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor overcurrent</td>
<td>2 to 3 In during 0.1 s</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charging time</td>
<td>4 s max.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching rate</td>
<td>3 cycles per minute max.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical endurance</td>
<td>100000 remote controlled opening operations Evolis P1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH contact</td>
<td>10 A at 240 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Power supply</th>
<th>Direct current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold</td>
<td>0.6 A &lt; I &lt; 3 A</td>
<td></td>
</tr>
<tr>
<td>Response time of the circuit breaker at Un</td>
<td>11 ms</td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Power supply</th>
<th>Vac 50/60 Hz</th>
<th>24/30</th>
<th>48/60</th>
<th>100/130</th>
<th>200/250</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vdc</td>
<td>24/30</td>
<td>48/60</td>
<td>100/130</td>
<td>200/250</td>
<td></td>
</tr>
<tr>
<td>Threshold</td>
<td>0.7 to 1.1 Un</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumption (VA or W)</td>
<td>Pick-up: 200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hold: 4.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response time of the circuit breaker at Un</td>
<td>50 ms ± 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Current transformers

#### Characteristics of the functional units

**For unit QMC**

**Transformer ARJP1/N2F**
- Single primary winding;
- Double secondary winding for measurement and protection.

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

<table>
<thead>
<tr>
<th>( I_{1n} ) (A)</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>50</th>
<th>75</th>
<th>100</th>
<th>150</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_{th} ) (kA)</td>
<td>1.2</td>
<td>2.4</td>
<td>3.6</td>
<td>6</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>( t ) (s)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Measurement and protection:
- 5 A
- 15 VA - class 0.5

---

**For unit CRM**

**Transformer ARJP1/N2F**
- Single primary winding;
- Double secondary winding for measurement and protection.

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

<table>
<thead>
<tr>
<th>( I_{1n} ) (A)</th>
<th>50</th>
<th>100</th>
<th>150</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_{th} ) (kA)</td>
<td>6</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( t ) (s)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Measurement and protection:
- 5 A
- 15 VA - class 0.5

---

**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 \( I_{th} \) (kA)**

<table>
<thead>
<tr>
<th>( I_{1n} ) (A)</th>
<th>10/20</th>
<th>20/40</th>
<th>50/100</th>
<th>100/200</th>
<th>200/400</th>
<th>300/600</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_{th} ) (kA)</td>
<td>5</td>
<td>12.5</td>
<td>12.5/21*</td>
<td>12.5/25*</td>
<td>12.5/25*</td>
<td>25</td>
</tr>
<tr>
<td>( t ) (s)</td>
<td>1</td>
<td>0.8</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Measurement and protection:
- 5 A
- 7.5 VA - class 0.5

- 1 A
- 1 VA - 10P30
- 5 A
- 5 VA - 5P10
- 5 VA - 5P15

*For 5 A protection*

---

**Characteristics of the functional units**

---

*Note: please consult us for other characteristics.*
Characteristics of the functional units

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 \( I_{th} \) (kA)

<table>
<thead>
<tr>
<th>( I_{th} ) (kA)</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_{th} ) (kA)</td>
<td>25</td>
</tr>
<tr>
<td>Measurement and protection</td>
<td>5 A</td>
</tr>
<tr>
<td>10 VA class 0.5</td>
<td>15 VA class 0.5</td>
</tr>
<tr>
<td>15 VA class 0.5</td>
<td>15 VA class 0.5</td>
</tr>
<tr>
<td>20 VA class 0.5</td>
<td>2.5 VA</td>
</tr>
<tr>
<td>2.5 VA</td>
<td>5 VA</td>
</tr>
<tr>
<td>5 VA</td>
<td>5 VA</td>
</tr>
<tr>
<td>5 VA</td>
<td>7.5 VA</td>
</tr>
<tr>
<td>5 VA</td>
<td>5 VA</td>
</tr>
</tbody>
</table>

For 1250 A units
DMV-A, DMV-D
Transformer ARJP3/N2F
■ single primary winding;
■ double secondary winding for measurement and protection.

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

<table>
<thead>
<tr>
<th>( I_{th} ) (kA)</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_{th} ) (kA)</td>
<td>25</td>
</tr>
<tr>
<td>Measurement and protection</td>
<td>1 A</td>
</tr>
<tr>
<td>30 VA - class 0.5</td>
<td>10 VA - 5P20</td>
</tr>
<tr>
<td>5 A</td>
<td>5 VA</td>
</tr>
<tr>
<td>5 VA</td>
<td>7.5 VA</td>
</tr>
<tr>
<td>5 VA</td>
<td>5 VA</td>
</tr>
<tr>
<td>5 VA</td>
<td>5 VA</td>
</tr>
<tr>
<td>5 VA</td>
<td>5 VA</td>
</tr>
</tbody>
</table>

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 \( (U_{m}) \) (kV) | 24 |
Rated power-frequency withstand (kV) | 50 |
### Characteristics of the functional units

#### Voltage transformers

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

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

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>CM</th>
<th>DM1-A</th>
<th>DM1-D</th>
<th>DM2</th>
<th>GBC-A</th>
<th>GBC-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary voltage (kV)</td>
<td>10√3</td>
<td>15√3</td>
<td>15/20√3</td>
<td>20√3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary voltage (V)</td>
<td></td>
<td>100√3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal power (VA)</td>
<td>250</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy class</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated output for single primary winding (VA)</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated output for double primary winding (VA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30-50</td>
<td></td>
</tr>
</tbody>
</table>

**For units DMV-A, DMV-D**

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

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>DMV-A</th>
<th>DMV-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td>17.5</td>
<td></td>
</tr>
<tr>
<td>Primary voltage (kV)</td>
<td>10√3</td>
<td>15√3</td>
</tr>
<tr>
<td>Secondary voltage (V)</td>
<td>100√3</td>
<td></td>
</tr>
<tr>
<td>Thermal power (VA)</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>Accuracy class</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Rated output for single primary winding (VA)</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

**For units CM2, GBC-A, GBC-B**

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

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>CM2</th>
<th>GBC-A</th>
<th>GBC-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary voltage (kV)</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Secondary voltage (V)</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal power (VA)</td>
<td>500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy class</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated output for single primary winding (VA)</td>
<td>50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**For units GBC-A, GBC-B**

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

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>First secondary</th>
<th>Second secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td>12</td>
<td>17.5</td>
</tr>
<tr>
<td>Primary voltage (kV)</td>
<td>10√3</td>
<td>15√3</td>
</tr>
<tr>
<td>Secondary voltage (V)</td>
<td>100√3 - 100√3</td>
<td></td>
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<tr>
<td>Thermal power (VA)</td>
<td>200</td>
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</tr>
<tr>
<td>Accuracy class</td>
<td>0.5</td>
<td></td>
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<tr>
<td>Rated output for single primary winding (VA)</td>
<td>30-50</td>
<td></td>
</tr>
<tr>
<td>Thermal power (VA)</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Accuracy class</td>
<td>3P</td>
<td></td>
</tr>
<tr>
<td>Rated output</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>
Voltage transformers

For unit TM
Transformers VCT24 (phase-to-phase) 50 or 60 Hz

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>24</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary voltage (kV)</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Secondary voltage (V)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Output (VA)</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td></td>
<td>4000</td>
<td>4000</td>
<td></td>
</tr>
</tbody>
</table>

*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*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>400/630</th>
<th>10</th>
<th>12</th>
<th>17.5</th>
<th>24</th>
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</thead>
<tbody>
<tr>
<td>In (A) (unit)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Un (kV) (unit)</td>
<td>7.2</td>
<td>10</td>
<td>12</td>
<td>17.5</td>
<td>24</td>
</tr>
</tbody>
</table>

*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 64.20;
- 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 0 kV, select either Solefuse fuses rated 43 A or Fusarc CF fuses rated 50 A.

### Fuse selection table

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

Rating in A - no overload at −5°C < t < 40°C.

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

<table>
<thead>
<tr>
<th>Type of fuse</th>
<th>Service voltage (kV)</th>
<th>Transformer rating (kVA)</th>
<th>Rated voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solefuse (UTE NFC standards 13.100, 64.210)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.5</td>
<td>6.3</td>
<td>16</td>
<td>31.5</td>
</tr>
<tr>
<td>10</td>
<td>6.3</td>
<td>6.3</td>
<td>16</td>
</tr>
<tr>
<td>15</td>
<td>6.3</td>
<td>6.3</td>
<td>16</td>
</tr>
<tr>
<td>20</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>Solefuse (general case, UTE NFC standard 13.200)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td>6.3</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>5.5</td>
<td>6.3</td>
<td>6.3</td>
<td>16</td>
</tr>
<tr>
<td>6.6</td>
<td>6.3</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>10</td>
<td>6.3</td>
<td>6.3</td>
<td>16</td>
</tr>
<tr>
<td>13.8</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>15</td>
<td>6.3</td>
<td>6.3</td>
<td>16</td>
</tr>
<tr>
<td>20</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>22</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>Fusarc CF and SIBA(1) (general case for QM, QMB and QMC cubicle according to IEC 62271-105)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td>6.3</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>16</td>
<td>16</td>
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<tr>
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<td>10</td>
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<td>31.5</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
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<td>10</td>
<td>16</td>
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</tr>
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<td>11</td>
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</tr>
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<td>13.8</td>
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<tr>
<td>22</td>
<td>6.3</td>
<td>6.3</td>
<td>10</td>
</tr>
</tbody>
</table>

*Please consult us
(1) = SIBA fuses
### Characteristics of the functional units

**Protection transformers**

#### Fuses dimensions

<table>
<thead>
<tr>
<th><strong>Solefuse (UTE standards)</strong></th>
<th><strong>Ur (kV)</strong></th>
<th><strong>Ir (A)</strong></th>
<th><strong>L (mm)</strong></th>
<th><strong>Ø (mm)</strong></th>
<th><strong>Weight (kg)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2</td>
<td>6.3 to 125</td>
<td>450</td>
<td>55</td>
<td></td>
<td>2</td>
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<td>12</td>
<td>100</td>
<td>450</td>
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<td>2</td>
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<tr>
<td>17.5</td>
<td>80</td>
<td>450</td>
<td>55</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>24</td>
<td>6.3 to 63</td>
<td>450</td>
<td>55</td>
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<td>2</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Fusarc CF</strong></th>
<th><strong>Ur (kV)</strong></th>
<th><strong>Ir (A)</strong></th>
<th><strong>L (mm)</strong></th>
<th><strong>Ø (mm)</strong></th>
<th><strong>Weight (kg)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2</td>
<td>125</td>
<td>292</td>
<td>86</td>
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</tr>
<tr>
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<td>1.2</td>
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<td>10</td>
<td>292</td>
<td>50.5</td>
<td>1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>292</td>
<td>50.5</td>
<td>1.2</td>
<td></td>
<td></td>
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<td>20</td>
<td>292</td>
<td>50.5</td>
<td>1.2</td>
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<td>292</td>
<td>57</td>
<td>1.5</td>
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<td>292</td>
<td>57</td>
<td>1.5</td>
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<tr>
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<td>1.5</td>
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</tr>
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</tr>
<tr>
<td>80</td>
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<td>2.8</td>
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</tr>
<tr>
<td>100</td>
<td>292</td>
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<td>2.8</td>
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<td></td>
</tr>
<tr>
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<td>1.6</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>442</td>
<td>50.5</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>442</td>
<td>50.5</td>
<td>1.6</td>
<td></td>
<td></td>
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<td>20</td>
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</tr>
<tr>
<td>25</td>
<td>442</td>
<td>57</td>
<td>2.2</td>
<td></td>
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</tr>
<tr>
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<td>442</td>
<td>57</td>
<td>2.2</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>2.2</td>
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</tr>
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<td>442</td>
<td>78.5</td>
<td>4.1</td>
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<td>80</td>
<td>442</td>
<td>86</td>
<td>5.3</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>SIBA</strong></th>
<th><strong>Ur (kV)</strong></th>
<th><strong>Ir (A)</strong></th>
<th><strong>L (mm)</strong></th>
<th><strong>Ø (mm)</strong></th>
<th><strong>Weight (kg)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2</td>
<td>160</td>
<td>292</td>
<td>85</td>
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<td>3.8</td>
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</tr>
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<td>125</td>
<td>442</td>
<td>85</td>
<td></td>
<td>5.4</td>
</tr>
</tbody>
</table>

---

**Dimensions:**

- **Ur (kV):** 7.2, 12, 17.5, 24
- **Ir (A):** 6.3 to 125, 6.3 to 63
- **L (mm):** 450
- **Ø (mm):** 55, 6, 45
- **Weight (kg):** 2, 3.3, 1.2, 1.6, 1.5, 2.8, 4.1, 5.3
The current rating of fuses installed in CRM units depends on:

- Motor current rating \( I_n \);
- Starting current \( I_d \);
- Frequency of starts.

The fuses rating is calculated such that a current equal to twice the starting current does not blow the fuse within period equal to the starting time.

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

- Direct on-line startup;
- \( I_d/I_n \leq 6 \);
- \( \eta = 0.9 \) (\( \leq 500 \text{ kW} \)) or \( 0.94 \) (\( > 500 \text{ kW} \)).

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

**Example:**
Consider a 950 kW motor at 5 kV.

\[
I_n = \sqrt[3]{\frac{P}{U \cdot \eta \cdot \text{pf}}} = 130 \text{ A}
\]

\[I_d = 6 \times I_n = 780 \text{ A}\]

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.

<table>
<thead>
<tr>
<th>Starting current (A)</th>
<th>Starting time (s)</th>
<th>5</th>
<th>10</th>
<th>20</th>
<th>Maximum service voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of starts per hour</td>
<td>6</td>
<td>12</td>
<td>6</td>
<td>12</td>
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<tr>
<td>1410</td>
<td>250</td>
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<td>1290</td>
<td>250 250 250</td>
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</tr>
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<td>710</td>
<td>200 200 200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>640</td>
<td>200 200 200</td>
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<td>540</td>
<td>160 200 200</td>
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<td>160 160 160</td>
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<td></td>
</tr>
<tr>
<td>310</td>
<td>160 160 160</td>
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<td></td>
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<tr>
<td>280</td>
<td>125 160 160</td>
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<td>160</td>
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</tr>
<tr>
<td>250</td>
<td>125 125 125</td>
<td>125</td>
<td>125</td>
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<td>240</td>
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<td>170</td>
<td>100 100 100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>11</td>
</tr>
</tbody>
</table>

**Maximum switchable power (kW)**

<table>
<thead>
<tr>
<th>Maximum switchable power (kW)</th>
<th>(direct on-line startup, six 5 sec. starts per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service voltage (kV)</td>
<td>3.3 4.16 5 5.5 6 6.6 10 11</td>
</tr>
<tr>
<td>Without fuses</td>
<td>1550 1960 2360 2590 2830 3110 4710 5180</td>
</tr>
<tr>
<td>With fuses</td>
<td>100 A 140 180 215 240 260 285 435 480</td>
</tr>
<tr>
<td>200 A</td>
<td>625 800 960 1060 1155 1270</td>
</tr>
<tr>
<td>250 A</td>
<td>1135</td>
</tr>
</tbody>
</table>

### 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

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

<table>
<thead>
<tr>
<th>Units</th>
<th>Interlock</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM, IMB, IMC</td>
<td>A1</td>
</tr>
<tr>
<td>CRM</td>
<td></td>
</tr>
<tr>
<td>NSM</td>
<td></td>
</tr>
<tr>
<td>GAM</td>
<td></td>
</tr>
<tr>
<td>SM</td>
<td></td>
</tr>
</tbody>
</table>

### Key-type interlocks

#### Outgoing units

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

**Legend for key-type interlocks:**
- no key
- free key
- captive key
- panel or door
### Interlocks

#### A3 type

**Ring units**

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

#### A4 type

- to prevent the simultaneous closing of two switches.

#### A5 type

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

#### 50 type

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

---

**Legend for key-type interlocks:**

- no key
- free key
- captive key
- panel or door
Characteristics of the functional units

Interlocks

P1 type
- to prevent the closing of an earthing switch if the switch of the other unit has not been locked in the "open" position.

P2 type
- to prevent on-load operation of the disconnector unless the switch is locked "open";
- to prevent the closing of the earthing switches unless the disconnector and the switch are locked "open".

P3 type
- to prevent on-load operation of the disconnector unless the switch is locked "open";
- to prevent the closing of the earthing switches with the unit energised, unless the disconnector and the switch are locked "open";
- to allow off-load operation of the switch.

P5 type
- 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:
- no key
- free key
- captive key
- panel or door
The ageing resistance of the equipment in an MV/LV substation depends on three key factors:

- **the need to make connections correctly**
  New cold fitted connection technologies offer ease of installation that favours resistance over time. Their design enables operation in polluted environments under severe conditions.

- **the impact of the relative humidity factor**
  The inclusion of a heating element is essential in climates with high humidity levels and with high temperature differentials.

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

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

The bimetallic lugs are:
- round connection and shank for cables $\leq 300 \text{ mm}^2$;
- square connection round shank for cables $> 300 \text{ mm}^2$ 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:**
- $630 \text{ mm}^2$ for 1250 A incomer and feeder cables;
- $300 \text{ mm}^2$ for 400 - 630 A incomer and feeder cables;
- $95 \text{ mm}^2$ for transformer protection cubicles with fuses.

Access to the compartment is interlocked with the closing of the earthing disconnector.

**The reduced cubicle depth makes it easier to connect all phases.**
A 12 mm $\varnothing$ 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

<table>
<thead>
<tr>
<th>Performance</th>
<th>Lug type</th>
<th>X-section mm$^2$</th>
<th>Supplier</th>
<th>Number of cables</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 to 24 kV 400 A - 630 A</td>
<td>Round connector 50 to 300 mm$^2$</td>
<td>All cold fitted cable end suppliers: Silec, 3M, Pirelli, Raychem, etc.</td>
<td>1 or 2 per phase</td>
<td>For larger x-sections, more cables and other types of lugs, please consult us</td>
<td></td>
</tr>
<tr>
<td>3 to 24 kV 1250 A</td>
<td>Round connector 50 to 630 mm$^2$</td>
<td>All cold fitted cable end suppliers: Silec, 3M, Pirelli, Raychem, etc.</td>
<td>1 or 2 per phase</td>
<td>For larger x-sections, more cables and other types of lugs, please consult us</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Square connector $&gt; 300 \text{ mm}^2$ admissible</td>
<td></td>
<td>$\varnothing 400 \text{ mm}^2$ per phase</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:
- The lugs, covered by a field distributor, can be square;
- PM/QM type cubicle, round end connections $\varnothing 30 \text{ mm}$ max.
## Cable-connection from below

### Cable-connection height

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

<table>
<thead>
<tr>
<th>Connection</th>
<th>630 A</th>
<th>1250 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM, NSM-cables, NSM-busbars</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td>SM</td>
<td>950</td>
<td>950</td>
</tr>
<tr>
<td>IMC</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>PM, QM</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>QMC</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>CRM</td>
<td>430</td>
<td></td>
</tr>
<tr>
<td>DM1-A SF1</td>
<td>370</td>
<td>650</td>
</tr>
<tr>
<td>DM1-A SFset, DM1-S</td>
<td>430</td>
<td></td>
</tr>
<tr>
<td>DMV-A, DMV-S</td>
<td>324</td>
<td>324</td>
</tr>
<tr>
<td>DM1-W</td>
<td>360</td>
<td>650</td>
</tr>
<tr>
<td>GAM2</td>
<td>760</td>
<td></td>
</tr>
<tr>
<td>GAM</td>
<td>470</td>
<td>620</td>
</tr>
</tbody>
</table>

### Diagrams

- **IM, NSM-cables, NSM-busbars, SM**
- **IMC, PM, QM, QMC**
- **CRM**
- **GAM2**
- **GAM**
- **DMV-A, DMV-S 400 - 630 - 1250 A**
- **DM1-A, DM1-S, DM1-W 400 - 630 A**
- **DM1-A, DM1-W 1250 A**
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.

<table>
<thead>
<tr>
<th>Single-core cables</th>
<th>Units until 630 A</th>
<th>1250 A units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable x-section (mm$^2$)</td>
<td>Bending radius (mm)</td>
<td>IM, SM, NSM-cables, NSM-busbars</td>
</tr>
<tr>
<td>P1</td>
<td>P2</td>
<td>P3</td>
</tr>
<tr>
<td>P1</td>
<td>50</td>
<td>70</td>
</tr>
<tr>
<td>370</td>
<td>400</td>
<td>440</td>
</tr>
<tr>
<td>140</td>
<td>200</td>
<td>160</td>
</tr>
<tr>
<td>400</td>
<td>500</td>
<td>240</td>
</tr>
<tr>
<td>430</td>
<td>500</td>
<td>470</td>
</tr>
<tr>
<td>400</td>
<td>500</td>
<td>470</td>
</tr>
<tr>
<td>430</td>
<td>500</td>
<td>500</td>
</tr>
</tbody>
</table>

(2) Must be installed with a 100 mm deep pan.
(3) Must be installed with a 350 mm deep pan, in a floor void.

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

Cabling from 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.

Technical pit drawings

1250 A units
- SM, GAM for single and tri-core cables
- DMV-A for single and tri-core cables
- DM1-A, DM1-W for single-core cables

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

Cable-connection from below

Trench diagrams example

**Note 1:** for connection with conduits, the bevel $C$ must correspond to the following trench dimensions: $P1 = 75$ mm or $P2/P3 = 150$ mm.

**Note 2:** please refer to chapter "Layout examples" for a site application.
For enhanced internal arcing 16 kA 1 s cubicles

Installation with technical pit
Downwards exhaust

Installation with trench diagram
Upwards exhaust

Note: to evacuate gases through the bottom, the technical pit volume must be over or equal to 2 m³.
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 DM2 or DM23 unit, use an extension unit with a depth of 60 mm;
   - for all other VM6 units, a depth of 920 mm is required.

(3) for the 1250 A unit.

<table>
<thead>
<tr>
<th>Type of unit</th>
<th>Height (mm)</th>
<th>Width (mm)</th>
<th>Depth (mm)</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM, IMB</td>
<td>1600(1)</td>
<td>375</td>
<td>940</td>
<td>120</td>
</tr>
<tr>
<td>IMC</td>
<td>1600(1)</td>
<td>500</td>
<td>940</td>
<td>200</td>
</tr>
<tr>
<td>PM, QM, QMB</td>
<td>1600(1)</td>
<td>375</td>
<td>940</td>
<td>130</td>
</tr>
<tr>
<td>QMC</td>
<td>1600(1)</td>
<td>625</td>
<td>940</td>
<td>230</td>
</tr>
<tr>
<td>CRM</td>
<td>2050</td>
<td>750</td>
<td>940</td>
<td>390</td>
</tr>
<tr>
<td>DM1-A, DM1-D, DM1-W, DM1-Z, DM2</td>
<td>1600(1)</td>
<td>750</td>
<td>1220</td>
<td>400</td>
</tr>
<tr>
<td>DM1-S</td>
<td>1600(1)</td>
<td>750</td>
<td>1220</td>
<td>260</td>
</tr>
<tr>
<td>DMV-A, DMV-D</td>
<td>1600(1)</td>
<td>625</td>
<td>940</td>
<td>320</td>
</tr>
<tr>
<td>DMV-S</td>
<td>1600(1)</td>
<td>625</td>
<td>940</td>
<td>260</td>
</tr>
<tr>
<td>CM</td>
<td>1600(1)</td>
<td>375</td>
<td>940</td>
<td>190</td>
</tr>
<tr>
<td>CM2</td>
<td>1600(1)</td>
<td>500</td>
<td>940</td>
<td>210</td>
</tr>
<tr>
<td>GBC-A, GBC-B</td>
<td>1600</td>
<td>750</td>
<td>1020</td>
<td>290</td>
</tr>
<tr>
<td>NSM-cables, NSM-busbars</td>
<td>2050</td>
<td>750</td>
<td>940</td>
<td>260</td>
</tr>
<tr>
<td>GIM</td>
<td>1600</td>
<td>125</td>
<td>840</td>
<td>30</td>
</tr>
<tr>
<td>GEM(2)</td>
<td>1600</td>
<td>125</td>
<td>920/1060</td>
<td>30/35</td>
</tr>
<tr>
<td>GBM</td>
<td>1600</td>
<td>375</td>
<td>940</td>
<td>120</td>
</tr>
<tr>
<td>GAM2</td>
<td>1600</td>
<td>375</td>
<td>940</td>
<td>120</td>
</tr>
<tr>
<td>GAM</td>
<td>1600</td>
<td>500</td>
<td>1020</td>
<td>120</td>
</tr>
<tr>
<td>SM</td>
<td>1600(1)</td>
<td>375/500(2)</td>
<td>940</td>
<td>120</td>
</tr>
<tr>
<td>TM</td>
<td>1600</td>
<td>375</td>
<td>940</td>
<td>190</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>a (mm)</th>
<th>125</th>
<th>375</th>
<th>500</th>
<th>625</th>
<th>750</th>
</tr>
</thead>
<tbody>
<tr>
<td>b (mm)</td>
<td>95</td>
<td>345</td>
<td>470</td>
<td>595</td>
<td>720</td>
</tr>
</tbody>
</table>
Installation

Units dimensions

IM, IMB, PM, QM, QMB, SM

IMC, QMC, CM, CM2

CRM

NSM-cables, NSM-busbars

GBM, GAM2

GAM

GIM

GEM

GBC-A, GBC-B
Installation

Units dimensions


DM1-A, DM1-W 1250 A

DMV-A

DMV-D

DMV-S

Internal arcing enhanced cubicles upwards exhaust

Internal arcing enhanced cubicles downwards exhaust
### Layout examples

#### Biosco prefabricated substation

#### Conventional substation

<table>
<thead>
<tr>
<th></th>
<th>Without circuit breaker</th>
<th>With circuit breaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>630/1250 A</td>
<td>630/1250 A</td>
</tr>
<tr>
<td>A</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>B</td>
<td>100</td>
<td>140</td>
</tr>
</tbody>
</table>

(*) Advised access dimension

### Switchboard extension example

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

<table>
<thead>
<tr>
<th></th>
<th>200</th>
<th>1200 (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1160</td>
<td>1200 (*)</td>
</tr>
</tbody>
</table>

(*') Advised access dimension
Schneider Electric’s recycling service for SF6 products is part of a rigorous management process.

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 recyclability. 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.

<table>
<thead>
<tr>
<th>Material</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrous metal</td>
<td>71%</td>
</tr>
<tr>
<td>Non-ferrous metal</td>
<td>10.5%</td>
</tr>
<tr>
<td>Thermohardening</td>
<td>15%</td>
</tr>
<tr>
<td>Thermoplastics</td>
<td>3.35%</td>
</tr>
<tr>
<td>Fluid</td>
<td>0.5%</td>
</tr>
<tr>
<td>Fluid</td>
<td>0.5%</td>
</tr>
</tbody>
</table>
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.

For more information on all the services proposed by Schneider Electric, please contact your Schneider Electric Sales Office.
Trip curves for VIP 300 LL or LH relays

Definite time tripping curves

**SI curve**

- Time vs. Current (t(I)}
- Threshold values: 0.01, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5
- Range: 1 to 100

**VI curve**

- Time vs. Current (t(I)}
- Threshold values: 0.01, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5
- Range: 1 to 100

**EI curve**

- Time vs. Current (t(I)}
- Threshold values: 0.01, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5
- Range: 10 to 1000

**RI curve**

- Time vs. Current (t(I)}
- Threshold values: 0.01, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5
- Range: 10 to 1000

---

Appendices
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

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

Fuse and limitation curves

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

Limitation curve 7.2 - 12 - 17.5 - 24 kV

Maximum value of the limited broken current (kA peak)

Fuse curve 7.2 - 12 - 17.5 - 24 kV

Rms value of the presumed broken current (kA)
Modular switchboard

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

<table>
<thead>
<tr>
<th></th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated voltage Ur</strong> (kV)</td>
<td></td>
</tr>
<tr>
<td><strong>Short-circuit current Isc</strong> (kA)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Type of cubicle</strong></th>
<th><strong>SM 375</strong></th>
<th><strong>IM 375</strong></th>
<th><strong>IMB 375</strong></th>
<th><strong>IMB 375 without E/S</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SM 500</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IM 500</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IMC 500</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Position number in the switchboard (from left to right)</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direction of lower busbars for IMB</strong></td>
<td></td>
</tr>
<tr>
<td>left (impossible as first cubicle of switchboard)</td>
<td>□</td>
</tr>
<tr>
<td>right</td>
<td>□</td>
</tr>
</tbody>
</table>

### Options

**Replacement of CIT by**

<table>
<thead>
<tr>
<th></th>
<th>CI1</th>
<th>CI2</th>
</tr>
</thead>
</table>

**Electrical driving motorization**

<table>
<thead>
<tr>
<th></th>
<th>24 Vdc</th>
<th>110 Vdc</th>
<th>120/127 Vac (50 Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 Vdc</td>
<td></td>
<td>120-125 Vdc</td>
<td>220/230 Vac (50 Hz)</td>
</tr>
<tr>
<td>48 Vdc</td>
<td></td>
<td>137 Vdc</td>
<td>120/127 Vac (60 Hz)</td>
</tr>
<tr>
<td>60 Vdc</td>
<td></td>
<td>220 Vdc</td>
<td>220/230 Vac (60 Hz)</td>
</tr>
</tbody>
</table>

**Remote control signalling**

<table>
<thead>
<tr>
<th></th>
<th>2 lights</th>
<th>2 lights and 2 PB</th>
<th>2 lights and 2 PB + 1 switch</th>
</tr>
</thead>
</table>
| **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)**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
</table>
| **A - Top incomer**
 | (cable maxi 240 mm² with voltage indicator) |
| 3/7.2 kV single core |        |        |
| 10/24 kV single core | 2 x single core | 2 x single core |
| **B - Low voltage control cabinet** (h = 450 mm) |
| with unpunched door |
| **C - Wiring duct** |

**Cable connection by the bottom**

<table>
<thead>
<tr>
<th></th>
<th>three core</th>
<th>single core</th>
<th>2 x single core</th>
</tr>
</thead>
</table>

**Heating element**

<table>
<thead>
<tr>
<th></th>
<th>Ronis</th>
<th>Profalux</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interlocking (with key)</td>
<td>A4</td>
<td>A3 SM6-SM6</td>
</tr>
<tr>
<td></td>
<td>P1 SM6-SM6</td>
<td></td>
</tr>
<tr>
<td>Localisation of 2nd lock for A3</td>
<td>on switch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>on earthing switch</td>
<td></td>
</tr>
<tr>
<td>Localisation of 2nd lock for A4</td>
<td>cubicle no.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P2 SM6-SM6</td>
<td>P3 SM6-SM6</td>
</tr>
</tbody>
</table>

**Surge arrestors for IM 500**

<table>
<thead>
<tr>
<th></th>
<th>7.2 kV</th>
<th>10 kV</th>
<th>12 kV</th>
<th>17.5 kV</th>
<th>24 kV</th>
</tr>
</thead>
</table>

**Operating counter**

<table>
<thead>
<tr>
<th></th>
<th>CTs for IMC (quantity)</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
</table>

**Replacement of 630 A busbar by 1250 A (not possible for IMB)**

|                      | 16 kA 1 s (not possible with "top incomer" option) |

**Internal arc version 16 kA 1 s**

<table>
<thead>
<tr>
<th></th>
<th>(not possible with &quot;top incomer&quot; option)</th>
</tr>
</thead>
</table>

**Telecontrol** (48 Vdc electrical motorization compulsory)

<table>
<thead>
<tr>
<th></th>
<th>Cubicle with relay</th>
<th>without relay</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication protocol</strong></td>
<td>Modbus</td>
<td>IEC</td>
</tr>
<tr>
<td><strong>Modern type</strong></td>
<td>RS232</td>
<td>RS485</td>
</tr>
<tr>
<td></td>
<td>Not for DNP</td>
<td>PSTN</td>
</tr>
<tr>
<td></td>
<td>3 core balance current transformers</td>
<td></td>
</tr>
</tbody>
</table>

---

---
Modular switchboard

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.

<table>
<thead>
<tr>
<th>Basic cubicle</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage Ur (kV)</td>
<td></td>
</tr>
<tr>
<td>Short-circuit current Isc (kA)</td>
<td></td>
</tr>
<tr>
<td>Rated current Ir (A)</td>
<td></td>
</tr>
<tr>
<td>Type of cubicle</td>
<td></td>
</tr>
<tr>
<td>QM 500</td>
<td></td>
</tr>
<tr>
<td>QM 375</td>
<td></td>
</tr>
<tr>
<td>QMB 375</td>
<td></td>
</tr>
<tr>
<td>QMC 625</td>
<td></td>
</tr>
<tr>
<td>PM 375</td>
<td></td>
</tr>
<tr>
<td>Position number in the switchboard (from left to right)</td>
<td></td>
</tr>
<tr>
<td>Current transformers for QMC (to see price structure)</td>
<td></td>
</tr>
<tr>
<td>Quantity of CTs</td>
<td></td>
</tr>
<tr>
<td>Direction of lower busbars for QMB</td>
<td></td>
</tr>
<tr>
<td>Options</td>
<td></td>
</tr>
<tr>
<td>Fuses (see fuse price structure)</td>
<td>service voltage 6 12 kV</td>
</tr>
<tr>
<td>Replacement of mechanism</td>
<td></td>
</tr>
<tr>
<td>CIT by C1 (only for PM)</td>
<td></td>
</tr>
<tr>
<td>C11 by C12 (only for QM)</td>
<td></td>
</tr>
<tr>
<td>Electrical driving motorization</td>
<td></td>
</tr>
<tr>
<td>24 Vdc</td>
<td>110 Vdc</td>
</tr>
<tr>
<td>32 Vdc</td>
<td>120-125 Vdc</td>
</tr>
<tr>
<td>48 Vdc</td>
<td>137 Vdc</td>
</tr>
<tr>
<td>60 Vdc</td>
<td>220 Vdc</td>
</tr>
<tr>
<td>20 Vdc</td>
<td></td>
</tr>
<tr>
<td>120/127 Vac (50 Hz)</td>
<td></td>
</tr>
<tr>
<td>220/230 Vac (50 Hz)</td>
<td></td>
</tr>
<tr>
<td>120/127 Vac (60 Hz)</td>
<td></td>
</tr>
<tr>
<td>220/230 Vac (60 Hz)</td>
<td></td>
</tr>
<tr>
<td>Shunt trip</td>
<td></td>
</tr>
<tr>
<td>opening (on C11)</td>
<td></td>
</tr>
<tr>
<td>closing &amp; opening (on C12)</td>
<td></td>
</tr>
<tr>
<td>24 Vdc</td>
<td>110 Vdc</td>
</tr>
<tr>
<td>32 Vdc</td>
<td>120-125 Vdc</td>
</tr>
<tr>
<td>48 Vdc</td>
<td>137 Vdc</td>
</tr>
<tr>
<td>60 Vdc</td>
<td>220 Vdc</td>
</tr>
<tr>
<td>380 Vac (50/60 Hz)</td>
<td></td>
</tr>
<tr>
<td>Remote control signalling (not applicable on PM, QMC and QMB)</td>
<td></td>
</tr>
<tr>
<td>2 lights</td>
<td></td>
</tr>
<tr>
<td>2 lights and 2 PB</td>
<td></td>
</tr>
<tr>
<td>2 lights and 2 PB + 1 switch</td>
<td></td>
</tr>
<tr>
<td>Voltage of the lights (must be the same than electrical driving mechanism)</td>
<td></td>
</tr>
<tr>
<td>24 V</td>
<td>110/125 V</td>
</tr>
<tr>
<td>48 V</td>
<td>220 V</td>
</tr>
<tr>
<td>Auxillary contact signalling</td>
<td></td>
</tr>
<tr>
<td>1 C on SW and 1 O &amp; 1 C on ES</td>
<td></td>
</tr>
<tr>
<td>2 O &amp; 2 C on SW</td>
<td></td>
</tr>
<tr>
<td>2 O &amp; 3 C on SW and 1 O &amp; 1 C on ES</td>
<td></td>
</tr>
<tr>
<td>Blown fuse signalling contact (mechanical indication PM, electrical for the other cubicles)</td>
<td></td>
</tr>
<tr>
<td>Roof configuration (A, B or C only one choice possible)</td>
<td></td>
</tr>
<tr>
<td>A - Top Incomer (cable maxi 240 mm² with voltage indicator)</td>
<td></td>
</tr>
<tr>
<td>37.2 kV</td>
<td>single core</td>
</tr>
<tr>
<td>10/24 kV</td>
<td>single core</td>
</tr>
<tr>
<td>B - Low voltage control cabinet (h = 450 mm) with unpunched door</td>
<td></td>
</tr>
<tr>
<td>C - Wiring duct</td>
<td></td>
</tr>
<tr>
<td>Interlocking</td>
<td></td>
</tr>
<tr>
<td>Ronis</td>
<td></td>
</tr>
<tr>
<td>Profalux</td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>A1</td>
</tr>
<tr>
<td>C1</td>
<td></td>
</tr>
<tr>
<td>Heating element</td>
<td></td>
</tr>
<tr>
<td>Operation counter</td>
<td></td>
</tr>
<tr>
<td>Replacement of 630 A busbar by 1250 A (not possible for QMB)</td>
<td></td>
</tr>
<tr>
<td>Internal arc version 16 kA 1 s (not possible with “top incomer” option)</td>
<td></td>
</tr>
</tbody>
</table>
### Modular switchboard

**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

<table>
<thead>
<tr>
<th>Rated voltage Ur (maxi 17.5 kV for Evolis CB)</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short-circuit current Isc (kA)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rated current Ir (A)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Type of cubicle

For **SF1** circuit breaker
- DM1-S 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 switchboard (from left to right)

<table>
<thead>
<tr>
<th>Busbar (if S Ir cubicle)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>For DM1-A, DM1-S, DM1-W</td>
<td>400 A 630 A 1250 A</td>
</tr>
<tr>
<td>For DM1-D, DM2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>For DM1-A, DM1-D, DM1-W, DM1-Z</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>400 A 630 A 1250 A</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>For DMV-A, DMV-D, DMV-S</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>630 A 1250 A</td>
<td></td>
</tr>
</tbody>
</table>

#### Protection

<table>
<thead>
<tr>
<th>For DM1-S, DMV-S</th>
<th>VIP35 with CRc</th>
</tr>
</thead>
</table>

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

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

#### Control for DMV-A and DMV-D

- Local (shunt trip coil compulsory)
- Remote (opening coil and closing coil compulsory)
- Local and remote (opening coil and closing coil compulsory)

| Voltage of the auxiliaries | 48/60 Vdc 110/125 or 220/250 Vdc 110/130 or 220/240 Vdc (50 Hz) |

| Voltage of signalling | 48/60 Vdc 110/125 Vdc 220/250 Vdc 110/130 Vac (50 Hz) 220/240 Vac (50 Hz) |

#### Cable connection by the bottom

For DM1-A, DM1-W
- 3 x single core cable maxi 240 mm²
- 6 x single core cable maxi 240 mm²

#### Options

**Roof configuration** (not applicable on DMV-A, DMV-S, DMV-D)

- **A - Top incomer** (cable maxi 240 mm² with voltage indicator)
  - 3/7.2 kV single core
  - 10/24 kV single core
  - DM2

- **B - Low voltage control cabinet**
  - DM2
  - 1 cabinet 2 cabinets

- **C - Wiring duct**
  - DM2
  - 1 set 2 sets
  - Other cubicles
  - 1 set

<table>
<thead>
<tr>
<th>Interlocking</th>
<th>Ronis Profalux</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CTs and VTs (not applicable for DM1-S, DMV-S)</th>
<th></th>
</tr>
</thead>
</table>

| Surge arrester (for DM1-W 630 A without VTs) | See specific order form |

| Signalling contact | 2 O & 2 C on SW (not applicable with VTs) 2 O & 3 C on SW and 1 O & 1 C on ES (not applicable with VTs) 1 O & 2 C on SW (available only on cubicle with VTs) |

| Heating element | |

| Circuit breaker | See specific order form |

| Internal arc version 16 kA 1 s | |
### Order form
**SM6-24**
**MV metering**

**Basic cubicle**

<table>
<thead>
<tr>
<th>Quantity</th>
</tr>
</thead>
</table>

**Rated voltage Ur** (kV)

**Short-circuit current Isc** (kA)

**Rated current Ir** (A)

<table>
<thead>
<tr>
<th>Type of cubicle</th>
<th>In = 630 A, In busbar = 400 A</th>
<th>CM</th>
<th>CM2</th>
<th>TM</th>
<th>GBC-A</th>
<th>GBC-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>In = 630 A, In busbar = 630 A</td>
<td>CM</td>
<td>CM2</td>
<td>TM</td>
<td>GBC-A</td>
<td>GBC-B</td>
<td></td>
</tr>
<tr>
<td>In = 1250 A, In busbar = 1250 A</td>
<td>GBC-A</td>
<td>GBC-B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Direction of lower busbars for GBC-A**

- left
- right

**VTs for GBC** (to see price structure)

<table>
<thead>
<tr>
<th>Phase/phase</th>
</tr>
</thead>
</table>

**CTs for GBC** (to see price structure)

<table>
<thead>
<tr>
<th>Quantity</th>
</tr>
</thead>
</table>

**Ratio choice for GBC**

<table>
<thead>
<tr>
<th>Protections</th>
</tr>
</thead>
</table>

**Signalling contact**

| 1 O and 1 C on SW (CM, CM2, TM) |

**Fuses for CM, CM2 and TM only** (see fuse price structure)

### Options

#### Roof configuration (A, B or C only one choice possible)

- **A - Top incomer** (cable maxi 240 mm² with voltage indicator)
  - 3/7.2 kV
  - 10/24 kV

- **B - Low voltage control cabinet** (h = 450 mm) with unpunched door

- **C - Wiring duct**

**Heating element for CM, CM2, TM**

**Internal arc version T6 kA 1 s**
## Order form
### SM6-24
#### Casing

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

Orange box \( \square \) corresponds to none priced functions.

### Basic Cubicle

<table>
<thead>
<tr>
<th>Rated Voltage Ur (kV)</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short-circuit Current Isc (kA)</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rated Current Ir (A)</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Cubicle</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>In = 630 A, In busbar = 400 A</td>
<td>GAM 500, GAM 2 375, GBM 375</td>
</tr>
<tr>
<td>In = 630 A, In busbar = 630 A</td>
<td>GAM 500, GAM 2 375, GBM 375</td>
</tr>
<tr>
<td>In = 1250 A, In busbar = 1250 A</td>
<td>GAM 500, GBM 375</td>
</tr>
</tbody>
</table>

**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** - Top incomer (cable maxi 240 mm\(^2\) with voltage indicator)
  - 3/7.2 kV
  - 10/24 kV
- **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)

<table>
<thead>
<tr>
<th>Surge Arrestors for GAM 500, 630 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2 kV</td>
</tr>
</tbody>
</table>

#### Interlocking on GAM 500

<table>
<thead>
<tr>
<th>Interlocking on GAM 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ronis</td>
</tr>
<tr>
<td>Profalux</td>
</tr>
<tr>
<td>A3 SM6-SM6</td>
</tr>
<tr>
<td>PS SM6-SM6</td>
</tr>
</tbody>
</table>

**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**
## Basic cubicle

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage Ur (kV)</td>
<td></td>
</tr>
<tr>
<td>Short-circuit current Isc (kA)</td>
<td></td>
</tr>
<tr>
<td>Rated current Ir (A)</td>
<td></td>
</tr>
<tr>
<td>Type of cubicle</td>
<td></td>
</tr>
<tr>
<td>In = 630 A, In busbar = 400 A</td>
<td>NSM busbar, NSM cable</td>
</tr>
<tr>
<td>In = 630 A, In busbar = 630 A</td>
<td>NSM busbar, NSM cable</td>
</tr>
<tr>
<td>In = 630 A, In busbar = 1250 A</td>
<td>NSM cable, NSM cable</td>
</tr>
</tbody>
</table>

### Position number in the switchboard (from left to right)

<table>
<thead>
<tr>
<th>Position number in the switchboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>left</td>
</tr>
<tr>
<td>right</td>
</tr>
</tbody>
</table>

### Way of the busbars for NSM

- **left**: 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
- **right**: three core on both, single core on both

### Stand by source

- **generator**: with paralleling, without paralleling
- **Utility**: with paralleling, without paralleling

## Options

### Signalling contact on earthing switch

- 1 C on SW and 1 O & 1 C on ES

### Operation counter

<table>
<thead>
<tr>
<th>Operation counter</th>
</tr>
</thead>
</table>

### Interlocking

<table>
<thead>
<tr>
<th>Interlocking</th>
<th>SM6-SM6</th>
<th>Ronis</th>
<th>Profalux</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 x P1</td>
<td>right cubicle, left cubicle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 x P1</td>
<td>right and left cubicle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 x A3</td>
<td>right cubicle, left cubicle</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>on switch, earthing switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 x A3</td>
<td>right cubicle, on switch, earthing switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>left cubicle, on switch, earthing switch</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Telecontrol (only with utility stand by source)

<table>
<thead>
<tr>
<th>Communication protocol</th>
<th>Modbus</th>
<th>IEC</th>
<th>DNP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modern type</td>
<td>RS232</td>
<td>RS485</td>
<td></td>
</tr>
<tr>
<td>Not for DNP</td>
<td>PSTN</td>
<td>GSM</td>
<td>FSK</td>
</tr>
</tbody>
</table>
### 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 functions.

<table>
<thead>
<tr>
<th>Basic circuit breaker</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated voltage Ur</strong></td>
<td>(kV)</td>
</tr>
<tr>
<td><strong>Impulse voltage Up</strong></td>
<td>(kVbil)</td>
</tr>
<tr>
<td><strong>Breaking current Isc</strong></td>
<td>(kA)</td>
</tr>
<tr>
<td><strong>Rated current Ir</strong></td>
<td>(A)</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td></td>
</tr>
<tr>
<td>Fixed</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Withdrawable</td>
<td>60 Hz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Installation</th>
<th>Fixed</th>
<th>A1</th>
<th>B1</th>
<th>Withdrawable</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Colour for push buttons and indicators</th>
<th>IEC standard</th>
<th>ANSI standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push buttons open/close</td>
<td>red/black</td>
<td></td>
</tr>
<tr>
<td>Indicator open/close</td>
<td>black/white</td>
<td>green/red</td>
</tr>
<tr>
<td>Operating mechanism charged/discharged</td>
<td>white/yellow</td>
<td>charge/discharge</td>
</tr>
</tbody>
</table>

### Circuit breaker options

**1st opening release** *(see possible choices combination table below)*

- **Shunt opening release**
  - 24 Vdc: 60 Vdc
  - 30 Vdc: 110 Vdc
  - 48 Vdc: 125 Vdc

- **Undervoltage release**
  - 24 Vdc: 60 Vdc
  - 30 Vdc: 110 Vdc
  - 48 Vdc: 125 Vdc

<table>
<thead>
<tr>
<th>MITOP</th>
<th>without contact</th>
<th>with contact</th>
</tr>
</thead>
</table>

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

- **Shunt opening release**
  - 24 Vdc: 60 Vdc
  - 30 Vdc: 110 Vdc
  - 48 Vdc: 125 Vdc

- **Undervoltage release**
  - 24 Vdc: 60 Vdc
  - 30 Vdc: 110 Vdc
  - 48 Vdc: 125 Vdc

**Remote control**

- **Electric motor - MCH**
  - 24...32 Vdc
  - 48...60 Vdc/ac
  - 110...127 Vdc/ac
  - 220...250 Vdc/ac

**Shunt closing release**

<table>
<thead>
<tr>
<th>24 Vdc</th>
<th>60 Vdc</th>
<th>220 Vdc</th>
<th>220 Vac (50 Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Vdc</td>
<td>110 Vdc</td>
<td>48 Vac (50 Hz)</td>
<td>120 Vac (60 Hz)</td>
</tr>
<tr>
<td>48 Vdc</td>
<td>125 Vdc</td>
<td>110 Vac (50 Hz)</td>
<td>240 Vac (60 Hz)</td>
</tr>
</tbody>
</table>

### Leaflets language

- French
- English
- Spanish

(*) Different releases combinations:

<table>
<thead>
<tr>
<th>Shunt opening release</th>
<th>1</th>
<th>2</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undervoltage release</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MITOP</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
**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 breaker

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage Ur (kV)</td>
<td></td>
</tr>
<tr>
<td>Impulse voltage Up (kVbil)</td>
<td></td>
</tr>
<tr>
<td>Breaking current Isc (kA)</td>
<td></td>
</tr>
<tr>
<td>Rated current Ir (A)</td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>50 Hz</td>
</tr>
<tr>
<td></td>
<td>60 Hz</td>
</tr>
<tr>
<td>Mechanism position</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>B1</td>
</tr>
<tr>
<td>Colour for push buttons and indicators</td>
<td>IEC standard</td>
</tr>
<tr>
<td>Push buttons open/close</td>
<td>red/black</td>
</tr>
<tr>
<td>Indicator open/close</td>
<td>black/white</td>
</tr>
<tr>
<td>Operating mechanism charged/discharged</td>
<td>white/yellow</td>
</tr>
</tbody>
</table>

### Control unit and sensors

**Until end of 2004**

- **VIP 13**  
  - (not available for all electrical characteristics)
  - Is = 10 to 100 A
  - Is = 62.5 to 630 A

- **VIP 300P**  
  - (not available for all electrical characteristics)
  - CsA 200/1
  - Is = 10 to 50 A
  - Is = 40 to 200 A
  - CsB 1250/1
  - Is = 63 to 312 A
  - Is = 250 to 1250 A

- **VIP 300LL**  
  - CsA 200/1
  - Is = 10 to 50 A
  - Is = 40 to 200 A
  - CsB 250/1
  - Is = 63 to 32 A
  - Is = 250 to 250 A

### Circuit breaker options

#### 2nd opening release *see possible choices combination table below*

- **Shunt opening release**
  - 24 Vdc
  - 30 Vdc
  - 48 Vdc
  - 60 Vdc
  - 110 Vdc
  - 125 Vdc
  - 48 Vac (50 Hz)
  - 110 Vac (50 Hz)
  - 220 Vac (50 Hz)
  - 220 Vac (60 Hz)
  - 120 Vac (60 Hz)
  - 240 Vac (60 Hz)

- **Undervoltage release**
  - 24 Vdc
  - 30 Vdc
  - 48 Vdc
  - 60 Vdc
  - 110 Vdc
  - 125 Vdc
  - 48 Vac (50 Hz)
  - 110 Vac (50 Hz)
  - 220 Vac (50 Hz)
  - 220 Vac (60 Hz)
  - 120 Vac (60 Hz)
  - 240 Vac (60 Hz)

- **Remote control**
  - Electric motor - MCH
  - 24...32 Vdc
  - 48...60 Vdc/ac
  - 110...127 Vdc/ac
  - 220...250 Vdc/ac

- **Shunt closing release**
  - 24 Vdc
  - 30 Vdc
  - 48 Vdc
  - 60 Vdc
  - 110 Vdc
  - 125 Vdc
  - 48 Vac (50 Hz)
  - 110 Vac (50 Hz)
  - 220 Vac (50 Hz)
  - 220 Vac (60 Hz)
  - 120 Vac (60 Hz)
  - 240 Vac (60 Hz)

### Test box (VAP 6)

- **Leaflets language**
  - French
  - English
  - Spanish

(*) Different releases combinations

<table>
<thead>
<tr>
<th>MITOP</th>
<th>Shunt opening release</th>
<th>Undervoltage release</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

---

MITOP

Shunt opening release

Undervoltage release

---

MITOP

Shunt opening release

Undervoltage release

---

SF6 circuit breaker
**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.

<table>
<thead>
<tr>
<th>Basic fixed circuit breaker</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage Ur (kV)</td>
<td>12 17.5</td>
</tr>
<tr>
<td>Rated short-circuit breaking current Isc</td>
<td>25 kA</td>
</tr>
<tr>
<td>Rated normal current Ir (A)</td>
<td>630 1250</td>
</tr>
<tr>
<td>Phase distance</td>
<td>185 mm</td>
</tr>
<tr>
<td>Rated voltage Ur (kV)</td>
<td>IEC standard ANSI standard</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Circuit breaker options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening release * (see possible choices in combination table below)</td>
</tr>
<tr>
<td>Shunt opening release - MX</td>
</tr>
<tr>
<td>24 Vac 24…30 Vdc 100…130 Vdc/ac</td>
</tr>
<tr>
<td>48 Vac 48…60 Vdc 200…250 Vdc/ac</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Shunt opening release</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>MITOP</td>
<td>1</td>
</tr>
</tbody>
</table>
# 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.

<table>
<thead>
<tr>
<th>Basic unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Function</strong></td>
<td></td>
</tr>
<tr>
<td>Generator auto changeover</td>
<td>[ ]</td>
</tr>
<tr>
<td>Network auto changeover</td>
<td>[ ]</td>
</tr>
<tr>
<td>Telecontrol</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Communication protocol module</strong></td>
<td></td>
</tr>
<tr>
<td>(generator auto changeover is without communication)</td>
<td></td>
</tr>
<tr>
<td>IEC 870-5-101</td>
<td>[X]</td>
</tr>
<tr>
<td>Modbus</td>
<td>[ ]</td>
</tr>
<tr>
<td>DNP3</td>
<td>[ ]</td>
</tr>
<tr>
<td>Without</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Transmission system</strong></td>
<td></td>
</tr>
<tr>
<td>RS485</td>
<td>[ ]</td>
</tr>
<tr>
<td>RS232, not insulated</td>
<td>[ ]</td>
</tr>
<tr>
<td>Except DNP3:</td>
<td></td>
</tr>
<tr>
<td>Radio modem V23 FSK</td>
<td>[ ]</td>
</tr>
<tr>
<td>PSTN</td>
<td>[ ]</td>
</tr>
<tr>
<td>GSM</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

| 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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**Easergy T200 S**

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