Medium Voltage Distribution

# SM6-36

## Modular units

## Catalogue
April 2009

Schneider Electric

# A new path for achieving your electrical installations

## A comprehensive offer

The SM6-36 range is part of a comprehensive offer of products that are perfectly coordinated to meet all medium and low voltage electrical distribution requirements.
All of these products have been designed to work together: electrical, mechanical and communication compatibility.
The electrical installation is thus both optimised and has improved performance:

- better service continuity,
- increased personnel and equipment safety,
- guaranteed upgradeability,
- efficient monitoring and control.

You therefore have all the advantages at hand in terms of know-how and creativity for achieving optimised, safe, upgradeable and compliant installations.

## Tools for facilitating the design and installation

With Schneider Electric, you have a complete range of tools to help you get to know and install the products whilst complying with current standards and good working practices.
These tools, technical sheets and guides, design software, training courses, etc are regularly updated.

# Schneider Electric is associating itself with your know-how and your creativity to produce optimised, safe, upgradeable and compliant installations

## For a real partnership with you

A universal solution doesn't exist because each electrical installation is specific.
The variety of combinations on offer allows you to truly customise the technical solutions.
You are able to express your creativity and put your know-how to best advantage when designing, manufacturing and exploiting an electrical installation.

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# The experience of a world leader

MT20140

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 internal arc cubicles 16 kA 1 s to reinforce the safety of people.
This gives you the advantage of unique experience, that of a world leader, with over 2,000,000 SF6 Medium Voltage units installed throughout the world.
Putting this experience at your service and remaining attentive to your requirements is the spirit of active partnership that we want to develop in offering you the SM6-36 range.

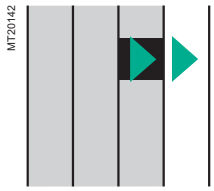
MT20141

The modular SM6-36 is a range of harmonised cubicles equipped with SF6 technology switchgear with 30 years life span.

These cubicles allow you to produce all your Medium Voltage substation requirements from 10 kV to 36 kV by superposing their various functions.

The result of in-depth analysis of your requirements, both now and in the future, SM6-36 cubicles mean that you can take advantage of all the features of both a modern and proven technology.

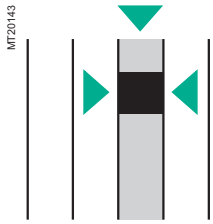
# The range's advantages




## Upgradability

**SM6-36, a comprehensive range**

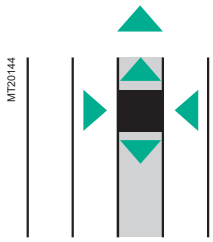
- a comprehensive offer covering your present and future requirements
- a design adapted to the extension of your installations
- a catalogue of functions for all your applications
- a product designed to be in compliance with standards constraints
- options to anticipate the telecontrol of your installations.




## Compactness

**SM6-36, an optimised range**

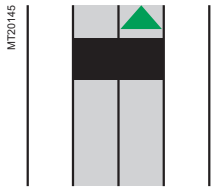
- compact units, with low increment cubicles
- rationalised space requirement for switchboard installation
- reduction of civil works costs
- easy integration in factory-built outdoor substations for which the SM6-36 is particularly well designed.




## Maintenance

**SM6-36, a range with reduced maintenance**

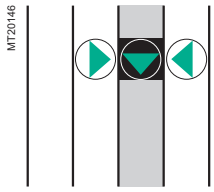
- the active parts (breaking and earthing) are integrated in an SF6-filled, "sealed for life" unit
- the control mechanisms, are intented to function with reduced maintenance under normal operating conditions
- enhanced electrical endurance when breaking.




## Ease of installation

**SM6-36, a simple range to incorporate**

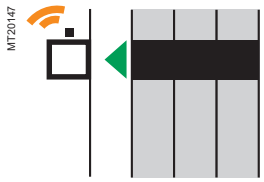
- reduced dimensions and weights
- only one civil works layout
- a solution adapted to cable connection
- simplified switchboard busbar design.




## Ease and safe to operate

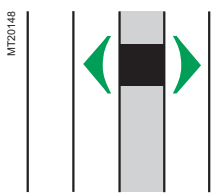
**SM6-36, a proven range**

- a three position switch to block incorrect switching
- the earthing disconnector has full closing capacity
- positive breaking of position indicators
- internal arc withstand in the cable and switchgear compartments
- clear and animated display diagrams
- switching lever with an "anti-reflex" function
- compartmented cubicles.




## SM6-36: a range designed with telecontrol in mind

SM6-36 switchgear is perfectly adapted to telecontrol applications. Motorised, either when installed or at a later date on-site without any interruption in service, SM6-36 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.




## SM6-36: a range with adapted protection devices

With the SM6-36, Schneider Electric proposes solutions for network management the Sepam and VIP or relay ranges protect installations, providing continuity of electrical supply and reducing downtime.

# Protecting the environment

61051N

## Schneider Electric's environment policy

Schneider Electric is committed to a long term environmental approach.
As part of this, the SM6-36 has been designed to be environmentally friendly, notably in terms of the product's recycleability.
The materials used, both conductors and insulators, are identified and easily separable.
At the end of its life, SM6-36 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.

SM6-36 is compliant with the RoHS directive.
RoHS restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment.

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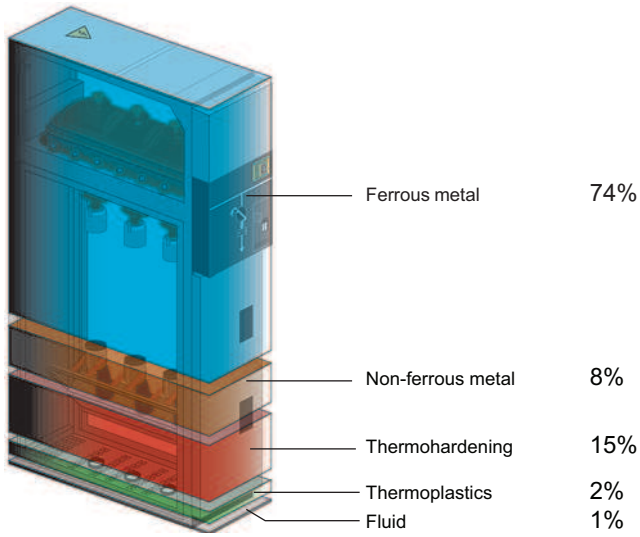



MT55145

The environmental management system adopted by Schneider Electric production sites that produce the SM6-36 have been assessed and judged to be in conformity with requirements in the ISO 14001: 2004 standard.

# Quality assurance
## Quality certified to ISO 9001

### A major advantage

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

- uniform throughout all departments
- recognised by many customers and approved organisations.

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

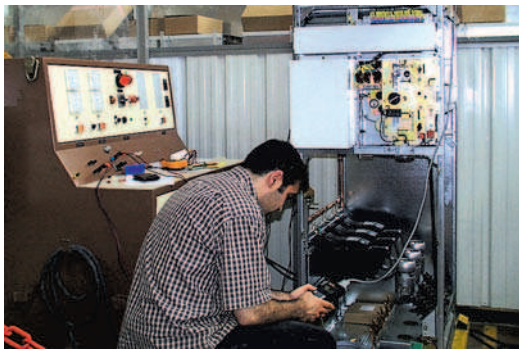
**The quality system for the design and manufacture of SM6-36 units has been certified in conformity with the requirements of the ISO 9001: 2000 quality assurance model.**

MT55054

AFAQ ISO 9001

MT55055

AFAQ ISO 9002



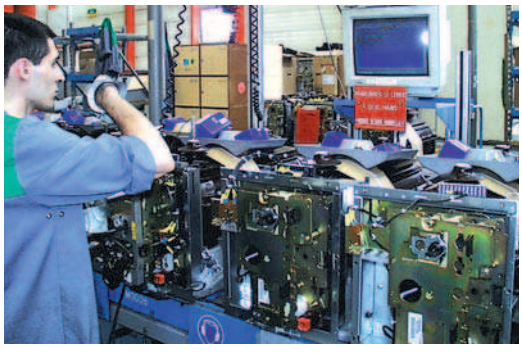
61002N

### Meticulous and systematic controls

During manufacture, each SM6-36 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.



61003N

The environmental management system adopted by Schneider Electric production sites that produce the SM6-36 have been assessed and judged to be in conformity with requirements in the ISO 14001 standard.

MT55145

AFAQ ISO 14001

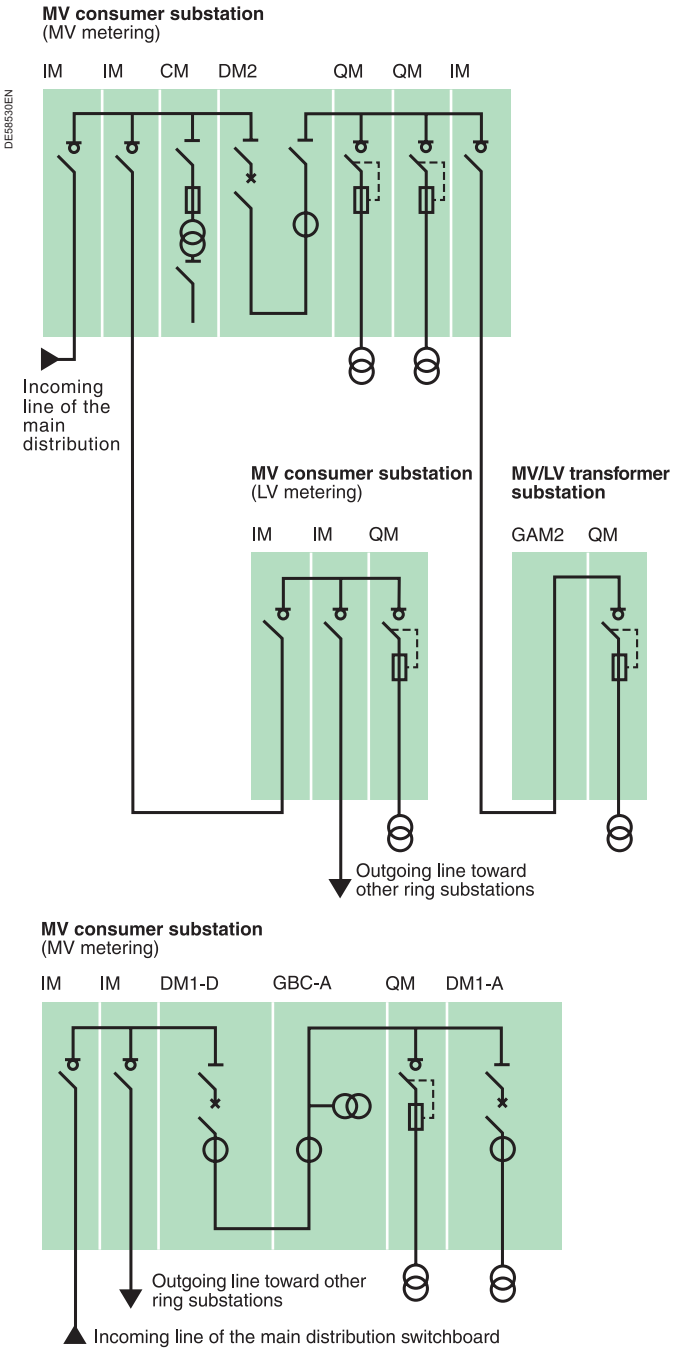
# Field of application

The SM6-36 is made up of modular units containing fixed or withdrawable metal-enclosed SF6 switchgear, using sulphur hexafluoride (SF6):

- switch-disconnector
- SF1 circuit breaker
- disconnector.

SM6-36 units are used for the MV section in MV/LV transformer substations in public distribution systems and MV consumer or distribution substations from 10 kV to 36 kV.

## MV/LV transformer substations



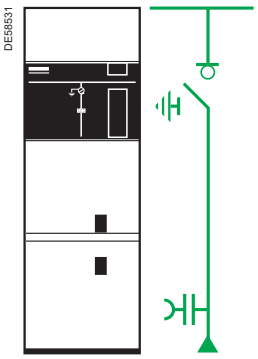

## Unit definitions

Below is the list of SM6-36 range units used in MV/LV transformer substations and industrial distribution substations:

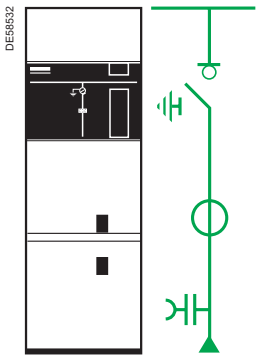
- **IM, IMC, IMB** switch
- **PM** fused switch
- **QM, QMC, QMB** fuse-switch combination
- **DM1-A, DM1-D** single-isolation SF6 type circuit breaker
- **DM1-W** withdrawable single-isolation SF6 type circuit breaker
- **DM2** double-isolation SF6 type circuit breaker
- **DM2-W** withdrawable double-isolation 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
- **GBM** connection unit
- **GAM2, GAM** incoming cable connection unit
- **SM** disconnector
- **TM** MV/LV transformer unit for auxiliaries
- other units, consult us.

# Units for all functions

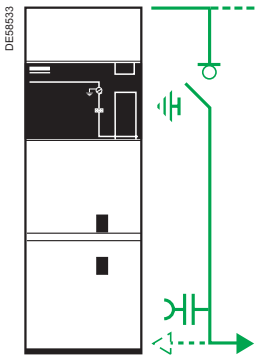
## Connection to the networks




**Incoming or outgoing switch unit IM** (750 mm)

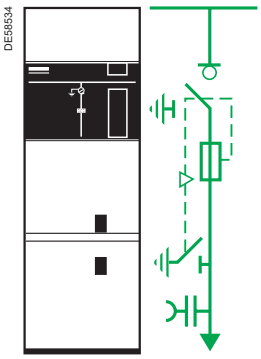



**Incoming or outgoing switch unit IMC** (750 mm)

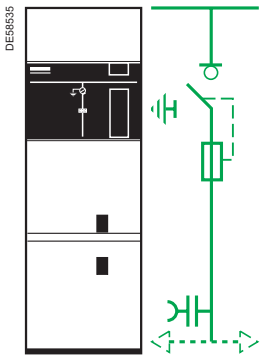



**Switch unit right or left outgoing line IMB** (750 mm)

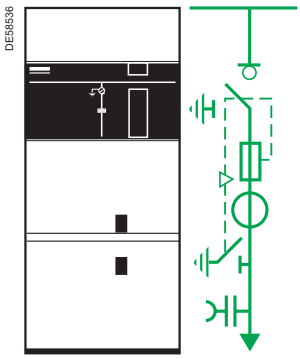
## Fuse-switch protection



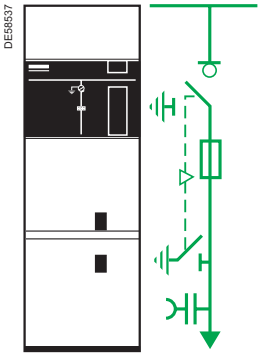

**Fuse-switch combination unit QM** (750 mm)




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



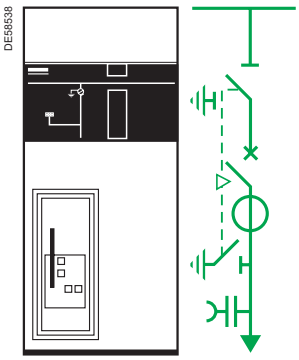

**Fuse-switch combination unit QMC** (1000 mm)



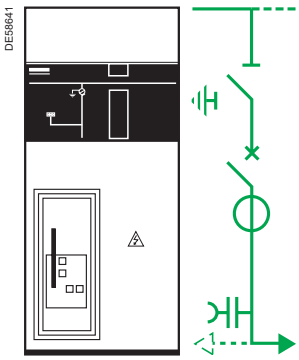

**Fuse-switch unit PM** (750 mm)

# Units for all functions

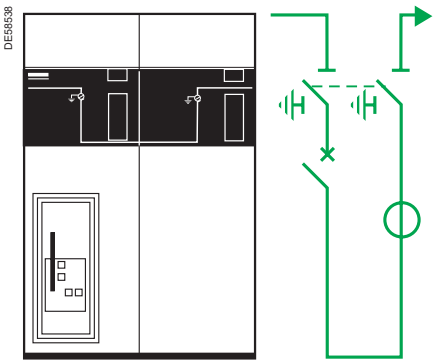
## SF6 circuit-breaker protection



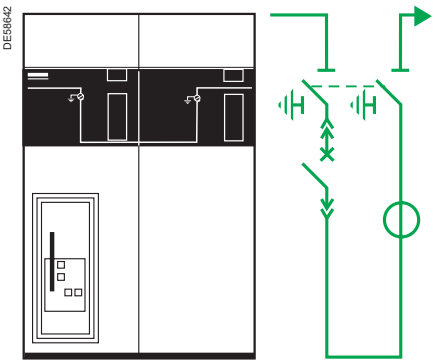

**Single-isolation circuit breaker unit**
**DM1-A** (1000 mm)




**Withdrawable single-isolation circuit breaker unit**
**DM1-W** (1000 mm)

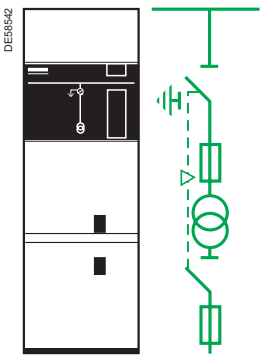



**Double-isolation circuit breaker unit right or left outgoing line**
**DM2** (1500 mm)

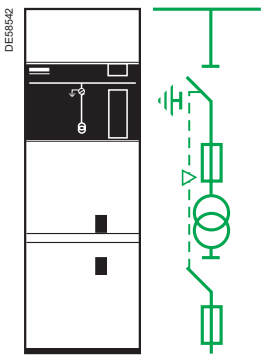



**Withdrawable double-isolation circuit breaker unit right outgoing line**
**DM2-W** (1500 mm)

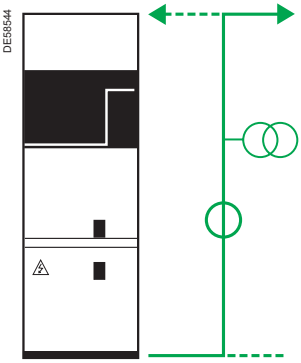
## MV metering



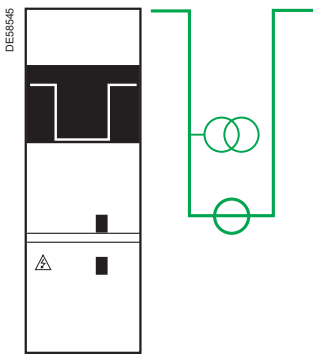

**Voltage transformers for mains with earthed neutral system**
**CM** (750 mm)




**Voltage transformers for mains with insulated neutral system**
**CM2** (750 mm)



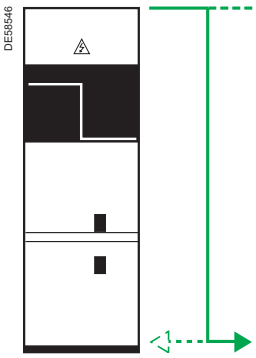

**Current and/or voltage measurement unit right or left outgoing line**
**GBC-A** (750 mm)



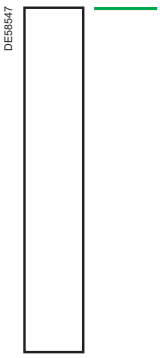

**Current and/or voltage measurement unit**
**GBC-B** (750 mm)

# Units for all functions

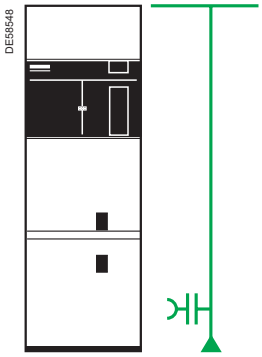
## Casings



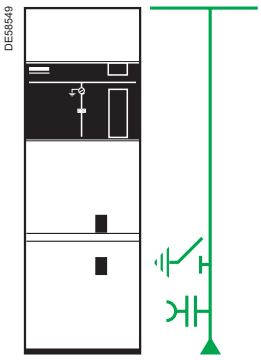

**Connection unit**
**right or left outgoing line**
**GBM** (750 mm)




**Intermediate bus unit**
**GIM** (250 mm)

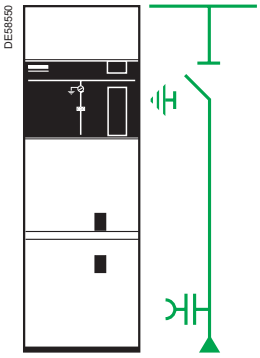



**Incoming**
**cable-connection unit**
**GAM2** (750 mm)

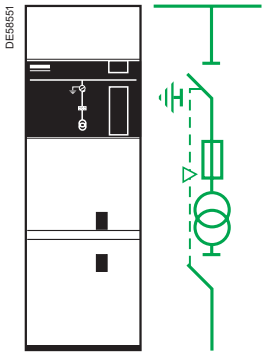



**Incoming**
**cable-connection unit**
**GAM** (750 mm)

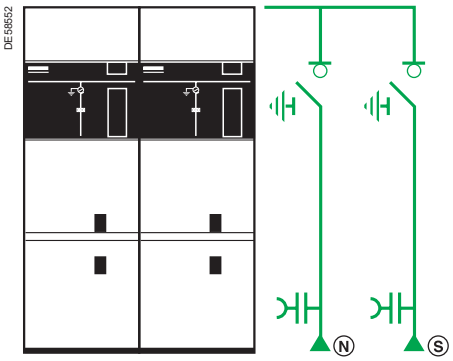
## Other functions



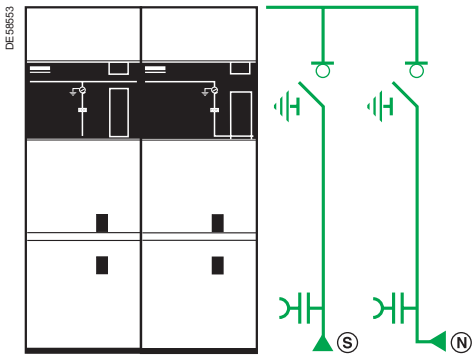

**Disconnector unit**
**SM** (750 mm)




**MV/LV transformer unit**
**for auxiliaries**
**TM** (750 mm)




**Cables power supply**
**for main incoming line**
**and standby line**
**NSM-cables** (1500 mm)




**Busbars power supply**
**for main incoming line**
**on right or left and cables**
**for standby line**
**NSM-busbars** (1500 mm)

# Operating conditions

In addition to its technical characteristics, SM6-36 meets requirements concerning safety of life and property as well as ease of installation, operation and protecting the environment.

PE57221

SM6-36 units are designed for indoor installations (IP3X).
Their compact dimensions are:
- 750 mm to 1500 mm width
- 2250 mm height
- 1400 mm depth…

… this makes for easy installation in small rooms or prefabricated substations.
Cables are connected via the front.
All control functions are centralised on a front plate, thus simplifying operation.
The units may be equipped with a number of accessories (relays, toroids, instrument transformers, low power current transformers (with Sepam only), surge arrester, telecontrol, etc.).

## Standards

SM6-36 units meet all the following recommendations, standards and specifications:

**■ IEC recommendations**
62271-1: 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 and including 52 kV.
60265-1: High voltage switches for rated voltages above 1 kV and less than 52 kV.
62271-105: High voltage alternating current switch-fuse combinations.
62271-100: High-voltage alternating current circuit breakers.
62271-102: High-voltage alternating current disconnectors and earthing switches.
60282-1 : High voltage fuses.
60255 : Protection relays (Sepam).
60044-1 : Current transformers.
60044-2 : Voltage transformers.

## Designation

SM6-36 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 (Ir): 400 - 630 - 1250 A
- the rated voltage (Ur): 36 kV
- the maximum short-time withstand current values (Ik): 12.5 - 16 - 20 - 25 kA, time duration (tk) 1 s
- the colour is of RAL 9002 type (grey white).

Example for a unit designated: IM 630 - 36 - 12.5
- IM indicates an “incoming” or “outgoing” unit
- 630 indicates the rated current is 630 A
- 36 indicates the rated voltage is 36 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.

PE57220

**Internal arc withstand**
■ 16 kA ,1 s, IAC: A-FL
in accordance with IEC 62271-200.

**Protection index**
■ Units: IP3X
■ Between compartments: IP2XC
■ Partition class: PI (non-metallic)
■ Loss of service continuity classes: LSC2A.

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

## General characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| **Rated voltage** | | **Ur** | kV | | **36** | |
| **Insulation level** | | | | | | |
| 50/60 Hz, 1 min | Insulation | **Ud** | kV rms | | 70 | |
| | Isolation | **Ud** | kV rms | | 80 | |
| 1.2/50 µs | Insulation | **Up** | kV peak | | 170 | |
| | Isolation | **Up** | kV peak | | 195 | |
| **Breaking capacity** | | | | | | |
| **Rated current** | | **Ir** | A | | **630** | **1250** |
| **Units** | Mainly active load | | A | | 630 | – |
| **IM, IMC, IMB** | Transformer off load | | A | | 16 | |
| | Cables off load | | A | | 50 | |
| **QM, PM, QMB, QMC** | | **I1** | kA | | 20 | – |
| **DM1-A, DM1-D, DM1-W, DM2, DM2-W** | | **Isc** | kA | | 20 | 25 |
| Short-time withstand current | | **Ik/tk** | kA/1 s | 16 | ■ | ■ |
| | | | | 20 | ■ | ■ |
| | | | | 25 | – | ■ |

The making capacity is equal to 2.5 times the short-time withstand current.

## Endurance

| Units | | Mechanical endurance | Electrical endurance |
|---|---|---|---|
| **SM** | Disconnector | IEC 62271-102<br>1 000 operations | |
| **IM, IMC, IMB, PM,** | Switch | IEC 60265<br>1 000 operations<br>class M1 | IEC 60265<br>100 breaks at Ir,<br>p.f. = 0.7, class E3 |
| **QM, QMB, QMC** | Switch-fuse | IEC 60265<br>1 000 operations<br>class M1 | IEC 60265<br>100 breaks at Ir,<br>p.f. = 0.7, class E3 |
| | | | IEC 62271-105<br>with 63 A fuses<br>3 breaks at transfer 800 A<br>p.f. = 0.2 |
| **DM1-A, DM1-D, DM1-W, DM2, DM2-W** | Disconnector | IEC 62271-102<br>1 000 operations | |
| | SF circuit breaker | IEC 62271-100<br>10 000 operations<br>class M2 | IEC 62271-100<br>25 breaks at 25 kA<br>10 000 breaks at Ir,<br>p.f. = 0.7, class E2 |

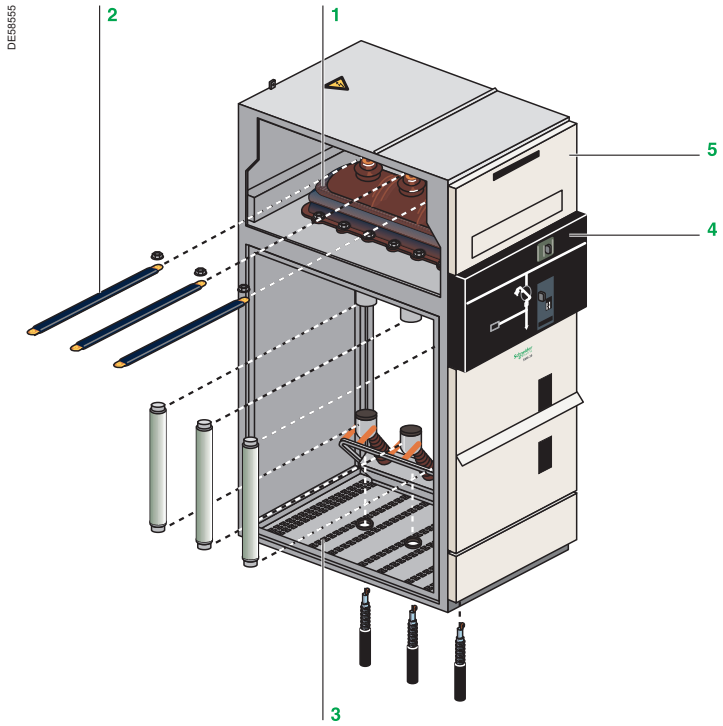
## Electromagnetic compatibility

**Emission tests**
■ Radiated disturbances
□ CISPR 11: 2004
□ IEC 60694: 1996, clause 6.9.1
□ Quasi-peak values within the frequency range 30-1000 MHz for both horizontal and vertical polarizations of the antenna. Limits increased with 10 dB, due to 3 meters measuring distance.
□ Electronic equipment fulfilled the requirements.

**Immunity tests**
■ Impulse voltage
□ IEC 60694: 1996, clause 6.9.2
□ IEC 255-5, clause 8
□ Secondary systems subjected ± 5 kV impulses, 3 times at 10 s intervals
□ Secondary equipment still fully operative.
■ Electrical fast transient/burst
□ IEC 61000-4-4: 2000
□ IEC 60694: 1996, clause 6.9.2
□ Secondary systems subjected ± 2 kV impulses for 1 min.
□ Criterion: 2.
■ Oscillatory wave immunity
□ IEC 61000-4-12: 2001
□ IEC 60694: 1996, clause 6.9.2
□ Secondary systems subjected:
- ± 1 kV 100 kHz damped oscillatory waves 5 times at 10 s intervals
- ± 2.5 kV 100 kHz damped oscillatory waves 5 times at 10 s intervals
□ Criterion: 2.

# Description

## Switch cubicles




**1 Switchgear**: switch-disconnector and earthing switch in an enclosure filled with SF6 and satisfying “sealed pressure system” requirements.

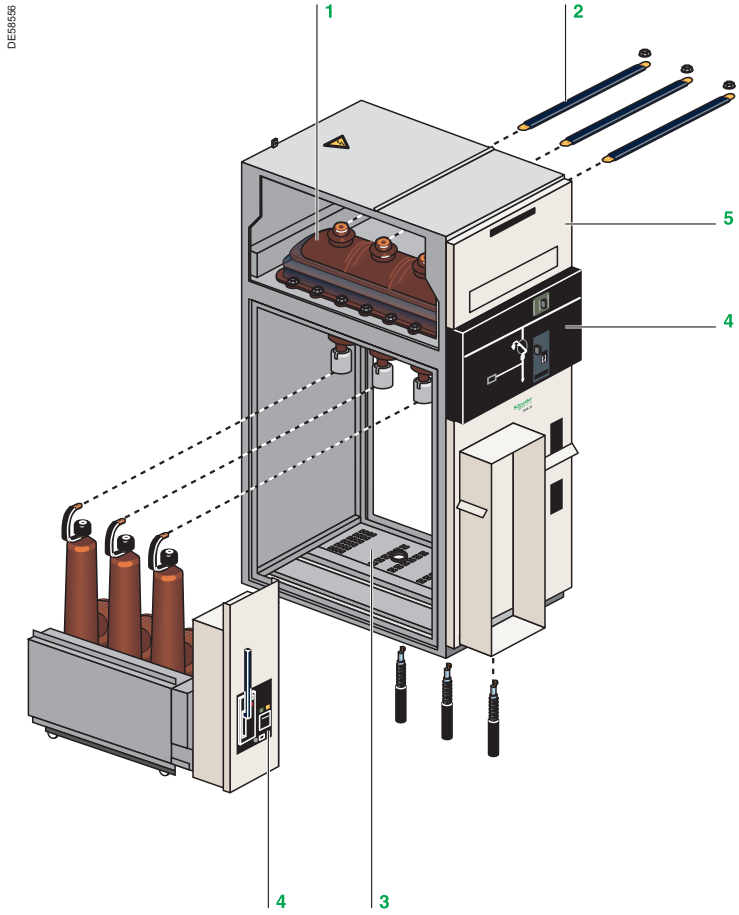
**2 Busbars**: all in the same horizontal plane, thus enabling later switchboard extensions.

**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 transformer protection units (QM cubicles).

**4 Operating mechanism**: contains the elements used to operate the switch-disconnector and earthing switch and actuate the corresponding indications (positive break). The operating functions may be motorized (optional).

**5 Low voltage**: installation of a terminal block (if motor option installed), LV fuses and compact relay devices.

## 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.

**3 Connection and switchgear**: accessible through front, connection to the downstream terminals of the SF1 circuit breaker.

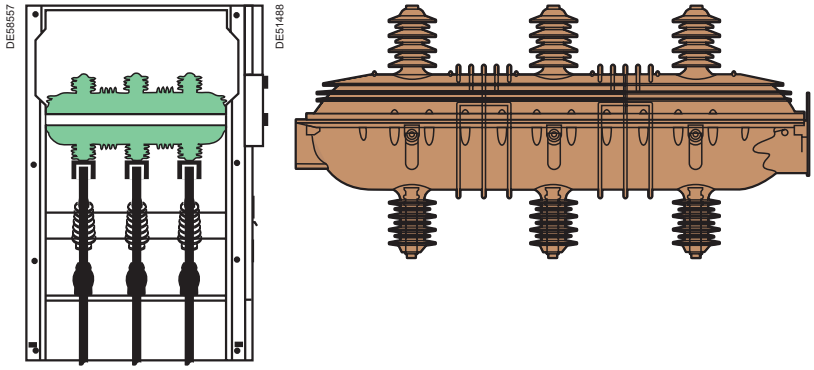
**4 Operating mechanism**: contains the elements used to operate the disconnector(s), the circuit breaker and the earthing switch and actuate the corresponding indications. The circuit breaker operating functions may be motorized (optional).

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

# Description

Cubicles are made up of three compartments separated by metal or insulating partitions, operating mechanism cabinets and low voltage cabinet.

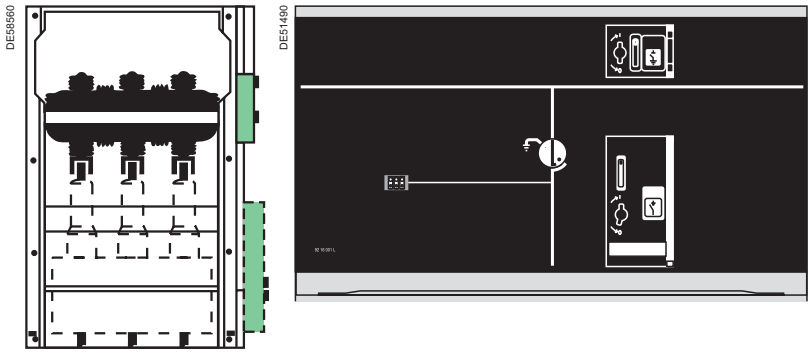
## Switchgear compartment




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

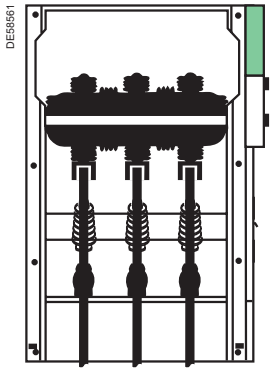
## Operating-mechanism cabinet

This cabinet contains the various operating functions for the switch, the circuit breaker, the earthing switch and the voltage presence indicator.
The operating-mechanism compartment for the switch, earthing switch 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.).



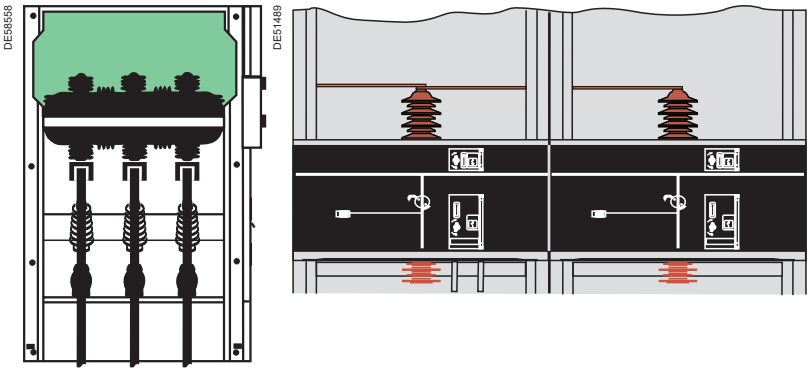

## Low-voltage cabinet

If the switch operating mechanism is motorised, this cabinet is equipped with a terminal block and LV fuses.
These compartment may be accessed with the cables and busbars energised and without isolating the substation.



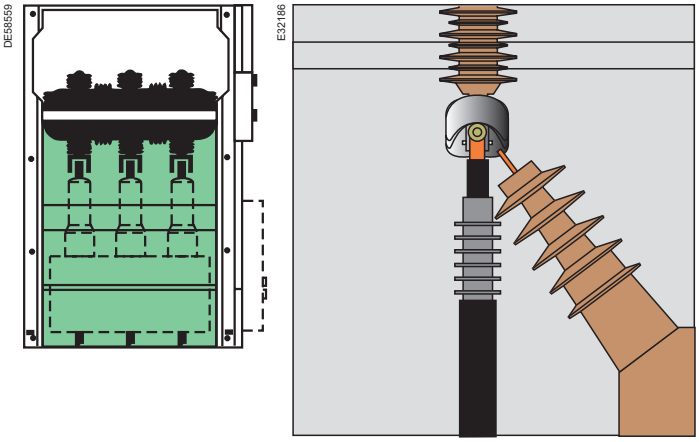
# Description

## Busbar compartment




The three insulated busbars are parallel-mounted. Connection is made to the upper pads of the enclosure. Rating 630 - 1250 A.

## Connection (cable) compartment




The network cables are connected to the terminals of the switch, of the circuit breaker and the earthing switch. Transformer cables are connected to the lower fuse holder.

**Cables may have either:**

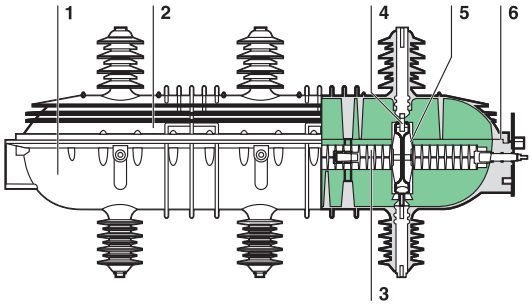
- simplified terminations for dry-type one-core cables heat-shrink ends for dry-type or paper-insulated cables.

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

- 240 $mm^2$ for incoming or outgoing cubicles
- 95 $mm^2$ for transformer protection cubicles incorporating fuses.

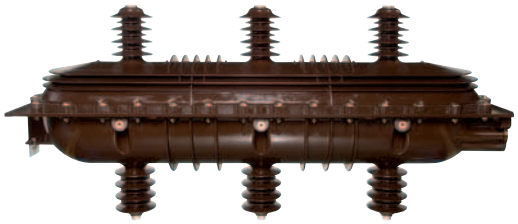
The earthing switch must be closed before the cubicle may be accessed. The reduced depth of the cubicle makes for easy connection of all phases.
A stud incorporated in the field distributor makes it possible to position and secure the cable-end lug with a single hand.

DE58562

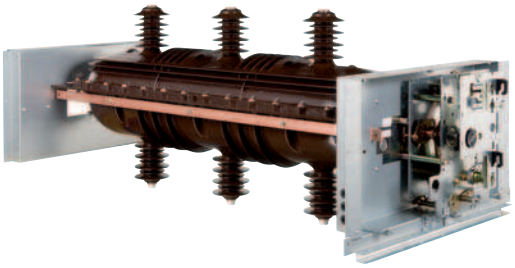



*1* *Enclosure*
*2* *Cover*
*3* *Operating shaft*
*4* *Fixed contact*
*5* *Moving contact*
*6* *Seal*

PE57226



PE57227



## Switch and earthing switch

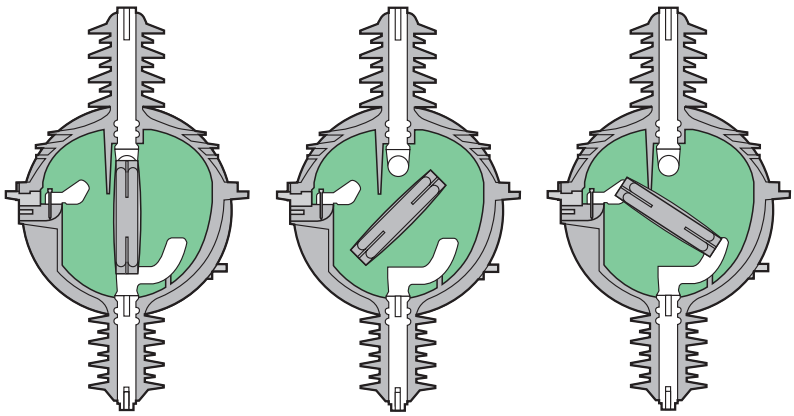
The three rotating contacts are placed in an enclosure filled with gas to a relative pressure of 1.5 bar (1500 hPa).
This system offers maximum operating reliability.

■ **gas tightness**
The enclosure filled with SF6 gas satisfies “sealed pressure system” requirements and seal tightness is always checked in the factory.

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

■ **breaking principle**
The exceptional qualities of SF6 gas are used to extinguish the electrical arc.
To increase cooling of the arc, a rotative movement is created between the arc and the gas. The arc appears when the fixed and moving contacts separate.
The combination of the current and a magnetic field created by a permanent magnet provokes arc rotation around the fixed contact, resulting in arc extension and cooling unit it is extinguished at current zero.
The distance between the fixed and moving contacts is then sufficient to withstand the recovery voltage.
This system is both simple and sure and also provides improved electrical endurance due to very low wear on contacts.

DE58563



*Contacts closed* *Contacts open* *Contacts earthed*

**SF6, the switchgear manufacturer’s gas**
SM6-36 switch-disconnectors and earthing switches use sulphur hexafluoride gas (SF6) for insulation and breaking. The active parts are placed in an insulating enclosure in accordance with the definition of IEC 56/Appendix EE (1987 edition) for sealed pressure systems.

SM6-36 devices offer remarkable characteristics:
■ long service life (30 years)
■ maintenance-free active parts
■ high electrical endurance
■ very low overvoltage level
■ operating safety.

61012N

*SF1 circuit breaker*

## SF1 circuit breaker

The SF1 circuit breaker is made up of three separate pole 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 2 max bar.
This system offers maximum operating reliability:

■ **gas tightness**
The enclosure filled with SF6 gas 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.

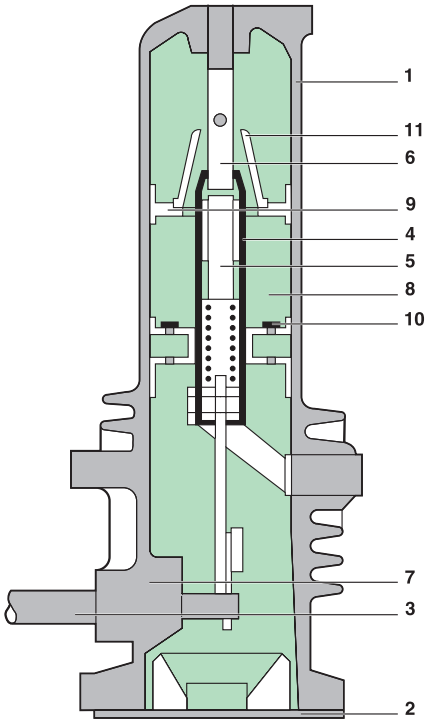
■ **breaking principle**
The circuit breaker is based on the SF6 gas autocompression principle.
The inherent qualities of SF6 and the soft break resulting from this technique reduce switching over-voltages.

■ **precompression**
When the contacts begin to open, the piston slightly compresses the SF6 gas in the pressure chamber.

■ **arcing period**
The arc then forms between the arcing contacts and the piston continues its downward movement. A small quantity of gas, directed by the insulating nozzle, is injected into the arc.
The cooling of the arc is thus achieved through forced convection for the interruption of low currents, however, during the interruption of high currents, thermal expansion is responsible for the transfer of the hot gases toward the cold parts of the pole unit.
Toward current zero, the distance between the two arcing contacts is sufficient for final interruption of the current due to the dielectric properties of the SF6 gas.

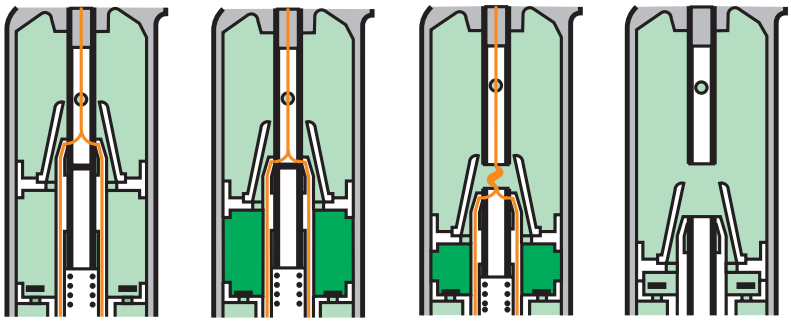
■ **sweeping over-stroke**
The moving parts finish their travel whereas the cold gas injection continues until the contacts are completely open.

DE58565




***1*** *Enclosure*
***2*** *Bottom cover*
***3*** *Operating shaft*
***4*** *Main moving contact*
***5*** *Moving arcing contact*
***6*** *Fixed arcing contact*
***7*** *Compression chamber*
***9*** *Moving piston*
***10*** *Valves*
***11*** *Insulating nozzle*

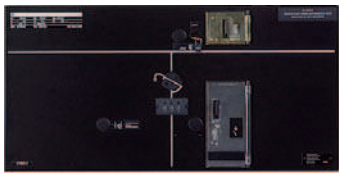
DE58566



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

# Safety of people
## By operating mechanism safety

PE57225



## Reliable operating mechanism

**Switchgear status indicator**
Fitted directly to the mobile equipment's shaft, these give a definite indication of the switchgear's position (IEC 62271-102 appendix A).

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

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

## Simple and effortless switching

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

**Closed**
The mobile equipment is operated via a quick acting mechanism, independent of the operator. No energy is stored in the switch, apart from when switching operations are taking place.
For combined switch fuses, the opening mechanism is armed at the same time as the contacts are closed.

**Opening**
The switch is opened using the same quick acting mechanism, operated in the opposite direction.
For circuit breakers and the combined switch fuses, opening is controlled by:
- a push-button
- a fault.

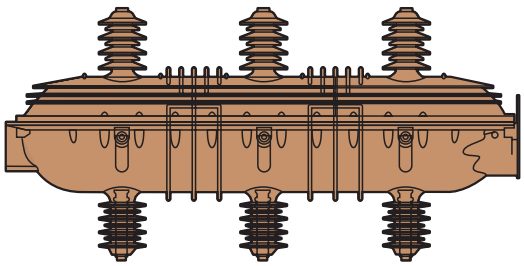
**Earthing**
A specific control shaft enables the opening or closing of the earthing contacts. Access to this shaft is blocked by a cover that can be slid back if the switch is open but which remains locked in place if it is closed.

PE56823


## 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.

DE51488



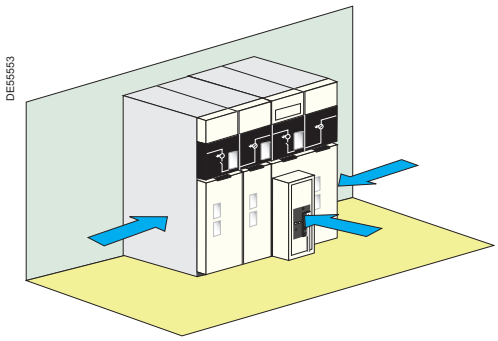
*Switch-disconnector and earthing switch*

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

# Safety of people
## By internal arc protection (optional)

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


DE55553

*Case of an SM6-36 switchboard installed against the wall exhaust: 3-sides internal arc protection*

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

### Consequently:

**The SM6-36 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/CAM 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

- **internal arc is optional**
  - IAC: A-FL 16 kA 1 s (three sides).

## SM6-36 internal arc (in conformity with IEC 62271-200 appendix A)

In its internal arc version, the SM6-36 has successfully passed all of the type testing relative to standard IEC 62271-200 (5 acceptance criteria).
The materials used meet the constraints for which the SM6-36 is designed.
The thermal and mechanical forces that an internal arc can produce are perfectly absorbed by the enclosure.
An operator situated in the front of or on the sides of the cubicle SM6-36 switchboard during an internal fault will not be exposed to the effects of arcing.

## SM6-36 proposes several options to install an internal arc enhanced switchboard

- **3-sides internal arc protection**

In case of an SM6-36 switchboard positioned against the wall, access to the rear of the cubicles is impossible, internal arc protection from three sides brings more reliability to the customers.

## Way of exhaust

- **Sidewards exhaust**
  - Civil engineering document for internal arc protected cubicles to be considered,
  - Civil engineering with an adequate volume is necessary.

# Remote control switch interface

**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 SM6-36 cubicle LV control cabinet.
It is limited to control 2 switches. It is intended for remote control applications for source transfer switching and back up generator set switching in NSM cubicle.

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

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

## Functional unit dedicated to Medium Voltage applications

Easergy 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.

61017N

*Control command*

61019N

*Local information*

61020N

*Power unit*

PE150078

*Split core CTs*

PE150079

*Back up power supply*

# Fault indicators

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

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

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

■ Easergy Flair 279 and 219, have a wall-mounted case for the MV cubicles substation or LV compartment and 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.).

PE57154

PE57156

PE57157

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

PE57228

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

SM6-36 integrates Flair 21D, Flair 21DT, Flair 22D and Flair 23D on every incoming cubicles.

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

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

■ **Maintenance free.**

| | | Flair 21D | Flair 21DT | Flair 22D | Flair 23D |
|---|---|---|---|---|---|
| **Power supply** | | | | | |
| | Self-powered | ■ | ■ | ■ | ■ |
| | Dual power supply | | | ■ (battery) | ■ (external) |
| **Display** | | | | | |
| | Ammeter | ■ | ■ | ■ | ■ |
| | Peak demand | | | ■ | ■ |
| | Frequency meter | | | ■ | ■ |
| **Options** | | | | | |
| | SCADA interface | ■ (transistor output) | ■ | ■ | ■ |
| | External light | ■ | ■ | ■ | ■ |
| | External reset | | | ■ | ■ |
| | Advanced settings (keypad) | | | ■ | ■ |

# Ammeter

PE56822


■ **At the leading edge of technology,** Amp 21 D is suitable for Medium Voltage network load management.

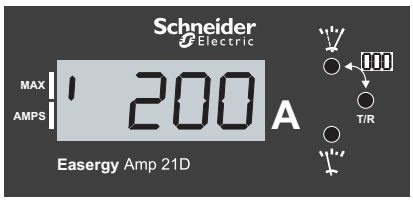
■ **Self-powered,** it ensures a permanent display of currents.

■ **Compact and in DIN format,** it fits naturally into MV cubicles.

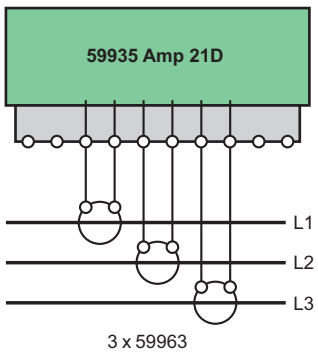
■ **Cost efficient,** it uses the CT optimised for Fault Passage Indicator.

■ **Performant,** it displays phase current and maximum of current.

DE58460




DE58461




Easergy Amp 21D is an ammeter dedicated to display the load current on a Medium Voltage network. It is particularly suited for network load management application.

## Functions

- Display of 3 phase current: I1 , I2 , I3
  Range: 3 A to 800 A
- Display of 3 phase current maximeter: I1 , I2 , I3
  Range: 3 to 800 A.

## Display principle

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

## Technical data

| | | |
|---|---|---|
| **Application** | | |
| Frequency | | 50 Hz and 60 Hz |
| Load current | Minimum current | > 3 A |
| **Measurement** | | |
| Range | Phase current | 3 to 800 A |
| | Accuracy (I < 630 A) | ±5%, ±2 A |
| Reset of maximeter | Manual from device | Yes |
| **Power supply** | | |
| Self power | From the current sensors | I load > 3 A |
| Battery | | No |
| Auxiliary supply | | No |
| **Display** | | |
| | Display | 4 digits LCD |
| | Current per phase | Yes (resolution 1 A) |
| | Maximeter per phase | Yes |
| **Sensors** | | |
| | Phase CTs | 3 split core CT |
| **Miscellaneous** | | |
| | Test | Yes |
| **Characteristics** | | |
| Dielectric | IEC 60255-5 | |
| Electromagnetic | IEC 61000-4-4 (level 4)<br>IEC 61000-4-12 | Insulation 10 kV<br>Shock wave 20 kV |
| Climatic | Operating temperature<br>Storage temperature<br>Salt fog | – 25°C to + 70°C<br>– 40°C to + 85°C<br>200 h |
| Mechanical | IEC 60068-2-6<br>IEC 60068-2-29 | Vibrations 10 to 500 Hz: 2 g<br>Protection IP23 |

## Assembly

**Small size enclosure**

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

**Current sensors**

- Split core CT for mounting on MV cables (product MF1, ref 59963).

PE57229

# 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 4 families:

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

PE57158

## Sepam protection relay

### A range adapted at your application

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

### Accurate measurement and detailed diagnosis

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

### Simplicity

**Easy to install**

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

**User-friendly**

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

### Flexibility and evolutivity

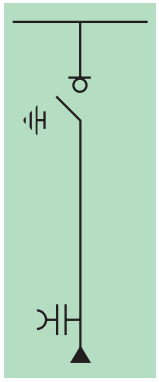
- Enhanced by optional modules to evolve in step with your installation.
- Possible to add optional modules at any time.
- Simple to connect and commission via a parameter setting procedure.

| Sepam | Characteristics | Protections | | Applications | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Basic | Specific | Substation | Transformer | Motor | Generator | Busbars |
| **Sepam series 10**<br>For simple applications | ■ 4 logic inputs<br>■ 7 relay outputs<br>■ 1 communication port | Phase-overcurrent and earth fault protection | | **10A**<br>**10B** | **10A**<br>**10B** | | | |
| **Sepam series 20**<br>For common applications | ■ 10 logic inputs<br>■ 8 relay outputs<br>■ 1 Modbus communication port | Current protection | | **S20** | **T20** | **M20** | | |
| | | Voltage and frequency protection | | | | | | **B21** |
| | | | Loss of mains (ROCOF) | | | | | **B22** |
| **Sepam series 40**<br>For demanding applications | ■ 10 logic inputs<br>■ 8 relay outputs<br>■ 1 Modbus communication port<br>■ Logic equations editor | Current voltage and frequency protection | | **S40** | **T40** | | **G40** | |
| | | | Directional earth fault | **S41** | | **M41** | | |
| | | | Directional earth fault and phase overcurrent | **S42** | **T42** | | | |
| **Sepam series 80**<br>For complete applications | ■ 42 logic inputs<br>■ 23 relay outputs<br>■ 2 Modbus communication port<br>■ Logic equations editor<br>■ Removal memory cartridge<br>■ Battery to save event logging data | Current voltage and frequency protection | | **S80** | | | | |
| | | | Directional earth fault | **S81** | **T81** | **M81** | | |
| | | | Directional earth fault and phase overcurrent | **S82** | **T82** | | **G82** | |

# Functional units selection
## Network connection

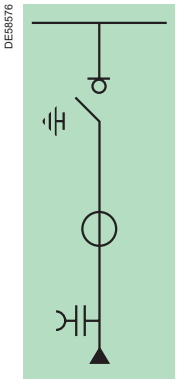
**IM** (750 mm)
Switch unit

DE58575



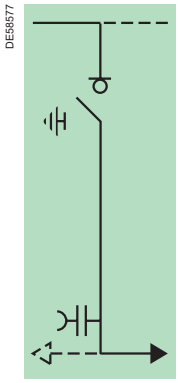
**IMC** (750 mm)
Switch unit

DE58576



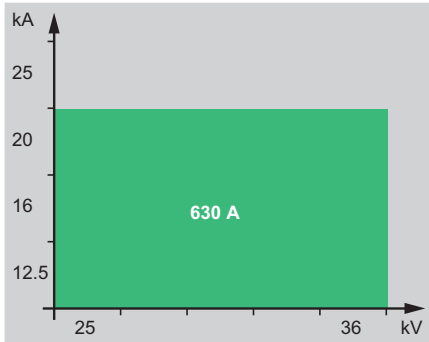
**IMB** (750 mm)
Switch unit
Right or left outgoing

DE58577



### Electrical characteristics

DE58570




### Basic equipment:

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

- connection pads for dry-type cables

- three CTs

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

### Versions:

- Manual or motorised operating mechanism CI1 or CI2 with opening and closing shunt trips

- CI1 operating mechanism
- CI2 operating mechanism

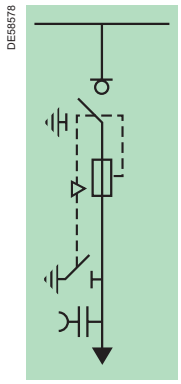
### Optional accessories:

- motor for operating mechanism
- auxiliary contacts
- key-type interlocks
- cable connection by the top
- release units (coil)

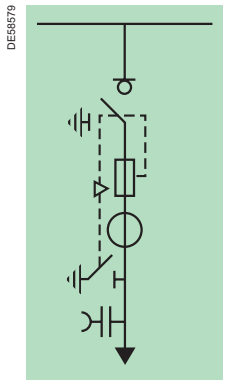
- phase comparator
- fault indicators
- Connection pads for two dry-type single-core cables
- surge arresters

# Functional units selection
## Transformer protection

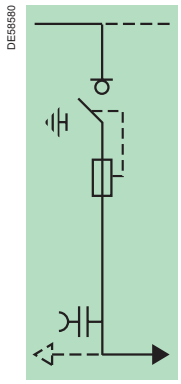
**QM** (750 mm)
Fuse-switch
combination unit




**QMC** (1000 mm)
Fuse-switch
combination unit




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




### Electrical characteristics


### Basic equipment:

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

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

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

- three CTs

### Version:

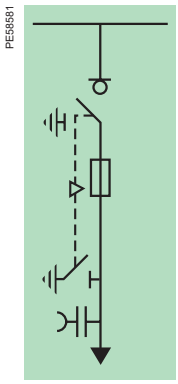
- CI2 operating mechanism

### Optional accessories:

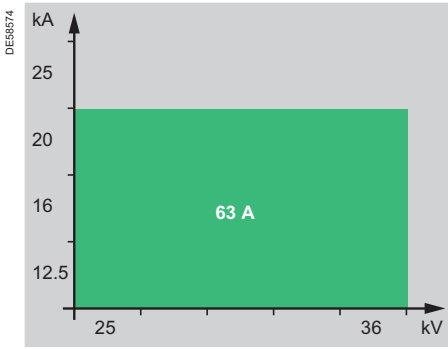
- motor for operating mechanism with opening shunt trips
- auxiliary contacts
- key-type interlocks
- auxiliary contact for blown fuses
- cable connection by the top
- DIN striker fuses
- opening shunt trip release
- release units (coil)

# Functional units selection
## Transformer protection

**PM** (750 mm)
Fused-switch unit




### Electrical characteristics




### Basic equipment:

- switch and earthing switch
- three-phase busbars
- voltage presence indicator
- equipment for three DIN fuses
- mechanical indication system for blown fuses
- connection pads for dry-type single-core cables
- downstream earthing switch
- CIT operating mechanism
- 150 W heating element

### Version:

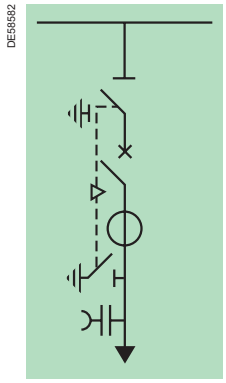
- CI1 operating mechanism
- CI2 operating mechanism

### Optional accessories:

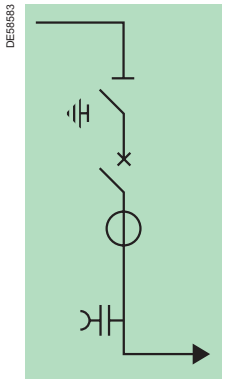
- motor for operating mechanism
- auxiliary contacts
- key-type interlocks
- auxiliary contact for blown fuses
- DIN striker fuse
- opening shunt trip release
- cable connection by the top
- Release units

# Functional units selection
## SF6 type circuit breaker protection

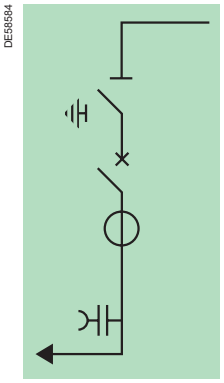
**DM1-A** (1000 mm)
Single-isolation
circuit breaker



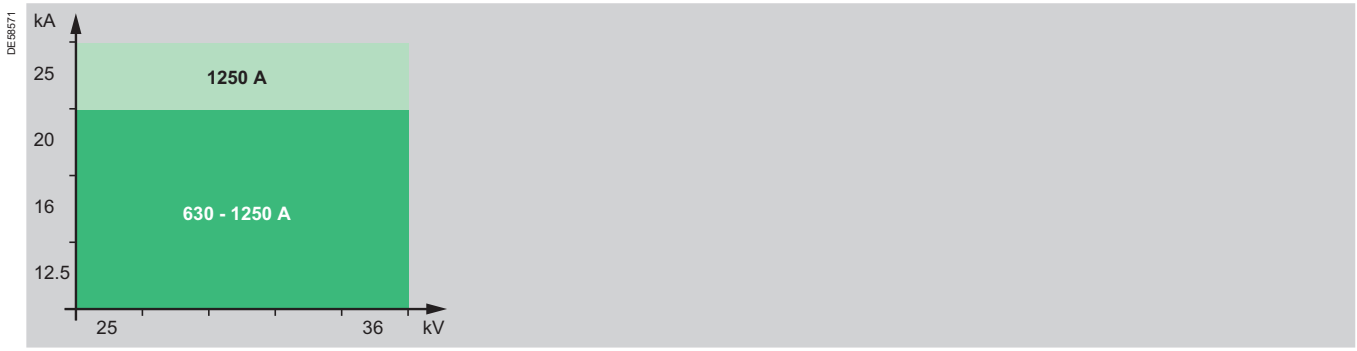

**DM1-D** (1000 mm)
Single-isolation circuit breaker
Outgoing line on right




**DM1-D** (1000 mm)
Single-isolation circuit breaker
Outgoing line on left




### Electrical characteristics




### Basic equipment:

- SF1 circuit breaker disconnectable
- disconnector and earthing switch
- three-phase busbars
- circuit breaker operating mechanism RI
- disconnector operating mechanism CS
- voltage presence indicator
- three CTs
- auxiliary contacts on circuit breaker
- 150 W heating element

### Version:

- connection pads for dry-type cables
- downstream earthing switch
- three-phase bottom busbars

### Optional accessories:

■ **cubicle:**
□ auxiliary contacts on the disconnector
□ cable connection by the top
□ protection using Sepam programmable electronic unit for SF1 circuit breaker
□ key-type interlocks
□ connection pads for two dry-type single-core cables
□ surge arresters

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

■ **cubicle:**
□ LPCT (Low Power Current Transformer)
can only be used with Sepam relays

# Functional units selection
## SF6 type circuit breaker protection

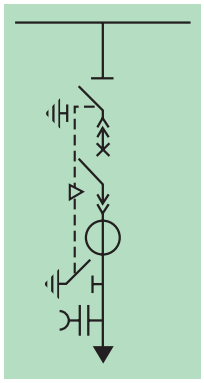
**DM1-W** (1000 mm)
Withdrawable single-isolation circuit breaker

**DM2-W** (1500 mm)
Withdrawable double-isolation circuit breaker
Outgoing line on right

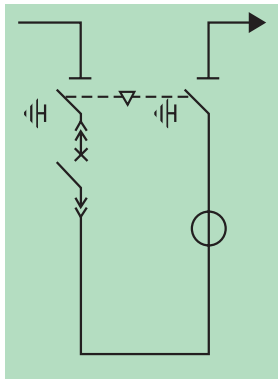
**DM2** (1500 mm)
Double-isolation circuit breaker
Outgoing line on right

**DM2** (1500 mm)
Double-isolation circuit breaker
Outgoing line on left

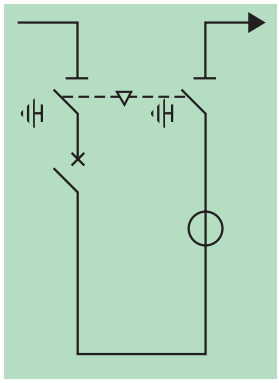
DE58585



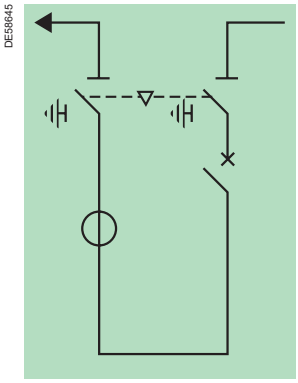
DE58643



DE58644

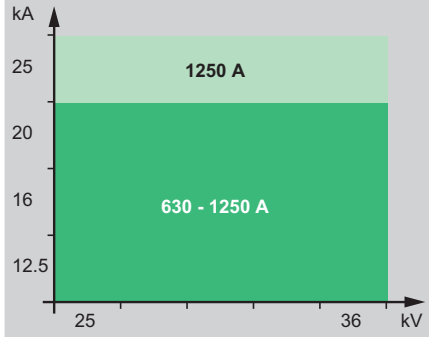


DE58645



### Electrical characteristics

DE58571




### Basic equipment:

- ■ SF1 circuit breaker withdrawable
- ■ SF1 circuit breaker disconnectable
- ■ three-phase busbars
- ■ circuit breaker operating mechanism RI
- ■ disconnector operating mechanism CS
- ■ voltage presence indicator
- ■ three CTs
- ■ auxiliary contacts on circuit breaker
- ■ 150 W heating element

### Version:

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

### Optional accessories:

- ■ **cubicle:**
- □ auxiliary contacts on disconnectors
- □ cable connection by the top
- □ key-type interlocks

- □ protection using Sepam programmable electronic unit for SF1 circuit breaker
- □ connection pads for two dry-type single-core cables
- □ LPCT (Low Power Current Transformer) can only be used with Sepam relays
- □ surge arresters

- □ protection using Statimax relays or Sepam protection electronic unit

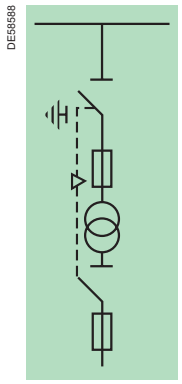
- ■ **circuit breaker:**
- □ motor for operating mechanism
- □ operation counter on manual operating mechanism

- □ release units (coil)

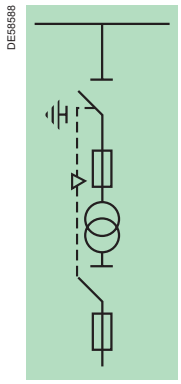
- □ low-energy Mitop or undervoltage opening release
- □ opening and closing shunt trips

# Functional units selection
## MV metering

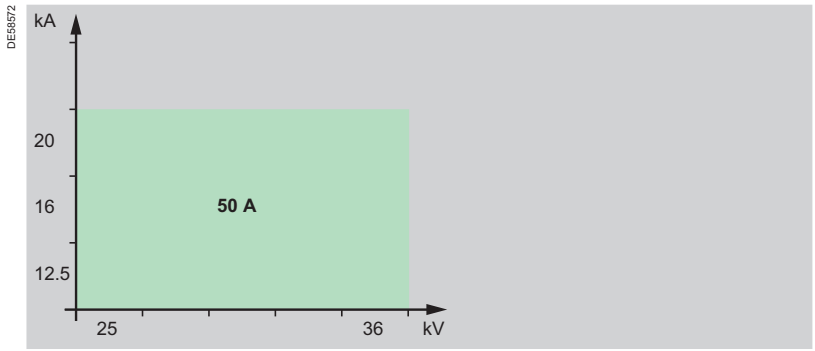
**CM** (750 mm)
Voltage transformers for mains with earthed neutral system




**CM2** (750 mm)
Voltage transformers for mains with insulated neutral system




### Electrical characteristics




### Basic equipment:

- disconnector and earthing switch
- three-phase busbars
- operating mechanism CS
- LV circuit isolation switch
- LV fuses
- three 6.3 A fuses
- 150 W heating element

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

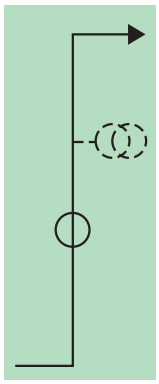
### Optional accessories:

- auxiliary contacts
- cable connection by the top

# Functional units selection
## MV metering

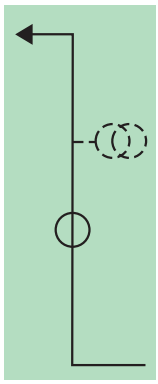
**GBC-A** (750 mm)
Current and/or voltage measurements
Outgoing line on right

DE58590



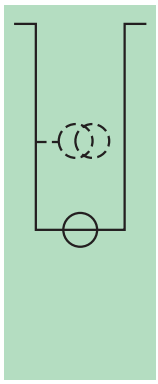
**GBC-A** (750 mm)
Current and/or voltage measurements
Outgoing line on left

DE58591



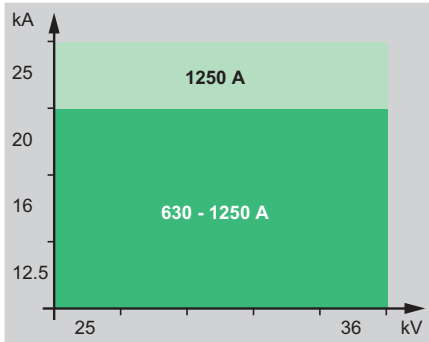
**GBC-B** (750 mm)
Current and/or voltage measurements

DE58592



### Electrical characteristics

DE58571




### Basic equipment:

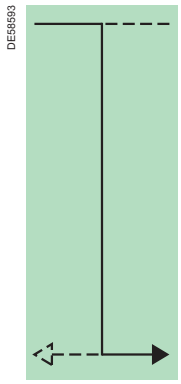
- three CTs
- connection bars
- three-phase busbars
- 150 W heating element

### Optional accessories:

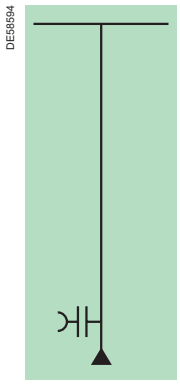
- extended LV compartment
- three voltage transformers (phase-to-earth)
- cable connection by the top

# Functional units selection
## Functions required by private networks

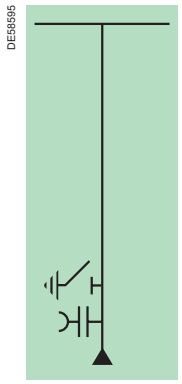
**GBM** (750 mm)
Connection unit
Outgoing line right or left




**GAM2** (750 mm)
Incoming cable-connection unit




**GAM** (750 mm)
Incoming cable-connection unit with earthing switch




**GIM** (250 mm)
Intermediate bus unit


### Electrical characteristics


### Basic equipment:

- connection bars
- 150 W heating element
- three-phase busbars

- three-phase busbars for outgoing lines right or left

- three-phase busbars
- voltage presence indicator
- connection pads for dry-type cables

- earthing switch

### Optional accessories:

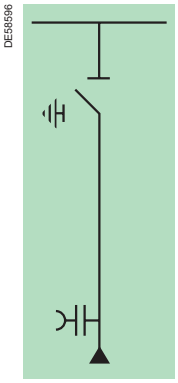
- cable connection by the top

- surge arresters

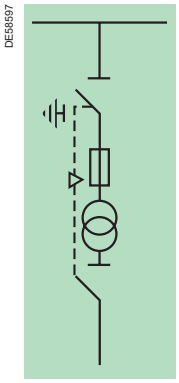
- operating mechanism CS1
- auxiliary contacts
- key-type interlocks

# Functional units selection
## Other functions

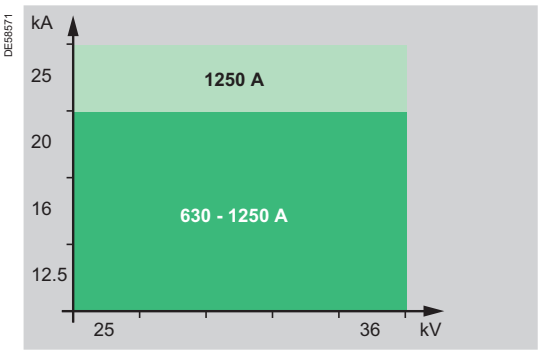
**SM** (750 mm)
Disconnector unit

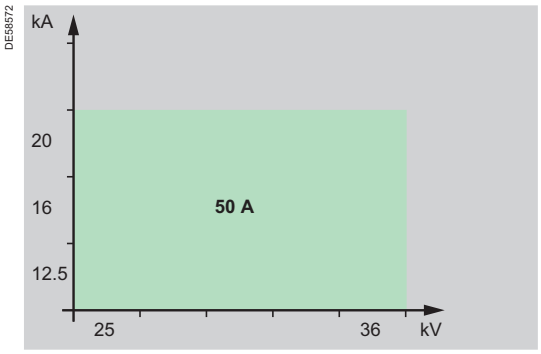



**TM** (750 mm)
MV/LV transformer unit
for auxiliaries




### Electrical characteristics




### Basic equipment:

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

- connection pads for dry-type single-core or three-core cables
- voltage presence indicator

- two 6.3 A fuses DIN type
- one or two voltage transformer (phase-to-phase)

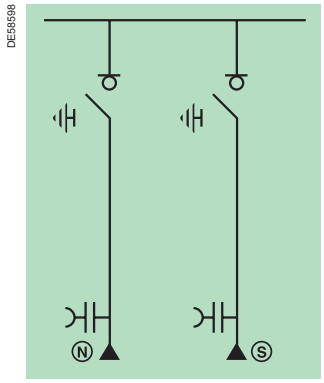
### Optional accessories:

- auxiliary contacts
- key-type interlocks

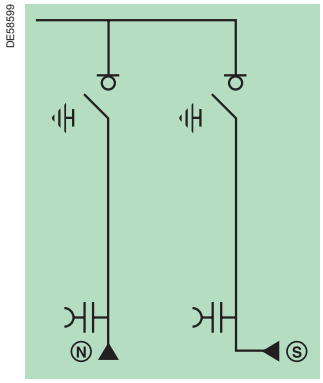
- phase comparator
- fault indicators
- cable connection by the top
- release units
- connection pads for two dry-type single-core cables
- surge arresters

# Functional units selection
## Automatic Transfer System

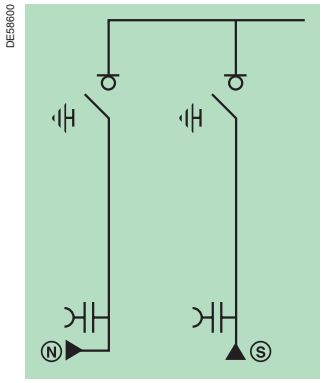
**NSM-cables** (1500 mm)
Cables power supply for main incoming line (N) and standby line (S)



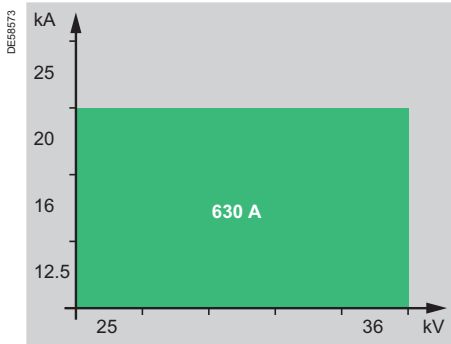

**NSM-busbars** (1500 mm)
Cables power supply for main incoming line on left (N) and busbars for standby line (S) on right




**NSM-busbars** (1500 mm)
Busbars power supply for main incoming line on left (N) and cables for standby line (S) on right




### Electrical characteristics




### Basic equipment:

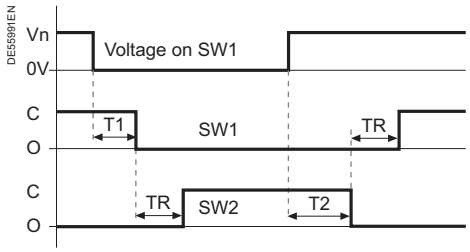
- switches and earthing switches
- three-phase busbars 630 A
- connection pads for dry-type cables
- voltage presence indicator
- mechanical interlocking
- motorised operating mechanism CI2 with shunt trips
- additional enclosure
- automatic-control equipment
- 150 W heating element

### Optional accessories:

- auxiliary contacts
- key-type interlocks
- telecontrol

# Automatic switching controls
## With NSM unit
## T200 S

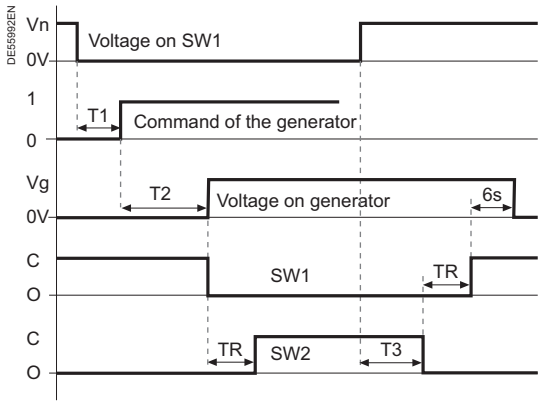
**Network back up**




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

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

**Generator back up**




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

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

## Transfer switch

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

**Operating modes**
- **Operating mode is selected using the Easergy T200 S configuration tool.**
- **Semi-Auto mode, SW1 ⟷ SW2**

When the voltage disappears on the channel in service, the automatic control switches to the other channel after a time delay T1. The automatic control does not switch back, unless there is a voltage break on the new channel in service.
- **Mode SW1 ➡ 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.

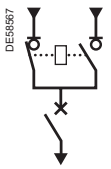
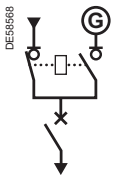
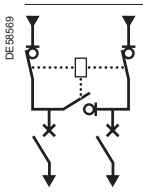
- **Switching back to the main channel in “AUTO” modes is executed if:**

□ the priority channel is open
□ the MV voltage on the priority channel is OK for a time period of T3.

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

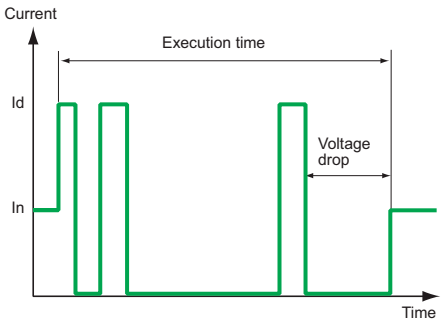
**Source transfer locking**

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.

| Single line | Solutions | Behaviour |
|---|---|---|
|  | Automatic Transfer System<br>ATS Network (1/2)<br>T200 S/T200 I | On loss of voltage on L1<br>ATS automatically switches to L2 |
|  | Automatic Transfer System<br>ATS Generator (1/2)<br>T200 S/T200 I | On loss of voltage on L1<br>ATS starts the generator<br>ATS waits for voltage presence on L2<br>ATS automatically switches to L2 |
|  | Bus Tie Automation<br>BTA Network (2/3)<br>T200 I | On loss of voltage on L1 or L2<br>ATS automatically switches to the live line |

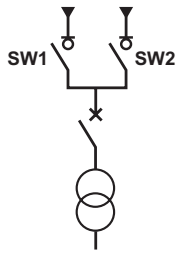
# Automatic switching controls
## T200 I

DE58640EN

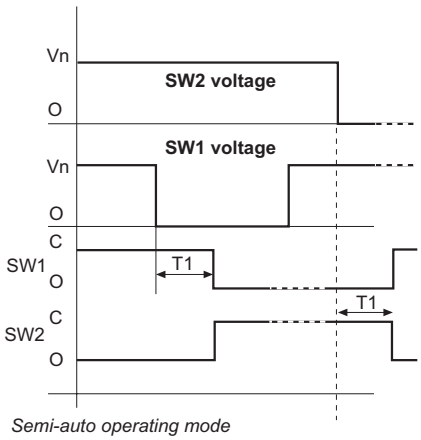



■ Configurable parameters:
□ Number of faults: from 1 to 4
□ Execution time: from 20 s to 4 mins configurable in 5 s steps
□ Automation system valid/invalid.

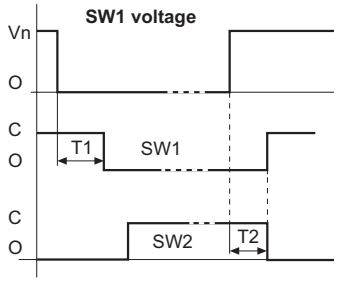
DE56654




MT10013EN




*Semi-auto operating mode*




*Auto-SW1 operating mode*

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

Easergy T200 I automation systems are factory predefined. No on-site programming is required.

■ The automation systems can be switched on and off from the local operator panel and disabled using the configurator.

■ Switches can be controlled manually in the following circumstances:
□ automation system switched off
□ switch in local mode.

## Sectionaliser (SEC)

The sectionaliser automation system opens the switch after a predefined number of faults (1 to 4) during the voltage dip in the reclosing cycle of the top circuit breaker.

■ The automation system counts the number of times a fault current followed by a voltage loss is detected. It sends an open order if:
□ the switch is closed
□ the fault has disappeared
□ the MV supply is absent.

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

## Automatic Transfer System (ATS)

The transfer switch automation system allows for the automatic control and management of power supply sources in the MV secondary distribution network. It is linked to voltage presence detectors **VD3H**.

### Operating modes

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

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

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

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

### Switching sequence

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

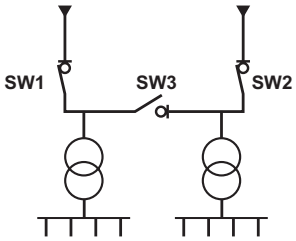
**The automation system switches back to the main channel in “AUTO” mode if:**
■ The priority channel is open
■ The MV supply on the priority channel is correct for the time delay T2.
The close order on the back-up channel is given once the opening of the channel in use is reported.

### Source transfer interlock

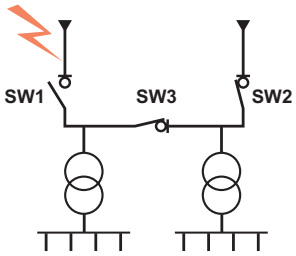
A digital input can be used to prohibit the issuing of orders from the local operator panel, the automation system and the remote control supervisor.
This input is generally connected to the downstream circuit breaker.

# Automatic switching controls
## T200 I (cont.)

DE58655

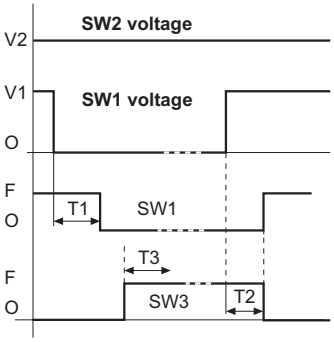



*"Normal" position*




*Active coupling*

DE56656EN




**Configurable parameters:**
- Operating mode
- Automatic return SW1/SW2
- Automation system on/off
- Delay before switching

T1: 100 ms to 60 s in 100 ms steps
- Delay before return

T2: 5 s to 300 s in 1 s steps
- Interlock delay on voltage loss

T3: 100 ms to 3 s in 100 ms steps
- Motorisation type: command time.

## Bus tie coupling (BTA)

The BTA (Bus Tie Automatism) is an automation system for switching sources between two incoming lines (SW1 and SW2) and a busbar coupling switch (SW3). It must be used in conjunction with VD3H type voltage presence detectors and the fault current detection function on the busbar incoming lines.

### Operating mode

**Two operating modes can be configured:**

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

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

**Coupling sequence**

■ Coupling takes place if the following conditions are met:
□ the automation system is switched on
□ the switches on incoming channels SW1 and SW2 are closed
□ the earthing switches SW1, SW2 and SW3 are open
□ there is no voltage on an incoming line SW1 or SW2
□ there is no fault current detection on SW1 and SW2
□ there is no transfer interlock
□ voltage is present on the other incoming line.

■ The coupling sequence in standard mode is as follows:
□ opening of the de-energised incoming line switch after a delay T1
□ closing of the coupling switch SW3.

■ The coupling sequence in "Interlock on loss of voltage after coupling" mode is completed as follows:
□ monitoring of the voltage stability for a delay T3
□ opening of the coupling switch SW3 if this condition is not met
□ locking of BTA automation system.

■ The system returns to standard mode after coupling if:
□ the "return to SW1 or SW2" option is activated
□ voltage on the channel has been normal for a delay T2
□ the automation system is activated
□ the automation system is not locked
□ there is no coupling interlock.

**Coupling interlock**

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

**Locking the automation system**

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

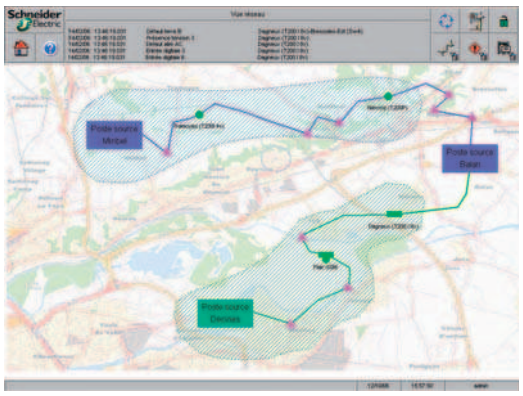
# Network remote control and monitoring

## Continuity of service guaranteed by an overall telecontrol offer

Schneider Electric offers you a complete solution, including:

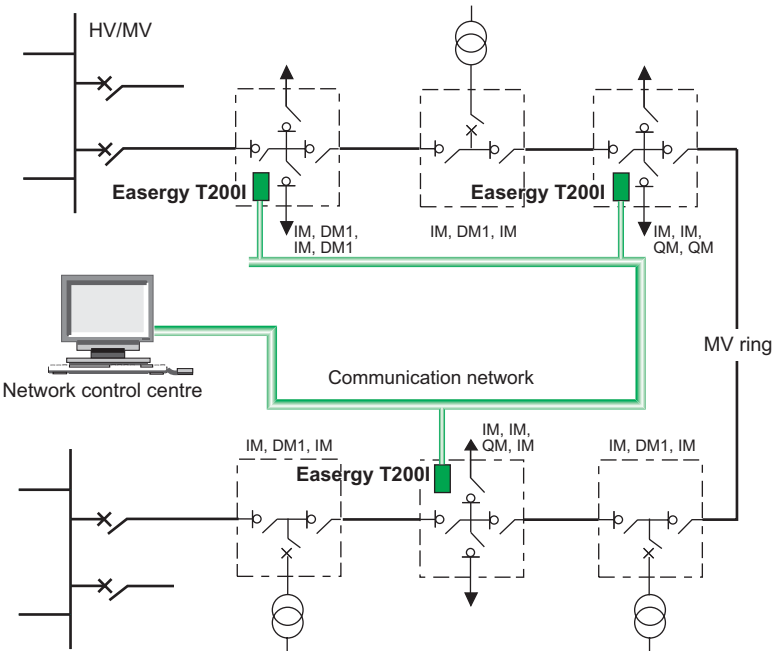
- the Easergy T200 I telecontrol interface,
- SM6-36 switchgear that is adapted for telecontrol,
- the Easergy L500 SCADA system.

PE56312

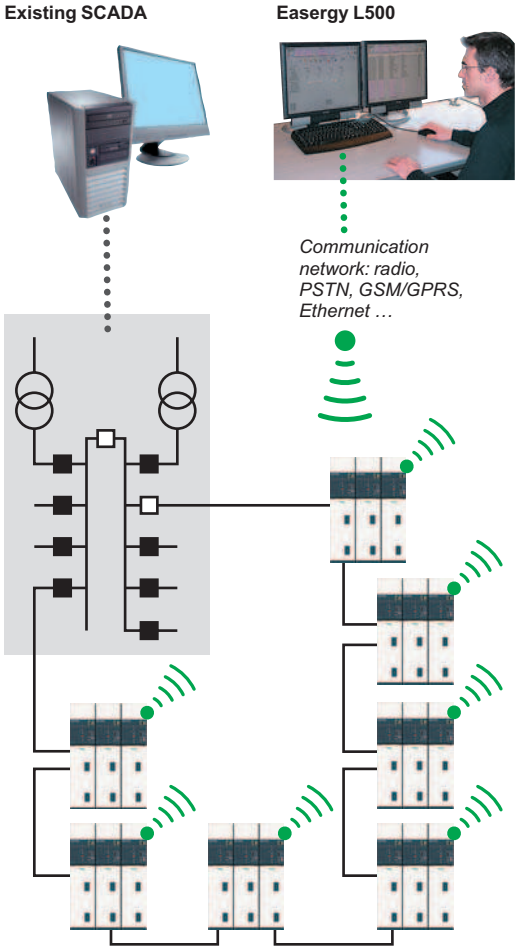


*L500 network monitoring screen*

DE59610EN




DE58611




## SM6-36 range, more than ready

SM6-36 switchgear is perfectly adapted to the telecontrol context, thanks to options such as:

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

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

** SAIDI: system average interruption duration index*

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

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

**Advantages**

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

# Operating mechanisms

The control devices required for the unit operating mechanisms are centralised on the front panel. The different types of operating mechanism are presented in the table opposite.
Operating speeds do not depend on the operator, except for the CS.
For the interlocks, consult the table pages 43 to 45 according to concerned cubicles.

| Units | Type of operating mechanism | | | | | |
|---|---|---|---|---|---|---|
| | Switch/disconnector | | | | | Circuit breaker |
| | CIT | CI1 | CI2 | CS | CC | RI |
| IM, IMB, IMC | ■ | □ | □ | | | |
| PM | ■ | □ | □ | | | |
| QM, QMB, QMC | | ■ | □ | | | |
| CM, CM2, GAM | | | | ■ | | |
| DM1-A, DM1-D, DM1-W, DM2, DM2-W | | | | ■ | | ■ |
| SM | | | | ■ | | |
| NSM-cables, NSM-busbars | | | ■ | | | |

■ Provided as standard
□ Other possibility

| Operating mechanism types | CIT | | CI1 | | CI2 | | | CS1 | |
|---|---|---|---|---|---|---|---|---|---|
| **Unit applications** | Load-break switch Fused switch | | Load-break switch Fuse switch combination | | Load-break switch Fuse switch combination | | | Disconnector | |
| **Main circuit switch** | Closing | Opening | Closing | Opening | Mechanism charging | Closing | Opening | Closing | Opening |
| **Manual operating mode** | Hand lever | Hand lever | Hand lever | Push button | Hand lever | Push button | Push button | Hand lever | Hand lever |
| **Electrical operating mode (option)** | Motor | Motor | Motor | Coil | Motor | Coil | Coil | N/A | N/A |
| **Speed of operation** | 1 to 2 s | 1 to 2 s | 4 to 7 s | 35 ms | 4 to 7 s | 55 ms | 35 ms | N/A | N/A |
| **Network applications** | Remote control network management | | Remote control transformer protection | | Remote control network management, need of quick reconfiguration (generator source, loop) | | | N/A | |
| **Earthing switch** | Closing | Opening | Closing | Opening | N/A | Closing | Opening | Closing | Opening |
| **Manual operating mode** | Hand lever | Hand lever | Hand lever | Hand lever | Hand lever | Hand lever | Hand lever | Hand lever | Hand lever |

61029N

## Double-function operating mechanism CIT

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

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

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

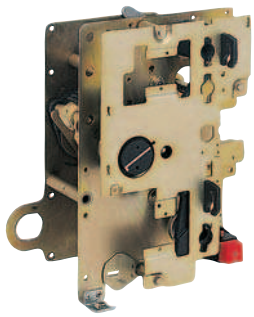
■ **Mechanical indications**
Fuses blown in unit PM.

■ **Motor option**

*(*) Included with the motor option*

# Operating mechanisms

61030N



## Double-function operating mechanism CI1

■ **Switch function**
□ independent-operation closing by lever or motor.
Operating energy is provided by a compressed spring which, when released, causes the contacts to 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).

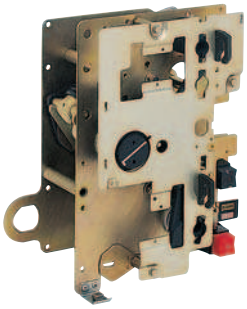
■ **Mechanical indications**
Fuses blown in units PM, QM.

■ **Opening releases**
□ shunt trip.

■ **Motor option**

*(*) Included with the motor option*

61031N



## Double-function operating mechanism CI2

■ **Switch function**
□ independent-operation closing in two steps:
1 - operating mechanism recharging by lever or motor,
2 - stored energy released by push-button (I) or trip unit.
□ independent-operation opening by push-button (O) or trip unit.

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

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

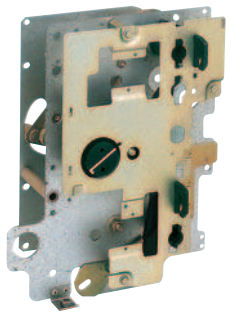
■ **Opening release shunt trip**

■ **Closing release shunt trip**

■ **Motor option**

*(*) Included with the motor option*

61032N



## Double-function operating mechanism CS

■ **Switch and earthing 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,
□ disconnector (2 O + 3 C) and earthing switch (1 O + 1 C) for units DM1-A, DM1-D, DM1-W, DM2,
□ disconnector (1 O + 2 C) for units CM, CM2, TM, DM1-A, DM1-D, DM2.

■ **Mechanical indications**
Fuses blown in units CM, CM2 and TM.

# Operating mechanisms

PE57163

## Single-function operating mechanism RI for the SF circuit breaker

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

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

■ **Mechanical indications**
Operation counter.

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

■ **Closing release**
□ shunt trip

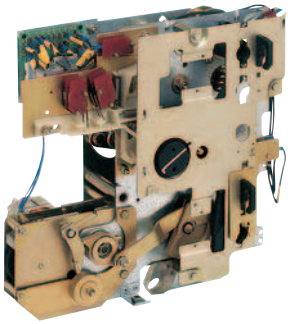
■ **Motor option** (option and installation at a later date possible).

**Possible combinations between opening releases**

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

# Auxiliaries selection

61036N



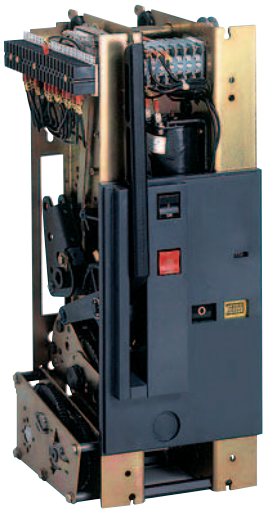
## Motor option and releases for switch-units

The operating mechanisms CIT, CI1 and CI2 may be motorised.
The motor option can be installed on the site “switch open” without replacement the operating mechanism.

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

** Please consult us for other frequencies.*

PE57164



## Motor option and releases for circuit breakers

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

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

** Please consult us for other frequencies.*

# Instrument transformers

PE57222

*Current transformer ARM6T*

## Current transformers

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

**Transformer ARM6T/N1 or N2**

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

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

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

PE57162

*Transformer TLP 130*

## Low Power Current Transformer (LPCT)

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

**Transformer TLP 130, TLP 190**

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

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

### LPCT advantages

More reliable and safe solution for a wide rated primary current range with smaller dimensions.

- No possibility to cause insulation faults. LPCT's are installed on the high voltage cables, they are not undervoltage.
- Not effected from short circuit dynamic and thermic forces. LPCT's are not connected directly to the primary circuit.
- Accuracy is guaranteed up to the primary and short time thermal current.
- More safe secondary circuit operations,. LPCT's have low output voltage, they provide voltage only for relay.
- Easy installation and maintenance. LPCT's have smaller and fixed dimensions, they are covering less space in a cubicle and their dimensions do not change according to changing current. Conventional type CT's are covering larger spaces and their dimensions are directly proportional with the rated primary current.

Optimum solution for protection and measurement (Accuracy class for measuring 0.5) requirements.

# Instrument transformers

PE57223

*Voltage transformer VRF3*

PE57224

*Voltage transformer VRC3*

## Voltage transformers

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

**Transformer VRF3n/S2** (phase-to-earth)
- single primary winding
- single secondary

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

### For units CM2

**Transformer VRC3/S1** (phase-to-phase)
- single primary winding
- single secondary

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

### For units TM

**Transformer VRC3/S1** (phase-to-phase)
- single primary winding
- single secondary

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

## Surge arrester

### For units IM, DM1-A, SM, GAM2

| | |
|---|---|
| In (A) | 630 |
| Un (kV) | 36 |

# Interlocks

## Switch units

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

## Circuit-breaker units

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

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

## Functional interlocks

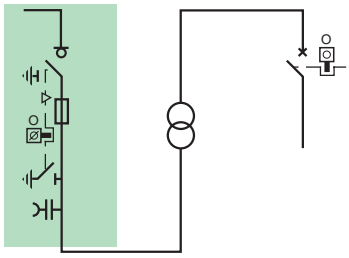
These comply with IEC recommendation 62271-200.
In addition to the functional interlocks, each disconnector and switch include:
■ **built-in padlocking** capacities (padlocks not supplied)
■ **four knock-outs** that may be used for keylocks (supplied on request) for mechanism locking functions.

**Unit interlock**

| Units | Interlock | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | A1 | C1 | C4 | A3 | A4 | A5 | 50 | P1 | P2 | P3 | P5 |
| IM, IMC | | | | ■ | ■ | | | ■ | | | |
| PM, QM, DM1-A, DM1-D, DM1-W | ■ | ■ | ■ | | | | ■ | | | | |
| SM | | | | | | | | | ■ | ■ | |
| GAM | | | | | | ■ | ■ | | | | ■ |

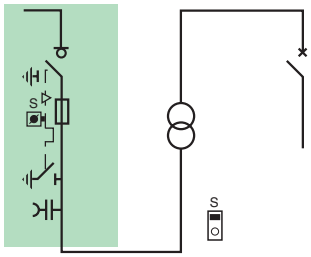
DE58613

**A1 type**



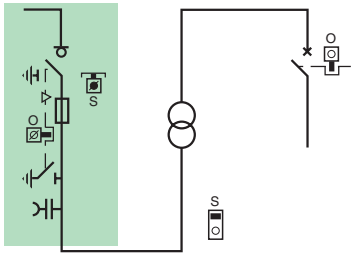

DE58614

**C1 type**




DE58615

**C4 type**




## Key-type interlocks

### Outgoing units

**Aim:**

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

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

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

MT20240EN

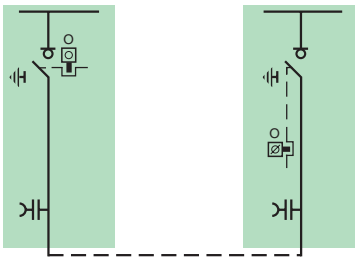
**Legend for key-type interlocks:**

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

# Interlocks

DE58616

**A3 type**



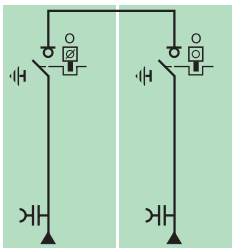
## Ring units

**Aim:**

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

DE58617

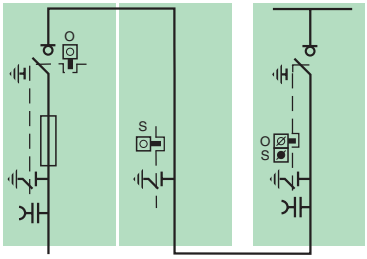
**A4 type**



■ to prevent the simultaneous closing of two switches.

DE58618

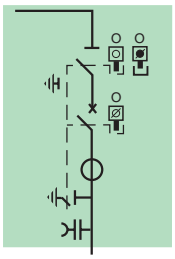
**A5 type**




■ 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.

DE58619

**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).

MT20240EN

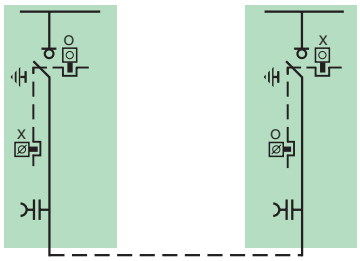
**Legend for key-type interlocks:**

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

# Interlocks

DE58620

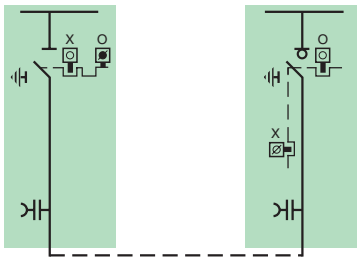
**P1 type**




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

DE58621

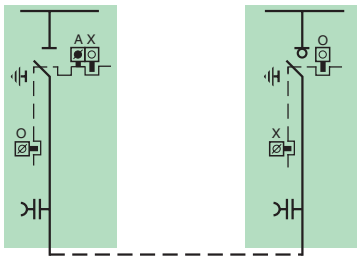
**P2 type**




■ 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”.

DE58622

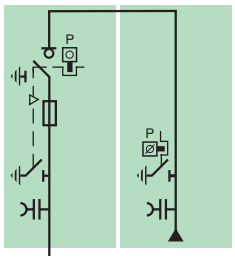
**P3 type**




■ 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.

DE58623

**P5 type**




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

MT20240EN

**Legend for key-type interlocks:**

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

# Transformer protection
## Fuses selection

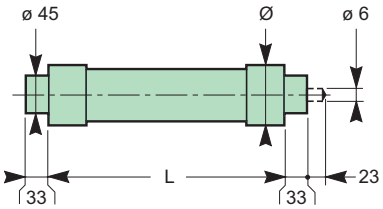
PE57161

Fuse ratings for SM6-36 protection units such as PM, QM, depend, among other things, on the following criteria:
- service voltage
- transformer rating
- fuse technology (manufacturer).

Different types of fuses with medium loaded striker may be installed.
Fusarc CF fuses as per DIN dimensions 43.625.

**Example:** for the protection of a 400 kVA transformer at 33 kV, select Fusarc CF fuses rated 20 A.

DE58612




## Dimensions of fuses

**Fusarc CF (DIN standards)**

| Rated voltage (kV) | Rating (A) | L (mm) | Ø (mm) | Weight (kg) |
|---|---|---|---|---|
| 36 | 10 - 16 | 537 | 50.5 | 1.8 |
| | 25 | 537 | 57 | 2.6 |
| | 31.5 - 40 | 537 | 78.5 | 4.7 |
| | 50 - 63 | 537 | 86 | 6.4 |

## Selection table of fuses (2)

Rating in A - no overload, –5 °C < 0 < 40 °C (1)

| Service voltage (kV) | Transformer rating (kVA) 160 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | Rated voltage (kV) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **For dry type transformers** | | | | | | | | | | | | |
| **Fusarc CF** | | | | | | | | | | | | |
| 30 | 10 | 10 | 16 | 20 | 25 | 31.5 | 31.5 | 50 | 50 | 63 | 63 | 36 |
| 31.5 | 10 | 10 | 16 | 20 | 25 | 25 | 31.5 | 50 | 50 | 63 | 63 | 36 |
| 33 | 6.3 | 10 | 16 | 20 | 25 | 25 | 31.5 | 40 | 50 | 50 | 63 | 36 |
| 34.5 | 6.3 | 10 | 16 | 20 | 25 | 25 | 31.5 | 40 | 50 | 50 | 63 | 36 |
| **For oil immersed type transformers** | | | | | | | | | | | | |
| **Fusarc CF** | | | | | | | | | | | | |
| 30 | 10 | 10 | 16 | 20 | 25 | 31.5 | 31.5 | 40 | 40 | 50 | 63 | 36 |
| 31.5 | 10 | 10 | 16 | 20 | 25 | 31.5 | 31.5 | 40 | 40 | 50 | 63 | 36 |
| 33 | 10 | 10 | 16 | 20 | 25 | 25 | 31.5 | 31.5 | 40 | 40 | 50 | 36 |
| 34.5 | 10 | 10 | 16 | 20 | 25 | 25 | 31.5 | 31.5 | 40 | 40 | 50 | 36 |

***(1)*** *Please consult us for overloads and operation over 40°C.*
***(2)*** *This selection table has been prepared according to the technical characteristics of France Transfo.*
*The characteristics of transformers and fuses may change according to manufactures and standards.*

### 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 overcurrent 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.

# Connections
## Connections with dry-type cables

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

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

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

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

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

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

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

**The bimetallic cable end terminals are:**
■ round connection and shank for cables ⩽ 240 $mm^2$.
Crimping of cable lugs to cables must be carried out by stamping.

**The end connectors are of cold fitted type**
Schneider Electric's experience has led it to favour this technology wherever possible for better resistance over time.

**The maximum admissible copper(*) cable cross section:**
■ 2 x (1 x 240 $mm^2$ per phase) for 1250 A incomer and feeder cubicles
■ 240 $mm^2$ for 400-630 A incomer and feeder cubicles
■ 95 $mm^2$ for transformer protection cubicles with fuses.

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

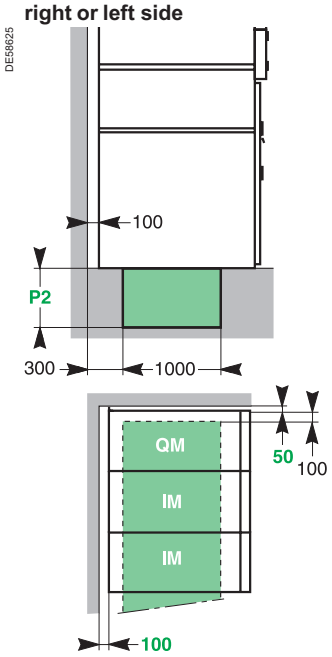
*(*) Consult us for alu cable cross sections*

## Cabling from below

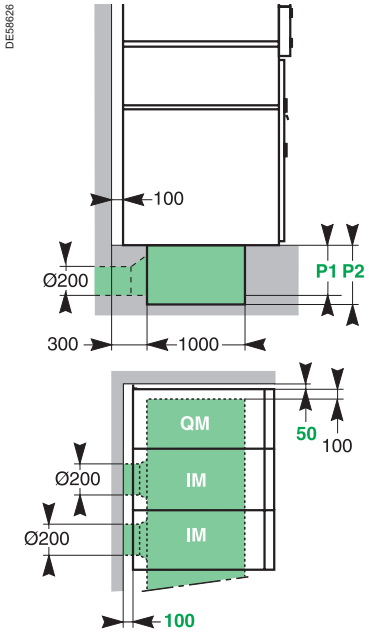
All units through trenches
■ the trench depth P is given in the table opposite for commonly used types of cables.

## Trench diagrams

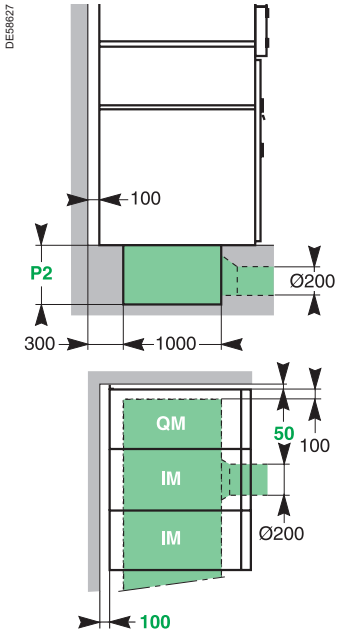
**Cable entry or exit through right or left side**




**Rear entry or exit with conduits**



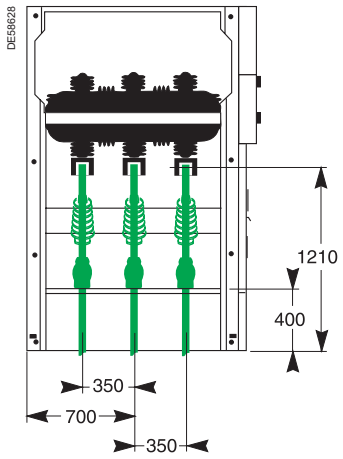

**Front entry or exit with conduits**



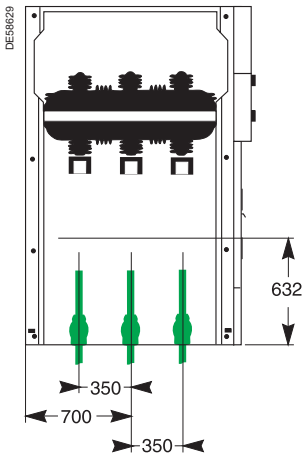
# Installation

## Cable-connection height

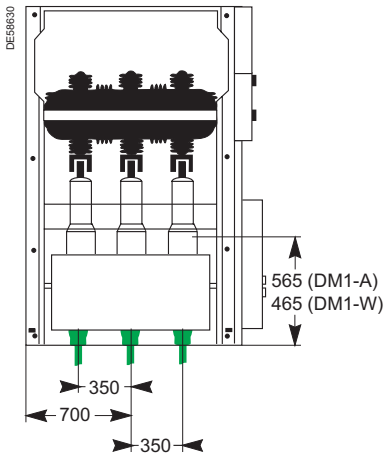
**IM, SM units**



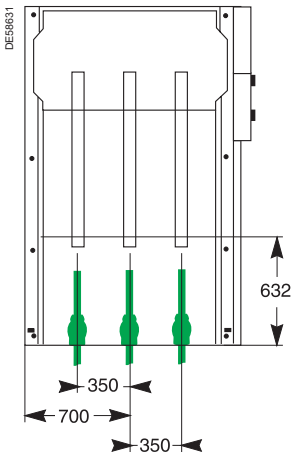

**QM, PM units**




**DM1-A, DM1-W units**




**GAM2 unit**




## Floor preparation

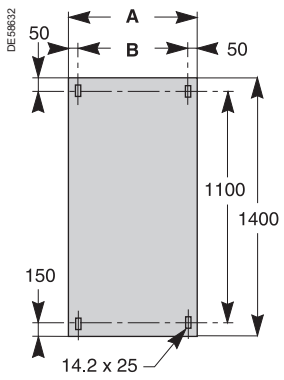
Units may be installed on ordinary concrete floors, with or without trenches depending on the type and cross-section of cables.
Required civil works are identical for all units.

## Dimensions and weights

| Unit type | Height (mm) | Width (mm) | Depth (1) (mm) | Weight (kg) |
|---|---|---|---|---|
| IM, SM | 2250 | 750 | 1400 (3) | 310 |
| IMC, IMB | 2250 | 750 | 1400 (2) | 420 |
| QM, PM, QMB | 2250 | 750 | 1400 (3) | 330 |
| QMC | 2250 | 1000 | 1400 (3) | 420 |
| DM1-A | 2250 | 1000 | 1400 (2) | 600 |
| DM1-D | 2250 | 1000 | 1400 (2) | 560 |
| DM1-W | 2250 | 1000 | 1400 (2) | 660 |
| NSM | 2250 | 1500 | 1400 (2) | 620 |
| GIM | 2250 | 250 | 1400 | 90 |
| DM2 | 2250 | 1500 | 1400 (2) | 900 |
| DM2-W | 2250 | 1500 | 1400 (2) | 920 |
| CM, CM2 | 2250 | 750 | 1400 (2) | 460 |
| GBC-A, GBC-B | 2250 | 750 | 1400 (3) | 420 |
| GBM | 2250 | 750 | 1400 (3) | 260 |
| GAM2 | 2250 | 750 | 1400 (3) | 250 |
| GAM | 2250 | 750 | 1400 (3) | 295 |

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

## 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**

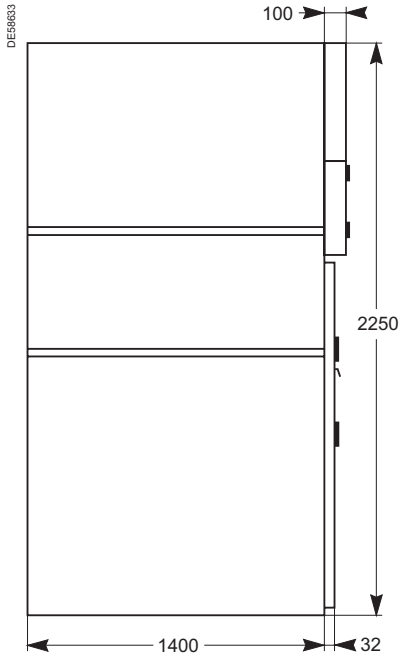
■ for switchboards comprising up to three units, the four corners of the switchboard must be secured to the floor using:
□ bolts (not supplied) screwed into nuts set into the floor using a sealing pistol
□ screw rods grouted into the floor
■ for switchboards comprising more than three units, the number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

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

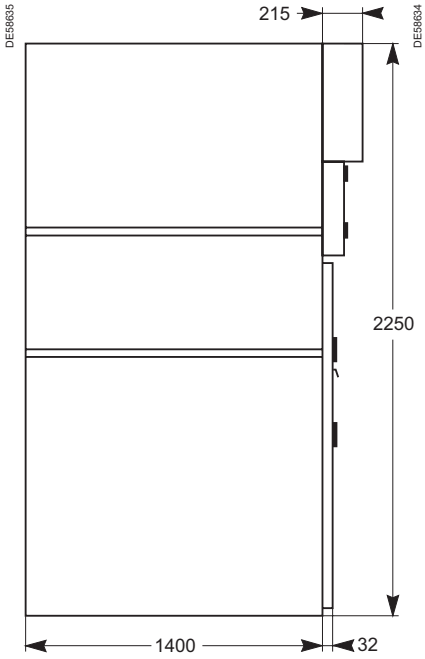
# Installation

## Dimensions

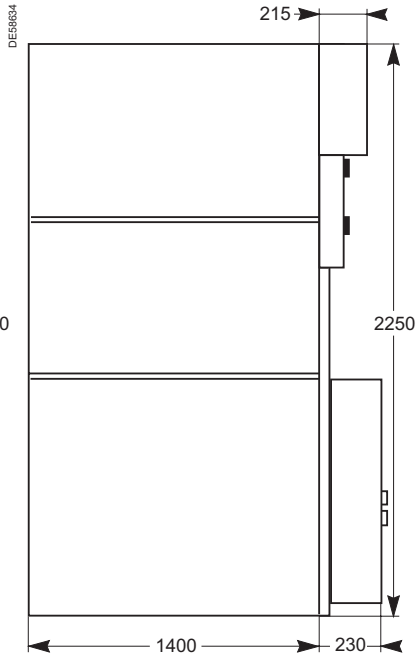
**IM, SM, IMC, QM, PM, IMB, GBM, GAM, GAM2, GBC-A,GBC-B QMB, QMC units**




**CM, CM2, NSM units**

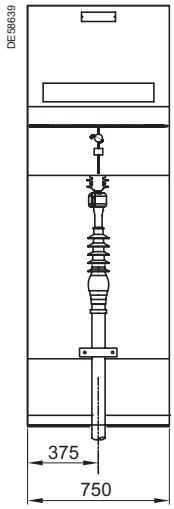



**DM1-A, DM1-D, DM2, DM1-W, DM2-W units**

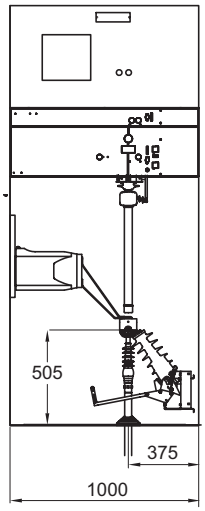



## Cable positions

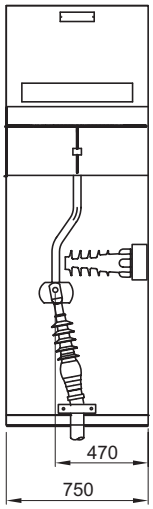
**IM, SM**



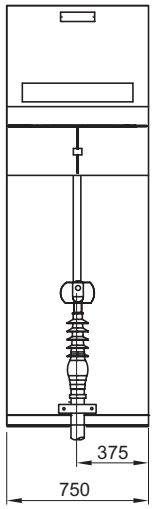

**QMC**



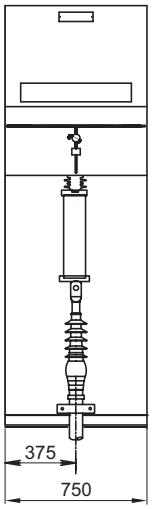

**GAM**



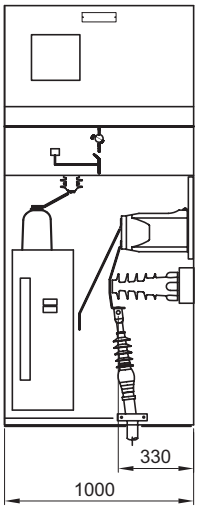

**GAM2**




**QM, PM**

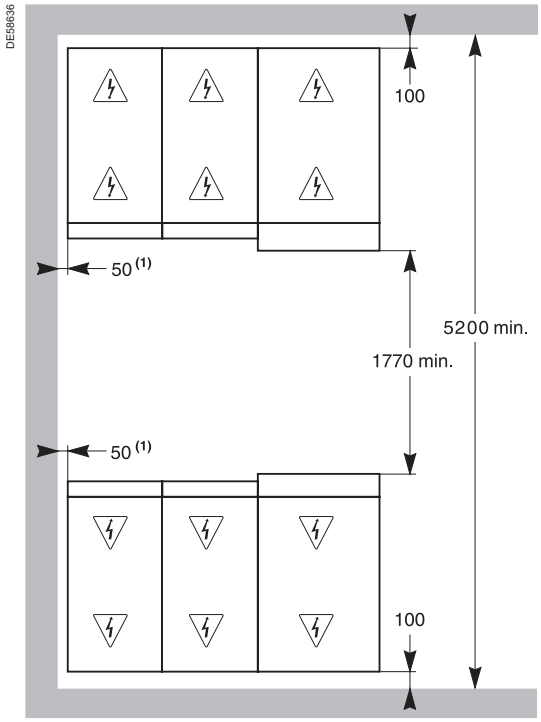



**DM1-A**

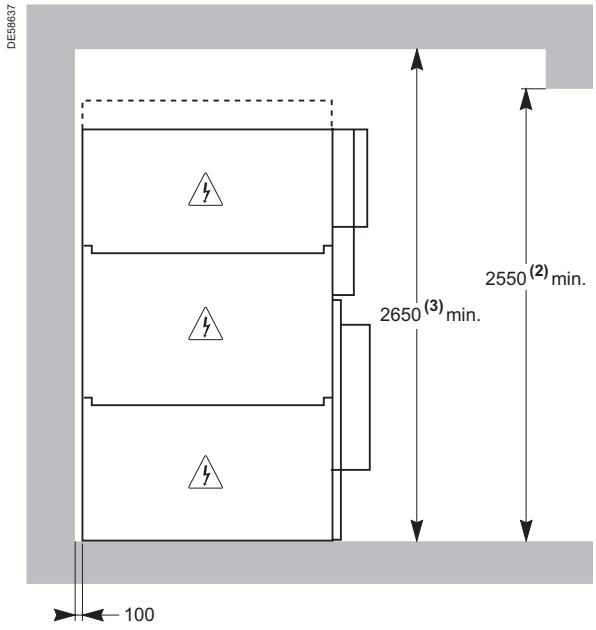


## Conventional concrete substation

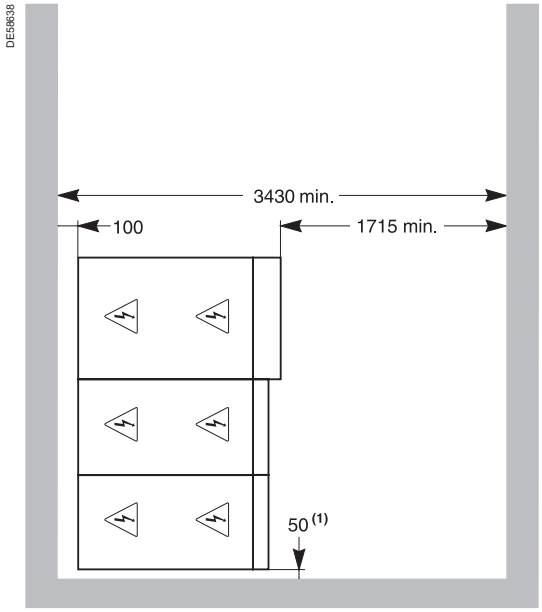
**Top view**




**Side view**




**Top view**




*Minimum required dimensions (mm)*
*(1) 100 mm for internal arc version*
*(2) In case of upper incoming option: it must be 2730 mm*
*(3) In case of upper incoming option: it must be 2830 mm*

# Order form
## SM6-36
## Connection to the network

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

## Basic cubicle

Quantity

| | |
|---|---|
| **Rated voltage Ur** | **(kV)** |
| **Service voltage** | **(kV)** |
| **Short-circuit current Isc** | **(kA)** |
| **Rated current Ir** | **(A)** |

**Type of cubicle**
IM 750 ☐ IMB 750 ☐ IMC 750 ☐ SM 750 ☐

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

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

## Options

**Replacement of CIT by** CI1 ☐ CI2 ☐

**Electrical driving motorization** CIT ☐

**Electrical driving mechanism (with O/C coils and AC contacts)**
CI1 ☐ CI2 ☐

**O/C coils without electrical driving mechanism** CI1 ☐ CI2 ☐

**Electrical driving mechanism** and/or coil voltage (not applicable on SM cubicle)

| | | |
|---|---|---|
| 24 Vdc ☐ | 110 Vdc ☐ | 120/127 Vac (50 Hz) ☐ |
| 32 Vdc ☐ | 120-125 Vdc ☐ | 220/230 Vac (50 Hz) ☐ |
| 48 Vdc ☐ | 137 Vdc ☐ | 120/127 Vac (60 Hz) ☐ |
| 60 Vdc ☐ | 220 Vdc ☐ | 220/230 Vac (60 Hz) ☐ |

**Signalling contact** 1 C on SW and 1 O & 1 C on ES (not applicable on SM cubicle) ☐
2 O & 2 C on SW ☐ 2 O & 3 C on SW and 1 O & 1 C on ES ☐

**Top incomer** (Single core cable maxi 240 mm$^2$ with voltage indicator) ☐

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

**Interlocking**

| | | | |
|---|---|---|---|
| For all cubicle (except SM) | A4 ☐ | A3 SM6-SM6 ☐ | P1 SM6-SM6 ☐ |
| Localisation of 2nd lock for A3 | | On switch ☐ | On earthing switch ☐ |
| Localisation of 2nd lock for A4 | | | Cubicle no. |
| SM cubicle only | | P2 SM6-SM6 ☐ | P3 SM6-SM6 ☐ |

**Surge arresters** (not applicable on IMB cubicle) 36 kV ☐

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

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

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

| | | | |
|---|---|---|---|
| **Cubicle** | With relay ☐ | | Without relay ☐ |
| **Communication protocol** | Modbus ☐ | IEC ☐ | DNP ☐ |
| **Modem type** | | RS232 ☐ | RS485 ☐ |
| Not for DNP | PSTN ☐ | GSM ☐ | FSK ☐ |
| **3 core balance current transformers** | | | ☐ |

**Flair fault indicator**
21D ☐ 21DT ☐ 22D ☐ 23D ☐ 23D zero sequence ☐
**or ammeter** AMP 21D ☐

# Order form
## SM6-36
## Fuse switch protection

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

## Basic cubicle

Quantity

| | |
|---|---|
| **Rated voltage Ur** | **(kV)** |
| **Service voltage** | **(kV)** |
| **Short-circuit current Isc** | **(kA)** |
| **Rated current Ir** | **(A)** |

**Type of cubicle**
PM 750 ☐ QM 750 ☐ QMB 750 ☐ QMC 1000 ☐

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

**Direction of lower busbars for QMB**
Left ☐ Right ☐

## Options

**Fuses** (see fuse price structure) ☐

**Replacement of mechanism**
For PM: CIT by CI1 ☐ CIT by CI2 ☐
For QM: CI1 by CI2 ☐

**Electrical driving mechanism**

| | | |
|---|---|---|
| 24 Vdc ☐ | 110 Vdc ☐ | 120/127 Vac (50 Hz) ☐ |
| 32 Vdc ☐ | 120-125 Vdc ☐ | 220/230 Vac (50 Hz) ☐ |
| 48 Vdc ☐ | 137 Vdc ☐ | 120/127 Vac (60 Hz) ☐ |
| 60 Vdc ☐ | 220 Vdc ☐ | 220/230 Vac (60 Hz) ☐ |

**Shunt trip**
Opening (on CI1) ☐ Closing and opening (on CI2) ☐

| | | |
|---|---|---|
| 24 Vdc ☐ | 110 Vdc ☐ | 120/127 Vac (50 Hz) ☐ |
| 32 Vdc ☐ | 120-125 Vdc ☐ | 220/230 Vac (50 Hz) ☐ |
| 48 Vdc ☐ | 137 Vdc ☐ | 120/127 Vac (60 Hz) ☐ |
| 60 Vdc ☐ | 220 Vdc ☐ | 220/230 Vac (60 Hz) ☐ |
| | | 380 Vac (50/60 Hz) ☐ |

**Auxiliary contact signalling**
1 C on SW and 1 O & 1 C on ES ☐
2 O & 2 C on SW ☐ 2 O & 3 C on SW and 1 O & 1 C on ES ☐

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

**Top incomer** (Single core cable maxi 240 $mm^2$ with voltage indicator) ☐

**Interlocking** C4 ☐ A1 ☐ C1 ☐

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

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

# Order form
## SM6-36
## Circuit breaker protection

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

## Basic cubicle

Quantity

| | |
|---|---|
| **Rated voltage Ur** | **(kV)** |
| **Service voltage** | **(kV)** |
| **Short-circuit current Isc** | **(kA)** |
| **Rated current Ir** | **(A)** |

**Type of cubicle**

| | | |
|---|---|---|
| DM1-A 1000 | DM1-D left 1000 | DM1-D right 1000 |
| DM1-W 1000 | DM2 left 1500 | DM2 right 1500 |
| | | DM2-W right 1500 |

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

**Voltage of the auxiliaries**: 48/60 Vdc; 110/125 or 220/250 Vdc; 110/130 or 220/240 Vac (50 Hz)

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

## Options

**Top incomer** (cable maxi 240 mm$^2$ with voltage indicator)

**Cable connection by the bottom** (for DM1-A and DM1-W only)
- 3 x 2 x single core cable maxi 240 mm$^2$

**Interlocking** (not applicable on DM2): C4; A1; C1

**Current transformers CTs and LPCTs**: See specific order form

**Surge arrester**: 36 kV

**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)

**SF1 circuit breaker**: See specific order form

**Sepam relay protection**: See specific order form

**Replacement of 630 A busbar by 1250 A** (only for DM1-A and DM1-W)

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

# Order form
## SM6-36
## MV metering

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

## Basic cubicle

Quantity

| | | | |
|---|---|---|---|
| **Rated voltage Ur** | | | **(kV)** |
| **Service voltage** | | | **(kV)** |
| **Short-circuit current Isc** | | | **(kA)** |
| **Rated current Ir** | | | **(A)** |
| **Type of cubicle** | CM 750 | CM2 750 | GBC-A 750 |
| | | TM 750 | GBC-B 750 |
| **Internal arc version 16 kA 1 s** (not possible with “top incomer” option) | | | |
| **Direction of lower busbars for GBC-A** | | Left | Right |
| **Position number in the switchboard** (from left to right) | | | |
| **Voltage transformers** | | | See specific order form |
| **Signalling contact** (for CM, CM2 and TM only) | | | 1 O and 2 C on SW |
| | | | Blown fuse mechanical indication (CM, CM2) |
| **Fuses** (for CM, CM2 and TM only) | | | See fuse price structure |

## Options

| | |
|---|---|
| **Current transformers and voltage transformers for GBC** | See specific order form |
| **Top incomer** (cable maxi 240 $mm^2$ with voltage indicator) | |
| **Replacement of 630 A busbar by 1250 A** (for CM, CM2 and TM only) | |

# Order form
## SM6-36
## Casing

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

### Basic cubicle

Quantity

| | | | |
|---|---|---|---|
| **Rated voltage Ur** | | | **(kV)** |
| **Service voltage** | | | **(kV)** |
| **Short-circuit current Isc** | | | **(kA)** |
| **Rated current Ir** | | | **(A)** |
| **Type of cubicle** | GAM 750 ☐ | GAM2 750 ☐ | GBM 750 ☐ |
| **Position number in the switchboard** (from left to right) | | | |
| **Direction of lower busbars for GBM** | | | |
| Left (impossible on the first cubicle of the switchboard) ☐ | | | Right ☐ |

### Options

- **Top incomer** (single core cable maxi 240 mm$^2$ with voltage indicator) ☐
- **Replacement of 630 A busbar by 1250 A** (for GAM2 only) ☐
- **Internal arc version 16 kA 1 s** (not possible with “top incomer” option) ☐

# Order form
## SM6-36
## Automatic Transfer System

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

## Basic cubicle

Quantity

**Rated voltage Ur** (kV)

**Service voltage** (kV)

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

**Rated current Ir** (A)

**Type of cubicle** NSM busbar ☐ NSM cable ☐

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

**Incoming busbar for NSM busbar**
Left ☐ Right ☐

**Cable connection by the bottom** (cable maxi 240 mm$^2$) **for NSM cable**
Three core on both ☐ Single core on both ☐ 2 x single core on both ☐
3 x single core on one cubicle and 2 x three core on the other one ☐

**Stand by source**
Generator — Without paralleling ☐
Utility — With paralleling ☐ Without paralleling ☐

## Options

**Signalling contact** 1 C on SW and 1 O & 1C on ES ☐

**Operation counter** ☐

**Interlocking** SM6-SM6
- 1 x P1 — Right cubicle ☐ Left cubicle ☐
- 2 x P1 — Right and left cubicle ☐
- 1 x A3 — Right cubicle ☐ Left cubicle ☐
- On switch ☐ On earthing switch ☐
- 2 x A3 Right cubicle — On switch ☐ On earthing switch ☐
- Left cubicle — On switch ☐ On earthing switch ☐

**Telecontrol** (only with utility stand by source) ☐

**Communication protocol** Modbus ☐ IEC ☐ DNP ☐

**Modem type** RS232 ☐ RS485 ☐

Not for DNP — PSTN ☐ GSM ☐ FSK ☐

# Order form

## SF1 fixed or withdrawable for SM6-36

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

## Basic circuit breaker

Quantity

| | | | |
|---|---|---|---|
| **Rated voltage Ur** | | | **(kV)** |
| **Service voltage** | | | **(kV)** |
| **Impulse voltage Up** | | | **(kVbil)** |
| **Short-circuit current Isc** | | | **(kA)** |
| **Rated current Ir** | | | **(A)** |
| **Frequency** | | | 50 Hz |
| **Installation** | Fixed | A1 | B1 |
| | Withdrawable | | B1 |

**Colour for push buttons and indicators**

Push buttons open/close: Red/black
Indicator open/close: Black/white
Operating mechanism charged/discharged: White/yellow

## Circuit breaker options

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

Shunt opening release **YO1**

| | | | |
|---|---|---|---|
| 24 Vdc | 48 Vdc | 110 Vdc | 48 Vac (50 Hz) |
| 30 Vdc | 60 Vdc | 125 Vdc | 110 Vac (50 Hz) |
| | | 220 Vdc | 230 Vac (50 Hz) |

Undervoltage release **YM**

| | | | |
|---|---|---|---|
| 24 Vdc | 48 Vdc | 110 Vdc | 48 Vac (50 Hz) |
| 30 Vdc | 60 Vdc | 125 Vdc | 110 Vac (50 Hz) |
| | | 220 Vdc | 220 Vac (50 Hz) |

| | | |
|---|---|---|
| Mitop | Without contact | With contact |

### 2nd opening release (see possible choices combination table below)

Shunt opening release **YO2**

| | | | |
|---|---|---|---|
| 24 Vdc | 48 Vdc | 110 Vdc | 48 Vac (50 Hz) |
| 30 Vdc | 60 Vdc | 125 Vdc | 110 Vac (50 Hz) |
| | | 220 Vdc | 230 Vac (50 Hz) |

Undervoltage release **YM**

| | | | |
|---|---|---|---|
| 24 Vdc | 48 Vdc | 110 Vdc | 48 Vac (50 Hz) |
| 30 Vdc | 60 Vdc | 125 Vdc | 110 Vac (50 Hz) |
| | | 220 Vdc | 220 Vac (50 Hz) |

| | | |
|---|---|---|
| Mitop | Without contact | With contact |

### Remote control

| | | |
|---|---|---|
| Electrical motor **M** | 24…32 Vdc | 110…127 Vdc/ac |
| | 48…60 Vdc/ac | 220…250 Vdc/ac |

Shunt closing release **YF**

| | | | |
|---|---|---|---|
| 24 Vdc | 48 Vdc | 110 Vdc | 48 Vac (50 Hz) |
| 30 Vdc | 60 Vdc | 125 Vdc | 110 Vac (50 Hz) |
| | | 220 Vdc | 220 Vac (50 Hz) |

| | | |
|---|---|---|
| **Leaflets language** | French | English |

*Different releases combinations*

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