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# MV prefabricated equipment

## SM6

### IM, IMC Cubicles

## Incoming or Outgoing Load Break Switch Unit up to 24 kV

### Introduction

IM and IMC are part of SM6 product range. This SM6 range is made up of modular units and used for the MV/LV substation in secondary distribution system up to 24 kV

### Application

IM is usually applied for incoming switchgear for on load switching. IMC is IM type cubicle with additional current transformer for measurement (for overload protection please consult us).

This IM or IMC is normally installed in the system with other part of SM6 product range such as QM, \* auxiliary contacts QMC, CM, DM1, DM2, etc., in accordance with the design of a distribution system.

### Basic Equipment

- \* SF6 Functional load break switch and earthing switch
- \* Three phase busbar 630 A
- \* CIT operating mechanism (IM & IMC)
- \* Voltage presence indicators
- \* Heater 50 W, 220 VAC
- \* Three current transformers (IMC)
- \* Connection pads for dry-type cables

### Condition Monitoring

- \* Basic : thermal sensors (TH110)
- \* Option : humidity sensors (CL110)

### Option

- \* Motor for operating mechanism
- \* key-type interlocks
- \* release units (coil)
- \* operation counter
- \* visibility of main contacts
- \* pressure indicator device
- \* earth fault indicators
- \* digital ammeter
- \* surge arrester
- \* arc detection

SM6 units meet all the following standards and specifications:

- IEC standards
- UTE standards for SM6-24
- EDF specifications for SM6-24
- SEISMIC standards for 24 kV

### IEC standards

62271-200 ,62271-1, 62271-103, 62271-105, 62271-100, 62271-102, 61869-2, 61869-3, 60044-8, 62271-206, 62271-304

### SEISMIC standards for 24kV

IEEE-693 2005  
EN600068-3-3 1993

### UTE standards for 24 kV

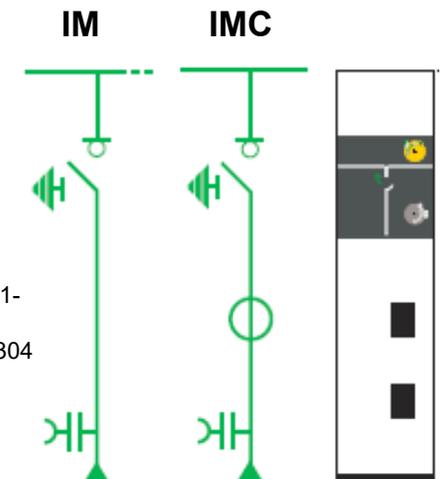
NFC 13.100  
NFC 13.200  
NFC 64.130  
NFC 64.160

### EDF specifications for 24 kV

HN 64-S-41  
HN 64-S-43

### Colour

White RAL 9003



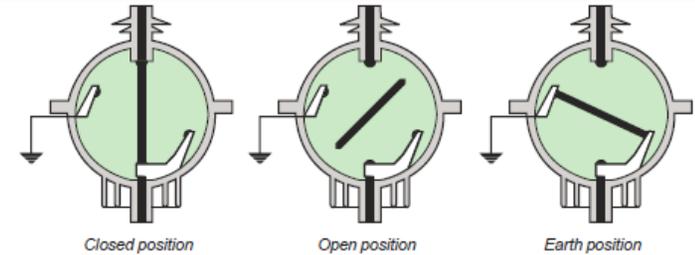
# MV prefabricated equipment SM6 IM, IMC Cubicles

## Electrical characteristics

| Rated voltage                | Ur                   | kV                       | 7.2               | 12               | 17.5 | 24  |
|------------------------------|----------------------|--------------------------|-------------------|------------------|------|-----|
| <b>Insulation level</b>      |                      |                          |                   |                  |      |     |
| Insulation                   | Ud                   | 50/60 Hz, 1 min (kV rms) | 20                | 28               | 38   | 50  |
| Insulation                   | Ud                   | 50/60 Hz, 1 min (kV rms) | 23                | 32               | 45   | 60  |
| Insulation                   | Up                   | 1.2/50 $\mu$ s (kV peak) | 60                | 75               | 95   | 125 |
| Insulation                   | Up                   | 1.2/50 $\mu$ s (kV peak) | 70                | 85               | 110  | 145 |
| <b>Breaking capacity</b>     |                      |                          |                   |                  |      |     |
| Transformer off load         |                      | A                        | 16                |                  |      |     |
| Cables off load              |                      | A                        | 31.5              |                  |      |     |
| Rated current                | Ir                   | A                        | 400 - 630 - 1250  |                  |      |     |
| Short-time withstand current | Ik/tk <sup>(1)</sup> | kA/1 s                   | 25                | 630 - 1250       |      |     |
|                              |                      |                          | 20 <sup>(2)</sup> | 630 - 1250       |      |     |
|                              |                      |                          | 16                | 630 - 1250       |      |     |
|                              |                      |                          | 12.5              | 400 - 630 - 1250 |      |     |
| Making capacity (50 Hz)      | Ima                  | kA                       | 62.5              | 630              | NA   |     |
|                              |                      |                          | 50                | 630              |      |     |
|                              |                      |                          | 40                | 630              |      |     |
|                              |                      |                          | 31.25             | 400 - 630        |      |     |



Switch-disconnector for 24 kV



## Switch or disconnector and earthing switch

### • Gas tightness

The three rotating contacts are placed in an enclosure filled with gas to a relative pressure of 0.4 bar (400 hPa) for SM6-24 and 1 bar (1000 hPa) for SM6-36. It satisfies "sealed pressure system" requirements and seal tightness is always factory checked, and leakage rate is less than 0.1% for 30 years life span.

### • Operating safety

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

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# MV prefabricated equipment SM6 IM, IMC Cubicles

## Normal operating conditions

- **Ambient air temperature:**

- 1) less than or equal to 40°C
- 2) less than or equal to 35°C on average over 24 hours
- 3) greater or equal to -5°C.

- **Altitude**

- 1) less than or equal to 1000 m
- 2) above 1000 m, a derating coefficient is applied (please consult us).

- **Solar radiation**

- 1) no solar radiation influence is permitted.

- **Ambient air pollution**

- 1) no significant pollution by dust, smoke, corrosive and/or flammable gases, vapours or salt.

- **Humidity**

- 1) average relative humidity over a 24 hour period, less than or equal to 95%
  - 2) average relative humidity over a 1 month period, less than or equal to 90%
  - 3) average vapor pressure over a 24 hour period, less than or equal to 2.2 kPa
  - 4) average vapor pressure over a 1 month period, less than or equal to 1.8 kPa.
- For these conditions, condensation may occasionally occur. Condensation can be expected where sudden temperature changes occur in periods of high humidity. To withstand the effects of high humidity and condensation, such as breakdown of insulation, please pay attention on Civil Engineering recommendations for design of the building or housing, by suitable ventilation and installation.

- **Seismic (for 24 Kv and 36 kV):**

- 1) Up to 0.5 g (horizontal) and 0.4 g (vertical)
- 2) Class 2 for 24 kV and Class 1 for 36kV
- 3) According to standards IEEE-693/2005 and EN 60068-3/1993 for the 24 kV and 36 kV

## Protection index:

- Classes: PI (insulating partition)
- Loss of service continuity classes: LSC2A (LSC1 for metering GAM/GBM functions)
- Units in switchboard: IP3X
- Between compartments: IP2X for SM6-24, IP2XC for SM6-36
- Cubicle: IK08 for SM6-24, IK07 for SM6-36.

## Electro-magnetic compatibility:

- Relays: 4 kV withstand capacity, as per recommendation IEC 60801.4
- Compartments:
  - electrical field:
    - 40 dB attenuation at 100 MHz
    - 20 dB attenuation at 200 MHz
  - magnetic field: 20 dB attenuation below 30 MHz.
- According to standards IEEE-693/2005 and EN 60068-3/1993
- for 36 kV** (please contact us).

## Temperatures:

The cubicles must be stored and installed in a dry area free from dust and with limited temperature variations.

- For stocking: from -40°C to +70°C
- For working: from -5°C to +40°C
- Other temperatures, consult us.
- Seismic:
  - for 24 kV** (option):
    - 1) Up to 0.5 g (horizontal) and 0.4 g (vertical)
    - 2) Class 2

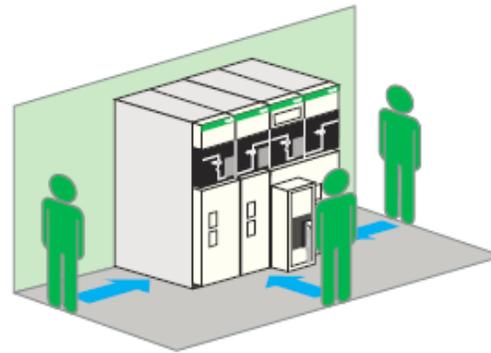
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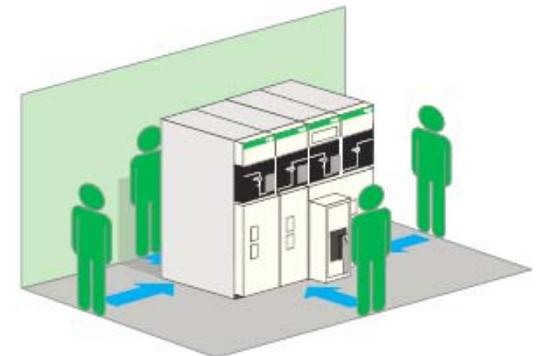
# MV prefabricated equipment SM6 IM, IMC Cubicles

## Safety of people By internal arc protection

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



Example of installation of an SM6 switchboard installed against the wall downwards exhaust 12.5 kA 1 s and 16 kA 1 s, IAC: A-FL: 3-sides internal arc protection



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

### Internal arc withstand

(in conformity with IEC 62271-200)

•• 3 versions are available for SM6-24:

Basic:

-- 12.5 kA 1 s, IAC: A-FL

Advance:

-- 12.5 kA 1 s, IAC: A-FLR

-- 16 kA 1 s, IAC: A-FL & IAC: A-FLR

-- 20 kA 1 s, IAC: A-FL & IAC: A-FR

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.

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# MV prefabricated equipment SM6 IM, IMC Cubicles

## Continuous Thermal Monitoring

The power connections in the Medium Voltage products are one of the most critical points of the substations especially for those made on site like:

- MV Cable connections

Loose and faulty connections cause an increase of resistance in localized points that will lead to thermal runaway until the complete failure of the connections. Preventive maintenance can be complicated in severe operating conditions also due to limited accessibility and visibility of the contacts.

The continuous thermal monitoring is the most appropriate way to early detect a compromised connection.

## Easergy TH110 Thermal Sensor

Easergy TH110 is part of the new generation of wireless smart sensors ensuring the continuous thermal monitoring of all the critical connections made on field allowing to:

- Prevent unscheduled downtimes
- Increase operators and equipments safety
- Optimize and predictive maintenance

Thanks to its very compact footprint and its wireless communication, Easergy TH110 allows an easy and widespread installation in every possible critical points without impacting the performance of the MV Switchgears.

By using Zigbee Green Power communication protocol, Easergy Th110 ensure a reliable and robust communication that can be used to create interoperable solutions evolving in the Industrial Internet of Things (IIoT) age.

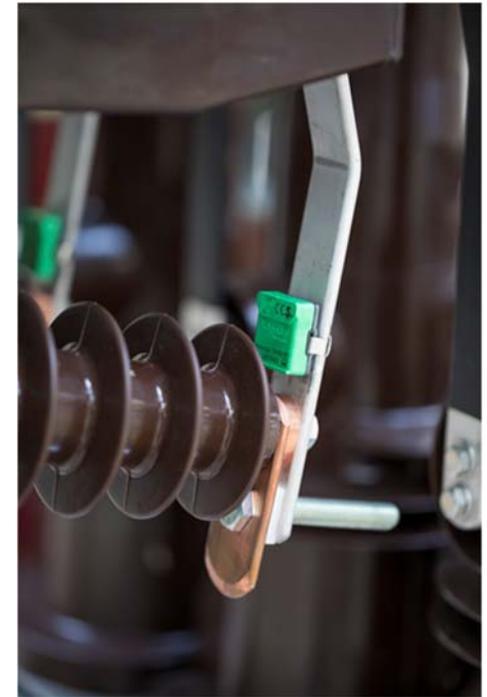
Easergy TH110 is self powered by the network current and it can ensure high performances providing accurate thermal monitoring being in direct contact with the measured point.



Zigbee Dongle



Easergy TH110

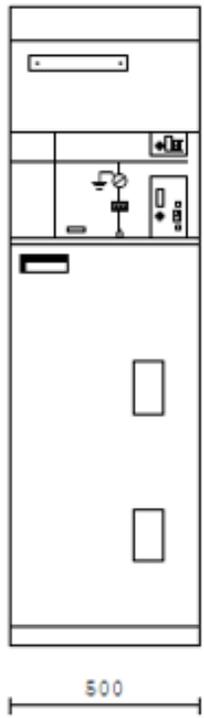


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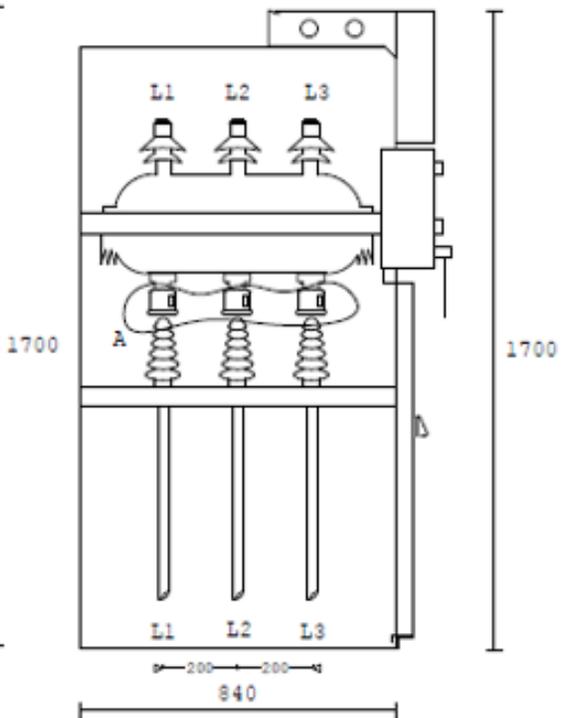
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# MV prefabricated equipment SM6 IM, IMC Cubicles

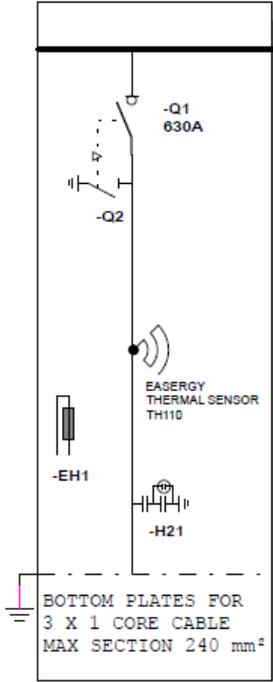
**FRONT VIEW**



**SIDE VIEW**

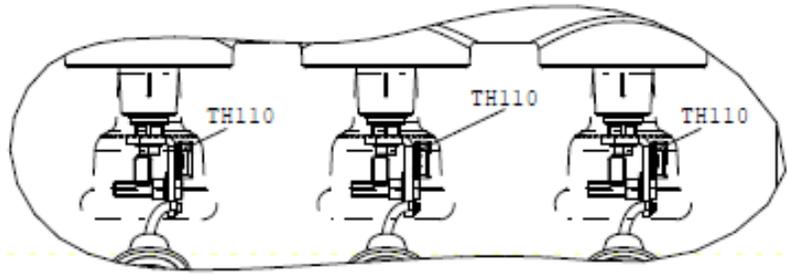


**SLD**



| Overall dimension | IM   | IMC  |
|-------------------|------|------|
| Width (mm)        | 500  | 500  |
| Depth (mm)        | 840  | 840  |
| Height (mm)       | 1700 | 1700 |
| Weight (kg)       | 120  | 200  |

Detail A



# MV prefabricated equipment

## SM6

### GAM Cubicle

## Incoming or Outgoing Cable Unit up to 24 kV

### Introduction

GAM is a part of SM6 product range. This SM6 range is made up of modular units and used for the MV/LV substation in secondary distribution system up to 24 kV

### Application

GAM is incoming or outgoing cable connection unit, used for incoming or outgoing cable connection to busbar.

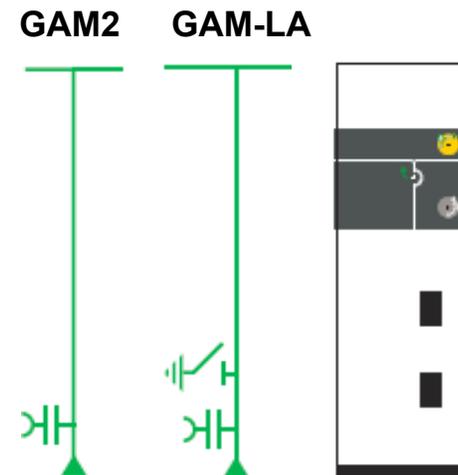
This cubicle is normally installed together in the system with other part of SM6 product range such as IM, IMC, QM,QMC, PM, DM1, DM2, etc., in accordance with the design of a distribution system.

### Basic Equipment

- \* Three phase busbar 630 A
- \* Voltage presence indicators
- \* Heater 50 W, 220 VAC

### Optional Accessories

- \* Large LV compartment on top of cubicle, h=450 mm
- \* Key-type locks
- \* Earthing switch



# MV prefabricated equipment

## SM6

### GAM Cubicle

## Electrical characteristics

| Rated voltage                | Ur                   | kV                       | 7.2               | 12               | 17.5 | 24  |
|------------------------------|----------------------|--------------------------|-------------------|------------------|------|-----|
| <b>Insulation level</b>      |                      |                          |                   |                  |      |     |
| Insulation                   | Ud                   | 50/60 Hz, 1 min (kV rms) | 20                | 28               | 38   | 50  |
| Isolation                    | Ud                   | 50/60 Hz, 1 min (kV rms) | 23                | 32               | 45   | 60  |
| Insulation                   | Up                   | 1.2/50 $\mu$ s (kV peak) | 60                | 75               | 95   | 125 |
| Isolation                    | Up                   | 1.2/50 $\mu$ s (kV peak) | 70                | 85               | 110  | 145 |
| <b>Breaking capacity</b>     |                      |                          |                   |                  |      |     |
| Transformer off load         |                      | A                        | 16                |                  |      |     |
| Cables off load              |                      | A                        | 31.5              |                  |      |     |
| Rated current                | Ir                   | A                        | 400 - 630 - 1250  |                  |      |     |
| Short-time withstand current | Ik/tk <sup>(1)</sup> | kA/1 s                   | 25                | 630 - 1250       |      |     |
|                              |                      |                          | 20 <sup>(2)</sup> | 630 - 1250       |      |     |
|                              |                      |                          | 16                | 630 - 1250       |      |     |
|                              |                      |                          | 12.5              | 400 - 630 - 1250 |      |     |
| Making capacity (50 Hz)      | Ima                  | kA                       | 62.5              | 630              | NA   |     |
|                              |                      |                          | 50                | 630              |      |     |
|                              |                      |                          | 40                | 630              |      |     |
|                              |                      |                          | 31.25             | 400 - 630        |      |     |

SM6 units meet all the following standards and specifications:

- IEC standards
- UTE standards for SM6-24
- EDF specifications for SM6-24
- SEISMIC standards for 24 kV

### IEC standards

62271-200 ,62271-1, 62271-103, 62271-105, 62271-100, 62271-102, 61869-2, 61869-3, 60044-8, 62271-206, 62271-304

### SEISMIC standards for 24kV

IEEE-693 2005  
EN600068-3-3 1993

### UTE standards for 24 kV

NFC 13.100  
NFC 13.200  
NFC 64.130  
NFC 64.160

### EDF specifications for 24 kV

HN 64-S-41  
HN 64-S-43

### Colour

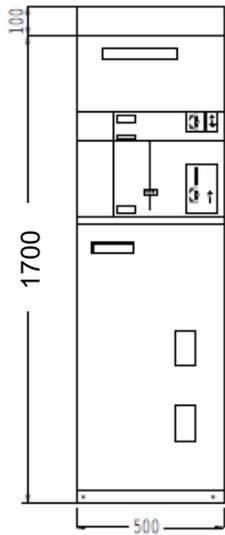
White RAL 9003

Life Is On

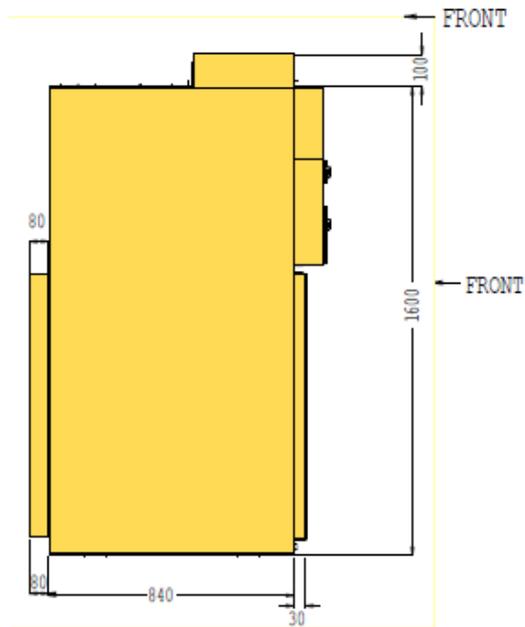
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# MV prefabricated equipment SM6 GAM Cubicles

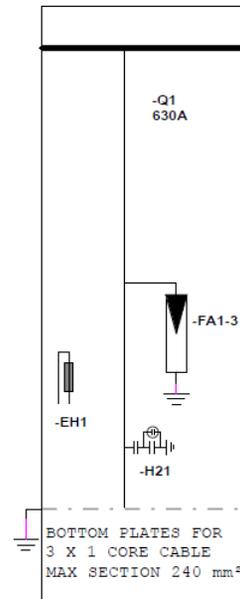
**FRONT VIEW**



**SIDE VIEW**



**SLD  
GAM-LA**



| Overall dimension | GAM2 | GAM-LA |
|-------------------|------|--------|
| Width (mm)        | 500  | 500    |
| Depth (mm)        | 940  | 940    |
| Height (mm)       | 1700 | 1700   |
| Weight (kg)       | 120  | 160    |

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# MV prefabricated equipment SM6 DM1-A, DM1-W Cubicles

## Incoming or Outgoing, Fixed or Withdrawable Single Isolation Circuit Breaker up to 24 kV

### Introduction

DM1-A & DM1W are part of SM6 product range and called as single section isolation circuit breaker.

This modulator unit is used for MV section of MV/LV substation in secondary distribution system up to 24 kV

### Application

DM1-A is single isolation circuit breaker unit with fixed breaker, normally used as incoming or outgoing cubicle.

DM1-W is withdrawable single isolation circuit breaker Unit and it is also used for incoming or outgoing feeder. This DM1-A or DM1-W is normally installed together in system with other parts of SM6 product reange such as IM, IMC, QM, QMC, CM, etc, in accordance with the design of a distribution system

### Basic Equipment

- \* SF1 circuit break 630 amp
- \* Three phase busbar 630 A
- \* Disconnectro and earthing switch
- \* RI circuit breaker operating mechanism
- \* Enlarge low voltage compartment
- \* Three current transformers
- \* Auxiliary contacts on circuit breaker
- \* CC earthing switch operating mechanism (only for DM1-W)
- \* Downstream earthing switch
- \* Heater 50 W, 220V
- \* Voltage presence indicator

### Optional LV Control DM1-A

- \* DM1-A fix LV cable connection
- \* DM1-A plug in LV cable connection

### Condition Monitoring

- \* Basic : thermal sensors (TH110)
- \* Option : humidity sensors (CL110)

SM6 units meet all the following standards and specifications:

- IEC standards
- UTE standards for SM6-24
- EDF specifications for SM6-24
- SEISMIC standards for 24 kV

### IEC standards

62271-200 ,62271-1, 62271-103, 62271-105, 62271-100, 62271-102, 61869-2, 61869-3, 60044-8, 62271-206, 62271-304

### SEISMIC standards for 24kV

IEEE-693 2005  
EN600068-3-3 1993

### UTE standards for 24 kV

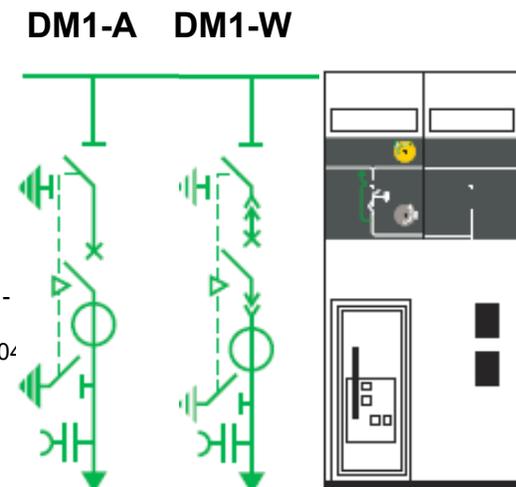
NFC 13.100  
NFC 13.200  
NFC 64.130  
NFC 64.160

### EDF specifications for 24 kV

HN 64-S-41  
HN 64-S-43

### Colour

White RAL 9003



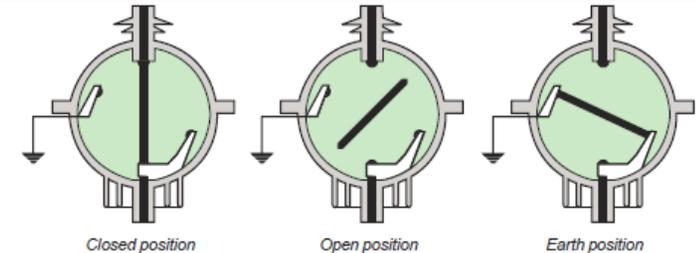
# MV prefabricated equipment SM6 DM1-A, DM1-W Cubicles

## Electrical characteristics

| Rated voltage                | Ur                   | kV                       | 7.2               | 12               | 17.5 | 24  |
|------------------------------|----------------------|--------------------------|-------------------|------------------|------|-----|
| <b>Insulation level</b>      |                      |                          |                   |                  |      |     |
| Insulation                   | Ud                   | 50/60 Hz, 1 min (kV rms) | 20                | 28               | 38   | 50  |
| Insulation                   | Ud                   | 50/60 Hz, 1 min (kV rms) | 23                | 32               | 45   | 60  |
| Insulation                   | Up                   | 1.2/50 $\mu$ s (kV peak) | 60                | 75               | 95   | 125 |
| Insulation                   | Up                   | 1.2/50 $\mu$ s (kV peak) | 70                | 85               | 110  | 145 |
| <b>Breaking capacity</b>     |                      |                          |                   |                  |      |     |
| Transformer off load         |                      | A                        | 16                |                  |      |     |
| Cables off load              |                      | A                        | 31.5              |                  |      |     |
| Rated current                | Ir                   | A                        | 400 - 630 - 1250  |                  |      |     |
| Short-time withstand current | Ik/tk <sup>(1)</sup> | kA/1 s                   | 25                | 630 - 1250       |      |     |
|                              |                      |                          | 20 <sup>(2)</sup> | 630 - 1250       |      |     |
|                              |                      |                          | 16                | 630 - 1250       |      |     |
|                              |                      |                          | 12.5              | 400 - 630 - 1250 |      |     |
| Making capacity (50 Hz)      | Ima                  | kA                       | 62.5              | 630              | NA   |     |
|                              |                      |                          | 50                | 630              |      |     |
|                              |                      |                          | 40                | 630              |      |     |
|                              |                      |                          | 31.25             | 400 - 630        |      |     |



Switch-disconnector for 24 kV



## Switch or disconnector and earthing switch

### • Gas tightness

The three rotating contacts are placed in an enclosure filled with gas to a relative pressure of 0.4 bar (400 hPa) for SM6-24 and 1 bar (1000 hPa) for SM6-36. It satisfies "sealed pressure system" requirements and seal tightness is always factory checked, and leakage rate is less than 0.1% for 30 years life span.

### • Operating safety

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

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# MV prefabricated equipment SM6 DM1-A, DM1-W Cubicles

## SF6 circuit breaker cubicles

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

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

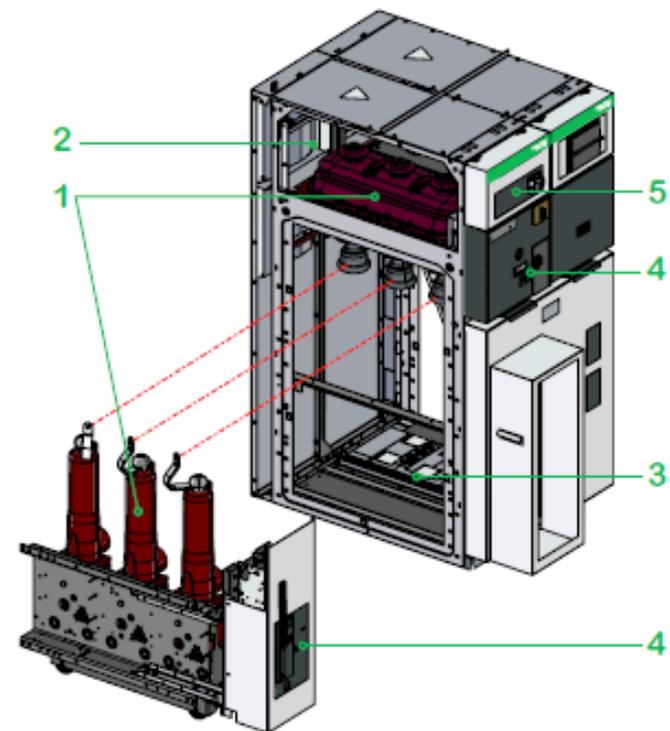
**3 connection and switchgear:** accessible through front, connection to the downstream terminals of the circuit breaker.

Two circuit breaker offers are possible:

- SF1: combined with an electronic relay and standard sensors (with or without an auxiliary power supply)
- SFset: autonomous set equipped with an electronic protection system and special sensors (requiring no auxiliary power supply).

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

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



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# MV prefabricated equipment SM6 DM1-A, DM1-W Cubicles

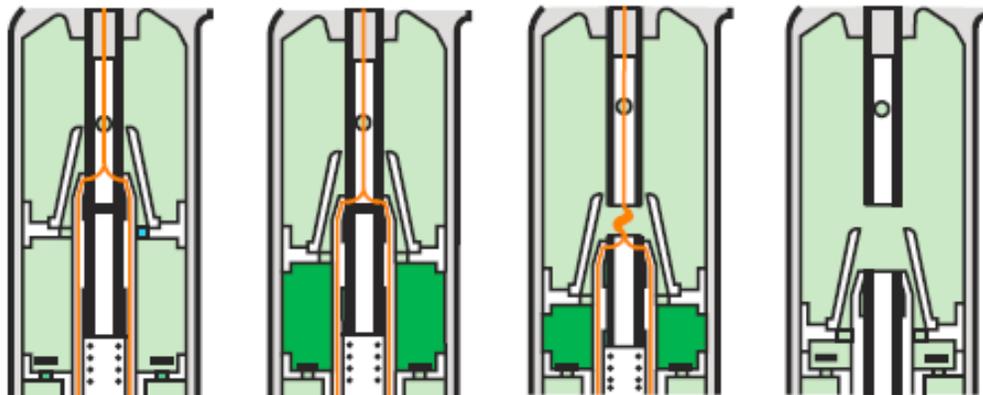
## SF6 circuit breaker: SF1

- **Gas tightness**

The SF1 circuit breaker is made up of three separate poles mounted on a structure supporting the operating mechanism. Each pole-unit houses the active elements in an insulating enclosure filled with gas to a relative pressure of 1.5 bar (0,15 mPa) for 24 kV and 2 bar (0,2 mPa) for 36 kV. It satisfies "sealed pressure system" requirements and seal tightness is always checked in the factory.

- **Operating safety**

Accidental over-pressures are eliminated by the opening of the safety membrane.



Contacts closed

Precompression

Arcing period

Contacts open



SF1 circuit breaker

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# MV prefabricated equipment SM6 DM1-A, DM1-W Cubicles

## Normal operating conditions

- **Ambient air temperature:**

- 1) less than or equal to 40°C
- 2) less than or equal to 35°C on average over 24 hours
- 3) greater or equal to -5°C.

- **Altitude**

- 1) less than or equal to 1000 m
- 2) above 1000 m, a derating coefficient is applied (please consult us).

- **Solar radiation**

- 1) no solar radiation influence is permitted.

- **Ambient air pollution**

- 1) no significant pollution by dust, smoke, corrosive and/or flammable gases, vapours or salt.

- **Humidity**

- 1) average relative humidity over a 24 hour period, less than or equal to 95%
  - 2) average relative humidity over a 1 month period, less than or equal to 90%
  - 3) average vapor pressure over a 24 hour period, less than or equal to 2.2 kPa
  - 4) average vapor pressure over a 1 month period, less than or equal to 1.8 kPa.
- For these conditions, condensation may occasionally occur. Condensation can be expected where sudden temperature changes occur in periods of high humidity. To withstand the effects of high humidity and condensation, such as breakdown of insulation, please pay attention on Civil Engineering recommendations for design of the building or housing, by suitable ventilation and installation.

- **Seismic (for 24 Kv and 36 kV):**

- 1) Up to 0.5 g (horizontal) and 0.4 g (vertical)
- 2) Class 2 for 24 kV and Class 1 for 36kV
- 3) According to standards IEEE-693/2005 and EN 60068-3/1993 for the 24 kV and 36 kV

## Protection index:

- Classes: PI (insulating partition)
- Loss of service continuity classes: LSC2A (LSC1 for metering GAM/GBM functions)
- Units in switchboard: IP3X
- Between compartments: IP2X for SM6-24, IP2XC for SM6-36
- Cubicle: IK08 for SM6-24, IK07 for SM6-36.

## Electro-magnetic compatibility:

- Relays: 4 kV withstand capacity, as per recommendation IEC 60801.4
- Compartments:
  - electrical field:
    - 40 dB attenuation at 100 MHz
    - 20 dB attenuation at 200 MHz
  - magnetic field: 20 dB attenuation below 30 MHz.
- According to standards IEEE-693/2005 and EN 60068-3/1993
- for 36 kV** (please contact us).

## Temperatures:

The cubicles must be stored and installed in a dry area free from dust and with limited temperature variations.

- For stocking: from -40°C to +70°C
- For working: from -5°C to +40°C
- Other temperatures, consult us.
- Seismic:
  - for 24 kV** (option):
    - 1) Up to 0.5 g (horizontal) and 0.4 g (vertical)
    - 2) Class 2

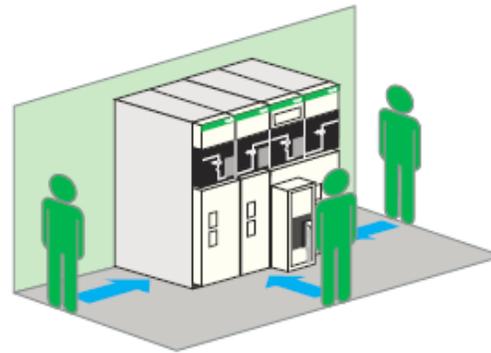
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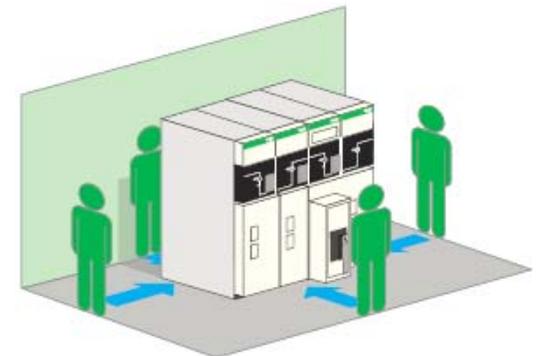
# MV prefabricated equipment SM6 DM1-A, DM1-W Cubicles

## Safety of people By internal arc protection

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



Example of installation of an SM6 switchboard installed against the wall downwards exhaust 12.5 kA 1 s and 16 kA 1 s, IAC: A-FL: 3-sides internal arc protection



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

### Internal arc withstand

(in conformity with IEC 62271-200)

•• 3 versions are available for SM6-24:

Basic:

-- 12.5 kA 1 s, IAC: A-FL

Advance:

-- 12.5 kA 1 s, IAC: A-FLR

-- 16 kA 1 s, IAC: A-FL & IAC: A-FLR

-- 20 kA 1 s, IAC: A-FL & IAC: A-FR

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.

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# MV prefabricated equipment SM6 DM1-A, DM1-W Cubicles

## Continuous Thermal Monitoring

The power connections in the Medium Voltage products are one of the most critical points of the substations especially for those made on site like:

- MV Cable connections

Loose and faulty connections cause an increase of resistance in localized points that will lead to thermal runaway until the complete failure of the connections. Preventive maintenance can be complicated in severe operating conditions also due to limited accessibility and visibility of the contacts.

The continuous thermal monitoring is the most appropriate way to early detect a compromised connection.

## Easergy TH110 Thermal Sensor

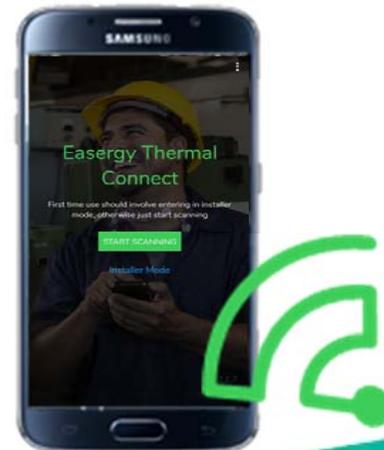
Easergy TH110 is part of the new generation of wireless smart sensors ensuring the continuous thermal monitoring of all the critical connections made on field allowing to:

- Prevent unscheduled downtimes
- Increase operators and equipments safety
- Optimize and predictive maintenance

Thanks to its very compact footprint and its wireless communication, Easergy TH110 allows an easy and widespread installation in every possible critical points without impacting the performance of the MV Switchgears.

By using Zigbee Green Power communication protocol, Easergy Th110 ensure a reliable and robust communication that can be used to create interoperable solutions evolving in the Industrial Internet of Things (IIoT) age.

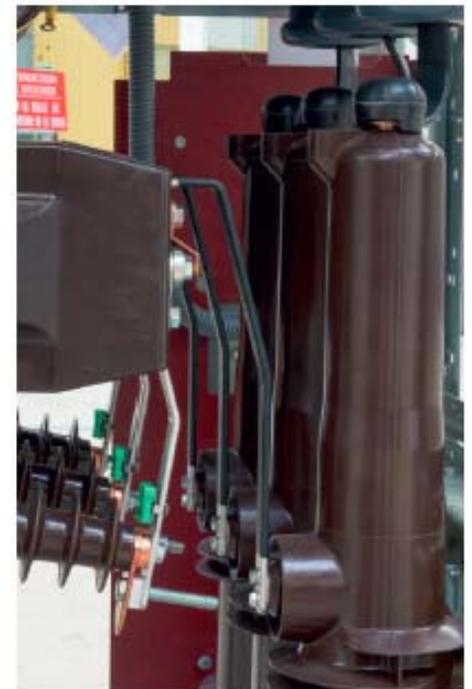
Easergy TH110 is self powered by the network current and it can ensure high performances providing accurate thermal monitoring being in direct contact with the measured point.



Zigbee Dongle



Easergy TH110

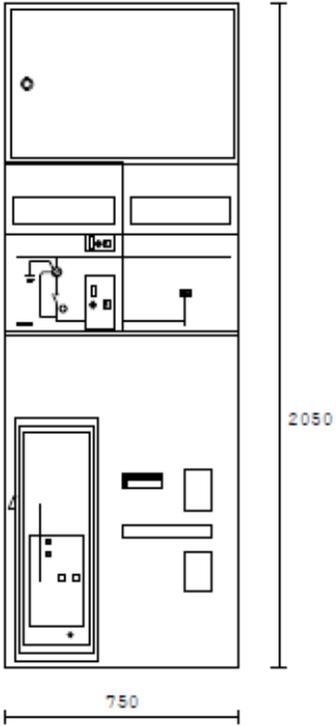


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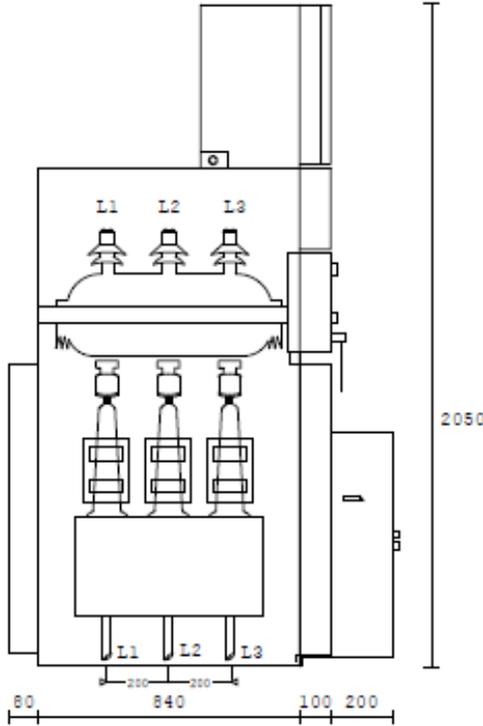
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# MV prefabricated equipment SM6 DM1-A, DM1-W Cubicles

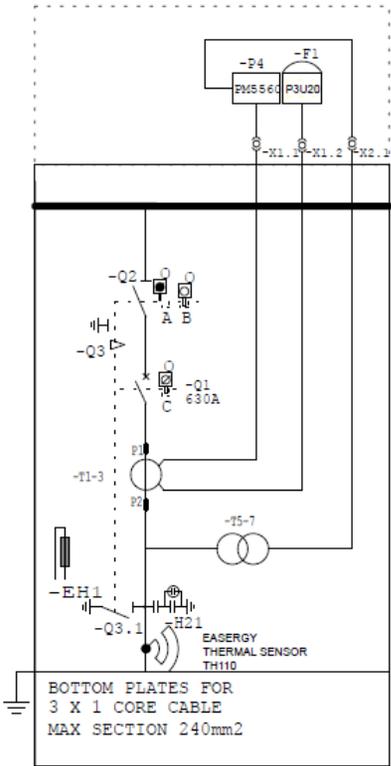
**FRONT VIEW**



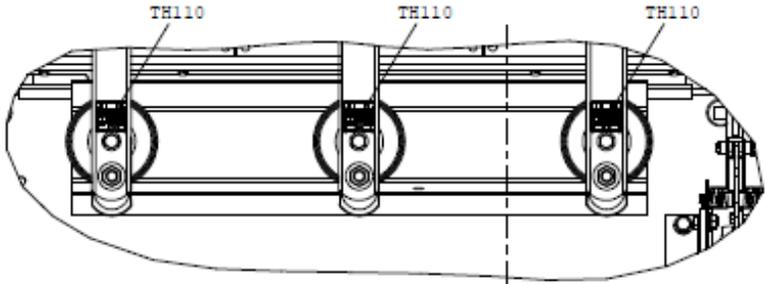
**SIDE VIEW**



**SLD**



| Overall dimension | DM1-A | DM1-W |
|-------------------|-------|-------|
| Width (mm)        | 750   | 750   |
| Depth (mm)        | 1220  | 1220  |
| Height (mm)       | 2050  | 2050  |
| Weight (kg)       | 400   | 400   |



# MV prefabricated equipment SM6 DM1-A, DM1-W Cubicles

## Current Transformer

|                                           |       |                                                                                          |
|-------------------------------------------|-------|------------------------------------------------------------------------------------------|
| Service Condition                         |       | Indoor                                                                                   |
| Insulation                                |       | Dry epoxy resin moulded and treated under vacuum                                         |
| Highest system voltage                    | kV    | 24                                                                                       |
| Rated power-frequency withstand voltage   | kV    | 50                                                                                       |
| Lightning impulse test voltage            | kV    | 125                                                                                      |
| Rated frequency                           | Hz    | 50 or 60                                                                                 |
| Rated primary current                     | A     | 10 to 800                                                                                |
| Single ratio, double ratio or multi ratio |       | Single ratio or double ratio on primary taps                                             |
| Rated secondary current                   | A     | 1 or 5                                                                                   |
| Rated continuous thermal current          | A     | 1.2 I <sub>n</sub>                                                                       |
| Rated short-time thermal current          | kA/1s | <sup>1</sup> Up to 25 kA/1s ; Up to 40 kA/1s                                             |
| Number of cores                           |       | 1 or 2                                                                                   |
| Accuracy classes                          |       | Measurement : 0.2S ; 0.2 ; 0.5 ; 1<br>Protection : 10P10 ; 5P10 ; 5P15 ; 5P20            |
| Rated burdens                             | VA    | <sup>2</sup> 2.5 ; 5 ; 7.5 ; 10 ; 15 ; 30<br>Different values are available upon request |
| Approx. weights                           | kg    | 27                                                                                       |

<sup>1</sup> Rated short-time thermal current depend on rated primary current, accuracy class & burden

<sup>2</sup> Rated burden depend on rated short-time thermal current & accuracy class



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# MV prefabricated equipment SM6 DM1-A, DM1-W Cubicles

## Voltage Transformer

|                                         |    |                                                                 |
|-----------------------------------------|----|-----------------------------------------------------------------|
| Service Condition                       |    | Indoor                                                          |
| Insulation                              |    | Dry epoxy resin moulded and treated under vacuum                |
| Connection                              |    | Phase to earth                                                  |
| Highest system voltage                  | kV | 24                                                              |
| Rated power-frequency withstand voltage | kV | 50                                                              |
| Lightning impulse test voltage          | kV | 125                                                             |
| Rated frequency                         | Hz | 50 or 60                                                        |
| Rated primary voltage                   | kV | $2.4\sqrt{3} \sim 22/\sqrt{3}$                                  |
| Rated secondary voltage                 | V  | $100\sqrt{3}$ ; $110\sqrt{3}$ ; $100/\sqrt{3}$ ; $110/\sqrt{3}$ |
| Number of secondary windings            |    | 1 or 2                                                          |
| Rated voltage factor                    | Un | 1.2 Cont : 1.9/30 s or 1.9/8 h                                  |
| Accuracy classes                        |    | Measurement : 0.2 ; 0.5 or 1<br>Protection : 3P or 6P           |
| Rated burdens                           | VA | <sup>1</sup> 10 ; 15 ; 25 ; 30 ; 50 ; 75                        |
| Approx. weights                         | kg | 24                                                              |

<sup>1</sup> Rated burden depend on accuracy class



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# MV prefabricated equipment

## SM6

### CM Cubicle

## Voltage Transformer Unit for Metering up to 24 kV

### Introduction

CM is part of SM6 product range.  
This SM6 range is made up of modular units and used for the MV/LV substation in secondary distribution system up to 24 kV

### Application

CM is voltage transformer unit equipped with fuse and disconnecting switch and usually used for metering

This CM is normally installed together in the system with other part of SM6 product range such as IM, QM, QMC, CM, PM, DM1, DM2, etc., in accordance with the design of a distribution system.

### Basic Equipment

- \* Disconnecter and earthing switch
- \* Three phase busbar 630 A
- \* CS operating mechanism
- \* Three 6.3 A solefuse
- \* LV circuit isolating switch
- \* LV Fuses
- \* Three voltage transformers (phase to earth)

### Optional Accessories :

- \* Large LV compartment on top of cubicle, h = 450 mm
- \* Auxiliary contacts
- \* Indicating contact for blown fuses

SM6 units meet all the following standards and specifications:

- IEC standards
- UTE standards for SM6-24
- EDF specifications for SM6-24
- SEISMIC standards for 24 kV

### IEC standards

62271-200 ,62271-1, 62271-103, 62271-105, 62271-100, 62271-102, 61869-2, 61869-3, 60044-8, 62271-206, 62271-304

### SEISMIC standards for 24kV

IEEE-693 2005  
EN600068-3-3 1993

### UTE standards for 24 kV

NFC 13.100  
NFC 13.200  
NFC 64.130  
NFC 64.160

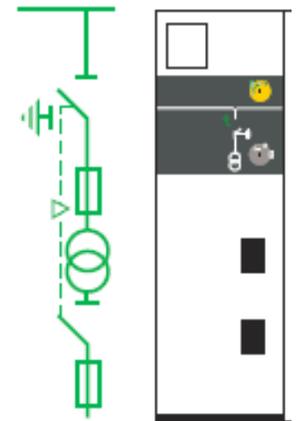
### EDF specifications for 24 kV

HN 64-S-41  
HN 64-S-43

### Colour

White RAL 9003

### CM



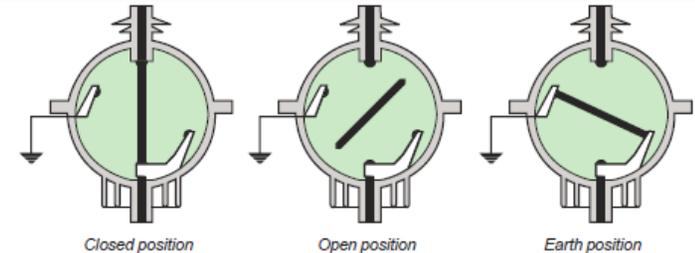
# MV prefabricated equipment SM6 CM Cubicle

## Electrical characteristics

| Rated voltage                | Ur                   | kV                       | 7.2               | 12               | 17.5 | 24  |
|------------------------------|----------------------|--------------------------|-------------------|------------------|------|-----|
| <b>Insulation level</b>      |                      |                          |                   |                  |      |     |
| Insulation                   | Ud                   | 50/60 Hz, 1 min (kV rms) | 20                | 28               | 38   | 50  |
| Insulation                   | Ud                   | 50/60 Hz, 1 min (kV rms) | 23                | 32               | 45   | 60  |
| Insulation                   | Up                   | 1.2/50 $\mu$ s (kV peak) | 60                | 75               | 95   | 125 |
| Insulation                   | Up                   | 1.2/50 $\mu$ s (kV peak) | 70                | 85               | 110  | 145 |
| <b>Breaking capacity</b>     |                      |                          |                   |                  |      |     |
| Transformer off load         |                      | A                        | 16                |                  |      |     |
| Cables off load              |                      | A                        | 31.5              |                  |      |     |
| Rated current                | Ir                   | A                        | 400 - 630 - 1250  |                  |      |     |
| Short-time withstand current | Ik/tk <sup>(1)</sup> | kA/1 s                   | 25                | 630 - 1250       |      |     |
|                              |                      |                          | 20 <sup>(2)</sup> | 630 - 1250       |      |     |
|                              |                      |                          | 16                | 630 - 1250       |      |     |
|                              |                      |                          | 12.5              | 400 - 630 - 1250 |      |     |
| Making capacity (50 Hz)      | Ima                  | kA                       | 62.5              | 630              | NA   |     |
|                              |                      |                          | 50                | 630              |      |     |
|                              |                      |                          | 40                | 630              |      |     |
|                              |                      |                          | 31.25             | 400 - 630        |      |     |



Switch-disconnector for 24 kV



## Switch or disconnector and earthing switch

### • Gas tightness

The three rotating contacts are placed in an enclosure filled with gas to a relative pressure of 0.4 bar (400 hPa) for SM6-24 and 1 bar (1000 hPa) for SM6-36. It satisfies "sealed pressure system" requirements and seal tightness is always factory checked, and leakage rate is less than 0.1% for 30 years life span.

### • Operating safety

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

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# MV prefabricated equipment

## SM6

### CM Cubicle

#### Normal operating conditions

- **Ambient air temperature:**

- 1) less than or equal to 40°C
- 2) less than or equal to 35°C on average over 24 hours
- 3) greater or equal to -5°C.

- **Altitude**

- 1) less than or equal to 1000 m
- 2) above 1000 m, a derating coefficient is applied (please consult us).

- **Solar radiation**

- 1) no solar radiation influence is permitted.

- **Ambient air pollution**

- 1) no significant pollution by dust, smoke, corrosive and/or flammable gases, vapours or salt.

- **Humidity**

- 1) average relative humidity over a 24 hour period, less than or equal to 95%
  - 2) average relative humidity over a 1 month period, less than or equal to 90%
  - 3) average vapor pressure over a 24 hour period, less than or equal to 2.2 kPa
  - 4) average vapor pressure over a 1 month period, less than or equal to 1.8 kPa.
- For these conditions, condensation may occasionally occur. Condensation can be expected where sudden temperature changes occur in periods of high humidity. To withstand the effects of high humidity and condensation, such as breakdown of insulation, please pay attention on Civil Engineering recommendations for design of the building or housing, by suitable ventilation and installation.

- **Seismic (for 24 Kv and 36 kV):**

- 1) Up to 0.5 g (horizontal) and 0.4 g (vertical)
- 2) Class 2 for 24 kV and Class 1 for 36kV
- 3) According to standards IEEE-693/2005 and EN 60068-3/1993 for the 24 kV and 36 kV

#### Protection index:

- Classes: PI (insulating partition)
- Loss of service continuity classes: LSC2A (LSC1 for metering GAM/GBM functions)
- Units in switchboard: IP3X
- Between compartments: IP2X for SM6-24, IP2XC for SM6-36
- Cubicle: IK08 for SM6-24, IK07 for SM6-36.

#### Electro-magnetic compatibility:

- Relays: 4 kV withstand capacity, as per recommendation IEC 60801.4
- Compartments:
  - electrical field:
    - 40 dB attenuation at 100 MHz
    - 20 dB attenuation at 200 MHz
  - magnetic field: 20 dB attenuation below 30 MHz.
- According to standards IEEE-693/2005 and EN 60068-3/1993
- for 36 kV** (please contact us).

#### Temperatures:

The cubicles must be stored and installed in a dry area free from dust and with limited temperature variations.

- For stocking: from -40°C to +70°C
- For working: from -5°C to +40°C
- Other temperatures, consult us.
- Seismic:
  - for 24 kV** (option):
    - 1) Up to 0.5 g (horizontal) and 0.4 g (vertical)
    - 2) Class 2

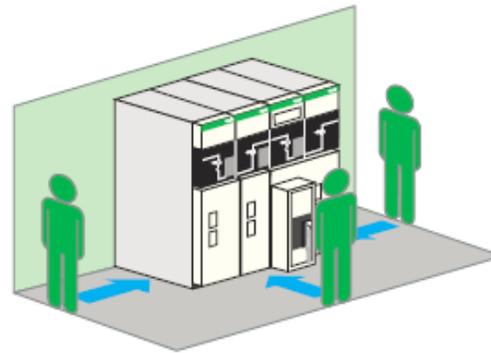
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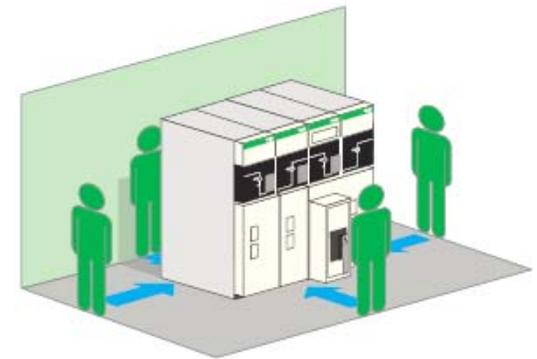
# MV prefabricated equipment SM6 CM Cubicle

## Safety of people By internal arc protection

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



Example of installation of an SM6 switchboard installed against the wall downwards exhaust 12.5 kA 1 s and 16 kA 1 s, IAC: A-FL: 3-sides internal arc protection



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

### Internal arc withstand

(in conformity with IEC 62271-200)

•• 3 versions are available for SM6-24:

Basic:

-- 12.5 kA 1 s, IAC: A-FL

Advance:

-- 12.5 kA 1 s, IAC: A-FLR

-- 16 kA 1 s, IAC: A-FL & IAC: A-FLR

-- 20 kA 1 s, IAC: A-FL & IAC: A-FR

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:

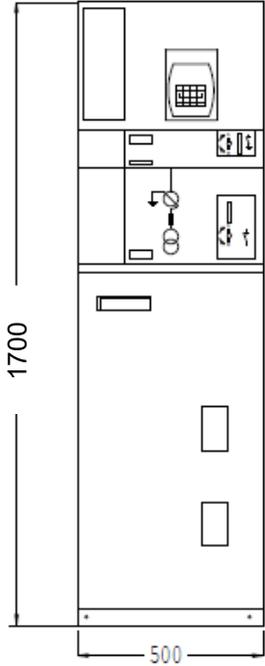
- Evacuation systems which direct gases towards the top or the bottom of the switchboard enabling over pressure to be limited in the case of an internal fault in the compartments
- Channelling and evacuating hot gases towards an external area, which is not hazardous for the operator
- Materials which are non-inflammable in the cubicles
- Reinforced panels.

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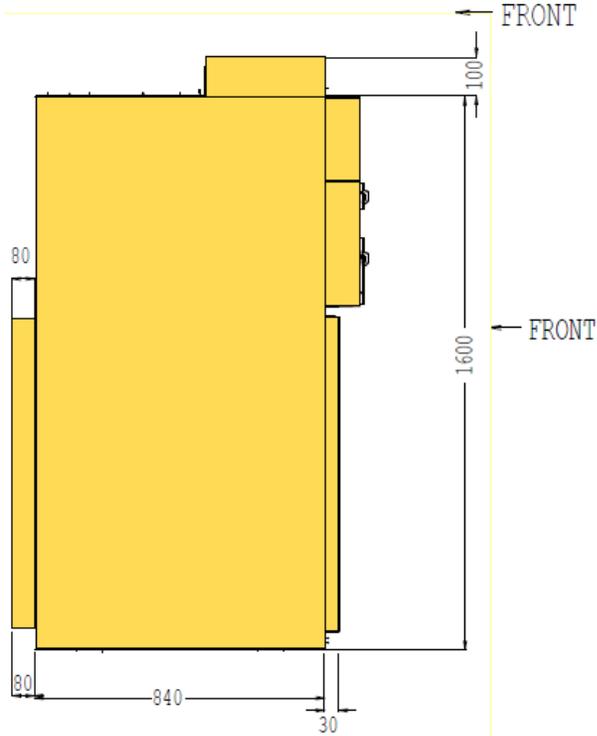
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# MV prefabricated equipment SM6 CM Cubicle

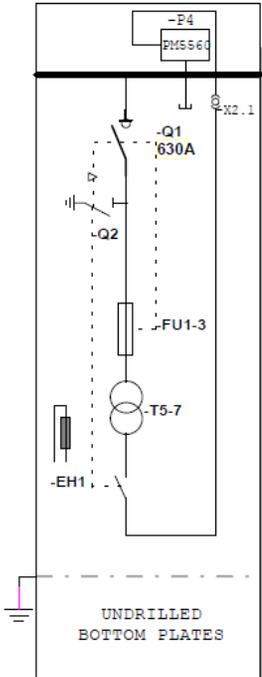
**FRONT VIEW**



**SIDE VIEW**



**SLD**



| Overall dimension | CM Blank | CM w/ PM |
|-------------------|----------|----------|
| Width (mm)        | 500      | 500      |
| Depth (mm)        | 950      | 950      |
| Height (mm)       | 1700     | 1700     |
| Weight (kg)       | 190      | 190      |

## MV prefabricated equipment SM6 CM Cubicle

Voltage Transformer for CM unit :

| Reference number | Ratio                             | Rated output and accuracy class | Rated insulation level | Output | Frequency    |
|------------------|-----------------------------------|---------------------------------|------------------------|--------|--------------|
| S3735155         | 15000:r.3-20000:r.3 /<br>100: r.3 | 30 - 50 VA cl 0,5               | 24 kV                  | —      | 50 and 60 Hz |

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