

AIR-INSULATED SWITCHGEAR UP TO 24 kV  
FOR PRIMARY AND SECONDARY DISTRIBUTION SYSTEMS

**SG15\_MILE**  
**SG25\_MILE**

17.5 kV, 3150 A, 31.5 kA  
24 kV, 2500 A, 25 kA



# CONTINUOUS INNOVATION

## Introduction

Supporting the growing movement towards banning sulfur hexafluoride (SF6) insulated switchgear due to its significant environmental impact, the MILE family switchgear is based on air insulation technology and digital capabilities, offering a great solution for modern power distribution systems.



Recognizing the urgency to mitigate climate change, various norms, standards, and regulations have been established to phase out SF6-insulated switchgear. The regulatory frameworks such as the European Union's F-Gas Regulation (EU) No 517/2014 emphasize the adoption of air-insulated switchgear with vacuum circuit breakers and aim to reduce emissions of fluorinated greenhouse gases, including SF6, through strict containment measures and gradual phase-outs.



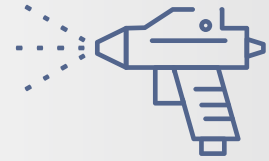
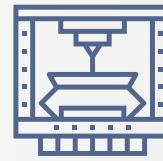
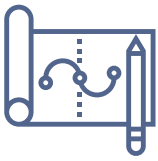
In support of green issues throughout the entire product life, MILE utilizes fully recyclable materials ensuring safe and efficient product recycling at the end of its life. This guarantees a completely sustainable solution utilizing MILE applications. To highlight our commitment to design and manufacture environmentally friendly products, the Birch style of MILE has been implemented.

Adhering to the highest international quality standards, our products are manufactured within the European Union (Tallinn, Estonia) in compliance with ISO 9001 and ISO 14001 certifications.





# STATE-OF-THE-ART MANUFACTURING



- Application of the latest technologies in sheet metal and copper busbar processing such as laser cutting, CNC machining, powder coating, electroplating, etc. allows MILE to meet the highest standards in quality product production.

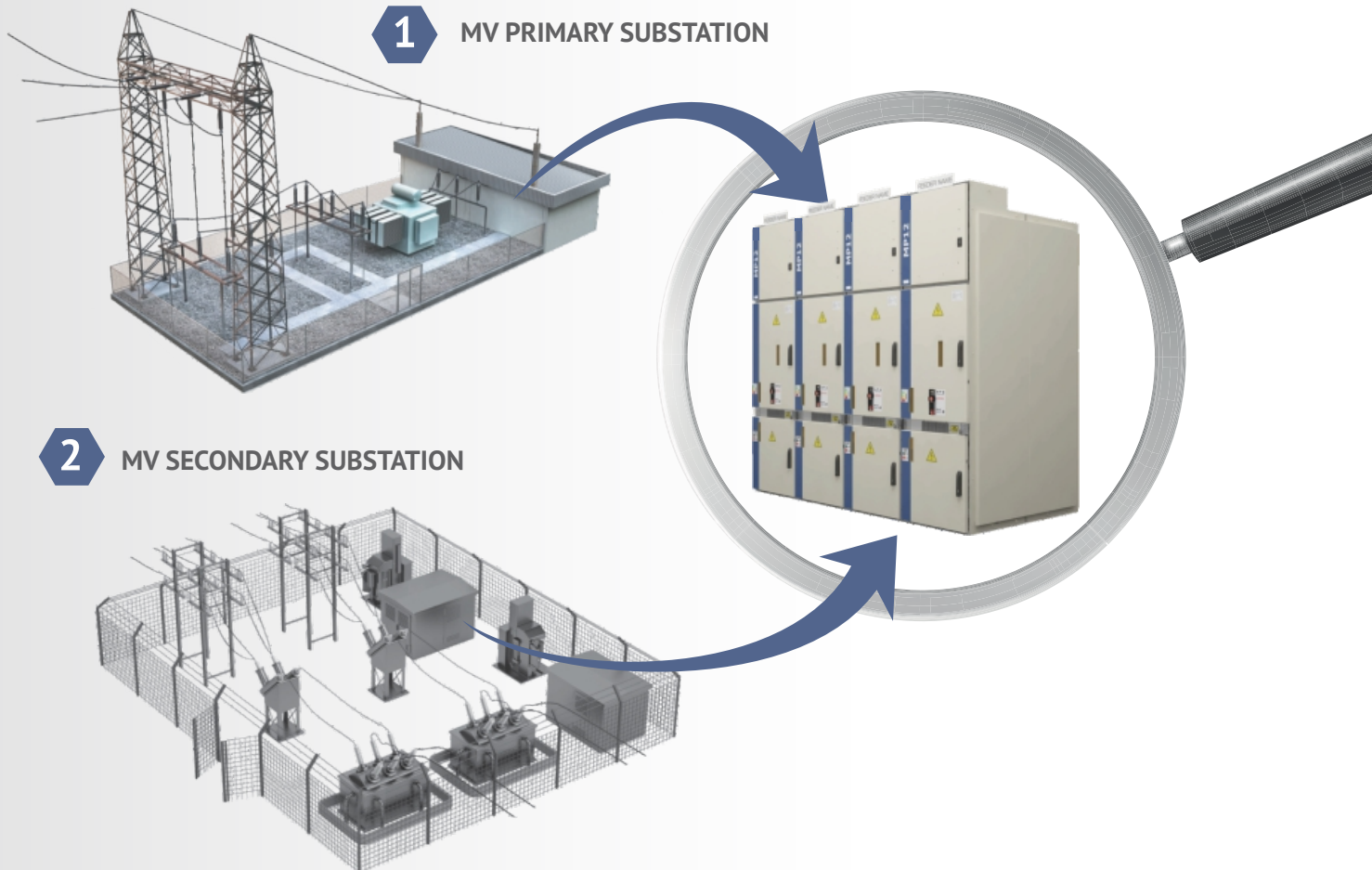




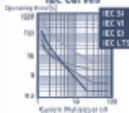




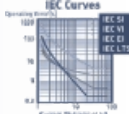

- In-house testing facilities are available to conduct primary and secondary current injection tests as well as high voltage and partial discharge tests which constitute the core of the comprehensive routine testing program on MILE.



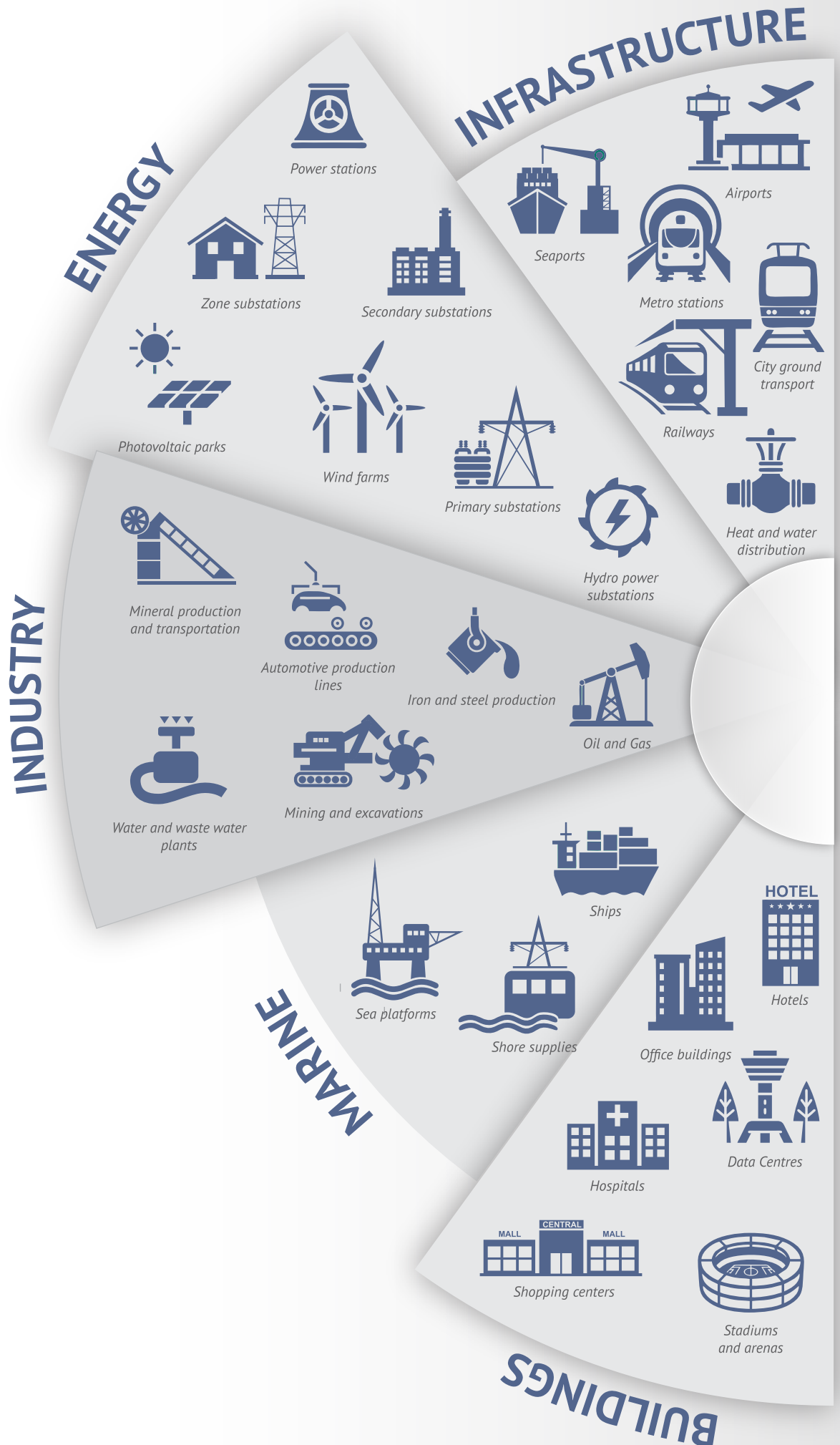
# GREATER APPLICATION VERSATILITY

MILE is designed for indoor installations and applications with voltage level up to 24 kV, continuous rated current up to 3150 A, short-circuit current of up to 31.5 kA and intended for use in primary and secondary distribution systems.



| MV PRIMARY SUBSTATION   |  |                                     |                                  |   |  |   |   |
|-------------------------|--|-------------------------------------|----------------------------------|---|--|---|---|
| 1                       | VCB<br> | Isc rating<br><br><b>Isc=31.5kA</b> | Ir rating<br><br><b>Ir=3150A</b> | Protocol<br><br> | Protection<br><br> | Energy metering<br><br><br>kWh | IAC AFLR<br><br> |
| MV SECONDARY SUBSTATION |  |                                     |                                  |   |  |   |   |
| 2                       | VCB<br> | Isc rating<br><br><b>Isc=25kA</b>   | Ir rating<br><br><b>Ir=1250A</b> | Protocol<br><br> | Protection<br><br> | Sensors<br><br>CT-VT/Sensors  | IAC AFLR<br><br> |



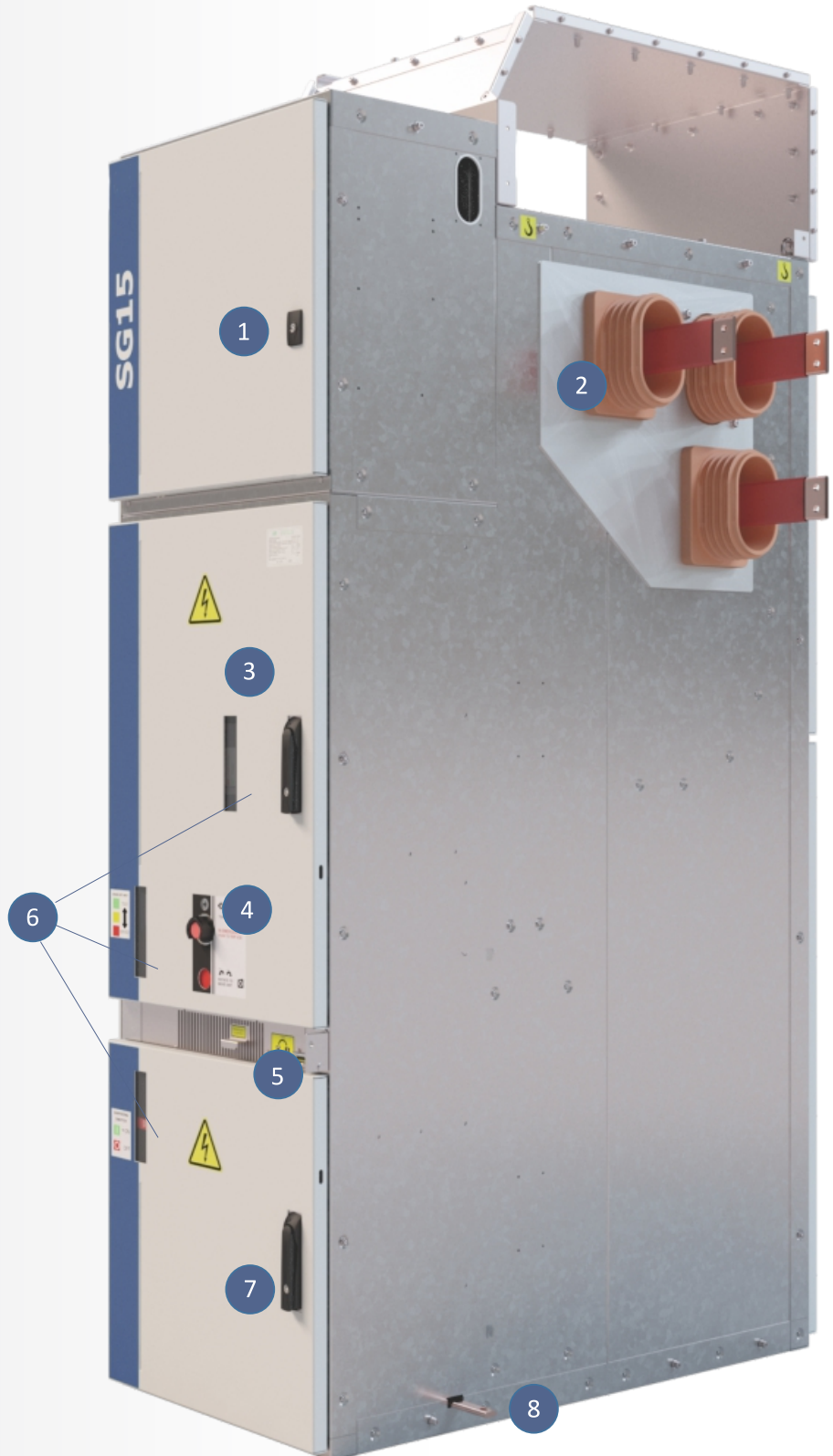


# FIELD-PROVEN DESIGN EVEN BETTER



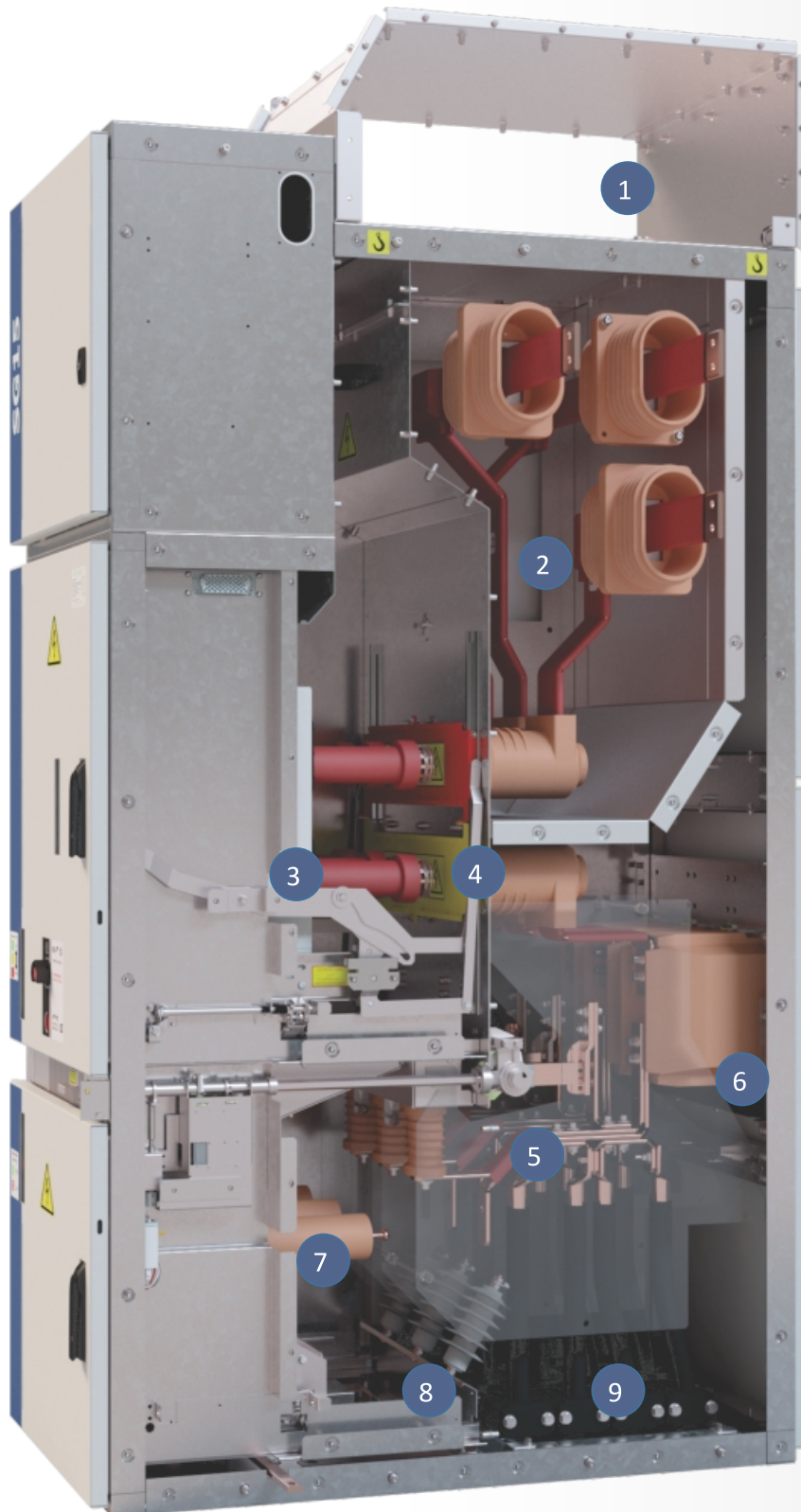
MILE has a typified design so that the arrangement of equipment and instruments in the panel represents the mainstream concept of switchgear specified by most customers worldwide. In addition to draw-out units at a central location and make-type earthing switches, the design is considerably augmented to provide exceptional safety, absolute reliability and top performance.

- 1 LV compartment
- 2 Busbar compartment
- 3 VCB compartment
- 4 VCB control
- 5 Earthing switch control
- 6 Inspection windows
- 7 Cable compartment
- 8 Earthing busbar





MILE is created for straightforward manufacturing. No turning, grinding or cleansing is necessary. No jigs or welding processes are required for assembly. The enclosure is made of corrosive resistant hot-dip galvanized metal sheets. Its design allows fast assembly with rivets and screws only.



- 1 Gas exhaust duct
- 2 Insulated busbars
- 3 Withdrawable VCB
- 4 Automatic shutters
- 5 Earthing switch
- 6 Current transformers
- 7 Voltage transformers
- 8 Surge arresters
- 9 MV cables



## LV COMPARTMENT

The compartment is of a detachable design for easy and convenient handling during transportation and erection on site. It is segregated with earthed metal partitions and has ample space for multi-functional protection relays, energy meters, lighting, heating and many other devices.

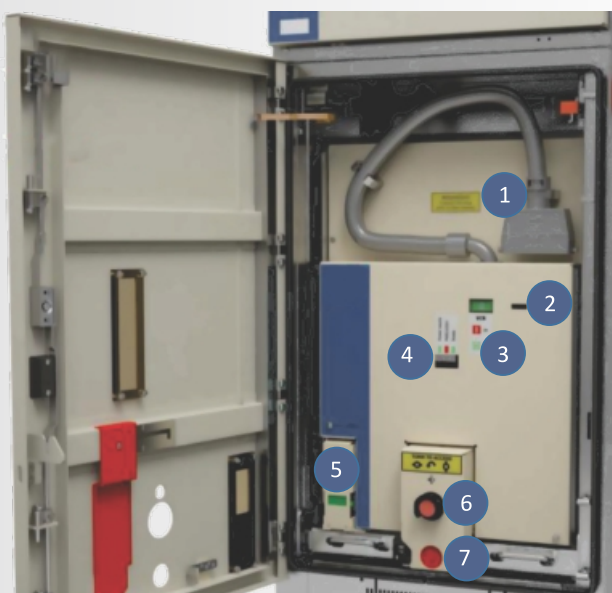


## VCB COMPARTMENT

Fully segregated by earthed metal partitions and having its own pressure relief channel, the VCB compartment houses the bushing insulators containing fixed contacts for the connection of the circuit breaker to the busbars and the cable compartment. The bushings are covered by automatic metallic shutters.

All safety interlocking mechanisms required for safe and reliable operations of the VCB, an emergency trip push-button, two inspection windows for mechanical position indication: one for VCB and the other for draw-out unit mechanisms; are fitted into the compartment. The VCB is mechanically and electrically interlocked with the compartment door so that the door cannot be opened until the VCB is turned off and racked out to the test position.

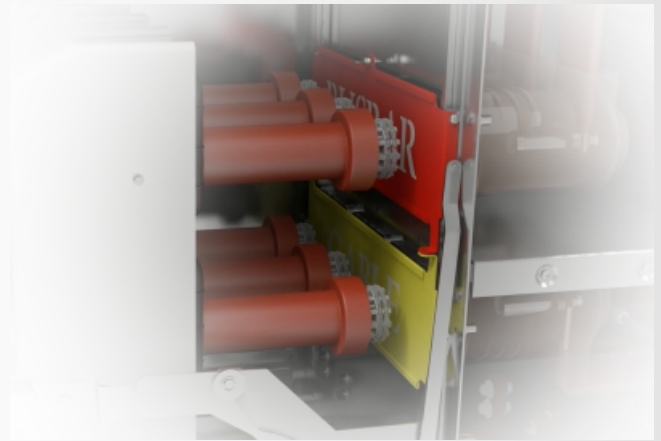
For extra safety, the tool orifice to the racking in/out mechanism is equipped with a shutter operated by a keylock.



- 1 Umbilical control cable
- 2 Operation counter
- 3 VCB position indicator
- 4 Control module indicator
- 5 DOU position indicator
- 6 VCB manual trip
- 7 DOU operational slot

## AUTOMATIC SHUTTERS

Individually operated earthed metallic shutters are automatically driven during the movement of the VCB from the test to the service position and vice versa. The busbar and cable shutters can be separately padlocked in the open position to prevent accidental contact with any live parts.

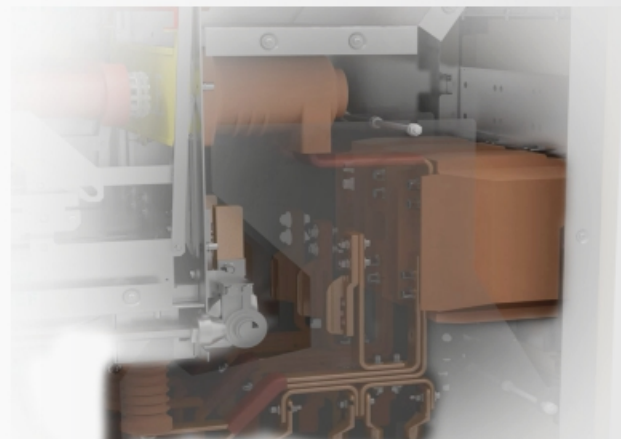
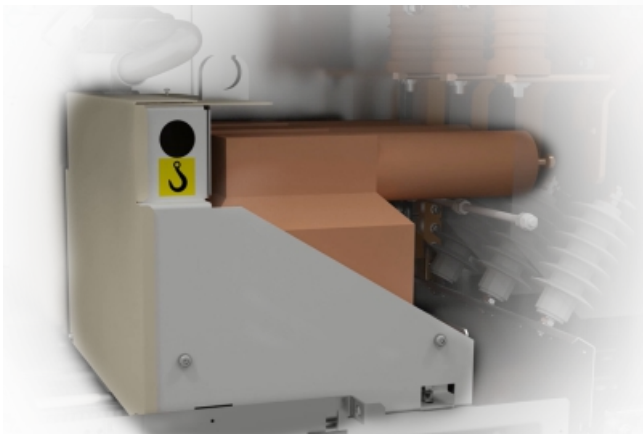


## BUSBAR COMPARTMENT

The busbar system is made of electrolytic copper and totally enclosed in its own earthed metal compartment with a pressure relief flap on the top. The busbars are connected to the fixed contacts of the upper bushing insulators by means of branch connections. Optionally, the busbars and the branch connections can be completely insulated. The busbar compartment of each panel is segregated from the adjacent busbar compartments with through insulators.

## CURRENT TRANSFORMERS

To facilitate maintenance, cast resin CTs are fitted onto a pivoting plate. The fixing points of the plate can receive a wide range of CTs of different brands. Two sets of CTs can be installed on a panel for distance or differential protection.

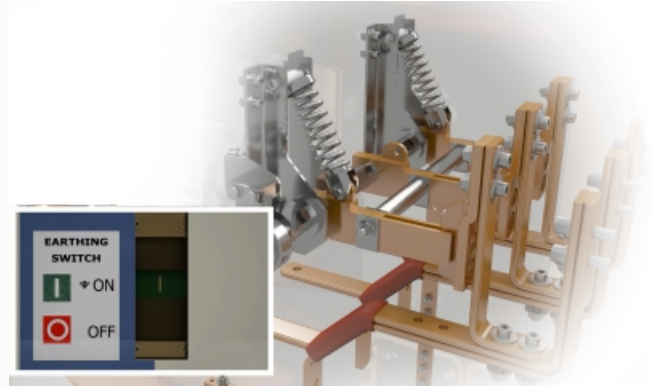


## VOLTAGE TRANSFORMERS

VTs with replaceable primary fuses and a striker system can be mounted on central or lower draw-out units. The striker system is intended for sending a signal about a blown fuse into the SCADA system. Optionally, fixed or top installations of VTs are available.

## EARTHING SWITCH

The make-type ES is equipped with a mechanical position indicator that can be viewed through the inspection window on the cable compartment door. An additional mechanical position indicator is located in the ES operating mechanism. The ES can be operated manually from the front of the panel or by an electrical motor via SCADA. The ES is mechanically and electrically interconnected with the VCB and the cable compartment door to provide exceptional operator safety.



## EARTHING BAR

Made of 10x30mm electrolytic copper, the earthing bar runs along all adjacent panels and connects to the main earthing bar of the substation. All current-carrying parts are interconnected with each other for equipotential bonding to guarantee personal safety against electrical shock.



## CABLE TERMINATIONS

Single and three-core cables up to a maximum of 7 per phase and up to 4 cables when a VT draw-out unit is installed, can be used depending on the rated voltages, panel dimensions and cable cross section. Cables are terminated with compression lugs onto copper tails and fixed by cable glands.



## GAS EXHAUST DUCT

The gas exhaust duct accommodates all three pressure relief flaps and is mounted on the top of each panel. It runs along the whole length of the switchboard. The pressure generated by the internal arc makes a pressure relief flap open thus allowing hot gases to run into a special chimney to be evacuated to dedicated areas.



# COMPLIANCE WITH IEC 62271-200 TO PERFORM SAFER



With the general term "metal enclosed", the formerly used category "metal clad" has now been replaced in IEC 62271-200 by classification according to accessibility to HV compartments, service continuity during maintenance, the classes of partitions and shutters and internal arc classification.

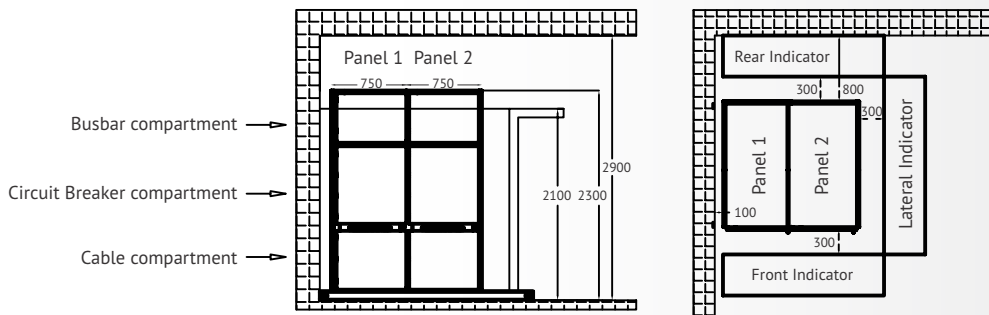
MILE is designed to meet the LSC2B-PM AFLR 31,5kA 1s classification.

LSC (loss of service continuity)2B provides the least restriction to service continuity. It means that all adjacent panels as well as cable and busbar compartments remain energized when the VCB compartment has been opened. It requires partition walls to the adjacent panels with at least three compartments and two visual breaks of the primary circuit per panel.

Class PM (partition of metal) stands for a panel with metallic shutters and partitions between each compartment.  
AFLR stands for: (A – Authorized personal access)

(F – Front side)  
(L – Lateral side)  
(R – Rear side)

31,5kA 1s is a switchgear panel internal arc classified (IAC) with a short circuit current of 31,5kA during one second initiated in each compartment separately. During tests, neither of the indicators for front, lateral and rear accessibility is damaged. Electrical room simulation and indicators` position are shown below.



## EXCEPTIONAL SAFETY WITH MAGVATECH™ VCB

While a major design consideration is to provide continuity of supply, it is operator safety that is regarded as the most important issue. In addition to IEC 62271-200 requirements, the application of vacuum circuit breaker (VCB) with linear motor drives in MILE provides unique and unrivalled safety features.



**Remote and safe manual closing of VCB with a handheld closing device.**  
An operator can step aside from the panel front to a safe distance before VCB closing. This totally eliminates the risk of personal injury resulting from a possible internal arc flash.



### The fastest arc fault interruption in less than one cycle.

An arc fault instantaneously releases large amount of energy. Arcing time is a critical factor in limiting the damage and risk of personal injury. The energy released in an arc fault is directly proportional to the total clearing time. While relay response times have improved, opening times of the VCB with motor-spring mechanism are usually as long as five cycles.

MAGVATECH circuit breakers are able to interrupt fault currents in 16 ms – the fastest arc fault interruption in the industry.



# HIGH OPERATIONAL RELIABILITY

MILE design incorporates all essential elements of product reliability. Intuitively understood operating controls and indications, a rugged and secured construction as well as a long-lasting service life are directly associated with overall product reliability.

## MILE RELIABILITY FEATURES:



**The robust enclosure, made of 2mm corrosive resistant hot-dip galvanized metal sheets** with reinforced doors and a safety labyrinth allows fast and simple erection even on an uneven floor.



**A rivet nut design** provides not only the rigidity of construction but also an opportunity to replace metal parts on site without the use of special tools.



**An emergency trip push-button** is located in the center of the panel. It has a striking, protruding design protected against accidental operation. The trip button can be quickly spotted in an emergency.



**Large and clearly visible mechanical position indicators** located in view of an operator allows him to positively identify the operating status of the draw-out unit, VCB and earthing switch. Each mechanical indicator abruptly changes its status so that it exactly corresponds to the status of the switching device. Mechanical position indicators are duplicated by electrical auxiliary contacts to provide electrical signals into secondary circuits.



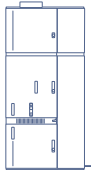
**Lockable access to the VCB racking in/out mechanism** by a metallic shutter prevents unauthorized operations and interlocks the VCB in the trip position prior to racking a draw-out unit. An LV plug interlock visually prompts an operator to connect the draw-out unit to secondary circuits before the compartment door is closed.



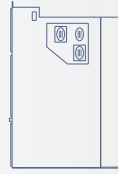
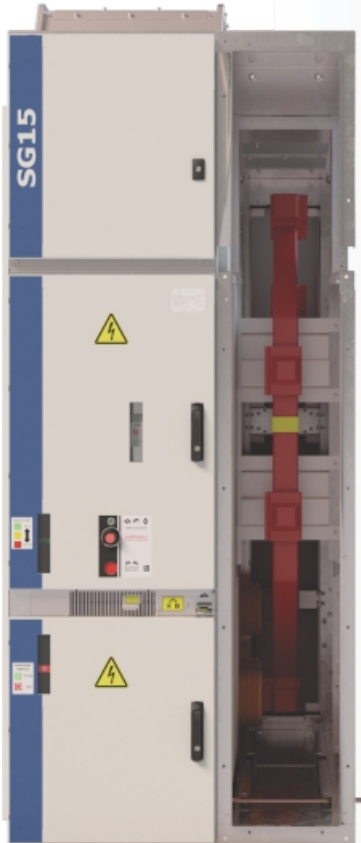
**Minimum service checks on site.** MILE is designed for a service life of at least 30 years. The VCB, earthing switch and cast resin insulation technology is considered virtually maintenance free, so the maintenance requirements are only related to periodical checks to make sure that the system operates correctly. Refined accessories, such as door hinges, handlebars, locks and electrical indicators and buttons withstand thousands of operations and guarantee the appearance of a beautifully crafted product.



# FLEXIBLE SOLUTIONS ACROSS VARIETY OF USER-SPECIFIC TECHNICAL REQUIREMENTS



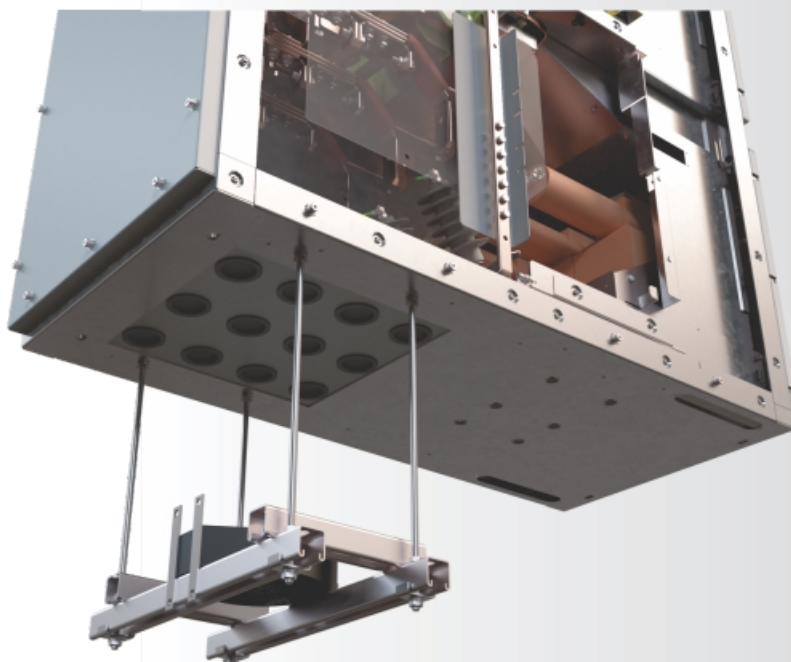
➤ Side wall busbar



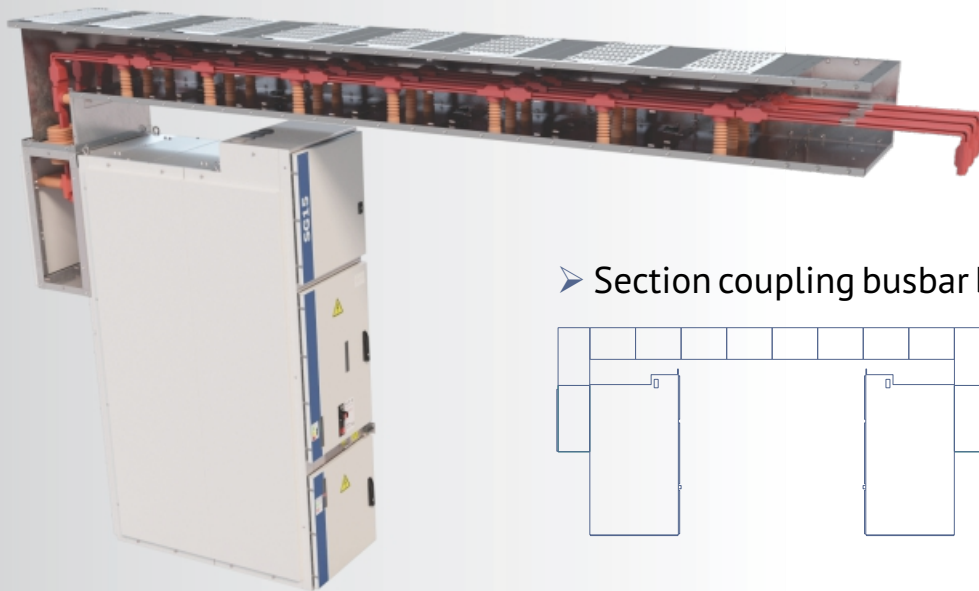
➤ Rear wall cable attachment



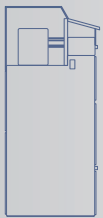
➤ Ring core residual transformer in the cable cellar



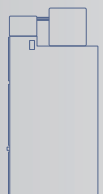
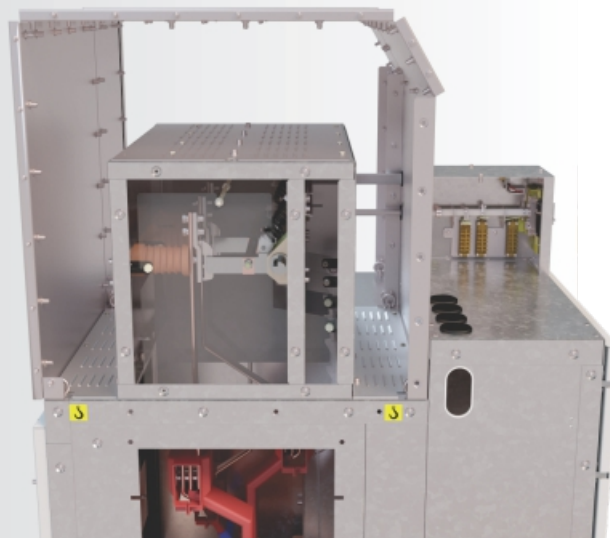




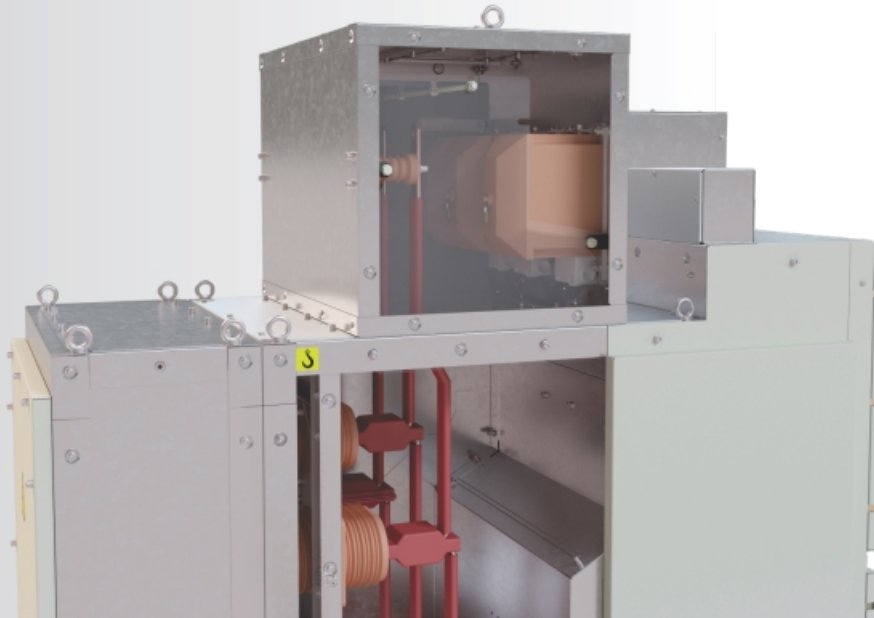
➤ Section coupling busbar bridge



➤ Earthing switch top installation



➤ Voltage transformer top installation

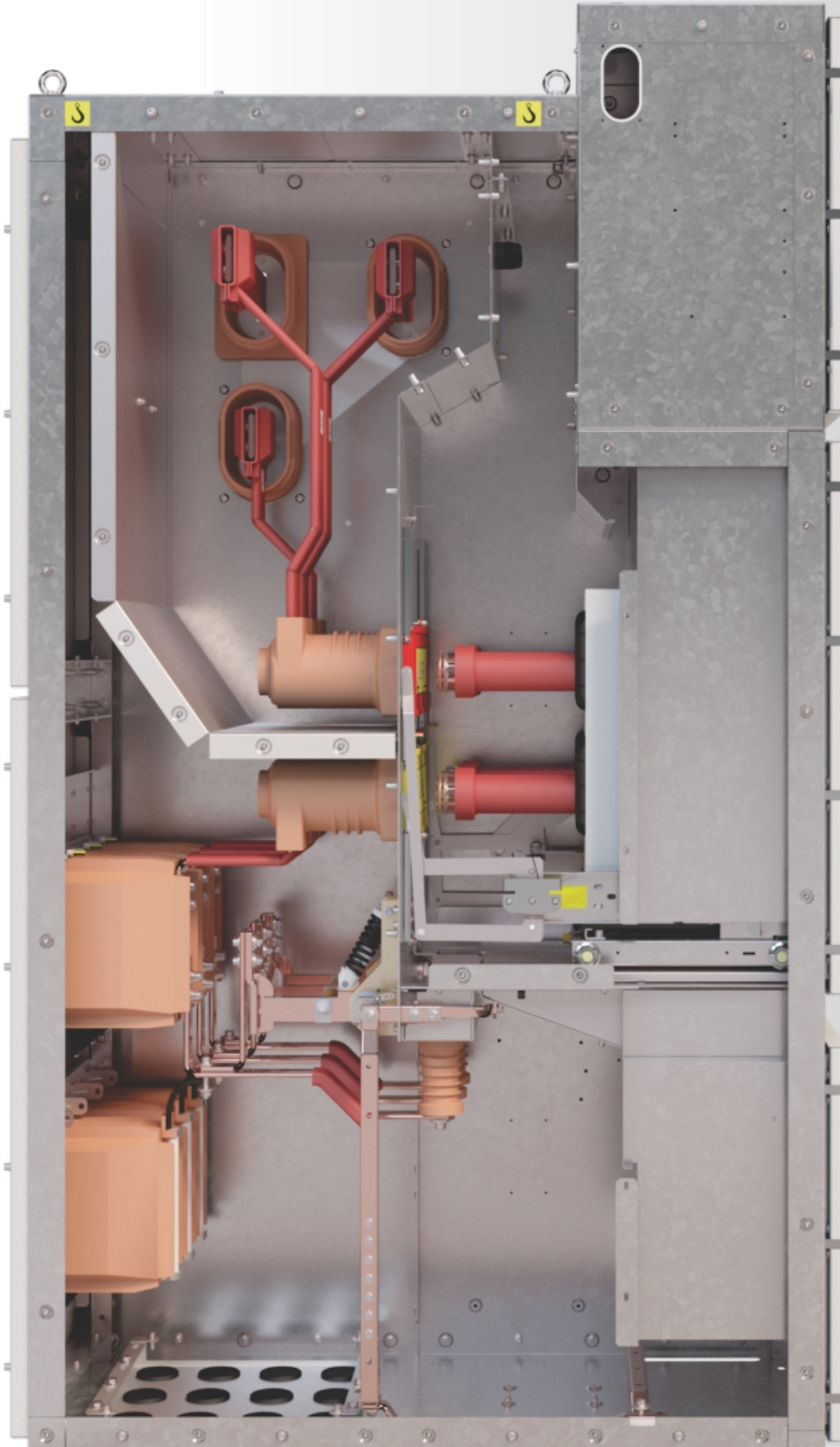


# FLEXIBLE SOLUTIONS ACROSS VARIETY OF USER-SPECIFIC TECHNICAL REQUIREMENTS



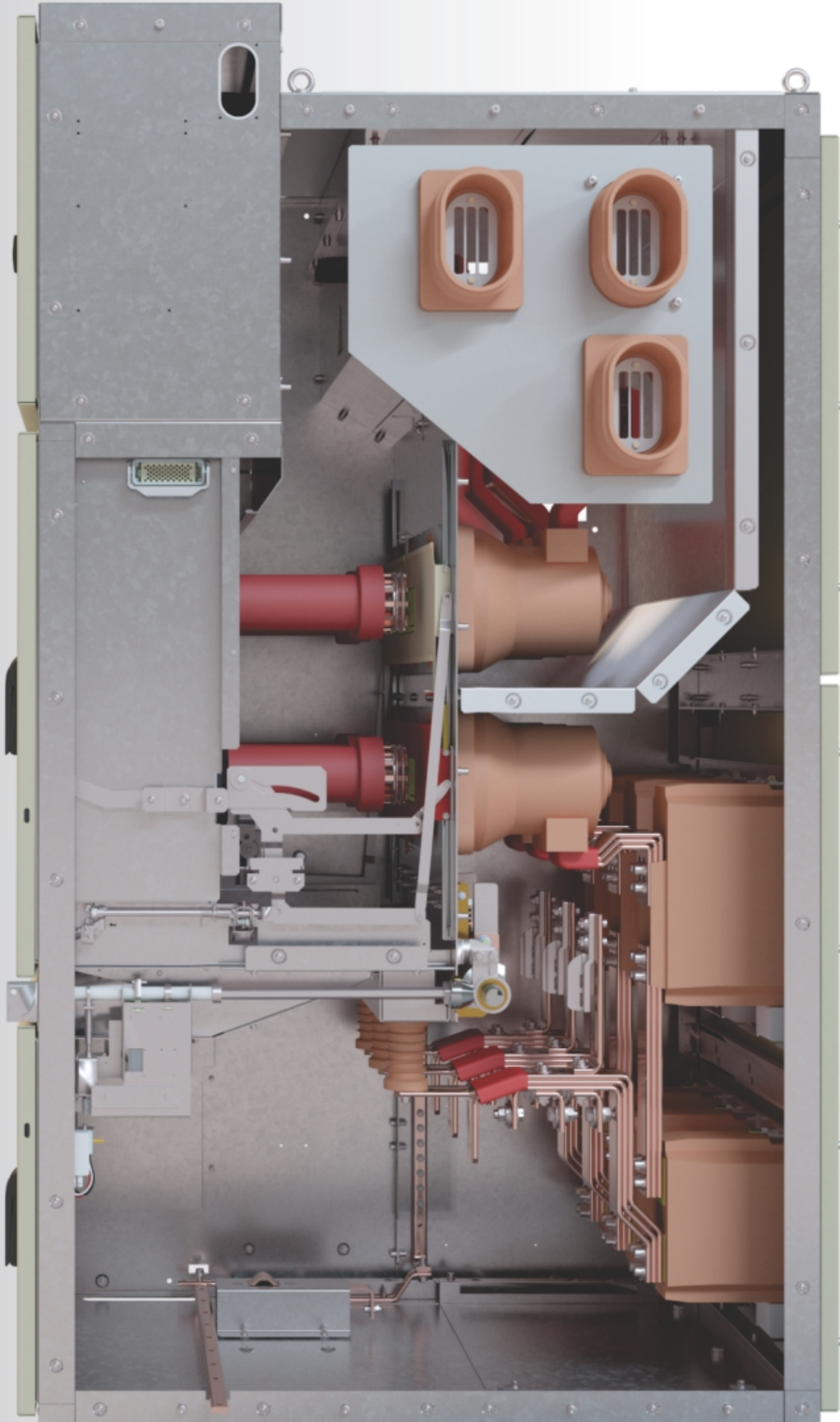
2xVT

➤ Double set of instrument voltage transformers



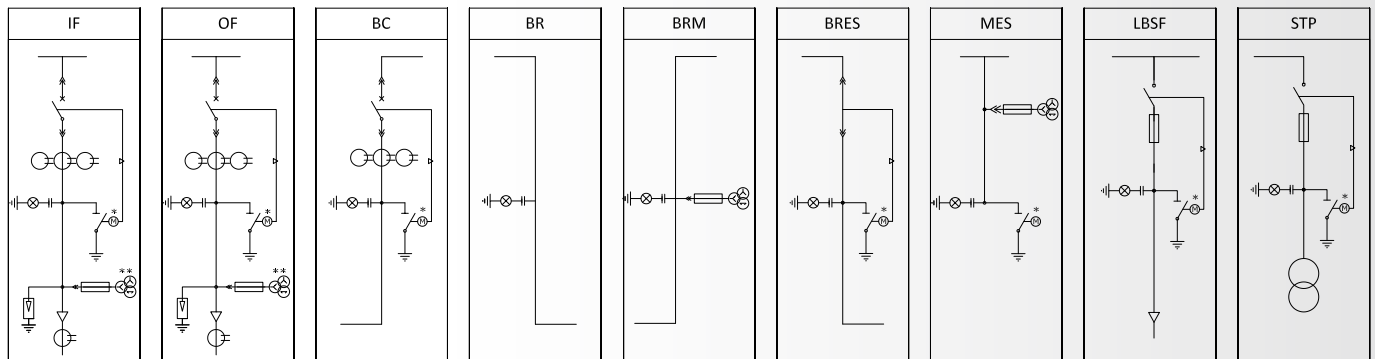


- Double set of instrument current transformers

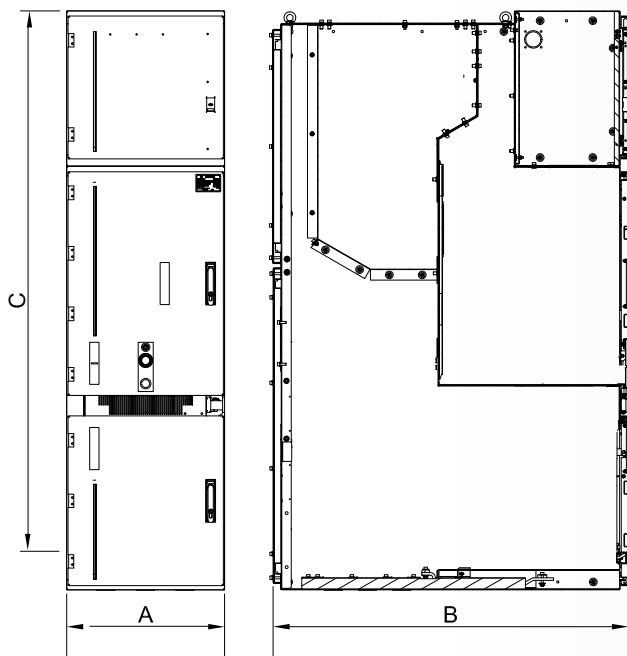




# PANEL CONFIGURATIONS



# DIMENSIONS AND WEIGHTS



| Voltage | Width A, mm    | Depth B, mm | Height C, mm |
|---------|----------------|-------------|--------------|
| 12kV    | 600, 750, 1000 | 1350        | 2348         |
| 17,5kV  | 600, 750, 1000 | 1350        | 2348         |
| 24kV    | 750, 1000      | 1590        | 2348         |

## 12-17,5 kV

|                   |      |      |      |      |      |       |
|-------------------|------|------|------|------|------|-------|
| Depth (mm)        | 1350 |      |      |      |      |       |
| Height (mm)       | 2348 |      |      |      |      |       |
| Width (mm)        | 1000 |      |      |      |      |       |
|                   | 750  |      |      |      |      |       |
|                   | 600  |      |      |      |      |       |
| Weight (kg)       | 780  | 930  |      | 1050 |      |       |
| Rated current (A) | 630  | 1250 | 1600 | 2000 | 2500 | 3150* |
| IF                |      |      |      |      |      |       |
| OF                |      |      |      |      |      |       |
| BC                |      |      |      |      |      |       |
| BR                |      |      |      |      |      |       |
| BRES              |      |      |      |      |      |       |
| M                 |      |      |      |      |      |       |
| MES               |      |      |      |      |      |       |
| LBSF*             |      |      |      |      |      |       |
| STP*              |      |      |      |      |      |       |

## 24 kV

|                   |      |      |      |      |      |
|-------------------|------|------|------|------|------|
| Depth (mm)        | 1590 |      |      |      |      |
| Height (mm)       | 2348 |      |      |      |      |
| Width (mm)        | 1000 |      |      |      |      |
|                   | 750  |      |      |      |      |
| Weight (kg)       | 1010 |      | 1100 |      |      |
| Rated current (A) | 630  | 1250 | 1600 | 2000 | 2500 |
| IF                |      |      |      |      |      |
| OF                |      |      |      |      |      |
| BC                |      |      |      |      |      |
| BR                |      |      |      |      |      |
| BRES              |      |      |      |      |      |
| M                 |      |      |      |      |      |
| MES               |      |      |      |      |      |
| LBSF**            |      |      |      |      |      |
| STP**             |      |      |      |      |      |

\*4000A with forced cooling

\*\*STP and LBSF cubicle maximum ratings are 630A

# TECHNICAL SPECIFICATIONS

The rated characteristics of the switchgear are guaranteed under the following ambient conditions:

| Parameter                        | Parameter value  |
|----------------------------------|--|
| Minimum ambient temperature      | - 40 °C*   |
| Maximum ambient temperature      | + 40 °C**  |
| Maximum altitude above sea level | 3000 m ***   |
| Relative humidity                | 95%  |
| Ambient atmosphere               | Presence of normal, non-corrosive and uncontaminated atmosphere. |

\* with selected microprocessor electronics only.

\*\* + 55 °C on request.

\*\*\* in accordance with IEC 60721-2-1 for altitudes above 1000 m, it is required to take into consideration the decrease of dielectrical strength applying factor from the table.

The SG\_MILE series switchgear are suitable for operation in the climate of Wda type in accordance with IEC 60721-2-1 standard.

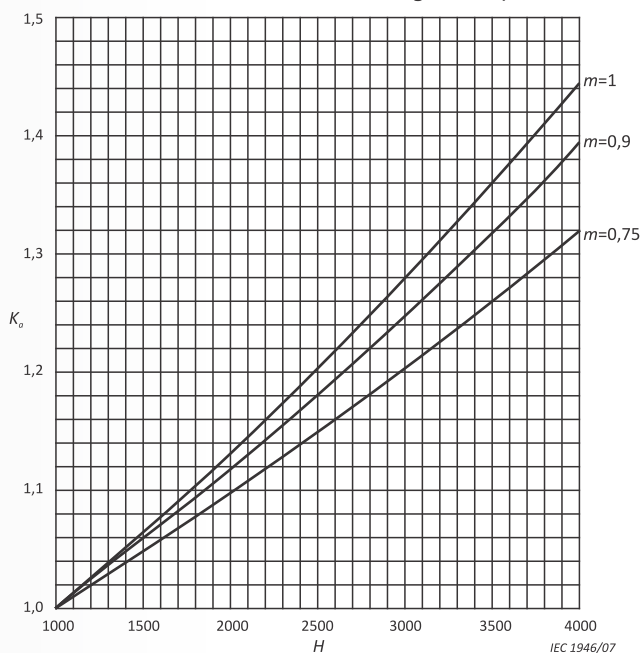
## Main technical data:

|   |   |   |                                  |
|---|---|---|----------------------------------|
| Rated voltage, kV                                   | 12                                      | 17,5                                    | 24                               |
| Rated insulation voltage, kV                        | 12                                      | 17,5                                    | 24                               |
| Rated frequency, Hz                                 | 50/60                                   | 50/60                                   | 50/60                            |
| Rated power frequency withstand voltage, 1 min, kV* | 28/32                                   | 38/45                                   | 50/60                            |
| Rated lightning impulse withstand voltage, kV*      | 75/85                                   | 95/110                                  | 125/145                          |
| Rated branch connection current, A                  | 630;1000;1250;<br>1600;2000;2500;3150** | 630;1000;1250;<br>1600;2000;2500;3150** | 630;1000;1250;<br>1600;2000;2500 |
| Rated main busbar current, A                        | 1250;2000;3150**                        | 1250;2000;3150**                        | 1250;2000; 2500                  |
| Rated breaking current, kA                          | 25; 31,5                                | 25; 31,5                                | 25                               |
| Rated short-time withstand current (3 s), kA        | 25; 31,5                                | 25; 31,5                                | 25                               |
| Rated peak withstand current, kA                    | 64; 83                                  | 64; 83                                  | 64                               |
| Rated supply voltage for auxiliary circuits, V      |   |   |                                  |
| DC  | 48; 110; 220                            | 48; 110; 220                            | 48; 110; 220                     |
| AC  | 100; 230                                | 100; 230                                | 100; 230                         |
| Insulation level                                    | Normal                                  | Normal                                  | Normal                           |
| Insulation type                                     | Air                                     | Air                                     | Air                              |
| IAC classification (IEC62271-200)                   | AFLR 31,5kA/1s                          | AFLR 31,5kA/1s                          | AFLR 25kA/1s                     |
| Busbar insulation                                   | Partly-insulated                        | Insulated                               | Insulated                        |
| Maintenance version                                 | Front; front/rear access                | Front; front/rear access                | Front; front/rear access         |
| Control versions                                    | Local and RTU                           | Local and RTU                           | Local and RTU                    |
| Height  | 2348                                    | 2348                                    | 2348                             |
| Width, mm   |   |   |                                  |
| 600   | Up to 1250A                             | Up to 1250A                             | -                                |
| 750   | 630..2000A                              | 630..2000A                              | 630..1250A                       |
| 1000  | 2001..3150A**                           | 2001..3150A**                           | 1251..2500A                      |
| Depth   | 1350                                    | 1350                                    | 1590                             |
| Class of protection                                 | IP 4X (IP 41 on request)                | IP 4X (IP 41 on request)                | IP 4X (IP 41 on request)         |

\* Extended BIL version on request

\*\* 4000A with forced cooling

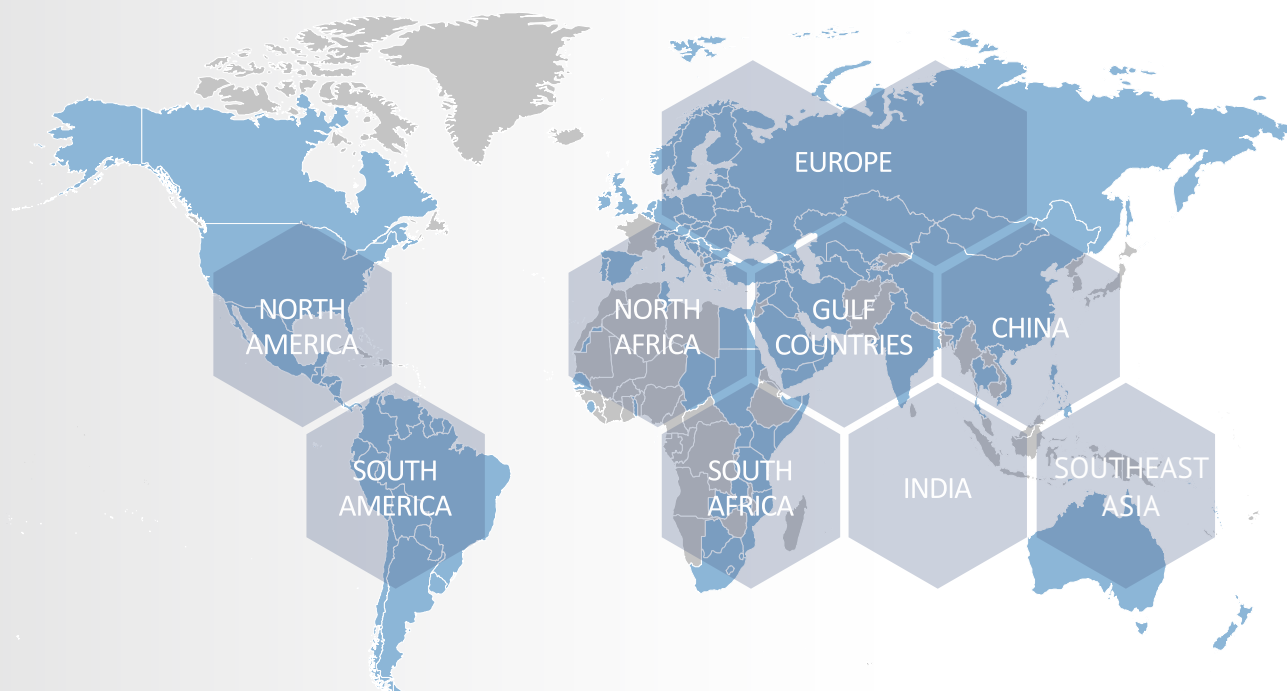
The panel operation environment must not have dust, particles, fumes or smoke, corrosive or flammable gases, vapors or salts.



# APPLICABLE STANDARDS

| Description  | Standard          |
|--|-------------------|
| High-voltage switchgear and control gear – Part 1: Common specifications   | IEC 62271-1       |
| High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV | IEC 62271-200     |
| High-voltage switchgear and control gear – Part 200: High-voltage alternating current disconnectors and earthing switches                                    | IEC 62271-102     |
| Insulation coordination – Part 2: Application guide  | IEC 60071-2       |
| High-voltage switchgear and control gear – Part 100: High-voltage alternating current circuit-breakers   | IEC 62271-100     |
| Instrument transformers - Part 2: Additional requirements for current transformers   | IEC 61869-2       |
| Instrument transformers - Part 3: Additional requirements for inductive voltage transformers   | IEC 61869-3       |
| High-voltage switchgear and control gear - Part 103: Switches for rated voltages above 1 kV up to and including 52 kV  | IEC 62271-103     |
| Unsealed metal-enclosed switchgear and control gear for voltages up to 10 kV. General specifications   | GOST 14693-90     |
| Factory-assembled metal-enclosed switchgear for rated voltages up to and including 35 kV. General specifications   | GOST R 55190-2012 |
| Alternating-current circuit-breakers for voltages from 3 to 750kV. General specifications  | GOST R 52565-2006 |
| EU LV directive  | 2014/35/EU        |
| EU EMC directive   | 2014/30/EU        |





# TE<sup>2</sup>Energy

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