



**TAVRIDA ELECTRIC**



# **SG MILE series air-insulated switchgear** **Elegance & Performance**

**PRODUCT CATALOGUE**

# CONTINUOUS INNOVATION

TAVRIDA ELECTRIC introduces the latest generation of MILE, innovative in its design; compact air insulated withdrawable medium voltage switchgear. As the inventor of a revolutionarily new design of VCB with magnetic actuators in the 1980s, it was logical for TAVRIDA ELECTRIC to bring into the market another innovative product that beats its peers in terms of public and operator safety, style, reliability, performance and environmental sustainability. To highlight our commitment to design and manufacture environmentally friendly products, the Birch style of MILE has been implemented.



Based on vacuum switching technology, air insulation, digital protection and arc-flash relays, MILE inherently saves the environment as it is an SF6-free switchgear. Harmful SF6 gas used in some switchgear panels contributes to the greenhouse effect and associated climate change. 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.

TAVRIDA ELECTRIC, with the assistance of The European Union Regional Development Fund, manufactures MILE panels in Tallinn, Estonia.



European Union  
Regional Development Fund



Investing in your future







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, which comprises a complete range of 12, 17.5 and 24kV voltage classes, is intended for operation in diverse industries.

### MILE APPLICATION FEATURES

#### Electrical Energy distribution



#### Power plants and network grids

- Power generation stations
- Transit (transformer) stations
- Switching substations
- Primary and secondary switchgears

#### Industries

- Petrochemicals
- Cement
- Pulp and paper
- Textiles
- Automotive
- Metallurgy
- Mines
- Oil and gas



#### Services

- Shopping malls
- Hypermarkets
- Hospitals
- Large infrastructures

#### Transport

- Seaports
- Airports
- Railways
- Undergrounds



Built to the latest IEC, GOST, GB and IEEE standards, MILE design meets and exceeds most customer specifications for metal-clad panels worldwide.

**One of the strongest features:** a selectable approach to the partnership based on the demands of different customers. Depending on the customer's request, MILE MP panels can be supplied as:

- Knock-down parts, ready for assembly in a customer workshop
- Powerblocks - assembled metal construction including all necessary mechanical interlocks with auxiliary wiring to be tailored by the customer
- Completely assembled and factory type-tested panels ready to be installed on site.

Additionally, standard insulation withstand level of a panel can be augmented by the use of switchgear parts with extended insulation, covered with heat-shrinkable tubes or parts intended for higher rated voltages.

**MILE VERSATILITY FEATURES**

**The design of 12, 17.5 and 24kV panels is unified**

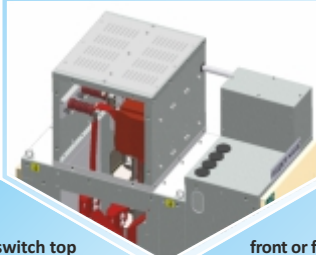
**CASSETTE VERSION**



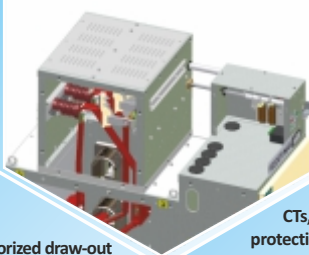
**TRUCK VERSION**



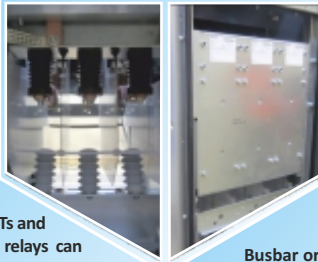
panel top or cable/VCB compartment installation of VTs



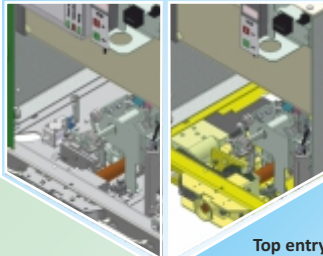
earthing switch top installation and gas exhaust ducts



front or front and rear accessibility to the cable compartment



Manual or motorized draw-out unit and earthing switch mechanisms



CTs, VTs and protection relays can vary with customer specifications



Busbar or cable bridge



Top entry for cables or busbars



Applicable for installation in metal kiosks or concrete buildings

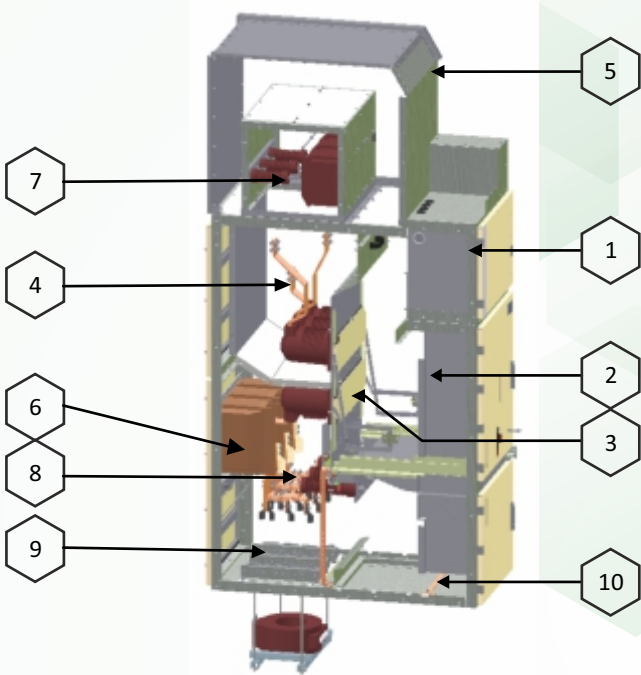




# FIELD-PROVEN DESIGN EVEN BETTER

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.

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. LV compartment
2. VCB compartment
3. Automatic shutters
4. Busbar compartment
5. Gas exhaust duct
6. CTs
7. VTs
8. Earthing switch
9. Cable terminations
10. Earthing bar

## 1. 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.



## 2. 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.

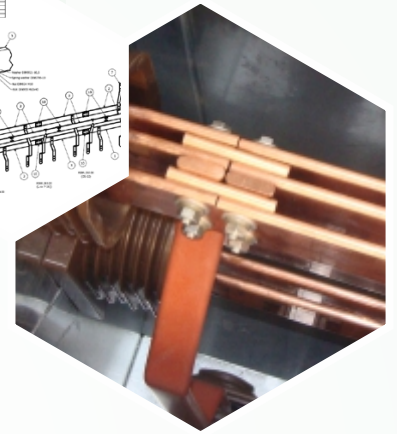
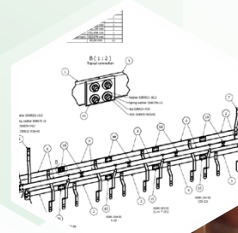
### 3. AUTOMATIC SHUTTERS

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.



### 4. 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.



### 5. 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.



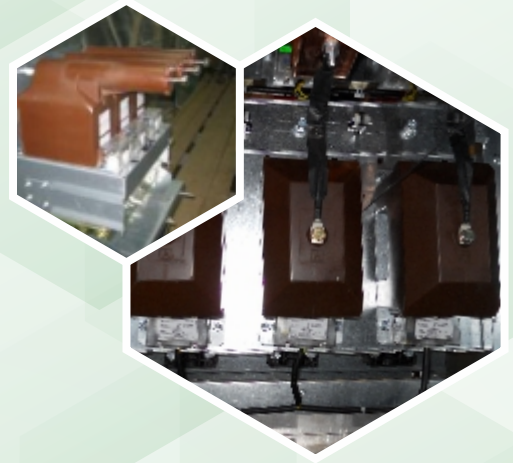
### 6. CURRENT TRANSFORMERS

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.



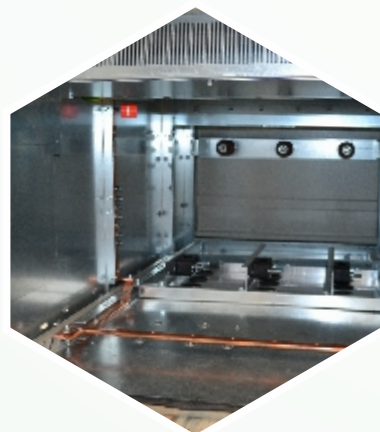
## 7. VOLTAGE TRANSFORMERS

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.



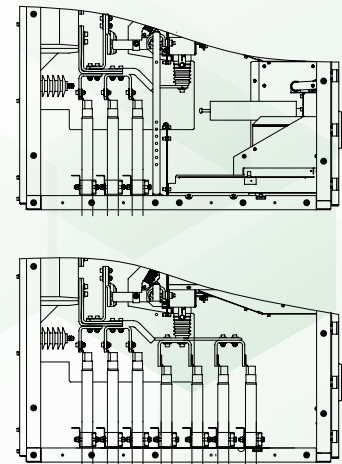
## 9. CABLE TERMINATIONS

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.



## 8. 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.



## 10. 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.



# 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.

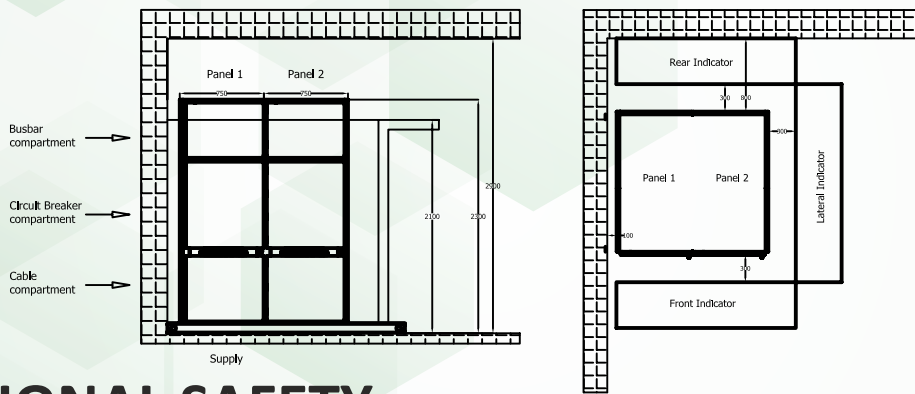
AFLR (A – authorized personal access)

(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

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 TAVRIDA ELECTRIC VCB with MAGNETIC ACTUATORS in MILE provides unique and unrivalled safety features.



**Remote and safe manual closing** of VCB with a palm-held manual generator.

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.

TAVRIDA ELECTRIC'S outstanding VCB operating mechanism, The MAGNETIC ACTUATOR, is able to interrupt in 16ms – 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.

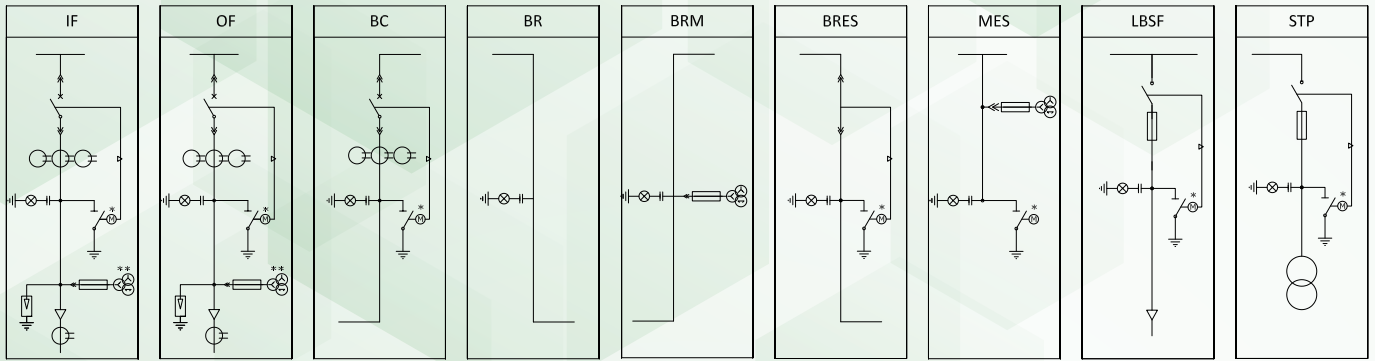


**An LV plug interlock** visually prompts an operator to connect the draw-out unit to secondary circuits before the compartment door is closed.

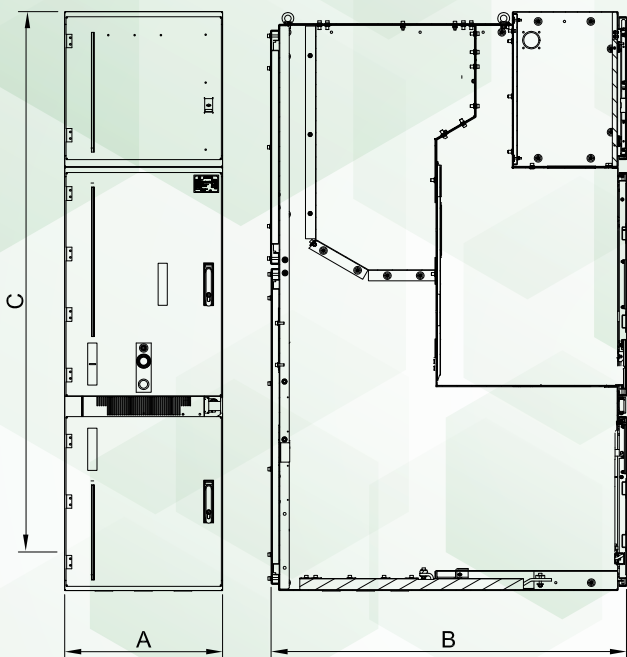
**Refined accessories**, such as door hinges, handlebars, locks and electrical indicators and buttons withstand thousands of operations and guarantee the appearance of a beautifully crafted product.

**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.

# PANEL CONFIGURATIONS



# DIMENSIONS AND WEIGHTS



Voltage	Width A, mm	Depth B, mm	Height C, mm
12kV	600, 750, 1000	1355	2348
17,5kV	600, 750, 1000	1355	2348
24kV	750, 1000	1593	2348

## 12-17,5 kV

Depth (mm)	1355						
Height (mm)	2348						
Width (mm)	1000						
	750						
	600						
Weight (kg)	780	930	1050				
Rated current (A)	630	1250	1600	2000	2500	3150	4000
IF							
OF							
BC							
BR							
BRES							
M							
MES							
LBSF*							
STP*							

## 24 kV

Depth (mm)	1593				
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*					

\*STP and LBSF cubicle maximum ratings are 630A



# TECHNICAL SPECIFICATIONS

The rated characteristics of the switchgear are guaranteed under the following ambient conditions: In accordance with 62271-1 standard.

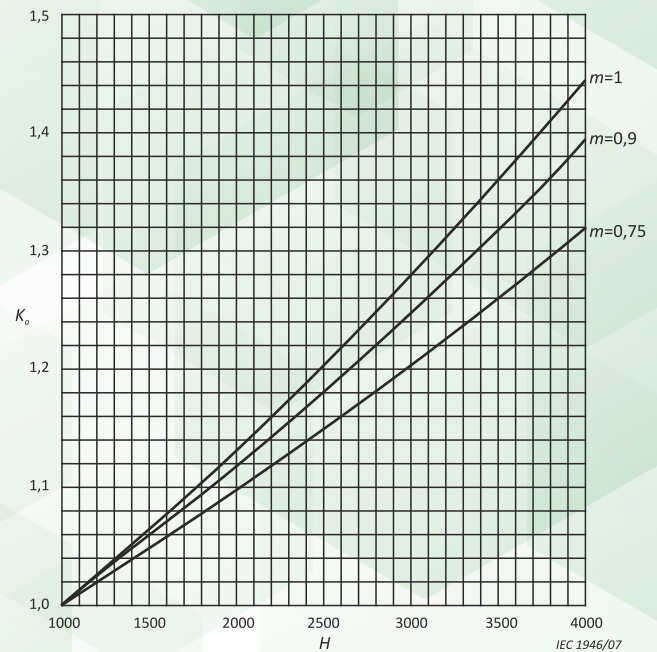
Parameter	Parameter value
Minimum ambient temperature	- 40 °C*
Maximum ambient temperature	+40 °C (on request +55 °C)
Maximum altitude above sea level	3000 m **
Relative humidity	95%
Ambient atmosphere	Presence of normal, non-corrosive and uncontaminated atmosphere.

\* with selected microprocessor electronics only.

\*\* 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.

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



## 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	42	42 (55 on request)	50
Rated lightning impulse withstand voltage, kV	75	95	125
Rated branch connection current, A	630;1000;1250;1600; 2000;2500;3150; 4000*	630;1000;1250;1600; 2000;2500;3150;4000*	630;1000;1250; 1600;2000;2500;
Rated main busbar current, A	1250; 1600; 2000; 2500; 3150; 4000*	1250; 1600; 2000; 2500; 3150; 4000*	1250; 1600; 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..4000A	2001..4000A	1251...2500A
Depth	1355	1355	1593
Class of protection	IP 4X (IP 41 on request)	IP 4X (IP 41 on request)	IP 4X (IP 41 on request)

\*-with forced cooling

# Applicable standards

IEC 62271-1	Common specifications
IEC 62271-100	Circuit breakers (E2, M2, C2)
IEC 62271-102	Disconnectors and earthing switches (E2, M0)
IEC 62271-200	Metal enclosed switchgear and controgear
IEC 60044-1	Current transformers
IEC 60044-2	Voltage transformers
IEC 60529	Degrees of protection (IP Code)
IEC 61850	Communication networks and systems in substations
IEC 61243-5	Live working - voltage detectors - Part 5: voltage detecting systems

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