

FLEXIBLE AND RELIABLE SOLUTION
FOR PRIMARY AND SECONDARY DISTRIBUTION SYSTEMS

SG_MILE AIS



CONTINUOUS INNOVATION

Introduction

As the inventor of a revolutionarily new design of VCB with linear motor drives in the 1980s, it was logical for Tavrída 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.



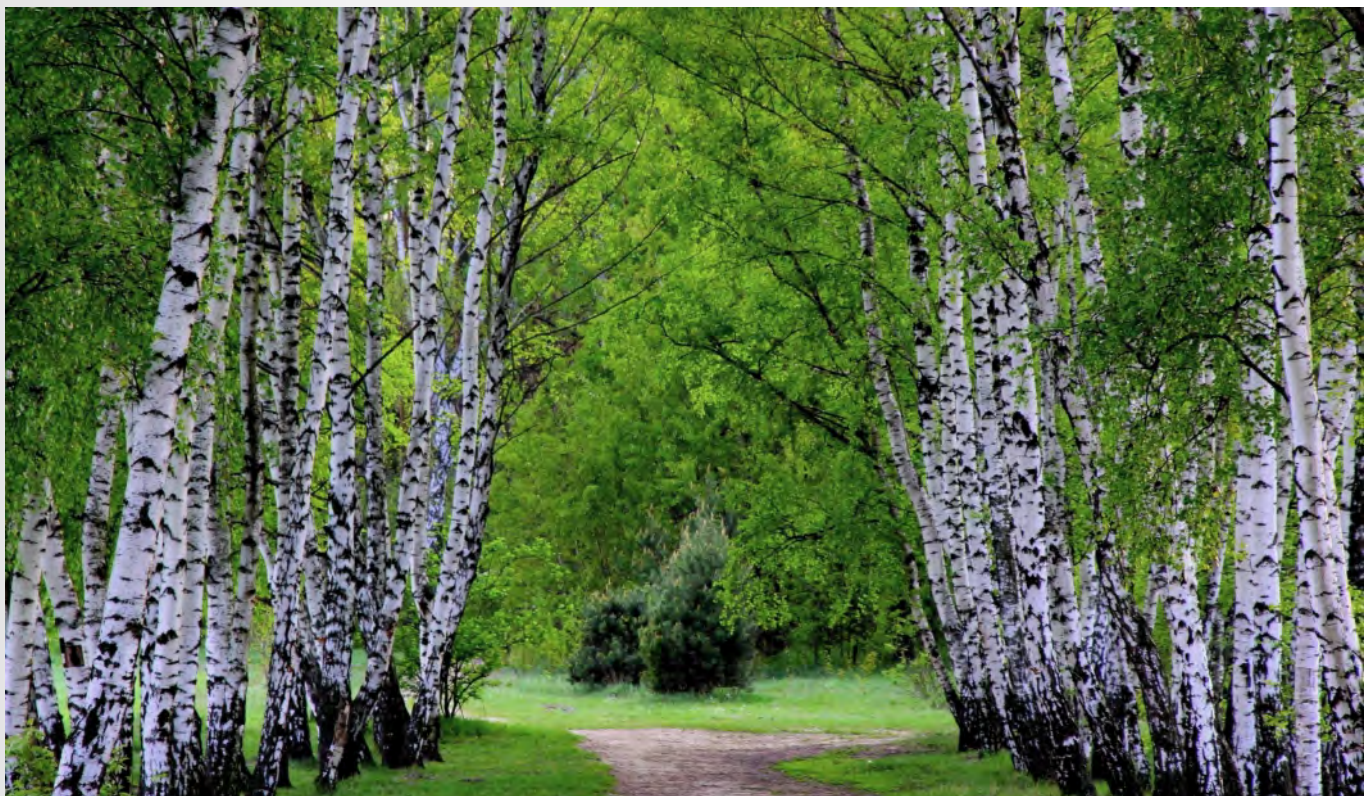
Tavrída Electric, with the assistance of The European Union Regional Development Fund and Enterprise Estonia Agency, manufactures MILE panels in Tallinn, Estonia, following the highest international quality standards.



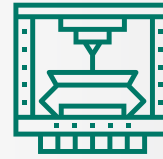
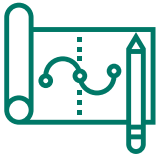
European Union
Regional Development Fund



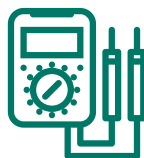
Investing in your future



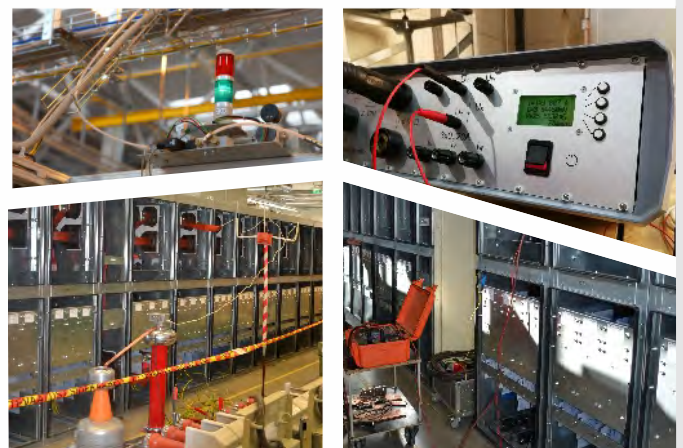
STATE-OF-THE-ART MANUFACTURING



- 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.

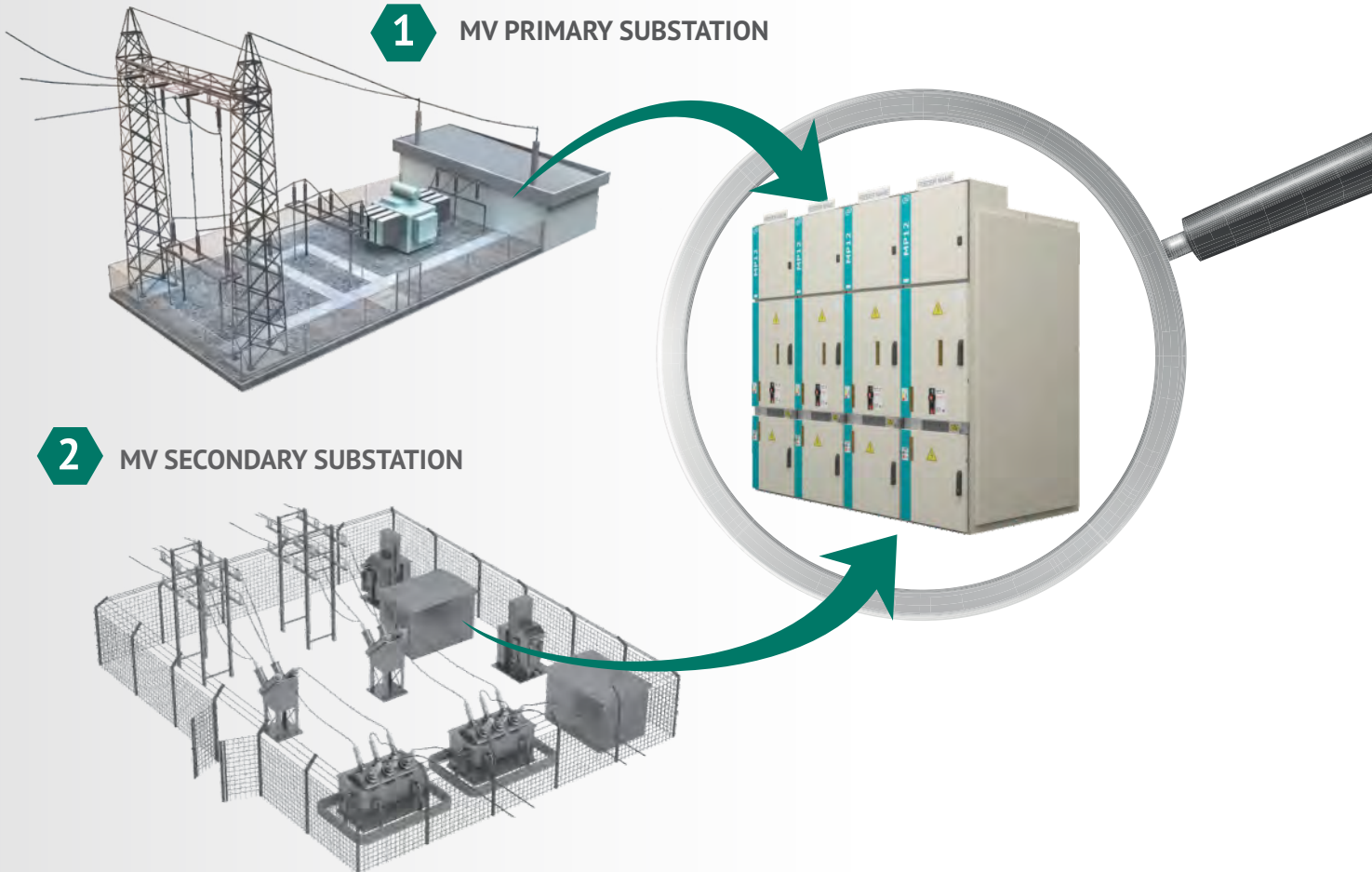


- In-house testing facilities are available to conduct primary and secondary current injection tests as well as high voltage and partial discharge tests which constitute the core of the comprehensive routine testing program on MILE.





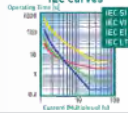




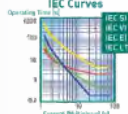

GREATER APPLICATION VERSATILITY

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.



1 MV PRIMARY SUBSTATION

2 MV SECONDARY SUBSTATION

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

ENERGY



Power stations



Zone substations



Secondary substations



Photovoltaic parks



Wind farms



Primary substations



Hydro power substations



Mineral production and transportation



Automotive production lines



Iron and steel production



Oil and Gas



Water and waste water plants



Mining and excavations



Ships



Sea platforms



Shore supplies



Office buildings



Hotels



Hospitals



Data Centres



Shopping centers



Stadiums and arenas

INFRASTRUCTURE



Airports



Seaports



Metro stations



City ground transport



Railways



Heat and water distribution

MARINE

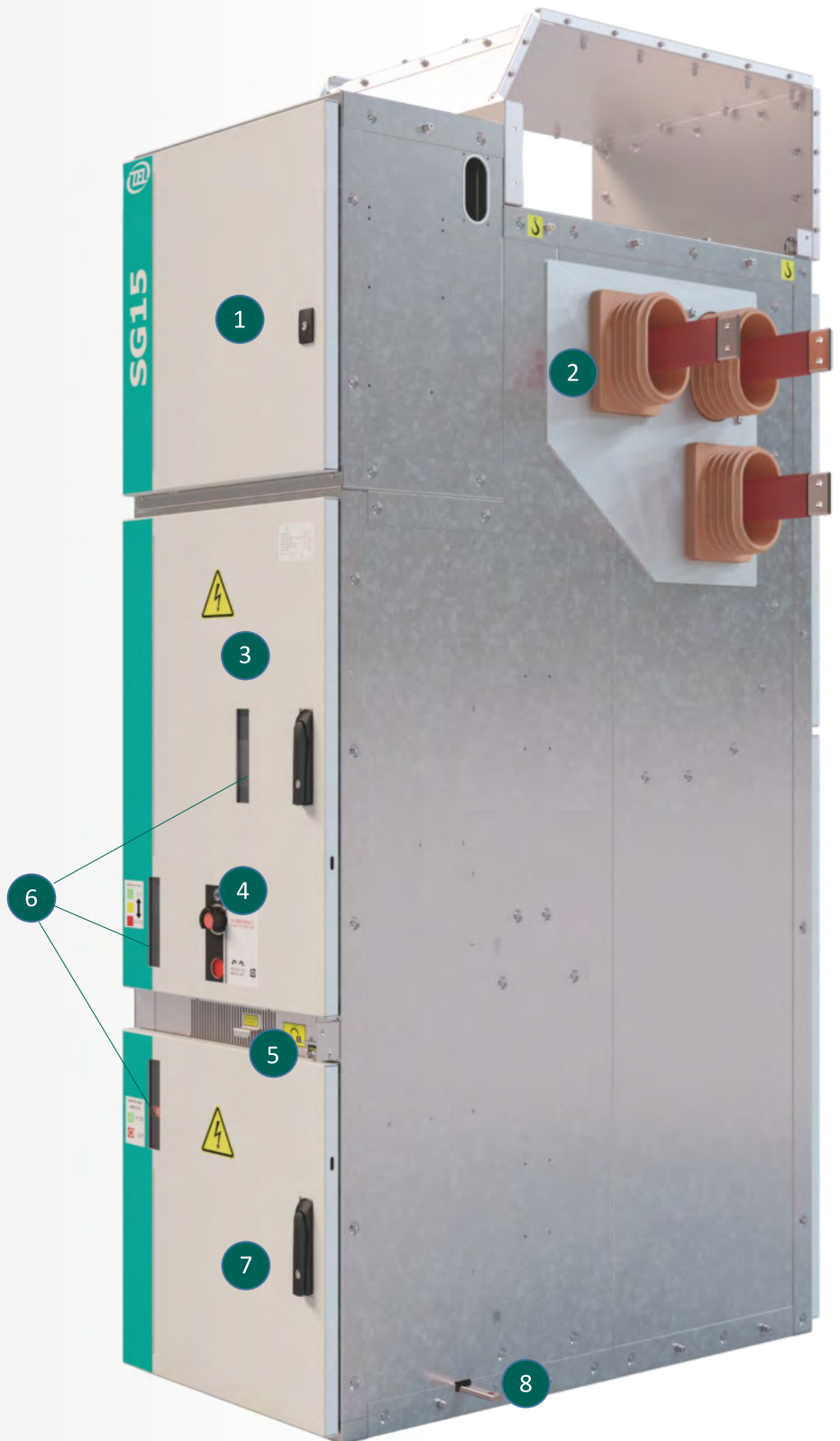
BUILDINGS

FIELD-PROVEN DESIGN EVEN BETTER



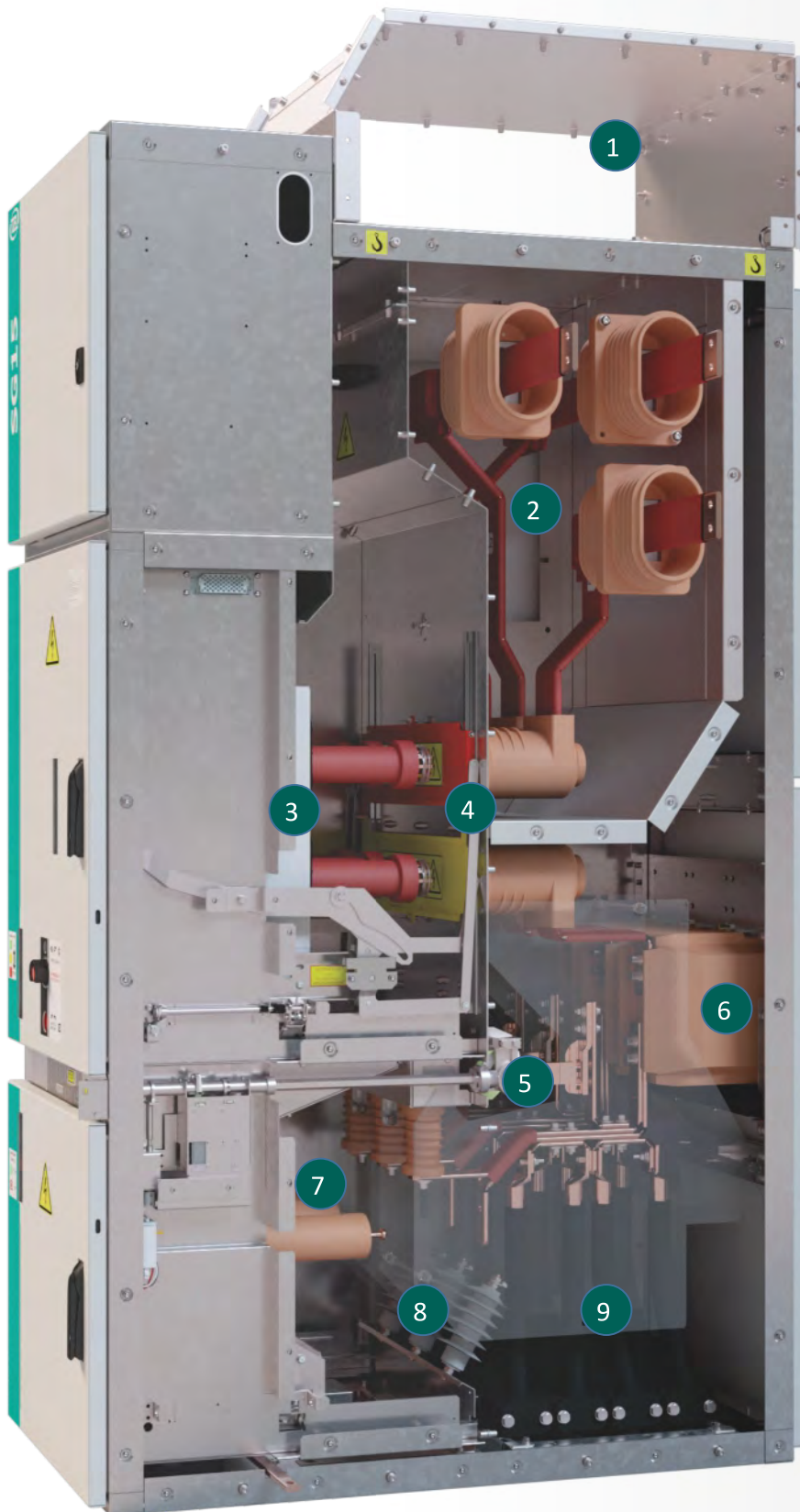
MILE has a typified design so that the arrangement of equipment and instruments in the panel represents the mainstream concept of switchgear specified by most customers worldwide. In addition to draw-out units at a central location and make-type earthing switches, the design is considerably augmented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

- 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.

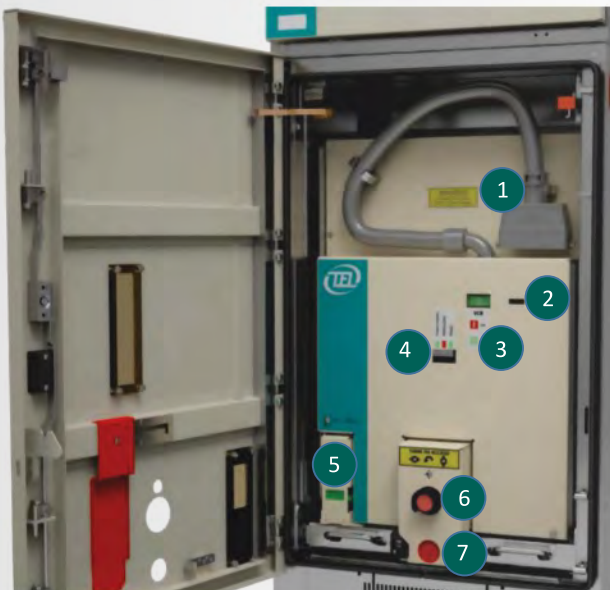


VCB COMPARTMENT

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

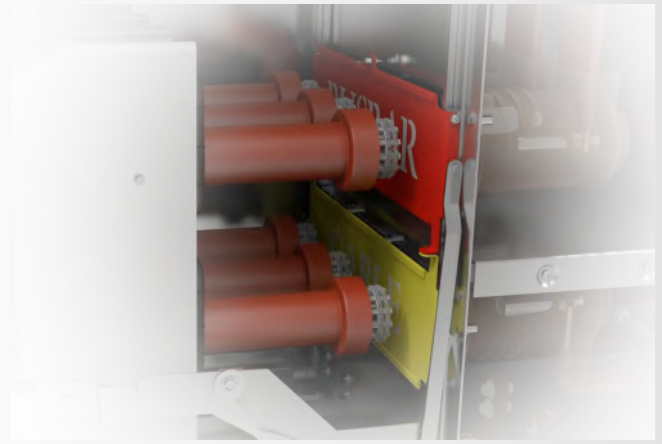
AUTOMATIC SHUTTERS

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.



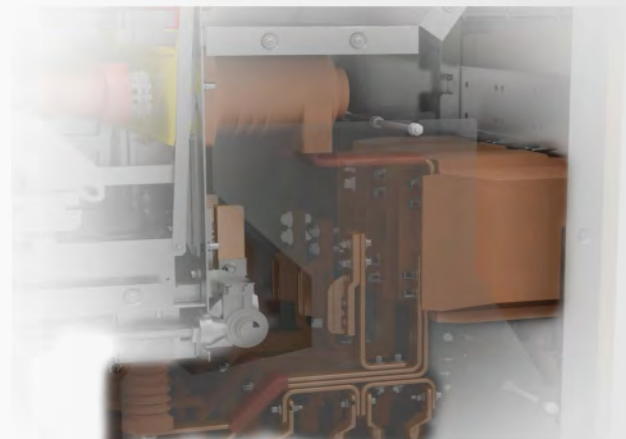
CURRENT TRANSFORMERS

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.



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.

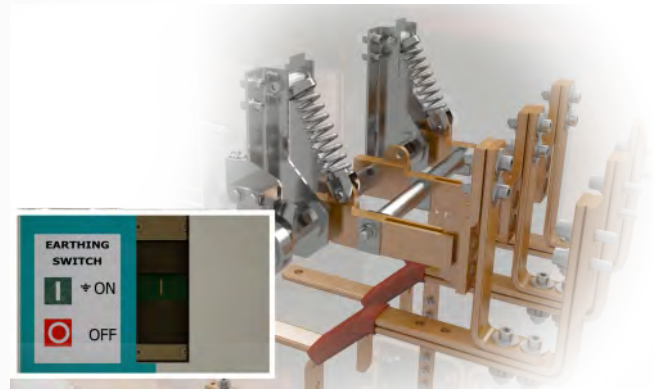


VOLTAGE TRANSFORMERS

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.



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.

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.



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.

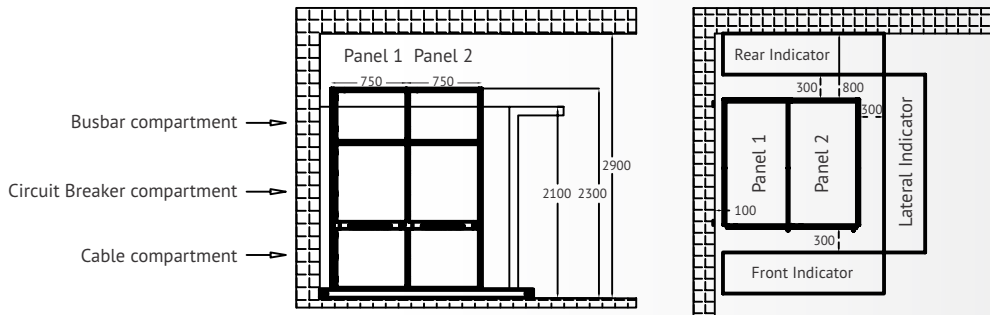
AFLR stands for: (A – Authorized personal access)

(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 TAVRIDA 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 Tavrida Electric 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.

Tavrida Electric's 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.



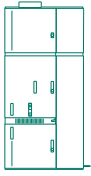
Lockable access to the VCB racking in/out mechanism by a metallic shutter prevents unauthorized operations and interlocks the VCB in the trip position prior to racking a draw-out unit. An LV plug interlock visually prompts an operator to connect the draw-out unit to secondary circuits before the compartment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



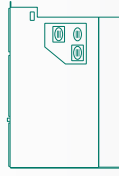
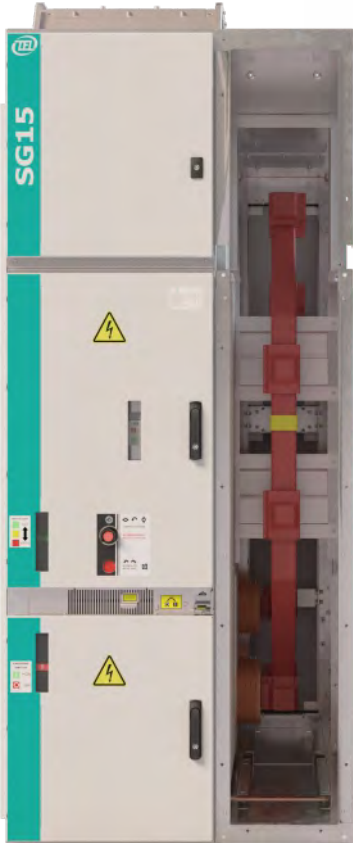
Minimum service checks on site. MILE is designed for a service life of at least 30 years. The VCB, earthing switch and cast resin insulation technology is considered virtually maintenance free, so the maintenance requirements are only related to periodical checks to make sure that the system operates 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



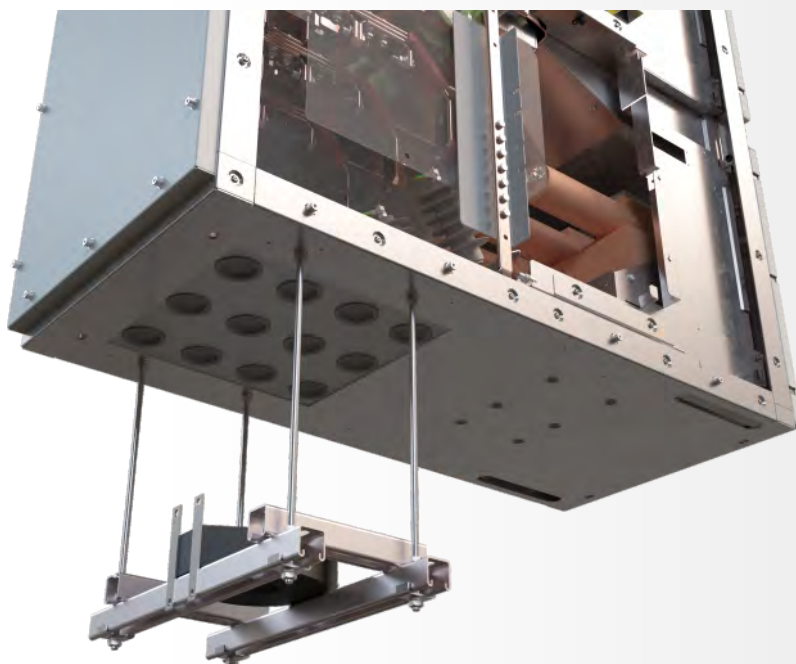
➤ Side wall busbar

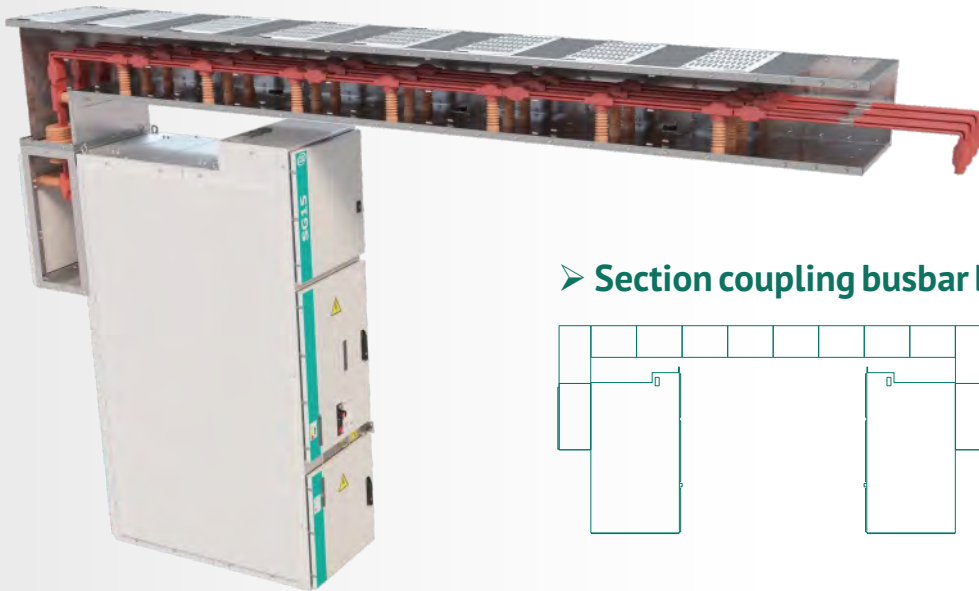


➤ Rear wall cable attachment

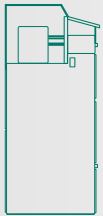


➤ Ring core residual transformer in the cable cellar

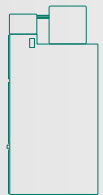




➤ **Section coupling busbar bridge**



➤ **Earthing switch top installation**



➤ **Voltage transformer top installation**

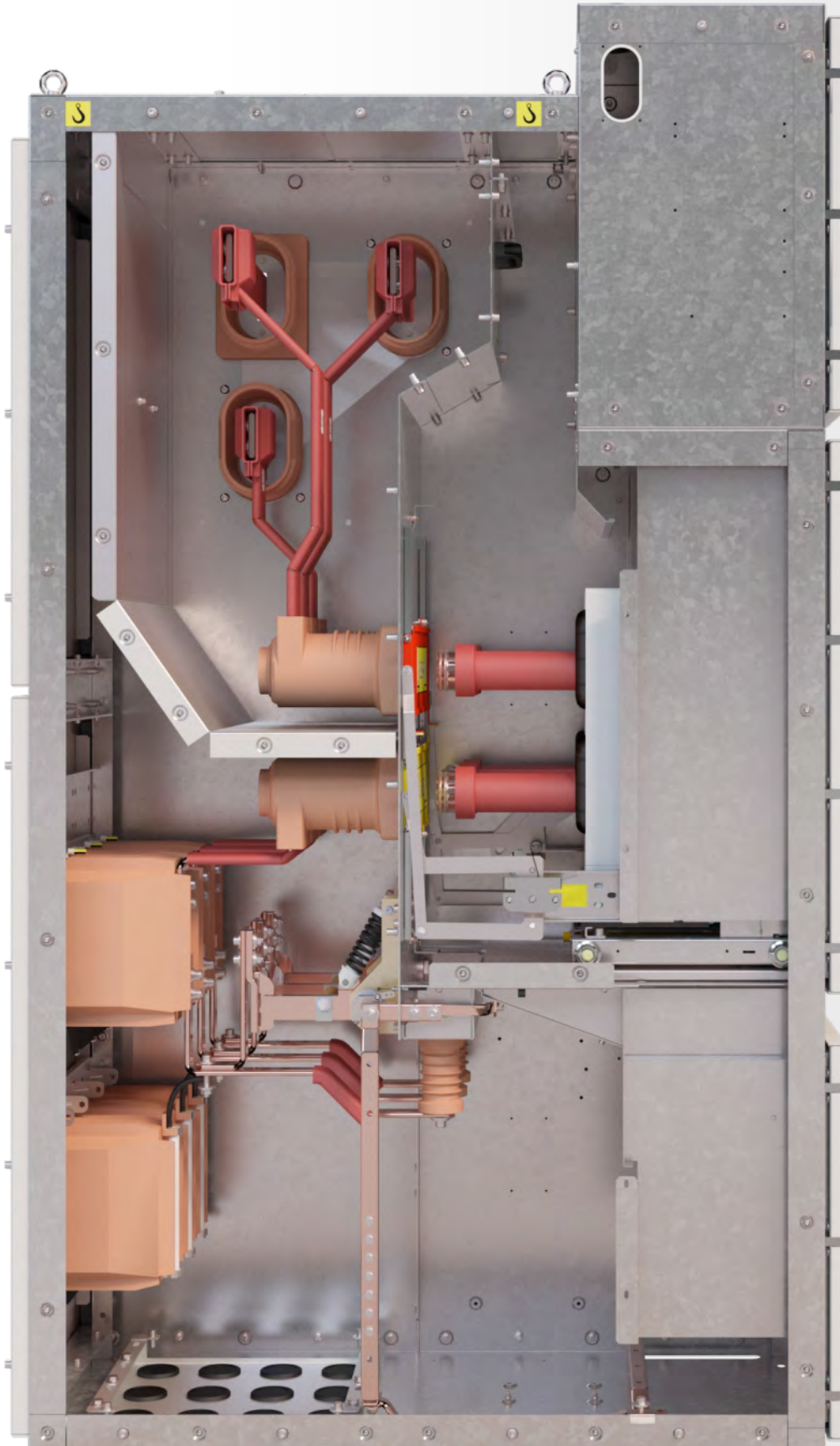


FLEXIBLE SOLUTIONS ACROSS VARIETY OF USER-SPECIFIC TECHNICAL REQUIREMENTS



2xVT

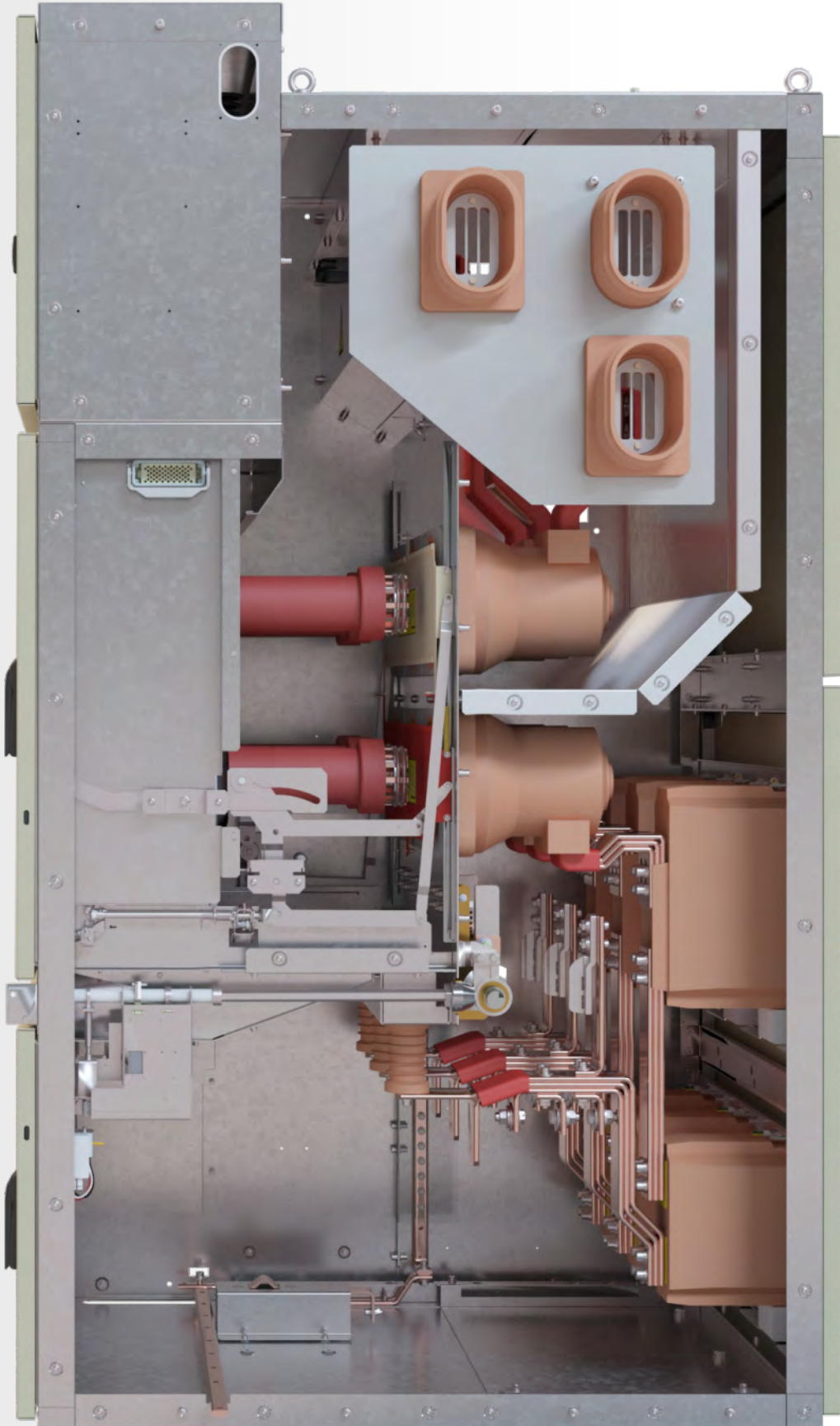
➤ Double set of instrument voltage transformers



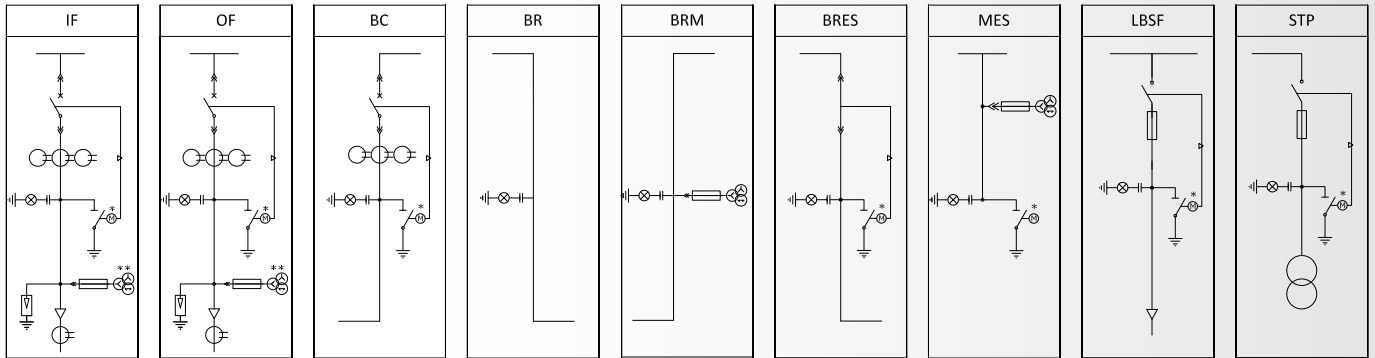


2xCT

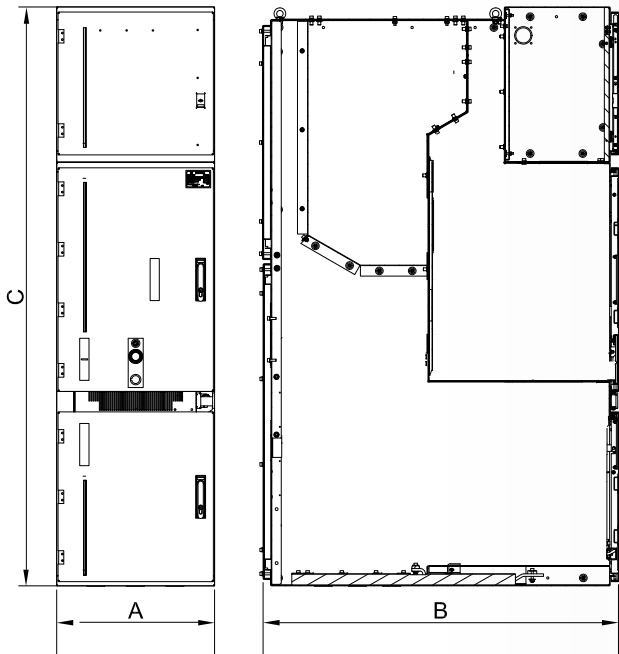
➤ Double set of instrument current transformers



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.

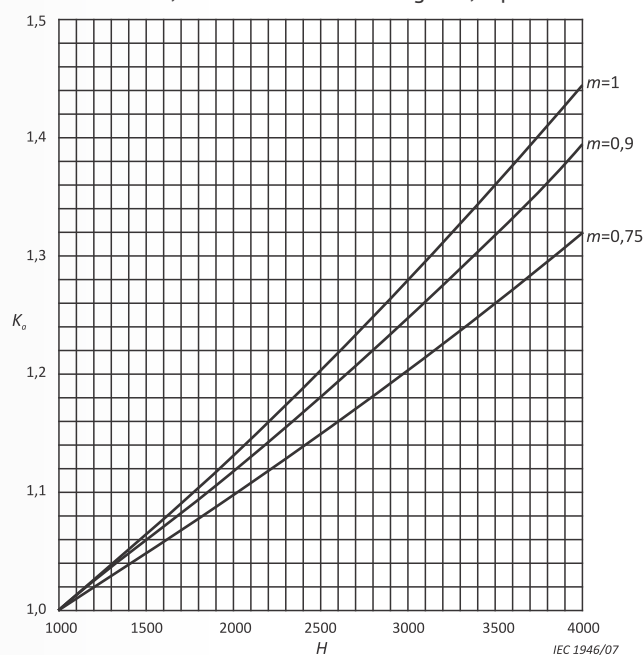
Main technical data:

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; 1600;2000;2500;3150**	630;1000;1250; 1600;2000;2500;3150**	630;1000;1250; 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	2500..3150A**	2500..3150A**	1600..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)

* GOST version on request

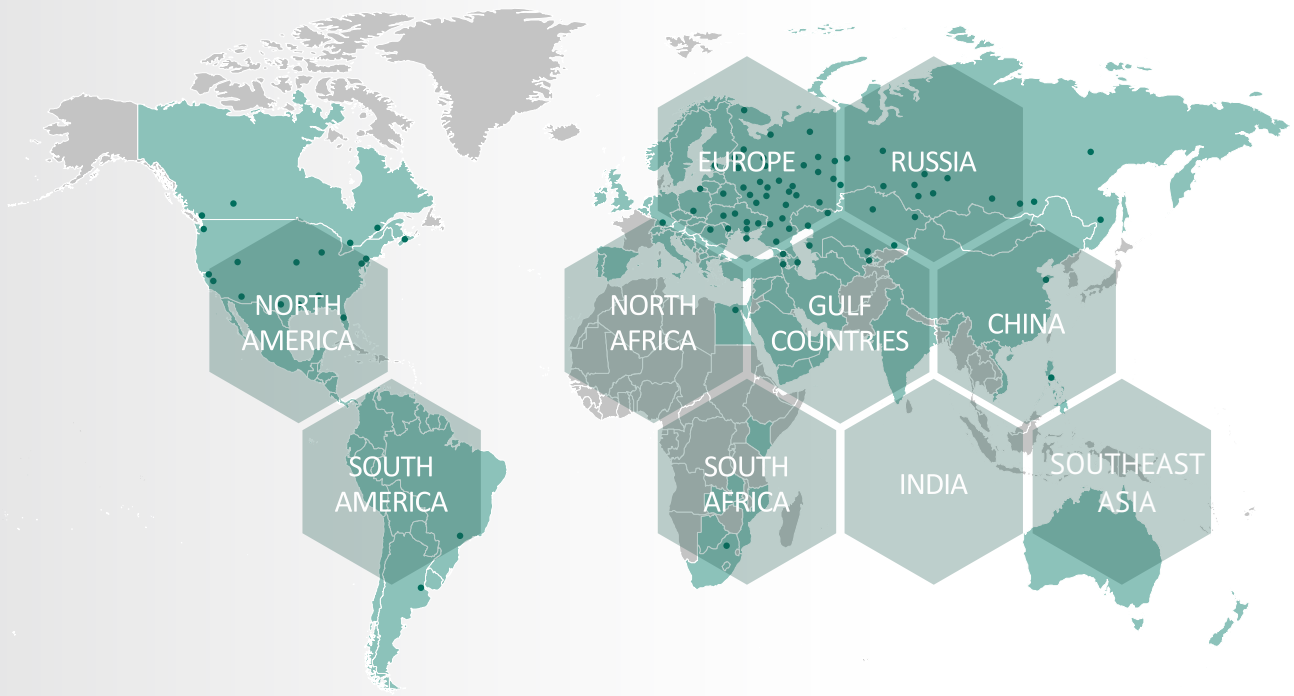
** 4000A with forced cooling

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



Tavrída Electric worldwide

ESTONIA

AS Tavrída Electric Export

14, Visase str.,
Tallinn 11415 Estonia

Tel.: +372 606 47 57
Fax: +372 606 47 59

E-mail: export@tavrida.eu
Web: www.tavrida.com

POLAND

Tavrída Electric Poland sp. z o.o.

Graniczna 44,
43-100 Tychy Poland

Tel.: +48 (32) 3271986
Fax: +48 (32) 3271987

E-mail: telp@tavrida.pl
Web: www.tavrida.com

ROMANIA

SC Energobit Tavrída SRL

Romania 400221 Cluj Napoca,
Industrial Park Tetarom I,
Taietura Turcului str., 47/11

Tel.: +40 264 207 583 / 584
Fax: +40 264 207 555

E-mail: paul.pandrea@energobit.com
Web: www.tavrida.com

EGYPT

Tavrída Electric North And East Africa S.A.E

Building Number 476,
Street Number 9, D area,
Mokattam, 11571, Cairo, Egypt

Tel.: (+202) 25079317
Fax: (+202) 25079319

E-mail: mmh@tavrida.eu
Web: www.tavrida.com

OMAN

Tavrída Electric Commercial Representative Office

Ocean Business Center,
Al Maha street, Bausher, Muscat

Tel.: +968 7116 8395

E-mail: gks@tavrida.eu
Web: www.tavrida.com



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