SG25_SCELL

AIS MV COMPACT SWITCHGEAR

24 kV, 25 kA, 1250 A

TECHNICAL MANUAL

ISO 9001:2015
ISO 14001:2015

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CE All low voltage devices meet the requirements of the EMC Directive 2014/30/EC, the Low Voltage Directive 2014/35/EU

Table of Contents

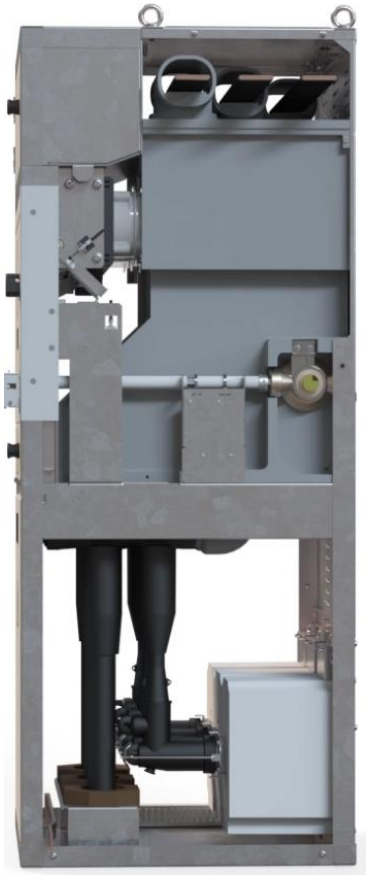
1. General

1.1. Abbreviations

AC	Alternating Current
CB	Circuit Breaker
CC	Cable Compartment
CM	Control Module
CO	Close-Open (operation)
COS	Change-Over Switch
CT	Current Transformer
CTF	Cable Testing Facility
DC	Direct Current
DIN	German Institute for Standardization
EM	Electromagnetic
EMC	Electromagnetic Compatibility
EU	European Union
GB	Great Britain
GOST	State Standard of the Russian Federation
HCD	Handheld Closing Device
IAC	Internal Arc Classification
IEC	International Electrotechnical Commission
IED	Intelligent Electronic Device
IP	Ingress Protection
ISM	Indoor Switching Module
LD	Low Duty
LED	Light-Emitting Diode
LF	Line Feeder
LFVT	Line Feeder with Voltage Transformer
LI	Line Input
LV	Low Voltage
M	Metering (panel)
PB	Power Block
PCD	Pole-Center Distance
PD	Partial Discharge
PI	Insulating Partitions (class)
R&D	Research and Development
RTU	Remote Terminal Unit
SA	Surge Arrester
SF6	Sulfur Hexafluoride
SD	Switch (line) Disconnector
SG	Switchgear
SP	Switchgear Panel
ST	Service Transformer panel
TLF	Time Limit Fuse
VDS	Voltage Detecting System
VI	Voltage Indicator
VPIS	Voltage Presence Indicating System
VS	Voltage Sensor
VT	Voltage Transformer

1.2. Presentation

Thank you for choosing this TE Energy product. The SCELL series switchgear is designed for primary and secondary distribution networks intended for indoor and outdoor installation. SCELL panel is designed using combined insulation: solid and air as interrupting medium. It is the most compact panel in the class of non-extensible and extensible SF6-free switchgear up to 24 kV.



Main features:

SCELL panel is a universal building block to build up customer's sophisticated network of any configuration and functionality thanks to its instant digital network readiness, powerful electrical parameters, functional versatility and compact size.

• SCELL intelligence is provided by a powerful Intelligent Electronic Device (IED) with digital current and voltage inputs, rich protection, automation and communication features.

• SCELL heart represents a standard combination of:

- Change-Over Switch COS with detachable earthing blades;

- Fast vacuum circuit breaker ISM with magnetic actuator. Simple, durable and safe with extremely long electrical and mechanical life.

Both of switching devices are capable to perform as of "isolation device" as per IEC 61140.

• SCELL sensing includes digital current and voltage sensors, temperature and PD sensors.

1.3. Reference standards

SCELL series switchgear meet all the requirements for prefabricated metal enclosed switchgear for indoor and outdoor installation in accordance with the latest revision of IEC 62271-200. A complete list of applicable standards is given in Table 1.1.

Table 1.1 Applicable standards

Equipment	Standard
IEC 62271-1	HV switchgear and controlgear: common specifications
IEC 62271-100	Alternating current circuit breakers
IEC 62271-102	Alternating current disconnectors and earthing switches
IEC 62271-200	AC metal enclosed switchgear and control gear above 1 kV and up to and including 52 kV
IEC 62271-304	Classification of indoor enclosed switchgear and controlgear for rated voltages above 1 kV up to and including 52 kV related to the use in special service conditions with respect to condensation and pollution
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IEC 61869-1	Instrument transformers - Part 1: General requirements
IEC 61869-2 IEC 61869-3	Instrument transformers - Part 2: Current transformers Instrument transformers - Part 3: Inductive voltage transformers
IEC 60255	Measuring relays and protection equipment
IEC 61243-5	Voltage detecting systems (VDS)
IEC 62271-206	VPIS systems for rated voltages between 1kV and 52kV
IEC 61140	Protection against electric shock - Common aspects for installation and equipment
EN 50181	Plug-in type bushings above 1 kV up to 52 kV
2014/35/EU	EU LV directive
2014/30/EU	EU EMC directive
ISO 9001	Quality management
ISO 14001	Environmental management

1.4. Normal service conditions

The rated characteristics of the switchgear are guaranteed under the ambient conditions given in Table 1.2.

Table 1.2 Service conditions

Parameter	Value
Minimum ambient temperature, °C	-25[1]
Maximum ambient temperature, °C	+50[2]
Maximum altitude above sea level, m	1000[3]
Maximum relative humidity	95%
Ambient atmosphere in accordance with IEC 60721-2-1- "Wda": non-explosive, uncontaminated and non-corrosive. Atmosphere type II according to GOST 15150-69; Degree of severity of service conditions under condensation and pollution as per IEC 62271-304: Degree 0: C0PI.	

[1]Value is limited by instrument transformers and electronic protection devices.

[2]IEC 62271-200 limits the upper level of ambient temperature at +40°C.

[3]For installations in altitudes above 1000 m, the external insulation is calculated as multiplication of rated insulation with Ka in accordance with IEC 62271-1.

1.5. Rated characteristics

The main rated characteristics of the switchgear are given in Table 1.3.

Table 1.3 Rated characteristics

Type of panel	SG15_SCELL		SG25_SCELL	
Applicable CB	**ISM25_LD**	**ISM25_Shell**	**ISM25_LD**	**ISM25_Shell**
Rated voltage, kV	17,5		24	
Rated frequency, Hz	50/60		50/60	
Rated power frequency withstand voltage,	38		50	
Across COS and ISM[1] open contacts,	45		60	
Rated lightning impulse withstand voltage,	95		125	
Across COS and ISM[1] open contacts,	110		145	
Rated peak withstand current, kA	52	65	52	65
Rated short-time withstand current, kA (3s)	20	25	20	25
Rated current, A	800	1250	800	1250
IAC classification	A-FL; A-FLR (with rear attachment)			
Isc, kA/1s	20	25	20	25
Loss of service continuity	LSC2B			
Partition type	PI			
Partial discharge level at 1.1 x Urated, pC	<20			
Degree of protection indoor	IP4X (IP41)			
Auxiliary voltage, V	24/48/110/220DC; 230AC			
Circuit breaker class	M2 (30.000CO), S2, E2, C2			
Autoreclosing cycle	O-0,3s-CO-10s-CO			
COS class as Disconnector	M1			
COS class as Earthing switch	M1, E2			
Dimensions (WxDxH), mm	Standard LV compartment:		500x600(750[4])x1540[5]	
	Extended LV compartment:		500x600(750[4])x1695[5]	
	High LV compartment:		500x600(750[4])x2095[5]	
Rear[2] attachment depth, mm	325			
Front[3] attachment depth, mm	300			

[1]As per IEC 61140 an “isolation device”.

[2]A-FLR ort motorized COS option.

[3]Front attachment for extra cables.

[4]Depth with ISM25_Shell.

[5]Height with lifting lugs.

2. Safety information

2.1. General recommendations

The instructions in this manual are not intended as a substitute for competency in the use of the equipment described. Installation, use and repair should only be carried out by trained and experienced personnel, who are familiar with the equipment and with electrical safety requirements.

Pay attention to the following recommendations:

- Make sure that during installation, commissioning and operation, the respective legal regulations (GB/IEC/IEEE/GOST) and appropriate national safety regulations are adhered to.
- Only install and operate the switchgear in an environment suitable for the installation and operation of electrical equipment.
- Make sure that the parameters specified by the manufacturer are not exceeded under the switchgear operation.
- Make sure that this manual is available to all persons concerned with installation, commissioning and operation.
- Pay special attention to the hazard statements described in section 2.2.

2.2. Hazard statements

This manual may contain three types of hazard statements:

DANGER: Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

WARNING: Indicates a potentially hazardous situation that, if not avoided, could result in personal injury or equipment damage.

NOTE: Indicates important items of information throughout the manual.

2.3. Personnel safety

2.3.1. Internal Arc Classification (IAC)

The personnel safety factor was a primary goal when SCELL switchgear was designed. Thus, the SCELL switchgear has been designed and tested to withstand an internal arc due to a short-circuit current of the same levels as the panel rated breaking currents. These tests ensure that the metal construction of the SCELL switchgear is able to protect personnel operating near the switchgear subjected to an internal arc fault. The internal arc is treated to be the most unlikely event from all type of faults, however, a small percentage of occurrence still exists due to many factors including improper connection of incoming cables and tightening contact connections, intrusion of animals, deterioration of insulation over time, severe atmospheric conditions and human factors. The proven characteristics of the SCELL switchgear drastically reduce the incidence of these causes in generation of faults, but not all can be fully eliminated. An internal arc event produces a large amount of energy which instantly transforms into phenomena such as rapid increase of internal pressure and temperature, visual and sound effects, which consequently result in high mechanical stresses on the switchgear structure, and/or in melting and evaporation of the materials. Such significant stresses, unless properly controlled, may cause a serious threat to the service personnel due to harmful effects (shock-wave, flying parts, doors opening, emission of hot gases, open flame).

The IEC 62271-200 Standard describes the test methods required. The SCELL switchgear conforms to all criteria stated in Annex A of the standard:

The doors of the switchgear must remain closed and no opening of the cover panels must occur
No part of the switchgear, which may be hazardous for personnel, may be ejected
Arcing does not cause holes in the accessible sides up to a height of 2 m
Vertically and horizontally arranged fabric indicators placed outside the switchgear may not get burnt
All the switchgear earthing connections must remain effective

The SCELL switchgear is IAC classified: A-FL(R) 25kA, 1s. For the installation of the SCELL switchgear the following factors are obligatory to be considered:

Level of the fault current (20...25 kA)
Duration of the fault current (0.1...1s)
Hot gases evacuation routes
Dimensions of the switchboard room, with special attention to the height

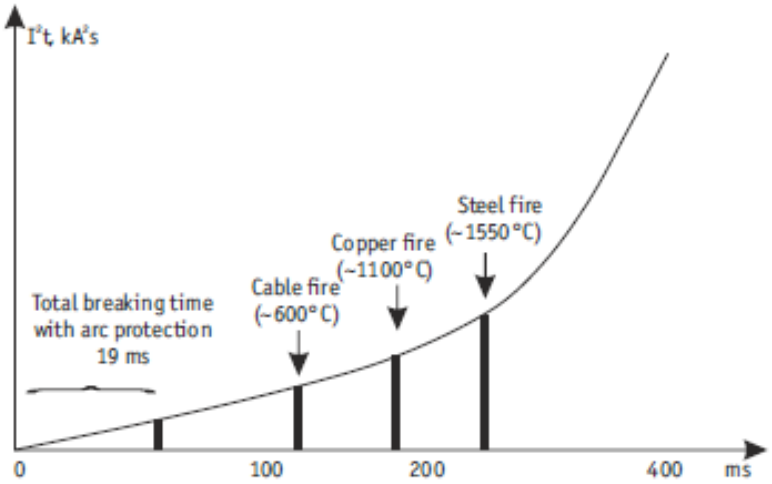


Fig.2.1. Internal arc development

2.3.2. Interlocks and locking devices

The SCELL switchgear is fitted with all interlocks needed to guarantee the highest level of safety for operators.

The following conditions and operations are prevented (mechanically):

Circuit breaker operation when the change-over switch is in intermediate position
Change-over switch operation when the circuit breaker is in closed position
Closing of the circuit breaker when the change-over switch is in earthed position
Opening of the cable compartment cover unless the change-over switch is in earthed position
Opening of the cable testing cover unless the change-over switch is in earthed position

The full list of interlocking conditions is given in Table 2.1.

All doors of the SCELL switchgear equipped with the key-locks and padlock facilities.

Table 2.1 Interlocking conditions

Operations	**CB**		**COS**		**CC door Interlock**			**Cable Test knife**		**CTF door**			**Busbar Earth Switch External**	
	Open	Closed	Earthed	Service	Installed	Removed	Locked	Earthed	Opened	Open	Closed	Locked	Open	Closed
CB closing	X			X *	X*		X*	X *			X*	X*	X	
CB opening		X		X *	X*		X*	X *			X*	X*	X	
CB Emergency trip		X	any		any			any		any			any	
COS closing	X*		X		X*			X *			X*		X	
COS opening	X*			X	X		X*	X *			X*	X*	X	
CC Door														
Installing	X*		X *			X		X			X*		any	
Removal	X*		X *		X			X			X*		any	
CTF door														
open	X*		X *		X*		X*	X			X		any	
close	X*(any)		X *		any			X		X			any	
Cable Test knife														
Opening	X*		X *		X*		X*	X			X		any	
Earhting	X*(any)		X *		X*		X*		X		X		any	
Bus Earth Switch (el.magnet)														
Closing	X		X		any			any			any		X	
Opening	X		X		any			Any			any			X
X - Conditions to be Satisfied														
* - Shall be a Mechanical Interlock														

[1] For motorized COS an electromechanical interlock shall be provided to block unauthorized operations due to auxiliary supply loss or external signal absence.

[2] All mechanical and electromechanical interlocks have defeat option.

3. Design

3.1. General

The SCELL switchgear panel is assembled with standard, pre-fabricated, hot-dip zinc galvanized sheet steel units forming a rigid, free-standing structure. The switchgear consists of five compartments described in sections 3.2-3.5 which are separated from each other by means of insulating material partitions. The design category of SCELL series switchgear is defined as LSC2B-PI. The overall design is presented in Fig.3.1 and Fig.3.2.

1 Low voltage compartment
2 Mimic diagram
3 Nameplate
4 Inspection window
5 CB trip button
6 COS operation
7 Cable test facility
8 Cable access door
9 Earthing bar

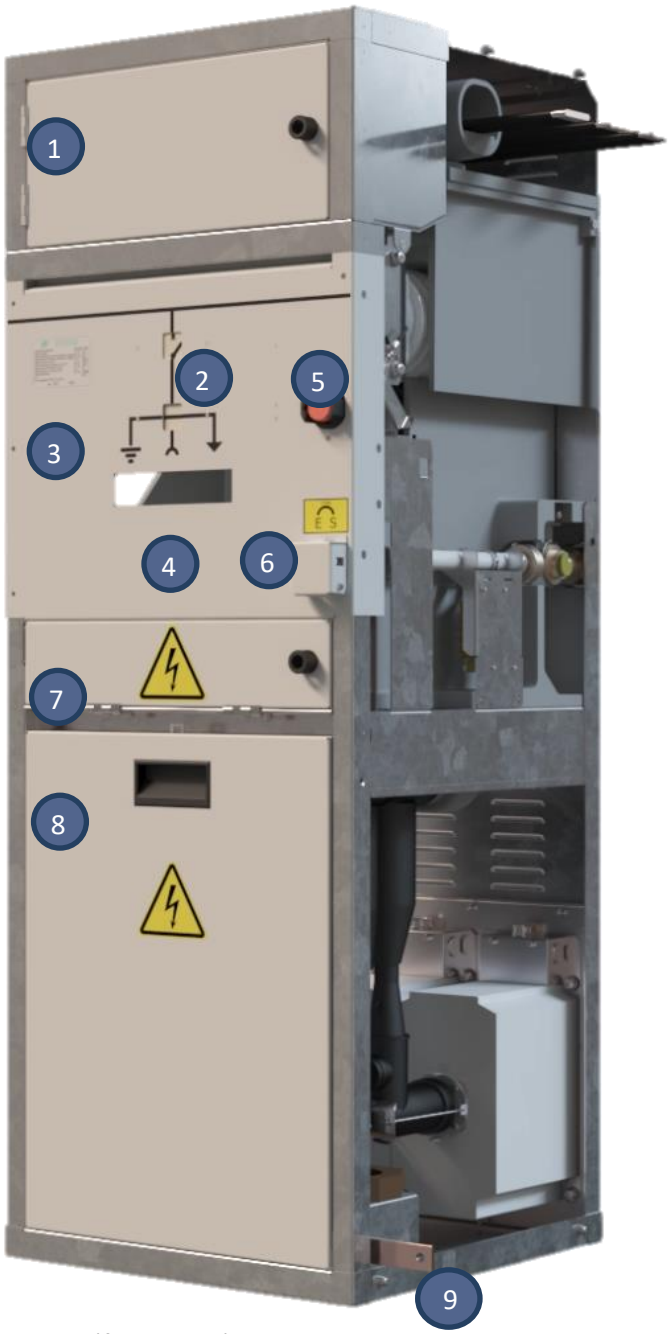


Fig.3.1. SCELL panel (front view)

1 Main busbars
2 Circuit breaker
3 COS
4 Arc duct
5 Cables
6 Extra cables with front attachment

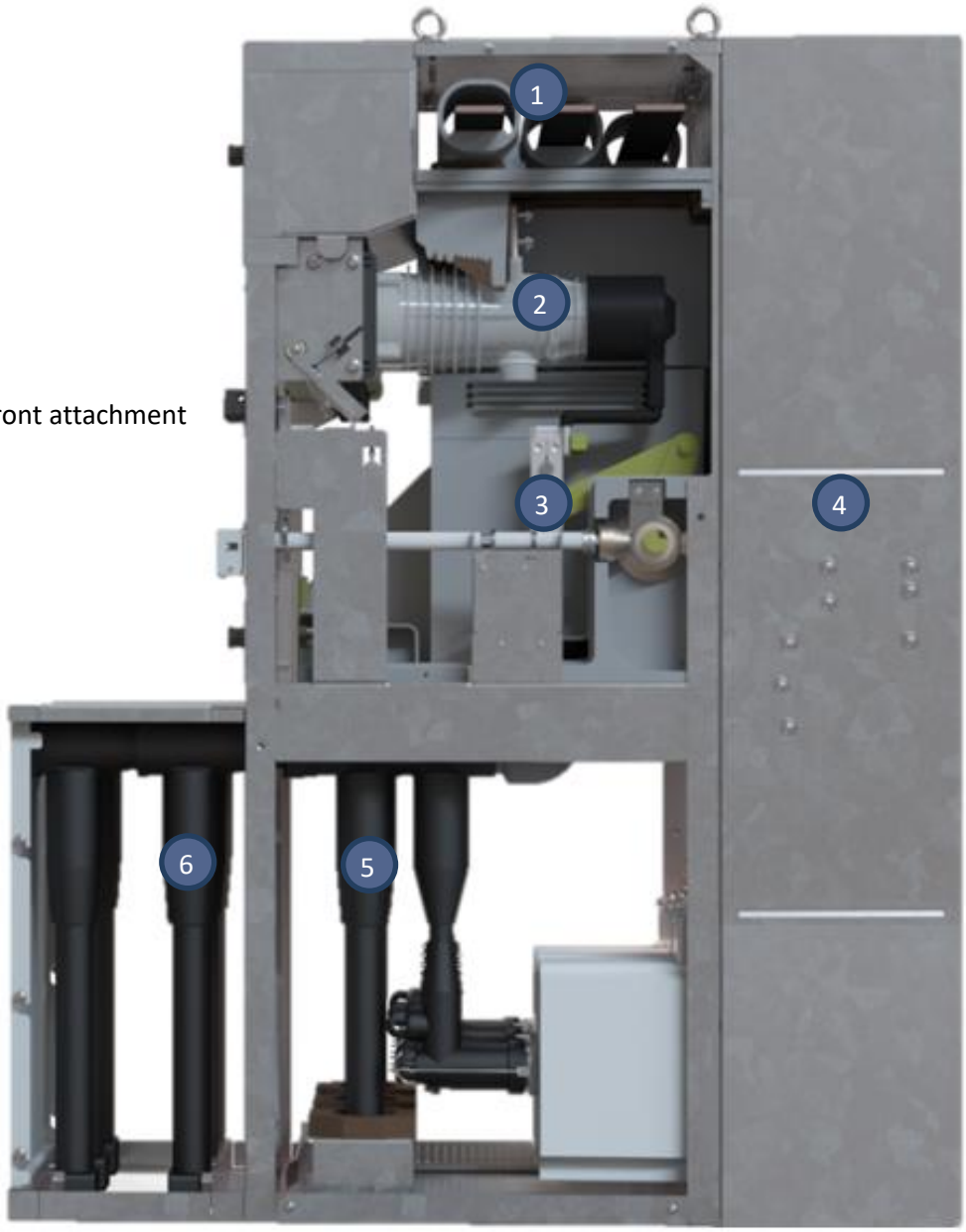


Fig.3.2. SCELL panel (inside view)

3.2. Busbar compartment

The busbar compartment (see Fig.3.3) houses the main busbar system connected to the fixed upper isolating contacts of the circuit breaker by means of branch connections. The main busbars are made of electrolytic copper and covered with heat shrinkable insulation sleeves. The busbar compartment of each panel is segregated from the busbar compartments of the neighbouring panels with bushing insulators. The bushing insulators were tested with electrodynamic forces load withstand during the flow of fault current. The maximum rating of busbar system 1250A. The busbars are covered with heat shrinkable sleeves.

Table 3.1 Main busbars

Main busbars rated current, A	Busbar type	Busbar size, mm
≤800	Rectangular flat	1x10x40
≤1250	Round	⌀34

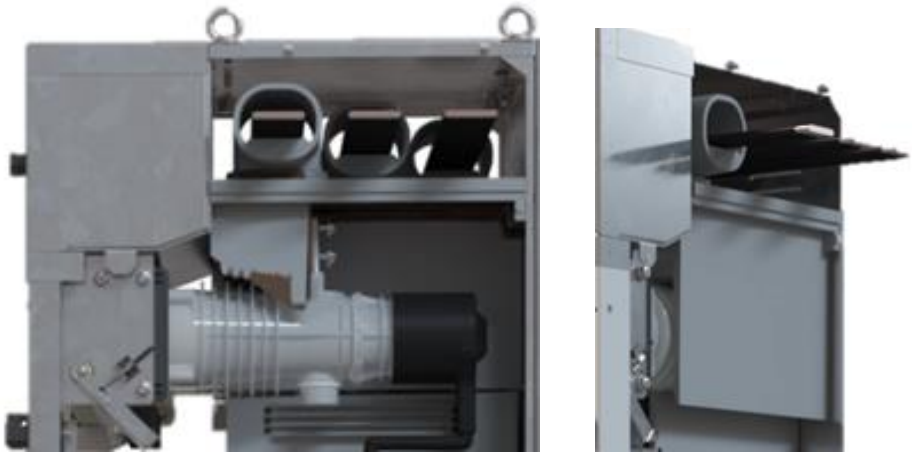
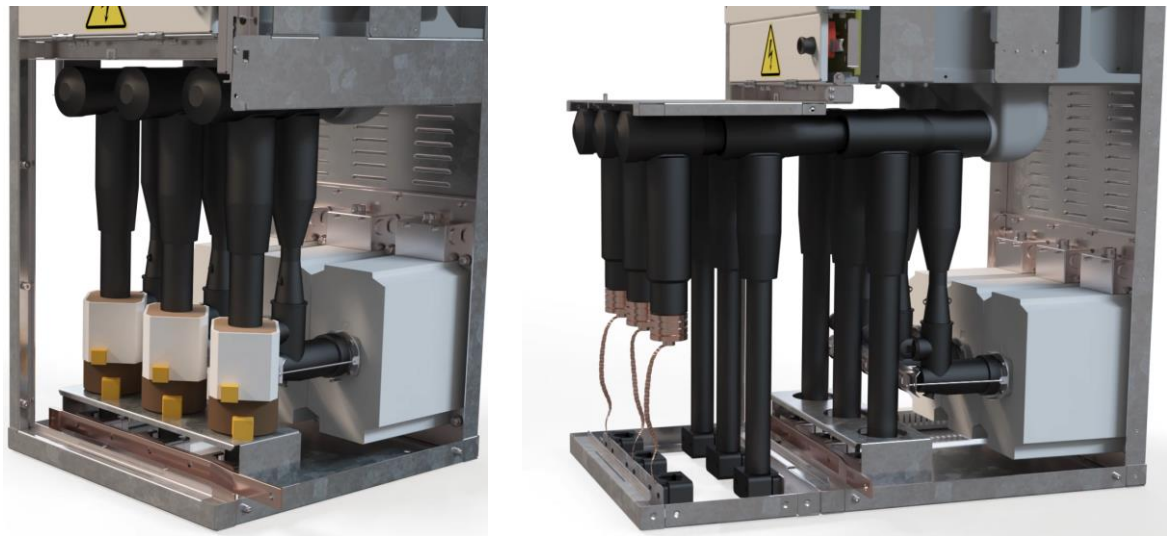


Fig.3.3. Busbar compartment

3.3. Cable compartment

The cable compartment (see Fig.3.4) is located at the front of the panel with horizontally mounted Type C bushings (according to CENELEC EN 50180 and IEC 60137 requirements) for ease of cable connection. The cable compartment houses the branch connections, earthing busbar, power cables, surge arresters, instrument transformers or sensors. The cable compartment design allows up to 4 cables per phase connections with an additional front attachment.



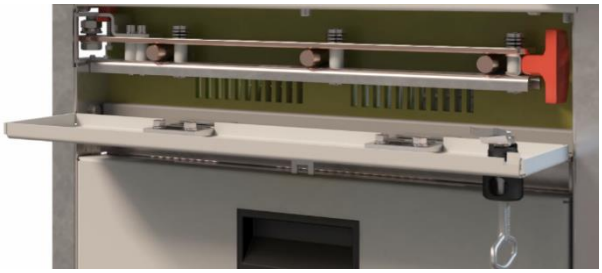
Without front attachment *With front attachment*

Fig.3.4. Cable compartment

3.4. Cable testing facility

For convenience and ease of cable testing, a special cable testing facility (see Fig.3.5) is provided at the frontal part of the panel. The compartment door can only be opened in case of the COS is opened and earthed. After door opening, an earth jumper should be removed and the voltage application pins shall be accessible for testing cables.

Door closed



Door open

Earthing knife removed

Fig.3.5. Cable testing facility

Test values for cable testing are given in Table 3.2.

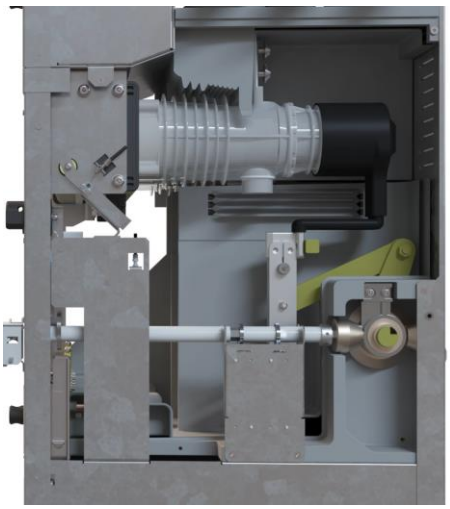
Table 3.2 Test values for cable testing

AC testing	DC testing	VLF testing
Phase-to-phase value for 5 mins between conductor and metallic screen/sheath	As per cable or test equipment manufacturer recommendations	As per cable or test equipment manufacturer recommendations

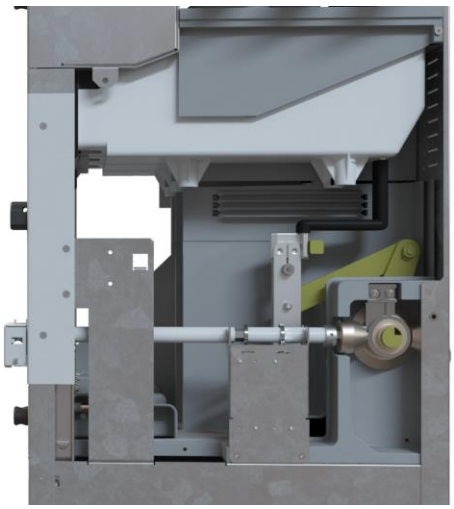
Refer to “7.4. Cable testing” for the detailed instructions about cable testing.

3.5. Circuit breaker compartment

The circuit breaker compartment houses the COS and fixed circuit breaker ISM (see Fig.3.7). The position of the circuit breaker can be seen from the front of the panel through the inspection window.



ISM25_LD



ISM25_Shell

3.6. Low voltage compartment

The low-voltage compartment (see Fig.3.8) is designed to mount all secondary circuit connections within the single panel as well as interconnections between adjacent panels and transit connections. Special holes are provided for transit cables. The spacious compartment allows the installation of multi-functional microprocessor protection relay, energy meters, lighting, heating and many other devices. The sensors, indicators, microprocessor protection relay management blocks, mimic diagram, and control buttons are placed on the front panel. Three versions of the low voltage compartment are available: standard (height 250 mm), extended (height 450 mm) and high (850 mm). Refer to “Appendix 1. Dimensions” for the dimensional drawings.

1 Relay
2 Local/Remote switch
3 CB trip button
4 CB close button
5 Voltage indication
6 Lock

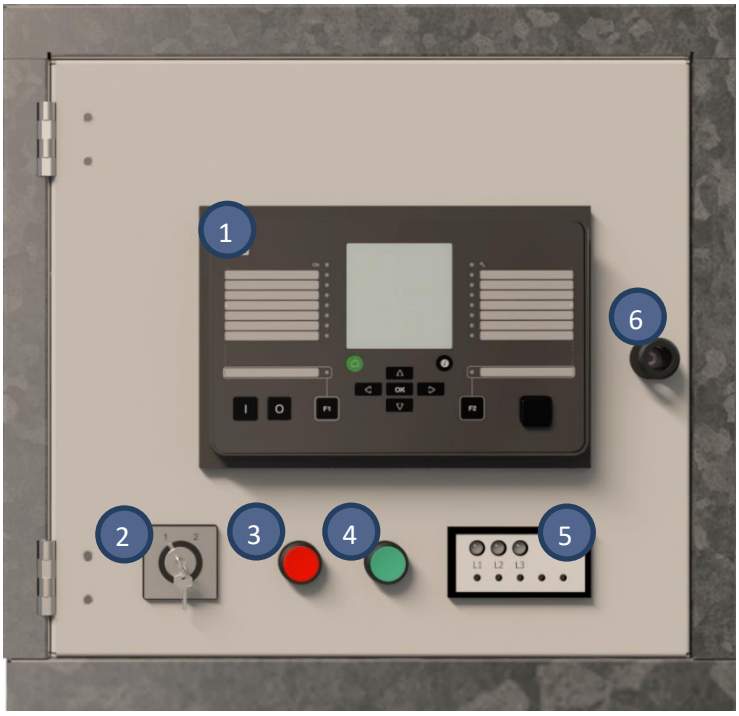


Fig.3.6. Extended low voltage compartment (450 mm)

3.7. Attachments

3.7.1. Rear and front attachments

Rear arc duct attachment is designed to provide A-FLR classification with gases exhaust directed vertically.
Front cable attachment is designed to accommodate extra 2 cables.
The depth of rear attachment is 325mm.
The depth of front attachment is 300mm.

Rear attachment is also used to accommodate the motor for COS (option available upon request).

1 Rear attachment
2 Front attachment

Fig.3.7. Front and rear attachments

3.7.2. Top VT attachment

VT top attachments are available up to 17.5 kV rated voltage and allows installation of three fixed voltage transformers (non-fused option) for protection and metering purposes.

The top attachment is 600 mm high and it is delivered fully assembled and connected to the main busbars.

1 Fixed VT
2 Cable bushings
3 Isolating barriers
4 Main busbars

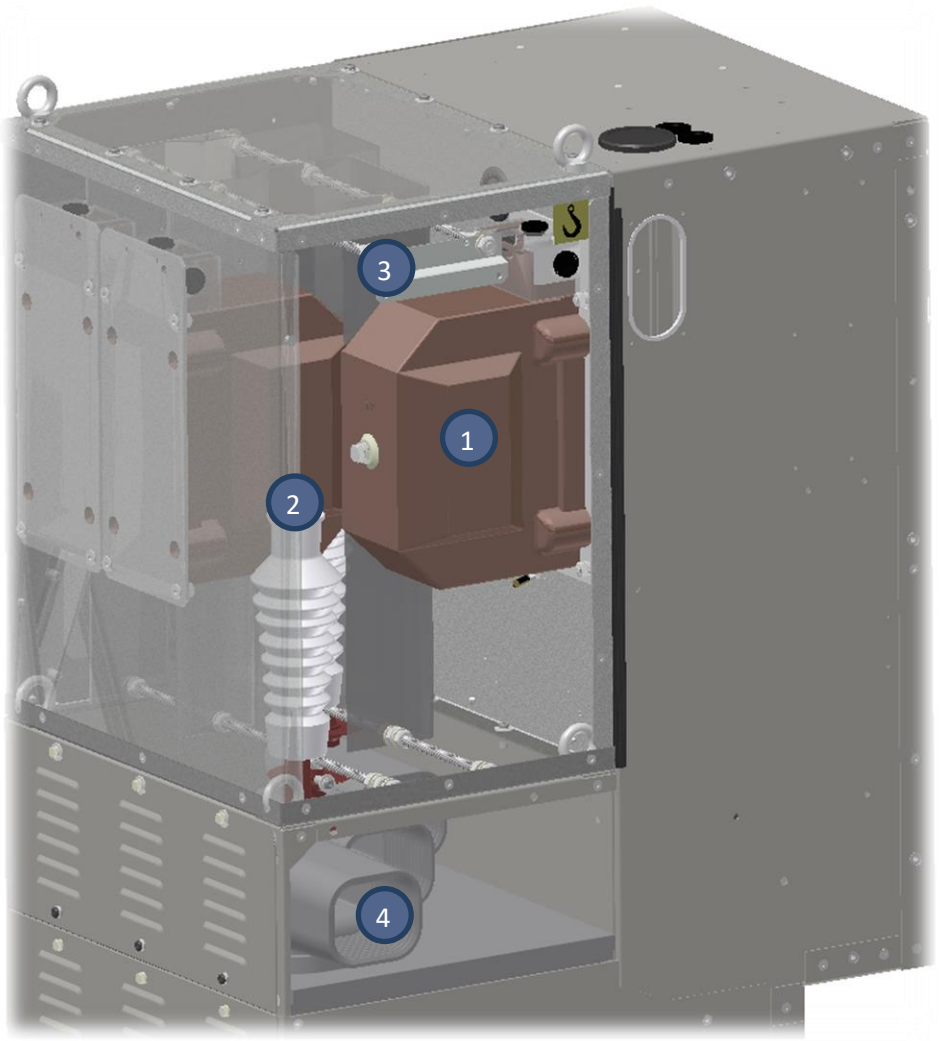


Fig.3.8. Top VT attachment

3.7.3. Side cable attachment

Side cable attachments are available up to 17.5 kV rated voltage and 800A rated current and allow connection of power cables up to 300mm^2 with standard lugs (one per phase).

The side attachment is 250mm wide and it is delivered fully assembled and connected to an adjacent panel (left or right option).

1 Cable compartment door
2 Cable clamps
3 Isolating barriers
4 Cable bushings
5 Main busbars

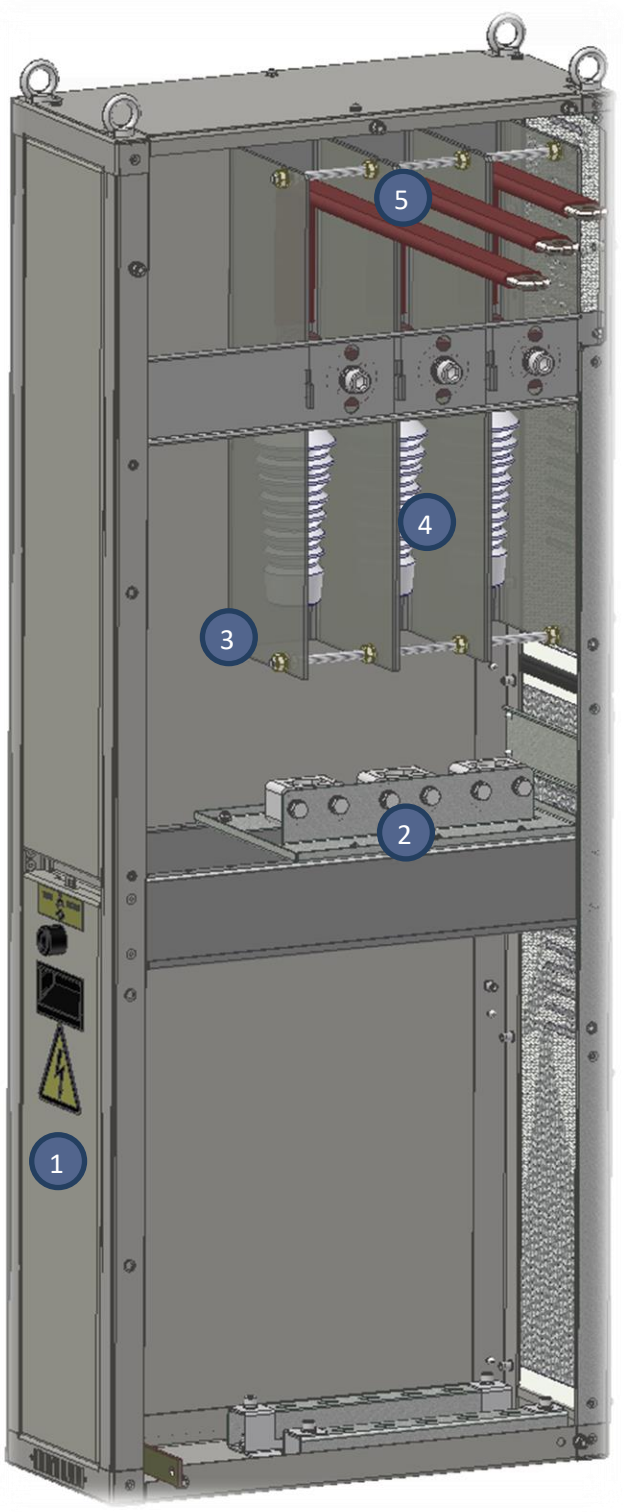


Fig.3.9. Side attachment

3.7.4. Bottom attachment (base frame)

When the SCELL panel is placed directly on a floor, the height from the floor to the centre of the cable bushings is 600 mm. If there is no cable cellar, this height might not be sufficient for proper installation of cables or a zero-sequence transformer. In this case it is possible to install the switchgear on an additional base frame.

The base frame is 400 mm and it is delivered as kit for installation on site.

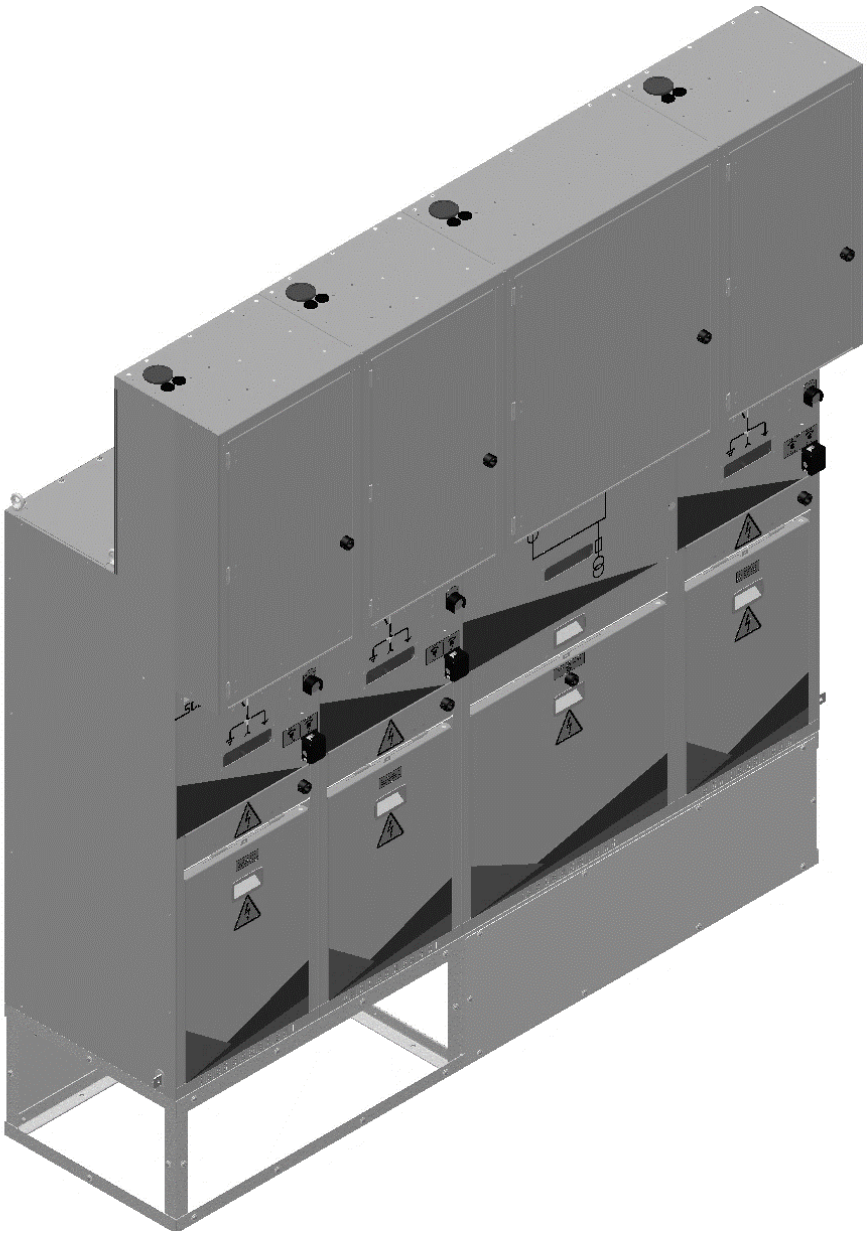


Fig.3.10. Base frame

4. Equipment

4.1. Circuit breaker

4.1.1. Presentation

The circuit breaker version is based on a fixed type MVT indoor switching module ISM and control module CM.

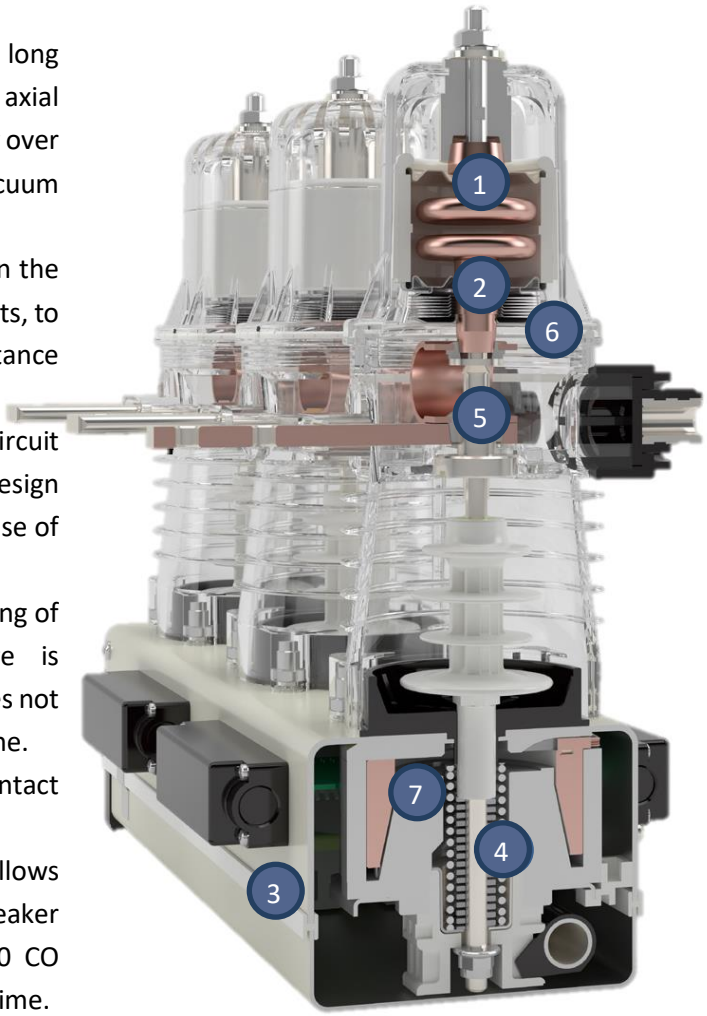
These modules, developed with the latest switching and electronic control technology are used as the core components of medium voltage switchgear. There are three basic module types:

- Circuit breakers (LD or Shell types) are used to close and open primary circuits.
- Control modules (CM) are used to provide control (close and trip operations) of LD or Shell modules.

Circuit breakers are three pole units. Each pole incorporates a vacuum interrupter and single-coil magnetic actuator encapsulated in solid insulation.

Control modules are microprocessor-based electronic units, containing built-in close and trip capacitors. The close and trip capacitors can be discharged onto the actuator coil to provide appropriate operations. The ability to choose switching and control modules separately allows any type of switchgear to be easily configured with regard to its primary and auxiliary circuits.

The LD and Shell circuit breakers and the CM control modules are the result of years of R&D by scientists and engineers. Their use in the SCELL switchgear allow users to benefit from a unique combination of features:



1 Compact vacuum interrupters with an extraordinarily long mechanical and electrical lifespan. A specially designed axial magnetic field distribution provides an even current density over the contact surface, substantially improving the vacuum interrupting performance.

2 Vacuum interrupter contacts have unique design, based on the mixture of copper and chromium metals and various dopants, to ensure long electrical life of contacts, low contacts resistance and chopping current.

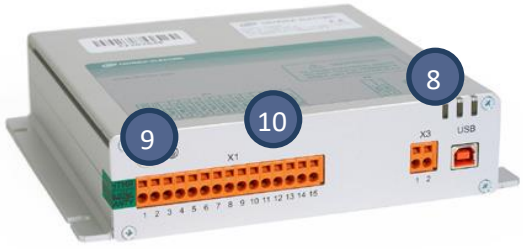
3 The patented, super-compact actuator design allows the circuit breaker to be installed directly underneath each pole. The design is optimal in terms of reliability, dimensions, weight and ease of installation.

4 A spring charged by the magnetic actuator during the closing of the circuit breaker ensures main contacts pressure is maintained. The spring is integrated in the actuator and does not require any maintenance during the circuit breaker's lifetime.

5 Circuit breaker terminals are designed to reduce contact resistance and mitigate the risk of contacts overheating.

6 The use of robot welded steel discs as opposed to folded bellows eliminates the main failure point of conventional circuit breaker designs and allows interrupter to do more than 150,000 CO cycles and contain high vacuum (10^{-6} Pa) for the entire lifetime.

7 Patented actuators designed and fabricated within our own facilities to drive the interrupter contacts. All switching elements of a pole are assembled along a single axis meaning all mechanical movements are direct and linear.



8 Self-supervision system continuously monitors control, switching modules, functional wiring and auxiliary power supply quality. CM16 allows the user to forget about scheduled trip and close wiring inspections - as in the event of malfunction corresponding notification will be sent to the operator using one of the inbuilt output relays and indicated by inbuilt in CM LEDs.

9 Low power consumption. Vacuum circuit breakers equipped with the CM16 control module need less than 42W in charging mode – just 10% of what the best alternatives available on the market need! Such low power consumption finally solves the problem of auxiliary power supply – much less powerful source and UPS can now provide substation auxiliary equipment with required power.

10 Ease of use and robustness. CM16 type control modules are connected with the circuit breaker they control and supervise be means of simple wires. It allows the CM installation to be located at any position convenient for the OEM, system integrator or End-user location. Very compact dimensions and low weight further simplify the process. CM16 has a robust design, enclosed in an aluminium housing it provides high EMC level confirmed by KEMA test laboratories.

4.1.1. Range of circuit breakers

The range of circuit breakers is shown in Fig.4.1.

ISM25_LD ISM25_Shell

Fig.4.1. VCB range

Circuit breaker rated characteristics are presented in Table 4.1.

Table 4.1 Circuit breaker rated characteristics

Parameter	Value	
Circuit breaker type	**ISM25_LD**	**ISM25_Shell**
Rated voltage, kV	24	24
Rated Frequency, Hz	50/60	
Rated power frequency withstand voltage, kV	50	50
Rated lightning impulse withstand voltage, kV	125	125
Rated peak withstand current, kA	41,5	64
Rated short-time withstand current, kA (4s)	20	25
Rated current, A	800	1250
Closing time, ms, not more than	35	30
Opening time, ms, not more than	15	8
Breaking time, ms, not more than	25	11
Circuit breaker class	M2 (30.000CO), S2, E2, C2	
Autoreclosing cycle	O-0,3s-CO-10s-CO	
Dimensions (WxDxH), mm	560x265x510	565x247x560
Weight. kg	36	56

Refer to MAGVATECH ISM for more details on the VCB electrical operation, operating sequences, etc.

4.1.2. Range of control modules

Control module rated characteristics and range are presented in Table 4.2.

Table 4.2 Control module rated characteristics

Parameter	Value	
Control module type	**CM_16_1(60)**	**CM_16_1(220)**
Rate supply voltage, V	24/48/60 DC	110/220 DC, 100/127/220 AC
Operating power supply voltage range, V	19 to 72 DC	85 to 265 AC/DC
Power consumption, VA, no more than		
Standby	55	
Charging the close/trip capacitors	5	
Mechanical vibration withstand capability	Class 4M4	
Dimensions (WxDxH), mm	190x165x45	
Weight. kg	1	

4.1.3. Handheld closing device

The handheld closing device (HCD) is used to charge the CM capacitors to perform the first close in case of auxiliary power supply outage (see Fig.4.2). It is kept in the low voltage compartment and used when needed. This device provides additional safety to an operator, compared to manual closing mechanisms of conventional circuit breakers. The operator can step aside from the switchgear panel at a safe distance before closing the ISM. The HCD range is given in Table 4.3.

Table 4.3 HCD range

HCD	SGkit_HCD_60	SGkit_HCD_220
Control module type	CM_16_1(60)	CM_16_1(220)
Rated voltage, VDC	35	110
Auxiliary power source	AA-size 1.5V LR6 battery (10 pcs)	

Fig.4.2. HCD

4.2. Change-Over Switch (COS)

The COS provides disconnector and earthing switch functions for the SCELL switchgear:

- Closing of the main circuit.
- Opening of the main circuit including visual gap.
- Reliable earthing.

Three positions are available: service (closed), earthed and isolated.
Isolated position is achieved by manual removal of the earthing knife for the purpose of cable testing (refer to section 3.4).

The range of COS switches is given in Table 4.4.

Table 4.4 COS range

COS type	Description
630_1_0	630A/800A with capacitive voltage sensors and without EM interlock
630_1_1	630A/800A with capacitive voltage sensors and with EM interlock
630_1_M	630A/800A with capacitive voltage sensors and with motor 110 or 220 VDC
1250_1_1	1250A with capacitive voltage sensors and with EM interlock
1250_1_M	1250A with capacitive voltage sensors and with motor 110 or 220 VDC

Main technical data and control module technical parameters are presented in Table 4.5.

Table 4.5 COS rated characteristics

Parameters	Value
COS as Disconnector IEC62271-102	
Rated voltage, kV	24
Rated power frequency withstand voltage, kV	50
Rated lightning impulse withstand voltage, kV	125
Rated current, A	800/1250
Rated peak withstand current, kA	64
Rated short-time withstand current, kA (3s)	25
Mechanical endurance class	M1 (2000 CO)
COS as Earthing switch IEC62271-102	
Rated voltage, kV	24
Rated peak withstand current, kA	64
Rated short-time withstand current, kA (3s)	25
Mechanical endurance class	M1 (2000 CO)
Electrical endurance class	E2

4.3. Current transformers

The ring core current transformers are used to provide current information from the line to protection relays, control systems and power metering devices. All active parts are solidly insulated with cast resin. The insulation level is 0,72/3/- kV. Current transformers comply with IEC 60044-1, GOST 1983-89 and DIN 42600. The table below lists the manufacturers of measuring devices compatible with SCELL switchgear.

Table 4.6 Manufacturers of measuring devices compatible with SCELL

Measuring device	CT	VT		CS	VS
Type	**Ring core**	**Plug-in type A**	**Support type**[1]	**Ring core**	**Plug-in type C**
ABB				✓	✓
ALCE Elektrik		✓	✓		
Arteche (Esitas Elektrik)		✓	✓		
Beontop			✓		
D.K. Moriarty	✓				
Epoxy House (Kaizen Switchgear Products)	✓		✓		
Fanox Electronic	✓				
Intra			✓		
ITR Energetyka				✓	✓
Kuvag	✓				
Narayan Powertech	✓		✓		
RITZ Instrument Transformers		✓	✓		
S.T.E. Strumenti Trasformatori Elettrici	✓				
Zelisko (Knorr-Bremse)		✓		✓	✓

Note:
CT – Current transformer; **VT** – Voltage transformer
CS – Current sensors; **VS** – Voltage transformer
[1]Only for installation in the CM panel or top VT attachment

4.4. Voltage transformers

Voltage transformers are used to provide voltage information from the line to protection relays, control systems and power metering devices. All active parts of transformer are solidly insulated with cast resin. This material performs both the electrical insulating and the mechanical functions.

Two types of voltage transformers can be used: plug-in (Interface type A – 250A) and support type.

The support type voltage transformers can be equipped with protection fuses with a striker system. This system can also send a signal of a blown fuse to SCADA. Voltage transformers comply with IEC 60044-2, GOST 1983- 89 and DIN 42600.

4.5. Zero sequence transformer

Zero sequence current transformers are used for measuring phase currents or detect earth fault currents. They are solidly insulated with cast resin. Transformers can be mounted inside a panel or fitted to the bottom of switchgear in a cable cellar.

4.1. Current sensors

Current sensors are based on the Rogowski coil principle. A Rogowski coil is a toroidal coil without an iron core placed around the primary conductor. Current sensors are used to provide current information from the line to protection relays, control systems and power metering devices. Current sensors comply with IEC 60044-8.

4.2. Voltage sensors

Voltage sensors are based on the capacitive divider principle. Voltage sensors are used to provide voltage information from the line to protection relays, control systems and power metering devices. Voltage sensors comply with IEC 60044-7. Voltage sensor are mounted on the cable outlet at the back of the T-connector.

4.3. Surge arresters

The switchgear can be equipped with the “T-shaped” screened, separable surge arresters. They are used to protect the panel against lightning and switching over voltages and are installed in the cable compartment. Surge arresters conform to IEC 60099-4 and GOST 163576-83 standards.

4.4. Voltage indicators

Voltage indicators are used to detect the presence or absence of medium voltage.

SCELL panels can be equipped with voltage presence indication systems integrated into the insulators at busbar side or into COS at the cable side based on the customer’s request.

5. Selection

5.1. Available configurations

The SCELL range is available in extensible format. Available configurations are described in Fig. 5.1.

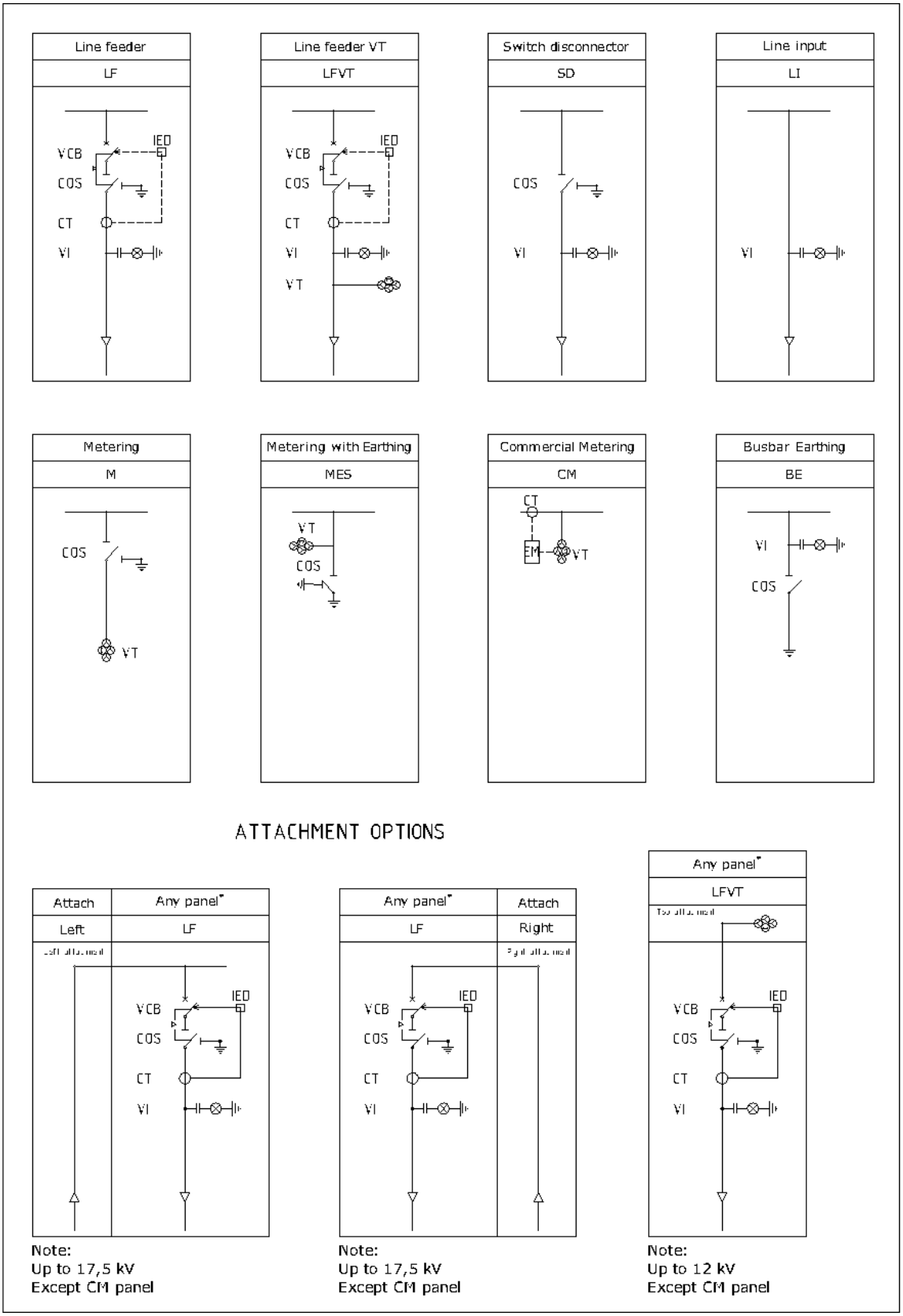


Fig.5.1. SCELL range

5.2. Ordering details

The SG_SCELL Switchgear is available in two different options:

- SP (Switchgear panel) – fully assembled and tested SG15(25) SCELL switchgear panels.
- PB (Power block) – semi-assembled and routine tested panel supplied without LV equipment.

All major parts, components or accessories are grouped into different kits. Each kit belongs to a certain component group, subgroup, has a type and parameter, which may vary depending on the quantities, ratings or characteristics. The combination of the kits forms the unique code of the panel, indicating what equipment is in each panel. The basic groups, subgroups, types and parameters of the SCELL series switchgear are presented below:

Parameters:
(X_W(X)_M(X)_X(x)_FCA(x)_LVx(x)_PBmet1(x)_Cx(x)_CT0_VT(x)_Ins(x)_COS(x)_X(X)_ScLock(IND)_X(x)_SCELL(X)_BusIns(x)_Wire(1)_Fast(2)_CF(x)_MachP(1)_X(X)_SA(X)_GET(X)_Tconx_X(x)_HT(1_5))
If any of the kits is not included, a "0" is displayed.

Classifier Group	Abbreviation	Description	
GROUP	**SP15**	Fully assembled and routine tested panel up to 17,5kV	
	SP25	Fully assembled and routine tested panel up to 24kV	
	PB15	Assembled enclosure with functional interlocks to 17.5kV	
	PB25	Assembled enclosure with functional interlocks to 24kV	
SUBGROUP	**SCELL**	SCELL series switchgear	
TYPE	**LD1**	Switchgear panel with LD vacuum breaker Ur = 24kV, Isc = 20кA	
	Shell1	Switchgear panel with Shell vacuum breaker Ur = 24kV, Isc = 25кA	
Type Nr.	**Type(Parameter)**	**Classifier Group_Subgroup**	**Description**
PARAMETERS	**LI**	**(1) ScellType** Type of panel	Line input
	SD		Line disconnector
	LF		Line feeder (Incomer / Coupler)
	LFVT		Line feeder VT
	M		Metering
	MES		Metering with Busbar Earthing
	CM		Commercial Metering
	BE		Busbar Earthing
	500_W(500)	**(2) ScellWidth** Panel width	500mm
	750_W(750)		750mm
	1000_W(1000)		1000mm
	M(630)	**(3) SGkit_Busbars_** Main busbar rated current	Rated current 630A/800A
	M(1250)		Rated current 1250A

Classifier Group	Abbreviation	Description	
	LD1	**(4) Scell_ISM** Circuit breaker	ISM25__LD_1 with insulation hoods Ir=800A
	Shell1		ISM25__Shell_2 with insulation covers Ir=1250A
	FCA(1)	**(5) SGkit_Attach** Attachments	Front attachment for 6xsingle cables entry including metal frame and cable clamps
	RMO(1)		AFLR rear attachment 325mm including motor operated COS (110VDC)
	RMO(2)		AFLR rear attachment 325mm including motor operated COS (220VDC)
	RAR(2)		AFLR rear attachment 325mm
	VTt(15)		VT top attachment ≤ 17,5kV
	LT(800)		Left cable attachment ≤ 17,5kV
	RT(800)		Right cable attachment ≤ 17,5kV
	LVStd(Sc250)	**(6) SGkit_LVmet** LV cabinet	LV cabinet standard size 250mm
	LVExt(Sc450)		LV cabinet extended size 450mm
	LVExt(Sc850)		LV cabinet extended size 850mm
	PBmet(Sc1_500)	**(7) SGkit_PBmet** Enclosure type	Metal enclosure without LV compartment for quantities <3 and IP4X size 500mm
	PBmet(Sc1_750)		Metal enclosure without LV compartment for quantities <3 and IP4X size 750mm
	PBmet(Sc1_1000)		Metal enclosure without LV compartment for quantities <3 and IP4X size 1000mm
	PBmet(Sc3_500)		Metal enclosure without LV compartment for quantities >=3 for outdoor size 500mm
	PBmet(Sc3_750)		Metal enclosure without LV compartment for quantities >=3 for outdoor size 750mm
	PBmet(Sc3_1000)		Metal enclosure without LV compartment for quantities >=3 for outdoor size 1000mm
	CTX(X)	**(8) SGcomp_CT25**[1] Current transformer	Single or dual-core ring CT or current sensor
	CTX(0_X)	**(9) SGcomp_CT25**[1] Zero current transformer	Zero-sequence CT

Classifier Group	Abbreviation	Description	
	VTX(X)	**(10) SGcomp_VT25**[1] Voltage transformer	Plug-in type VT up to three cores or voltage sensor integrated in plug-in cable connectors
	Ins(BS-630)	**(11) SGkit_Ins25** Insulators kit (fixed contact and through)	Insulator kit for up to 630A/800A
	Ins(BS-1250)		Insulator kit for up to 1250A
	COS(630_1_0)	**(12) SGcomp_ES25** COS	630A/800A with capacitive voltage sensors and without EM interlock
	COS(630_1_1)		630A/800A with capacitive voltage sensors and with EM interlock
	COS(630_1_M)		630A/800A with capacitive voltage sensors and with motor 110 or 220 VDC
	COS(1250_1_1)		1250A with capacitive voltage sensors and with EM interlock
	COS(1250_1_M)		1250A with capacitive voltage sensors and with motor 110 or 220 VDC
	VS0(R_4)	**(13) SGkit_VS25** Voltage indication kit	Voltage Indicator with 2CO connected to COS Ins at cable side. Cable length 4m
	ScLock(IND)	**(14) SGkit_Lock** Locks kit	Hinges, handles and locks kit
	X(X)	**(15) SGcomp_Relay**[1] Protective relay	Any type of protection relay based on project requirements
	SCELL(TLF)	**(16) SGkit_LVcomp** Aux wiring and accessories	Aux wiring and accessories for TLF arrangement
	SCELL(SCI)		Aux wiring and accessories for SCI arrangement
	SCELL(IED)		Aux wiring and accessories for simple IED arrangement
	SCELL(IED2)		Aux wiring and accessories for complicated IED arrangement
	BusIns(1)	**(17) SGkit_BusIns25** Insulation kit	Heat-Shrink Insulation, incl. barriers as per GOST or IEC
	BusIns(2)		Soft covers for ISM and heat-shrink insulation kit
	Wire(1)	**(18) SGkit_Wire** Panel cabling	Internal panel cabling (CT-LV; COS-LV; CT0-LV)
	Wire(2)		Internal panel cabling (CT-LV; ES-LV; Fixed VT-LV or CT0-LV)
	Wire(3)		Internal panel cabling (arc protection with gas flap limit switches)

Classifier Group	Abbreviation	Description	
	Fast(2)	**(19) SGkit_Fastener** Fasteners and fittings kit	Fasteners and standard fitting kit incl. panel interconnection
	CF(1)	**(20) SGkit_CableFix** Cable fixing kit (holders)	MV cable fixing for 1 cable per phase
	CF(2)		MV cable fixing for 2 cables per phase
	MachP(1)	**(21) SGkit_MechDet** Machining details kit	Small machining details or plastic alloys parts
	SP(Scell_1)	**(22) Service_Assembly** Assembly work and routine testing service	Panel assembly with standard aux wiring, 1x IED, 1x test block
	SP(Scell_2)		Panel assembly with simplified aux wiring, 1x IED without mimic diagram, 1x test block
	PB(Scell)		Panel assembly without auxiliary wiring and LV
	X(X)	**(23) SGcomp_SA**[1] Surge arrester kit	Support type metal-oxide surge arresters (only for BE type panels)
	GET(R_300)	**(24) SGkit_ArcDuct** Gas exhaust duct	Rear GET attachment with top exhaust 300mm depth for Motor COS. Motor not included
	GET(R_150)		Rear GET attachment with top exhaust 150mm depth
	TconX(3_250_VT)	**(25) SGkit_Con25**[1] Elbow connector	Kit of T-connector plug in 250A for 3xsingle core cables (M panels only)
	TconX(3_630)		Kit of T-connector plug in 630A for 3xsingle core cables
	TconX(3_630_VT)		Kit of T-connector plug in 630A for 3xsingle core cables and VT
	TconX(3_630_SA)		Kit of T-connector plug in 630A for 3xsingle core cables with integrated surge arresters
	TconX(3_630_VT_SA)		Kit of T-connector plug in 630A for 3xsingle core cables with integrated surge arresters and VT
	TconX(3_1250)		Kit of T-connector plug in 1250A for 3xsingle core cables
	TconX(3_1250_VT)		Kit of T-connector plug in 1250A for 3xsingle core cables and VT
	TconX(3_1250_SA)		Kit of T-connector plug in 1250A for 3xsingle core cables with integrated surge arresters

Classifier Group	Abbreviation	Description	
	TconX(3_1250_VT_SA)		Kit of T-connector plug in 1250A for 3xsingle core cables with integrated surge arresters and VT
	X(X)	**(26) RecKit_RTU**[1] RTU	Any type of communication equipment for SCADA/DMS based on project requirements
	HT(1_5)	**(27) SGcomp_HT**[1] House transformer	House transformer for auxiliary power supply, 1.5kVA up to 24kV

[1]Contact your TE Energy representative for a complete list of all available options.

5.3. Ordering code example

SP25_SCELL_LD1(W(500)_ M(630)_ LD1_ FCA(1)_LVStd(Sc250)_ PBmet1(Sc1_500)_ CSR(1-50)_0_ VTA(VEI-24A)_ Ins(BS-630)_ COS(630_1_1)_ VS0(R_4)_ ScLock(IND)_ Mupasz(M101)_ SCELL(IE2)_ BusIns(1)_ Wire(1)_ Fast(2)_ CF(2)_ MachP(1)_ SP(Scell_1)_ 0_ GET(R_150)_ TconNx(3_630_VT)_MiniRTU(Elseta)_0)

SP25	Fully assembled and routine tested panel up to 24kV
SCELL	SCELL series switchgear
LD1	Assembled switchgear up to 24kV. The Breaking Current of SP is up to 20kA
LF	Line feeder
W(500)	Panel width 500mm
M(630)	Main busbar rated current 630A
LD1	Circuit breaker ISM25__LD_1 with insulation hoods Ir=800A
FCA(1)	Front attachment for 6xsingle cables entry including metal frame and connector kit
LVStd(Sc250)	LV cabinet standard size 250mm
PBmet1(Sc1_500)	Metal enclosure without LV compartment for quantities <3 and IP4X size 500mm
CSR(1-50)	Teleradio Wawa phase current sensor CR1-50
0	Zero-sequence CT not included
VTA(VEI-24A)	Alce plug-in VT VEI-24A
Ins(BS-630)	Insulator kit for up to 630A/800A
COS(630_1_1)	COS 630A/800A with capacitive voltage sensors and with EM interlock
VS0(R_4)	Voltage Indicator with 2CO connected to COS Ins at cable side. Cable length 4m
ScLock(IND)	Hinges, handles and locks kit
Mupasz(M101)	Overcurrent non-directional protection relay, 3xI (Rogowski coils)+1xI0 (1A), 4xDI/DO, Modbus (RS485), 100…230VAC/DC
SCELL(IED2)	Aux wiring and accessories for complicated IED arrangement
BusIns(1)	Heat-Shrink Insulation, incl. barriers as per GOST or IEC
Wire(1)	Internal panel cabling (CT-LV; COS-LV; CT0-LV)
Fast(2)	Fasteners and standard fitting kit incl. panel interconnection
CF(2)	MV cable fixing for 2 cables per phase
MachP(1)	Small machining details or plastic alloys parts included
SP(Scell_1)	Panel assembly and Routine testing with auxiliary wiring and LV
0	Surge arresters not included
GET(R_150)	Rear GET attachment with top exhaust 150mm depth
TconNx(3_630_VT)	Nexans kit of 3xK430TB/G+3K300PBM+K200LR 630A for 3xsingle core cables 95-240mm2 and VT 250A link 16-95mm2
MiniRTU(Elseta)	Elseta MiniRTU
0	House transformer not included

6. Installation

6.1. Transportation and handling

The panels are delivered from the factory ready for installation.

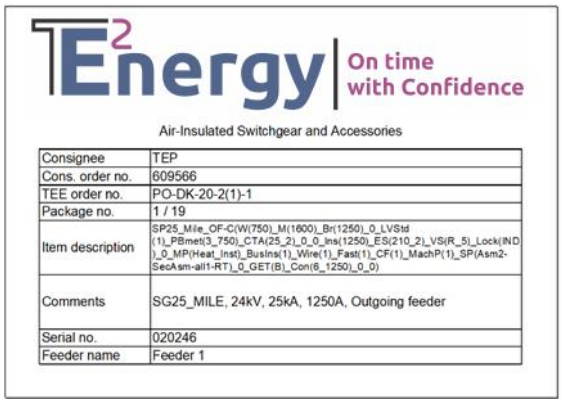
The panel is fitted with four lifting lugs on the top compartment and can be also moved on pallets with a forklift truck. The size of pallet is 1000x1200x160 mm (WxLxH). One pallet can accommodate two standard panels with dimensions 500x600 mm (WxD).

The weight of one standard panel without additional equipment and attachments does not exceed 400 kg.

Fig.6.1. Unpacked SCELL panels

Fig.6.2. Packed SCELL panels

Fig.6.3. Cardbox with accessories (example)


TE Energy | On time with Confidence

Air-Insulated Switchgear and Accessories

Consignee	TEP
Cons. order no.	609566
TEE order no.	PO-DK-20-2(1)-1
Package no.	1 / 19
Item description	SP25_Mile_OF-C(W(750)_M(1600)_Br(1250)_0_LVStd (1)_PBmet(3_750)_CTA(25_2)_0_0_Ins(1250)_ES(210_2)_VS(R_5)_Lock(IND)_0_MP(Heat_Inst)_BusIns(1)_Wire(1)_Fast(1)_CF(1)_MachP(1)_SP(Asm2-SecAsm-all1-RT)_0_GET(B)_Con(6_1250)_0_0)
Comments	SG25_MILE, 24kV, 25kA, 1250A, Outgoing feeder
Serial no.	020246
Feeder name	Feeder 1

Fig.6.4. Sticker with product and project details

6.2. Storage

Panels, equipment, spare parts, and instructions must be stored indoors. The storage area must be free of dust particles, fumes or smoke, corrosive or flammable gases, vapours or salts.

6.3. Unpacking and installation

6.3.1. Foundation surface

Installation of the panel requires a flat, concrete structure. The following floor surface requirements must be obeyed:

Evenness tolerance: ± 1mm within a measuring length of 1m
Straightness tolerance: 1mm per 1m, but not more than 3mm over entire length of frame

Floor, ceiling and walls of the building must be finished with materials, which do not raise or collect dust.

6.3.2. Unpacking

Unpacking panels should only take place on the installation site. Remove plastic stretch wrapping from the panel. Visually inspect the exterior of panel.

6.3.3. Installation

Panels must be positioned on the site in accordance with developed and approved civil project and single line diagram. Floor openings for high-voltage cables must be provided. The layout drawings are shown in Fig.6.2.

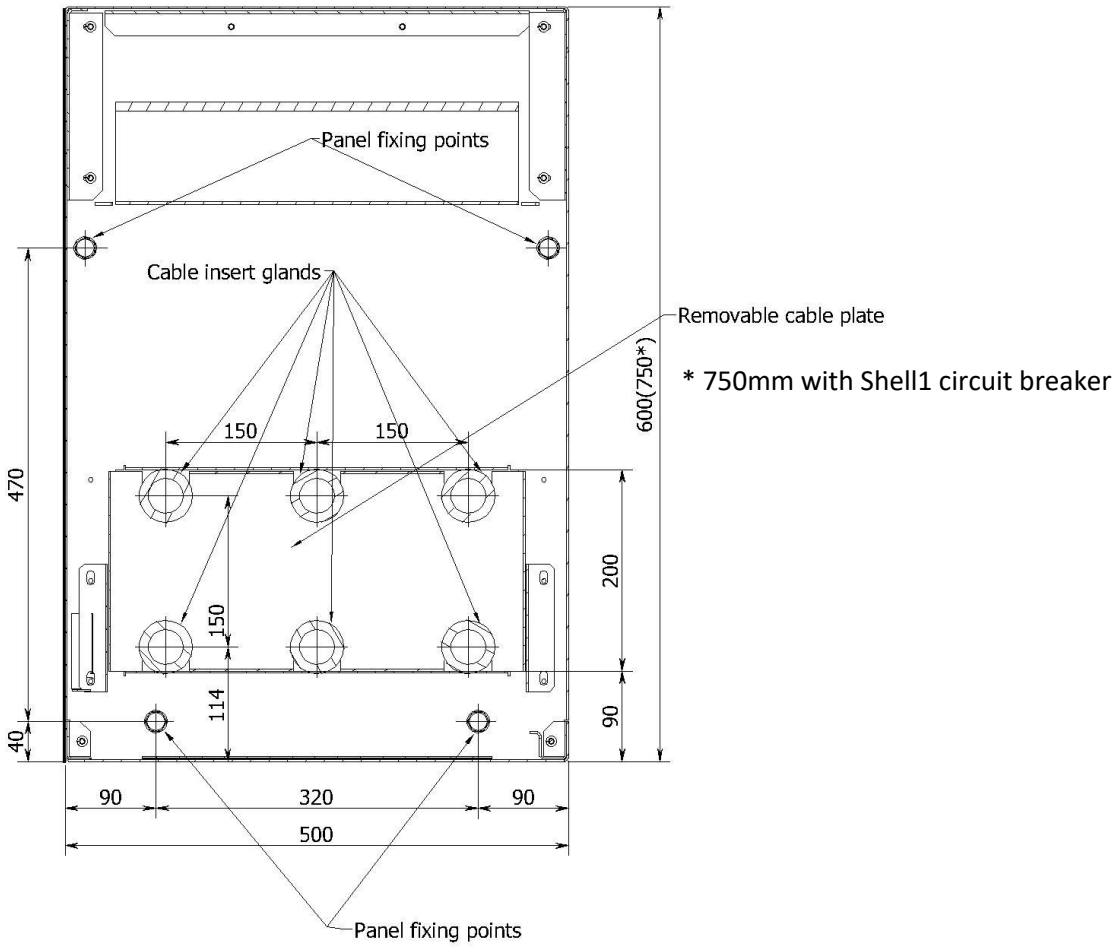


Fig.6.5. SG15(25) SCELL layout

6.3.4. Connecting panels

The below example illustrates how to connect three panels together (end-left, middle and end-right).

Make sure that all panels are perpendicular in relation to the floor surface. Align the front facing panels. Proceed with the layout of the other panels by repeating the same checks each time.

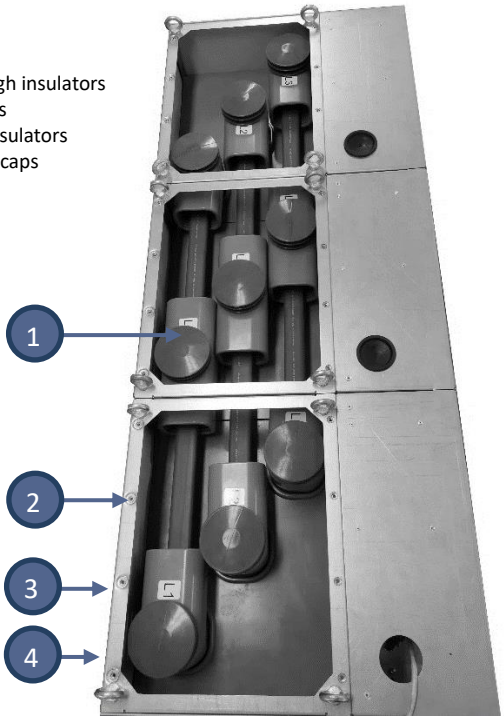
Installation steps:

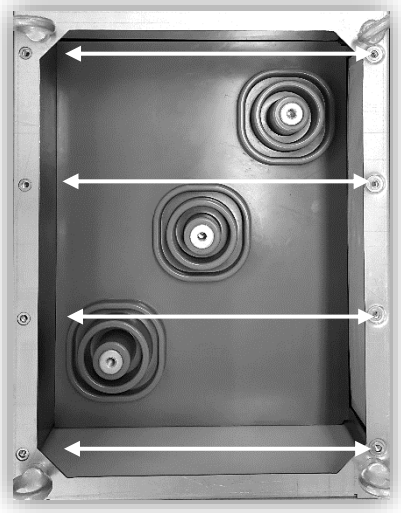
The assembled branch busbar system is shown in the left figure for reference.

1. Start the assembly by releasing the top covers and removing 8x M6 bolts to access the bushings.

Bolt size: M6x16, D6 washer and D6 spring washer.

Legend:
1. T-shape through insulators
2. Branch busbars
3. L-shape end insulators
4. End insulating caps





2. Lubricate the bushings and put the insulators on top for all three panels starting with the phase L1.

There are three types of insulators:

1) **L**-shape end insulators for end panels;
2) **T**-shape through insulators for middle panels;
3) End insulating caps (mounted at the end of installation).

Ring rubber gaskets must be installed to prevent the loss of torque.

Fasteners, busbars, insulators and gaskets are included in the standard delivery.

Ring rubber gaskets used for **T**-shape insulators.

Ring rubber gaskets used for **L**-shape insulators.

3.1 Pass the busbar through the **L**-shape insulator of the end-left panel and the **T**-shape insulator of the middle panel.

3.2. Fix the busbar through the **L**-shape insulator.

Bolt size: M12x30, D12 washer and D12 spring washer.

3.3. Keep the other end of the busbar loose.

Use a torque wrench to prevent over-tightening problems and avoid damage of equipment during the installation. Torque values for bolted connection are given in Table 6.1.

Table 6.1 Tightening torque table

Bolt size class 8.8	Torque value for copper connections, dry, N·m	Torque value for copper connections, lubricated, N·m	Torque value for other connections as specified in ISO 898-1, N·m
M6	-	-	10,4
M8	15	10	25,4
M10	30	20	50
M12	60	40	-

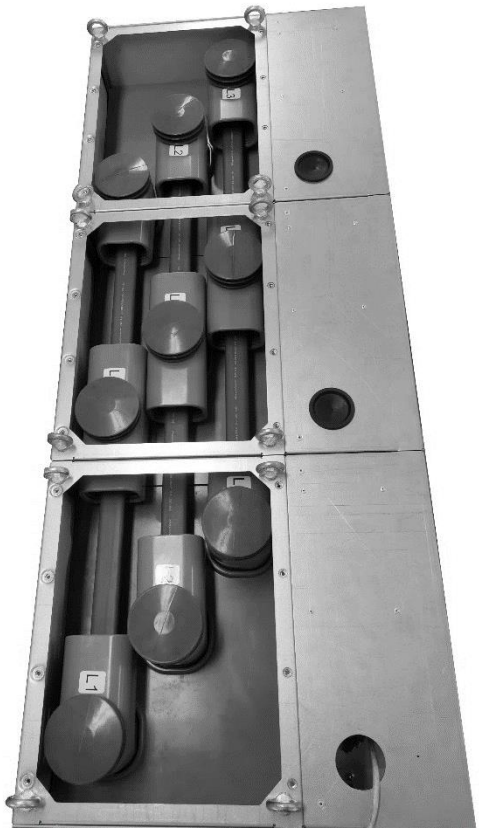
4.1. Take another busbar for connecting the middle panel.

4.2. Pass the busbar through the **T**-shape insulator of the middle panel and the **L**-shape insulator of the end-right panel.

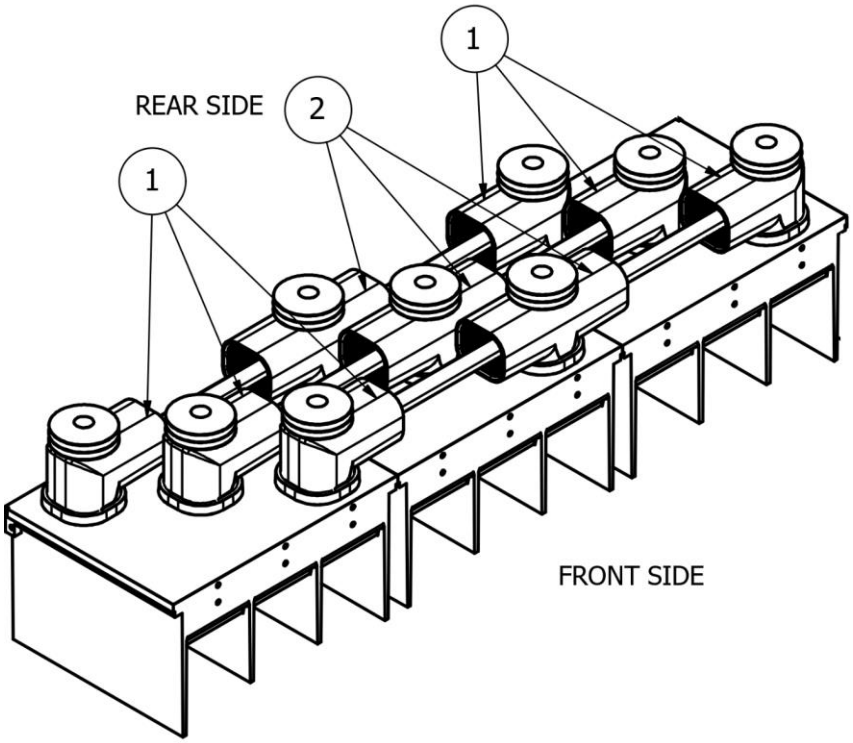
4.3. Fix the busbar through the **T**-shape insulator of the middle panel and **L**-shape insulator of the end-right panel (refer to **3.2**).

Bolt size: M12x40, D12 washer and D12 spring washer.

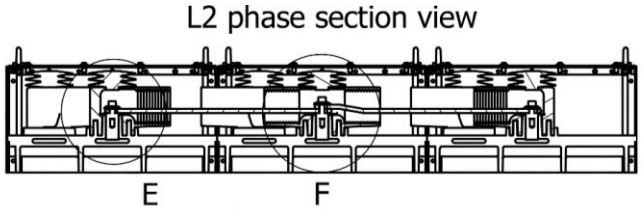
5. Put the end insulating caps on top to complete the assembly of the branch busbar system.

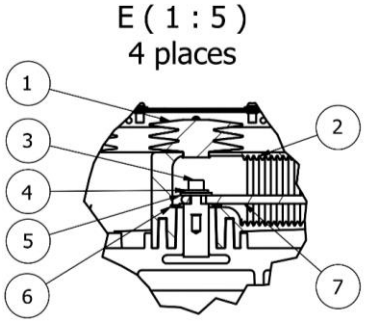


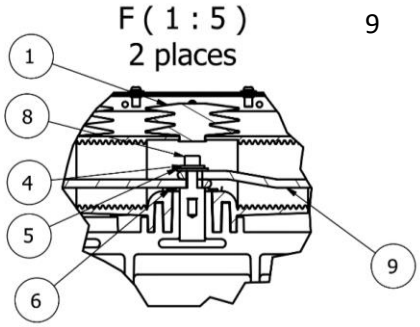
6. The final view of the busbar assembly must be as shown below.



1 L-shape insulator
2 T-shape insulator



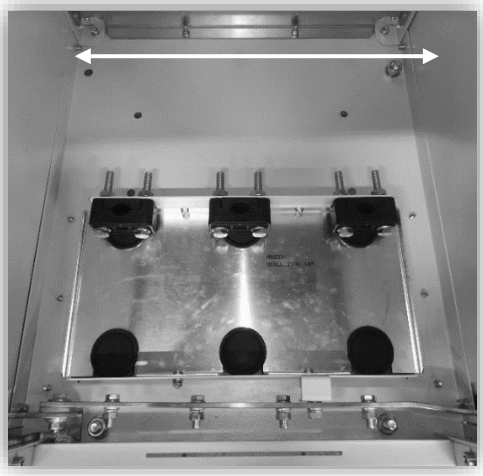




1 L-shape insulator
2 T-shape insulator
3 Bolt M12 x 30
4 Spring-washer D12
5 Washer D12
6 Ring rubber gasket
7 Busbar 10x40
8 Bolt M12 x 40
9 Busbar 10x40

7. Fix the adjacent panels together with 4x M8 bolts using openings in the busbar and cable compartments.

Bolt size: M8x40, D8 washer and D8 spring washer.



6.3.5. Connecting cables

Remove the door by pulling the handle up to access the cable compartment (see Fig.6.7).

The cable compartment door can only be accessed when the COS is in the earthed position.

SCELL is equipped with Type C – 630A bushings for termination of cables (see Fig.6.6).
The bushings are situated in the same height from the floor.
The height from the floor to the centre of the cable bushings is 600 mm

Fig.6.7. Cable compartment

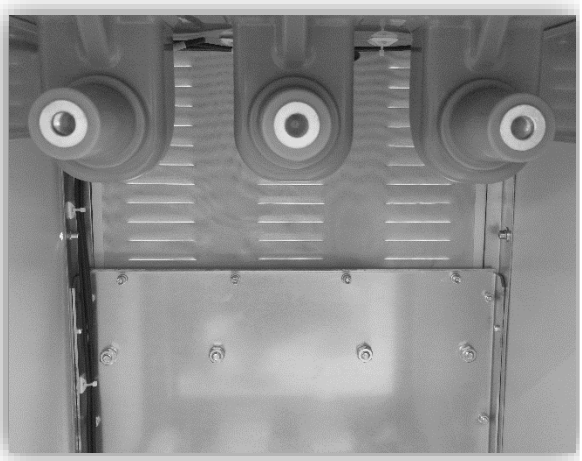


Fig.6.6. Cable bushings

Fig.6.8. Type C connectors with voltage sensors (example)

The manufacturer's installation instructions must be followed to connect cable connectors. Be sure to lubricate the bushings thoroughly with the silicone supplied.

6.3.1. Earthing

The earthing bar is inserted into the cable compartment through the special rectangular openings and fixed by bolt (see Fig.6.9). Make sure that the contact surface of earthing busbar is flat and clean. Adjoin the earthing busbar to the connection point and fix with M12 bolt.

Fig.6.9. SCELL earthing

Connection between panel earthing busbar and the substation main earthing bar must be done according to maximum earth-fault current of switchgear.

Connection of cable or wire with earthing contour at substation is permitted, if their cross-section conforms to short-circuit current.

7. Operation

7.1. General

SCELL design provides 3 main positions as shown in Fig.7.1.

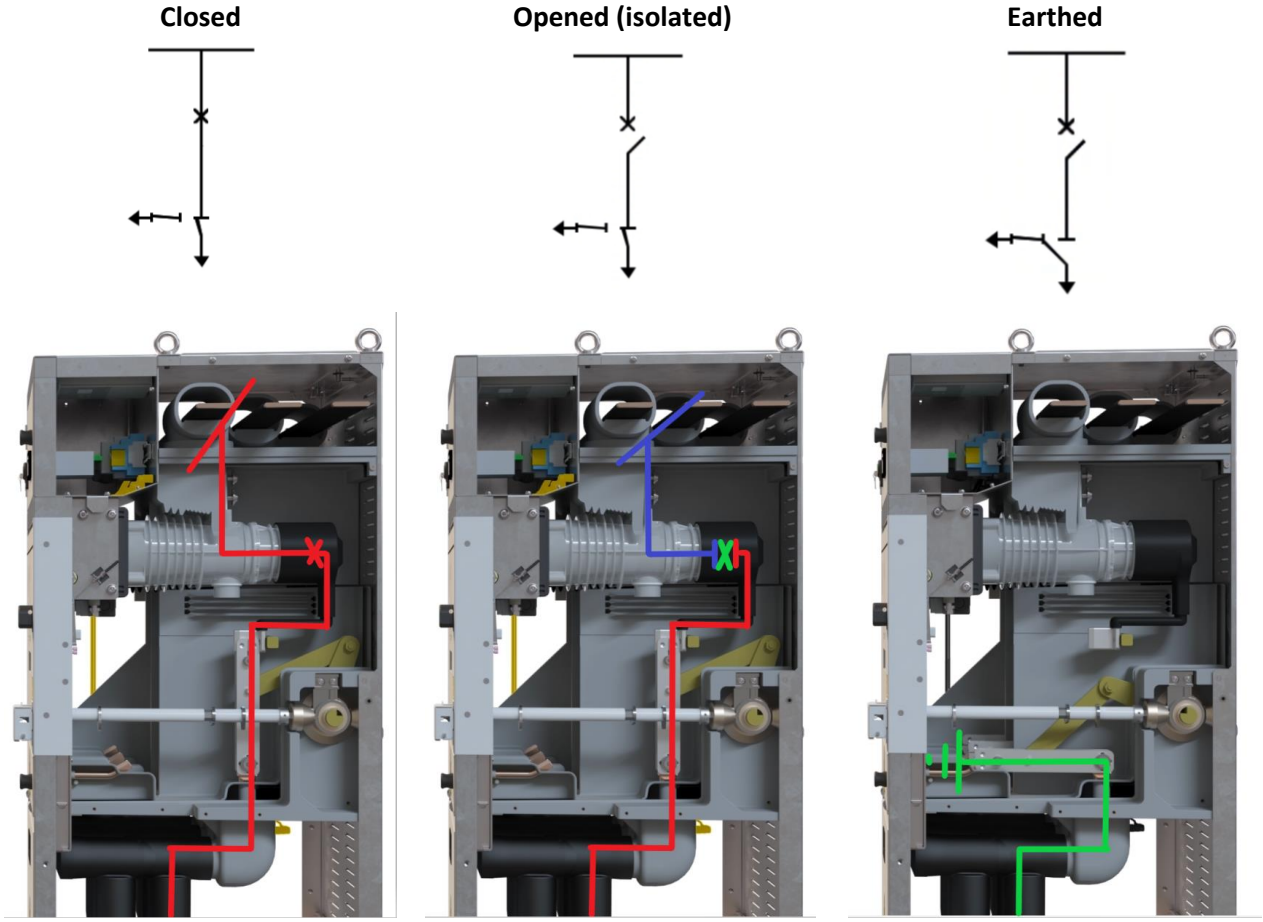


Fig.7.1. 3-position design

The isolated position is achieved though opened contacts of the vacuum circuit breaker.

The COS is operated with the included operating handle (see Fig.7.2). Circuit breaker is normally operated with the close/open buttons located at the front of low voltage compartment. Emergency opening is possible with the manual trip button located at the front of circuit breaker compartment. Emergency closing is possible with the handheld closing device. Internal mechanical interlocking between the COS and circuit breaker prevents incorrect operation. The operation of the COS can be restricted by means of a padlock.

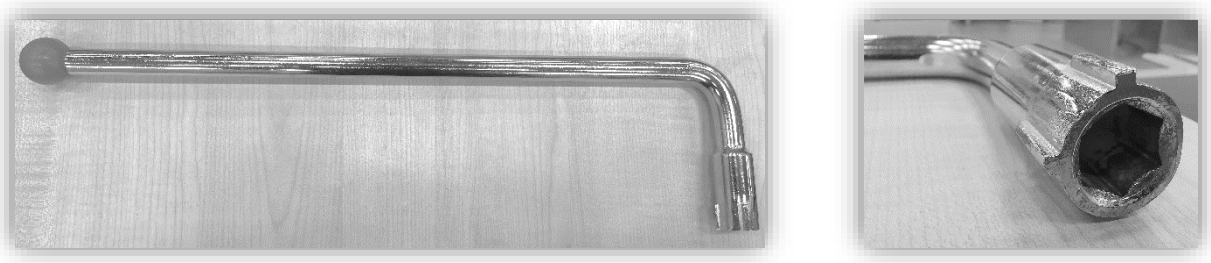
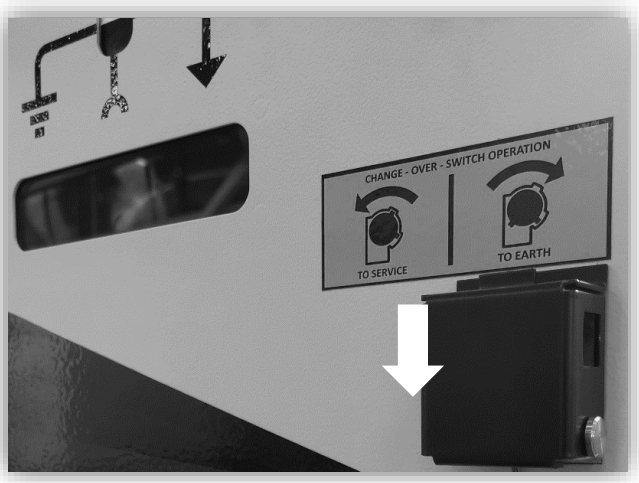
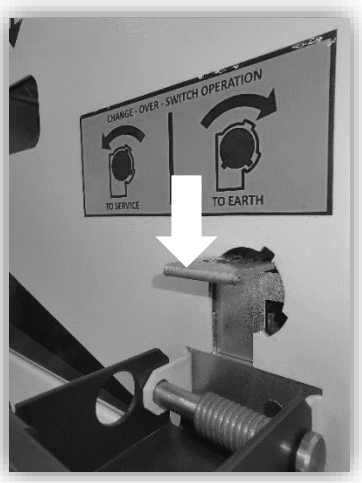


Fig.7.2. Operating handle

7.2. COS operation

Follow the below instructions to manually operate the COS:





1. Pull down the locking mechanism to access the COS operation interface.

To access the COS operation interface, ensure that:

1) VCB is OPEN;
2) VCB is deactivated[1];
3) Cable compartment door is CLOSED;
4) Cable testing facility door is CLOSED.

SG15(25) SCELL_Shell has an additional interface for activating and deactivating the VCB. Refer to "7.3.2. ISM25_Shell operation" for the detailed instructions.

2. Follow the instuctions on the sticker to operate the COS.

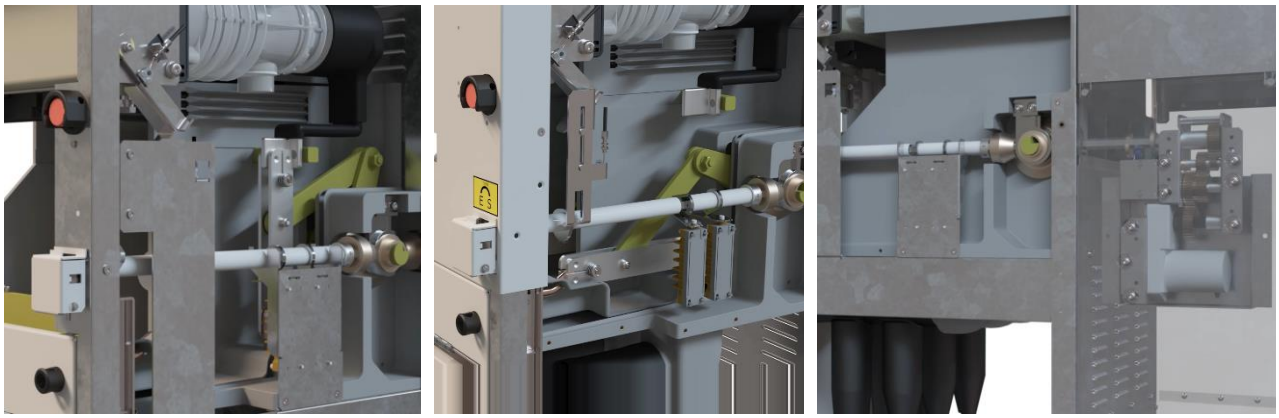
To Service: Turn the operating handle anti-clockwise.

Service position

To Earth: Turn the operating handle clockwise. **Earthed position**

Fig.7.3. COS operation

COS positions are shown in Fig.7.4. Motor operated COS is available upon request.



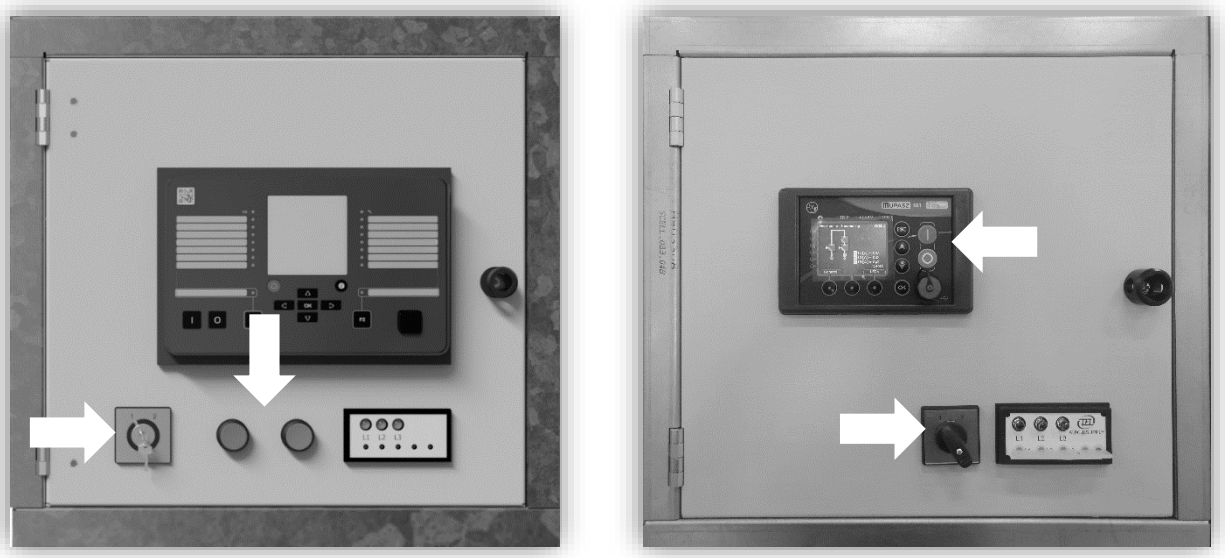
Service position *Earthed position* *Motor operated*

Fig.7.4. COS positions

7.3. Circuit breaker operation

7.3.1. ISM25_LD operation

Follow the instructions to manually operate the VCB in case of the presence of auxiliary power supply:



To Close: Switch the Local/Remote switch to Local position and push the red button on the LV door compartment or relay front panel.

To Open: Push the green button button on the LV door compartment or relay front panel.

Fig.7.5. Circuit breaker operation (examples)

VCB operation is restricted when the COS is in intermediate or earthed position.
The exact interface arrangement for operating the VCB may vary depending on the project requirements and relay type.

7.3.2. ISM25_Shell operation

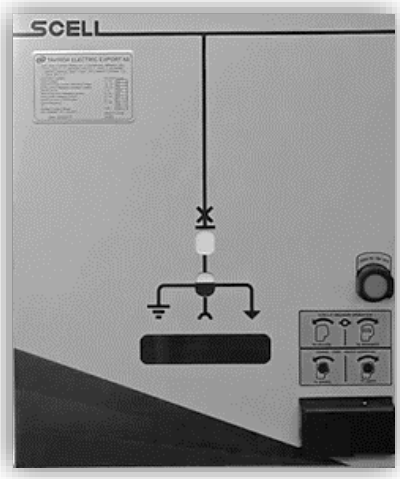
The above section 7.3.1. is applicable, given that ISM15(25)_Shell needs to be manually activated before operating.

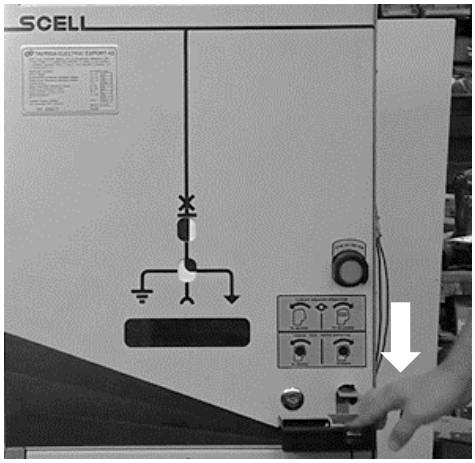
Follow the below instructions to activate the VCB.

To access the VCB activation interface ensure that:

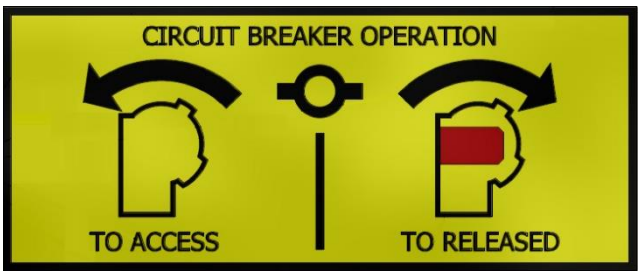
1) VCB is OPEN.
2) Cable compartment door is CLOSED.
3) Cable testing facility door is CLOSED.

1. Pull down the locking mechanism to acces the VCB activation interface.

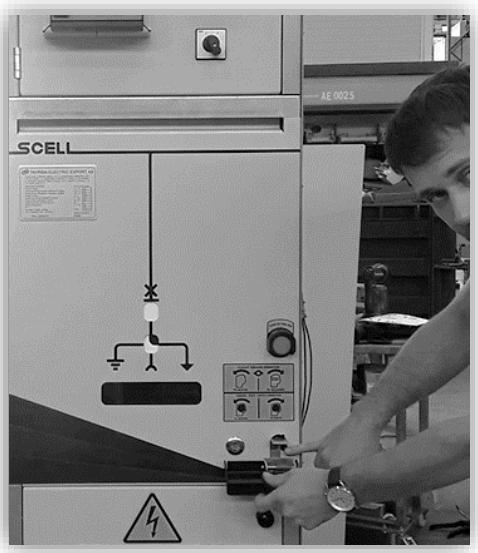




2. Follow the instuctions on the sticker to activate the VCB.



3. To activate the VCB, insert 5-mm double-bit key in the left slot and turn the key clockwise.
4. The red pin will show up in the right slot to indicate that VCB has been activated and ready to operate.

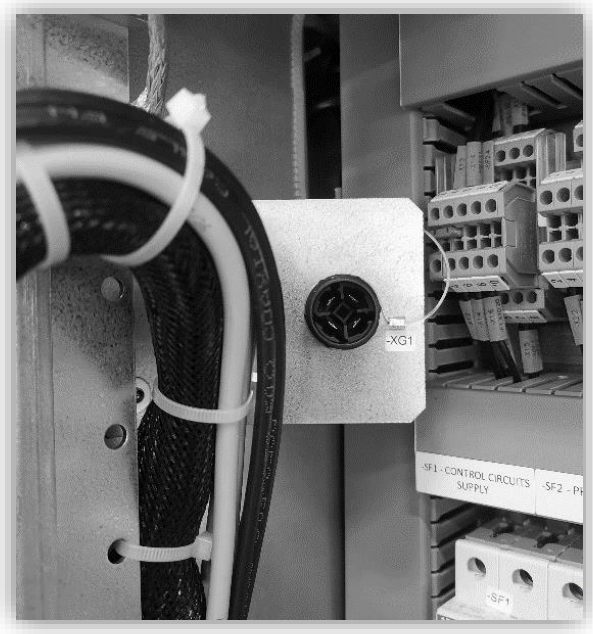


5: Refer to 7.3.1. ISM25_LD operation to operate the VCB from the LV compartment.

The red pin is blocking the COS operation interface while the VCB is activated.
To access the COS operation interface, insert 5-mm double-bit key in the left slot and turn the key anti-clockwise to remove the red pin and deactivate the VCB.

7.3.1. Emergency operation

Follow the instructions to manually operate the circuit breaker in case of the loss of auxiliary power supply (emergency close/trip):



To Close:

1. Connect the HCD to the socket located in the low voltage compartment.

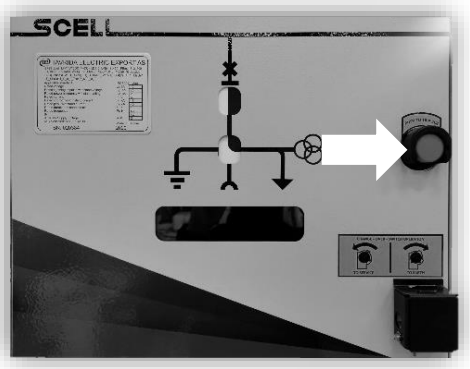
2. To check the battery level press and hold the “BATTERY TEST” button for up to 10 sec. If the ligh is green, the battery is good. If the light is red or there is no light, replace all batteries at the same time.

3. Press and hold the “CM SUPPLY” button for up to 30 sec until the CM shows “READY” state. Activation time depends on the battery condition.

4. Press the “CB CLOSE” button while holding the “CM SUPPLY” button to close CB.

5. Release all buttons, remove the plug and put it into holder.

To Open: Push the red emergency button.



ISM15(25)_Shell must be reset after emergency opening before it can be CLOSED.
To reset it, push the OPEN button on the LV door compartment or relay front panel.

Fig.7.6. Circuit breaker emergency operation

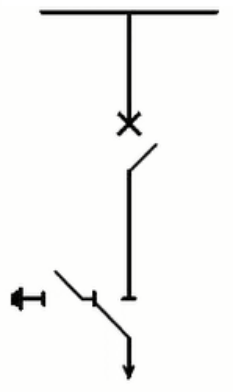
7.4. Cable testing

Follow the instructions to access and use the cable testing facility:

1. Ensure that the COS is in the open/earthed position before accessing the cable testing compartment. Refer to “7.2. COS operation” for the detailed instructions.

2. Open the compartment door using 5-mm double-bit key to access the earthing knife.

3. Remove earthing by releasing the earthing knife and connect the voltage source to the test facility.



Earthing removed

4. Follow the instructions in reverse order to finish testing and close the compartment door.

Push down the fixation pin before closing the earthing knife and closing the compartment door.

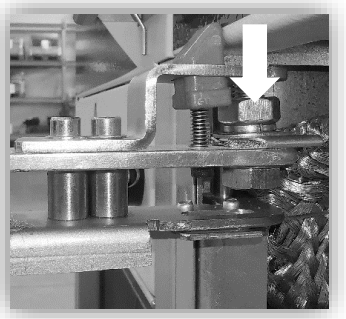


Fig.7.7. Cable testing facility

8. Maintenance

8.1. General

All components are maintenance-free for the entire lifetime. Mechanical parts are surface-treated to prevent corrosion. All moving parts are greased at the factory for the product's entire lifetime.

If the panels sustain to any scratches or damage, these must be repaired with paint to prevent corrosion.

Under normal operating conditions the COS shall be capable of at least 2000 service operations without maintenance works. Further maintenance works are recommended to prolong the lifetime of COS and are described in the next section. During the maintenance works, it is also recommended to replace the COS locking magnet. Refer to "8.3. COS locking magnet" for the detailed instructions.

8.2. COS maintenance

The following maintenance works are recommended to prolong the lifetime of COS:

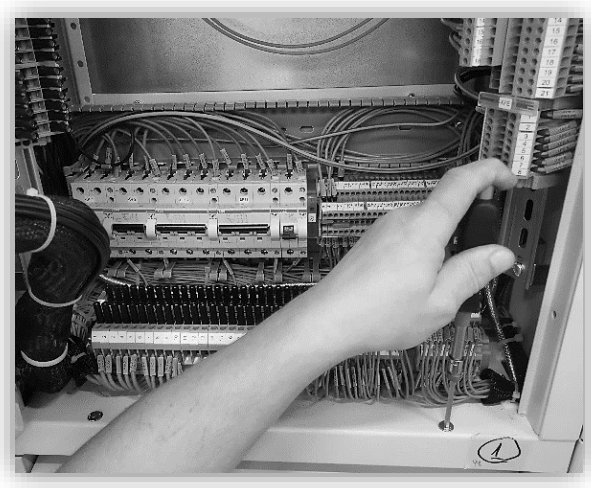
- Visual inspection;
- Cleaning the dust from all reachable surfaces in the compartment;
- Cleaning and greasing switching knife-type contacts.

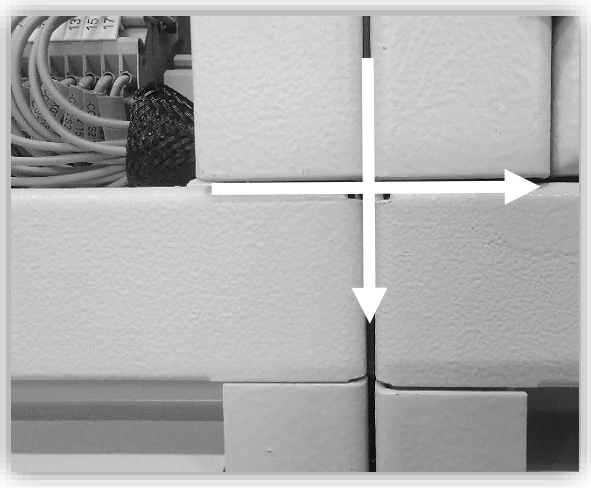
Equipment must be de-energized and earthed to allow maintenance to be performed safely. Auxiliary power supply must be present to allow access to the front cover of the circuit breaker and COS compartment.

Use only special antioxidant joint compound such as Ensto SR1 or similar to grease contact surfaces.

Follow the instructions to remove the front cover and access the COS for maintenance:

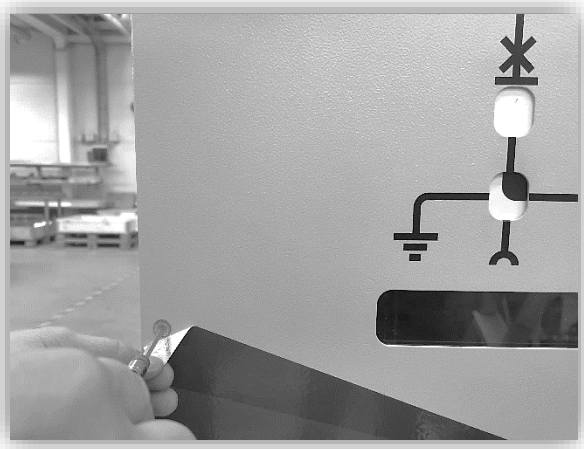
1. Access the low voltage compartment and use a hex key to remove two M6x16 bolts.

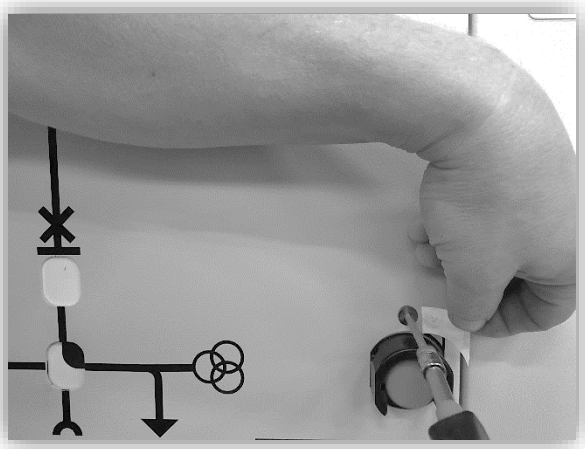




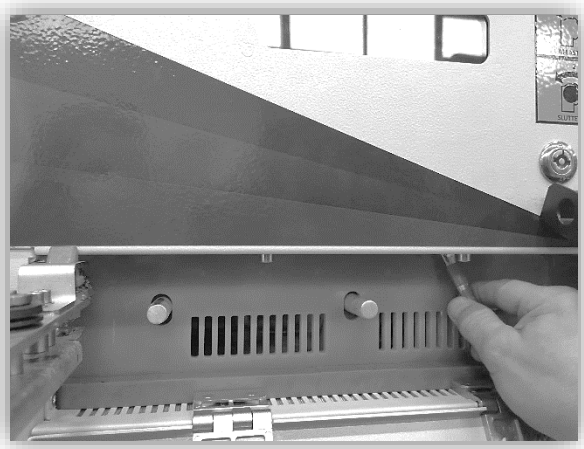
After maintenance, ensure that the bolts are properly tightened. Low voltage compartments of two adjacent panels must be joined in one line as shown in the above right figure.

2. Use a hex key to remove two hidden bolts M6x16 on the front cover of the circuit breaker compartment.



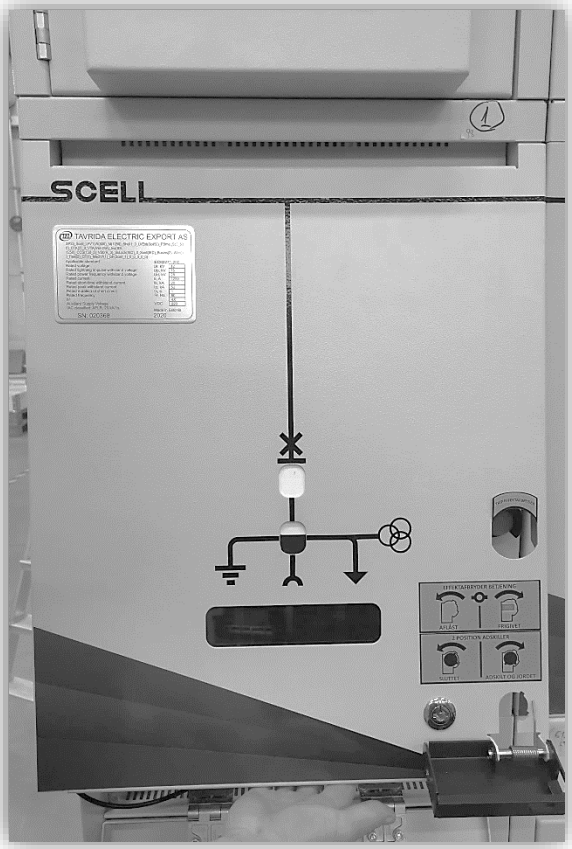


3. Access the cable testing facility door and use a spanner to remove two M6x12 bolts.

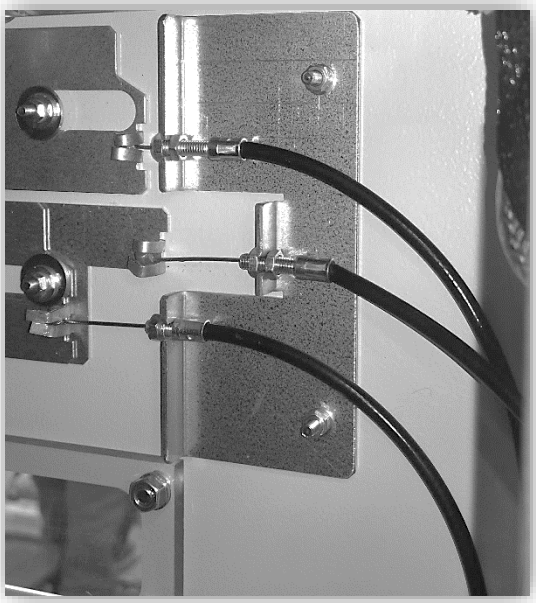


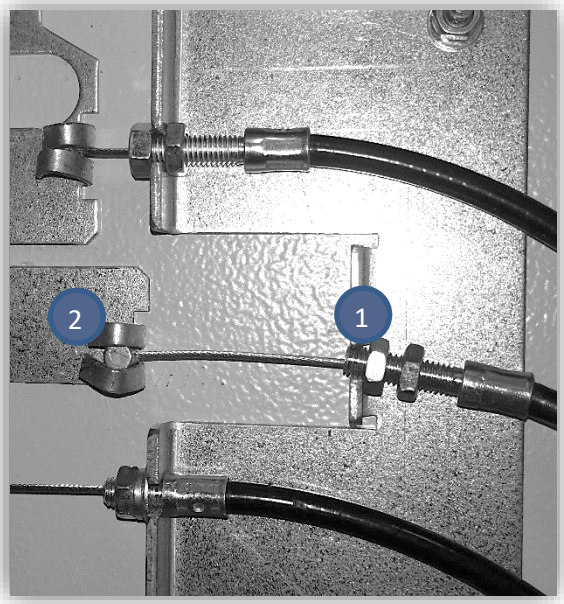
COS must be in earthed position to open the cable testing cover.

4. Pull the cover up to access the position indicator cables.



5. Release the D8 nut (1) and unbend the locking clamp (2) to free the middle position indicator cable.



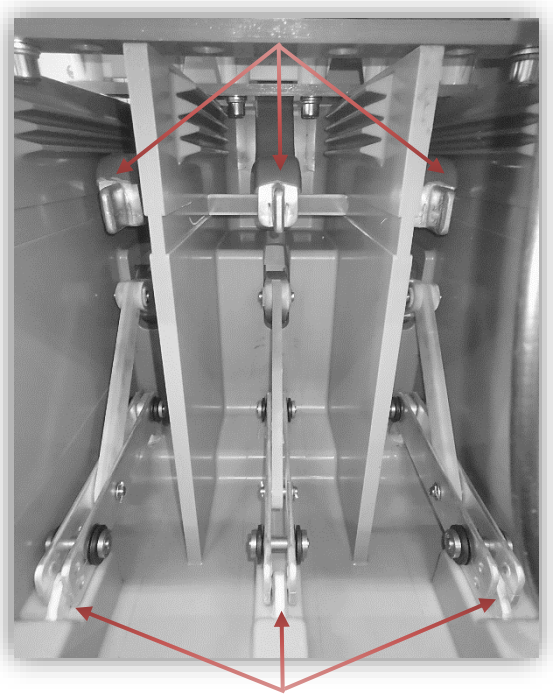


There is no necessity for releasing the top and bottom cables.
Bend the locking clamp after returning the position indicator cable back to its position.

6. Gently put the front cover aside.

Avoid any tension of the position indicator cables during maintenance.

7. Start the maintenance works:
7.1. Inspect the switching knife-type contacts of COS for any signs of excesse wear requiring replacement;
7.2. Clean the dust from all reachable surfaces in the compartment;
7.3. Use Ensto SR1 or similar grease to lubricate the contact surfaces of COS as shown below.



8. Complete the maintenance works and follow the instructions in reverse order to install the cover.
9. Perform a few switching operations after the maintenance works and check the operation of interlocks.

8.3. COS locking magnet

The locking magnet (solenoid) is used to restrict access to the COS operation interface when interlocking conditions are met. The available types are given in Table 8.1.

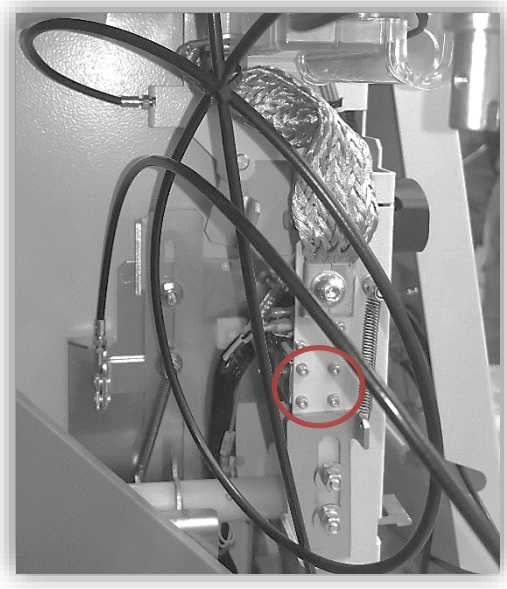
Table 8.1 COS locking magnet

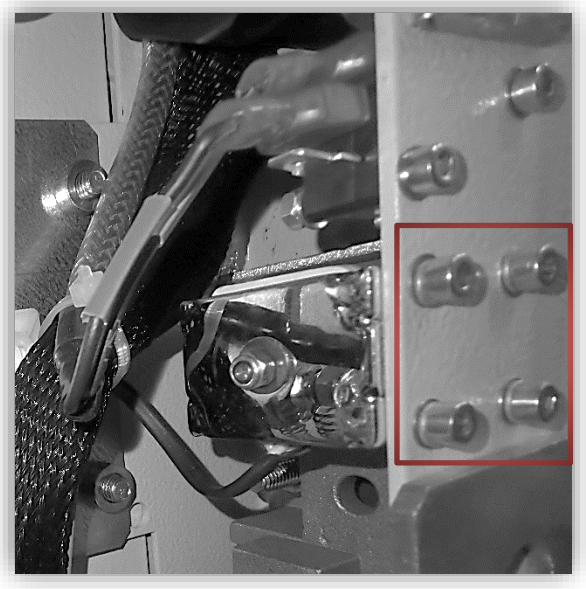
Type	Description	Figure
CD_LM_110VDC	Locking magnet 110VDC (93.5…132VDC, 33mA, 3300Ω)	
CD_LM_220VDC	Locking magnet 220VDC (187…264VDC, 22mA, 9600Ω)	
CD_LM_48VDC	Locking magnet 48VDC (42…57.6VDC, 209mA, 230Ω)	
CD_LM_24VDC	Locking magnet 24VDC (21…28.8VDC, 192mA, 125Ω)	

Follow the instructions to replace the solenoid:

1. Refer to “8.2. COS maitnenance” for the detailed instructions how to open the front cover.

2. Use a hex key to remove four M3x8 bolts to release the solenoid and replace it with a new one.





9. Troubleshooting

Table 9.1 Troubleshooting steps

Malfunction	Possible issue	Solution
Cannot open the cable compartment door	COS open	Check if the COS open by the indicator or through the front inspection window. Close the COS.
	Cable testing compartment door open	Apply earthing by closing the earthing knife and close the cable testing compartment door.
Cannot open cable testing compartment door	COS closed	Check if the COS open/earthed by the indicator or through the front inspection window. Open the COS.
Cannot close CB	COS in the intermediate position	Check if the COS closed/open by the indicator or through the front inspection window. Open/close the COS.
	Internal malfunction or warning	Check if the LED indicator "Failure" blinking. See Table 9.2 for further instructions.
	CB operation mode set to the remote mode	Use a selector switch to choose the local CB operation mode. Close the CB.
	After manual trip RESET was not performed	Press OPEN button.
Cannot open CB	Internal malfunction or warning	Check if the LED indicator "Failure" blinking. See Table 9.2 for further instructions.
Cannot close COS	CB open	Check if the CB open by the indicator or through the front inspection window. Open the CB.
Cannot open COS	CB open	Check if the CB open by the indicator or through the front inspection window. Open the CB.
Blinking LED indicator "Failure"	Internal malfunction or warning associated with CM or CB operation	See Table 9.2 for further instructions.

Table 9.2 Troubleshooting steps associated with CM operation

Failure Code LED indication (No. of flashes)	Malfunction/Warning	Solution
1	Power outage exceeds 1,5 s ± 0,5 s or applied voltage exceeds prescribed limit value	Check the presence of CM auxiliary power supply, its polarity and voltage level.
2	CB closing or tripping failure	Check the circuit of CB actuator coil connection with connector X3 of CM, check state of CB electrical interlocks.
3	Actuator-coil is open-circuited	Check the circuit of ISM actuator coil. connection with connector X3 of CM, check state of CB electrical interlocks.
4	Actuator-coil is short circuited	Check the circuit of ISM actuator coil connection with connector X3 of CM, check state of CB electrical interlocks.
5	CB opened and locked	Check the CB and its interlock state
6	Overheating of CM	Stop performing CO operations until the blinks stop.
7	CB emergency trip	Check the CB and its interlock state.
Continuous red	Internal failure of CM	Replace the CM.

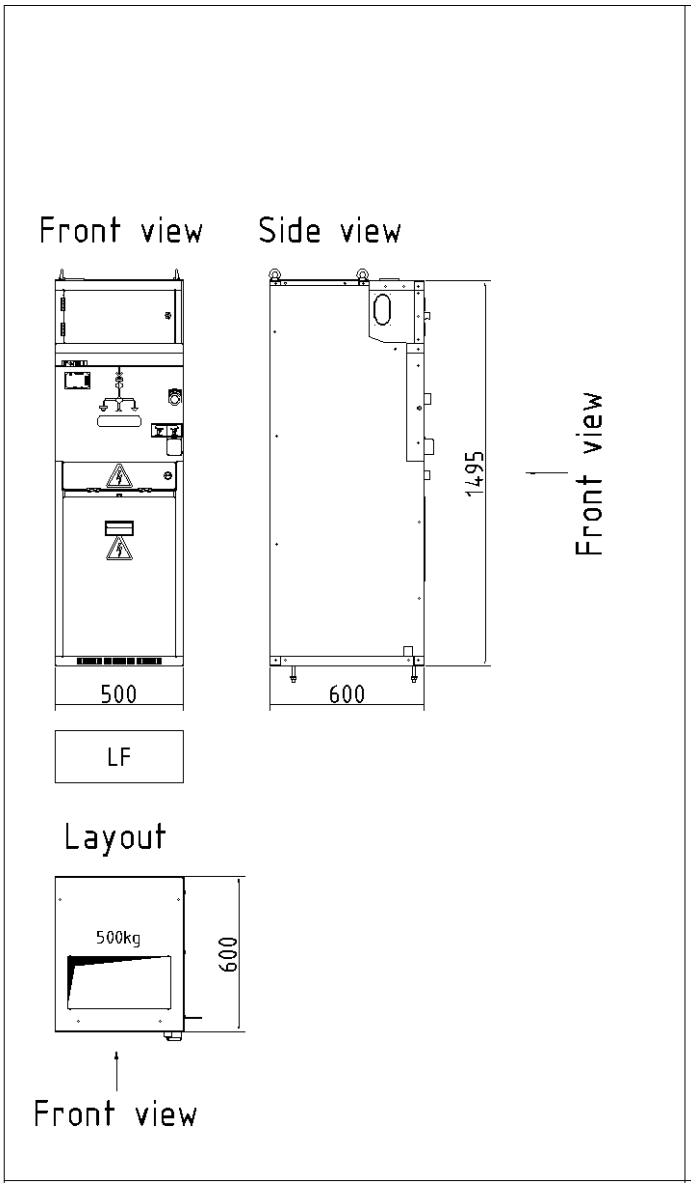
In case the actions listed above do not help, contact your TE Energy representative.

10. Disposal

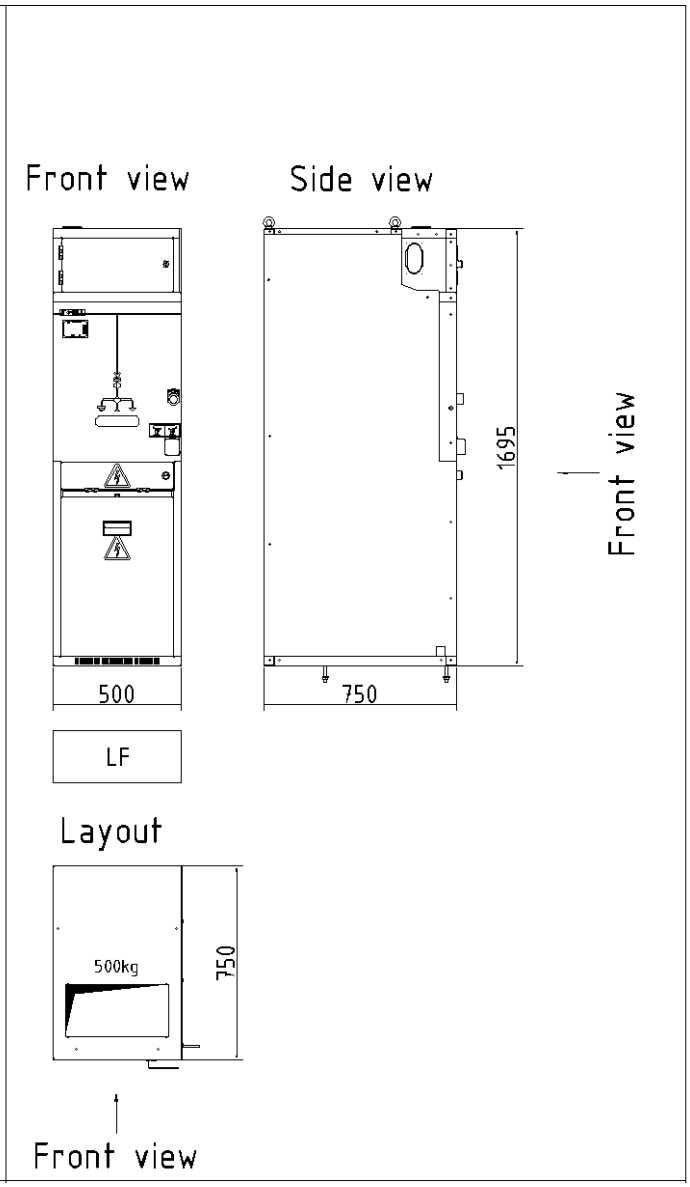
The equipment and materials applicable in SCELL series switchgear do not contain any materials that are hazardous for the environment or for personnel. No special methods of disposal are required.

Appendix 1. General arrangement drawings

STANDARD PANELS WITH LOW LV COMPARTMENT
LF / LFVT / SD / LI / M / MES / BE



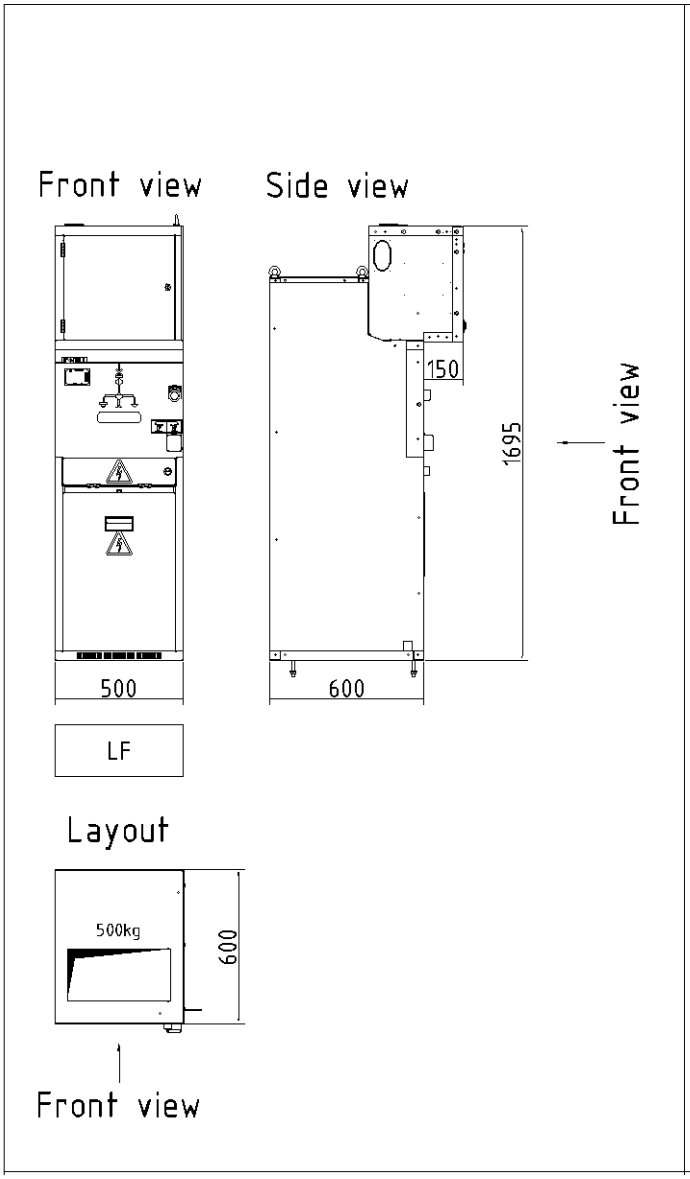
24kV, 800A, 20kA (Low LV)



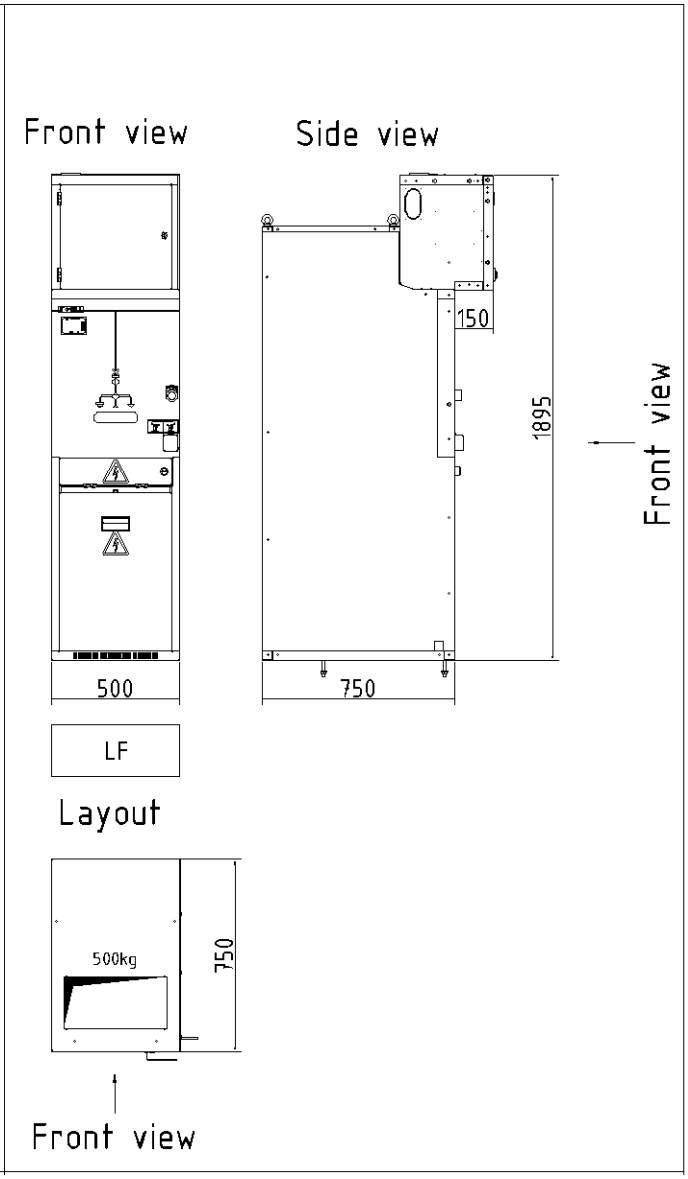
24kV, 1250A, 25kA (Low LV)

STANDARD PANELS WITH EXTENDED LV COMPARTMENT

LF / LFVT / SD / LI / M / MES / BE



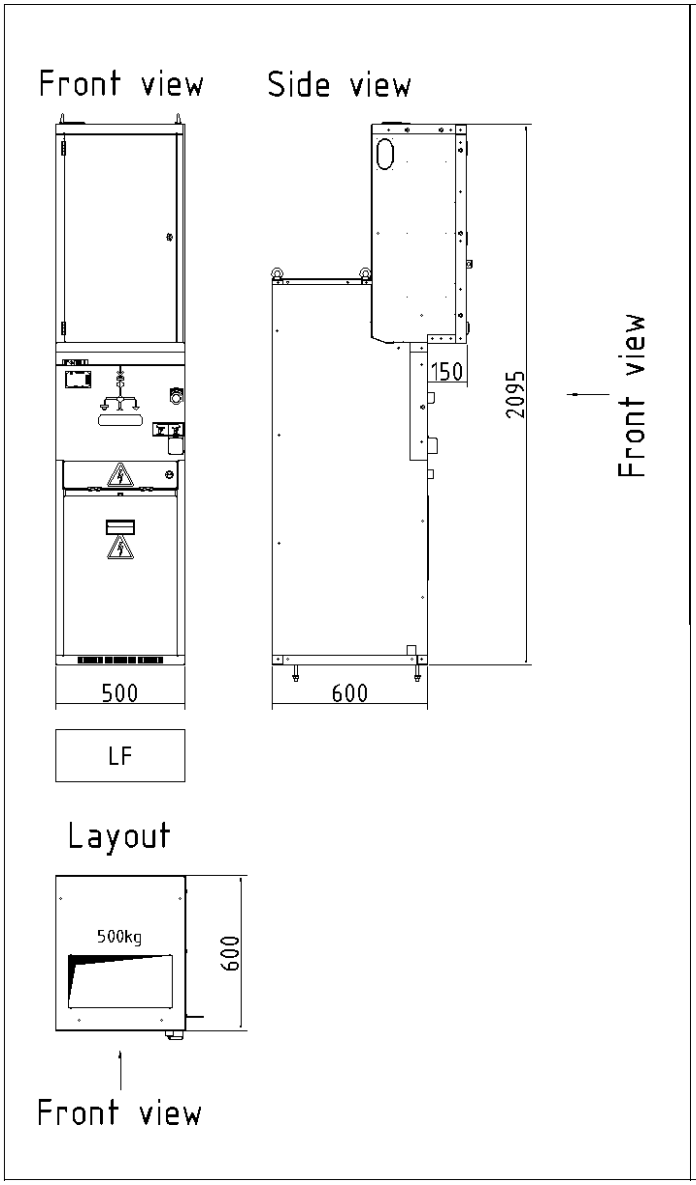
24kV, 800A, 20kA (Extended LV)



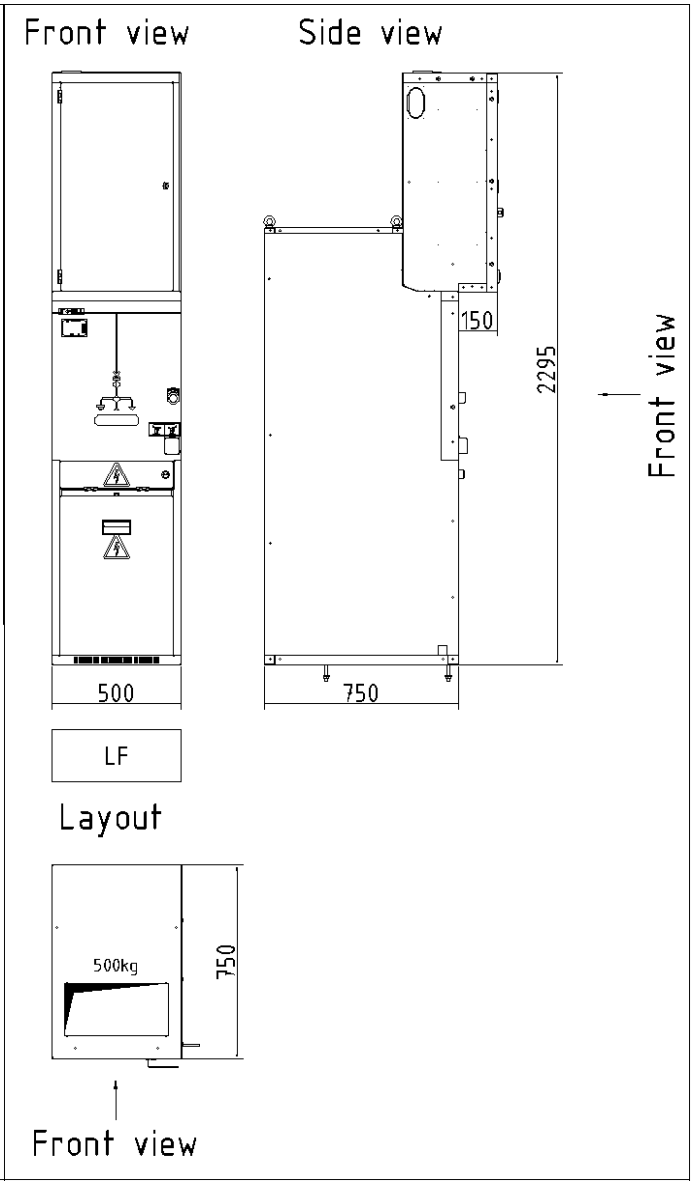
24kV, 1250A, 25kA (Extended LV)

STANDARD PANELS WITH HIGH LV COMPARTMENT

LF / LFVT / SD / LI / M / MES / BE

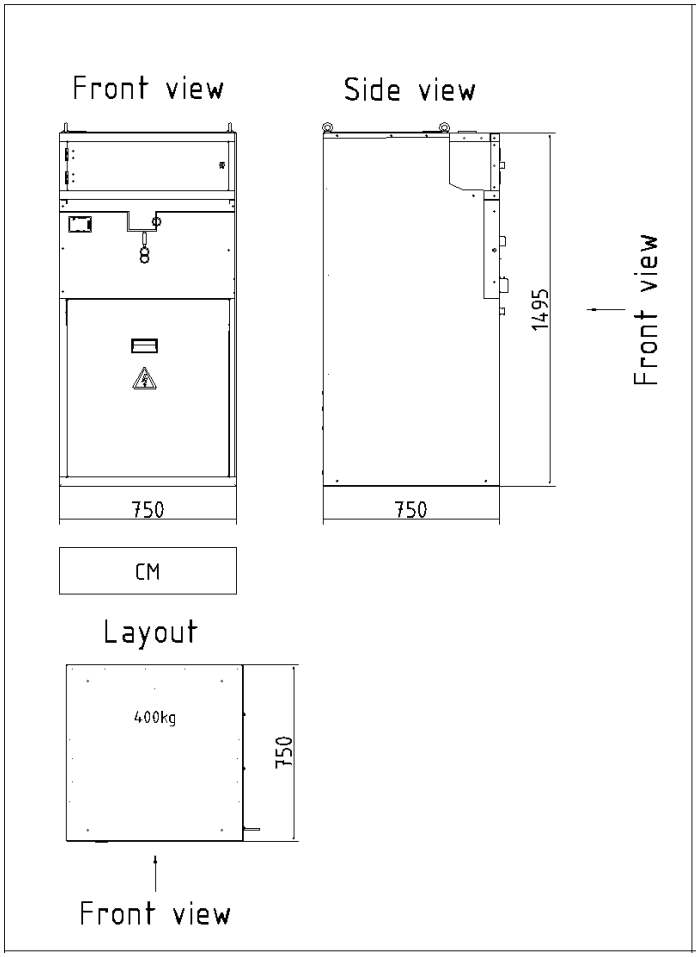


24kV, 800A, 20kA (High LV)

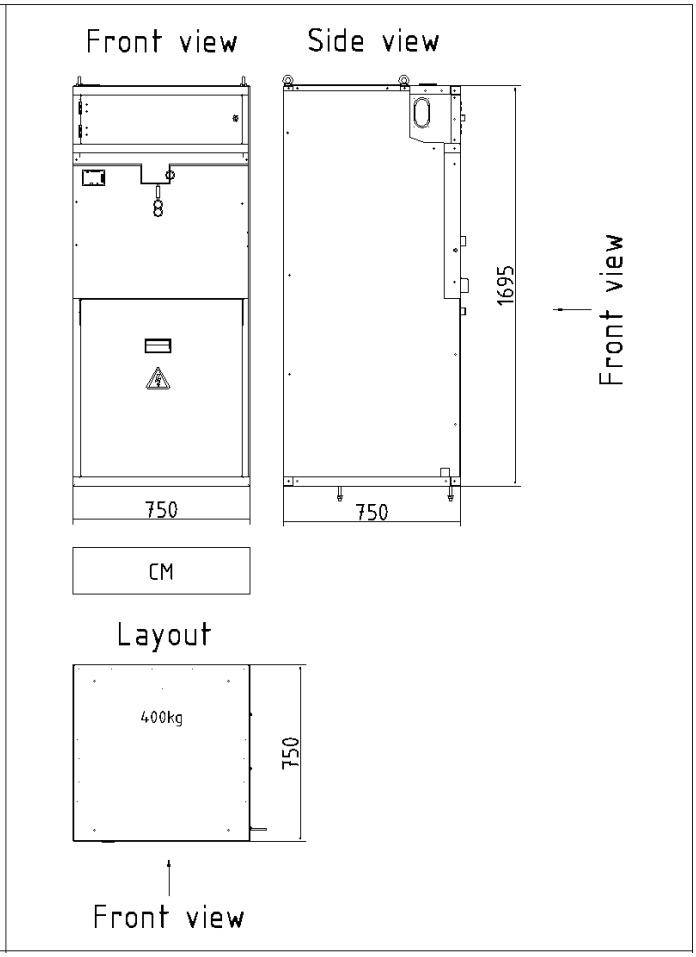


24kV, 1250A, 25kA (High LV)

COMMERCIAL METERING PANEL WITH CT/VT (CM)

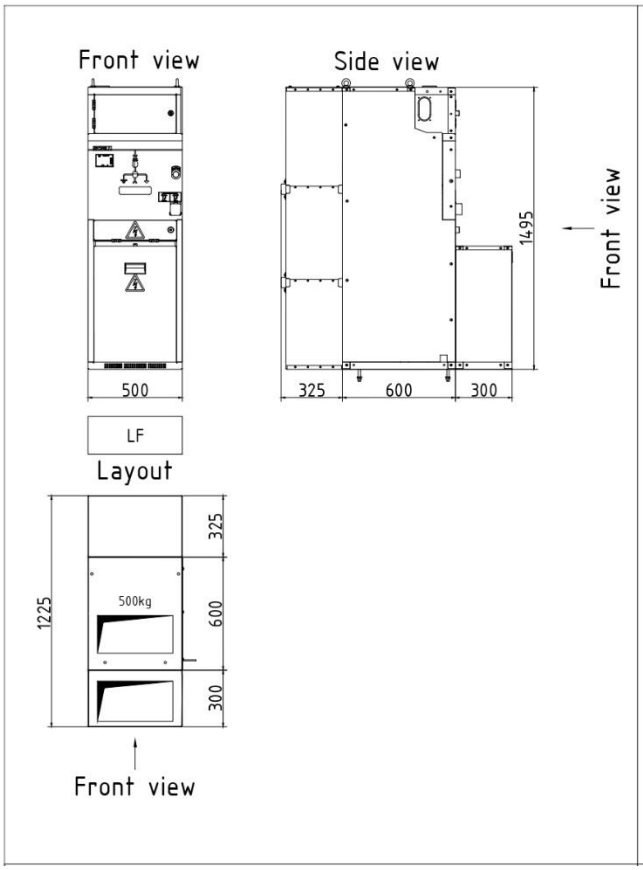


24kV, 800A, 20kA

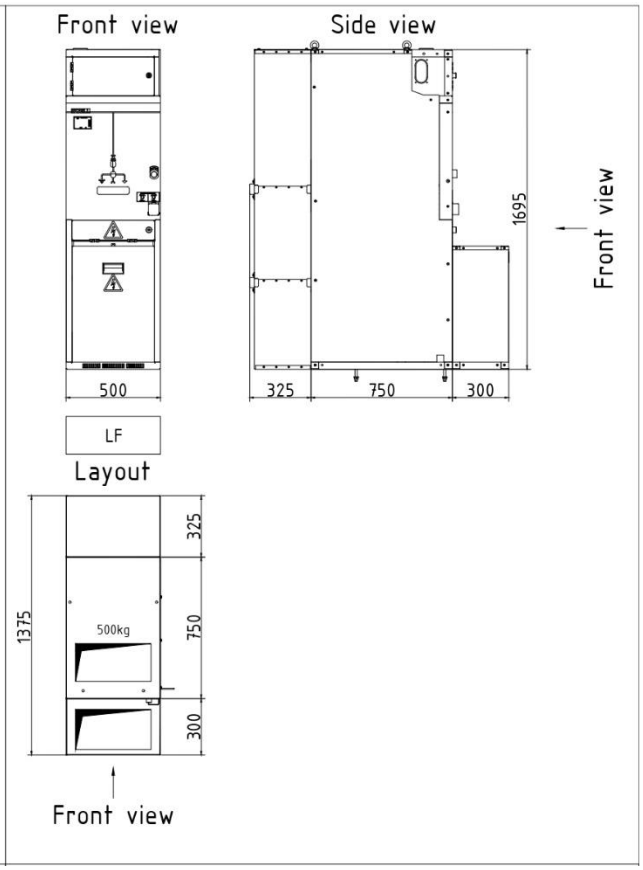


24kV, 1250A, 25kA

REAR AND FRONT ATTACHMENTS

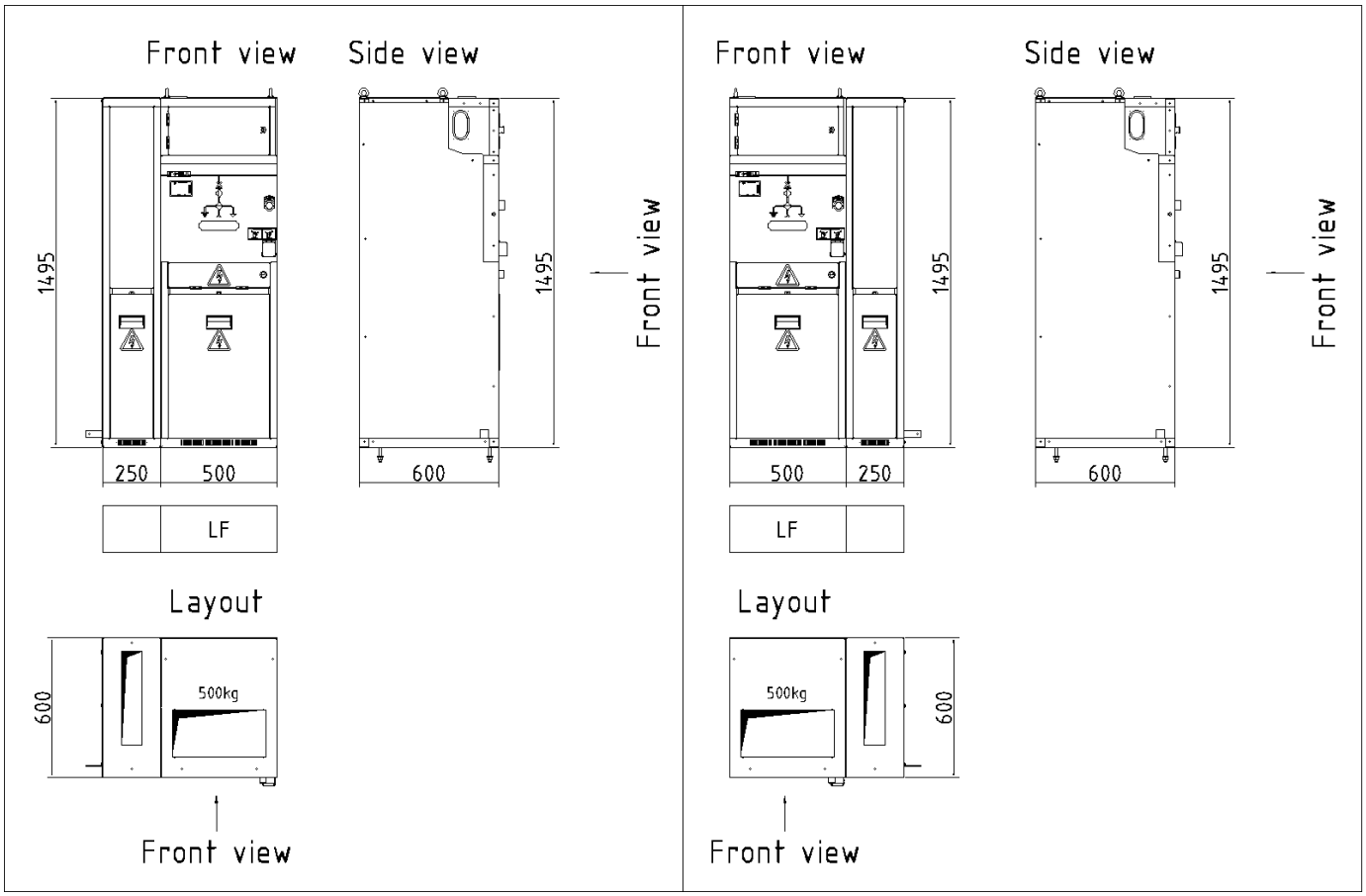


24kV, 800A, 20kA/3s



24kV, 1250A, 25kA

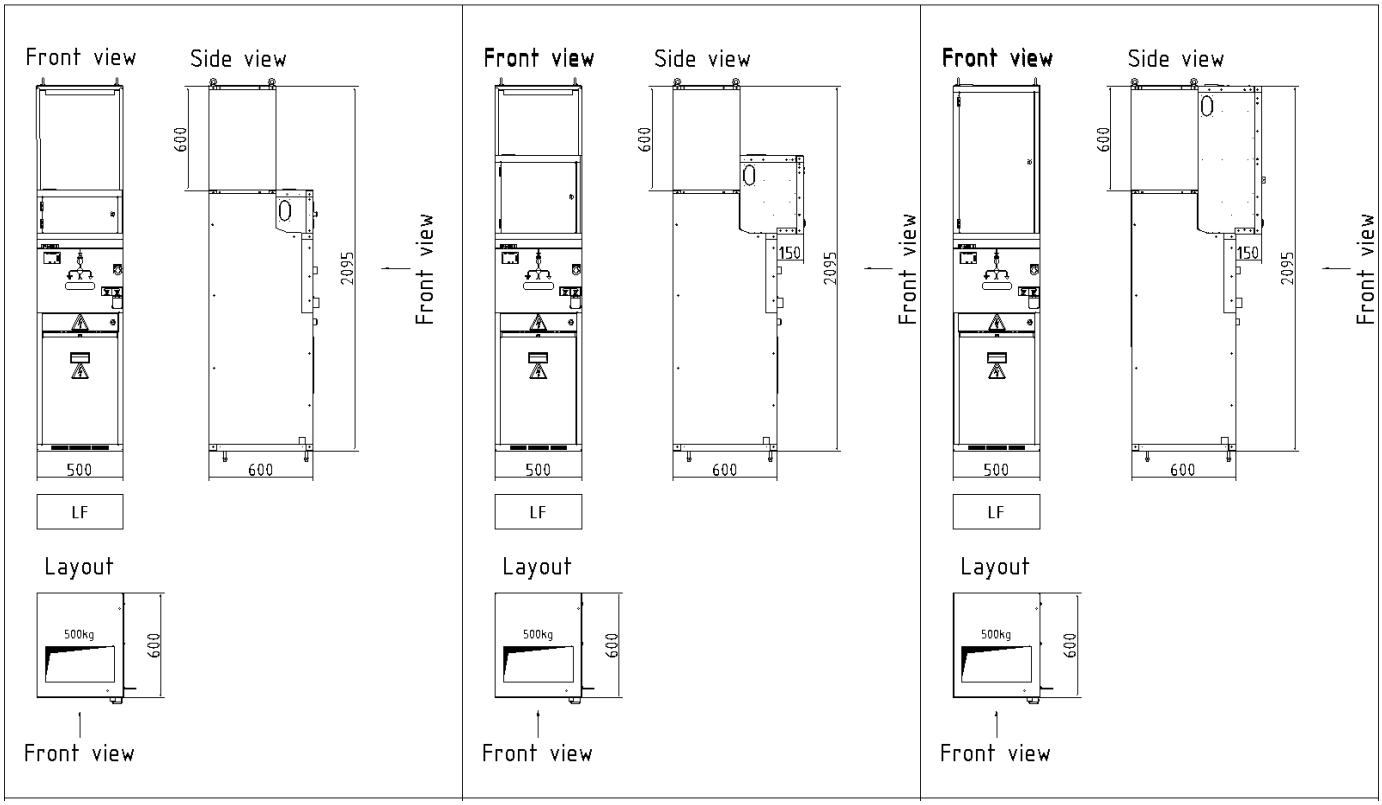
SIDE ATTACHMENTS FOR CABLE INPUT (UP TO 17,5 KV / 800 A)



17,5kV, 800A, 20kA (Left attachment)

17,5kV, 800A, 25kA (Right attachment)

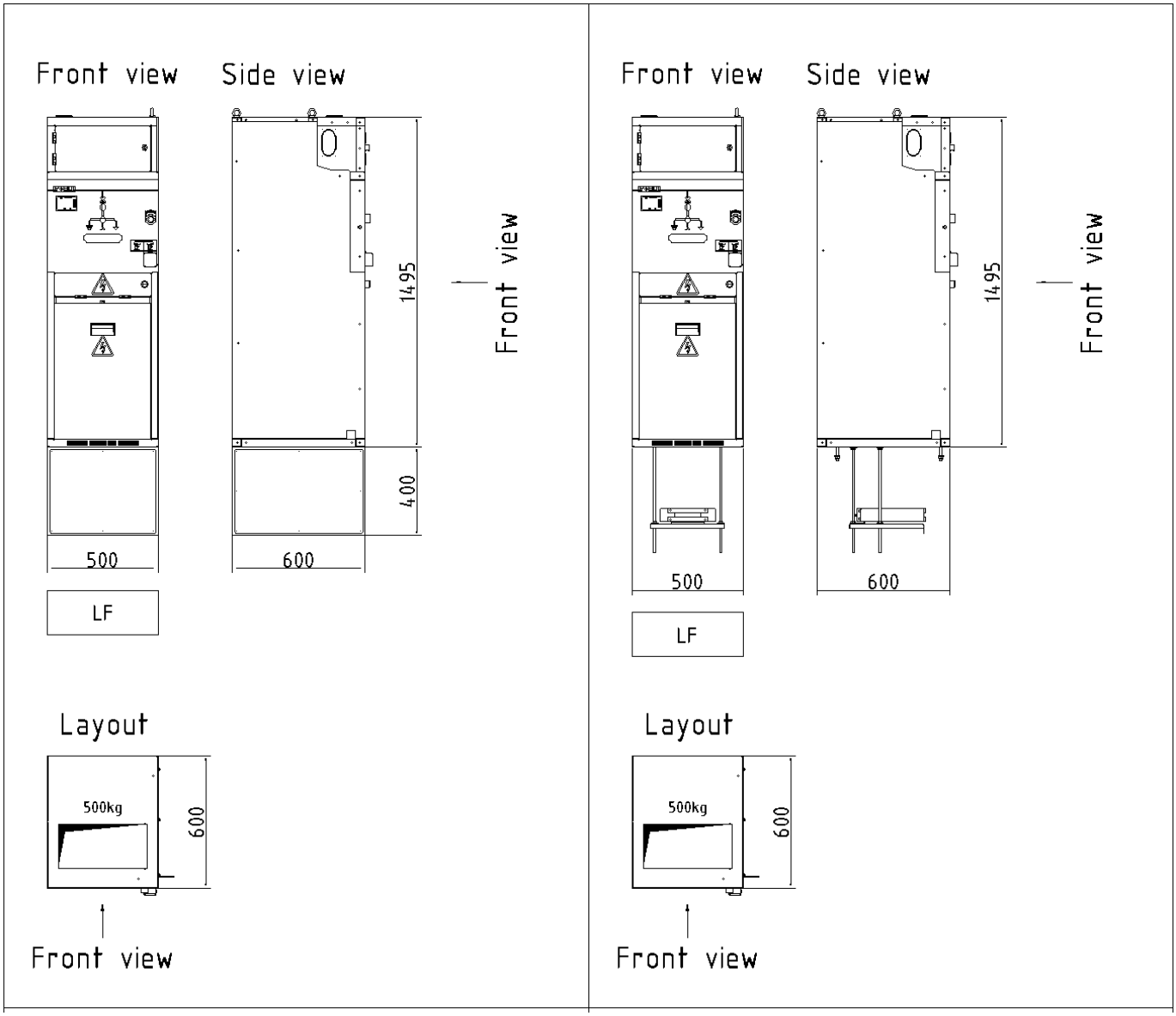
TOP ATTACHMENT WITH VOLTAGE TRANSFORMERS (UP TO 12KV)



Low LV Extended LV High LV

Note: 12kV/800A/20kA and 12kV/1250/25kA options are available

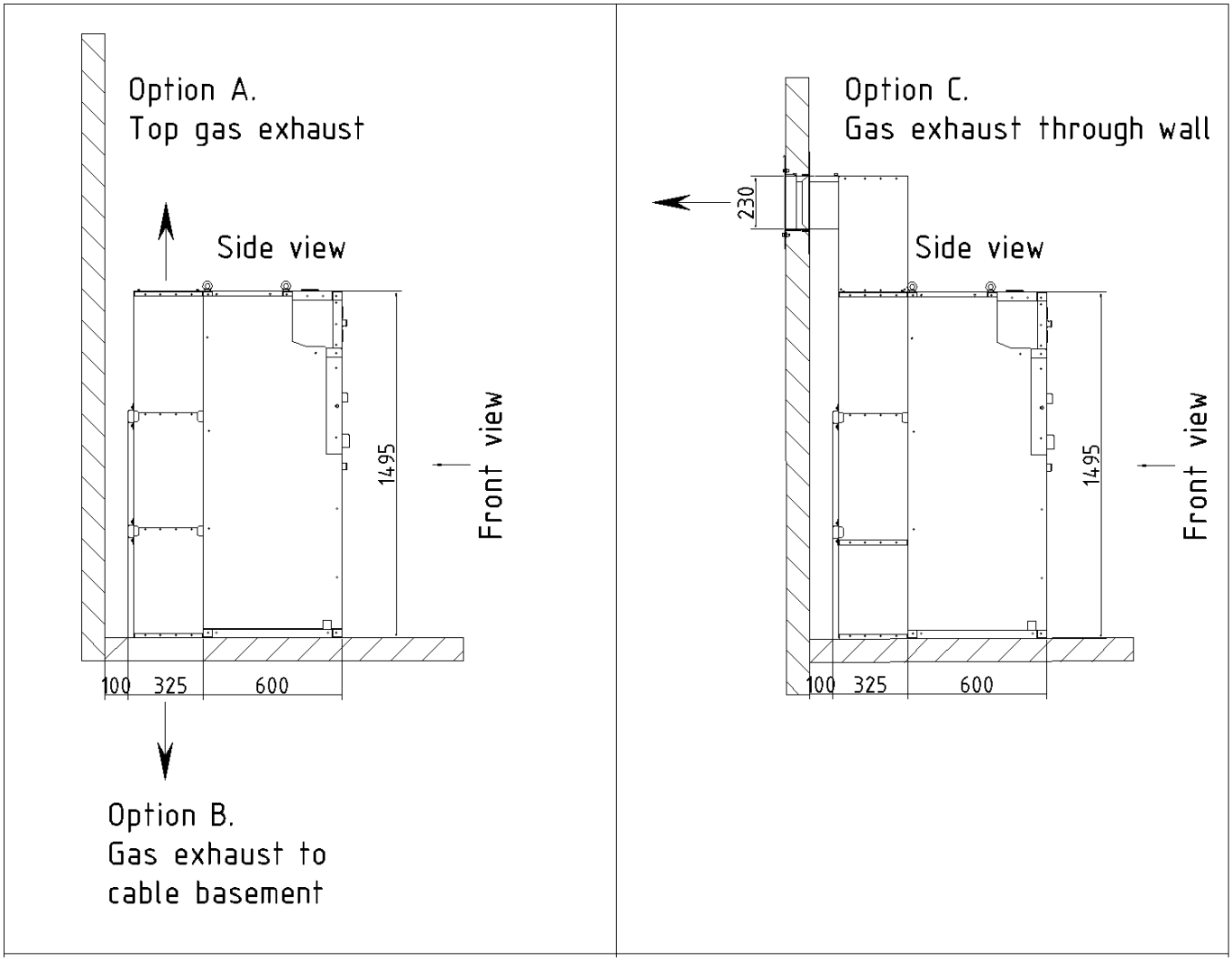
BASE FRAME AND RESIDUAL CT (ZCT) SUPPORT CONSTRUCTION



Base frame (400mm) Residual CT (ZCT support)

Note: 12kV/800A/20kA and 12kV/1250/25kA options are available

GAS EXHAUST CHANNEL OPTIONS



Top/Bottom gas exhaust option

Gas exhaust through wall

Note: 12kV/800A/20kA and 12kV/1250/25kA options are available

Appendix 2. Type test reports

SCELL ≤24kV, 800A

Standard	Chapter	Test name	Test center name	Test report
IEC 62271-200: 2020 (2023)	6.101	Verification of making and breaking capacities	IEL, Poland	128/19/NZL/NBR/WN
	6.102	Mechanical operation tests		110/19/NZL/NBR/WN
	6.106	Internal arc test		128/19/NZL/NBR/WN
	6.2	Dielectric tests		110/19/NZL/NBR/WN
	6.4	Measurement of the resistance of circuits		110/19/NZL/NBR/WN
	6.5	Temperature-rise tests		110/19/NZL/NBR/WN
	6.6	Short-time withstand current and peak withstand current tests		110/19/NZL/NBR/WN
	6.7	Verification of the protection		128/19/NZL/NBR/WN
	6.10	Additional tests on auxiliary and control circuits		128/19/NZL/NBR/WN
IEC 62271-102:2018	8.5.4	Extended mechanical endurance tests M1		128/19/NZL/NBR/WN
IEC 62271-202:2021	7.102	Internal arc test	IEN, Poland	EUR.4032.75.2022.R2.EN
	7.6	Short-time withstand current and peak withstand current test of earthing circuits		EUR.4032.75.2022.R2.EN
	7.7.2	Verification of the IK coding		EUR.4032.75.2022.R1.EN

SCELL ≤24kV, 1250A

Standard	Chapter	Test name	Test center name	Test report
IEC 62271-200: 2020 (2023)	6.106	Internal arc test	IEL, Poland	147.01/20/CLIE/NBR/WN
	6.2	Dielectric tests		147/20/CLIE/NBR/WN
	6.4	Measurement of the resistance of circuits		091/20/CLIE/NBR/WN
	6.5	Temperature-rise tests		091/20/CLIE/NBR/WN
	6.6	Short-time withstand current and peak withstand current tests		147.01/20/CLIE/NBR/WN

Amendment list

Date	Page, clause	Scope
29.03.2019		Initial version
07.08.2020		Information updated
17.11.2020	24-43	Installation, operation and maintenance sections updated
09.06.2023	8-9, 13-14, 26-27, 29-35, 59-68	Sections revised (1.3, 1.5, 3.1, 4.2, 4.3, 5.1, 5.2, 5.3, 6.3.4, Appendix 1). Sections added (3.7.1-3.7.4, Appendix 2)
01.03.2024		Document design updated

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