

SM6 Fully-Insulated Ring Main Unit

Operation and Maintenance

Periodic Overhaul	2
Troubleshooting Maintenance	3
Anomalies / Solution Table - Spare Parts - Options	13
Environmental Protection	19
End-of-Life and Recycling	21
SF6 Gas Recovery at End-of-Life	22

Cleaning Instructions

You may contact our company if necessary.

We strongly recommend performing several operating cycles for the switchgear on a regular basis (at least about every 2 years).

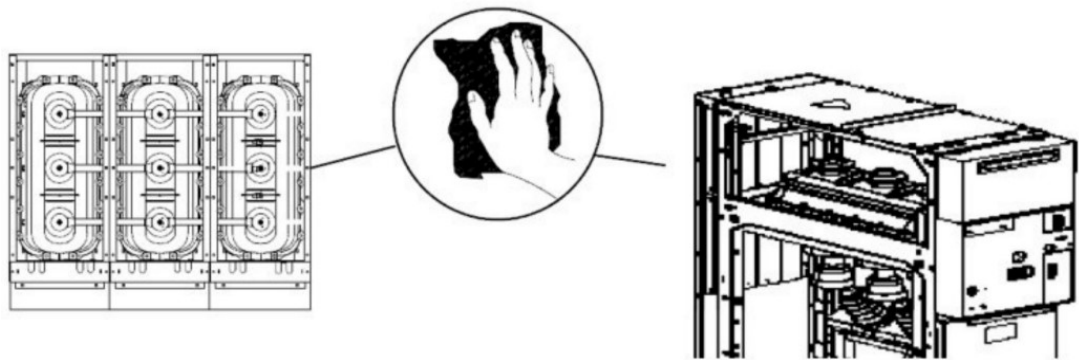
Under severe conditions (aggressive air, dust, temperature below -5°C or above 40°C, etc.), please consult our company.

NOTE!
Do not lubricate the switch mechanism. Contact our company if necessary. No special maintenance is required under normal operating conditions (temperature between -5°C and 40°C).

NOTE!
Do not use solvents or alcohol. We recommend regular inspection of each compartment (cable, fuse, busbar) according to environmental conditions. If dust accumulates on insulating parts, wipe it off with a dry cloth.

Example:

Example:



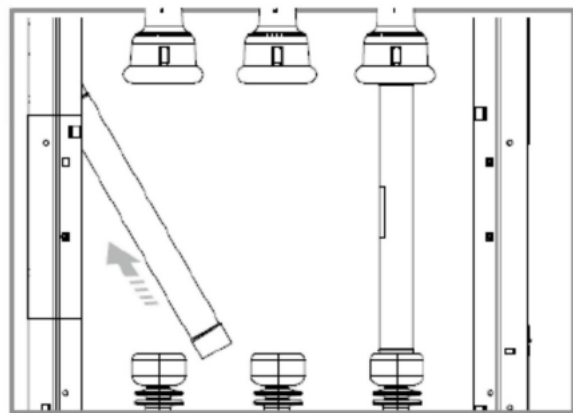
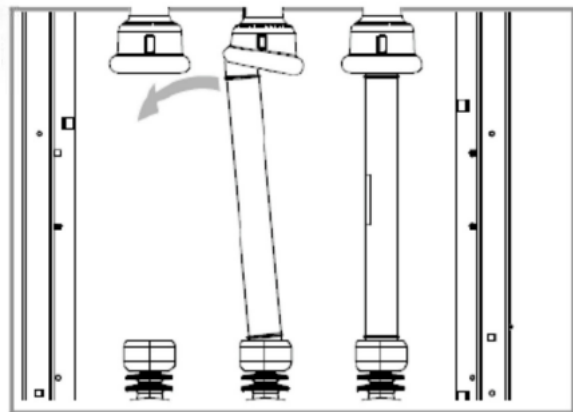
Replacement of Medium-Voltage Fuses

Modular switchgear CM, CM2, TM, QMC, QM5

DANGER!

- The switchgear must be de-energized.
- The disconnecter must be open.
- The earthing switch must be closed. The front panel shall be opened before replacing fuses.

As specified in Clause 23.2 of standard IEC 282.1: If one of the three fuses blows, all three fuses shall be replaced.



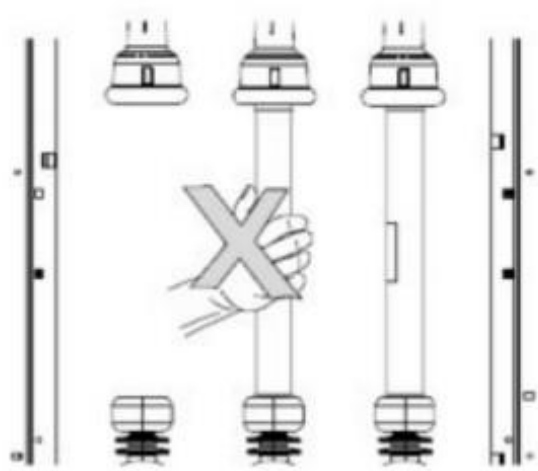
- First, move the top of the fuse out, then pull the fuse out from the base.
- Remove the complete fuse.

CM/CM2/TM/QMC/QM/QMB

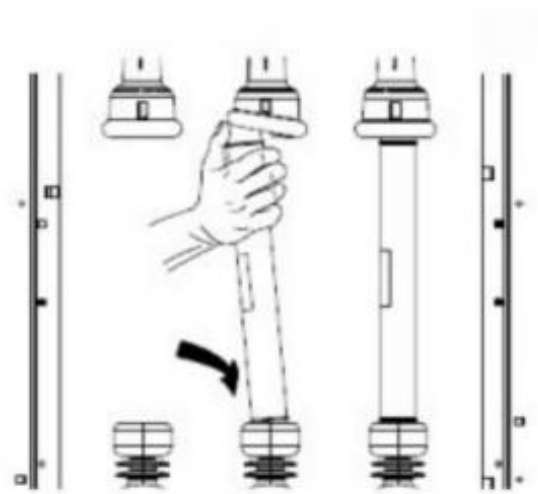
Fuse Assembly

NOTE!
When replacing fuses, replace all fuses. Do not reuse fuses that have already been used.

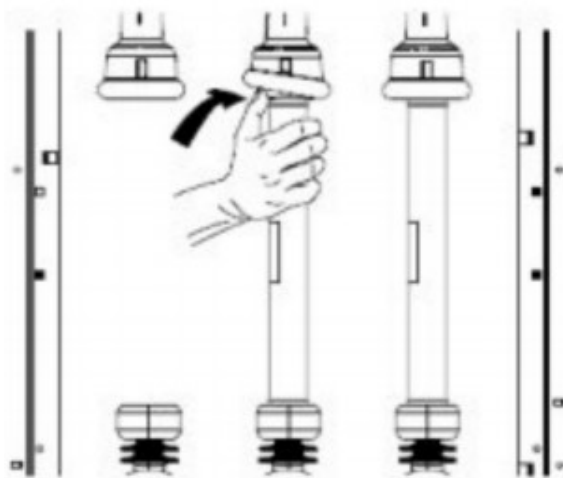
It is strongly recommended not to grip the middle section of the fuse.



■ Fully insert the bottom of the fuse into the lower ring-shaped contact.



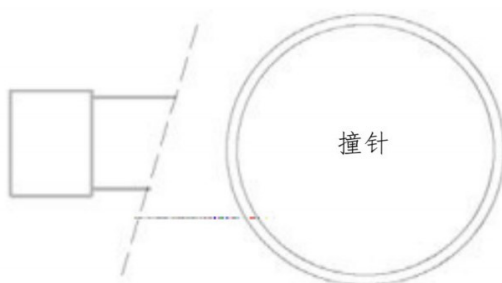
- Then place the top of the fuse into the upper contact.
- Check the upper grading ring to ensure it is in the correct mounting position.
- Rotate the fuse so that the label faces forward.



Installation Direction of Striker-type Fuse

Install the striker-type fuse, which will trip the switch upon fuse blowing.

The end marking of the striker-type fuse is shown in the figure.



The rated current, rated voltage and installation direction of the fuse are printed on the fuse body.

Rotate the fuse so that the label faces front and the striker is located at the top.



GBC-A and GBC-B Switchgear

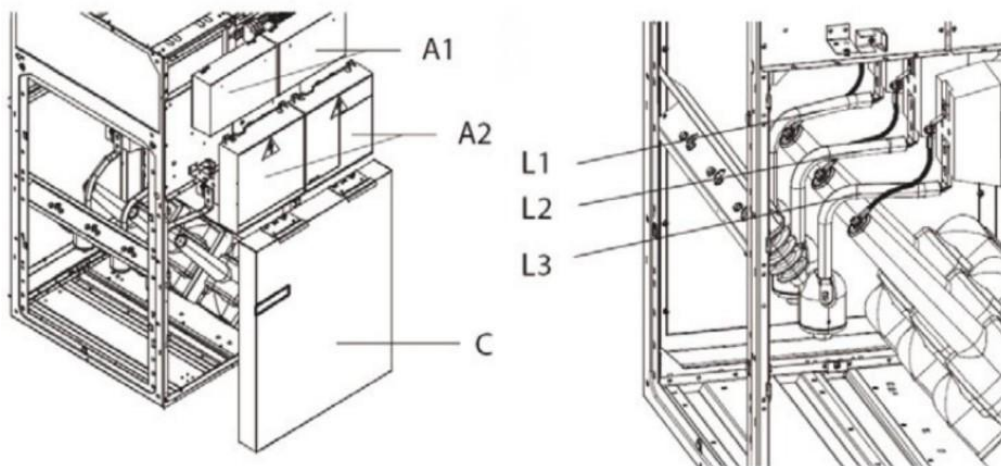
DANGER!

Before carrying out this replacement operation, the entire switchgear must be de-energized prior to any work.

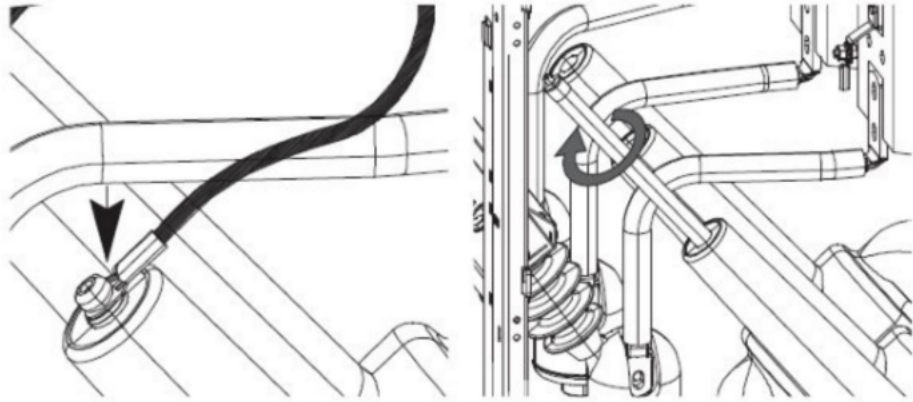
Required tools:

- 10 mm spanner
- Voltage test stick

According to Clause 23.2 of IEC 282.1: If any one of the three medium-voltage fuses blows, all three fuses shall be replaced.

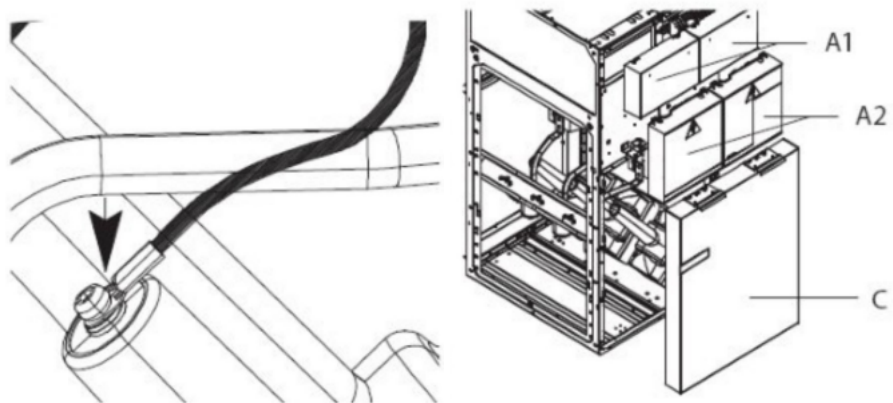


- Remove covers A1 and A2, then remove front panel C.
- Before accessing the switchgear, use a voltage test stick to verify that no voltage is present on each phase.



■ Unscrew the special nuts and remove the fuses to be replaced.

■ Screw the new fuses into their compartments.



■ Connect the voltage transformer wires.

■ Rotate and moderately tighten the special nuts by hand.

NOTE!

Do not leave any objects inside the busbar compartment.

■ Refit front panel C, then install covers A1 and A2.

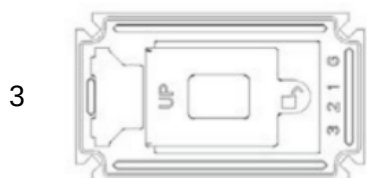
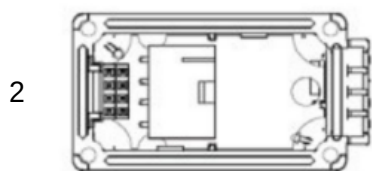
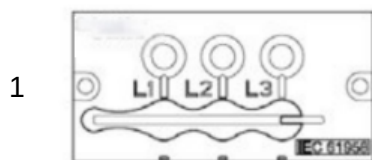
Replacing VPIS-V1 with VPIS-V2

Instructions to be observed

For extension of switchboards equipped with VPIS-V1 voltage presence detection units: All VPIS-V1 units inside the switchgear shall be replaced, so that phase-to-phase comparison can be performed for all switchgears of the switchboard.

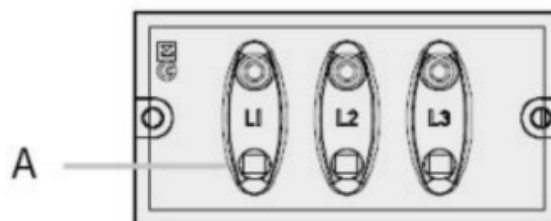
Contents of VPIS-V2 Kit

- 1: Indicator lamp unit
- 2: Cable sealing pressure cover
- 3: VPIS-V2 safety device
- 4: Screws (4 pieces)



Previously removed screws may be reused. (2 self-tapping screws)

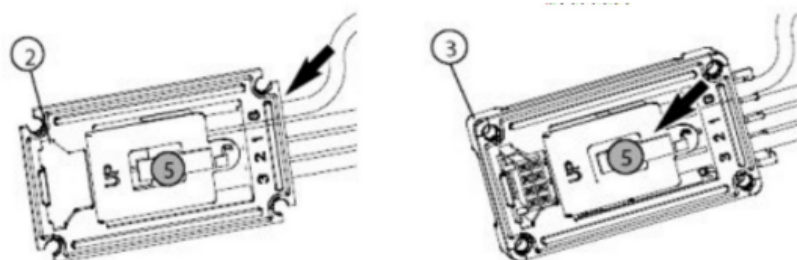
Removing the VPIS-V1 Voltage Indication Unit



- Remove 2 screws from the front panel.

Previously removed screws may be reused.

Installing VPIS-V2



- Fit the cable sealing pressure cover (2) onto the voltage indication connection point (5).

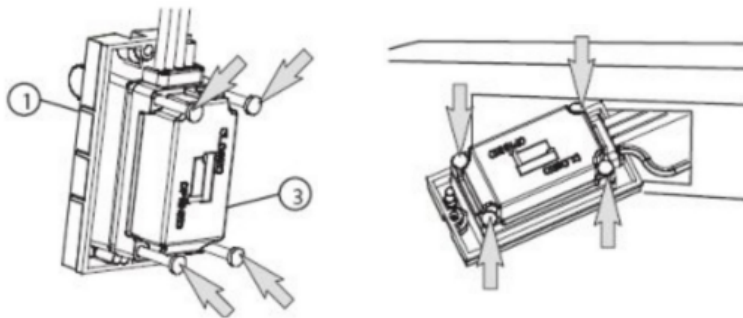
- Clip the cable harness connector (5) onto the VPIS-V2 safety device (3) and fit the sealing.

Troubleshooting Maintenance

Checks to be performed before proceeding with operation

Use the optional diagnostic tool (VP162420) (not included in the kit) to check the condition of harness (5) and the rated values of VPI-S-V2, or refer to the relationship table below.

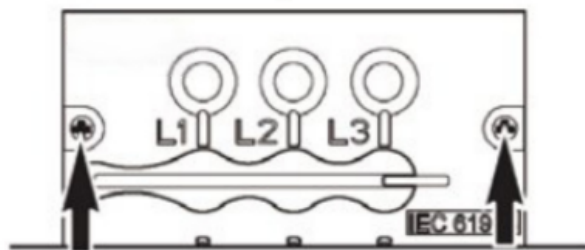
No-voltage With-voltage	VPI62403 VPI62413		VPI62404 VPI62414		VPI62405 VPI62415		VPI62407 VPI62417		VPI62408 VPI62418	
Operating voltage	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
	2kV	3kV	3.1kV	5.9kV	6kV	8.9kV	9kV	17.9kV	18kV	25kV
Key point	The minimum and maximum operating voltages apply for both 50 Hz and 60 Hz.									



- Screw the indicator unit (1) onto the VPI-S-V2 safety device (3) using 4 screws.

NOTICE!

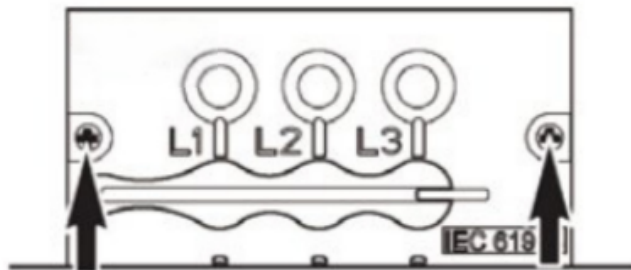
Tighten the screws to apply slight pressure to the cable gland seal without distorting it.



- Mount the voltage-indicating unit in the correct position using the 2 self-tapping screws removed previously.

Replacing VPIS-V1 with VPIS-V2

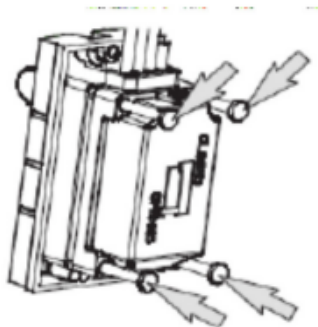
Removing the VPIS-V2 voltage indicating and detecting unit



- Remove 2 screws from the front panel.

Re-use the screws removed earlier.

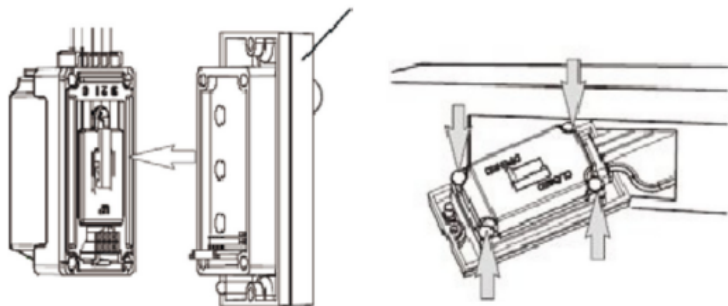
Installing the VPIS-V2 voltage indicating and detecting unit



- Remove this unit.
- Remove the 4 screws of the indicator unit.
- Discard the faulty indicator unit, keep the existing safety device and seals.

NOTICE!

Only the indicator unit needs to be replaced. At the end-of-life of the product, contact our administrative department for recycling treatment.



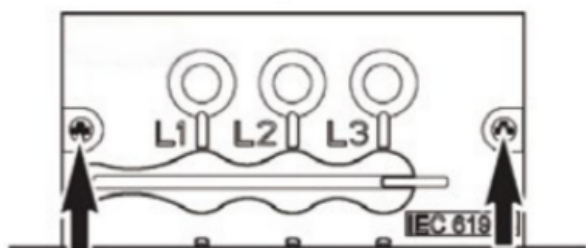
■ Install the new voltage indicator unit.

■ Screw in the 4 screws.

NOTICE!

Tighten the screws to apply slight pressure to the cable gland seal without distorting it.

Re-use the screws removed earlier.



■ Mount the voltage indicating and detecting unit in the correct position using the 2 self-tapping screws removed previously.

IM/QM/SM/IMC/IMB/QMC/QMB/CM/ CM2/TM/GAM2 Switchgears

Table of Abnormal Conditions and Solutions

Fault	Solution
■ Voltage indicator lamp does not light up	■ Check whether the supply cable is live ■ Check whether the supply cable is live (for MB cabinet only) ■ Inspect the voltage indicator unit ■ Check if the circuit-breaker is closed (for MC, QMC, IM, QM cabinets only) ■ Verify fuses are properly fitted (for MC, QMC, IM, QM cabinets only) ■ Check fuse condition (for MC, QMC, IM, QM cabinets only)
■ Front panel cannot be opened or closed	■ Check whether the earthing switch is closed
■ Earthing switch cannot be operated	■ Check whether the switch is in open position
■ Disconnecter cannot be operated	■ Check whether the earthing switch is in open position

Fault (Continued)	Solution (Continued)
■ Circuit-breaker cannot be operated	■ Verify the earthing switch is in open position
Motor Operating Mechanism (Optional Accessory)	
■ Motor operation fails; S13 = Circuit-breaker handle inserted; S14 = Earthing switch handle inserted	■ Check low-voltage fuse HA21 (CIP2) ■ Check electrical interlock S13-14 (handle insertion status) ■ Check whether the earthing-switch operating shaft has reached its end position ■ Verify S14 contacts do not cut off power supply; readjust if necessary ■ Check CIP1 module configuration (refer to schematic diagram)
■ Voltage 15 % below rated value: Manual operation unavailable after motor closing cycle	■ Apply torque in closing direction with operating handle until limit position is reached; manual operation will then be available
■ Voltage 15 % above rated value: Handle cannot be inserted after motor closing cycle	■ Perform motor operation whenever possible; use backup power supply if needed ■ To insert the handle: Push the rear end of the switch shaft toward closing direction with a large-size screwdriver. Safety note: Lock the motor operating mechanism first; press and hold the paddle actuating S13 contact if required
Normal operation is guaranteed within $\pm 15\%$ of rated voltage.	

Annex

■ Voltage-indicating device				
■ UTE or DIN fuses (contact us for other types)				
■ 6.3?A UTE fuse for CM type				
■ 6.3?A DIN or UTE fuse for CM2 and TM types				
Un (V)	49	60-72	100-127	220-250
Is (A)	10	3.15	2.5	1.25
Contact us for other components.				

Options (Contact us)

■ Motor operating mechanism
■ Auxiliary contacts
■ Top-entry cables
■ Key-lock device
■ 50 W heater
■ Phase-sequence monitor
■ Low-voltage compartment
■ Earth-fault relay
■ "Fuse blown" indication contact (QM, QMC types)
■ Tripping coil
■ Extended / additional low-voltage compartment

For NSM distribution panel

Troubleshooting table

Fault	Solution
■ No display on voltage-indicating device	■ Check whether supply cables or busbars are live ■ Inspect the indicator box
■ Front panel cannot be opened or closed	■ Check whether the earthing circuit-breaker is closed
■ Earthing circuit-breaker cannot be operated	■ Check whether the main circuit-breaker is open
■ Circuit-breaker cannot be operated	■ Check whether the earthing circuit-breaker is open
■ Motor operation failure: motor, interlock and unlocking abnormal; if fault persists after all checks, refer to technical document T200S (reference user manuals NT00044, T00045); S13 = circuit-breaker operating-handle position; S14 = earthing circuit-breaker operating-handle position	■ Check low-voltage fuse (on CIP2) ■ Verify normal operation of the automation unit (refer to the automation activation chapter) ■ Check electrical interlock S13-14 (operating-handle inserted) ■ Confirm the earthing circuit-breaker operating shaft is in open position ■ Verify no power input signal at S14 contacts; readjust if necessary ■ Check CIP1 module configuration
■ Manual operation with handle unavailable after motor operation; voltage is 15 % below rated value after completing one closing cycle	■ Check torque at closing position and perform manual opening operation

Fault (Continued)	Solutions (Continued)
■ Operating handle cannot be fitted after electric operation; if possible, perform an electric closing cycle for voltage levels above +15 % of rated value	■ Use backup power supply if necessary. ■ To insert the operating handle, push the base of the switch shaft in the closing direction using a large-blade screwdriver. (Ensure the motor operating mechanism is de-energized. Keep the lock on the S13-contact position if required.)
■ Yellow lamp lit	■ Normal fault case: Contact the manufacturer. ■ Switch the transfer switch (TALUS200) to manual mode (do not operate the main distribution enclosure). ■ Restart the device and close the backup unit (→ backup-mode operation). ■ Carry out maintenance to replace the operating mechanism, coil and drive unit of the main distribution enclosure. ■ Backup-side fault case: Contact the nearest repair centre (do not manually operate this distribution enclosure). ■ Carry out maintenance to replace the operating mechanism, coil and motor of the backup unit.

Accessories

■ Voltage-indicating device
For other parts, please contact the manufacturer.

Options (Contact us)

■ Auxiliary contacts
■ Key-lock device
■ 50 W heater

For DM1-A / DM1-S / DM1-D / DM1-W
/ DM1-Z / DM2 / DMVL-A / DMVL-D /
DMV-A / DMV-S / DMV-D switchgears

Troubleshooting Table

Operating Fault	Solutions
■ Voltage-indicating device does not work	■ Check the voltage indicator module ■ Check whether the isolating circuit-breaker and circuit-breaker are closed (for outgoing distribution enclosures) ■ Check whether the incoming supply cable is live
■ Front panel cannot be opened or closed	■ Check whether the isolating circuit-breaker is in earthing position
■ Isolating circuit-breaker cannot be set to earthing position	■ Check whether the isolating circuit-breaker is in open position
■ Isolating circuit-breaker cannot be set to closed position	■ Check whether the isolating circuit-breaker is in open position
■ Circuit-breaker cannot be operated	■ Check whether the isolating circuit-breaker is in open position ■ Refer to the circuit-breaker manual
■ Downstream earthing-switch branch manually closed by mistake	■ Re-open the downstream earthing switch by actuating the contact support arm, then reset the system with a screwdriver to fit the operating handle. ■ 

Accessories

■ Voltage-indicating device
For other parts, please contact the manufacturer.

Options (Contact us)

■ Auxiliary contacts for the isolating circuit-breaker
■ Key-lock device
■ Monitoring enclosure
■ Voltage transformer (VT)
■ 50 W heater
■ Top-entry supply cable
■ Protection device: electrical protection unit

GBC-A / GBC-B switchgears

Spare Parts

■ Fuse for VRM3
For any other service work, please contact us.

Options (Contact us)

■ Voltage transformer (VT)
■ Monitoring enclosure

Product Overview

The main function of the SM6-24 series is to switch and interrupt circuits from 1 kV to 24 kV.

This series features: maximum rated voltage 24 kV (Ur), rated current 630/1250 A (Ir), internal arc-withstand capability of 25 kA/1 s (Ik/tk), as well as 12.5 kA/1 s, 16 kA/1 s and 20 kA/1 s at 50/60 Hz.

Representative products for analysis:

■ IM and QM (fuse-free), DM1-A and DMV-A.

■ The environmental impacts of the above-mentioned products are representative of other products within the series developed with the same technology.

■ Environmental analysis is performed in accordance with ISO 14040 Environmental management - Life-cycle assessment - Principles and framework.

This analysis takes all phases of the product life-cycle into consideration.

Manufacturing

The SM6-24 series is manufactured at Mingri Electric production sites with an ISO 14001-certified environmental management system.

Distribution

Packaging weight and volume are reduced in compliance with EU Packaging Directive requirements.

■ IM and QM packaging weight: 7 kg. Consists of wooden pallet (4.8 kg), cardboard box (1.6 kg), hardware parts (0.4 kg), polystyrene (0.1 kg), strapping band (0.1 kg).

■ DMV-A packaging weight: 12 kg. Consists of wooden pallet (8.6 kg), cardboard box (2 kg), hardware parts (0.8 kg), polystyrene (0.2 kg), strapping band (0.4 kg).

■ DM1-A packaging weight: 12.5 kg. Consists of wooden pallet (8.7 kg), cardboard box (2.2 kg), hardware parts (0.8 kg), polystyrene (0.4 kg), strapping band (0.4 kg).

Product distribution processes are optimized by establishing local distribution centres close to market regions.

Utilisation

The SM6-24 series products do not generate environmental pollution (noise, emissions, etc.) requiring special preventive measures.

For consumable products, note the following:

Power dissipation depends on the conditions of product implementation and operation.

The electric power consumption of the SM6-24 series ranges from 8.6 W to 78.2 W:

- For IM&QM referenced units: 8.6 W in active mode, 0% in standby mode.
- For DMV-A referenced unit: 38.6 W in active mode, 0% in standby mode.
- For DM1-A referenced unit: 78.2 W in standby mode, 0% in standby mode.

This consumed power accounts for no more than 30% of the total power passing through the product.

For dissipative products, note the following:

Power dissipation depends on product implementation and operating conditions. For the SM6-24 product series, this dissipated power ranges from 100 W to 850 W.

At 100% utilisation rate:

- For IM&QM referenced units: 100 W.
- For DMV-A referenced unit: 440 W.
- For DM1-A referenced unit: 850 W.

This thermal dissipation accounts for less than 0.2, 10-3%; 1.6, 10-3% and 3.3, 10-3% respectively of the power flowing through IM&QM, DMV-A and DM1-A products.

Environmental Impact

EIME (Environmental Impact and Management Explorer) software Version V3 with its Version 5.4 database is used for Life-Cycle Assessment (LCA).

Under 100% facility utilisation, the expected service life of this product is 30 years, and the electrical-power model used is the European-type model.

The scope of analysis is limited to IM&QM, DMV-A and DM1-A.

Environmental-impact analysis is carried out for the Manufacturing (M) phase including raw-material processing, the Distribution (D) phase and the Utilisation (U) phase.

Product Overview

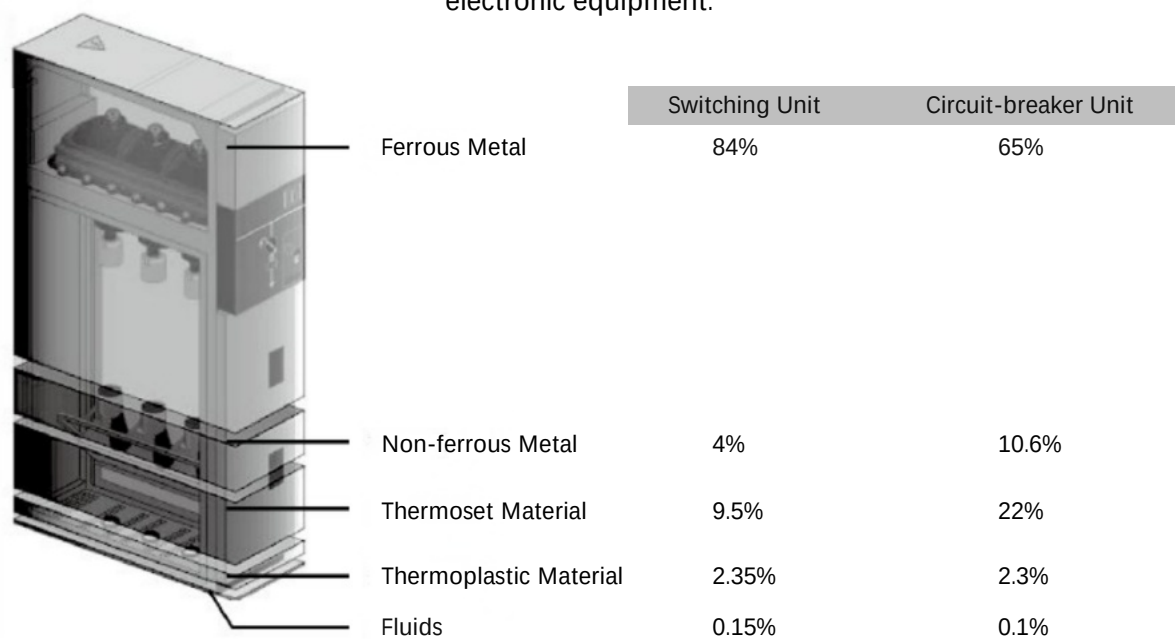
This series complies with RoHS requirements: designed in accordance with RoHS Directive (European Directive 2002/95/EC dated 27 January 2003), the products may be integrated without restriction into components or installations complying with this directive.

End-of-Life

At the end of service life, SM6-24 products must be disassembled to enable recycling of various material components. A material is regarded as recyclable if its individual weight exceeds 15% of the total functional weight. The proportion of recyclable materials is higher than 85%. This percentage covers materials including steel and copper.

Recycling

As one of its design considerations, the SM6-24 is developed following eco-friendly principles, especially with regard to product recyclability. Materials used, including conductors and insulators, are identified in the product environmental profile analysis and are easy to separate. This analysis is performed in accordance with ISO 14040 Environmental management — Life-cycle assessment — Principles and framework. Upon end-of-life, the SM6-24 may be processed and recycled in compliance with European draft regulations for end-of-life electrical and electronic equipment for material recovery. Specifically, no gas is released into the atmosphere and no polluting liquids are discharged. The SM6-24 complies with the RoHS Directive, which restricts the use of six hazardous materials in the manufacture of various electrical and electronic equipment.



In accordance with the procedures specified in IEC-61634, SF6 must be removed before carrying out any disassembly operations.

This gas shall be handled in accordance with IEC-60480.

■ Gas volume to be recovered: 35 L per switch;

■ Internal gauge pressure: 40 kPa.

This manual is for operation guidance only. Actual operations shall be performed by certified professional personnel in combination with the factory-issued technical documents and on-site practical conditions.

The manufacturer shall not be liable for equipment damage or safety accidents caused by non-compliant operations.