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ZPUE[®]

Koronea group



VCB GIS

Vacuum circuit breaker
in SF₆ gas insulation

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Vacuum circuit breaker in SF₆ gas insulation

General characteristics

The ZPUE S.A. company has in its offer a medium voltage circuit breaker in SF₆ gas insulation, called VCB GIS, dedicated for use in modular ROTOBLOK switchgears. Switchgears of this group are devices in which the primary busbars compartment and cable compartment are air insulated, whereas switching activities are performed by air, vacuum or gas insulated devices.

The VCB GIS device has a compact enclosure, where the entire device forms a hermetically sealed stainless steel tank, in which the switching devices are placed. The device name refers to the insulation method: GIS, that is gas insulation, and to the environment in which the "on" and "off" working and short-circuit current switching operations are performed, that is vacuum – VCB. The device was designed in a manner which minimises hazard to human life and harmful environmental impacts.

The circuit breaker has a position indicator for all devices, state-of-the-art manual drive, motor drive option, on and off coils and the possibility of using an additional coil, for example undervoltage coil.

The dimensions of the VCB GIS device enable the construction of a compartmented air insulated switchgear with a bay width of 500 mm and depth of 950 mm, operating with a rated voltage of 20 kV without the need to use additional insulating elements.

Main advantages

Safety of operation, ease of operation

- The robust design of the VCB GIS circuit breaker guarantees high reliability and ensures resistance to environmental conditions,
- Pressure increase caused by internal arcing is eliminated by opening of the safety valve installed in the lower part of the switchgear's tank, eliminating the hazard to personnel,
- The use of a disconnecter and earthing switch which ensures a safe insulation gap in the circuit,
- The disconnecter and earthing switch, the construction of which is based on a common shaft with moving contacts and separated fixed contacts of the disconnecter and earthing switch ensures that it is physically impossible to close them simultaneously,
- The circuit breaker is equipped with vacuum chambers, which improves the safety of operation during the breaking of short-circuit currents, and reduces the generation of harmful by-products of gas breakdown caused by electrical arcing,
- Intuitive device layout,
- Reliable and intuitive operating drive ensuring snap-action switching of the circuit breaker,
- A system of internal mechanical interlocks preventing incorrect switching operation allows opening the disconnecter only after appropriate opening of the circuit breaker chambers, whereas the earthing switch integrated with the disconnecter provides additional safety to the personnel working with the doors to the switchgear open,
- Clear and legible system display of the devices, which enables physical readout of their current condition,
- Lower insulating bushings equipped with capacitive voltage dividers – no need to use additional equipment in order to indicate the presence of voltage on the cable,
- The operating drive of the device with space for the installation of: independent protections providing primary protection functions, short-circuit current indicators, voltage indicators,
- Ease of installation of cable connections,
- Wide range of accessories and components (sensors/transformers/indicators).

Safe for environment

- The circuit breaker constructed in accordance with the requirements of the PN-EN 62271-100 standard,
- Compact dimension = lower amount of material, which allows a reduction of CO₂ emissions on every stage of manufacturing,,
- Anticipated operational life under normal operating conditions indoors is 30 years,
- The VCB GIS circuit breaker is filled with SF₆ gas at an absolute nominal pressure of 125 kPa (0.125 MPa) at a temperature of 20°C,
- The device may be recycled after it's end of life. 80% of its components are various types of steel, and the gas may be pumped off at a specialist station located at ZPUE S.A. facilities.

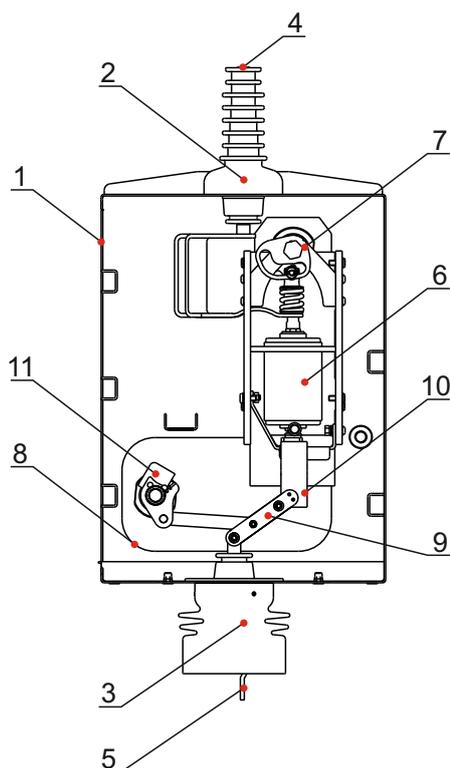
Economy

- Compact, light design,
- Economical transport,
- Compact dimension = space can be used more efficiently.

Circuit breaker design

The VCB GIS type circuit breaker consists of vacuum chambers connected in series with a disconnecter and earthing switch, placed inside a stainless steel enclosure filled with SF₆ gas. The tightness of the enclosure is checked for each device using helium, and gas loss is under 0.1% annually, which guarantees that it is not necessary to refill it even over 30 years. Connection in the primary busbars compartment and in the cable compartment is implemented with insulating bushings, with the lower bushing enabling the indication of the presence of voltage on the cable due to the installed voltage dividers.

The stainless steel enclosure of the device forms a mechanical partition between its upper and lower part, forming compartments: busbar, connecting and switching devices. This solution enables safe work in the lower part of the switchgear (connection compartment) while the primary busbar circuit is live (busbar compartment).

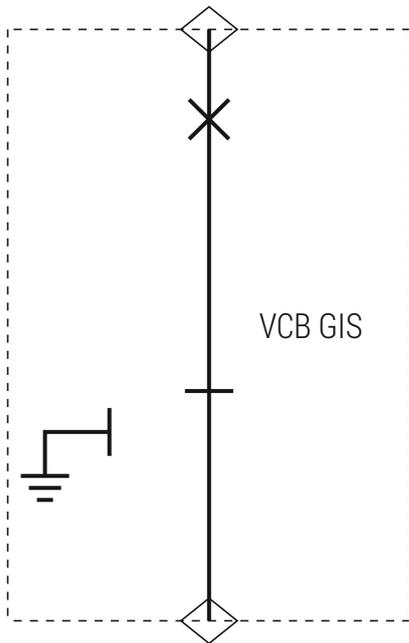


1. Stainless steel gas-tight enclosure of the circuit breaker,
2. Upper insulating bushing in the primary busbars compartment,
3. Lower insulating bushing in the cable connections compartment, equipped with capacitive voltage dividers,
4. Upper contact for connection to primary busbars,
5. Lower contact for cable connection,
6. Vacuum chamber,
7. Charging and vacuum chamber switching mechanism,
8. Disconnecter and earthing switch unit,
9. The disconnecter and earthing switch based on a common shaft,
10. Fixed contact of the disconnecter,
11. Fixed contact of the earthing switch.

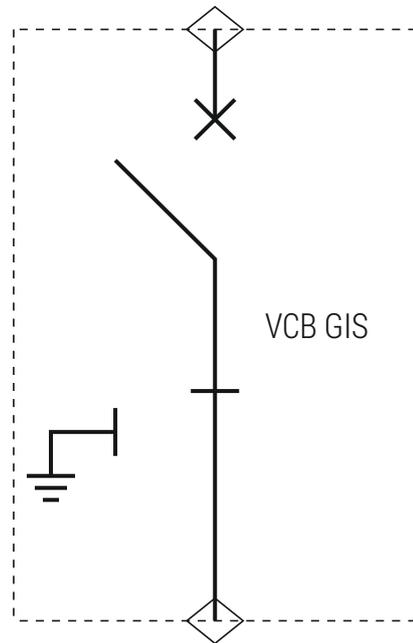
Rys. 1.1. Device inside view

Four switching positions are possible, acc. to Fig. 1.2.

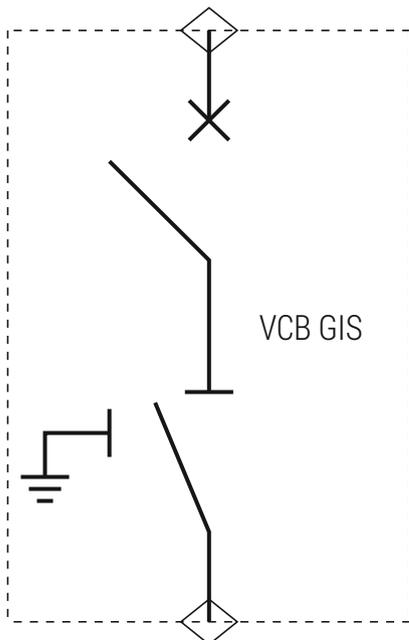
on – closed



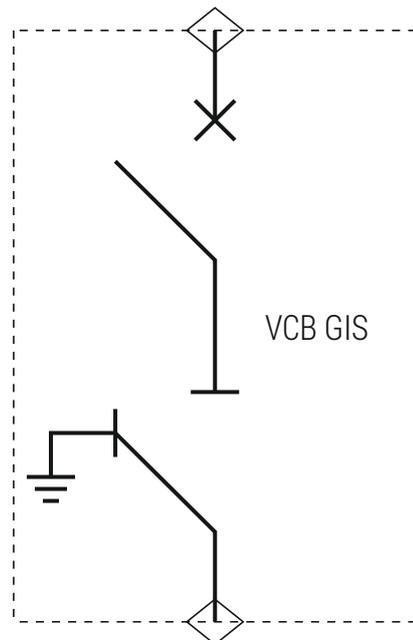
off – closed



off – open



earthed



Rys. 1.2. Device switching positions

Rated parameters

Number of phases	3	
MV rated voltage	24kV	
Rated frequency	50 Hz	60 Hz
Rated network frequency withstand voltage	50 kV / 60 kV	
Withstand lightning surge voltage (1.2/50 μ s)	125 kV / 145 kV	
Primary busbars continuous rated current	630 A	
Rated short-time withstand primary circuits current	16 kA(1s)	
Rated peak withstand primary circuits current	40 kA	
Rated short-circuit making current	16 kA (1s)	
Mechanical class	M2	
Electrical class	E2	

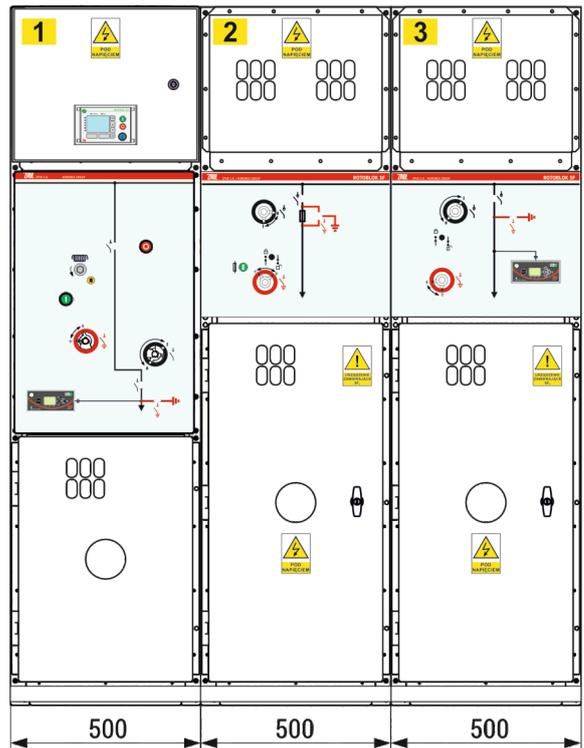
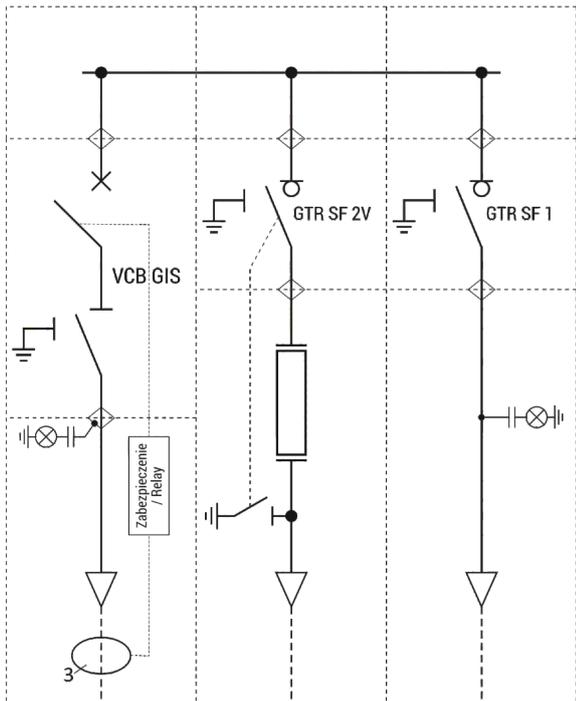
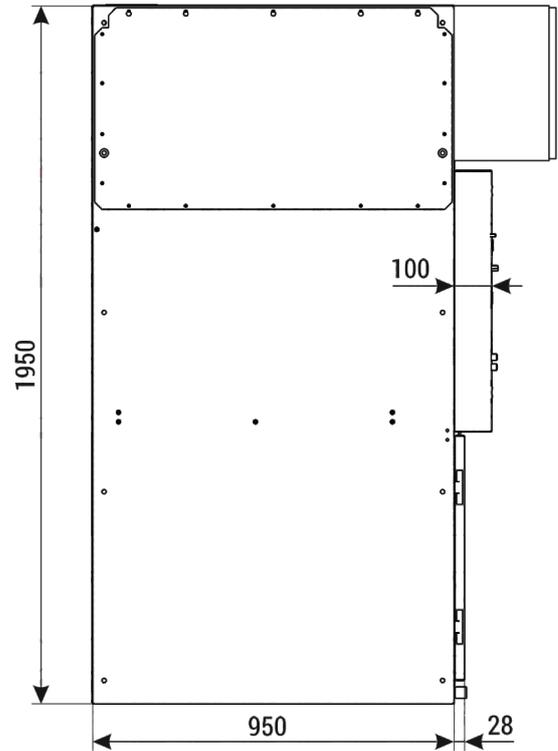
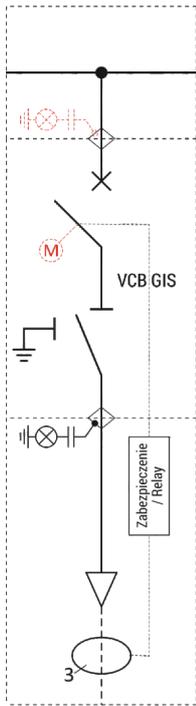
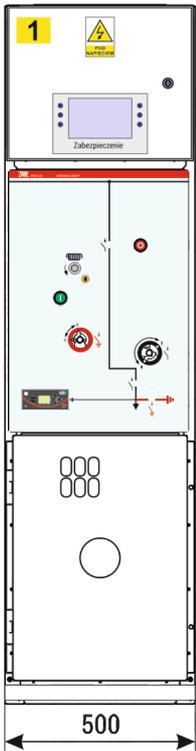
Area of application

- Power distribution sector
- Ring networks
- Light industry
- Hospitals, hotels, markets etc.

Compliance with standards

- PN-EN 62271-1 High-voltage switchgear and controlgear. Common specifications;
- PN-EN 62271-100 High-voltage switchgear and controlgear. Alternating-current circuit-breakers;
- PN-EN 62271-102 High-voltage switchgear and controlgear. Alternating current disconnectors and earthing switches;
- PN-EN 62271-200 High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV.

Example installation of VCB GIS circuit breaker





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