NS-2

SF6 gas free insulated switchgear



NS-2 36kV Dry air GIS

PRODUCT MANUAL

SGC

SwitchGear Company

THE SPECIALIST IN MEDIUM VOLTAGE SWITCHGEAR

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1. INTRODUCTION

NS-2 gas-insulated switchgear (GIS) is a medium voltage, dry air primary distribution level switchgear. A solid, insulated busbar can be connected to the exterior of the gas tank due to the airtight construction and the metal enclosure of the switchgear. Dry air is used by the switchgear in place of SF6 as the insulating medium. Under IEC 62271/DIN EN 62271, a metal tank without phase isolation encloses the internal switching devices for each pole.



With our dry air technology, SGC preserves the key benefits of a GIS, including great dependability, small size, and low maintenance requirements, while doing away with the need for SF6, one of the strongest greenhouse gases with stringent usage limitations.



NS-2 Switchgear is metal-enclosed, gas- insulated, withdrawable, and has been type tested to the relevant standards by internationally recognized STL approved testing laboratories. In our industrial complex, we research and produce our switchgear products.
Founded in Berlin in year 2017, the company has been on a journey of innovation and expansion. The pioneering spirit resulted in the successful pilot of prototype in year 2018, which was a crucial milestone in the development. Building on this momentum, we carried out the first type testing of the product in year 2020, confirming its dependability and effectiveness. In 2021, we reached new heights by conducting a grid trial, which validated the technological potential. The same year, first commercial installation took place, demonstrating the actual implementation of technologies in real- world scenarios. The dedication to sustainability was obvious in year 2022, with the first renewable installation, confirming the role in spearheading the shift.



Applications:
SGC NS-2 switchgear is widely applicable in various industrial applications such as:
Wind and solar,



Energy utilities



Mining/Transportation (Shipyard, Railways, Airport)



Industries



Datacenters (Waste to energy).



Our expertise:

- Expected lifetime of 30-40 years,
- Front access,
- As Compact design as SF6 – GIS,
- No SF6 gas handling – Climate friendly,
- 100% dry air insulation.

2. Product specification

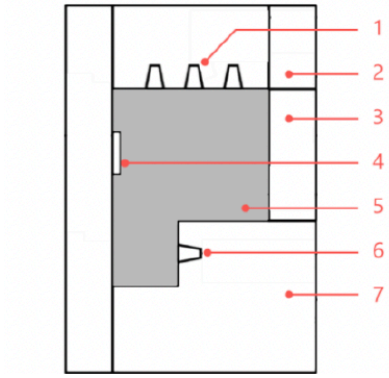
2.1.Standards:

SGC's NS-2 switch gear complies with international standards and specifications. In accordance with the European standards (IEC standards).

Components	IEC standard/ EN standard	Title
Switchgear	62271-1	High-voltage switchgear and controlgear: Common specifications for alternating current switchgear and controlgear
	62271-200	High-voltage switchgear and controlgear: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
Circuit breaker	62271-100	High-voltage switchgear and controlgear: Alternating-current circuit-breakers
Disconnector / earthing switch	62271-102	High-voltage switchgear and controlgear: Alternating current disconnectors and earthing switches
Current transformers (CT)	61869-2	Current transformers
Voltage transformers (VT)	61869-3	Voltage transformers
Insulation	60071	Insulation co-ordination
IP code	60529	Degrees of protection provided by enclosures
IK code	62262	Degree of protection provided by enclosures
Voltage detection system (VDS)	62271-213	Voltage detecting system (VDS)
Operation	EN 50110	Operation of electrical installation
Installation	61936-1	Power installations exceeding 1 kV a.c.
Environmental conditions	60721-3-3	Classification of environmental conditions

2.2. Technical ratings

The switchgear complies with the standards and regulations specified in this document. Any specification not specified in this document may require additional compliance with the additional standards.



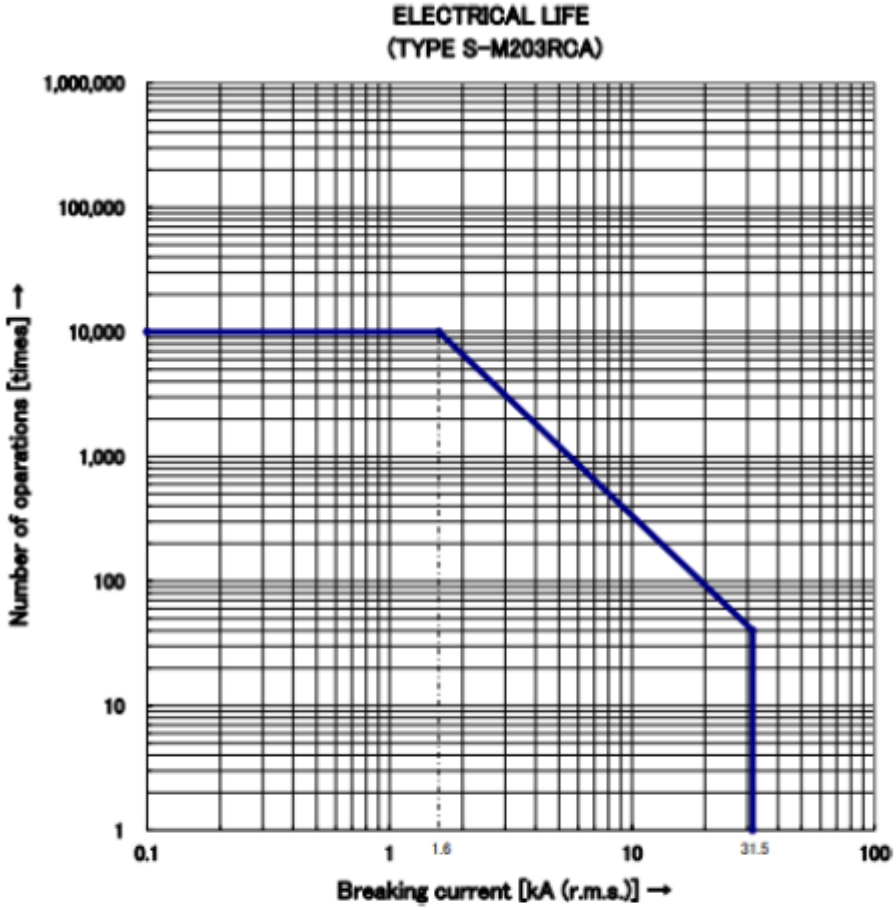
Main components of the SGC switchgear:

1. Busbar bushing
2. Low-voltage compartment
3. Drive compartment
4. Pressure relief
5. Gas-insulated tank
6. Cable bushing
7. Cable compartment

Electrical data	Units	IEC 62271-200 Data	
Rated voltage (U_r)	kV	24	36
Testing voltage (PF/Impulse) (U_d/U_p)	kV	50/125	70/170
Rated frequency (f_r)	Hz	50/60*	
Rated bus bar current (I_r)	A	2500**	
Rated feeder current	A	1250/2000*	
Rated peak withstand current (I_p)	kA	78.8/81.9	
Rated short time current (I_k)	kA / 3 sec	31.5	
Internal arc protection (AFLR)	kA / 1 sec	31.5	
Operating temperature	°C	-5 ... +40	

Dimensions			
Width	mm	650 (1250 A)	
		900 (2000 A)	
Height	mm	2300	
Depth	mm	1500	
Dry air insulation medium			
Filling pressure (rel.) (P_{re})	kPa	100 at 20 °C	200 at 20 °C
Min. Operating pressure (rel.) (P_{me})	kPa	80 at 20 °C	180 at 20 °C
Gas leakage rate	%/year	< 0.1 at 20 °C	
Operating pressure of brust disc	kPa	≥ 300	
Rated operating sequence	O-0.3s-CO-15s-CO		
Classification according to IEC 62271			
Endurance class of vacuum circuit breaker (according to IEC 62271-100)	at rated normal current	10,000 operating cycles	
Endurance classes of circuit breaker (according to IEC 62271-100)	M2, E2, C2		
Endurance classes of Disconnector (according to IEC 62271-102)	M0, E0		

Electrical life of Vacuum interrupter:

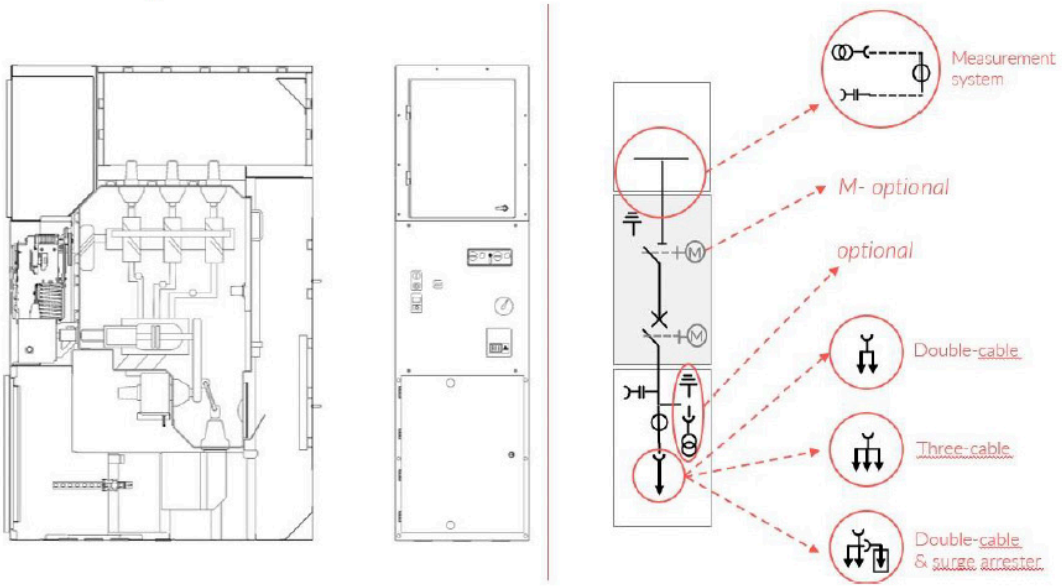


Operation	"O"
Asymmetrical DC component	≤ 40%
Arcing time	≤ 8.0 ms
Initial opening speed (0-2 ms)	≥ 1.4 m/s
Average opening speed	1.4–1.8 m/s

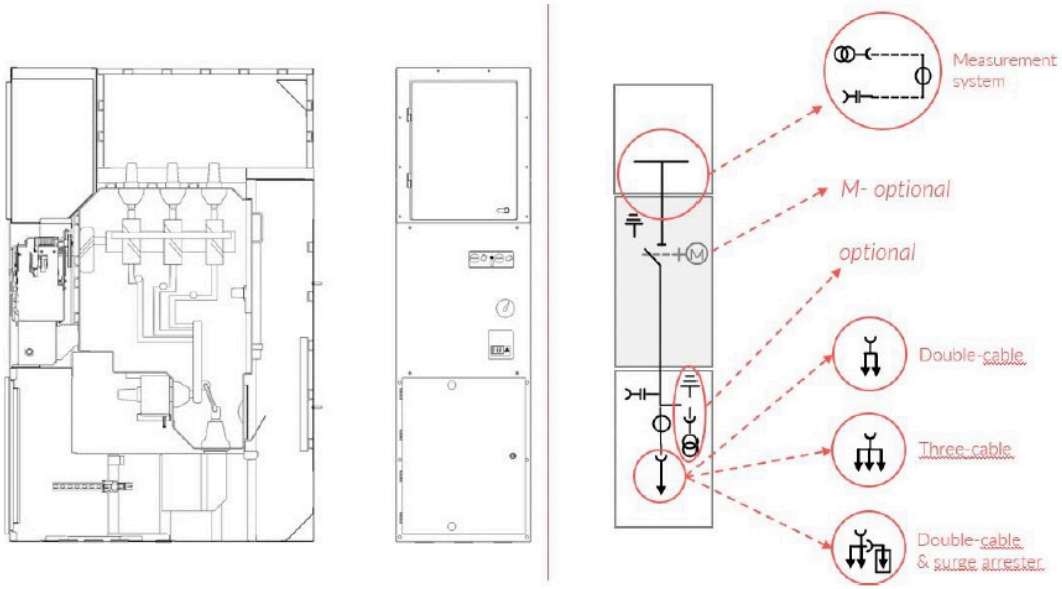
2.3. Variants

SGC NS-2 is compliant with the international standards.

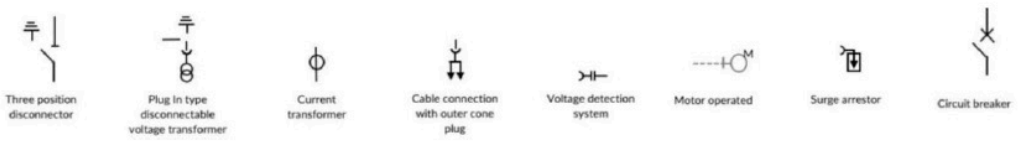
Circuit breaker panel



Disconnector panel

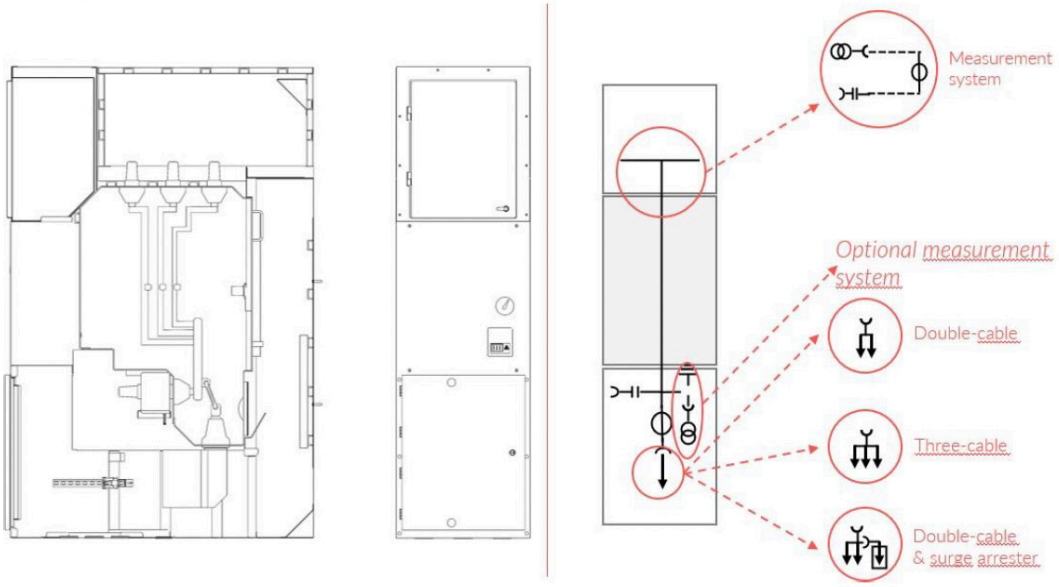


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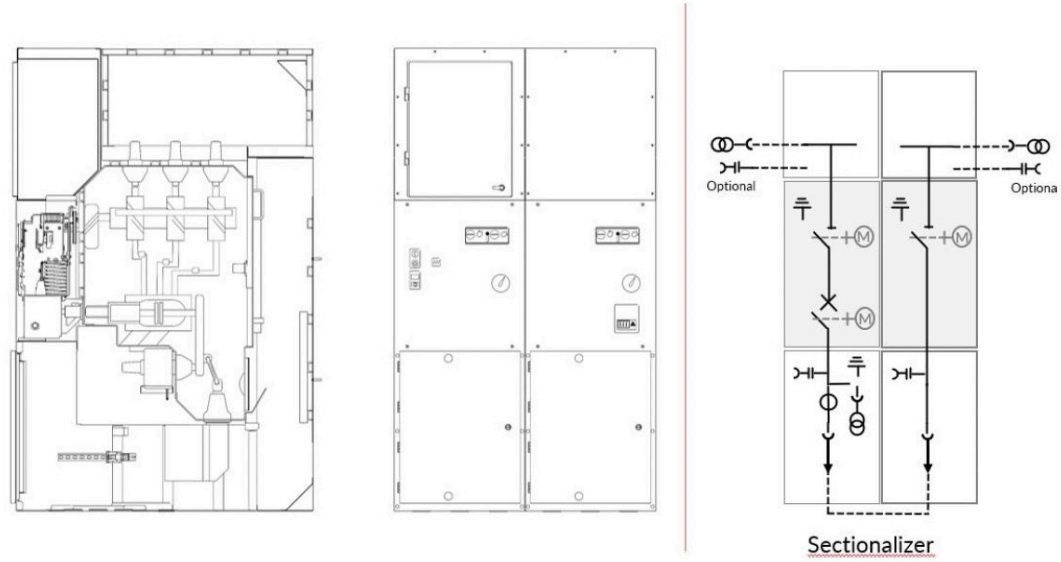


Electrical life of Vacuum interrupter:

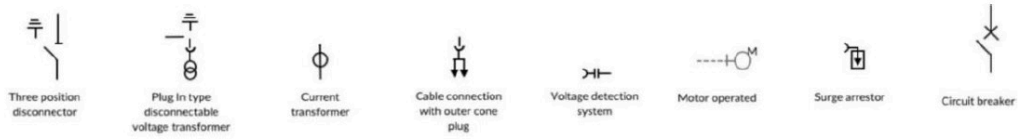
Bus riser panel



Sectionalizer panel



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3. Technology

General

- Hermetically sealed stainless-steel vessel enclosing the switching devices.
- Dry air insulation medium reduces the gas handling process and avoids F-gas leakage.
- Compact dimensions as equivalent to SF_6 insulation.
- Cable connection with outer-cone plug-in system for connection of solid-insulated busbars.
- The installation, commissioning and extension of switchgear is independent of the gas work or any changes to the existing panel.
- Integrated pressure relief duct systems
- Access to cable compartment, current transformer and voltage transformer from the front of the switchgear.
- The busbar isolation and cable earthing through vacuum circuit breaker providing safe operation.
- Metallized measuring instruments and screened touch proof cables and busbars provide safety.
- Equipped with intelligent sensors updating the health of the switchgear in real time.

Interlocks

- Logical mechanical interlocks according to IEC 62271-200 and VDE 0671-200 prevents maloperation.
- In circuit breaker panels, the disconnector switch positioning can prevent circuit breaker operations to ensure safety of product and personnel.
- Disconnector operation is separated into opening/closing and opening/earthing operations, both with separate tool access slots for individual tools.
- Tool slots mechanically prevent removal of operating tools before operation step has been completed.
- Optional: Tool access slots can be padlocked to prevent operation by non-qualified personnel.
- Optional: Electromechanical interlocks.

Modular design

- Current and voltage transformers are provided outside the switchgear vessel allowing ease of maintenance.
- Metal-coated, plug-in and disconnectable voltage transformers.
- Maintenance-free under normal ambient conditions No relubrication or readjustment required during the lifetime.
- Panel can be replaced without moving other panels and additional gas work.
- Protection and measuring system can be integrated.
- Low-voltage compartment removable, plug-in busbar and instrument transformers.
- Option: Numerical multifunction protection relay with integrated protection, control, communication, operating and monitoring functions.

3.1. Features

Environmental independence

The SGC NS-2 consists of switching devices inside a hermetically sealed stainless- steel vessel. This enclosure protects the high voltage parts from environmental impacts:

- independent of aggressive ambient conditions and external parameters like:
  - salt & dust,
  - humidity & corrosion,
  - insects & rodents,
  - high installation altitudes.

Compactness

Thanks to the use of SGC's innovative solution, the NS-2 is as compact as SF_6 insulatied GIS. Designed mainly to ensure people's safety and reliability of service, the SGC NS-2 range contributes to improving electrical distribution in medium voltage networks up to 36 kV.

Climate-friendliness

By completely avoiding F-gases like SF6 and only using dry air based on natural gases, SGC's GIS avoids any release of greenhouse gases to the atmosphere.

User-friendly

- Compact design;
- Accessible control panels;
- No SF6-handling
- Front-access to the switchgear.

Maintenance-free design

The SGC switching devices are enclosed in a sealed vessel inside dry air insulation providing maintenance free lifetime. This ensures:

- safety of the service personnel;
- reliable and uninterrupted supply;
- sealed pressure system that is designed for 30 - 40 years of lifetime;
- no additional gas handling work during installation, commissioning and extension of the switchgear bay;
- maintenance free operation;
- Reduction of operating cost.

Automation and digitization

The intelligent relay and automation system ensure the timely and conditional operation of the control devices. This ensures:

- automation and integration of the devices in to the central SCADA system;
- cost efficient and operation of devices based on logic functions leading to flexible and integrated solutions.

Sensor integration

The intelligent sensor system integrated inside the switching devices provides real time data about the vital parameters of the device. This ensures:

- real time health measurement of the vital health indicators for switchgear;
- continuous monitoring of temperature, partial discharge, gas quality and density in the switchgear vessel;

- save cost in periodic maintenance. The intelligent system identifies the failure mode before it occurs.

Service life

The SGC NS-2 is designed for 30 to 40 years of lifetime. Considering the dry air insulation medium, the switching compartment may additionally be opened for any kind of service and lifetime extension review if necessary. The hermetically sealed system together with intelligent sensor system ensures service lifetime. This ensures performance:

- for circuit-breakers according to the endurance class defined in IEC 62271-100;
- for three-position disconnectors and earthing switches according to the endurance class defined in IEC 62271-102;

3.2. Safety

No SF6 gas handling

- No special technical training for gas handling required.
- Avoid administrative effort to report SF_6 emissions.
- Save operational cost in gas handling
- Ensures safety of environment and personnel during unforeseen leakage.

Operational safety

- Sealed pressure system with switching devices inside hermetically sealed stainless-steel vessels ensures personal safety and protection against environmental effects (pollution, humidity and rodents).
- Mechanism operation is accessible at the ergonomic position in front of the switchgear positioned outside the sealed switchgear vessel.
- Inductive voltage transformers mounted outside the dry air switchgear vessel as a removable pluggable solution. The earthing of voltage transformer allows for easy maintenance.
- Inductive current transformers as ring-core current transformers mounted outside the dry air switchgear vessel and accessible for maintenance.
- Logical mechanical and electrical interlocking ensures no wrong operation and ensures safety throughout the lifetime.
- Type and routine-tested.
- Quality assurance in accordance with DIN EN ISO 9001.
- Equipped with sensors to measure the switchgear health in real time.

Personal safety

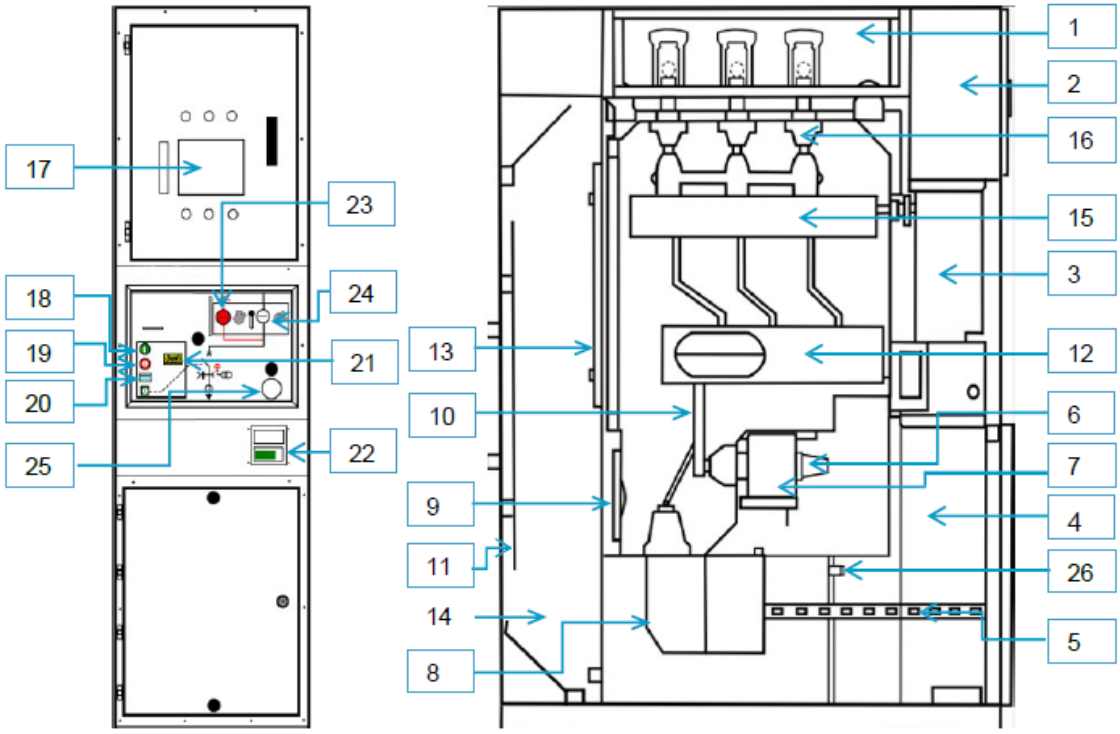
- Capacitive voltage detecting system are equipped to indicate the presence of voltage for the safety personnel.
- Hermetically sealed switchgear vessel together with shielded busbar ensures safe-to-touch possibility to personnel.
- Operating mechanisms and auxiliary switches safely accessible outside the primary enclosure (switchgear vessel).
- The cable terminations, busbars, current and voltage transformers and other high voltage components are metal enclosed.
- Safety of the operation is ensured by means of make-proof earthing achieved through vacuum circuit-breaker.
- The switching devices are hermetically sealed in stainless steel vessel providing IP65 protection. The switchgear enclosure provides IP3XD protection. The operating mechanism cover provides IP2XD protection according to IEC 60529 and VDE 0470-1.
- Cable terminations and busbars are earthed to the surrounding earthing bars.
- Switchgear enclosure tested and qualified to withstand the short circuit current without damage to surroundings during internal arcs up to 31.5 kA.
- Logical mechanical interlocks prevent mal operation.

Reliability

- Fully type tested product together with routine tests during manufacturing.
- Standardized production processes.
- Produced at DIN EN ISO 9001 certified factory.

4. Design

1. Busbar compartment
2. Low voltage compartment
3. Drive
4. Cable compartment
5. Cable support system
6. T-plug cable connections
7. Current transformer
8. Voltage transformer
9. Pressure relief system
10. Secondary two position switch
11. Panel back door
12. Vacuum circuit breaker
13. Gas tank door
14. Pressure relief duct
15. Three position disconnector
16. Busbar connector bushing
17. Protection relay
18. Circuit breaker actuation push buttons
19. Circuit breaker operations counter
20. Circuit breaker operations indicator
21. Spring charge indicator
22. Voltage detecting system
23. ON/OFF disconnector operation tool slot and indicator
24. OFF/EARTH Disconnector operation slot and indicator
25. System pressure gauge
26. Earthing bar



4.1 Product features

General:

- Hermetically sealed stainless-steel tank enclosing the switching devices.
- Dry air insulation medium reduces the gas handling process and avoids gas leakage.
- Compact dimensions equivalent to SF6 insulation.
- Cable connection with outer-cone plug-in system for connection of solid-insulated busbars.
- The gas work or any changes to the existing panel is independent of installation, commissioning, and lifetime extension.
- Integrated pressure relief duct systems.
- Equipped with sensor updating the health of the switchgear in real time.
- User friendly:
- compact design,
- accessible control panels,
- no SF6 – handling – Climate friendly,
- front access to the switchgear.

• Accessibilty:

Cable compartment, current transformer, and voltage transformer from front of the switchgear.

The busbar isolation and cable earthing through vacuum circuit breaker providing safe operation.

Metallized measuring instruments, screened touch proof cables and busbars provide safety.

• Insulating medium:

Switchgear tank filled with dry air insulation gas.

Features of dry air gas:

- non-toxic,
- no F-gases involved,
- climate-neutral,
- non-inflammable,

chemically neutral.

• Panel design:

- Factory-assembled, type-tested.
- Single-pole, solid-insulated, screened busbars, plug-in type.
- Maintenance-free.
- Vacuum circuit breaker.
- Three-position disconnector for disconnecting and earthing by means of the circuit-breaker.
- Make-proof earthing by means of the vacuum circuit-breaker.
- Cable connections with outer cone plug- in system is according to DIN EN 50 181.
- Instrument transformers can be replaced without gas work.
- Degree of protection:
- IP 65 for all high voltage parts of the primary circuit.
- IP 3X for the switchgear enclosure.

• Modular design:

- Current and voltage transformers are provided outside the switchgear vessel allowing ease of maintenance.
- Voltage transformers are metal coated, plug-in and disconnectable.
- Panels can be replaced without additional gas work and moving other panels.
- Protection and measuring systems can be integrated.
- Low voltage compartment is removable, busbar and instrument transformers are plug-in.
- Optional: Numerical multifunction protection relay with integrated protection, control, communication, operating and monitoring functions.

• Environmental independence:

The NS-2 consists of switching device in hermetically sealed tank inside an enclosure. This enclosure protects the high voltage components from environmental impacts like:

- Aggressive ambient conditions,
- External parameters like:
  - Salt, dust
  - Humidity, corrosion
  - Insects, rodents
  - High installation altitudes.

• Maintenance free design:

The SGC switching devices are enclosed in a sealed vessel inside dry air insulation providing maintenance free lifetime ensuring:

- safety of the service personnel.
- reliable and un-interrupted supply.
- sealed pressure system that is designed for 30 years of lifetime.
- maintenance free under ambient conditions.
- reduces operation costs.

• Automation and digitalization:

On-time and conditional operation of the control devices is ensured by the automation system and relay. This ensures:

- one directional automation and integration of the devices into the central Supervisory Control and Data Acquisition (SCADA) system.
- cost efficient and operation of devices based on logic functions leading to flexible and integrated solution.
- Sensor integration (optional):

The sensor system is integrated in the switching devices. This ensures:

- real time health measurement,
- continuous monitoring of temperature, partial discharge, quality, and density of gas,
- save cost in periodic maintenance,
- failure occurrence is identified before occurrence.

• Interlocks:

- Electromechanical interlocks are according to IEC 62271-200 and VDE 0671-200 prevent maloperations.
- In circuit breaker panels, the disconnector switch positioning can prevent circuit breaker operations to ensure safety of product and personnel.
- Disconnector operation is separated into opening/closing and opening/earthing operations, both with separate tool access slots for individual tools.
- Optional: Tool access slots can be padlocked to prevent operations by non- qualified personnel.





• Service life:

- The NS-2 is designed for 30 years of service time, considering the dry air insulation medium.
- The switching compartment may additionally be opened for any service and lifetime extension review if necessary.
- The hermetically sealed system together with intelligent sensor system ensures to ensure service lifetime, and performance.



5. Components

5.1. Vacuum circuit breakers

Features

- The switching device is situated inside the hermetically sealed, welded switchgear vessel in conformity with the system.
- Climate-independent vacuum interrupter poles in the dry air-filled switchgear vessel.
- Maintenance-free for indoor installation according to IEC 62271-1 & VDE 0671-1.
- The vacuum interrupters are tested for X-ray emission.
- The breaker is tested for C2 class of restrike possibility according to IEC 62271-100.
- The circuit breaker operation is linked to control and protection system for logical operations.
- The circuit breaker operation is mechanically coupled to disconnector operation by means of mechanical interlocking.
- The circuit breaker operation is rated up to M2 class - 10.000 operations according to IEC 62271-100.

Trip-free mechanism

The vacuum circuit-breaker is fitted with a trip-free mechanism according to IEC 62271 and VDE 0671.
The mechanism is located outside the switchgear vessel in the operating mechanism box and behind the control board.

Stored-energy operating mechanism

The closing spring is charged by means of a motor and latched in the charged position ("spring charged" indication is visible). Closing is effected either by means of an ON push-button or a closing solenoid. The closing spring is recharged automatically.

Class	Standard	Comment
M2	IEC 62271-100	10.000 mechanical operation without maintenance
E2	IEC 62271-100	10.000 times rated current without maintenance 20 times short circuit breaking current without maintenance
C2	IEC 62271-100	Low probability of restrike

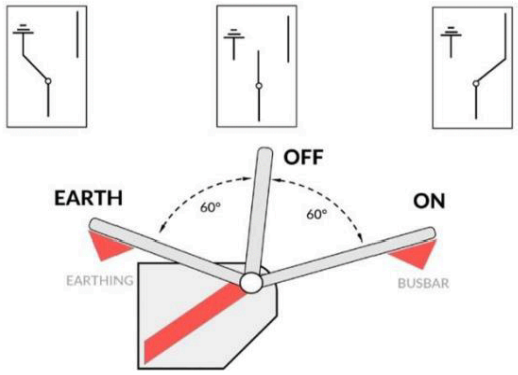
Endurance class

5.2. Common features

- Free-release spring drive for fast and torque-independent operation
- The switching device is situated inside the hermetically welded switchgear
- The disconnector is connected outside the hermetically sealed vessel through a rotary bushing. Operation of disconnector is performed at the front of the switchgear vessel.
- In circuit-breaker panels, earthing and circuit-closing the cable connection is completed by closing the vacuum circuit-breaker.
- Maintenance-free due to non-rusting design of parts subjected to mechanical stress. No lubrication required for bearing during lifetime.
- 1000 mechanical operating cycles for CLOSED/OPEN/EARTHED.
- Manual or motorized operating.

Interlocks

- The disconnector operation is coupled with circuit breaker operation by means of interlocks.
- Operating lever cannot be removed until switching operation has been completed.
- Operation of the disconnector is separated into opening/closing and opening/earthing with separate individual tool access slots.
- Clearly indicated switch positions CLOSED, OPEN and EARTHED.
- Circuit-breaker cannot be closed unless disconnector is in CLOSED or EARTHED position and operating tool has been removed.
- Operating the three-position disconnector is only possible with circuit breaker in OPEN position.
- Additional electromechanical interlocks for motor operation are possible.

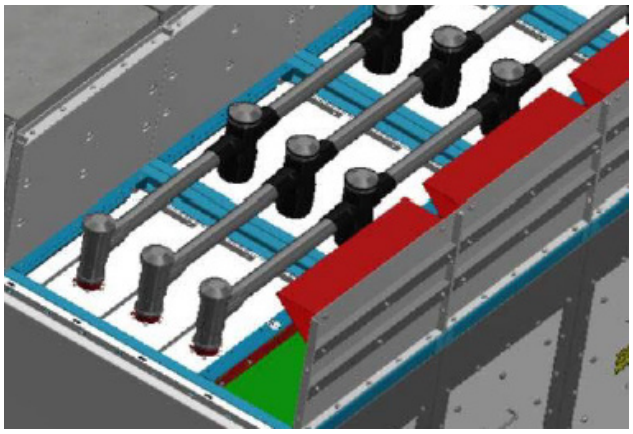


Class	Function	Standard	Comment
M0	Disconnecting Earthing	IEC 62271-102	1000 mechanical operation without maintenance
E2	Earthing	IEC 62271-102	5 times rated circuit current without maintenance

Endurance class

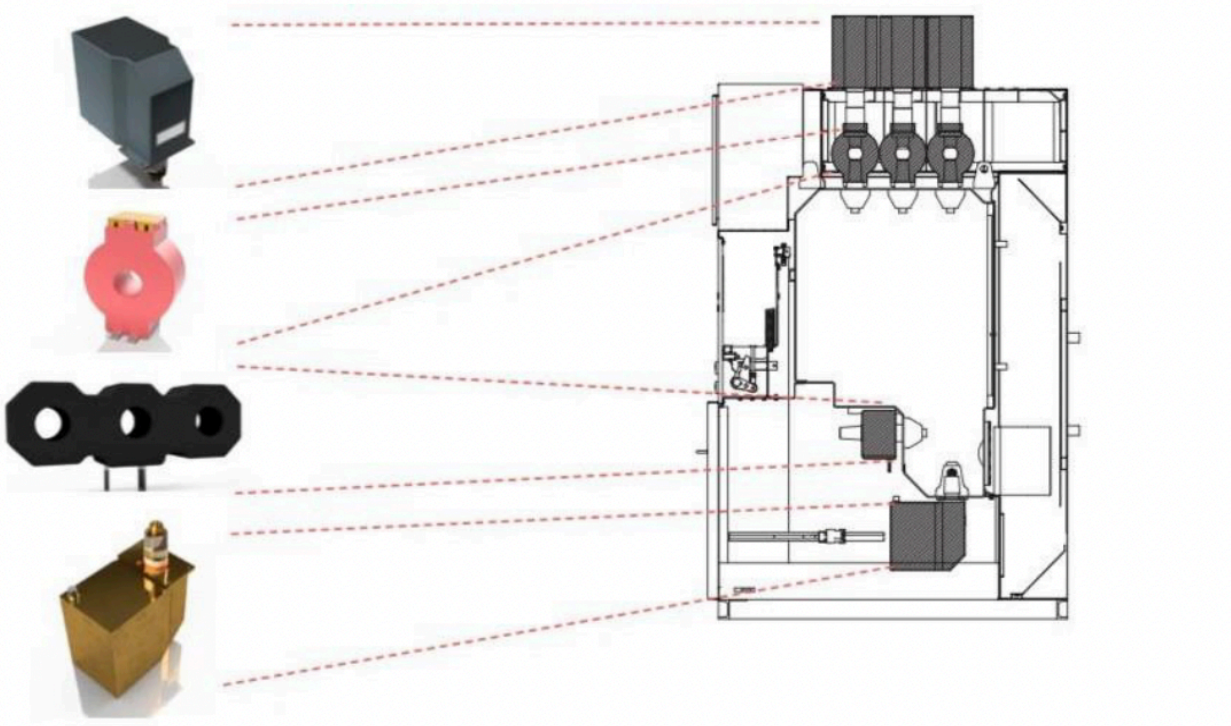
5.3 Busbar:

- Connection via single-pole solid insulated busbars.
- Section wise coupling using T-couplers for customized bay expansion.
- Touchproof earthing and field shielded design for electrical safety.
- Standardized connectors for possible connection of all NS-2 switchgear variations.
- Insusceptible to dust and corrosion.
- Busbar compartment is additionally protected with IP3XD cover.
- No gas handling is required in busbar handling.
- Easy installation.
- Capacitive measuring point.
- Screening by outer conductive layer.





5.4. Current and voltage transformers



Features

- Current and voltage transformers according to customer specific requirements.
- Plug-in designs for flexible operation-based installation.
- Placement outside the gas-insulated core tank allows maintenance or replacement without disassembly of the switchgear.
- Climate protected and factory-assembled for low installation and maintenance requirements.

Voltage transformers

- Single pole, solid insulated design.
- Plug-in mounting with inner cone bushing in the cable compartment and support flange for bolted mounting.
- Voltage transformer with outer cone plug, size 1 according to EN 50181.
- Transformers according to standards IEC 61869-2 and VDE 0414-9-2.
- Low voltage takeout link freely accessible within the cable compartment.
- Additional low voltage access via terminal strip ergonomically accessible within the overhead low voltage compartment from the panel front.
- All side metalclad design for touch proof electrical insulation.
- Optional single pole solid insulated plug-in voltage transformers for mounting above overhead busbars via inner cone T-connectors within the busbar compartment.

Current transformers

- Ring shape inductive design.
- Solid insulated plug-on variant, mounted onto bushings in the cable compartment.
- Maintenance free transformers for indoor application according to standards IEC 61869-2 and VDE 0414.
- Support frames in cable and busbar compartment for stress free mounting.
- Cable guides to take secondary wires from current transformers to the low voltage compartment.

Parameters	IEC standard
Type	Indoor, 3 phase ring type
Insulation material	Polyurethane
Standard	IEC 61869-2
Insulation level (AC/Impulse)	0.72/3 kV
Frequency	50 Hz
Rated Short circuit current	31.5 kA
Peak short circuit current	82 kA
Rated continuous thermal current	Max 1.2 times rated current
Secondary cable length	3m, 2.5 mm²
Rated current ratio - Core 1	800A/1A (example)
Rated current ratio - Core 2	400A/1A (example)
Class	0.2S metering class (example)
Burden	30 VA (example)

Current transformer specifications (cable compartment)

Parameters	IEC standard
Type	Indoor, 1 phase
Connection	Plug in type, inner cone size 2
Standard	IEC 61869-3
Insulation level (AC/Impulse)	70/170 kV
Frequency	50 Hz
Rated voltage	36 kV
Ratio	33 kV/ 100 V (example)
Voltage factor	1.9 times the rated voltage for 8 hours
Secondary cable length	3 m, 2.5 mm²
Measurement class	30 VA, class 0.2 (example)
Protection class	60 VA, class 2P (example)

Voltage transformer specifications (cable compartment)

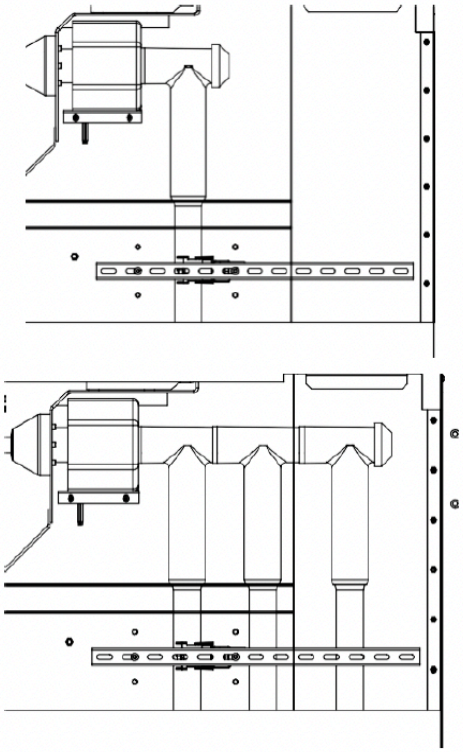
Parameters	IEC standard
Type	Indoor, 1 phase ring type
Standard	IEC 61869-2
Insulation level (AC/Impulse)	0.72/3 kV
Frequency	50 Hz
Rated short circuit current	31.5 kA
Peak short circuit current	82 kA
Rated continuous thermal current	Max 1.2 times rated current
Rated current ratio - Core 1	800A/1A (example)
Rated current ratio - Core 2	400A/1A (example)
Burden	30 VA (example)

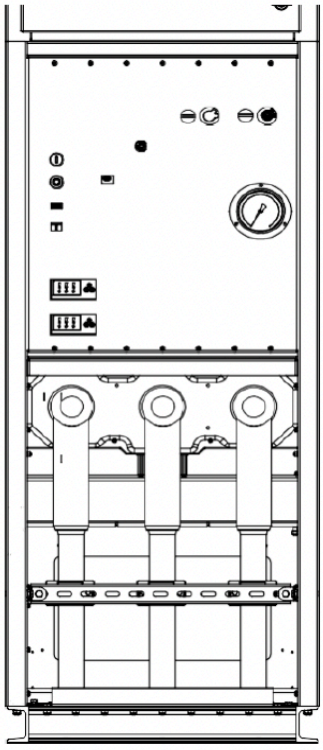
Current transformer specifications (busbar).

Parameters	IEC standard
Type	Indoor, 1 phase
Connection	Plug in type, Outer cone size C
Standard	IEC 61869-3
Insulation level (AC/Impulse)	70/170 kV
Frequency	50 Hz
Rated voltage	36 kV
Ratio	33 kV/ 100 V (example)
Voltage factor	1.9 times the rated voltage for 8 hours
Rated current ratio - Core 1	30 VA, class 0.2 (example)
Rated current ratio - Core 2	60 VA, class 2P (example)

Voltage transformer specifications (busbar).

5.5 Cable compartment





Features

- Cable compartment accessible from the front of the switchgear with covered bottom opening for cable trench routing.
- Design with three single pole screened cable bushings as connection inside the gas-insulated vessel.
- Dirt and rodent protection by a IP 3XD classified metal housing and rubber cable sleeves. Protection for connectors and optional plug-in voltage transformers.
- Easy access by lockable, removable, light-weight door.
- Standardized cable connections with outer cone, type C2, up to 1250 A rated current with bolted electric connection.
- Bushings including capacitive voltage indicators for VDS system on panel front.
- Mounting possibility for up to three cables per phase using T-couplings. Alternatively, application with up to two cables and surge arrester per phase. Use of surge arresters is recommended when the switchgear is outside of the protection zone of end-of-overhead-line surge arresters.
- Mounting rail system for cable supports, freely adjustable in depth and width, stepwise adjustable and extendable in height.
- Support system for cables up to a cross section of 630 mm^2. Size extendable if required.
- Copper earthing bar for common earthing.

Rating (kV)	Manufacturer	Cables per phase	Cross section(mm^2)	Insulation	Branch connector	Coupling connector	Surge arrester
36 (1250 A)	NKT*	1	240-630	Silicone	1 x CB 36-630 (1250)	-	1 x CSA M16
		2	240-630	Silicone	1 x CB 36-630 (1250)	1 x CC 36-630 M16	1 x CSA M16
		3	240-630	Silicone	1 x CB 36-630 (1250)	2 x CC 36-630 M16	-
36 (2000 A)		2	240-630	Silicone	1 x CB 36-630 (1250)	1 x CC 36-630 M16	1 x CSA M16
		4	240-630	Silicone	1 x CB 36-630 (1250)	2 x CC 36-630 M16	1 x CSA M16

5.6 Variants

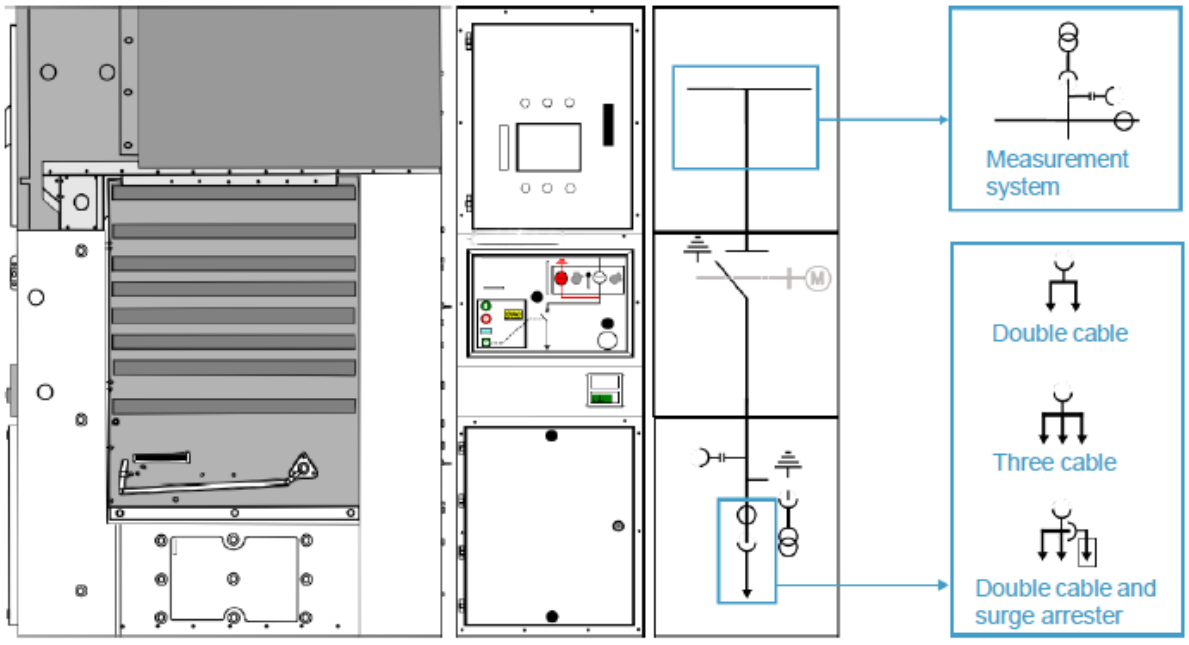
The following are the panel variants:
- Circuit breaker panel
- Disconnector panel
- Bus sectionalizer panel

*All panels shown below are available as versions of free-standing installation. On request, additional required variants can be provided.

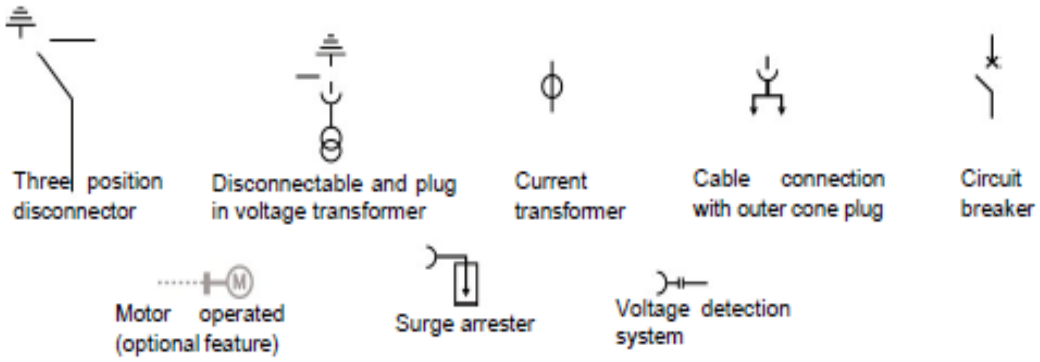
Variants technical data:

Dimensions (W x H x D) (mm)	1250 A 2000 A		(650 x 2300 x 1500) (900 x 2300 x 1500)	
variant	Busbar VT	Busbar CT	Cable VT	Cable CT
Circuit breaker panel	Optional	Optional	Optional	Optional
Disconnector panel	Optional	Optional	Optional	Optional
Bus sectionalizer panel	Optional	Optional	-	-

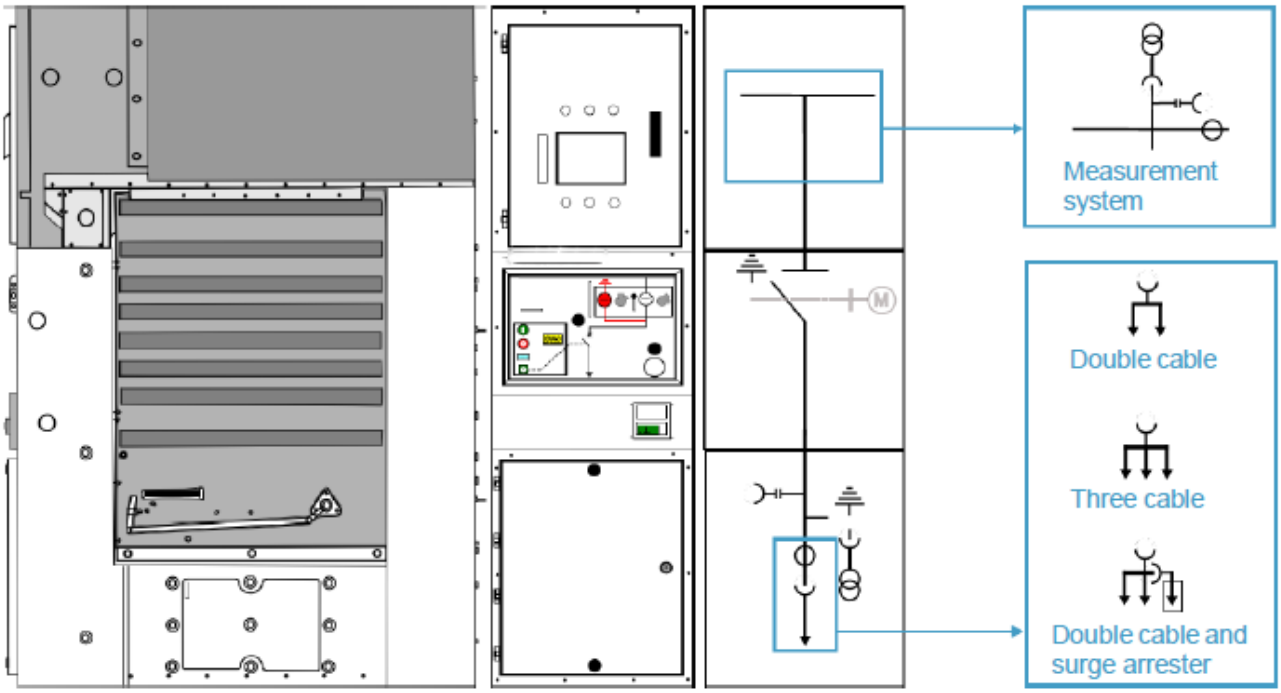
Circuit breaker panel:



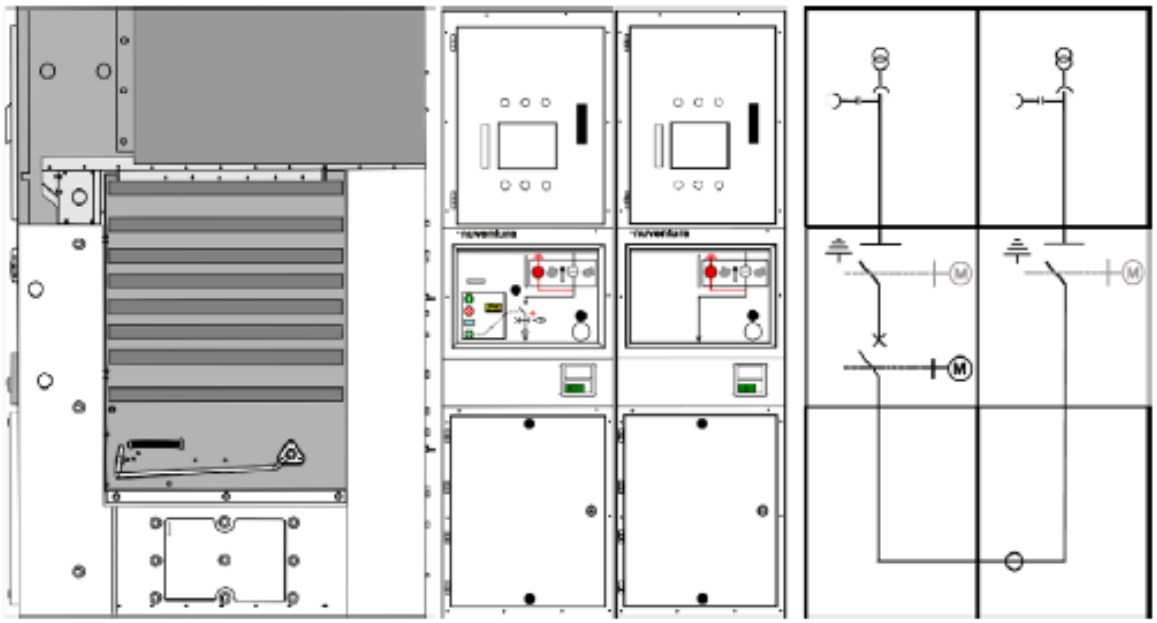
- **Index:**



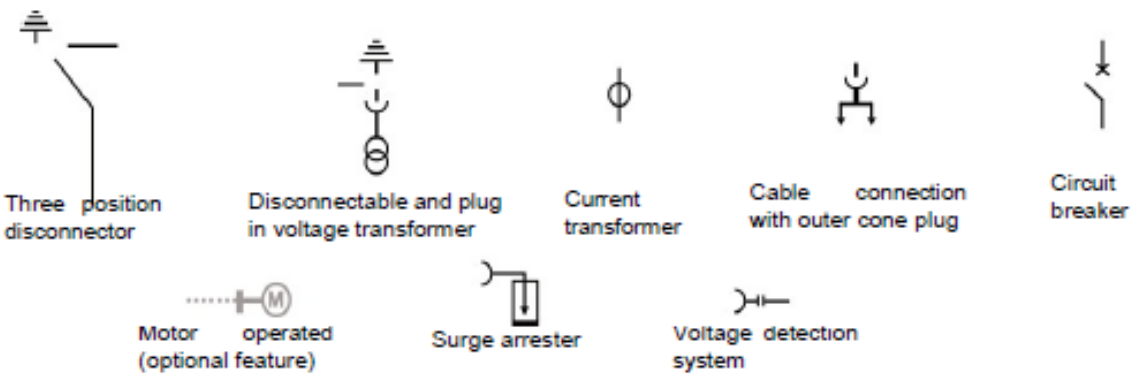
Disconnector panel:



Sectionalizer panels:
The bus section panel and bus riser panel are coupled to form the bus sectionalizer panel.



Index:



Cables per panel and phase	Make	Rating (kV)	Conductor size (mm2)	Insulation	T Plug per phase	Coupling plugs	Surge arresters	Arrester coupling insert
1	Euromold	36	50 to 240	EPDM	1x 400 TB/G	-	1x 400PB 5(10) SA-xxx	-
	Euromold	36	50 to 240	EPDM	1x 430 TB/G	-	1x 300SA-10xx	-
	Euromold	36	50 to 240	EPDM	1x 440 TB/G	-	1x 400PB 5(10) SA-xxx	-
	Südkabel	36	70 to 500	Silicone	1x SEHT	-	1x MUT33	1x KU33
	NKT cables	36	25 to 300	Silicone	1x CB36-630	-	1x CSA36-10	-
	NKT cables	36	400 to 630	Silicone	1x CB36-1250	-	1x CSA36-10	-
	Tyco Raychem	36	25 to 300	Silicone	1x RSTI-66xx	-	1x RSTI-CC-665Axxx	-
	Tyco Raychem	36	25 to 300	Silicone	1x RSTI-68xx	-	-	-
	Tyco Raychem	36	25 to 300	Silicone	1x RSTI-66Lxx	-	1x RSTI-665Axxx	1x RSTI-66CP
	Tyco Raychem	36	25 to 300	Silicone	1x RSTI-69xx	-	-	-
2	Euromold	36	50 to 240	EPDM	2x M400 TB/G	1x M400CP	-	-
	Euromold	36	50 to 240	EPDM	1x M430 TB/G	1x M300PB	-	-
	Euromold	36	300 to 630	EPDM	2x M440 TB/G	1x M400CP	-	-
	Südkabel	36	70 to 500	Silicone	1x SEHT	1x KU33	-	-
	NKT cables	36	25 to 300	Silicone	1x CB36-630	1x CP-630C	-	-
	NKT cables	36	25 to 300	Silicone	2x CB36-630	1x CP 630C	-	-
	NKT cables	36	400 to 630	Silicone	1x CB36-630	1x CC36-630	-	-
	Tyco Raychem	36	25 to 300	Silicone	1x RSTI-66xx	1x RSTI-CC-66xx	-	-
	Tyco Raychem	36	25 to 300	Silicone	1x RSTI-68xx	1x RSTI-CC-68xx	-	-
	Tyco Raychem	36	400 to 630	Silicone	2x RSTI-66Lxx	1x RSTI-66CP	-	-
	Tyco Raychem	36	400 to 630	Silicone	1x RSTI-69xx	1x RSTI-CC-66xx	-	-
3	NKT cables	36	25 to 300	Silicone	1x CB36-630	2x CC36-630	-	-
	NKT cables	36	25 to 300	Silicone	3x CB36-630	2x CP 630C	-	-
	NKT cables	36	400 to 630	Silicone	1x CB36-630	2x CC36-630	-	-
	Tyco Raychem	36	25 to 300	Silicone	1x RSTI-66xx	2x RSTI-CC-66xx	-	-
	Tyco Raychem	36	25 to 300	Silicone	1x RSTI-68xx	2x RSTI-CC-68xx	-	-
	Tyco Raychem	36	400 to 630	Silicone	3x RSTI-66Lxx	2x RSTI-66CP	-	-
	Tyco Raychem	36	400 to 630	Silicone	1x RSTI-69xx	2x RSTI-CC-69xx	-	-

5.7 Indication & measuring instruments

Voltage detecting systems according to IEC 61243-5 (VDE 0682-415)

- To verify safe isolation from supply.

CAPDIS-S1+ Common features

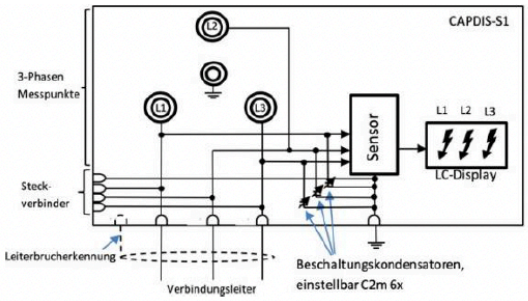
- No battery and maintenance required.
- Integrated display, without auxiliary power.
- Fail-Safe functions: complete insulation monitoring of capacitive divider, self-test which offers inherent safety.
- Secondary part of capacitive divider is adjustable by user. Six steps to set the correct value are available.
- With integrated 3-phase test point for phase comparison.

Indication LCD	Indication during normal operation with nominal voltage	Explanation	Indication during bringing into service with nominal voltage	Indication with pressed Test-button
	Overvoltage	Insulation problem at primary part of divider or U >> 1.2xUn	C2 < Min.	CAPDIS® OK
	Nominal voltage present	Signal OK Insulation OK U> 0.45xUn	C2m correct	Internal error
	Voltage present	Insulation problem at secondary part of divider 0.1xUn < U < 0.45xUn	C2m > Max.	Internal error
No indication	No voltage	Short circuit at connecting leads U < 0.1xUn	C2m >> Max.	Internal error
ERROR	-	System error	System error	Broken lead (with optional broken lead detection)

Technical Data	Description
Housing	Front panel mount, h x w x d = 48 x 96 x 37 mm
Operating temperature	-25 °C to +75 °C, storage temperature: -30 °C to +70 °C, IP 54
Connectors for signal leads	Fast-on receptacles 4.8 x 0.8 mm

WEGA 1.2 Common features

- Voltage detecting system according to IEC 61243-5 (VDE 0682-415).
- Maintenance-free.
- Overvoltage indication: phase selective
- Retrofit ready.
- Fully enclosed electronics.



Indication LCD	Indication during normal operation with nominal voltage	Explanation
	Voltage present	Threshold values for voltage presence indication: 0.1 - 0.45 x V_{nom}
	Voltage present	Integrated maintenance test passed
	Voltage present	Integrated maintenance test passed Voltage signal too high (overvoltage indication)
No indication	No voltage present	-

Technical Data	Description
Nominal frequency	50 - 60 Hz
Interface	3 LRM measuring sockets (one per Phase) and 1 earth socket LRM system, 14 mm distance between sockets, with captive anti-dust cap
Indication	LCD display with arrow, dot and wrench tool
Power supply	No auxiliary voltage needed LCD display: fed by measuring voltage
Temperature range	-25 to +65 °C
Housing	Polycarbonate, IP54
Dimensions	96 x 48 x 20 mm (w x h x d)

5.8. Gas handling

The insulation medium is dry air (also known as technical air or synthetic air), readily available at commonly accepted gas suppliers. It is filled into the gas tank via non-return inlet valves, using standard DN8 coupling connections.

During the filling procedure the filling pressure can be controlled via a manometer dial at the front side of the switchgear, attached via a second identical inlet. No specialized gas handling qualification is required.

6. Maintenance access

The switchgears are designed for maintenance free operation in indoor environments during their lifetime.

Due to the bolted housing design and safe insulation medium access to inner components for maintenance is possible. Additionally, components mounted outside the gas insulated tank are freely accessible when the switchgear is disconnected.

Free access:

- Low voltage compartment on the front side of the panel, overhead height access with non-lockable cover door.

Bolted access:

- Standardized bolts DIN EN ISO 4017 for all closing bolted connections. Unscrewing possible with electric powered or hand powered tools with tool diameter at least up to 20 mm.
- Access to pressure relief duct through bolted maintenance door on the backside of the switchgear.
- Pressure safety of back door by self-securing door mount design on the inside of the panel enclosure, mounting and de-mounting possible through access opening.
- Multiple ergonomic handles on the door cover for ease of handling. Door weight within 25 kg for lifting and removing. Handling meets risk class 1 (low load stress) for male personnel or risk class 2 (stress acceptable for able-bodied persons) for female personnel according to work safety guidelines by the federal office for workplace safety..
- Working space within pressure relief duct at least 640 mm width and 270 mm depth.
- Secondary bolted maintenance lid on the core gas-insulated pressure vessel, accessible from the pressure relief duct.
- Access to protection relays, automation and sensor electronics.
- Connection options for additional measurement instruments or temporary monitoring devices.
- Cable compartment with removable maintenance door cover.
- Access to cable connections and optionally current and voltage transformers.
- Door cover lockable to prevent unqualified opening and opening during operation.
- Working space within cable compartment up to 800 mm height and depth for ergonomic handing position
- Airing out the core tank for de-pressurization is possible by valve on the front side of the switchgear when it is disconnected. Depressurized tank allows access to core components for maintenance.
- Stainless steel back lid in ergonomic height with multiple handles a maximum weight within 30 kg. Carrying equipment and safety gear is recommended during handling of heavy components.
- Access to circuit breaker and disconnector components for diagnostics and maintenance.
- In depressurized container no danger for service personnel due to use of non-hazardous insulation medium.
- Electrically earthed pressure tank is touch proof in the disconnected switchgear.
- Safe opening procedure requires time within one man-hour.
- Closing of the opened core tank requires evacuation down to at least 0.1 bar absolute pressure of remaining air for moisture reduction by means of standardized vacuum pump. After evacuation, the tank can be filled with the

insulation medium up to the rated filling pressure. For both operations, a standardized inlet non-return valve is located at the front side of the pressure vessel.

- Gas-tight encapsulation by means of sealing elements and specified bolting connections.
- Access to busbar compartment through bolted side and top cover sheets. Access from sides and top of the panel.
- Access to drive unit, gas valve and status indicators (VDS and manometer) by unscrewing the front panel cover.

7. Sensor integration and continuous monitoring

Introduction

The SGC switchgear can be optionally integrated with an intelligent sensor system to provide real-time data about vital parameters of the device health.

Online monitoring of SGC GIS gas vessel enables detection of abnormal conditions such as thermal or insulation degradation and can be used as part of a maintenance strategy to prevent functional breakdown and extend the lifetime of the switchgear.

Key Features

- Online monitoring of temperature and partial discharge via a single platform.
- Passive measurement methods used to ensure long lifetime of sensors.
- Simple GUI for local measurement display and configuration.
- Connectivity to private SCADA networks or public networks via Modbus-RTU or Modbus TCP communication protocols.
- Long term data storage on USB or micro SD card.
- Alarm outputs for relay available.

Additional Features (available on request)

- Ambient environmental monitoring of temperature, humidity and dew point.
- Additional analog input/outputs also available.
- Additional connectivity methods and protocols supported (4G/LTE, IEC 61850, Ethernet MQTT TLS 1.2).

System Overview

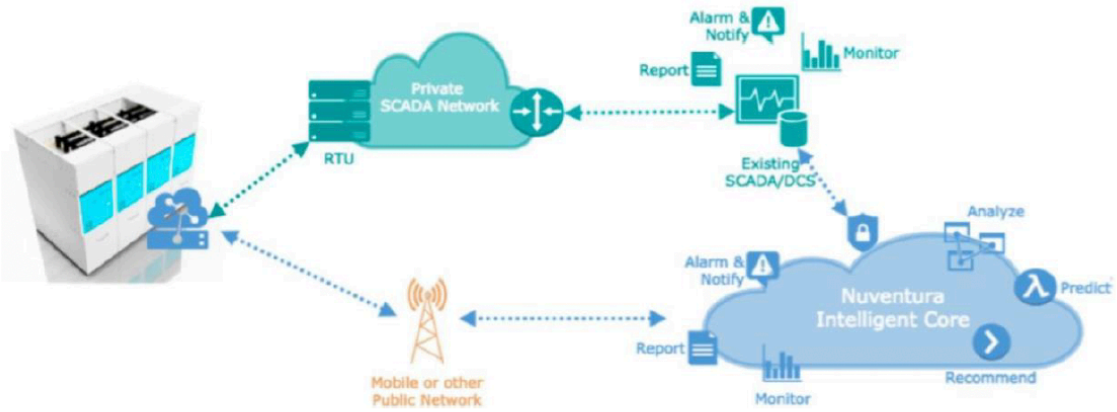
The SGC GIS is designed for online partial discharge (PD) and temperature monitoring using a passive antenna and sensors which can be integrated into the GIS core vessel. The use of passive components ensures a long service lifetime and reduces the need for maintenance or replacement. The system is also able to measure ambient environmental parameters such as temperature, humidity and dew point via an external sensor which can be installed in the cable compartment or other suitable location in the substation.

The measurement system can be connected to an existing SCADA network or the SGC cloud platform via industry standard protocols such as Modbus for remote monitoring, analysis, reporting and configuration. A graphical user interface (GUI) can also be used to easily view information stored locally or to configure the system onsite.

Temperature measurement

The temperature of the conductors within the GIS vessel is measured using Surface Acoustic Wave (SAW) sensors located on each of the phases. The sensors connect wirelessly to an antenna which is installed on the inside of the rear access of the GIS gas vessel. The

temperature data can be analysed and correlated with the ambient temperature or temperature of other conductors within the same switchgear, or switchgear within the same bay to detect anomalous behavior that would indicate an early onset of thermal breakdown.



Partial Discharge measurement

Partial discharge measurement is implemented using a non-conventional Ultra-High Frequency (UHF) method based on the IEC 62478 standard. This UHF method detects electromagnetic radiation generated by discharges and is able to measure the amount of discharge, intensity as well as provide a trend of the change in discharge over time. The system includes real-time noise cancellation algorithms and uses a calibrated UHF dB measurement.

The types of discharges that are possible to detect include:

- internal (partial) discharges
- corona discharges
- surface discharges
- particle discharges
- floating electrode discharges

Transceiver Specification

The transceiver is meant for indoor use and is designed to be installed within the low voltage compartment of the switchgear. It connects to the antenna within the GIS vessel and is used to collect, filter, store, analyse and transmit data to the local or wide area network. Local access to the transceiver is possible via USB to configure the system as well as for local diagnostics and viewing real-time or historical data.

Transceiver	Specification
Supply voltage	24 VDC [1]
Consumption	100 mA [2]
Operating temperature range	-20°C to +55°C [3] 10 - 95% RH non-condensing
Dimensions	Standard version: 150x99x67.5mm
Mounting	DIN rail
Ingress Protection	IP20 with enclosure
Frequency bands	420MHz to 450MHz for Temperature (SAW Sensors) 300MHz to 1500MHz for Partial Discharge (UHF Method)
Digital Communication	Modbus-RTU over RS485 through RJ45 Other connectivity options on request e.g. Modbus TCP over Ethernet/IP)
Local data access	USB for local access connection to PC. Local data storage options available [4]
Antenna connection	50 ohms SMA or SMB connectors for antennas[5]
Certification	IEC 61000-4 (-2, -4, -17) others depending on transceiver model

1. *AC/DC power converter not included. Other supply voltages on request*
2. *Typical value at 25°C*
3. *For indoor use only: place the transceiver inside the switchgear low voltage cabinet.*
4. *A USB or microSD card with adapter is delivered with the transceiver. GUI for Windows 7 (or higher) is required.*
5. *Transceiver connects to SMA connector on the rear access of the gas vessel. The antenna is located inside the gas vessel.*

Installation

The sensors and antenna are factory-assembled and connected internally within the GIS core vessel to a hermetically sealed SMA feedthrough in the rear access. This is then accessible on the outside of the gas vessel for connectivity to the transceiver located in the low voltage compartment. High quality double-shielded coaxial cables in pre-set lengths can be ordered to ensure no signal degradation during data acquisition. The cables are assembled with the required SMA connectors to interface from the GIS core vessel to the transceiver.

The transceiver has three SMA ports for connections to antennas. These ports can be used to connect to individual GIS core vessels or to antennas located in other parts of the switchgear such as the cable compartment.

SGC Management System

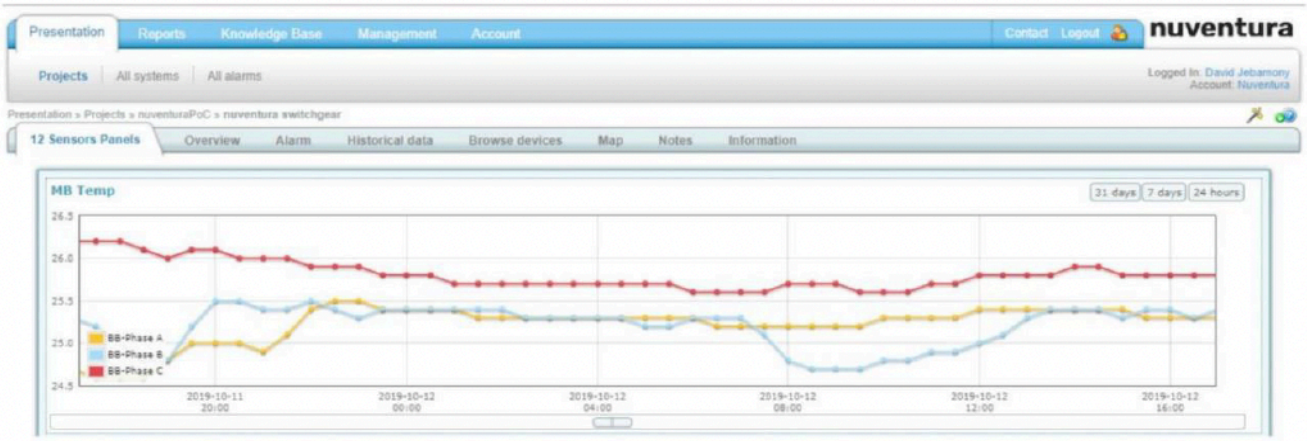
The SGC management system is a secure cloud-based solution that allows customers to store and access their data from SGC switchgear. It is a multi-tenanted solution for security and isolation of customer data and features enabling each customer to visualize, monitor, manage and analyse the switchgear health data and provides secure live access to time-critical data 24/7.

Configurable dashboards

The SGC platform includes the ability to create customizable graphical dashboards which present data from the field. This feature enables users to easily create a graphical layout of their remote installation using a visual layout that is easy to understand.

- Visualize your system in a clear and simple way
- Drag and drop live parameters into your graphical display
- Use default images or upload your own to create your dashboard
- Save your dashboard as a profile to enable fast deployment of new sites

Customizable dashboard with real-time graphing of temperature across different phases



Alarm Management

- Receive notifications via e-mail, SMS or RSS.
- Easily configure alarm thresholds for your field equipment.
- Manage all alarms from one or several sites in a single view.
- Direct alarms to yourself or service personnel in the field.
- Integrated Google™ Maps provides exact GPS location to service personnel.

Data trends and reports

- Allows for analysis of field data and spot deviations.
- Export trend data into tools like Microsoft Excel.

Security

- User authentication (2-step).
- All access to the online system at requires password authentication. In addition, several user levels are possible providing permissions to access different functions. 2-step verification is optional and can be configured per user.
- Separate user data from others.
- A built-in mechanism manages authenticated users and ensures they have access only to data they are responsible for.
- Secure communications.
- All communications are secure using Secure Socket Layer (SSL) encryption.

8. Installation requirements

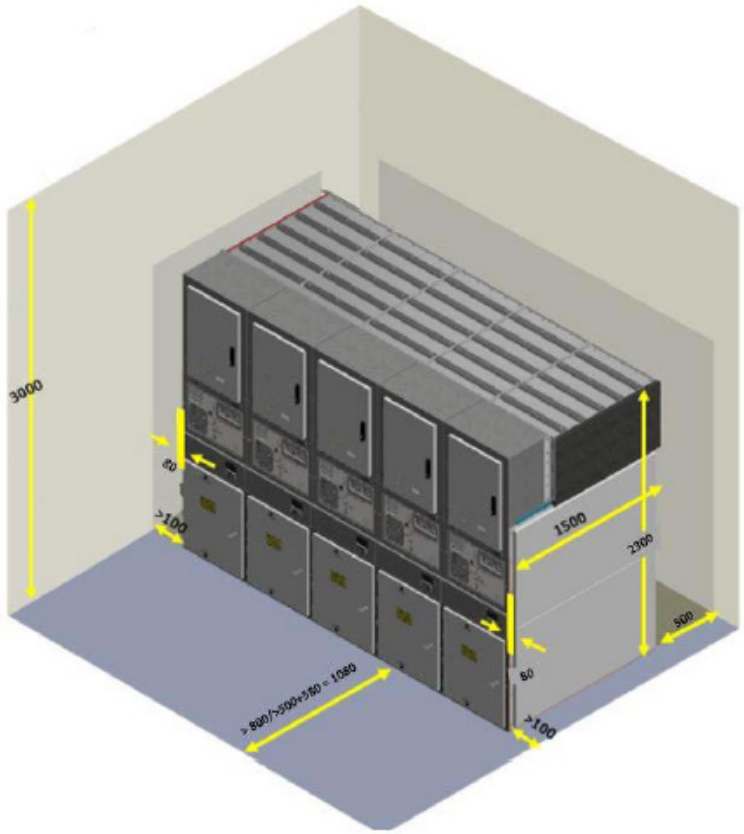
The installation area must be prepared accordingly and checked for suitability. The lateral wall distances on the left or right. For installation and maintenance in free standing and wall standing arrangement (according to IEC 61936-1):

- ≥ 500 mm recommendable,
- ≥ 500 mm for auxiliary transformer panels with lateral cable connection as end panels.

Required space

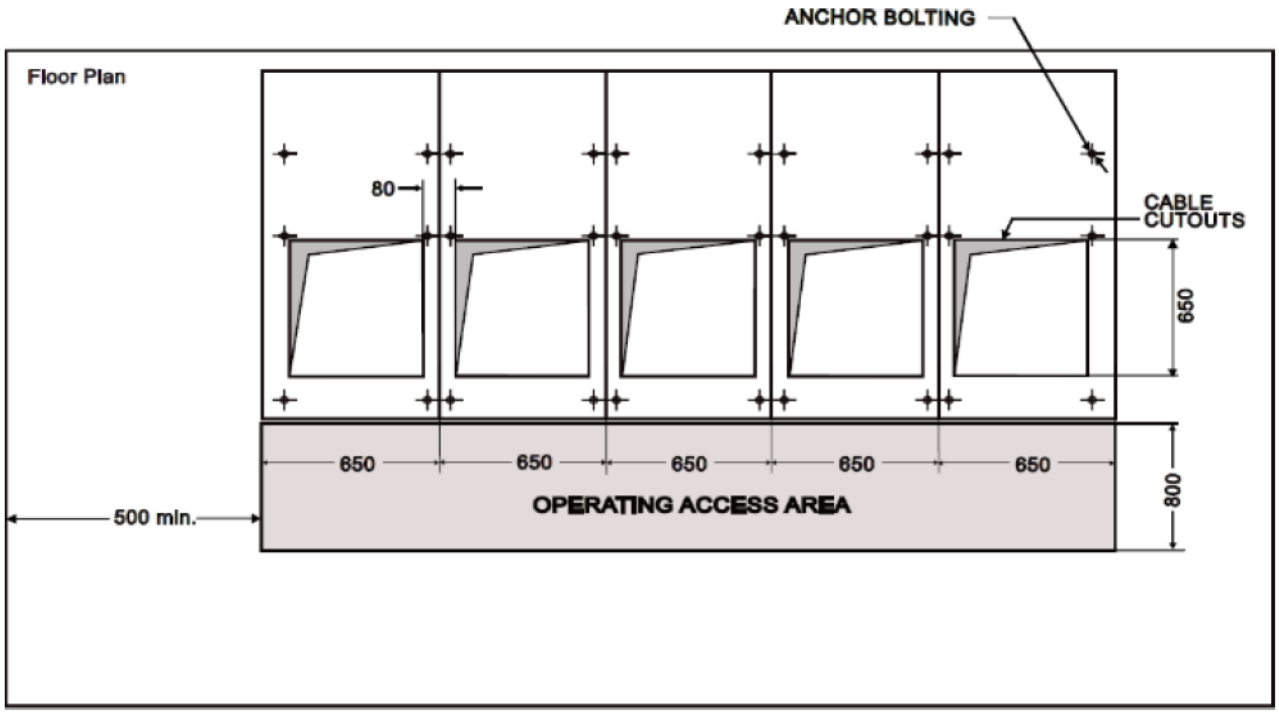
Addition to the base dimension of the panel:

Area	Dimension
Side covers	80 mm each
Operating area	800 mm min.
Door clearance	580 mm min.
Lateral wall distance	100 mm min.
Lateral wall distance for duct	≥ 500 mm rec.
Rear access	550 mm min.



Floor plan:
For details regarding the below see the project specific floor plan:
- Bolting points,
- Cut-outs,
- Room preparation,
- Duct installation.

Any base frame is to be aligned and levelled according to DIN 43661:
- Cable connection from the bottom
- A cable trench or cable basement is required.
- Cable trench minimum depth is dependent on the cables used, but commonly a minimum of 800mm is recommended.


ANCHOR BOLTING
Floor Plan
80
CABLE CUTOUTS
650
650
650
650
650
650
800
500 min.
OPERATING ACCESS AREA



BUILT TO LAST!
SGC

SGC - SwitchGear Company nv

Medium voltage switchgear, built to last.

SGC - SwitchGear Company nv has been supplying reliable products for electrical distribution for more than 40 years. Innovative ideas and environmental care are the driving forces behind SGC - SwitchGear Company nv. The development of complete solutions consists of a minimum number of components, all of which have an exceptional life span. SGC - SwitchGear Company nv stands for exceptional quality and superior customer care. Your desired specifications and deadlines are our main concern.

An exclusive factory and highly automated production lines are key factors in our "state of the art" components and systems. It enables us to develop the DF-2, DR-6/DT-6, DF-3 ,DI-2, SI-2, DW-2, GI-2 and N_2 Blue to the highest quality standards. When it comes to delivery times, prices and products SGC - SwitchGear Company nv delivers.

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