



---

# next-generation GIS

**Nu1 - nuventura's 36 kV dry-air GIS**

Catalogue  
*Version 5*

## TABLE OF CONTENTS

<b>1. SCOPE OF APPLICATION</b>	<b>3</b>
<b>2. PRODUCT SPECIFICATION</b>	<b>2</b>
2.1 STANDARDS	2
2.2 TECHNICAL SPECIFICATIONS	3
2.3 VARIANTS	4
2.4 TECHNICAL DATA	6
<b>3. PRODUCT FEATURES</b>	<b>7</b>
3.1 TECHNOLOGY	7
3.2 FEATURES	8
3.3 SAFETY	1
<b>4. DESIGN</b>	<b>2</b>
<b>5. COMPONENTS</b>	<b>2</b>
5.1 VACUUM CIRCUIT BREAKERS	2
5.2 THREE POSITION DISCONNECTOR	1
5.3 BUSBARS	3
5.4 CURRENT AND VOLTAGE TRANSFORMERS	2
5.5 CABLE COMPARTMENT	5
5.6 INDICATION AND MEASURING INSTRUMENTS	2
5.7 GAS HANDLING	2
<b>6. MAINTENANCE ACCESS</b>	<b>2</b>
<b>7. SENSOR INTEGRATION AND CONTINUOUS MONITORING</b>	<b>2</b>

## 1. Scope of application

This specification applies to the dry air primary distribution level medium voltage gas insulated switchgear. The switchgear is metal-enclosed and the gas vessel is an airtight construction making it possible to connect a solid insulated bus bar to the outside of the gas vessel. The switchgear replaces SF<sub>6</sub> with dry air as the insulating medium. The interior switching devices for all poles are enclosed by a metal vessel without phase segregation according to DIN EN 62271-200.

The panel is designed for indoor applications enabling the discharge of any exhaust gas inside the room in the case of an internal arc event. Special designs that discharge the gas outside of the room are also possible but need to be customized according to the request.

The switchgear complies with the requirements of the standards and regulations listed in this document. Any special requirements not specified in this document may require additional compliance with additional standards.

### Application

Nuventura Nu1 switchgear is widely applicable in various Industrial applications such as:

- marine,
- oil and gas,
- nuclear,
- wind and solar,
- energy utilities,
- transport (shipyard, railways, airport),
- infrastructures and buildings.





## 2. Product specification

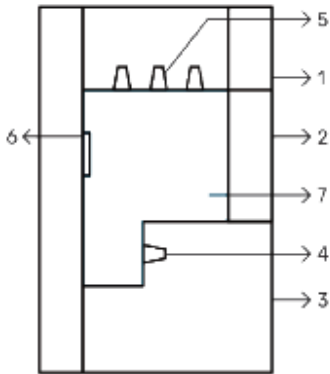
### 2.1 Standards

Nuventura Nu1 is compliant with the international standards

Components	IEC standard	EN standard
Switchgear	IEC 62271-1	EN 62271-1
	IEC 62271-200	EN 62271-200
Circuit breaker	IEC 62271-100	EN 62271-100
Disconnecter / earthing switch	IEC 62271-102	EN 62271-102
Insulation	IEC 60071	EN 60071
IP code	IEC 60529	EN 60529
IK code	IEC 62262	EN 50102
Current transformers	IEC 60044-1	EN 60044-1
Voltage detection system	IEC 61243-5	EN 61243-5



## 2.2 Technical specifications



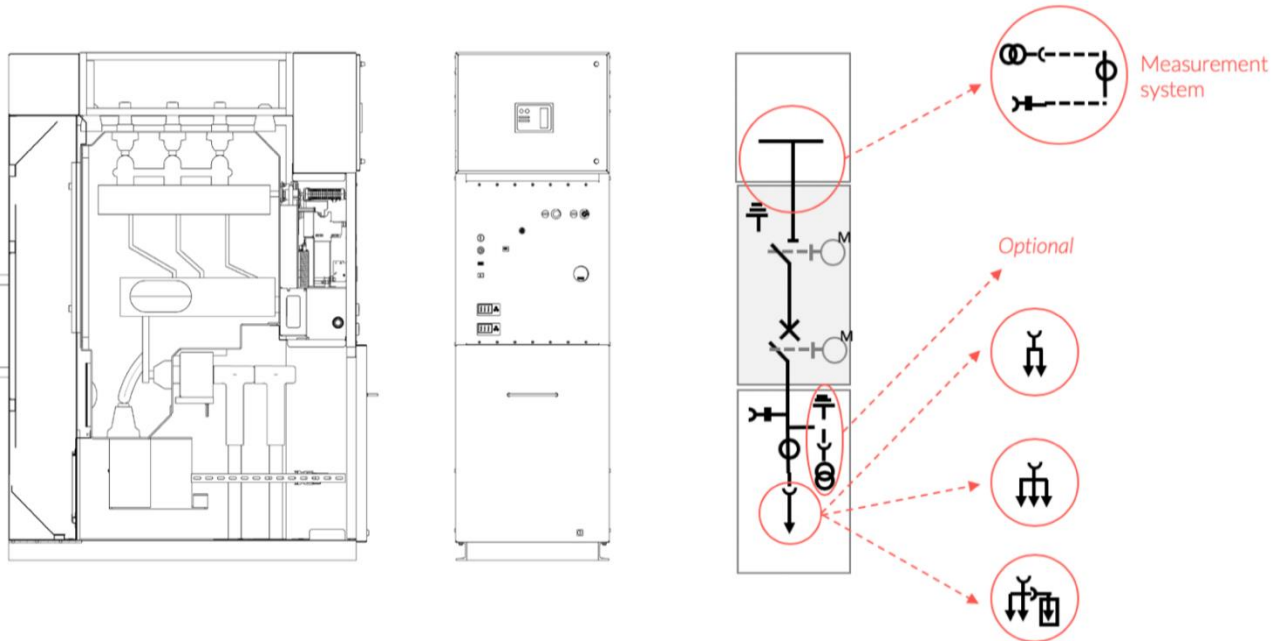
Main components of the nuventura switchgear:

1. Low voltage compartment (Protection relay)
2. Drive mechanism
3. Cable compartment
4. Feeder bushing for cable connection
5. Bus bar bushing
6. Pressure relief
7. Gas insulated tank (circuit breaker & disconnector unit)

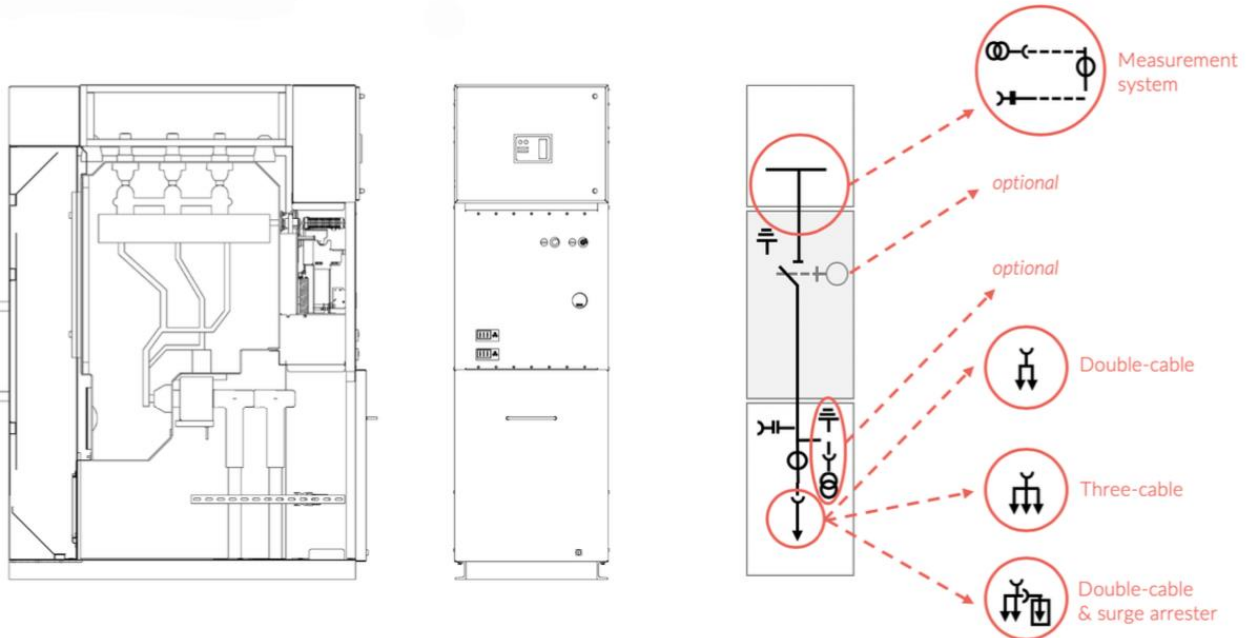
Technical data		IEC 62271-200 Data	
Rated voltage	kV	36	
Testing voltage (PF/Impulse)	kV	70/170	
Rated frequency	Hz	50/60	
Rated bus bar current	A	1250	
Rated feeder current	A	1250	
Rated peak withstand current	kA	78.8	
Rated short time current	kA	31.5	
Dimensions			
Width	mm	650	
Height	mm	2300	
Depth	mm	1500	
Dry air insulation medium (minimum pressure)	bar	1.6	
Filling pressure	bar	1.8	

## 2.3 Variants

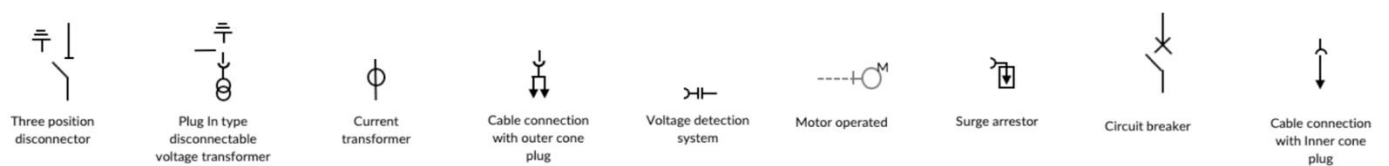
### Circuit breaker panel



### Disconnecter panel



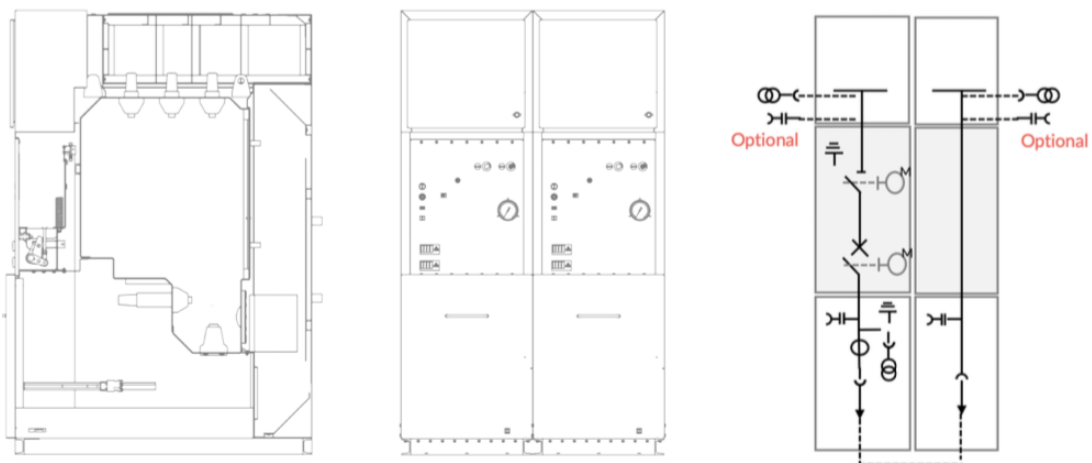
### Index



### Bus riser panel



### Sectionalizer panel



### Index





## 2.4 Technical data

Technical data		Unit	IEC 62271-200 Data			
Rated voltage	kV	36				
Testing voltage (PF/Impulse)	kV	70/170				
Rated frequency	Hz	50/60				
Rated bus bar current	A	1250				
Rated feeder current	A	1250				
Rated peak withstand current	kA	78.8				
Rated short time current	kA	31.5				
Dimension			Busbar VT	Busbar CT	Cable VT	Cable CT
Circuit breaker panel						
Width	mm	650	Optional	Optional	Optional	Optional
Height	mm	2300				
Depth (including pressure duct)	mm	1500				
Filling pressure	bar	1.8				
Disconnecter panel						
Width	mm	650	Optional	Optional	Optional	Optional
Height	mm	2300				
Depth (including pressure duct)	mm	1500				
Filling pressure	bar	1.8				
Bus riser panel						
Width	mm	650	Optional	Optional	Optional	Optional
Height	mm	2300				
Depth (including pressure duct)	mm	1500				
Filling pressure	bar	1.8				
Bus sectionalizer panel						
Width	mm	1300	Optional	Optional	Optional	Optional
Height	mm	2300				
Depth (including pressure duct)	mm	1500				
Filling pressure	bar	1.8				

## 3. Product features

### 3.1 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<sub>6</sub> insulation.
- Cable connection with outer-cone plug-in system for connection of solid-insulated bars.
- 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 disconnect switch positioning can prevent circuit breaker operations to ensure safety of product and personnel.
- Disconnect 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 according to IEC 62271-1 and VDE 0671-1.
- No relubrication or readjustment required during the lifetime.
- Panel can be replaced without interfering the positions of other panels and additional gas work.
- Sealed for life system with touch proof function.
- 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.

## 3.2 Features

### *Environmental independence*

The Nuventura Nu1 consists of switching devices inside a hermetically sealed welded stainless-steel vessel. The single-pole solid insulation makes the parts of the primary circuit under high voltage of Nuventura switchgear:

- independent of aggressive ambient conditions, such as:
  - salt,
  - humidity,
  - dust,
  - condensation;
- inert to ingress of external parameters, such as:
  - dust,
  - pollution,
  - rodents,
  - humidity,
- independent of the site altitude.

### *Compactness*

Thanks to the use of Nuventura's innovative solution, the Nu1 is as compact as SF<sub>6</sub> insulation. Designed mainly to ensure people's safety and reliability of service, the Nuventura Nu1 range contributes to improving electrical distribution in medium voltage networks up to 36 kV.

### *User-friendly*

- Compact design;
- Sensor data in real time;
- Accessible control panels;
- Access to operation at the front of the switchgear.

### *Maintenance-free design*

The Nuventura switching devices are enclosed in a sealed vessel inside dry air insulation connected through cable plugs 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 Nuventura Nu1 is designed for 30 to 40 years of lifetime. Considering the dry air insulation medium, the switching compartment may even be opened for any kind of service 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;
- For earthing switches according to the endurance class defined in IEC 60265-1.



### 3.3 Safety

#### *No gas handling*

- No gas handling involved with SF<sub>6</sub>.
- No special technical training for gas handling required.
- Avoid administrative hassle to report SF<sub>6</sub> 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).
- Product designed for maintenance free operation in an indoor environment (IEC 62271-1 and VDE 0671-1).
- 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.
- Safety against fire through type test
- Type and routine-tested.
- Quality assurance in accordance with DIN EN ISO 9001.
- Equipped with sensors to measure the switchgear health in real time.

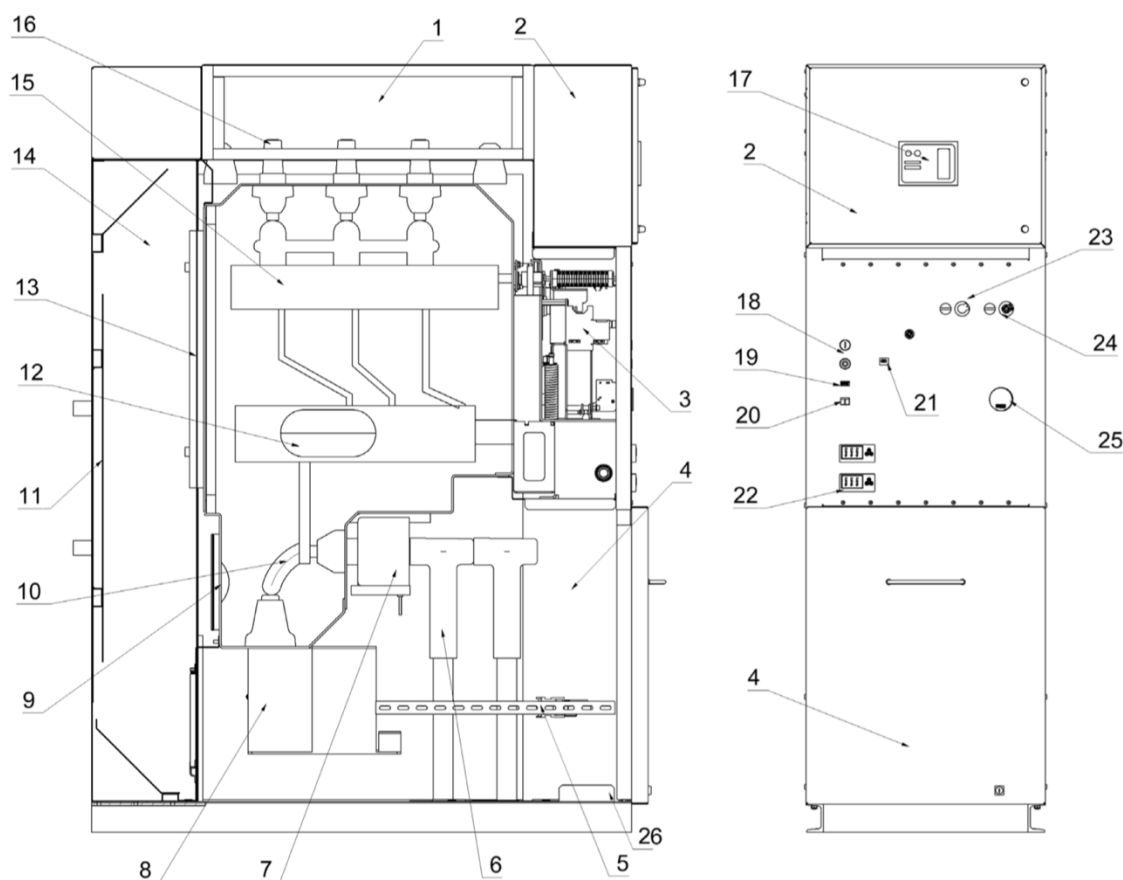
#### *Personal safety*

- 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.
- The design ensures the operation of the switchgear only with a closed enclosure.
- 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 25 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 Connection
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 Disconnecter
16. Busbar Connector Bushings
17. Protection Relay
18. Circuit Breaker Actuation Push Buttons
19. Circuit Breaker Operations Counter
20. Circuit Breaker Status Indicator
21. Spring Charge Indicator
22. Voltage Presence Indication System
23. ON/OFF Disconnecter Operation Tool Slot and Indicator
24. OFF/EARTH Disconnecter Operation Tool Slot and Indicator
25. System Pressure Gauge
26. Earthing bar



### *Insulating system*

Switchgear vessel filled with dry air insulation gas:

- features of dry air gas:
  - non-toxic,
  - no F gases involved,
  - odourless and colourless,
  - non-inflammable,
  - chemically neutral.
- pressure of dry air gas in the switchgear vessel (relative values at 20 °C):
  - rated filling level: 1700 kPa,
  - rated minimum filling level: 1500 kPa,
  - design pressure: 1950 kPa,
  - operating pressure of bursting disc:
    - $\geq 3000$  kPa,
    - gas leakage rate:  $< 0.1$  % per year.

### *Panel design*

- Factory-assembled, type-tested.
- Hermetically tight, welded switchgear vessel made of stainless steel.

- Single-pole, solid-insulated, screened busbars, plug-in type.
- Maintenance-free.
- Degree of protection:
  - IP 65 for all high-voltage parts of the primary circuit;
  - IP 3XD for the switchgear enclosure.

### *Vacuum circuit-breaker*

- Three-position disconnectors for disconnecting and earthing by means of the circuit-breaker.
- Make-proof earthing by means of the vacuum circuit-breaker.
- Cable connection with outer-cone plug-in system according to DIN EN 50 181
- Free-standing arrangement.
- Installation and possible later extension of existing panels without gas work.
- Replacement of switchgear vessel without gas work.
- Replacement of instrument transformers without gas work.

## 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.
- A metal bellow is used for gasket less separation of the dry air insulation and the operating mechanism.
- The circuit breaker operation is linked to automation and relying 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. Several operating mechanism types are available for the vacuum circuit-breaker:

- manual spring-operated mechanism;
- motor operated spring mechanism;
- motor operated stored-energy mechanism.

Located outside the switchgear vessel in the operating mechanism box and behind the control board.

#### *Operating mechanism functions*

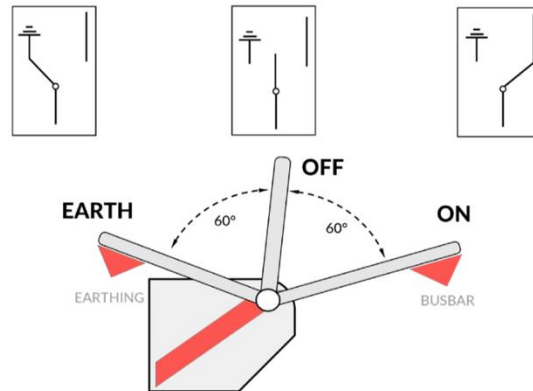
- Manual Spring-operated mechanism:
- A hand crank mechanism is used to charge the closing spring. The circuit breaker closes automatically after the charging process.
- Operating spring mechanism motor:  
In the case of motor operating spring mechanism, the closing spring is charged by means of the drive motor. When the spring is completely charged, the circuit-breaker closes automatically.
- Operating stored-energy mechanism motor:

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 pushbutton or a closing solenoid. The closing spring is recharged automatically.

Class	Standard	Comment
M2	IEC 62271-100	10000 mechanical operation without maintenance
E2	IEC 62271-100	2000 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 Three position disconnecter



### Common features

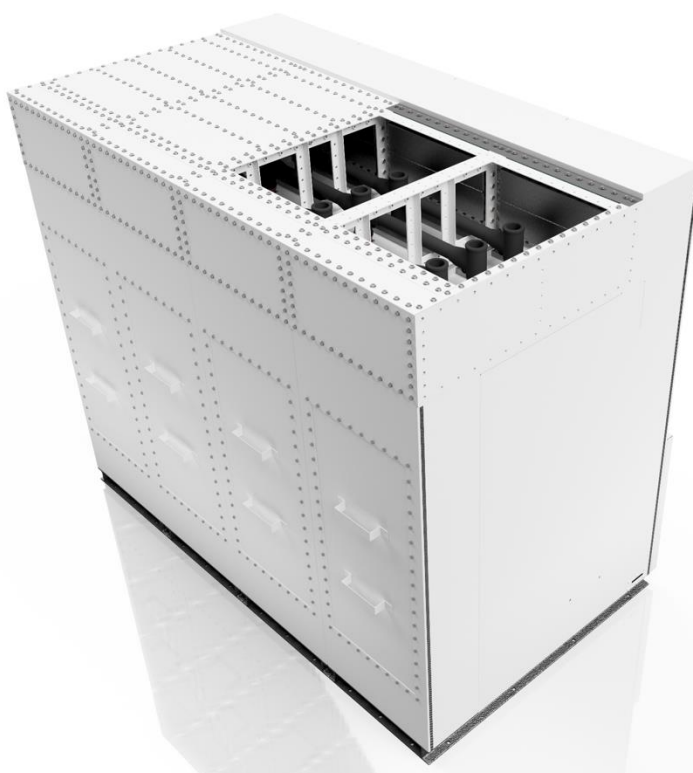
- The switching device is situated inside the hermetically welded switchgear vessel in conformity with the system.
- Climate-independent vacuum interrupter poles in the dry air-filled switchgear vessel.
- Maintenance-free for indoor installation according to IEC 62271-1 & VDE 0671-1.
- The disconnecter is connected outside the hermetically sealed vessel through a rotary bushing. Operation of disconnecter is performed at the front of the switchgear vessel.
- Reliable mechanical switch positions up to the operating front of the panel
- 1000 mechanical operating cycles for CLOSED/OPEN/EARTHED.
- Application with slow motion mechanism in:
  - Circuit-breaker panel 1250 A (with interlock against the disconnecter);
  - Disconnector panel 1250 A.
- Manual or motorized operating.
- Operating lever cannot be removed until switching operation has been completed
- Operation of the disconnecter is separated into opening/closing and opening/earthing with sperate individual tool access slots.
- Clearly indicated switch positions CLOSED, OPEN and EARTHED.
- Circuit-breaker cannot be closed unless disconnecter is in CLOSED or EARTHED position and operating tool has been removed.
- Operating the three-position disconnecter is only possible with circuit breaker in OPEN position.
- Opening of the disconnecter when circuit breaker is closed will automatically trip the circuit breaker to open.
- Additional electromechanical interlocks for motor operation are possible.
- 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.

### Interlocks

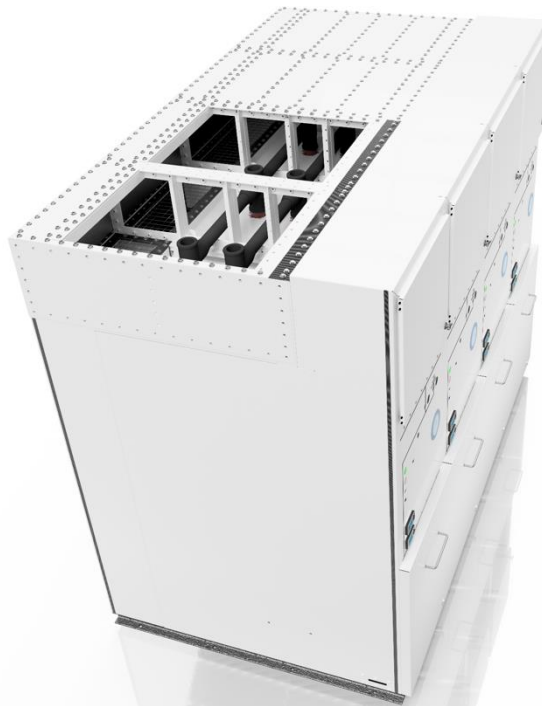
- The disconnecter operation is coupled with circuit breaker operation by means of interlocks.

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

*Endurance class*

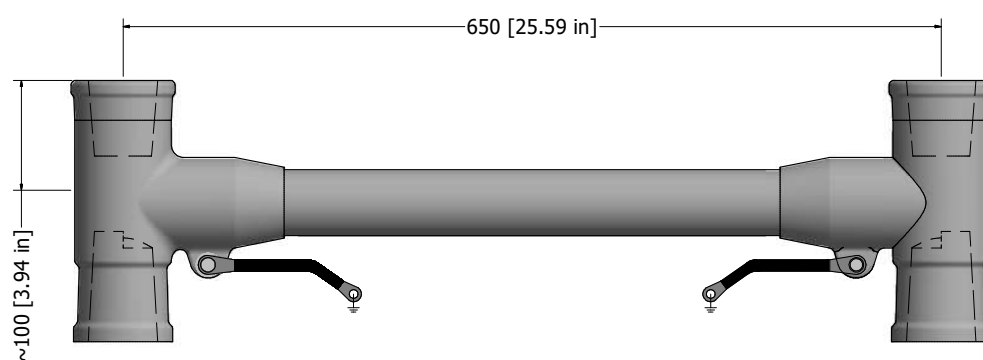


### 5.3 Busbars



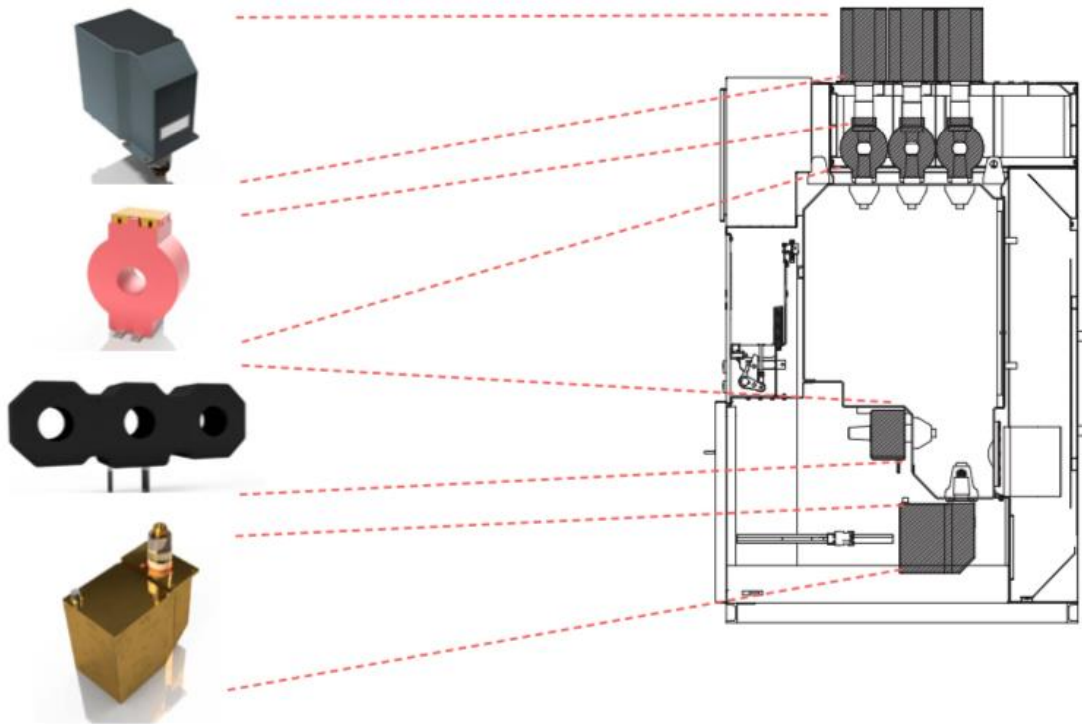
#### *Features*

- 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 Nu1 switchgear variations.
- Insusceptible to dust and corrosion.
- Busbar compartment during operation additionally protected with IP 3XD cover
- Optional busbar connectors with inner cone adapters allow for connection of plug-in voltage transformers.
- No gas handling necessary in busbar handling due to freely accessible positions outside of the gas insulated core tank.
- Easy installation due to plug-in connections with bolted mounting fixation.
- Screening by outer conductive layer.
- Integrated stress control system.
- Capacitive measuring point.





## 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 gasinsulated core tank allows maintenance or replacement without disassembly of the switchgear.
- Climate protected and factory-assembled for low installation and maintenance requirements.

### Voltage transformer

- 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.
- Transformation at ratio 36 kV/100 V. 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 touchproof 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 transformer specifications (cable side):

- Three pole ring shape design.

- Solid insulated plug on variant, mounted onto bushings within the cable compartment.
- Inductive coupling with three phase bushing.
- Maintenance free transformers for indoor application according to standards IEC 61869-2 and VDE 0414.
- Full epoxy resin mantle for touchproof insulation.
- Rated transformation at ratio 2500 A to 1 A.
- Bolted support rack within the cable compartment for stress free mounting.
- Current link accessible in the cable compartment with linking to the terminal strip within the low voltage compartment.

Parameters	IEC standard
Type	Indoor, 3 phase
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
Rated current ratio - Core 1	800A/1A
Rated current ratio - Core 2	400A/1A
Class	0.2S metering class
Burden	30 VA
Secondary cable length	3 m, 2.5 mm <sup>2</sup>

*Voltage transformer specifications (cable compartment). Other specifications possible*

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

*Voltage transformer specifications (cable compartment). Other specifications possible*

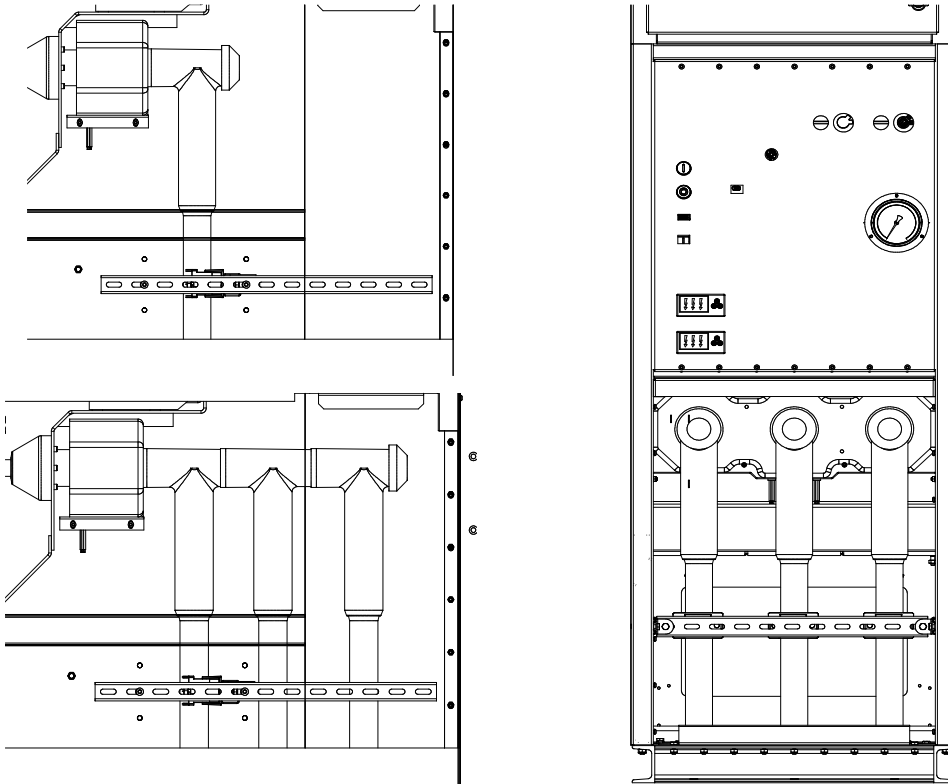
Parameters	IEC standard
Type	Indoor, 1 phase ring type
Standard	IEC 61869-2
Insulation level (AC/Impulse)	0.72/3 kV
Frequency	50 Hz
Rated short circuit current	31.5 kA
Peak short circuit current	82 kA
Rated continuous thermal current	Max 1.2 times rated current
Rated current ratio - Core 1	800A/1A
Rated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

*Current transformer specifications (busbar). Other specifications possible*

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

*Voltage transformer specifications (busbar). Other specifications possible*

## 5.5 Cable compartment



### Features

- Cable compartment accessible from the front of the installed 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 C, up to 2500 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 240 mm<sup>2</sup>.
- Copper earthing bar.

Cables per panel and phase	Make	Rating (kV)	Conductor size (mm <sup>2</sup> )	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	-	-
	NKT cables	36	25 to 300	Silicone	1x CB36-630	2x CC36-630	-	-
3	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	-	-
	NKT cables	36	25 to 300	Silicone	1x CB36-630	2x CC36-630	-	-

## 5.6 Indication and measuring instruments




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

- To verify safe isolation from supply.

*CAPDIS-S1+ Common features*

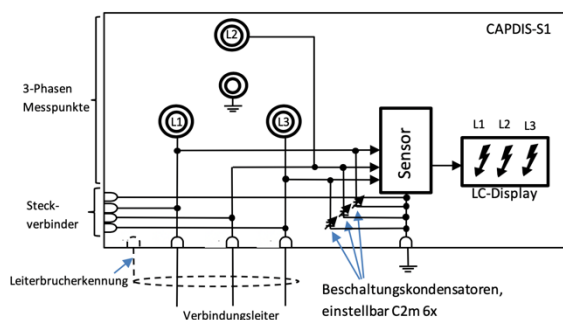
- No battery and maintenance required.
- Integrated display, without auxiliary power.

- 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		Indication during bringing into service with nominal voltage	Indication with pressed Test-button
		Explanation		
	Overvoltage	Insulation problem at primary part of divider or $U \gg 1.2xU_n$	$C2 < \text{Min.}$	CAPDIS® OK
	Nominal voltage present	Signal OK Insulation OK $U > 0.45xU_n$	$C2m$ correct	Internal error
	Voltage present	Insulation problem at secondary part of divider $0.1xU_n < U < 0.45xU_n$	$C2m > \text{Max.}$	Internal error
No indication	No voltage	Short circuit at connecting leads $U < 0.1xU_n$	$C2m \gg \text{Max.}$	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 during normal operation with nominal voltage		
Indication LCD	Explanation	
	Voltage present	Threshold values for voltage presence indication: 0.1 - 0.45 x V <sub>nom</sub>
	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)

## 5.7 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.

Characteristic	Description
Composition	20/80 Oxygen O <sub>2</sub> /Nitrogen N <sub>2</sub> mixture
Features	Colorless, odorless, non-hazardous, non-flamable, non-toxic, non-reactive
Purity	≤ 10 ppm foreign particles
Mositure Content	≤ 10 ppm of H <sub>2</sub> O
Mixture tolerance	≤ 1.5 %
CAS-Nr	7782-44-7
Gas pressure inside the gas tank	1.8 bar

### *Non-return valve*

- The coupling allows to establish a connection by simply fitting both coupling parts into each other.
- Before load relieving of the coupling seats the pressure tight coupling is sealed inside with an O-ring during coupling process.
- The coupling is forced to be open in coupled position.
- If both coupling sides are separated again the sealing seats shut off automatically
- Coupling is temperature-resistant from -40 °C to +80 °C.
- M26 connection for gas inlet.

### *Manometer*

- Relative gas pressure monitoring of the closed gas tank.
- Bourdon tube measurement system as per EN 837-1 with mechanical display and electronic angle encoder for analog signaling.
- Suited for harsh environmental conditions due to stainless steel case and optional additional silicone oil case filling.
- Wear-free non-contact measurement system for reliable leakage detection.

Technical Data	Description
Display Pressure	-1 ... +3 bar (rel.)
Signaling Trigger	1.7 bar (leakage risk), 1.6 bar (permissible minimum)
Materials	Stainlesss Steel Case, PC dial window, copper alloy pressure element
Ingress Protection	EN/IEC 60529 IP65
Type	EN 837-1 Burdon tube
Output	50 mm optical check dial, 2-channel 4-Pin NPN or PNP trigger signal $\leq 1$ A
Power Supply	DC 12...32 V
Accuacy Specifications	Accuracy Class 2.5, max. $\pm 0.4\%$ / 10K temperature deviation
Temperature Range	-20 ... + 60 °C

## 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.
- 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.
- Door cover with ergonomic handle and latching hanging counterhook mounting brackets. Lifting weight of door cover within 15 kg for single person handling within workplace safety guidelines.
- Working space within cable compartment up to 800 mm height and depth for ergonomic handling position



*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 Bundesanstalt für Arbeitsschutz (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 gasinsulated pressure vessel, accessible from the pressure relief duct.
- Airing out the core tank for de-pressurization is possible by valve on the frontside 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 touchproof 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 nuventura 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 nuventura 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*

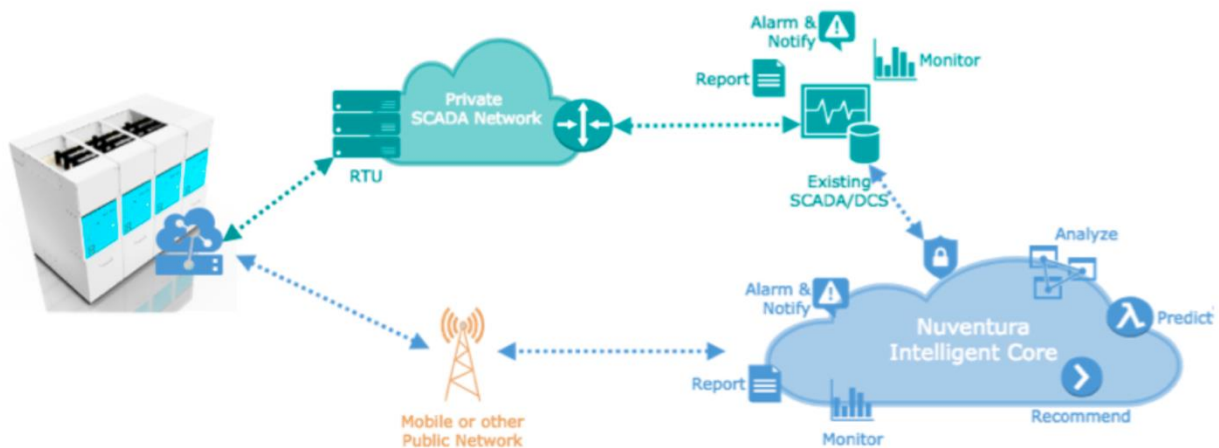
The nuventura GIS is designed for online partial discharge (PD) and temperature monitoring using a passive antenna and sensors which can be integrated into the GIS core vessel. The use of passive components ensures a long service lifetime and reduces the need for maintenance or replacement. The system 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 nuventura 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 behaviour 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 <sup>1</sup>
Consumption	100 mA <sup>2</sup>
Operating temperature range	-20°C to +55°C <sup>3</sup> 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)

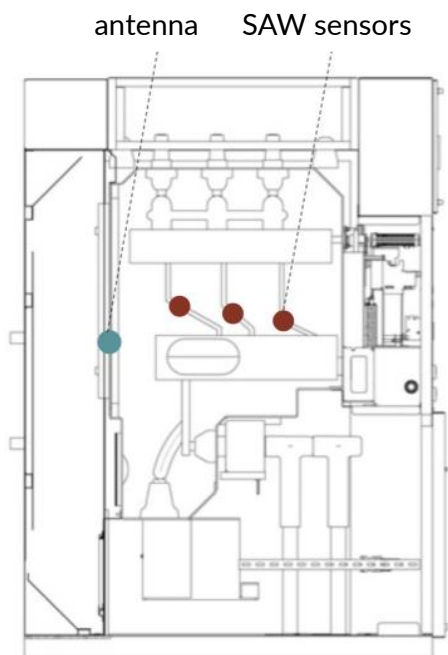
Local data access	USB for local access connection to PC. Local data storage options available <sup>4</sup>
Antenna connection	50 ohms SMA or SMB connectors for antennas <sup>5</sup>
Certification	IEC 61000-4 (-2, -4, -17) others depending on transceiver model

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.



*Internal view of the GIS and gas vessel with sensors and antennas*

## Nuventura Management System

The nuventura management system is a secure cloud-based solution that allows customers to store and access their data from nuventura 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.

## Key features

- Alarming and notifications via dashboard and email
- Access to real-time and historical data
- Configurable dashboards
- User access and control
- Customizable reporting

## Configurable dashboards

The nuventura 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.

The screenshot displays the nuventura web application interface. The top navigation bar includes links for Presentation, Reports, Knowledge Base, Management, Account, Contact, and Logout. The user is logged in as David Jebamony. The main content area shows the 'Alarm' tab selected, with a sub-tab for 'Historical data'. Below this, there is a table for 'Alarm History' with columns for Source, Alarm, Time, Severity, Type, and Information. The table shows two entries for 'HTR02-6AWS-BerlinPoC' with 'Temp Alarm ID3'.

Source	Alarm	Time	Severity	Type	Information
HTR02-6AWS-BerlinPoC	Temp Alarm ID3	2019-10-07 18:48:34	Major	Normal	13.1
HTR02-6AWS-BerlinPoC	Temp Alarm ID3	2019-10-07 12:05:03	Major	Occured	41.4

## 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.

Published by and copyright © 2020:  
nuventura GmbH  
Jablonskistr 21,  
10405 Berlin  
Germany

**For more information, please contact:**

**Phone: +49 30 120 87 375**

**E-Mail: [technology@nuventura.com](mailto:technology@nuventura.com)**

All rights reserved. If not stated otherwise on the individual pages of this catalog, we reserve the right to include modifications, especially regarding the stated values, dimensions and weights. Drawings are not binding. All product designations used are trademarks or product names of Nuventura GmbH. If not stated otherwise, all dimensions in this catalog are given in mm. Subject to change without prior notice. The information in this document contains general descriptions of the technical options available, which may not apply in all cases. The required technical options should therefore be specified in the contract