

Gas density monitoring/analysis/handling | Asset protection

# Power transmission and distribution industry



Smart in sensing



### **WIKA in brief**

A family business  
since 1946

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> 11,200 employees

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Global service and  
distribution

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1.2 billion euro turnover

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Quality management:  
ISO 9001, ISO 13485

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Environmental  
management: ISO 14001

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**WIKA's unique experience  
and know-how make  
sensing technology  
smarter, add more value  
and prepare it for a  
sustainable future.**

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Power transmission and distribution is undergoing radical change. The megatrends of decarbonisation and digitalisation pose challenges for the industry. Energy companies have to integrate renewable energy sources into existing electricity grids, which makes their operation more complex. Furthermore, it is important to implement smart digital technologies and develop new business models. Successfully shaping change requires the experience and expertise of strong partners.

As the market leader in measurement technology, we support your transformation with a broad portfolio of innovative and high-precision products, IIoT solutions and services, which we are continuously developing with more than 100 development engineers. Together with our global service and distribution network and our own production, we offer smart, efficient, and sustainable top quality for your requirements. In this way, we can continue to grow together. That is “Smart in sensing” and you can rely on it now and in the future.

Alexander Wiegand,  
Chairman and CEO, WIKA

# SUSTAINABILITY AT WIKA

## Enabling sustainable progress

Preserve a planet that can be lived on for future generations. This goal increasingly determines the actions and thinking at WIKA – and makes sustainability a driver for innovations. Sustainability, as we understand it, has many facets. It includes ecological, social and economic aspects. We are therefore firmly convinced that we can only shape our future positively with solutions and processes that are conceived holistically.

The demands we place on our ecological endeavours are therefore: to use resources as sparingly as possible, to minimise emissions along the entire value chain, to enforce the highest environmental standards and to think more in terms of circular systems.

On a social level, we create a modern and respectful working environment for our employees and partners, work on a basis of trust with our suppliers and support education and development projects worldwide.

In addition, we expand global cooperation, provide innovative impetus for our markets and, thanks to a high level of in-house manufacturing depth, we can control a large part of the conditions and effects of our economic activities.

With climate-friendly production, the ecological footprint of which is constantly decreasing, WIKA is ever more sustainable. With our solutions we enable others to implement efficient, and therefore resource-saving, processes.

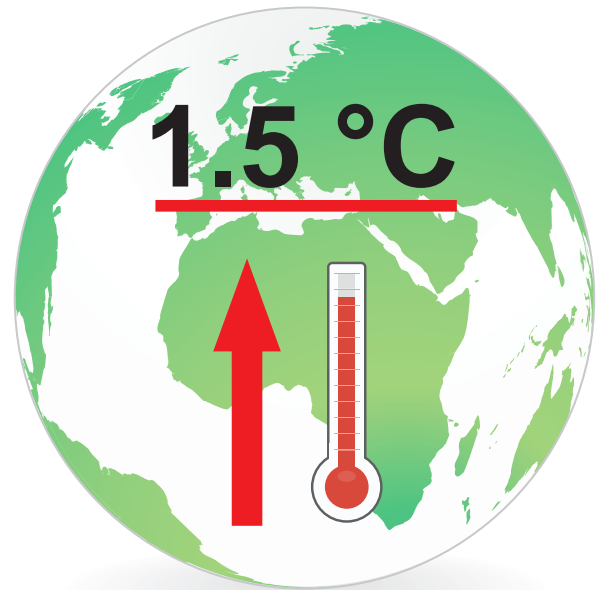
Because sustainability is teamwork – and we are committed team players. Accordingly, we want to drive forward the transformation of the economy together, and thus preserve the beauty of our planet for future generations.



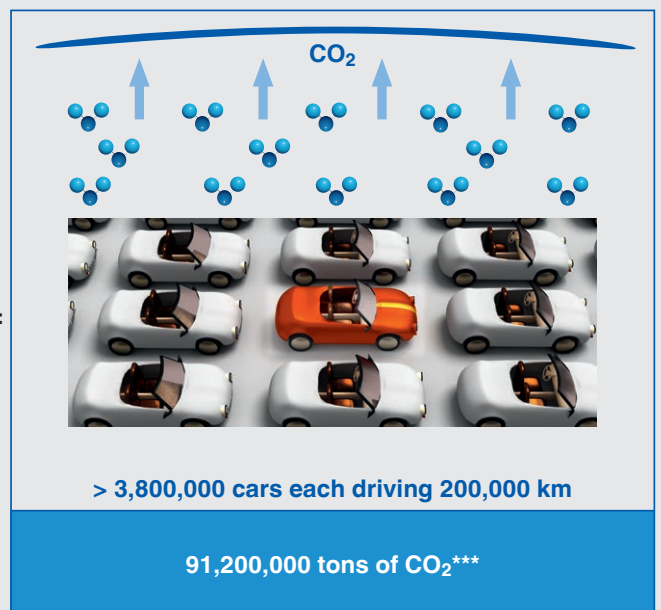
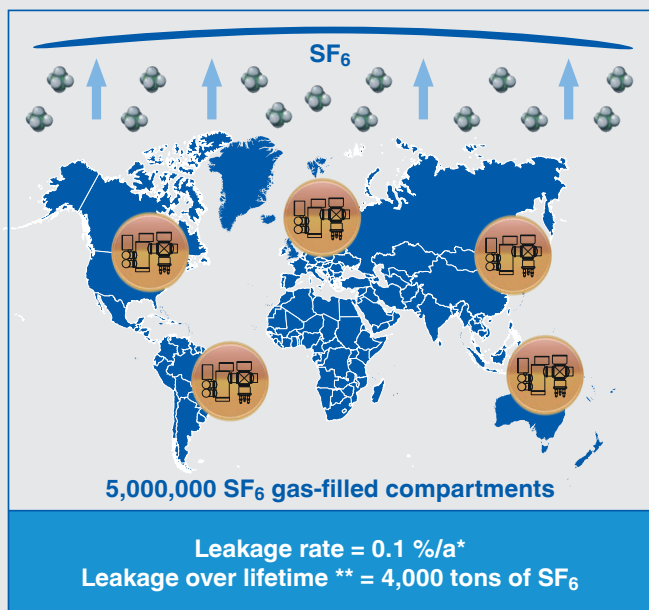
Sustainability report



- "Aim: Global warming below 1.5 degrees by 2100".
- This means reducing the man-made global temperature increase caused by the greenhouse effect to 1.5 degrees Celsius.
- At the 21<sup>st</sup> UN Climate Conference in 2015 (COP 21), almost all the countries of the world, with the Paris Agreement, signed a treaty whereby they would make efforts to achieve the 1.5 degree target.
- SF<sub>6</sub> gas is the strongest greenhouse gas worldwide and thus has a negative impact on global warming.



- Responsible use of SF<sub>6</sub> gas.
- The correct and safe handling and online monitoring of SF<sub>6</sub> gas is very important.



\* Spec. of new GIS  
 \*\* Lifetime = 50 years  
 \*\*\* CO<sub>2</sub> equivalent of SF<sub>6</sub> = 24,300

# WEGRID SOLUTIONS



**Alexander Hein**  
Vice President  
WEgrid Solutions

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We support the digital transformation of the power transmission network with solutions to modernise maintenance processes and radically reduce greenhouse gas emissions of electrical switchgear.

## Who we are

Proper operation of gas-filled equipment requires a large number of special instruments and specialist know-how. WEgrid Solutions is an expert team, consisting of WIKA employees specialised in specific requirements of the power transmission industry.

WEgrid Solutions is the only supplier on the market that offers a complete product portfolio and customised complete solutions for plants filled with SF<sub>6</sub> gas and alternative gases.

## What we do

WEgrid Solutions stands for intelligent SF<sub>6</sub> and alternative gas solutions tailored to your needs.

With our three segments, we offer products and services for all areas of interest in the industry.

## WEgrid Products

## Innovation is our passion – quality our principle

Our daily motivation is to constantly improve the protection of people, machinery and not least the environment. To accomplish this, we use our passion for technological progress. We are a versatile team of creative people with extensive expertise and innovative capacity.

As all WIKA employees, we attach great importance to the fundamental principles of our family-run company and are guided by them in our everyday working life. That is why the highest quality is a matter of course for us at all times.

## WEgrid Asset Protection

Our comprehensive product portfolio covers all areas of gas-filled equipment:

- Gas density monitoring
- Gas analysis
- Connecting parts
- Gas handling
- Online monitoring

## WEgrid Services

Maximum plant safety through digitalised gas monitoring embedded in intelligent overall solutions – everything from one source. This is WEgrid Asset Protection. Our high-quality products are combined with adapted data transfer technology and intelligent software. We plan and implement the entire project. Thus, we design your SF<sub>6</sub> gas monitoring as simple and safe as possible.

We see ourselves not only as a product supplier, but also as a long-term partner of our customers. That is why we support you for a long time after commissioning of our products.

- Repair and maintenance
- Commissioning
- Rental service
- On-site gas analysis
- Seminars and consulting



# PLANT SAFETY

## WEgrid Products – Gas density instrumentation ensures plant safety

**For safety reasons, the filling volume of SF<sub>6</sub> gas, or alternative gases, is defined for each gas compartment and monitored using a density measuring instrument.**

WIKA's gas density determination is made with pressure measurement that has been specifically adapted to the 'real gas' behaviour by compensating for the effects of temperature changes. Measurement uncertainties, resulting from the fluctuating ambient pressure, are also eliminated by the hermetically sealed case.

Should the gas density decrease due to leakage, defined alarm contacts in the gas density monitor provide a warning or, if the lower limit is reached, shut the plant down. Modern plant monitoring in the era of the "Smart Grid" requires the use of gas density transmitters with analogue or digital signal output.

The transmitters allow a more precise, continuous and central signal monitoring.

The signals or data packets sent are permanently monitored by SCADA systems with integrated data storage and data processing.

In addition to the gas density measurement, the GDHT-20 multi-sensor can provide pressure, temperature and humidity signals in Modbus® protocol.

Alongside the instrumentation, WIKA offers analytics and handling products and connecting parts.

SCADA: Supervisory control and data acquisition



## Proactive plant monitoring and service for high-voltage switchgear

The online monitoring with trend analysis of the SF<sub>6</sub> gas, or alternative gases, reduces the risk of failure and the operating costs.

The continuous visibility of the plant status enables operators to move away from the previously used preventive or reactive maintenance strategies. In the future, the electricity grid operators will be able to implement a condition-based service and maintenance strategy. Unnecessary work within defined maintenance cycles is eliminated. Thus, the number of service calls for fault rectification and the associated plant downtime is reduced significantly. If a leak is detected with the gas density measuring instrument, its exact location can be determined with the portable SF<sub>6</sub> detection instruments from WIKA and repairs undertaken.



## Analysis

With the help of WIKA gas analytic instruments, the condition of insulating gases like SF<sub>6</sub> or alternatives in the plant can be determined directly in the field. Within 5 to 10 minutes, directly on-site, the user is able to decide whether the equipment needs repair. Depending on the instrument version, the quality parameters of purity, humidity and concentration of decomposition products are measured. Operation is very simple, since after the connection of the gas compartment, the measurement must simply be started manually. The automatic flow control provides for precise and reproducible results. Following the measurement, the result is compared to the applicable benchmarks in accordance with IEC or CIGRE, and, depending on the instrument version, can be saved.



## Connecting parts

For the filling or evacuation procedure for SF<sub>6</sub> tanks, reliable connection technology is required in order to prevent gas leakage and to enable efficient operation. WIKA connecting parts fulfil the highest customer requirements, and include valves, couplings, hoses and other components.



## Handling

Filling and handling equipment can be used for the filling and treatment of SF<sub>6</sub> gas. Depending on the application, equipment is used in manufacture, installation and maintenance. The size of the plant depends on the volume of the gas compartment being worked upon. Depending on the customer requirements, the operation, performance and form of the equipment varies.





# GAS DENSITY MONITORING

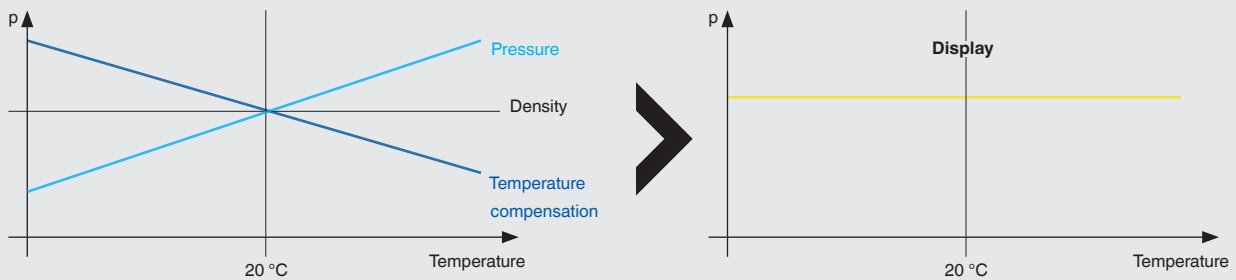
Plants filled with SF<sub>6</sub> gas, or alternative gases, are often exposed to harsh conditions, including, for example, extreme temperature fluctuations, strong winds, high air humidity and ambient pressure changes.

In the face of this, to ensure optimal operational safety of the plants, the correct interpretation of the gas density measurement is of central importance. The SF<sub>6</sub> gas and alternative gas density measuring instruments from WIKA are especially durable.



## Temperature compensation of pressure measuring instruments

The principle reason for pressure changes in plants filled with SF<sub>6</sub> gas or alternative gases are changes in the ambient temperature. With known gas pressure and temperature, the gas density can be calculated exactly.



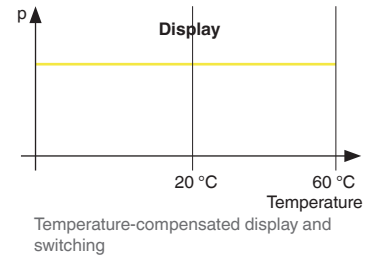
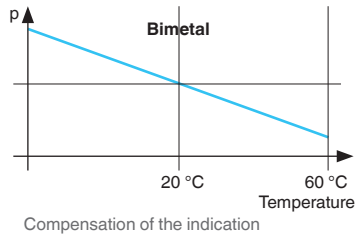
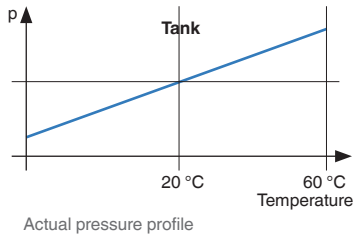
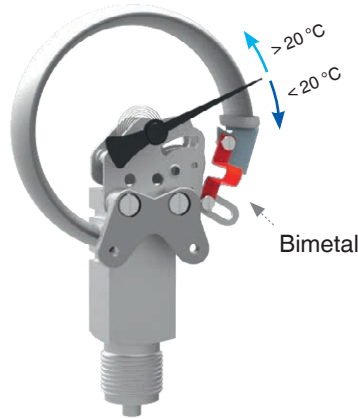
In the diagram on the left, the black horizontal line represents the current gas density. The light-blue line shows the rising pressure due to rising temperature measured with a standard pressure gauge. So that the correct gas density may be determined using a pressure measuring instrument, the pressure increase resulting from the rise in temperature must be compensated in the indication. In the diagram on the right, the temperature-compensated pressure indication, corresponding to the gas density of the gas tank, is shown.

Long-term advantages	Technology	WIKA product
Constant indication with temperature changes	Temperature compensation	<ul style="list-style-type: none"> <li>■ Density monitor</li> <li>■ Density indicator</li> <li>■ Density switch</li> <li>■ Density transmitter</li> </ul>
No condensation problems on the window	Hermetically sealed case or compensating diaphragm	<ul style="list-style-type: none"> <li>■ Density monitor</li> <li>■ Density indicator</li> </ul>
No influence due to altitude or atmospheric pressure	Hermetically sealed case or absolute pressure measurement by means of metal bellows	<ul style="list-style-type: none"> <li>■ Density monitor</li> <li>■ Density indicator</li> <li>■ Density switch</li> <li>■ Density transmitter</li> </ul>
Measuring system will not leak or corrode	<ul style="list-style-type: none"> <li>■ Welded measuring system from 316L stainless steel</li> <li>■ Helium leakage rate &lt;math&gt;&lt; 1 \times 10^{-8}&lt;/math&gt; mbar x l/s</li> </ul>	<ul style="list-style-type: none"> <li>■ Density monitor</li> <li>■ Density indicator</li> <li>■ Density switch</li> </ul>
Reliable switch point setting	Fixed setting	<ul style="list-style-type: none"> <li>■ Density monitor</li> <li>■ Density switch</li> </ul>
Sealed, tamper-resistant case	Case secured with weld spot	<ul style="list-style-type: none"> <li>■ Density monitor</li> <li>■ Density indicator</li> </ul>

# Temperature compensation principles

## Bimetal: Density monitor and density indicator

A bimetal between the movement and the measuring tube converts temperature changes into changes in length. The indication on the dial is constant, despite the temperature-induced pressure variations. Only declining pressure due to loss of gas is displayed.



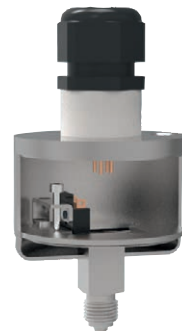
## Reference chamber: Density monitor and density switch

A chamber filled with SF<sub>6</sub> gas or an alternative gas serves as a reference. With environmental influences, the reference chamber behaves the same as the tank and thus does not cause any change in the switching or display status.

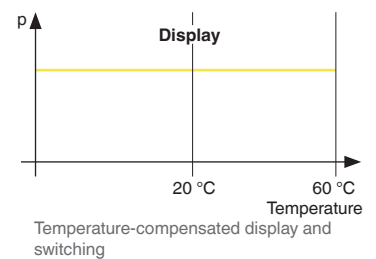
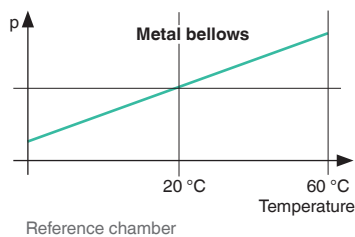
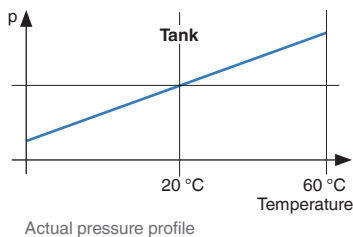
### High voltage



### Medium voltage

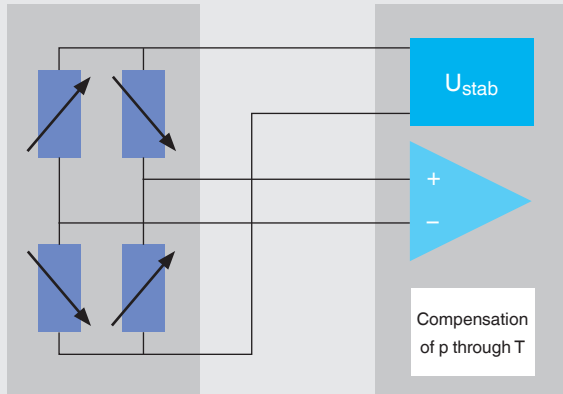


Reference chamber



## Electronic sensor: Density transmitter

A pressure transmitter specifically developed for SF<sub>6</sub> density measurement delivers a temperature-compensated output signal.



Wheatstone bridge with temperature compensation for SF<sub>6</sub> gas or alternative gas



# PRODUCT OVERVIEW

## GAS DENSITY MONITORING

The components and processes for manufacturing WIKA's SF<sub>6</sub> measuring instrument family have proven themselves in the widest variety of industries and applications. With the help of WIKA's extensive modular system for measurement technology, the instruments have been specifically designed and optimised for SF<sub>6</sub> gas and alternative gas applications. This results in synergies that benefit the customer in the long run.

With the wide range of instrument variants, different customer requirements are served, in terms of equipment, measurands, measuring ranges, accuracy and alarm functionality.

### Gas density instrumentation



Model	GDI-63, GDI-100	GDM-RC-100	GDM-RC-100-T	GDM-63, GDM-100
Model designation	Gas density indicator NS 63 and 100	Gas density monitor NS 100	Hybrid gas density monitor with Modbus® or analogue signal	Gas density monitor NS 63 and 100
Output	–	Max. 4 switch contacts	Max. 4 switch contacts	<ul style="list-style-type: none"> <li>■ NS 63: max. 2 switch contacts</li> <li>■ NS 100: max. 3 switch contacts</li> </ul>
Special features	<ul style="list-style-type: none"> <li>■ Bimetal compensation</li> <li>■ Dial layout to customer requirements</li> </ul>	<ul style="list-style-type: none"> <li>■ Reference chamber compensation</li> <li>■ Complete local display of the density and vacuum range on a 100-mm dial</li> <li>■ Microswitch</li> <li>■ Increased plant safety through self-diagnostics</li> <li>■ Excellent shock resistance</li> <li>■ Optional recalibration valve</li> </ul>	<ul style="list-style-type: none"> <li>■ Reference chamber compensation</li> <li>■ On-site display with switch contacts and digital or analogue output</li> <li>■ Online monitoring with the highest measurement accuracy</li> <li>■ Live availability of pressure, temperature and gas density measured values (Modbus® RTU) or compensated pressure or density (4 ... 20 mA)</li> <li>■ Suitable for alternative gases</li> </ul>	<ul style="list-style-type: none"> <li>■ Bimetal compensation</li> <li>■ Complete local display of the density and vacuum range on a 100-mm dial</li> <li>■ Dial layout to customer requirements</li> <li>■ Optional recalibration valve</li> </ul>
Data sheets	SP 60.21, SP 60.03	SP 60.27	SP 60.80	SP 60.70, SP 60.02

## Mechanical and mechatronic gas density measurement

While gas density indicators only show the temperature-compensated filling status on a colour-coded dial, gas density monitors offer additional alarm signals at predefined switching thresholds for equipment monitoring. Offering only the switching function, gas density switches complete the portfolio for this sector.

## Electronic gas density and gas condition measurement

The analogue and digital transmitters provide continuous signals or data packets for evaluation in the SCADA control rooms of modern transformer and distribution stations. Through the combination of transmitter and gas density monitor, in addition to the signal redundancy, it is possible to read the status of the SF<sub>6</sub> gas or alternative gas – on-site and in the control room.



GDM-100-T	GD-20	GD-20-W	GDHT-20	GDI-100-D
Hybrid gas density monitor with Modbus® or analogue signal	Transmitter for gas density, temperature and pressure with Modbus® or analogue output for compensated pressure or density	Battery-powered wireless transmitter for gas density, temperature and pressure with LoRaWAN® output	Transmitter for gas density, temperature, pressure and humidity with Modbus® output	Digital gas density indicator NS 100
Max. 3 switch contacts	Modbus® RTU via RS485 or 4 ... 20 mA	LoRaWAN®	Modbus® RTU via RS485	Bluetooth®
<ul style="list-style-type: none"> <li>■ On-site display with switch contacts and digital or analogue output</li> <li>■ Online monitoring with high measurement accuracy</li> <li>■ Live availability of pressure, temperature and gas density measured values (Modbus® RTU) or compensated pressure or density (4 ... 20 mA)</li> <li>■ Suitable for alternative gases</li> <li>■ Variants with integrated or mounted sensor</li> </ul>	<ul style="list-style-type: none"> <li>■ Calculation of the gas density values</li> <li>■ Up to 247 transmitters on one master (Modbus® RTU)</li> <li>■ Compact design</li> <li>■ Suitable for alternative gases</li> </ul>	<ul style="list-style-type: none"> <li>■ Calculation of the gas density values</li> <li>■ Up to 12 years battery life</li> <li>■ Compact design</li> <li>■ Low installation effort → ideal for retrofit applications</li> <li>■ Suitable for alternative gases</li> </ul>	<ul style="list-style-type: none"> <li>■ Calculation of the gas density or gas humidity values</li> <li>■ Online monitoring with the highest measurement accuracy</li> <li>■ Up to 247 transmitters on one master</li> <li>■ Optionally available with adapter or measuring chamber</li> <li>■ Suitable for alternative gases</li> </ul>	<ul style="list-style-type: none"> <li>■ Calculation and on-site display of gas density, pressure and temperature</li> <li>■ Integrated data logger for up to 20,000 measured values</li> <li>■ Data export by means of Bluetooth®</li> <li>■ Battery-powered</li> </ul>
SP 60.79	SP 60.77	SP 60.78	SP 60.14	SP 60.07



# PERIODIC CHECKING OF LEAKAGE DETECTION SYSTEMS

**Gas density monitors and gas density transmitters reliably warn the plant operator in case of leaks and loss of the insulation gas.**

As a result of the significant contribution to operational safety offered by gas-insulated instruments and within the meaning of the sustainable climate protection, many plant operators already check their gas density monitors on a regular basis. With the entry into force of the regulation (EU) no. 2024/573 on fluorinated greenhouse gases, under specific conditions

these regular checks have become mandatory. For this, WIKA offers solutions that allow you to check your leakage detection system even when it is installed. In addition to the gas density monitor with an integrated test port, retrofit valves are available. They can be installed between the gas tank and the existing leakage detection system.

This enables simple retrofitting to a system which can be calibrated in the future when installed. The entire check can also be carried out in form of a service supplied by us - whether in laboratory or on-site.



## ACS-10

The model ACS-10 calibration system is used for fully automated checking of mechanical leakage detection systems such as gas density monitors, gas density indicators and gas density switches in accordance with regulation (EU) no. 2024/573 on fluorinated greenhouse gases. Article 5 of this EU regulation provides for the mandatory checking of the leakage detection system at least every 6 years if it contains more than 20,5 kg [45 lbs] SF<sub>6</sub> gas (for alternative gases 500 t CO<sub>2</sub> equivalent or more) in the tank and the plant was installed after 01 January 2017. In addition to the highly accurate reference sensor system and the powerful compressor, all the necessary components required for fully automatic recalibration are integrated in this calibration case.

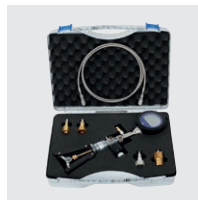
The large touch display enables easy configuration of the test parameters, explains the test process step by step and enables clear management and viewing of historical test results.

In conjunction with gas density monitors with a premounted or retrofitted recalibration valve, the easiest of recalibrations in the field is possible without dismantling and decommissioning the electrical system.



## Model BCS-10

The robust modular calibration system model BCS-10 serves for the inspection of SF<sub>6</sub> gas density measuring instruments. Both mechanical and electronic measuring instruments can be checked quickly and easily.



The combination of the temperature-compensated precision digital gas density indicator model GDI-100-D and the test pump allows precise setting of the measuring point and representation of measured values in different units. External temperature and pressure fluctuations do not affect the measurement. The calibration system model BCS-10 is delivered in a robust service case made of plastic.

## Connecting parts

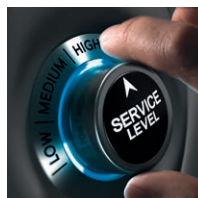
WIKA developed special connecting parts in order to combine a secure checking of gas density monitors and transmitters with an efficient handling. The self-sealing DN 20 connection ensures a high gas flow during filling and evacuation of the plant and prevents the gas from escaping unintentionally. With the help of a blocking mechanism, the gas density monitor can be safely disconnected from the gas compartment. The self-sealing connection for the gas density monitor prevents any loss of the insulating gas when the measuring instrument is dismantled.

If the gas density monitors are used in combination with a test connection, the checking can also be carried out when the instrument is installed.

If no test connection is available on the gas density monitor or transmitter, this connection can be retrofitted using an adapter. It will be positioned between the measuring instrument and the gas compartment. Depending on the requirement, the connection threads can also be changed or adapted. Due to the integrated shut-off mechanism, the connection to the gas compartment is automatically interrupted after connecting a recalibration instrument to the test port and a check can be carried out without dismantling the leakage detection system. After disconnecting the recalibration instrument, the connection to the gas compartment is automatically reestablished. The checking of the instrument can be carried out through the connection without dismantling.

## Service

With the WIKA calibration vans, accredited to DIN EN ISO/IEC 17025, we can check your instruments directly on-site. Alternatively, you can also send your instruments to our calibration & service centre. All operations will be carried out by certified service technicians.





# CONNECTING PARTS

**A suitable connection technology is essential for conducting the SF<sub>6</sub> gas or alternative gas from one gas compartment to another without losses and in an efficient manner.**

WIKA's connecting parts enable the secure storage and handling of environmentally hazardous greenhouse gas, among others, in the equipment provided for this. The connections have been precisely and specifically optimised for this application.

By using WIKA's connecting parts, the maintenance-free and reliable separation of gas compartments from the environment is made possible. In this way, not only is the escape of the insulating gas prevented, but also the ingress of moisture.

## Manifolds (GMA)

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The WIKA manifolds help to significantly increase the efficiency of gas handling with service trolleys in GIS plant production or at energy suppliers. The WIKA manifolds are equipped with three DN 20 connections and one DN 20 or DN 40 connection on the service trolley as standard. This makes it possible to fill, evacuate or empty three or more gas compartments at the same time.



Manifolds

## Valves (GCV) and couplings (GCC)

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Self-sealing valves and couplings reliably prevent accidental emissions. The two-stage sealing principle with O-ring and metal contour seal enables safe connection and disconnection under pressure. The connecting parts are manufactured in nominal widths from DN 6 to DN 20. They are manufactured from high-quality aluminium, brass and stainless steel. A material certificate can be provided on request.



Valves and couplings

## Adapters (GCA), fittings (GCF) and protective caps (GCP)

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In addition to valves and couplings, the standard delivery program also includes adapters, fittings and protective caps. WIKA also manufactures customer-specific designs or assemblies according to individual requirements. Robust design, high-quality materials and full leak testing of all connecting parts are ensured to provide for long-term and reliable quality.



## Hoses (GCH)

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These hoses ensure the safe handling of the insulating gas. Each hose is fitted with self-sealing couplings and is 100% leak tested. It is thus ensured that no gas can escape into the atmosphere. A distinction is made between rubber hoses and stainless steel hoses.

The rubber hoses are lighter and handier than the stainless steel hoses which are more stable and more robust due to the additional steel mesh.



## Adapter sets

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In addition, there are adapter sets which enable connection to switches of different manufacturers. The adapters are made of brass and stainless steel to ensure a long service life in the field.

Our entire equipment is supplied in robust transport cases and is thus a perfect companion for service personnel.



# PRODUCT OVERVIEW FOR GAS CONNECTING PARTS

## Quality through robust design, ideal materials and leak testing

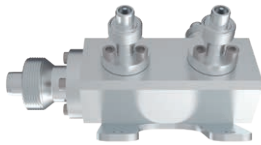
A suitable connection technology is essential for conducting the SF<sub>6</sub> gas from one gas compartment to another without losses and in an efficient manner. Self-sealing valves prevent the gas from escaping unintentionally. In addition to valves, the standard delivery program also includes adapters and protective caps. Robust design, high-quality materials and full leak testing of all connecting parts ensure long-term and reliable quality.



Model	GQC	GCY	GTP	GMC
Model designation	Gas quick coupling	Gas cylinder connection	Gas T-piece	Gas measuring chamber
Special feature	<ul style="list-style-type: none"> <li>Vacuum-resistant and pressure-tight (-1 ... +35 bar)</li> <li>Tested helium tightness of 100 %</li> <li>Operating temperature -40 ... +80 °C (EPDM)</li> <li>Leakage rate: <math>\leq 1 \cdot 10^{-5}</math> mbar · l/s</li> </ul>	<ul style="list-style-type: none"> <li>Vacuum-resistant and pressure-tight (-1 ... +64 bar)</li> <li>Tested helium tightness of 100 %</li> <li>Operating temperature -40 ... +80 °C</li> <li>Leakage rate: <math>\leq 1 \cdot 10^{-5}</math> mbar · l/s</li> </ul>	<ul style="list-style-type: none"> <li>Vacuum-resistant and pressure-tight (-1 ... +50 bar)</li> <li>Tested helium tightness of 100 %</li> <li>Operating temperature -40 ... +80 °C</li> <li>Leakage rate: <math>\leq 1 \cdot 10^{-5}</math> mbar · l/s</li> </ul>	<ul style="list-style-type: none"> <li>Vacuum-resistant and pressure-tight (-1 ... +64 bar)</li> <li>Tested helium tightness of 100 %</li> <li>Operating temperature -40 ... +80 °C</li> <li>Leakage rate: <math>\leq 1 \cdot 10^{-8}</math> mbar · l/s</li> </ul>
Description	For a fast and reliable connection, the quick coupling is particularly suitable for use with SF <sub>6</sub> gas applications. A selection of different configurations, including the common Hansen HK8, Hansen HK2 and Malmquist/ASEA connections, complete the range	For a reliable connection to gas cylinders. Available in various sizes and in accordance with the following standards <ul style="list-style-type: none"> <li>DIN 477, No.6 (Europe),</li> <li>DIN 477, No. 8 (Europe),</li> <li>CGA 590, (USA),</li> <li>DIN 477, No. 7 (China)</li> </ul>	For a gas-tight connection with more than two connections. Can be customised to meet the high requirements for SF <sub>6</sub> gas applications.	Mostly used in combination with transmitters. Due to the additional volume in the interior, the measuring chamber is particularly suitable for SF <sub>6</sub> gas measuring methods.



Model	GCV, GCC	GCH	GSH
<b>Model designation</b>	Gas coupling and valve	Gas coupling hose	Gas storage hose
<b>Special feature</b>	<ul style="list-style-type: none"> <li>The valves can be disconnected or coupled under pressure and vacuum</li> <li>Vacuum-resistant and pressure-tight (-1 ...+64 bar)</li> <li>Tested helium tightness of 100 %</li> <li>Operating temperature -40 ... +80 °C</li> <li>Leakage rate: <math>\leq 1 \cdot 10^{-8}</math> mbar · l/s</li> </ul>	<ul style="list-style-type: none"> <li>Robust materials</li> <li>Vacuum-resistant and pressure-tight</li> <li>Tested helium tightness</li> </ul>	<ul style="list-style-type: none"> <li>The valves can be disconnected or coupled under pressure and vacuum</li> <li>Vacuum-resistant and pressure-tight (-1 ...+64 bar)</li> <li>Tested helium tightness of 100 %</li> <li>Operating temperature -40 ... +80 °C</li> <li>Leakage rate: <math>\leq 1 \cdot 10^{-8}</math> mbar · l/s</li> </ul>
<b>Description</b>	Self-sealing spring-loaded valve mechanism / Male thread and female thread (union nut) / Also available as flange connection	Connection between switchgear and handling equipment or analytic instrument	–



GMA	GTR	GFA	GCP
Gas manifold	Gas transition piece	Gas filling adapter	Gas protective cap
<ul style="list-style-type: none"> <li>Vacuum-resistant and pressure-tight (-1 ... +64 bar)</li> <li>Tested helium tightness of 100 %</li> <li>Operating temperature -40 ... +80 °C</li> <li>Leakage rate: <math>\leq 1 \cdot 10^{-5}</math> mbar · l/s</li> </ul>	<ul style="list-style-type: none"> <li>Vacuum-resistant and pressure-tight (-1 ... +64 bar)</li> <li>Tested helium tightness of 100 %</li> <li>Operating temperature -40 ... +80 °C</li> <li>Leakage rate: <math>\leq 1 \cdot 10^{-5}</math> mbar · l/s</li> </ul>	<ul style="list-style-type: none"> <li>Vacuum-resistant and pressure-tight (-1 ... +64 bar)</li> <li>Tested helium tightness of 100 %</li> <li>Operating temperature -40 ... +80 °C</li> <li>Leakage rate: <math>\leq 1 \cdot 10^{-5}</math> mbar · l/s</li> </ul>	Operating temperature -40 ... +80 °C
Manifolds are used to distribute one joint to multiple joints for connecting multiple chambers simultaneously.	The transition valve group is used to connect two joints that cannot be directly connected.	The correct handling of SF <sub>6</sub> gas is important and requires the correct components and tools to be used. The filling adapter enables the safe filling and refilling of SF <sub>6</sub> gas-filled equipment and systems. All connecting parts are a perfect fit and specially designed for this application.	The protective cap serves to protect against dirt and damage.



# GAS ANALYSIS

**Discharges during switching operations in plants filled with SF<sub>6</sub> gas or an alternative gas lead, over time, to increased concentrations of toxic and highly corrosive decomposition products.**

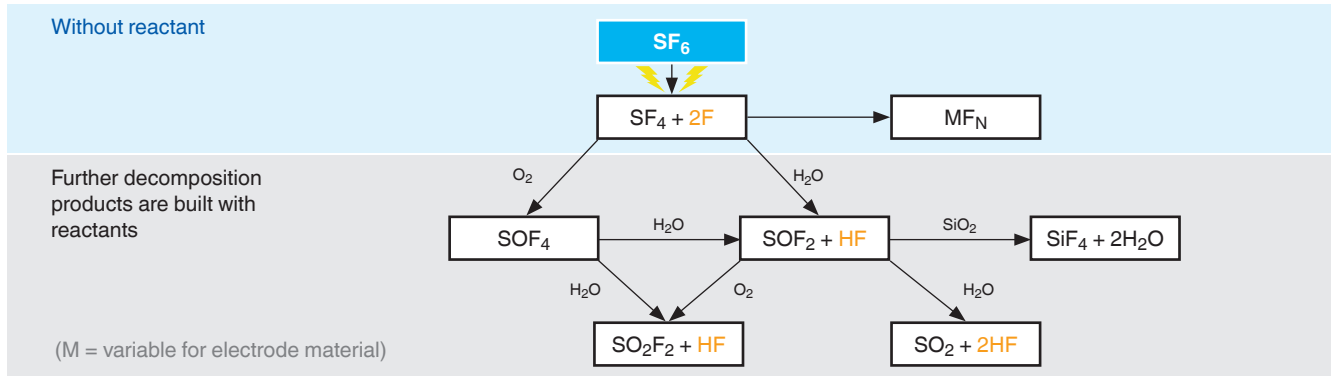
The formation of decomposition products is dependent on the amount of air and humidity reactants in the SF<sub>6</sub> or alternative gas during the discharge. These contaminants (air, humidity and decomposition products) prevent the continued safe operation of the switchgear.

In particular, the decomposition products strongly attack and corrode the surfaces within the tank. This progressively reduces the dielectric strength of the insulation materials in the switchgear.

The use of gas analysis instruments is absolutely necessary to monitor the concentration of harmful decomposition products, thus ensuring long-term plant safety.

## Formation of decomposition products

With energy input during plant operation, the otherwise stable  $\text{SF}_6$  gas decomposes into reactive and corrosive products such as  $\text{SF}_4$  and other compounds (see illustration “Formation of decomposition products”). From the reactants of air and humidity in the gas, further decomposition products are formed.



Chemical	Stability in air	End products	Common limit values [ppm <sub>v</sub> ]	Odour
$\text{S}_2\text{F}_{10}$ disulphur decafluoride	stable	$\text{SF}_4$ , $\text{SF}_6$	0.01	acid
$\text{SF}_4$ sulphur tetrafluoride	fast decay	$\text{HF}$ , $\text{SO}_2$	0.3	acid, sour
$\text{SO}_2\text{F}_2$ sulphuryl fluoride	stable		0.3	odourless
$\text{SOF}_4$ Thionyl tetrafluoride	stable	$\text{SO}_2\text{F}_2$	0.5	sour
$\text{SiF}_4$ Silicon tetrafluoride	fast decay	$\text{SiO}_2$ , $\text{HF}$	0.5	pungent
$\text{SO}_2$ sulphur dioxide	stable		1.0	acid
$\text{SOF}_2$ Thionyl fluoride	slow decay	$\text{HF}$ , $\text{SO}_2$	1.5	acid, pungent
$\text{HF}$ Hydrogen fluoride	stable		2.0	sour
$\text{SF}_6$ sulphur hexafluoride	stable		1,000	odourless

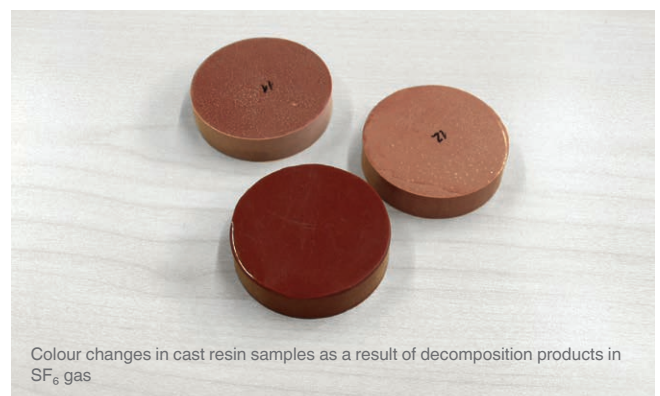
## Quality directives

The IEC and CIGRE organisations develop criteria and limit values for  $\text{SF}_6$  gas. These specify the limits at which a contamination exists, and how the correct handling of the  $\text{SF}_6$  gas used in switchgear should be made.

The permissible guideline values are stated in IEC 60480, the “Guidelines for the checking and treatment of sulphur hexafluoride ( $\text{SF}_6$ )”.

### Maximum concentration of contaminants in $\text{SF}_6$ gas for reuse (in accordance with IEC 60480):

- Air and/or  $\text{CF}_4$ : 3 %
- Gaseous decomposition products: 50 ppm<sub>v</sub>
- Humidity: Dew point:
  - 23 °C (filling pressure < 200 kPa abs.) or
  - 36 °C (filling pressure > 200 kPa abs.)



# DETECTION INSTRUMENTS

Leakage in switchgear can cause high maintenance costs and, depending on the size, can quickly become a safety risk. Thus, gas leaks must be pinpointed promptly and reliably and then eliminated.



## Leak location

### GIR-10 2,000 ppm<sub>v</sub>

The GIR-10, with a measuring range of 2,000 ppm<sub>v</sub> is the ideal measuring instrument for locating the leak on-site and to make a quantitative measurement of it.

Thus specific repair measures can be taken. The leak location using infrared spectroscopy is neither distorted by humidity or common volatile organic compounds, nor by wind.



## Emission monitoring

### GA35 SF<sub>6</sub> monitor

Stationary measuring instrument for the monitoring of the concentration of SF<sub>6</sub> gas in the ambient air to guarantee occupational safety in enclosed spaces.

The instrument continually checks the room air with a non-dispersive infrared sensor. Via a high-volume alarm, there is an immediate warning of any hazardous gas concentrations in the air. Usually, samples are taken continuously, close to gas tanks or gas-insulated switchgear, from which large quantities of SF<sub>6</sub> gas could escape within a short period of time.

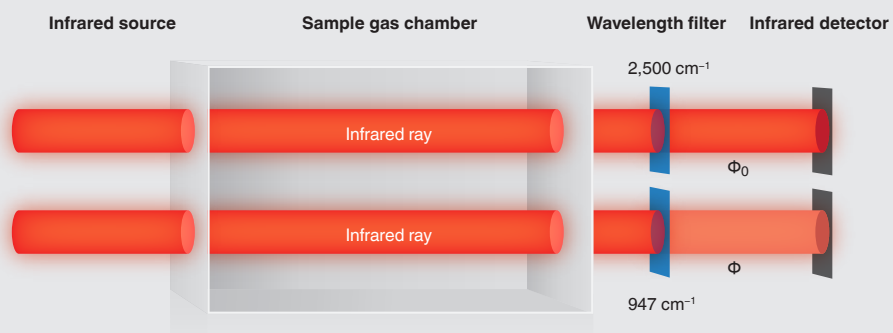






## Infrared technology measurement principle

### Non-dispersive infrared technology



#### The Lambert-Beer law

$$A = -\lg \frac{\Phi}{\Phi_0} = \epsilon \cdot c \cdot l$$

- A: Absorption
- $\Phi$ : Light intensity after absorption of  $\text{SF}_6$  gas
- $\Phi_0$ : Light intensity without absorption
- $\epsilon$ : Extinction coefficient
- $c$ : Concentration
- $l$ : Length of the irradiated chamber (sample gas chamber)

# PRODUCT OVERVIEW FOR GAS ANALYSIS

## Quality measurement



Model	GA11 SF <sub>6</sub> in N <sub>2</sub> /CF <sub>4</sub>	GA11 C4-FN gas mixture in CO <sub>2</sub>	GA11 N <sub>2</sub> in SF <sub>6</sub> /He
Model designation	Analytic instrument for SF <sub>6</sub> gas	Analytic instrument for C4-FN gas mixtures	Analyser for nitrogen
Parameters	Frost point/Dew point SF <sub>6</sub> percentage SO <sub>2</sub> , HF, H <sub>2</sub> S	Frost point/Dew point C4-FN gas mixtures in CO <sub>2</sub> Percentage O <sub>2</sub>	Frost point/Dew point N <sub>2</sub> percentage, O <sub>2</sub> Helium in nitrogen SF <sub>6</sub> in nitrogen
Special features	<ul style="list-style-type: none"> <li>■ SF<sub>6</sub> quality measurement with pump-back function</li> <li>■ Battery/mains operated</li> </ul>	<ul style="list-style-type: none"> <li>■ C4-FN gas mixtures quality measurement with pump-back function</li> <li>■ Battery/mains operated</li> </ul>	<ul style="list-style-type: none"> <li>■ Nitrogen quality measurement with pump-back function</li> <li>■ Battery/mains operated</li> </ul>
Data sheet	SP 62.11	SP 62.11	SP 62.11

## Accessories



Model	GA45
Model designation	SF <sub>6</sub> -Recovery-Bag Gas recovery bag
Parameters	–
Special features	<ul style="list-style-type: none"> <li>■ Space-saving as foldable</li> <li>■ 110 l capacity</li> <li>■ Overpressure safety</li> </ul>
Data sheet	SP 62.08

## Leak location/leak test



Model	GIR-10	GPD-1000
Model designation	SF <sub>6</sub> -IR-Leak	SF <sub>6</sub> detection instrument
Parameters	0 ... 50 ppm <sub>v</sub> 0 ... 2,000 ppm <sub>v</sub>	–
Special features	<ul style="list-style-type: none"> <li>■ Non-dispersive infrared sensor</li> <li>■ Portable battery-operated instrument</li> <li>■ Switchable to leakage rate</li> </ul>	<ul style="list-style-type: none"> <li>■ Based on the negative corona principle</li> <li>■ Portable battery-operated instrument</li> <li>■ Adjustable sensitivity</li> <li>■ Acoustic signal</li> </ul>
Data sheet	SP 62.02	SP 62.18

## Emission monitoring



Model	GA35
Model designation	SF <sub>6</sub> -IR-Monitor
Parameters	0 ... 2,000 ppm <sub>v</sub>
Special features	Non-dispersive infrared sensor
Data sheet	SP 62.06



# FILLING AND HANDLING EQUIPMENT

Filling and handling equipment for SF<sub>6</sub> gas are the central tools for the maintenance of gas-insulated equipment. Both for the installation as well as for the maintenance of gas-insulated equipment in power transmission and distribution, WIKA delivers the complete product range of efficient filling and handling equipment.

The core processes are the evacuation, initial filling, extraction, gas preparation and refilling of SF<sub>6</sub> equipment. Furthermore, the instruments support the plant operator with the recording of the SF<sub>6</sub> gas volumes and emissions, as is prescribed in the F-gas regulation (EU), no. 2024/573, for specified equipment.

WIKA is a specialist for safe SF<sub>6</sub> gas handling and simple user guidance which is especially reflected in the products of the fully automatic series GPU-x-x000. The motto: Simple and intuitive for more safety!

## Criteria for plant definition





- |  |   |
|--|---|
| 1. How much SF <sub>6</sub> gas should be transferred and in what time?            | 1. Air flow or mass flow                              |
| 2. Which storage vessel should be installed?                                       | 2. External storage vessel                            |
| 3. What are the accessibility and connection possibilities at the gas compartment? | 3. Hose lengths and connecting parts                  |
| 4. Which operating concept?  | 4. Automatically programmed control or manual control |
| 5. Into which region will the plant be delivered?                                  | 5. Applicable standards                               |
| 6. Where will the plant be used?   | 6. Indoor or outdoor switchgear                       |

In accordance with the above definition, WIKA can offer standard plants or – with special processes and further definition – engineer special plants.

## SF<sub>6</sub> service equipment

### GPU-x-2000, GPU-x-3000



	GPU-B-2000	GPU-S-2000	GPU-B-3000	GPU-S-3000
Fully automatic operation	✓	✓	✓	✓
Intuitive operation by means of a 10" IntelliTouch touchscreen	✓	✓	✓	✓
Fast SF <sub>6</sub> gas recovery for large gas compartments 	✗	✗	✓	✓
Additional SIL 2 safety control with SF <sub>6</sub> gas warning device 	✗	✓	✗	✓

### Safety at WIKA

Safety for people and the environment is the highest priority of WIKA. Preventing or detecting emission of the SF<sub>6</sub> gas during handling and ensuring safe operation is of the utmost importance not only for reasons of climate protection, but also because of personnel safety. The aim is to provide a safe system that limits emissions to a minimum and at the same time almost excludes any faults in application.

**WIKA is the only provider of SF<sub>6</sub> handling equipment with a safety control in accordance with SIL 2 / PL d.**

This unique safety concept is an integral part of the GPU-S-x000 series. Therefore, errors during handling and the resulting emission of SF<sub>6</sub> to the atmosphere are technically impossible.



GFK-10 are portable filling kits which allow filling and refilling of the SF<sub>6</sub> gas plants directly from a gas cylinder.

The GFU08 series of modular gas cylinder transport carts are used for the filling and refilling of SF<sub>6</sub> gas in the required gas compartment. The modular design enables worldwide application through the various mechanical and electrical connections.

The model GPU-10 SF<sub>6</sub> service equipment has been developed specifically for the mobile operation of SF<sub>6</sub> gas-filled plants. Through the handy dimensions and the rubberised tyres, the SF<sub>6</sub> service equipment can be moved easily to different locations. The GPU-10 can be used for the filling, cleaning, recovery, evacuation and venting of SF<sub>6</sub> gas-filled switchgear and other SF<sub>6</sub> gas-filled equipment. The individual components, such as the SF<sub>6</sub> transfer unit can easily be removed from the equipment and be operated individually. This modular design ensures easy and flexible transport.

## Gas handling equipment



Model	GFK	GFU08	GPU-10	GPU-x-x000
<b>Model designation</b>	Gas filling kit	SF <sub>6</sub> filling cart	SF <sub>6</sub> handling and filling equipment	SF <sub>6</sub> handling and filling equipment
<b>Process</b>	Gas filling	Gas filling and evacuation	Gas handling	Automatic gas handling
<b>Description</b>	<p>High quality for safe handling. The correct handling of SF<sub>6</sub> gas is important and requires that the right components and tools are used. The GFK-10 filling kit enables the safe filling and refilling of SF<sub>6</sub> gas-filled equipment and systems. All connecting parts are precision-fit and specially designed for this application.</p> <p>Easy handling</p> <p>For filling or refilling, the required filling pressure is set on the pressure reducer. The filling hose is connected to the equipment via the self-closing valves. The pressures can be checked via the two pressure gauges and regulated via the pressure reducer.</p>	<p>The filling cart model GFU08 enables simple and comfortable transport of the gas cylinders to the site of operation. The desired target pressure can be set using a pressure reducer. An optionally available balance allows the user to check the transferred SF<sub>6</sub> gas volume. A wide range of optionally available vacuum pumps allows you to evacuate air from the gas compartment before filling it with SF<sub>6</sub>.</p>	<p>The GPU-10 can be used for the filling, cleaning, recovery and venting of SF<sub>6</sub> gas-filled equipment.</p> <p>The individual components can easily be removed from the equipment and be operated individually. This modular design ensures easy and flexible transport.</p>	<p>The WIKA-GPU-x-x000 platform offers the highest level of comfort due to ease of operation and low maintenance effort.</p> <p>In fully automated processes, the main functions include filling, extraction and cleaning of SF<sub>6</sub> gas, evacuation and filling of switchgear, linear accelerators and other SF<sub>6</sub> gas-filled equipment. This plant can also be easily consolidated with SF<sub>6</sub> gas cylinders and tanks.</p> <p>Optional and unique in the market is the additional SIL 2 safety control which, in addition to the redundant pressure and weight measurement system, also includes a SIL 2 SF<sub>6</sub> gas sensor, thus making it impossible for larger amounts of SF<sub>6</sub> to be emitted unnoticed.</p>
<b>Data sheet</b>	SP 61.20	SP 63.08	SP 60.25	SP 63.16

## Gas handling equipment



GAD-2000
Automatic SF <sub>6</sub> dehydration during operation of the switchgear
Drying/Filtering
<p>The gas dehydration system, model GAD-2000, can reduce the humidity content of SF<sub>6</sub> gas-filled equipment.</p> <p>It takes the gas out, dries it independently and fills it back to the gas compartment. The double safety system consisting of an implemented SIL 2 safety control and a status query of the gas density monitor enables a risk-free and trouble-free execution during the operation of the switchgear.</p>
SP 63.14

## Accessories



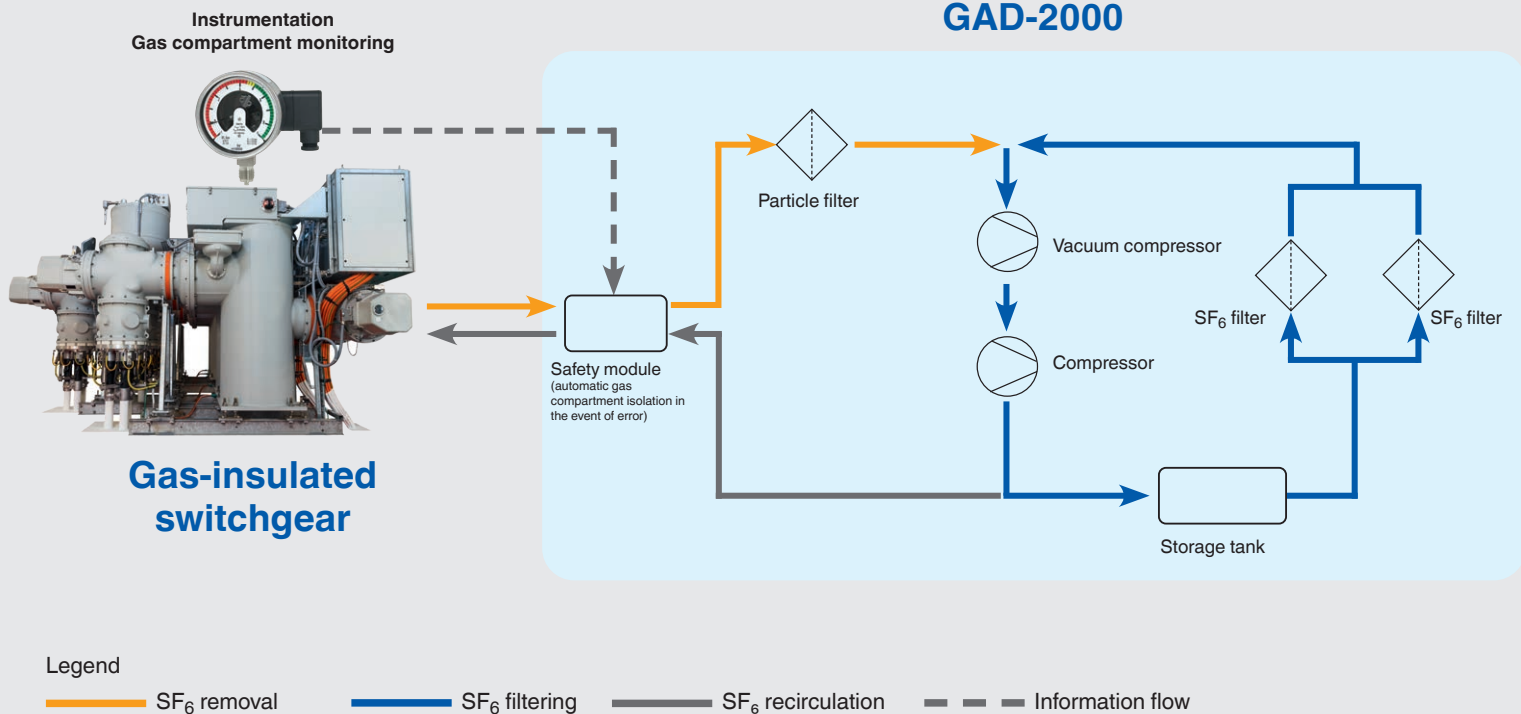
Model	GPF-10	GWS-10
<b>Model designation</b>	Portable SF <sub>6</sub> filter unit	Portable SF <sub>6</sub> gas cylinder scale
<b>Process</b>	Filtration	Determining the transferred SF <sub>6</sub> gas mass
<b>Description</b>	Filtering out of particles, humidity and decomposition products	Measuring the gas cylinder weight before and after the filling/extraction
<b>Data sheet</b>	SP 63.11	SP 63.09

## Product characteristics GAD-2000

- Ensuring system safety through a double safety system. Continuous checking of monitoring instrumentation from the gas compartment, plus an additionally implemented SIL 2 safety control
- Efficient reduction of maintenance costs and plant downtime on SF<sub>6</sub> gas-filled equipment through gas dehydration during plant operation
- Use of two parallel filters (model GPF-10) for high water absorption capacities
- Oil-less compressor
- Oil-less vacuum compressor
- Low maintenance effort
- Easy and intuitive operation via 7" touchscreen



## Automatic gas dehydration with the GAD-2000





## Moisture in SF<sub>6</sub> gas-filled equipment – the root of all evil

In medium and high-voltage switchgear of the electricity grid operators, the gas acts as an extremely efficient insulation medium and operates as the arc quenching during the switching process. Pure SF<sub>6</sub> gas provides the ideal solution due to its high dielectric strength and its ability for recombination.

The reality is usually different, since absolutely pure SF<sub>6</sub> is found in very little SF<sub>6</sub> gas-filled equipment. Depending on the amount of reactants present, with humidity occurring the most frequently, following energy input, highly toxic decomposition products are formed. These decomposition products attack the surfaces of tanks and cause them to corrode. Furthermore, they increasingly reduce the dielectric strength of the insulation materials in the switchgear.

## Act in time, without downtimes - gas dehydration of assets during operation

The gas dehydration system, model GAD-2000, enables you to reduce the humidity content in your SF<sub>6</sub> gas-filled equipment. The unit takes the gas out of the compartment, dries it independently within the machine and fills it back to the gas compartment. Due to the double safety system, consisting of implemented SIL 2 safety control as well as the processing of the signals from the gas compartment monitoring instrumentation, it is possible to carry this out without risk and trouble-free during continuous operation.

## Everything at a glance, thanks to GSM data transfer

The GAD-2000 can be equipped, optionally, with a GSM module for data transfer to the mobile device of the operator. For example, information regarding the estimated remaining time of the process or the current humidity values in the gas compartment, as well as information on necessary service operations, such as a filter replacement, are transmitted. Thus, after commissioning, the user can leave the instrument to operate independently and look after other tasks, even at different locations.

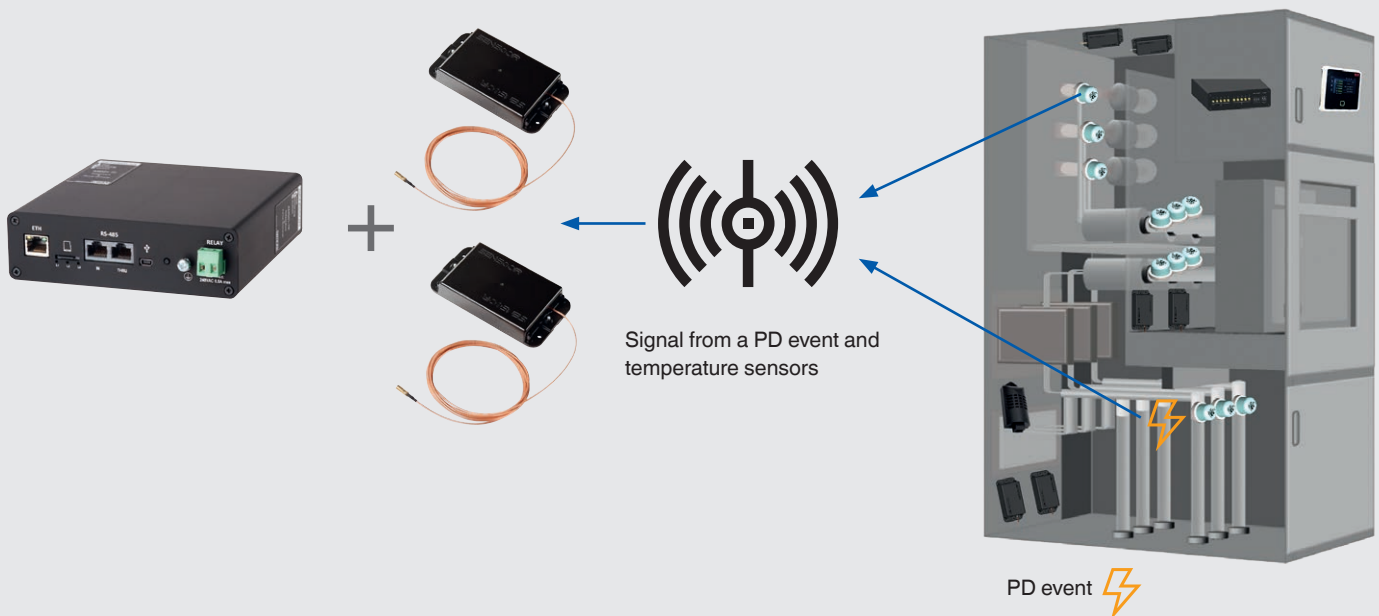


# PARTIAL DISCHARGE AND TEMPERATURE MONITORING FOR MV SWITCHGEAR

Dealing with unexpected switchgear failures and costly maintenance can be a major challenge. Field experience shows that approximately 75 % of breakdowns can be prevented through early fault detection, significantly reducing maintenance costs and intervals. Our solution enhances the safety, efficiency, and longevity of medium-voltage switchgears. SENSEOR addresses these issues using the latest

surface acoustic wave and ultra high frequency sensor technologies, integrated into an advanced IIoT platform. The solution monitors temperature and partial discharges with wireless, batteryless sensors, protecting your equipment from overheating and failure. Designed for installation within metallic AIS & GIS switchgear cabinets and compliant with IEC 62271

## Operating principle of partial discharge and temperature monitoring



The UHF signal generated by the PD event and from the temperature sensor (surface acoustic wave – piezoelectric substrate) are captured by the antennas and then analysed by the IIoT platform.

## AMS01 - Reader

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The AMS01 reader is dedicated to monitoring electrical equipment like switchgear. The temperature of live conductors is measured by SAW wireless, batteryless sensors to prevent overheating and overload.

Partial discharges are measured by antenna pairs to prevent equipment failure. Ambient temperature and humidity can also be measured through an environmental sensor wired to the reader.

The reader is intended to be installed in low-voltage compartments of switchgear or in similar type of assets. It can also be installed in a weatherproof environmental enclosure.



## AN-F1 - Antenna

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AN-F1 antennas with various cable lengths are dedicated to switchgear monitoring by measurement using TSAEV11 temperature sensors and partial discharge detection and are connected to the AMS01 reader.

## TSA-EV11 – Temperature sensor

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TSA-EV11 sensors are passive SAW temperature sensors dedicated to switchgear monitoring. They measure the temperature of live conductors and prevent overheating and overload.



## EXT-ENV-SENS – Environmental sensor

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Dedicated to switchgear monitoring, the EXT-ENV-SENS sensor for ambient temperature, relative humidity and dew point is wired to the reader (AMS1) to complement the partial discharge data.



# WEGRID ASSET PROTECTION – EVERYTHING FROM ONE SOURCE

**“Everything that can be digitalised will be digitalised.”**

**— Carly Fiorina, former CEO HP.**

**In the realm of SF<sub>6</sub> gas-filled systems, this adage holds true.**

**WEgrid Solutions** is dedicated to safeguarding people, machinery, and the environment in the power transmission industry. A pivotal step in achieving this mission is the digitalisation of gas monitoring.

## **WEgrid Asset Protection: the solution**

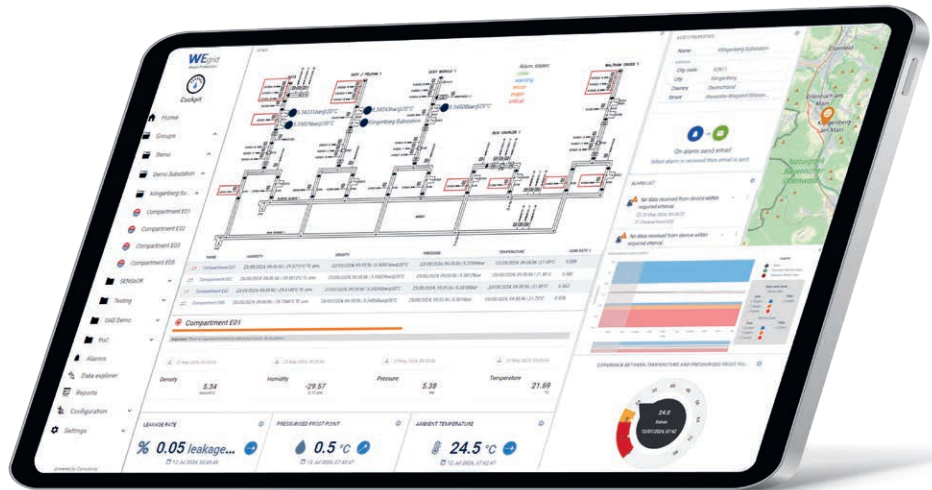
Our comprehensive approach provides intelligent solutions to our customers. With over 40 years of experience in the SF<sub>6</sub> gas industry and an innovation-driven expert team, WEgrid Asset Protection offers a turnkey concept.

## **Online monitoring for SF<sub>6</sub> gas**

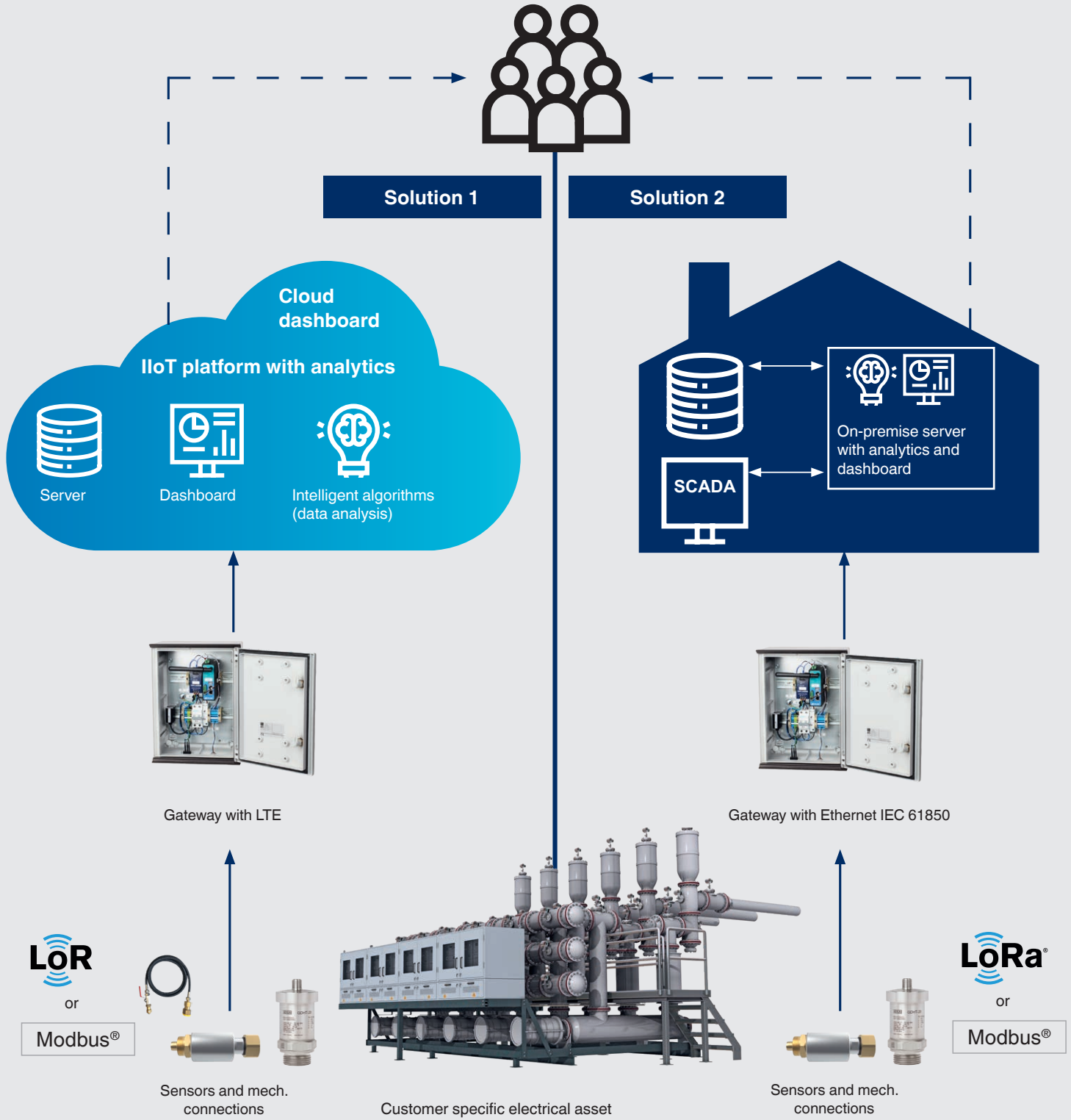
At the heart of WEgrid Asset Protection lies online monitoring of the insulating gas in your SF<sub>6</sub> gas-filled plant. Our cutting-edge sensors continuously communicate with a data centre. This centre analyses transmitted values and promptly alerts you in case of leaks or increased humidity in the insulating gas. You can also access these values directly whenever needed.

## **Looking ahead with intelligent algorithms**

But that's not all. Our intelligent system acquaints itself with your plant. Specially developed algorithms adapt to each gas compartment and calculate reliable trends from the measured data, allowing you to proactively address issues. The motto here is clear: Act rather than react. This transition from time-based maintenance to condition-based maintenance ensures optimal performance.



# System architecture



## On-prem or cloud-based

Whether you choose an on-premise solution integrated into your existing IT infrastructure and SCADA system or opt for direct connection to our WEgrid cloud via a **web application**, WEgrid Asset Protection ensures the shortest project lead time and maximum flexibility. Regular updates of new features are also part of the subscription package.

## Products

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Our digital sensors are the foundation of WEgrid Asset Protection. They measure, reliably and continuously, all important gas parameters.

Thanks to WIKA's extensive portfolios of adapters, these transmitters can be used almost anywhere and are also suitable for retrofitting.

## Data information

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Measured values can, with the aid of common industrial protocols (e.g. IEC61850 or DNP3), be fed directly into your SCADA system for further processing.

## Data management

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Our online sensors measure the condition of your SF<sub>6</sub> gas at short intervals. The transmitted values are managed and stored in our system. In addition, the measured values can, with the aid of common industrial protocols (e.g. IEC61850, DNP3 or OPC UA), be fed directly into your SCADA or ERP system for further processing.

## Intelligence

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Our algorithms constantly analyse the measured values for unusual deviations and detect anomalies. With the help of the information obtained, forecasts are made for the future development of the gas parameters. This enables efficient condition-based maintenance planning.

## Visualisation

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All historical and live readings and forecasts are graphically presented on a digital dashboard. Thus, you always have the perfect overview of the condition of your facilities. In addition, reports can be created.

## Predictive maintenance

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If gas density decreases or humidity content increases, rapid action is important. Our system informs you in the event of exceeding limit values and anomalies, even on your mobile device.

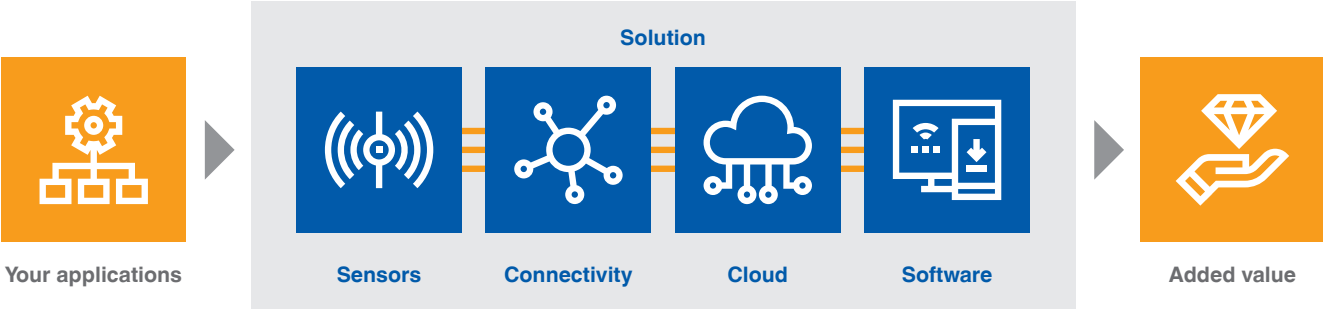
## Engineering and installation

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We are a reliable long-term partner for you. We will take care of planning and implementation of your digitalisation project and assist with our advice. Our expert team commissions our products and the entire system on-site at your premises.

**We appreciate individuality of our customers and their wishes. That is why we offer flexible models of our concept and we will be glad to advise you about possible module combinations.**

# WIRELESS GAS DENSITY MEASUREMENT



## GAS DENSITY SENSOR GD-20-W

The model GD-20-W gas density sensor utilises high-accuracy sensor technology with a wireless LoRaWAN® output signal. It offers a long battery life, very good long-term stability and compact design. The sensor calculates gas density accurately, compensating for pressure changes due to thermal effects, making it maintenance-free and reliable for various applications in closed tanks and electrical equipment.

Due to the integrated battery-powered design, the sensor requires minimal installation effort and is ideal for retrofit applications.



## LORA, LTE AND 5G NETWORKS

Secure data transmission guaranteed: With mobile technologies such as LTE/5G and LTE-M or LPWAN, there is always an optimum solution for your specific requirements.

As a founding member of the mioty alliance, WIKA supports the innovative LPWAN standard and helps customers set up a private LoRaWAN® network with LORIoT servers or other hosts.





## CUSTOMISED DATA PROCESSING

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**IloT cloud solution:** The WIKA IloT cloud enables device management, data acquisition, data storage, and the creation of an application-specific digital twin. The generic device manager detects and decodes data from wireless instruments – quickly, securely, and reliably. This instrument data is recorded and stored in the databases in accordance with the digital twin of the customer system, where it is available to the application-specific forecasting algorithms. With appropriate authorisation, both internal and external applications, can access this data via a secure API backend layer.

**On-premise IloT solution:** If you prefer a stand-alone solution, WIKA will install all the necessary components at your location to implement a self-sufficient system. WIKA's IloT cloud and on-premise solutions are continuously improved and developed to ensure that your valuable data remains available and protected at all times.

## PERFECTLY SCALABLE FOR YOUR BUSINESS

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WIKA's IloT application solutions help you optimise processes, increase efficiency and achieve added value. The applications adapt seamlessly to your individual requirements and offer:

- An overview of all devices, assets and their digital twins
- Configurable parameters for each instrument
- Adjustable alarms and events
- Intuitive dashboard for data visualisation
- Special presentations for diagnostic and documentation purposes

No installation required – simply access WIKA's IloT cloud solution via a web browser.





# TRAINING

Due to the immense climatic effects, SF<sub>6</sub> gas is an important topic worldwide, on which there is a need for action to eliminate emissions.

The consequences are governmental controls with the requirement for verification of the SF<sub>6</sub> filling volumes in plants. In the seminars, WIKA informs about the applicable regulations coupled with practical knowledge for the selection and operation of the right equipment.

We offer many different topics

- Basic understanding
- Rules and regulations
- Emission monitoring
- Density measurement and humidity measurement
- Connecting parts
- Filling and handling equipment
- Analysis
- Detection

# Certification

EU regulation no. 2024/573 on fluorinated greenhouse gases replaced the previous (EC) 517/2014 with effect from 12 March 2024. The new regulation limits the validity of the certificates to 7 years. Until the new implementing regulation comes into force, by 12 March 2026 at the latest, training will take place based on regulation 2015/2066.

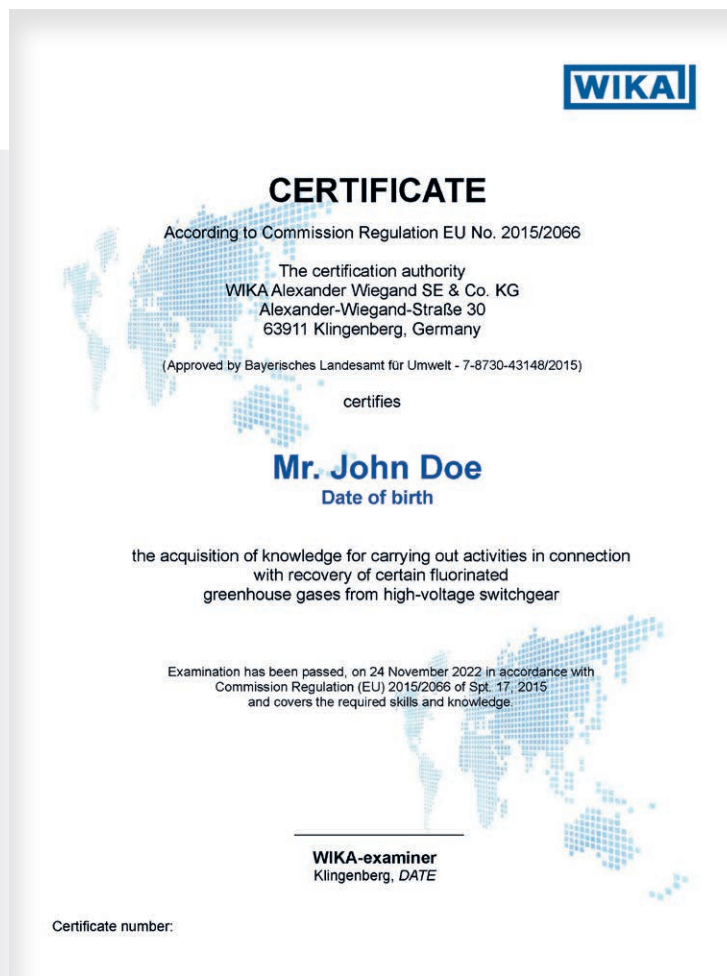
After the new enforcement regulation has entered into force, all certificate holders must have taken part in a refresher course by 12 March 2029. The regulation stipulates training measures for personnel who carry out work in connection with sulphur hexafluoride (SF<sub>6</sub> gas) and other fluorinated greenhouse gases.

In particular, this work includes:

- Installation, service, maintenance, repair or shutdown of gas-insulated electrical switchgear
- Performing leak testing on plants that fall under the F-gas regulation
- Recovery of SF<sub>6</sub> gas and other fluorinated greenhouse gases

As a testing and certification body recognised by the Bavarian state office, WIKA offers competence training with subsequent examination, so personnel can be certified across all of Europe. The training and certification is carried out in accordance with the European regulations (EU) 2015/2066 as well as the chemicals climate protection regulation.

Certified WIKA instructors pass on their extensive know-how for daily, practical application. Among those we train are installers, service technicians and maintenance personnel.



# WEGRID SERVICES

## Worldwide service network with system calibration

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To keep your machine and instrument availability at a high level, simply have your instrument calibrated in a WIKA service hub.

## Repair service

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No matter which continent you are located on, there's always a local contact person available for repairs.

## Spare parts service

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Order any spare parts for machines and instruments in a quick and reliable manner, thus increasing your availability of machines.



## Laboratory analysis of SF<sub>6</sub> and alternative gases

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Get certainty about the composition of the gases in your gas compartments and task us with a gas sample analysis.

## Consulting

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New territory? No problem - we have many years of experience in the area of SF<sub>6</sub>/alternative gases and we would be very happy to handle your concerns.

## Digitalisation

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Regardless of whether it is a new project or an existing plant. Enjoy the advantage of solutions from a single source.

## Rental and hire service for equipment

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We offer you the necessary flexibility – plan when, where and how long you need equipment to prevent short-term bottlenecks.

## Returned goods

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If needed, your local contact person will quickly assist you and support you in organising and expediting the return transport of the equipment.



## Laboratory analysis of SF<sub>6</sub> and alternative gases

On-site analysis does not always provide sufficient insight into the complete composition of the gas in question. To broaden the perspective and generate additional, empirical data, we'll go into detail for you.

For the analytics, we have the latest measuring equipment at our disposal, such as infrared spectrometers, gas chromatographs

and a scanning electron microscope with elemental analysis.

The various analyses are performed in accordance with the relevant standards such as IEC 60376 and IEC 60480.

Various laboratory areas are certified in accordance with IEC 17025.



### Our extensive range of services includes:

- Analysis of SF<sub>6</sub> for decomposition products and impurities
- SF<sub>6</sub> gas composition
- Analysis of C4-FN gas mixtures in matrix N<sub>2</sub> and CO<sub>2</sub> for decomposition products and impurities
- Gas composition of C4-FN gas mixtures in matrix N<sub>2</sub> and CO<sub>2</sub>
- Analysis of C5-FK gas mixtures in matrix N<sub>2</sub> and CO<sub>2</sub> for decomposition products and impurities
- Gas composition of C5-FK gas mixtures in matrix N<sub>2</sub> and CO<sub>2</sub>
- Analysis of dry and synthetic air for decomposition products and impurities
- Gas composition of dry and synthetic air
- Determination of the gas moisture by means of different technical procedures which correspond to the usual standards and are based on P2O5 phosphorus pentoxide, chilled mirror as well as capacitive and optical measurement procedures.

All services described above include the delivery of an official test report stating the declared measurement accuracies (and detection limits). If we detect the generation/formation of solids in your gases, we can also extend the range of services offered to include solids analysis using a scanning electron microscope (SEM).

The use of this service requires a gas sample shipment to the nearest gas laboratory. Depending on duration of customs and transport handling, a reaction of the more reactive decomposition products may occur.

# FACTS ABOUT SF<sub>6</sub> GAS

## SF<sub>6</sub> gas: the strongest known greenhouse gas

**In the atmosphere, SF<sub>6</sub> gas is undesirable due to its high global warming potential and it was listed, along with five other gases, in the Kyoto Protocol.**

Its climatic impact is 24,300 times greater than that of carbon dioxide, and its residence time in the atmosphere is approximately 3,200 years. Worldwide there are strict regulations that demand emission reductions in SF<sub>6</sub> gas.

In the EU, the F-gas regulation, (EC) no. 517/2014 on the limitation of greenhouse gas emissions, came into force in 2014. In this, the general requirements for the specific handling of SF<sub>6</sub> gas and other fluorinated gases (F-gases) were established. The updated regulation 2024/573 was released in February 2024.

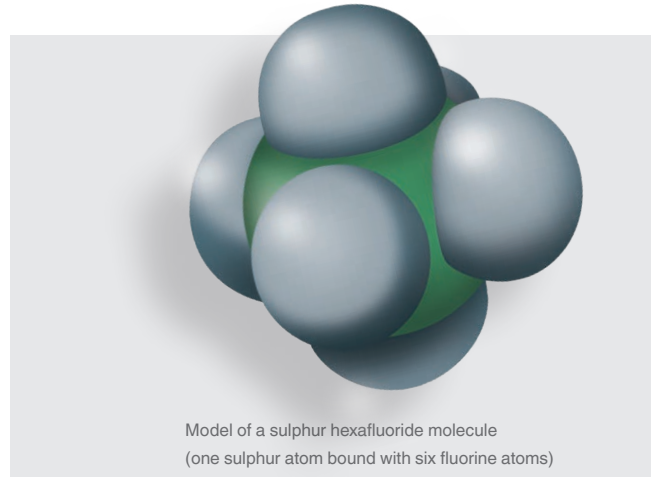
Gas losses on a component filled with SF<sub>6</sub> gas are both an environmental problem as well as a safety risk, with the associated production or plant shutdown and/or costly service call-outs.

In Germany, the producers of SF<sub>6</sub> gas and the manufacturers and operators of gas-filled switchgear have thus joined forces and signed a voluntary undertaking including emission limits.

The current state of the art for SF<sub>6</sub> gas-filled equipment is mature and is constantly evolving to take account of climate-related problems.

### Characteristics

- Chemical name: Sulphur hexafluoride
- Colourless, odourless, non-toxic, non-flammable, chemically inert
- High dielectric strength, almost 3 x higher than air or N<sub>2</sub>
- Climate-affecting CO<sub>2</sub> equivalent: 24,300
- Lifetime in the atmosphere: 3,200 years



### Applications

- For over 50 years in various segments of industry
- Switchgear and switch-disconnectors in electricity transmission and distribution
- Particle accelerators
- Radar systems
- X-ray equipment
- MRI instruments

In medium and high-voltage switchgear of the electricity grid operators, the gas acts as an extremely efficient insulation medium and operates as the arc quenching during the switching process.

The gas provides the ideal solution due to its high dielectric strength and its ability for recombination. Due to its superior properties in comparison with other media, such as air or nitrogen, plants can be built with much more compact dimensions.

# MILESTONES IN THE T&D- FOCUSED DIVISION AT WIKA

- 1976** Introduction of the first gas density monitor with temperature compensation
- 1992** The first generation of “Online Monitoring” with a gas density transmitter
- 2000** Introduction of the first gas density indicators, gas density switches and gas density monitors for medium-voltage systems
- 2005** Introduction of the second generation of “Online Monitoring” with a gas density transmitter with field case
- 2009** Acquisition of the SF<sub>6</sub> division of the gas analysis specialists G.A.S. in Dortmund
- 2010** Extension of the portfolio with valves and gas handling instruments
- 2013** Introduction of digital SF<sub>6</sub> condition transmitters of the “Smart Grid” generation
- 2015** Recognition as testing and certification body for personnel certification in the handling of SF<sub>6</sub>
- 2016** Market launch of the new generation of ground-breaking handling instruments
- 2017** Renaming the company division to WEgrid Solutions and extension of the portfolio with WEgrid Asset Protection
- 2020** Market launch of the first gas density monitor with reference chamber and display of the full measuring range on a 100-mm dial
- Market launch of compact and future-oriented smart grid gas density transmitters for SF<sub>6</sub> gas and alternative gas applications
- 2022** New edition and market launch of the hybrid gas density monitor series with bimetal and reference chamber compensation for highly accurate online monitoring
- Market launch of a fully automated calibration system for checking mechanical leakage detection systems such as gas density monitors, gas density indicators and gas density switches in accordance with regulation (EU) no. 2024/573.
- 2023** Integration of the French company SENSEOR and its solution for partial discharge and temperature monitoring of medium-voltage switchgear into the WIKA Group



# WIKA worldwide

## Europe

### Austria

WIKA Messgerätevertrieb  
Ursula Wiegand GmbH & Co. KG  
Tel. +43 1 8691631  
info@wika.at / www.wika.at

### Benelux

WIKA Benelux  
Tel. +31 475 535500  
info@wika.nl / www.wika.nl

### Bulgaria

WIKA Bulgaria EOOD  
Tel. +359 2 82138-10  
info@wika.bg / www.wika.bg

### Croatia

WIKA Croatia d.o.o.  
Tel. +385 1 6531-034  
info@wika.hr / www.wika.hr

### Denmark

WIKa Danmark A/S  
Tel. +45 4581 9600  
info@wika.as / www.wika.as

### Finland

WIKa Finland Oy  
Tel. +359 9 682492-0  
info@wika.fi / www.wika.fi

### France

WIKa Instruments s.a.r.l.  
Tel. +33 1 71 68 10 00  
info@wika.fr / www.wika.fr

### Germany

WIKa Alexander Wiegand SE & Co. KG  
Tel. +49 9372 132-0  
info@wika.de / www.wika.de

### Ireland

WIKa Instruments Ireland Limited  
Tel. +35 386 1449 360  
info@wika.ie / www.wika.ie

### Italy

WIKa Italia S.r.l. & C. S.a.s.  
Tel. +39 02 93861-1  
info@wika.it / www.wika.it

### Poland

WIKa Polska spółka z ograniczoną  
odpowiedzialnością sp. k.  
Tel. +48 54 230110-0  
info@wikapolska.pl  
www.wikapolska.pl

### Romania

WIKa Instruments Romania S.R.L.  
Tel. +40 21 4048327  
info@wika.ro / www.wika.ro

### Russia

AO "WIKa MERA"  
Tel. +7 495-648018-0  
info@wika.ru / www.wika.ru

### Serbia

WIKa Merna Tehnika d.o.o.  
Tel. +381 11 2763722  
info@wika.rs / www.wika.rs

### Spain

Instrumentos WIKa S.A.U.  
Tel. +34 933 9386-30  
ventas@wika.com.ar  
www.wika.com.ar

### Switzerland

WIKa Schweiz AG  
Tel. +41 41 91972-72  
info@wika.ch / www.wika.ch

### Türkiye

WIKa Instruments  
Eayel Ölçüm Cihazları Tic. Ltd. Şti.  
Tel. +90 216 41590-66  
info@wika.com.tr  
www.wika.com.tr

### Ukraine

TOV WIKa Prylad  
Tel. +38 044 496 83 80  
info@wika.ua / www.wika.ua

### United Kingdom

WIKa Instruments Ltd  
Tel. +44 1737 644-008  
info@wika.co.uk / www.wika.co.uk

## North America

### Canada

WIKa Instruments Ltd.  
Tel. +1 780 4637035  
info@wika.ca / www.wika.ca

### USA

WIKa Instrument, LP  
Tel. +1 770 5138200  
info@wika.com / www.wika.us

### Gayesco-WIKa USA, LP

Tel. +1 713 4750022  
info@wikhouston.com  
www.wika.us

### Mensor Corporation

Tel. +1 512 3964200  
sales@mensor.com  
www.mensor.com

## Latin America

### Argentina

WIKa Argentina S.A.  
Tel. +54 11 5442 0000  
ventas@wika.com.ar  
www.wika.com.ar

### Brazil

WIKa do Brasil Ind. e Com. Ltda.  
Tel. +55 15 3459-9700  
ventas@wika.com.br  
www.wika.com.br

### Chile

WIKa Chile S.p.A.  
Tel. +56 9 4279 0308  
info@wika.cl / www.wika.cl

### Colombia

Instrumentos WIKa Colombia S.A.S.  
Tel. +57 601 7021347  
info@wika.co / www.wika.co

### Mexico

Instrumentos WIKa Mexico S.A. de C.V.  
Tel. +52 55 50205300  
ventas@wika.com / www.wika.mx

## Asia

### China

WIKa Instrumentation Suzhou Co., Ltd.  
Tel. +86 512 6878 8000  
info@wika.cn / www.wika.com.cn

### India

WIKa Instruments India Pvt. Ltd.  
Tel. +1800-123-101010  
info@wika.co.in / www.wika.co.in

### Japan

WIKa Japan K. K.  
Tel. +81 3 5439-6673  
info@wika.co.jp / www.wika.co.jp

### Kazakhstan

TOO WIKa Kazakhstan  
Tel. +7 727 220 80 08  
info@wika.kz / www.wika.kz

### Korea

WIKa Korea Ltd.  
Tel. +82 2 869-0505  
info@wika.co.kr / www.wika.co.kr

### Malaysia

WIKa Instrumentation (M) Sdn. Bhd.  
Tel. +60 3 5590 6666  
info@wika.my / www.wika.my

### Philippines

WIKa Instruments Philippines Inc.  
Tel. +63 2 234-1270  
info@wika.ph / www.wika.ph

### Singapore

WIKa Instrumentation Pte. Ltd.  
Tel. +65 6844 5506  
info@wika.sg / www.wika.sg

### Taiwan

WIKa Instrumentation Taiwan Ltd.  
Tel. +886 3 420 6052  
info@wika.tw / www.wika.tw

### Thailand

WIKa Instrumentation Corporation  
(Thailand) Co., Ltd.  
Tel. +66 2 326 6876  
info@wika.co.th / www.wika.co.th

### Uzbekistan

WIKa Instrumentation FE LLC  
Tel. +998 71 205 84 30  
info@wika.uz / www.wika.uz

## Africa/Middle East

### Botswana

WIKa Instruments Botswana (Pty.) Ltd.  
Tel. +267 3110013  
info@wika.co.bw / wika.co.bw

### Egypt

WIKa Near East Ltd.  
Tel. +20 2 240 13130  
info@wika.com.eg / www.wika.com.eg

### Namibia

WIKa Instruments Namibia Pty Ltd.  
Tel. +26 4 61238811  
info@wika.com.na / www.wika.com.na

### Nigeria

WIKa WEST AFRICA LIMITED  
Tel. +234 17130019  
info@wika.com.ng / www.wika.ng

### Saudi Arabia

WIKa Saudi Arabia LLC  
Tel. +966 53 555 0874  
info@wika.sa / www.wika.sa

### South Africa

WIKa Instruments Pty. Ltd.  
Tel. +27 11 62100-00  
sales@wika.co.za / www.wika.co.za

### United Arab Emirates

WIKa Middle East FZE  
Tel. +971 4 883-9090  
info@wika.ae / www.wika.ae

## Australia

### Australia

WIKa Australia Pty. Ltd.  
Tel. +61 2 88455222  
sales@wika.com.au / www.wika.com.au

### New Zealand

WIKa Instruments Limited  
Tel. +64 9 8479020  
info@wika.co.nz / www.wika.co.nz

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**WIKa Alexander Wiegand SE & Co. KG**  
Alexander-Wiegand-Straße 30 | 63911 Klingenberg | Germany  
Tel. +49 9372 132-0 | info@wika.de | www.wika.de

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You can find further  
information here!



Smart in sensing

www.wika.com