

973-SF₆ Analyzer



Precise and Stable SF₆ Gas Analyzer

- Simultaneous measurement of humidity, SF₆ purity and SO₂ concentration
- Integrated gas recovery system with automatic pump back
- Fully automated SF₆ gas testing
- Fundamental drift-free measuring principle
- Measurement results at SF₆ compartment or standard pressure
- Intuitive color touch screen user interface
- User verifiable calibration
- Robust case for easy transportation

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Optimum SF₆ Gas Analysis Solution

The 973-SF₆ is an advanced analyzer for the measurement of humidity, SF₆ purity and SO₂ concentration in SF₆ gas insulated switchgears (GIS) and other high voltage equipment. With its internal gas containment and recovery system, the 973-SF₆ provides a high quality and environmentally safe measurement solution within a single, self-contained unit.

Pure SF₆ is the standard filling within GIS, but over time gas compartments become contaminated with water vapor (H₂O) through permeation and by desorption from internal components.

Whilst water vapor and SF₆ do not normally react with each other, in the presence of a high-energy discharge, hydrogen and oxygen disassociated from water vapor will react with the sulfur and fluorine from SF₆ to form decomposition by-products. These include sulfur dioxide (SO₂) and hydrofluoric acid (HF) that are corrosive to the internal components of gas compartments. SF₆ with low water vapor content (low humidity) significantly reduces the potential for formation of these corrosive compounds, which is why accurate and repeatable measurement data is an invaluable part of any GIS preventative maintenance program.

Accuracy and Repeatability using Advanced Chilled Mirror Technology

A polished mirror surface is cooled to the point at which condensation forms on the mirror surface, then the temperature is measured. Since this condensation temperature is specific to water vapor concentration, highly precise results are achieved without the need for humidity sensors.

Chilled mirror technology is the most accurate and reliable humidity measurement technique available. Since the 973-SF₆ employs the same condensation principle in the determination of SF₆ purity, the same high levels of repeatability and long-term stability are attained for both key SF₆ measurements.



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Innovative and Cost Effective SF₆ Analysis

Unlike dew point humidity sensor-based systems that rapidly and continually drift out of specification, the 973-SF₆ chilled mirror technology relies on the drift-free physical principles of condensation formation. Whilst sensor-based systems may

have a lower initial acquisition cost, on-going charges for sensor replacement, re-calibration, and the lower reliability of their measurements, make the 973-SF₆ a more cost effective option, precise and long term solution.

2.3	SO ₂ ppmv	<input type="text"/>
207.6	Humidity ppmv	<input type="text"/>
99.9	Volume SF ₆ %	<input type="text"/>
750.5	Vessel Pressure kPa abs.	<input type="text"/>
Start	<input checked="" type="checkbox"/> SO ₂ <input checked="" type="checkbox"/> Humidity <input checked="" type="checkbox"/> %Vol SF ₆	Pump <input type="checkbox"/> Internal Cylinder <input type="checkbox"/>

Intuitive User Interface

Measurement results are clearly presented on a clear full color touch screen in the units of choice. Results are held on the display for user notation and can easily be imported into Microsoft Excel using the software and cable supplied. The 973-SF₆ data format is compatible with test procedures issued by all major SF₆ equipment manufacturers and standards organizations such as Cigré and IEC.

User Verifiable Calibration with Ice Test Function

The melting point of ice at atmospheric pressure is always 0 °C. The 973-SF₆ takes advantage of this fundamental value to provide users with an immediate check of calibration stability with the Ice-Test function. During this automatic test, the mirror is cooled below 0 °C, causing water vapor from the air to condense and freeze on the mirror surface. The mirror is then warmed and whilst observing the mirror, the user simply presses the on-screen button to confirm the point at which the ice melts. The 973-SF₆ measures the mirror temperature at this point and provides a pass/fail indication on screen. The test can be repeated as often as required without affecting instrument performance.



Easy to Use and Minimal Maintenance

Taking a measurement using the 973-SF₆ could not be easier. Once connected to the gas compartment using the couplings provided, the user simply starts an automated test sequence and the instrument does the rest. Measurement results are held on the instrument display until the next measurement is started by the user, and SF₆ gas pump back can be user programmed to take place as part of the automated sequence. Full analysis and gas pump back is typically completed within 10 minutes and without user supervision.

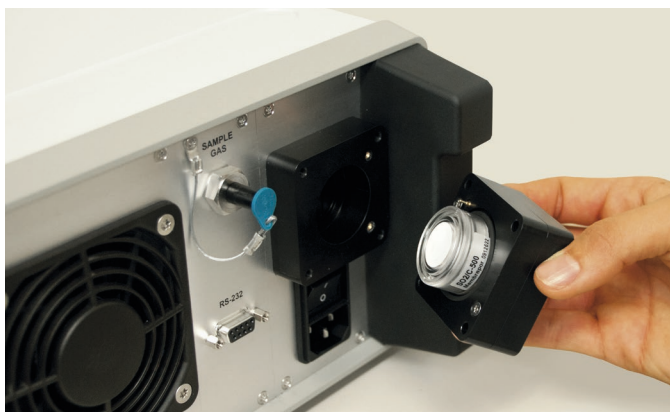
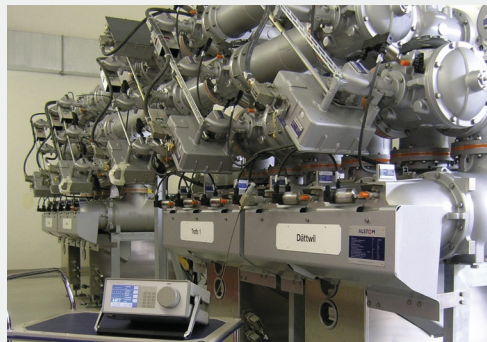
973-SF₆ maintenance is limited to occasional mirror cleaning and physical inspection of gas hoses. Automated tests and user warnings for key operational parameters such as pumping capability, cylinder capacity and correct pressurization allow the system to be easily managed by the user. There is no need for regular sensor replacement or return of the instrument for recalibration.



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Zero Emission Gas Analysis

The 973-SF₆ includes integrated gas recovery, allowing analysis to be performed without emission of SF₆ gas to atmosphere. During measurement, the 973-SF₆ pumps a sample from the gas compartment through the measuring head and into the internal storage cylinder. Once testing is completed, the gas can be pumped straight back to the compartment. Optionally, it may be held within the 973-SF₆ for later pump back into a waste cylinder. The 973-SF₆ incorporates a completely sealed, high-pressure pump and gas path for precise, zero-emission gas analysis.



SO₂ Measurement

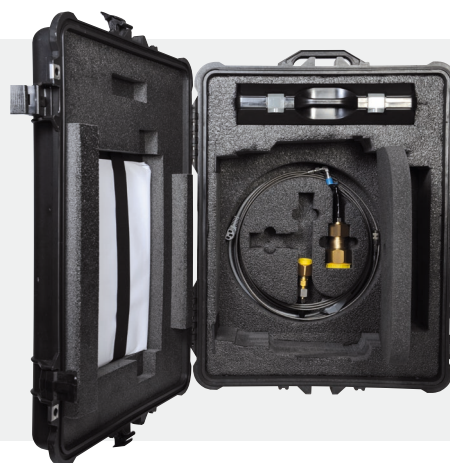
The 973-SF₆ is available with integrated measurement of SO₂ concentration (ppm_v). The electrochemical SO₂ measurement cell is conveniently located on the rear panel for simple user replacement with low cost, pre-calibrated, interchangeable SO₂ modules. From 2012, all new 973-SF₆ instruments are ready for SO₂ measurement, so if required, this option may be field upgraded by means of a plug-in sensor module and a software activation key. Earlier instruments can also be factory upgraded; please contact MBW or your local representative for guidance. All SO₂ sensors supplied by MBW are calibrated before delivery.

Transportable, Robust and Complete Analyzer Set

The 973-SF₆ is supplied in a robust, shock-resistant, waterproof case that is suitable for use on-site and for transportation.

Included in the instrument case:

- 6 m self-sealing armored sample tube
- Self-sealing DN8 and DN20 couplings
- USB stick with Excel Data Collection file
- Calibration Certificate
- 2.5 m power cable
- Maintenance kit
- Operating manual



Quality Assurance

High precision together with excellent reliability and stability make the 973-SF₆ the gas analyzer of choice for the major switchgear manufacturers.

All new and serviced instruments are delivered with a traceable calibration certificate that complies with the requirements of Quality Management Systems such as ISO9001 and to provide the user with confidence in the measurements obtained.

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Specifications:	973-SF ₆	
Measuring Range		
Frost/Dew Point	-50...+20 °C	
Humidity content by volume	40...20'000 ppm _v	
Humidity content by weight	5...2'500 ppm _w	
Volume SF ₆	80...100%	
Inlet pressure	120...1'000 kPa abs.	
Accuracy		
Frost/Dew point	≤ ± 0.5 °C	
ppm _v /ppm _w	≤ ± 1 ppm +6% of reading	
Volume SF ₆	≤ ± 0.5%	
Pressure	≤ ± 3 kPa	
Standard Features		
Digital I/O	RS-232	
Thermoelectric mirror cooling	3-stage	
Mirror temperature sensor	RTD (Pt100)	
Display	5.7" LCD with touch screen	
Internal gas tubes	Stainless Steel 316L / FEP	
SO ₂ preparation	Mechanically and electrically prepared, measurement cell cover fitted	
Gas connections	Self-sealing quick connect fitting (Swagelok® QM Series)	
Couplings	Self-sealing SF ₆ coupling DN8 (VK/F-02/8) and DN20 (VK/F-02/20)	
External sample gas tube	Self-sealing 6 m stainless steel armored PTFE tubing	
ORIS	Optimum Response Injection System	
Transport case	Custom fit foam lined Peli 1620	
Power cable	2.5 m	
Operating instructions	English, German, French or Italian	
Calibration certificate	Pressure calibration, 2-point dew/frost point, 3-point %Volume SF ₆	
Optional		
Internal SO ₂ -Module	Measuring range:	0...100 ppm _v or 0...500 ppm _v
	Accuracy:	< 2% of range or < 2% of range
	Sensitivity drift:	≤ 5% / year or ≤ 5% / year
	Life time:	2 years in normal operation
Additional Information		
Supply voltage	100-120 VAC / 200-240 VAC, 50/60 Hz (auto switching)	
Supply voltage fluctuations	up to ± 10% of nominal voltage / Overvoltage category II Rated pollution degree 2	
Power consumption	200 Watt	
Pump back pressure max.	900 kPa	
Cooling	Air	
Operational conditions	-10...+40 °C, 98 %rh, non-condensing, altitude up to 2000 m	
Storage temperature	-20 °C...+50 °C	
Outdoor use	Permissible, instrument must be protected against exposure to water.	
Weights & Dimensions	Instrument	In Transport Case
Width	420 mm	650 mm
Height	155 mm	370 mm
Depth	390 mm	510 mm
Weight	16.5 kg	32 kg

973-SF₆ V3.1 04.2016 We reserve the right to change design or technical data without notice.

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Ordering Information

	Order Code
973-SF ₆ Analyzer, SO ₂ ready Including transport case, 6 m stainless steel armored PTFE sample tube, DN8 and DN20 fittings	100054
Options:	
SO ₂ measurement module 100 ppm _v (factory fit)	103608
SO ₂ measurement module 500 ppm _v (factory fit)	103920
SO ₂ measurement module 100 ppm _v (sensor and software activation key for SO ₂ ready 973)	103941
SO ₂ measurement module 500 ppm _v (sensor and software activation key for SO ₂ ready 973)	103942
SO ₂ measurement module 100 ppm _v (retro-fit by return to MBW*)	103921
SO ₂ measurement module 500 ppm _v (retro-fit by return to MBW*)	103729
Additional 1 year warranty upgrade (max. 3 years)	103632
Accessories:	
6 m stainless steel armored PTFE tube	102764
12 m stainless steel armored PTFE tube	102674
3 m stainless steel armored PTFE tube	103640
3 m stainless steel armored PTFE tube extension with quick coupling	103464
6 m stainless steel armored PTFE tube extension with quick coupling	103465
973-SF ₆ Software USB stick, RS-232 cable, USB adapter	102968
Spare parts:	
SO ₂ sensor module 100 ppm _v including calibration	103915
SO ₂ sensor module 500 ppm _v including calibration	103916
SO ₂ sensor module 100 ppm _v including calibration, exchange	103917
SO ₂ sensor module 500 ppm _v including calibration, exchange	103918
For the complete range of options and accessories, please contact us and request our pricelist.	

* Older instruments may require additional modifications in order to be retro-fitted with the new SO₂ module. Please contact us to verify your serial number.

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