MEASURING QUALITY. SINCE 1796

KRÜSS
A.KRÜSS OPTRONIC
GERMANY

MODIFIED ATMOSPHERE TESTERS

GAS ANALYSERS FOR CONTROLLING PROTECTIVE GAS PACKAGING



MADE IN
GERMANY

www.kruess.com

A.KRÜSS OPTRONIC – CUTTING-EDGE TECHNOLOGY, MADE IN GERMANY

A.KRÜSS Optronic is a leading manufacturer of high-precision optoelectronic measuring devices and analytical instruments. The family enterprise founded in 1796 offers an extensive range of products and customised solutions for quality assurance in the pharmaceutical, chemical, petrochemical, food and beverage industry as well as for research and science. We also offer a wide variety of products for professional gemology. Whether it is a refractometer, polarimeter, density meter, gas analyser, flame photometer, melting point meter or microscope – our instruments meet the highest requirements in terms of speed, accuracy and reliability. Thanks to our strong R&D capacities, we are a driving force in the technology market setting the standards for functional scope and user-friendliness. A dense network of sales partners and certified service partners allows us to provide individual consultation as well as optimised service and support for our customers around the globe.

OVER 200 YEARS OF PIONEERING SPIRIT AND SUCCESS

1796

The Mechanicus Opticus Edmund Gabory sets up his optical workshop in Hamburg

1823

The daughter of the late Gabory, Mary Ann, marries Andres Krüss, who continues the company together with his brother-in-law, Edmund Nicolas. He responds to the increasing demand for nautical instruments by selling sea charts

1844

Andres Krüss establishes his own company Optisches Institut von A. Krüss and in 1848 incorporates Gabory into the company

1862

Andres' son, Edmund Johann Krüss, who took over the company in 1851, is awarded the first prize for his photographic lenses at the world exhibition in London

1865

Krüss has his improvement of the Laterna Magica patented

1888

The heydays of the company boasting many innovations and inventions begin after Edmund Johann Krüss's son, Hugo, took over the management. Dr. Hugo Krüss' handbook of electrotechnical photometry lays the groundwork for this subject

1920

The son of Dr. Hugo Krüss, Paul, takes over the company and leads it successfully through World War II and the time of reconstruction. He not only makes important contributions to the spectral analysis and photometry, but he also invents and produces the corresponding devices, among other things, for school lessons

1946

Ing. Andres Krüss becomes joint partner of the company in the sixth Krüss generation. Hard work and the economic miracle bring new markets and customers

1975

A.KRÜSS Optronic offers a digital tensiometer for the automatic measurement of boundary and surface tension of liquids

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1980

Andres Krüss's daughter, Martina Krüss-Leibrock, is the seventh generation to take over the A.KRÜSS Optronic GmbH. She makes important advances in the internationalisation of the company

2000

A.KRÜSS Optronic launches a refractometer featuring a fully automatic data acquisition

2003

A.KRÜSS Optronic is the first company in this sector to offer measuring devices and analytical instruments with a touch-screen display

A.KRÜSS Optronic develops the P8000 series that are still the fastest polarimeters in the world

2005

The daughter of Martina Krüss-Leibrock, Karin Leibrock, joins the management

A.KRÜSS Optronic is awarded with the "Top 100" seal of approval for especially innovative mid-sized companies

2008

A.KRÜSS Optronic is the first manufacturer in Germany to offer density meters

2011

A.KRÜSS Optronic puts a flame photometer on the market – worldwide one of a kind to this day – allowing for a simultaneous high-precision measurement of up to five elements

2013

Thomas Schmauck joins the management and is now together with Karin Leibrock in charge of the operative business of A.KRÜSS Optronic

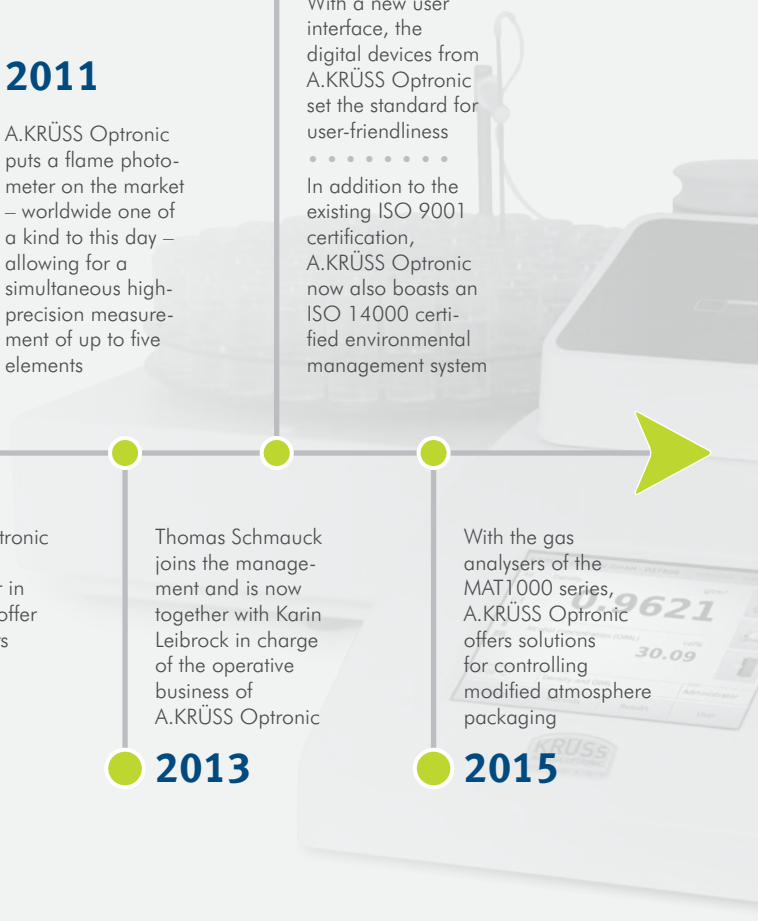
2014

With a new user interface, the digital devices from A.KRÜSS Optronic set the standard for user-friendliness

In addition to the existing ISO 9001 certification, A.KRÜSS Optronic now also boasts an ISO 14000 certified environmental management system

2015

With the gas analysers of the MAT1000 series, A.KRÜSS Optronic offers solutions for controlling modified atmosphere packaging



MODIFIED ATMOSPHERE PACKAGING

In order to be successful on the market, manufacturers of sensitive or perishable products must be able to guarantee first-class quality over a long period of time. This applies, in particular, to the food industry but also the electronics, pharmaceutical or cosmetics industry.
Modified Atmosphere Packaging (MAP) plays a decisive role in this. Typical protective gases are nitrogen (N_2), carbon dioxide (CO_2) and oxygen (O_2) as well as a mixture of these gases. These are natural components of the ambient air but in modified concentrations that need to be checked. In most food packages, the oxygen concentration is reduced while the carbon dioxide concentration is increased in order to inhibit the growth of aerobic microorganisms. That also allows you to slow down oxidation processes that change the ingredients and thus the taste and colour of the products. Other foodstuff, however, requires a certain oxygen content inside the packaging so it can stay fresh or keep its colour.
But protective gases are not only used in the food industry. Electronic components are also packaged under nitrogen in order to prevent oxidation and corrosion processes. The same applies to pharmaceutical or cosmetic products, for example, in vials or blister packages. In addition, the modified atmosphere stabilises the packaging providing the product with a mechanical protection.

ANALYSIS OF HEADSPACE VOLUME

In order to check the mixture ratio of the protective gases inside a package, a self-adhesive septum is applied to a sampling point. The suction needle of the gas analyser is then inserted through the septum into the headspace of the package. A simple touch on the touch-screen of the device will ensure that the required sample is automatically drawn in. Within a very short time, the oxygen and carbon dioxide content is measured, the nitrogen content calculated, and the results are shown on the display.



Taking a protective gas mixture sample from a food package

PROTECTIVE GASES

NITROGEN (N_2)

Nitrogen is an inert gas and does not react with surrounding substances. For manufacturing reasons, it has a high purity of up to 99.99%, it is colourless, odourless and tasteless and diffuses only very slowly through plastic film. That is why it is used in MAP to displace oxygen, to adjust a gas mixture or to function as a filling gas that prevents the collapse of the packaging. A 100% nitrogen atmosphere is used for snack products to prevent oxidation and thus rancidity.

CARBON DIOXIDE (CO_2)

Carbon dioxide – colourless, odourless and tasteless just like nitrogen – inhibits oxidation processes and the growth of most aerobic bacteria and moulds. It is therefore often used to increase the storage life of packaged foodstuff. Generally, the following applies: the higher the CO_2 content, the longer the storage life. However, some food will change its taste if the CO_2 content is high. In addition, the gas might be absorbed by the product or escape from the packaging making it collapse.

OXYGEN (O_2)

If food comes into contact with oxygen, it will usually oxidise and go bad. Oxygen also allows for the growth of aerobic microorganisms. This is the reason why protective gas packaging often does not contain any oxygen or only very little. Fresh produce, however, requires oxygen since it still "breathes" after the harvest. A high O_2 content of 70% in the packaging is even beneficial in case of raw red meat: It prevents the product from becoming "pale" as well as its colonisation by anaerobic microorganisms.

THE GAS ANALYSERS OF THE MAT1000 SERIES

Quality assurance and ever increasing consumer requirements make it necessary to control modified atmosphere packaging on a regular basis. Gas analysers must deliver fast, reliable measurement results and be easily integrated into the work process – just like our devices from the MAT1000 series. They are used by many companies for the quality inspection in the lab but also at the production line if sensitive or perishable products are filled or packaged. Our Modified Atmosphere Testers (MAT) are suitable for both the random sampling and the permanent monitoring of the gas mixture used on packaging machines. Their solid metal housing with an interchangeable protective cover offers protection against impact and dirt from the outside.



Gas analysers of the MAT1000 series

EASY OPERATION AND HIGH SAFETY STANDARD

As a user of our gas analysers, you enjoy many benefits:

- Easy and intuitively to use via touch-screen – even by untrained personnel
- Methods and scales that can be configured by the user for many different applications
- Freely definable formulas and parameters for complex conversions
- Shortcut keys for the most important functions
- Optional user administration with two authorisation levels
- Easy-to-understand, menu-guided adjustment
- Only a small sample volume required
- High accuracy even with small sample volumes
- Short measurement period
- Customised layout of the result reports
- Compliance with global standards such as GMP/GLP and 21 CFR Part 11 (Audit Trail)
- Validation possible
- High safety standard thanks to the traceability and reproducibility of all measured data
- Integrated interfaces for the convenient transfer of measured values (USB, Ethernet, RS-232)
- Compact design in robust cast aluminium housing
- IQ/OQ/PQ by A.KRÜSS Optronic or certified service partners
- Service, maintenance, calibration and adjustment on site

INDIVIDUAL SOLUTIONS FOR ANY MODIFIED ATMOSPHERE

In order to meet the different requirements on the quality control of protective gas packaging, we offer four types of gas analysers that are fitted with different sensors and measuring cells.

MAT1100

THE REASONABLY PRICED ENTRY-LEVEL MODEL FOR SAMPLE CHECKS

The MAT1100 is the right choice whenever you only need to be concerned with the oxygen concentration or whenever only nitrogen is used. Its electrochemical oxygen cell (EC) measures within the range of 0.5 and 35 volume per cent and with an accuracy of ±0.2 volume per cent. Unlike our other models, the MAT1100 requires very little time to heat up and can therefore be quickly used for occasional measurement or in case of frequent "changes of location".

MAT1200

THE ECONOMICAL SOLUTION FOR O_2 AND CO_2 MEASUREMENTS

If you need to measure the concentrations of oxygen and carbon dioxide, then the MAT1200 will be the appropriate model. In addition to an electrochemical oxygen cell, it features a non-dispersive infrared sensor (NDIR) for the CO_2 measurement over the measuring range of 0 and 100 volume per cent and with a high accuracy of ±0.5 volume per cent. The MAT1200 hence covers most carbon dioxide applications in modified atmosphere packaging – at a very attractive price.

MAT1400

THE SPECIALIST FOR FAST, HIGH-PRECISION OXYGEN MEASUREMENTS

The zirconium dioxide sensor (ZrO_2) of the MAT1400 measures the oxygen concentration over the entire measurement range between 0 and 100 volume per cent. Especially in case of a very low concentration, it will achieve an excellent accuracy of ±0.001 volume per cent. The MAT1400 is therefore suitable for the inspection of oxygen-free as well as oxygen-rich modified atmospheres. It can also be used in the cold storage room from ambient temperatures of 10 °C.

MAT1500

THE ALL-ROUNDER FOR HIGHEST STANDARDS

Fitted with a zirconium dioxide sensor and a non-dispersive infrared sensor, the MAT1500 combines the advantages of the MAT1200 and MAT1400 and is our number one when it comes to the range of application, performance and precision. The measurements are completed within only approx. ten seconds. As is the case with the MAT1400, highly precise results can be achieved with single measurements of oxygen concentrations thanks to the min/max detection even if only a small sample volume is available.

NEEDS-BASED MEASUREMENT PROCEDURES

MANUAL MEASUREMENT

In case of a manual measurement, the user can individually set the measurement period and therefore adjust it to the available headspace volume. This will prevent a vacuum from forming in flexible packages that would allow the product to enter and clog the needle.

AUTOMATIC MEASUREMENT

When an automatic measurement is performed, the measurement will be automatically ended as soon as the measured value stays within a variance that the user can freely set. This saves significant time and improves the reproducibility of the measurement results.



MIN/MAX DETECTION

In case of single measurements of oxygen concentrations, our models MAT1400 and MAT1500 will achieve highly precise results even if only a small sample volume is available. This is ensured by their short measurement period, the so-called t_{90} time, in combination with the min/max detection, where in each case only the lowest or highest measured value is evaluated. Therefore, the additional taking in of ambient air after the sample volume has been consumed does not pose a problem.

OVERVIEW OF OUR GAS ANALYSERS AND SENSORS

	MAT1100	MAT1200	MAT1400	MAT1500
AREA OF APPLICATION	Sporadic O_2 sample check	Combined O_2 and CO_2 measurement	High sample throughput	High sample throughput
			High O_2 concentration	High O_2 concentration
				Combined O_2 and CO_2 measurement
ADVANTAGES	Cost-effective option	Cost-effective option	Long service life	Long service life
	Fast operational readiness		Fast measurement	Fast measurement
			High precision with the lowest O_2 concentrations	High precision with the lowest O_2 concentrations
			Wide measurement range	Wide measurement range
	Low drift	Low drift	Drift-free	ZrO_2: drift-free, NDIR: low drift
		Environmentally compensated CO_2 measurement		Environmentally compensated CO_2 measurement
O_2 SENSOR	EC	EC	ZrO_2	ZrO_2
CO_2 SENSOR		NDIR		NDIR
N_2		Arithmetic determination		Arithmetic determination

ELECTROCHEMICAL OXYGEN CELL (EC)

The measurement range of the electrochemical oxygen cell between 0.5 and 35 volume per cent O_2 makes it especially interesting for products such as fresh fruit, raw, low-fat fish or sea food, which are packaged neither under an oxygen-free nor particularly oxygen-rich modified atmosphere. Since this low-cost measuring cell is quickly ready for use, it is recommended for sporadic sample checks or if only a few samples are measured every day. The low-drift long-life cell in our MAT1100 and MAT1200 devices boasts an above-average service life of up to six years. Unlike conventional alkaline cells, it uses an acidic electrolyte (formic acid), which is why its cross-sensitivity toward acidic gas components such as carbon dioxide is low (< 0.002 volume per cent O_2 with a load of 100 volume per cent CO_2), and a measured value correction as a function of the CO_2 concentration is not required. The carbon monoxide in coffee packages or flammable gas components such as alcohol also do not influence the specified accuracy.

ZIRCONIUM DIOXIDE SENSOR (ZrO_2)

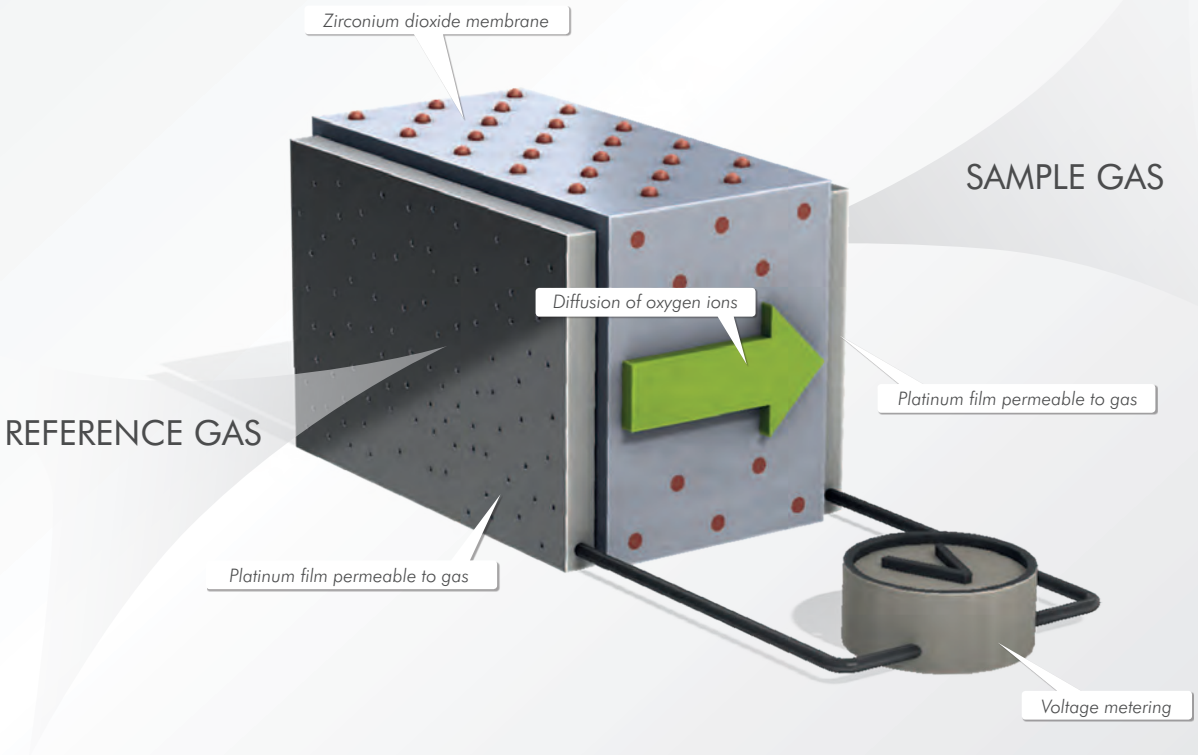
Because of its excellent accuracy of ±0.001 volume per cent with the lowest O_2 concentrations, the zirconium dioxide sensor is primarily used to test oxygen-free modified atmospheres for sterilised finished products or electronic, pharmaceutical or cosmetic products. Thanks to its wide measurement range between 0 and 100 volume per cent, it can also be used for high oxygen concentrations as required for red fresh meat. The investment in the zirconium dioxide sensor of the MAT1400 and MAT1500 devices will quickly pay off if many samples are measured every day due to the long service life of up to 15 years. Thanks to the fast response time of 0.3 seconds, only very little sample gas is required – an advantage especially in case of a small headspace volume as it is common with sachets and cosmetics products. The cross-sensitivity of the sensor toward humidity and temperature is low. A regular adjustment is not necessary because it is free of drift. We simply recommend an occasional calibration with synthetic air.

NON-DISPERSIVE INFRARED SENSOR (NDIR)

From poultry with skin to cut cheese to cake and pastries – the non-dispersive infrared sensor with its wide measurement range between 0 and 100 volume per cent is suitable for most applications of carbon dioxide in modified atmospheres. Its high accuracy of ±0.5 volume per cent always ensures precise measurement results.
The NDIR sensor operates according to a patented process that uses two wavelengths of the infrared spectrum in order to automatically compensate for temperature, humidity and other environmental influences. Since it does not have any moving parts, it is very reliable, and no additional maintenance work is required. The NDIR sensor of the MAT1200 and MAT1500 models can be very easily adjusted via the intuitive user interface, but thanks to the low drift this is rarely necessary.

FLOW RATE MONITORING AND TEMPERATURE CONTROL

In support of the sensor technology, our gas analysers measure further values in order to ensure the absolute reliability of the measured values related to the protective gases. For example, the flow rate of the sample is determined so that optimum measurement results are always guaranteed regardless of tube length, contaminations in the filter and similar application conditions.
If the additional automatic monitoring of the gas flow is activated, a warning will appear if the flow rate does not reach the value set by the user. The temperature of the zirconium dioxide sensor of the MAT1400 and MAT1500 models is kept at 750 °C regardless of the sample temperature as it operates most efficiently by this means.



DESIGN AND FUNCTIONALITY OF THE ZIRCONIUM DIOXIDE SENSOR

Inside the sensor, a ZrO_2 membrane heated to 750 °C separates the sample gas from the ambient air. Due to the Yttrium oxide stabilisation of the membrane, oxygen ions diffuse in the direction of the lower oxygen partial pressure and hence to the lower oxygen concentration. Both sides of the membrane are coated with a platinum film permeable to gas. These electrodes allow you to measure an electrical potential difference between the sides of the membrane from which the oxygen concentration of the sample gas can be calculated.

EASY, INTUITIVE OPERATION FOR MAXIMUM EFFICIENCY

The gas analysers of the MAT1000 series feature a self-explanatory, well-arranged user interface. A state-of-the-art TFT display ensures a clear, bright visual representation of all the information. The integrated touch-screen allows even non-expert personnel to intuitively and thus quickly operate the device. Once the measurement is started, the sample is drawn in, and the display shows the measured values for oxygen, carbon dioxide and nitrogen as well as the air pressure, the gas flow and – depending on the model – the temperature of the measuring cell. Only a small sample volume is required, and stable measured values are already available after an average of five to ten seconds. Optionally, measurements can also be triggered with a foot switch allowing for a fast, fatigue-proof mode of operation when serial analyses are performed.

THE MAIN SCREEN: EVERYTHING RELEVANT AT A GLANCE

- Freely assignable shortcut keys for the most important functions
- Measured values can be viewed at a glance
- Optional secondary and tertiary scale to display up to three measured values
- Method selection with only two clicks

CREATE YOUR OWN METHODS

- Create any number of methods so that the respective desired parameters can be used for each sample
- Available method parameters: scales, measurement procedures, limit values, comment and much more
- Selectable measurement modes: single or continuous
- Several single measurement procedures: manual, automatic, min/max detection



HIGH OPERATING COMFORT

- Easy, menu-guided adjustment
- Measurements can be triggered with an optional foot switch
- Can be connected to a barcode scanner
- Printer configuration with numerous options
- A selection of six languages (de, en, fr, es, it, pt)



INTELLIGENT USER ADMINISTRATION

- Two authorisation levels
- Can be activated or deactivated depending on the requirements
- Optional setup of user profiles
- Differentiations with the help of user-defined colour schemes
- Customised settings for different users or work groups

COMPLETE DOCUMENTATION OF MEASURED VALUES

- Integrated measured data storage: complete recording of all measured data as well as system or method settings
- Consecutive numbering of the measurements
- Documentation of all measured values of the last 999 measurements

CUSTOMISE YOUR RESULT REPORTS

- Customisable result table using the column configuration
- Selection of the results with filters
- Ascending or descending sorting of the datasets according to number

INTEGRATED INTERFACES, FLEXIBLE DATA EXPORT

- Print-out on serial ASCII printer at RS-232 interface
- Print-out on network printer in PDF or GS format
- Print-out as PDF on USB flash drive or to network share
- Export of the measurement results in HTML or CSV format on USB flash drive or to network share
- Easy integration into existing networks (DHCP client) or a LIMS

EXTENSIVE RANGE OF SERVICES



YOUR BENEFITS AS AN A.KRÜSS CUSTOMER

- Service, maintenance, calibration and adjustment on site
- IQ/OQ/PQ by A.KRÜSS Optronic or certified service partners
- Calibration and adjustment with certified test gases
- Training and application consulting on site
- Spare parts and accessories directly from the manufacturer
- Customer-specific customisation of devices
- Efficient support thanks to a fast confirmability of the customer's situation based on extensive reports

CALIBRATION AND ADJUSTMENT OF OUR GAS ANALYSERS

We recommend to have our gas analysers of the MAT1000 series calibrated and adjusted once a year exclusively by A.KRÜSS Optronic or by one of our certified service partners.
Our calibration protocols and certificates are GMP-/GLP-compliant and thus one component that ensures a GMP-/GLP-compliant work. For the calibration and adjustment of our gas analysers, we use certified test gases that are also calibrated on a regular basis. A calibration and adjustment is usually completed within a very short period of time so that any interference with the operational processes of our customers is minimised.

MAINTENANCE OF OUR GAS ANALYSERS

Our maintenance contracts include the following services:

- Response time of no more than 48 hours and phone support during office hours, e. g. technical support in case of faults
- Maintenance of the devices named in the maintenance contract including functional check and safety inspection, cleaning of all components important for the proper function as well as calibration with certified test gases and, if necessary, adjustment
- Provision of the required certified test gases as well as measuring, control and special tools
- Firmware updates if they are required for the functionality of the devices
- Should repairs be required within the scope of maintenance work, we will charge for the required spare parts separately. We will grant a one year warranty on replacement and spare parts
- Provision of rental equipment to bridge the time required for maintenance, calibrations, adjustments and repairs. Maintenance customers will have preferential rights on rental equipment
- Preparation of GMP-/GLP-compliant maintenance and calibration protocols
- Warranty extension from 24 to 36 months when registered at www.kruess.com within three months after purchase

OVERVIEW OF MODELS, ACCESSORIES AND CONSUMABLES

ORDER NUMBER	MAT1000 SERIES
MAT1100	Gas analyser with electrochemical oxygen cell
MAT1200	Gas analyser with electrochemical oxygen cell and NDIR sensor for carbon dioxide
MAT1400	Gas analyser with zirconium dioxide sensor for oxygen
MAT1500	Gas analyser with zirconium dioxide sensor for oxygen and NDIR sensor for carbon dioxide

ORDER NUMBER	OPTIONAL ACCESSORIES AND CONSUMABLES
MAT1001	Suction filter, 10 pieces
MAT1002	Needle, stainless steel (0.8 mm x 40 mm), 12 pieces
MAT1003	Needle, stainless steel (0.45 mm x 18 mm), 12 pieces
MAT1004	Tygon tube, 80 cm
MAT1005	Suction unit (set), consisting of: Handle Handle adapter Tygon tube (80 cm) Suction filter, 10 pieces Needle made of stainless steel (0.8 mm x 40 mm), 12 pieces
MAT1010	Septa, white, self-adhesive, roll of 1000 in cardboard dispenser
MAT1080	Foot switch for MAT1000 series
BC876	Barcode scanner
KB876DE	Mini keyboard with German layout
KB876EN	Mini keyboard with English layout
KB876F	Protective cover for mini keyboard
PC761	Protective cover
CBM910	24-character plain paper printer
CBM910P	Plain paper roll for printer CBM910
CBM916	Interface cable for printer CBM910
CBM910F	Ink ribbon for printer CBM910

MANUFACTURER	TEST GASES IN DISPOSABLE BOTTLES (filling volume in gas [litres]: 34 l, 58 l, 110 l)
	Zero gas – 100% nitrogen (N_2)
	Reference gas – 50% carbon dioxide (CO_2), 50% nitrogen (N_2)
	Test gas – 1% oxygen (O_2), 99% nitrogen (N_2)
	Synthetic air
	For all 3 bottle sizes, suitable flow valves can be supplied
AIR PRODUCTS	Customer service Air Products PLC 2 Millennium Gate, Westmere Drive Crewe CW1 6AP, United Kingdom Phone: +44 1270 612708 E-mail: apukinfo@airproducts.com www.airproducts.co.uk

FEATURES AND TECHNICAL DATA

FEATURES

- Easy and intuitively to use via touch-screen – even by untrained personnel
- Low-drift electrochemical oxygen cell (EC)
- Low-drift non-dispersive infrared sensor (NDIR)
- Low-drift zirconium dioxide sensor (ZrO_2)
- Only a small sample volume required
- Short measurement period
- Easy, menu-guided adjustment
- Compact design in cast aluminium housing
- Built-in air pressure sensor
- Integrated flow rate monitoring
- Interface package for convenient transfer of measured values (USB, Ethernet, RS-232)
- Any number of measurement methods for the monitoring of the measurement process according to method, batch, product and/or production line incl. limit value monitoring
- User administration (optional password protection with different usage rights)
- Measured data storage (saves the last 999 measurements)
- Numerous flexible filter functions
- Selectable measurement modes: single or continuous measurement
- Measurement procedures: manual, automatic, min/max detection

COMPLIANCE WITH GLOBAL STANDARDS

- GMP/GLP
- 21 CFR Part 11 (Audit Trail)
- Pharmacopoeia, OIML, ASTM
- Validation possible

SCALES	
OXYGEN (O_2)	MEASUREMENT RANGE
	ACCURACY
	RESOLUTION
CARBON DIOXIDE (CO_2)	MEASUREMENT RANGE
	ACCURACY
	RESOLUTION
NITROGEN (N_2)	ARITHMETIC DETERMINATION
O_2 SENSOR	TYPE
	MEASUREMENT PRINCIPLE
	SERVICE LIFE
	CROSS-SENSITIVITY
	DRIFT
CO_2 SENSOR	TYPE
	MEASUREMENT PRINCIPLE
	SERVICE LIFE
	CROSS-SENSITIVITY
	DRIFT
AVERAGE MEASUREMENT PERIOD	
HEATING TIME	
AMBIENT TEMPERATURE	
HUMIDITY OF THE SAMPLE GAS	
OPERATING VOLTAGE	
POWER CONSUMPTION	
ADJUSTMENT	
CONTROL	
INTERFACES	
DIMENSIONS (WxHxD)	
WEIGHT	

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MAT1100	MAT1200	MAT1400	MAT1500
Oxygen Any number of user-defined scales	Oxygen Carbon dioxide Nitrogen Any number of user-defined scales	Oxygen Any number of user-defined scales	Oxygen Carbon dioxide Nitrogen Any number of user-defined scales
0.5–35 vol%	0.5–35 vol%	0–100 vol%	0–100 vol%
±0.2 vol%	±0.2 vol%	±0.001 vol% (< 1 vol%) ±0.01 vol% (< 6 vol%) ±0.1 vol% (< 35 vol%) ±0.4 vol% (> 35 vol%)	±0.001 vol% (< 1 vol%) ±0.01 vol% (< 6 vol%) ±0.1 vol% (< 35 vol%) ±0.4 vol% (> 35 vol%)
0.1 vol%	0.1 vol%	0.001 vol%	0.001 vol%
N/a	0–100 vol%	N/a	0–100 vol%
	±0,5 vol%		±0,5 vol%
	0,1 vol%		0,1 vol%
N/a	Residual content of the gas mixture	N/a	Residual content of the gas mixture
Electrochemical cell (EC)	Electrochemical cell (EC)	Zirconium dioxide sensor (ZrO_2)	Zirconium dioxide sensor (ZrO_2)
Acidic electrolyte	Acidic electrolyte	Potentiometric measurement	Potentiometric measurement
Up to 6 years (@20 vol% O_2)	Up to 6 years (@20 vol% O_2)	Unlimited	Unlimited
No CO_2 cross-sensitivity	No CO_2 cross-sensitivity	Cross-sensitive toward inflammable gases	Cross-sensitive toward inflammable gases
Low drift, < 3%/month	Low drift, < 3%/month	Drift-free	Drift-free
N/a	Two-channel NDIR sensor	N/a	Two-channel NDIR sensor
	Infrared spectroscopy		Infrared spectroscopy
	Unlimited		Unlimited
	Not affected by moisture		Not affected by moisture
	Low drift < 1%/month		Low drift < 1%/month
7 s	10 s	5 s	10 s
< 10 s	5 min	10 min	10 min
10–50 °C			
< 90% RH			
100–250 V, 50/60 Hz			
Max. 60 W			
Automatic (menu-guided)			
5.7" TFT touch-screen, 640 x 480 pixels			
USB (USB flash drive, barcode scanner, keyboard, mouse); Ethernet (network printer, network share, LIMS); RS-232 (serial ASCII printer)			
200 mm x 150 mm x 350 mm			
4.6 kg			

EN

A.KRÜSS Optronic GmbH
Alsterdorfer Straße 276–278
22297 Hamburg | Germany

Phone +49 40 514317-0
Fax +49 40 514317-60

E-Mail info@kruess.com
Web www.kruess.com

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