

INDUSTRIAL GASES

GAS ANALYSIS MAGAZINE

ISSUE
ONE - 2017

SUPPORTING YOUR BULK GAS AND
SPECIALTY GAS APPLICATIONS

NEW PRODUCTS

MultiExact 4100 previewed

APPLICATION STUDY

Solder furnace control

EXPERT ADVICE

Designing a multi-gas monitoring system



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SERVOMEX OXYDETECT

Our non-depleting Paramagnetic oxygen monitor available for safe and hazardous areas – see the benefits



INSIDE SERVOMEX USA

Explore our manufacturing base for oxygen and moisture analyzers, and hub for global IG and semiconductor support



DF-700 SERIES

See all the benefits of our ultra-trace moisture analyzers, monitoring high performance in specialist environments



SERVOFLEX PORTABLES

Four gas analyzers in 60 seconds – see why we've made gas analysis easy to handle in this product range movie



Watch at servomex.com/videos

DEAR READER

AN INTRODUCTION TO THE SERVOMEX INDUSTRIAL GAS GROUP.

Welcome to the first edition of our new magazine focused on the industrial gas (IG) market sector.

Servomex began its journey into the industrial gas market when its founders developed an advanced version of a Paramagnetic oxygen sensor using a platinum feedback loop. This landmark innovation became the basis for a business that has grown over seven decades to become a world leader in IG gas sensing.

Over that time we have maintained our IG technical and manufacturing edge, aided first by the opening of a state-of-the-art Technical Centre in Crowborough, UK, in 2008, and then by the creation of the R&D/manufacturing US Technical Center in Boston, Massachusetts, in 2010.

The Boston facility has since grown into our center of excellence for IG, becoming the central hub that supports our IG business across the world, providing production and application support with local-for-local sales and service in the regions.

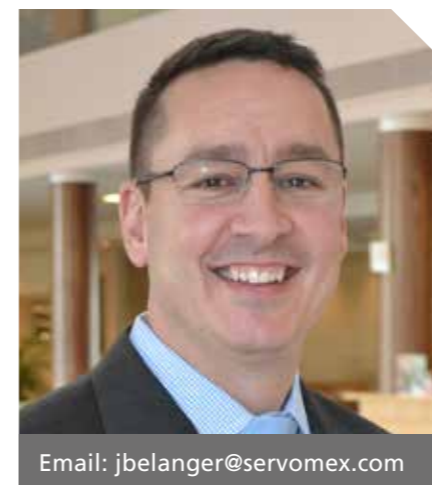
Today's Servomex IG group provides a wider range of gas analyzers than any other company in the world, with single and multi-component analyzers using 16 core technologies, capable of measuring 14 different gas components over a wide range of concentrations.

As an ever-evolving organization, we continue to develop our product lines, with multiple new analyzer launches set to emerge from our US Technical Center in 2017 to support the continually growing global IG market.

These innovations mean our customers can look forward to an enhanced capability for automation and calibration features, dovetailing with a lower overall cost of ownership. We are looking to further enhance our product line, lowering cost of ownership for our customers while ensuring that they don't have to retrain to use our analyzers as they improve.

Our IG team is ready to help you find the right solutions for your process in 2017 and beyond – so get in touch with us today.

Jim Belanger
Global IG Sector Manager.



Email: jbelanger@servomex.com

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IG MARKET FOCUS

What lies ahead for the specialty gas sector?



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PRODUCT PREVIEW: MULTIEXACT 4100 MULTI-GAS ANALYZER

The successor to the SERVOPRO 4100 and the MultiExact 5400.



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OLD FRIENDS, NEW FACES

DF MonoExact analyzers raise the bar for oxygen analysis.



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AquaXact 1688 DEBUTS

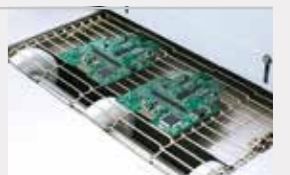
A new era for accurate moisture measurement.



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PERFECT PARTNERSHIP

A dual analyzer solution for monitoring solder reflow furnaces.



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SERVICE FOCUS

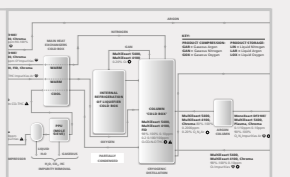
Benefits of remote certification for the DF-700 series.



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GAS ANALYSIS IN AIR SEPARATION UNITS

Exploring the Servomex solutions for this key IG process.



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EXPERT FOCUS

How the multi-gas monitoring system can improve your process.



See our latest product ranges. Analyzer guide starts on page 16

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FOR THE FULL RANGE OF ANALYZERS VISIT servomex.com/gas-analyzers

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P03

MARKET FOCUS: SPECIALTY GASES



A BRIGHT FUTURE

SERVOMEX IG PRODUCT MANAGER DOUGLAS BARTH REVIEWS THE OPPORTUNITIES THE GLOBAL SPECIALTY GAS MARKET OFFERS INDUSTRIAL GAS MANUFACTURERS.



VITAL TO MANUFACTURING LED PANELS, LED LIGHTS, SEMICONDUCTORS, PETROCHEMICAL AND MEDICAL GASES, THE SPECIALTY GAS MARKET CONTINUES TO GROW.

Specialty gases are high-purity gases for specific applications, and are either ultra-high-purity single component gases or accurately prepared gas mixtures.

Specialty gases include high-purity air-separated gases, noble gases, ammonia, hydrocarbon gases, and halogen gases. These gases require rigorous chemical analysis to ensure their composition meets stringent

specifications, particularly the detection of moisture and oxygen impurities that can contaminate the gas during the transportation or production process. Present in even minute ultra-trace quantities, these impurities can ruin the batch production of products being produced, so rigorous analysis is required to the very lowest detection levels possible.

A GLOBAL PICTURE

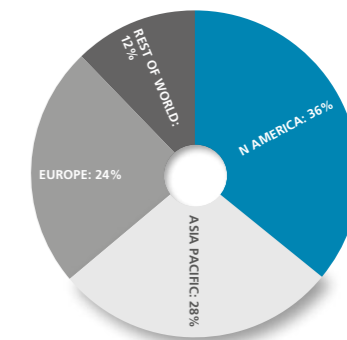
Globally, the multi-billion-dollar market for specialty gases continues to grow, with consumption having increased significantly over recent years due to a demand in key applications like LED lighting/flat panel display production, semiconductor chip manufacturing, petrochemical production and the calibration of analytical instrumentation.

By 2018, it is expected that the sector could be worth more than \$20bn, with

an average annual growth rate of approximately 4-6%.

In addition, the idea of large-scale reuse of carbon dioxide, particularly to create synthetic fuel sources, has gained traction in recent years and will open up a number of fresh opportunities.

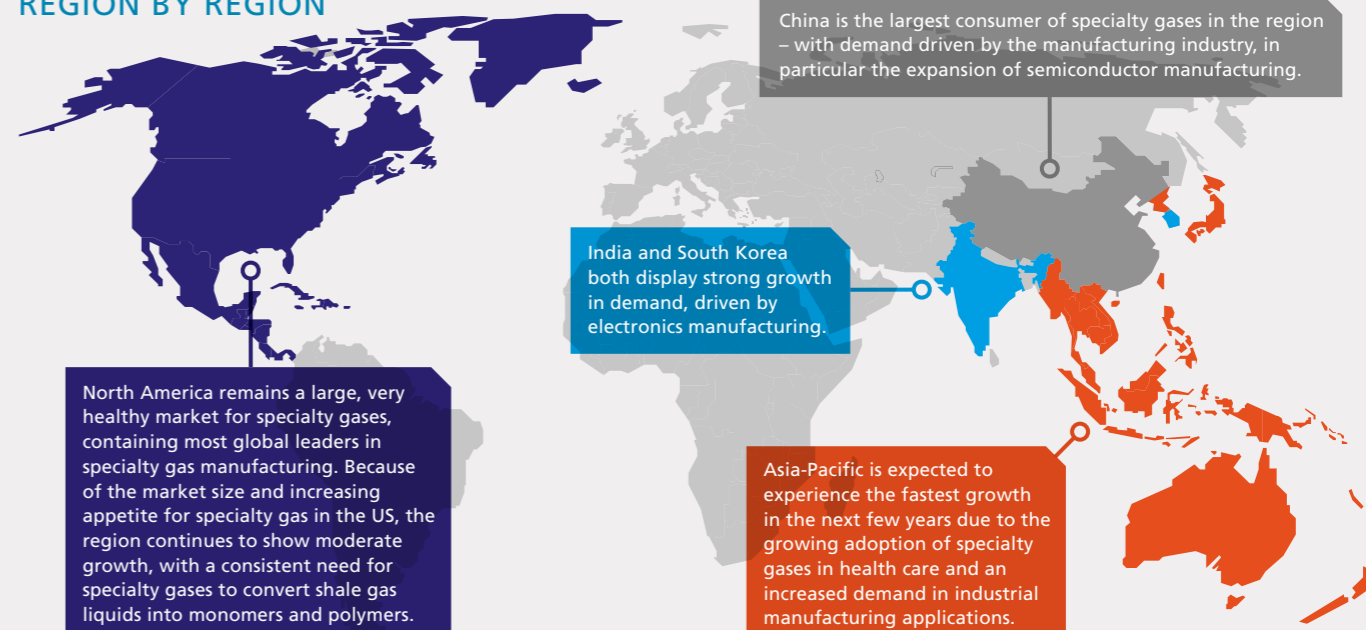
Reforming CO₂ into other high-value molecules is a big area of exploration and research, and there will be a wide range of requirements for analytical purity measurements, an area where Servomex already has a strong position.



SPECIALTY GAS MARKET REVENUE, BY GEOGRAPHY 2015 (%)

DATA: INDUSTRY ARC ANALYSIS, EXPERT INSIGHTS

REGION BY REGION



SERVOMEX IS THE LEADER IN THE ANALYSIS OF UHP AND SPECIALTY GASES: THE ONLY MANUFACTURER ABLE TO OFFER A SINGLE-SUPPLIER GAS ANALYSIS SOLUTION.

PPM OXYGEN



SERVOPRO MonoExact DF150E AND DF310E

PPB/PPT OXYGEN



HIGH PURITY DF-500 SERIES

PPB/PPT MOISTURE



HIGH PURITY DF-700 SERIES

PPT MULTI-GAS



SERVOPRO NanoChrome

Email Douglas about specialty gas analysis solutions: dbarth@servomex.com

PRODUCT NEWS



SERVOPRO MultiExact 4100

SERVOMEX ANNOUNCES THE RELEASE OF A FOUR-MEASUREMENT DIGITAL SUCCESSOR TO THE SERVOPRO 4100 AND MultiExact 5400.

MULTIPLE GASES



This multi-gas analyzer incorporates all of the latest digital communication protocols and up to four digital gas analysis sensors in a single analyzer.

In total, there are seven sensor types available, with high percent level to low ppm ranges. The calibration information is stored in the sensor which makes 'plug-and-play' field repairs easy.

The SERVOPRO MultiExact 4100 gas analyzer is configured with a high-brightness color touchscreen display, and an intuitive, icon-driven user interface.

It is a highly sophisticated gas analyzer, with built-in support for the new Servomex AquaXact 1688 moisture sensor, up to 32 relays/alarms and four analog inputs for integrating information from external sensors such as temperature, pressure or concentration information from another gas sensor.

In addition, analog and digital communications include the traditional 0-10V DC, 4-20mA, RS232 and RS485 outputs, while also providing optional advanced digital protocols, including Ethernet, Serial Modbus, Modbus TCP/IP and PROFIBUS.

The analyzer is configured with a high-brightness color touchscreen display, and an intuitive, icon-driven user interface, easy to learn and consistent across all of the industrial/semiconductor gas analysis products.

The MultiExact 4100 is a prime example of the way Servomex is moving forward with solutions to meet the changing requirements of the IG market, by improving connectivity and remote operation capability without compromising on performance.

The improved interface for the next-generation range of Servomex analyzers also demonstrates how ease of operation is becoming more important as on-site

staff numbers are reduced and time constraints increase.

In recent years, there has been a steady decline of on-site personnel with the adequate experience or time to operate and calibrate existing analytics packages. This trend has led to an increase in requests for automated solutions, enabling the remote operation and calibration of devices, systems and even entire plants.

Servomex is developing the necessary next-generation analyzer technology to meet these developments in the market, integrating proven, trusted sensing technology into cutting-edge interfaces, compliant with advanced digital protocols.

Alongside hardware developments, it is also providing improvements in control and diagnostic software (see page 14) to enhance remote operation and ease of use, meeting the requirements of a market which is increasingly looking towards automation.

"These new analyzers advance and standardize a complete, integrated analysis capability through the latest innovations in software and hardware. By listening to our customers, we have developed a next-generation platform that delivers the functionality, ease of use, low maintenance and low cost of ownership they require for efficiencies across their operations."

Jim Belanger - Global Market Sector Manager at Servomex. Email: jbelanger@servomex.com



To find out more: [contact your local Business Center](#)



MonoExact DF310E

NEXT-GENERATION TOUCHSCREEN TRACE OXYGEN ANALYZER



The SERVOPRO MonoExact DF310E updates the DF-310E oxygen analyzer with connectivity to a new moisture measurement, an alternative Paramagnetic % oxygen measurement and the latest digital protocols – all in a compact, intuitive, touchscreen-navigable unit.

Designed for the IG market, the MonoExact DF310E offers operational advantages over its predecessor. Low ppb to 10,000 ppm oxygen measurements are delivered through Servomex's proven Coulometric sensor, while 0-25% range O₂ measurements are available as an alternative using Paramagnetic technology.

The MonoExact DF310E also offers integration of Servomex's new AquaXact 1688 moisture sensor, an external Aluminum Oxide (Al₂O₃) moisture sensor probe that enables the analyzers to make two simultaneous measurements for oxygen and moisture.

Fully backwards-compatible with its forerunner, the MonoExact DF310E offers full connectivity with existing hardware wiring inputs and gas inlets, ensuring full compliance with existing standards and customer agreements.

Up to 16 relays and two analog inputs are available for automation of calibration/validation tasks and remote diagnostics. Comprehensive communications are provided using traditional 0-10 VDC, 4-20mA, RS232 and RS485 analog protocols as well as Ethernet, Modbus TCP/IP and PROFIBUS digital connectivity options.

The MonoExact DF310E is optimized for measuring trace oxygen across a range of applications including nitrogen, argon and hydrogen production, tanker transfilling, specialty gas blending and electronic gases verification.

ALSO AVAILABLE: SERVOPRO MonoExact DF150E

Designed for trace oxygen measurements in industrial applications including glove boxes, heat treating, solder reflow ovens, laboratory and industrial gas production.



For more information on both analyzers visit:

servomex.com/monoexactdf310e

servomex.com/monoexactdf150e



AquaXact 1688

FAST, ACCURATE AND RESILIENT MOISTURE MEASUREMENT



The AquaXact 1688 provides a fast, accurate and resilient H₂O measurement for a wide range of gas phase process applications.

Using class-leading, ultra-thin film Aluminum Oxide sensor technology, the AquaXact measures dew point and ppm H₂O in ambient temperatures ranging from -10°C to +70°C. By using a much thinner aluminum oxide layer, a better defined oxide barrier layer and unique pore geometry that makes it easier to entrap water molecules, a much more sensitive and stable performance is given in comparison to rival technologies

Housed in a weatherproof stainless steel casing, the sensor remains unaffected by condensation and liquid water, providing an accurate dew point measurement across a range from -100°C to +20°C, even

under extreme temperature conditions. Unlike conventional moisture sensors, the AquaXact 1688 suffers no drift, the response curve remains the same, even after several months of operation at raised temperatures.

Sensor replacement is easily accomplished with high-quality manufacturing processes ensuring highly uniform performance between sensors. This ensures sensors can be interchanged freely without the loss of measurement quality or need for recalibration.

The AquaXact functions as a standalone 4-20mA transmitter, but can also be remotely interfaced with the SERVOPRO MonoExact DF310E gas analyzer (see above). This enables control using MonoExact's high-clarity touchscreen,

alarms, relays and advanced communication protocols including RS485, Modbus TCP/IP and PROFIBUS.

Should recalibration become necessary – usually no more than annually – the associated calibration file can be uploaded into the AquaXact transmitter using a USB memory stick.

The AquaXact is flexible across a wide range of moisture measurements, including use in air separation processes, natural gas processing and transportation, glove boxes, instrument air units, ethylene production, refining gases, medical gases, semiconductors and furnace gas/heat treating.

servomex.com/aquaxact1688

Stay up to date with the latest Servomex releases: servomex.com/news-and-events

DF-700 REMOTE CERTIFICATION

SERVOMEX'S INNOVATIVE REMOTE CERTIFICATION PROGRAM AVOIDS ANALYZER DOWNTIME AND SAVES ON-SITE SERVICE COSTS.



Servomex's DF-700 series uses Tunable Diode Laser (TDL) sensing technology to deliver robust reliability and the highest level of sensitivity when analyzing moisture at ultra-trace levels.

With Servomex's exceptional TDL sensing technology providing an industry-leading 200ppt Lower Detection Limit (LDL), the DF-700 series products give a stable, highly accurate measurement that meets the precise monitoring needs of semiconductor production.

The DF-700 analyzers also offer attractive affordability over product life. The durable sensor construction has low lifetime maintenance requirements and delivers zero-drift stability that eliminates the need for routine calibration intervals. The DF-700 measurement ranges are optimized for semiconductor, LED and specialty gas

applications that depend on exceptional ultra-high-purity (UHP) gas quality.

Typically, customers working with these high-purity gas analysis applications need to qualify the performance of their analyzers on an annual basis. This often means returning the analyzer to the factory so it can undergo performance qualification.

However, sending the analyzer away for any length of time can be a major problem when it is critically needed for process control. The alternative, arranging an on-site visit from a qualifying engineer, reduces the downtime but is still an expensive option.

Servomex's solution for the DF-700 series is the Analyzer Remote Certification Program, a new service product that provides a remote analysis of all the important parameters and signals for your analyzer.

THE HEALTH VERIFICATION PROGRAM IS A THREE-STEP PROCESS:

STEP 1



Firstly, the customer downloads the system data files from the analyzer and saves them onto a USB memory stick or floppy disk for transfer to a PC.

STEP 2



The diagnostic and system files are then sent via email to a certified Servomex engineer at our US Technical Center, along with a purchase order for the service.

STEP 3



This expert engineer analyzes the records and generates an analyzer health verification certificate, which is then sent to the customer as a PDF file.

By following this process, customers can avoid the costly downtime associated with losing the analyzer for the period of time necessary to return it to the factory, have it qualified, and then returned. There is also a considerable cost saving when compared to paying for an engineer to make an on-site visit to qualify the analyzer.

HEALTH CHECK



COMMISSIONING



ON-SITE SERVICE SUPPORT



SERVICE CONTRACTS



SPARES



SERVICE CENTER SUPPORT



RENTAL EQUIPMENT



TRAINING



CALIBRATION KITS



For information on all our nine service products visit: servomex.com/service

PROCESS STUDY

GAS ANALYSIS IN CRYOGENIC AIR SEPARATION PROCESSES

Separating atmospheric air into its primary components results in the production of three pure gaseous elements: nitrogen, oxygen, and argon, with further separation able to produce quantities of noble gases such as neon, krypton and xenon.

This process is carried out at an industrial level by an air separation plant, with the most significant in terms of production value and volume being cryogenic distillation.

Non-cryogenic methods, such as pressure swing adsorption, vacuum swing adsorption, and membrane technologies, are used in applications which require smaller volume and lower purity, and are focused on separating a single component from ordinary air.

Cryogenic distillation is also required for the ultra-high-purity oxygen, nitrogen, and argon gases used for semiconductor device fabrication.

Typical bulk gas product composition specifications are for the nitrogen product to contain less than 10 ppm oxygen, the oxygen product to be better than 99.5% oxygen, and the argon to contain fewer than 10 ppm impurities.

Accurate gas compositional analysis makes effective improvements across the air separation process, providing improved process control, increasing safety and optimizing product quality.

KEY ANALYZERS IN AIR SEPARATION UNIT (ASU)

Servomex offers a complete single-supplier solution for cryogenic ASUs, providing the broadest choice of technologies to achieve the widest measurement ranges. Our extensive range covers all ASU applications that control processes, guarantee product purity and ensure plant safety.

SERVOPRO MultiExact 5400



A highly-flexible, performance-enhanced digital multi-gas analyzer designed for IG monitoring.

SERVOPRO MonoExact DF310E



Next-generation trace-level digital oxygen analyzer designed for IG applications.

SERVOPRO MultiExact 4100



Four-measurement multi-gas analyzer with all the latest digital protocols.

SERVOPRO Plasma



Sensitive, reliable Plasma Emissions Detection for continuous gas stream monitoring of nitrogen in cryogenic air separation and gas bottling plants.

SERVOPRO Chroma



An ultra-accurate, highly versatile trace gas analyzer that can be configured for a wide range of applications.

SERVOPRO FID



A high-specification flame ionization detector providing a robust solution to trace total hydrocarbon measurements.

SERVOMEX AquaXact 1688



A rugged ultra-thin film Al₂O₃ moisture sensor that enables fast and accurate measurements.

Get advice from the experts:
europe_sales@servomex.com

Find out more about our analyzer range:
servomex.com/gas-analyzers

DID YOU KNOW...

The measurement of O₂ is a constant presence in the air separation process, required for effective process control, process safety, and product quality at different stages of the process.

PROCESS STUDY

AIR SEPARATION APPLICATION MAP

CRYOGENIC AIR SEPARATION

The process begins with the air being filtered and compressed to remove dust. The air is then cooled and purified, generally through a series of filters, to remove water vapor, carbon dioxide and gaseous hydrocarbons.

Next, the air is passed through an integrated heat exchanger and cooled to around -180°C cryogenically. Part of the

air is liquefied, to form a liquid rich in oxygen, while the remaining gas is much richer in nitrogen.

This mixture of liquid and vapor air is then separated and fed to a separation column – consisting of a high pressure and low pressure column, where the mixture is then separated into oxygen, nitrogen and argon streams.

Gas analyzers are required to provide continuous and reliable measurements throughout the process. Alongside analysis of the quality of the produced gases themselves, safety and control measurements may be required to monitor the levels of carbon dioxide, nitrous oxide, hydrocarbons, water vapor and trace impurities.

QUALITY APPLICATIONS



Maintenance of product purity is essential between the separation process and product transportation by pipeline or vehicle. Servomex offers a complete range of highly accurate trace measurements for O₂, CO₂, total hydrocarbons (THC) and impurities, ensuring quality is maintained to the highest standards.

CONTROL APPLICATIONS

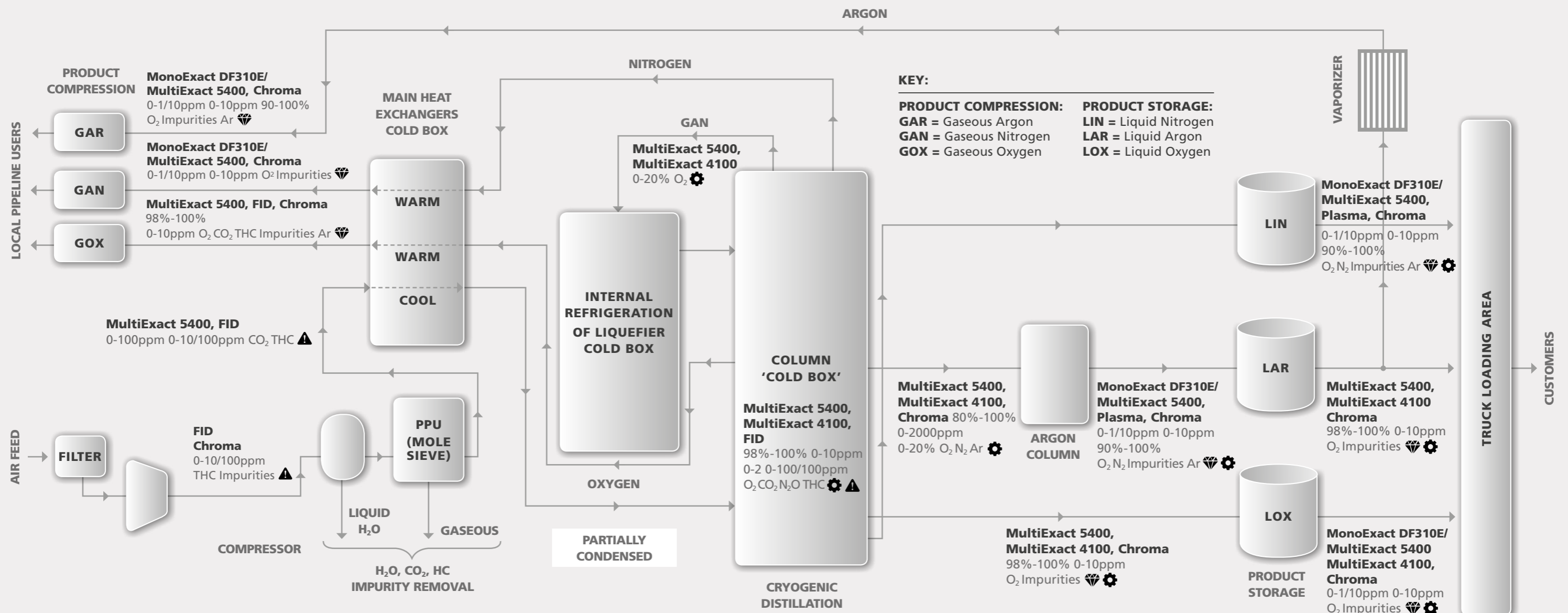


Strict control of the ASU production is crucial to ensure a consistent process with optimum yields. Servomex's industry-leading range of sensing technologies means that not only does it provide a versatile range of analysis solutions for oxygen, nitrogen and argon, but also that it can recommend specific analyzers for each control point in the process, ensuring optimum performance.

SAFETY APPLICATIONS



Cryogenic air separation is a complex process which requires careful monitoring. Low levels of CO₂, NO and THC present safety risks and so must be monitored at all times. Servomex's FID, Chroma and MultiExact analyzers provide highly sensitive analysis of gases, hydrocarbons and impurities to protect your ASU process at all times.



SOFTWARE SOLUTIONS FOR MULTI-GAS MONITORING

BUILDING A CONTINUOUS QUALITY CONTROL (CQC) INFRASTRUCTURE FOR BULK AND PROCESS GAS DISTRIBUTION SYSTEMS

Many processes involving industrial gases need to monitor different impurities at the same time, requiring several gas analyzers working together reliably. In recent years, there has been a steady decline of on-site personnel with the adequate experience or time to operate and calibrate existing analytics packages. This has led to an increase in requests for automated solutions enabling the remote operation and calibration of devices, systems and even entire plants.

Servomex's multi-gas monitoring system (MMS) offers a holistic and scalable solution for the analysis and quality control of trace and ultra-trace industrial and electronic gases. Utilizing analyzers including Servomex's DF range of DF analyzers for sub-ppb oxygen and moisture, and SERVOPRO NanoChrome for sub-ppb methane and NMHC, the systems can be used to effectively monitor impurities in bulk gases such as hydrogen, nitrogen, argon and helium. Analysis of medical, beverage and food grade gases is also available.

The experienced Servomex system design and integration team ensures that the MMS captures the full potential of each analyzer used, whatever the customer application or measurement range.

Each component is specially chosen to meet the particular requirements of the application and to ensure longevity and ease of operation. Analyzers and technologies are carefully selected to cover desired ranges and response times, and to comply with current legislation and industry standards.

The systems are available as fixed racks or in a mobile cart configuration and can be operated manually, or partially or fully automated – continuously monitoring or on-demand – just as required.

The MMS provides a modular Continuous Quality Control (CQC) infrastructure for bulk and/or process gas distribution systems.



Servomex offers fixed and mobile MMS system options.

It manages data collection, data storage and alarm notification, and provides a facility for remote operation and diagnostics, via an Ethernet connection, all in one place.

It provides analysis and control systems for gaseous applications including: aerospace, air separation plants, medical, semiconductors, filling plants and food.

All systems are designed to meet the most stringent safety requirements for handling hydrogen and other explosive gases. Gas detection, fans and shut-off valves are all incorporated when hazardous gases are present.

IGS – THE BRAIN OF THE SYSTEM

The Servomex Intuitive Gas Software (IGS) is the brain of the MMS and its data acquisition system.

A modular, Windows 10-based software package developed to meet customer needs in an intuitive and efficient way, IGS can monitor a process continuously or on-demand for quality purposes like cylinder or truck filling applications, and allows for monitoring and reporting of several analysis points.

Data is collected and displayed on a touchscreen PC. Historical analysis, certificates and calibration data is saved to the hard disk and an external drive as back-up memory.

As the IGS software offers full traceability and multi-user access management, including audit trail, and does not allow deletion of entries, it is in full accordance with medical validation rules, like CFR21 part 11.

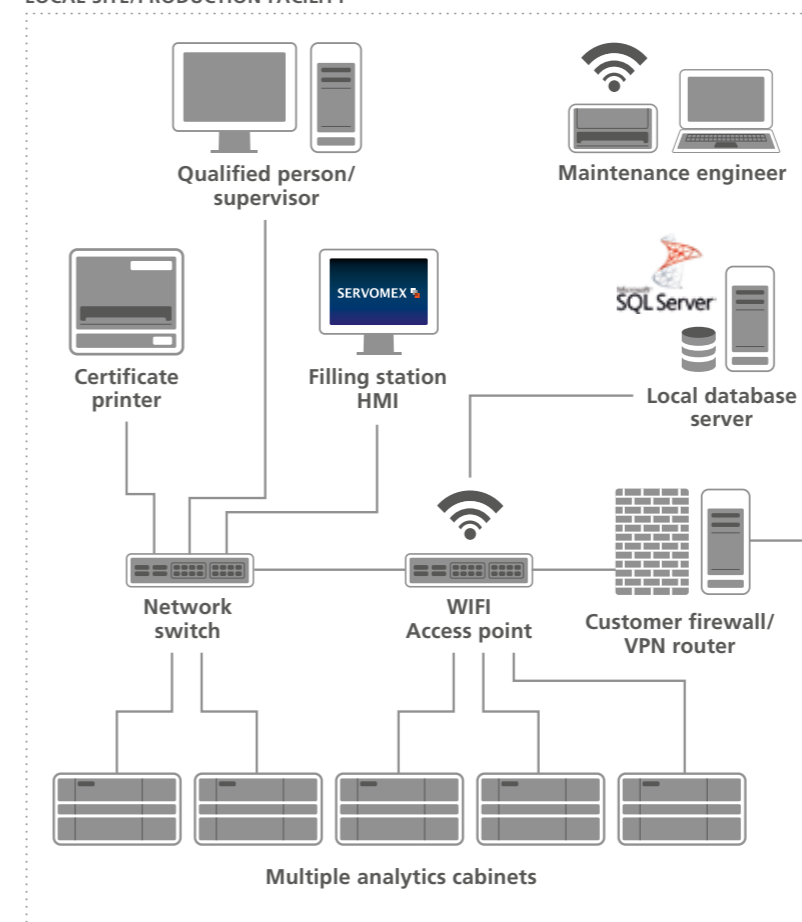
Trends and graphs are available on a selectable time frame, with analysis certificates available in several formats. Statistical analysis and abnormal states during measurements or calibrations can be added as a trend overlay and then printed directly to facilitate reporting. These functionalities greatly support the operator with regard to preventive maintenance and troubleshooting.

Certificates of past analysis are stored in a secure archive and can be generated at any moment. Servomex's world-class direct support is available with remote VPN access for prompt assistance, and there is also online help.

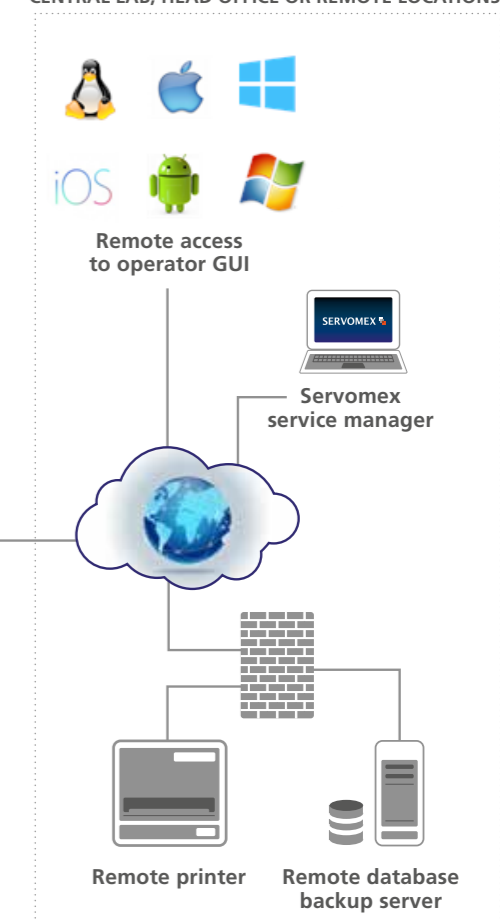
The software allows multiple operators to log in with varying permission levels, and can handle and manage several applications at the same time, producing a summary table with all current readings, warnings and alarms.

A SCALABLE PLANT MANAGEMENT SOLUTION USING IGS

LOCAL SITE/PRODUCTION FACILITY



CENTRAL LAB, HEAD OFFICE OR REMOTE LOCATIONS



"Since the IGS software enables real-time monitoring, MMS analyzer performance is constantly under review. Any issues are flagged in real time, allowing engineers to resolve them immediately, ensuring optimum performance at all times"

Patrick Hellberg - Key Account Manager at Servomex. Email: phellberg@servomex.com



Find the right system for your process: talk to our team at europe_sales@servomex.com

IG PRODUCT GUIDE

Servomex has set the standard for gas analysis in the industrial gas (IG) market for the last 60 years. From air separation to gas bottling and transportation, Servomex has pioneered monitoring technologies and ground-breaking systems solutions that deliver accurate sensitivity, unparalleled performance and reduced cost of ownership.

It offers the most extensive range of analyzer technologies available from a single gas analysis

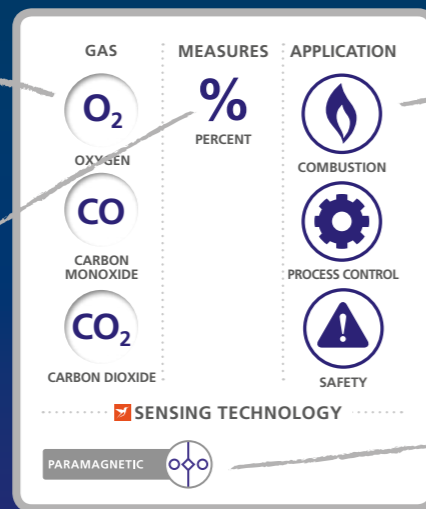
manufacturer, ensuring delivery of the precise, correct solution for every point in your process.

Leading the field in measurement sensitivity, Servomex offers accurate, stable monitoring from percent levels down to the very lowest ultra-trace levels demanded by the semiconductor market. When these exceptional technology range and measurement capabilities are combined, Servomex is unique in offering a genuine 'all of market' solution to the IG Industry.

HOW TO GUIDE

Some analyzers are optimized for single gas measurements while others monitor multiple gas types.

We offer all measurement ranges from percentage to ultra trace parts per trillion analysis.



We identify which application types the analyzer is suitable for operating in.

The Hummingbird sensing technologies used are listed.

For the full range of Servomex analyzers, visit servomex.com/gas-analyzers

SERVOPRO NOx

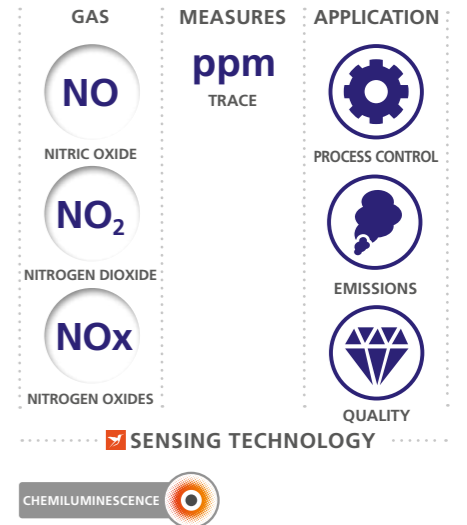
SAFE AREA



CHEMILUMINESCENCE DETECTOR (CLD) ANALYZER FOR KEY EMISSIONS APPLICATIONS INVOLVING ULTRA-LOW NO, NO₂ AND NO_x

Utilizing Chemiluminescence detection technology to measure NO or NO/NO₂/NO_x concentrations in industrial gas and vehicle emission applications, the versatile SERVOPRO NO_x can be calibrated for four measurement ranges starting from ultra-low to high ppm and is easy to install and operate.

- Multiple range NO_x emissions monitoring solution with a fast response
- Non-depleting light-based measurement and electronic flow control keeps costs low
- Heated version available for wet to dry conversion option



SERVOPRO SO₂

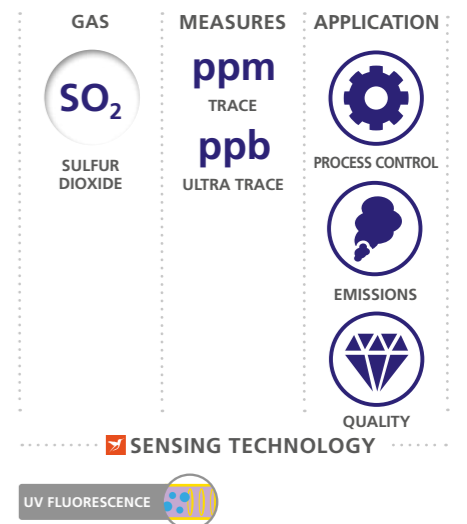
SAFE AREA



USES PROVEN PULSED UV FLUORESCENCE TECHNOLOGY TO DELIVER A PRECISE AND RELIABLE MEASUREMENT OF ULTRA-LOW SULFUR DIOXIDE IN EMISSIONS AND AMBIENT AIR

For industrial applications that require ultra-low emissions monitoring of sulfur dioxide, this robust analyzer is designed to slot seamlessly into rack systems, making it easy to integrate with existing emissions monitoring systems to provide unrivaled performance.

- Ultra-long-lasting UV light source
- Removable flash memory stores up to 10 years of data
- Operation over wide temperature range reduces cost of ownership



AquaXact 1688

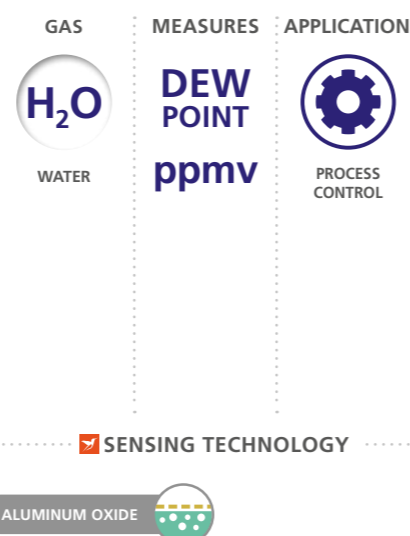
SAFE AREA



A FAST, ACCURATE AND RESILIENT MOISTURE MEASUREMENT SOLUTION

The AquaXact 1688 is a rugged ultra-thin film Aluminum Oxide moisture sensor that enables the measurement of moisture in a wide variety of gas phase process applications, such as glove boxes, air separation units, natural gas processing, transportation, and instrument air, with no calibration required after sensor replacement or dry-out.

- Functions as a standalone 4-20 mA transmitter or remotely interfaces with SERVOPRO MonoExact DF310E and MultiExact 4100 gas analyzers
- High-performance field-replaceable sensor element unaffected by condensation and liquid water
- Stainless steel, weatherproof casing (which is Class 1 Div 2) enables operation in ambient temperatures ranging from -10°C to +70°C



SERVOPRO HFID

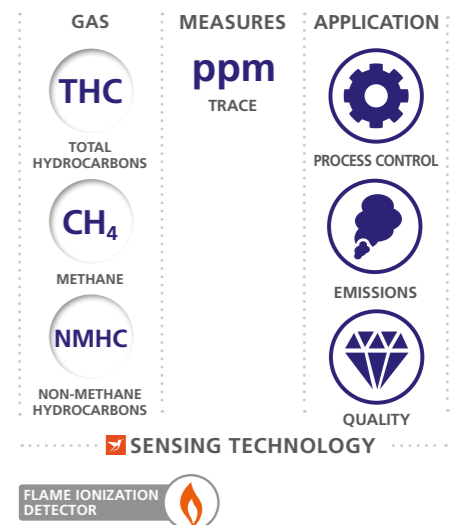
SAFE AREA



HIGH-PERFORMANCE FAST ANALYSIS OF TOTAL HYDROCARBONS, METHANE AND NON-METHANE HYDROCARBONS

Using a highly sensitive Flame Ionization Detector (FID) for measuring volatile hydrocarbon concentrations in industrial or vehicle emission applications, the HFID utilizes an internally heated oven set to 190°C to maintain the sample gas above its dew point, for optimum performance in total hydrocarbon analysis (THC).

- Four user-definable measurement ranges, reconfigurable in the field
- High-accuracy, gas-selective FID technology for maximized uptime
- Heated oven for maximum stability and "hot/wet" sampling



SERVOPRO MonoExact DF150E

SAFE AREA



TOUCHSCREEN PPM OXYGEN ANALYZER FOR GENERAL INDUSTRIAL APPLICATIONS

With a brand new digital, programmable touchscreen and easier navigation, the MonoExact DF150E combines the reliability of Servomex's tried and tested Coulometric oxygen sensor with a more user-friendly package.

- Advanced touchscreen GUI for intuitive hands-on setup and operation
- Back-compatible with DF-150E platform, including hardware wiring inputs and gas inlets
- Servomex proprietary software makes reporting and parameter control simple

GAS	MEASURES	APPLICATION
O ₂ OXYGEN	ppm TRACE ppb ULTRA TRACE	PROCESS CONTROL QUALITY

SENSING TECHNOLOGY

COULOMETRIC

SERVOPRO MonoExact DF310E

SAFE AREA



NEXT-GENERATION DIGITAL OXYGEN ANALYZER DESIGNED FOR INDUSTRIAL GAS APPLICATIONS

Designed specifically to accurately measure oxygen in industrial gas applications, the MonoExact DF310E is a next-generation digital oxygen analyzer that combines precision a trace-level measurement with new performance benefits and extended digital communications compatibility.

- Advanced touchscreen GUI for intuitive hands-on setup and operation
- Back-compatible with DF-310E platform, including hardware wiring inputs and gas inlets
- Field-proven Servomex Coulometric electrochemical performance and reliability

GAS	MEASURES	APPLICATION
O ₂ OXYGEN	% PERCENT ppm TRACE ppb ULTRA TRACE	PROCESS CONTROL QUALITY

SENSING TECHNOLOGY

COULOMETRIC

PARAMAGNETIC

SERVOPRO 4100

SAFE AREA



ANALOG MULTI-GAS ANALYZER OFFERING WIDE RANGE OF TRACE AND PERCENT MEASUREMENTS

Offering the capability of measuring CO, CO₂, N₂O, CH₄, O₂ at trace levels and CO, CO₂ and CH₄ at percent levels - as well as an O₂ purity measurement - the flexibility of the SERVOPRO 4100 meets a wide range of process control and product qualification needs.

- FDA validated for medical oxygen and nitrogen production. European Pharmacopoeia compliant
- Simultaneous measurement of up to four gas streams
- Independent auto-calibration of all measurements with up to eight isolated analog outputs and up to 12 relays with follow or freeze option

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT ppm TRACE	PROCESS CONTROL QUALITY

SENSING TECHNOLOGY

GAS FILTER CORRELATION

PARAMAGNETIC

INFRARED

ZIRCONIA

SERVOPRO 4200/4210

SAFE AREA



GAS ANALYZER SUITABLE FOR FLAMMABLE GAS MIXTURES

The SERVOPRO 4200/4210 multi-gas analyzer is designed to monitor flammable gas samples including H₂/CO, 'HyCO' or 'Syngas' mixtures for trace level contaminants and percent level components. The 4200/4210 offers oxygen control using Servomex's unique Paramagnetic cell, trace level measurement of CO, CO₂, N₂O and CH₄ and percent levels of CO, CO₂, CH₄ using Photometric sensor technology.

- In compliance with Low Voltage, EMC and applicable Directives
- Measures up to four gases simultaneously
- RS232/RS485 and Modbus communications

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT ppm TRACE	PROCESS CONTROL QUALITY

SENSING TECHNOLOGY

GAS FILTER CORRELATION

PARAMAGNETIC

INFRARED

SERVOPRO 4900

SAFE AREA



CONTINUOUS EMISSIONS MONITORING (CEMS) ANALYSIS OF MULTIPLE FLUE GAS COMPONENTS

The SERVOPRO 4900 is specifically designed for Continuous Emissions Monitoring, where legislation requires the measurement of several gas components in flue gas. The 4900 offers multi-gas capability for pollutants, greenhouse gases and reference O₂, including CO, CO₂, NO, SO₂, CH₄, N₂O.

- MCERTS/TÜV approved measurements
- Low maintenance and cost of ownership
- Easy integration with other systems

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT ppm TRACE	EMISSIONS

SENSING TECHNOLOGY

GAS FILTER CORRELATION

PARAMAGNETIC

INFRARED

SERVOPRO FID

SAFE AREA



TRACE HYDROCARBON ANALYZER IDEAL FOR ASU SAFETY AND QUALITY CONTROL APPLICATIONS

A Flame Ionization Detector analyzer designed to assure safe operation for cryogenic air separation plants, the FID ensures the level of Total Hydrocarbons (THC) is maintained below flammable limits, as well as providing quality control in pure O₂, N₂, Ar, Air, He and CO₂.

- Electrical safety to IEC 61010-1. In compliance with Low Voltage, EMC and applicable Directives
- Excellent output resolution over three operating ranges
- Electronic flow controllers for air, fuel & sample for no dependency to atmospheric pressure variations and inlet pressure variation

GAS	MEASURES	APPLICATION
THC TOTAL HYDROCARBONS	ppm TRACE	SAFETY QUALITY

SENSING TECHNOLOGY

FLAME IONIZATION DETECTOR

SERVOPRO Chroma SAFE AREA



HIGHLY VERSATILE TRACE GAS ANALYZER PLATFORM CONFIGURABLE TO A WIDE RANGE OF APPLICATIONS

Offering a unique, non-depleting plasma emission detector, the Chroma (K4000) analyzer is one of the most versatile gas analyzers for trace gas measurement available. Most applications will be satisfied by a single 4U rack analyzer configuration, making the Chroma a compact, cost effective solution for continuous process control or quality monitoring.

- PlasmaHC measurement system requires no FID for THC measurement
- Fully automated - tune to the application - system for unique simplicity of use
- Standalone systems requires no third-party software or computer to operate

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT	QUALITY
	ppm TRACE	PROCESS CONTROL
	ppb ULTRA TRACE	

SENSING TECHNOLOGY

GAS CHROMATOGRAPHY	PLASMA
FLAME IONIZATION DETECTOR	THERMAL CONDUCTIVITY

SERVOPRO MultiExact 4100 SAFE AREA



A SOPHISTICATED, NEXT-GENERATION MULTI-GAS ANALYZER PROVIDING A HIGHLY ADAPTABLE ANALYSIS SOLUTION

The SERVOPRO MultiExact 4100 is a high-performance multi-gas analyzer designed to provide up to four simultaneous gas stream measurements including: O₂ (trace, control, and purity), CO₂, CO, N₂O, CH₄ (trace), Ar in O₂, N₂ in Ar, O₂ or air, and He in Ar, O₂ or N₂.

- Comprehensive solution for industrial and medical gas manufacture and for pharmacopeia applications
- Integrated support for the AquaXact 1688 Aluminum Oxide moisture transmitter
- Uses ultra-stable, non-depleting digital sensing technologies that help extend maintenance intervals

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT	QUALITY
	ppm TRACE	PROCESS CONTROL

SENSING TECHNOLOGY

GAS FILTER CORRELATION	ZIRCONIA
PARAMAGNETIC	THERMAL CONDUCTIVITY
INFRARED	ALUMINUM OXIDE

SERVOPRO Plasma SAFE AREA



RELIABLE MONITORING OF NITROGEN IN ARGON AND HELIUM, OPTIMIZED FOR ASU PLANT OPERATIONS

Specifically designed for the continuous monitoring of N₂ in Ar or He or both, the Plasma's unique plasma emission detector provides an accurate, highly stable and reliable measurement ideal for the requirements of ASU plant operators.

- Electrical safety to IEC 61010-1: Ed 3. In compliance with Low Voltage, EMC and applicable Directives
- Wide measurement range - 0-1ppm, 0-10ppm, 0-100ppm (higher on request)
- Electronic flow control system for low flow consumption and reading stability

GAS	MEASURES	APPLICATION
N ₂ NITROGEN	ppm TRACE	QUALITY

SENSING TECHNOLOGY

PLASMA

SERVOPRO MultiExact 5400 SAFE AREA



DIGITAL MULTI-GAS ANALYZER, OPTIMIZED FOR WIDE RANGE OF ASU MEASUREMENTS

Combining industry-leading performance and a range of new and enhanced functions as standard, the MultiExact 5400 offers air separation plants a multi-gas analyzer specifically optimized to industry requirements - with GFx and Paramagnetic measurements now augmented by Servomex's revolutionary TCD measurement sensing technology.

- IEC 61010-1. European Pharmacopeia compliant. US Pharmacopeia compliant (O₂). In compliance with Low Voltage, EMC and applicable Directives
- TruRef technology offers class leading measurements for Ar, He and N₂
- Options include digital communication options, an integrated valve block function and unique Servomex Flowcube flow sensor technology

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT	QUALITY
	ppm TRACE	PROCESS CONTROL

SENSING TECHNOLOGY

GAS FILTER CORRELATION	ZIRCONIA
PARAMAGNETIC	THERMAL CONDUCTIVITY

SERVOPRO NanoChrome SAFE AREA



SUB-PPB TRACE MEASUREMENT OF H₂, CH₄, CO, CO₂, N₂, Ar AND NMHC FOR THE SEMICONDUCTOR INDUSTRY

Incorporating the latest advances in gas sensing technology and signal processing methodology, the NanoChrome revolutionizes ultra-trace purity measurements for the semiconductor industry.

- In compliance with Low Voltage, EMC and applicable Directives
- New PED Sensor technology enables sub-ppb measurements of H₂, CH₄, CO, CO₂, N₂, Ar and NMHC
- Enables unique total Servomex solution for UHP gas analysis

GAS	MEASURES	APPLICATION
MULTIPLE	ppb ULTRA TRACE	QUALITY
	ppt ULTRA TRACE	

SENSING TECHNOLOGY

GAS CHROMATOGRAPHY	PLASMA
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SERVOPRO MonoExact TCD SAFE AREA



DIGITAL SINGLE GAS ANALYZER WITH TCD MEASUREMENTS

The MonoExact TCD gas analyzer brings Servomex's acclaimed TruRef Thermal Conductivity (TCD) technology to ASU operators in a compact, single component analyzer, offering class-leading measurements for Ar, He, N₂ and H₂.

- In compliance with Low Voltage, EMC and applicable Directives
- TruRef offers ASU operators truly industry-leading measurements for drift accuracy, linearity and repeatability
- Cost of ownership optimized by longer calibration intervals and no reference gas requirements

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT	QUALITY
		PROCESS CONTROL

SENSING TECHNOLOGY

THERMAL CONDUCTIVITY

SERVOFLEX Micro i.s. 5100

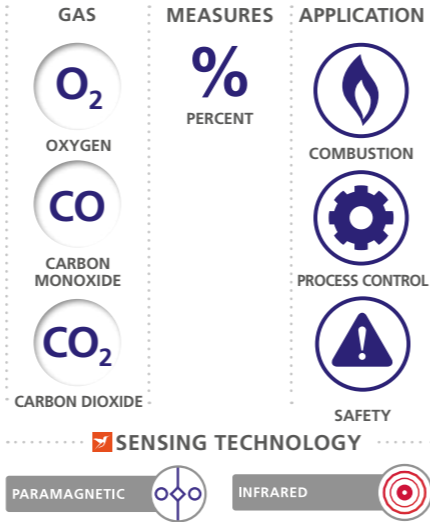
PORTABLES



INTRINSICALLY SAFE ANALYZER MEASURES OXYGEN, CARBON MONOXIDE OR CARBON DIOXIDE

Designed for the measurement of toxic and flammable gas samples, the intrinsically safe Micro i.s. 5100 is a unique analyzer certified to Zone 0 and Zone 1 and suitable for measuring percent levels of O₂, CO and CO₂.

- Intrinsically safe design to ATEX and IEC standards ensures safety operation in hazardous environments
- Ergonomic design ensures easy operation on the move
- Available in non-pump or pump versions with optional sample conditioning kit



GAS DETECTION OxyDetect

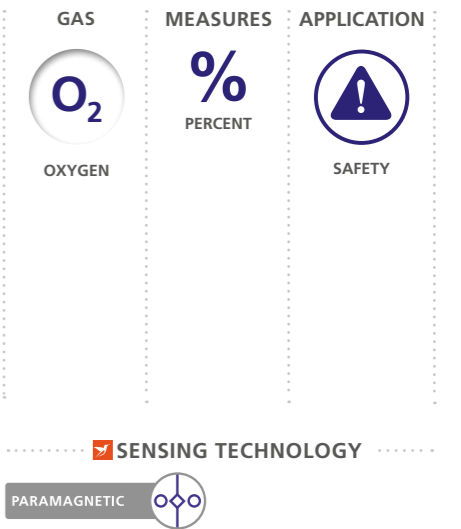
SERVOMEX



NON-DEPLETING PARAMAGNETIC OXYGEN MONITOR DESIGNED FOR LIFE SAFETY APPLICATIONS

Life safety monitor designed for safe area or hazardous area environments, utilizing superior performance of non-depleting Hummingbird Paramagnetic O₂ sensing technology.

- IP66 (indoor use only)
- The most reliable O₂ detector on the market
- No more false readings or false alarms caused by depleting cell technologies
- SIL 2 approval



SERVOFLEX MiniMP 5200

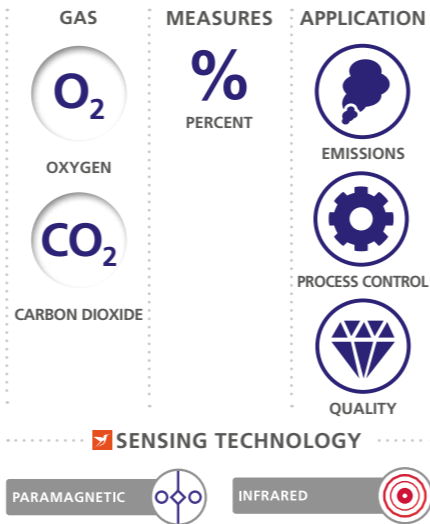
PORTABLES



BENCHTOP ANALYZER OFFERING SINGLE OR DUAL MEASUREMENTS OF OXYGEN AND CARBON DIOXIDE

The only truly portable battery-powered gas analyzer with MCERTS certification, the MiniMP 5200 is designed to offer single or dual measurement of O₂ and CO₂ by utilizing Servomex's advanced Paramagnetic and Infrared sensing technologies.

- EN15267-3 (MCERTS V3.3, Annex F) makes the MiniMP ideal for source testers that require reference O₂ analysis for CEMS verification
- Li-ion battery system offers unique true portability
- Non-depleting sensor design ensures long service with minimal calibration



DELTA F DF-500 Range

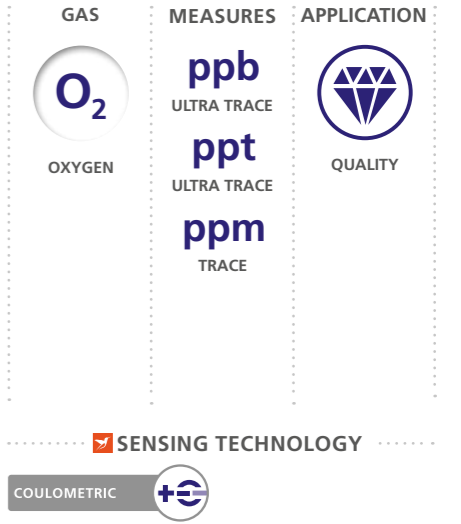
HIGH PURITY



LEADING ULTRA-TRACE PPT O₂ ANALYZER RANGE

Verified by independent experts as measuring O₂ to the lowest ppt levels available, the DF-500 analyzer range delivers the premium performance in ultra-trace oxygen measurement. Consisting of the DF-550E NanoTrace and DF-560E NanoTrace II, the NanoTrace series delivers exceptional O₂ measurements at trace and ultra-trace ppt levels.

- The industry standard for the reliable measurement of oxygen in semiconductor manufacture
- Fast response and quick upset recovery ensures ultimate performance
- Options include flexible configurations and hand carry portable option



SERVOFLEX MiniHD 5200

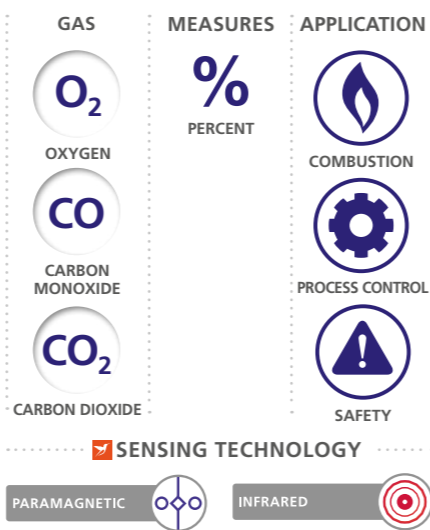
PORTABLES



PORTABLE GAS ANALYZER FOR MEASUREMENT OF COMMON GAS MIXTURES

Designed for use in field locations or light industrial applications, the MiniHD 5200 portable gas analyzer is a rugged, heavy duty analyzer designed to accurately measure the levels of O₂, CO and CO₂ within common gas mixtures. The MiniHD utilizes Servomex's non-depleting Paramagnetic and Infrared sensors to give dependable and accurate results.

- Robust IP65 construction meets the demanding needs of field location analysis
- Long life Li-ion rechargeable batteries and range of sampling options ensure ease of use
- Accurate measurement of O₂, CO and CO₂ levels with no background interference



DELTA F DF-700 Range

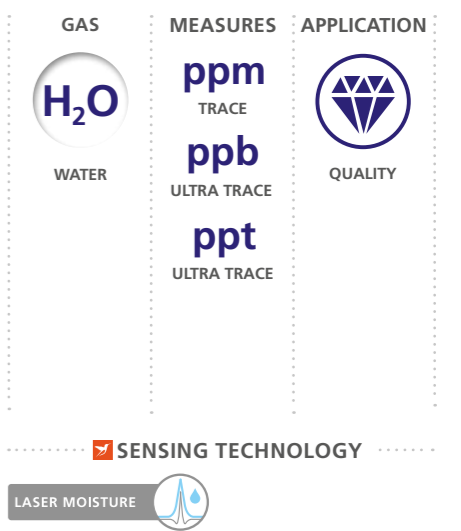
HIGH PURITY



TDL TRACE MOISTURE ANALYZER RANGE

A sophisticated process moisture analyzer range which offers users the comprehensive solution for trace and ultra-trace moisture measurement, the DF-700 series combines the latest Tunable Diode Laser (TDL) Absorption Spectroscopy technology, a robust measuring cell and a true baseline reference for highly accurate moisture measurement.

- Exceptional sub-ppb moisture level readings which exceed current UHP moisture measurement requirements
- Models include DF-730 (moisture in HCl); DF-740 (moisture in ammonia); DF-745 (high sensitivity 2ppb LDL); DF-745 SGMMax (specialty gas trace moisture analyzer); DF-750 NanoTrace (base model); DF-760 dual oxygen and moisture measurement
- 2F TDL detection technology for robustness to particulates contamination



INDUSTRIAL GASES

WE'RE READY TO HELP

WHATEVER YOUR INDUSTRIAL GAS REQUIREMENTS, WHEREVER YOU ARE



SERVOMEX 

A MEASURABLE ADVANTAGE

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