

INDUSTRIAL GASES

GAS ANALYSIS MAGAZINE

ISSUE
TWO - 2018

SUPPORTING YOUR BULK GAS AND
SPECIALTY GAS APPLICATIONS

MEDICAL GASES

Systems capability to serve the market

PRODUCT NEWS

New four-measurement analyzer is a step forward in medical and industrial gas analysis

PROCESS STUDY

Moisture measurements across the ASU process

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PRESCRIBE THE BEST!

IN THIS EDITION, FIND OUT WHY SERVOMEX IS THE BEST CHOICE FOR MEDICAL GAS PRODUCTION.

We also explore the current conditions in the market, and demonstrate Servomex's comprehensive, accurate solutions for ensuring gas purity.

The benefits of our latest multi-gas analyzer, the SERVOPRO MultiExact 4100, are explained, including the way it seamlessly integrates with the AquaXact 1688 moisture sensor.

We explore how this advanced moisture-sensing capability extends to provide key measurements throughout the air separation unit process.

IG/semiconductor customers are now served by our Purity and Specialty team, which is even better suited than before to delivering our application-based expertise.

This provides the next step forward following the move to make our US Technical Center (US TC) Servomex's center of excellence for IG and semiconductor gas analysis.

The newest member of the reorganized team is Douglas Barth (dbarth@servomex.com), who joined Servomex last year as Senior Global Product Manager.

Based at our US TC in Woburn, MA, Douglas is instrumental in the development and release of our future IG analyzer platforms. He also provides support for our recent releases including the AquaXact 1688, SERVOPRO MonoExact DF150E, SERVOPRO MonoExact DF310E and the SERVOPRO MultiExact 4100.

With a master's degree in Environmental Sciences from The Ohio State University and 17 years of analytical instrumentation experience, Douglas brings to Servomex a wealth of applications knowledge from both the semiconductor and industrial market spaces, which will directly benefit our customers.

This understanding will help customers find the right solutions for their process, and will assist us in continuing to develop the right products to meet the needs of the IG industry.

Our Purity and Specialty team is ready to supply the solutions and expertise to help you overcome the process challenges you may face in 2018 and beyond. Contact us today to find out more.



Jim Belanger
Global Sales Manager,
Purity & Specialty
Division.

Email: jbelanger@servomex.com

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IG MARKET FOCUS

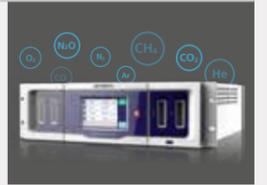
What does the future hold for the medical gas sector?



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MULTI-GAS ANALYSIS: EVOLVED

Meet the SERVOPRO MultiExact 4100, our next-generation analyzer platform.



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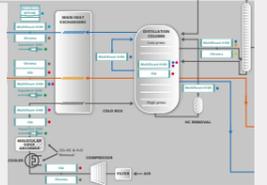
Servomex's expert support for ultra-high-purity gas analyzers.



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A TOTAL SOLUTION FOR ASU ANALYSIS

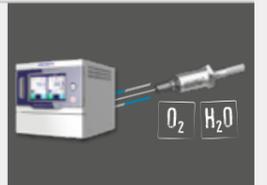
Learn how our next-generation products provide the measurements you need across your ASU processes.



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A DUAL ANALYSIS SOLUTION

The SERVOPRO MonoExact DF310E and AquaXact 1688 combine for oxygen and moisture measurements.



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EXPERT FOCUS

Our combined analyzers, system and service solutions for the IG market.



SEE THE FULL PICTURE ONLINE

SERVOPRO MultiExact 4100

Discover the future of multi-gas analysis with our four-sensor digital analyzer platform for industrial and medical gases.



SERVOPRO MonoExact DF310E

See the benefits of our O₂ analyzer for industrial gas applications, designed to integrate with the AquaXact 1688 moisture sensor.



SERVOPRO MonoExact DF150E

Watch why this digital Coulometric oxygen analyzer is the trusted choice for your industrial applications.



INSIDE SERVOMEX USA

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



Watch at servomex.com/videos

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

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A GROWING MARKET

DOUGLAS BARTH, SERVOMEX'S SENIOR GLOBAL PRODUCT MANAGER, ASSESSES THE MEDICAL GAS MARKET, HIGHLIGHTING KEY OPPORTUNITIES FOR GAS ANALYSIS.



Medical gases are widely used by healthcare professionals for diagnostic and treatment applications, and for an extensive variety of purposes in the pharmaceutical and biotechnology industries.

The industrial gas (IG)-related healthcare market includes gas producers and distributors who supply a wide range of gases and specialty gas mixtures to the traditional institutional and homecare markets, as well as to emerging healthcare-related industries such as alternative medical treatment manufacturers and cryotherapy centers.

Globally, the medical gas market was valued at around \$13.73bn in 2016 and is predicted by some analysts to reach \$19.68bn by 2022, with a compound annual growth rate of around 7.4%.

The key factors driving this growing demand are the high prevalence of respiratory and chronic diseases, rising pollution levels, a rapidly growing elderly population and an increasing demand for home healthcare and point-of-care products.

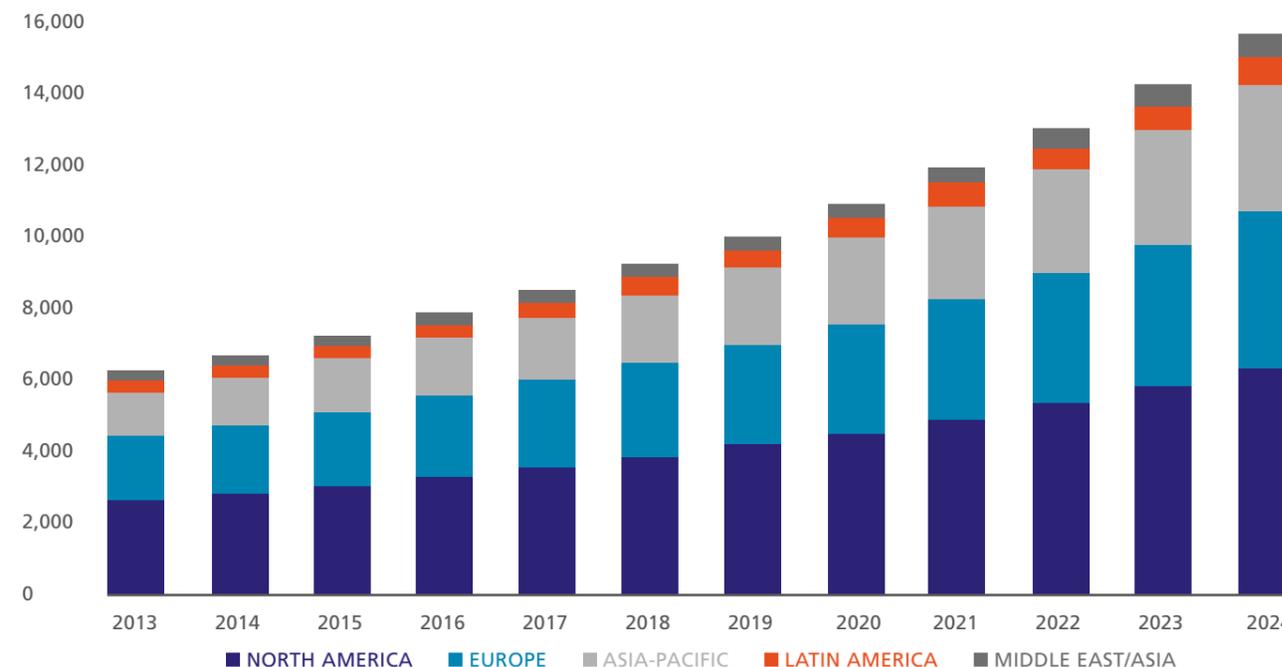
The Asia-Pacific region is expected to be the fastest-growing region over the

2016-2022 period. Populous countries including India and China, along with growing levels of respiratory and cardiovascular disease, are expected to accelerate this growth.

With a large proportion of geriatric population, the United States continues to provide the largest overall market for medical gases, followed by Germany.

The value of the US medical gas market was estimated at \$2.6bn in 2016. This makes up 11% of the total IG market in the US.

ESTIMATED GLOBAL MEDICAL GASES MARKET, BY REGION, 2013-2024 (US\$ MILLION)



Source: Grand View Research, 2016

US HEALTHCARE SPENDING AS PERCENTAGE OF REAL GDP 2013-2017 (EST)

US\$ TRILLIONS	2013	2014	2015	2016	2017
Real GDP	15.6	16.0	16.3	16.7	17.1
Total healthcare expenditures	2.9	3.1	3.2	3.4	3.5
Percent spent on healthcare	18.7%	19.3%	19.8%	20.1%	20.7%

Source: CMS, US BEA and Intelligas Consulting estimates

COMMON STEPS IN THE PROCESS OF MEDICAL GAS TRACEABILITY

Medical and specialty gas production requires accurate, correctly functioning analysis devices for process and quality control. Increasingly, they also demand a holistic traceability throughout the production process.

- Identifying a cylinder by size and maximum pressure
- Purging, drying and preparing the cylinder for filling
- Optional pre-fill analysis as cylinder qualification for precise mixtures
- Filling by gravimetric, volumetric or manometric method
- Optional settling and/or rolling process for cylinders
- Post-fill analysis and verification of matrix and impurities
- Certification of compliance (CoC), printout of CoC documents

SERVOMEX OFFERS DIGITAL COMMUNICATIONS

The traditional process of manually filling, analyzing and writing certificates for gas mixtures is increasingly being further optimized, usually by employing some kind of identification like a barcode or RFID tag. This ID is repeatedly being scanned at every process step to ensure quality compliance and full traceability during the filling and weighing.

Optimization of the filling and analysis process commonly goes alongside an increase in the amount of data gathered.

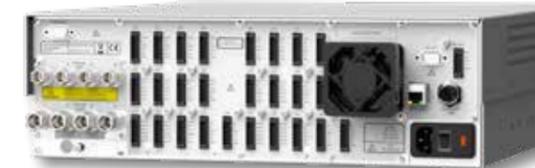
The latest Servomex analyzers support these traceability requirements by offering modern digital communication protocols for precise transfer of readings, detailed logging of operator interaction and calibration procedures, as well as password-protected configuration settings.

The new SERVOPRO MultiExact 4100, for example, offers RS232/RS485 Modbus and PROFIBUS digital communications, with Ethernet Modbus TCP/IP capabilities to be added soon.

Control via the color touchscreen display permits precise logging and calibration, along with password control for secure configuration.



NEW MultiExact 4100 multi-gas analyzer



Alternative medical treatments

P04



Cryotherapy centers

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PRODUCT NEWS

SERVOPRO MultiExact 4100

SERVOMEX'S NEW FOUR-MEASUREMENT ANALYZER IS A STEP FORWARD IN MEDICAL AND INDUSTRIAL GAS ANALYSIS.

MULTIPLE GASES



Gas analysis has evolved with the launch of Servomex's high-performance digital multi-gas analyzer, the SERVOPRO MultiExact 4100, suitable for a wide range of industrial and medical gas applications.

Configurable with up to four of Servomex's world-leading range of gas analysis sensors in a single package, the

MultiExact 4100 is designed to digitally measure simultaneous gas streams including oxygen, nitrogen, methane, nitrous oxide, carbon monoxide, argon, helium and carbon dioxide.

The new MultiExact 4100 is an advanced successor to the SERVOPRO 4100 and SERVOPRO MultiExact 5400 analyzers,

using the same tried and tested sensor technologies while delivering the improved measurement stability of a digital format. It is backwards compatible with existing installations, and complies with the same standards and agreements, so it is easy to upgrade.

SENSING TECHNOLOGIES AVAILABLE FOR THE SERVOPRO MultiExact 4100:



New features include advanced communications for remote access, 32 alarms, 32 relays, and intelligent functionality, including independent auto-calibration. It offers the latest digital communications protocols, including 0-10V DC, 4-20mA, RS232, RS485, Serial Modbus, Ethernet Modbus TCP/IP and PROFIBUS.

Low cost of ownership is delivered through Servomex's ultra-stable non-depleting digital

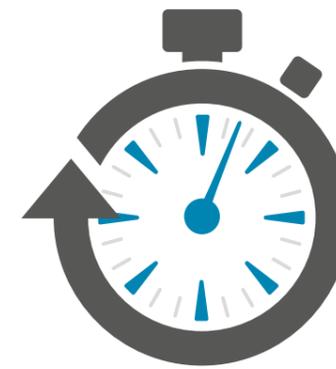
sensing technologies, which help extend maintenance intervals. An independent auto-calibration function helps keep operational and maintenance costs to a minimum.

It's easy to interact with the MultiExact 4100, using the intuitive, icon-driven color touchscreen. A USB serial port allows data logging and software upgrades, and makes it simple to duplicate analyzer configurations using a thumb drive.

With flexible, customizable analysis solutions capable of meeting specific process monitoring needs, the MultiExact 4100 delivers precise, stable results at every point of the ASU process.

It is also suitable for an extensive range of applications, including bottling/filling plant applications and validation of medical gas purity.

DELIVERING OUTSTANDING PERFORMANCE THROUGH:



OPTIMIZING PROCESSES



IMPROVING YIELDS



ENSURING HIGH QUALITY

SEAMLESS INTEGRATION WITH THE AquaXact 1688 MOISTURE SENSOR

The MultiExact 4100 is designed to remotely interface with the new AquaXact 1688 moisture sensor, providing a simultaneous moisture measurement alongside three other gas stream readings.

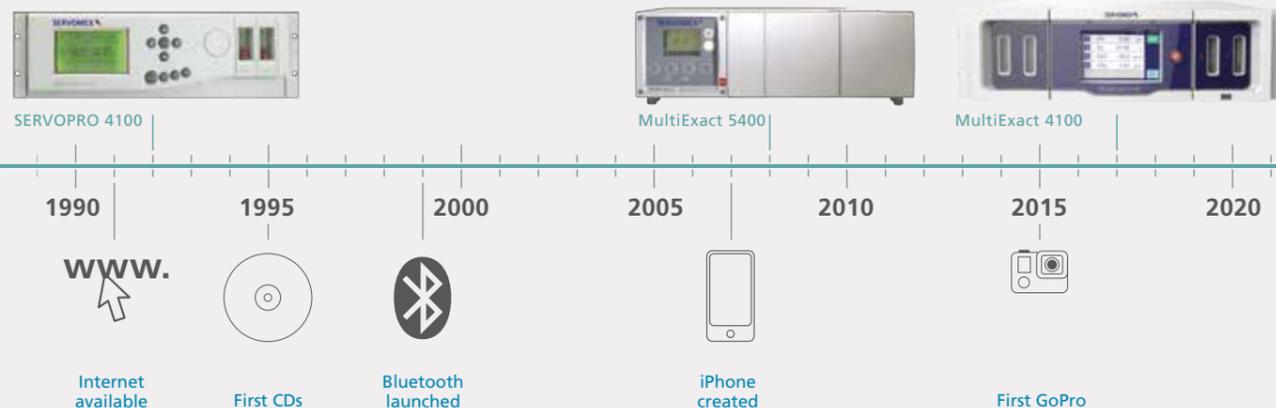
Operation is simple, with the connected moisture sensor automatically detected by the MultiExact 4100 on start-up. This enables control of the sensor using the

touchscreen, as well as access to the alarms, relays and communications of the MultiExact 4100.

It also ensures easy field replacement of the AquaXact 1688's Aluminum Oxide ultra-thin film sensor tip, as the associated calibration file can be loaded into the sensor through the MultiExact 4100's USB port.



GAS ANALYSIS HAS EVOLVED



COMPLIANCES:

- United States Pharmacopeia compliant method for assay of medical oxygen and air
- European Pharmacopeia compliant for medical oxygen and air
- In compliance with Low Voltage, EMC and applicable EU directives

"The MultiExact 4100 is a new milestone in our continued leadership of multi-gas analysis, delivering a performance that further optimizes processes, improves product yields and ensures high product quality."



Jim Belanger - Global Sales Manager, Purity & Specialty Division.
Email: jbelanger@servomex.com

Find out more: servomex.com/multiexact4100

APPLICATION STUDY

MONITORING PURITY DURING MEDICAL GAS FILLING

MEDICAL GASES

Medical gases are defined as any gases used for the medical treatment of humans, and are regulated under the same rules as medicinal drugs.

These regulations are set out in an official publication known as a Pharmacopeia, which specifies – among other things – how each gas should be produced and validated, the acceptable level of purity and official measurement methods.

Although they share some of the same rules, the United States Pharmacopeia (USP) and European Pharmacopeia (EP) have different regulations, and the acceptable concentration levels often vary.



PROCESS MEASURING POINTS

Medical gas cylinders are filled either at a facility adjacent to an Air Separation Unit (ASU) or at specific cylinder filling plants. The gas composition is measured at the source of supply, while quality is measured before and/or after the bulk gas delivery.

Gases are delivered to the filling plant via pipeline from an ASU or a tanker, in a liquefied form which is stored in a cryogenic tank. For EP regulations,

dedicated tankers do not need to be sampled after filling a cryogenic vessel if a certificate of analysis is provided with the delivery.

The liquefied gas is vaporized into gas and pumped to the filling manifold. The quality is usually high enough that no further purification is required.

There must be a dedicated manifold for each single gas, and a dedicated mixture manifold for two or more gases,

with control procedures to prevent cross-contamination.

For multi-cylinder manifolds, the gas from at least one cylinder from each manifold filling cycle is tested for identity and assay each time the cylinders are changed on the manifold. For single gases filled one cylinder at a time, at least one cylinder per cycle is tested.

Air is classed as a single gas so long as it is not mixed using N₂ and O₂.

THE SERVOMEX SOLUTION

SERVOPRO MultiExact 4100



A multi-gas analyzer capable of utilizing several sensing technologies, providing a solution for O₂ assay analysis and impurity analysis for CO, CO₂ and CH₄. It uses a Paramagnetic cell for a highly stable oxygen reading, with customized Infrared Gas Filter Correlation (GFx) technologies for the other measurements.

SERVOPRO Chroma



The Chroma provides a nitrogen assay measurement utilizing Thermal Conductivity Detector (TCD) technology. When using Flame Ionization Detection (FID) with a methanizer, it also delivers impurity analysis for carbon monoxide.

SERVOTOUGH SpectraExact 2500



This is tailored for purity analysis of CO₂ and N₂O, using Infrared sensing and specific calibration. Servomex recommends that sample temperature, pressure and flow is maintained for the most accurate analysis.

GAS MIXTURE	ANALYTE	ASSAY OR IMPURITY	MEASUREMENT TECHNOLOGY	ACCEPTABLE CONCENTRATION (EP)	ACCEPTABLE CONCENTRATION (USP/NF ⁴)
Medical air	O ₂	Assay	Paramagnetic (MultiExact 4100)	20.4-21.4%	19.5-23.5%
	CO	Impurity	Infrared Gfx ¹ (MultiExact 4100)	<5ppm	<10ppm
	CO ₂	Impurity	Infrared Gfx ¹ (MultiExact 4100)	<500ppm	<500ppm
Air, synthetic medicinal	O ₂	Assay	Paramagnetic (MultiExact 4100)	21-22.5%	N/A
Medical oxygen	O ₂	Assay	Paramagnetic (MultiExact 4100)	>99.5%	>99.0%
	CO	Impurity	Infrared Gfx ¹ (MultiExact 4100)	<5ppm	<10ppm
	CO ₂	Impurity	Infrared Gfx ¹ (MultiExact 4100)	<300ppm	<300ppm
O ₂ 93%	O ₂	Assay	Paramagnetic (MultiExact 4100)	90-96%	90-96%
	CO	Impurity	Infrared Gfx ¹ (MultiExact 4100)	<5ppm	<10ppm
	CO ₂	Impurity	Infrared Gfx ¹ (MultiExact 4100)	<300ppm	<300ppm
Medical N ₂	N ₂	Assay	GC TCD (Chroma)	>99.5%	>99.0%
	CO	Impurity	Infrared Gfx ¹ (MultiExact 4100)	<5ppm	<10ppm
	CO ₂	Impurity	Infrared Gfx (MultiExact 4100)	<300ppm	N/A
N ₂ 97%	N ₂	Assay	GC TCD (Chroma)	N/A	>97.0%
	CO	Impurity	Infrared Gfx ¹ (MultiExact 4100)	N/A	<10ppm
	CO ₂	Impurity	Infrared Gfx ¹ (MultiExact 4100)	N/A	<300ppm
Carbon dioxide	CO ₂	Assay	Infrared (SpectraExact 2500)	>99.5%	N/A
	CO	Impurity	GC FID with methanizer (Chroma)	<5ppm	N/A
Helium	CH ₄	Impurity	Infrared Gfx (MultiExact 4100)	<50ppm	N/A
	CO	Impurity	Detector Tube	N/A	<10ppm
Argon	O ₂	Impurity	Paramagnetic (MultiExact 4100)	Not O ₂ ³	N/A
Nitrous oxide	N ₂ O	Assay	Infrared ² (SpectraExact 2500)	>98%	>98.0%
	CO	Impurity	GC FID with methanizer ¹ (Chroma)	<5ppm	<10ppm
	CO ₂	Impurity	GC TCD ¹ (Chroma)	<300ppm	<300ppm

¹ The detector tube is the measurement technology for impurities in the USP. Gas analyzers can be used as an alternative method if supported by validation tests.

² GC TCD (Chroma) for the USP.

³ For medical argon, Servomex provides a solution that confirms it is not oxygen before it is measured using gas chromatography.

⁴ The National Formulary (NF) provides standards for medicinal N₂ and 93% N₂ in the US.

Find the right solution for your process: servomex.com/quotes-and-enquiries

ASIA-PACIFIC SERVICE SUPPORT FOR IG PRODUCERS

SERVOMEX PROVIDES EXPERT ENGINEER COVER ACROSS ITS GLOBAL NETWORK, WITH GROWING SUPPORT FOR THE IMPORTANT ASIA-PACIFIC MARKET.

The Servomex Service Network offers a range of service products developed to ensure optimum business performance. This includes commissioning, on-site servicing and the supply of spare parts.

This network of regional service centers is located close to customers, ready to receive analyzers for repair, preventative maintenance and upgrades.

Support for customers in the Asia-Pacific region has increased from a team of 5 just 4 years ago to its current level of 11. In addition, a dedicated engineer for Korea is set to join the center in the second quarter of 2018, to support the busy Korean semiconductor market.

Service center capabilities differ slightly depending on location. For example, the service center in Singapore has access to purified gases, enabling local calibration for the DF analyzer range instead of returning the device to the US Technical Center. It also means the service team is able to repair and test DF analyzers locally.

Servomex ensures that the Singapore office and its other service center in Shanghai both stock sufficient spares to support key customers in the region at all times. It also keeps commercial partners fully stocked with spares to support urgent customer needs.



"We have trained our commercial partners' engineers, so we have qualified engineering cover in almost all countries in Asia. They support after-sales services for us whenever our own engineers have a full schedule. This means the response time for getting a qualified engineer on site is never an issue for customers in Asia."



Customers outside the Asia-Pacific region also benefit from Servomex's growing service network. We operate workshops in Houston, Boston and the UK, with service centers and offices around the world. In addition, our field service teams will attend your site, providing truly global coverage. The Americas currently has five field service engineers, while the Europe and Middle East team has nine, providing a rapid response whenever you need it.

Leong Kee Keat - Servomex Service Manager and IG Market Manager, Asia Pacific.
Email: kleong@servomex.com

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

PROCESS STUDY

A TOTAL SOLUTION FOR AIR SEPARATION UNIT GASES

MOISTURE IS A COMMON CONTAMINANT AFFECTING THE PURITY OF GASES PRODUCED THROUGH AIR SEPARATION. THE ADDITION OF THE AquaXact 1688 MOISTURE SENSOR COMPLETES SERVOMEX'S COMPREHENSIVE ASU SOLUTION.

The air separation process takes atmospheric air and produces three pure gaseous elements: nitrogen, oxygen and argon. Further separation enables the production of quantities of noble gases such as neon, krypton and xenon.

At an industrial level, this process is carried out by an air separation plant. Cryogenic distillation is the most

common method employed, and also the most significant in terms of production value and volume.

Cryogenic gases are purchased for their particular properties. They may be used as an inert blanket, in a chemical reaction, or as a catalyst. Because of this variety of usage, they are sold in various degrees of purity.

Moisture is regarded as an impurity, albeit on a very small scale. However, because it is so prevalent in the atmosphere, it can be difficult to remove.

Typically, moisture levels will be around 0-10ppm for each separated gas.

Moisture measurements are critical for ultra-high-purity gases used in semiconductor manufacturing processes.

KEY ANALYZERS IN AIR SEPARATION UNIT APPLICATIONS

SERVOPRO MonoExact DF310E



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

SERVOMEX AquaXact 1688



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

SERVOPRO MultiExact 4100



Highly flexible, 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.

Get advice from the experts:

europe_sales@servomex.com | asia_sales@servomex.com

americas_sales@servomex.com | MEI_sales@servomex.com

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

PROCESS STUDY

AIR SEPARATION APPLICATION MAP

A TOTAL SOLUTION FOR AIR SEPARATION UNIT GASES

In the ASU process, ambient air is filtered and compressed to remove dust. The air is then cooled and purified through a series

of filters to remove most of the carbon dioxide, hydrocarbons and moisture. Moisture measurements are made after

the compression and purification steps. The moisture transmitter range recommended for ASU applications is 0-100ppm.

The air is then cooled and separated into its primary components – nitrogen, oxygen and argon. The moisture level in the separated gases and liquids also needs to be measured, to assure the product purity meets specifications.

Typical bulk gas product specifications are for nitrogen to contain less than 10ppm oxygen, oxygen to be better than

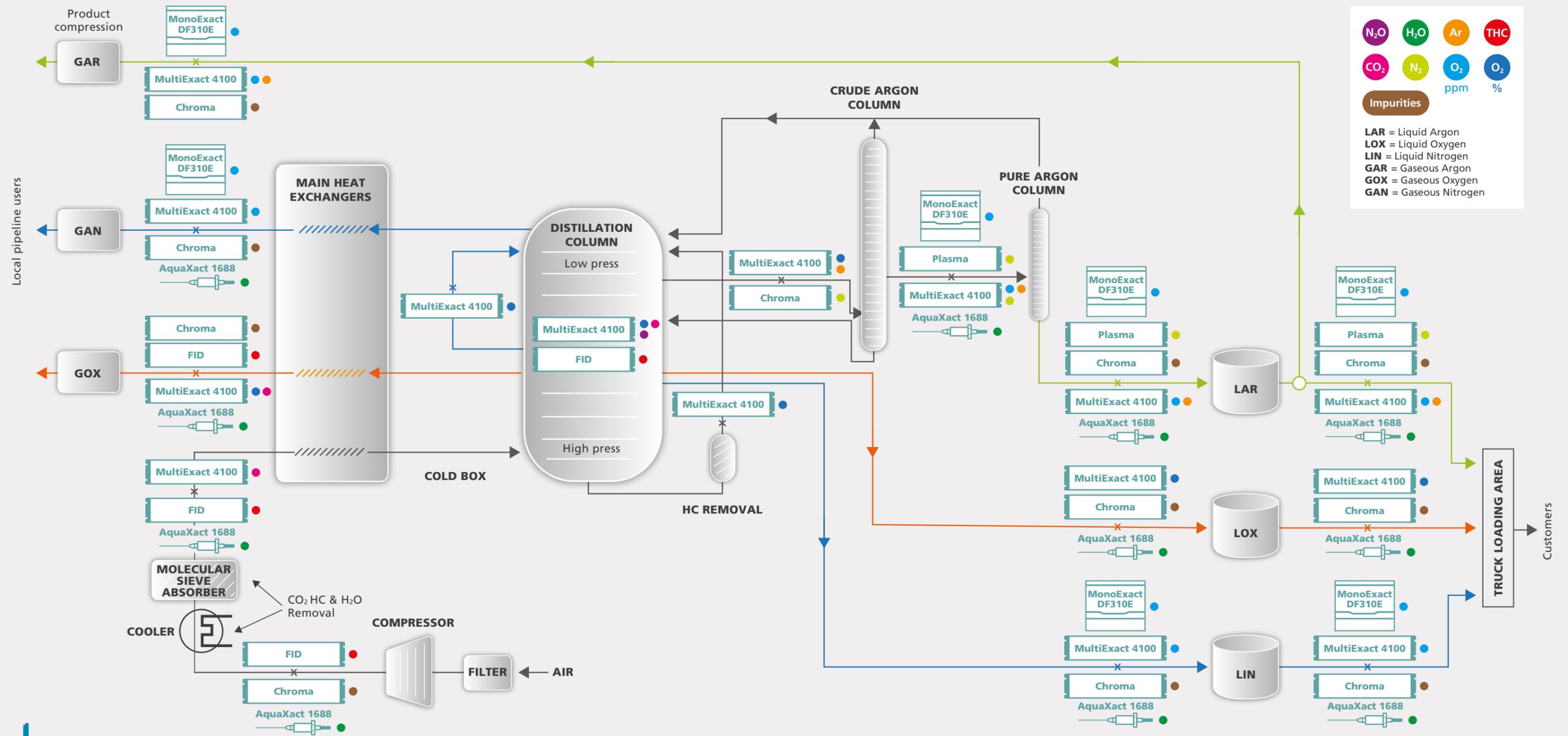
99.5% pure, and argon to contain fewer than 10ppm impurities.

The trace level oxygen monitoring makes the dual measurement combination of the AquaXact 1688 moisture sensor and the SERVOPRO MonoExact DF310E oxygen analyzer a highly cost-effective solution.

There are few problems with this application, thanks to the purity of the

gas and the cleanliness of the application. Ideally, the sensor should be located in a bypass after a vaporizer (for liquid samples) and not directly in the flow.

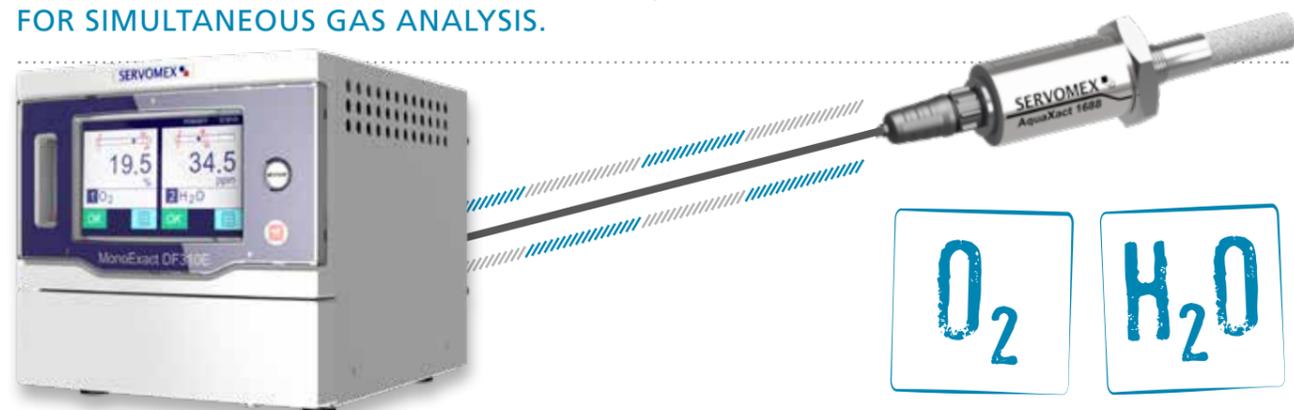
This ensures that the sample is warmed and that the flow past the sensor is not excessive. The recommended flow rate is between two and five liters per minute, with a gas temperature of >20°C.



PRODUCT NEWS

DUAL MEASUREMENT SOLUTION FOR OXYGEN AND MOISTURE

THE SERVOPRO MonoExact DF310E AND AquaXact 1688 WERE DESIGNED TO COMBINE FOR SIMULTANEOUS GAS ANALYSIS.



Servomex's gas analysis expertise means there's now a single, combined solution for the measurement of oxygen and moisture.

The SERVOPRO MonoExact DF310E digital oxygen analyzer and AquaXact 1688 moisture sensor were developed together at our US Technical Center to ensure seamless integration and a simultaneous dual analysis of oxygen and moisture.

Built around the latest innovations in software and hardware, the MonoExact DF310E provides customers with a choice of accurate, reliable oxygen measurement technologies. It offers an updated Coulometric sensor, for three different parts-per-million ranges (ppm),

and/or a non-depleting Paramagnetic sensor, for percentage measurements.

The AquaXact 1688 is a fast-response moisture sensor using stable, sensitive Aluminum Oxide technology. It measures dew point from -100°C to 20°C, and ppm moisture.

With industry-leading sensitivity and stability, the AquaXact 1688 is accurate to within ±3°C, and offers repeatability of 0.5°C for a wide range of gas phase process applications.

Working together, they provide an ideal solution for applications that need simultaneous monitoring of oxygen and moisture.

Connecting the AquaXact 1688 to the MonoExact DF310E is simple: once the sensor is connected and powered on, the digital analyzer automatically detects it.

This allows control via the color touchscreen, access to eight alarms and eight relays, and advanced digital communication options, including Ethernet, Modbus TCP/IP and PROFIBUS.

It also makes it easy to replace the AquaXact 1688's ultra-thin film sensor tip in the field, without losing measurement quality. Simply upload the calibration file using the USB port on the MonoExact DF310E, so there's no need for return-to-factory calibrations.

TYPICAL DUAL MEASUREMENT APPLICATIONS INCLUDE:



Get the combined solution for your process today:
servomex.com/monoexactdf310e | servomex.com/aquaxact1688

EXPERT FOCUS



A COMBINED SOLUTION FOR YOUR INDUSTRIAL GAS PROCESS

SERVOMEX PROVIDES A COMPREHENSIVE, SINGLE-SUPPLIER SOLUTION FROM PRECISION GAS ANALYSIS TO ENTIRE SYSTEMS AND EXPERT GLOBAL SUPPORT.



Discover our analyzer range:
servomex.com/gas-analyzers

Servomex's analyzer range is the most comprehensive available from a single manufacturer, setting the standard for the industrial gas (IG) market for decades with a unique 'all of market' solution.

Powered by reliable, ground-breaking sensor technologies, our range delivers accurate, stable measurements

for every point in your process, with a full range of percent to ultra-trace measurements.

Servomex analyzers support quality control, maintaining gas purity during the production process and detecting impurities during processes such as medical gas supply or semiconductor production.

We also provide solutions for process control and ensure safety and emissions monitoring for potentially hazardous processes.

Our commitment to ongoing development ensures that even the most trusted measurements are continuously improved, with added features that increase ease of use and reduce the cost of ownership.



Discover our systems solutions:
servomex.com/integrated-systems

In addition to individual analyzers, Servomex also supplies complete system solutions designed to order for your project.

State-of-the-art systems engineering centers in the US, China, India and Europe provide a global service, offering solutions ranging from simple utilities panels to fully-contained air-conditioned shelters.

Proven experience ensures the optimum level of efficiency, safety and cost-effective operation for your application.



Discover our service solutions:
servomex.com/service-network

Servomex support doesn't end with the supply of your analyzer or system. Our expert team delivers gas analysis expertise directly to your plant.

With global coverage provided by service centers and mobile engineers worldwide, the Servomex Service Network ensures your processes run efficiently, safely and profitably.

Support offered includes service contracts, spares, calibration kits, commissioning, health checks, training, and equipment rental. We also provide expert support from our extensive network of service centers, or on-site at your facility.

> 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

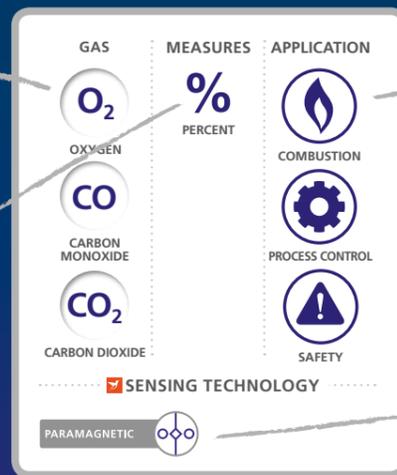
manufacturer, ensuring delivery of the precise, correct solution for every point in your process.

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

AquaXact 1688 Controller

SAFE AREA

DIGITAL CONTROLLER PLATFORM FOR THE AQUAXACT 1688

Built specifically to work in harmony with the AquaXact 1688 ultra-thin film Aluminum Oxide moisture transmitter, this digital controller provides a high-clarity color touchscreen display, alarms, relays and advanced communications protocols, and allows easy sensor tip replacement in the field.



FEATURES AND BENEFITS

- Seamless integration with the AquaXact 1688 moisture sensor for advanced digital control of dew point and ppmv H₂O measurements
- Compact footprint for easy integration into your system
- Advanced digital communications including Ethernet, Modbus TCP/IP and PROFIBUS

APPLICATIONS

- Air separation units
- Glove boxes
- Instrument air units
- Refining gases



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.



FEATURES AND BENEFITS

- 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

APPLICATIONS

- Glove boxes
- Heat treating
- Solder reflow ovens
- Industrial gas production



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.

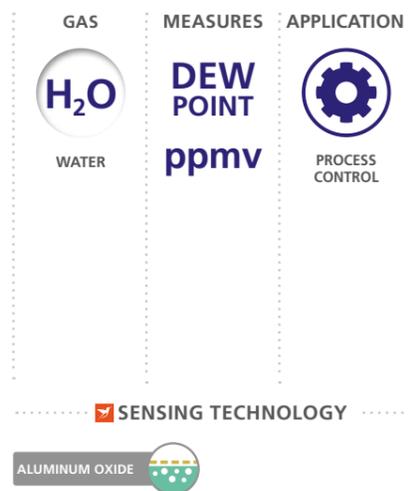


FEATURES AND BENEFITS

- Functions as a standalone 4-20 mA transmitter or remotely interfaces with SERVOPRO MonoExact DF310E multichannel gas analyzer system
- 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

APPLICATIONS

- Glove boxes
- Solder reflow ovens
- Compressed air generation
- Ethylene production



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 trace-level measurement with new performance benefits and extended digital communications compatibility.

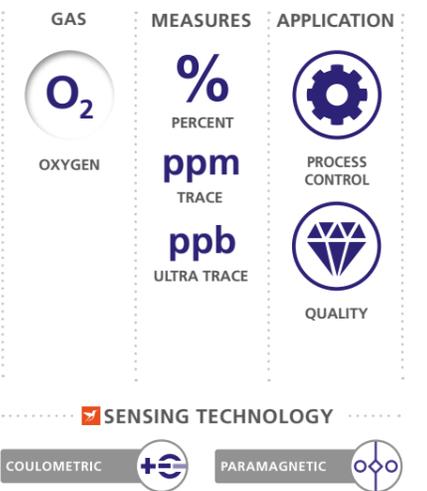


FEATURES AND BENEFITS

- 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

APPLICATIONS

- Air separation units
- Medical/industrial gases
- Specialty gas blending



SERVOPRO 4200/4210 SAFE AREA

GAS ANALYZER SUITABLE FOR FLAMMABLE GAS MIXTURES

The 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.



FEATURES AND BENEFITS

- Meets the requirements of EN 61010-1:2010 and EN 61326-1:2013
- Measures up to four gases simultaneously
- RS232/RS485 and Modbus communications

APPLICATIONS

- Product quality validation in hydrogen plants
- HyCO process control
- Bottling/filling plants producing flammable gas blends

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT ppm TRACE	PROCESS CONTROL QUALITY
SENSING TECHNOLOGY		
GAS FILTER CORRELATION	INFRARED	
PARAMAGNETIC		

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 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.



FEATURES AND BENEFITS

- 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

APPLICATIONS

- Medical gas production
- Air separation plants
- Cryogenic truck loading station
- High purity gas production

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT ppm TRACE ppb ULTRA TRACE	QUALITY PROCESS CONTROL
SENSING TECHNOLOGY		
GAS CHROMATOGRAPHY	PLASMA	
FLAME IONIZATION DETECTOR	THERMAL CONDUCTIVITY	

SERVOPRO 4900 Multigas SAFE AREA

AN ADVANCED DIGITAL MULTI-GAS CEMS ANALYZER

Specifically designed for Continuous Emissions Monitoring (CEMS) of flue gas, the SERVOPRO 4900 Multigas provides up to four simultaneous gas stream measurements. It combines Servomex's leading-edge sensing technologies with a modern digital platform for next-generation performance.



FEATURES AND BENEFITS

- A comprehensive solution for CEMS analysis of multiple flue gas components
- Low maintenance and cost of ownership
- Advanced digital communications including Ethernet, Modbus TCP/IP and PROFIBUS

APPLICATIONS

- Utility boilers
- Chemical incinerators
- Crematoria
- Mobile labs

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT ppm TRACE	EMISSIONS
SENSING TECHNOLOGY		
GAS FILTER CORRELATION	INFRARED	
PARAMAGNETIC		

SERVOPRO Plasma SAFE AREA

RELIABLE MONITORING OF NITROGEN IN ARGON AND HELIUM, OPTIMIZED FOR AIR SEPARATION UNIT (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.



FEATURES AND BENEFITS

- 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

APPLICATIONS

- Argon production
- Track loading
- Pure gas bottling
- Specialty gas laboratories

GAS	MEASURES	APPLICATION
N ₂ NITROGEN	ppm TRACE	QUALITY
SENSING TECHNOLOGY		
PLASMA		

SERVOPRO FID SAFE AREA

TRACE HYDROCARBON ANALYZER IDEAL FOR AIR SEPARATION UNITS (ASU) SAFETY AND QUALITY CONTROL APPLICATIONS

A Flame Ionization Detector analyzer designed to assure safe operation for cryogenic ASU, 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.



FEATURES AND BENEFITS

- 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 and sample for no dependency to atmospheric pressure variations and inlet pressure variation

APPLICATIONS

- Cryogenic air separation
- Process control
- Food gas manufacture
- Product validation

GAS	MEASURES	APPLICATION
THC TOTAL HYDROCARBONS	ppm TRACE	SAFETY QUALITY
SENSING TECHNOLOGY		
FLAME IONIZATION DETECTOR		

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.



FEATURES AND BENEFITS

- 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

APPLICATIONS

- Semiconductor production – quality control measurements
- Semiconductor production – stationary analytical systems
- UHP gas production – quality control measurements

GAS	MEASURES	APPLICATION
MULTIPLE	ppb ULTRA TRACE ppt ULTRA TRACE	QUALITY
SENSING TECHNOLOGY		
GAS CHROMATOGRAPHY	PLASMA	

SERVOPRO MultiExact 4100

SAFE AREA

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

The 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.



FEATURES AND BENEFITS

- 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

APPLICATIONS

- Product purity on air separation plant
- Process control on air separation plant
- Monitor trace CO₂ on scrubbed air inlet to air separation process
- Validation of medical O₂, N₂, air and He

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT ppm TRACE	PROCESS CONTROL QUALITY

SENSING TECHNOLOGY

GAS FILTER CORRELATION	ZIRCONIA
PARAMAGNETIC	THERMAL CONDUCTIVITY
INFRARED	ALUMINUM OXIDE

SERVOPRO MultiExact 5400

SAFE AREA

DIGITAL MULTI-GAS ANALYZER, OPTIMIZED FOR WIDE RANGE OF AIR SEPARATION UNIT (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, Zirconia and Paramagnetic measurements now augmented by Servomex's revolutionary TCD measurement sensing technology.



FEATURES AND BENEFITS

- 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

APPLICATIONS

- Product purity on air separation plant
- Process control on air separation plant
- Monitor trace CO₂ on scrubbed air inlet to air separation process
- Validation of medical O₂, N₂, air and He

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT ppm TRACE	PROCESS CONTROL QUALITY

SENSING TECHNOLOGY

GAS FILTER CORRELATION	ZIRCONIA
PARAMAGNETIC	THERMAL CONDUCTIVITY

SERVOPRO MonoExact TCD

SAFE AREA

DIGITAL SINGLE-GAS ANALYZER WITH TCD MEASUREMENTS

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



FEATURES AND BENEFITS

- 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

APPLICATIONS

- Validation on industrial processes
- Hydrogen purity
- Process control on air separation plants
- Bottling/filling plant applications

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT	PROCESS CONTROL QUALITY

SENSING TECHNOLOGY

THERMAL CONDUCTIVITY

SERVOPRO NOx

SAFE AREA

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

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



FEATURES AND BENEFITS

- Multiple-range NOx 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
- EPA 1065/1066 and LD Euro 6, HD Euro V1 compliant

APPLICATIONS

- Continuous emissions monitoring (CEMS)
- Scrubber efficiency
- Turbine/generator feedback control
- SCR/SNCR feedback control

GAS	MEASURES	APPLICATION
NO NITRIC OXIDE	ppm TRACE	PROCESS CONTROL
NO ₂ NITROGEN DIOXIDE		EMISSIONS
NOx NITROGEN OXIDES		QUALITY

SENSING TECHNOLOGY

CHEMILUMINESCENCE

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.



FEATURES AND BENEFITS

- 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

APPLICATIONS

- Continuous emissions monitoring (CEMS)
- Ambient air monitoring

GAS	MEASURES	APPLICATION
SO ₂ SULFUR DIOXIDE	ppm TRACE ppb ULTRA TRACE	PROCESS CONTROL
		EMISSIONS
		QUALITY

SENSING TECHNOLOGY

UV FLUORESCENCE

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). Can be equipped with a non-methane cutter for additional CH₄ and non-methane hydrocarbon (NMHC) reporting.



FEATURES AND BENEFITS

- 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
- EPA Method 25A compliant
- EPA 1065/1066 and LD Euro 6, HD Euro V1 compliant

APPLICATIONS

- Continuous emissions monitoring (CEMS)
- VOC abatement
- Scrubber efficiency
- Compliance monitoring and testing

GAS	MEASURES	APPLICATION
THC TOTAL HYDROCARBONS	ppm TRACE	PROCESS CONTROL
CH ₄ METHANE		EMISSIONS
NMHC NON-METHANE HYDROCARBONS		QUALITY

SENSING TECHNOLOGY

FLAME IONIZATION DETECTOR

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.



FEATURES AND BENEFITS

- 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

APPLICATIONS

- Hazardous area combustion optimization
- Refineries – catalytic cracker regeneration
- Process monitoring
- Inerting applications

GAS	MEASURES	APPLICATION
O ₂ OXYGEN	% PERCENT	COMBUSTION
CO CARBON MONOXIDE		PROCESS CONTROL
CO ₂ CARBON DIOXIDE		SAFETY

SENSING TECHNOLOGY

PARAMAGNETIC INFRARED

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.



FEATURES AND BENEFITS

- 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

APPLICATIONS

- Pharmaceutical plants
- Helium production and storage
- Semiconductor facilities
- Laboratories & universities

GAS	MEASURES	APPLICATION
O ₂ OXYGEN	% PERCENT	SAFETY

SENSING TECHNOLOGY

PARAMAGNETIC

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 and designed to offer single or dual measurement of O₂ and CO₂ by utilizing Servomex's advanced Paramagnetic and Infrared sensing technologies.



FEATURES AND BENEFITS

- 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

APPLICATIONS

- Laboratories and research
- Air separation and gas bottling plants
- Transfilling
- Combustion analysis

GAS	MEASURES	APPLICATION
O ₂ OXYGEN	% PERCENT	EMISSIONS
CO ₂ CARBON DIOXIDE		PROCESS CONTROL
		QUALITY

SENSING TECHNOLOGY

PARAMAGNETIC INFRARED

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.



FEATURES AND BENEFITS

- 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

APPLICATIONS

- Continuous quality control monitoring
- Inert gases control checks for electronics grade gases
- Post purifier quality certification
- Leak detection for electronics grade gases

GAS	MEASURES	APPLICATION
O ₂ OXYGEN	ppb ULTRA TRACE ppt ULTRA TRACE ppm TRACE	QUALITY

SENSING TECHNOLOGY

COULOMETRIC

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 5200 utilizes Servomex's non-depleting Paramagnetic and Infrared sensors to give dependable and accurate results.



FEATURES AND BENEFITS

- 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

APPLICATIONS

- Physiology studies
- Universities
- Combustion optimization
- Medical gas verification

GAS	MEASURES	APPLICATION
O ₂ OXYGEN	% PERCENT	COMBUSTION
CO CARBON MONOXIDE		PROCESS CONTROL
CO ₂ CARBON DIOXIDE		SAFETY

SENSING TECHNOLOGY

PARAMAGNETIC INFRARED

DELTA F DF-700 Range HIGH PURITY

TUNABLE DIODE LASER (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 TDL Absorption Spectroscopy technology, a robust measuring cell and a true baseline reference for highly accurate moisture measurement.



FEATURES AND BENEFITS

- 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 SGMax (specialty gas trace moisture analyzer); DF-750 NanoTrace (base model); DF-760E dual oxygen and moisture measurement
- 2F TDL detection technology for robustness to particulates contamination

APPLICATIONS

- 730: Quality control of HCl gas in semiconductor fabs
- 740: Trace moisture analysis for quality control of electronics-grade NH₃ specialty gas used in microelectronics production
- 745 NanoTrace: Inert gases leak detection for LED and LCD plant applications
- 745 SGMax: Specialty gas cylinder quality control checks
- 749: Leak detection checks for UHP bulk gases used semiconductor applications
- 750: Bulk UHP gas quality control checks for high-end semiconductor fabs
- 760E: Leak detection checks for UHP bulk gases used semiconductor applications

GAS	MEASURES	APPLICATION
H ₂ O WATER	ppm TRACE ppb ULTRA TRACE ppt ULTRA TRACE	QUALITY

SENSING TECHNOLOGY

LASER MOISTURE

INDUSTRIAL GASES

WE'RE READY TO HELP

WHATEVER YOUR INDUSTRIAL GAS REQUIREMENTS, WHEREVER YOU ARE



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