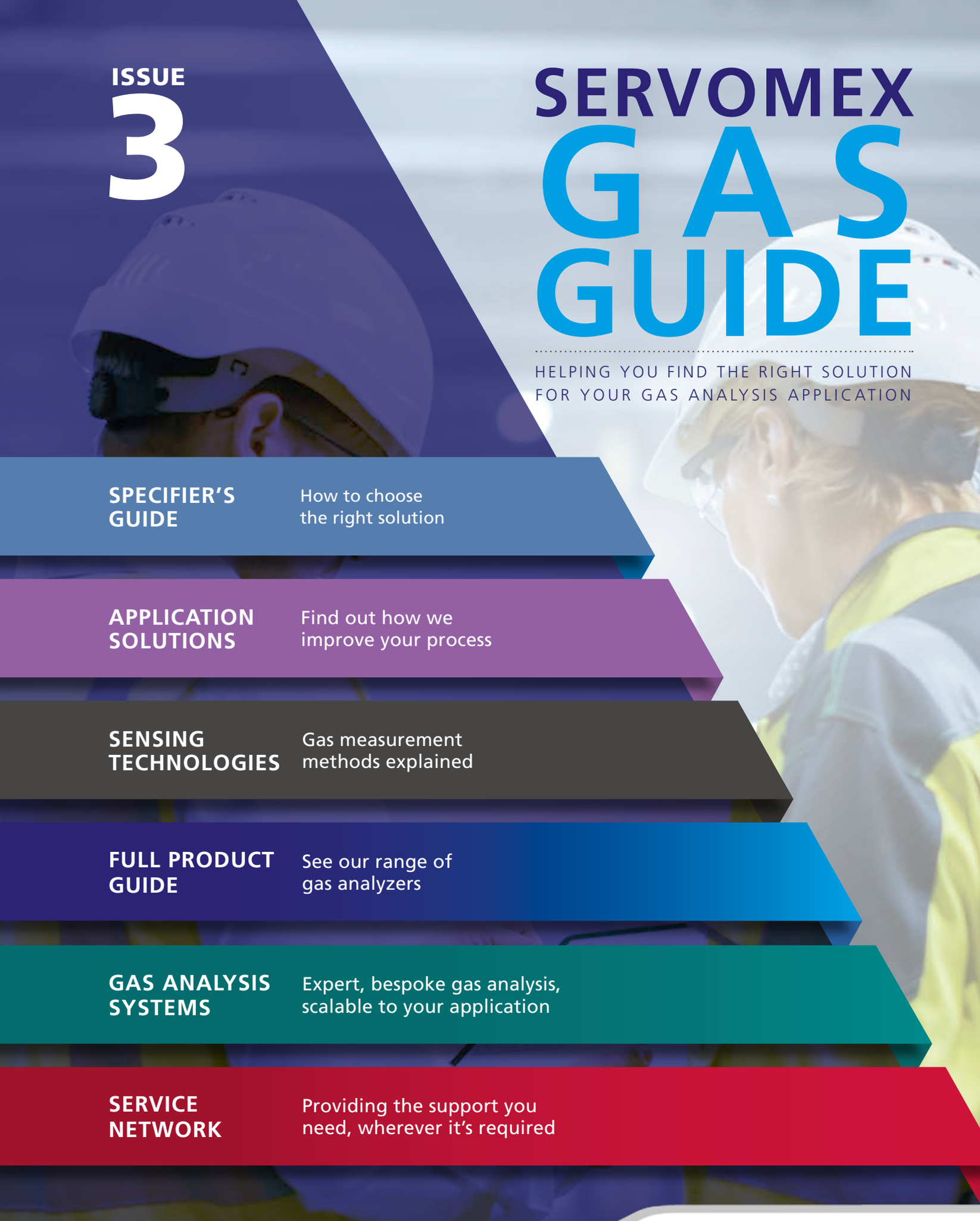
ISSUE 3

SERVOMEX GAS GUIDE

HELPING YOU FIND THE RIGHT SOLUTION FOR YOUR GAS ANALYSIS APPLICATION



SERVOMEX
a spectris company

ISSUE 3
OF OUR GAS GUIDE

HELPING YOU FIND THE RIGHT SOLUTION FOR YOUR GAS ANALYSIS APPLICATION

Andy Cowan, Servomex President

Welcome to the new issue of our Gas Guide, the latest edition of our comprehensive handbook covering all aspects of gas analysis and our sensing solutions.

Once again, we've collected all the resources you need to find the best gas analysis solution for your application, including an introduction to our complete product range, from analyzers and systems to service support packages.

We detail the sensing technology that powers our innovative gas analysis – how it works, which gases it detects, and what makes it the best fit for certain applications.

We've also highlighted some of those applications in this publication explaining the processes involved and where our gas analyzers and systems deliver the most effective results.

A complete specifier's guide is included, to help you find the right solution for your process, so you can be confident the gas analyzer you choose will deliver an accurate gas measurement, in the right range, with the correct certifications for your process environment.

And remember, our team is here to help, so contact us if you want to find out more, or have any questions.

HOW TO USE THIS GUIDE

To make it easier to find what you're looking for, we've divided this comprehensive guide into several sections:

SPECIFIER'S GUIDE TO GAS ANALYSIS

The key criteria driving analyzer choice, plus flowcharts to find solutions for common gas measurements.

KEY APPLICATIONS

A selection of process and purity applications illustrating the role of our analytical systems.

A-Z OF SENSING TECHNOLOGIES

The advantages and disadvantages of each sensor type for your application.

SERVOMEX PRODUCT GUIDE

The complete range of Servomex analyzers.

SYSTEMS & SERVICES

Our customized systems builds and flexible service support packages.

FURTHER RESOURCES

Manuals, videos, and expert papers, ready to download or view online.

We want you to be certain you're making the right choice, so if you still need help, our expert team is ready to assist you.

Get in touch: **servomex.com/contact**

CONTENTS

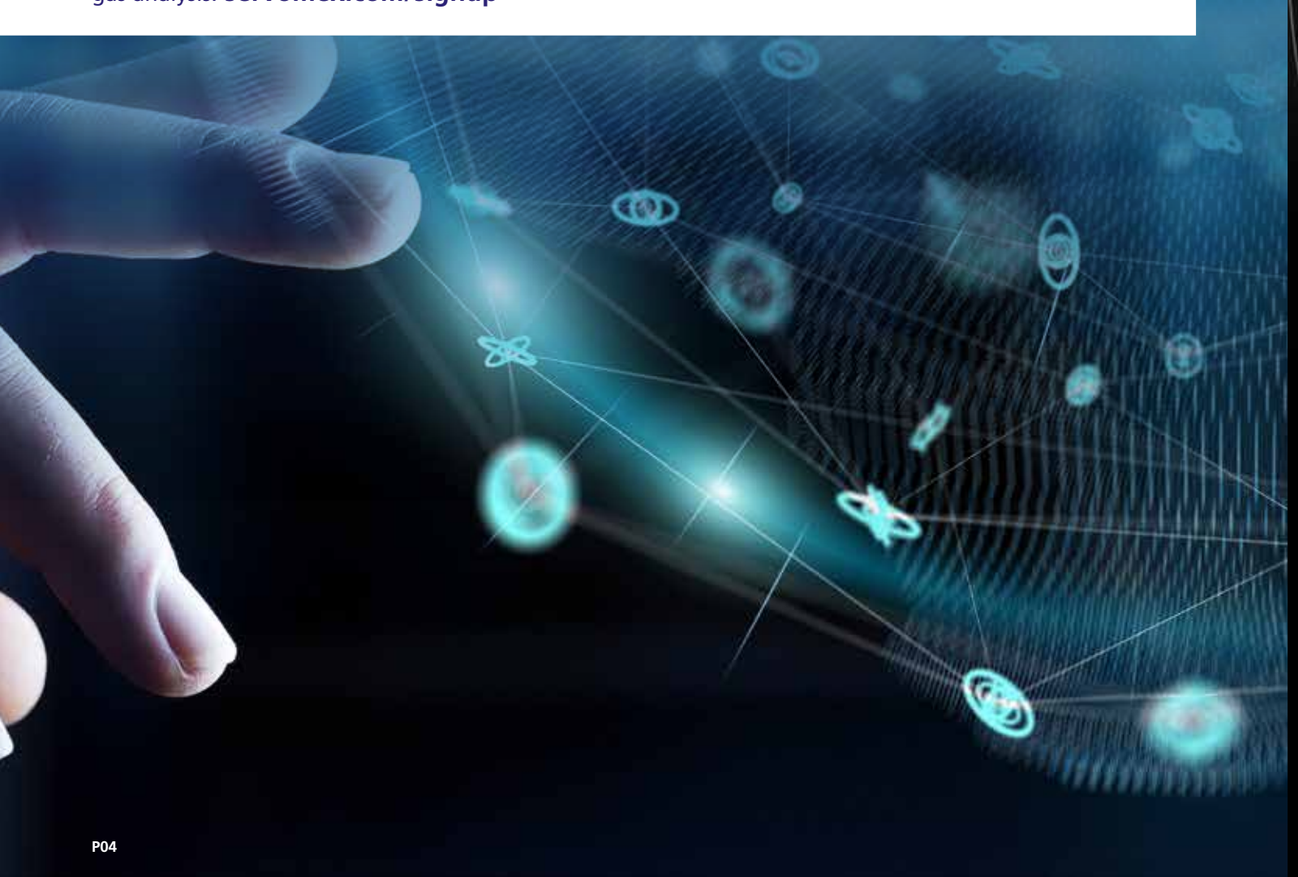
ABOUT SERVOMEX

With an emphasis on providing innovative solutions for industries around the world, we are the global expert in gas analysis. Servomex manufactures one of the widest ranges of sensing technologies offered by a single supplier, delivering reliable, accurate and stable gas measurements.

Good business practice has been at the cornerstone of our business since our foundation in 1952, and we remain committed to the continuous improvement of all aspects of our manufacturing and management systems. This ranges from compliance with internationally recognized business standards to global investment in staff development.

We continue to instill a positive business culture that empowers our staff to engage with our stakeholders in a manner that is honest, transparent, and trusted the world over.

In 2022, Servomex celebrated its 70th anniversary by looking to the future and applying seven decades of expertise to the new industrial challenges that are emerging, and we have no intention of slowing down now. Servomex remains firmly focused on providing gas analysis support for carbon net-zero strategies, helping customers to deliver cleaner processes and fewer emissions. Keep up to date with our news bulletins to find out how we're driving the future of gas analysis: **servomex.com/signup**



SUSTAINABILITY ACROSS THE ORGANIZATION

Servomex is committed to sustainability, not just as a company, but as part of the wider Spectris group. This commitment is supported at the corporate level, ensuring our local-level activities have the full weight of the Spectris leadership team behind them.

Our focus is not just on reducing emissions – with a commitment to reach net-zero carbon across our organization by 2030 and across our value chain by 2040 – but on introducing a sustainable approach to our people and operations.

We partner with leading expert organizations such as EcoAct and EcoVadis to validate the effectiveness and veracity of the activities within our sustainability program, and our Net Zero targets have been validated by the Science Based Targets initiative (SBTi).

MIKE PROCTOR
DIRECTOR OF SUSTAINABILITY AND STRATEGIC PROJECTS

OUR SUSTAINABILITY STRATEGY HAS THREE CORE PILLARS:

ENVIRONMENT

We're tackling environmental degradation and climate change in two ways: first, by providing products and services that reduce the environmental impact of our customers, and secondly, by actively managing and mitigating the environmental impact of our own operations.

OPERATIONS

We're committed to supporting the values and sustainable goals of all our stakeholders through our own operational activity, and are developing a common set of tools to categorize our products and understand the sustainability of our market position.

PEOPLE

We want to provide long-term, sustainable and rewarding careers in a safe and inclusive working environment, with a long-term culture of healthy high performance and appreciation for our people's talents and achievements.

SERVOMEX GROUP LTD

HAS BEEN AWARDED AN ECOVADIS GOLD MEDAL FOR ITS SUSTAINABILITY PRACTICES

Find out more: **servomex.com/sustainability**

AN ETHICAL APPROACH TO BUSINESS

Servomex strives for a positive business culture that empowers our staff across the world to engage with our stakeholders in a manner that is honest, transparent, and trusted. We encourage and expect our customers, suppliers and other business partners to share this constant ambition and to tell us if they, we or others do not live up to the high standards of behavior that we have set.

We have a proud history of acting legally and ethically, and a responsibility to pass on to future generations a business that is strong and successful.

Recognizing that each of us has a duty to live up to our Values and our Code of Business Ethics – our code of conduct that encourages, as its core message, the active responsibility of every employee to speak up and be the Voice of Integrity. We know this is not always easy, but it is the right thing to do. Any concern raised in good faith will be respected, investigated and appropriate action taken, as part of our ongoing commitment to continuous improvement. There is a zero-tolerance policy regarding retaliation. Anyone who retaliates against an individual raising a concern in good faith will face disciplinary action. We work as a team to achieve and maintain a world-class standard of ethical and legal behavior.

We consider this as best practice when serving our customers and other stakeholders. This is achieved by always following our Values and Code of Business Ethics, taking personal responsibility, working together to deliver our promises, and constantly aiming to be at our best, while fully respecting the laws of the countries where we operate.

OSKAR EKSTRÖM
SERVOMEX GENERAL COUNSEL

BE TRUE

We believe in absolute integrity; it's how we win for stakeholders, the environment, and each other.

OWN IT

We believe in teamwork and keeping our promises; it's how we build our brands and businesses.

AIM HIGH

We believe in being bold and positive; it's how we perform at our best and achieve greater success.

Learn more: **servomex.com/ethics**

INTRODUCING YOUR SPECIFIER'S GUIDE

Choosing the right gas analyzer for your essential process measurement can be a challenge. Factors such as gas measurement range, process environments and the sensing technology used can all affect the results achieved by your analyzer.

Our Specifier's Guide section is designed to help you identify the key criteria you need to address, leading you to make the best choice for your application.

We'll explore the variety of hazardous area, safety, and environmental certifications offered by gas analysis equipment, and what you should look out for when picking a gas analysis supplier.

Easy-to-use flowcharts are included, to help you solve your oxygen, carbon dioxide, carbon monoxide or methane measurement challenges.

If you need more guidance to find the ideal solution, get in touch with our expert team at **servomex.com/contact**

YOUR ANALYZER CHOICE MAY DEPEND ON MEASUREMENT RANGE

Gas analyzers can measure gas concentration from complete purity to tiny trace levels, depending on the sensing technology and configuration used.

Ensuring that the gas concentration stays within a certain level is essential for applications which control processes for safety and efficiency. Additionally, gas purity measurements need to ensure the required purity by measuring ultra-trace levels of contamination.

%	PPM	PPB/PPT
PERCENTAGE	**PARTS PER MILLION**	**ULTRA-TRACE**
These analyzers measure gas concentration based on its parts per hundred ratio in the gas mixture. This is often a large-scale measurement.	Sometimes referred to as trace-level measurements, ppm results are used for many applications, including combustion control, and emissions monitoring.	Gases in medical or semiconductor applications must have a very high level of purity, so it is necessary to measure even the smallest impurities.

GAS MEASUREMENT GUIDE

WANT TO VIEW OUR PRODUCTS ONLINE? Visit **servomex.com**

SERVOTOUGH	O_2	Ar	CO	CO_2	He	C1-C6	NMHC	H_2	HCl	H_2S	CH_4	NO	NOx	NO_2	N_2	N_2O	NH_3	C_3H_6	THC	H_2O	SO_2	KEY APPLICATIONS | HAZARDOUS AREA	PAGE
Oxy 1900	%																					■ Process control ■ Flare stack analysis ■ Vapor recovery ■ Safety-critical oxidation	103
OxyExact 2200	%																					■ Oxidation control reactions ■ EO, PTA and EDC manufacturing ■ Catalyst regeneration ■ Solvent recovery	104
H2scan								%														■ Refinery ■ Petrochemical ■ Manufacturing ■ Industrial gas supply	105
SpectraScan 2400			%CV	%CV		%CV				%CV												■ BTU/Wobbe content measurement ■ Gas turbine, engines, fuel cells ■ Flare stack monitoring	106
SpectraExact 2500			%ppm	%ppm		%			%ppm		%	%ppm				%ppm	%	%	%	%		■ Water in EDC/solvents ■ Ethylene production ■ TDI production ■ Chlorine production	107
FluegasExact 2700	%		ppm																			■ Process heaters ■ Utility boilers ■ Thermal crackers ■ Crematoria and incinerators	108
Laser 3 Plus Environmental																	ppm					■ Process heaters ■ Incinerators ■ Power stations ■ Furnaces ■ Thermal oxidizers	109
Laser 3 Plus Combustion	%		ppm								%											■ Process heaters ■ Incinerators ■ Power stations ■ Furnaces ■ ESP protection ■ Thermal oxidizers	110
Laser 3 Plus Process	%																					■ Oxidation control ■ Inerting ■ Safety monitoring ■ Flare gas monitoring ■ Combustion control (<500°C) ■ Coal to chemical	111

SERVOPRO	O_2	Ar	CO	CO_2	He	C1-C6	NMHC	H_2	HCl	H_2S	CH_4	NO	NOx	NO_2	N_2	N_2O	NH_3	C_3H_6	THC	H_2O	SO_2	KEY APPLICATIONS | SAFE AREA	PAGE
AquaXact 1688																				ppmvdp		■ Glove boxes ■ Solder reflow ovens ■ Compressed air generation ■ Ethylene production	112
AquaXact 1688 Controller																				ppmvdp		■ Glove boxes ■ Air separation units ■ Instrument air units ■ Refining gases	113
MonoExact DF150E	ppm/b																					■ Glove boxes ■ Heat treating ■ Solder reflow ovens ■ Industrial gas production	114
MonoExact DF310E	ppm/b																			ppm		■ Air separation units ■ Medical/industrial gases ■ Specialty gas blending	115
4900 Multigas	%		%ppm	%							ppm	ppm				ppm					ppm	■ Utility boilers ■ Clinical waste incinerators ■ Chemical incinerators ■ Mobile labs	116
MultiExact 4100	%ppm		%ppm	%ppm							%ppm					ppm				ppm		■ Product purity on ASU ■ Validation of medical O_2, N_2 and air ■ Process control on ASU ■ Monitor trace CO_2 on scrubbed air inlet to air separation process	117
MultiExact 4200	%		ppm	ppm							ppm					ppm						■ Hydrogen production ■ HyCO plants ■ Syngas production	118
Chroma	ppm/b	ppm/b	ppm/b	ppm/b	ppm/b		ppm	ppm/b			ppm/b				%ppm/b							■ Medical gas production ■ ASU ■ Cryogenic truck loading station ■ High purity gas production	119
NanoChrome	ppb/t	ppb/t	ppb/t	ppb/t			ppb/t	ppb/t			ppb/t				ppb/t							■ Semiconductor production ■ Quality control measurements ■ Stationary analytical systems UHP gas production	120
DF-500 Range	ppm/b/t																					■ Continuous quality control monitoring ■ Post purifier quality certification ■ Leak detection for electronics grade gases	121
DF-700 Range	ppm/b/t																			ppm/b/t		■ Continuous quality control monitoring ■ Bulk gas cylinder quality control ■ Trace moisture analysis	122
NanoChrome ULTRA	ppb/t	ppb/t	ppb/t	ppb/t			ppb/t	ppb/t			ppb/t				ppb/t							■ Semiconductor production – quality control measurements – stationary analytical systems ■ UHP gas production	123
DF-560E NanoTrace ULTRA	ppm/b/t																					■ Continuous quality control monitoring ■ Inert gases control checks ■ Post-purifier quality certification ■ Leak detection	124
DF-750 NanoTrace ULTRA																				ppm/b/t		■ Continuous quality control of bulk UHP gases for semiconductor fabs	125
DF-760E NanoTrace ULTRA	ppm/b/t																			ppm/b/t		■ Monitoring O_2 and H_2O as comtaminants in UHP bulk gases used in semiconductor applications	126
Plasma															ppm							■ Argon production ■ Truck loading ■ Pure gas bottling ■ Specialty gas laboratories	127
NOx												ppm	ppm	ppm								■ Scrubber efficiency ■ Turbine/generator feedback control ■ SCR/SNCR feedback control ■ CEMS	128
FID																			ppm			■ Cryogenic air separation ■ Process control ■ Food gas manufacture ■ Product validation	129
HFID							ppm				ppm								ppm			■ Compliance monitoring and testing ■ VOC abatement ■ Scrubber efficiency ■ CEMS	130

SERVOFLEX	O_2	Ar	CO	CO_2	He	C1-C6	NMHC	H_2	HCl	H_2S	CH_4	NO	NOx	NO_2	N_2	N_2O	NH_3	C_3H_6	THC	H_2O	SO_2	KEY APPLICATIONS | PORTABLES	PAGE
Micro i.s. 5100	%																					■ Process monitoring ■ Inerting applications ■ Controlled atmosphere ■ Hazardous area combustion optimization	131
MiniMP 5200	%			%																		■ Laboratories and research ■ Air separation and gas bottling plants ■ Transfilling ■ Combustion analysis ■ Medical gas verification	132
MiniHD 5200	%		%	%																		■ Physiology studies ■ Universities ■ Combustion optimization	133

MEASUREMENT TYPE: PERCENT/PARTS PER MILLION/PER BILLION/PER TRILLION/BY VOLUME/DEW POINT

MEASUREMENT TYPE: PERCENT/PARTS PER MILLION/PER BILLION/PER TRILLION/BY VOLUME/DEW POINT

CHOOSE AN ANALYZER CERTIFIED FOR YOUR PROCESS

Be confident that your analyzer will meet safety requirements and perform to the required level. Official certifications, approvals and compliances ensure that your analyzer has been fully tested and approved for use in specified conditions.

EXAMPLES OF MAJOR INTERNATIONAL CERTIFICATIONS FOR GAS ANALYZERS:

These certifications utilize a range of protection concepts and global agencies for the certification of equipment for use in potentially explosive atmospheres, including testing to European and International Safety and EMC Standards, and North American General-Purpose requirements. They offer UK Ex, ATEX, IEC Ex, and North American certifications for harsh environments and for dust and gas hazardous areas.

Assessing electrical equipment and components, typically related to safety, IEC 61010-1 specifies general safety requirements for test, measurement, and process control equipment, along with laboratory instrumentation. IEC 61326-1:2012 specifies requirements for immunity and emissions regarding electromagnetic compatibility (EMC) for electrical equipment.

Built around International and European standards, to ensure that monitoring data is of a high level, the UK Environment Agency's Monitoring Certification Scheme (MCERTS) provides a route to compliance with European Directives that regulate industrial emissions.

Based on the European EN 15267 Air Quality standard for certification of automated measuring systems, QAL1 is an internationally recognized German standard for performance testing of automated measuring systems used for the purpose of monitoring emission limit values at plants and incinerators.

Safety Integrity Level (SIL) is a measurement of performance required for a safety instrumented function. It is defined as a relative level of risk reduction provided by a safety function, or to specify a target level of risk reduction. In the European functional safety standards based on the IEC 61508 standard, four SILs are defined. SIL is determined based on several quantitative factors in combination with qualitative factors such as development process and safety life cycle management.

OXYGEN

A colorless and odorless gas, oxygen (O_2) makes up approximately 21% of the Earth's atmosphere. It is essential to human life, and so is vital to many medical gas applications.

O_2 also has many industrial uses, including the production of metals and plastics. Oxide compounds are used in a wide range of processes so, in many applications, O_2 measurements are key to process control, safety, and efficiency.

O_2 is not harmful to the environment, but O_2 emissions may need to be monitored as part of a continuous emissions monitoring system.

Several sensing technologies are available to measure O_2, and the most appropriate solution depends on the application.

For example, Paramagnetic sensing is a long-proven method of measuring percentage O_2 and is ideal for many industrial processes, as well as life safety monitoring.

Zirconia provides a trusted, in-situ ppm measurement for combustion applications – O_2 measurements are essential to controlling the combustion reaction.

O_2 is often found as a contaminant in high-purity gases such as nitrogen and argon, so a Coulometric sensor offers excellent ultra-trace detection of O_2 down to ppt concentrations.

Use pages **14-15** to identify the best O_2 solution for your process

OXYGEN GAS ANALYZER FINDER

WHAT LEVEL/RANGE OF OXYGEN DO YOU REQUIRE?

PURITY
90-100 %

- SAFE AREA
  - WHICH MOUNTING STYLE?
    - RACK
      - SERVOPRO MultiExact 4100
- HAZARDOUS AREA
  - SERVOTOUGH OxyExact 2200

ENRICHMENT
21-100 %

- SAFE AREA
  - WHICH MOUNTING STYLE?
    - RACK
      - SERVOPRO MultiExact 4100
- HAZARDOUS AREA
  - SERVOTOUGH OxyExact 2200
  - SERVOTOUGH Oxy 1900

PROCESS/INERTING/ COMBUSTION
0-1/5/10/21/25 %

- SAFE AREA
  - WHICH MOUNTING STYLE?
    - PORTABLE
      - SERVOFLEX MiniHD 5200
      - SERVOFLEX MiniMP 5200
    - FULL RACK
      - SERVOPRO MultiExact 4100
      - SERVOPRO 4900 Multigas
      - HALF RACK
        - SERVOPRO MonoExact DF310E
    - WALL
      - SERVOTOUGH Oxy 1900
    - IN SITU (COMBUSTION)
      - SERVOTOUGH FluegasExact 2700
    - ACROSS PROCESS
      - SERVOTOUGH Laser 3 Plus
- HAZARDOUS AREA
  - WHICH MOUNTING STYLE?
    - WALL
      - SERVOTOUGH Oxy 1900
      - SERVOTOUGH OxyExact 2200
    - IN SITU (COMBUSTION)
      - SERVOTOUGH FluegasExact 2700
    - ACROSS PROCESS
      - SERVOTOUGH Laser 3 Plus
    - PORTABLE
      - SERVOFLEX Micro i.s. 5100

TRACE
0-10/100/1000 ppm

- SAFE AREA
  - NON-FLAMMABLE
    - SERVOPRO MultiExact 4100
  - FLAMMABLE
    - SERVOPRO MonoExact DF310E

ULTRA-TRACE
<1 ppm

- SAFE AREA
  - ppb/ppt
    - SERVOPRO DF-550E
  - ppm
    - SERVOPRO MonoExact DF310E

See our full range of analyzers on **pages 102-103** or visit: **servomex.com**

THE RIGHT SOLUTION FOR YOUR PROCESS ENVIRONMENT

SAFE AREA
SERVOPRO

Analyzers built to operate in standard ambient conditions, such as those found in a laboratory, air separation unit, or any non-hazardous industrial environment. They require no special adaptations to operate reliably in these conditions.

servomex.com/servopro

HAZARDOUS AREA
SERVOTOUGH

Analyzers designed to operate in hostile environments, including high temperatures, acidic or corrosive conditions, or outdoors, exposed to the weather. Typically enclosed in protective casings, meeting specific standards for hazardous area operation.

servomex.com/servotough

PORTABLE
SERVOFLEX

Mobile analyzers typically designed for use in safe areas. However, they also need to have a robust design in order to cope with being transported to and from each measurement site, as well as day-to-day operation in the field.

servomex.com/servoflex

HAZARDOUS AREA ENCLOSURES

A range of custom-built enclosures are offered by the Servomex systems team to ensure safe and reliable operation in hazardous environments.

These rugged enclosed cabinets keep instruments under controlled conditions for reliable, continuous performance, while allowing easy access for maintenance.

Fully contained air-conditioned shelters can also be constructed for large systems projects, with their own lighting and power supply. These provide reliable protection for gas analysis systems and personnel.

Learn more on **page 134** or visit: **servomex.com/systems**

METHANE

The primary constituent of natural gas, methane (CH_4) is an extremely flammable hydrocarbon, and can form explosive mixtures with air. It is used in many industrial processes, both as a chemical feedstock and as fuel.

When methane is used in combustion, it is important to measure CH_4 levels in the heater, to ensure safety. Pockets of high methane concentration can form during the process, which significantly increases the risk of an explosion. These may not be detected by spot measurements, so a cross-stack analyzer is better suited to this application.

Methane is used in the production of hydrogen gas through the steam reforming process, where the measurement of CH_4 is key to reaction efficiency and safety.

CH_4 reactions are typically difficult to control, so accurate monitoring by a gas analyzer is essential for safety and efficiency.

It may also be a contaminant in medical or semiconductor gases, so must be measured at trace levels to ensure product purity.

Methane is a greenhouse gas, so many industrial processes must be monitored to ensure CH_4 emissions do not exceed environmental regulatory limits.

Use pages **18-19** to identify the best CH_4 solution for your process

METHANE/TOTAL HYDROCARBONS GAS ANALYZER FINDER

CH_4 THC

WHAT MEASUREMENT/RANGE DO YOU REQUIRE?

%

HAZARDOUS AREA

WHICH MOUNTING STYLE?

WALL

SERVOTOUGH
SpectraExact 2500

CROSS-STACK
CROSS-PIPE

SERVOTOUGH
Laser 3 Plus

ppm

HAZARDOUS AREA

WHICH MOUNTING STYLE?

WALL

SERVOTOUGH
SpectraExact 2500

SAFE AREA

TYPE OF MEASUREMENT

METHANE (CH_4)

APPLICATION

PURE GAS

SERVOPRO
MultiExact 4100

CEMS

SERVOPRO
4900 Multigas

SERVOPRO
Chroma

TOTAL HYDROCARBONS (THC)

APPLICATION

DRY GAS

PURITY

SERVOPRO
FID

WET GAS

CEMS

SERVOPRO
HFID

See our full range of analyzers on **pages 102-103** or visit: **servomex.com**

SELECTING THE RIGHT GAS ANALYZER PARTNER

If you're unfortunate enough to pick the wrong gas analyzer supplier, it can lead to problems from the outset. However, the right choice will ensure smooth installation and many years of successful analyzer operation.

THE MAIN POINTS TO LOOK OUT FOR:

EXPERTISE

Deep applications knowledge will ensure the supplier understands the challenges you need to overcome, enabling them to find the best solution for your process – or create a bespoke one if necessary.

ETHICS

Partnering with a company that operates in a moral and responsible way – with strong and clearly established ethics policies – ensures your own business dealings are being handled properly, and protects you and your company from reputational damage.

REPUTATION

What do others in your marketplace think of the supplier? Are they well thought of, and do their products have a strong track record?

SUPPORT

To ensure maximum value from your gas analyzer, choose a supplier that delivers the support you need, when and where you need it. After all, gas analyzers are a long-term investment, and require support and maintenance to continue to operate at peak efficiency over their long lifetime.

CO_2 CARBON DIOXIDE

Carbon dioxide (CO_2) is a colorless gas with applications in the food, oil, and chemical industries, and is used in many pressurized gas tools.

Many industrial processes need to monitor CO_2 for process control and efficiency. Additionally, CO_2 is the largest contributor to global climate change, so emissions are also measured by industrial plants to prove compliance with environmental regulations.

Since it is present in air at trace levels, CO_2 is often encountered as a contaminant in high-purity gases, so measurements of very low-level CO_2 must be achieved for this application.

Use pages **22-23** to identify the best CO_2 solution for your process

CO CARBON MONOXIDE

Carbon monoxide (CO) is a poisonous, flammable gas which is colorless, odorless, and tasteless. It has applications in the chemical, food, medical and metals industries.

Measuring CO (along with O_2) helps to maintain the combustion reaction at an optimum balance, maintaining safety and reducing fuel costs. CO may also be monitored to avoid impurities in the production of industrial, medical, and UHP gases.

As it is regarded as a criterion pollutant under many environmental standards, any industrial emissions of CO must be monitored to ensure regulatory compliance.

Use pages **24-25** to identify the best CO solution for your process

CARBON DIOXIDE GAS ANALYZER FINDER

CO_2

WHAT LEVEL/RANGE OF CARBON DIOXIDE DO YOU REQUIRE?

%

HAZARDOUS AREA

SERVOTOUGH
SpectraExact 2500

SAFE AREA

WHICH MOUNTING STYLE?

RACK

NON-FLAMMABLE

GAS PURITY

SERVOPRO
MultiExact 4100

CEMS

SERVOPRO
4900 Multigas

WALL

SERVOTOUGH
SpectraExact 2500

PORTABLE

RUGGED IP65

SERVOFLEX
MiniHD 5200

TRANSPORTABLE IP40

SERVOFLEX
MiniMP 5200

ppm

HAZARDOUS AREA

SERVOTOUGH
SpectraExact 2500

SAFE AREA

WHICH MOUNTING STYLE?

WALL

SERVOTOUGH
SpectraExact 2500

RACK

FLAMMABLE

SERVOPRO
MultiExact 4200

NON-FLAMMABLE

GAS PURITY

SERVOPRO
MultiExact 4100

See our full range of analyzers on **pages 102-133** or visit: **servomex.com**

CARBON MONOXIDE GAS ANALYZER FINDER

CO

WHAT LEVEL/RANGE OF CARBON MONOXIDE DO YOU REQUIRE?

%

HAZARDOUS AREA

SERVOTOUGH
SpectraExact 2500

SAFE AREA

WHICH MOUNTING STYLE?

RACK

NON-FLAMMABLE

GAS PURITY

SERVOPRO
MultiExact 4100

CEMS

SERVOPRO
4900 Multigas

WALL

SERVOTOUGH
SpectraExact 2500

PORTABLE

SERVOFLEX
MiniHD 5200

ppm

HAZARDOUS AREA

WHICH MOUNTING STYLE?

IN SITU

ACROSS PROCESS

SERVOTOUGH
Laser 3 Plus

EXTRACTIVE

SERVOTOUGH
FluegasExact 2700

WALL (EXTRACTIVE)

SERVOTOUGH
SpectraExact 2500

FLAMMABLE

SERVOPRO
MultiExact 4200

SAFE AREA

WHICH MOUNTING STYLE?

IN SITU

ACROSS PROCESS

SERVOTOUGH
Laser 3 Plus

EXTRACTIVE

SERVOTOUGH
FluegasExact 2700

WALL

SERVOTOUGH
SpectraExact 2500

RACK

NON-FLAMMABLE

GAS PURITY

SERVOPRO
MultiExact 4100

CEMS

SERVOPRO
4900 Multigas

See our full range of analyzers on **pages 102-133** or visit: **servomex.com**

OUR SOLUTIONS FOR KEY GAS ANALYSIS APPLICATIONS

GAS ANALYSIS APPLICATION	KEY SERVOMEX SOLUTIONS
Air separation units	SERVOPRO MultiExact 4100, SERVOPRO AquaXact 1688, SERVOPRO Chroma
Medical gases	SERVOPRO MultiExact 4100, SERVOPRO Chroma
Ultra-high-purity gases and semiconductors	SERVOPRO DF-560E NanoTrace ULTRA, SERVOPRO DF-750 NanoTrace ULTRA, SERVOPRO NanoChrome ULTRA, SERVOPRO DF-760E NanoTrace ULTRA
Clean air	SERVOTOUGH FluegasExact 2700, SERVOTOUGH Laser 3 Plus Combustion, SERVOTOUGH Laser 3 Plus Environmental, SERVOPRO 4900 Multigas, SERVOPRO NOx, SERVOTOUGH SpectraExact 2500
Pre-combustion carbon capture	SERVOPRO 4900 Multigas, SERVOTOUGH SpectraExact 2500, SERVOPRO AquaXact 1688, SERVOPRO MultiExact 4100, SERVOTOUGH Oxy 1900, SERVOPRO DF-745 SGMax
Oxyfuel combustion carbon capture	SERVOTOUGH Oxy 1900, SERVOPRO MultiExact 4100, SERVOTOUGH Laser 3 Plus, SERVOTOUGH FluegasExact 2700, SERVOPRO 4900 Multigas, SERVOTOUGH SpectraExact 2500, SERVOPRO DF-745 SGMax, SERVOPRO AquaXact 1688, SERVOTOUGH OxyExact 2200
Post-combustion carbon capture	SERVOPRO 4900 Multigas, SERVOTOUGH SpectraExact 2500, SERVOPRO DF-745 SGMax, SERVOPRO AquaXact 1688, SERVOPRO MultiExact 4100, SERVOTOUGH Oxy 1900, SERVOTOUGH Laser 3 Plus

GAS ANALYSIS APPLICATION	KEY SERVOMEX SOLUTIONS
Direct reduction iron	SERVOTOUGH Oxy 1900, SERVOPRO 4900 Multigas, SERVOTOUGH SpectraExact 2500, SERVOPRO NOx
Ethylene production	SERVOTOUGH SpectraExact 2500
Ethylene dichloride production	SERVOTOUGH SpectraExact 2500
Ethylene oxide production	SERVOTOUGH OxyExact 2200
HyCO/Hydrogen production	SERVOPRO MultiExact 4200
Marine vapor control	SERVOTOUGH Oxy 1900, SERVOTOUGH OxyExact 2200
Process heaters and furnaces	SERVOTOUGH FluegasExact 2700, SERVOTOUGH Laser 3 Plus Combustion
Propylene oxide production	SERVOTOUGH Oxy 1900
Purified terephthalic acid production	SERVOTOUGH OxyExact 2200
Thermal power: coal	SERVOTOUGH FluegasExact 2700
Vinyl chloride monomer production	SERVOTOUGH SpectraExact 2500

GAS ANALYSIS SOLUTIONS FOR YOUR APPLICATIONS

Servomex provides an extensive range of scalable gas analysis solutions, from single analyzers to turnkey application systems in off-the-shelf and customized designs. These are used in hundreds of industrial applications across many different sectors.

In this section, we highlight some key examples of the hundreds of processes that use our gas analysis products to overcome their core application challenges.

We have divided it into two sections: Purity & Specialty – covering industrial, medical, and ultra-high-purity gases, including semiconductor processes – and Industrial Process & Emissions – covering power generation, hydrocarbon processing, and emissions monitoring.

Our extensive array of sensing technologies ensure we can find the best-fit solutions for your process, supported by our deep applications knowledge and global service network.

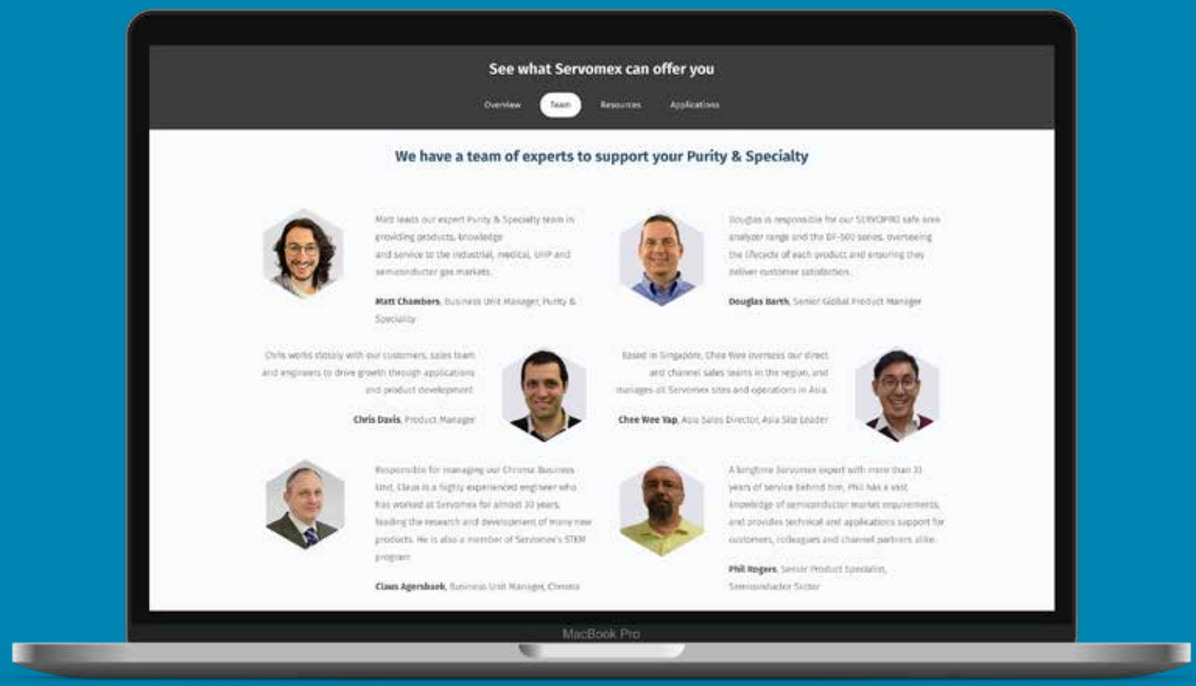
Get in touch with our experts to learn more:
servomex.com/contact

PURITY AND SPECIALTY (P&S)

Our P&S division delivers gas analysis products, knowledge and service support to market sectors including:

- Complete gas analysis for industrial gases
- High-purity trace analysis for medical gases
- Ultra-trace solutions for semiconductor gas applications

MEET THE TEAM ONLINE



Get in touch to learn more: **servomex.com/ps**

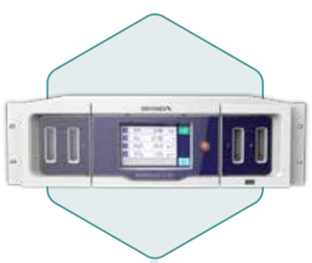
AIR SEPARATION UNIT (ASU) APPLICATIONS

Improving process control, safety, and product quality are critical considerations for ASU applications.

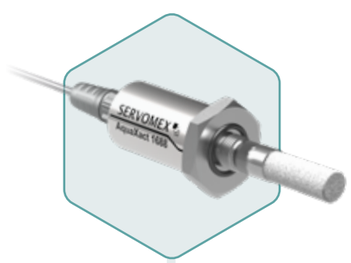
The ASU separates atmospheric air into pure gaseous nitrogen, oxygen and argon.

Further separation is required for quantities of noble gases such as neon, krypton and xenon. Accurate gas compositional analysis is essential to ensure purity across the air separation process.

It is essential to maintain product purity between the separation process and product transportation by pipeline or vehicle. This relies on highly accurate trace measurements for a range of impurities to ensure that quality is maintained at the highest possible standards.



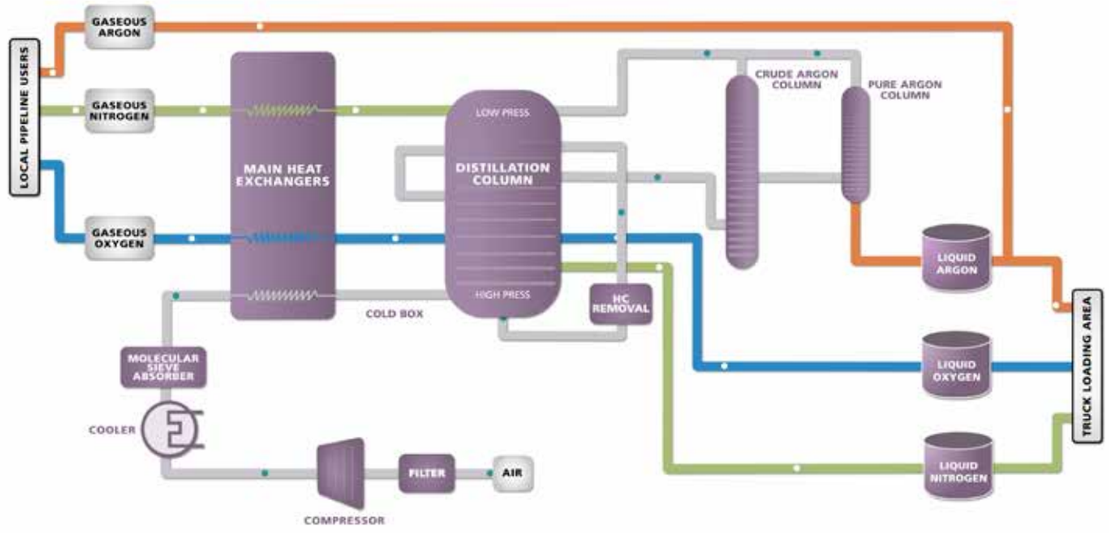
SERVOPRO MultiExact 4100



SERVOPRO AquaXact 1688

SERVOPRO Chroma

ASU PROCESS



KEY SOLUTIONS

We have a broad range of analytical solutions providing continuous, reliable analysis throughout the process. These include the **SERVOPRO MultiExact 4100** multigas analyzer, **SERVOPRO AquaXact 1688** moisture sensor, and the versatile **SERVOPRO Chroma**. All of which provides the complete application measurements required to control the process, ensure product purity and guarantee plant safety.

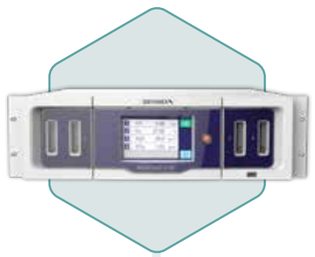
Watch our application video: **servomex.com/asu**

MEDICAL GASES

Gases for medical treatment are regulated like medicinal drugs. These regulations are typically covered in a publication called a Pharmacopeia, and specify production and validation methods, the acceptable purity level, and official measurement records.

For instance, under European Pharmacopeia (EP) rules, medical oxygen (O_2) requires an assay measurement to ensure that its O_2 purity is better than 99.5%. It also needs measurements of carbon monoxide (CO) and carbon dioxide (CO_2) to ensure that the impurities are less than 5 parts per million (ppm) of CO and less than 300 ppm of CO_2.

Servomex's high-performance solutions and technologies deliver the measurements required to meet US and European Pharmacopeia concentration limits for medical gas quality using industry-approved sensing techniques.



SERVOPRO MultiExact 4100

SERVOPRO Chroma

KEY SOLUTIONS

The **SERVOPRO MultiExact 4100** is an advanced solution for purity assay and impurity detection. It offers a combined solution for all three medical oxygen analytes, meeting EP standards and providing the measurement limits required. A multi-gas analyzer capable of monitoring up to four gas streams simultaneously, it can be fitted with a Paramagnetic cell for a highly stable O_2 reading, and a customized Infrared Gas Filter Correlation (GFC) sensor for CO and CO_2.

The **SERVOPRO Chroma** provides measurements for nitrogen assay and the determination of carbon dioxide impurity in nitrous oxide using Thermal Conductivity Detector sensing. The nitrogen assay measurement meets the European Pharmacopeia's required concentration limit of greater than 99.5% purity and the US National Formulary requirement of 99%.

Watch our application video: **servomex.com/medical-gases**

ULTRA-HIGH PURITY GASES AND SEMICONDUCTORS

Ultra-high purity (UHP) gases are essential for semiconductor manufacturing and the production of electronics such as LED and LCD displays.

Manufacturing the silicon wafers needed for semiconductor applications requires ultra-pure gases, as even the smallest impurities in the production atmosphere can cause major defects in a wafer, resulting in costly scrap and waste.

To ensure that UHP gases of the correct quality are delivered to the manufacturing process, multiple gas purification techniques and other strict procedures are used. This requires accurate gas monitoring at very low levels of concentration.

Quality control gas measurements must cover all the impurities present. A comprehensive solution is required, but this can lead to integration issues between hardware and software from different sources.

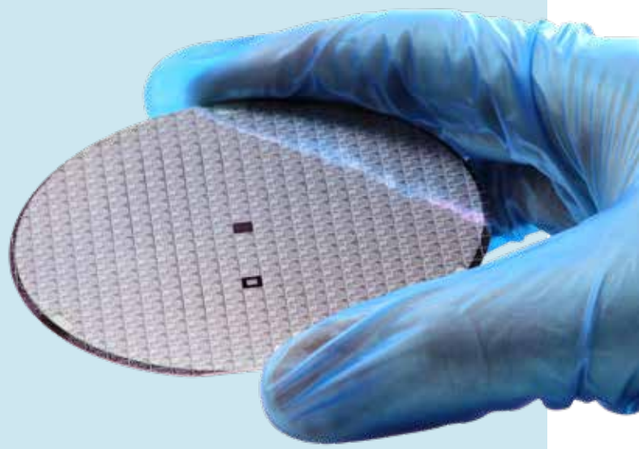
SERVOPRO DF-560E
NanoTrace ULTRA

SERVOPRO DF-750
NanoTrace ULTRA

SERVOPRO
NanoChrome ULTRA

KEY SOLUTIONS

Servomex provides a single-supplier solution for all UHP measurements in these applications. Our **SERVOPRO DF-560E** and **DF-750 NanoTrace ULTRA** oxygen and moisture analyzers offer the lowest detection limits available to the industry, while the multi-gas **SERVOPRO NanoChrome ULTRA** provides the other trace impurity measurements required. These can be seamlessly integrated into existing systems or supplied as a turnkey system designed to meet specific customer requirements.



Watch our application video: **servomex.com/uhp**

THE PROJECT

A gas analysis solution was required by a major petrochemical company based in the Middle East. The company required a combustion control system at its polymer plant furnace in order to achieve its efficiency and environmental goals.

THE CHALLENGE

The end-user has operated an ethylene plant for more than 20 years, and was in the process of upgrading the 14 dual-fired furnaces on its cracker units to improve efficiency and safety.

Oxygen measurements were being made using Zirconia sensing technology, which became less accurate and unreliable over time due to clogging, so more fuel had to be spent to control the combustion process.

The company is committed to using innovative technology to operate sustainably and minimize its impact on the environment, so it was necessary for the gas analysis solution to comply with this goal as well as achieving accurate measurements within the process.

It was looking to Servomex to supply an alternative technology that was non-contact, accurate, fast, and reliable.

THE SERVOMEX SOLUTION

Servomex has delivered 56 analyzers and purge panels as part of this upgrade project. The analyzers are SERVOTOUGH Laser 3 Plus Combustion instruments, with half configured to measure oxygen and the rest measuring carbon monoxide.

The Laser 3 Plus analyzers support the customer's environmental objectives by helping to provide better control of the cracking process – improving efficiency, reducing emissions, and limiting pollution.

Using non-contact, non-depleting Tunable Diode Laser sensing technology, they deliver fast and accurate measurements of the specified gas. Unlike single-point analysis techniques, they are installed across the stack, providing an average measurement which is much more effective for safety monitoring.

By measuring both oxygen and carbon monoxide (CO), they allow the combustion reaction to be optimized, increasing efficiency. Accurate CO breakthrough analysis, delivered quickly, helps control the amount of fuel spend on combustion, reducing consumption and increasing savings. The more efficient reaction also reduces the emissions generated by the process.

The analyzer was successfully commissioned and handed over to the client for full operation in 2021. They have since expressed their happiness with the performance to date with no major complaints and have already recommended the Laser 3 Plus analyzer for use in its future projects.

SERVOTOUGH
Laser 3 Plus Combustion

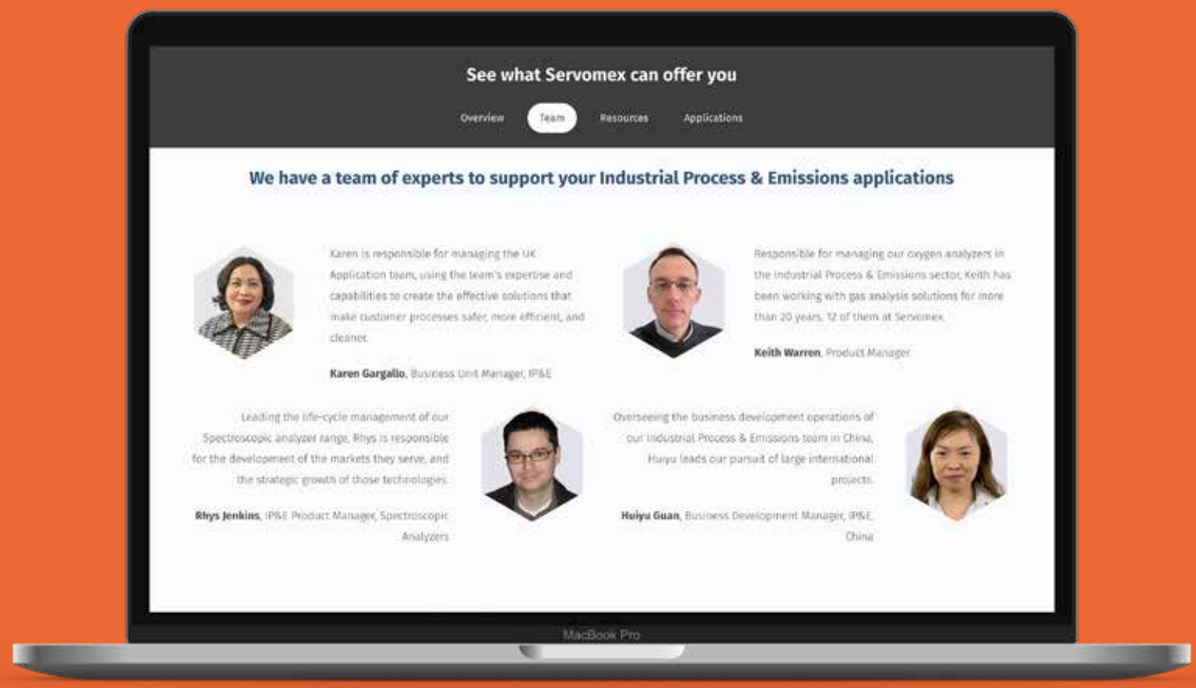
Find out more at: servomex.com/l3pluscombustion

INDUSTRIAL PROCESS & EMISSIONS (IP&E)

Servomex's IP&E division handles gas analysis solutions for applications in the power generation, hydrocarbon processing and emissions monitoring markets, including:

- Complete gas analysis for power processes
- Reliable HP application measurements
- Effective emissions monitoring solutions

MEET THE TEAM ONLINE



Get in touch to learn more: **servomex.com/ipe**

CLEAN AIR SOLUTIONS

PHASE **ONE**

COMBUSTION EFFICIENCY

Emissions of key pollutants, including NOx, SOx, carbon monoxide (CO) and carbon dioxide (CO_2), can be reduced by controlling this important process reaction. Accurate measurements of oxygen (O_2) and combustibles (COe) in the reaction mixture allow the optimum ratio between fuel and air to be achieved, lowering fuel consumption, and improving safety.

PHASE **TWO**

GAS CLEANING

A range of processes are available to safely remove harmful substances from process gases that might otherwise be emitted by the plant. Typical examples include DeNOx treatments (i.e. ammonia slip processes) and flue gas desulfurization. A variety of gas measurements are required depending on the gas cleaning process being used.

PHASE **THREE**

EMISSIONS MONITORING

By measuring pollutants within the flue gas, plant operators can determine process efficiency, protect the environment, and demonstrate that they are compliant with regulations. Continuous monitoring is required to measure all the necessary components of the flue gas, including criterion pollutants and greenhouse gases.

Servomex helps a wide range of industries achieve their clean air goals, working to reduce emissions and mitigate the damage caused by harmful pollutants. As the global expert in gas analysis, we offer a three-phase strategy focusing on the key process areas.

KEY SOLUTIONS

PHASE **ONE**

SERVOTOUGH FluegasExact 2700:
measures O_2 and COe in flue gases for improved combustion efficiency and reduced emissions

SERVOTOUGH Laser 3 Plus Combustion:
measures either O_2 or CO, and can be configured for a joint measurement of CO and CH_4 for safety

SERVOTOUGH **FluegasExact 2700**

SERVOTOUGH **Laser 3 Plus Combustion**

PHASE **TWO**

SERVOTOUGH Laser 3 Plus Environmental:
for ammonia slip, monitors NH_3 with an average signal across the duct, for accuracy despite uneven flow conditions

SERVOPRO 4900 Multigas:
for flue gas desulfurization, measures SO_2 in real-time, accurate to very low levels

SERVOTOUGH SpectraExact 2500:
For a range of demanding process applications, measures gases in flammable sample streams in hazardous areas.

SERVOTOUGH **Laser 3 Plus Environmental**

SERVOPRO **4900 Multigas**

SERVOTOUGH **SpectraExact 2500**

PHASE **THREE**

SERVOPRO 4900 Multigas:
for continuous emissions monitoring, can monitor four gas streams simultaneously, measuring from a choice of O_2, CO_2, CO, SO_2, NO, CH_4 and N_2O

SERVOPRO NOx:
uses non-depleting Chemiluminescence detection technology to measure NO or $NO/NO_2/NOx$ concentrations

SERVOPRO **4900 Multigas**

SERVOPRO **NOx**

Watch our application video: **servomex.com/cleanair**

PRE-COMBUSTION CARBON CAPTURE

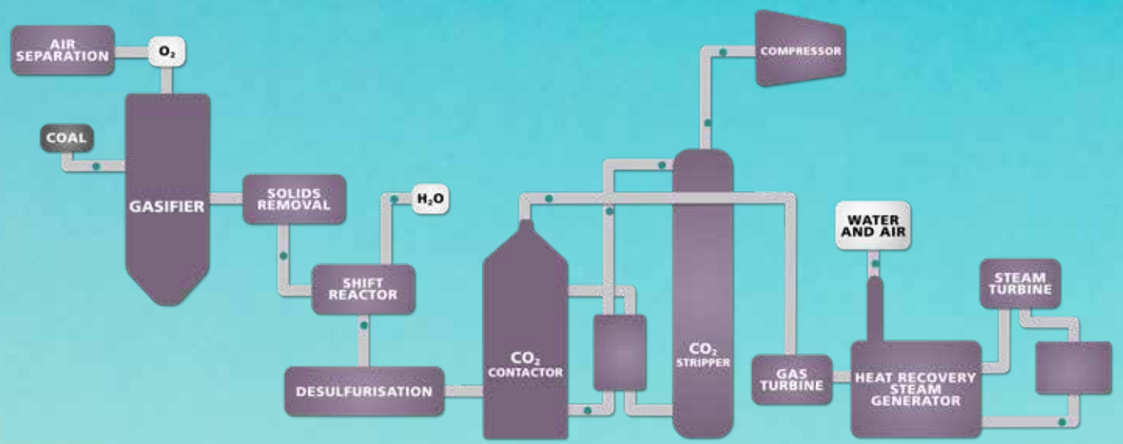
Collecting carbon dioxide (CO_2) emissions from power plants and heavy industry through carbon capture and storage (CCS) technologies helps to reduce the amount of CO_2 that enters the atmosphere.

Pre-combustion capture removes CO_2 before the combustion of the fuel, and requires a carbonaceous fuel to be broken down into hydrogen (H_2) and carbon monoxide (CO), a mixture known as syngas.

For high-efficiency CO_2 capture, the syngas has to be 'shifted' after it is cleaned, yielding heat and a gas stream with high CO_2 and H_2 concentrations.

The CO_2 can then be removed with chemical and physical solvents, adsorbents, and membranes. CO_2 traces can be present in the H_2 stream.

Other applications, for example H_2, NH_3 and synthetic fuel production have been using the same technology that captures CO_2 from the syngas generated in a gasifier for decades. In addition, the reforming and partial oxidation of natural gas are already widely applied, for example in the production of H_2 in the NH_3 production process.



PROCESS MEASURING POINTS

INSTALLATION LOCATION	GAS MEASURED	MEASURING RANGE	APPLICATION	SERVOMEX ANALYZER
Flue gas to stack	CO_2 NOx O_2 SO_2	5/10% 500 ppm 25% 100/2,000 ppm	Emissions	SERVOPRO 4900 Multigas
CO_2 stream to storage (product)	CO_2 CO SO_2	100% 300-4,000 ppm 100 ppm	Quality	SERVOTOUGH SpectraExact 2500
Pipeline/ temporary storage	CO_2 H_2O O_2	4% 70 ppm 21%	Safety	SERVOTOUGH SpectraExact 2500 SERVOPRO DF-745 SGMax SERVOPRO AquaXact 1688 SERVOPRO MultiExact 4100 SERVOTOUGH Oxy 1900
CO_2 storage	CO_2 O_2	4% 21%	Safety	SERVOTOUGH SpectraExact 2500 SERVOTOUGH Oxy 1900 SERVOPRO MultiExact 4100

Watch our application video: **servomex.com/ccs**

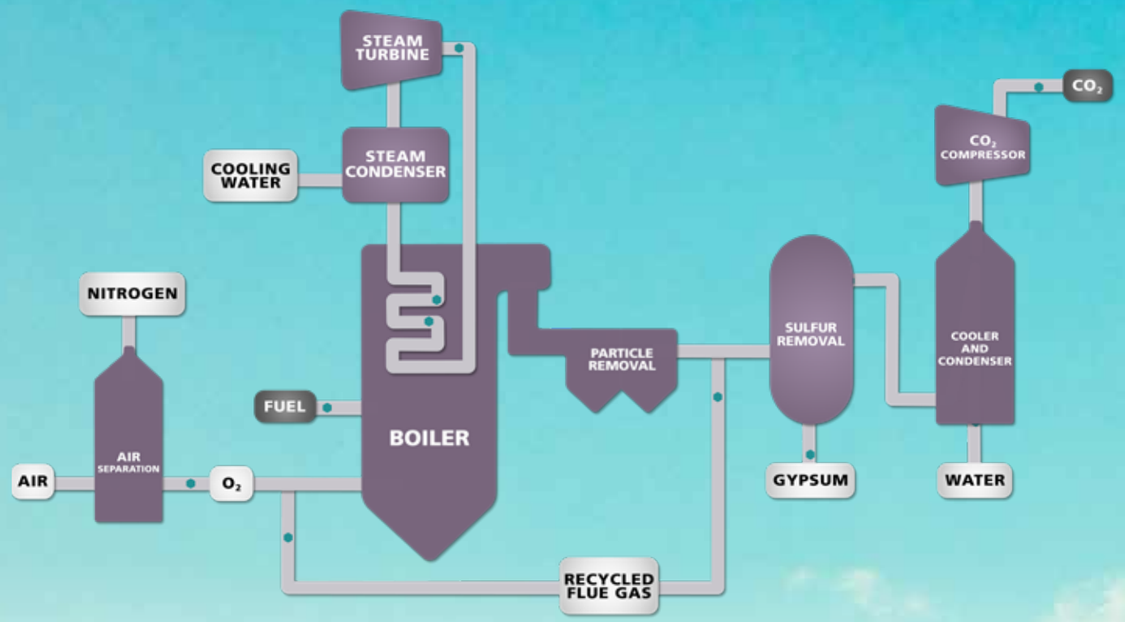
OXYFUEL COMBUSTION CARBON CAPTURE

Based on denitrification of the combustion medium, oxyfuel combustion sees the nitrogen removed from the air through a cryogenic air separation unit (ASU) or with the use of membranes.

This means that combustion takes place with almost pure oxygen, so the resultant flue gas contains mainly CO_2 and water. Trace components like oxides of nitrogen (NOx) and SO_2 may be present. The CO_2 is purified by removing water and impurities.

Remaining small amounts of N_2, O_2 and Ar are vented off, though they may contain traces of CO_2. The production of O_2 requires a significant amount of energy, which results in a reduction of the efficiency of the power plant. Further, the purification and the compression of the CO_2 stream also requires energy.

The combustion with O_2 is currently applied in the glass and metallurgical industry. Oxyfuel combustion for steam and power production using solid fuels has been at present only proven in test and pilot facilities. Oxyfuel combustion can also be applied in natural gas-fired concepts.



PROCESS MEASURING POINTS

INSTALLATION LOCATION	GAS MEASURED	MEASURING RANGE	APPLICATION	SERVOMEX ANALYZER
O_2 stream (ASU)	O_2	100%	Quality	SERVOTOUGH OxyExact 2200 SERVOPRO MultiExact 4100
Combustion control	CO O_2	1000 ppm 50%	Process control	SERVOTOUGH Laser 3 Plus SERVOTOUGH FluegasExact 2700 (modified)
Flue gas	CO_2 CO NOx O_2 SO_2	80% 500/3,000 ppm 500 ppm 25% 100/2,000 ppm	Emissions	SERVOPRO 4900 Multigas
CO_2 stream outlet cooler (product)	CO_2 SO_2 H_2O O_2	100% 100 ppm 70 ppm 5%	Quality	SERVOTOUGH SpectraExact 2500 SERVOPRO MultiExact 4100 SERVOPRO DF-745 SGMax SERVOPRO AquaXact 1688
Pipeline/ temporary storage	CO_2 H_2O O_2 NH_3	4% 70 ppm 21% 10 ppm	Safety	SERVOTOUGH SpectraExact 2500 SERVOPRO DF-745 SGMax SERVOPRO AquaXact 1688 SERVOPRO MultiExact 4100 SERVOTOUGH Oxy 1900 SERVOTOUGH Laser 3 Plus

Listen to our podcast: **servomex.com/ccs**

POST-COMBUSTION CARBON CAPTURE

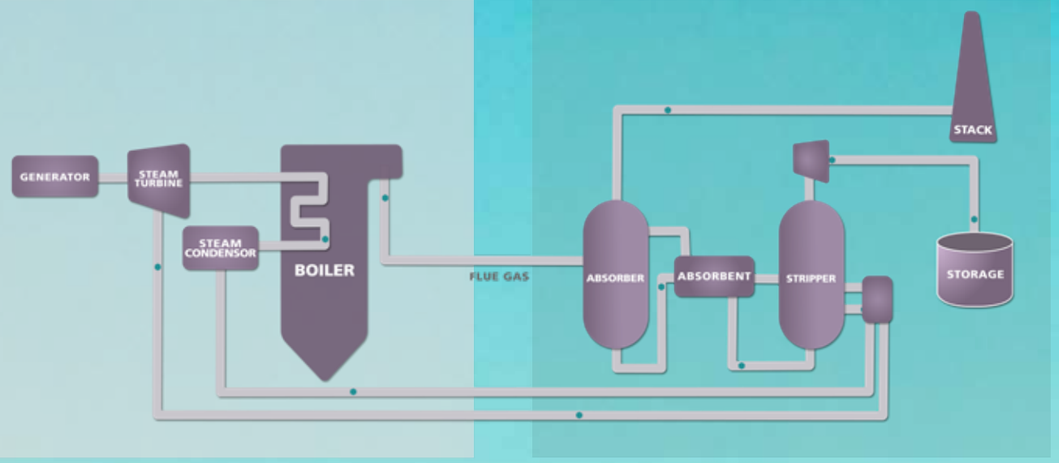
Carbon dioxide (CO_2) resulting from a combustion process can be captured from the flue gas. This flue gas may come from any pressurized combustion in a boiler, gas turbine, or industrial process yielding CO_2.

A flue gas cleaning process removes trace components like sulfur dioxide (SO_2) and hydrogen chloride (HCl) to prevent malfunctioning of the capture process.

Various capture mechanisms, or combinations of them can be applied, including phase separation, selective permeability, and sorption (the most common mechanism at large point sources).

After CO_2 is captured from the flue gas, the inert gases, for example nitrogen (N_2), oxygen (O_2) and argon (Ar) in the flue gas are vented to the atmosphere. Traces of CO_2 will be present in the vented gas due to the efficiency of the capture process being less than 100%.

Research, design and development in post-combustion capture is focused on reducing energy requirement and capital cost through developing and adapting solvents, optimizing the required process installations, and integrating the capture system within the process.



THERMAL POWER PLANT

CO_2 CAPTURE TECHNOLOGY

PROCESS MEASURING POINTS

INSTALLATION LOCATION	GAS MEASURED	MEASURING RANGE	APPLICATION	SERVOMEX ANALYZER
Flue gas from power plant	CO_2 CO NOx O_2 SO_2 H_2O	20% 500/3,000 ppm 500/3,000 ppm 25% 100/2,000 ppm 30%	Emissions	SERVOPRO 4900 Multigas SERVOTOUGH SpectraExact 2500
CO_2 stream capture/product	CO_2 SO_2 H_2O	100% 100 ppm 70 ppm	Quality	SERVOTOUGH SpectraExact 2500 SERVOPRO MultiExact 4100 SERVOPRO DF-745 SGMax SERVOPRO AquaXact 1688
Lean absorbent stream from CO_2 stripper	CO_2 (slip)	1%/10%	Process control	SERVOTOUGH SpectraExact 2500 SERVOPRO MultiExact 4100
Pipeline/ temporary storage	CO_2 H_2O O_2 NH_3	4% 70 ppm 21% 10 ppm	Safety	SERVOTOUGH SpectraExact 2500 SERVOPRO MultiExact 4100 SERVOPRO DF-745 SGMax SERVOPRO AquaXact 1688 SERVOTOUGH Laser 3 Plus
Flue gas to stack	CO_2 CO NOx O_2 SO_2	5% 100/1,000 ppm 500 ppm 25% 100/2,000 ppm	Emissions	SERVOPRO 4900 Multigas
CO_2 storage	CO_2 O_2	4% 21%	Safety	SERVOTOUGH SpectraExact 2500 SERVOTOUGH Oxy 1900 SERVOPRO MultiExact 4100

Watch our application video: **servomex.com/ccs**

DIRECT REDUCTION IRON (DRI)

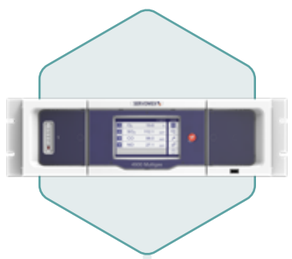
DRI plants are able to operate at the highest levels of efficiency, while achieving low emissions targets, with the assistance of accurate gas measurements.

The Midrex DRI process is a low-carbon-dioxide-emission application in steelmaking using virgin iron ore in an electric arc furnace. The iron ore is heated as it descends through a shaft furnace, and oxygen (O_2) is removed from the ore using counterflowing gases with a high hydrogen and carbon monoxide content. Accurate gas monitoring during this process ensures efficient operation.

The reaction between the counterflow gases and iron oxide in the ore produces metallic iron, water vapor, and carbon dioxide (CO_2), so emissions monitoring is also important. Oxides of nitrogen (NOx) may be generated by the process; these must be continuously monitored to ensure environmental compliance.

SERVOTOUGH Oxy 1900

SERVOTOUGH SpectraExact 2500



SERVOPRO 4900 Multigas

KEY SOLUTIONS

The **SERVOTOUGH Oxy 1900** provides essential O_2 monitoring in the DRI process. This industry-leading Paramagnetic O_2 analyzer is designed for hazardous areas. It is supported by the highly flexible **SERVOTOUGH SpectraExact 2500** photometric analyzer for the other measurements. The **SERVOPRO 4900 Multigas** and **SERVOPRO NOx** analyzers provide the required continuous emissions monitoring.

SERVOPRO NOx

O_2

PARAMAGNETIC

Find out more: **servomex.com/dri**

ETHYLENE PRODUCTION

The safe and efficient operation of ethylene plants is supported by rapid, accurate gas analysis, which brings control and confidence to every process point.

Ethylene production plants require reliable monitoring of process gases, while feed gas quality is also critical to the overall process. It is also vital to ensure a high product yield by controlling gas quality throughout the process.

Failure to monitor the gas feed throughout the process can significantly reduce efficiency.

A less pure gas results in a lower ethylene yield once the cracked gas is quenched and cleaned.

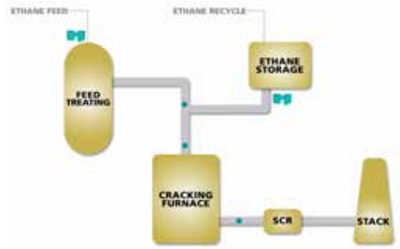
There are also issues for safety and emissions if high levels of contaminants enter the wrong part of the process.

ACCURATE, RELIABLE ANALYSIS OF PROCESS GASES

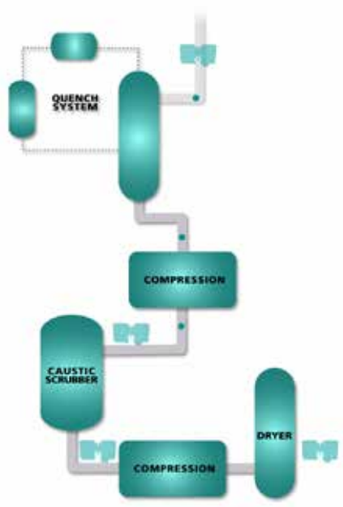
SERVOTOUGH SpectraExact 2500

THE ETHYLENE PRODUCTION PROCESS

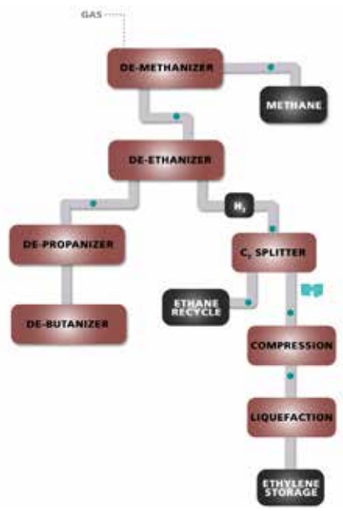
CRACKING FURNACE



AFTER QUENCH



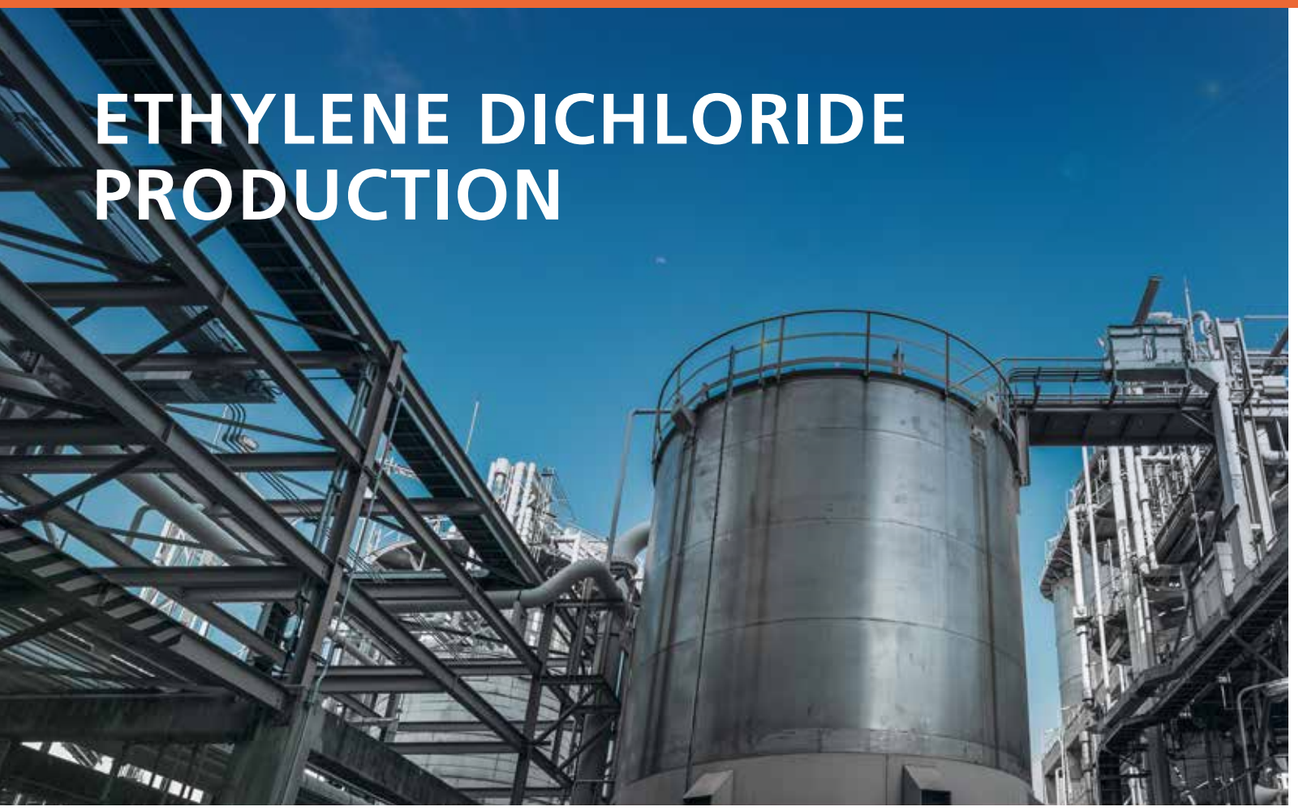
FRACTIONATION



KEY SOLUTIONS

The **SERVOTOUGH SpectraExact 2500** analyzer provide the accurate gas quality monitoring at many points throughout the ethylene process. This allows optimization of the process reactions to ensure greater efficiency, delivering a higher yield and better-quality product. We also supply analytical solutions for safety, combustion control and emissions monitoring.

Watch our application video at: **servomex.com/ep**



ETHYLENE DICHLORIDE PRODUCTION

The predominant global method for PVC production is the ethylene-based route, using ethylene dichloride (EDC) as an intermediate. EDC production requires gas analysis at several points, for process control and quality monitoring. A variety of technologies are needed to measure the range of gas components within the process.

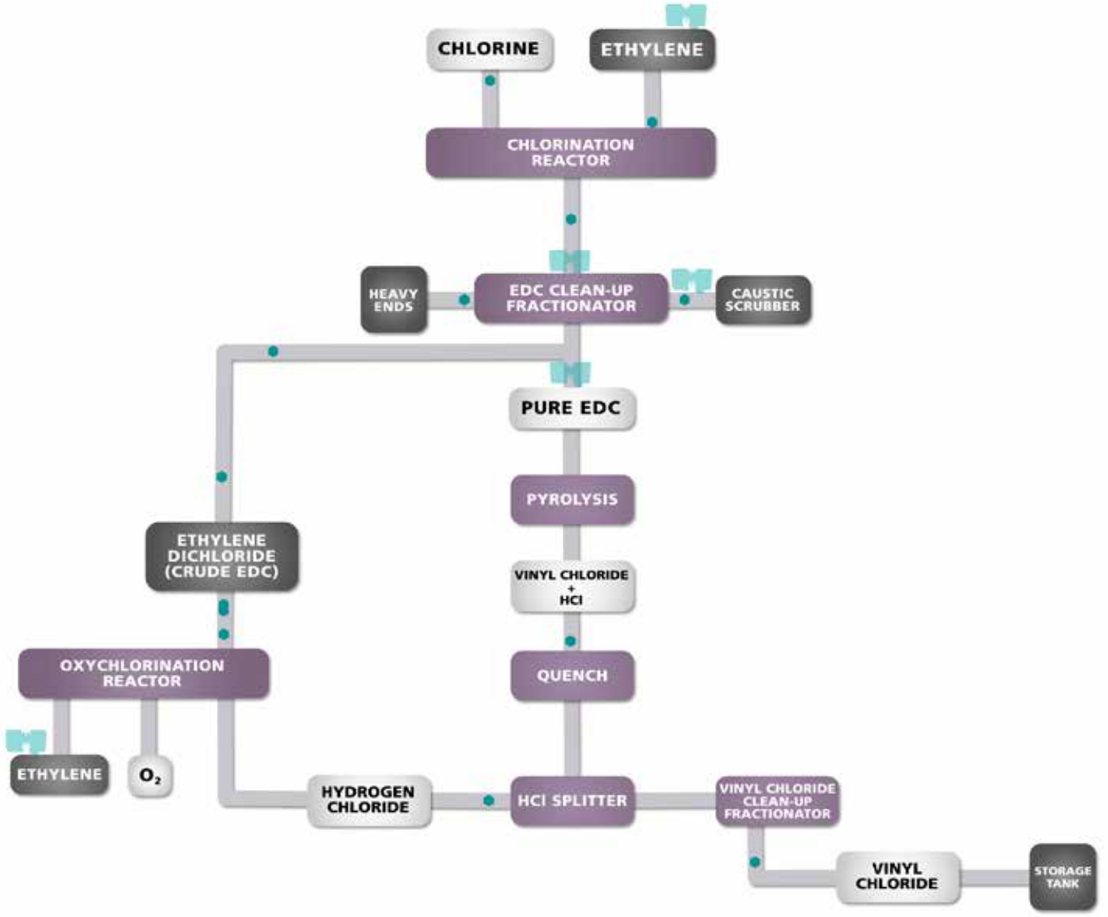
Gas analyzer systems must overcome challenging process conditions, including condensation and corrosion. Large amounts of hydrogen chloride, EDC and residual water can increase the corrosion damage, so a resilient analyzer that can make accurate moisture measurements in the EDC stream is required.

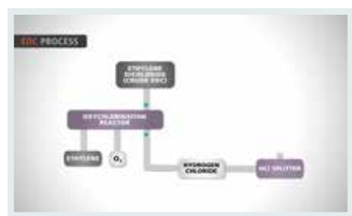
SERVOTOUGH SpectraExact 2500

KEY SOLUTIONS

Our rugged, highly flexible **SERVOTOUGH SpectraExact 2500** photometric gas analyzer delivers many of the key measurements required in the EDC process, including residual water levels in the EDC stream. Capable of single and multi-component analysis, it can also be used to monitor ethylene, sodium hydroxide, and hydrogen chloride in the EDC production process.

THE ETHYLENE DICHLORIDE PRODUCTION PROCESS





Watch our application video at: **servomex.com/edc**

ETHYLENE OXIDE PRODUCTION

Ethylene oxide (EO) is a versatile chemical building block. Its production relies on precise gas analysis measurements to ensure process safety and high productivity.

EO is formed in a reaction between oxygen and ethylene. Highly accurate monitoring of oxygen levels is required to protect the process against the risk of explosion. To support efficiency, quality and process control measurements are also made.

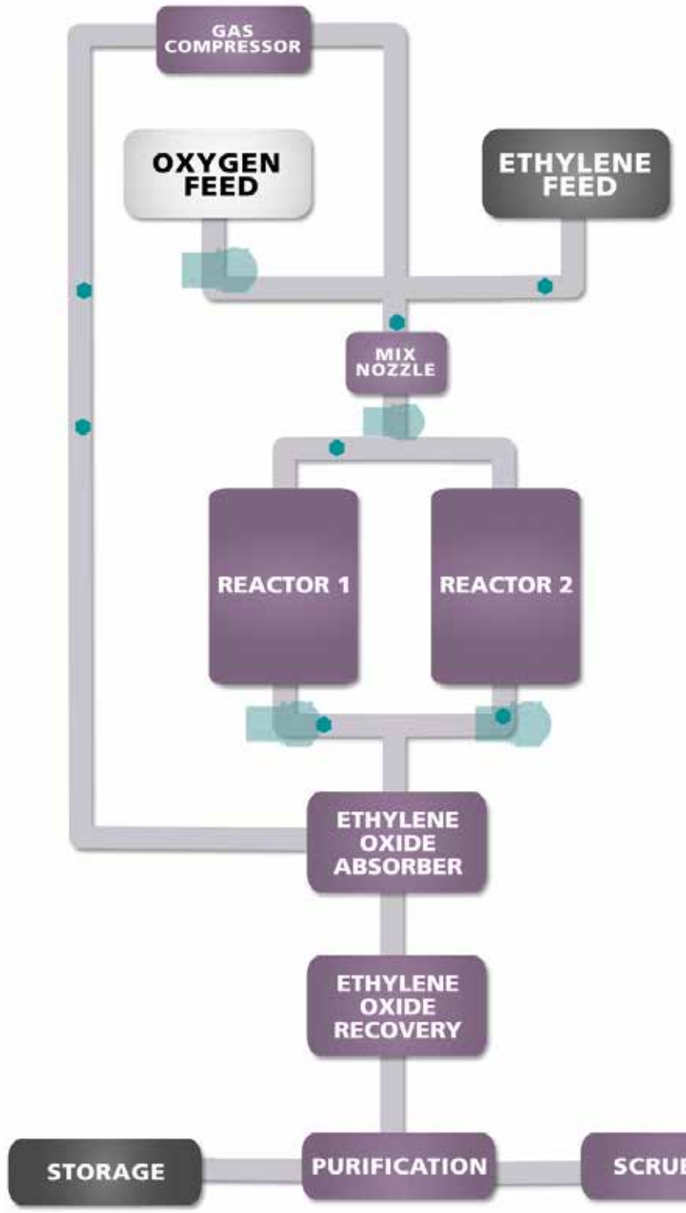
Safety is an essential concern, especially around the process reactors where hazardous flammable samples containing ethylene, oxygen, ethylene oxide and methane may be present.

SERVOTOUGH OxyExact 2200

KEY SOLUTIONS

To provide safety-critical oxygen analysis, Servomex supplies a dual or triple-redundancy gas analysis system using **SERVOTOUGH OxyExact 2200** analyzers. Specifically designed for hazardous area operation, these Paramagnetic analyzers deliver the accurate, reliable measurements needed as part of a Safety Integrated System (SIS).

THE ETHYLENE OXIDE PRODUCTION PROCESS



Watch our application video at: **servomex.com/eo**

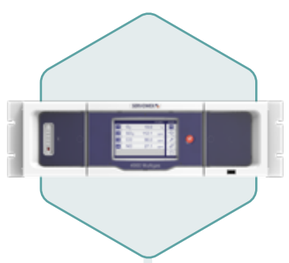
HYCO AND HYDROGEN PRODUCTION

HyCO is a synthetic fuel consisting of hydrogen and carbon monoxide. Also known as syngas, it is most commonly made by converting natural gas in a steam reformer into a mixture of H_2 and CO.

To obtain hydrogen for fuel, the CO is further converted into H_2 and CO_2 in water-shift reactors, then the CO_2 is removed via absorption or carbon capture.

When manufacturing hydrogen, a high-quality gas analysis system improves process control, increases safety, monitors emissions, and optimizes product quality.

Alongside product quality measurements for the hydrogen and carbon monoxide gases produced, safety and control measurements are required to monitor levels of oxygen, carbon dioxide, methane, total hydrocarbons, and trace moisture, as well as monitor feedstock and combustion processes.



SERVOPRO MultiExact 4200

KEY SOLUTIONS

Depending on the manufacturing method, the most common contaminants in hydrogen production will be O_2, CO, and CO_2. All three of these can be monitored by the **SERVOPRO MultiExact 4200**, Servomex's multi-component analyzer, using a combination of Paramagnetic and Gas Filter Correlation sensing.

The **MultiExact 4200** can measure up to four gas streams simultaneously, providing high-specification, multi-gas analysis of trace contaminants and flammable gas samples. The analyzer can also be configured to measure ppm-level CO, CO_2, CH_4, and N_2O.

Find out more: **servomex.com/4200**

MARINE VAPOR CONTROL

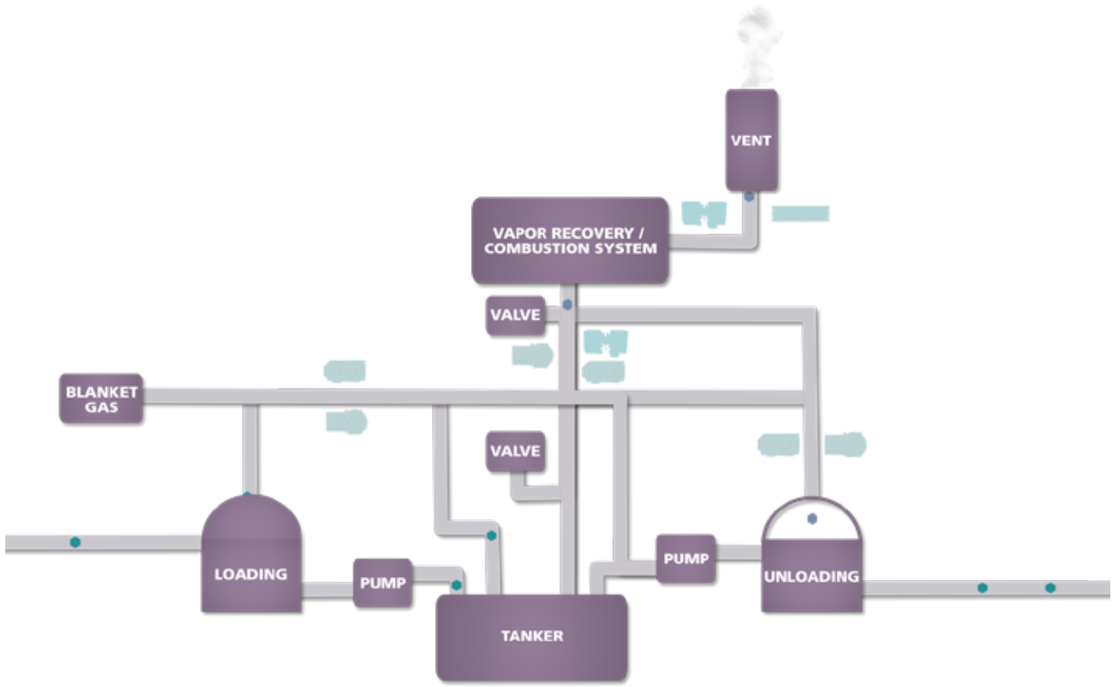
The systems used to monitor marine vapors are controlled by strict regulations which govern the performance levels of the analyzer and its suitability to the hazardous environment. Analyzers used in these systems must be approved by the relevant regulatory body.

The vapors produced during loading are either returned to the plant and used for fuel or raw materials, or taken to a safe area and incinerated. In either case, it is essential to monitor the return lines for air ingress, in order to prevent explosive conditions from occurring.

SERVOTOUGH Oxy 1900

SERVOTOUGH OxyExact 2200

THE MARINE VAPOR CONTROL PROCESS



KEY SOLUTIONS

At least two Paramagnetic oxygen analyzers are specified by the regulations for this application, to ensure redundancy within each system. Our proven solution uses either the **SERVOTOUGH Oxy 1900** or **SERVOTOUGH OxyExact 2200** analyzers, depending on application conditions. Both offer the enhanced reliability of non-depleting sensor technology, and are approved by regulatory bodies.

Watch our application video at: **servomex.com/mvc**

PROCESS HEATERS AND FURNACES

Process heaters and furnaces allow fuel and air to react together, producing extremely high gas temperatures. They use large quantities of fuel, generate emissions, and can create a safety hazard for plant and personnel alike.

The key to controlling combustion in process heaters and furnaces is the optimization of the air-to-fuel ratio. Using excess oxygen (air) leads to cooler burning, significantly reducing efficiency and increasing emissions. However, a low-oxygen, fuel-rich situation is a potential source of explosions.

Keeping the combustion reaction at the optimum point ensures safe operation while reducing both fuel costs and emissions.

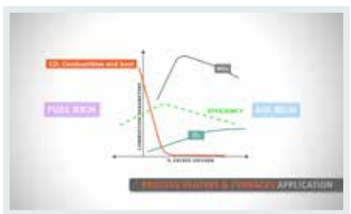
SERVOTOUGH
FluegasExact 2700

SERVOTOUGH
Laser 3 Plus Combustion

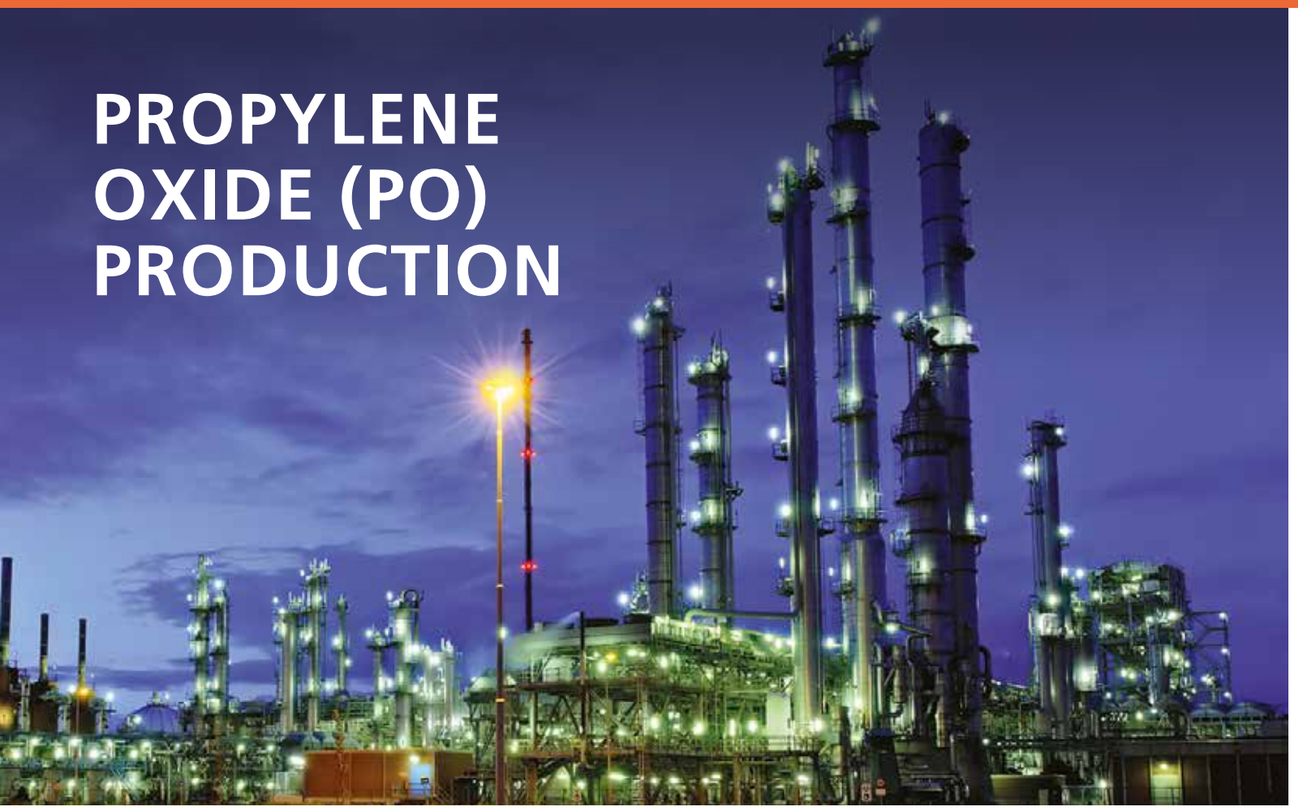
THE PROCESS HEATER MEASURING POINTS

KEY SOLUTIONS

Using close-coupled extractive sampling, the **SERVOTOUGH FluegasExact 2700** combines proven Zirconia sensing for oxygen and Thick Film Catalytic sensing for combustibles, delivering an effective solution in a single analyzer. The **SERVOTOUGH Laser 3 Plus Combustion** uses Tunable Diode Laser (TDL) technology for in-situ measurements of oxygen, carbon monoxide, or both carbon monoxide and methane. This provides an average measurement across the flue, and is especially effective in supporting safety.



Watch our application video at: **servomex.com/process-heaters**



PROPYLENE OXIDE (PO) PRODUCTION

An important intermediate for the manufacture of propylene glycol, PO can be used as an antifreeze agent or to create polyurethane plastics.

It can be manufactured through hydrochlorination – converting propene to propylene chlorohydrin and then dechlorinating. More commonly, it is made through the oxidation of propylene with an organic peroxide. Both methods require gas analysis for safety and quality control.

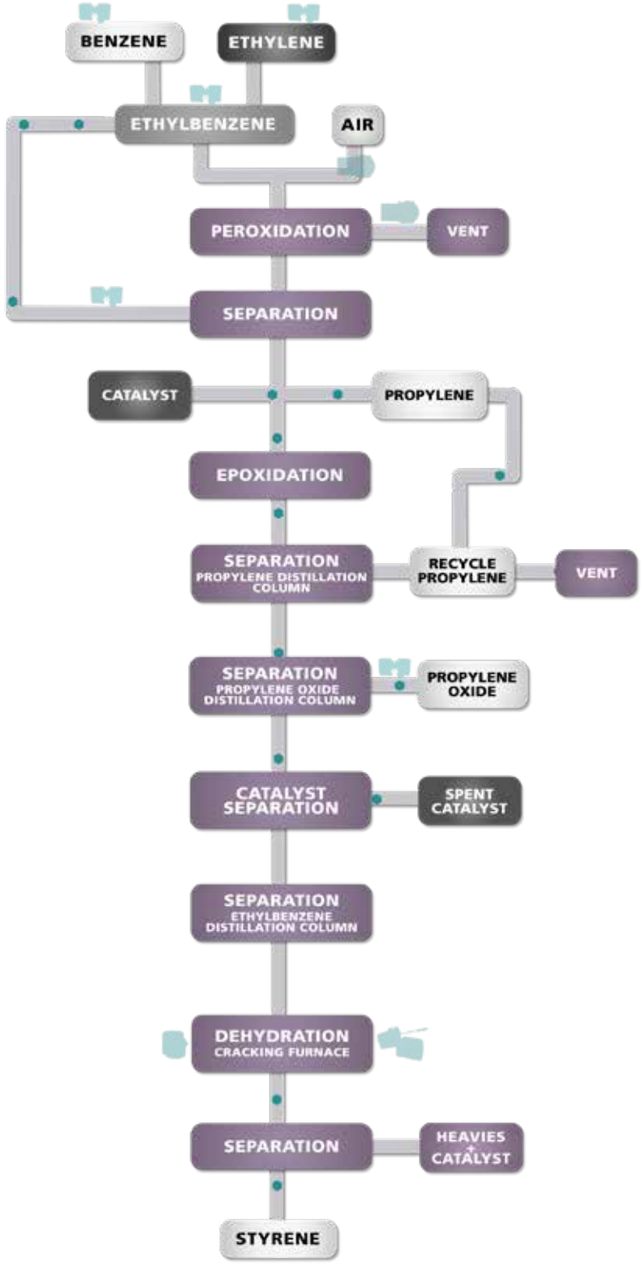
Manufacturing propylene oxide through the oxidation process requires oxygen levels to be monitored in the oxidation reactor for quality and safety. This analysis must be performed under hazardous conditions, since propylene oxide is volatile and highly flammable.

SERVOTOUGH Oxy 1900

KEY SOLUTIONS

The **SERVOTOUGH Oxy 1900** delivers accurate measurements of oxygen in the oxidation reactor. This hazardous area device provides safety-enhanced oxygen analysis, using stable, non-depleting Paramagnetic sensing technology. A heated sample compartment provides unrivalled stability and simplified sampling.

THE PROPYLENE OXIDE PRODUCTION PROCESS



Watch our application video at: **servomex.com/po**

PURIFIED TEREPHTHALIC ACID (PTA) PRODUCTION

The production of PTA relies upon expert gas analysis to ensure process control, efficiency and safety, as well as quality monitoring and environmental compliance.

In order to maintain safety and support productivity, oxygen (O_2) analysis is critical.

Additionally, some operators use an oxygen enrichment process on their PTA plants, which requires a specialist O_2 monitoring solution for both safety and efficiency.

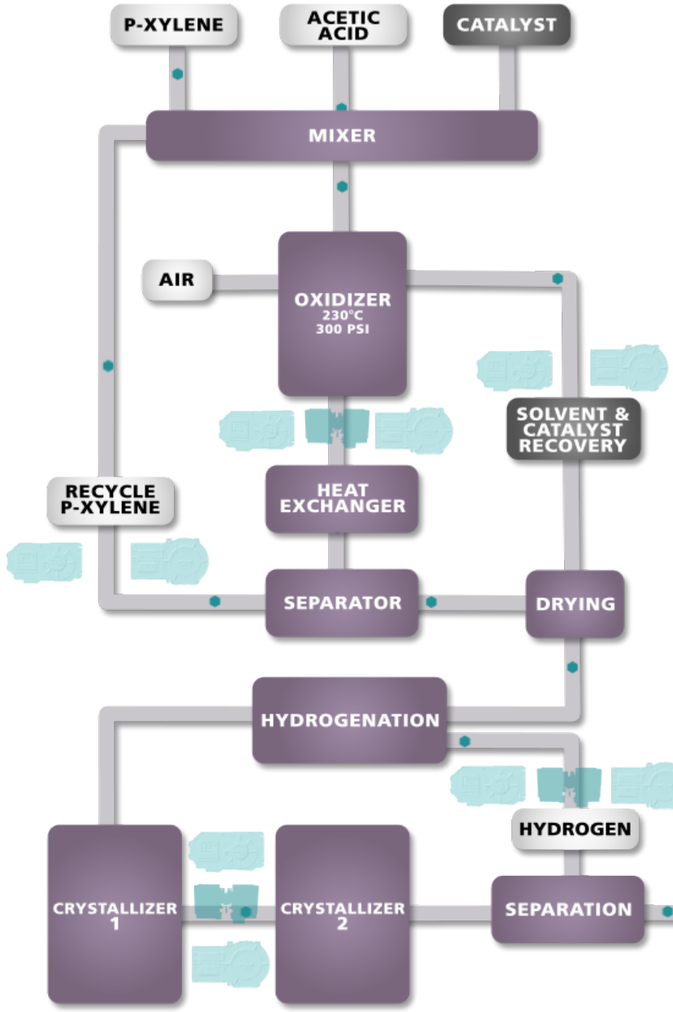
The enriched oxygen process involves adding O_2 to the air being fed to the reactors, ensuring a more efficient reaction, reducing catalyst consumption, and improving reactor performance. To keep O_2 concentration at the most efficient level, while ensuring it does not exceed safe levels, reliable and accurate monitoring is required.

SERVOTOUGH OxyExact 2200

KEY SOLUTIONS

Servomex's **SERVOTOUGH OxyExact 2200** high-specification Paramagnetic oxygen analyzer is able to operate effectively and reliably in hazardous environments. It has a resilient enclosure for the transmitter unit, providing an effective solution for this application.

THE PTA PRODUCTION PROCESS



Watch our application video at: **servomex.com/pta**

THERMAL POWER – COAL

In coal-fired power generation, pre-heated air and pulverized coal are fed into the boiler where combustion takes place. This is a demanding industry which requires operators to deliver the most efficient process while maintaining safe operation, controlling fuel costs and meeting stringent targets for emissions.

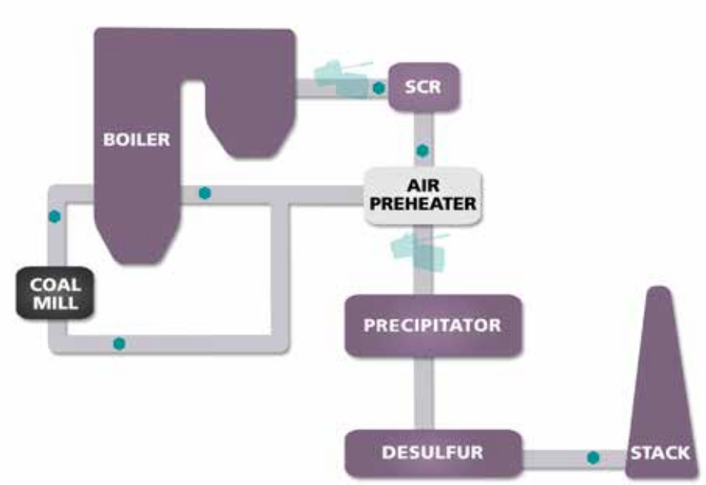
To ensure complete combustion, excess air is needed. However, if this excess is too high, combustion efficiency will fall through heat loss, while if the process is run with excess fuel, not all the fuel will be burnt. Precise monitoring and control of flue gas in the process is essential to optimize combustion efficiency, which will minimize fuel costs and reduce harmful emissions.

SERVOTOUGH
FluegasExact 2700

KEY SOLUTIONS

Our **SERVOTOUGH FluegasExact 2700** combustion analyzer continuously monitors oxygen and combustibles in the flue gas, enabling operators to achieve optimum combustion conditions. This helps to reduce carbon and NOx emissions, improve process safety, and save fuel – the FluegasExact 2700 has been proven to cut fuel costs by up to 4%.

COMBUSTION PROCESS



Watch our application video at: **servomex.com/thermal-power**

VINYL CHLORIDE MONOMER (VCM) PRODUCTION

An important intermediate product for the production of polyvinyl chloride (PVC), VCM is created by reacting hydrogen and chlorine (Cl_2) together to form hydrogen chloride (HCl). This in turn is combined with acetylene to produce VCM.

Gas analysis measurements are required across the process, including monitoring moisture in the Cl_2 stream to avoid compressor corrosion, safety measurements for both HCl and Cl_2, and oxygen measurements in the acetylene stream.

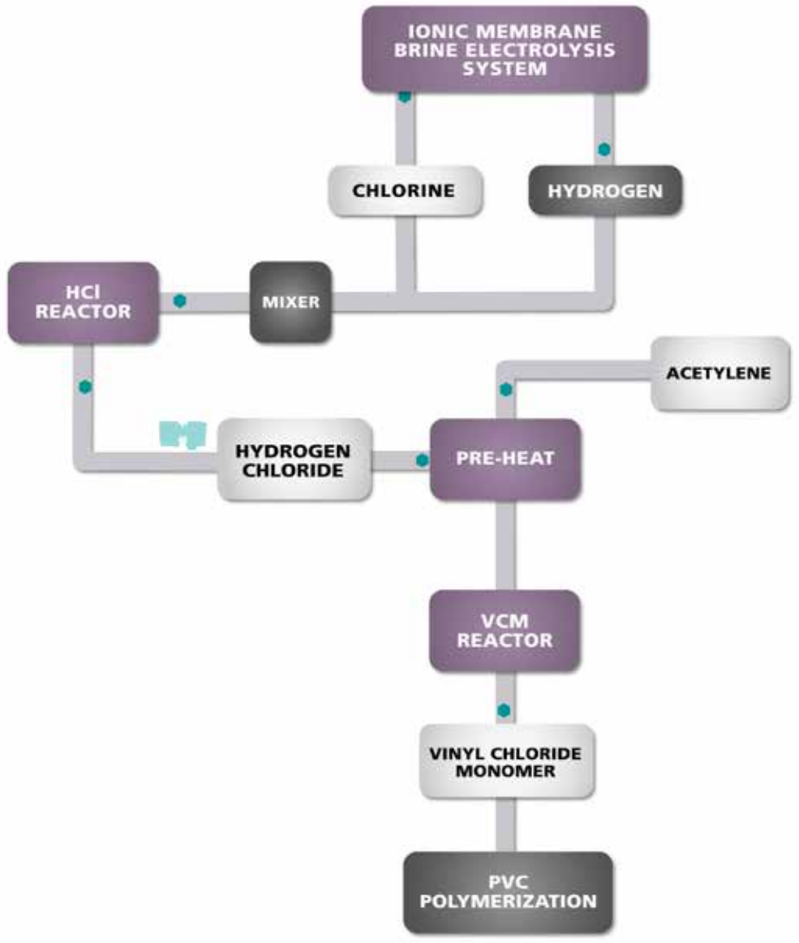
The gas analysis equipment used in this process can be affected by the challenging process conditions, such as condensation and corrosion. The analytical systems used must not only deliver reliable measurements for process control and safety, but be able to do so without being impaired by the conditions themselves.

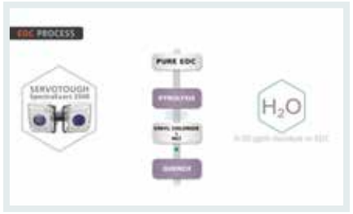
SERVOTOUGH SpectraExact 2500

KEY SOLUTIONS

The rugged **SERVOTOUGH SpectraExact 2500** accurately provides single and multi-component analysis at key process points, including measurements for moisture in Cl_2 to protect the compressor from corrosion damage. It can also make the necessary measurements for HCl and Cl_2 concentrations between the HCl reactor and preheater stages of the process.

THE VCM PRODUCTION PROCESS





Watch our application video at: **servomex.com/vcm**

HUMMINGBIRD: **TWO-TIME QUEEN'S AWARD WINNERS**

THE QUEEN'S AWARDS FOR ENTERPRISE: INTERNATIONAL TRADE 2022

WE ARE DELIGHTED THAT SERVOMEX'S 70TH YEAR HAS ALSO SEEN OUR HUMMINGBIRD SENSING TECHNOLOGY BRAND WIN THE QUEEN'S AWARD FOR ENTERPRISE: INTERNATIONAL TRADE 2022.

This accolade has been awarded to Hummingbird – the expert manufacturer of gas sensors for medical and industrial applications – as it has demonstrated significant growth in international trade over the past six years.

Part of this growth is attributed to the ways in which Hummingbird responded to the Covid-19 pandemic in order to meet a surge in demand for its sensors as the global need for medical equipment reached an all-time high.

When the pandemic broke out, methods were developed to increase productivity to meet heavy demand from partners in the healthcare market as the global need for critical care ventilators soared.

Our team effectively implemented a three-year development program over the course of 14 weeks, introducing stringent hygiene measures on-site and a seven-days-a-week shift system to allow better social distancing.

We also developed a new, faster-to-produce model of the paramagnetic oxygen sensor for non-medical OEM customers in an effort to maintain commitments to industrial customers while fulfilling the increased demand from the healthcare industry.

As part of the award, Hummingbird were invited to attend a grand reception at Buckingham Palace, hosted by His Royal Highness, King Charles III. There was also a formal presentation of the award at Hummingbird's state-of the-art manufacturing facility in Crowborough, UK.

PARACUBE® MODUS

AN INCREDIBLE ACHIEVEMENT

"We are incredibly proud to know that Hummingbird products and services have had – and continue to have – a positive impact on society and technological progress, benefiting the environment, healthcare, and quality of life globally.

"This is an exceptional achievement and I want to thank everyone involved for their dedication during what was a very challenging time for so many.

"We're seen by our customers as a global business operating with a local level of service and support, and it's this that has driven our outstanding growth. This approach also paid dividends during the recent pandemic and the increased demand for critical care medical devices.

"Existing and new customers around the world turned to us to meet the requirements for increased supply, something that was facilitated by our existing export network and ongoing partnerships."

Andy Cowan, Servomex President

Hummingbird
SENSING TECHNOLOGY

The Hummingbird Sensing Technology brand was launched in 2011, manufacturing gas sensors for medical and industrial applications such as critical care ventilators. In 2016, Hummingbird won the Queen's Award for Innovation for the development of a small, vibration-resistant sensor designed for medical critical care applications.

Since its formation, Hummingbird has developed world-leading technologies that redefine gas sensor performance.

Customers include major producers of equipment such as critical care medical devices, gas analyzers for industrial applications, research instruments and deep-sea diving analysis.

Discover more at: **hummingbirdsensing.com**

YOUR GUIDE TO OUR SENSING TECHNOLOGIES

This complete A-Z guide introduces our wide range of sensing technologies ready for use in gas analysis applications within a variety of important industries.

These sensors are key to the highly accurate and reliable measurements provided by our comprehensive range of gas analyzers.

One of Servomex's major advantages as a supplier of gas analysis solutions is the variety of sensors that we have available to select from. Instead of choosing from just two or three sensing technologies to resolve an application challenge, we can apply the most accurate and cost-effective solution from our entire range.

SELECTING THE RIGHT SENSING TECHNOLOGY IS ESSENTIAL

TECHNOLOGY	GAS SENSED	TYPICAL APPLICATIONS
Aluminum Oxide	H_2O	Air separation units (ASU), medical gases, semiconductors
Calorimetry	CO, COe	Process heaters, thermal crackers, incinerators
Chemiluminescence	NO, NO_2, NOx	Vehicle emissions testing, continuous emissions monitoring, combustion efficiency
Coulometric	O_2	Semiconductors, solder reflow ovens, reactor process control
Flame Ionization Detector	Total hydrocarbons	ASU, product pipelines, cylinder filling stations
Gas Chromatography	Multiple	Semiconductors, ASU, medical gases
Gas Filter Correlation	Multiple	Continuous emissions monitoring, ethylene, chlorine and TDI production processes, HyCO process control
Infrared	Multiple	Ethylene, chlorine and TDI production, continuous emissions monitoring, ASU process control
Paramagnetic	O_2	Oxidation control reactions, EO, PTA and EDC manufacturing, industrial and medical gas production
Plasma	Multiple	Semiconductors, medical gases, ASU process control
Thermal Conductivity Detector	Binary gas mixtures	Medical gases
Tunable Diode Laser Absorption Spectroscopy	H_2O	Semiconductors, UHP gas purity, specialty gases
Tunable Diode Laser	O_2, CO, CH_4, NH_3	Process and combustion control, ammonia slip DeNOx measurements, safety monitoring
Zirconia	O_2	Process heaters, thermal crackers, incinerators

MOISTURE AND DEW POINT ANALYSIS

Aluminum Oxide (Al_2O_3) sensors work by measuring the capacitance between the aluminum core and a gold film deposited on the oxide layer.

The capacitance varies according to the water vapor content in the pores of the oxide layer.

The ultra-thin Al_2O_3 sensors have three innovative structural improvements that offer better performance than traditional Al_2O_3 sensors, with advantages for sensitivity and stability.

1. A MUCH THINNER OXIDE LAYER

This results in higher capacitance, since this is inversely proportional to the distance of the capacitor's plates from each other. Higher capacitance results in a more sensitive measurement.
The thinner layer also allows water molecules to travel in and out of the pores more quickly, ensuring a faster response.

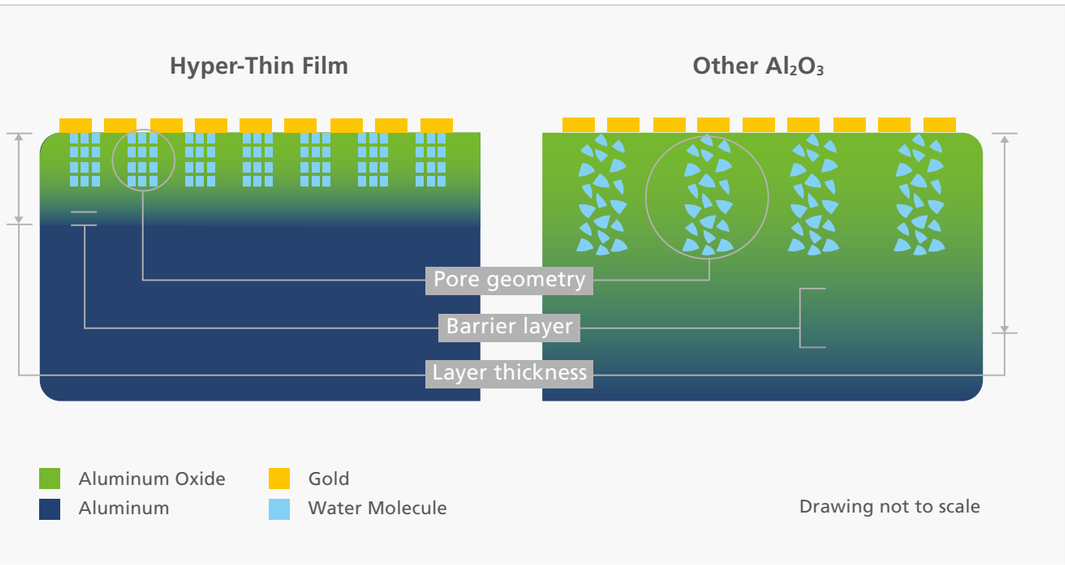
2. A BETTER-DEFINED BARRIER LAYER

The sharply defined barrier means that the sensor's wet to dry capacitance ratio is very high, reducing the effects of any drift due to undesirable factors. It also reduces metal migration, one of the major causes of drift in conventional Al_2O_3 sensors.

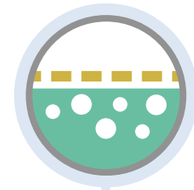
3. UNIQUE PORE GEOMETRY

Holding more water than conventional sensors, the ordered pore geometry increases the change in capacitance for a given change in dew point. This means greater accuracy and a quicker response. It is also more stable, so only annual calibration checks are needed when the sensor is used in clean, non-corrosive gases.

ALUMINUM OXIDE SENSOR STRUCTURE



ALUMINUM OXIDE



KEY APPLICATIONS

- Air separation units
- Medical gases
- Semiconductors

KEY BENEFITS

- Fast response
- Highly accurate
- Free of drift

IDEAL FOR

Dew point and parts-per-million moisture measurements in a wide range of industrial gas applications.

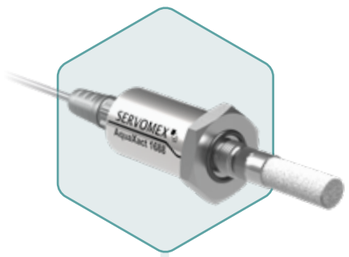
LIMITATIONS

Aluminum Oxide sensing does not reach the ultra-trace levels of detection required for all UHP gases. Tunable Diode Laser Absorption Spectroscopy technology is often a better fit for this application.

WORKS WITH

Paramagnetic and Coulometric sensors for a dual measurement of oxygen and moisture.

USED IN



SERVOPRO AquaXact 1688

ACCURATE COMBUSTIBLES MEASUREMENTS

The sensor measures combustibles (COe) from its exothermic reaction with oxygen (O_2) over a catalytic platinum surface, which produces carbon dioxide (CO_2) and the heat generated is used to determine the COe concentration.

A four quadrant bridge track is over-glazed to shield the circuit from the sample gas and two quadrants are then coated in platinum catalyst. These quadrants form a Wheatstone bridge circuit, with the disc mounted in a cell heated to 300°C (572°F) or 400°C (752°F).

When the gas sample is added, any COe present in the sample will combust on the catalyst, which will heat the respective quadrant and alter the Wheatstone bridge output voltage.

The output delivered will be directly proportional to the COe concentration, providing an accurate measurement.

WHEATSTONE BRIDGE

CALORIMETRY

KEY APPLICATIONS

- Process heaters
- Thermal crackers
- Incinerators
- Utility boilers

KEY BENEFITS

- Highly sensitive
- Accurate and stable at low concentrations
- Reduced ongoing maintenance

IDEAL FOR

Highly sensitive, accurate and stable measurements of COe at low concentrations in combustion applications.

LIMITATIONS

High levels of sulfur emissions may degrade the catalyst. A sulfur-resistant sensor may be required. Potential cross sensitivity to other combustible gases.

WORKS WITH

Zirconia O_2 sensing for an all-in-one combustion control solution.

USED IN

SERVOTOUGH FluegasExact 2700

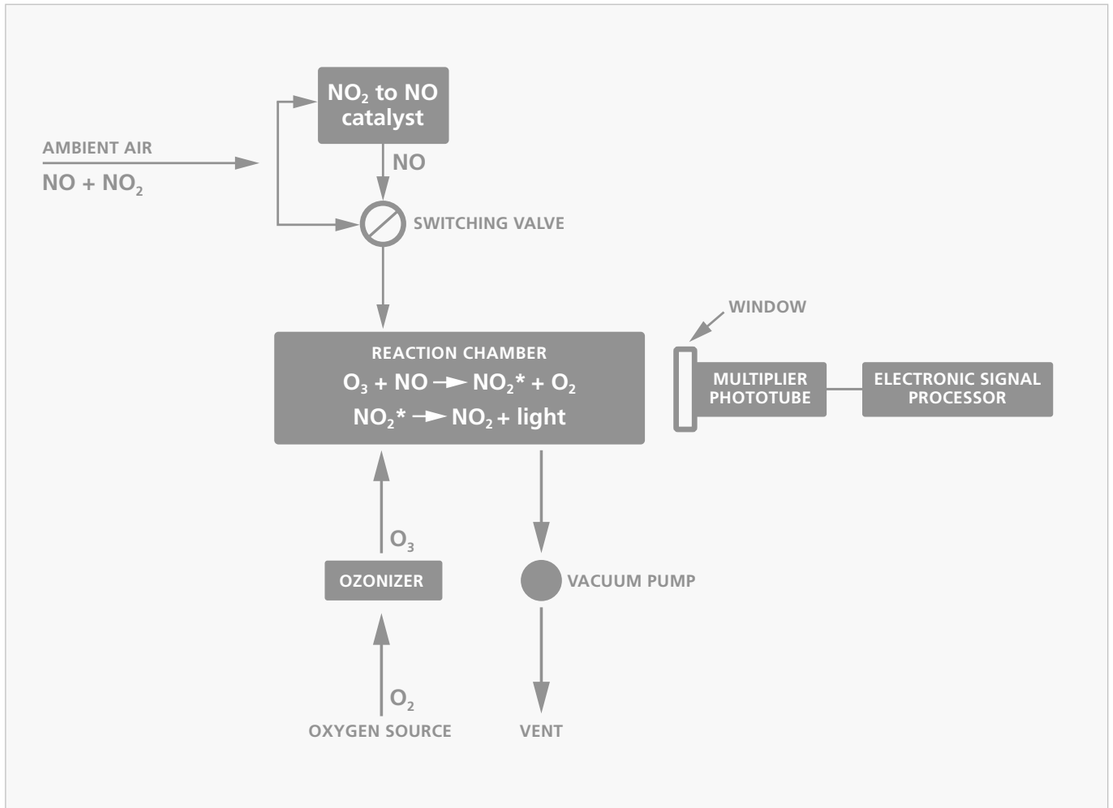
LIGHT-BASED MEASUREMENTS FOR NOx ANALYSIS

Chemiluminescence detectors take advantage of nitric oxide (NO) and nitrogen dioxide (NO_2) chemical reactions that emit light as part of that process. This is different from fluorescence or phosphorescence, in that the light produced stems from a chemical reaction rather than by the absorption of photons by the molecule.

Chemiluminescence analyzers use a thermally stabilized photodiode to measure the intensity of the light produced by the reaction of NO with ozone (O_3). The intensity is directly proportional to the concentration of NO that was converted to NO_2 by the reaction.

By converting the NO_2 in the gas stream to NO, then reacting it with the O_3, the total NOx value can be calculated, allowing speciation of NO, NO_2 and total NOx with a single analyzer.

CHEMILUMINESCENCE PROCESS DIAGRAM



CHEMILUMINESCENCE

KEY APPLICATIONS

- Vehicle emissions testing
- Continuous emissions monitoring (CEM)
- Combustion efficiency
- DeNOx systems

KEY BENEFITS

- Excellent trace analysis results
- Rapid response time
- Non-depleting technology keeps cost of ownership low

IDEAL FOR

Rapid-response applications such as vehicle and engine emissions certification testing, CEM, combustion efficiency, and process gas monitoring.

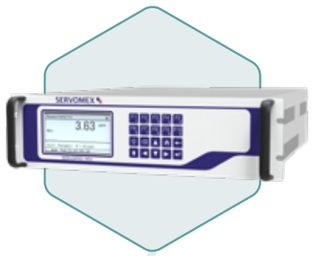
LIMITATIONS

If the sample gas pressure varies, the amount of light emitted will be affected even if the NOx concentration remains stable. Pressure control of the sample gas is essential for accurate measurement.

WORKS WITH

Gas Filter Correlation, Infrared, Paramagnetic and Flame Ionization Detector sensing technologies for a comprehensive CEMs solution.

USED IN



SERVOPRO NOx

HIGH-SENSITIVITY MEASUREMENTS OF OXYGEN

Our Coulometric technology enables the measurement of oxygen (O_2) at percent or parts-per-million (ppm) levels. It is non-depleting, so there is no requirement for periodic cell replacement, and it avoids the false low readings associated with standard electrochemical sensors.

It operates through a simple Coulometric process where O_2 from the sample gas is reduced to hydroxyl ions at the sensor cathode. The resulting current flow is proportional to the O_2 content in the gas, and the process signal can be displayed in ppm or parts-per-billion (ppb) units of O_2.

Coulometric sensors respond very quickly to changing O_2 concentrations. For instance, a 0-1,000 ppm range sensor can be exposed to air and in less than a minute will measure <10 ppm on pure nitrogen. This is highly beneficial for users who have upset-prone applications.

Additionally, the performance of the sensor is unaffected by reasonable changes in flow rate. Because the non-depleting sensor is not consumed when exposed to O_2, it has a long lifespan and does not require a purge gas to protect it when not in use.

HUMMINGBIRD COULOMETRIC SENSOR

COULOMETRIC

KEY APPLICATIONS

- Semiconductors
- Solder reflow ovens
- Reactor process control

KEY BENEFITS

- Industry-leading lower detection limits
- Fast response and rapid recovery
- Non-depleting sensor – long lifespan

IDEAL FOR

Sensitive, parts-per-million measurements of O_2, for example in impurity monitoring for UHP semiconductor gases.

LIMITATIONS

Coulometric sensors should avoid sample streams that contain acidic gases. For applications involving these gases, a Paramagnetic or Tunable Diode Laser Absorption Spectroscopy sensor is recommended instead.

WORKS WITH

Tunable Diode Laser Absorption Spectroscopy sensing for a highly sensitive dual measurement of O_2 and moisture at ppm levels.

USED IN

- SERVOPRO DF-500 Range
- SERVOPRO DF-760E NanoTrace ULTRA
- SERVOPRO DF-560E NanoTrace ULTRA
- SERVOPRO MonoExact DF150E
- SERVOPRO DF-760E
- SERVOPRO MonoExact DF310E

MEASURING HYDROCARBONS DOWN TO ULTRA-TRACE LEVELS

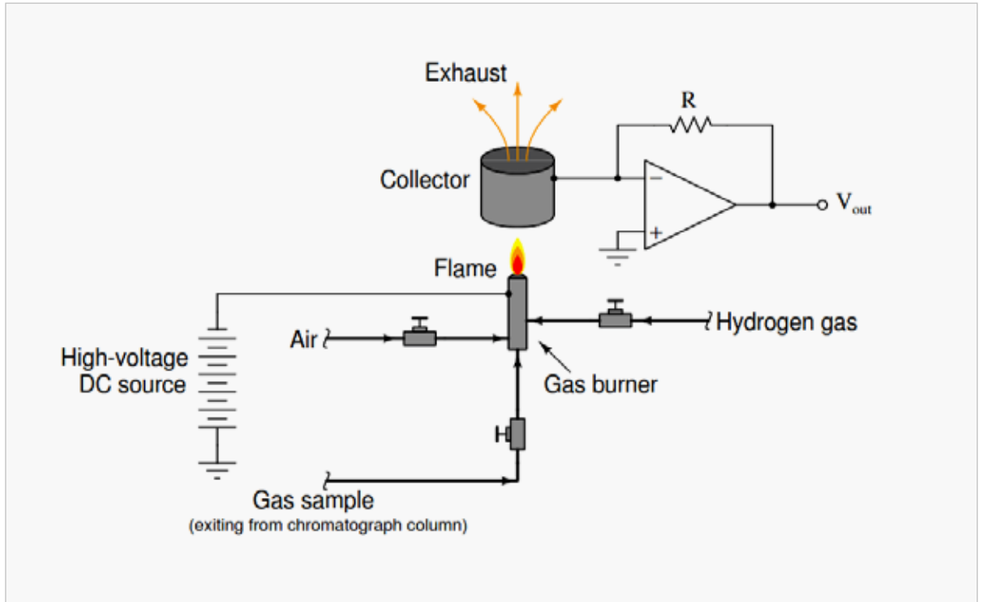
Flame Ionization Detector (FID) sensors are designed to measure flammable Total Hydrocarbons (THC) down to parts-per-billion (ppb) levels.

They work by detecting ions formed in the combustion of organic compounds in a sample, producing charged molecules that cause electrical conduction between two electrodes.

The ions are attracted to a collector plate and induce a current upon hitting the plate. The FID measures this conduction and produces an output which is directly proportional to the concentration of THC in the sample.

This signal is then enhanced by a logarithmic amplifier that reduces drift and thermal noise, delivering an accurate, non-depleting measurement with 100 ppb resolution.

A TYPICAL FLAME IONIZATION DETECTOR



FLAME IONIZATION DETECTOR

KEY APPLICATIONS

- Air separation units
- Product pipelines
- Cylinder filling stations

KEY BENEFITS

- Decreased drift and thermal noise
- Accurate, non-depleting measurement
- Resolution of 100 ppb

IDEAL FOR

Industrial processes where THC contamination is possible, such as air separation units, product pipelines, and cylinder filling stations.

LIMITATIONS

Some carbon-containing compounds, and a number of gases of common industrial interest, fail to significantly ionize in a flame and so are either undetectable or may not be effectively measured by the FID.

WORKS WITH

Gas Chromatography techniques to provide trace gas measurements for a wide range of applications.

USED IN

SERVOPRO FID

SERVOPRO Chroma

SERVOPRO HFID

HIGH-PURITY ANALYSIS FOR A RANGE OF GASES

Gas Chromatography (GC) separates out a mixture in the gas phase to determine the presence and concentration of constituent components. Under optimized conditions, it can measure down to parts-per-billion (ppb) levels, making it ideal for high purity processes.

The components of a mixture in the gas phase are separated by introducing a small portion of the sample into a flowing carrier gas (mobile phase), which percolates through a stationary phase consisting of particulates packed within a column.

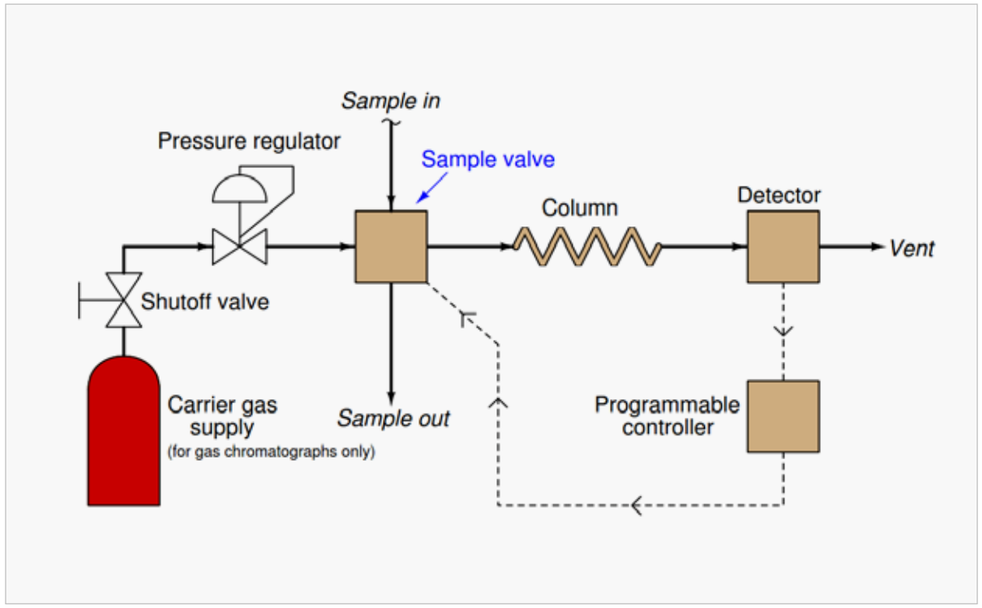
The different gas constituents are separated due to their own specific, adsorptive interaction between the stationary phase and the mobile phase. This causes the constituents to exit the column (elute) at different times.

These specific times are detected at the exit of the column.

By comparing times, users can identify analytes by the order in which they elute from the column. Each constituent concentration is determined, after calibration, from the integral of each analyte's detector response time.

The conditions under which GC technology operates differ for each application, and require individual optimization.

THE GAS CHROMATOGRAPHY TECHNIQUE



GAS CHROMATOGRAPHY

KEY APPLICATIONS

- Semiconductors
- Medical gases
- Air separation units

KEY BENEFITS

- Measures multiple components down to ppb levels
- Highly reliable results
- Works for a wide range of background gases

IDEAL FOR

High-purity processes that require accurate gas detection down to ppb levels, including electronic and medical gases, plus cryogenic air separation processes.

LIMITATIONS

GC analyzers do not deliver real-time measurements, so are unsuited to applications where rapidly changing gas concentrations must be monitored.

WORKS WITH

Plasma, Flame Ionization Detector and Thermal Conductivity technologies in the Chroma and NanoChrome.

USED IN

SERVOPRO Chroma

SERVOPRO NanoChrome

SERVOPRO NanoChrome ULTRA

STABLE, ULTRA-ACCURATE PHOTOMETRIC GAS ANALYSIS

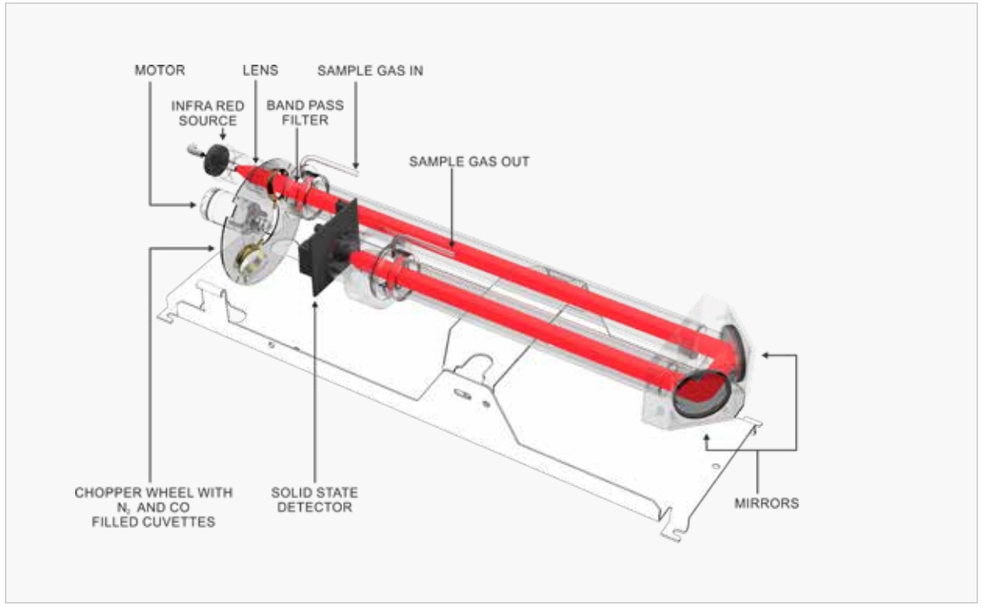
Gas Filter Correlation (GFC) sensing is an enhanced version of the photometric analysis used in our Infrared technologies. It performs effectively where extremely accurate, low-level measurements are needed, or where background gases may interfere with the measurement.

Gases have the ability to absorb unique light wavelengths – GFC sensing uses that property to detect the concentration of a selected gas in a mixture.

Two gas-filled cuvettes are mounted on a rotating disk, each passing through a beam of light alternately. One cuvette (the measure cuvette) is typically filled with nitrogen while the other cuvette (the reference cuvette) is filled with a sample of the gas to be measured. Light is passed through the gas to be measured: the difference in absorbance is measured and provides a direct output of the gas concentration.

Offering real-time measurement response, GFC measurements are unaffected by background gases, and the technique is virtually immune to obscuration of the optics. This prevents sensor drift, greatly reducing calibration frequency.

THE GFC TRANSDUCER



GAS FILTER CORRELATION

KEY APPLICATIONS

- Continuous emissions monitoring
- Ethylene, LNG and TDI production processes
- HyCO process control

KEY BENEFITS

- Industry-leading lower detection limit
- High selectivity
- Non-depleting sensor – long lifespan

IDEAL FOR

Sensitive, parts-per million measurements of heterogeneous diatomic molecules in applications which require excellent cross-interference rejection from complex backgrounds.

LIMITATIONS

Only gases which exhibit rotational fine structure can be measured by this technology, so it is not suitable for noble gases, or single element diatomic molecules such as N_2 or O_2.

WORKS WITH

Single-beam, dual wavelength Infrared sensing to provide real-time process analysis for a range of industrial applications.

USED IN

- SERVOTOUGH SpectraExact 2500
- SERVOPRO MultiExact 4100
- SERVOPRO MultiExact 4200
- SERVOPRO 4900 Multigas

REAL-TIME MEASUREMENTS OF GASES IN A MIXTURE

Our Infrared (IR) sensors focus an IR light source through a sample cell holding a continuously flowing sample of the gas mixture, and onto a detector after wavelength selection.

The property of some gases to absorb unique light wavelengths can be used to detect the concentration of a selected gas in a mixture.

Depending on the intended application, this concept can be applied in two ways:

SINGLE BEAM, SINGLE WAVELENGTH (SBSW)

Delivers fast, stable and accurate real-time measurements with low maintenance requirements. It is used where a small transducer is required – the IR light source is electronically modulated, removing the need for a motor and rotating filters.

SINGLE BEAM, DUAL WAVELENGTH (SBDW)

Uses a pair of optical filters mounted on a rotating disc, which passes through a beam of IR light alternately. One filter (the measure filter) is chosen to pass light only at a wavelength that the gas to be measured absorbs, while the other filter (the reference filter) has a light passed through it at a wavelength unaffected by the gas to be measured. The difference in absorbance is measured by the detector and provides a direct output of the gas concentration.

SERVOTOUGH SpectraExact 2500

INFRARED

KEY APPLICATIONS

- Ethylene, chlorine and TDI production
- Continuous emissions monitoring
- ASU process control

KEY BENEFITS

- Real-time measurement response
- Low maintenance requirements

IDEAL FOR

Real-time, non-contact measurement applications, particularly where contamination might be an issue for other technologies.

LIMITATIONS

Infrared sensing cannot be used to detect gases that do not absorb infrared energy, for example hydrogen. In addition, for some applications, there may be more cost-effective solutions available.

WORKS WITH

Paramagnetic sensing for dual measurements of oxygen and carbon dioxide, and Gas Filter Correlation sensing for many industrial applications.

USED IN

- SERVOTOUGH SpectraExact 2500
- SERVOPRO MultiExact 4100
- SERVOFLEX MiniMP 5200
- SERVOPRO 4900 Multigas
- SERVOFLEX MiniHD 5200

AN INNOVATIVE SOLUTION FOR PERCENTAGE OXYGEN

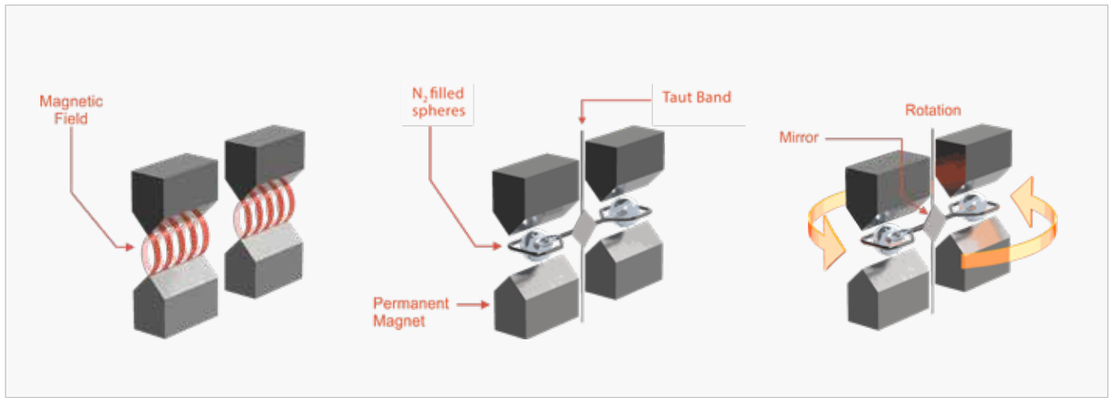
Our groundbreaking magnetodynamic Paramagnetic technology provides fast, accurate and sensitive measurements of percentage levels of oxygen (O_2).

The Paramagnetic cell consists of two nitrogen-filled glass spheres, mounted within a magnetic field, on a rotating suspension, with a centrally-placed mirror. Light shines on the mirror and is reflected onto a pair of photocells.

O_2 is naturally Paramagnetic, so is attracted to the magnetic field, displacing the glass spheres and causing suspension rotation which is detected by the photocells. Current is applied through a feedback coil present in the magnetic field to provide sufficient torque to return the suspension to its original position. The magnitude of this current is directly proportional to the O_2 present in the sample gas mixture.

Unlike electrochemical sensing technologies, a Paramagnetic cell never needs changing and its performance never deteriorates over time, reducing ongoing maintenance requirements and delivering a long operational life.

INSIDE A PARAMAGNETIC CELL



PARAMAGNETIC

KEY APPLICATIONS

- Oxidation control reactions
- EO, PTA and EDC manufacturing
- Industrial and medical gas production
- Medical/patient monitoring

KEY BENEFITS

- Fast, accurate measurements specific to O_2
- Non-depleting, with a long operational life

IDEAL FOR

O_2 measurement in flammable or corrosive gas mixtures.

LIMITATIONS

Paramagnetic sensing can be affected by significant levels of movement and vibration. It also requires careful sample conditioning to protect the sensor and ensure an accurate measurement.

WORKS WITH

Infrared and Gas Filter Correlation sensing in key industrial processes such as ASU and CEMs applications.

USED IN

- SERVOTOUGH Oxy 1900
- SERVOTOUGH OxyExact 2200
- SERVOPRO MultiExact 4100
- SERVOPRO MultiExact 4200
- SERVOPRO 4900 Multigas
- SERVOPRO MonoExact DF310E
- SERVOFLEX Micro i.s 5100
- SERVOFLEX MiniMP 5200
- SERVOFLEX MiniHD 5200

A HIGHLY SPECIFIC AND STABLE GAS MEASUREMENT

A discharge process occurs when sufficient energy is provided to ionize a gas stream. The resulting plasma consists of free electrons, ions, neutral molecules, and high-energy photons in a continuous state of ionization and recombination.

When energized by an external alternating high voltage field, gases flowing in a Dielectric Barrier Discharge (DBD) glow plasma produce intense emission spectra which relate directly to their unique molecular bonds.

The optical emission spectroscopy (OES) method combines precision optical filters and detectors to provide a highly selective gas measurement.

Our DBD plasma sensor consists of a custom quartz cell with transparent windows fitted with electrodes powered by a controlled radio frequency (RF) electromagnetic field. Multiple OES detector assemblies surrounding the quartz cell make selective measurements of emitted spectra of multiple gas species at the same time.

This highly sensitive and selective speciation of gases enables measurement of trace parts per billion (ppb) of gases.

EACH GAS PRODUCES UNIQUE GAS SPECTRA

PLASMA

KEY APPLICATIONS

- Semiconductors
- Medical gases
- Air separation units

KEY BENEFITS

- Safer and more stable than competing technologies
- Reliable, gas-specific selectivity
- No sensor maintenance requirements

IDEAL FOR

Safe, stable trace-level analysis of hydrocarbons as impurities in Pure Gas (P-Gas) for semiconductor fabs.

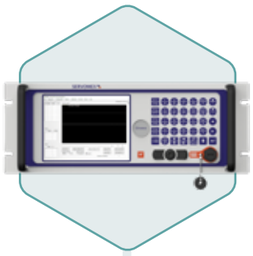
LIMITATIONS

The sensitivity of the Plasma measurement means it is only suitable for trace analysis applications.

WORKS WITH

Gas Chromatography technology to deliver measurements down to ppb levels.

USED IN



SERVOPRO Chroma

SERVOPRO NanoChrome

SERVOPRO Plasma

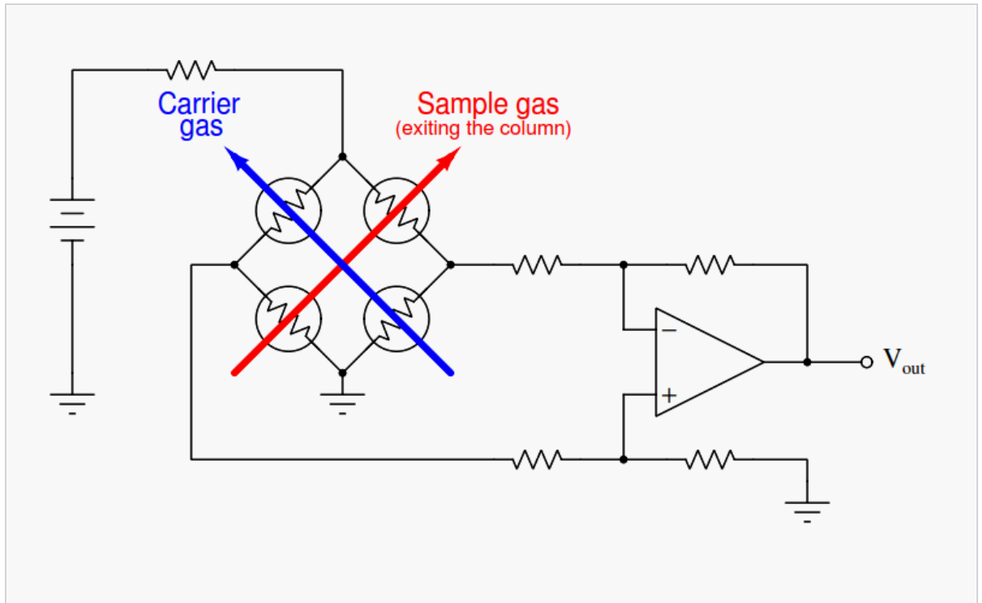
MEASURING INERT GASES IN A BINARY MIXTURE

The Thermal Conductivity Detector (TCD) consists of an electrically heated Wheatstone bridge in a temperature-controlled cell. For GC-TCD applications, the carrier gas (helium) is passed over the reference arm of the bridge, and the column effluent passes over the analyte arm under the same conditions for flow rate and temperature.

When no impurities are eluting from the column, the heat loss from the analyte arm matches that from the reference arm. When an analyte elutes from the column, it affects the thermal conductivity, changing the electrical resistance, which can be measured as a signal.

Thermal Conductivity is a robust technique for determining the concentrations of gases in a binary mixture. The TCD is a universal sensor. Analytical methods involving a TCD can be used where the constituents of the binary gas are known, such as in GC-TCD.

THE THERMAL CONDUCTIVITY SENSOR



THERMAL CONDUCTIVITY DETECTOR

KEY APPLICATIONS

- Medical gases

KEY BENEFITS

- A robust method for binary mixture analysis
- Universal detector for Gas Chromatography analysis
- Measures from very low concentrations up to percentage levels

IDEAL FOR

Binary gas mixture measurements, for medical and industrial gases.

LIMITATIONS

TCD sensing has a relatively low sensitivity to changes in flow rates, which requires larger sample sizes. Additionally, more cost-effective solutions may be available for some applications.

WORKS WITH

Gas Chromatography to deliver measurements down to ppb levels for industrial and medical gases.

USED IN

SERVOPRO Chroma

SIMPLE, SENSITIVE MOISTURE ANALYSIS

This moisture analysis technology uses Tunable Diode Laser Absorption Spectroscopy (TDLAS) spectroscopy to measure trace moisture in pure gases. It has a simple, robust design, using a single laser source and single detector to measure the sample and reference gases.

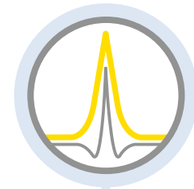
TDLAS has advantages over other measurement techniques, as the moisture sample comes only into contact with a few optical components made from very robust materials. It works according to the fundamental principle of Beer's law; therefore the reading is stable over time and never requires calibration.

To provide a more sensitive measurement, our sensors use a Herriott cell to reflect the laser back and forth numerous times, using mirrors inside the measuring cell. This increases the laser path length, achieving extremely high sensitivity.

TDLAS moisture sensing delivers exceptional performance capable of measuring down to industry-leading sub-ppb levels, drift-free operation, high accuracy and low maintenance. This is achieved through self-correcting optics and laser line locking onto the water peak, removing all possibility of significant drift.

SEMICONDUCTOR MANUFACTURE RELIES ON ULTRA-HIGH-PURITY GASES

TUNABLE DIODE LASER ABSORPTION SPECTROSCOPY



KEY APPLICATIONS

- Semiconductors
- Ultra-high purity gases
- Specialty gases

KEY BENEFITS

- Exceptional performance down to industry-leading sub-ppb levels
- Reading is stable over time – never requires calibration
- Laser line lock removes possibility of significant drift

IDEAL FOR

Very low-level trace measurements of moisture as a contaminant in ultra-high purity gases.

LIMITATIONS

While TDLAS sensing offers the best low-level detection of moisture, it may be more cost-effective to use Aluminum Oxide sensing where ultra-low measurements are not required.

WORKS WITH

Coulometric sensing for a highly sensitive dual measurement of oxygen and moisture at parts-per-million levels.

USED IN

SERVOPRO DF-700
NanoTrace Range

FAST IN-SITU CROSS-STACK MEASUREMENTS

Tunable Diode Laser (TDL) sensors use a single-line "monochromatic" spectroscopy technique that offers highly stable calibration, a continuous, fast, in-situ measurement, and the avoidance of cross-interference from other gases.

The TDL system consists of a laser light source, transmitting optics, an optically accessible absorbing medium, receiving optics and detector(s). The signal information is held in the gas absorption line shape, which is obtained by scanning the laser wavelength over the specific absorption line. This causes a reduction of the measured signal intensity, which is detected by a photodiode and used to determine the gas concentration and other properties.

Our TDL analyzers use a second harmonic detection (2f) modulation technique that delivers greater accuracy, sensitivity, and reliability of measurement, especially in low ppm-level measurements.

FIG. 1: CLOSE-UP OF THE LINE LOCK SYSTEM SHOWING THE CUVETTE AND BEAM SPLITTER

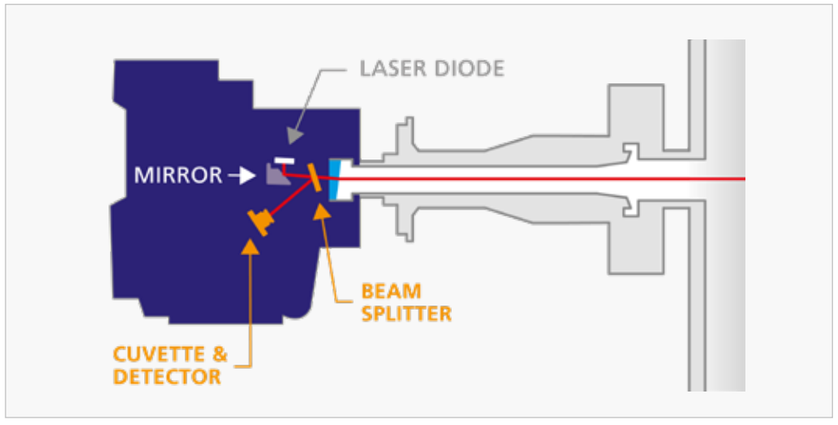
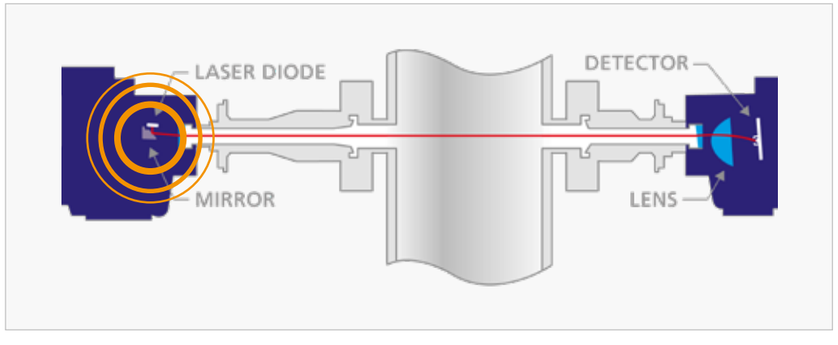


FIG. 2: THE LASER 3 PLUS INSTALLED ACROSS A STACK, WITH LINE LOCK SYSTEM (CIRCLED)



TUNABLE DIODE LASER

KEY APPLICATIONS

- Process and combustion control
- Ammonia slip DeNOx measurements
- Safety monitoring

KEY BENEFITS

- A fast response to changing gas concentrations
- Highly specific to the gas being measured
- Line lock system prevents signal drift

IDEAL FOR

Cross-stack measurements in process and combustion control applications in hydrocarbon processing and power generation industries.

LIMITATIONS

Susceptible to a range of environmental factors that must be compensated for, including path length variation, window purge gas effects, optical interferences and temperature and pressure changes.

WORKS WITH

Zirconia sensors in combustion applications, providing complementary carbon monoxide and methane measurements.

USED IN

SERVOTOUGH Laser 3 Plus Range

A TRUSTED AND ACCURATE OXYGEN MEASUREMENT

Our Zirconia sensor consists of a cell made of ceramic zirconium oxide, stabilized with an oxide of yttrium or calcium to form a lattice structure. The cell is coated with a conductive coating that serve as electrodes on both sides of the lattice.

At temperatures above 700°C (1292°F), the openings in the lattice permit the passage of Oxygen (O_2) ions at a rate determined by temperature and the difference in the O_2 partial pressures of the sample gas and the reference gas.

The passage of the ions produces a voltage across the electrodes – the magnitude of this is a logarithmic function of the ratio of the O_2 partial pressures of the sample and reference gases.

Since the partial pressure of the reference gas is predetermined, the voltage produced by the cell indicates the O_2 content of the sample gas.

HUMMINGBIRD ZR700 SENSOR

ZIRCONIA

KEY APPLICATIONS

- Process heaters
- Thermal crackers
- Incinerators
- Nitrogen purity
- Utility boilers

KEY BENEFITS

- Measures O_2 concentrations in ppm or up to 21%
- Extractive sampling equipment is not required
- Suitable for high-temperature measurements

IDEAL FOR

Measuring O_2 in in-situ combustion processes, where the measuring probe can be directly installed into the flue for high-temperature combustion gas analysis, eliminating the need for extractive sampling equipment.

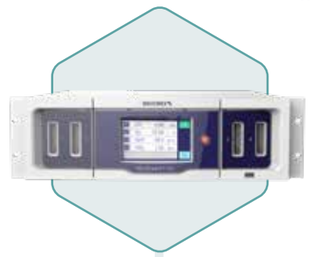
LIMITATIONS

Measurement errors may result if the sample contains hydrocarbons. Depending on the application, a Paramagnetic or Tunable Diode Laser sensor may be recommended for the oxygen measurement instead.

WORKS WITH

Calorimetry sensing for an all-in-one combustion control solution.

USED IN



SERVOPRO MultiExact 4100

SERVOTOUGH FluegasExact 2700

MEET THE BOSS:
OUR NEW SpectraExact 2500

THE LATEST VERSION OF THE SERVOTOUGH SpectraExact 2500 IS OUR MOST ADVANCED PHOTOMETRIC GAS ANALYZER YET.

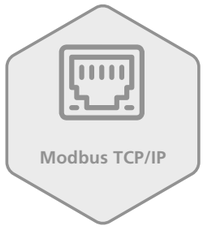
Rugged and reliable, it is designed to be the leading solution for a wide range of industrial applications, including ethylene production, carbon capture and storage, ethylene dichloride manufacture, and direct reduction iron processes.

A proven, versatile analyzer, the **SpectraExact 2500** is trusted and widely used globally, delivering a winning combination of proven performance and flexible operation in a resilient and reliable design.

That design has now been taken to the next level, with advancements that ensure it is easier to use than ever before, adapting effortlessly to your process for online single and multi-component analysis. Field mounting capabilities enable flexible use in the harshest process conditions.

The new SpectraExact 2500's feature-rich design – including sample cell and electronics segregation – and trusted non-depleting sensing technologies help to extend maintenance intervals and dramatically reduce operating costs.

The analyzer is fully certified for gas and dust hazardous areas, and there are three model variants to choose from, each utilizing industry-leading infrared non-depleting sensing technologies, to ensure your specific application needs are met.



Digital communication platforms enable the full functionality of the **SpectraExact 2500** to be controlled remotely and safely, with Modbus implemented through Modbus TCP (Ethernet) protocol.

Further options include a high-integrity cell, supplied with specialist perfluoroelastomer seals to ensure improved leak tightness for use in highly toxic gas measurements. A heated cell is a standard option available on safe area, ATEX, IECEx and US Class 1 Division 2 variants.

GAS	MEASUREMENT
AMMONIA (NH_3)	%
CARBON MONOXIDE (CO)	%, ppm
CARBON DIOXIDE (CO_2)	%, ppm
HYDROGEN CHLORIDE (HCl)	%
METHANE (CH_4)	%, ppm
NITROUS OXIDE (N_2O)	%, ppm
PROPYLENE / PROPENE (C_3H_6)	%
TOTAL HYDROCARBONS (THC)	%, ppm
WATER VAPOR (MOISTURE) (H_2O)	%
NITRIC OXIDE (NO)	%, ppm
SULFUR DIOXIDE (SO_2)	%, ppm
ETHYLENE (C_2H_4)	%

Discover our most advanced photometric analysis: **servomex.com/2500**

YOUR PRODUCT GUIDE

Developed and manufactured in our state-of-the-art technical centers in the UK and US, Servomex gas analyzers are hand-built to meet precise requirements. Every product we make is optimized to the need of each customer process.

Built around stable, accurate and reliable gas measurements provided by world-leading sensor technologies, our analyzers incorporate the latest advances in hardware design and software control.

These are incorporated into resilient designs for use in a range of environments, with our SERVOTOUGH range focused on hazardous area applications, SERVOPRO products for safe areas, and SERVOFLEX portable products.

With a variety of analog and digital communication options, Servomex analyzers can be easily integrated into existing systems. They can also be designed into a complete, fully customized gas analysis system, developed and built to the same high standards by our global network of systems integration facilities.

Because we offer the widest selection of gas analysis technologies, you can be sure of finding the best fit for your application. In this section, you'll discover the complete range of Servomex products. If you need more help, you can narrow down the search on our website at **servomex.com/gas-analyzers/finder**

SERVOTOUGH

Oxy 1900
HAZARDOUS AREA

AWARD-WINNING PARAMAGNETIC DIGITAL O_2 ANALYZER DESIGNED FOR HAZARDOUS AREA USE

Offering industry-standard features alongside revolutionary, value-added options, the Oxy 1900 O_2 gas analyzer sets new standards for flexibility, measurement stability and reliability from a single, cost-effective unit. Operating in hazardous areas, this Paramagnetic oxygen analyzer frequently serves in critical processes where optimum uptime is essential. Because of the challenging environments, regular servicing and calibration are recommended to assure reliable accuracy.

APPLICATIONS

- Process control
- Safety-critical oxidation, such as ethylene oxide and propylene oxide purity
- Flare stack analysis
- Vapor recovery

FEATURES AND BENEFITS

- Safe Area to Zone 1/Division 1 hazard-rated locations
- Heated sample gas compartment provides improved measurement performance with optional sample heater for simplified sample conditioning system design
- Unique Servomex Flowcube flow sensor technology for improved safety
- Internal sample pressure compensation option available for improved measurement performance.
- RS485 Modbus communications available as standard, Ethernet TCP/IP Modbus as an option
- SIL 2 hardware compliant

MAINTENANCE REQUIREMENTS

- Periodic calibrations on zero and span to ensure measurement accuracy
- Flow alarm calibration validation as required
- Perform compensated pressure calibration checks as required
- Test all relays and 4-20mA outputs, making adjustments as required

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL SAFETY

SENSING TECHNOLOGY

PARAMAGNETIC

SUGGESTED SERVICE PRODUCTS

- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- ON-SITE SERVICE SUPPORT
- HEALTH CHECK

Download product brochure.
Scan the QR code or visit servomex.com/1900

SERVOTOUGH

OxyExact 2200

HAZARDOUS AREA

HIGH-SPEC PROCESS O_2 ANALYZER OFFERS SAFE OR HAZARDOUS AREA CONTROL WITH UP TO SIX TRANSMITTERS

The OxyExact 2200 high-specification O_2 analyzer offers an unrivaled combination of precision, flexibility and performance for optimum process and safety control. The OxyExact 2200 can be configured with a Zone 1 or Zone 2 hazardous area control unit, with up to six transmitters per control unit. This rugged analyzer is frequently used in safety and process control applications, typically in challenging environments. It requires periodic calibration checks to ensure ongoing accuracy and reliability.

APPLICATIONS

- Oxidation control reactions
- EO, PTA and EDC manufacturing
- Catalyst regeneration
- Solvent recovery

FEATURES AND BENEFITS

- Zone 1 certified to ATEX Cat 2, IECEx, CML (Japan) and FM/CSA Class 1 Division 1
- Up to six transmitters can be connected to one control unit
- Control units use an option card based I/O system to allow expansion of I/O to suit system requirements
- Transmitter three-enclosure systems allow sampling of any flammable gas up to 100% O_2 and pressures of up to 45 psia
- High-temperature transmitter eliminates the need to condense hot wet samples prior to analysis
- SIL 2 hardware compliant

MAINTENANCE REQUIREMENTS

- Periodic calibrations on zero and span to ensure measurement accuracy
- Flow alarm calibration validation as required
- Perform compensated pressure calibration checks as required
- Test all relays and 4-20mA outputs, making adjustments as required

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL SAFETY

SENSING TECHNOLOGY

PARAMAGNETIC

SUGGESTED SERVICE PRODUCTS

- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- ON-SITE SERVICE SUPPORT
- HEALTH CHECK

Download product brochure.
Scan the QR code or visit servomex.com/2200

SERVOTOUGH

H2scan

HAZARDOUS AREA

EXPLOSION-PROOF IN-LINE HYDROGEN PROCESS ANALYZER, USING A SOLID-STATE, NON-CONSUMABLE SENSOR CONFIGURED TO OPERATE IN PROCESS GAS STREAMS

The H2scan hydrogen process analyzer features thin film technology that provides a direct hydrogen measurement that is not cross-sensitive to other gases. Its solid-state design and non-consumable sensor mean that the H2scan has reduced maintenance requirements. Calibration is performed according to the desired tolerances, with intervals of a week, three weeks, or three months.

APPLICATIONS

- Refinery
- Petrochemical
- Manufacturing
- Industrial gas supply

FEATURES AND BENEFITS

- UL Class 1, Division 1, Groups B, C, D. ATEX and CSA certifications
- Easily configurable alongside SERVOTOUGH SpectraScan 2400
- Simple system integration

MAINTENANCE REQUIREMENTS

Annual calibration and validation to ensure sensor is performing to specification

GAS	MEASURES	APPLICATION
HYDROGEN	PERCENT	PROCESS CONTROL QUALITY

SUGGESTED SERVICE PRODUCTS

- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- ON-SITE SERVICE SUPPORT
- HEALTH CHECK

Download product brochure.
Scan the QR code or visit servomex.com/h2scan

SERVOTOUGH

SpectraScan 2400

HAZARDOUS AREA

REVOLUTIONARY INLINE REAL-TIME ANALYSIS OF HYDROCARBON COMPONENTS C1-C6

A real-time optical analyzer utilizing the Precisive field-proven optical bench, the SpectraScan 2400 delivers a breakthrough capability in the continuous analysis of light hydrocarbons C1-C6. The sample cell is segregated from the electronics for ease of maintenance. The SpectraScan 2400 requires regular servicing and occasional part replacement to ensure continuous high performance.

APPLICATIONS

- BTU/Wobbe content measurement
- Gas turbine, engines, fuel cells
- Flare stack monitoring

FEATURES AND BENEFITS

- North American Cat 1, Division 2 ATEX Cat 3 IECEx Zone 2
- Tunable band-pass filter enables simultaneous scanning of selected wavelength bands for gases including methane, ethane, propane and iso-butane
- Unique tunable filter process with Infrared photometer technology delivers industry-leading interference compensation

MAINTENANCE REQUIREMENTS

- Periodic calibrations on zero and span to ensure measurement accuracy
- Lamp replacement every 18 months, or when below 40% intensity
- Stepper motor replacement every five years to maintain maximum performance

GAS	MEASURES	APPLICATION
CARBON MONOXIDE	PERCENT	PROCESS CONTROL
CARBON DIOXIDE	CALORIFIC VALUE	QUALITY
C1-C6		
HYDROGEN SULFIDE		

SUGGESTED SERVICE PRODUCTS

- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- ON-SITE SERVICE SUPPORT
- HEALTH CHECK

SENSING TECHNOLOGY

- SPECTROSCOPIC

Download product brochure.
Scan the QR code or visit servomex.com/2400

SERVOTOUGH

SpectraExact 2500

HAZARDOUS AREA

RUGGED PHOTOMETRIC GAS ANALYZER FOR DEMANDING PROCESS APPLICATIONS

Servomex's iconic industry-leading Photometric analyzer delivers flexible gas analysis capability for flammable sample streams. The SpectraExact 2500's reliable, accurate and stable real-time online process analysis makes it ideal for a range of process, combustion and emissions gas analysis applications.

APPLICATIONS

- Water in EDC/solvents
- Ethylene production
- TDI production
- Chlorine production

FEATURES AND BENEFITS

- IECEx and North American hazardous area approvals
- Robust and high-performance NDIR analyzer for industrial and process applications
- Non-contact analysis, with the sample cell segregated from the electronics for ease of maintenance and safe operation

MAINTENANCE REQUIREMENTS

- Perform annual service, calibration, and validation
- Check diagnostics and condition of cell windows, source voltage, detector, etc
- Replace scrubbers and seals as required
- Periodically replace chopper motor, source and detector to achieve maximum performance and uptime

GAS	MEASURES	APPLICATION
TOXIC	PERCENT	PROCESS CONTROL
FLAMMABLE	TRACE PPM	
CORROSIVE		

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT
- HEALTH CHECK

SENSING TECHNOLOGY

- GAS FILTER CORRELATION
- INFRARED

Download product brochure.
Scan the QR code or visit servomex.com/2500

SERVOTOUGH

FluegasExact 2700

HAZARDOUS AREA

ADVANCED FLUE GAS ANALYZER FOR HIGH-TEMPERATURE MEASUREMENT OF O_2 AND COMBUSTIBLES

Designed to measure O_2 and COe in flue gases for improved combustion efficiency and reduced emissions, the FluegasExact 2700 gas analyzer is designed to suit the most demanding needs of combustion efficiency applications in the power generation and process industries. Constantly exposed to high-temperature conditions, this advanced combustion flue gas analyzer needs regular checks and preventative maintenance to ensure the highest accuracy and optimum uptime.

APPLICATIONS

- Process heaters
- Utility boilers
- Thermal crackers
- Crematoria and incinerators

FEATURES AND BENEFITS

- ATEX Cat. 3, IECEx Zone 2 and North America Class 1, Division 2
- Unique Flowcube flow sensor technology enables positive flow conditions to be validated with optional flow alarm
- Sulfur-resistant combustibles sensor enables sensor to operate at elevated sulfur levels
- Close-coupled extractive measurement principle
- Flame traps incorporated as standard within sample compartment
- Wide selection of probe lengths and materials available

MAINTENANCE REQUIREMENTS

- Perform annual service, calibration and validation
- Check diagnostics, condition, and performance of analyzer
- Carry out preventative maintenance, replacing cells, aspirator, filters and probes as required

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
COMBUSTIBLES	TRACE PPM	COMBUSTION

SENSING TECHNOLOGY

- CALORIMETRY
- ZIRCONIA

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT

Download product brochure.
Scan the QR code or visit servomex.com/2700

SERVOTOUGH

Laser 3 Plus Environmental

HAZARDOUS AREA

COMPACT NH_3 MEASUREMENT, OPTIMIZED FOR AMMONIA SLIP DeNOx APPLICATIONS

This Tunable Diode Laser (TDL) analyzer, specifically optimized for ammonia slip measurement, provides all the benefits of Servomex's TDL technology in a compact, light unit, offering unparalleled installation flexibility plus cost and performance benefits.

APPLICATIONS

- Process heaters
- Incinerators
- Power stations
- Furnaces
- Thermal oxidizers

FEATURES AND BENEFITS

- High measurement reliability utilizing Servomex's own line lock cuvette technology
- ATEX, IECEx and North American hazardous area approvals
- A compact analyzer specifically optimized for the fast, accurate and responsive measurement of NH_3
- Auto-validation feature provides complete assurance of ongoing measurement accuracy
- Meets all uptime and performance requirements for the US EPA PS18 standard for reliable CEMS monitoring of NH_3

MAINTENANCE REQUIREMENTS

- Annual preventative maintenance is a basic requirement
- Perform measurement validation and check status history
- Validate the purge flows, health of windows and overall alignment of the analyzer to achieve maximum uptime and measurement accuracy
- Check and replace flange O-rings as required

GAS	MEASURES	APPLICATION
AMMONIA DeNOx	TRACE PPM	PROCESS CONTROL
ENVIRONMENTAL NH_3		EMISSIONS

SENSING TECHNOLOGY

- TUNABLE DIODE LASER

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- HEALTH CHECK
- ON-SITE SERVICE SUPPORT
- RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/l3environmental

SERVOTOUGH

Laser 3 Plus Combustion

HAZARDOUS AREA

COMPACT COMBUSTION ANALYZER OPTIMIZED FOR CO, O_2, OR CO + CH_4 MEASUREMENTS

Containing all the benefits of Servomex's Tunable Diode Laser (TDL) technology in a light, compact unit, with unmatched installation flexibility plus cost and performance benefits, this analyzer is optimized for fast, accurate and responsive measurements in combustion and process control, making it a must for safety applications.

APPLICATIONS

- Process heaters
- Incinerators
- Power stations
- Furnaces
- ESP protection
- Thermal oxidizers

FEATURES AND BENEFITS

- High safety integrity utilizing Servomex's own line lock cuvette technology
- Compact size means quick and easy installation by one person with on-board display negating the need for laptop configuration
- ATEX, IECEx and North American hazardous area approvals. Approved for process Zone 2. SIL 2 assessed and CE marked
- Auto-validation feature provides complete assurance of ongoing measurement accuracy

MAINTENANCE REQUIREMENTS

- Annual preventative maintenance is a basic requirement
- Perform measurement validation and check status history
- Validate the purge flows, health of windows and overall alignment of the analyzer to achieve maximum uptime and measurement accuracy
- Check and replace flange O-rings as required

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
CARBON MONOXIDE	TRACE PPM	COMBUSTION
CARBON MONOXIDE + METHANE		

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- HEALTH CHECK
- ON-SITE SERVICE SUPPORT
- RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/l3combustion

SERVOTOUGH

Laser 3 Plus Process

HAZARDOUS AREA

COMPACT TDL GAS ANALYZER, OPTIMIZED FOR PROCESS O_2 MEASUREMENTS

All the benefits of Servomex's Tunable Diode Laser (TDL) technology in a small, light unit offering unparalleled installation flexibility plus cost and performance benefits. Optimized for the fast, accurate and responsive measurement of process oxygen in hot or hazardous conditions.

APPLICATIONS

- Oxidation control
- Inerting
- Safety monitoring
- Flare gas monitoring
- Combustion control (<500°C, 932°F)
- Coal to chemical

FEATURES AND BENEFITS

- High safety integrity utilizing Servomex's own line lock cuvette technology
- ATEX, IECEx and North American hazardous area approvals. Approved for process Zone 2. SIL 2 assessed and CE marked
- Quick and easy installation by one person with on-board display negating the need for laptop configuration
- Auto-validation capability provides complete assurance of ongoing measurement accuracy

MAINTENANCE REQUIREMENTS

- Annual preventative maintenance is a basic requirement
- Perform measurement validation and check status history
- Validate the purge flows, health of windows and overall alignment of the analyzer to achieve maximum uptime and measurement accuracy
- Check and replace flange O-rings as required

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
		COMBUSTION

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- HEALTH CHECK
- ON-SITE SERVICE SUPPORT
- RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/l3process

SERVOPRO

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, regenerative skid dryers, combustion, and instrument air, with no calibration required after dry-out. The sensor must have its performance validated annually – if out of specification, a sensor tip replacement or span point calibration is required. Annual tip replacement may be needed to meet NIST traceable requirements.

APPLICATIONS

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

FEATURES AND BENEFITS

- Functions as a standalone 4-20mA transmitter or remotely interfaces with our digital controller, MonoExact DF310E and MultiExact 4100
- NIST-traceable field-replaceable sensor element for seamless recalibration
- Stainless steel, weatherproof casing enables operation in ambient temperatures ranging from -10°C to +70°C (14°F to 158°F)

MAINTENANCE REQUIREMENTS

- Validate the performance of the transmitter yearly
- Replace the sensor tip or perform a span point calibration if out of specification
- Annual tip replacement is recommended to ensure the analyzer meets NIST traceable requirements (If applicable)

GAS	MEASURES	APPLICATION
MOISTURE	DEW POINT	PROCESS CONTROL
	PPMV	

SENSING TECHNOLOGY

ALUMINUM OXIDE

SUGGESTED SERVICE PRODUCTS

- SERVICE AGREEMENTS
- SERVICE CENTER SUPPORT
- SPARES
- RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/1688

SERVOPRO

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. The sensor must have its performance validated annually and a sensor tip replacement or span point calibration may be required.

APPLICATIONS

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

FEATURES AND BENEFITS

- Dew point and ppmv H_2O measurements
- Tight Al_2O_3 pore structure provides the AquaXact 1688 sensor with rapid response times
- The dense geometry increases stability and reduces drift
- Compact footprint for easy integration into your system
- Advanced digital communications including Ethernet, Modbus TCP/IP and PROFIBUS

MAINTENANCE REQUIREMENTS

- Validate the performance of the transmitter yearly
- Replace the sensor tip or perform a span point calibration if out of specification
- Annual tip replacement is recommended to ensure the analyzer meets NIST traceable requirements (If applicable)

GAS	MEASURES	APPLICATION
MOISTURE	DEW POINT	PROCESS CONTROL
	PPMV	

SENSING TECHNOLOGY

ALUMINUM OXIDE

SUGGESTED SERVICE PRODUCTS

- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- ON-SITE SERVICE SUPPORT
- HEALTH CHECK
- ON-SITE SERVICE SUPPORT
- HEALTH CHECK

Download product brochure.
Scan the QR code or visit servomex.com/1688controller

SERVOPRO

MonoExact DF150E

SAFE AREA

TOUCHSCREEN-OPERATED PPM O_2 ANALYZER FOR GENERAL INDUSTRIAL APPLICATIONS

With a new and improved digital touchscreen and icon-driven guided user interface (GUI) for easier operation, the MonoExact DF150E combines the reliability of Servomex's tried and tested Coulometric O_2 sensor with a more user-friendly package. Exposure to dry gas for an extended period extracts water from the sensor, so the sensor electrolyte must be replenished regularly to ensure optimum performance and long-term reliability.

APPLICATIONS

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

FEATURES AND BENEFITS

- Updated digital sensor includes new operation and maintenance features that reduce cost of ownership
- Digital analyzer with self-diagnostic smart operating system monitors itself, so you can better manage your process
- Servomex proprietary software makes reporting and parameter control simple

MAINTENANCE REQUIREMENTS

- Routine preventative maintenance, adding replenishment solution to the electrolyte as required to maintain optimum performance and long-term reliability
- Perform periodic span calibration/validation to ensure measurement accuracy
- Review zero and span reference values for quality of calibration

GAS	MEASURES	APPLICATION
OXYGEN	TRACE PPM	PROCESS CONTROL
	ULTRA TRACE PPM	QUALITY

SENSING TECHNOLOGY

COULOMETRIC

SUGGESTED SERVICE PRODUCTS

SERVICE PLANS | COMMISSIONING
SPARES | SERVICE AGREEMENTS
ON-SITE SERVICE SUPPORT | RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/df150e

SERVOPRO

MonoExact DF310E

SAFE AREA

NEXT-GENERATION DIGITAL O_2 ANALYZER DESIGNED FOR INDUSTRIAL GAS APPLICATIONS

Designed specifically for accurate measurements of O_2 in industrial gas applications, the MonoExact DF310E is a next-generation digital O_2 analyzer that combines precision trace-level measurement with a new icon-driven guided user interface (GUI) and advanced digital communications. This digital oxygen analyzer's Coulometric sensor requires regular addition of replenishment solution to the electrolyte in order to deliver continued reliability and accuracy. Span calibration and validation is also needed as an accuracy check.

APPLICATIONS

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

FEATURES AND BENEFITS

- Advanced touchscreen GUI for intuitive setup and operation; now with favorite icon page and text over icon display
- Digital analyzer with self-diagnostic smart operating system monitors itself, so you can better manage your process
- AquaXact Aluminum Oxide sensor is optional for simultaneous O_2 and H_2O monitoring
- RS232, RS485, Modbus, PROFIBUS and Ethernet Modbus TCP/IP

MAINTENANCE REQUIREMENTS

- Routine preventative maintenance, adding replenishment solution to the electrolyte as required to maintain optimum performance and long-term reliability
- Perform periodic span calibration/validation to ensure measurement accuracy
- Review zero and span reference values for quality of calibration

GAS	MEASURES	APPLICATION
OXYGEN	TRACE PPM	PROCESS CONTROL
MOISTURE	ULTRA TRACE PPB	
	DEW POINT	QUALITY
	PPMV	

SENSING TECHNOLOGY

COULOMETRIC | PARAMAGNETIC
ALUMINUM OXIDE

SUGGESTED SERVICE PRODUCTS

SERVICE PLANS | COMMISSIONING
SPARES | SERVICE AGREEMENTS
ON-SITE SERVICE SUPPORT | RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/df310e

SERVOPRO

4900 Multigas

SAFE AREA

AN ADVANCED DIGITAL MULTI-GAS CEMS ANALYZER

Specifically designed for Continuous Emissions Monitoring (CEMS) of flue gas, the 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. Any potential issues with this analyzer can be predicted early by recording and analyzing diagnostics. For reliable operation, consumables such as sample, fan, and sintered filters should be replaced annually, along with calibration, validation and pressure compensation.

APPLICATIONS

- Utility boilers
- Chemical incinerators
- Crematoria
- Mobile labs

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), Modbus RS485 and PROFIBUS
- Automated calibration/validation routines triggered by internal timer or external triggers
- Completely updated icon-driven software interface for easy set-up and operation

MAINTENANCE REQUIREMENTS

- Annual calibration and validation
- Pressure compensation as required
- Record and analyze diagnostics to predict failures early
- Annual replacement of consumables
- Routine planned maintenance at years three and five to ensure optimum performance and reduced downtime

GAS	MEASURES	APPLICATION
MULTIPLE	PERCENT	EMISSIONS
	TRACE PPM	

SENSING TECHNOLOGY

- GAS FILTER CORRELATION
- INFRARED
- PARAMAGNETIC

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- COMMISSIONING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT
- RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/4900

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: O_2 (trace, control, and purity), CO_2, CO, N_2O, CH_4 (trace) and H_2O. Capable of being configured with a range of sensors, this analyzer requires annual calibration and validation, plus the regular replacement of consumables. Routine planned maintenance after three and five years ensures optimum performance and reduced downtime.

APPLICATIONS

- Product purity on air separation plants
- Process control on air separation plants
- Monitor trace CO_2 on scrubbed air inlet to air separation process
- Validation of medical O_2, N_2 and air

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

MAINTENANCE REQUIREMENTS

- Annual calibration and validation
- Pressure compensation (O_2 purity)
- Record and analyze diagnostics to predict failures early
- Yearly replacement of consumables
- Routine planned maintenance at years three and five to ensure optimum performance and reduced downtime

GAS	MEASURES	APPLICATION
MULTIPLE	PERCENT	PROCESS CONTROL
	TRACE PPM	QUALITY

SENSING TECHNOLOGY

- GAS FILTER CORRELATION
- ZIRCONIA
- PARAMAGNETIC
- ALUMINUM OXIDE
- INFRARED

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- COMMISSIONING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT
- RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/4100

SERVOPRO

MultiExact 4200

SAFE AREA

A SOPHISTICATED, NEXT-GENERATION MULTI-GAS ANALYZER PROVIDING A HIGHLY ADAPTABLE ANALYSIS OF FLAMMABLE GAS SAMPLES FOR TRACE CONTAMINANTS IN INDUSTRIAL APPLICATIONS

The MultiExact 4200 is a high-performance multi-gas analyzer designed to provide up to four simultaneous gas stream measurements including: O_2 control, and trace CO_2, CO, N_2O and CH_4. This high-performance multi-gas analyzer should receive regular planned maintenance to ensure peak performance and minimal downtime. Annual calibration and validation, regular parts replacement, and servicing after three and five years are recommended.

APPLICATIONS

- Hydrogen production
- HyCO plants
- Syngas production

FEATURES AND BENEFITS

- Comprehensive solution for flammable gas contaminant monitoring
- Advanced digital communications including Ethernet (Modbus TCP/IP) and Modbus RS485
- Automated calibration/validation routines triggered by internal timer or external triggers
- Completely updated icon-driven software interface for easy set-up and operation
- Uses ultra-stable, non-depleting digital sensing technologies that help extend maintenance intervals

MAINTENANCE REQUIREMENTS

- Annual calibration and validation
- Pressure compensation (O_2 purity)
- Record and analyze diagnostics to predict failures early
- Yearly replacement of consumables
- Routine planned maintenance at years three and five to ensure optimum performance and reduced downtime

GAS	MEASURES	APPLICATION
MULTIPLE	PERCENT	PROCESS CONTROL
		QUALITY

SENSING TECHNOLOGY

- GAS FILTER CORRELATION
- PARAMAGNETIC

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- COMMISSIONING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT

Download product brochure.
Scan the QR code or visit servomex.com/4200

SERVOPRO

Chroma

SAFE AREA

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

Offering a non-depleting Plasma Emission Detector (PED), Flame Ionization Detector (FID) and Thermal Conductivity Detector (TCD), 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. It offers superior performance when supported by monthly calibration and measurement validation. Column regeneration should be carried out each year, with fans and filters cleaned regularly.

APPLICATIONS

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

FEATURES AND BENEFITS

- Fully automated – tune to the application – system for unique simplicity of use
- Standalone system requires no third-party software or computer to operate
- For CH_4/NMHC measurements, the Plasma HC system requires no FID and therefore no H_2 fuel gas

MAINTENANCE REQUIREMENTS

- Perform monthly calibration
- Record and analyze diagnostics to predict failures early
- Regenerate columns and retune yearly
- Routine planned maintenance at years two, four and five to ensure optimum performance and reduced downtime

GAS	MEASURES	APPLICATION
MULTIPLE	PERCENT	PROCESS CONTROL
	TRACE PPM	QUALITY
	ULTRA TRACE PPB	

SENSING TECHNOLOGY

- GAS CHROMATOGRAPHY
- PLASMA
- FLAME IONIZATION DETECTOR
- THERMAL CONDUCTIVITY

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT

Download product brochure.
Scan the QR code or visit servomex.com/chroma

SERVOPRO

NanoChrome

SAFE AREA

SUB-PPB TRACE MEASUREMENT OF H_2, CH_4, CO, CO_2, N_2, 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. It requires monthly calibration to ensure high accuracy, along with fan and filter cleaning. Measurements should be calibrated and validated, while diagnostics can be checked to determine any developing issues.

APPLICATIONS

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

FEATURES AND BENEFITS

- In compliance with Low Voltage, EMC and applicable Directives
- New Plasma Emission Detector (PED) sensor technology enables sub-ppb measurements of H_2, CH_4, CO, CO_2, N_2, Ar, and NMHC
- Enables unique total Servomex solution for UHP gas analysis

MAINTENANCE REQUIREMENTS

- Perform monthly calibration
- Record and analyze diagnostics to predict failures early
- Regenerate columns and retune yearly
- Routine planned maintenance at years two, four and five to ensure optimum performance and reduced downtime

GAS	MEASURES	APPLICATION
MULTIPLE	ULTRA TRACE PPB	QUALITY
	ULTRA TRACE PPT	

SENSING TECHNOLOGY

GAS CHROMATOGRAPHY

PLASMA

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT

Download product brochure.
Scan the QR code or visit servomex.com/nanochrome

SERVOPRO

DF-500 Range

SAFE AREA

LEADING ULTRA-TRACE PPT O_2 ANALYZER RANGE

Verified by independent experts as measuring O_2 to the lowest ppt levels available, the DF-500 analyzer range delivers the premium performance in ultra-trace O_2 measurement. Consisting of the DF-550E NanoTrace and DF-560E NanoTrace II, the NanoTrace series delivers exceptional O_2 measurements at trace and ultra-trace ppt levels. To ensure continued high performance from this analyzer's Coulometric sensor, annual calibration is recommended, and the electrolyte solution needs replenishing. Validation of the primary and secondary electrode measurements helps predict failures early.

APPLICATIONS

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

FEATURES AND BENEFITS

- The industry standard for the reliable measurement of O_2 in semiconductor manufacture
- Fast response and quick upset recovery ensures ultimate performance
- Options include flexible configurations hand-carry portable option and on-board calibration systems

MAINTENANCE REQUIREMENTS

- Perform annual calibration
- Record and analyze diagnostics (primary and secondary electrode measurements) to predict failures early
- Routine planned maintenance at year three to ensure optimum performance and reduced downtime

GAS	MEASURES	APPLICATION
OXYGEN	TRACE PPM	QUALITY
	ULTRA TRACE PPB	
	ULTRA TRACE PPT	

SENSING TECHNOLOGY

COULOMETRIC

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT
- RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/df-500

SERVOPRO

DF-700 Range

SAFE AREA

TUNABLE DIODE LASER ABSORPTION SPECTROSCOPY (TDLAS) TRACE MOISTURE ANALYZER RANGE

The all new DF-700 Series Gen-7 is a sophisticated trace and ultra-trace moisture analyzer range combining new digital electronics with tried and tested sensing technology. Designed for manufacturability and repairability, it allows for field serviceability with many components able to be replaced in the field. Annual diagnostics analysis ensures this low-maintenance moisture analyzer maintains its uptime with no unexpected failures. Optional parts – such as a zero gas purifier and pump, may need replacement at regular intervals.

APPLICATIONS

- 740: Analysis of electronics-grade NH_3 specialty gas
- 745: Inert gases leak detection for LED and LCD plants
- 745 SGMax: Specialty gas cylinder quality control
- 749: HP bulk gases used in semiconductor applications
- 750: Bulk UHP gas CQC for semiconductor fabs
- 760E: O_2 and H_2O monitoring in UHP bulk gases used in semiconductor applications

FEATURES AND BENEFITS

- Exceptional range from 100 ppt to 20 ppm moisture level readings depending on the model
- Only true Laser Absorption Spectroscopy technology in the market space which is unaffected by gas contaminants that plague CRDS laser systems
- TDLAS line lock technology keeps the laser on the moisture peak centroid measuring the entirety of the moisture's mass under the Voigt curve

MAINTENANCE REQUIREMENTS

- Record and analyze diagnostics to predict failures early
- Routine planned maintenance at years two, three, and four to ensure optimum performance and reduced downtime

GAS	MEASURES	APPLICATION
MOISTURE	PPM	QUALITY
	TRACE PPB	
	ULTRA TRACE PPT	

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SUGGESTED SERVICE PRODUCTS

SERVICE PLANS · FACTORY ACCEPTANCE TESTING · COMMISSIONING · TRAINING · SPARES · SERVICE AGREEMENTS · ON-SITE SERVICE SUPPORT · RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/df-700

SERVOPRO

NanoChrome ULTRA

SAFE AREA

THE NUMBER ONE CHOICE FOR ULTRA-TRACE PURITY MEASUREMENTS IN THE SEMICONDUCTOR INDUSTRY

Delivering superior ultra-trace measurements of UHP gases in a wide range of background gases, the revolutionary NanoChrome ULTRA incorporates the latest advances in sensing and signal processing methodology, for exceptional performance. Monthly calibration and measurement validation keep this industry-leading ultra-trace gas analyzer at peak performance. Fans and filters should be cleaned regularly, while diagnostics should be checked to detect any developing issues.

APPLICATIONS

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

FEATURES AND BENEFITS

- Innovative high-sensitivity Plasma Emission Detector (PED) enables ultra-trace measurements of Ar, N_2, H_2, CH_4, CO, CO_2, and NMHC
- ProPeak peak detection technique enables unprecedented measurement sensitivity
- A complete stand-alone UHP gas analysis solution when combined with DF-500 and DF-700 analyzers

MAINTENANCE REQUIREMENTS

- Perform monthly calibration
- Record and analyze diagnostics to predict failures early
- Regenerate columns and retune yearly
- Routine planned maintenance at years two, four, and five to ensure optimum performance and reduced downtime

GAS	MEASURES	APPLICATION
MULTIPLE	ULTRA TRACE PPB	QUALITY
	ULTRA TRACE PPT	

SENSING TECHNOLOGY

GAS CHROMATOGRAPHY · PLASMA

SUGGESTED SERVICE PRODUCTS

SERVICE PLANS · FACTORY ACCEPTANCE TESTING · COMMISSIONING · TRAINING · SPARES · SERVICE AGREEMENTS · ON-SITE SERVICE SUPPORT

Download product brochure.
Scan the QR code or visit servomex.com/nanochrome-ultra

SERVOPRO

DF-560E NanoTrace ULTRA

SAFE AREA

MEASURES ULTRA-TRACE O_2 TO THE LOWEST LEVELS

Designed to measure ultra-trace O_2 to the ultra-low ppt levels demanded by the semiconductor sector, the DF-560E ULTRA delivers an industry-leading 45 ppt LDL. Once the analyzer is measuring below 1 ppb, the units automatically convert to ppt for better resolution of the smallest of concentration movements. Annual calibration and regular replenishment of the Coulometric sensor's electrolyte solution ensures this analyzer continues to deliver industry-leading ultra-trace oxygen measurements. Planned maintenance supports maximum uptime.

APPLICATIONS

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

FEATURES AND BENEFITS

- Lowest level O_2 detection available to the semiconductor industry
- Automated maintenance performs zero and span calibrations on a scheduled basis
- Fast response and quick upset recovery ensures highly stable operation

MAINTENANCE REQUIREMENTS

- Perform annual calibration
- Record and analyze diagnostics (primary and secondary electrode measurements) to predict failures early
- Routine planned maintenance at year three to ensure optimum performance and reduced downtime

GAS	MEASURES	APPLICATION
OXYGEN	TRACE PPM	QUALITY
	ULTRA TRACE PPB	
	ULTRA TRACE PPT	

SENSING TECHNOLOGY

COULOMETRIC

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT
- RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/df-560e-ultra

SERVOPRO

DF-750 NanoTrace ULTRA

SAFE AREA

THE FIRST CHOICE IN MOISTURE ANALYSIS FOR THE SEMICONDUCTOR INDUSTRY

A TDL-based trace/ultra-trace analyzer, the DF-750 ULTRA delivers industry-best measurements of moisture as a contaminant in the UHP gases used in 300mm semiconductor fabs, with a LDL of 55 ppt. Using the new DF-700 Gen-7 digital electronics, it offers improved serviceability and field replacement for key components. This analyzer uses non-depleting sensing technology, for low maintenance and only annual diagnostics checks. If optional components such as a pump or zero gas purifier are fitted, they may need occasional replacement.

APPLICATIONS

- Continuous quality control of bulk UHP gases for semiconductor fabs

FEATURES AND BENEFITS

- Exceptional 55 ppt LDL delivers the sensitivity and precision demanded by semiconductor makers
- Water contact with optical components is minimized for optimum reliability
- Storage and recall function for archiving of operational history

MAINTENANCE REQUIREMENTS

- Record and analyze diagnostics to predict failures early
- Routine planned maintenance at years two, three and four to ensure optimum performance and reduced downtime

GAS	MEASURES	APPLICATION
MOISTURE	PPM	QUALITY
	TRACE PPB	
	ULTRA TRACE PPT	

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT
- RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/df-750-ultra

SERVOPRO

DF-760E NanoTrace ULTRA

SAFE AREA

MARKET-LEADING DUAL ANALYSIS OF O_2 AND MOISTURE

Delivering an industry-leading LDL of 55 ppt for moisture and 45 ppt O_2 in the UHP gases used in <14 nm semiconductor fabs, the new DF-760E ULTRA Gen-7 is designed for manufacturability and repairability. A completely new digital electronic package offers enhanced field serviceability and parts replacement.Using both a Coulometric and TDLAS sensor, this analyzer requires annual calibration of its O_2 sensor, along with regular replenishment of the sensor solution. Diagnostics analysis assures performance of the moisture sensor.

APPLICATIONS

- Monitoring O_2 and moisture as contaminants in UHP bulk gases used in semiconductor applications

FEATURES AND BENEFITS

- Industry-leading LDLs of 45 ppt O_2 and 55 ppt moisture
- Non-depleting sensing technologies reduce ongoing costs
- Easy operation via front panel or digital communication options

MAINTENANCE REQUIREMENTS

- Perform annual calibration (O_2 only, not for H_2O)
- Record and analyze diagnostics (primary and secondary electrode measurements) to predict failures early
- Routine planned maintenance at years two, three and four to ensure optimum performance and reduced downtime

GAS	MEASURES	APPLICATION
MOISTURE	PPM	QUALITY
OXYGEN	TRACE PPB	
	ULTRA TRACE PPT	

SENSING TECHNOLOGY

COULOMETRIC

TUNABLE DIODE LASER

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- COMMISSIONING
- TRAINING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT
- RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/df-760e-ultra

SERVOPRO

Plasma

SAFE AREA

RELIABLE MONITORING OF N_2 IN Ar AND He, OPTIMIZED FOR AIR SEPARATION UNIT (ASU) PLANT OPERATIONS

Specifically designed for the continuous monitoring of N_2 in Ar, the Plasma's non-depleting Plasma Emission Detector provides an accurate, highly stable and reliable measurement ideal for the requirements of ASU plant operators. Weekly calibration will ensure optimum performance from this analyzer. To predict future problems, regular checks of zero, span, and flow counts are recommended, plus a flow leak check, along with routine planned servicing.

APPLICATIONS

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

FEATURES AND BENEFITS

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

MAINTENANCE REQUIREMENTS

- Perform weekly calibration
- Routine planned maintenance at years two, four, and five to ensure optimum performance and reduced downtime

GAS	MEASURES	APPLICATION
NITROGEN	TRACE PPM	QUALITY

SENSING TECHNOLOGY

PLASMA

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT
- RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/plasma

SERVOPRO

NOx

SAFE AREA

CHEMILUMINESCENCE DETECTOR ANALYZER FOR KEY EMISSIONS APPLICATIONS INVOLVING ULTRA-LOW NO, NO_2, AND NOx

Utilizing Chemiluminescence detection technology to measure NO or NO/NO_2/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. This emissions analyzer requires periodic zero and span calibrations to ensure measurement accuracy, checking and recording trend of raw signal voltage to ensure signal loss has not occurred. Key components should be replaced on an annual or biennial basis.

APPLICATIONS

- Continuous Emissions Monitoring Systems
- Scrubber efficiency
- Turbine/generator feedback control
- SCR/SNCR feedback control

FEATURES AND BENEFITS

- High-dynamic-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
- Mobile Source emissions standard EPA 1065/1066 and LD Euro 6, HD Euro V1 compliant

MAINTENANCE REQUIREMENTS

- Periodic zero and span calibrations to ensure accuracy of measurement
- Check and record trend of raw signal voltage checks to ensure signal loss has not occurred

GAS	MEASURES	APPLICATION
NITRIC OXIDE	TRACE PPM	PROCESS CONTROL
NITROGEN DIOXIDE		QUALITY
NITROGEN OXIDES		EMISSIONS

SENSING TECHNOLOGY

CHEMILUMINESCENCE

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT

Download product brochure.
Scan the QR code or visit servomex.com/nox

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 ASUs, the FID ensures the level of Total Hydrocarbons (THC) is maintained below flammable limits, as well as providing quality control in pure O_2, N_2, Ar, air, He and CO_2. Regular calibration will ensure continued accurate performance. The zero and span counts must be checked for gain, and then adjusted to offset this.

APPLICATIONS

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

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

MAINTENANCE REQUIREMENTS

- Check zero and span counts, gain and offset
- Adjust calibration frequency as required

GAS	MEASURES	APPLICATION
TOTAL HYDROCARBONS	TRACE PPM	SAFETY
		QUALITY

SENSING TECHNOLOGY

FLAME IONIZATION DETECTOR

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT
- RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/fid

SERVOPRO

HFID

SAFE AREA

HIGH-PERFORMANCE FAST ANALYSIS USING HEATED FID

Using a highly sensitive Heated Flame Ionization Detector (HFID) for measuring volatile hydrocarbon concentrations in industrial or vehicle emission applications, the HFID utilizes an internally heated oven set to 190°C (374°F), to maintain the sample gas above its dew point, for optimum performance in THC analysis. It can be equipped with a non-methane cutter for additional methane (CH_4) and non-methane hydrocarbon (NMHC) reporting. Annual calibration will ensure the continued accurate performance. The zero and span counts must be checked for gain, and then adjusted to offset this.

APPLICATIONS

- Continuous Emissions Monitoring Systems
- VOC abatement
- Scrubber efficiency
- Compliance monitoring and testing

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

MAINTENANCE REQUIREMENTS

- Annual calibration
- Check zero and span counts, gain and offset
- Adjust as required to guarantee instrument accuracy

GAS	MEASURES	APPLICATION
TOTAL HYDROCARBONS	TRACE PPM	PROCESS CONTROL
METHANE		QUALITY
NON-METHANE HYDROCARBONS		EMISSIONS

SENSING TECHNOLOGY

FLAME IONIZATION DETECTOR

SUGGESTED SERVICE PRODUCTS

- SERVICE PLANS
- FACTORY ACCEPTANCE TESTING
- SPARES
- SERVICE AGREEMENTS
- ON-SITE SERVICE SUPPORT
- RENTALS

Download product brochure.
Scan the QR code or visit servomex.com/hfid

SERVOFLEX

Micro i.s. 5100

PORTABLES

INTRINSICALLY SAFE ANALYZER THAT MEASURES O_2

Designed for the measurement of oxygen in potentially flammable gas samples, the intrinsically safe Micro i.s. 5100 is a unique analyzer certified to Zone 0 and Division 1 and suitable for measuring percent levels of O_2. This portable O_2 analyzer requires periodic zero and span calibrations to ensure measurement accuracy.

APPLICATIONS

- Process monitoring
- Inerting applications
- Controlled atmosphere monitoring
- Hazardous area combustion optimization

FEATURES AND BENEFITS

- Intrinsically safe design (Zone 0) to ATEX and IECEx standards, Division 1 to FM and CSA standards, ensures safety operation in hazardous environments
- IP65 rugged design and optional carry case allows for use in the most demanding environments
- Powered by integral rechargeable battery with up to 18-hour run time
- Ergonomic compact design ensures easy operation on the move
- Available in non-pump or internal pumped versions with optional sample conditioning kit

MAINTENANCE REQUIREMENTS

- Periodic calibrations on zero and span to ensure measurement accuracy
- Check and replace AFCD filter as required

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
		SAFETY

SENSING TECHNOLOGY

PARAMAGNETIC

SUGGESTED SERVICE PRODUCTS

- TRAINING
- SPARES
- SERVICE CENTER SUPPORT
- RENTALS
- HEALTH CHECK

Download product brochure.
Scan the QR code or visit servomex.com/micro-i-s-5100

SERVOFLEX

MiniMP 5200

PORTABLES

BENCHTOP ANALYZER OFFERING SINGLE OR DUAL MEASUREMENTS OF O_2 AND CO_2

The only truly portable battery-powered gas analyzer with MCERTS and TÜV certification, the MiniMP 5200 is designed to offer single or dual measurement of O_2 and CO_2 by utilizing Servomex's advanced Paramagnetic and Infrared sensing technologies. Offering measurements of oxygen and carbon dioxide, this benchtop analyzer requires annual calibration checks and the testing of all outputs. Regular filter checks and replacement are also highly recommended to ensure peak performance.

APPLICATIONS

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

FEATURES AND BENEFITS

- MCERTS V3.3, Annex F and TÜV QAL 1 makes the MiniMP ideal for source testers that require reference O_2 analysis for Continuous Emissions Monitoring Systems (CEMS) verification
- Li-ion battery system offers unique true portability
- Non-depleting sensor design ensures long service with minimal calibration

MAINTENANCE REQUIREMENTS

- Periodic calibrations on zero and span to ensure measurement accuracy
- Flow alarm calibration validation
- Perform compensated pressure calibration checks as required
- Test all relay and 4-20mA outputs, making adjustments as required
- Check and replace AFCD filter as required

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
CARBON DIOXIDE		QUALITY
		EMISSIONS

SUGGESTED SERVICE PRODUCTS

- TRAINING
- SPARES
- SERVICE CENTER SUPPORT
- RENTALS
- HEALTH CHECK

SENSING TECHNOLOGY

- PARAMAGNETIC
- INFRARED

Download product brochure.
Scan the QR code or visit servomex.com/minimp-5200

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 O_2, CO or CO_2 within common gas mixtures. The MiniHD 5200 utilizes Servomex's non-depleting Paramagnetic or Infrared sensors to give dependable and accurate results. This analyzer should be tested regularly to ensure it delivers the expected high performance. Annual calibration checks and filter replacements are all recommended to maintain accuracy and reliability.

APPLICATIONS

- Physiology studies
- Universities
- Combustion optimization

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 O_2, CO, and CO_2 levels

MAINTENANCE REQUIREMENTS

- Periodic calibrations on zero and span to ensure measurement accuracy
- Check and replace AFCD filter as required

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
CARBON MONOXIDE		COMBUSTION
CARBON DIOXIDE		SAFETY

SUGGESTED SERVICE PRODUCTS

- TRAINING
- SPARES
- SERVICE CENTER SUPPORT
- RENTALS
- HEALTH CHECK

SENSING TECHNOLOGY

- PARAMAGNETIC
- INFRARED

Download product brochure.
Scan the QR code or visit servomex.com/minihd-5200

SERVOMEX SYSTEMS
CONSULT. DESIGN. DELIVER.

EXPERT SOLUTIONS DESIGNED TO MATCH YOUR NEEDS

As global experts in gas analysis systems integration, Servomex designs and delivers the most accurate, reliable solutions available, across a wide range of industries.

Whether you need a single analyzer and sampling system, or multiple gas analyzers working together in an air-conditioned shelter, we can deliver. Our experts work with you to create a scalable system that meets your exact requirements and provides the precise measurements you need.

Each system is designed from the customer perspective. First, all the requirements are established, then we work together with the customer to find the best way to resolve their unique process challenges.

This collaborative approach, combined with our extensive systems expertise, transforms the way we create and deliver systems.

Our professional, knowledgeable, and experienced team has a product-focused methodology for delivering the best, most competitively priced solutions to our customers.

In addition, our gas analysis technologies offer the widest range available to the market from a single supplier – from Paramagnetic or Infrared to Gas Chromatography or Tunable Diode Laser, with direct measurements and extractive sampling.

This means customers are not limited to one or two options – we're familiar with an extensive range of sensing technologies, so can ensure the best measurement technique is applied to each process.

Servomex provides global systems capability at a local level, including full support from our service network, which offers assistance from experts located close to your plant.

Our systems methodology is built around the process of 'consult, design, deliver'. With this in mind, we are consistently able to build systems that work – reliably, accurately, and cost-effectively, with ease of use and maintenance at the forefront of our designs.

WITH PROVEN EXPERIENCE ACROSS A WIDE RANGE OF INDUSTRIES, WE DELIVER SYSTEMS THAT TRANSFORM YOUR PROCESS

		MEASUREMENT TYPE				
		COMBUSTION	EMISSIONS	PROCESS CONTROL	QUALITY	SAFETY
IP&E	Chemicals	⬢	⬢	⬢	⬢	⬢
	Oil and Gas Upstream	⬢	⬢	⬢	⬢	⬢
	Petrochemicals	⬢	⬢	⬢	⬢	⬢
	Refining	⬢	⬢	⬢	⬢	⬢
	Power	⬢	⬢	⬢		
P&S	Industrial Gases (N_2, O_2, H_2, CO_2)	⬢		⬢	⬢	⬢
	Semiconductor (UHP)			⬢	⬢	
	Pharmaceuticals		⬢	⬢	⬢	⬢

SERVOMEX SYSTEMS
CONSULT. DESIGN. DELIVER.

Analyzers and Panels

EXPERT GAS ANALYSIS INSTRUMENTATION, AND SAMPLING SYSTEMS FOR EASY ACCESS TO COMPONENTS FOR HASSLE-FREE CALIBRATION AND MAINTENANCE

Our wide range of sensing technologies provides diverse, easy-to-use solutions for many industrial applications.

FEATURES AND BENEFITS

- Optimized sampling and wiring for easy operation
- Keeps instrumentation in safe areas for maintenance
- Tailor-made to suit your application needs
- Fully integrated Servomex gas analysis technology

Racks

SYSTEMS INTEGRATING RACK-MOUNTED ANALYZERS FROM OUR SERVOPRO AND DF RANGES

Our rack systems locate multiple gas analyzers into a single cabinet for easy control of an array of gas analysis solutions.

FEATURES AND BENEFITS

- Multiple analyzers working seamlessly and reliably
- Intelligent software for continuous monitoring
- Designed to meet stringent safety requirements
- A scalable solution, available as fixed racks or mobile carts

Enclosures

ENCLOSURES ENSURE SUITABLE WEATHER PROTECTION FOR YOUR SYSTEM. DESIGNED FOR HAZARDOUS AREAS

Rugged enclosed cabinets keep the instrumentation under controlled conditions for reliable, continuous performance, while allowing easy access for maintenance.

FEATURES AND BENEFITS

- A complete system, designed into a protective cabinet
- Tailor-made to operate reliably in your process conditions
- Robust, high-quality materials
- Fully assembled, tested and certified

Houses

FULLY-CONTAINED AIR CONDITIONED SHELTERS FOR LARGE SYSTEMS PROJECTS, CUSTOMIZED FOR INDIVIDUAL PROCESS REQUIREMENTS

With their own lighting and power supply, these shelters provide reliable protection for gas analysis equipment and people alike.

FEATURES AND BENEFITS

- Suitable for interior or exterior installation
- Supplied with air conditioning, power distribution, lighting and customized engineering inputs and outputs
- Maximum protection against weather conditions and hazardous process environments
- Custom-designed to accommodate any number of analyzers, equipment and other utilities

Continuous Quality Control

A SOPHISTICATED, NEXT-GENERATION MULTI-GAS ANALYZER SYSTEM PROVIDING GAS ANALYSIS FOR TRACE CONTAMINANTS IN INDUSTRIAL GAS APPLICATIONS

The revolutionary SERVOPRO Chroma gives stable ppb, ppm or % level measurements for CH_4, CO, CO_2, H_2, O_2, N_2, Ar, He, and NHMC. The industry-leading SERVOPRO MonoExact DF310E provides trace level oxygen and ppm and ppb moisture measurements. And the SERVOPRO MultiExact 4100 measures O_2 purity along with CO, CO_2 and CH_4 contaminants.

FEATURES AND BENEFITS

- Unique single-manufacturer system for the Industrial Gas industry
- Monitors purity and trace impurities in all bulk inert and noble gases
- Utilizes Servomex's industry-leading analyzers
- Standard systems available, along with configurable selections for your precise stationary rack applications

SERVOMEX SYSTEMS
CONSULT. DESIGN. DELIVER.

Contact our service team today:
servomex.com/systems

SYSTEMS BUILD PROCESS

SERVOMEX SYSTEMS
CONSULT. DESIGN. DELIVER.

FOLLOW THE SYSTEM JOURNEY, FROM INITIAL CONSULTATION TO DESIGN, TEST AND DELIVERY.

CONSULT

1 CUSTOMER CONTACT

Hold initial discussions with customer. Assign dedicated team to manage project through its life.

2 APPLICATION

Determine process parameters for the system, plant, unit and application requirements.

3 ADMIN

Our team handles proposed schedules, budgets and project management.

4 TECHNICAL

Expert insight from:
- Project engineers
- Workshop/integration staff
- Quality assurance and start-up technicians

DESIGN

5 KICK-OFF MEETING (KOM)

Establish points of contact, streamline decision-making, clarify project scope.

6 REVIEW ORDER

Establish final deliverables and schedule key project milestones.

7 GENERATE DRAWING PACKAGE

Issue for Approval (IFA) design package is created.

8 SUBMIT FOR REVIEW

Customer reviews and approves IFA drawings.

9 DRAWINGS UPDATED

The approved IFA package is updated to Issue for Construction (IFC).

10 SYSTEMS BUILD

Construction of electrical and mechanical components begins. Assemblies and parts prepared in advance.

TEST

11 INTERNAL TESTING

The integrated system is tested to ensure it meets all customer requirements and quality control standards.

12 FACTORY ACCEPTANCE TEST (FAT)

Customer invited to final collaborative FAT at the build site.

DELIVER

13 SHIPPING

The completed, approved system is shipped to the customer site.

14 POST-SHIPPING SUPPORT

Complete global support for installation, commissioning and personnel training.

GLOBAL EXPERTISE DELIVERED LOCALLY

Service plays an essential role in Servomex's gas analysis expertise. Our analyzer systems are designed to meet the precise process requirements of every customer, and the same is true of our service support.

We supply an extensive range of service products, backed by deep applications knowledge, that support the optimum performance of our analyzers and systems.

Our global network of engineers delivers the expertise your product needs, wherever it's needed.

We believe that service should cover the entire life of your analyzer. That's why our experts can be present from day one, commissioning, setting up, and calibrating your new instrument for optimum performance.

Commissioning gives your analyzer the best start, while a planned maintenance schedule helps to ensure that it continues to operate efficiently and accurately throughout its life cycle. We also provide easy access to the spares you need, with rapid dispatch and expert advice on what to keep stocked, for minimal downtime.

Servomex operates regional service centers around the world – including our latest facility in Korea – allowing our experienced engineers to provide a rapid response, covering all maintenance needs from routine servicing to emergency repairs or replacement.

We can also deliver training for your staff to ensure you get the most from your gas analyzer, and provide remote support options when expert help is required.

You can find out more about our service products, and how they support your analyzers, in the new edition of our Service Product Guide.

It's a comprehensive guide to keeping your process running at top performance, including recommended service options for each of our analyzers.

See how the Servomex Service Network can be tailored to your unique needs, and get in touch with our team if you want to learn more.

SERVOMEX SERVICE NETWORK

Find out more about our customized service support at **servomex.com/service**

WHEREVER YOU ARE, WE'RE READY TO HELP, WITH REMOTE OR ON-SITE SUPPORT OVERSEEN BY OUR REGIONAL LEADERS:

- Houston
- Boston
- UK
- Netherlands
- Singapore
- Abu Dhabi
- China
- South Korea

Contact our service team today: **servomex.com/contact/service**

WANT TO VIEW OUR PRODUCTS ONLINE? Visit **servomex.com**

MEET THE TEAM ONLINE

Servomex Service Network

Our global network of expert engineers delivers the support your product needs throughout its life, including:

- Customized service products to support optimum analyzer performance
- Full maintenance coverage from routine servicing to emergency repairs
- Rapid, easy-access spares support to help ensure minimal downtime

Get in touch to learn more at **servomex.com/service**

OUR SERVICE PRODUCT RANGE

Whatever your service needs, Servomex Service Network has the solution. Through our network of mobile engineers and service centers, we deliver Servomex expertise directly to your plant.

Find out more at: **servomex.com/service**

Service Plans

COMPLETE SUPPORT FOR YOUR ANALYZER

For maximum peace of mind, a service plan keeps your analyzer operating at optimum performance from day one, with the full expertise and resources of Servomex behind it.

Backed by on-site and remote support from our highly trained service engineers, application specialists, and scientists, a service plan delivers the highest possible measurement availability from your analyzer, ensuring it provides trusted gas analysis whenever needed.

Service plans are expertly customized to suit individual customer needs, from commissioning to routine preventative maintenance, and are designed to keep your process running, with minimal unplanned downtime.

FEATURES AND BENEFITS

- Customized services to match your process
- Full access to Servomex's expertise and resources
- On-site and remote support
- A cost-effective package

Factory Acceptance Testing

ENSURE YOUR SYSTEM MEETS SPECIFICATIONS

For maximum peace of mind, a Factory Acceptance Test (FAT) ensures your gas analysis system will arrive ready to operate according to your exact specifications.

Performed at one of our regional service centers, in collaboration with your own staff, the FAT is an extensive testing process that allows any issues to be identified and corrected prior to shipping to your site.

Designed to cover system builds, it is also beneficial for large-scale analyzer projects. A successful FAT means that when the system arrives on your site, it can be installed and ready to operate quickly.

FEATURES AND BENEFITS

- The system performance you're expecting
- Ready to deliver the results you need from day one
- A chance to resolve unforeseen issues
- Opportunity to consult with our expert systems team

Commissioning

OPTIMUM PERFORMANCE FROM THE OUTSET

Correctly installing and configuring your gas analyzer ensures it delivers the expected performance from day one, meeting safety, compliance, and operational needs. Commissioning makes certain that systems and components are designed, installed, tested, operated, and maintained according to requirements.

Our highly trained team provides a fast, seamless, and comprehensive commissioning service that delivers optimum performance and peace of mind.

Servomex commissioning ensures the analyzer meets process requirements, avoiding the dangers of compromised plant safety, and qualifies the analyzer for an additional six-month warranty period.

FEATURES AND BENEFITS

- Fast, seamless commissioning service
- Trained Servomex engineers
- Ensures optimum performance
- Qualifies analyzers for six months additional warranty

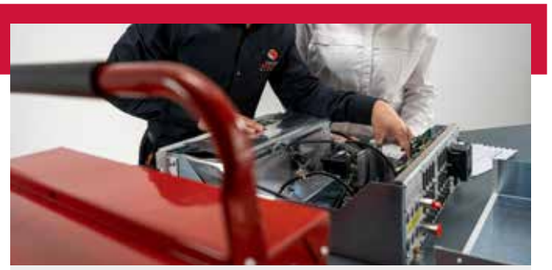
Training

SHARING OUR GAS ANALYSIS EXPERTISE

Providing your on-site user and maintenance teams with full training on the relevant analyzers supports long-term reliability and maximum performance.

Our customized training programs ensure teams can get the most from their equipment. They range from basic user training through to providing an advanced understanding of the measurement technology used, or diagnostic and maintenance capabilities.

Courses are run by experienced, highly qualified specialists, who review specific requirements to create a program that combines classroom and hands-on workshops at the customer's preferred location.



FEATURES AND BENEFITS

- In-depth systems training
- Covers all key Servomex analyzers
- Presented by Servomex experts
- Given at our global training centers or on-site

Spares

MAINTAIN YOUR PROCESS UPTIME

Access to the right spare parts and consumables at the right time is critical to maintaining plant operations and safeguarding productivity.

With our global sales and distribution network, Servomex can supply high-quality, authorized parts wherever and whenever you need them. Every Servomex spare part is precision-made to the highest specifications, with a no-compromise approach to quality.

Comprehensive factory-authorized spares packages are available for our analyzers, each customized to exact requirements, with all the parts needed for quick and easy component replacement. Our global team is on hand to assist in selecting the right part for your analyzer, further reducing downtime.

FEATURES AND BENEFITS

- Factory-authorized replacement parts
- Fully tested spares kits
- Ready for fast shipping
- Recommended reserve packs available

Service Agreements

INCREASED UPTIME AND PEACE OF MIND

With a Servomex service agreement, you get the peace of mind that comes from proactive analyzer maintenance and an ongoing expert partnership. Regular servicing adds real value to gas analysis systems, improving reliability, increasing uptime, and optimizing processes.

We offer a wide range of maintenance packages to meet individual customer requirements, providing guaranteed service levels with numerous benefits, including discounts on spare parts, priority response times, and emergency call-outs to resolve issues quickly.

Our unrivaled product knowledge allows our expert engineers to deliver the best possible support, reducing the risk of costly breakdowns and optimizing your service budget.

FEATURES AND BENEFITS

- Proactive maintenance
- Ongoing partnership
- Pre-structured
- Wide range of options

OUR SERVICE PRODUCT RANGE

Whatever your service needs, Servomex Service Network has the solution. Through our network of mobile engineers and service centers, we deliver Servomex expertise directly to your plant.

Find out more at: **servomex.com/service**

On-site Service Support

OUR EXPERTISE DELIVERED DIRECT TO YOU

From urgent assistance with an emergency to scheduled maintenance visits, on-site service support from our expert team helps keep plants and processes running efficiently.

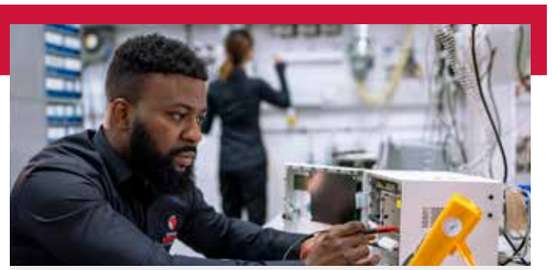
Our service engineers are the heart of the Servomex Service Network, and are based around the globe to deliver rapid support for any plant's on-site analyzer and system requirements.

These skilled product specialists are fully qualified and equipped with the necessary spares for all servicing requirements, from commissioning to maintenance and repair. On-site support means that even when plants are run remotely or with minimal staff, the gas analyzers remain supported, for complete peace of mind.

FEATURES AND BENEFITS

- Skilled product specialists
- Highly experienced experts
- Covers all operational and maintenance needs
- Locally based for fast response

Service Center Support



EXPERT SUPPORT CLOSE TO YOUR PLANT

Developing proactive maintenance programs will sustain the life of your analyzer, preventing risk of failures. However, when problems do occur, it is essential to get the analyzer up and running again as quickly as possible.

That's why we operate a global network of state-of-the-art service centers, located close to customers and ready to receive analyzers for repair, preventative maintenance, and upgrades.

A dedicated in-house co-ordination team works closely with our experienced repair engineers to provide a streamlined, hassle-free service at each center. They co-ordinate with local couriers to ensure the fastest possible turnaround and minimal process downtime.

FEATURES AND BENEFITS

- Full range of services
- Regional support
- Cost-effective repairs, no compromise in quality
- Dedicated in-house team

Rentals

CONTINUED MEASUREMENT AVAILABILITY

Servomex analyzers are available for hire, whenever you need them. Source a temporary replacement analyzer for your system quickly, with complete confidence that it will operate correctly and integrate easily.

Short and long-term agreements can be made, ensuring businesses receive the latest product technology, maintained to the highest standards and upgraded to the latest specifications.

If the efficiency, quality, and safety of your process depend on a Servomex analyzer but that device needs servicing or repairs, a rental agreement is a valuable solution. It ensures a like-for-like replacement, configured to your specifications, that keeps your process running with minimal disruption.

FEATURES AND BENEFITS

- A full range of analyzers to meet your requirements
- Equipment maintained to specification
- Expertise on hand to assist
- Fast delivery

Health Check

ENSURE OPTIMUM ANALYZER PERFORMANCE

Keeping on top of the operational efficiency of your analyzer can be difficult and time-consuming. An expert engineer will carry out a thorough evaluation and review of your plant's analyzers and sample system.

Carried out on-site, this provides unmatched protection for your investment in gas analysis systems, and verifies that the instrument is performing within specifications. Operators can then be confident that measurements are accurate and the quality of results is not compromised.

A health check allows for a more proactive approach to analyzer maintenance, detecting performance anomalies before they become costly problems, and avoiding downtime caused by unscheduled repairs.

FEATURES AND BENEFITS

- Quality assurance of instrument performance
- Increased reliability and trustworthy results
- Expert maintenance plans
- Avoids unscheduled repairs

SERVOMEX SERVICE NETWORK

Contact our service team today:
servomex.com/contact/service

RECOMMENDED SERVICE CHART

This table outlines our suggested service support for each of our products. However, all our service products are available for every Servomex analyzer and system – contact your nearest service center to learn more.

SERVOTOUGH	Service Plans	Factory Acceptance Testing	Commissioning	Training	Spares	Service Agreements	On-site Service Support	Service Centre Support	Rentals	Health Check	PAGE
Oxy 1900		✓	✓	✓	✓		✓			✓	103
OxyExact 2200		✓	✓	✓	✓		✓			✓	104
H2scan		✓	✓	✓	✓		✓			✓	105
SpectraScan 2400		✓	✓	✓	✓		✓			✓	106
SpectraExact 2500	✓	✓	✓	✓	✓	✓	✓			✓	107
FluegasExact 2700	✓	✓	✓	✓	✓	✓	✓				108
Laser 3 Plus Range	✓	✓	✓	✓	✓	✓	✓		✓		109-111

SERVOPRO	Service Plans	Factory Acceptance Testing	Commissioning	Training	Spares	Service agreements	On-site Service Support	Service Centre Support	Rentals	Health Check	
AquaXact 1688					✓	✓		✓	✓		112
MonoExact DF150E	✓		✓		✓	✓	✓		✓		114
MonoExact DF310E	✓		✓		✓	✓	✓		✓		115
4900 Multigas	✓		✓		✓	✓	✓		✓		116
MultiExact 4100	✓		✓		✓	✓	✓		✓		117
MultiExact 4200	✓		✓		✓	✓	✓				118
Chroma	✓	✓	✓	✓	✓	✓	✓				119
NanoChrome	✓	✓	✓	✓	✓	✓	✓				120
DF-500 Range	✓	✓	✓	✓	✓	✓	✓		✓		121
DF-700 Range	✓	✓	✓	✓	✓	✓	✓		✓		122
NanoChrome ULTRA	✓	✓	✓	✓	✓	✓	✓				123
DF-560E NanoTrace ULTRA	✓	✓	✓	✓	✓	✓	✓		✓		124
DF-750 NanoTrace ULTRA	✓	✓	✓	✓	✓	✓	✓		✓		125
DF-760E NanoTrace ULTRA	✓	✓	✓	✓	✓	✓	✓		✓		126
Plasma	✓		✓		✓	✓	✓		✓		127
NOx	✓		✓		✓	✓	✓				128
FID/HFID	✓		✓		✓	✓	✓		✓		129-130

SERVOFLEX	Service Plans	Factory Acceptance Testing	Commissioning	Training	Spares	Service Agreements	On-site Service Support	Service Centre Support	Rentals	Health Check	
Micro i.s. 5100				✓	✓			✓	✓	✓	131
MiniMP 5200				✓	✓			✓	✓	✓	132
MiniHD 5200				✓	✓			✓	✓	✓	133

WANT TO VIEW OUR SERVICES ONLINE? Visit **servomex.com/service**

GET THE RESOURCES YOU NEED TO SUPPORT YOUR PROCESS SOLUTION

EXPERT PAPERS

For an in-depth look at our gas analyzers and the technologies they use, download our expert papers. Written by our knowledgeable team, they examine how our sensing technologies work and explain why certain products deliver the best solution for key applications.

PRODUCT BROCHURES

For the best available information about our products, you'll want to read our product brochures. They outline how the analyzer works and which applications it's best suited to. It also explains the main features and their benefits, and lists all the certifications it has.

MANUALS

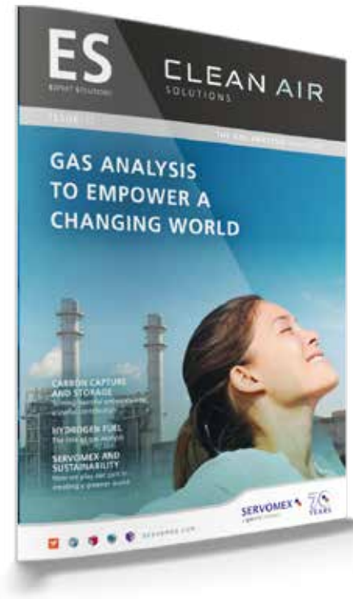
Whether you need to replace a lost product manual, need a quick online reference, or just want to see how the product works before you order, we've got you covered. All our existing product instruction manuals are available to download, for quickstart, installation, operation and certification.

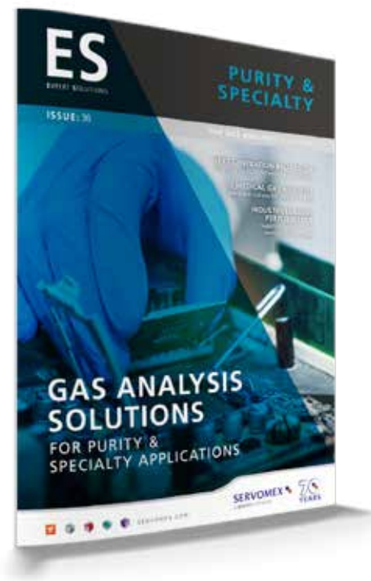
VIDEOS

Our extensive array of videos are ready to view on our website now. Some focus on our products, including expert 'unboxings'. Others look at applications and how our products deliver the solutions you need. We also feature our experts discussing key areas of gas analysis, and how Servomex can help customers in a range of markets.

STAY INFORMED WITH OUR EXPERT SOLUTIONS MAGAZINES

Available in downloadable and interactive versions, our Expert Solutions (ES) magazines cover a wide variety of topics, ranging from new product launches to complete process solutions. The publications also cover key markets, sensing technologies, and expert applications advice. Our annual Product Guide is also available, highlighting all our available gas analysis solutions.





To access these resources go to: **servomex.com/resources**

INDEX

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