

# SERVOMEX GAS GUIDE

## 2022

### SPECIFIER'S GUIDE

How to choose  
the right solution

### APPLICATION SOLUTIONS

Find out how we  
improve your process

### SENSING TECHNOLOGIES

Gas measurement  
methods explained

### FULL PRODUCT GUIDE

See our range of gas analyzers

### GAS ANALYSIS SYSTEMS

Expert, bespoke gas analysis,  
scalable to your application

### SERVICE NETWORK

Providing the support you  
need, wherever it's required

[servomex.com](https://servomex.com)

**SERVOMEX**   
a spectris company

**70**  
YEARS



# WELCOME TO OUR 2022 GAS GUIDE

HELPING YOU FIND THE RIGHT SOLUTION FOR YOUR GAS ANALYSIS APPLICATION

Andy Cowan, Servomex President

Welcome to the 2022 edition of our Gas Guide, the comprehensive handbook covering all aspects of gas analysis and our sensing solutions. It has 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.

There's a complete specifier's guide 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. We've highlighted some key industry applications in this publication, explaining the

processes involved and where our gas analyzers and systems deliver the most effective results. In addition, 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. Remember, our team is here to help, so if you want to find out more, or have any questions, just get in touch.

## 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:

<b>SPECIFIER'S GUIDE TO GAS ANALYSIS</b>	<b>KEY APPLICATIONS</b>	<b>SENSING TECHNOLOGIES A-Z</b>
The key criteria driving analyzer choice, plus flowcharts to find solutions for common gas measurements.	A selection of process and purity applications illustrating the role of our analytical systems.	The advantages and disadvantages of each sensor type for your application.
<b>SERVOMEX PRODUCT GUIDE</b>	<b>SYSTEMS</b>	<b>SERVICES</b>
The complete range of Servomex analyzers.	Expert, bespoke gas analysis, scalable to your application.	Providing the support you need, wherever it's required.

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.

To get in touch go to: [servomex.com/contact](https://servomex.com/contact)

## CONTENTS

<b>ABOUT SERVOMEX</b>	<b>04</b>
<b>SUSTAINABILITY</b>	<b>05</b>
<b>SPECIFIER'S GUIDE TO GAS ANALYSIS</b>	<b>06-23</b>
• Range/purity	07
• Gas measurement guide	08-09
• Certifications	10
• CO <sub>2</sub> /CO guide	11-15
• Environments	16
• Methane guide	17-19
• Type of supplier	20
• Oxygen guide	21-23
<b>KEY APPLICATIONS</b>	<b>24-65</b>
• Purity and specialty applications	27-33
• Industrial process and emissions applications	34-65
<b>AN A-Z OF SENSING TECHNOLOGIES</b>	<b>66-95</b>
<b>SERVOMEX PRODUCT GUIDE</b>	<b>96-109</b>
• SERVOTOUGH hazardous area analyzers	97-100
• SERVOPRO safe area analyzers	101-107
• SERVOFLEX portable analyzers	108-109
<b>SERVOMEX GAS ANALYSIS SYSTEMS</b>	<b>110-115</b>
<b>SERVOMEX SERVICE NETWORK</b>	<b>115-123</b>
<b>FURTHER RESOURCES</b>	<b>124-125</b>
<b>INDEX</b>	<b>126-127</b>



# ABOUT SERVOMEX

Servomex is the global expert in gas analysis, providing innovative solutions for industries around the world. We manufacture one of the widest ranges of sensing technologies offered by a single supplier, delivering reliable, accurate and stable gas measurements.

Since our foundation in 1952, we have placed good business practice at the cornerstone of our business.

We are committed to continuous improvement across all aspects of our manufacturing and management systems, from compliance with internationally recognized business standards to global investment in staff development.

Our aim is 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.



2022 marks our 70<sup>th</sup> anniversary. From the outset, Servomex has strived to move with the times, delivering advanced solutions to meet the challenges facing industries in the present and future. As we enter our eighth decade, our focus is firmly on supporting carbon net-zero strategies, helping customers ensure cleaner processes and fewer emissions. Keep up to date with our news bulletins to find out how we're celebrating this milestone: [servomex.com/signup](https://servomex.com/signup)

# SUSTAINABILITY

## OUR COMMITMENT TO SUSTAINABILITY

Servomex is dedicated to operating as a fully sustainable business, and has joined the global pledge to achieve carbon net zero by 2030.

We are members of the Business Ambition for 1.5°C campaign run by Science Based Targets (SBTi), which aims to keep the global temperature rise to 1.5°C above pre-industrial levels.

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.



Beyond these targets, we continue to prioritize the development of products and services that support customers on their own decarbonization journey, as part of our wider purpose to make the world cleaner, healthier, and more productive.

Find out more at [servomex.com/sustainability](https://servomex.com/sustainability)



# YOUR SPECIFIER'S GUIDE

This Specifier's Guide section is designed to help you identify the key criteria you need to address when choosing the right gas analyzer for your essential process measurement.

It explains how factors such as gas measurement range, process environments and the sensing technology used can all affect the results achieved by your analyzer.

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

We've also provided easy-to-use flowcharts that will help you solve your oxygen, carbon dioxide, carbon monoxide or methane measurement challenges.

If you need more help from our expert team, get in touch at [servomex.com/contact](https://servomex.com/contact)

## RANGE/PURITY

# HOW MEASUREMENT RANGE AFFECTS ANALYZER CHOICE

Depending on sensing technology and configuration, gas analyzers can measure gas concentration from complete purity to tiny traces.

Applications which control processes for safety and efficiency need to ensure that the gas concentration stays within a certain level. Gas purity measurements need to measure ultra-trace levels of contamination to ensure the required purity.

%

### PERCENTAGE

These analyzers measure gas concentration based on its parts per hundred ratio in the gas mixture. This is often a large-scale measurement.

PPM

### PARTS PER MILLION

Sometimes referred to as trace-level measurements, ppm results are used for many applications, including combustion control, and emissions monitoring.

PPB/PPPT

### ULTRA-TRACE

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

SERVOTOUGH	NH <sub>3</sub>	Ar	CO	CO <sub>2</sub>	He	C1-C6	NMHC	H <sub>2</sub>	HCl	H <sub>2</sub> S	CH <sub>4</sub>	NO	NO <sub>x</sub>	NO <sub>2</sub>	N <sub>2</sub>
H2scan								%							
Oxy 1800															
Oxy 1900															
OxyExact 2200															
SpectraScan 2400			%CV	%CV		%CV				%CV					
SpectraExact 2500	%		%ppm	%ppm		%		%ppm		%	%ppm				
FluegasExact 2700			ppm												
Laser 3 Plus Environmental	ppm														
Laser 3 Plus Combustion			ppm								%				
Laser 3 Plus Process															

SERVOPRO	NH <sub>3</sub>	Ar	CO	CO <sub>2</sub>	He	C1-C6	NMHC	H <sub>2</sub>	HCl	H <sub>2</sub> S	CH <sub>4</sub>	NO	NO <sub>x</sub>	NO <sub>2</sub>	N <sub>2</sub>
AquaXact 1688															
AquaXact 1688 Controller															
MonoExact DF150E															
MonoExact DF310E															
4900 Multigas			%ppm	%							ppm	ppm			
MultiExact 4100			%ppm	%ppm							ppm				
MultiExact 4200			ppm	ppm							ppm				
NanoTrace FTIR			ppm	ppm/b/t							ppm/b				
Chroma		ppm/b	ppm/b	ppm/b	ppm/b		ppm	ppm/b			ppm/b			%ppm/b	
NanoChrome		ppb/t	ppb/t	ppb/t			ppb/t	ppb/t			ppb/t				ppb/t
DF-500 Range															
DF-700 Range															
NanoChrome ULTRA		ppb/t	ppb/t	ppb/t			ppb/t	ppb/t			ppb/t				ppb/t
DF-560E NanoTrace ULTRA															
DF-750 NanoTrace ULTRA															
DF-760E NanoTrace ULTRA															
Plasma															ppm
FID															
NO <sub>x</sub>												ppm	ppm	ppm	
HFID							ppm				ppm				

GAS DETECTION	NH <sub>3</sub>	Ar	CO	CO <sub>2</sub>	He	C1-C6	NMHC	H <sub>2</sub>	HCl	H <sub>2</sub> S	CH <sub>4</sub>	NO	NO <sub>x</sub>	NO <sub>2</sub>	N <sub>2</sub>
OxyDetect															

SERVOFLEX	NH <sub>3</sub>	Ar	CO	CO <sub>2</sub>	He	C1-C6	NMHC	H <sub>2</sub>	HCl	H <sub>2</sub> S	CH <sub>4</sub>	NO	NO <sub>x</sub>	NO <sub>2</sub>	N <sub>2</sub>
Micro i.s. 5100															
MiniMP 5200				%											
MiniFoodPack 5200				%											
MiniHD 5200			%	%											

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

WANT TO VIEW OUR PRODUCTS ONLINE? Visit [servomex.com](https://www.servomex.com)

N <sub>2</sub> O	O <sub>2</sub>	C <sub>3</sub> H <sub>6</sub>	THC	H <sub>2</sub> O	SO <sub>2</sub>	KEY APPLICATIONS   HAZARDOUS AREA	PAGE
						■ Refinery ■ Petrochemical ■ Manufacturing ■ Industrial gas supply	97
	%					■ Waste water treatment ■ Food storage ■ Marine inerting applications ■ Inert blanketing	97
	%					■ Process control ■ Flare stack analysis ■ Vapor recovery ■ Safety-critical oxidation	97
	%					■ Oxidation control reactions ■ EO, PTA and EDC manufacturing ■ Catalyst regeneration ■ Solvent recovery	98
						■ BTU/Wobbe content measurement ■ Gas turbine, engines, fuel cells ■ Flare stack monitoring	98
%ppm		%	%	%		■ Water in EDC/solvents ■ Ethylene production ■ TDI production ■ Chlorine production	98
	%					■ Process heaters ■ Utility boilers ■ Thermal crackers ■ Crematoria and incinerators	99
						■ Process heaters ■ Incinerators ■ Power stations ■ Furnaces ■ Thermal oxidizers	100
	%					■ Process heaters ■ Incinerators ■ Power stations ■ Furnaces ■ ESP protection ■ Thermal oxidizers	100
	%					■ Oxidation control ■ Inerting ■ Safety monitoring ■ Flare gas monitoring ■ Combustion control (<500°C) ■ Coal to chemical	100

N <sub>2</sub> O	O <sub>2</sub>	C <sub>3</sub> H <sub>6</sub>	THC	H <sub>2</sub> O	SO <sub>2</sub>	KEY APPLICATIONS   SAFE AREA	PAGE
				ppmvdp		■ Glove boxes ■ Solder reflow ovens ■ Compressed air generation ■ Ethylene production	101
				ppmvdp		■ Glove boxes ■ Air separation units ■ Instrument air units ■ Refining gases	101
	ppm/b					■ Glove boxes ■ Heat treating ■ Solder reflow ovens ■ Industrial gas production	101
	%ppm			ppm		■ Air separation units ■ Medical/industrial gases ■ Specialty gas blending	102
ppm	%				ppm	■ Utility boilers ■ Clinical waste incinerators ■ Chemical incinerators ■ Mobile labs	102
ppm	%ppm			ppm		■ Product purity on ASU ■ Validation of medical O <sub>2</sub> , N <sub>2</sub> and air ■ Process control on ASU ■ Monitor trace CO <sub>2</sub> on scrubbed air inlet to air separation process	102
ppm	%ppm					■ Hydrogen production ■ HyCO plants ■ Syngas production	103
						■ In-line process monitoring ■ Batch sampling ■ Gas purity analysis ■ Gas certification analysis ■ Leak detection	103
	ppm/b					■ Medical gas production ■ ASU ■ Cryogenic truck loading station ■ High purity gas production	103
	ppb/t					■ Semiconductor production ■ Quality control measurements ■ Stationary analytical systems UHP gas production	104
	ppm/b/t					■ Continuous quality control monitoring ■ Post purifier quality certification ■ Leak detection for electronics grade gases	104
	ppm/b/t			ppm/b/t		■ Continuous quality control monitoring ■ Bulk gas cylinder quality control ■ Trace moisture analysis	104
	ppb/t					■ Semiconductor production – quality control measurements – stationary analytical systems ■ UHP gas production	105
	ppm/b/t					■ Continuous quality control monitoring ■ Inert gases control checks ■ Post-purifier quality certification ■ Leak detection	105
				ppm/b/t		■ Continuous quality control of bulk UHP gases for semiconductor fabs	105
	ppm/b/t			ppm/b/t		■ Monitoring O <sub>2</sub> and H <sub>2</sub> O as contaminants in UHP bulk gases used in semiconductor applications	106
						■ Argon production ■ Truck loading ■ Pure gas bottling ■ Specialty gas laboratories	106
			ppm			■ Cryogenic air separation ■ Process control ■ Food gas manufacture ■ Product validation	106
						■ Scrubber efficiency ■ Turbine/generator feedback control ■ SCR/SNCR feedback control ■ CEMS	107
			ppm			■ Compliance monitoring and testing ■ VOC abatement ■ Scrubber efficiency ■ CEMS	107

N <sub>2</sub> O	O <sub>2</sub>	C <sub>3</sub> H <sub>6</sub>	THC	H <sub>2</sub> O	SO <sub>2</sub>	KEY APPLICATIONS   GAS DETECTION	PAGE
	%					■ Pharmaceutical plants ■ Helium production and storage ■ Semiconductor facilities ■ Laboratories and universities	107

N <sub>2</sub> O	O <sub>2</sub>	C <sub>3</sub> H <sub>6</sub>	THC	H <sub>2</sub> O	SO <sub>2</sub>	KEY APPLICATIONS   PORTABLES	PAGE
	%					■ Process monitoring ■ Inerting applications ■ Controlled atmosphere ■ Hazardous area combustion optimization	108
	%					■ Laboratories and research ■ Air separation and gas bottling plants ■ Transfilling ■ Combustion analysis ■ Medical gas verification	108
	%					■ EMAP fresh consumable produce testing ■ Laboratory and research ■ MAP quality testing for food, packaged pharmaceuticals and beverage products	109
	%					■ Physiology studies ■ Universities ■ Combustion optimization	109

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



# MAKE SURE YOUR ANALYZER HAS THE RIGHT CERTIFICATIONS

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

EXAMPLES OF MAJOR INTERNATIONAL CERTIFICATIONS FOR GAS ANALYZERS:



An internationally recognized certification covering two European Directives for controlling explosive atmospheres. ATEX 95 is specifically directed at equipment and systems intended for use in potentially explosive atmospheres. These hazardous atmospheres are divided into zones according to the likely presence of a potentially explosive atmosphere being present in the gas:

- Zone 0 – explosive mixture is continuously present or present for long periods (Class I Division 1 in North America)
- Zone 1 – an explosive mixture is likely to occur in normal operation (Class I Division 1 in North America)
- Zone 2 – an explosive mixture is not likely to occur in normal operation or, if it occurs, will only exist for a short time (Class I Division 2 in North America)

Equipment with official ATEX/Ex approval has been fully tested and found to be intrinsically safe in the intended zone of operation.



Assessments of 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.



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



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. It is based on the European EN 15267 Air Quality standard for certification of automated measuring systems.



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.



## CO<sub>2</sub> CARBON DIOXIDE

A colorless gas, carbon dioxide (CO<sub>2</sub>) has applications in the food, oil, and chemical industries, and is used in many pressurized gas tools.

Monitoring CO<sub>2</sub> is important in many industrial processes for process control and efficiency, while CO<sub>2</sub> emissions are measured by industrial plants to prove compliance with environmental regulations.

Since it is present in air at trace levels, CO<sub>2</sub> is often encountered as a contaminant in high-purity gases, so measurements of very low-level CO<sub>2</sub> must be achieved for this application.

Use pages 12-13 to identify the best CO<sub>2</sub> solution for your process

## CO CARBON MONOXIDE

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

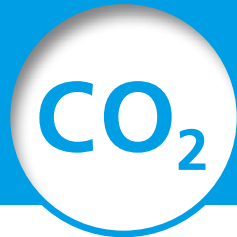
A measurement of CO (along with O<sub>2</sub>) helps to maintain the combustion reaction at an optimum balance, maintaining safety and reducing fuel costs. It may also be monitored to avoid impurities in the production of industrial, medical, and UHP gases.

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

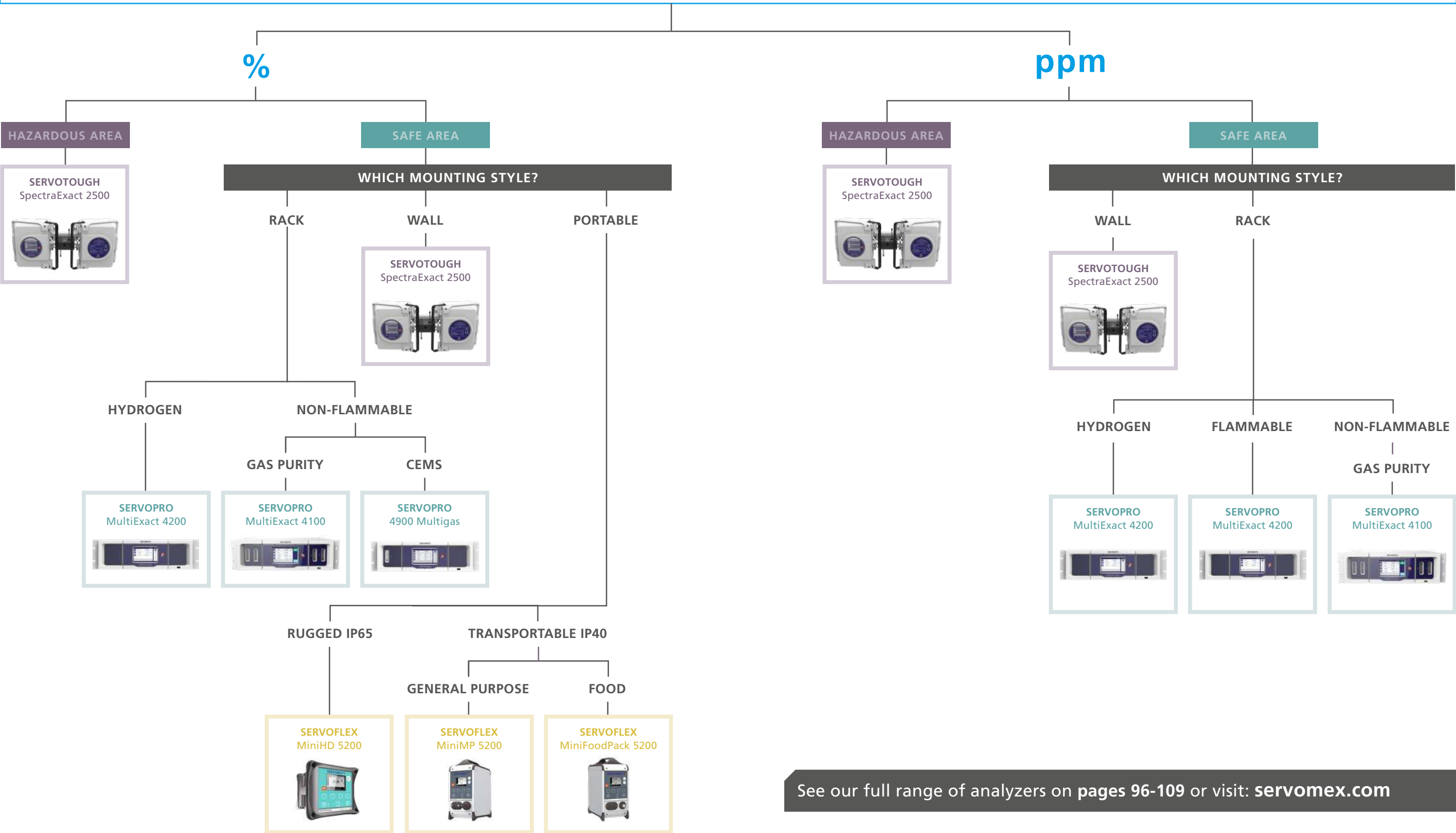
Use pages 14-15 to identify the best CO solution for your process



# CARBON DIOXIDE GAS ANALYZER FINDER



## WHAT LEVEL/RANGE OF CARBON DIOXIDE DO YOU REQUIRE?



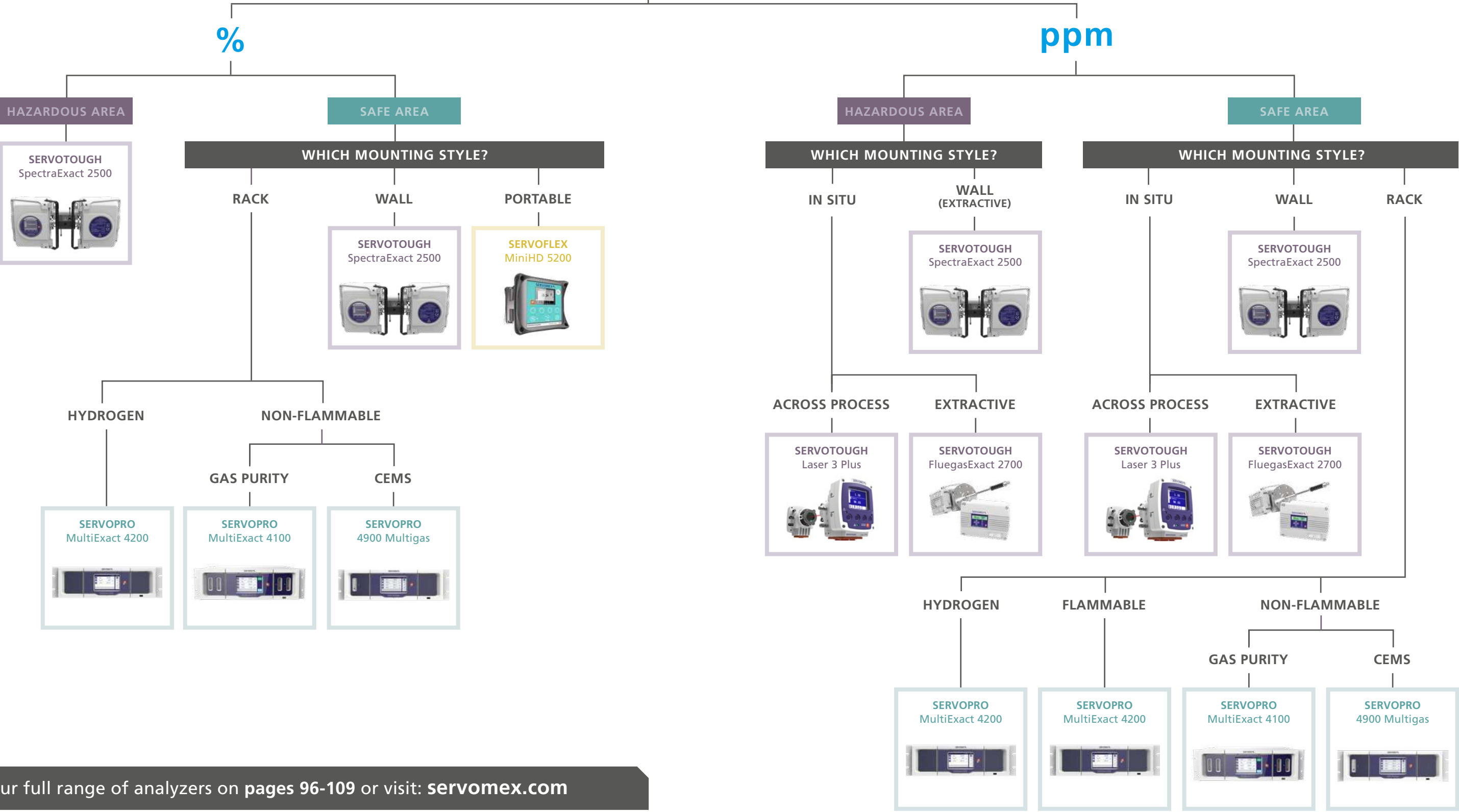
See our full range of analyzers on pages 96-109 or visit: [servomex.com](http://servomex.com)



# CARBON MONOXIDE GAS ANALYZER FINDER



## WHAT LEVEL/RANGE OF CARBON MONOXIDE DO YOU REQUIRE?



See our full range of analyzers on pages 96-109 or visit: [servomex.com](http://servomex.com)



# MAKE SURE YOUR ANALYZER HAS THE RIGHT CERTIFICATIONS

## 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](http://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](http://servomex.com/servotough)

## PORTABLE SERVOFLEX



Mobile analyzers which are usually designed for use in safe areas, but also need to have a robust design in order to cope with being transported to and from each measurement site.

[servomex.com/servoflex](http://servomex.com/servoflex)

## HAZARDOUS AREA ENCLOSURES

Servomex systems offer a range of custom-built enclosures 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.

These have their own lighting and power supply, and provide reliable protection for gas analysis systems and personnel.



Learn more on **page 110** or visit: [servomex.com/systems](http://servomex.com/systems)

# METHANE



Methane (CH<sub>4</sub>) is a hydrocarbon and the primary constituent of natural gas. It is extremely flammable, and can form explosive mixtures with air. Methane is used in many industrial processes, both as a chemical feedstock and as a fuel.

When methane is used in combustion, it is important to measure CH<sub>4</sub> levels in the heater, to ensure safety. Pockets of high methane concentration can form during the process, which

significantly increase 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. Measurement of CH<sub>4</sub> is key to reaction efficiency and safety.

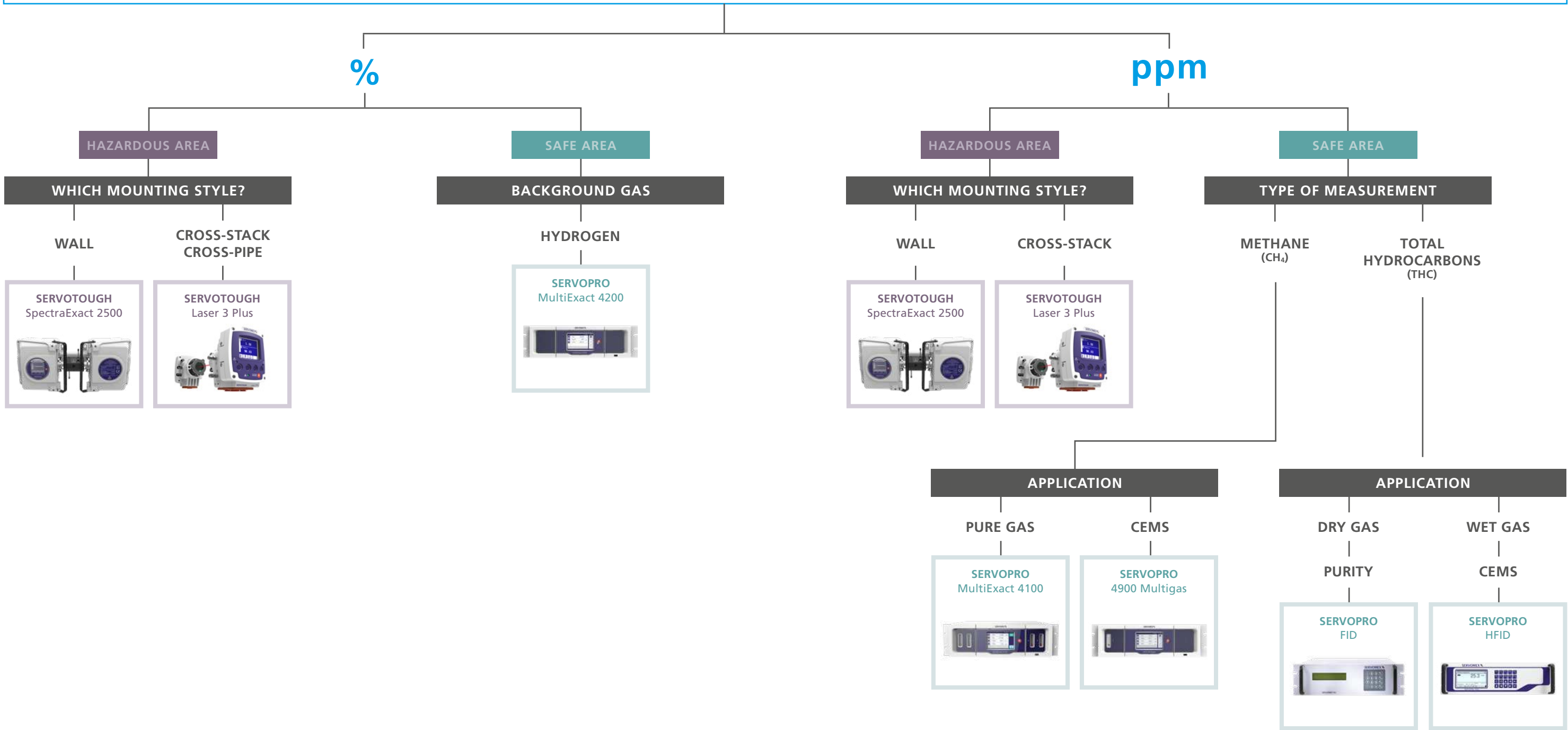
CH<sub>4</sub> reactions are typically difficult to control, so accurate monitoring by a gas analyzer is essential for safety and efficiency.

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

As methane is a greenhouse gas, many industrial processes must be monitored to ensure CH<sub>4</sub> emissions do not exceed environmental regulatory limits.

Use pages **18-19** to identify the best CH<sub>4</sub> solution for your process

## WHAT MEASUREMENT/RANGE DO YOU REQUIRE?



See our full range of analyzers on pages 96-109 or visit: [servomex.com](http://servomex.com)



# CHOOSING THE RIGHT GAS ANALYZER SUPPLIER

Picking the wrong gas analyzer supplier can cause problems from the outset, while the right choice can ensure smooth installation and many years of successful analyzer operation.



KEY FACTORS TO LOOK OUT FOR:

EXPERTISE

A supplier with deep applications knowledge will understand the challenges you need to overcome, finding the best solution for your process – or creating a bespoke one if necessary.

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?

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.

SUPPORT

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

# OXYGEN



Oxygen (O<sub>2</sub>) makes up approximately 21% of the Earth's atmosphere. Colorless and odorless, it is essential to human life, and so is vital to many medical gas applications. It also has a wide variety of industrial uses, including the production of metals and plastics. Oxide compounds are used in many processes so, in many applications, O<sub>2</sub> measurements are key to process control, safety, and efficiency.

While O<sub>2</sub> is not harmful to the environment, O<sub>2</sub> emissions may need to be monitored as part of a continuous emissions monitoring system. A number of sensing technologies are available to measure O<sub>2</sub>, and the most appropriate solution depends on the application. For example, Paramagnetic sensing is a long-proven method of measuring percentage O<sub>2</sub> and is ideal for many industrial

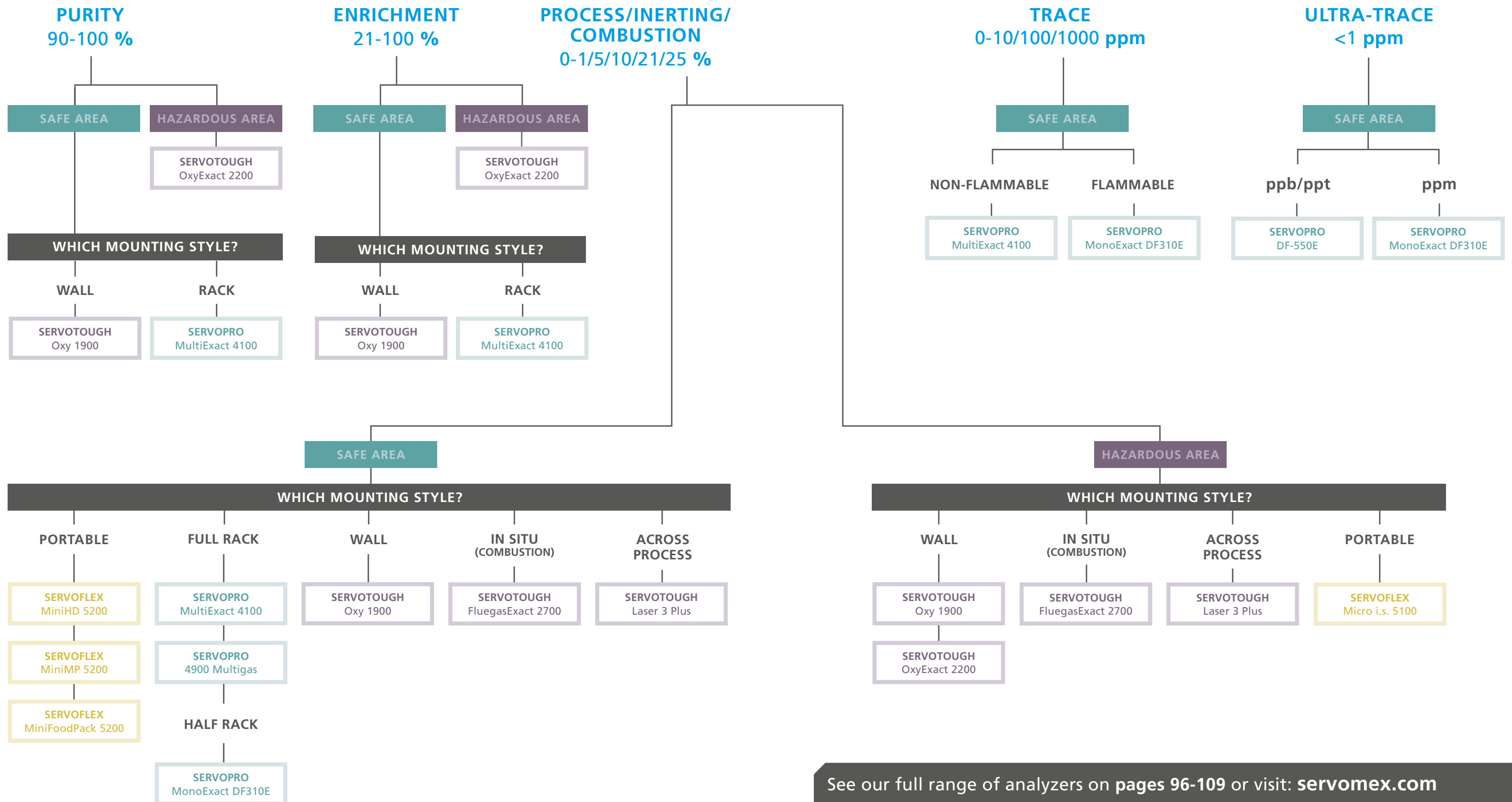
processes, as well as life safety monitoring. Zirconia provides a trusted, in-situ ppm measurement for combustion applications – O<sub>2</sub> measurements are essential to controlling the combustion reaction. O<sub>2</sub> is often found as a contaminant in high-purity gases such as nitrogen and argon, so a Coulometric sensor offers excellent ultra-trace detection of O<sub>2</sub> down to ppt concentrations.

Use pages 22-23 to identify the best O<sub>2</sub> solution for your process

# OXYGEN GAS ANALYZER FINDER

O<sub>2</sub>

## WHAT LEVEL/RANGE OF OXYGEN DO YOU REQUIRE?



See our full range of analyzers on pages 96-109 or visit: [servomex.com](http://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
Ultra-high-purity gases and semiconductors	SERVOPRO DF-560E NanoTrace ULTRA, SERVOPRO DF-750 NanoTrace ULTRA, SERVOPRO NanoChrome ULTRA, SERVOPRO NanoTrace FTIR
Clean air	SERVOTOUGH FluegasExact 2700, SERVOTOUGH Laser 3 Plus Combustion, SERVOTOUGH Laser 3 Plus Environmental, SERVOPRO 4900 Multigas, SERVOPRO NOx
Carbon capture – pre-combustion	SERVOPRO 4900 Multigas, SERVOTOUGH SpectraExact 2500, SERVOPRO AquaXact 1688, SERVOPRO MultiExact 4100, SERVOTOUGH Oxy 1900
Carbon capture – post-combustion	SERVOPRO 4900 Multigas, SERVOTOUGH SpectraExact 2500, SERVOPRO DF-745 SGMax, SERVOPRO AquaXact 1688, SERVOPRO MultiExact 4100, SERVOTOUGH Oxy 1900
Carbon capture – oxyfuel combustion	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

GAS ANALYSIS APPLICATION	KEY SERVOMEX SOLUTIONS
Direct reduction iron	SERVOTOUGH Oxy 1900, SERVOPRO 4900 Multigas, SERVOTOUGH SpectraExact 2500, SERVOPRO NOx
Ethylene production	SERVOTOUGH SpectraScan 2400, 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 APPLICATION SOLUTIONS

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

This section highlights just a fraction of the key processes that use our gas analysis products to overcome core application challenges.

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

Our extensive array of sensing technologies ensure we are able to find 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](https://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



**MIKE PROCTOR**  
BUSINESS UNIT DIRECTOR,  
P&S

Mike leads our expert Purity and Specialty team in providing products, knowledge and service to the industrial, medical, UHP and semiconductor gas markets.



**CHEE WEE YAP**  
ASIA SALES DIRECTOR,  
ASIA SITE LEADER

Based in Singapore, Chee Wee oversees our direct and channel sales teams in the region, and manages all Servomex sites and operations in Asia.



**JAN HORDIJK**  
REGIONAL SALES MANAGER

Jan is an expert in our solutions for the Purity & Specialty sector, delivering analytical solutions and applications knowledge to operators in the industrial, medical, and specialty gases markets.



**XIAOWEI ZHAI**  
CHINA SALES MANAGER

Leading our Regional Sales Managers across the country, Xiaowei works closely with our major customers, ensuring our sales teams and engineers work closely with them to drive growth in the markets through applications and product development.



**MATT CHAMBERS**  
HEAD OF ENGINEERING, P&S

Matt leads our engineering team working on product ranges and systems for the Purity & Specialty sector, driving analyzer lifecycles from design to manufacture, and delivering reliable, accurate, and easy-to-use products.

Get in touch to learn more: [servomex.com/ps](https://servomex.com/ps)



# AIR SEPARATION UNIT (ASU) APPLICATIONS



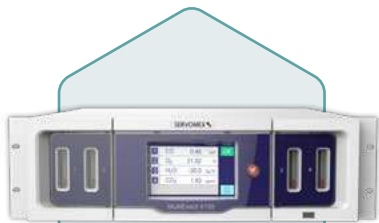
Critical for ASU applications is improving process control, safety, and product quality.

The ASU separates atmospheric air into pure gaseous nitrogen, oxygen and argon. Further separation is required for quantities of noble gases such

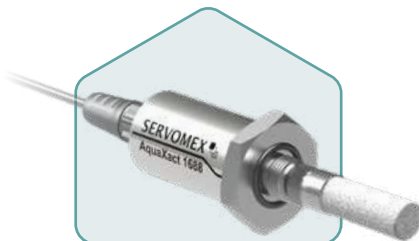
as neon, krypton and argon. Accurate gas compositional analysis is essential to ensure purity across the air separation process.

Maintenance of product purity is essential between the separation process and product

transportation by pipeline or vehicle. This requires highly accurate trace measurements for a range of impurities to ensure that quality is maintained at the highest possible standards.



SERVOPRO MultiExact 4100

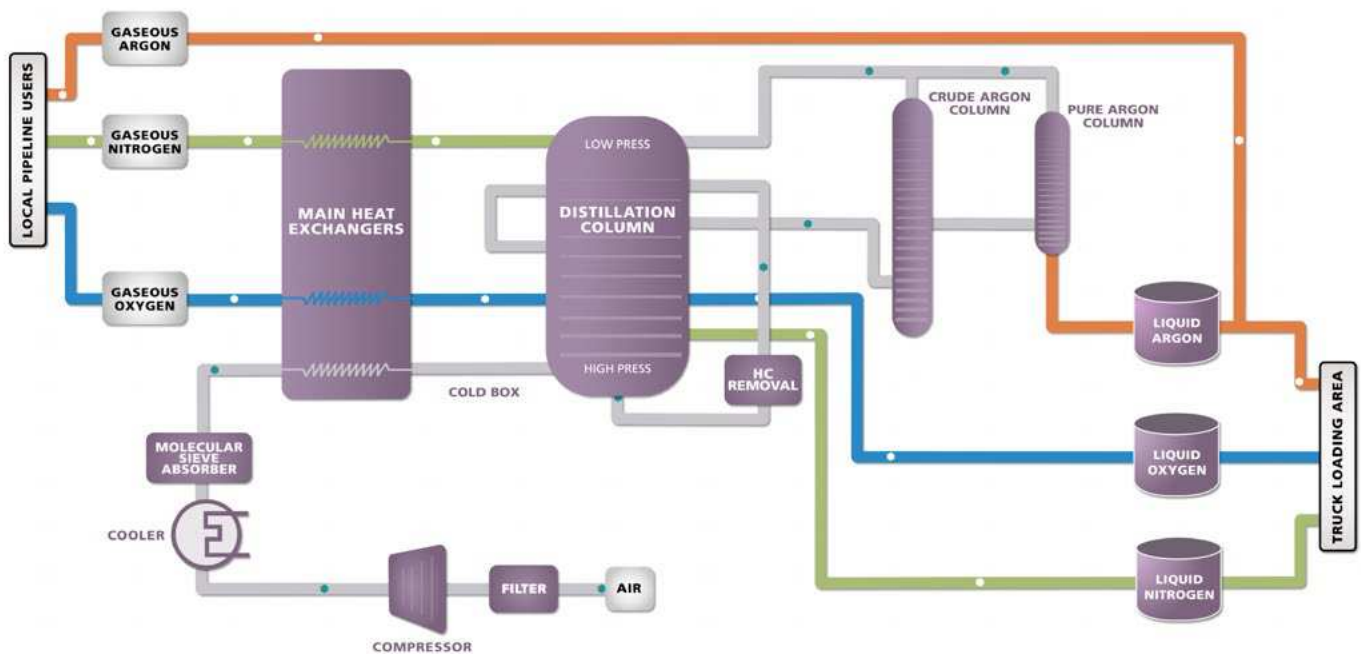


SERVOPRO AquaXact 1688



SERVOPRO Chroma

## ASU PROCESS



## KEY SOLUTIONS

Our broad range of analytical solutions provide continuous, reliable analysis throughout the process. Solutions including the SERVOPRO MultiExact 4100 multigas analyzer, SERVOPRO AquaXact 1688 moisture sensor, and the versatile SERVOPRO Chroma provide the complete application measurements required to control the process, ensure product purity and guarantee plant safety.



Find out more: [servomex.com/asu](https://servomex.com/asu)



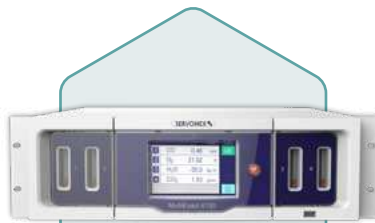
# MEDICAL GASES

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

For example, under European Pharmacopeia (EP) rules, medical oxygen (O<sub>2</sub>) requires an assay measurement to ensure O<sub>2</sub> purity is better than 99.5%, and impurity measurements of carbon monoxide (CO) and carbon dioxide (CO<sub>2</sub>). The impurities must be less

than 5 parts per million (ppm) of CO and less than 300ppm of CO<sub>2</sub>.

Our 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

## KEY SOLUTIONS

An advanced solution for purity assay and impurity detection, the SERVOPRO MultiExact 4100 offers a combined solution for all three 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<sub>2</sub> reading, and a customized Infrared Gas Filter Correlation (Gfx) sensor for CO and CO<sub>2</sub>.



Find out more: [servomex.com/medical-gases](https://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 the use of ultra-pure gases. Even the smallest

impurities can cause major defects in a wafer, leading to costly scrap and waste.

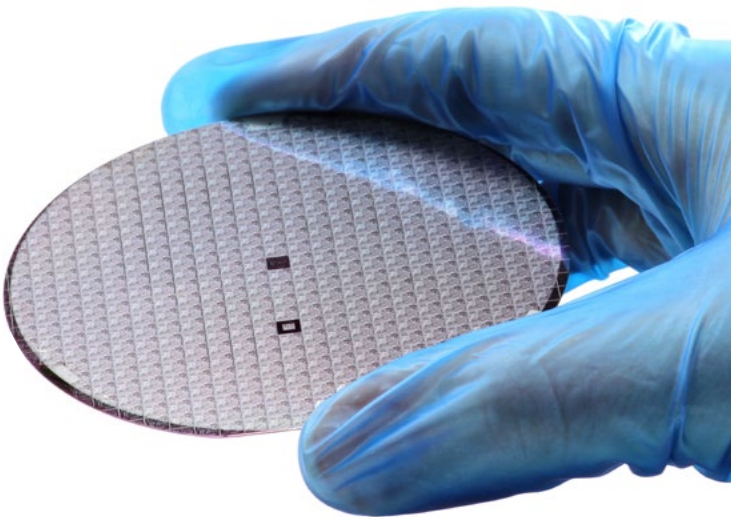
Multiple gas purification techniques and other strict procedures are used to ensure that UHP gases are delivered to the manufacturing process.

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.

## KEY SOLUTIONS

We provide a single-supplier solution for all UHP measurements in these applications. Our SERVOPRO DF-560E and SERVOPRO 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 THE ULTRA SERIES VIDEO



SERVOPRO DF-560E  
NanoTrace ULTRA



SERVOPRO DF-750  
NanoTrace ULTRA



SERVOPRO  
NanoChrome ULTRA



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. Installation and commissioning took place in 2020 and the gas analysis systems are now undergoing final testing prior to completion and handover. The client has already recommended the Laser 3 Plus analyzer for use in its future projects.



Find out more at: [servomex.com/l3pluscombustion](https://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



**SANGWON PARK**  
BUSINESS UNIT DIRECTOR,  
IP&E

Sangwon oversees application development, project management and engineering for our solutions in the power generation, HP, and emissions monitoring sectors.



**KAREN GARGALLO**  
APPLICATIONS  
MANAGER

Karen is responsible for managing the UK Application team, using the team's expertise and capabilities to make customer processes safer, more efficient, and cleaner.



**HUIYU GUAN**  
BUSINESS DEVELOPMENT MANAGER,  
IP&E, CHINA

Overseeing the business development operations of our IP&E team in China, Huiyu leads our pursuit of large international projects.



**AFZAL KHAN**  
GENERAL MANAGER,  
MIDDLE EAST

Based in our UAE business center, Afzal oversees our sales operations in the Middle East, leading our expert team in providing products and applications knowledge to industries working in the power generation, hydrocarbon processing and emissions monitoring markets.



**RHYS JENKINS**  
IP&E PRODUCT MANAGER,  
SPECTROSCOPIC ANALYZERS

Leading the life-cycle management of our Spectroscopic analyzer range, Rhys is responsible for the development of the markets they serve, and the strategic growth of those technologies.



**KEITH WARREN**  
PRODUCT  
MANAGER

Responsible for managing our oxygen analyzers in the IP&E sector, Keith has been working with gas analysis solutions for more than 20 years.

Get in touch to learn more: [servomex.com/ipe](https://servomex.com/ipe)



# CLEAN AIR

SOLUTIONS

As the global expert in gas analysis, Servomex plays a major role in helping a wide range of industries achieve their clean air goals. Our three-phase strategy focuses on the key process areas, working to reduce emissions and mitigate the damage caused by harmful pollutants.

PHASE ONE

PHASE TWO

PHASE THREE

## COMBUSTION EFFICIENCY

Controlling this important process reaction reduces emissions of key pollutants, including NO<sub>x</sub>, SO<sub>x</sub>, carbon monoxide (CO) and carbon dioxide (CO<sub>2</sub>), lowers fuel consumption, and improves safety. Accurate measurements of oxygen (O<sub>2</sub>) and combustibles (CO<sub>e</sub>) in the reaction mixture allow the optimum ratio between fuel and air to be achieved.

## GAS CLEANING

This involves the safe removal of harmful substances from process gases that might otherwise be emitted by the plant. Typical applications within this phase include DeNO<sub>x</sub> 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.

## EMISSIONS MONITORING

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

## KEY SOLUTIONS

PHASE ONE

PHASE TWO

PHASE THREE

SERVOTOUGH FluegasExact 2700: measuring O<sub>2</sub> and CO<sub>e</sub> in flue gases for improved combustion efficiency and reduced emissions

SERVOTOUGH Laser 3 Plus Combustion: measures either O<sub>2</sub> or CO, and can be configured for a joint measurement of CO and CH<sub>4</sub> for safety.

SERVOTOUGH Laser 3 Plus Environmental: for ammonia slip, monitors NH<sub>3</sub> with an average signal across the duct, for accuracy despite uneven flow conditions

SERVOPRO 4900 Multigas: for flue gas desulfurization, measures SO<sub>2</sub> in real-time, accurate to very low levels.

SERVOPRO 4900 Multigas: for continuous emissions monitoring, can monitor four gas streams simultaneously, measuring from a choice of O<sub>2</sub>, CO<sub>2</sub>, CO, SO<sub>2</sub>, NO, CH<sub>4</sub> and N<sub>2</sub>O

SERVOPRO NO<sub>x</sub>: uses non-depleting Chemiluminescence detection technology to measure NO or NO/NO<sub>2</sub>/NO<sub>x</sub> concentrations.



Watch the video at: [servomex.com/cleanair](https://servomex.com/cleanair)



PRE-COMBUSTION CARBON CAPTURE

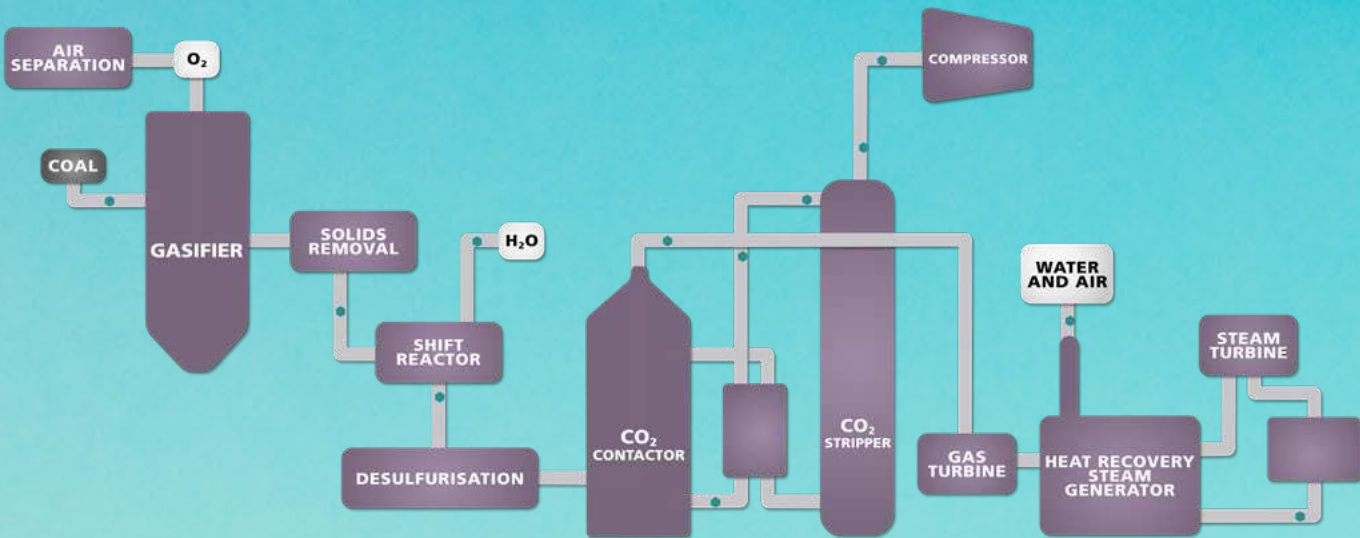
Carbon capture and storage (CCS) technologies are used to collect carbon dioxide (CO<sub>2</sub>) emissions from power plants and heavy industry, in order to reduce the amount of CO<sub>2</sub> that enters the atmosphere.

Pre-combustion capture removes CO<sub>2</sub> before the combustion of the fuel, and requires a carbonaceous fuel to be broken down into hydrogen (H<sub>2</sub>) and carbon monoxide (CO), a mixture known as syngas.

For high-efficiency CO<sub>2</sub> capture, the syngas has to be 'shifted' after it is cleaned, yielding heat and a gas stream with high CO<sub>2</sub> and H<sub>2</sub> concentrations.

The CO<sub>2</sub> can then be removed with chemical and physical solvents, adsorbents, and membranes. CO<sub>2</sub> traces can be present in the H<sub>2</sub> stream.

The technology to capture CO<sub>2</sub> from the syngas generated in a gasifier has been used for decades in other applications, for example H<sub>2</sub>, NH<sub>3</sub> and synthetic fuel production. Also, the reforming and partial oxidation of natural gas are already widely applied, for example in the production of H<sub>2</sub> in the NH<sub>3</sub> production process.



PROCESS MEASURING POINTS

INSTALLATION LOCATION	GAS MEASURED	MEASURING RANGE	APPLICATION	SERVOMEX ANALYZER
Flue gas to stack	CO <sub>2</sub> NO <sub>x</sub> O <sub>2</sub> SO <sub>2</sub>	5/10% 500 ppm 25% 100/2,000 ppm	Emissions	SERVOPRO 4900 Multigas
CO <sub>2</sub> stream to storage (product)	CO <sub>2</sub> H <sub>2</sub> S CO SO <sub>2</sub>	100% 1-2% 300-4,000 ppm 100 ppm	Quality	SERVOTOUGH SpectraExact 2500 SERVOPRO AquaXact 1688
Pipeline/ temporary storage	CO <sub>2</sub> H <sub>2</sub> S H <sub>2</sub> O O <sub>2</sub>	4% 100 ppm 70 ppm 21%	Safety	SERVOTOUGH SpectraExact 2500 SERVOPRO MultiExact 4100
CO <sub>2</sub> storage	CO <sub>2</sub> O <sub>2</sub>	4% 21%	Safety	SERVOTOUGH Oxy 1900 SERVOTOUGH SpectraExact 2500 SERVOPRO MultiExact 4100



Watch our carbon capture application video: [servomex.com/ccs](https://servomex.com/ccs)



POST-COMBUSTION CARBON CAPTURE

Carbon dioxide (CO<sub>2</sub>) can be captured from the flue gas resulting from a combustion process. This can be flue gas coming from any pressurized combustion in a boiler, gas turbine, or industrial process yielding CO<sub>2</sub>.

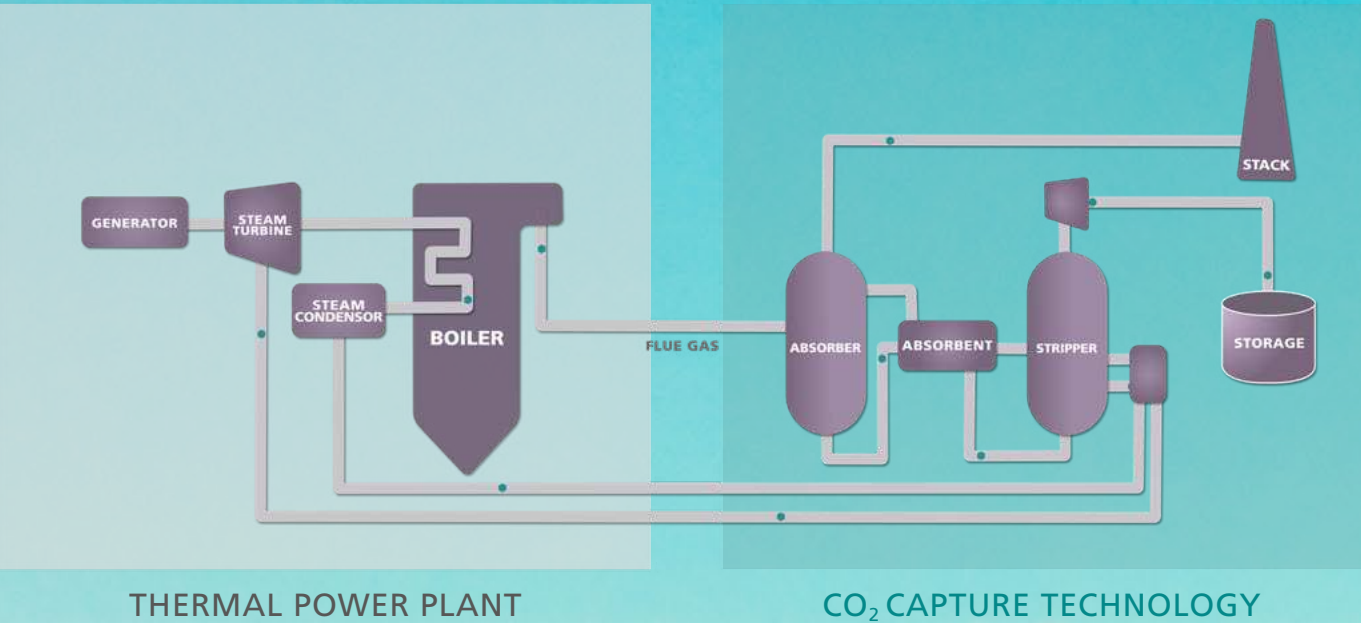
Typically, the flue gas is first cleaned, with trace components like sulfur dioxide (SO<sub>2</sub>) and hydrogen chloride (HCl) being removed to prevent

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<sub>2</sub> is captured from the flue gas, the inert gases, for example nitrogen (N<sub>2</sub>), oxygen (O<sub>2</sub>) and argon (Ar) in the flue gas are vented to the atmosphere.

Traces of CO<sub>2</sub> will be present in the vented gas due to the efficiency of the capture process being less than 100%.

The focus of research, design and development in post-combustion capture is aimed at reducing energy requirement and capital cost through developing and adapting solvents, optimizing the required process installations, and integrating the capture system within the process.



PROCESS MEASURING POINTS

INSTALLATION LOCATION	GAS MEASURED	MEASURING RANGE	APPLICATION	SERVOMEX ANALYZER
Flue gas from power plant	CO <sub>2</sub> CO NO <sub>x</sub> O <sub>2</sub> SO <sub>2</sub> H <sub>2</sub> O	20% 500/3,000 ppm 500/3,000 ppm 25% 100/2,000 ppm 30%	Emissions	SERVOPRO 4900 Multigas SERVOTOUGH SpectraExact 2500
CO <sub>2</sub> stream capture/product	CO <sub>2</sub> SO <sub>2</sub> H <sub>2</sub> O	100% 100 ppm 70 ppm	Quality	SERVOTOUGH SpectraExact 2500 SERVOPRO DF-745 SGMax SERVOPRO AquaXact 1688 SERVOPRO MultiExact 4100
Lean absorbent stream from CO <sub>2</sub> stripper	CO <sub>2</sub> (slip)	1%/10%	Process control	SERVOTOUGH SpectraExact 2500 SERVOPRO MultiExact 4100
Pipeline/temporary storage	CO <sub>2</sub> H <sub>2</sub> S H <sub>2</sub> O O <sub>2</sub> NH <sub>3</sub>	4% 100 ppm 70 ppm 21% 10 ppm	Safety	SERVOTOUGH SpectraExact 2500 SERVOPRO MultiExact 4100 SERVOPRO DF-745 SGMax SERVOPRO AquaXact 1688
Flue gas to stack	CO <sub>2</sub> CO NO <sub>x</sub> O <sub>2</sub> SO <sub>2</sub>	5% 100/1,000 ppm 500 ppm 25% 100/2,000 ppm	Emissions	SERVOPRO 4900 Multigas
CO <sub>2</sub> storage	CO <sub>2</sub> O <sub>2</sub>	4% 21%	Safety	SERVOTOUGH Oxy 1900 SERVOTOUGH SpectraExact 2500 SERVOPRO MultiExact 4100



Watch our carbon capture application video: [servomex.com/ccs](https://servomex.com/ccs)



OXYFUEL COMBUSTION CARBON CAPTURE

Oxyfuel combustion is based on denitrification of the combustion medium. The nitrogen is removed from the air through a cryogenic air separation unit (ASU) or with the use of membranes.

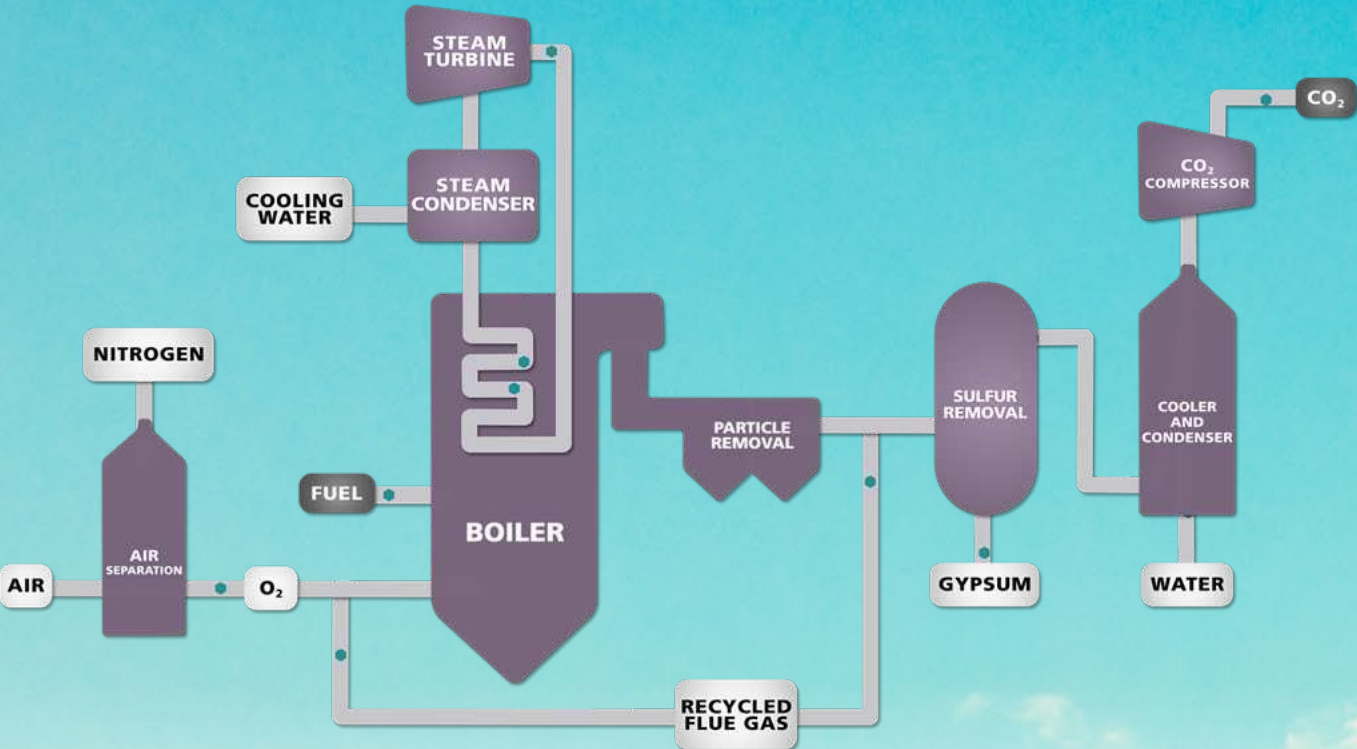
Combustion thus takes place with nearly pure oxygen, and the resultant flue gas contains mainly CO<sub>2</sub> and water. Trace components like oxides of nitrogen (NO<sub>x</sub>) and

SO<sub>2</sub> may be present. The CO<sub>2</sub> is purified by removing water and impurities.

Remaining small amounts of N<sub>2</sub>, O<sub>2</sub> and Ar are vented off, but may contain traces of CO<sub>2</sub>. The production of O<sub>2</sub> 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<sub>2</sub> stream also requires energy.

The combustion with O<sub>2</sub> 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 <sub>2</sub> stream (ASU)	O <sub>2</sub>	100%	Quality	SERVOTOUGH Oxy 1900 SERVOPRO MultiExact 4100
Combustion control	CO O <sub>2</sub>	1000 ppm 50%	Process control	SERVOTOUGH Laser 3 Plus SERVOTOUGH FluegasExact 2700 (modified)
Flue gas	CO <sub>2</sub> CO NO <sub>x</sub> O <sub>2</sub> SO <sub>2</sub>	80% 500/3,000 ppm 500/3,000 ppm 25% 100/2,000 ppm	Process control	SERVOPRO 4900 Multigas
CO <sub>2</sub> stream outlet cooler (product)	CO <sub>2</sub> SO <sub>2</sub> H <sub>2</sub> O O <sub>2</sub>	100% 100 ppm 70 ppm 5%	Quality	SERVOTOUGH SpectraExact 2500 SERVOPRO DF-745 SGMax SERVOPRO AquaXact 1688
Pipeline/ temporary storage	CO <sub>2</sub> H <sub>2</sub> S H <sub>2</sub> O O <sub>2</sub> NH <sub>3</sub>	4% 100 ppm 70 ppm 21% 10 ppm	Safety	SERVOTOUGH SpectraExact 2500 SERVOPRO MultiExact 4100 SERVOPRO DF-745 SGMax SERVOPRO AquaXact 1688
CO <sub>2</sub> storage	CO <sub>2</sub> O <sub>2</sub>	4% 21%	Safety	SERVOTOUGH Oxy 1900 SERVOTOUGH SpectraExact 2500 SERVOPRO MultiExact 4100



Listen to our carbon capture podcast: [servomex.com/ccs](https://servomex.com/ccs)



# DIRECT REDUCTION IRON (DRI)



Accurate gas measurements ensure DRI plants can operate at the highest levels of efficiency, while achieving low emissions targets. 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<sub>2</sub>) is removed from the ore using counterflowing gases with a high hydrogen and carbon monoxide content. This process requires accurate gas monitoring for efficient operation.

Emissions monitoring is also important, as the reaction between the counterflow gases and iron oxide in the ore produces metallic iron, water vapor, and carbon dioxide (CO<sub>2</sub>). The process may generate oxides of nitrogen (NO<sub>x</sub>) which must be continuously monitored to ensure environmental compliance.

## KEY SOLUTIONS

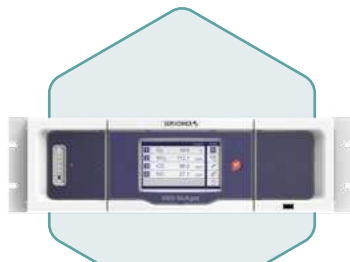
The SERVOTOUGH Oxy 1900 provides essential O<sub>2</sub> monitoring in the DRI process. This industry-leading Paramagnetic O<sub>2</sub> analyzer is designed for hazardous areas. It is supported by the highly flexible SERVOTOUGH SpectraExact 2500 photometric analyzer for the other measurements. The SERVOPRO 4900 Multigas and SERVOPRO NO<sub>x</sub> analyzers provide the required continuous emissions monitoring.



SERVOTOUGH Oxy 1900



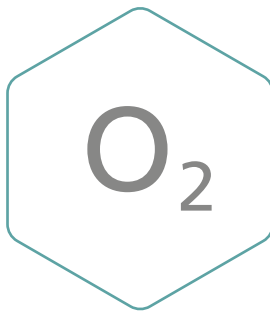
SERVOTOUGH SpectraExact 2500



SERVOPRO 4900 Multigas



SERVOPRO NO<sub>x</sub>



Find out more: [servomex.com/dri](https://servomex.com/dri)



# ETHYLENE PRODUCTION



Rapid, accurate gas analysis supports the safe, efficient operation of ethylene plants, bringing 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. Additionally, it is vital to control gas quality throughout the process in order to ensure a high product yield.

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.

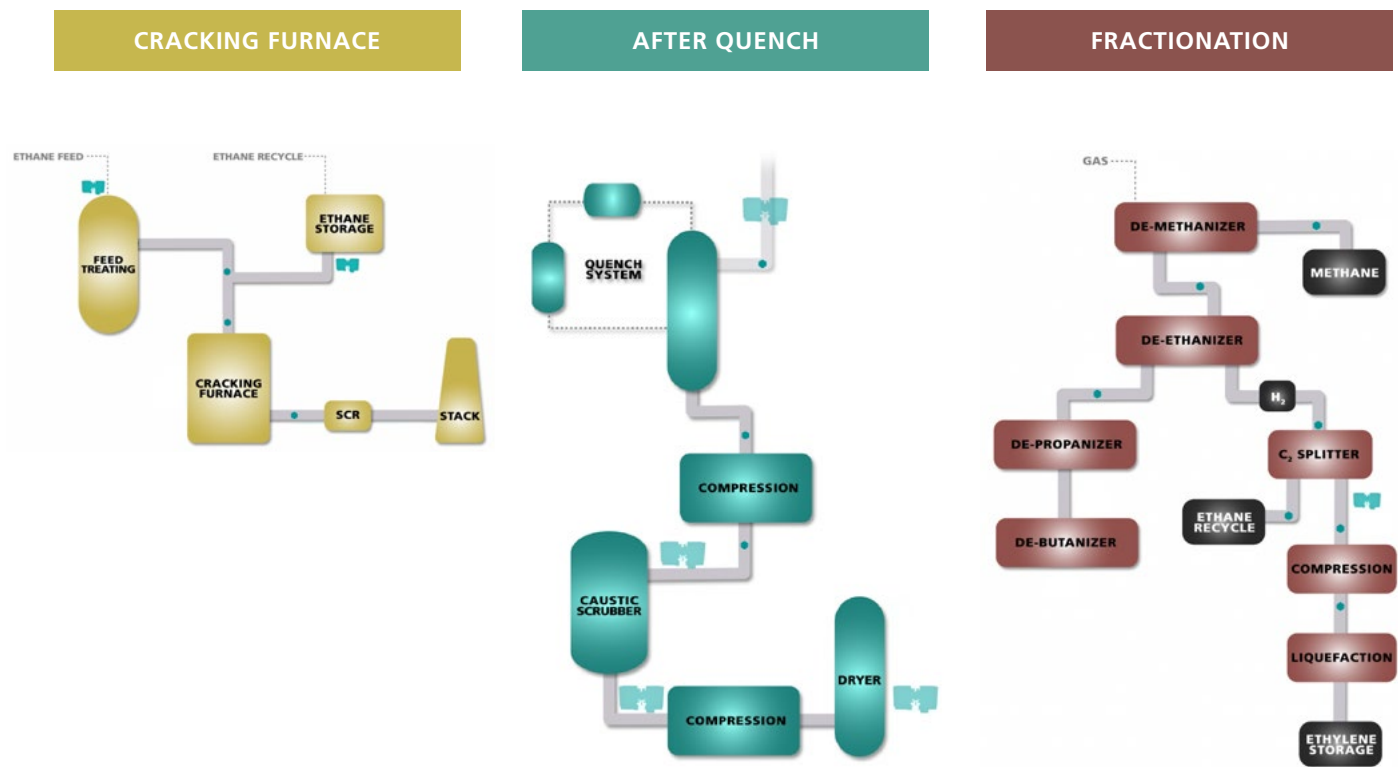


ACCURATE, RELIABLE ANALYSIS OF PROCESS GASES



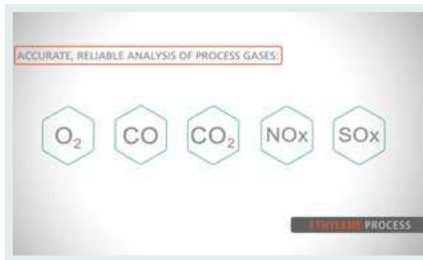
SERVOTOUGH SpectraExact 2500

## THE ETHYLENE PRODUCTION PROCESS



## KEY SOLUTIONS

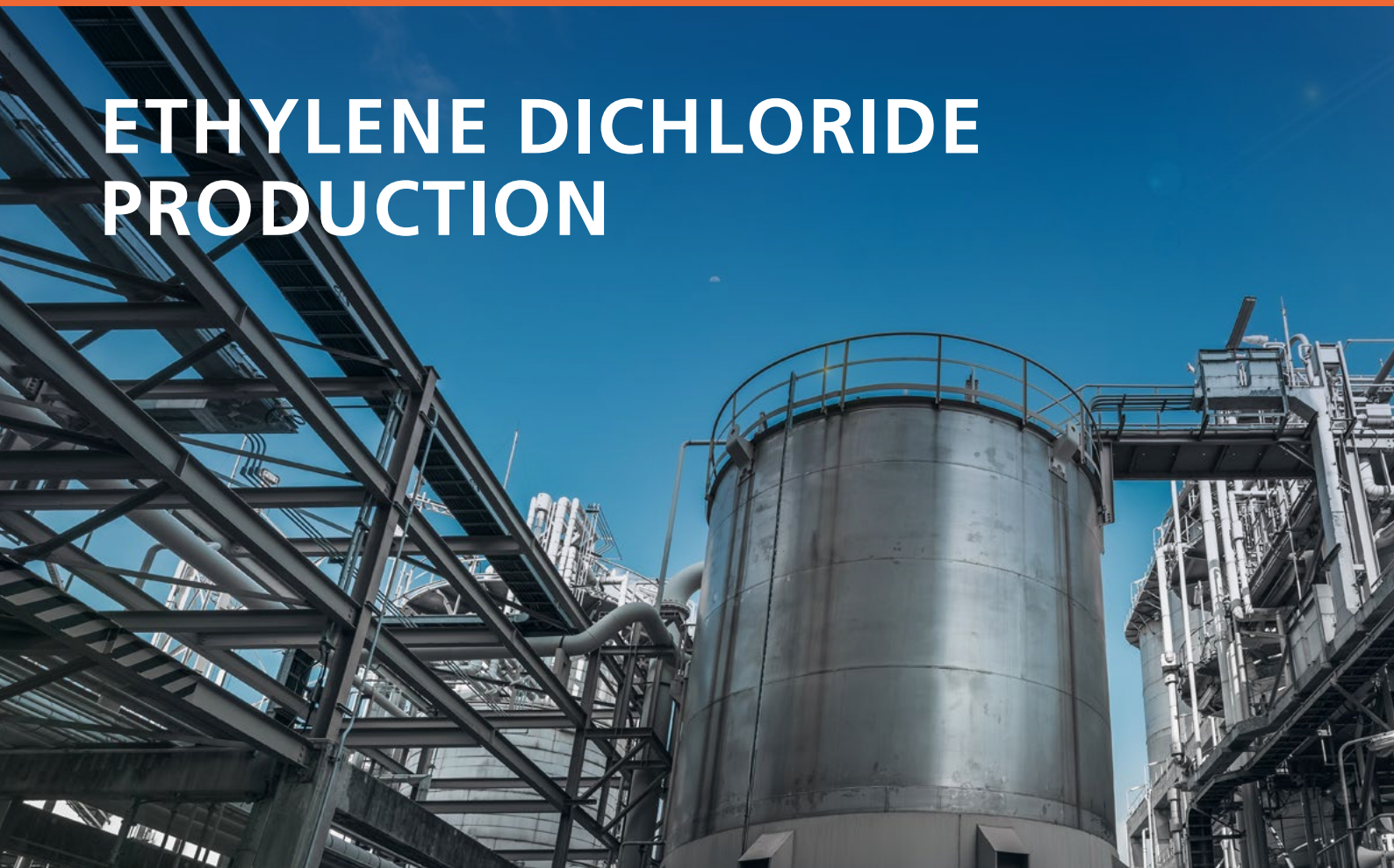
The SERVOTOUGH SpectraExact 2500 analyzer provides the accurate gas quality monitoring at many points throughout the ethylene process require. This allows optimization of the process reactions to ensure greater efficiency, delivering a higher yield and better-quality product. We also supply analytical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



Watch our application video at: [servomex.com/ep](http://servomex.com/ep)



# ETHYLENE DICHLORIDE PRODUCTION



The ethylene-based route to PVC production, using ethylene dichloride (EDC) as an intermediate, is the predominant method globally. Gas analysis is required at several points throughout EDC production, for process control and quality

monitoring. A variety of technologies are required to measure the range of gas components within the process.

Analyzer systems must contend with 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.

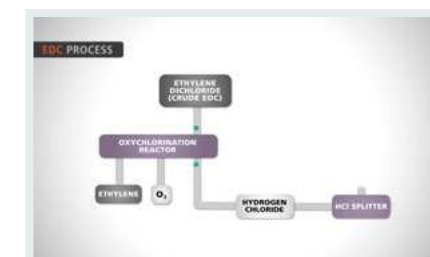
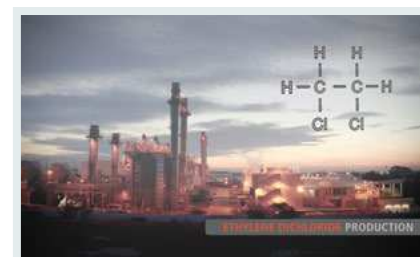
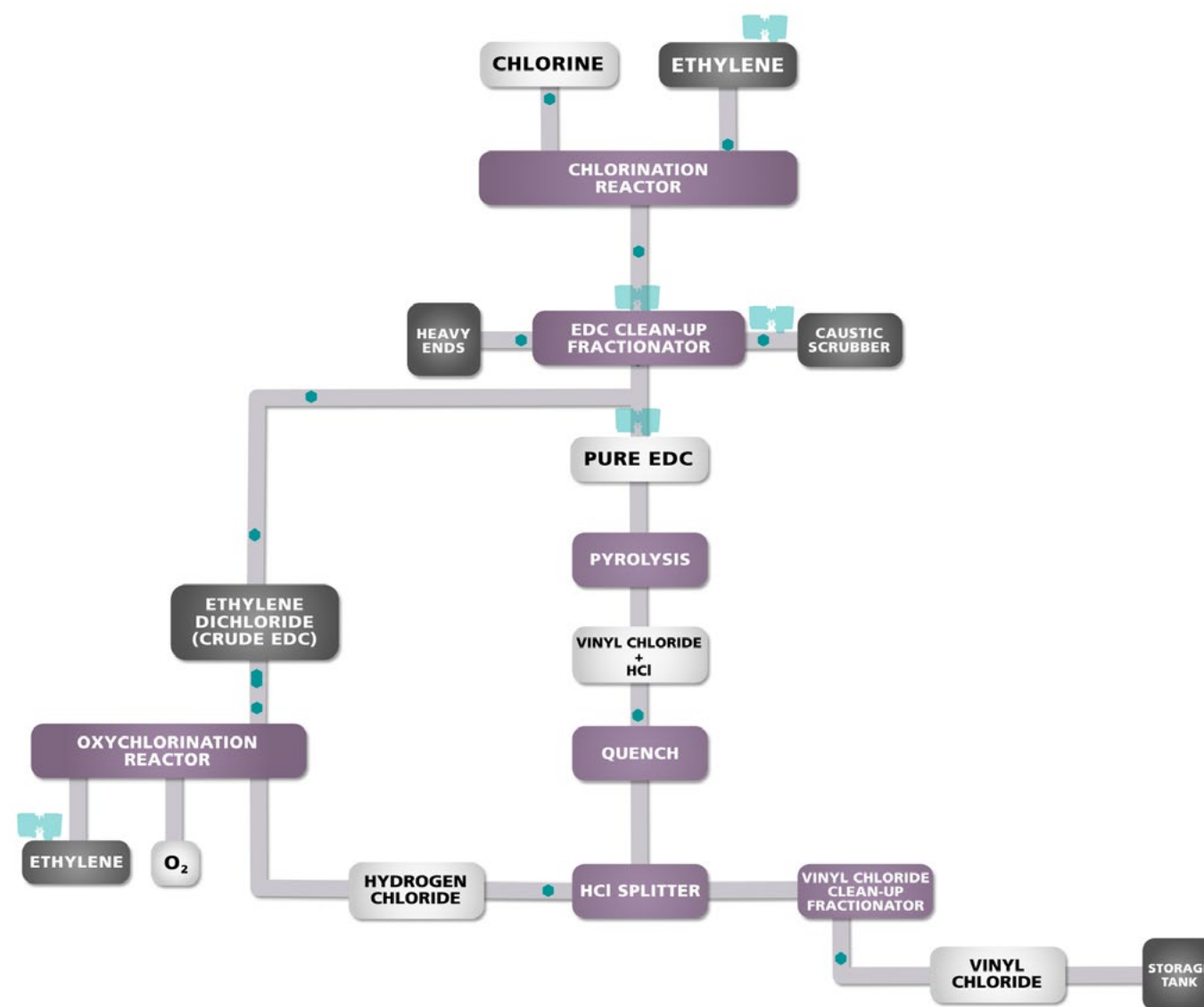


SERVOTOUGH SpectraExact 2500

## 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](http://servomex.com/edc)



# ETHYLENE OXIDE PRODUCTION



The production of ethylene oxide (EO), a versatile chemical building block, relies on precise gas analysis measurements to ensure process safety and high productivity. EO is formed in a reaction between oxygen and ethylene,

and requires highly accurate monitoring of oxygen levels to protect the process against a risk of explosion. Quality and process control measurements are also made to support efficiency.

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

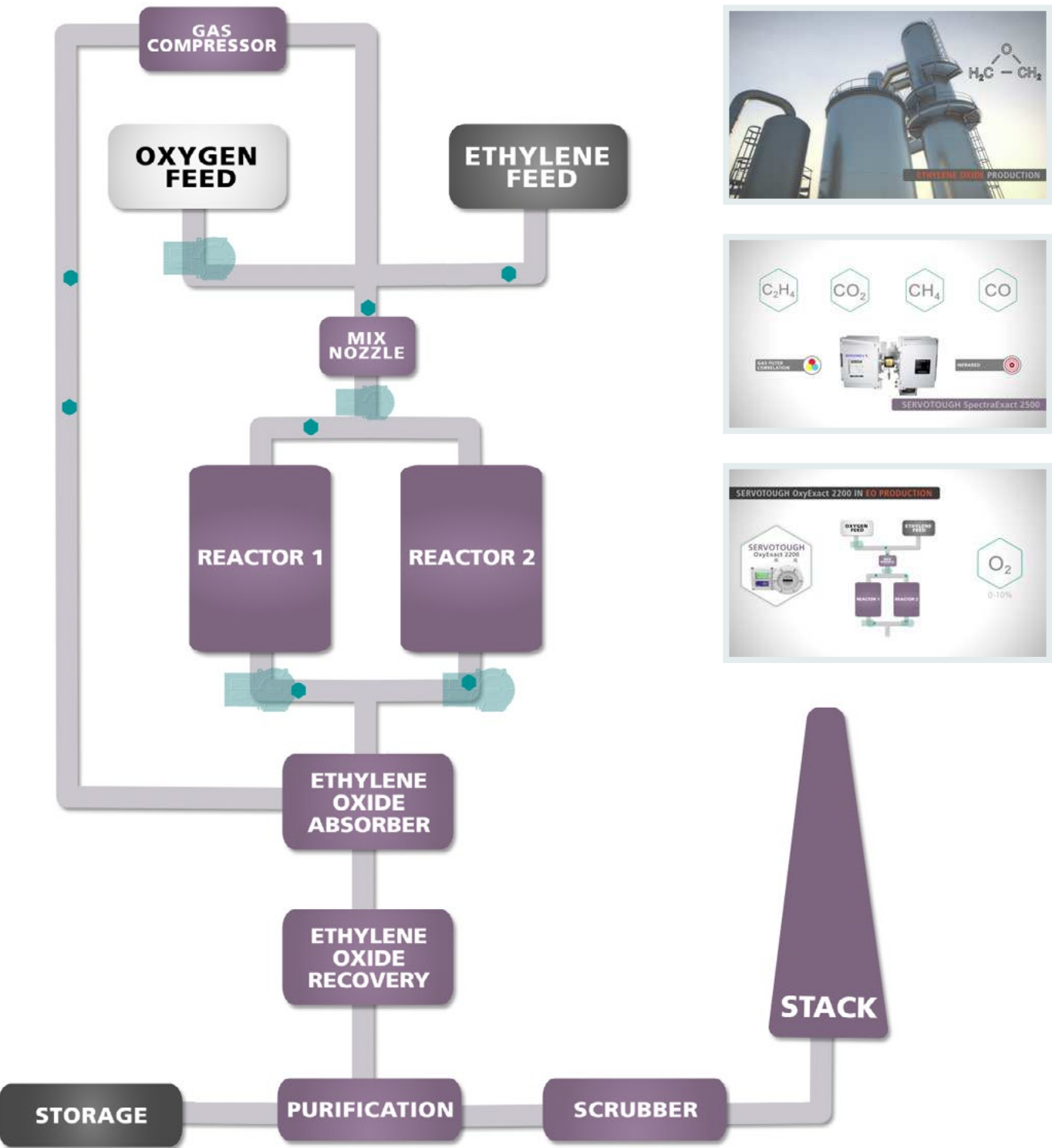


SERVOTOUGH OxyExact 2200

## 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](http://servomex.com/eo)



# HYCO AND HYDROGEN PRODUCTION

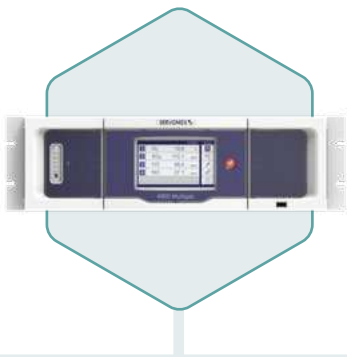
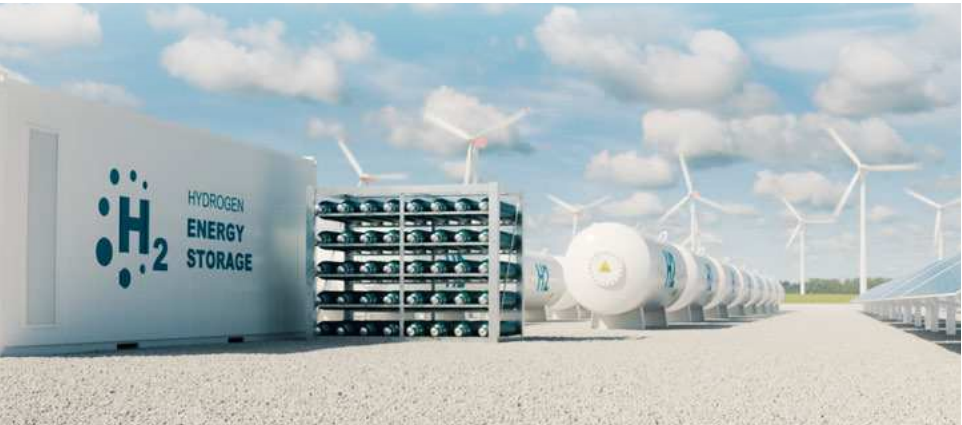
HyCO, also known as syngas, is a synthetic fuel consisting of hydrogen and carbon monoxide. It is most commonly made by converting natural gas in a steam reformer into a mixture of H<sub>2</sub> and CO.

To obtain hydrogen for fuel, the CO is further converted into H<sub>2</sub>

and CO<sub>2</sub> in water-shift reactors, then the CO<sub>2</sub> 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<sub>2</sub>, CO and CO<sub>2</sub>. All three of these can be monitored at percentage levels by the SERVOPRO MultiExact 4200, Servomex's new multi-component analyzer, using a mixture of Paramagnetic, Infrared, and Gas Filter Correlation sensing.

The MultiExact 4200 is capable of measuring 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 percentage CH<sub>4</sub> and ppm-level CO, CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O.



Find out more: [servomex.com/4200](https://servomex.com/4200)



# MARINE VAPOR CONTROL



Strict regulations are in place to control the systems used to monitor marine vapors. These 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.

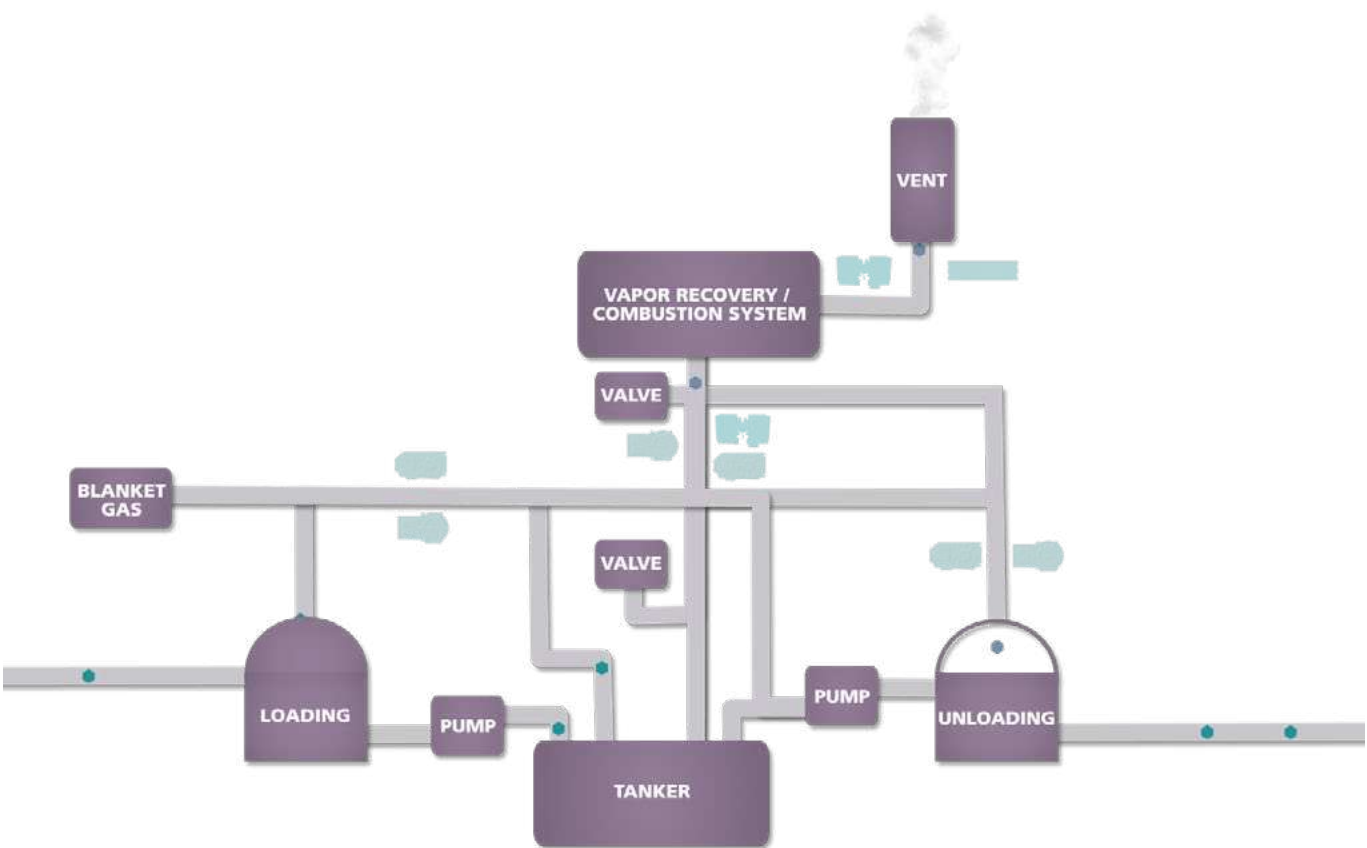


SERVOTOUGH Oxy 1900



SERVOTOUGH OxyExact 2200

## THE MARINE VAPOR CONTROL PROCESS



## KEY SOLUTIONS

Regulations for this application specify at least two Paramagnetic oxygen analyzers, 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](http://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.

Optimization of the air-to-fuel ratio is key to controlling combustion in process heaters and furnaces. Using excess oxygen (air) leads to cooler burning, significantly reducing efficiency and increasing emissions.

However, a low-oxygen, fuel-rich situation is 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



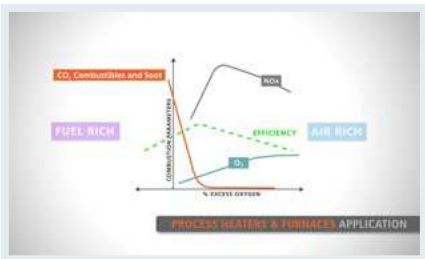
SERVOTOUGH  
Laser 3 Plus Combustion

## 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](https://servomex.com/process-heaters)



# PROPYLENE OXIDE (PO) PRODUCTION



PO is an important intermediate for the manufacture of propylene glycol, which 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 – or, more commonly, through oxidation of propylene with an organic peroxide. Both methods require gas analysis for safety and aquality 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.

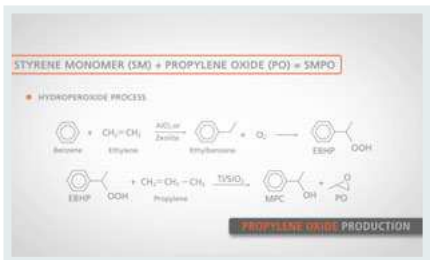
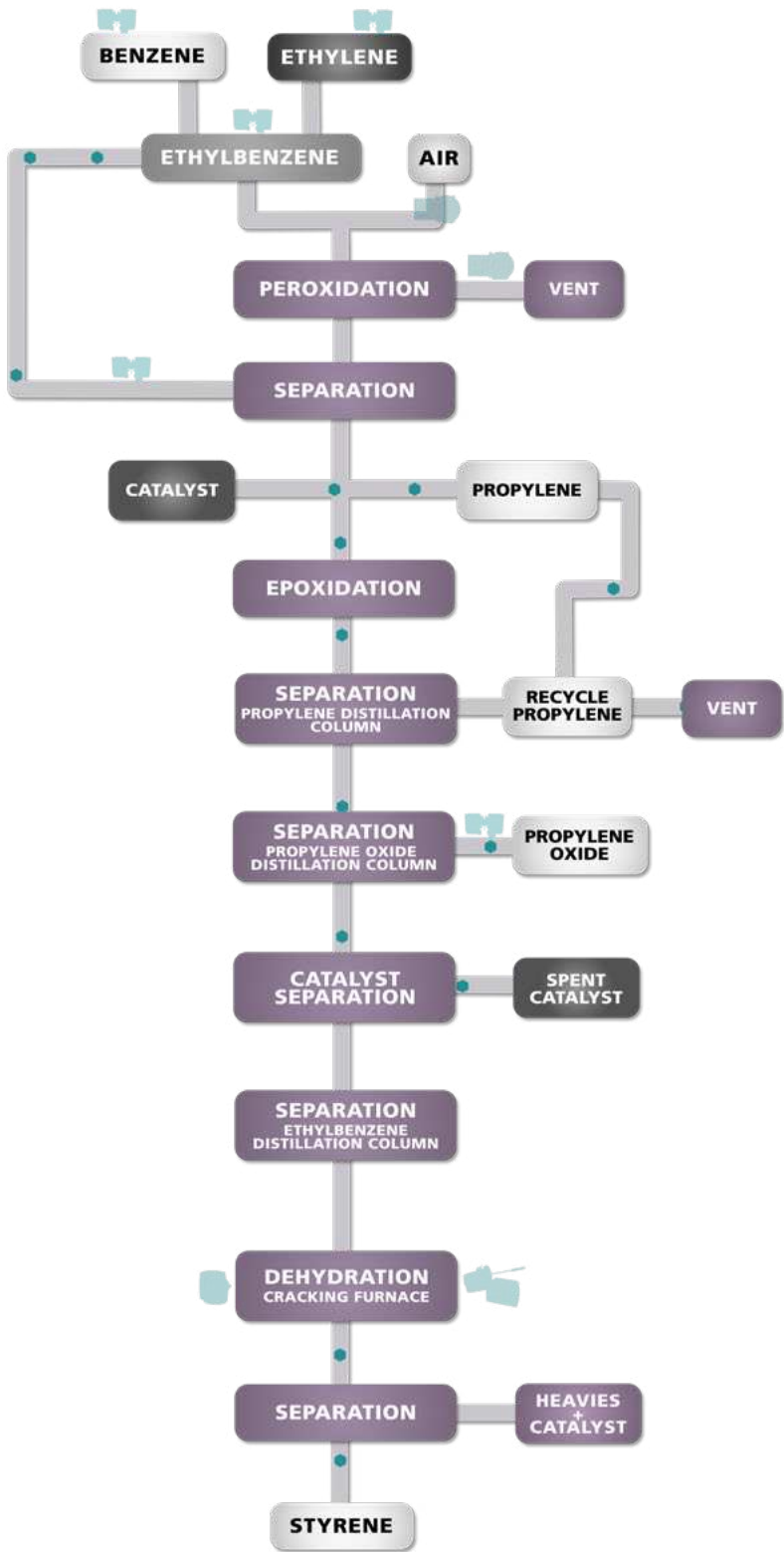


SERVOTOUGH Oxy 1900

## 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](https://servomex.com/po)



# PURIFIED TEREPHTHALIC ACID (PTA) PRODUCTION



The production of PTA requires expert gas analysis for process control, efficiency and safety, as well as quality monitoring and environmental compliance.

Oxygen analysis is critical to maintain safety and support productivity. In addition, some operators use an oxygen

enrichment process on their PTA plants – this requires a specialist oxygen (O<sub>2</sub>) monitoring solution for both safety and efficiency.

The enriched oxygen process involves adding O<sub>2</sub> to the air being fed to the reactors, ensuring a more efficient reaction, reducing catalyst consumption, and

improving reactor performance. Reliable and accurate monitoring is required to maintain the O<sub>2</sub> concentration at the most efficient level while ensuring it does not exceed safe levels.

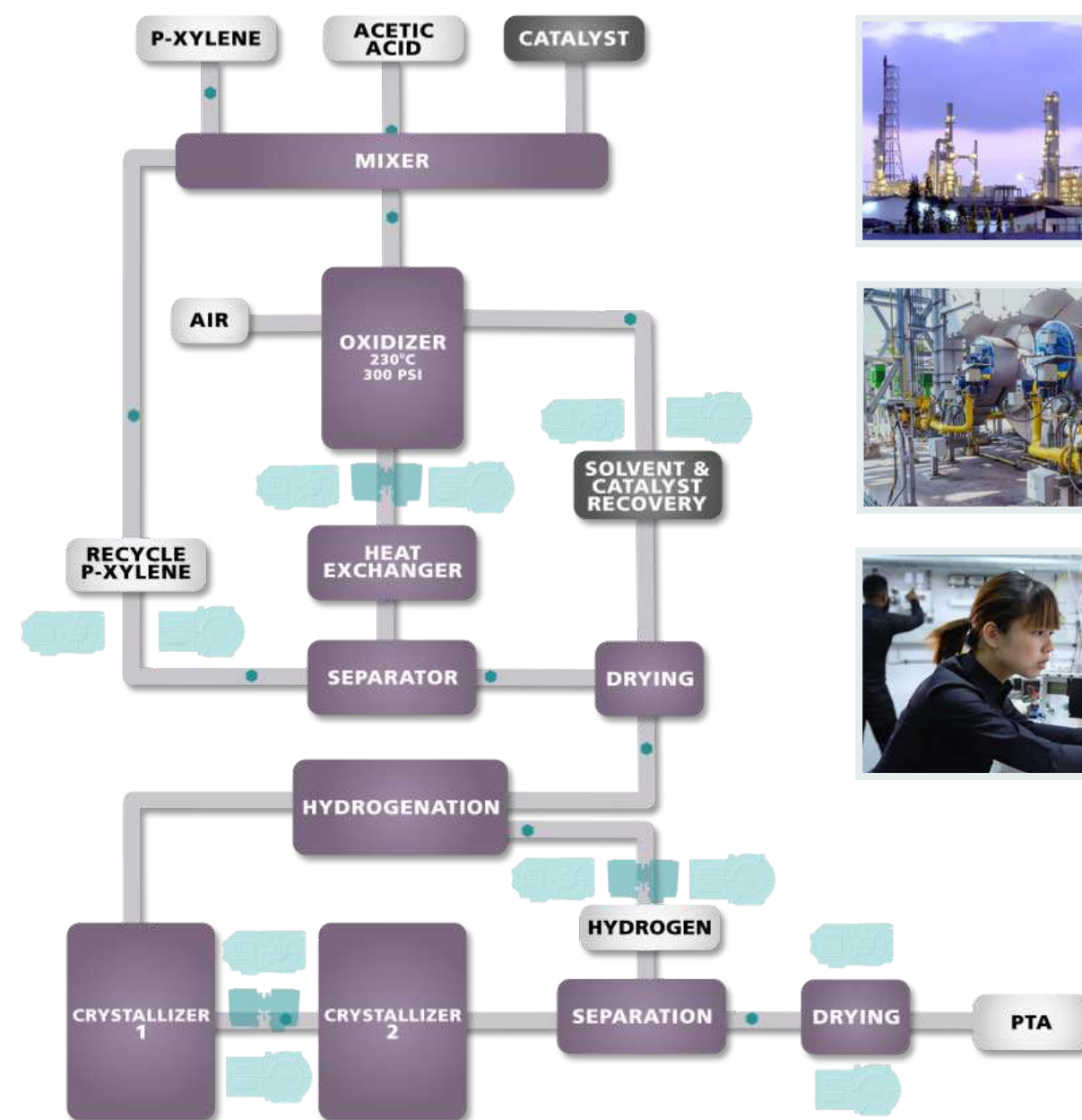


SERVOTOUGH OxyExact 2200

## KEY SOLUTIONS

Servomex's SERVOTOUGH OxyExact 2200 high-specification Paramagnetic oxygen analyzer is able to operate effectively and reliably in hazardous environments, with 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](https://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 demanding industry requires operators to deliver the most efficient process while maintaining safe operation, controlling fuel

costs and meeting stringent targets for emissions. Excess air is needed to ensure complete combustion, but if this excess is too high, combustion efficiency will fall through heat loss. However, 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.

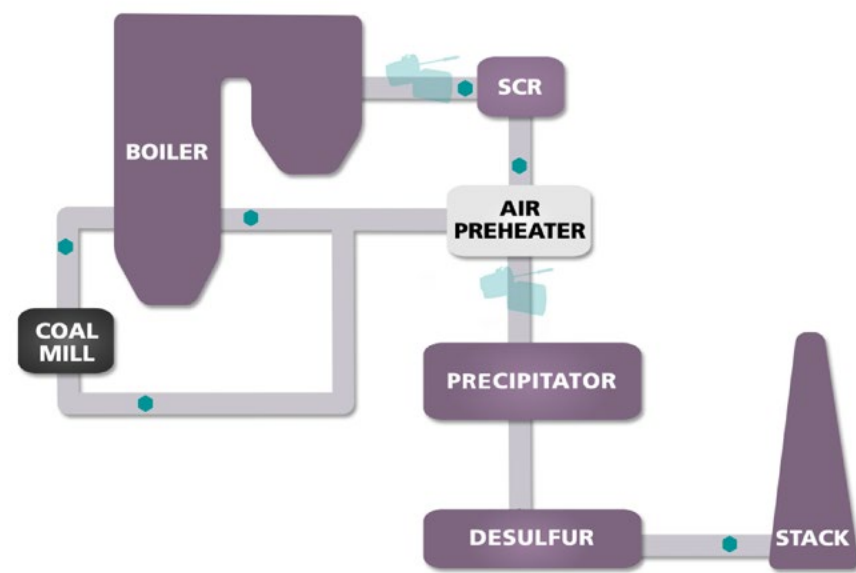


SERVOTOUGH FluegasExact 2700

## 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](http://servomex.com/thermal-power)



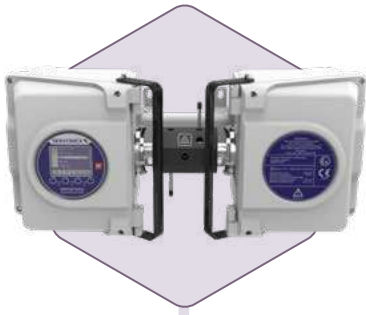
# VINYL CHLORIDE MONOMER (VCM) PRODUCTION



VCM is an important intermediate product for the production of polyvinyl chloride (PVC). It is created by reacting hydrogen and chlorine ( $\text{Cl}_2$ ) together to form hydrogen chloride (HCl), which in turn is combined with acetylene to produce VCM.

Gas analysis measurements are required across the process, including monitoring moisture in the  $\text{Cl}_2$  stream to avoid compressor corrosion, safety measurements for both HCl and  $\text{Cl}_2$ , and oxygen measurements in the acetylene stream.

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

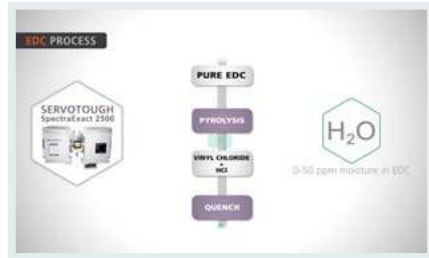
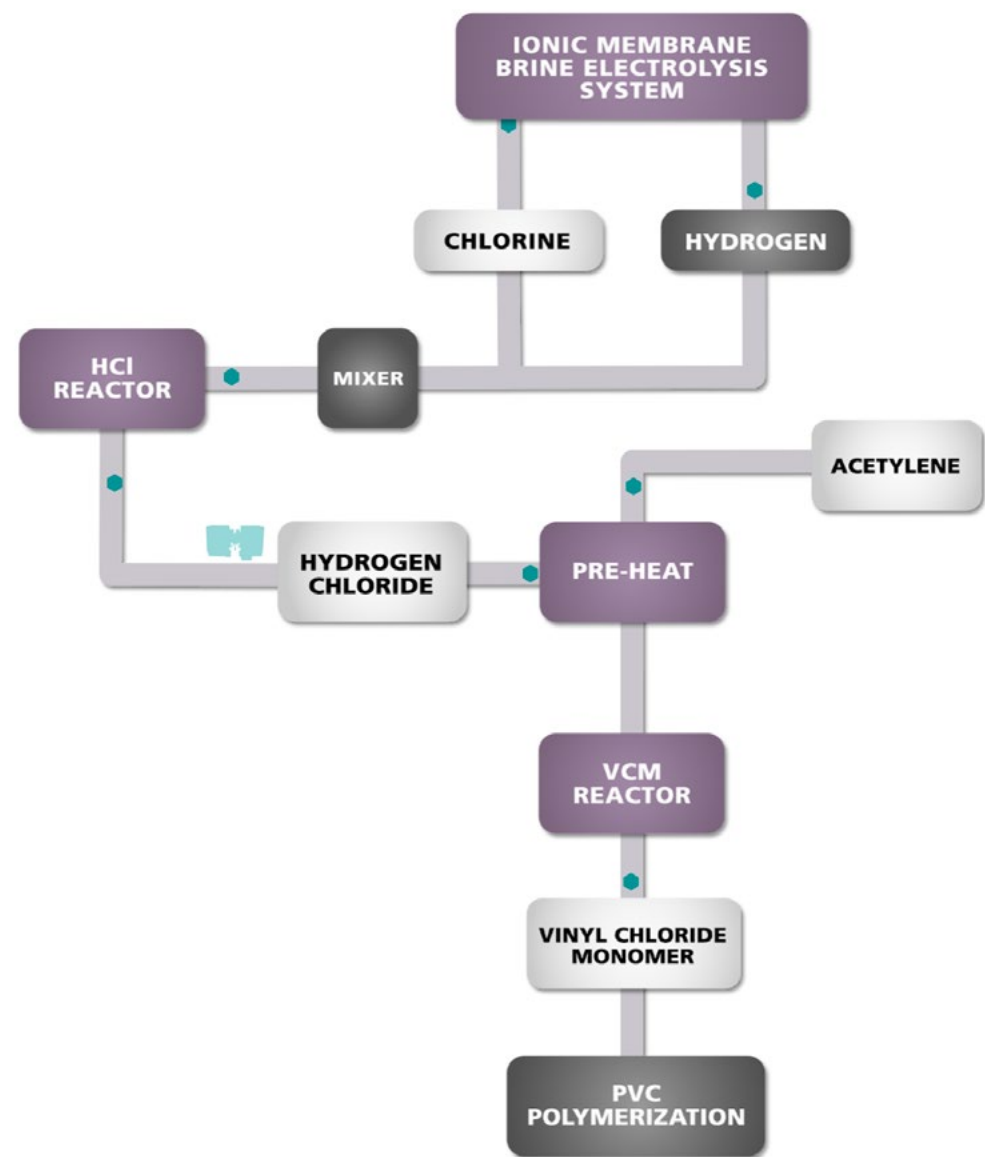


SERVOTOUGH SpectraExact 2500

## KEY SOLUTIONS

The rugged SERVOTOUGH SpectraExact 2500 accurately provides single and multi-component analysis at key process points, including measurements for moisture in  $\text{Cl}_2$  to protect the compressor from corrosion damage. It can also make the necessary measurements for HCl and  $\text{Cl}_2$  concentrations between the HCl reactor and preheater stages of the process.

## THE VCM PRODUCTION PROCESS



Watch our application video at: [servomex.com/vcm](http://servomex.com/vcm)



# YOUR GUIDE TO OUR SENSING TECHNOLOGIES




This section is a complete A-Z guide to our wide range of sensing technologies for gas analysis applications in a variety of important industries.

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

The variety of sensors available to Servomex is one of our major advantages as a supplier of gas analysis solutions. 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.

## SENSING TECHNOLOGIES

# SELECTING THE RIGHT SENSING TECHNOLOGY IS ESSENTIAL

TECHNOLOGY	GAS SENSED	TYPICAL APPLICATIONS
 Aluminum Oxide	H <sub>2</sub> O	Air separation units (ASU), medical gases, semiconductors
 Chemiluminescence	NO, NO <sub>2</sub> , NO <sub>x</sub>	Vehicle emissions testing, continuous emissions monitoring, combustion efficiency
 Calorimetry	CO, CO <sub>e</sub>	Process heaters, thermal crackers, incinerators
 Coulometric	O <sub>2</sub>	Semiconductors, solder reflow ovens, reactor process control
 FID	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
 Laser Moisture	H <sub>2</sub> O	Semiconductors, UHP gas purity, specialty gases
 Paramagnetic	O <sub>2</sub>	Oxidation control reactions, EO, PTA and EDC manufacturing, industrial and medical gas production
 Plasma	Multiple	Semiconductors, medical gases, ASU process control
 Thermal Conductivity	Binary gas mixtures	Medical gases, ASU process control, specialty gases
 TDL	O <sub>2</sub> , CO, CH <sub>4</sub> , NH <sub>3</sub>	Process and combustion control, ammonia slip DeNO <sub>x</sub> measurements, safety monitoring
 Zirconia	O <sub>2</sub>	Process heaters, thermal crackers, incinerators



# MOISTURE AND DEW POINT ANALYSIS

Aluminum Oxide ( $\text{Al}_2\text{O}_3$ ) 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  $\text{Al}_2\text{O}_3$  sensors have three innovative structural

improvements that offer better performance than traditional  $\text{Al}_2\text{O}_3$  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.

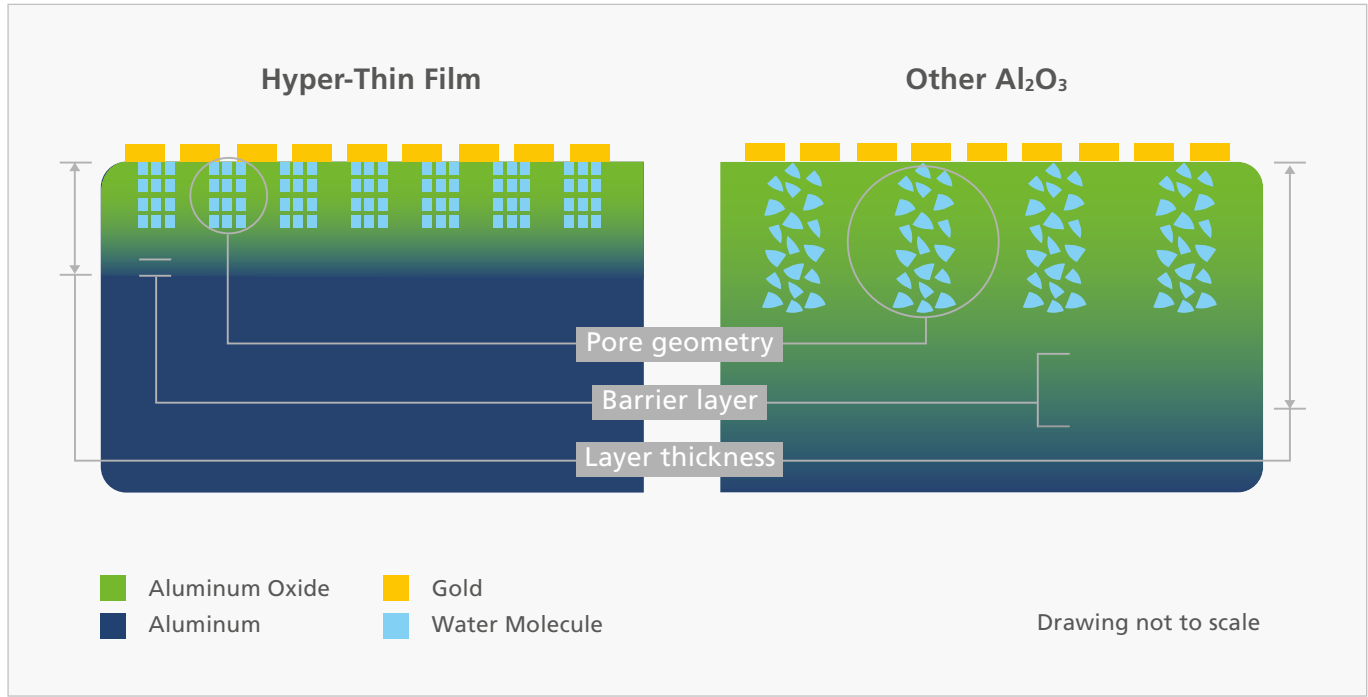
**2. A BETTER-DEFINED BARRIER LAYER**

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  $\text{Al}_2\text{O}_3$  sensors.

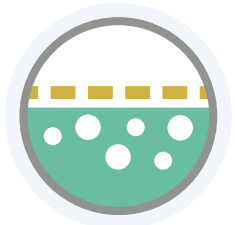
**3. UNIQUE PORE GEOMETRY**

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.

WORKS WITH

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

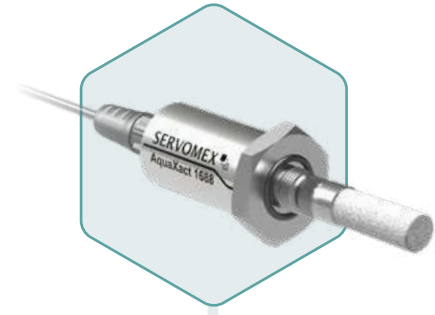


LIMITATIONS

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



USED IN



SERVOPRO AquaXact 1688



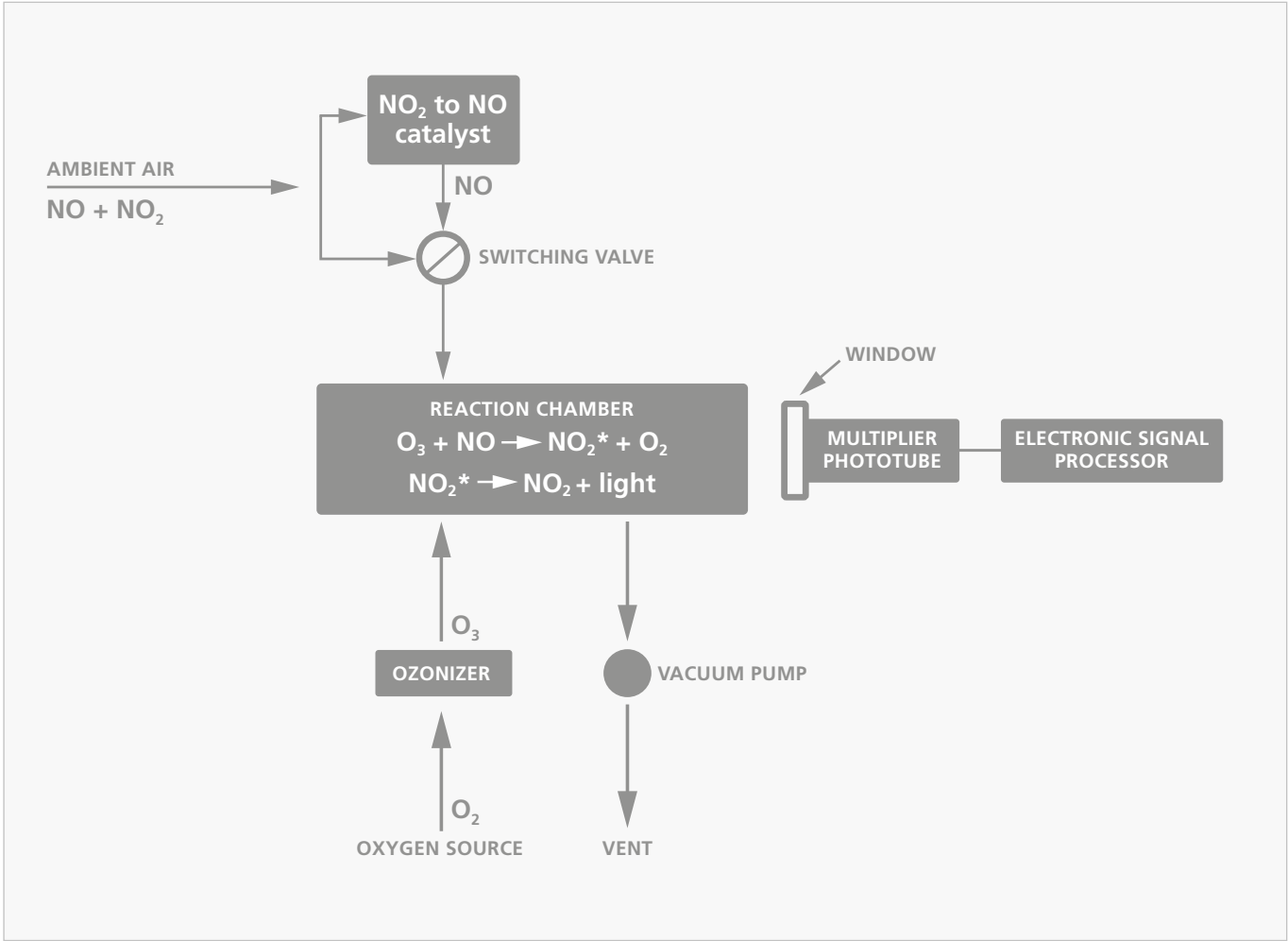
# LIGHT-BASED MEASUREMENTS FOR NOx ANALYSIS

Chemiluminescence detectors take advantage of nitric oxide (NO) and nitrogen dioxide (NO<sub>2</sub>) 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

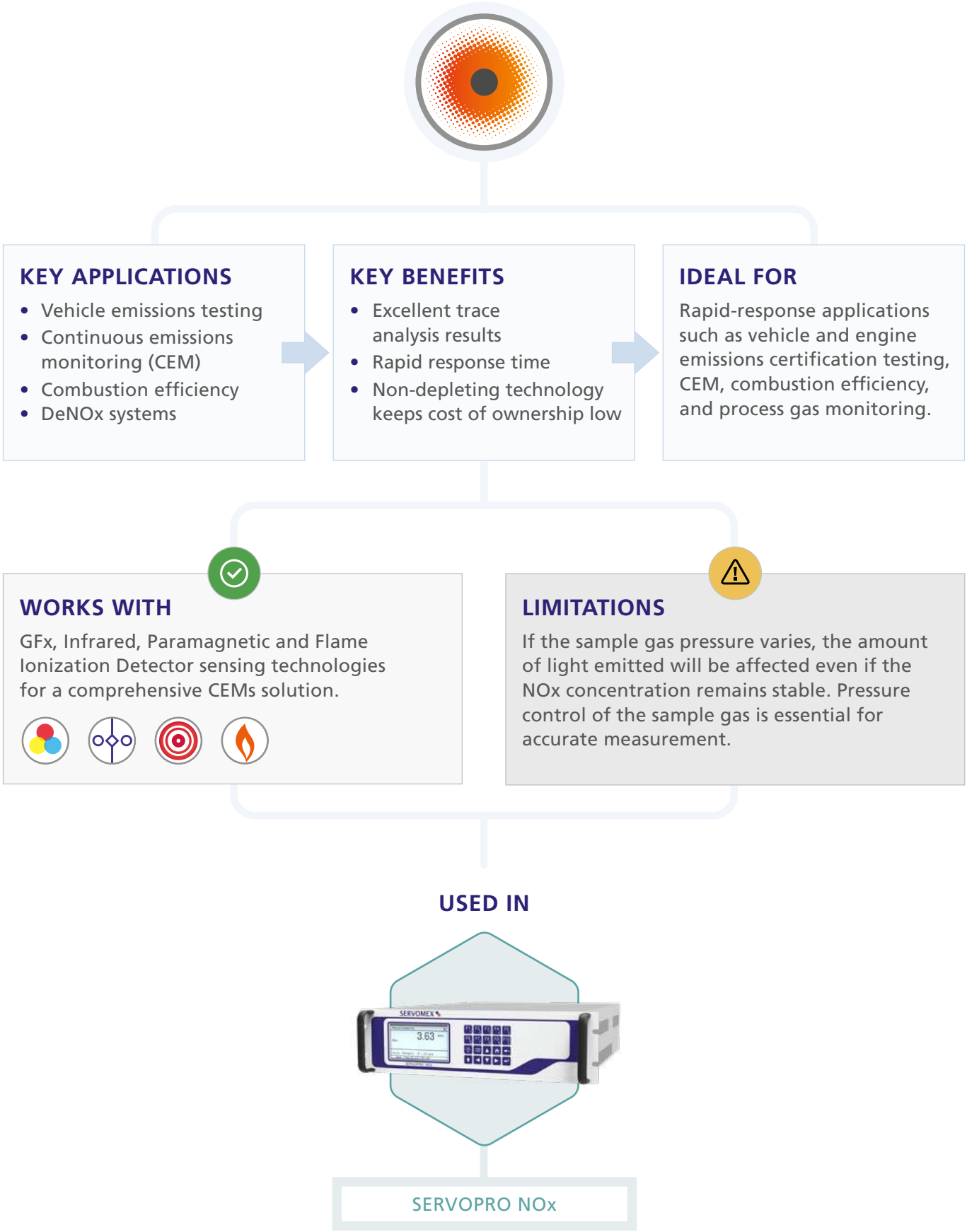
rather than by the absorption of photons by the molecule. Chemiluminescence analyzers use a thermally stabilized photodiode to measure the intensity of the light produced by the reaction of NO with ozone (O<sub>3</sub>). The intensity is directly proportional to the concentration of NO that was converted to NO<sub>2</sub> by the reaction.

By converting the NO<sub>2</sub> in the gas stream to NO, then reacting it with the O<sub>3</sub>, the total NOx value can be calculated, allowing speciation of NO, NO<sub>2</sub> and total NOx with a single analyzer.

CHEMILUMINESCENCE PROCESS DIAGRAM



## CHEMILUMINESCENCE





# ACCURATE COMBUSTIBLES MEASUREMENTS

The sensor measures combustibles (COe) from its exothermic reaction with oxygen (O<sub>2</sub>) over a catalytic platinum surface, which produces carbon dioxide (CO<sub>2</sub>) 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

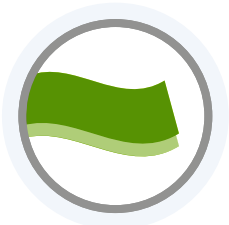
combust on the catalyst, which will heat the respective quadrant and alter the Wheatstone bridge output voltage.

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.

### WORKS WITH

Zirconia O<sub>2</sub> sensing for an all-in-one combustion control solution.



### LIMITATIONS

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

### USED IN



SERVOTOUGH FluegasExact 2700



# HIGH-SENSITIVITY MEASUREMENTS OF OXYGEN

Our Coulometric technology enables the measurement of oxygen (O<sub>2</sub>) 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<sub>2</sub> from the sample gas is reduced

to hydroxyl ions at the sensor cathode. The resulting current flow is proportional to the O<sub>2</sub> content in the gas, and the process signal can be displayed in ppm or parts-per-billion (ppb) units of O<sub>2</sub>.

Coulometric sensors respond very quickly to changing O<sub>2</sub> concentrations. For instance, a 0-1,000ppm range sensor can be exposed to air and in less than

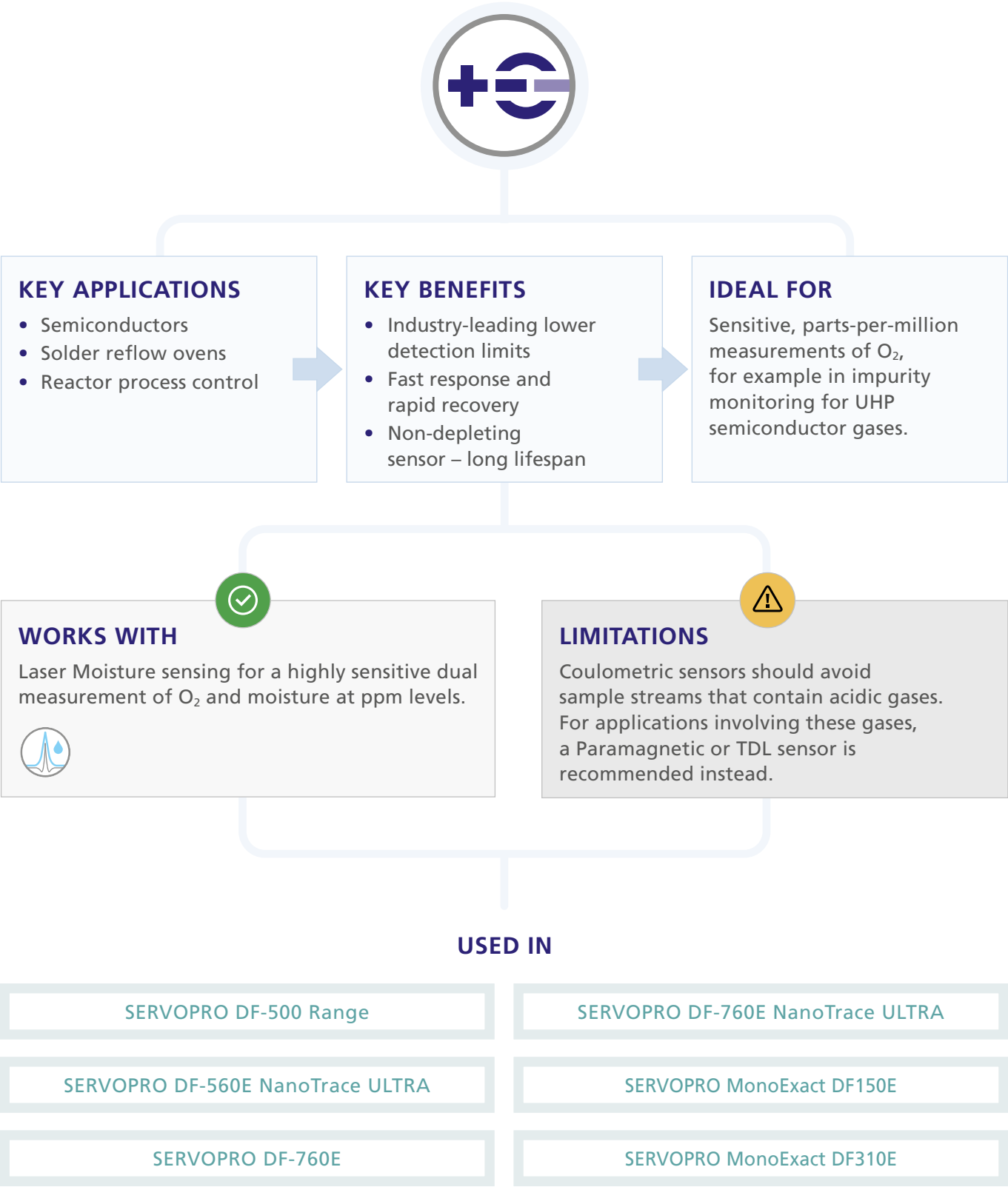
a minute will measure <10ppm on pure nitrogen. This is highly beneficial for users who have upset-prone applications.

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<sub>2</sub>, it has a long lifespan and does not require a purge gas to protect it when not in use.

## HUMMINGBIRD COULOMETRIC SENSOR



## COULOMETRIC



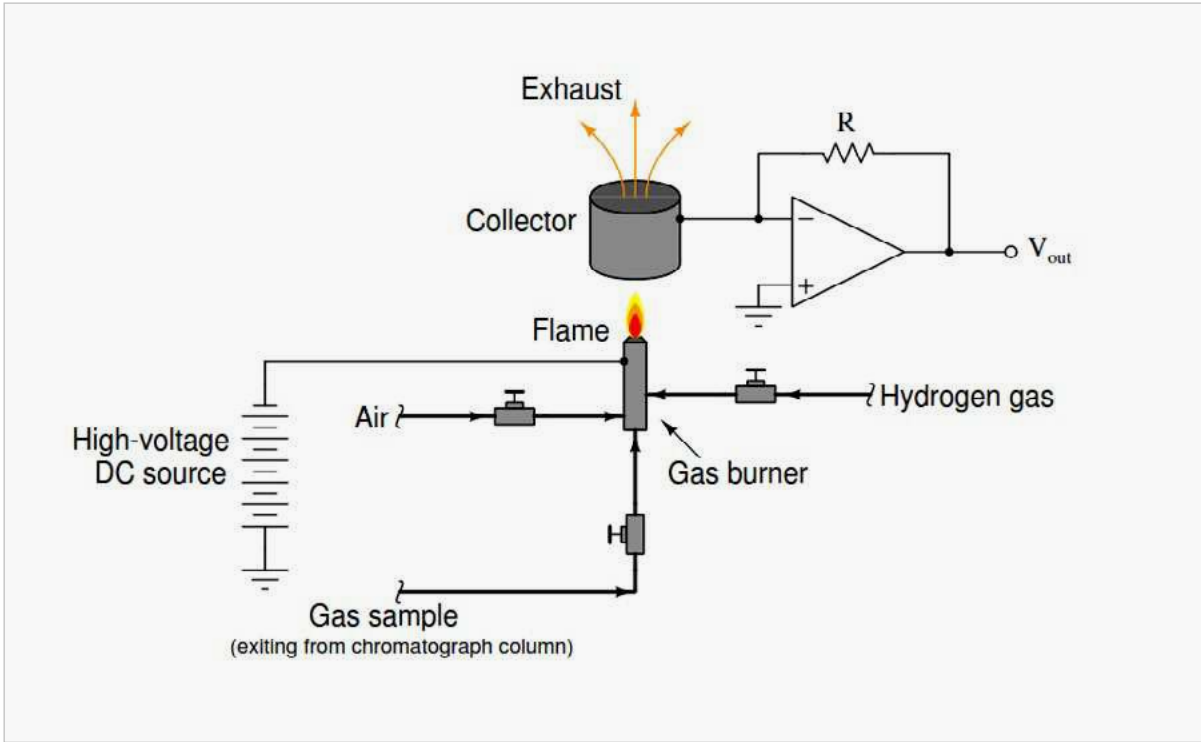
# MEASURING HYDROCARBONS DOWN TO ULTRA-TRACE LEVELS

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

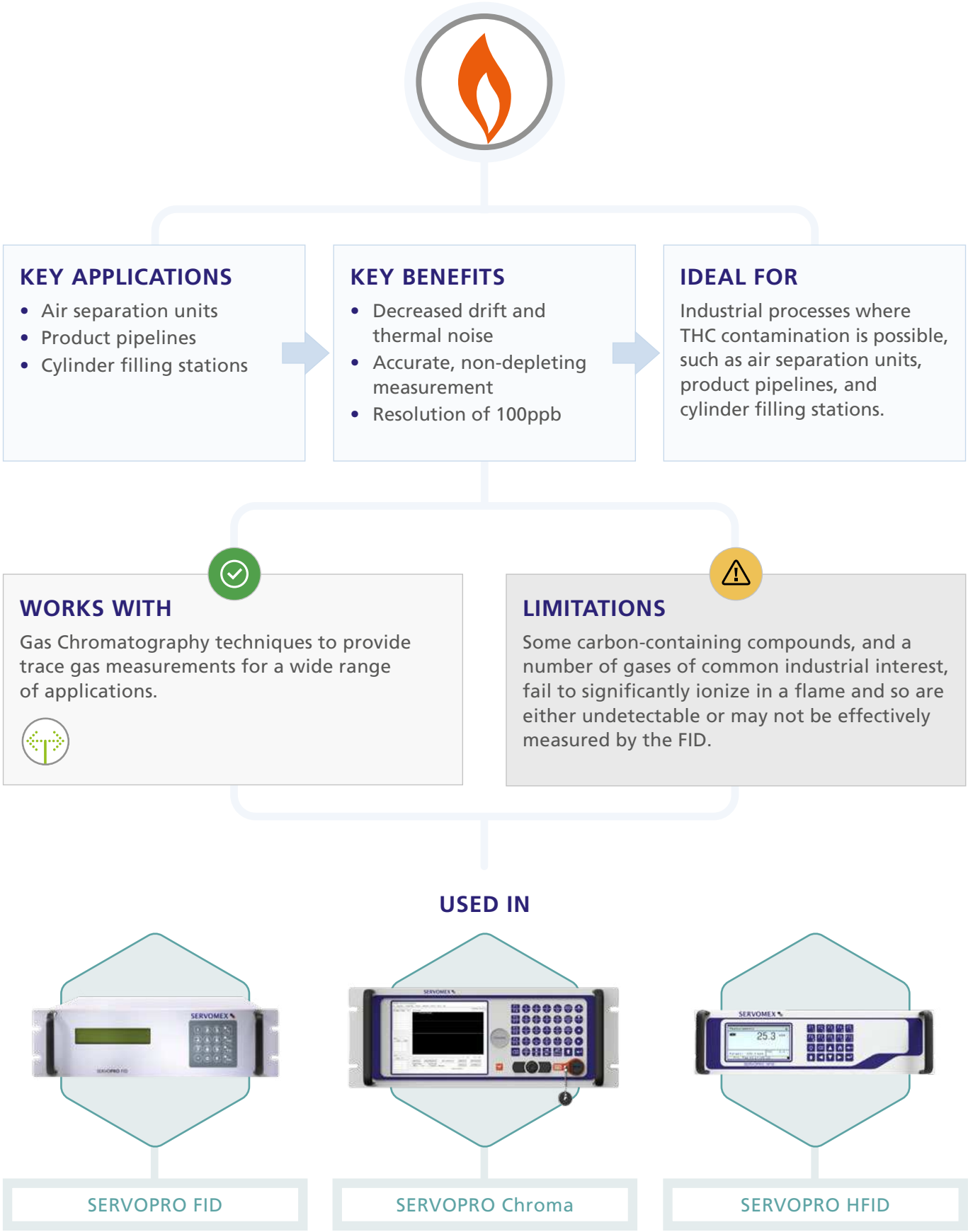
that cause electrical conduction between two electrodes. The ions are attracted to a collector plate and induce a current upon hitting the plate. The FID measures this conduction and produces an output which is directly proportional to the

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 100ppb resolution.

## A TYPICAL FLAME IONIZATION DETECTOR



## FLAME IONIZATION DETECTOR





# 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.

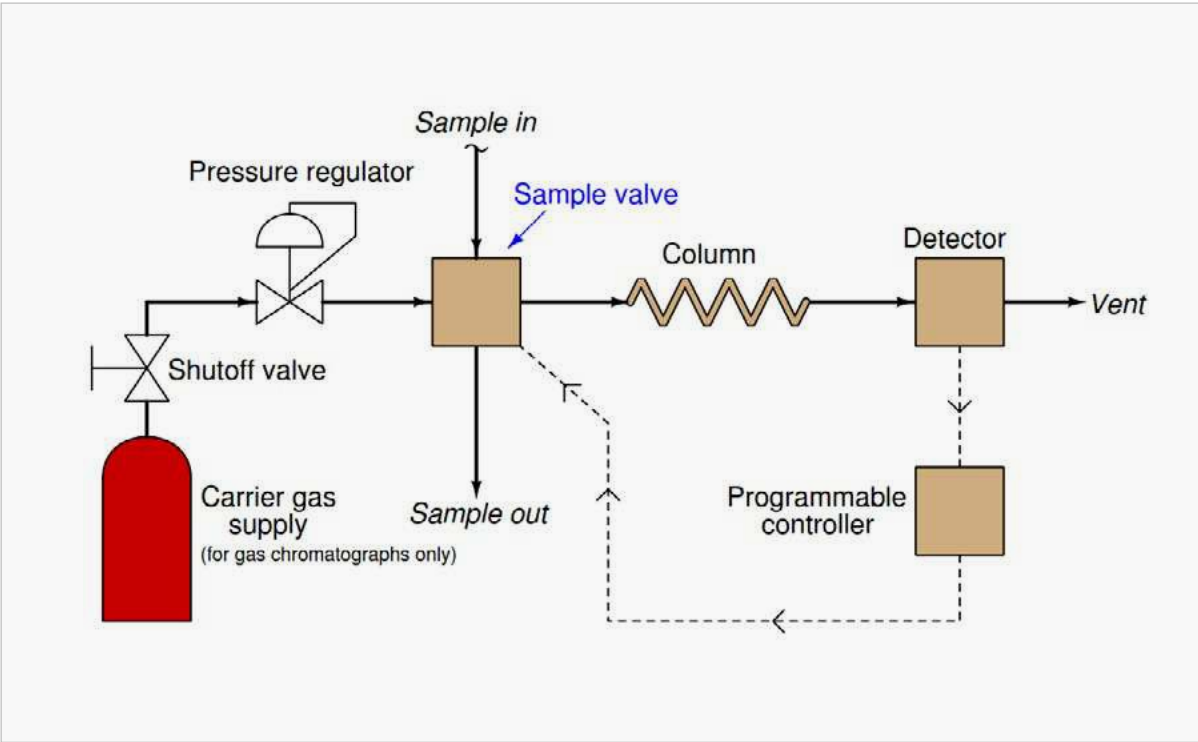
The different gas constituents are separated due to their own specific, adsorptive interaction between the stationary phase and the mobile phase. This causes the constituents to exit the column (elute) at different times.

These specific times are detected at the exit of the column. By comparing times, users can identify analytes by the

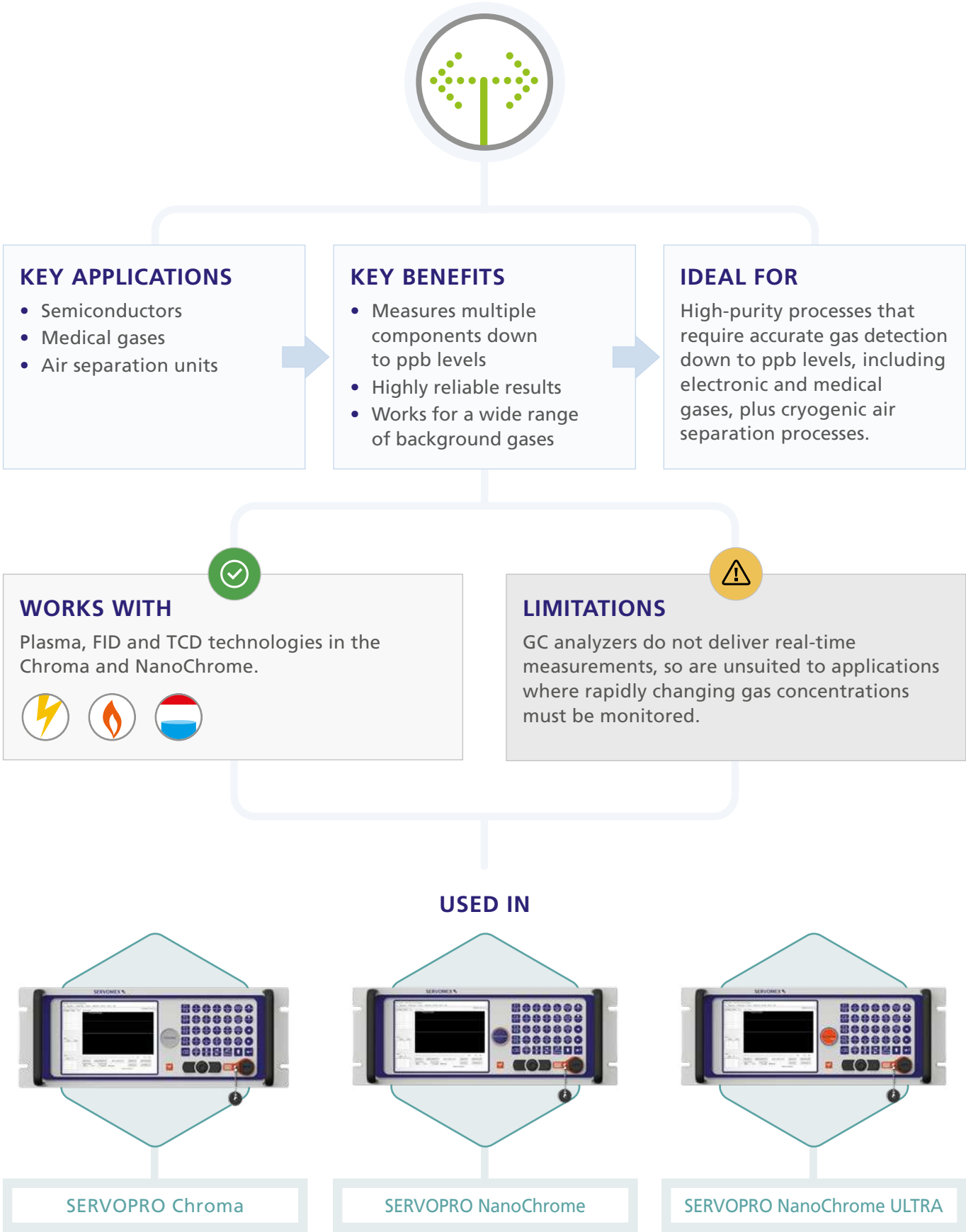
order in which they elute from the column. Each constituent concentration is determined, after calibration, from the integral of each analyte's detector response time.

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

## THE GAS CHROMATOGRAPHY TECHNIQUE



## GAS CHROMATOGRAPHY



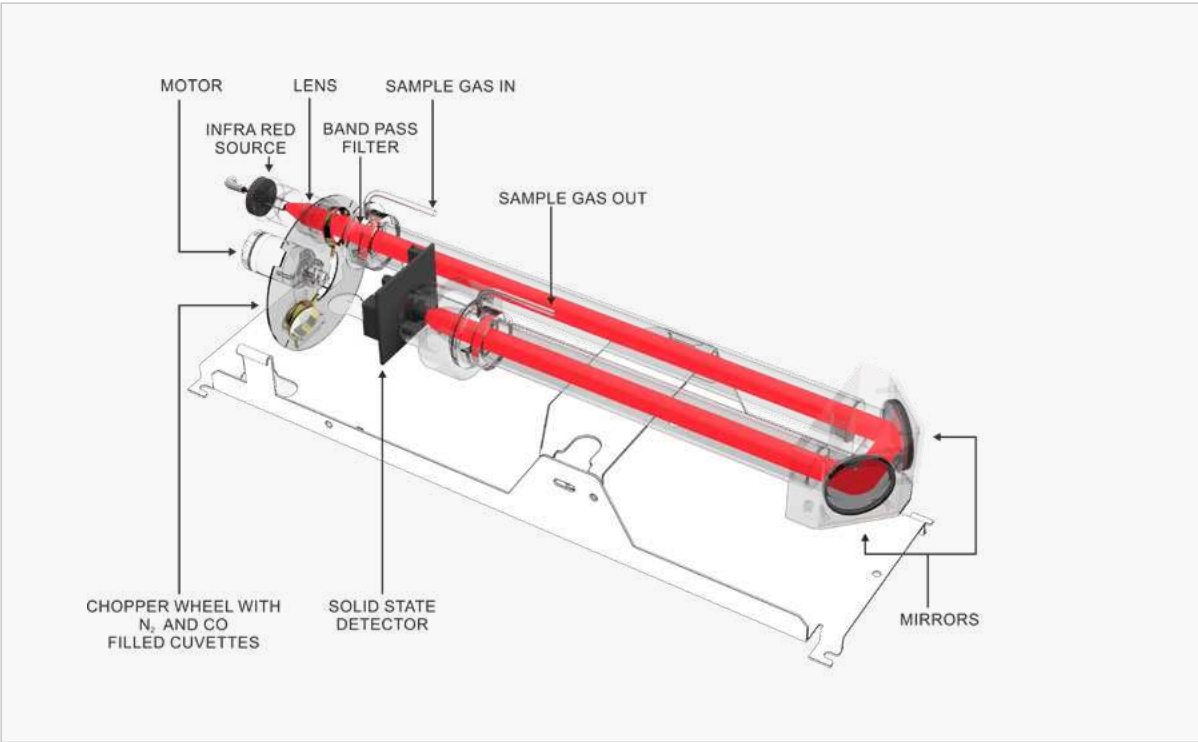
# STABLE, ULTRA-ACCURATE PHOTOMETRIC GAS ANALYSIS

Gas Filter Correlation (Gfx) 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 – Gfx sensing uses that property to detect the concentration of a selected gas in a mixture.

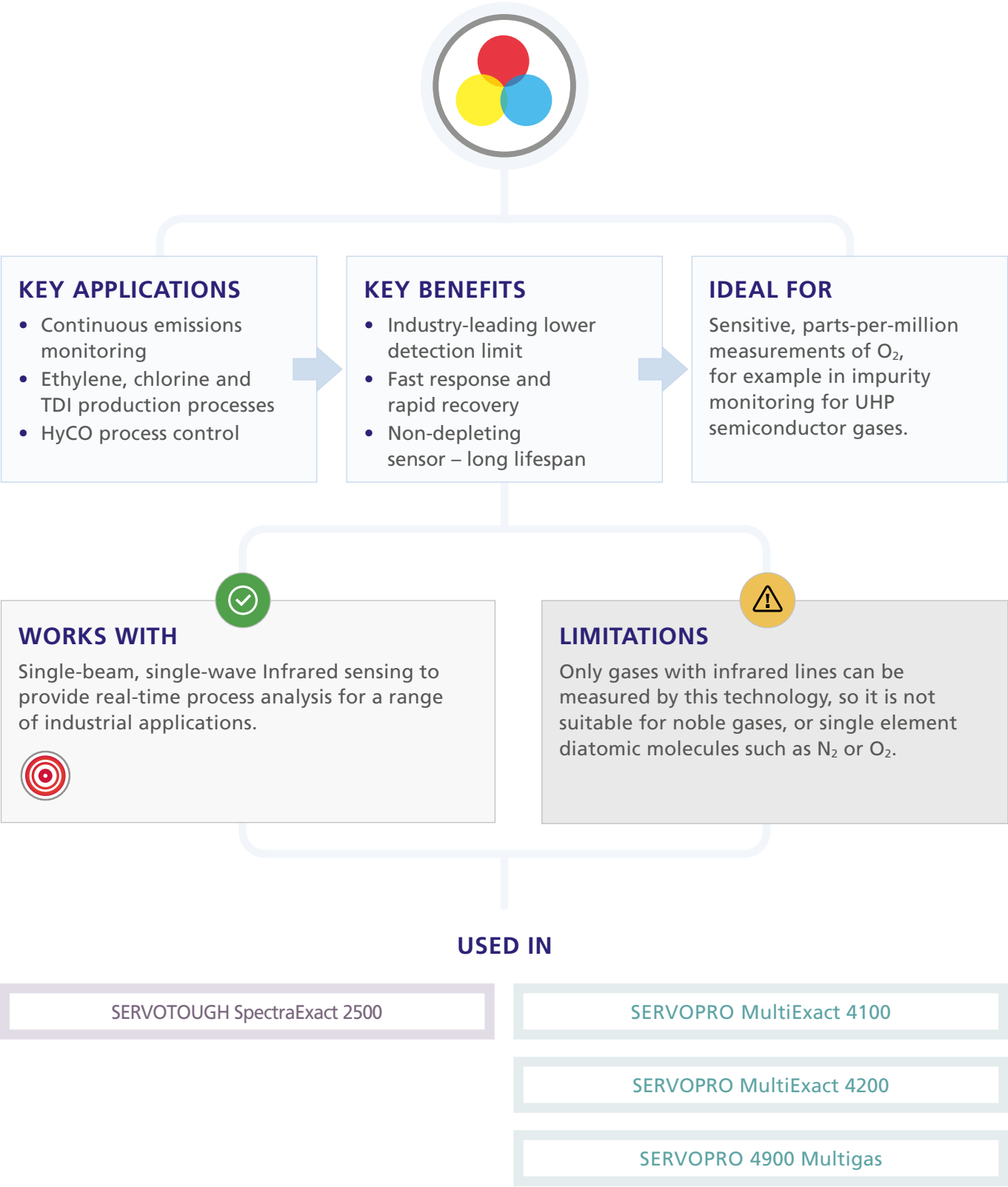
Two gas-filled cuvettes are mounted on a rotating disk, each passing through a beam of light alternately. One cuvette (the measure cuvette) is typically filled with nitrogen while the other cuvette (the reference cuvette) is filled with a sample of the gas to be measured. Light is passed through the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

Offering real-time measurement response, Gfx 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 Gfx TRANSDUCER



GAS FILTER CORRELATION





# 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 pass 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.

**WORKS WITH**

Paramagnetic sensing for dual measurements of oxygen and carbon dioxide, and Gfx sensing for many industrial applications.



**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.

**USED IN**

SERVOTOUGH SpectraExact 2500

SERVOPRO MultiExact 4100

SERVOFLEX MiniMP 5200

SERVOPRO MultiExact 4200

SERVOFLEX MiniHD 5200

SERVOPRO 4900 Multigas

SERVOFLEX MiniFoodPack 5200

SERVOPRO NanoTrace FTIR

# SIMPLE, SENSITIVE MOISTURE ANALYSIS

This moisture analysis technology uses Tunable Diode Laser (TDL) 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.

TDL has advantages over other measurement techniques, as the moisture sample comes only into contact with a few

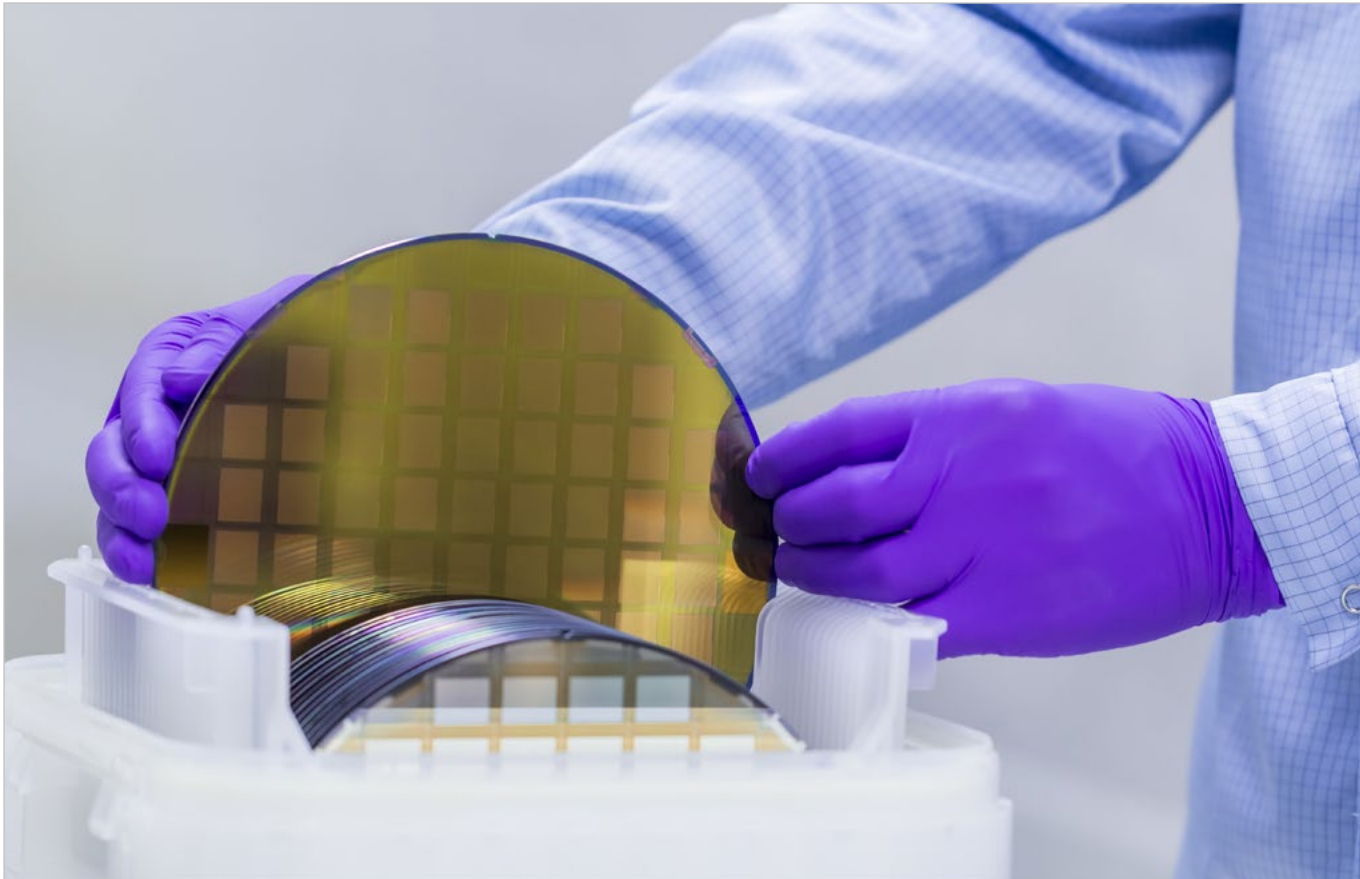
optical components made from very robust materials. It works according to the fundamental principle of Beer's law; therefore the reading is stable over time and never requires calibration.

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

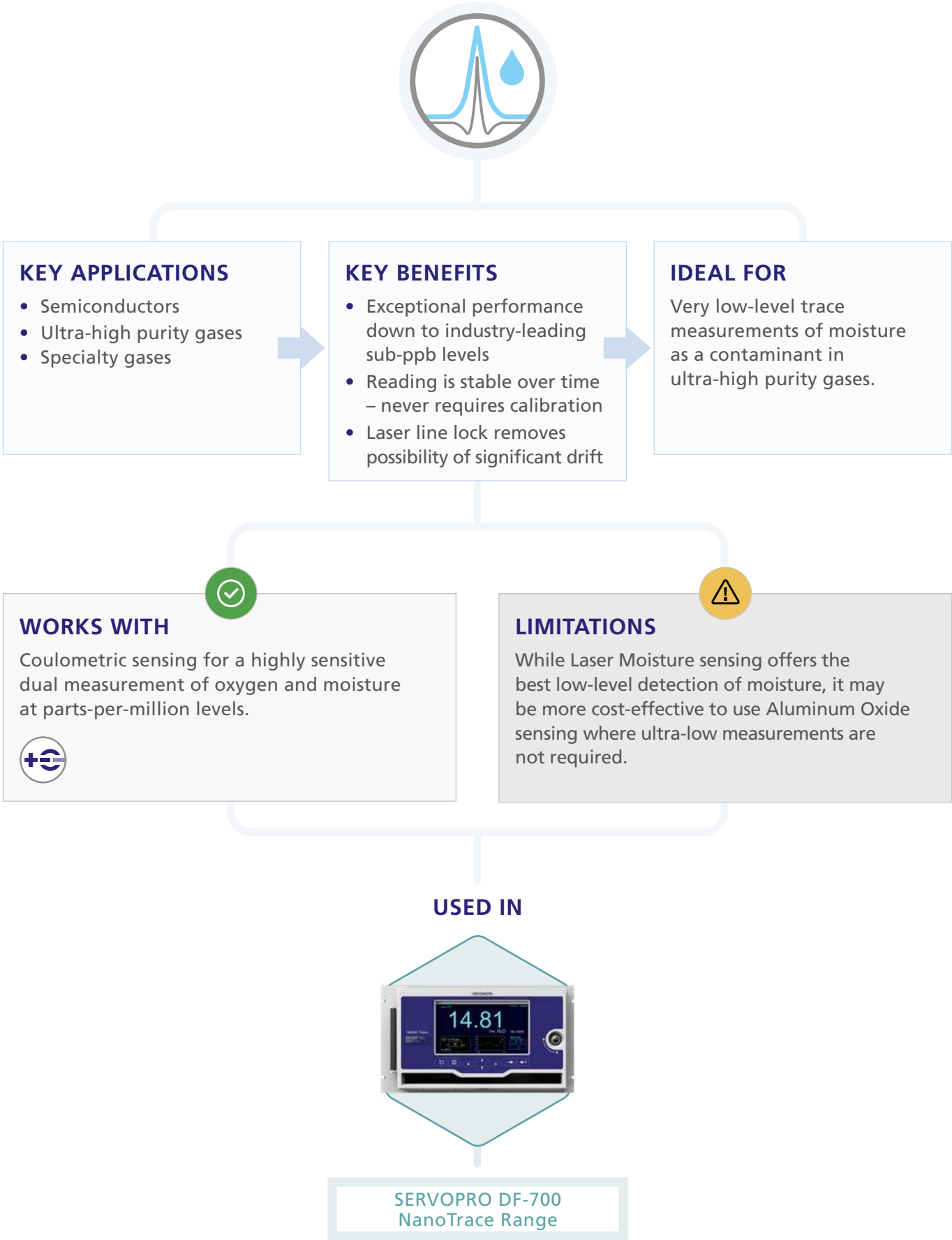
the laser path length, achieving extremely high sensitivity.

TDL 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



## LASER MOISTURE





# AN INNOVATIVE SOLUTION FOR PERCENTAGE OXYGEN

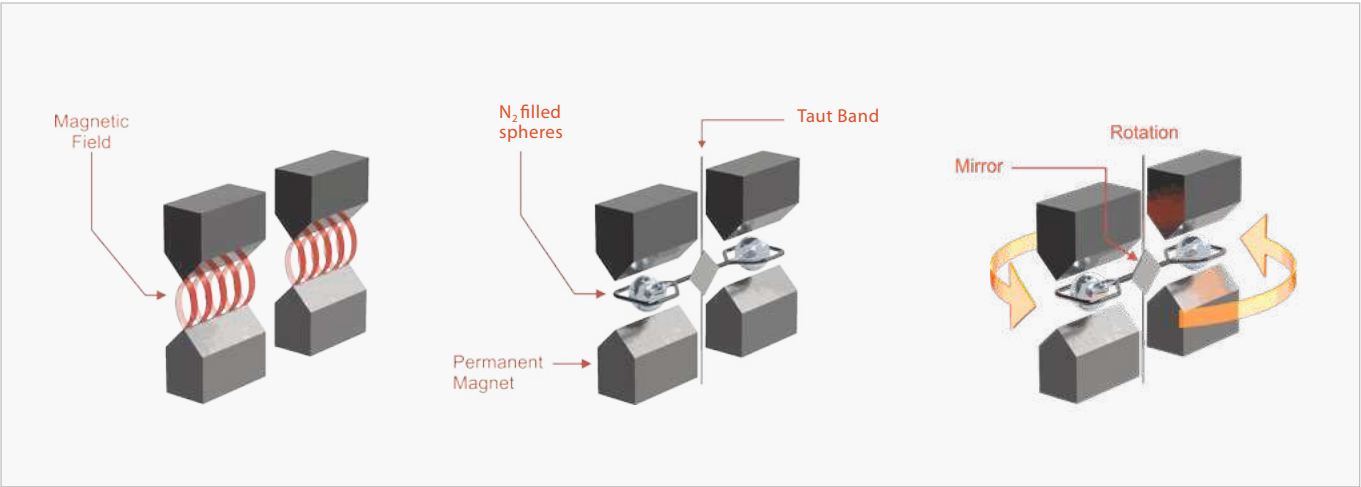
Our groundbreaking magnetodynamic Paramagnetic technology provides fast, accurate and sensitive measurements of percentage levels of oxygen (O<sub>2</sub>).

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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub>
- Non-depleting, with a long operational life

### IDEAL FOR

O<sub>2</sub> measurement in flammable or corrosive gas mixtures.

### WORKS WITH

Infrared and Gfx sensing in key industrial processes such as ASU and CEMs applications.



### 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.

## USED IN

SERVOTOUGH Oxy 1800

SERVOPRO MultiExact 4100

SERVOFLEX Micro i.s 5100

SERVOTOUGH Oxy 1900

SERVOPRO MultiExact 4200

SERVOFLEX MiniMP 5200

SERVOTOUGH OxyExact 2200

SERVOPRO 4900 Multigas

SERVOFLEX MiniHD 5200

SERVOPRO MonoExact DF310E

SERVOFLEX MiniFoodPack 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.

#### WORKS WITH

Gas Chromatography technology to deliver measurements down to ppb levels.



#### LIMITATIONS

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

### USED IN



SERVOPRO Chroma



SERVOPRO NanoChrome



SERVOPRO Plasma



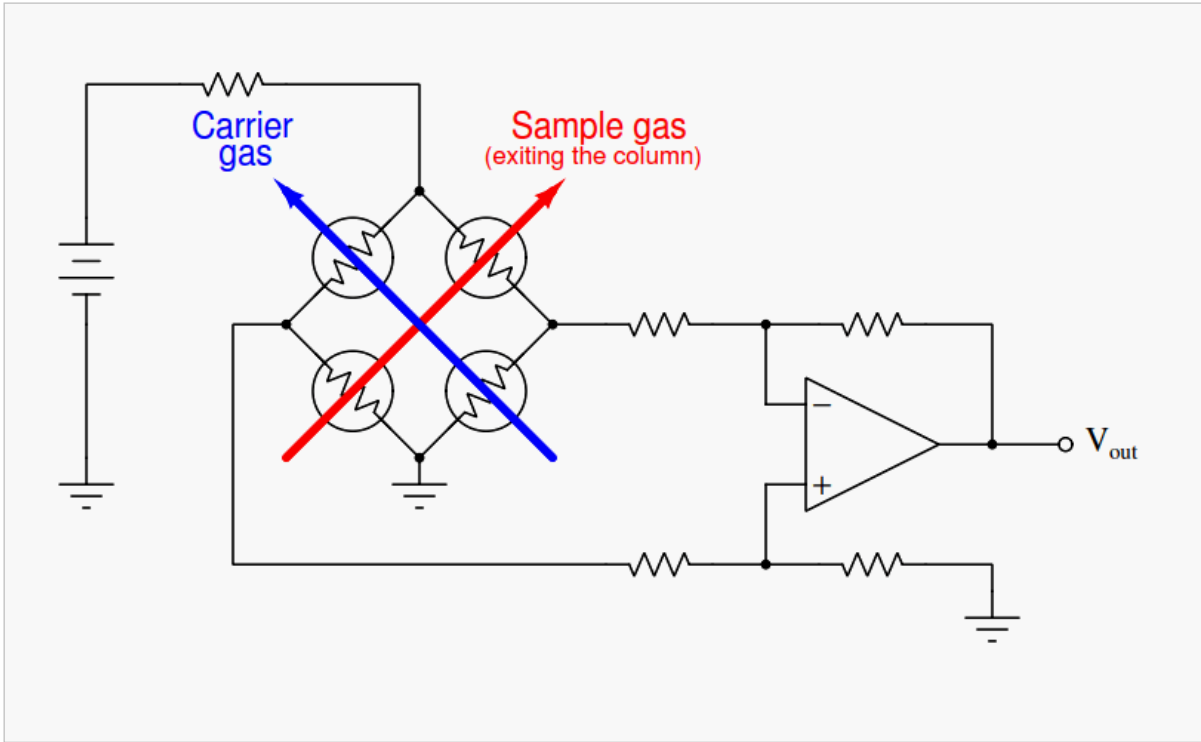
# MEASURING INERT GASES IN A BINARY MIXTURE

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.

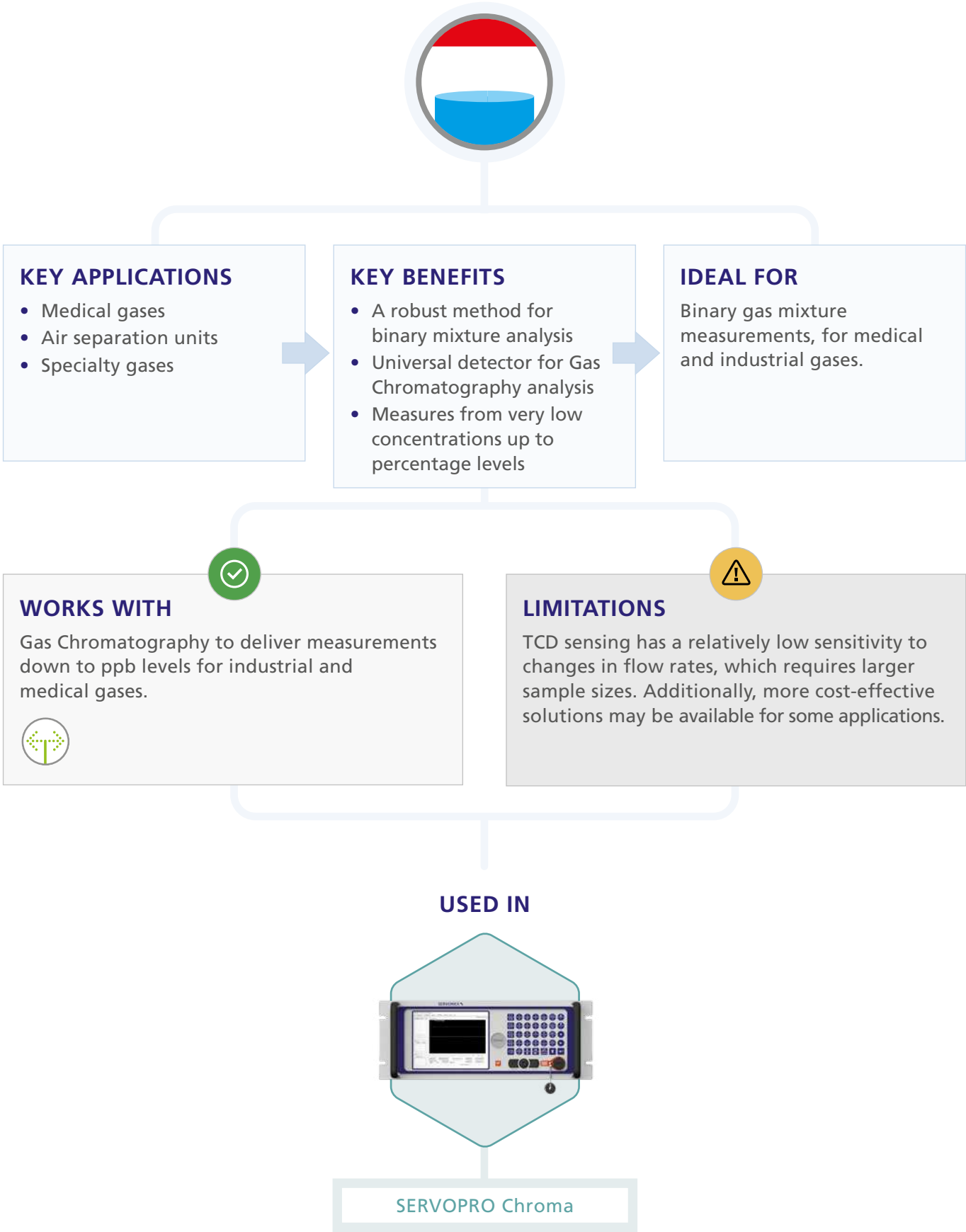
When no impurities are eluting from the column, the heat loss from the analyte arm matches that from the reference arm. When an analyte elutes from the column, it affects the thermal conductivity, changing the electrical resistance, which can be measured as a signal. Thermal Conductivity is a robust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

concentrations of gases in a binary mixture. The Thermal Conductivity detector 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



# 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

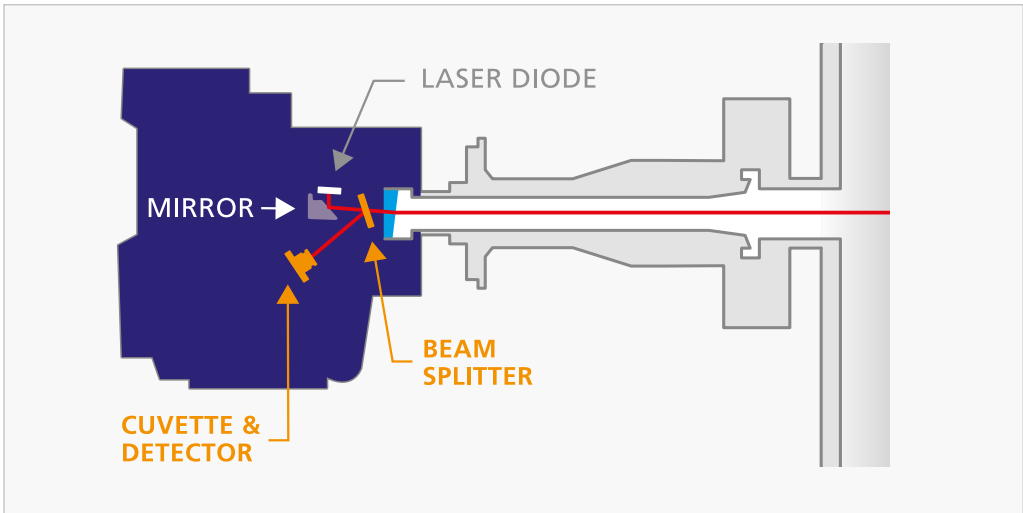
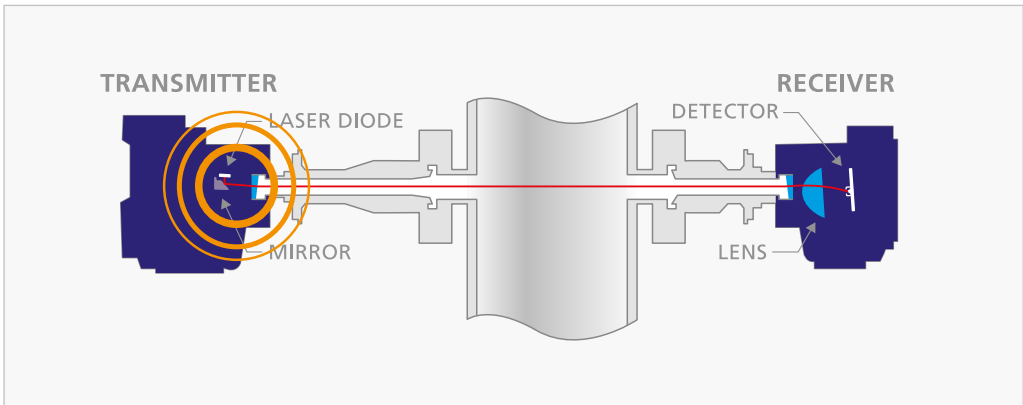
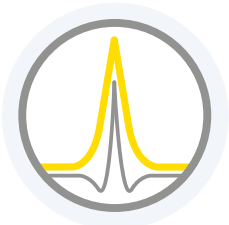


FIG. 2: THE LASER 3 PLUS INSTALLED ACROSS A STACK, WITH LINE LOCK SYSTEM (CIRCLED)



## 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.

### WORKS WITH

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



### 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.

### 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

O<sub>2</sub> ions at a rate determined by temperature and the difference in the O<sub>2</sub> partial pressures of the sample gas and the reference gas.

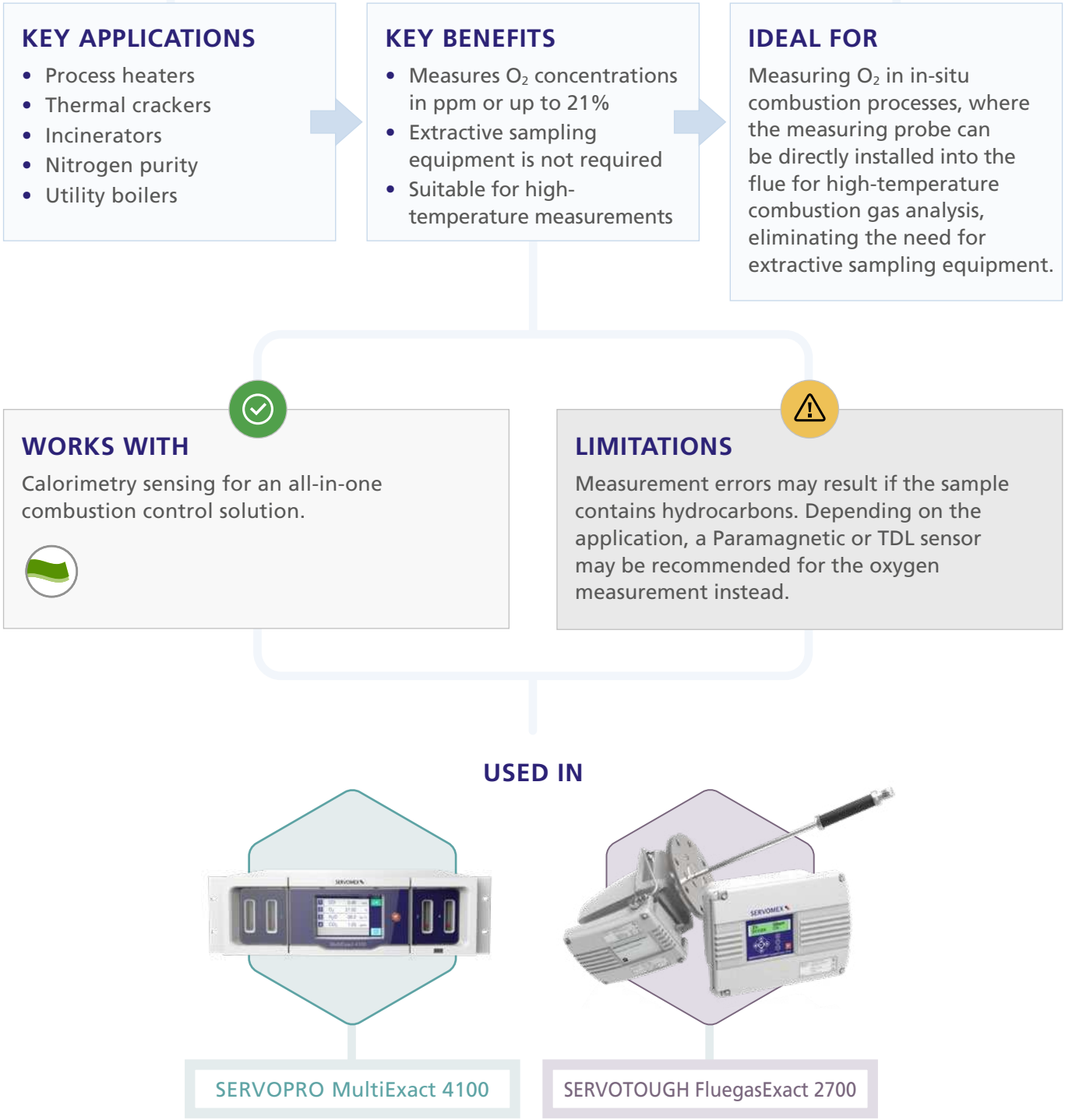
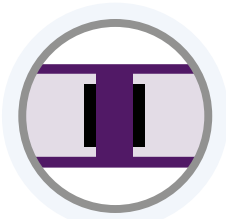
The passage of the ions produces a voltage across the electrodes – the magnitude of this is a logarithmic function of the ratio of the O<sub>2</sub> partial pressures of the sample and reference gases.

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

HUMMINGBIRD ZR700 SENSOR



ZIRCONIA



# YOUR PRODUCT GUIDE

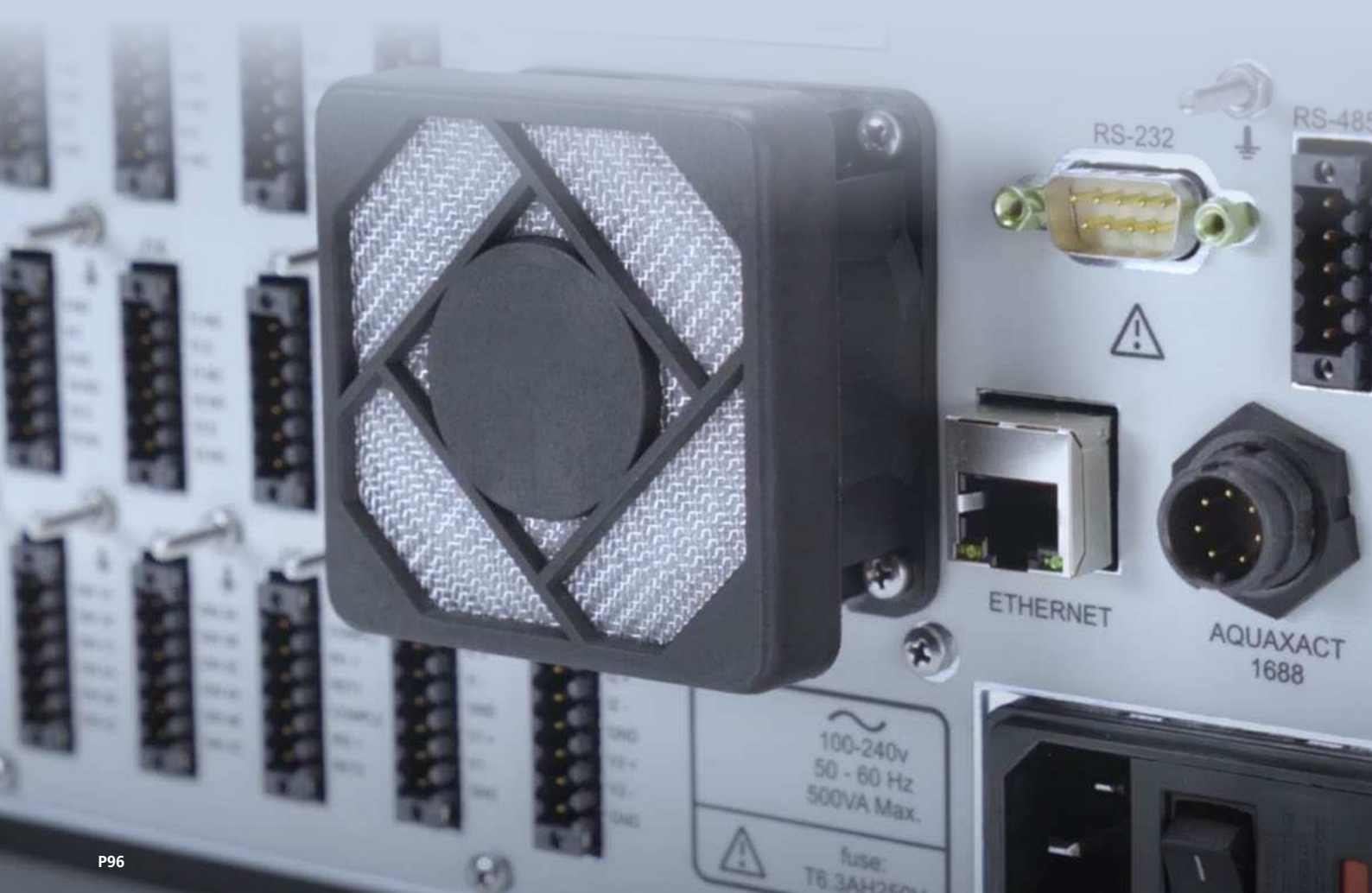
Developed and manufactured in our state-of-the-art technical centers in the UK and US, Servomex gas analyzers are hand-built to meet precise requirements. Every product we make is optimized to the need of each customer process.

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](http://servomex.com/gas-analyzers/finder)



## 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.



#### 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

#### APPLICATIONS

- Refinery
- Petrochemical
- Manufacturing
- Industrial gas supply

GAS	MEASURES	APPLICATION
HYDROGEN	PERCENT	PROCESS CONTROL
		QUALITY

## SERVOTOUGH Oxy 1800

SAFE AREA

### ACCURATE AND STABLE SAFE AREA O<sub>2</sub> ANALYZER

Designed to reliably measure non-flammable samples up to 100% O<sub>2</sub> in many industrial applications, the Oxy 1800 is a stable, accurate and highly specific O<sub>2</sub> analyzer for safe area use.



#### FEATURES AND BENEFITS

- Internal/external use (IP66/NEMA 4X rated)
- Special version for solvent-bearing samples
- A range of alarm outputs aids integration into control systems
- Easy to set-up, install and operate

#### APPLICATIONS

- Waste water treatment
- Food storage
- Marine inerting applications
- Inert blanketing

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
		SAFETY

#### SENSING TECHNOLOGY



## SERVOTOUGH Oxy 1900

HAZARDOUS AREA

### AWARD-WINNING PARAMAGNETIC DIGITAL O<sub>2</sub> ANALYZER DESIGNED FOR HAZARDOUS AREA USE

Offering industry-standard features alongside revolutionary, value-added options, the Oxy 1900 O<sub>2</sub> gas analyzer sets new standards of flexibility, measurement stability and reliability from a single, cost-effective unit.



#### 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 pressure compensation option available for improved measurement performance
- Modbus communications available as standard
- SIL 2 hardware compliant

#### APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
		SAFETY

#### SENSING TECHNOLOGY





SERVOTOUGH OxyExact 2200

HAZARDOUS AREA

HIGH-SPEC PROCESS O<sub>2</sub> ANALYZER OFFERS SAFE OR HAZARDOUS AREA CONTROL WITH UP TO SIX TRANSMITTERS

The OxyExact 2200 high-specification O<sub>2</sub> 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.



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<sub>2</sub> and pressures of up to 45psia
- High-temperature transmitter eliminates the need to condense hot wet samples prior to analysis
- SIL 2 hardware compliant

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
		SAFETY

SENSING TECHNOLOGY

PARAMAGNETIC

SERVOTOUGH SpectraScan 2400

HAZARDOUS AREA

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

A real-time optical analyzer utilizing the Precise field-proven optical bench, the SpectraScan 2400 delivers a breakthrough capability in the continuous analysis of light hydrocarbons C1-C6.



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

APPLICATIONS

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

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

SENSING TECHNOLOGY

SPECTROSCOPIC

SERVOTOUGH SpectraExact 2500

HAZARDOUS AREA

RUGGED PHOTOMETRIC GAS ANALYZER FOR DEMANDING PROCESS APPLICATIONS

Servomex's iconic industry-leading Photometric analyzer delivers flexible single and multicomponent gas analysis capability for corrosive, toxic and 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.



NEW MODEL COMING SOON

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
TOXIC	PERCENT	PROCESS CONTROL
FLAMMABLE	TRACE PPM	
CORROSIVE		

SENSING TECHNOLOGY

GAS FILTER CORRELATION

INFRARED

SERVOTOUGH FluegasExact 2700

HAZARDOUS AREA

ADVANCED FLUE GAS ANALYZER FOR HIGH-TEMPERATURE MEASUREMENT OF O<sub>2</sub> AND COMBUSTIBLES

Designed to measure O<sub>2</sub> 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.



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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
COMBUSTIBLES	TRACE PPM	COMBUSTION

SENSING TECHNOLOGY

CALORIMETRY

ZIRCONIA

LISTEN TO OUR EXPERTS

SERVOMEX PODCASTS DELIVER ADVICE AND SOLUTIONS FOR YOUR PROCESS

Find these podcasts on our website – with more to come: [servomex.com/podcasts](https://servomex.com/podcasts)

SERVOTOUGH Laser 3 Plus EnvironmentalHAZARDOUS AREA

COMPACT NH<sub>3</sub> 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.



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<sub>3</sub>
- Auto-validation feature provides complete assurance of ongoing measurement accuracy

APPLICATIONS

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

GAS	MEASURES	APPLICATION
AMMONIA DeNOx	TRACE PPM	PROCESS CONTROL
ENVIRONMENTAL NH <sub>3</sub>	TRACE PPM	EMISSIONS

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SERVOTOUGH Laser 3 Plus CombustionHAZARDOUS AREA

COMPACT COMBUSTION  
ANALYZER OPTIMIZED FOR CO,  
O<sub>2</sub>, OR CO + CH<sub>4</sub> MEASUREMENTS

Containing all the benefits of Servomex's 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.



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

APPLICATIONS

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

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

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SERVOTOUGH Laser 3 Plus ProcessHAZARDOUS AREA

COMPACT TDL GAS ANALYZER,  
OPTIMIZED FOR PROCESS O<sub>2</sub>  
MEASUREMENTS

All the benefits of Servomex's 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 O<sub>2</sub> in hot or hazardous conditions.



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 feature provides complete assurance of ongoing measurement accuracy

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
		COMBUSTION

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SERVOPRO AquaXact 1688SAFE 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.



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)

APPLICATIONS

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

GAS	MEASURES	APPLICATION
WATER	DEW POINT	PROCESS CONTROL
	PPMV	

SENSING TECHNOLOGY

ALUMINUM OXIDE

SERVOPRO AquaXact 1688 ControllerSAFE AREA

DIGITAL CONTROLLER PLATFORM  
FOR THE AquaXact 1688

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



FEATURES AND BENEFITS

- Dew point and ppmv H<sub>2</sub>O measurements
- Tight Al<sub>2</sub>O<sub>3</sub> 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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
WATER	DEW POINT	PROCESS CONTROL
	PPMV	

SENSING TECHNOLOGY

ALUMINUM OXIDE

SERVOPRO MonoExact DF150ESAFE AREA

TOUCHSCREEN OPERATED PPM  
O<sub>2</sub> 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<sub>2</sub> sensor with a more user-friendly package.



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

APPLICATIONS

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

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

SENSING TECHNOLOGY

COULOMETRIC



SERVOPRO MonoExact DF310E

SAFE AREA

NEXT-GENERATION DIGITAL O<sub>2</sub> ANALYZER DESIGNED FOR INDUSTRIAL GAS APPLICATIONS

Designed specifically for accurately measurements of O<sub>2</sub> in industrial gas applications, the MonoExact DF310E is a next-generation digital O<sub>2</sub> analyzer that combines precision trace-level measurement with a new icon-driven guided user interface (GUI) and advanced digital communications.



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<sub>2</sub> and H<sub>2</sub>O monitoring
- RS232, RS485, Modbus, PROFIBUS and Ethernet Modbus TCP/IP

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
WATER	TRACE PPM	QUALITY
	ULTRA TRACE PPB	

SENSING TECHNOLOGY

COULOMETRIC

PARAMAGNETIC

ALUMINUM OXIDE

SERVOPRO 4900 Multigas

SAFE AREA

AN ADVANCED DIGITAL MULTI-GAS CEMS ANALYZER

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



FEATURES AND BENEFITS

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

APPLICATIONS

- Utility boilers
- Chemical incinerators
- Crematoria
- Mobile labs

GAS	MEASURES	APPLICATION
MULTIPLE	PERCENT	EMISSIONS
	TRACE PPM	

SENSING TECHNOLOGY

GAS FILTER CORRELATION

PARAMAGNETIC

INFRARED

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<sub>2</sub> (trace, control, and purity), CO<sub>2</sub>, CO, N<sub>2</sub>O, CH<sub>4</sub> (trace) and H<sub>2</sub>O.



FEATURES AND BENEFITS

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

APPLICATIONS

- Product purity on air separation plants
- Process control on air separation plants
- Monitor trace CO<sub>2</sub> on scrubbed air inlet to air separation process
- Validation of medical O<sub>2</sub>, N<sub>2</sub> and air

GAS	MEASURES	APPLICATION
MULTIPLE	PERCENT	PROCESS CONTROL
	TRACE PPM	QUALITY

SENSING TECHNOLOGY

GAS FILTER CORRELATION

PARAMAGNETIC

INFRARED

ZIRCONIA

ALUMINUM OXIDE

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<sub>2</sub> control, CO<sub>2</sub>, CO, N<sub>2</sub>O and CH<sub>4</sub> (trace).



FEATURES AND BENEFITS

- Comprehensive solution for flammable gas contaminant monitoring
- Uses ultra-stable, non-depleting digital sensing technologies that help extend maintenance intervals

APPLICATIONS

- Hydrogen production
- HyCO plants
- Syngas production

GAS	MEASURES	APPLICATION
MULTIPLE	PERCENT	PROCESS CONTROL
	TRACE PPM	QUALITY

SENSING TECHNOLOGY

GAS FILTER CORRELATION

PARAMAGNETIC

INFRARED

SERVOPRO NanoTrace FTIR

SAFE AREA

UNRIVALLED ANALYSIS OF CO, CO<sub>2</sub> AND CH<sub>4</sub> IN UHP GASES

Using industry-leading Fourier Transformation Infrared Spectroscopy sensing, the FTIR gas analyzer is engineered to meet the requirements of most critical continuous quality control applications in ultra-high-purity (UHP) environments.



FEATURES AND BENEFITS

- Lower Detection Limits as low as 25ppt
- Broad detection range: 0ppb-10ppm
- Highly reliable, virtually no maintenance, calibration or liquid nitrogen cooling required

APPLICATIONS

- In-line process monitoring
- Batch sampling
- Gas purity analysis
- Gas certification analysis
- Leak detection

GAS	MEASURES	APPLICATION
MULTIPLE	TRACE PPT	QUALITY

SENSING TECHNOLOGY

INFRARED

COMING SOON

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.



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<sub>4</sub>/NMHC measurements, the Plasma HC system requires no FID and therefore no H<sub>2</sub> fuel gas

APPLICATIONS

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

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

SENSING TECHNOLOGY

GAS CHROMATOGRAPHY

FLAME IONIZATION DETECTOR

PLASMA

THERMAL CONDUCTIVITY

SERVOPRO NanoChrome

SAFE AREA

SERVOPRO NanoChrome ULTRA

SAFE AREA

SUB-PPB TRACE MEASUREMENT OF H<sub>2</sub>, CH<sub>4</sub>, CO, CO<sub>2</sub>, N<sub>2</sub>, Ar AND NMHC FOR THE SEMICONDUCTOR INDUSTRY


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

FEATURES AND BENEFITS

- In compliance with Low Voltage, EMC and applicable Directives
- New Plasma Emission Detector (PED) Sensor technology enables sub-ppb measurements of H<sub>2</sub>, CH<sub>4</sub>, CO, CO<sub>2</sub>, N<sub>2</sub>, Ar and NMHC
- Enables unique total Servomex solution for UHP gas analysis


APPLICATIONS

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




GAS	MEASURES	APPLICATION
MULTIPLE	ULTRA TRACE PPB	QUALITY
	ULTRA TRACE PPT	

-----


 SENSING TECHNOLOGY

-----

GAS  
CHROMATOGRAPHY



PLASMA



SERVOPRO DF-500 Range

SAFE AREA

SERVOPRO DF-560E NanoTrace ULTRA

SAFE AREA

LEADING ULTRA-TRACE PPT O<sub>2</sub> ANALYZER RANGE


Verified by independent experts as measuring O<sub>2</sub> to the lowest ppt levels available, the DF-500 analyzer range delivers the premium performance in ultra-trace O<sub>2</sub> measurement. Consisting of the DF-550E NanoTrace and DF-560E NanoTrace II, the NanoTrace series delivers exceptional O<sub>2</sub> measurements at trace and ultra-trace ppt levels.

FEATURES AND BENEFITS


- The industry standard for the reliable measurement of O<sub>2</sub> 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

APPLICATIONS


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



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

 SENSING TECHNOLOGY

COULOMETRIC



SERVOPRO DF-700 Range

SAFE AREA

SERVOPRO DF-750 NanoTrace ULTRA

SAFE AREA

TUNABLE DIODE LASER (TDL) TRACE MOISTURE ANALYZER RANGE


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

FEATURES AND BENEFITS

- Exceptional range from 100ppt to 20ppm 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

APPLICATIONS


- 730: Quality control of HCl gas
- 740: Analysis of electronics-grade NH<sub>3</sub> 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<sub>2</sub> and H<sub>2</sub>O monitoring in UHP bulk gases used in semiconductor applications



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

SENSING TECHNOLOGY

LASER MOISTURE





SERVOPRO DF-760E NanoTrace ULTRA

SAFE AREA

MARKET-LEADING DUAL ANALYSIS OF O<sub>2</sub> AND MOISTURE

Delivering industry-leading quality control measurements for UHP bulk gases, the compact DF-760E NanoChrome ULTRA analyzer is a superior solution for the dual measurement of trace and ultra-trace moisture and O<sub>2</sub>.



FEATURES AND BENEFITS

- Industry-leading LDLs of 45ppt O<sub>2</sub> and 55ppt moisture
- Non-depleting sensing technologies reduce ongoing costs
- Easy operation via front panel or digital communication options

APPLICATIONS

- Monitoring O<sub>2</sub> and moisture as contaminants in UHP bulk gases used in semiconductor applications

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

✓ SENSING TECHNOLOGY

LASER MOISTURE

COULOMETRIC

SERVOPRO Plasma

SAFE AREA

RELIABLE MONITORING OF N<sub>2</sub> IN Ar AND He, OPTIMIZED FOR AIR SEPARATION UNIT (ASU) PLANT OPERATIONS

Specifically designed for the continuous monitoring of N<sub>2</sub> in Ar or He or both, the Plasma's non-depleting Plasma Emission Detector provides an accurate, highly stable and reliable measurement ideal for the requirements of ASU plant operators.



FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
NITROGEN	TRACE PPM	QUALITY

✓ SENSING TECHNOLOGY

PLASMA

SERVOPRO FID

SAFE AREA

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

A Flame Ionization Detector analyzer designed to assure safe operation for cryogenic ASU, the FID ensures the level of Total Hydrocarbons (THC) is maintained below flammable limits, as well as providing quality control in pure O<sub>2</sub>, N<sub>2</sub>, Ar, air, He and CO<sub>2</sub>.



FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
TOTAL HYDROCARBONS	TRACE PPM	SAFETY
		QUALITY

✓ SENSING TECHNOLOGY

FLAME IONIZATION DETECTOR

SERVOPRO NOx

SAFE AREA

CHEMILUMINESCENCE DETECTOR ANALYZER FOR KEY EMISSIONS APPLICATIONS INVOLVING ULTRA-LOW NO, NO<sub>2</sub> AND NOx

Utilizing Chemiluminescence detection technology to measure NO or NO/NO<sub>2</sub>/NOx concentrations in industrial gas and vehicle emission applications, the versatile SERVOPRO NOx can be calibrated for four measurement ranges starting from ultra-low to high ppm and is easy to install and operate.



FEATURES AND BENEFITS

- 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

APPLICATIONS

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

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

✓ SENSING TECHNOLOGY

CHEMILUMINESCENCE

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. Can be equipped with a non-methane cutter for additional methane (CH<sub>4</sub>) and non-methane hydrocarbon (NMHC) reporting.



FEATURES AND BENEFITS

- Four user-definable measurement ranges, reconfigurable in the field
- High-accuracy, gas-selective FID technology for maximized uptime
- Heated oven for maximum stability and "hot/wet" sampling
- EPA Method 25A compliant
- EPA 1065/1066 and LD Euro 6, HD Euro V1 compliant

APPLICATIONS

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

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

✓ SENSING TECHNOLOGY

FLAME IONIZATION DETECTOR

GAS DETECTION OxyDetect

SERVOMEX

NON-DEPLETING PARAMAGNETIC O<sub>2</sub> MONITOR DESIGNED FOR LIFE SAFETY APPLICATIONS

Oxygen depletion monitor designed for safe area or hazardous area environments, utilizing superior performance of non-depleting Hummingbird Paramagnetic O<sub>2</sub> sensing technology.



FEATURES AND BENEFITS

- IP54 (indoor use only)
- The most reliable O<sub>2</sub> detector on the market
- No more false readings or false alarms caused by depleting cell technologies
- Configurable alarm relays and mA output available as standard
- Modbus digital communications option available
- SIL 2 hardware compliant

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	SAFETY

✓ SENSING TECHNOLOGY

PARAMAGNETIC

SERVOFLEX Micro i.s. 5100

PORTABLES

INTRINSICALLY SAFE ANALYZER MEASURES O<sub>2</sub>

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<sub>2</sub>.



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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
		SAFETY

SENSING TECHNOLOGY

PARAMAGNETIC

SERVOFLEX MiniFoodPack 5200

PORTABLES

BENCHTOP ANALYZER FOR QUALITY CONTROL/CHECKS IN MODIFIED ATMOSPHERE PACKAGING

A small sample volume portable benchtop analyzer designed specifically for the checking and quality control of gas mixtures in Modified Atmosphere Packaging (MAP) used in the food and pharmaceutical industries, the MiniFoodPack 5200 enables single or dual measurements for percent levels of O<sub>2</sub> and CO<sub>2</sub>.



FEATURES AND BENEFITS

- CE marked and in compliance with EEC, EMC and WEEE Directives. UL approved and CE marked 100-240V/43-70Hz AC power supply
- Range of sampling accessories is available for taking measurement from rigid or flexible pack
- Rechargeable battery option enables complete portability for flexible operation

APPLICATIONS

- MAP quality testing for food and beverage products
- MAP for packaged pharmaceuticals
- Equilibrium Modified Atmosphere Packaging (EMAP) fresh consumable produce testing
- Laboratory and research

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	QUALITY
CARBON DIOXIDE		

SENSING TECHNOLOGY

PARAMAGNETIC

INFRARED

SERVOFLEX MiniMP 5200

PORTABLES

BENCHTOP ANALYZER OFFERING SINGLE OR DUAL MEASUREMENTS OF O<sub>2</sub> AND CO<sub>2</sub>

The only truly portable battery-powered gas analyzer with MCERTS and TUV certification, the MiniMP 5200 is designed to offer single or dual measurement of O<sub>2</sub> and CO<sub>2</sub> by utilizing Servomex's advanced Paramagnetic and Infrared sensing technologies.



FEATURES AND BENEFITS

- MCERTS V3.3, Annex F and TUV QAL 1 makes the MiniMP ideal for source testers that require reference O<sub>2</sub> 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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
CARBON DIOXIDE		QUALITY
		EMISSIONS

SENSING TECHNOLOGY

PARAMAGNETIC

INFRARED

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<sub>2</sub>, CO or CO<sub>2</sub> within common gas mixtures. The MiniHD 5200 utilizes Servomex's non-depleting Paramagnetic or Infrared sensors to give dependable and accurate results.



FEATURES AND BENEFITS

- Robust IP65 construction meets the demanding needs of field location analysis
- Long life Li-ion rechargeable batteries and range of sampling options ensure ease of use
- Accurate measurement of O<sub>2</sub>, CO and CO<sub>2</sub> levels

APPLICATIONS

- Physiology studies
- Universities
- Combustion optimization

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

SENSING TECHNOLOGY

PARAMAGNETIC

INFRARED

WE'RE RIGHT BY YOUR SIDE



THE SERVOFLEX PORTABLE OXYGEN ANALYZER RANGE

Supporting the global medical care sector with reliable, portable analysis.

Contact us today: [servomex.com/servoflex](https://servomex.com/servoflex)



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 <sub>2</sub> , O <sub>2</sub> , H <sub>2</sub> , CO <sub>2</sub> )	●		●	●	●
	Semiconductor (UHP)			●	●	
	Pharmaceuticals		●	●	●	●





## 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<sub>4</sub>, CO, CO<sub>2</sub>, H<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, 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<sub>2</sub> purity along with CO, CO<sub>2</sub> and CH<sub>4</sub> contaminants.

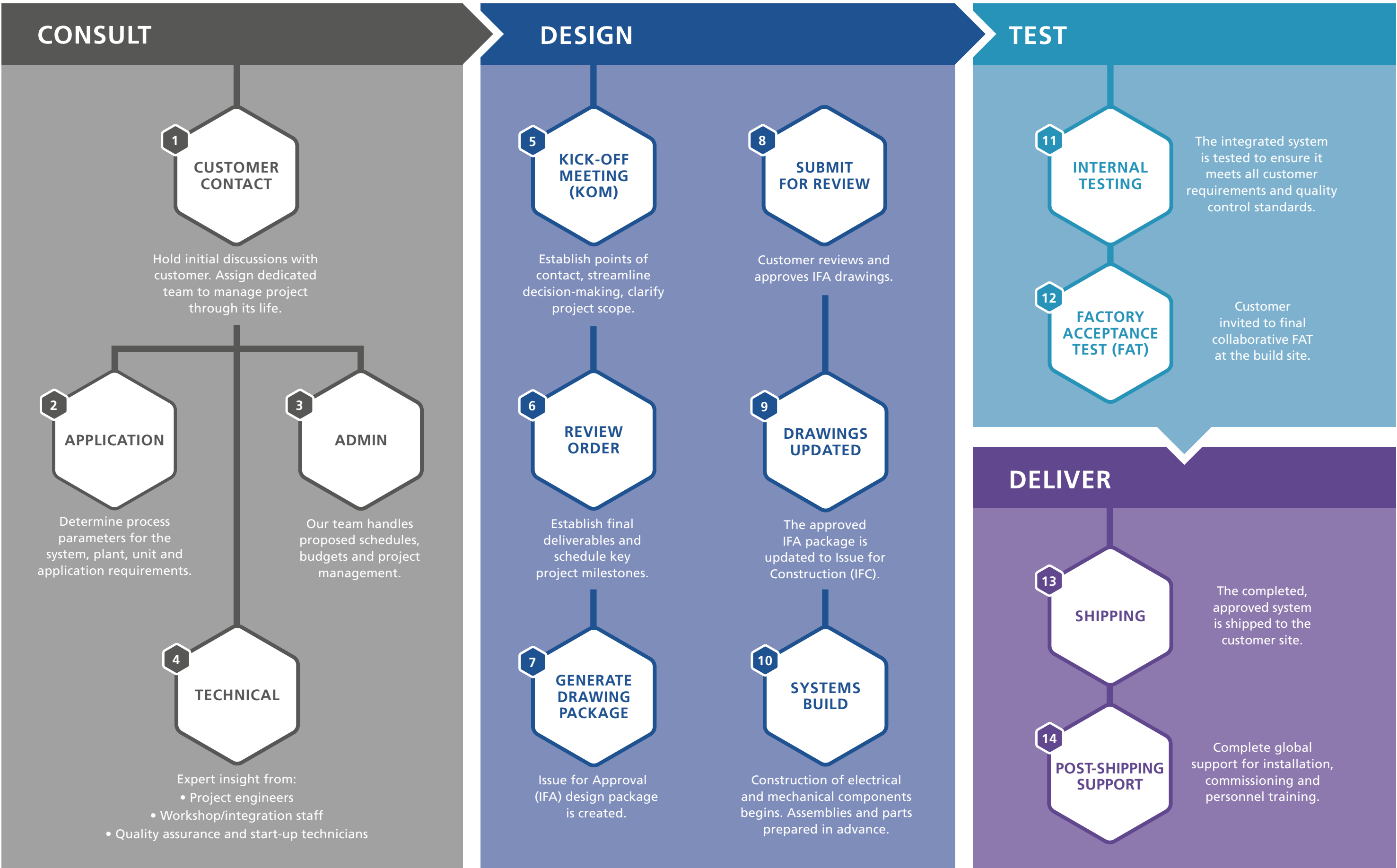
### FEATURES AND BENEFITS

- 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





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



READY TO  
SUPPORT  
YOUR UPTIME



Get in touch to find out more: [servomex.com/service](https://servomex.com/service)

WHEREVER YOU ARE,  
WE'RE READY TO HELP

All our systems and analyzers are backed by deep applications knowledge and a global, expert team that delivers the support you need, wherever you're based.

Operating from regional service centers around the world, the experienced engineers of our global service network provide a rapid response, covering all your maintenance needs from routine servicing to emergency repairs or replacement.

We can be present from day one, commissioning, setting up and calibrating your new analyzer for optimum performance. We also deliver training for your staff, make regular site visits to check and maintain your devices, and ensure you have access to the spares you need.

Find out more about our customized service support at [servomex.com/service](https://servomex.com/service)

FIND YOUR NEAREST CENTER FOR REMOTE OR ON-SITE SUPPORT

**ASIA PACIFIC AND CHINA**  
Email: [asia\\_service@servomex.com](mailto:asia_service@servomex.com)  
Email: [china\\_service@servomex.com](mailto:china_service@servomex.com)

**INDIA**  
Email: [MEI\\_service@servomex.com](mailto:MEI_service@servomex.com)

**MIDDLE EAST**  
Email: [MEI\\_service@servomex.com](mailto:MEI_service@servomex.com)

**EUROPE**  
Email: [europe\\_service@servomex.com](mailto:europe_service@servomex.com)

**AMERICAS**  
Email: [americas\\_service@servomex.com](mailto:americas_service@servomex.com)



**MARK CALVERT**  
GLOBAL HEAD OF SERVICE  
[mcalvert@servomex.com](mailto:mcalvert@servomex.com)

Mark leads our global service teams to meet customer needs and exceed their expectations, promoting best practice and delivering the same high standards of service across the world.

Responsible for the co-ordination of our service teams around the globe, he ensures that customer support and service delivery are provided quickly and effectively, promoting collaborative working and an ever-stronger customer-focused approach.





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.



## 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



## Training

### SHARING OUR GAS ANALYSIS EXPERTISE

Providing your on-site user and maintenance teams with full training on the relevant analyzers supports long-term reliable 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



## 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



## 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, 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



## 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



## 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 unrivalled product knowledge ensures the best possible expert 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.

## 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 depends 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



> RECOMMENDED SERVICE CHART

SERVOTOUGH	Service plans	Factory Acceptance Testing	Commissioning	Training	Spares
H2scan					
Oxy 1800					
Oxy 1900					
OxyExact 2200					
SpectraScan 2400					
SpectraExact 2500					
FluegasExact 2700					
Laser 3 Plus Range					
SERVOPRO	Service plans	Factory Acceptance Testing	Commissioning	Training	Spares
AquaXact 1688					
MonoExact DF150E					
MonoExact DF310E					
4900 Multigas					
MultiExact 4100					
MultiExact 4200					
Chroma					
NanoChrome					
DF-500 Range					
DF-700 Range					
NanoChrome ULTRA					
DF-560E NanoTrace ULTRA					
DF-750 NanoTrace ULTRA					
DF-760E NanoTrace ULTRA					
Plasma					
FID					
NOx					
HFID					
GAS DETECTION	Service plans	Factory Acceptance Testing	Commissioning	Training	Spares
OxyDetect					
SERVOFLEX	Service plans	Factory Acceptance Testing	Commissioning	Training	Spares
Micro i.s. 5100					
MiniMP 5200					
MiniHD 5200					
MiniFoodPack 5200					

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.

Service agreements	On-site service support	Service center support	Rentals	Health check	PAGE
					97
					97
					97
					98
					98
					98
					99
					100
Service agreements	On-site service support	Service center support	Rentals	Health check	PAGE
					101
					101
					102
					102
					102
					103
					103
					104
					104
					104
					105
					105
					105
					106
					106
					106
					107
					107
Service agreements	On-site service support	Service center support	Rentals	Health check	PAGE
					107
Service agreements	On-site service support	Service center support	Rentals	Health check	PAGE
					108
					108
					109
					109

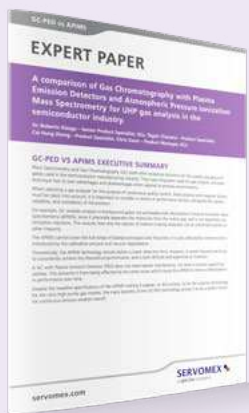
GET THE RESOURCES YOU  
NEED TO SUPPORT YOUR  
PROCESS SOLUTION

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.

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.



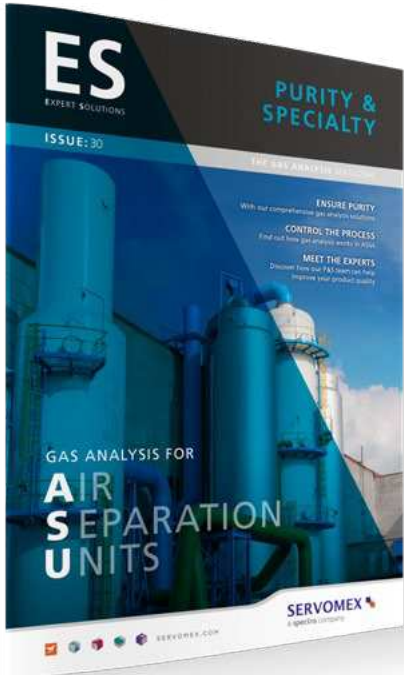
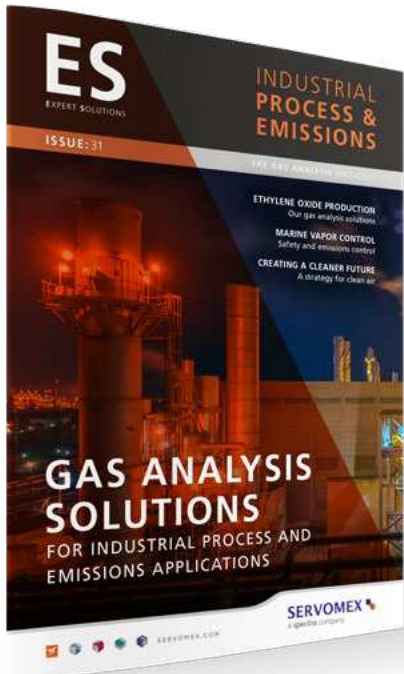
MANUALS

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.



To access these resources go to: [servomex.com/resources](http://servomex.com/resources)



0-9

*4900 Multigas* – 8-9, 12-13, 14-15, 18-19, 24, 25, 36-37, 38-39, 40-41, 42-43, 44-45, 80-81, 82-83, 86-87, 102, 122-123

A

*Air separation units* – 24, 28-29, 42-43, 67, 68-69, 76-77, 78-79, 82-83, 88-89, 103, 106, 108  
*Aluminum Oxide* – 67, 68-69, 84-85, 101, 102  
*Ammonia* – 8-9, 36-37, 38-39, 40-41, 42-43, 100  
*AquaXact 1688* – 8-9, 24, 28-29, 38-39, 40-41, 42-43, 68-69, 101, 122-123  
*AquaXact 1688 Controller* – 8-9, 101  
*Argon* – 8-9, 28-29, 40-41, 42-43  
*ATEX certification* – 10

C

*Calorimetry* – 56-57, 67, 72-73, 94-95, 99  
*Calvert, Mark* – 117  
*Carbon capture (oxyfuel combustion)* – 24, 42-43  
*Carbon capture (post-combustion)* – 24, 40-41  
*Carbon capture (pre-combustion)* – 24, 38-39  
*Carbon dioxide* – 8-9, 11, 12-13, 30-31, 36-37, 38-43, 44-45, 46-47, 52-53, 72-73, 98, 108, 109  
*Carbon monoxide* – 8-9, 11, 14-15, 30-31, 34, 36-37, 38-39, 40-41, 42-43, 46-47, 52-53, 56-57, 98, 100, 109  
*Chambers, Matt* – 27  
*Chemiluminescence* – 67, 70-71, 107  
*Chlorine* – 64-65  
*Chroma* – 8-9, 24, 28-29, 76-77, 78-79, 88-89, 90-91, 103, 122-123  
*Clean air* – 4, 24, 36-37  
*Combustibles (COe)* – 36-37, 56-57, 72-73, 99  
*Combustion* – 34, 36-37, 38-43, 67, 70-71, 92-93, 99, 108

*Coulometric* – 67, 68-69, 74-75, 84-85, 101, 102, 104, 105, 106  
*Cowan, Andy* – 4

D

*DeNOx* – 36-37, 67, 70-71, 92-93, 100  
*Direct reduction iron* – 25, 44-45  
*DF-500 Range* – 8-9, 22-23, 74-75, 104, 122-123  
*DF-560E ULTRA* – 8-9, 24, 32-33, 74-75, 105, 122-123  
*DF-700 Range* – 8-9, 24, 40-41, 42-43, 74-75, 84-85, 104, 122-123  
*DF-750 ULTRA* – 8-9, 24, 32-33, 84-85, 105, 122-123  
*DF-760E ULTRA* – 8-9, 74-75, 84-85, 106, 122-123

E

*Emissions monitoring* – 35, 36-37, 44-45, 67, 70-71, 82-83, 100, 107, 108, 109  
*Ethylene production* – 25, 46-47, 67, 82-83, 98  
*Ethylene dichloride production* – 25, 48-49, 67, 86-87  
*Ethylene oxide production* – 25, 50-51, 67, 86-87  
*Ethics* – 20

F

*FID (analyzer)* – 8-9, 18-19, 76-77, 106, 122-123  
*Flame Ionization Detector* – 67, 70-71, 76-77, 78-79, 103, 106, 107  
*FluegasExact 2700* – 8-9, 14-15, 22-23, 24, 25, 36-37, 42-43, 56-57, 62-63, 72-73, 94-95, 99, 122-123  
*FTIR* – 24, 82-83, 103

G

*Galley, Chris* – 117  
*Gargallo, Karen* – 35  
*Gas Chromatography* – 67, 76-77, 78-79, 90-91. 103, 104, 105  
*Gas Filter Correlation (Gfx)* – 52-53, 67, 70-71, 80-81, 86-87, 98, 102, 103  
*Guan, Huiyu* – 35

H

*H2scan* – 8-9, 97, 122-123  
*Helium* – 8-9  
*HFID* – 8-9, 18-19, 76-77, 107, 122-123  
*Hordijk, Jan* – 27  
*HyCO/hydrogen production* – 25, 52-53, 103  
*Hydrocarbons* – 8-9, 17, 18-19, 98  
*Hydrogen* – 8-9, 38-39, 40-41, 52-53, 64-65, 97, 103  
*Hydrogen chloride (HCl)* – 8-9, 48-49, 64-65  
*Hydrogen sulfide* – 8-9, 38-39, 40-41, 42-43, 98

I

*IEC certification* – 10  
*Industrial Process & Emissions (IP&E)* – 26, 35-65  
*Infrared* – 52-53, 67, 70-71, 80-81, 82-83, 86-87, 98, 102, 103, 108, 109

J

*Jenkins, Rhys* – 35

K

*Khan, Azfal* – 35

L

*Laser 3 Plus Combustion* – 8-9, 14-15, 18-19, 22-23, 24, 25, 34, 36-37, 42-43, 56-57, 92-93, 100, 122-123  
*Laser 3 Plus Environmental* – 8-9, 24, 36-37, 92-93, 100, 122-123  
*Laser 3 Plus Process* – 8-9, 22-23, 92-93, 100, 122-123  
*Laser Moisture* – 67, 68-69, 74-75, 84-85, 104, 105, 106  
*Luo, Louie* – 117

M

*Marine vapor control* – 25, 54-55  
*MCERTS* – 10  
*Medical gases* – 24, 30-31, 67, 68-69, 78-79, 86-87, 88-89, 103, 108  
*Methane* – 8-9, 17, 18-19, 36-37,

52-53, 100, 107  
*Micro i.s. 5100* – 8-9, 22-23, 86-87, 108, 122-123  
*MiniFoodPack 5200* – 8-9, 12-13, 22-23, 82-83, 86-87, 109, 122-123  
*MiniHD 5200* – 8-9, 12-13, 14-15, 22-23, 82-83, 86-87, 109, 122-123  
*MiniMP 5200* – 8-9, 12-13, 22-23, 82-83, 86-87, 108, 122-123  
*Moisture (H<sub>2</sub>O)* – 8-9, 38-39, 40-41, 42-43, 48-49, 52-53, 68-69, 84-85, 101, 102, 104, 105, 106  
*MonoExact DF150E* – 8-9, 74-75, 101, 122-123  
*MonoExact DF310E* – 8-9, 22-23, 74-75, 86-87, 102, 122-123  
*MultiExact 4100* – 8-9, 12-13, 14-15, 18-19, 22-23, 24, 28-29, 30-31, 38-39, 40-41, 42-43, 80-81, 82-83, 86-87, 94-95, 102, 122-123  
*MultiExact 4200* – 8-9, 12-13, 14-15, 18-19, 25, 52-53, 80-81, 82-83, 86-87, 103, 122-123

N

*NanoChrome* – 8-9, 78-79, 88-89, 104, 122-123  
*NanoChrome ULTRA* – 8-9, 24, 32-33, 78-79, 88-89, 105, 122-123  
*Nitric oxide (NO)* – 8-9, 36-37, 70-71, 107  
*Nitrogen* – 8-9, 28-29, 40-41, 42-43, 106  
*Nitrogen dioxide* – 8-9, 36-37, 70-71, 107  
*Nitrous oxide (N<sub>2</sub>O)* – 8-9, 36-37, 52-53, 107  
*Non-methane hydrocarbons (NMHC)* – 8-9, 107  
*NOx (analyzer)* – 8-9, 24, 25, 44-45, 70-71, 107, 122-123  
*NOx (oxides of nitrogen)* – 8-9, 36-37, 38-39, 40-41, 42-43, 44-45, 46-47, 70-71, 107

O

*Oxy 1800* – 8-9, 86-87, 97, 122-123  
*Oxy 1900* – 8-9, 22-23, 24, 25,

38-39, 40-41, 42-43, 44-45, 54-55, 58-59, 86-87, 97, 122-123  
*OxyDetect* – 8-9, 107, 122-123  
*OxyExact 2200* – 8-9, 22-23, 25, 50-51, 54-55, 60-61, 86-87, 98, 122-123  
*Oxygen* – 8-9, 21, 22-23, 28-29, 30-31, 34, 36-37, 38-39, 40-41, 42-43, 44-45, 46-47, 50-51, 52-53, 54-55, 56-57, 58-59, 60-61, 72-73, 74-75, 86-87, 94-95, 97, 98, 99, 100, 101, 102, 104, 105, 106, 107, 108, 109

P

*Paramagnetic* – 21, 50-51, 52-53, 54-55, 58-59, 60-61, 67, 68-69, 70-71, 74-75, 86-87, 94-95, 97, 98, 102, 103, 107, 108, 109  
*Park, Sangwon* – 35  
*Plasma (analyzer)* – 8-9, 88-89, 104, 105, 106, 122-123  
*Plasma (sensing technology)* – 67, 78-79, 88-89, 103, 106  
*Process heaters and furnaces* – 25, 56-57, 67, 72-73, 94-95  
*Proctor, Mike* - 27  
*Propylene* – 8-9, 58-59  
*Propylene oxide production* – 25, 58-59  
*Purified terephthalic acid (PTA) production* – 25, 60-61, 67, 86-87  
*Purity & Specialty (P&S)* – 26, 27-33

Q

*QAL1* – 10

R

*Range/Purity* – 7

S

*Semiconductors* – 24, 32-33, 67, 68-69, 74-75, 78-79, 88-89, 104, 105, 106  
*Service network* – 116-123  
*SIL* – 10  
*SOx (oxides of sulfur)* – 8-9, 36-37, 46-47

*SpectraExact 2500* – 8-9, 12-13, 14-15, 18-19, 24, 25, 38-39, 40-41, 42-43, 44-45, 46-47, 48-49, 64-65, 80-81, 82-83, 98, 122-123  
*SpectraScan 2400* – 8-9, 25, 46-47, 98, 122-123  
*Spectroscopic* – 98  
Sulfur dioxide – 8-9, 36-37, 38-39, 40-41, 42-43  
*Sustainability* – 4, 5  
*Systems integration* – 110-115

T

*Tan, Nick* – 117  
*Thermal Conductivity* – 67, 78-79, 90-91, 103  
*Thermal power (coal)* – 25, 62-63, 94-95  
*Thick Film Catalytic* – see Calorimetry  
*Tiley, Neil* – 117  
*Total hydrocarbons (THC)* – 18-19, 52-53, 76-77, 106, 107  
*Tunable Diode Laser (TDL)* – 56-57, 67, 74-75, 84-85, 92-93, 94-95, 100

U

*Ultra-high-purity (UHP) gases* – 24, 32-33, 67, 103

V

*Vinyl chloride monomer (VCM) production* – 25, 64-65

W

*Warren, Keith* – 35

Y

*Yap, Chee Wee* – 27

Z

*Zhai, Xiaowei* – 27  
*Zirconia* – 21, 56-57, 67, 72-73, 92-93, 94-95, 99, 102

# SIGN UP TO SERVOMEX NEWS

GET THE LATEST ALERTS ABOUT  
SERVOMEX SYSTEMS AND PRODUCTS



## 1. SCAN THE QR CODE

Get the latest  
information directly  
on your phone or  
smart device with  
only one click.



## 2. VISIT:

**[servomex.com/signup](https://servomex.com/signup)**

When you sign up to receive Servomex emails, you'll be the first to know about our new products. Take control of your preferences and make sure you get all the news that's relevant to you.

### TECHNICAL CENTERS

#### AMERICAS

Servomex Company Inc.  
US Technical and Service Center  
4 Constitution Way  
Woburn, MA 01801-1087 USA

#### UNITED KINGDOM

Servomex Group Limited  
UK Technical and Service Centre  
Jarvis Brook, Crowborough  
East Sussex, TN6 3FB, United Kingdom

### FOR ALL ENQUIRIES PLEASE CONTACT YOUR LOCAL BUSINESS CENTER

#### ASIA PACIFIC

Tel: +86 (0)21 6489 7570  
Fax: +86 (0)21 6442 6498  
Email: [asia\\_sales@servomex.com](mailto:asia_sales@servomex.com)

#### EUROPE

Tel: +44 (0)1892 603 330  
Fax: +44 (0)1892 662 253  
Email: [europe\\_sales@servomex.com](mailto:europe_sales@servomex.com)

#### INDIA

Tel: +91 22 6606 2700  
Fax: +91 22 6606 2701  
Email: [MEI\\_sales@servomex.com](mailto:MEI_sales@servomex.com)

#### MIDDLE EAST

Tel: +971 6552 8073  
Fax: +971 6552 8074  
Email: [MEI\\_sales@servomex.com](mailto:MEI_sales@servomex.com)

#### AMERICAS

Tel: +1 281 295 5800  
USA Toll Free +1 800 862 0200  
Fax: +1 281 295 5899  
Email: [americas\\_sales@servomex.com](mailto:americas_sales@servomex.com)