

HYDROCARBON PROCESSING



GAS ANALYSIS MAGAZINE

ISSUE
THREE - 2018

SUPPORTING YOUR HYDROCARBON
PROCESSING APPLICATIONS

MARKET SOLUTIONS

Solution for flare stack monitoring

APPLICATION STUDY

Paramagnetic analysis for oxygen

EXPERT ADVICE

Benefits of Tunable Diode Laser analyzers



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GET TO KNOW OUR HP TEAM:

MATT HALSEY



Hydrocarbon processing (HP) is one of the most demanding industries in the world.

To support customers in facing the challenges of this market, Servomex provides a team of dedicated, experienced HP experts, delivering in-depth knowledge of products and applications to ensure the best gas analysis solution for your process.

Installed in extensive midstream and downstream applications around the world, our analyzers provide the accurate, reliable gas analysis that forms a vital part of all HP processes.

One of the key members of the Servomex HP team is Matt Halsey, who became Product Manager for Process Oxygen, Zirconia and Oxygen Deficiency in June 2016.

Based at the UK Technical Centre in Crowborough, his role involves managing all aspects of the products in this category, which include the industry-leading SERVOTOUGH FluegasExact 2700, the award-winning SERVOTOUGH Oxy 1900 and the innovative OxyDetect.

With responsibility for campaigning, pricing, market positioning and customer focus across the life cycle of these products, Matt's expertise benefits customers looking for a strong understanding of their applications and the optimal solution.

Matt joined Servomex in 2007 as an apprentice, which gave him the opportunity to tour all departments of the company, gaining an insight into how the company operates from end-to-end.

He went on to become an Applications Engineer in 2010, working on the same products he now manages.

This role gave Matt experience in customer relationship management and a deep technical knowledge of customer processes and Servomex solutions. His knowledge and experience quickly established him as the combustions expert within the Applications team.

Matt recently completed his BEng (Hons) in Energy & Sustainability, graduating with First Class Honours.



UK Technical Centre

For HP solutions involving Process Oxygen, Zirconia and Oxygen Deficiency, email mhalsey@servomex.com

IN THIS ISSUE

P04

HP MARKET FOCUS

Learn why emissions reduction is key to the HP market in China.



P05

MARKET SOLUTIONS

Discover Servomex's superior solution for flare stack monitoring in industrial plants.



P06

APPLICATION STUDY

Paramagnetic analysis for safety-critical oxygen measurements.



P08

UPGRADE YOUR COMBUSTION ANALYSIS

Why switching to the SERVOTOUGH FluegasExact 2700 will transform your process.



P10

EXPERT FOCUS

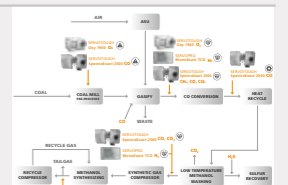
The benefits of Tunable Diode Laser gas analyzers in combustion safety.



P11

PROCESS STUDY

Gas monitoring solutions for efficiency and safety in coal to olefins conversion.



P14

SERVICE FOCUS

New manager appointments enhance Servomex's global service structure.



SEE THE FULL PICTURE ONLINE

SEE INSIDE SERVOMEX

Get an insight into our world-class manufacturing facilities where sensors and SERVOTOUGH & SERVOFLEX analyzers are built



SERVOMEX OxyDetect

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



SERVOTOUGH Laser 3 Plus

See the advantages of Servomex's latest product range as we introduce three compact TDL analyzers



SERVOFLEX Portables

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



Watch at servomex.com/videos

See our latest product ranges. Analyzer guide starts on page 15

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P02



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

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

P03

EMISSIONS REDUCTION KEY TO HP MARKET FUTURE IN CHINA

Emissions regulation continues to be a key area of development for hydrocarbon processing (HP) plants in China.

The Government Work Report (GRW) 2018 sets out specific, quantified indicators for ecological environmental protection.

As part of these atmospheric protections, sulfur dioxide and nitrogen oxide emissions will be cut by 3%, while the density of hazardous fine particle matter (PM2.5) will continue to be reduced in key urban areas such as Beijing, Tianjin and Shanghai.

Chemical oxygen demand and ammonia nitrogen emissions will both be decreased by 2%.

In the HP market, government policy supports the upgrading of plants. Petrochemical, iron and steel, and other industries are encouraged to make improvements to achieve the required ultra-low emissions and reduction in volatile organic compounds (VOCs).

For providers of gas analysis solutions, this offers significant opportunities. There is likely to be huge growth in upgrading projects for HP and iron and steel plants, particularly in oxygen monitoring for safety control in waste gas/water treatment to achieve the ultra-low emissions and VOC levels.

Servomex has extensive expertise in delivering the oxygen measurement solutions required for these applications, particularly in nitrogen seal and inerting applications aimed at reducing the risk of explosion and ensuring safe operation.

Key products for these applications come from Servomex's SERVOTOUGH range, suitable for hazardous area use in HP plants, and include the Oxy 1900, OxyExact 2200 and Laser 3 Plus analyzers.



SERVOMEX KEY OXYGEN MEASUREMENT SOLUTIONS

SERVOTOUGH Oxy 1900



An award-winning Paramagnetic digital oxygen analyzer designed for hazardous area use. Using highly accurate, non-depleting sensing technology, it requires minimal calibration, providing reliable percentage measurements of oxygen.

SERVOTOUGH OxyExact 2200



A high-specification process oxygen analyzer delivering safe or hazardous area control using up to six transmitters linked to a single control unit. It combines high-precision, non-depleting Paramagnetic sensing with a flexible, robust design.

SERVOTOUGH Laser 3 Plus



A range of compact, high-performance Tunable Diode Laser analyzers, optimized for combustion, process, and ammonia DeNOx applications. In-situ, cross-stack measurements deliver exceptional performance benefits and ease of operation.

Find out more at servomex.com or contact your nearest business center

FLARE STACK MONITORING

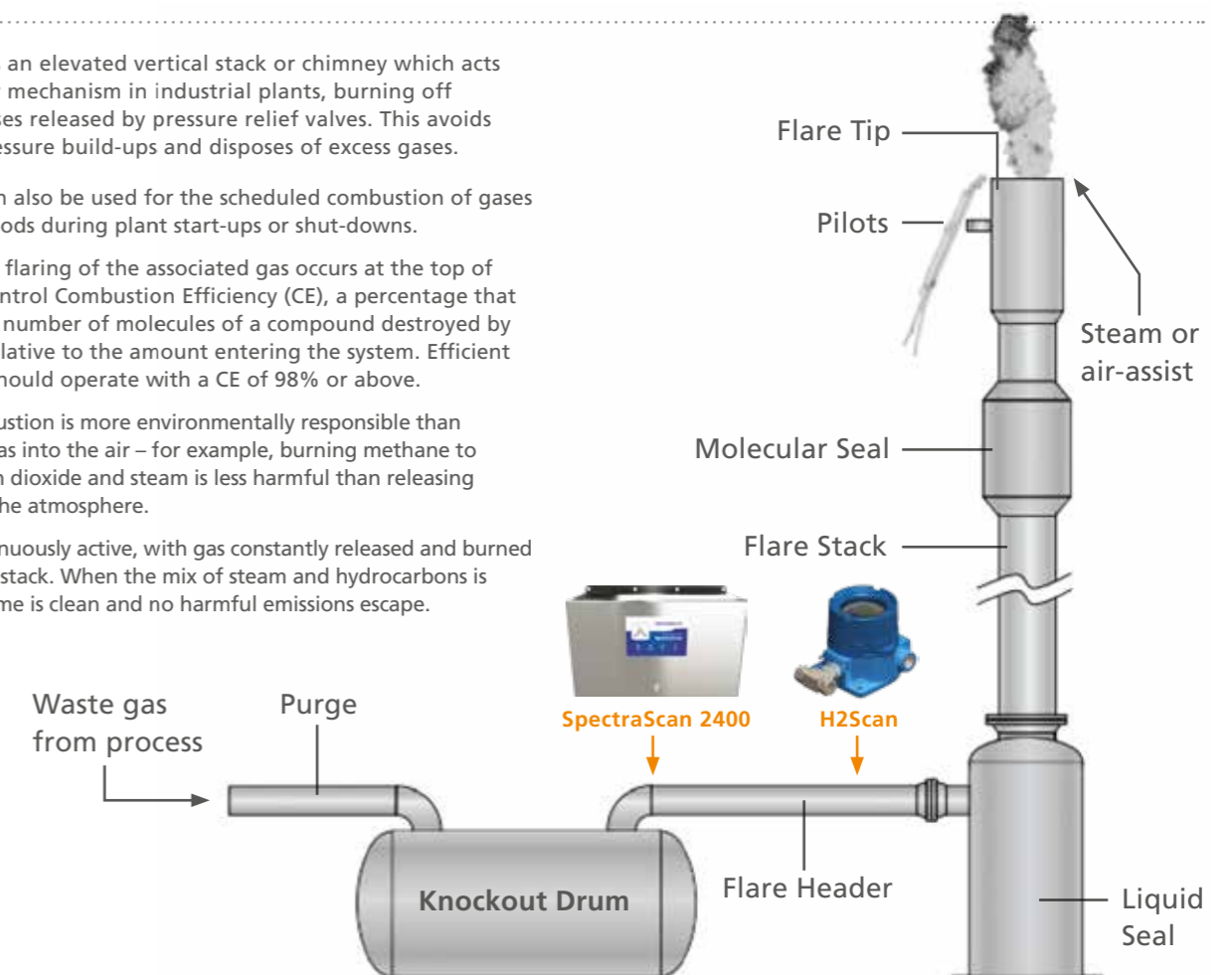
A flare stack is an elevated vertical stack or chimney which acts as a key safety mechanism in industrial plants, burning off flammable gases released by pressure relief valves. This avoids unplanned pressure build-ups and disposes of excess gases.

Flare stacks can also be used for the scheduled combustion of gases over short periods during plant start-ups or shut-downs.

Steam-assisted flaring of the associated gas occurs at the top of the stack to control Combustion Efficiency (CE), a percentage that represents the number of molecules of a compound destroyed by incineration relative to the amount entering the system. Efficient flare systems should operate with a CE of 98% or above.

Vent gas combustion is more environmentally responsible than releasing the gas into the air – for example, burning methane to produce carbon dioxide and steam is less harmful than releasing methane into the atmosphere.

Flares are continuously active, with gas constantly released and burned off at the flare stack. When the mix of steam and hydrocarbons is correct, the flame is clean and no harmful emissions escape.



SERVOMEX FLARE STACK ANALYSIS SOLUTION

Servomex's flare stack analysis system is comprised of the SERVOTOUGH SpectraScan 2400 and SERVOTOUGH H2Scan, providing a superior detection system that is used by some plants to benchmark the performance of GC/calorimeter analysis.

The combination of the two analyzers gives a continuous reading, measuring 14 components for an overall British Thermal Unit (BTU) value and individual component values.

The SpectraScan 2400 uses Tunable Filter Infrared technology to accurately separate and analyze light hydrocarbon components and H₂S.

Continuous sampling is made using a flow-through system, making it suitable for online, unattended operation.

With no carrier gas or recalibration requirements, the analyzer is low-maintenance and has few parameters affecting the sample.

Integrating simply with the SpectraScan 2400, the H2Scan uses non-depleting thin film technology to provide a direct, real-time hydrogen measurement that is not cross-sensitive to other gases. Hydrogen is vented more than any other gas, so is always present in flare lines.

SERVOTOUGH SpectraScan 2400



SERVOTOUGH H2Scan



Get advice from the experts: servomex.com/quotes-and-enquiries



PARAMAGNETIC OXYGEN ANALYSIS FOR SAFETY-CRITICAL MEASUREMENTS

Ethylene oxide and its derivatives are versatile chemical building blocks that are used in a wide range of commercial products.

It can be used to sterilize medical supplies and devices, but is more commonly used as an intermediate in the production of other chemicals, including ethylene glycol (polyester fibers, fiberglass, blending anti-freezing agents) and polyethylene terephthalate (PET) resin, used for packaging film and bottles.

Ethylene oxide (C₂H₄O) is formed through the reaction of oxygen (O₂) and ethylene (C₂H₄). This is an exothermic process, which means safety is a key concern, especially around the process reactors where flammable samples transit the process.

As a consequence, O₂ analysis for the reactor inlet and outlet is safety-critical, and forms part of a Safety Integrated System (SIS). This means that O₂ analyzers must be installed in triple redundancy, with two analyzers always in service, otherwise the process shuts down.



Ethylene oxide, which can be used as an intermediate in fiberglass production, is a hazardous substance.

SERVOMEX'S ETHYLENE OXIDE ANALYSIS SYSTEMS SOLUTION

As the world leader in gas analysis systems for ethylene oxide, Servomex has provided SIS installations to more than 40 plants around the world.

These systems use our trusted Paramagnetic, Infrared and Tunable Diode Laser (TDL) sensing technologies to deliver the accurate, reliable and safe measurements required through our resilient SERVOTOUGH analyzers, designed for operation in hazardous areas.

To provide safety-critical O₂ monitoring in the SIS, Servomex supplies the SERVOTOUGH OxyExact 2200.

Three of these Paramagnetic oxygen analyzers are positioned in a voting system on the inlet and each outlet of the reactors.

The OxyExact 2200 can also be used to ensure the purity of oxygen feedstock (in the 90-100% O₂ range) at the beginning of the production process.

A high-specification process O₂ analyzer, the OxyExact 2200 uses an intelligent three-enclosure system that facilitates the simplified and versatile sampling of any flammable gas up to 100% O₂. It does not require pre-sample drying in many cases, so dramatically reduces ongoing costs.

Up to six oxygen transmitters can be linked to a single control unit, delivering high performance and adaptability in a voting system.

Certified to Safety Integrity Level (SIL) 2, the OxyExact 2200 is designed to operate in hazard-rated locations including Zone 1 and Div 1.



Find out more at: servomex.com/oxyexact2200

SAFETY CRITICAL ANALYSIS FROM THE Oxy 1900

The SERVOTOUGH Oxy 1900 delivers leading-edge, safety-enhanced O₂ analysis for hazardous or challenging applications. This makes it an ideal solution for safety critical oxidation monitoring, such as the purity of ethylene oxide and propylene oxide.

It is Safety Integrity Level (SIL) 2 compliant, delivering solid reliability, and has ATEX Cat 2, IECEx Zone 1 and CSA Class 1 Div 1 certification for trusted performance in hazardous areas.

The Oxy 1900 is easy to install and use, with features including a heated sample compartment for unrivalled measurement

stability and simplified sampling. It also offers digital communications options, auto-calibration, and an intelligent flow sensor.



Find out more at: servomex.com/oxy1900

VOTING SYSTEMS



In a three-analyzer voting system, the process depends on the measurement made by the majority of analyzers. So, if only one analyzer detects a significant change, it is "outvoted" by the other two and no action is taken. However, if two analyzers detect a change, their reading is held as correct and action is taken. This may range from alerting the operator to automatically halting the process.

Voting systems allow problems with analyzers to be detected early without endangering the process. If two analyzers agree on a measurement and the third varies, it indicates a potential problem that can be investigated and corrected before the process is affected.

PARAMAGNETIC TECHNOLOGY

Both the SERVOTOUGH OxyExact 2200 and SERVOTOUGH Oxy 1900 are built around Servomex's high-precision Paramagnetic sensing technology, which provides reliable, accurate and stable percentage measurements of oxygen.

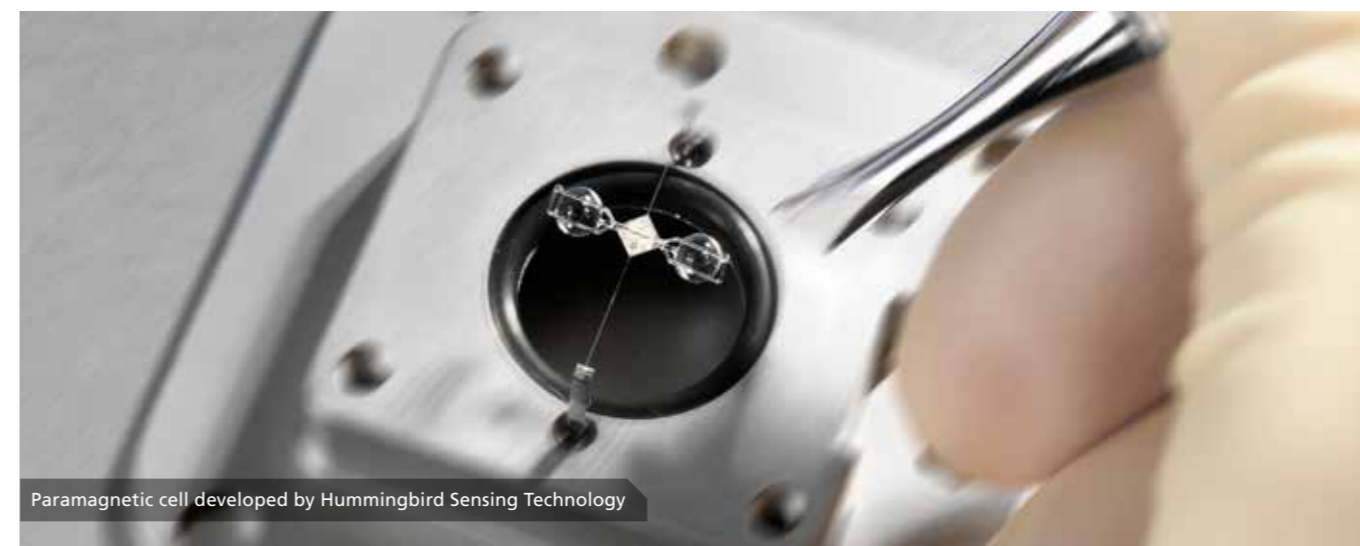
The magneto-dynamic Paramagnetic cell consists of two nitrogen-filled glass spheres, mounted on a rotating suspension within a magnetic field.

Light shines on a centrally-placed mirror and is reflected onto a pair of photocells.

Oxygen is naturally magnetic, and so is attracted into the magnetic field the spheres are suspended in, displacing them and causing the suspension to rotate. This rotation is detected by the photocells, generating a signal to a feedback system. This in turn passes a current through a wire mounted on the suspension, creating a motor effect.

The current produced is directly proportional to the concentration of oxygen within the gas mixture, allowing an accurate and linear percentage reading to be made.

Unlike electrochemical technologies, Paramagnetic cells never need changing, offering a performance that won't deteriorate. This results in reduced ongoing maintenance and a long operational life.



Paramagnetic cell developed by Hummingbird Sensing Technology

PRODUCT FOCUS



IMPROVE YOUR PROCESS WITH THE FluegasExact 2700



Upgrading to the SERVOTOUGH FluegasExact 2700 provides the highest performance for the measurement of oxygen (O₂) and combustibles (CO_e), all in one analyzer.

The resilient FluegasExact 2700 is the analyzer of choice for controlling a wide range of combustion processes in the most demanding hydrocarbon processing (HP) and power generation applications.

Its custom-designed, integral sampling system makes it ideal for operation in the hottest, most extreme combustion environments, including process heaters, utility boilers, thermal crackers, incinerators and furnaces.

Launched in 2013, the FluegasExact 2700 updates the Fluegas 2700 range (2700A, 2700B and 2700C), taking the trusted combustion measurements from those devices and evolving gas analysis to a higher level of accuracy and ease of use.

It also complies with the latest hazardous area and electrical safety standards, while offering extra features.

Combining Servomex's Zirconium Oxide and Thick Film Catalytic sensing technologies, the FluegasExact 2700 delivers proven accuracy in O₂ and CO_e analysis. These measurements improve process control, help reduce excess O₂, lower NO_x, SO_x and CO emissions, and save on fuel costs.

Designed for high-temperature, high-particulate processes up to 1750°C (3182°F), it can go where traditional in-situ Zirconia probes can't. It's easy to maintain and calibrate, with a unique, continuous flow monitoring system that enables preventative maintenance.

The analyzer is designed for safe area, Zone 2/Div 2 and ATEX Cat 3 hazardous area rated locations.

In addition to its other benefits, the FluegasExact 2700 offers both direct and remote mounting options to make access easier and safer for personnel, regardless of whether or not the desired measurement point is freely accessible.

It's also fully backwards compatible with all previous Servomex installations, and seamlessly replaces most systems by other manufacturers.

Choosing the FluegasExact 2700 doesn't just provide a high-performance analyzer that transforms combustion gas analysis. The Servomex Service Network can advise on the precise installation to suit each process, and deliver commissioning and training, anywhere in the world.

It ensures customers receive world-class expertise and experienced service support, giving the very best, most cost-effective results from day one of operation. See page 14 to find out more.

	Fluegas 2700	FluegasExact 2700
Zirconium oxide O ₂ sensing	Yes	Yes
Thick film CO _e sensing	Yes	Yes (with enhanced catalyst and platinum resistance thermometer)
FlowCube flow alarm	No	Yes
High sulfur TFX CO _e	No	Yes
Auxiliary air (for continuous CO _e measurement during reducing conditions)	Yes (external feed required for A and B models)	Yes (internal, enhanced)
MiniPurge (bespoke purge panel for hazardous areas)	No	Yes
Coated PCB option (for enhanced environmental protection)	C model only	Yes
SS thermal spacer	No	Yes
Filter/flame arrester	Yes	Yes (third party tested and approved)
Full flame trap protection	No	Yes
Updated microprocessor	B and C models only	Yes
Up to date certification and compliance	No	Yes
Simplified spares	No	Yes

UPGRADE TO GET:

- TRUSTED O₂ AND CO_e ANALYSIS
- UNIQUE LOW FLOW ALARM
- EASY MAINTENANCE AND CALIBRATION
- DIRECT AND REMOTE MOUNTING OPTIONS

"The FluegasExact 2700 is the industry-leading choice for combustion analysis in hazardous and challenging locations. Upgrading provides customers with a host of cost and performance benefits, while reducing plant emissions."



Matt Halsey, Product Manager, Process Oxygen, Zirconia & Oxygen Deficiency. Email: mhalsey@servomex.com

Upgrade today! Find out more at servomex.com/fluegasexact2700

MEASURING CO AND CH₄ FOR COMBUSTION SAFETY

The primary reasons for controlling combustion in fired heaters are to increase efficiency – lowering fuel consumption and related costs – and to ensure safety. Combustion is optimized by balancing levels of oxygen (O₂) and combustibles, usually in the form of carbon monoxide (CO).

Zirconia sensors provide accurate, continuous O₂ measurements, and can be paired with a combustibles sensor for a complete analysis solution.

However, Tunable Diode Laser (TDL) technology delivers significant advantages over combustible sensors, with a faster response and an average measurement across the process furnace, enabling a more accurate indication of CO and methane (CH₄) breakthrough.

The realization that a fuel-rich environment (traditionally high CO, but more recently the acceptance that CH₄ can be present) is a potential source of explosions has moved CH₄ analysis from a largely ignored measurement to a key safety monitoring requirement.

Servomex's SERVOTOUGH Laser 3 Plus Combustion TDL analyzer can be optimized to measure CH₄ and CO at the same time across the full temperature range of the furnace from start-up to operation, and customers are realizing the importance of such a measurement.

TDL measurements are being built into flame-out protection, specifically the measurement of CH₄. The TDL analyzer is installed so that a burner flame-out can be detected quickly, therefore enabling greater safety and delivering

key information to aid control and shut down processes.

Laser 3 Plus analyzers have Safety Integrity Level (SIL) 2 certification, and so can be easily incorporated into control loops and used in safety shutdown systems.

They also incorporate "Line Lock" technology to prevent the analyzer measuring an adjacent line if the measurement gas is absent. This ensures that readings are correct and measure the intended gas at all times – a clear advantage for safety systems.

When safety is a primary concern, the faster speed of response and the specificity of the TDL wins out over a Zirconia analyzer with an integrated combustibles sensor, especially when coupled with SIL safety assessments.



SERVOTOUGH Laser 3 Plus Combustion

Measurement	Specific to CO and/or CH ₄
Lower Detection Limit*	CO – 1ppm; CH ₄ – 0.05%
Response time (T90)**	<10s
SIL assessment	SIL 2

* 95% confidence interval for 1m optical path length at 25°C, 1Bara
 ** Faster response times available on request, at reduced specification



COAL TO OLEFINS

A COMPLEX CONVERSION PROCESS THAT REQUIRES GAS MONITORING TO ENSURE EFFICIENCY AND SAFETY

With global demand for coal remaining strong, the conversion of coal to a wide range of chemicals is one of the fastest-growing sectors in coal consumption.

One of the most important of these processes is the conversion of coal to olefins (also known as alkenes), particularly ethylene and propylene which are key components of the chemical industry.

The process follows two stages. Firstly, coal is converted to methanol. Then,

using a recently developed technique, the methanol is converted to olefins.

These applications are both complex procedures that require a high degree of gas analysis to maximize process efficiency, as well as ensuring the safety of flammable product streams.

Servomex supplies a comprehensive suite of gas analyzers to provide the versatile measurements required for these processes. Led predominantly by

the SERVOTOUGH range, they deliver highly accurate, reliable and safe measurements, utilizing a wide variety of non-depleting sensing technologies.

Combined into a complete system and supported by a global Service Network, Servomex's expert gas analysis solutions yield highly measurable efficiencies that improve output and ensure safety, while reducing maintenance requirements.

SERVOMEX ANALYZER SOLUTIONS FOR COAL TO OLEFIN PROCESSES

SERVOTOUGH Oxy 1900



An award-winning, safety-enhanced oxygen analyzer designed to deliver accurate Paramagnetic measurements in hazardous or challenging applications.

SERVOTOUGH SpectraScan 2400



A Tunable Filter Infrared absorption on-line gas analysis platform ideal for continuous flow-through monitoring of light hydrocarbons.

SERVOTOUGH SpectraExact 2500



A robust Photometric multi-gas analyzer designed to provide reliable analysis in corrosive, toxic and flammable gas streams.

SERVOTOUGH LaserSP 2930



A high-sensitivity cross-stack Tunable Diode Laser (TDL) analyzer optimized for fast and accurate gas measurements in hazardous locations.

SERVOTOUGH Laser 3 Plus Combustion



A full-featured compact TDL monitor providing fast and accurate gas measurements, optimized for O₂, CO and CO+CH₄.

SERVOPRO MonoExact TCD



A digital single-gas Thermal Conductivity Detection analyzer optimized to meet process control and product qualification application needs.

Find out more product data at: servomex.com/laser3pluscombustion

See our analyzers across the process **OVERLEAF**

PROCESS STUDY



COAL TO METHANOL

Coal is milled and dried in preparation for gasification. The SERVOTOUGH Oxy 1900 ① and SERVOTOUGH SpectraExact 2500 ② provide percentage safety measurements for oxygen (O₂) and carbon monoxide (CO) to prevent combustion.

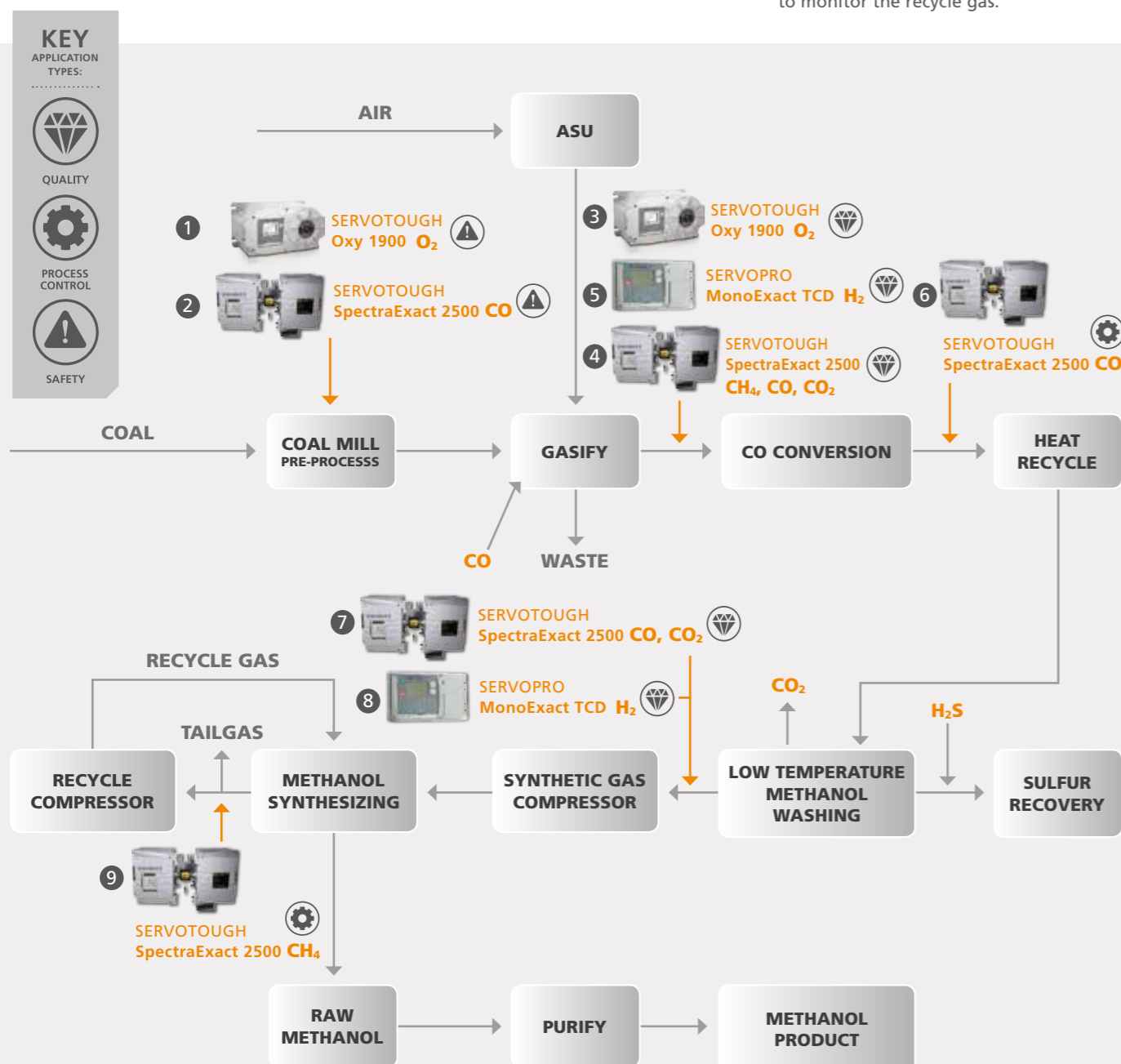
The milled coal is then gasified with steam (H₂O) to produce hydrogen (H₂), CO, carbon dioxide (CO₂) and methane (CH₄).

The clean coal gas produced in the gasifying process is monitored for O₂ by the Oxy 1900 ③, CO, CO₂ and CH₄ by the SpectraExact 2500 ④ and H₂ by the SERVOPRO MonoExact TCD ⑤.

The CO is then converted into H₂+CO₂ to raise the H₂ content, with the SpectraExact 2500 ⑥ closely monitoring the CO level to optimize the process.

Methanol washing removes most of the CO₂ and sulfur, with the SpectraExact 2500 ⑦ measuring CO and CO₂, and the MonoExact TCD ⑧ measuring H₂ to ensure gas components are present at the correct proportions.

Finally, the H₂ and CO are reacted to synthesize methanol, with the SpectraExact 2500 ⑨ measuring the CH₄ to monitor the recycle gas.



METHANOL TO OLEFINS

Methanol is converted into methylene and ethylene glycol (MEG), then cracked to produce olefins under high temperature. The crystalline catalyst must be regenerated regularly, so an optimized gas regeneration process is crucial.

The Oxy 1900 ① provides O₂ measurements while, depending on individual suitability, the SpectraExact 2500 or SERVOTOUGH LaserSP 2930 ②

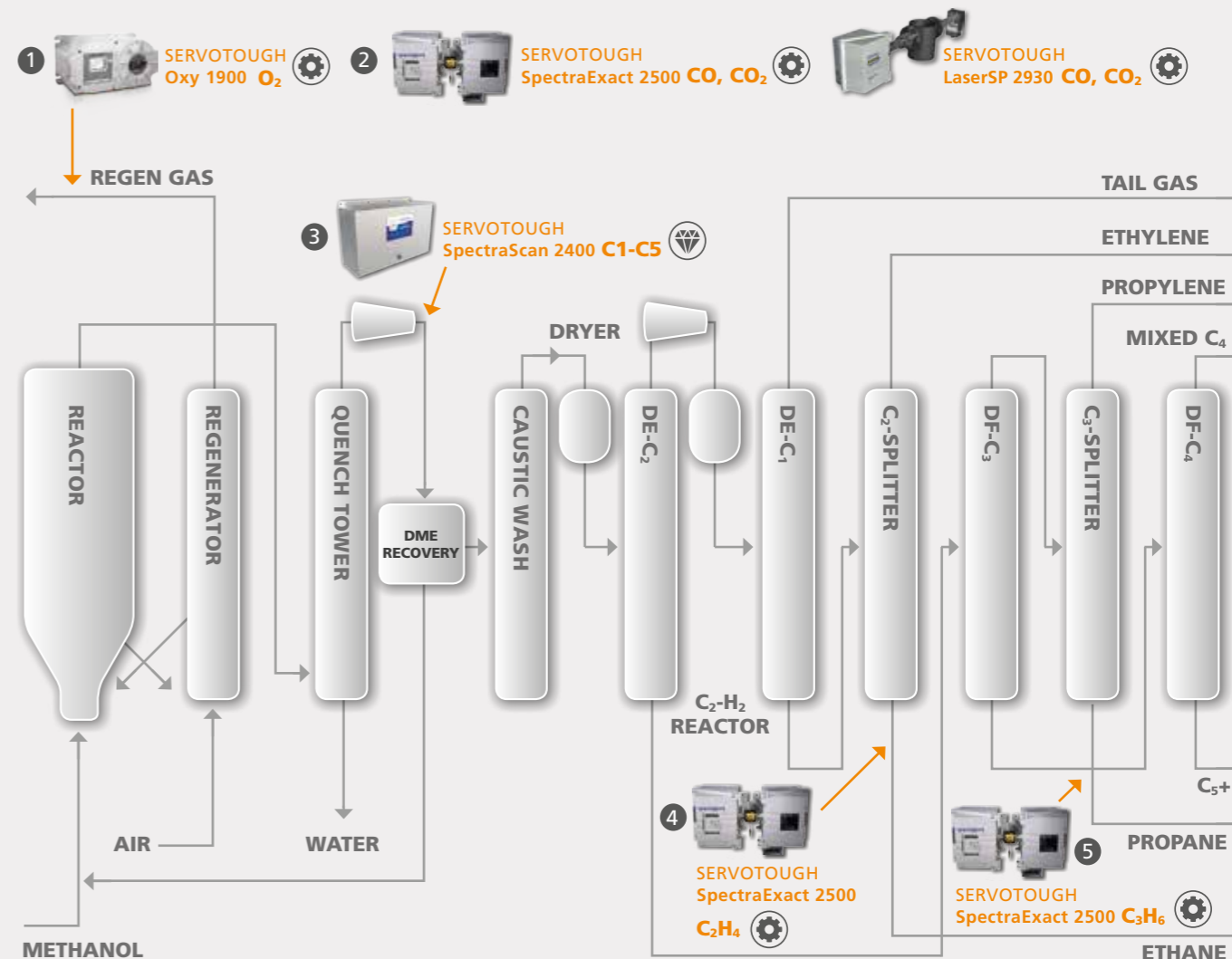
can monitor CO or CO₂, or the SERVOTOUGH Laser 3 Plus for CO.

The olefins are dried and separated to produce products including ethylene and propylene.

Utilized in an ethylene and propylene separation tower, the revolutionary light hydrocarbon analysis provided by the SERVOTOUGH SpectraScan

2400 ③ measures percentage levels of hydrocarbons C₁-C₅, while a SpectraExact 2500 measures percent levels of ethylene (C₂H₄) ④ and propylene (C₃H₆) ⑤ to increase production efficiency.

DID YOU KNOW...
Olefins can be used to make a strong synthetic fiber suitable for a diverse range of applications including wallpaper, carpets, rope-making and vehicle interiors.



Find out more at servomex.com or contact your nearest business center

NEW APPOINTMENTS EXPAND GLOBAL SERVICE SUPPORT



Mark Calvert - mcalvert@servomex.com

Servomex has enhanced its Service Network provision to customers with the appointment of two new Service Managers.

Mark Calvert has been appointed to the role of Service Manager for the EMEAI region, based at the UK Technical Centre in Crowborough.

He joins Servomex from Checkit, an Elektron Technology company based in Cambridge, where he was Head of Customer Experience, managing a team of 10. His position included responsibility



Christopher Galley - cgalley@servomex.com

for customer service from order entry through to after-sales support.

Mark has worked for Servomex before, first as a Field Service Engineer, then as Area Sales Manager UK South and Scotland. He will take charge of a team of nine service engineers operating across Europe, the Middle East and India.

Christopher Galley has joined Servomex as Service Manager for the Americas region, based in our US Service Center in Sugarland, Texas.



Leong Kee Keat - kleong@servomex.com

Most recently, Christopher held the role of Field Service Manager for the Americas with IMI CCI. He has also worked for Norvell Electronics, Omron Electronics, and Siemens (Robicon). He will lead the five service engineers supporting customers across the Americas.

The new appointments will work alongside Leong Kee Keat, Servomex's Service Manager for the Asia-Pacific region, to provide truly global coverage. He leads a team of 11, with a new dedicated engineer for Korea set to boost support even further.

The new Service Managers will both report to David Cantillon, Servomex's Global Operations Director, who said:

"We're delighted that Mark and Christopher have joined our service team, overseeing the provision of expert support in their respective regions."

"Mark's prior knowledge of Servomex products and applications will certainly be a great advantage, especially when added to the extensive customer support skills he has developed since his last role with us."

"Christopher's experience and substantial industry knowledge will be of immense benefit to our customers in the Americas."

"We wish both Mark and Christopher every success in their new roles at Servomex."



David Cantillon - Global Operations Director. Email: dcantillon@servomex.com



Get the expert support you need: servomex.com/service

> HP PRODUCT GUIDE

Hydrocarbon processing (HP) is one of the most demanding industries in the world. High levels of productivity must be achieved while constantly maintaining the very highest safety standards.

Effective gas analysis is a critical component of all HP processes, typically requiring a wide range of measurements to ensure the safe, optimized running of the process.

As the world leader in gas analysis, Servomex analyzers and systems are used extensively in midstream and downstream HP processes covering refining and the production of chemicals, petrochemicals, natural gas and fuels.

These rugged, resilient analyzers are custom designed to perform in the most extreme process conditions; our expertise, combined with a detailed applications knowledge, ensures the best gas analysis solution is delivered to your plant.

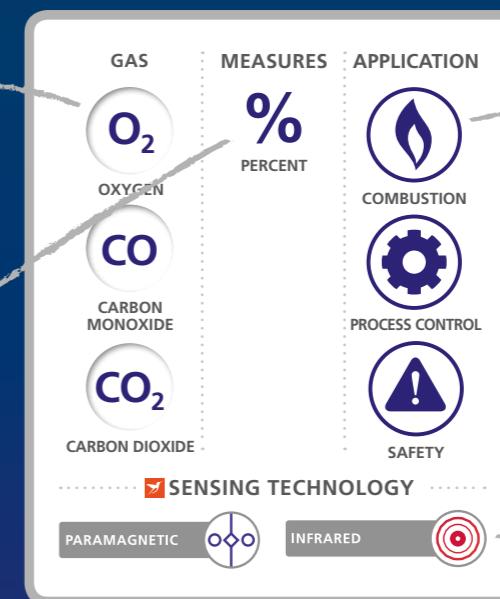
Supported by a global network of service and support, Servomex analyzers are chosen with confidence by HP operators worldwide in the knowledge that they guarantee operational safety, product quality and process efficiency.

FIND YOUR PRODUCT NOW

> HOW TO GUIDE

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

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



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

The Hummingbird sensing technologies used are listed.

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

SERVOTOUGH

Built to meet the extreme challenges of measuring gases in hot and hazardous environments, the SERVOTOUGH process and combustion analyzers integrate Servomex's exceptional analytical performance into a highly robust and resilient design.

Optimized for hazardous area use, and utilizing both extractive and in-situ analysis techniques, common gas measurements receive higher level analysis for light hydrocarbons and combustibles; this makes SERVOTOUGH analyzers ideal for extensive use within most hydrocarbon processing applications.

Manufactured to the highest specifications using custom-designed stainless steel enclosures, SERVOTOUGH analyzers are intrinsically safe and certified to the uppermost safety standards.

SUPPORTING



PROCESS CONTROL



PROCESS SAFETY



EMISSIONS MONITORING



COMBUSTION CONTROL



PRODUCT QUALITY

SERVOTOUGH OxyExact 2200

HAZARDOUS AREA

HIGH-SPEC PROCESS O₂ ANALYZER OFFERS SAFE OR HAZARDOUS AREA CONTROL WITH UP TO SIX TRANSMITTERS

The OxyExact 2200 high-specification O₂ analyzer offers an unrivaled combination of precision, flexibility and performance for optimum process and safety control. The OxyExact can be configured with a safe or hazardous area control unit with up to six transmitters.

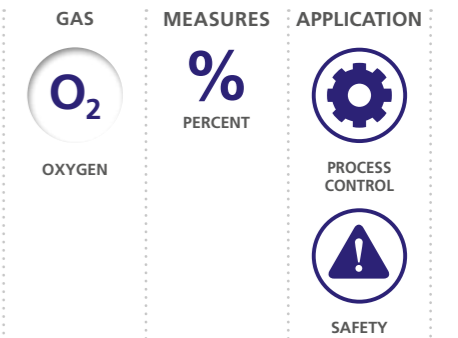


FEATURES AND BENEFITS

- Zone 1 certified to ATEX Cat 2, IECEx and FM/CSA Class 1 Div 1
- Three enclosure systems allow sampling of any flammable gas up to 100% O₂ and pressures of up to 40psi
- High-temperature version eliminates the need to condense hot sample prior to analysis

APPLICATIONS

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



SENSING TECHNOLOGY



SERVOTOUGH Oxy 1800

SAFE AREA

ACCURATE AND STABLE SAFE AREA O₂ ANALYZER

Designed to reliably measure percent O₂ in many safety-critical industrial applications, the Oxy 1800 is a stable, accurate and highly specific O₂ analyzer for safe area use.

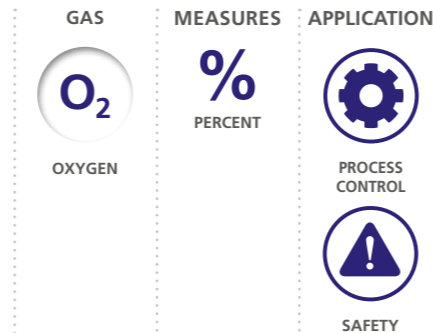


FEATURES AND BENEFITS

- Internal/external use (IP66/NEMA 4X rated)
- Special version for solvent-bearing samples
- Range of alarm outputs aids integration with other systems

APPLICATIONS

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



SENSING TECHNOLOGY



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.

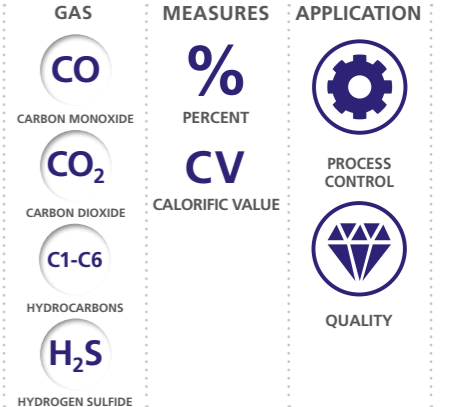


FEATURES AND BENEFITS

- North American Cat 1, Div 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



SENSING TECHNOLOGY



SERVOTOUGH Oxy 1900

HAZARDOUS AREA

AWARD-WINNING PARAMAGNETIC DIGITAL O₂ ANALYZER DESIGNED FOR HAZARDOUS AREA USE

Offering industry-standard features alongside revolutionary, value-added options, the Oxy 1900 O₂ gas analyzer sets new standards of flexibility, stability and reliability from a single, cost-effective unit.

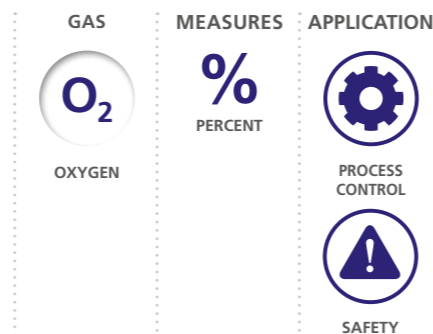


FEATURES AND BENEFITS

- Can be used in Safe Area to Zone 1/Div 1 hazard-rated locations
- Heated sample cell allowing simplified sample system requirements
- Unique Servomex Flowcube flow sensor technology for improved safety

APPLICATIONS

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



SENSING TECHNOLOGY



SERVOTOUGH SpectraExact 2500

HAZARDOUS AREA

RUGGED PHOTOMETRIC GAS ANALYZER FOR DEMANDING PROCESS APPLICATIONS

Servomex's iconic industry-leading Photometric analyzer delivers flexible single and multi-component 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.

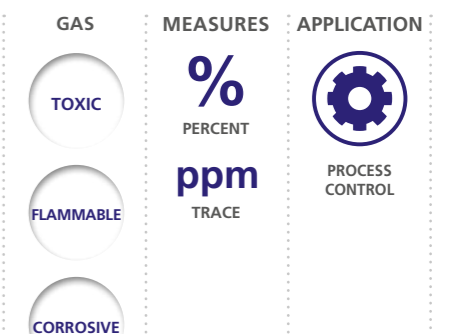


FEATURES AND BENEFITS

- IECEx and North American hazardous area approvals
- Easy integration with DCS – from 4-20mA to Modbus TCP
- Sample cell and electronics segregated – for easy maintenance and safe operation

APPLICATIONS

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



SENSING TECHNOLOGY



SERVOTOUGH FluegasExact 2700

HAZARDOUS AREA

ADVANCED FLUE GAS ANALYZER FOR HIGH-TEMPERATURE MEASUREMENT OF O₂ AND COMBUSTIBLES

Designed to measure O₂ and CO_e 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 & North America Class I, Div 2
- Unique Flowcube flow sensor technology enables positive flow conditions to be validated
- Sulfur-resistant combustibles sensor enables sensor to operate at elevated sulfur levels

APPLICATIONS

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

GAS	MEASURES	APPLICATION
O ₂ OXYGEN	% PERCENT	COMBUSTION
CO _e COMBUSTIBLES	ppm TRACE	PROCESS CONTROL

SENSING TECHNOLOGY

CALORIMETRY ZIRCONIA

SERVOTOUGH LaserSP 2930

HAZARDOUS AREA

HIGH-SENSITIVITY CROSS-STACK TDL ANALYZER

A high-performance gas analyzer designed for continuous in-situ monitoring, the LaserSP 2930 delivers a fast response time and highly stable performance. Suitable for measuring a range of gases including HCl, HF, H₂O, H₂S, HCN, and other hydrocarbons, the LaserSP is ideal for a wide range of process, combustion control and emissions applications.



FEATURES AND BENEFITS

- Designed for Zone 1 and Zone 2 hazard rated (gas/dust) locations
- In-situ with no sample conditioning delivers reliable operation
- Wavelength Modulated Spectroscopy provides wide dynamic range and lowest cross-interference

APPLICATIONS

- Emission control systems for CEMS
- Combustion control systems for process heaters and crackers
- Ammonia slip control in DeNOx plants

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT	PROCESS CONTROL
	ppm TRACE	EMISSIONS

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SERVOTOUGH Laser 3 Plus Process

HAZARDOUS AREA

THE WORLD'S SMALLEST TDL GAS ANALYZER, OPTIMIZED FOR PROCESS O₂ AND CO 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 oxygen 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
- Suitable for a range of combustion and process control applications

APPLICATIONS

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

GAS	MEASURES	APPLICATION
O ₂ OXYGEN	% PERCENT	PROCESS CONTROL
CO CARBON MONOXIDE	ppm TRACE	COMBUSTION

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SERVOTOUGH LaserCompact 2940

HAZARDOUS AREA

SHORT PATH LENGTH TDL ANALYZER

Optimized for measurement across pipes and along short measurement cells and able to measure through very thin nozzles, reducing or even eliminating consumption of purge gas, the LaserCompact 2940 delivers the fast response time, highly stable performance and minimum sample conditioning advantages of TDL technology.



FEATURES AND BENEFITS

- ATEX, IECEx and North American hazardous area approvals. ATEX Cat 3 (Gases) and Cat 2 (Dusts) IECEx Zone 2 and Zone 21. CSA Divisions and Zones (Gas and Dust)
- Line width correction delivers accurate measurement with variations in matrix
- In-situ with low purge gas consumption

APPLICATIONS

- Chemical reactor – inert gas control
- Moisture in VCM
- Natural gas contaminants – H₂O, CO₂, H₂S

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT	PROCESS CONTROL
	ppm TRACE	QUALITY

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SERVOTOUGH Laser 3 Plus Combustion

HAZARDOUS AREA

THE REVOLUTIONARY COMPACT COMBUSTION ANALYZER OPTIMIZED FOR CO, O₂, OR CO + CH₄ 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
- Optimized for combustion processes

APPLICATIONS

- Process heaters
- Incinerators
- Power stations
- Furnaces

GAS	MEASURES	APPLICATION
O ₂ OXYGEN	% PERCENT	PROCESS CONTROL
CO CARBON MONOXIDE	ppm TRACE	COMBUSTION
CO+CH ₄ CARBON MONOXIDE + METHANE		

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SERVOTOUGH LaserExact 2950

HAZARDOUS AREA

EXTRACTIVE TDL TRACE MULTI-GAS ANALYZER, DESIGNED FOR MEASURING TRACE GASES OFFLINE

Specifically designed for extractive trace analysis applications, the LaserExact 2950's TDL technology offers unsurpassed low ppb detection limits for most gases, making it ideal for the measurement of trace gases offline.



FEATURES AND BENEFITS

- Zone 2/Div 2 hazard-rated locations and use without purge
- Advanced multipass cell delivers ppb or low ppm detection limits
- Innovative PeakLock pattern recognition line tracking eliminates drift over extended operational periods

APPLICATIONS

- Refinery monitoring: H₂S and CO₂ (during natural gas refinement)
- HF and HCl impurity monitoring in process gas
- Monitoring H₂S during biogas production
- H₂O and H₂S in natural gas

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

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SERVOTOUGH DF-340E HAZARDOUS AREA

HIGH-SENSITIVITY TRACE/ PERCENT COULOMETRIC OXYGEN ANALYZER CERTIFIED FOR HAZARDOUS AREA USE

Designed for heated or external locations, the DF-340E remains stable in changing sample and flow rate conditions, and is designed to provide measurements of trace or percent level oxygen in pure gas streams and multi-gas backgrounds. It is ideal for upset-prone conditions.



FEATURES AND BENEFITS

- Coulometric sensing ideal for upset-prone applications and compensates for sample and flow rate fluctuations
- Suitable for outdoor installation, with NEMA 4-rated sensor enclosure options
- Multiple background gas stream monitoring, with simplified ongoing maintenance requirements

APPLICATIONS

- Pressure swing absorber N₂ skids
- Reactor process control
- Blanketing and inerting
- Oil refinery monitoring
- Petrochemical process monitoring

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

SENSING TECHNOLOGY
COULOMETRIC

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, Div 1, Groups B, C, D, ATEX & CSA certifications
- Easily configurable alongside SERVOTOUGH SpectraScan 2400
- Simple system integration

APPLICATIONS

- Refinery
- Petrochemical
- Manufacturing
- Industrial gas supply

GAS	MEASURES	APPLICATION
H ₂ HYDROGEN	% PERCENT	PROCESS CONTROL QUALITY

SENSING TECHNOLOGY
H2Scan thin film

GAS DETECTION OxyDetect SERVOMEX

NON-DEPLETING PARAMAGNETIC OXYGEN MONITOR DESIGNED FOR LIFE SAFETY APPLICATIONS

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



FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
O ₂ OXYGEN	% PERCENT	SAFETY

SENSING TECHNOLOGY
PARAMAGNETIC

SERVOPRO SUPPORTING

The SERVOPRO range makes Servomex's reliable, stable and accurate gas measurements available to a diverse range of safe area applications.

An extensive range of non-depleting Servomex gas sensing technologies - including Paramagnetic, Zirconium Oxide, Thermal Conductivity, Plasma and Gas Chromatography - are integrated into flexible analyzers that either meet specific measurement requirements, such as for syngas, hydrocarbons or trace gas mixtures, or provide multi-gas monitoring capabilities for applications including ASU production and continuous emissions monitoring (CEMS).

Designed for benchtop use, or mounting in a 19" rack, all SERVOPRO analyzers feature extensive functionality, remote communication options and can be operated directly via intuitive onboard software.

PROCESS CONTROL	PROCESS SAFETY	EMISSIONS MONITORING
COMBUSTION CONTROL	PRODUCT QUALITY	

AquaXact 1688 SAFE AREA

A FAST, ACCURATE AND RESILIENT MOISTURE MEASUREMENT SOLUTION

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



FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
H ₂ O WATER	DEW POINT ppmv	PROCESS CONTROL

SENSING TECHNOLOGY
ALUMINUM OXIDE

SERVOPRO 4900 Multigas SAFE AREA

AN ADVANCED DIGITAL MULTI-GAS CEMS ANALYZER

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



FEATURES AND BENEFITS

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

APPLICATIONS

- Utility boilers
- Chemical incinerators
- Crematoria
- Mobile labs

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT ppm TRACE	EMISSIONS

SENSING TECHNOLOGY
GAS FILTER CORRELATION INFRARED
PARAMAGNETIC

SERVOPRO NOx SAFE AREA

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

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



FEATURES AND BENEFITS

- Multiple-range NOx emissions monitoring solution with a fast response
- Non-depleting light-based measurement and electronic flow control keeps costs low
- Heated version available for wet to dry conversion option
- EPA 1065/1066 and LD Euro 6, HD Euro V1 compliant

APPLICATIONS

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

GAS	MEASURES	APPLICATION
NO NITRIC OXIDE	ppm TRACE	PROCESS CONTROL
NO₂ NITROGEN DIOXIDE		EMISSIONS
NOx NITROGEN OXIDES		QUALITY

SENSING TECHNOLOGY
CHEMILUMINESCENCE

SERVOPRO SO₂ SAFE AREA

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

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



FEATURES AND BENEFITS

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

APPLICATIONS

- Continuous emissions monitoring (CEMS)
- Ambient air monitoring

GAS	MEASURES	APPLICATION
SO₂ SULFUR DIOXIDE	ppm TRACE ppb ULTRA TRACE	PROCESS CONTROL
		EMISSIONS QUALITY

SENSING TECHNOLOGY
UV FLUORESCENCE

SERVOPRO HFID SAFE AREA

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

Using a highly sensitive Flame Ionization Detector (FID) for measuring volatile hydrocarbon concentrations in industrial or vehicle emission applications, the HFID utilizes an internally heated oven set to 190°C to maintain the sample gas above its dew point, for optimum performance in total hydrocarbon analysis (THC). Can be equipped with a non-methane cutter for additional CH₄ and non-methane hydrocarbon (NMHC) reporting.



FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
THC TOTAL HYDROCARBONS	ppm TRACE	PROCESS CONTROL
CH₄ METHANE		EMISSIONS
NMHC NON-METHANE HYDROCARBONS		QUALITY

SENSING TECHNOLOGY
FLAME IONIZATION DETECTOR

SERVOFLEX SUPPORTING

With the precision sensing technology of Servomex fixed analyzers in a compact, easy to use package, SERVOFLEX analyzers deliver high performance portable gas analysis for safe or hazardous area use.

Utilizing Servomex's non-depleting Paramagnetic and Infrared sensor technology, SERVOFLEX analyzers provide stable and reliable measurements for oxygen, carbon monoxide and carbon dioxide.

Ergonomically designed for easy handling, and powered by resilient lithium-ion batteries to ensure long usage with every charge, each analyzer offers an extensive range of features that includes audible alarms, data-logging and RS232 outputs.

Certified to a range of relevant safety requirements, Servomex's SERVOFLEX analyzers make the grade wherever they are used.

PROCESS CONTROL	PROCESS SAFETY	EMISSIONS MONITORING
COMBUSTION CONTROL	PRODUCT QUALITY	

SERVOFLEX Micro i.s. 5100 PORTABLES

INTRINSICALLY SAFE ANALYZER MEASURES OXYGEN, CARBON MONOXIDE OR CARBON DIOXIDE

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



FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
O₂ OXYGEN	% PERCENT	COMBUSTION
CO CARBON MONOXIDE		PROCESS CONTROL
CO₂ CARBON DIOXIDE		SAFETY

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 O₂, CO and CO₂ within common gas mixtures. The MiniHD 5200 utilizes Servomex's non-depleting Paramagnetic and Infrared sensors to give dependable and accurate results.



FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
O₂ OXYGEN	% PERCENT	COMBUSTION
CO CARBON MONOXIDE		PROCESS CONTROL
CO₂ CARBON DIOXIDE		SAFETY

SENSING TECHNOLOGY
PARAMAGNETIC INFRARED

> WE'RE READY TO HELP

WHATEVER YOUR GAS ANALYSIS REQUIREMENTS, WHEREVER YOU ARE

