# HYDROCARBON PROCESSING

## GAS ANALYSIS MAGAZINE

ISSUE
FOUR - 2019

**SUPPORTING YOUR HYDROCARBON PROCESSING APPLICATIONS**

### MARKET SOLUTIONS
TDL analysis for process oxygen

### APPLICATION STUDY
Enriched oxygen in combustion

### EXPERT ADVICE
Ethylene oxide production processes

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a spectris company

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## SEE INSIDE SERVOMEX

Get an insight into our world-class manufacturing facilities where sensors and SERVOTOUGH and 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


## FIRED HEATERS SAFETY

Discover how the SERVOTOUGH Laser 3 Plus can improve safety in fired heater combustion processes


Watch at **servomex.expert/videos**

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# SUPPORTING YOUR HP APPLICATIONS

## WELCOME TO OUR LATEST MAGAZINE FOCUSED ON THE HYDROCARBON PROCESSING (HP) MARKET.

Accurate, reliable oxygen ($O_2$) measurements are essential in many HP applications, delivering the readings that support process efficiency, safety and quality control.

Servomex has been a pioneer in $O_2$ measurement technologies since developing its first Paramagnetic sensor in the 1950s. We still lead the way in Paramagnetic sensing technology, but also offer a diverse range of alternative measurement techniques to suit a variety of applications.

This issue features some of those solutions, including a look at the SERVOTOUGH Laser 3 Plus Process, which uses Tunable Diode Laser (TDL) technology to monitor $O_2$ levels.

In addition, we explore the role of Servomex's $O_2$ analyzers in combustion and oxidation processes using enriched oxygen. Oxygen measurements also play an important part in flare stack analysis, a process we examine in detail.

Continual product development is a key part of Servomex's commitment to meet current and future gas analysis requirements. In this issue we look at the benefits of upgrading from older analyzers to the Oxy 1900 $O_2$ analyzer and the MultiExact 4100 multi-gas analyzer.

We've listened to our customers, enabling us to focus our analyzer development on what's really important to you, like low cost of ownership and high performance and reliability.

Our analyzers meet these criteria by combining trusted, reliable sensing technology with the latest software and hardware, providing a cutting-edge solution to many HP challenges.

Alongside improvements to our analyzers, we continue to provide the expertise and applications knowledge that helps ensure the best result for you and your plant. In this issue, we highlight how our experience and understanding can help provide safer oxygen measurements in the production of ethylene oxide.

Our global service network provides support and expertise directly to your plant. Commissioning is under the spotlight in our feature for this edition – find out more about the advantages for your analyzer or system.

In addition, our expert team is ready to help you find the most efficient, accurate and cost-effective solutions for your unique HP requirements. Get in touch with your nearest business center today, or use the online contact form, to learn more.

For HP solutions contact us today:
**servomex.expert/contact-us**

# IN THIS ISSUE



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

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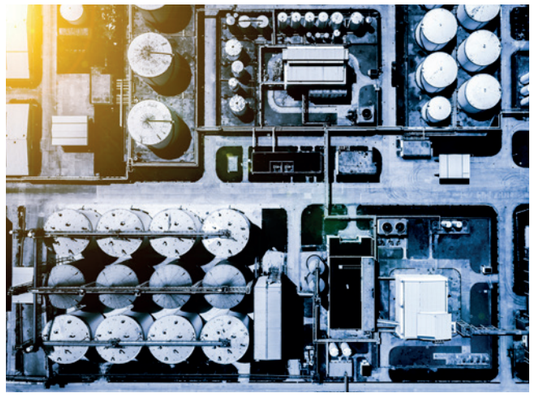
# MARKET FOCUS: GULF STATES

## SHIFTING TRENDS IN THE GCC PETROCHEMICALS INDUSTRY



The petrochemicals industry in the Gulf Co-operation Council (GCC) region contributes significantly towards regional industrial and manufacturing growth.

Until recently, ethane feedstock subsidies by GCC governments gave companies in the region a competitive edge. While oil prices were high, ethane was cheaper than the naphtha used predominantly elsewhere, and the subsidies kept prices constant.

However, following the 2014-15 slump in oil prices, and the resulting decline in the cost of feedstock naphtha, the GCC region faced increased competition from leading firms in the US and Europe.

Despite this, GCC nations have started to invest in the development of large-scale integrated plants domestically and abroad, in order to diversify their product offering and compete globally. To meet these changing market demands, petrochemical companies in the region are switching focus towards high value products.

### DOMESTIC DEVELOPMENTS

Most GCC petrochemical companies are wholly or partly state-owned. Saudi Basic Industries Corporation (SABIC) is one of the major producers of petrochemicals globally. Others include Kuwait's Petrochemicals Industries Company (KIPIC), the Qatar Petrochemical Company and the Abu Dhabi National Oil Company (ADNOC) in the UAE.

Saudi Arabia is the major producer of petrochemicals in the region.

Sadara Chemical Company, a joint venture between SABIC and the US's Dow Chemical, is bringing high-value products such as isocyanates and polyols to the market for the first time in Saudi Arabia.

The KIPIC complex includes three mega-projects: the Al Zour oil refinery, a liquefied natural gas import facility, and a petrochemicals complex.

ADNOC is creating the world's largest integrated refining and chemicals site in Ruwais (UAE), expecting to triple the current output of petrochemicals products annually by 2025.

### OFFSHORE INVESTMENTS

GCC petrochemicals companies are also looking at investment opportunities in other markets, especially in China and India.

- ADNOC, as part of its 2030 growth strategy, is planning to make investments abroad in downstream industries such as fertilizers and petrochemicals through joint ventures.
- In April 2018 Saudi Aramco signed a deal to invest in a refinery and petrochemicals complex, that it will develop with three Indian companies in the Indian state of Maharashtra.
- In 2017 SABIC signed a co-operative agreement with China's Sinopec to explore joint-venture petrochemicals projects in both countries.

GCC member states



# MARKET SOLUTIONS

## FAST-RESPONSE LASER $O_2$ MEASUREMENTS

THE ACCURATE MEASUREMENT OF PROCESS OXYGEN ($O_2$) IS KEY TO MANY HP PROCESSES. SERVOMEX OFFERS A STABLE, RAPID, LASER-BASED SOLUTION.

The SERVOTOUGH Laser 3 Plus Process is a compact Tunable Diode Laser (TDL) analyzer specifically optimized for fast-response measurement of process $O_2$.

Designed for in-situ, cross-stack measurements, it uses the latest Wavelength Modulated Spectroscopy measurement techniques and unique Servomex signal processing to monitor $O_2$ in multiple gas backgrounds.

Easy to install, configure and calibrate by just one person, the Laser 3 Plus uses a mounting assembly for multi-directional adjustment, ensuring precision alignment from the outset. When combined with the quick-release mechanism, it is easy to achieve fast, accurate reinstallation after maintenance, without the need for realignment.

The Laser 3 Plus uses line lock cuvette technology to ensure gas measurements that are reliable to SIL 2 levels, a clear advantage to safety systems.

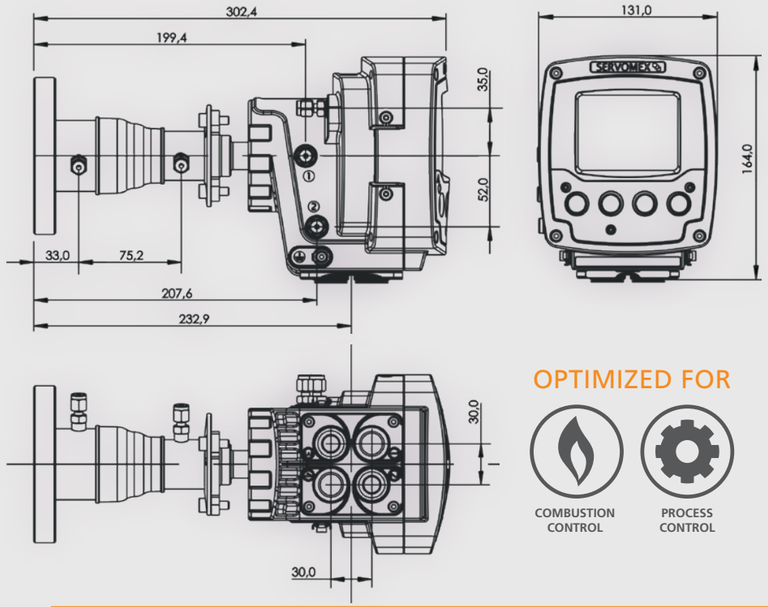
Thanks to a cuvette filled with the target gas, the secondary detector always has a known target gas to sense. This enables the main detector to remain "locked" in position, giving an accurate measurement of the gas, even if that measurement is zero.

The line lock system requires no maintenance and has built-in diagnostics that monitor the concentration within the cuvette.

The stability and reliability of this system provides measurement confidence in applications where incorrect measurements may affect safety or lead to heavy fines for non-compliance.

### A COMPACT SOLUTION

The Laser 3 Plus offers high performance in a design smaller than many traditional TDL analyzers.




### OPTIMIZED FOR

COMBUSTION CONTROL

PROCESS CONTROL

### APPLICATIONS INCLUDE:

- OXIDATION CONTROL
- INERTING
- SAFETY MONITORING
- PROCESS CONTROL
- FLARE GAS MONITORING
- COMBUSTION CONTROL (<500°C)
- COAL TO CHEMICAL


See how the Laser 3 Plus Process supports $O_2$ analysis at the flare stack: **page 11**
Watch the video: **servomex.expert/video-l3plus**

# APPLICATION STUDY

# ENRICHED OXYGEN IN COMBUSTION AND OXIDATION CONTROL

In a traditional combustion process, oxygen ($O_2$) is supplied to the combustion reaction in the form of atmospheric air. The $O_2$ contained within the air combines with hydrogen and carbon from the fuel source, forming water and carbon dioxide in a process that releases heat.

Air is composed of approximately 21% $O_2$, 78% nitrogen ($N_2$), and 1% other gases. During combustion, the chemically inert $N_2$ in the air dilutes the $O_2$, carrying away some of the energy in the hot combustion exhaust gas.

Increasing the $O_2$ level in the combustion air to a level above 21% reduces this energy loss, potentially increasing the efficiency of the combustion process. Typically, liquid $O_2$ is used to increase the $O_2$ concentration in the combustion air before it enters the furnace.

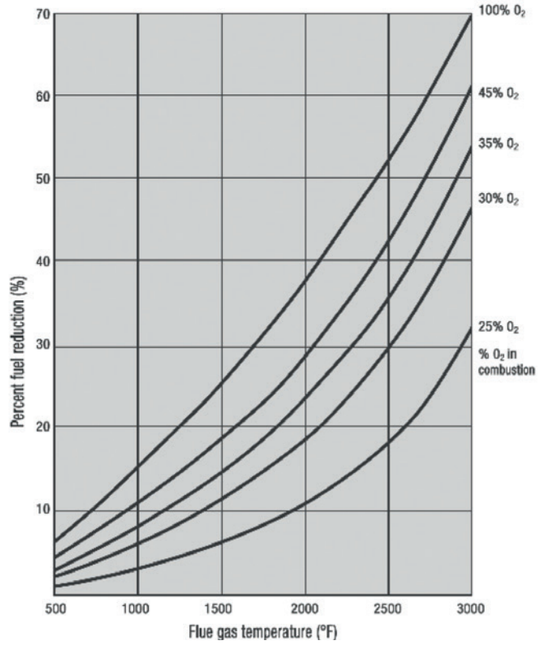
The efficiency of the process is dependent on both the exhaust gas temperature and the percentage of the $O_2$ in the combustion air.

Performance studies conducted by the US Department of Energy, using $O_2$ levels at 100%, have shown a fuel consumption reduction between 10-20%, alongside NOx reductions of 90%. Theoretical studies have postulated that fuel savings of 42% over conventional systems may be possible using $O_2$ at 95%.

At levels above 25%, flammability is increased significantly, which may impact upon plant safety. For this reason, many processes limit the $O_2$ enrichment to between 22-25%, which is still sufficient to achieve significant fuel savings.

Accurate monitoring is required to ensure that the $O_2$ concentration remains within the specified limits, to obtain the optimum balance between safety and efficiency.

## ENERGY SAVINGS FROM $O_2$ INJECTION




Energy Tips - Process Heating. September 2005

## BENEFITS OF OXYGEN-ENRICHED COMBUSTION

**INCREASED EFFICIENCY:**
Flue gas heat losses are reduced

**LOWER EMISSIONS:**
Reduced levels of NOx, carbon monoxide and hydrocarbons

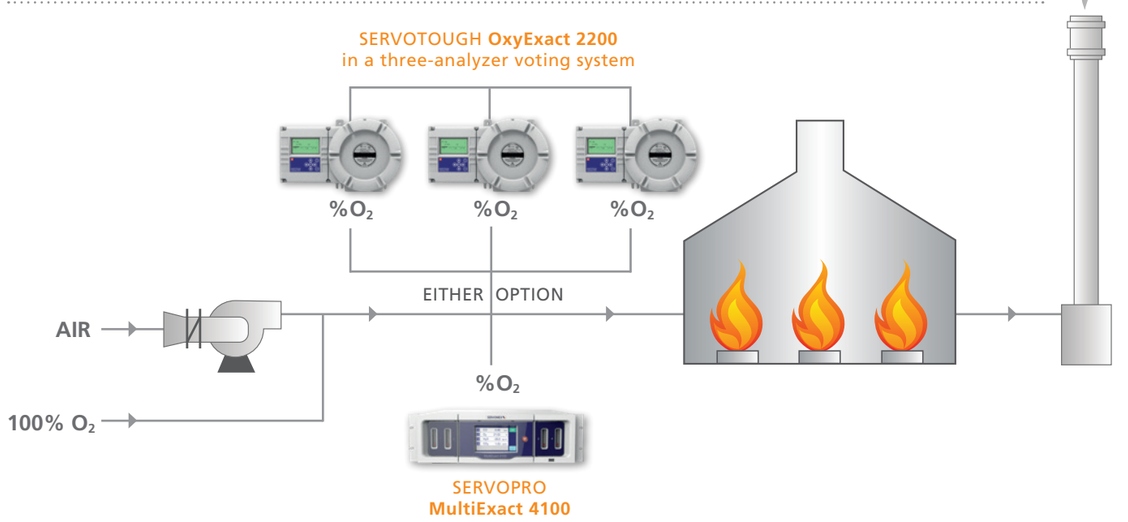
**IMPROVED STABILITY:**
Higher $O_2$ results in more stable combustion and higher temperatures, leading to better heat transfer

**INCREASED PRODUCTIVITY:**
The heat generated is increased for the same amount of fuel



# THE SERVOMEX SOLUTION

## SERVOMEX SUPPLIES THE EFFECTIVE GAS ANALYSIS SYSTEM FOR MONITORING ENRICHED $O_2$ IN THE COMBUSTION PROCESS.




This uses three SERVOTOUGH OxyExact 2200 process $O_2$ analyzers in a voting system, located between the air/$O_2$ mixing system and the furnace.

In a three-analyzer voting system, the process depends on the measurement made by the majority of analyzers. So, if only one analyzer reports a significant change in $O_2$ levels, 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 – in this case to adjust the $O_2$ mix accordingly to return it to the correct concentration.

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

It also provides a greater degree of safety, since using a single analyzer would make it more difficult to detect measurement variations, allowing incorrect measurements to go unnoticed for longer.

The OxyExact 2200 uses an intelligent three-enclosure system that enables simplified, versatile sampling of up to 100% $O_2$, with no requirement for pre-sample drying. It is certified for the use of enriched $O_2$ in Zone 1 hazardous areas.

High-precision Paramagnetic sensing technology provides the accurate performance required for optimum process control, while the robust design ensures reliable operation in demanding conditions.

Servomex has also recently installed SERVOPRO MultiExact 4100 analyzers at a site using oxygen-enriched air for combustion. These provide accurate $O_2$ analysis using the same digital non-depleting Paramagnetic technology as the OxyExact 2200s, except for safe areas only.

The advanced communications offered by the MultiExact 4100s provide easy integration into voting and control systems.

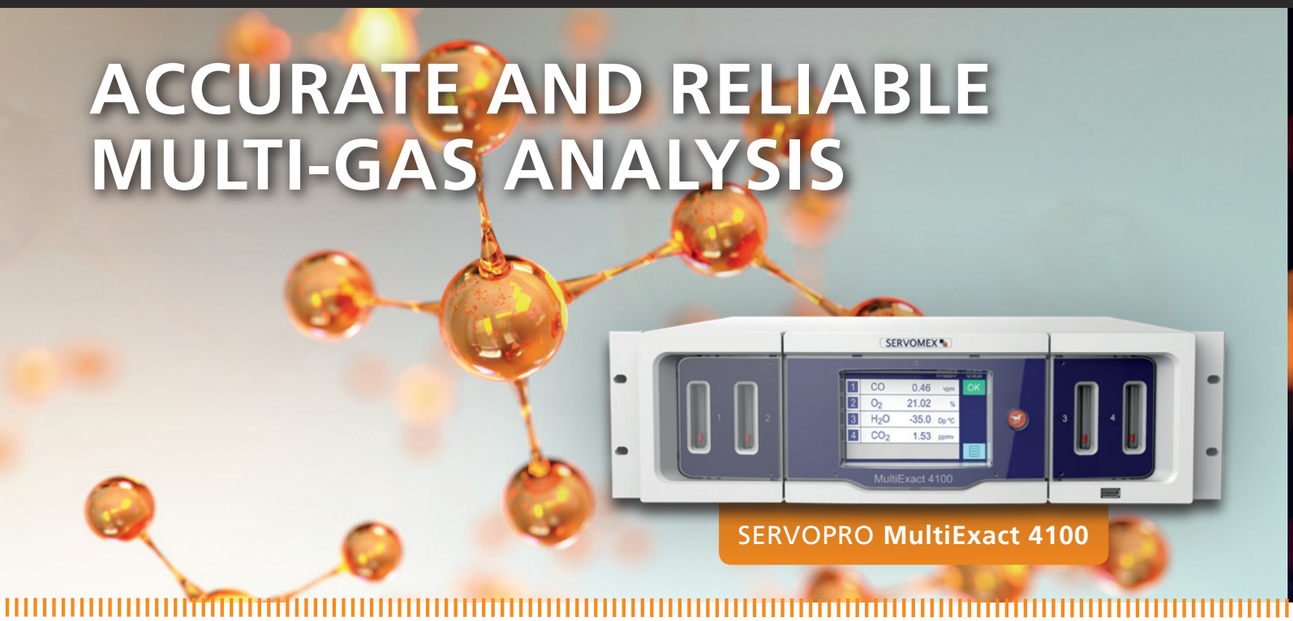
### SERVOPRO **MultiExact 4100**

### SERVOTOUGH **OxyExact 2200**

Find out more at: **servomex.expert/mag-2200**

# PRODUCT FOCUS

## ACCURATE AND RELIABLE MULTI-GAS ANALYSIS




SERVOPRO **MultiExact 4100**

Servomex has decades of experience in supplying the gas analysis technologies needed to control processes, guarantee product purity and ensure plant safety.

With the long-serving SERVOPRO 4100 multi-gas analyzer reaching the end of its life, the advanced SERVOPRO MultiExact 4100 has picked up the baton to continue the tradition of accuracy and dependability.

A digital multi-gas analyzer, the MultiExact 4100 can be configured with up to four of Servomex's world-leading sensors for simultaneous gas measurements, including oxygen, nitrogen, methane, nitrous oxide, carbon monoxide, argon, helium and carbon dioxide.

Low cost of ownership is delivered through Servomex's ultra-stable, non-depleting digital sensing technologies, which help extend maintenance intervals. An independent auto-calibration function helps to keep operational and maintenance expenses to a minimum.

An intuitive, icon-driven color touchscreen makes it easy to interact with the MultiExact 4100. The device also has a USB serial port to allow data logging and software upgrades.

This also makes it simple to duplicate analyzer configurations using a thumb drive.

The MultiExact 4100 is backwards compatible with many current installations, including the legacy 4100, and complies with existing standards and agreements. This makes it easy to upgrade and achieve the high-performance measurement stability and advanced digital communications capabilities of a modern analyzer platform.

It also offers built-in support for Servomex's AquaXact 1688 moisture transmitter, allowing touchscreen control and easy field replacement of the Aluminum Oxide ultra-thin film sensor tip.

This also provides a connected AquaXact 1688 with access to the MultiExact 4100's 32 alarms, 32 relays and full range of analog and digital communications, including 0-10V DC, 4-20mA, RS232, RS485, serial Modbus, Ethernet Modbus TCP/IP and PROFIBUS.

The flexibility of the MultiExact 4100 means it is suitable for a wide range of applications, including monitoring combustion processes using oxygen enrichment – see page 06.

### SENSING TECHNOLOGIES:

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


Watch our MultiExact 4100 product video: **servomex.expert/video-me4100**



## MAKE THE SWITCH TO DIGITAL $O_2$ ANALYSIS


SERVOTOUGH **Oxy 1900**

Spares support for the analog legacy version of Servomex's hazardous area Paramagnetic oxygen ($O_2$) analyzer, the 1900A/1900B, has now come to an end.

That makes it more important than ever before to upgrade any existing 1900A/1900B installations to the much more advanced SERVOTOUGH Oxy 1900 digital analyzer.

The Oxy 1900 was specifically designed to match or exceed its predecessor in every department, and has delivered proven reliability to processes around the world for several years, providing the compliances and features that modern engineers expect.

It sets the highest standards for accurate, reliable $O_2$ analysis in challenging industrial conditions, providing significant improvements over competing hazardous area $O_2$ analyzers.

A digital, microprocessor-based analyzer, the Oxy 1900 uses Servomex's trusted Paramagnetic $O_2$ sensing technology. This ensures fully up-to-date $O_2$ analysis, meeting current process demands for even the most demanding applications.

The Oxy 1900 provides efficient, complete sample heating for greater measurement stability, and advanced software that enables the analyzer to self-diagnose faults and issues.

It also has a unique Flowcube sensor to guarantee low-flow indication during normal operation, and an integrated pressure compensation system to enable tighter process control if the sample pressure varies.

Options available include an innovative heated sample bulkhead, which eliminates the need for a sample conditioning system on samples with a dew point up to 50°C (122°F). Sample system failure is the cause of around 80% of all Paramagnetic replacements, so this provides peace of mind by maintaining the process fluid in its gas phase, minimizing analyzer damage from sample compensation.

Delivering trusted reliability in hazardous areas, the Oxy 1900 is certified for ATEX Cat 2, IECEx Zone 1 and CSA Class 1, Div 1, and complies with Safety Integrity Level (SIL) 2.

Using an improved temperature coefficient, it is ideal for regions of the world with variable weather conditions and extreme temperature swings, such as the Middle East and Asia.

### APPLICATIONS INCLUDE:

- PROCESS CONTROL
- SAFETY CRITICAL OXIDATION (SUCH AS ETHYLENE OXIDE AND PROPYLENE OXIDE PURITY)
- FEEDSTOCK CLEAN-UP
- INERTING/BLANKETING
- FLARE STACK ANALYSIS
- VAPOR RECOVERY


Expert views on $O_2$ measurements: **servomex.expert/video-oxygen**

# EXPERT FOCUS

SERVOMEX EXPERT
UNRIVALLED KNOWLEDGE AND VISION

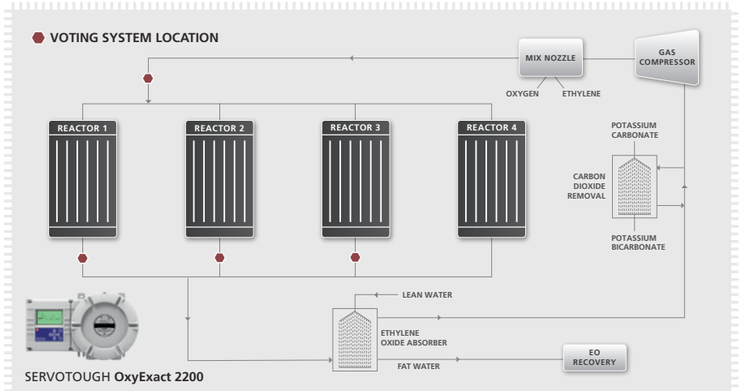
# OXYGEN ANALYSIS IN ETHYLENE OXIDE PRODUCTION

Ethylene oxide ($C_2H_4O$) is a versatile chemical building block used in the manufacture of many products including glycol-based antifreeze, synthetic clothing fibers, foam rubber, detergents, paint, various modern plastics, and as an important sterilizing agent. Reliable oxygen ($O_2$) monitoring is essential for safety and efficiency in the $C_2H_4O$ production process.

Most $C_2H_4O$ is commercially produced by the direct oxidation of ethylene ($C_2H_4$), using a mix of air and pure $O_2$.

The exothermic nature of the process means that safety is of paramount concern. Ethylene is a very reactive gas, and readily burns to form carbon dioxide ($CO_2$) and water vapor ($H_2O$). If not carefully handled, it does this explosively.

The desired $C_2H_4O$ intermediate is produced by feeding the two primary feedstock materials, in minor amounts, to a reactor maintained between 145 and 365psig (260psig is typical) and 200-300°C (392-572°F). A suitable catalyst, usually silver oxide, is also used.



SERVOTOUGH **OxyExact 2200**

Using air as the oxidant means that the inherently high proportion of nitrogen acts as a major diluent, keeping components outside of the explosive limit. It is essential to keep $O_2$ levels below 8% to avoid formation of an explosive mixture. However, it must be above 5%, otherwise the $C_2H_4O$ yield becomes uneconomic.

When the process uses pure $O_2$, the desirable operating range is very different and much narrower, typically 0.8% $O_2$ with a variation of ±0.1% $O_2$.

In either case, the reactions are optimized by keeping the $O_2$ level as high as possible to obtain the best yield, while remaining within safe limits.

## A PARAMAGNETIC $O_2$ ANALYSIS SOLUTION

The SERVOTOUGH OxyExact 2200 gas analyzer is ideal for monitoring these processes.

The analyzer's Paramagnetic sensor responds specifically to changes in gaseous $O_2$ levels, while the only sample preparation components required are a filter and a pressure reducing station.

The non-depleting Paramagnetic cell should never need replacement, and requires only occasional calibration checks, especially when used in safety shutdown duties. It provides proven, long-term stability, reliability, and a fast speed of response.

The OxyExact 2200 can be used to measure the quality of the $O_2$ feedstock. More critically, however, it is employed in a voting system – either one out of two or two out of three – to measure $O_2$ on the inlet and each outlet of the reactors. The OxyExact 2200 is SIL 2 hardware compliant to make integration into such safety systems simple.

These safety critical measurements are a fundamental element of the Safety Integrated Systems (SIS) required for safe operation and production.

Ethylene oxide reactors are monitored on a frequent basis, to detect gases other than $O_2$ in order to assess conversion efficiency and unwanted waste compound build-up. Signals from these analyzers can be continuously fed to the OxyExact 2200s to modify the $O_2$ analyzer output as required. This produces an online $O_2$ reading to better than ±0.02% accuracy.

Want expert support customized to your process?
Contact us now: **servomex.expert/contact-us**



# PROCESS STUDY

# FLARE STACK EMISSIONS

## SERVOMEX'S BENCHMARK-LEVEL ANALYSIS OF HYDROCARBON COMPONENTS AND OXYGEN MIXTURES ACROSS THE FLARE STACK PROCESS

A flare stack is one of the most important safety mechanisms in industrial plants, burning off flammable gases released by pressure relief valves, thereby avoiding unplanned pressure build-ups and disposing of excess gases.

They are also used for the planned combustion of gases over short periods during plant start-ups or shut-downs, both full and partial, and are employed by petrochemical facilities, natural gas processing facilities, chemical plants and refineries.

A flare stack is an elevated vertical stack or chimney, and steam-assisted flaring of the associated gas occurs at the top of this structure to control the combustion efficiency (CE).

Combustion of the vent gas is a much more environmentally responsible process than simply releasing the gas into the air. For example, if methane is burnt, the products are carbon dioxide ($CO_2$) and water, which are much less harmful than releasing methane itself.

Flares are active all the time, with a continuous release of gas being burned off at the flare stack. When this mix of steam and hydrocarbons is correct, the flame is clean and no harmful emissions escape into the atmosphere.

## SERVOMEX ANALYZER SOLUTIONS FOR THE FLARE STACK PROCESS

### SERVOTOUGH SpectraScan 2400

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

### SERVOMEX H2scan

Non-depleting thin film technology providing a robust and reliable direct measurement of hydrogen.

### SERVOTOUGH Oxy 1900

Award-winning, safety-enhanced digital $O_2$ analyzer designed to deliver accurate Paramagnetic measurements in challenging applications.

### SERVOTOUGH OxyExact 2200

Hazardous area process $O_2$ analyzer using high-precision Paramagnetic sensing technology for ultimate monitoring performance.

### SERVOTOUGH Laser 3 Plus Process

Highly-compact Tunable Diode Laser gas monitor for fast and accurate $O_2$ measurements in in-situ cross-stack applications.

See our analyzers across the process **OVERLEAF**

# FLARE STACK ANALYSIS PROCESS

In steam-assisted flares, the ratio of steam to vent gas is critical. Under-steaming leads to incomplete combustion, while over-steaming will reduce the efficiency of the flare. Visible smoke is a clear sign of pollutants being released into the atmosphere.

Efficient regulation needs continuous compositional analysis to ensure the steam-to-vent-gas ratio is maintained at its most efficient level and complies with the CE target.

Servomex's system, comprising the **SERVOTOUGH SpectraScan 2400** and the **SERVOMEX H2scan** working in combination, gives a continuous reading with a good compositional measurement. It measures 14 components, with an overall BTU value and individual component values.

The SpectraScan 2400 is a Tunable Filter Infrared analyzer which can accurately separate light hydrocarbon components in the C1 to C6 range. The H2scan uses non-depleting thin film technology to provide a direct, real-time hydrogen measurement that is not cross-sensitive to other gases.

This completely integrated system has no carrier gas and needs no recalibration or adjustment, so there are few, if any, parameters to affect the sample.

The combination of these two technologies provides a detection system that is simpler and superior to traditional analysis, with considerably lower implementation and product lifetime costs.

Continuous compositional analysis allows the system to help find the optimum point between over-steaming and under-steaming by fast, accurate reporting of the net heating value of the combustion-zone gases, taking flare control a step further than other methods.

The SpectraScan/H2scan system is so repeatable it is often used as a benchmark to determine the performance of analyzers using Gas Chromatography or Calorimetry.

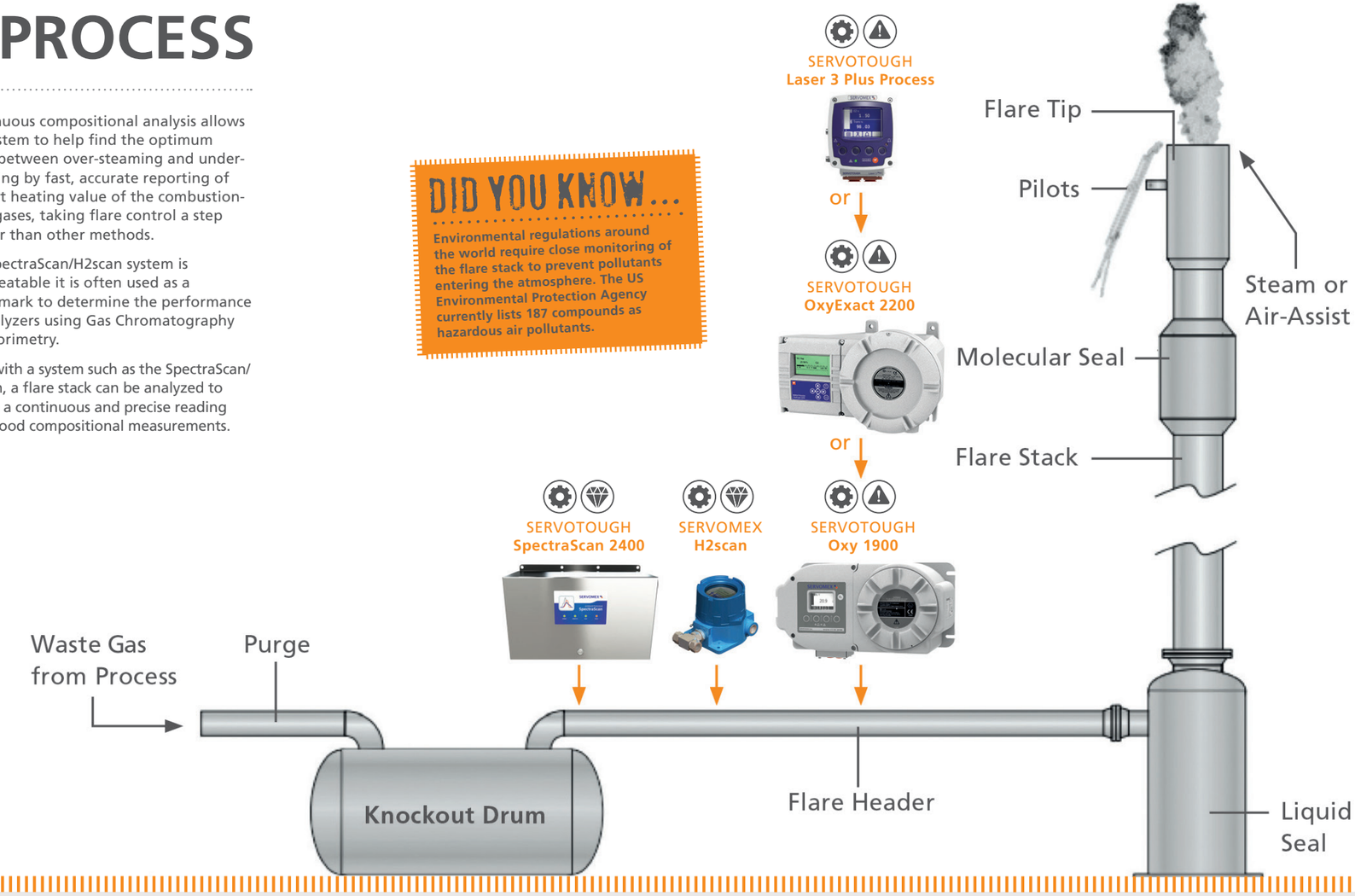
Used with a system such as the SpectraScan/H2scan, a flare stack can be analyzed to obtain a continuous and precise reading with good compositional measurements.

**KEY**
**APPLICATION TYPES:**

QUALITY | PROCESS CONTROL | SAFETY

**DID YOU KNOW...**

Environmental regulations around the world require close monitoring of the flare stack to prevent pollutants entering the atmosphere. The US Environmental Protection Agency currently lists 187 compounds as hazardous air pollutants.




## OXYGEN MONITORING REQUIREMENTS

There is also a requirement to monitor and control the amount of oxygen ($O_2$) in the flare. Monitoring $O_2$ at the burner prevents a potentially explosive mixture of flammable gas and $O_2$ building up, eliminating the risk of it igniting and causing a flash-back of burning gases into the plant.

Typically, alarms are in place to alert when the $O_2$ level exceeds 1%, so accurate and timely measurement of $O_2$ is an important factor in maintaining plant safety.

The recommended method of determining the $O_2$ level in a flare stack is to use an analyzer fitted with a magneto-dynamic cell, which measures the paramagnetic properties of the gas.

Oxygen is paramagnetic where other gases are not, making the Servomex Paramagnetic cell in analyzers such as the **SERVOTOUGH Oxy 1900** and **SERVOTOUGH OxyExact 2200** one of the safest and most reliable means of monitoring the presence of $O_2$ in hazardous situations.

Both analyzers boast an integrated pressure compensation system that not only compensates for barometric pressure, but also for back pressure variations from flare stacks, enabling emission compliance targets to be easily met.

Alternatively, the **SERVOTOUGH Laser 3 Plus Process** Tunable Diode Laser (TDL) analyzer is optimized for the monitoring of $O_2$ in processes where such monitoring is vital for the safe, efficient and reliable running of the process, and is essential for safety applications.

It gives a fast response to measuring $O_2$ in flare stacks, using the latest Wavelength Modulated Spectroscopy measurement techniques with unique Servomex signal processing to provide the most stable, repeatable results with minimal cross-interference from other gases.

The Oxy 1900, OxyExact 2200 and Laser 3 Plus are all SIL 2 rated, for easy integration into safety systems.

Waste gases from various points in the plant meet at the vent header. Reliable, accurate and continuous measurement of $O_2$ at the vent header is critical to keep $O_2$ content at safe levels, preventing an explosive mixture of gases which could have devastating consequences for the plant. In vented hydrocarbons, this safe level is 0-1% of $O_2$, so low-level detection accuracy is paramount.

The pressure of the vent header is generally dictated by the process pressures that connect to it, so the sample may be considered 'pressurized' (i.e. over 16psia). Servomex process analyzers have been developed with this in mind, operating with vent pressures ranging from 18-45psia, and higher for some applications.

Using these technology solutions, your plant flares can reach the highest levels of efficiency and safety, and better comply with all regulatory standards.

Our $O_2$ solutions:
**servomex.expert/video-oxygen**

# SERVICE FOCUS

SERVOMEX SERVICE NETWORK

# DELIVERING PEACE OF MIND TO YOUR ANALYZER SET-UPS

MARK CALVERT, SERVOMEX'S SERVICE MANAGER FOR THE EMEAI REGION, EXPLAINS THE BENEFITS OF COMMISSIONING FOR YOUR ANALYZER OR SYSTEM.

Correct installation and configuration of your analyzer is essential to ensure it provides optimum performance and that it meets your compliance and operational needs from the outset.

Servomex's highly trained commissioning engineers provide a fast, seamless and comprehensive service that supports your process. They will assess installation suitability and commission your analytical equipment to perform safely, accurately and reliably.

This delivers optimum performance from your analyzer or system, and qualifies the analyzer for an additional warranty period.

A customized
## solution

An engineer will provide a fully customized commissioning program that meets your compliance and operational needs. They will then hand over control to your in-house technicians with a face-to-face training session.

Return on your
## investment

Commissioning ensures you get the best return from your analyzer. It helps avoid costly process inefficiencies and ongoing maintenance costs caused by incorrectly installed equipment.

Optimize your
## performance

An analyzer commissioned by Servomex eliminates the operational errors caused by incorrect installation. This avoids the dangers of compromised plant safety, and ensures analyzer operation is tailored to suit your process requirements.

Health Check
## protection

You can protect your analyzer for two years by purchasing a Servomex Health Check with your Commissioning package. We will validate your analyzer's performance after the first year of installation, and provide you with a further 12-month warranty.


Commissioning by one of Servomex's highly-trained engineers can avoid the problems an incorrectly installed system can bring, ensuring customers have someone present on site with the knowledge, experience and expertise when it counts.

This means customers can achieve maximum levels of performance, reliability and, often, cost saving from their analyzer from day one.

Servomex Service Network offers your business a full range of service products developed to ensure optimum process performance. Contact your local Servomex Business Center today to find out more and protect your investment.

COMMISSIONING · SERVICE CONTRACTS · ON-SITE SERVICE SUPPORT · HEALTH CHECK · SERVICE CENTER SUPPORT · RENTAL EQUIPMENT · TRAINING · SPARES

Get the expert support you need: **servomex.expert/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.

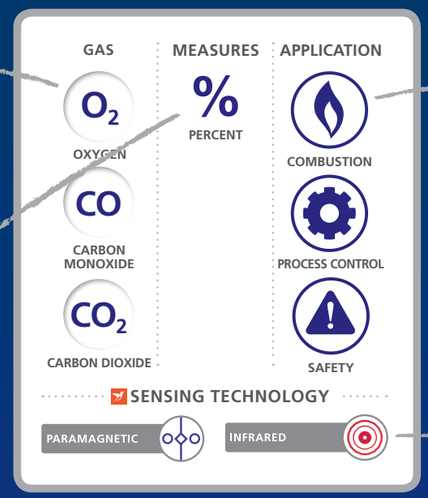
Supported by a global network of service and support, Servomex analyzers are chosen with confidence by HP operators worldwide in the knowledge that they guarantee operational safety, product quality and process efficiency.

# 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.expert/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 Oxy 1800

SAFE AREA

### ACCURATE AND STABLE SAFE AREA $O_2$ ANALYZER

Designed to reliably measure percent $O_2$ in many safety-critical industrial applications, the Oxy 1800 is a stable, accurate and highly specific $O_2$ 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

GAS: $O_2$ OXYGEN

MEASURES: % PERCENT

APPLICATION: PROCESS CONTROL; SAFETY

SENSING TECHNOLOGY: PARAMAGNETIC

## SERVOTOUGH Oxy 1900

HAZARDOUS AREA

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

Offering industry-standard features alongside revolutionary, value-added options, the Oxy 1900 $O_2$ gas analyzer sets new standards 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
- SIL 2 compliant

### APPLICATIONS

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

GAS: $O_2$ OXYGEN

MEASURES: % PERCENT

APPLICATION: PROCESS CONTROL; SAFETY

SENSING TECHNOLOGY: PARAMAGNETIC



## SERVOTOUGH OxyExact 2200

HAZARDOUS AREA

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

The OxyExact 2200 high-specification $O_2$ analyzer offers an unrivaled combination of precision, flexibility and performance for optimum process and safety control. The OxyExact 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% $O_2$ and pressures of up to 40psi
- High-temperature version eliminates the need to condense hot sample prior to analysis
- SIL 2 compliant

### APPLICATIONS

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

GAS: $O_2$ OXYGEN

MEASURES: % PERCENT

APPLICATION: 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 Precisive 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

GAS: CO CARBON MONOXIDE; $CO_2$ CARBON DIOXIDE; C1-C6 HYDROCARBONS; $H_2S$ HYDROGEN SULFIDE

MEASURES: % PERCENT; CV CALORIFIC VALUE

APPLICATION: PROCESS CONTROL; QUALITY

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 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

GAS: TOXIC; FLAMMABLE; CORROSIVE

MEASURES: % PERCENT; ppm TRACE

APPLICATION: PROCESS CONTROL

SENSING TECHNOLOGY: GAS FILTER CORRELATION; INFRARED

# SERVOTOUGH FluegasExact 2700

HAZARDOUS AREA

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

Designed to measure $O_2$ and COe in flue gases for improved combustion efficiency and reduced emissions, the FluegasExact 2700 gas analyzer is designed to suit the most demanding needs of combustion efficiency applications in the power generation and process industries.

## 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
- Close-coupled extractive measurement principle

## APPLICATIONS

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

GAS: $O_2$ OXYGEN; $CO_e$ COMBUSTIBLES

MEASURES: % PERCENT; ppm TRACE

APPLICATION: COMBUSTION; PROCESS CONTROL

SENSING TECHNOLOGY: CALORIMETRY; ZIRCONIA

# SERVOTOUGH Laser 3 Plus Process

HAZARDOUS AREA

## THE WORLD'S SMALLEST TDL GAS ANALYZER, OPTIMIZED FOR PROCESS $O_2$ 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: $O_2$ OXYGEN

MEASURES: % PERCENT

APPLICATION: PROCESS CONTROL; COMBUSTION

SENSING TECHNOLOGY: TUNABLE DIODE LASER

# SERVOTOUGH Laser 3 Plus Combustion

HAZARDOUS AREA

## THE REVOLUTIONARY COMPACT COMBUSTION ANALYZER OPTIMIZED FOR CO, $O_2$, OR CO + $CH_4$ 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: $O_2$ OXYGEN; CO CARBON MONOXIDE; $CO+CH_4$ CARBON MONOXIDE + METHANE

MEASURES: % PERCENT; ppm TRACE

APPLICATION: PROCESS CONTROL; COMBUSTION

SENSING TECHNOLOGY: TUNABLE DIODE LASER



# 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, $H_2O$, $H_2S$, 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: MULTIPLE

MEASURES: % PERCENT; ppm TRACE

APPLICATION: PROCESS CONTROL; EMISSIONS

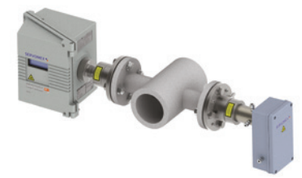
SENSING TECHNOLOGY: TUNABLE DIODE LASER

# 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 – $H_2O$, $CO_2$, $H_2S$

GAS: MULTIPLE

MEASURES: % PERCENT; ppm TRACE

APPLICATION: PROCESS CONTROL; QUALITY

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: $H_2S$ and $CO_2$ (during natural gas refinement)
- HF and HCl impurity monitoring in process gas
- Monitoring $H_2S$ during biogas production
- $H_2O$ and $H_2S$ in natural gas

GAS: MULTIPLE

MEASURES: ppb ULTRA TRACE; ppm TRACE

APPLICATION: PROCESS CONTROL; 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

- ATEX II and IECEx certified
- Class 1/Div 2 Groups A, B, C and D certified
- 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 $N_2$ skids
- Reactor process control
- Blanketing and inerting
- Oil refinery monitoring
- Petrochemical process monitoring

GAS: $O_2$ OXYGEN

MEASURES: ppb ULTRA TRACE; ppm TRACE

APPLICATION: 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: $H_2$ HYDROGEN

MEASURES: % PERCENT

APPLICATION: 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 $O_2$ sensing technology.


## FEATURES AND BENEFITS

- IP66 (indoor use only)
- The most reliable $O_2$ detector on the market
- No more false readings or false alarms caused by depleting cell technologies
- SIL 2 compliant

## APPLICATIONS

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

GAS: $O_2$ OXYGEN

MEASURES: % PERCENT

APPLICATION: SAFETY

SENSING TECHNOLOGY: PARAMAGNETIC



# SERVOPRO

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 air separation unit (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.

## SUPPORTING

- PROCESS CONTROL
- PROCESS SAFETY
- EMISSIONS MONITORING
- COMBUSTION CONTROL
- PRODUCT QUALITY

# SERVOMEX 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 4-20mA transmitter or remotely interfaces with our digital controller, MonoExact DF310E and MultiExact 4100
- NIST-traceable field-replaceable sensor element, for hassle-free recalibration
- Stainless steel, weatherproof casing (Class 1 Div 2 in 2019) enables operation in ambient temperatures ranging from -10°C to +70°C

## APPLICATIONS

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

GAS: $H_2O$ WATER

MEASURES: DEW POINT; ppmv

APPLICATION: 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
- Automated calbration/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: MULTIPLE

MEASURES: % PERCENT; ppm TRACE

APPLICATION: EMISSIONS

SENSING TECHNOLOGY: GAS FILTER CORRELATION; INFRARED; PARAMAGNETIC

# SERVOPRO NOx

SAFE AREA

## CHEMILUMINESCENCE DETECTOR (CLD) ANALYZER FOR KEY EMISSIONS APPLICATIONS INVOLVING ULTRA-LOW NO, $NO_2$ AND NOx

Utilizing Chemiluminescence detection technology to measure NO or NO/$NO_2$/NOx concentrations in industrial gas and vehicle emission applications, the versatile SERVOPRO NOx can be calibrated for four measurement ranges starting from ultra-low to high ppm and is easy to install and operate.


## 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 (CEMS)
- Scrubber efficiency
- Turbine/generator feedback control
- SCR/SNCR feedback control

GAS: NO — NITRIC OXIDE; $NO_2$ — NITROGEN DIOXIDE; NOx — NITROGEN OXIDES

MEASURES: ppm — TRACE

APPLICATION: PROCESS CONTROL; EMISSIONS; QUALITY

SENSING TECHNOLOGY: CHEMILUMINESCENCE

# SERVOFLEX

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.

# SUPPORTING

PROCESS CONTROL; PROCESS SAFETY; EMISSIONS MONITORING; COMBUSTION CONTROL; PRODUCT QUALITY

# SERVOPRO $SO_2$

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
- User-selectable dual ranges with auto-ranging
- Easy maintenance procedures

## APPLICATIONS

- Continuous emissions monitoring (CEMS)
- Ambient air monitoring

GAS: $SO_2$ — SULFUR DIOXIDE

MEASURES: ppm — TRACE; ppb — ULTRA TRACE

APPLICATION: PROCESS CONTROL; EMISSIONS; QUALITY

SENSING TECHNOLOGY: UV FLUORESCENCE

# 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 $O_2$, CO and $CO_2$.


## 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: $O_2$ — OXYGEN; CO — CARBON MONOXIDE; $CO_2$ — CARBON DIOXIDE

MEASURES: % — PERCENT

APPLICATION: COMBUSTION; PROCESS CONTROL; SAFETY

SENSING TECHNOLOGY: PARAMAGNETIC; INFRARED

# SERVOPRO HFID

SAFE AREA

## HIGH-PERFORMANCE FAST ANALYSIS USING HEATED FID

Using a highly sensitive heated 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 the dew point of most hydrocarbons expected to be present, for optimum performance in total hydrocarbon analysis (THC). Can be equipped with a non-methane cutter for additional methane ($CH_4$) 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
- Heated FID detector at 190°C for the most accurate THC determination

## APPLICATIONS

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

GAS: THC — TOTAL HYDROCARBONS; $CH_4$ — METHANE; NMHC — NON-METHANE HYDROCARBONS

MEASURES: ppm — TRACE

APPLICATION: PROCESS CONTROL; EMISSIONS; QUALITY

SENSING TECHNOLOGY: FLAME IONIZATION DETECTOR

# SERVOFLEX MiniHD 5200

PORTABLES

## PORTABLE GAS ANALYZER FOR MEASUREMENT OF COMMON GAS MIXTURES

Designed for use in field locations or light industrial applications, the MiniHD 5200 portable gas analyzer is a rugged, heavy duty analyzer designed to accurately measure the levels of $O_2$, CO and $CO_2$ 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 $O_2$, CO and $CO_2$ levels with no background interference

## APPLICATIONS

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

GAS: $O_2$ — OXYGEN; CO — CARBON MONOXIDE; $CO_2$ — CARBON DIOXIDE

MEASURES: % — PERCENT

APPLICATION: COMBUSTION; PROCESS CONTROL; SAFETY

SENSING TECHNOLOGY: PARAMAGNETIC; INFRARED

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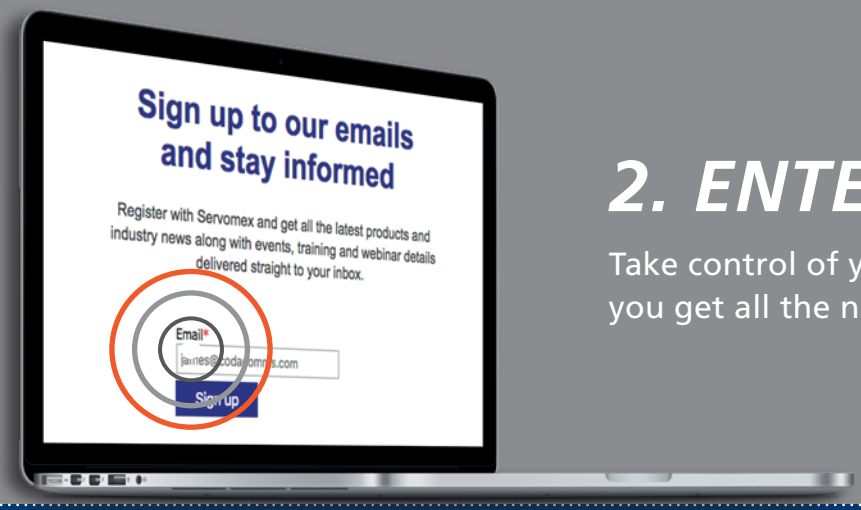


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