SERVOMEX

GAS GUIDE

2021

SPECIFIER'S GUIDE

How to choose the right solution

SENSING TECHNOLOGIES

Gas measurement methods explained

APPLICATION SOLUTIONS

Find out how we improve your process

FULL PRODUCT GUIDE

See our range of gas analyzers

SYSTEMS

Expert, bespoke gas analysis, scalable to your application

SERVICE NETWORK

Providing the support you need, wherever it's required

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a spectris company

WELCOME TO OUR GAS GUIDE

HELPING YOU FIND THE RIGHT SOLUTION FOR YOUR GAS ANALYSIS APPLICATION

Trevor Sands, Servomex President

Welcome to our comprehensive handbook covering all aspects of gas analysis and our sensing solutions.

For the first time, we've gathered in one publication all the resources you need to find the best gas analysis solution for your application.

It's an introduction to our complete product range, including analyzers, systems, and service support packages – but it's also so much more.

We've broken down the sensing technology that powers our innovative gas analysis, explaining how it works, which gases it detects, and what makes it the best fit for certain applications.

And we've highlighted some of those applications in this publication, explaining the processes involved and where our gas analyzers and systems fit within them for the most effective results.

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

Remember, our team is here to help, so get in touch if you want to find out more, or have any questions.

HOW TO USE THIS GUIDE

To make it easier to find what you're looking for, we've divided this comprehensive guide into several sections, all aimed at providing the information you need to select the best solution:

- Specifier's guide to gas analysis – read this to understand the key criteria that drives your analyzer choice; there are also flowcharts that help narrow down your choice for the most common gas measurements.
- Sensing technologies A-Z – see the advantages and disadvantages of each sensor type for your application, including the gases measured and the ranges covered.
- Key applications – to illustrate how our analytical systems fit into your application, we've picked out some typical process and purity applications.
- Servomex product guide – now you have a clearer idea of what you're looking for, view the complete range of Servomex analyzers, along with a tabulated gas measurement guide for easy reference.
- Systems and service – we're not just suppliers of analyzers; read this section to learn how our customized systems builds and flexible service support packages can ensure optimum analyzer performance from the outset.
- Further resources – if you need more details before making your decision, we have a range of information including manuals, videos, and expert papers, ready for you to download or view online.

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

Go to **servomex.com/contact** and get in touch.

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YOUR SPECIFIER'S GUIDE

Selecting the right gas analyzer for your essential process measurement can be challenging. To help, our experts have created this Specifier's Guide, identifying the key criteria you need to address when choosing your solution.

This section of our Gas Guide explains how factors such as gas measurement range, process environments and the sensing technology used can all affect the results achieved by your analyzer.

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

In addition, if you're looking for a reliable, accurate measurement of oxygen, carbon dioxide, carbon monoxide or methane, we've provided easy-to-use flowcharts that will help you narrow down your solution.

If you need more help, our expert team has a vast pool of applications knowledge, and is always ready to steer you in the right direction for optimum results – get in touch at **servomex.com/contact**

MEASUREMENT RANGE AFFECTS THE CHOICE OF ANALYZER

Depending on the sensing technology used and its configuration, gas analyzers can measure gas concentration across a wide range, from complete purity to tiny traces.

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

%

PERCENTAGE

These analyzers measure gas concentration based on its percentage (i.e parts per hundred) in the gas mixture. Often this is a large-scale measurement – for example, Paramagnetic oxygen (O_2) analyzers measure up to 100% O_2 in many industrial processes.

PPM

PARTS PER MILLION

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

PPB/PPT

ULTRA-TRACE

Some gases – chiefly for medical or semiconductor applications – must have a very high level of purity. Ultra-trace analyzers detect contaminants down to parts-per-billion (ppb) or parts-per-trillion (ppt) levels, equivalent to detecting a single drop of water in 10 Olympic-sized swimming pools.

THE RIGHT SOLUTION FOR YOUR PROCESS ENVIRONMENT

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

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

Analyzers that are usually designed for use in safe areas, but need to be robust to cope with being transported to and from each measurement site.

HAZARDOUS AREA ANALYZER ENCLOSURES

Servomex systems offer a range of custom-built enclosures to ensure safe and reliable operation in hazardous environments.

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

Fully contained air-conditioned shelters can also be constructed for large systems projects.

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

Find out more on **page 79** or visit: **servomex.com/systems**

CONTROL YOUR PROCESS AND EMISSIONS

CO_2 CARBON DIOXIDE

A colorless gas, carbon dioxide (CO_2) occurs naturally at trace levels in the Earth's atmosphere and is one of the primary greenhouse gases.

The gas has applications in the food, oil, and chemical industries, and is used in many pressurized gas tools.

Monitoring CO_2 is important in many industrial processes for process control and efficiency. In addition, CO_2 emissions are frequently measured by industrial plants to prove compliance with environmental regulations.

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

Use pages **08-09** to identify the best CO_2 solution for your process

CO CARBON MONOXIDE

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

It is dangerous to humans (and other animals that use hemoglobin to transport oxygen) in high concentrations within a confined space. In the atmosphere, it oxidizes to form CO_2, so is relatively short-lived in open areas.

A measurement of CO (along with oxygen) helps to maintain the combustion reaction at an optimum balance, maintaining safety and reducing fuel costs.

It may also be monitored to avoid impurities in the production of industrial, medical, and UHP gases.

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

Use pages **10-11** to identify the best CO solution for your process

CARBON DIOXIDE GAS ANALYZER FINDER

CO_2

WHAT LEVEL/RANGE OF CARBON DIOXIDE DO YOU REQUIRE?

%

HAZARDOUS AREA

SERVOTOUGH
SpectraExact 2500

SAFE AREA

WHICH MOUNTING STYLE?

RACK

WALL

SERVOTOUGH
SpectraExact 2500

PORTABLE

HYDROGEN

SERVOPRO
MultiExact 4200

FLAMMABLE

SERVOPRO
MultiExact 4200

NON-FLAMMABLE

GAS PURITY

SERVOPRO
MultiExact 4100

CEMS

SERVOPRO
4900 Multigas

RUGGED IP65

SERVOFLEX
MiniHD 5200

TRANSPORTABLE IP40

GENERAL PURPOSE

SERVOFLEX
MiniMP 5200

FOOD

SERVOFLEX
MiniFoodPack 5200

ppm

HAZARDOUS AREA

SERVOTOUGH
SpectraExact 2500

SAFE AREA

WHICH MOUNTING STYLE?

WALL

SERVOTOUGH
SpectraExact 2510

RACK

HYDROGEN

SERVOPRO
MultiExact 4200

FLAMMABLE

SERVOPRO
MultiExact 4200

NON-FLAMMABLE

GAS PURITY

SERVOPRO
MultiExact 4100

See our full range of analyzers on **pages 58-73** or visit: **servomex.com**

CARBON MONOXIDE GAS ANALYZER FINDER

CO

WHAT LEVEL/RANGE OF CARBON MONOXIDE DO YOU REQUIRE?

%

HAZARDOUS AREA

SERVOTOUGH
SpectraExact 2500

SAFE AREA

WHICH MOUNTING STYLE?

RACK

HYDROGEN

SERVOPRO
MultiExact 4200

FLAMMABLE

SERVOPRO
MultiExact 4200

NON-FLAMMABLE

GAS PURITY

SERVOPRO
MultiExact 4100

CEMS

SERVOPRO
4900 Multigas

WALL

SERVOTOUGH
SpectraExact 2500

PORTABLE

SERVOFLEX
MiniHD 5200

ppm

HAZARDOUS AREA

WHICH MOUNTING STYLE?

IN SITUE

ACROSS PROCESS

SERVOTOUGH
Laser 3 Plus

EXTRACTIVE

SERVOTOUGH
FluegasExact 2700

WALL (EXTRACTIVE)

SERVOTOUGH
SpectraExact 2510

SAFE AREA

WHICH MOUNTING STYLE?

IN SITUE

ACROSS PROCESS

SERVOTOUGH
Laser 3 Plus

EXTRACTIVE

SERVOTOUGH
FluegasExact 2700

WALL

SERVOTOUGH
SpectraExact 2510

RACK

HYDROGEN

SERVOPRO
MultiExact 4200

FLAMMABLE

SERVOPRO
MultiExact 4200

NON-FLAMMABLE

GAS PURITY

SERVOPRO
MultiExact 4100

CEMS

SERVOPRO
4900 Multigas

See our full range of analyzers on **pages 58-73** or visit: **servomex.com**

MAKE SURE YOUR ANALYZER HAS THE RIGHT CERTIFICATIONS

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

EXAMPLES OF MAJOR INTERNATIONAL CERTIFICATIONS FOR GAS ANALYZERS ARE:

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

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

These are safety assessments of electrical equipment and components. IEC 61010-1 specifies general safety requirements for test, measurement, and process control equipment, along with laboratory instrumentation. IEC 61326-1:2012 on the other hand, specifies requirements for immunity and emissions regarding electromagnetic compatibility for electrical equipment.

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

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

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

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

A KEY MEASUREMENT FOR MANY INDUSTRIAL PROCESSES

The primary constituent of natural gas, methane is a hydrocarbon with the formula CH_4. It is extremely flammable, and is capable of forming explosive mixtures with air. Methane is used in many industrial processes, both as a chemical feedstock and as a fuel.

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

Methane also plays a major role in the production of hydrogen gas, using the steam reforming process. Measurement of CH_4 is key to reaction efficiency and safety.

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

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

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

Use pages **14-15** to identify the best CH_4 solution for your process

METHANE/TOTAL HYDROCARBONS GAS ANALYZER FINDER

CH_4 THC

WHAT MEASUREMENT/RANGE DO YOU REQUIRE?

%

HAZARDOUS AREA

WHICH MOUNTING STYLE?

WALL

SERVOTOUGH
SpectraExact 2500

CROSS-STACK
CROSS-PIPE

SERVOTOUGH
Laser 3 Plus

SAFE AREA

BACKGROUND GAS

FLAMMABLE GAS

SERVOPRO
MultiExact 4200

HYDROGEN

SERVOPRO
MultiExact 4200

ppm

HAZARDOUS AREA

WHICH MOUNTING STYLE?

WALL

SERVOTOUGH
SpectraExact 2500

CROSS-STACK

SERVOTOUGH
Laser 3 Plus

SAFE AREA

TYPE OF MEASUREMENT

METHANE
(CH_4)

APPLICATION

PURE GAS

SERVOPRO
MultiExact 4100

CEMS

SERVOPRO
4900 Multigas

TOTAL HYDROCARBONS
(THC)

APPLICATION

DRY GAS

PURITY

SERVOPRO
FID

WET GAS

CEMS

SERVOPRO
HFID

See our full range of analyzers on **pages 58-73** or visit: **servomex.com**

WHAT TO LOOK FOR IN A GAS ANALYZER SUPPLIER

Your choice of gas analyzer supplier can be as important as selecting the product itself. Picking the wrong one can cause problems from the outset, while the right selection can ensure smooth installation and many years of successful analyzer operation.

KEY FACTORS WHEN SELECTING YOUR GAS ANALYZER SUPPLIER

EXPERTISE

A supplier with deep applications knowledge can help you fit the best solution to your process. They'll understand the difficulties you face and the challenges you need to overcome, and they'll be able to create bespoke solutions.

ETHICS

It's important to deal with a company that operates in a moral and responsible way. Not only does this ensure your own business dealings are being handled properly, it also protects you and your company from reputational damage that may result from dealing with unscrupulous operators. Look for suppliers that have strong and clearly established ethics policies.

REPUTATION

Ask around your marketplace to find out what others think of the supplier. Are they well thought of, and do their products have a strong track record?

SUPPORT

Your relationship with the supplier shouldn't end once your gas analyzer or system has been delivered. Gas analyzers are a long-term investment, and require support and maintenance to continue to operate at peak efficiency over their long lifetime. A supplier that delivers the support you need, when and where you need it, will ensure you get maximum value from your gas analyzer.

ESSENTIAL GAS WITH A RANGE OF ANALYTICAL SOLUTIONS

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

In industry, it has a wide variety of uses, including the production of metals and plastics. The extensive range of oxide compounds used in many processes also means that there are many applications where O_2 measurements are key to process control, safety, and efficiency.

Additionally, while O_2 is not harmful to the environment, it may be required to monitor O_2 emissions as part of a continuous emissions monitoring system.

There are a number of sensing technologies available for the measurement of O_2, and the most appropriate solution depends on the application.

For example, Paramagnetic sensing is a long-proven method of measuring percentage O_2, based on the gas's natural paramagnetic properties. This is ideal for many industrial processes, as well as life safety monitoring.

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

As a component of atmospheric air, O_2 is often found as a contaminant in high-purity gases such as nitrogen and argon. A Coulometric sensor offers excellent ultra-trace detection of O_2 down to parts-per-trillion (ppt) concentrations.

Use pages **18-19** to identify the best O_2 solution for your process

OXYGEN GAS ANALYZER FINDER

O_2

WHAT LEVEL/RANGE OF OXYGEN DO YOU REQUIRE?

PURITY
90-100 %

- SAFE AREA
  - WHICH MOUNTING STYLE?
    - WALL → **SERVOTOUGH** Oxy 1800
    - RACK → **SERVOPRO** MultiExact 4100
- HAZARDOUS AREA → **SERVOTOUGH** OxyExact 2200

ENRICHMENT
21-100 %

- SAFE AREA
  - WHICH MOUNTING STYLE?
    - WALL → **SERVOTOUGH** Oxy 1800
    - RACK → **SERVOPRO** MultiExact 4100
- HAZARDOUS AREA → **SERVOTOUGH** OxyExact 2200

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

- SAFE AREA
  - WHICH MOUNTING STYLE?
    - PORTABLE
      - **SERVOFLEX** MiniHD 5200
      - **SERVOFLEX** MiniMP 5200
      - **SERVOFLEX** MiniFoodPack 5200
    - FULL RACK
      - **SERVOPRO** MultiExact 4100
      - **SERVOPRO** 4900 Multigas
      - HALF RACK → **SERVOPRO** MonoExact DF310E
    - WALL → **SERVOTOUGH** Oxy 1800
    - IN SITU (COMBUSTION) → **SERVOTOUGH** FluegasExact 2700
    - ACROSS PROCESS → **SERVOTOUGH** Laser 3 Plus
- HAZARDOUS AREA
  - WHICH MOUNTING STYLE?
    - WALL
      - **SERVOTOUGH** Oxy 1800
      - **SERVOTOUGH** OxyExact 2200
    - IN SITU (COMBUSTION) → **SERVOTOUGH** FluegasExact 2700
    - ACROSS PROCESS → **SERVOTOUGH** Laser 3 Plus
    - PORTABLE → **SERVOFLEX** Micro i.s. 5100

TRACE
0-10/100/1000 ppm

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

ULTRA-TRACE
<1 ppm

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

See our full range of analyzers on **pages 58-73** or visit: **servomex.com**

YOUR A-Z SENSOR GUIDE

Servomex uses a wide range of sensor technologies to deliver solutions for gas analysis applications in a variety of important industries.

These sensors, many of which are manufactured in our cutting-edge technical facilities in the UK and USA, are key to the highly accurate and reliable measurements provided by our comprehensive range of gas analyzers.

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

This section offers a complete guide to our sensing technologies, from Aluminum Oxide to Zirconia. We also take a look at how we're investing in developing the technologies that may well end up joining our range in the future.

SELECTING THE RIGHT SENSING TECHNOLOGY IS ESSENTIAL

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

MOISTURE AND DEW POINT ANALYSIS

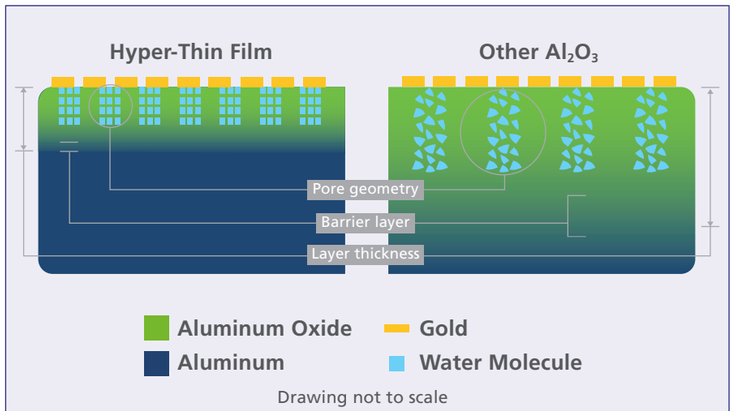
Aluminum Oxide (Al_2O_3) sensors work by measuring the capacitance between the aluminum core and a gold film deposited on the oxide layer. The capacitance varies according to the water vapor content in the pores of the oxide layer.

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

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

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

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



Aluminum Oxide sensor structure

KEY APPLICATIONS

- Air separation units
- Medical gases
- Semiconductors

KEY BENEFITS

✓ Fast response
✓ Highly accurate
✓ Free of drift

IDEAL FOR

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

WORKS WITH:

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

LIMITATIONS:

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

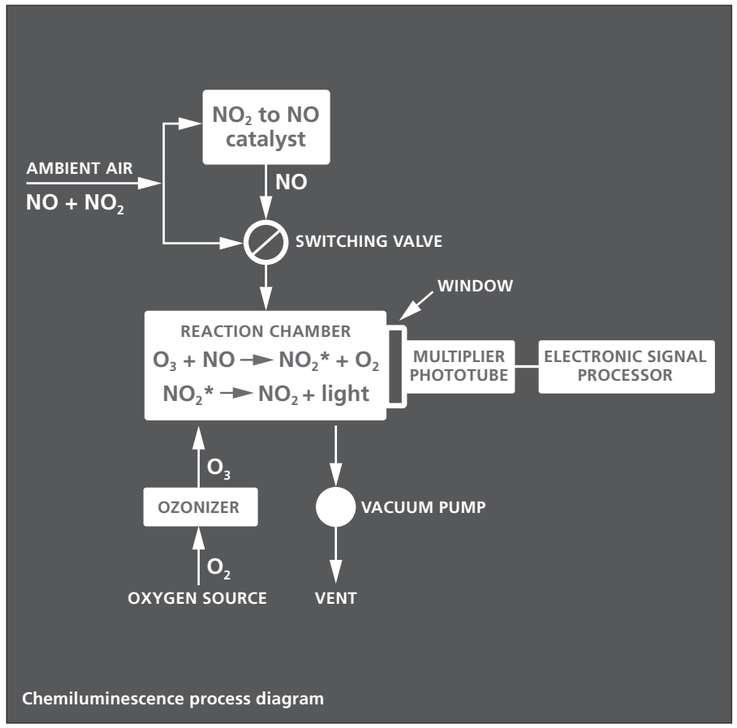
USED IN:

SERVOMEX AquaXact 1688

LIGHT-BASED MEASUREMENTS FOR NOx ANALYSIS

Chemiluminescence detectors take advantage of nitric oxide (NO) and nitrogen dioxide (NO_2) chemical reactions that emit light as part of that process. This is different from fluorescence or phosphorescence, in that the light produced stems from a chemical reaction rather than by the absorption of photons by the molecule. Chemiluminescence analyzers use a thermally stabilized photodiode to measure the intensity of the light produced by the reaction of NO with ozone (O_3). The intensity is directly proportional to the concentration of NO that was converted to NO_2 by the reaction.

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



Chemiluminescence process diagram

KEY APPLICATIONS

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

KEY BENEFITS

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

IDEAL FOR

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

WORKS WITH:

Gfx, Infrared, Paramagnetic and Flame Ionization Detector sensing technologies for a comprehensive CEM solution.

LIMITATIONS:

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

USED IN:

SERVOPRO NOx

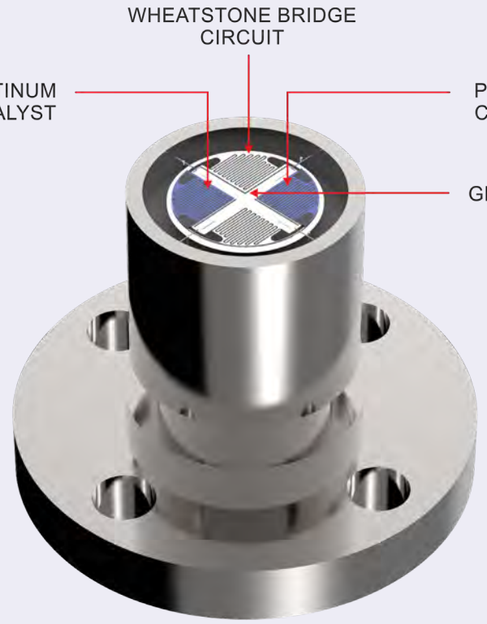
ACCURATE COMBUSTIBLES MEASUREMENTS

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

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

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

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



Wheatstone Bridge

KEY APPLICATIONS

- Process heaters
- Thermal crackers
- Incinerators
- Utility boilers

KEY BENEFITS

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

IDEAL FOR

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

WORKS WITH:

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

LIMITATIONS:

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

USED IN:

SERVOTOUGH FluegasExact 2700

HIGH-SENSITIVITY MEASUREMENTS OF OXYGEN

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

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

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

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

Hummingbird Coulometric sensor

WORKS WITH:

Laser Moisture sensing for a highly sensitive dual measurement of O_2 and moisture at ppm levels.

LIMITATIONS:

Coulometric sensors should avoid sample streams that contain acidic gases. For applications involving these gases, a Paramagnetic or TDL sensor is recommended instead.

USED IN:

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

KEY APPLICATIONS

- Semiconductors
- Solder reflow ovens
- Reactor process control

KEY BENEFITS

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

IDEAL FOR

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

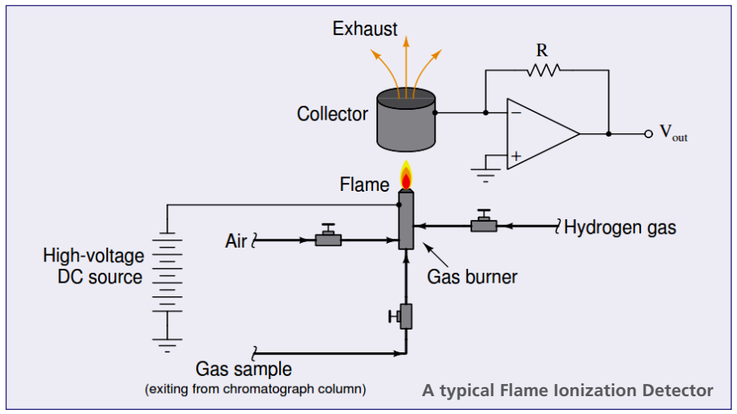
MEASURING HYDROCARBONS DOWN TO ULTRA-TRACE LEVELS

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

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

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

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



A typical Flame Ionization Detector

KEY APPLICATIONS

- Air separation units
- Product pipelines
- Cylinder filling stations

KEY BENEFITS

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

IDEAL FOR

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

WORKS WITH:

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

LIMITATIONS:

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

USED IN:

SERVOPRO FID

SERVOPRO Chroma

SERVOPRO HFID

HIGH-PURITY ANALYSIS FOR A RANGE OF GASES

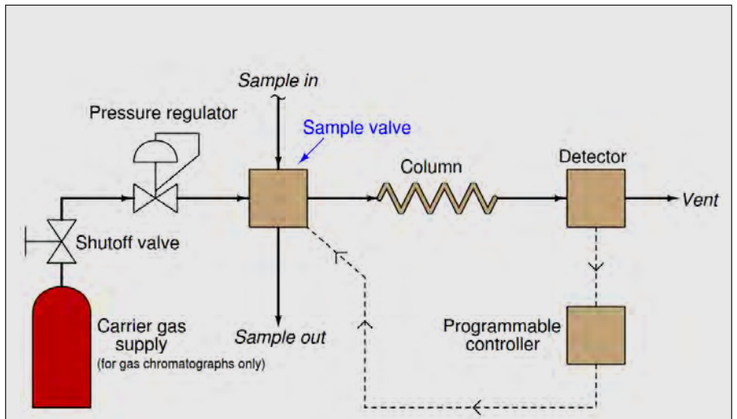
Gas Chromatography (GC) separates out a mixture in the gas phase to determine the presence and concentration of constituent components. Under optimized conditions, it can measure down to parts-per-billion (ppb) levels, making it ideal for high purity control processes.

The components of a mixture in the gas phase are separated by introducing a small portion of the sample into a flowing carrier gas (mobile phase), which percolates through a stationary phase consisting of particulates packed within a column. The different gas constituents are separated due to their own specific, adsorptive interaction between the stationary phase and the mobile phase. This causes the constituents to exit the column (elute) at different times.

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

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

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



The Gas Chromatography technique

KEY APPLICATIONS

- Semiconductors
- Medical gases
- Air separation units

KEY BENEFITS

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

IDEAL FOR

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

WORKS WITH:

Plasma, FID and TCD technologies in the Chroma and NanoChrome

LIMITATIONS:

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

USED IN:

SERVOPRO Chroma

SERVOPRO NanoChrome

SERVOPRO NanoChrome ULTRA

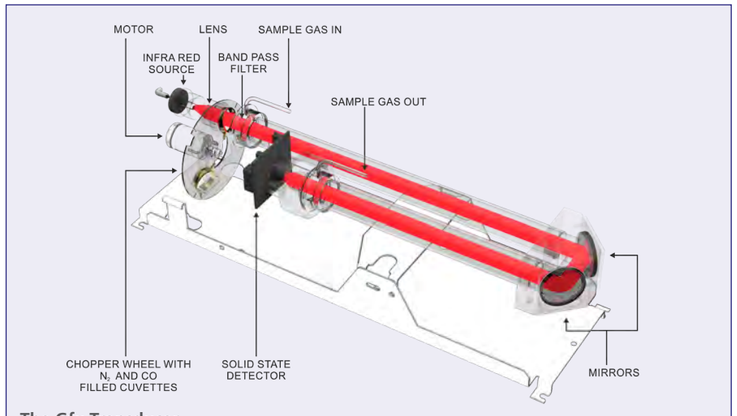
STABLE, ULTRA-ACCURATE PHOTOMETRIC GAS ANALYSIS

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

Gases have the ability to absorb unique light wavelengths – Gfx sensing uses that property to detect the concentration of a selected gas in a mixture. Two gas-filled cuvettes are mounted on a rotating disk, each passing through a beam of light alternately.

One cuvette (the measure cuvette) is typically filled with nitrogen while the other cuvette (the reference cuvette) is filled with a sample of the gas to be measured. Light is passed through the gas to be measured: the difference in absorbance is measured and provides a direct output of the gas concentration.

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



The Gfx Transducer

KEY APPLICATIONS

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

KEY BENEFITS

- ✓ Low cross interference by background gases
- ✓ Immune to obscuration of the optics
- ✓ Low sensor drift, reducing calibration frequency

IDEAL FOR

Providing a lower-cost alternative to more complex technologies when dealing with applications that require the measurement of low-level gases with high levels of interfering background gases.

WORKS WITH:

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

LIMITATIONS:

Only gases with infrared lines can be measured by this technology, so it is not suitable for noble gases, or single element diatomic molecules such as N_2 or O_2.

USED IN:

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

REAL-TIME MEASUREMENTS OF GASES IN A MIXTURE

Our Infrared (IR) sensors focus an IR light source through a sample cell holding a continuously flowing sample of the gas mixture, and onto a detector after wavelength selection. The property of some gases to absorb unique light wavelengths can be used to detect the concentration of a selected gas in a mixture.

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

Single Beam, Single Wavelength (SBSW)

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

Single Beam, Dual Wavelength (SBDW)

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

SERVOTOUGH SpectraExact 2500

WORKS WITH:

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

LIMITATIONS:

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

USED IN:

- SERVOPRO MultiExact 4100
- SERVOPRO 4900 Multigas
- SERVOPRO MultiExact 4200
- SERVOTOUGH SpectraExact 2500
- SERVOFLEX MiniMP 5200
- SERVOFLEX MiniHD 5200
- SERVOFLEX MiniFoodPack 5200

KEY APPLICATIONS

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

KEY BENEFITS

- ✓ Real-time measurement response
- ✓ Low maintenance requirements

IDEAL FOR

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

SERVOMEX – INVESTING IN RESEARCH

Servomex has a rich history of fundamental research into gas measurement principles. We have been awarded many patents in this field, and were awarded the Queen's Award for Enterprise (Innovation) in 2016.

Some of the patents awarded include innovations in Paramagnetic sensing, solid electrolyte (Zirconia), infrared source techniques, thick film sensing technologies, signal processing, and Tunable Diode Laser (TDL) absorption measurements.

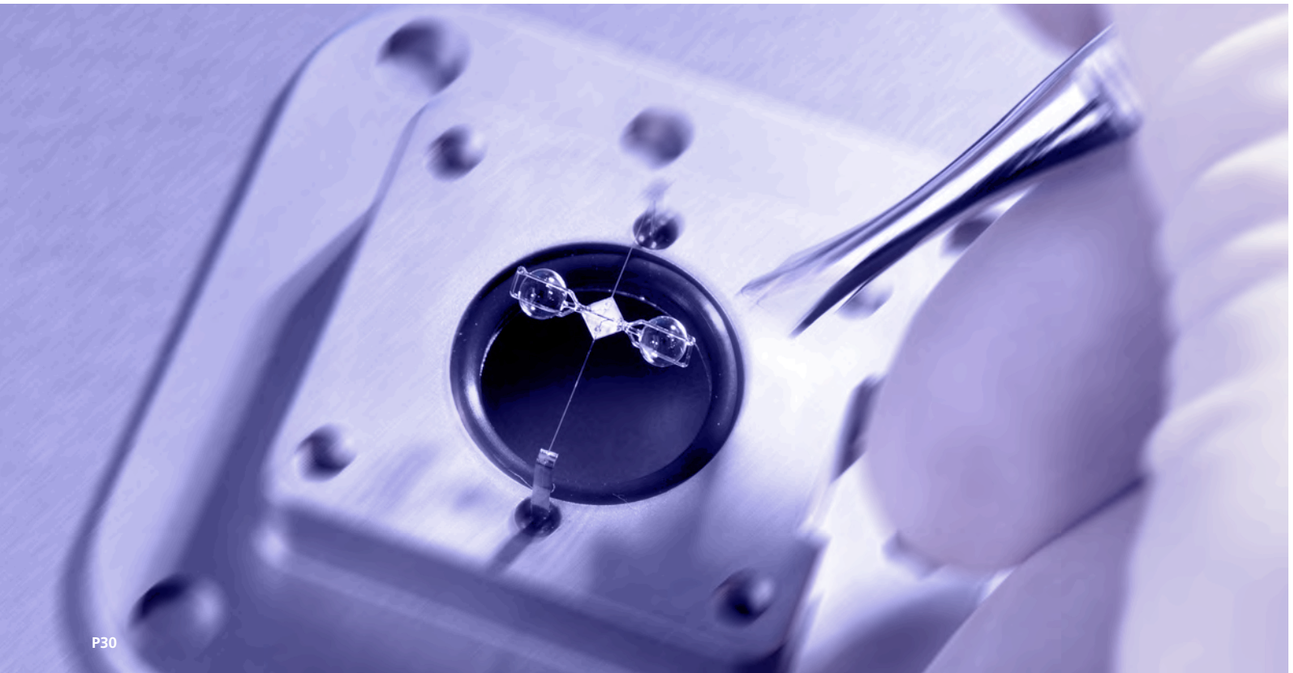
These innovations have had a direct benefit to many customers in a wide variety of applications, including process control and safety improvements in the chemical industry, and patient monitoring and life support in the medical device industry.

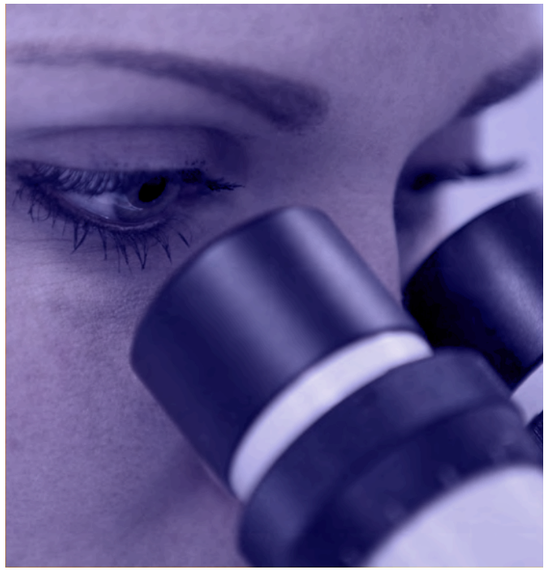
We continue to invest significantly in research, employing a diverse mix of industry-leading scientists and engineers. Our current patent portfolio covers filings across 19 innovations, seven technology types and seven countries.

We also have two patents pending across two different technology types, with more filings scheduled across the next 24 months.

The research function also forms a key part of our Hummingbird business unit, bringing research much closer to the end users and markets. This improves the flow of "voice of the customer" data into our research schedule.

Hummingbird
SENSING TECHNOLOGY





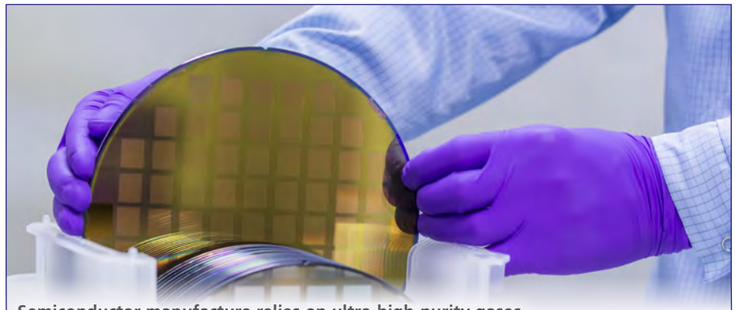
SIMPLE, SENSITIVE MOISTURE ANALYSIS

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

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

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

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



Semiconductor manufacture relies on ultra-high-purity gases

KEY APPLICATIONS

- Semiconductors
- Ultra-high purity gases
- Specialty gases

KEY BENEFITS

✓ Exceptional performance down to industry-leading sub-ppb levels

✓ Reading is stable over time – never requires calibration

✓ Laser line lock removes possibility of significant drift

IDEAL FOR

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

WORKS WITH:

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

LIMITATIONS:

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

USED IN:

SERVOPRO DF-700 Range

SERVOPRO DF-750 ULTRA

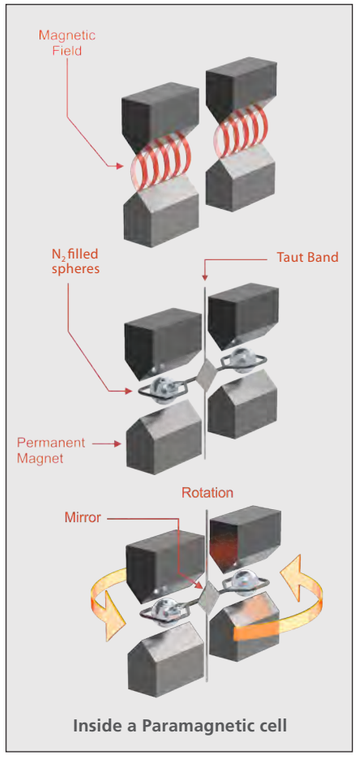
SERVOPRO DF-760E ULTRA

AN INNOVATIVE SOLUTION FOR PERCENTAGE OXYGEN

Our groundbreaking magnetodynamic Paramagnetic technology provides fast, accurate and sensitive measurements of percentage levels of oxygen (O_2). The Paramagnetic cell consists of two nitrogen-filled glass spheres, mounted within a magnetic field, on a rotating suspension, with a centrally-placed mirror. Light shines on the mirror and is reflected onto a pair of photocells.

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

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



Inside a Paramagnetic cell

WORKS WITH:

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

LIMITATIONS:

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

USED IN:

- SERVOTOUGH Oxy 1800
- SERVOTOUGH Oxy 1900
- SERVOTOUGH OxyExact 2200
- SERVOPRO MultiExact 4100
- SERVOPRO 4900 Multigas
- SERVOPRO MonoExact DF310E
- SERVOPRO MultiExact 4200
- SERVOFLEX Micro i.s 5100
- SERVOFLEX MiniMP 5200
- SERVOFLEX MiniHD 5200
- SERVOFLEX MiniFoodPack 5200
- GAS DETECTION OxyDetect

KEY APPLICATIONS

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

KEY BENEFITS

✓ Fast, accurate measurements specific to O_2

✓ Non-depleting, with a long operational life

IDEAL FOR

O_2 measurement in flammable or corrosive gas mixtures.

A HIGHLY SPECIFIC AND STABLE GAS MEASUREMENT

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

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

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

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

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

Each gas produces unique gas spectra

KEY APPLICATIONS

- Semiconductors
- Medical gases
- Air separation units

KEY BENEFITS

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

IDEAL FOR

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

WORKS WITH:

Gas Chromatography technology to deliver measurements down to ppb levels.

LIMITATIONS:

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

USED IN:

SERVOPRO Chroma

SERVOPRO NanoChrome

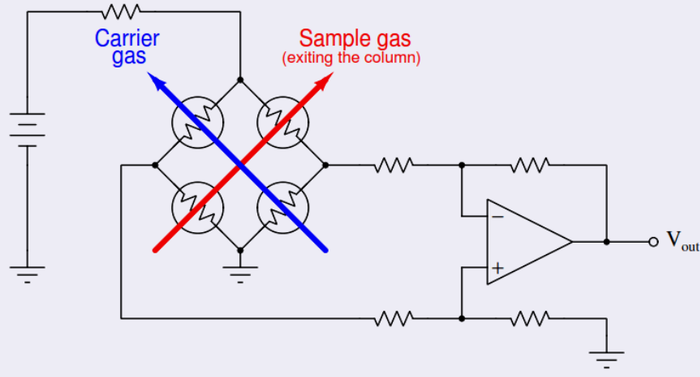
SERVOPRO Plasma

MEASURING INERT GASES IN A BINARY MIXTURE

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

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

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



The Thermal Conductivity sensor

KEY APPLICATIONS

- Medical gases
- Air separation units
- Specialty gases

KEY BENEFITS

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

IDEAL FOR

Binary gas mixture measurements, for medical and industrial gases.

WORKS WITH:

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

LIMITATIONS:

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

USED IN:

SERVOPRO Chroma

FAST IN-SITU CROSS-STACK MEASUREMENTS

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

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

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

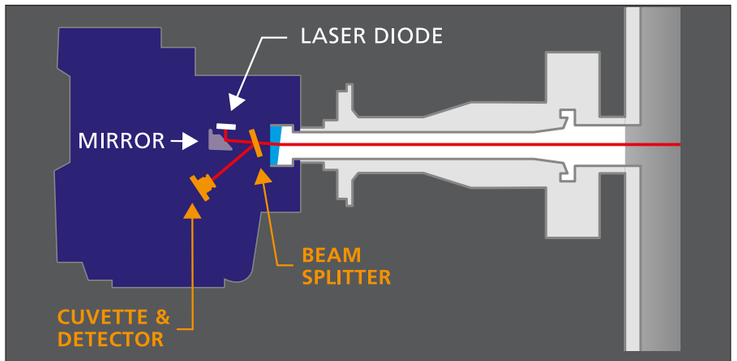


Fig. 1: Close-up of the line lock system showing the cuvette and beam splitter

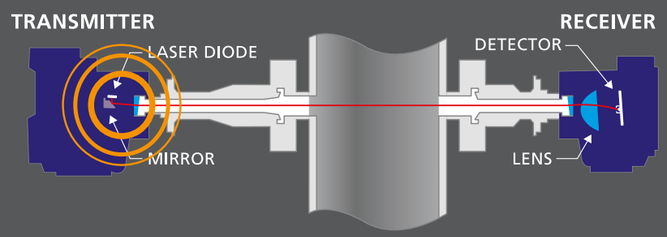


Fig. 2: The Laser 3 Plus installed across a stack, with line lock system (circled)

KEY APPLICATIONS

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

KEY BENEFITS

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

IDEAL FOR

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

WORKS WITH:

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

LIMITATIONS:

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

USED IN:

SERVOTOUGH Laser 3 Plus range

A TRUSTED AND ACCURATE OXYGEN MEASUREMENT

Our Zirconia sensor consists of a cell made of ceramic zirconium oxide, stabilized with an oxide of yttrium to form a lattice structure. The measure and reference sections of the cell are covered with catalytic, porous, electrically conductive coatings that serve as electrodes on both sides of the lattice barrier between sample and reference gas volumes.

At elevated temperatures, the lattice permits the passage of negatively charged oxygen ions, formed at the catalytic electrodes at a rate determined by temperature and the difference in the O_2 partial pressures of the sample gas and the reference gas.

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

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

There are two variants of our sensor: a higher-temperature variant for percentage O_2 in flue gas, and a lower-temperature variant with modified catalytic electrode properties for parts-per-million (ppm) O_2 measurements in purity applications.

Hummingbird Zr700 sensor

KEY APPLICATIONS

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

KEY BENEFITS

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

IDEAL FOR

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

WORKS WITH:

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

LIMITATIONS:

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

USED IN:

SERVOTOUGH FluegasExact 2700

SERVOPRO MultiExact 4100

ULTRA
SERIES

PURITY MADE SIMPLE

THE NEW ULTRA SERIES FOR YOUR ULTRA-HIGH-PURITY GAS ANALYSIS

NanoChrome
ULTRA

DF-560E NanoTrace
ULTRA

DF-750 NanoTrace
ULTRA

DF-760E NanoTrace
ULTRA

GO ULTRA NOW: **servomex.com**

CLEAN AIR
SOLUTIONS

CHANGE IS IN THE AIR

Change the way you operate with effective Servomex gas analyzers.
Built to minimize emissions today and for the future.
World-beating gas analyzers lead to a world-beating process.

CHANGE WITH SERVOMEX **TODAY**

A GUIDE TO GAS ANALYSIS APPLICATIONS

We provide scalable gas analysis solutions for hundreds of industrial applications in many different sectors, ranging from single analyzers to turnkey application systems in off-the-shelf and customized designs.

For this section, we've selected just a few of the key processes that illustrate how our gas analysis products overcome the challenges of many of the core applications encountered in industry.

To make it easier for you to find the expertise you need, we've divided these applications into Industrial Process and Emissions – covering power generation, hydrocarbon processing, and emissions monitoring – and Purity and Specialty – covering industrial, medical, and ultra-high-purity gases, including semiconductor processes.

We've also highlighted a recent turnkey application solution delivered to the natural gas industry, as an example of how our products can be adapted to meet application needs.

With an extensive array of sensing technologies, we are able to find best-fit solutions for your process, supported by our deep applications knowledge and global service network.

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

OUR SOLUTIONS FOR GAS ANALYSIS APPLICATIONS

GAS ANALYSIS APPLICATION	KEY SERVOMEX SOLUTIONS
Air separation unit	SERVOPRO MultiExact 4100 AquaXact 1688 SERVOPRO Chroma
Medical gases	SERVOPRO MultiExact 4100
Ultra-high purity gases and Semiconductors	SERVOPRO DF-560E NanoTrace ULTRA SERVOPRO DF-750 NanoTrace ULTRA SERVOPRO NanoChrome ULTRA
Direct reduction iron	SERVOTOUGH Oxy 1900 SERVOPRO 4900 Multigas SERVOTOUGH SpectraExact 2500 SERVOPRO NOx
Ethylene production	SERVOTOUGH SpectraExact 2500
Ethylene dichloride production	SERVOTOUGH SpectraExact 2500
Ethylene oxide production	SERVOTOUGH OxyExact 2200
Marine vapor control	SERVOTOUGH Oxy 1900 SERVOTOUGH OxyExact 2200
Process heaters and furnaces	SERVOTOUGH FluegasExact 2700 SERVOTOUGH Laser 3 Plus Combustion
Propylene oxide production	SERVOTOUGH Oxy 1900
Purified terephthalic acid production	SERVOTOUGH OxyExact 2200
Thermal power – coal	SERVOTOUGH FluegasExact 2700
Vinyl chloride monomer production	SERVOTOUGH SpectraExact 2500

PURITY AND SPECIALTY

Servomex's Purity & Specialty (P&S) division delivers gas analysis products, knowledge and service support to market sectors including industrial and medical gases, UHP gases, and semiconductor manufacture.

These are just three of the many applications for which we supply accurate, reliable and stable gas analysis solutions:

COMPLETE GAS ANALYSIS FOR INDUSTRIAL GASES

We set the standard for accurate, reliable gas analysis in the industrial gas (IG) market, delivering ground-breaking technologies and solutions for unparalleled performance and reduced cost of ownership.

HIGH-PURITY TRACE ANALYSIS FOR MEDICAL GASES

Our high-performance analyzer solutions and sensing technologies meet pharmacopeia standards for measuring medical gases. Versatile, industry-leading analysis delivers the purity monitoring you need.

ULTRA-TRACE SOLUTIONS FOR SEMICONDUCTOR GAS APPLICATIONS

Accurate, stable gas analysis that reaches the lowest detection limits is key to producing ultra-high-purity gases for semiconductor manufacturing. We have a unique, single-supplier solution that covers every essential UHP measurement in the sector.

MEET THE TEAM

MIKE PROCTOR
P&S BUSINESS UNIT DIRECTOR

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

DAN JOHNSON
HEAD OF PRODUCT MANAGEMENT, P&S

Responsible for ensuring Servomex is a leading supplier of gas analyzers to the industrial gas and semiconductor markets, Dan has an excellent understanding of our customers' strategic objectives.

CHEE WEE YAP
ASIA SALES DIRECTOR, ASIA SITE LEADER

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

Get in touch to learn more: **servomex.com/purity-and-specialty**

AIR SEPARATION UNIT APPLICATIONS

Accurate gas analysis is essential for air separation unit (ASU) applications, improving process control, safety, and product quality.

The ASU separates atmospheric air into three pure gaseous elements – nitrogen, oxygen and argon. Further separation is required for quantities of noble gases such as neon, krypton and argon. Accurate gas compositional analysis is essential to ensure purity across the air separation process.

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

KEY SOLUTIONS

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

SERVOPRO MultiExact 4100

AquaXact 1688

SERVOPRO Chroma

Find out more online at: **servomex.com/asu**

MEDICAL GASES

Gases used for medical treatment are regulated under the same rules as medicinal drugs. These regulations – typically covered in a publication called a Pharmacopeia – specify how each gas should be produced and validated, the acceptable purity level, and official measurement records.

For example, under European Pharmacopeia (EP) rules, medical oxygen (O_2) requires an assay measurement to ensure O_2 purity is better than 99.5%, and impurity measurements of carbon monoxide (CO) and carbon dioxide (CO_2). The impurities must be less than 5 parts per million (ppm) of CO and less than 300ppm of CO_2.

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

KEY SOLUTIONS

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

SERVOPRO MultiExact 4100

Find out more online at: **servomex.com/medical-gases**

ULTRA-HIGH PURITY GASES AND SEMICONDUCTORS

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

Manufacturing the silicon wafers needed for semiconductor applications requires the use of ultra-pure gases. Even the smallest impurities can cause major defects in a wafer, leading to costly scrap and waste. Multiple gas purification techniques and other strict procedures are used to ensure that UHP gases are delivered to the manufacturing process. This requires accurate gas monitoring at very low levels of concentration.

Quality control gas measurements must cover all the impurities present – adequate trace oxygen analysis will prevent oxidation and other reactions from affecting the process, but if trace-level moisture is missed, contamination will still occur.

A comprehensive solution for all impurities is required, but this can lead to integration issues between hardware and software from different sources.

KEY SOLUTIONS

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

SERVOPRO DF-560E NanoTrace ULTRA

SERVOPRO DF-750 NanoTrace ULTRA

SERVOPRO NanoChrome ULTRA

Find out more online at: **servomex.com/uhp**

A TURNKEY SOLUTION FOR NATURAL GAS TREATMENT

Servomex has supplied Netherlands energy network operator Gasunie with a gas analysis solution for its new nitrogen facility, which will be used to treat high-calorific natural gas imported from abroad.

Much of the Netherlands' natural gas supply comes from the Groningen Gas Field, and important steps have been taken in recent years to accelerate the reduction of gas extraction from this field.

Gasunie's new installation takes nitrogen from the air and blends it with imported high-calorific gas, replacing the need to extract gas from the Groningen field.

Gasunie and Servomex have worked in partnership for more than 15 years, and the energy network operator has been particularly satisfied with the product quality and service support provided by Servomex.

The nitrogen factory is scheduled to begin operation in April 2022, and will use 23 of Servomex's SERVOPRO MultiExact 4100 analyzers to deliver accurate, multi-component gas analysis at 37 required measuring points throughout the process.

The MultiExact 4100 measures up to four gas streams simultaneously, ensuring a much more cost-effective solution than using individual analyzers for each point.

The analyzers are configured to measure a combination of low oxygen, high oxygen, and carbon dioxide, using Paramagnetic and Infrared sensing technologies. For the most critical measurement points, analyzers with a single sensor were installed.

Servomex's turnkey gas analysis system includes 19-inch rack cabinets with pressure reduction and valves. Everything is operated through the Profibus protocol, using a one-line digital signal, simplifying the system and ensuring greater accuracy.

Servomex will also provide on-site commissioning for the entire system, and a service support plan.

32 ALARMS AND **32 RELAYS**

DIGITAL AND ANALOG COMMUNICATIONS FOR REMOTE ACCESS

SERVOPRO MultiExact 4100

INTELLIGENT FUNCTIONALITY AUTOCALIBRATION FOR REDUCED MAINTENANCE

EASY-TO-USE ICON-DRIVEN **TOUCHSCREEN INTERFACE**

Find out how Servomex supports your process: **servomex.com/contact**

INDUSTRIAL PROCESS & EMISSIONS

Servomex's Industrial Process and Emissions (IP&E) division handles gas analysis solutions for applications in the power generation, hydrocarbon processing and emissions monitoring markets.

COMPLETE GAS ANALYSIS FOR POWER PROCESSES

Our expert solutions help optimize and control your combustion applications, and increase safety and efficiency in power generation operations, while lowering harmful emissions.

RELIABLE HP APPLICATION MEASUREMENTS

We provide effective solutions for accurate, reliable gas analysis, process control, safety and quality for a range of midstream and downstream hydrocarbon processing applications.

EFFECTIVE EMISSIONS MONITORING SOLUTIONS

Ensure you operate efficiently and within legislative limits. Our accurate monitoring solutions and process controls help you achieve regulatory compliance and meet increasingly strict standards.

MEET THE TEAM

SANGWON PARK
IP&E BUSINESS UNIT DIRECTOR

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

MATT HALSEY
APPLICATION DEVELOPMENT MANAGER

Matt leads our application development team, enhancing our regional presence and ensuring strong customer relationships.

HUIYU GUAN
IP&E BUSINESS DEVELOPMENT MANAGER, CHINA

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

Get in touch to learn more: **servomex.com/ip-and-e**

DIRECT REDUCTION IRON

Accurate gas measurements ensure direct reduction iron (DRI) plants can operate at the highest levels of efficiency, while achieving low emissions targets.

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

Emissions monitoring is also important in the DRI process. The reaction between the counterflow gases and iron oxide in the ore produces metallic iron, water vapor, and carbon dioxide (CO_2). The process may generate oxides of nitrogen (NOx) which must be continuously monitored to ensure environmental compliance.

KEY SOLUTIONS

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

SERVOTOUGH Oxy 1900

SERVOPRO 4900 Multigas

SERVOTOUGH SpectraExact 2500

SERVOPRO NOx

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

ETHYLENE PRODUCTION

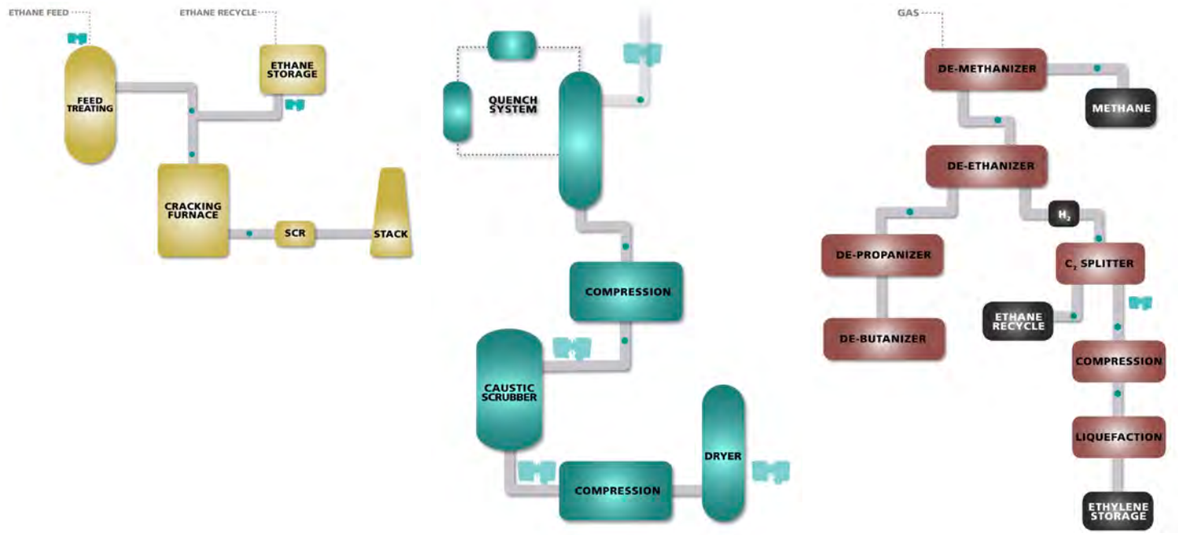
Rapid, accurate gas analysis supports the safe, efficient operation of ethylene plants, bringing control and confidence to every process point.

In ethylene production plants, it is essential to reliably monitor process gases, while feed gas quality is also critical to the overall process. Additionally, it is vital to monitor gas quality throughout the process in order to ensure a high product yield.

Failure to monitor the gas feed throughout the process can significantly reduce the efficiency of the process. A less pure gas results in a lower ethylene yield once the cracked gas is quenched and cleaned.

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

CRACKING FURNACE | AFTER QUENCH | FRACTIONATION



KEY SOLUTIONS

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

SERVOTOUGH SpectraExact 2500

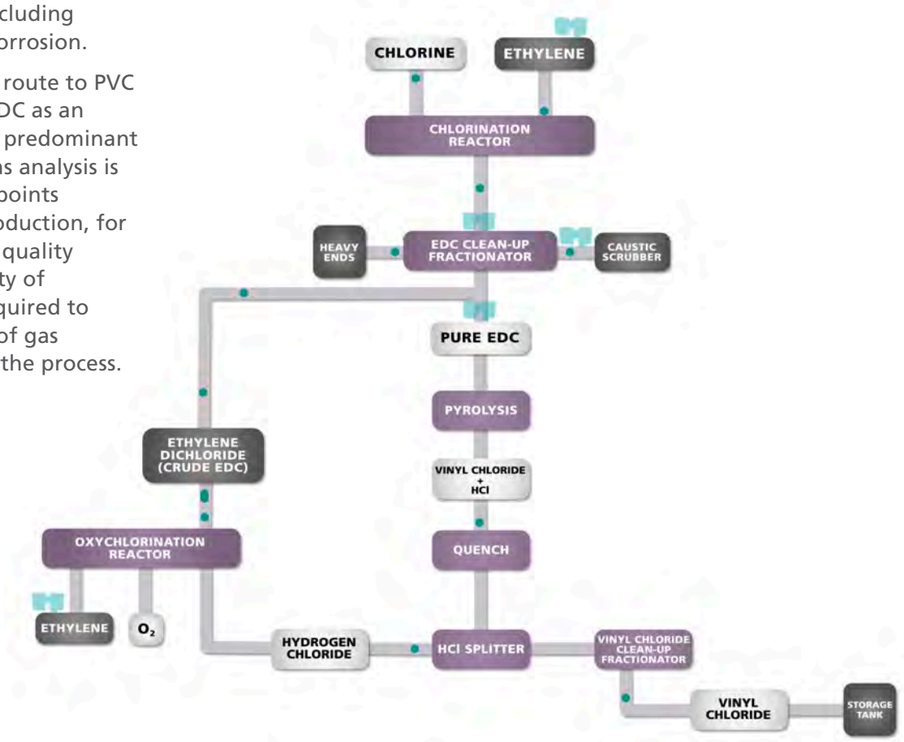
Find out more online at: **servomex.com/ep**

ETHYLENE DICHLORIDE PRODUCTION

Ethylene dichloride (EDC) is a key intermediate for the production of polyvinyl chloride (PVC). We deliver the industry-leading gas analysis solutions that overcome process problems including condensation and corrosion.

The ethylene-based route to PVC production, using EDC as an intermediate, is the predominant method globally. Gas analysis is required at several points throughout EDC production, for process control and quality monitoring. A variety of technologies are required to measure the range of gas components within the process.

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



KEY SOLUTIONS

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

SERVOTOUGH SpectraExact 2500

Find out more online at: **servomex.com/edc**

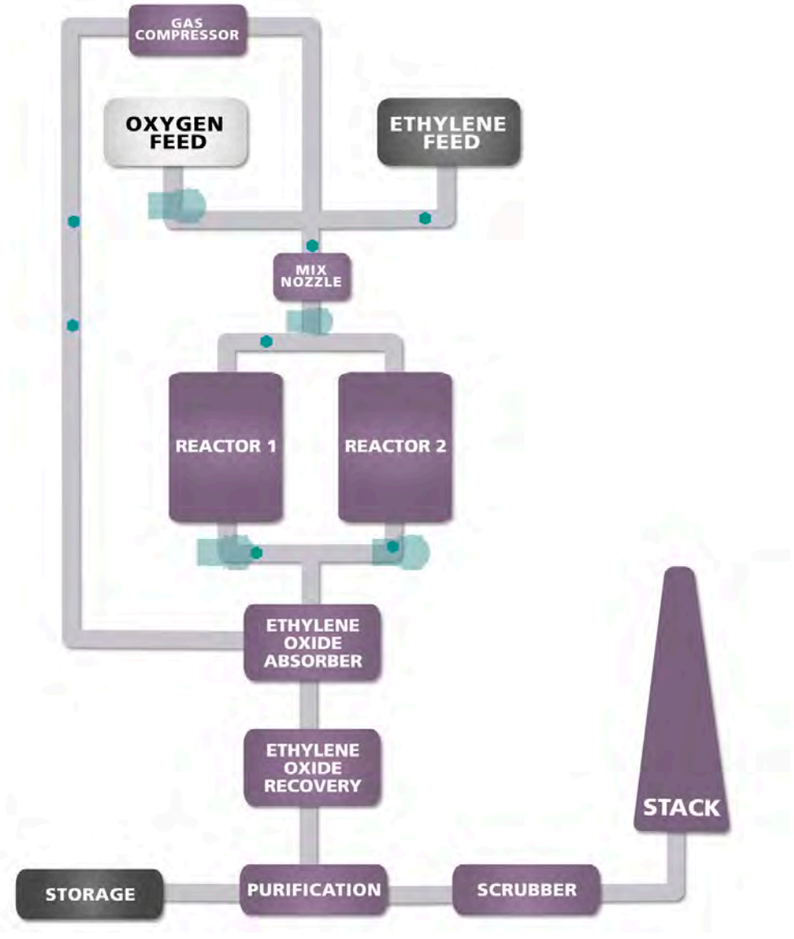
ETHYLENE OXIDE PRODUCTION

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

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

The exothermic nature of the EO process means safety is an essential concern, especially around the process reactors where hazardous flammable samples containing ethylene, oxygen, ethylene oxide and methane may be present. Failure to control oxygen levels at this point can create highly hazardous conditions.

Servomex has extensive experience in supplying solutions to the ethylene oxide process, with our safety integrated system (SIS) installations operating in more than 40 plants worldwide, and solutions across the process.



KEY SOLUTIONS

To provide safety-critical oxygen analysis, Servomex supplies a dual or triple-redundancy gas analysis system using SERVOTOUGH OxyExact 2200 analyzers.

Specifically designed for hazardous area operation, these Paramagnetic analyzers deliver the accurate, reliable measurements needed as part of a SIS.

SERVOTOUGH OxyExact 2200

Find out more online at: **servomex.com/eo**

MARINE VAPOR CONTROL

Servomex has more than 30 years of experience in this sector, providing fixed and portable gas analysis products to marine terminals and tanker vessels involved in the transfer and transportation of crude oil and refined products.

Strict regulations are in place to control the systems used to monitor marine vapors. These govern the performance levels of the analyzer and its suitability to the hazardous environment. Analyzers used in these systems must be approved by the relevant regulatory body.

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

KEY SOLUTIONS

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

SERVOTOUGH Oxy 1900

SERVOTOUGH OxyExact 2200

Find out more online at: **servomex.com/mvc**

PROCESS HEATERS AND FURNACES

Process heaters and furnaces are integral to many hydrocarbon processing and power generation applications. They allow fuel and air to react together and produce extremely high gas temperatures. In doing so, they use large quantities of fuel, generate emissions and can create a safety hazard for plant and personnel alike.

Our accurate, responsive gas analysis technologies and extensive applications knowledge can help make process heaters and furnaces safer and more efficient.

Optimization of the air-to-fuel ratio is key to controlling combustion in process heaters and furnaces. Post combustion excess oxygen (O_2) in the flue gas reduces process temperatures leading to reduced efficiency and increased emissions. Low O_2, fuel rich conditions are dangerous and pose an explosion risk.

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

KEY SOLUTIONS

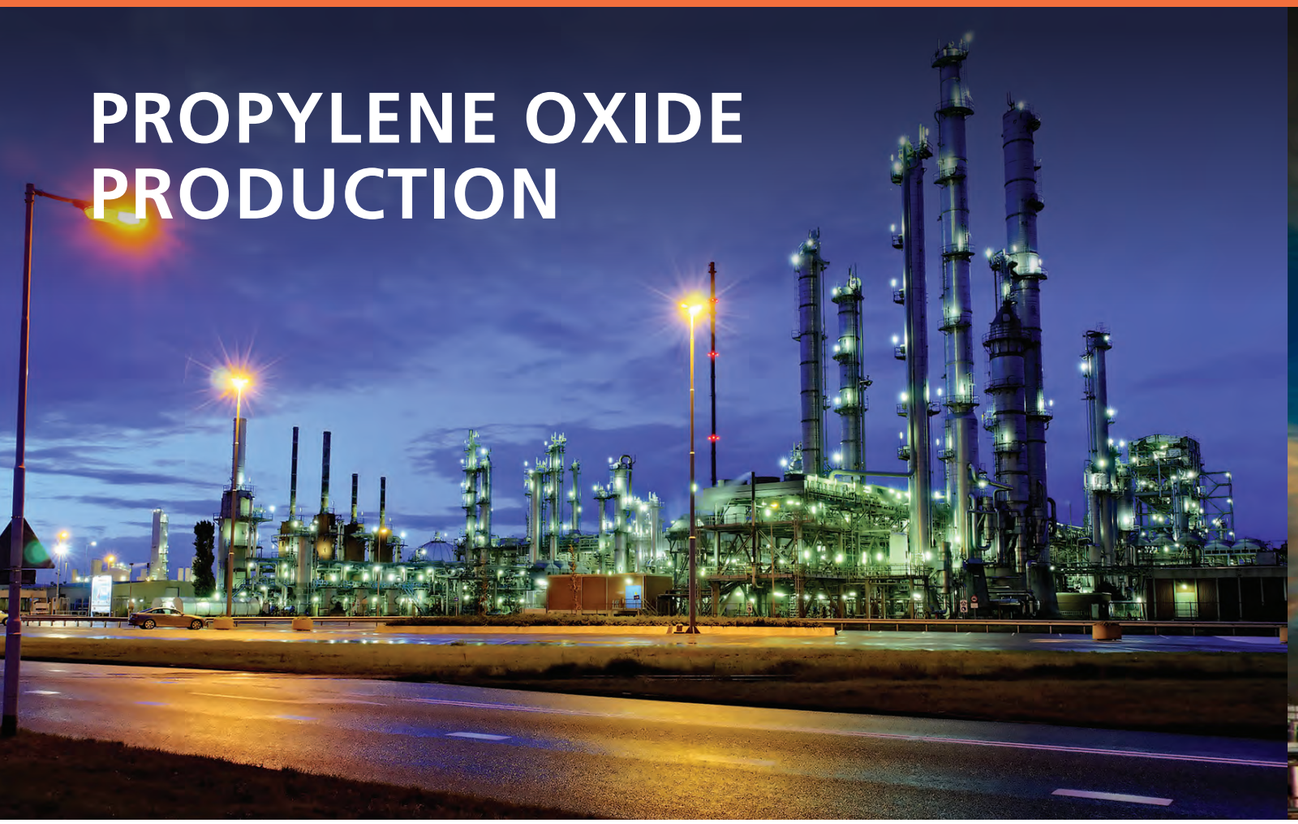
Using close-coupled extractive sampling, the SERVOTOUGH FluegasExact 2700 combines proven Zirconia sensing for oxygen and Thick Film Catalytic sensing for combustibles, delivering an effective solution in a single analyzer. The SERVOTOUGH Laser 3 Plus Combustion uses Tunable Diode Laser (TDL) technology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

SERVOTOUGH FluegasExact 2700

SERVOTOUGH Laser 3 Plus Combustion

Find out more online at: **servomex.com/process-heaters**

PROPYLENE OXIDE PRODUCTION



Propylene oxide (PO) is an important intermediate for the manufacture of propylene glycol, which can be used as an antifreeze agent or to create polyurethane plastics.

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

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

Servomex's solutions deliver key measurements across all processes used for PO production.

KEY SOLUTIONS

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

SERVOTOUGH Oxy 1900

Find out more online at: **servomex.com/po**

PURIFIED TEREPHTHALIC ACID PRODUCTION

The production of purified terephthalic acid (PTA) requires expert gas analysis for process control, efficiency and safety, as well as quality monitoring and environmental compliance. Servomex provides accurate, reliable solutions to these challenges.

Oxygen (O_2) analysis is critical to maintaining safety in the PTA process, and to supporting productivity. In addition, some operators use an oxygen enrichment process on their PTA plants – this requires a specialist O_2 monitoring solution for both safety and efficiency.

The enriched oxygen process involves adding O_2 to the air being fed to the reactors, bringing the O_2 level up to 25%. This ensures a more efficient reaction, reducing catalyst consumption, and improving reactor performance. A reliable and accurate monitoring solution is required to maintain the O_2 concentration at the most efficient level while ensuring it does not exceed safe levels.

KEY SOLUTIONS

Servomex's SERVOTOUGH OxyExact 2200 high-specification Paramagnetic oxygen analyzer delivers effective, reliable measurements of enriched O_2 samples in hazardous environments, with a resilient enclosure for the transmitter unit, providing an effective solution for this application.

SERVOTOUGH OxyExact 2200

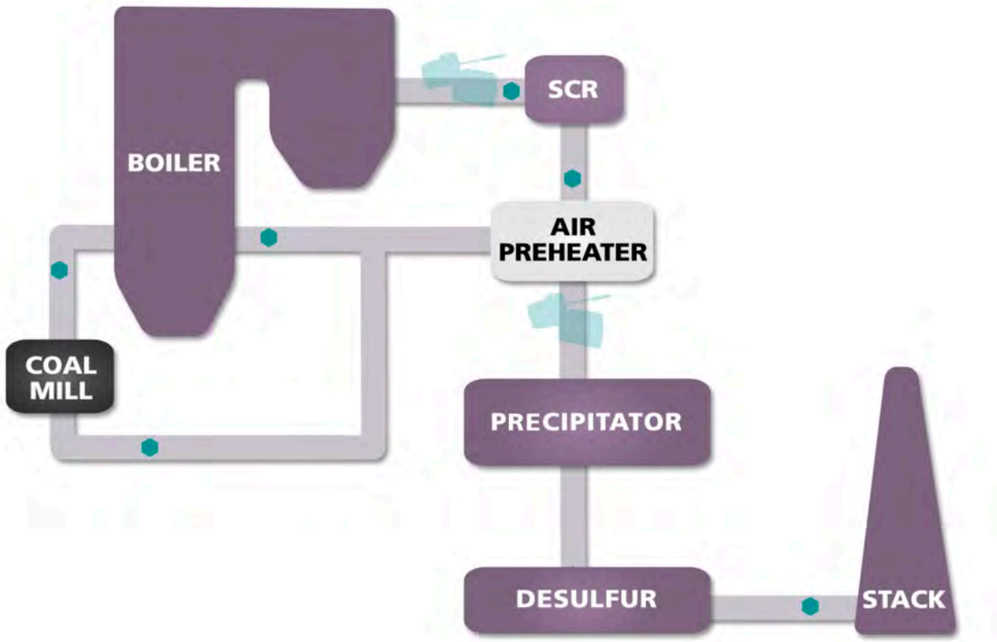
Find out more online at: **servomex.com/pta**

THERMAL POWER – COAL

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

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

Servomex is your expert gas analysis partner for this application. Supported by our expertise and experience, our total analytical solution delivers benefits for costs, process efficiency, safety and emissions across the process.



KEY SOLUTIONS

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

SERVOTOUGH FluegasExact 2700

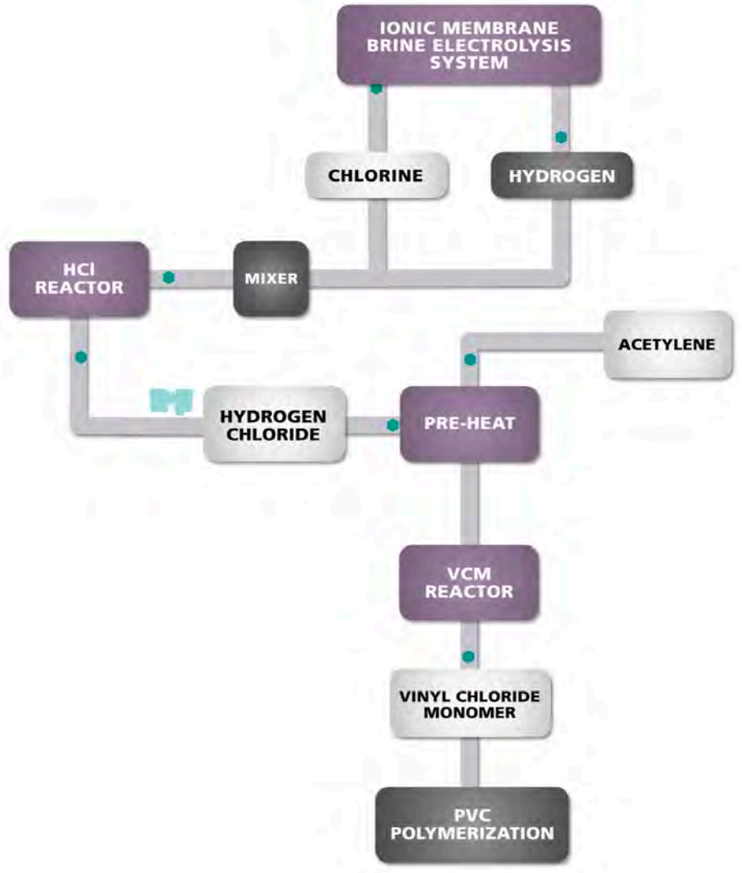
Find out more online at: **servomex.com/thermal-power**

VINYL CHLORIDE MONOMER PRODUCTION

Vinyl chloride monomer (VCM) is an important intermediate product for the production of polyvinyl chloride (PVC). It is created by reacting hydrogen (H_2) and chlorine (Cl_2) together to form hydrogen chloride (HCl), which in turn is combined with acetylene to produce VCM.

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

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



KEY SOLUTIONS

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

SERVOTOUGH SpectraExact 2500

Find out more online at: **servomex.com/vcm**

GAS MEASUREMENT GUIDE

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

SERVOTOUGH	NH_3	Ar	CO	CO_2	He	C1-C6	NMHC	H_2	HCl	H_2S	CH_4	NO	NOx	NO_2	N_2	N_2O	O_2	C_3H_6	THC	H_2O	SO_2	KEY APPLICATIONS | HAZARDOUS AREA	PAGE
H2scan								%														■ Refinery ■ Petrochemical ■ Manufacturing ■ Industrial gas supply	61
Oxy 1800																	%					■ Waste water treatment ■ Food storage ■ Marine inerting applications ■ Inert blanketing	61
Oxy 1900																	%					■ Process control ■ Flare stack analysis ■ Vapor recovery ■ Safety-critical oxidation	61
OxyExact 2200																	%					■ Oxidation control reactions ■ EO, PTA and EDC manufacturing ■ Catalyst regeneration ■ Solvent recovery	62
SpectraExact 2500	%		%ppm	%ppm		%			%ppm		%	%ppm				%ppm		%	%	%		■ Water in EDC/solvents ■ Ethylene production ■ TDI production ■ Chlorine production	62
FluegasExact 2700			ppm														%					■ Process heaters ■ Utility boilers ■ Thermal crackers ■ Crematoria and incinerators	62
Laser 3 Plus Environmental	ppm																					■ Process heaters ■ Incinerators ■ Power stations ■ Furnaces	64
Laser 3 Plus Combustion			ppm								%						%					■ Process heaters ■ Incinerators ■ Power stations ■ Furnaces	64
Laser 3 Plus Process																	%					■ Oxidation control ■ Inerting ■ Safety monitoring ■ Flare gas monitoring ■ Combustion control (<500°C) ■ Coal to chemical	64

SERVOPRO	NH_3	Ar	CO	CO_2	He	C1-C6	NMHC	H_2	HCl	H_2S	CH_4	NO	NOx	NO_2	N_2	N_2O	O_2	C_3H_6	THC	H_2O	SO_2	KEY APPLICATIONS | SAFE AREA	PAGE
AquaXact 1688																				ppmvdp		■ Glove boxes ■ Solder reflow ovens ■ Compressed air generation ■ Ethylene production	65
AquaXact 1688 Controller																				ppmvdp		■ Glove boxes ■ Air separation units ■ Instrument air units ■ Refining gases	65
MonoExact DF150E																	ppm/b					■ Glove boxes ■ Heat treating ■ Solder reflow ovens ■ Industrial gas production	65
MonoExact DF310E																	%ppm			ppm		■ Air separation units ■ Medical/industrial gases ■ Specialty gas blending	66
4900 Multigas			%ppm	%							ppm	ppm				ppm	%				ppm	■ Utility boilers ■ Clinical waste incinerators ■ Chemical incinerators ■ Mobile labs	66
NanoChrome		ppb/t	ppb/t	ppb/t			ppb/t	ppb/t			ppb/t				ppb/t		ppb/t					■ Semiconductor production – stationary analytical systems ■ UHP gas production – quality control measurements	66
DF-500 Range																	ppm/b/t					■ Continuous quality control monitoring ■ Post purifier quality certification ■ Leak detection for electronics grade gases	67
DF-700 Range																	ppm/b/t			ppm/b/t		■ Continuous quality control monitoring ■ Bulk gas cylinder quality control ■ Trace moisture analysis	67
NanoChrome ULTRA		ppb/t	ppb/t	ppb/t			ppb/t	ppb/t			ppb/t				ppb/t		ppb/t					■ Semiconductor production – quality control measurements – stationary analytical systems ■ UHP gas production	67
DF-560E NanoTrace ULTRA																	ppm/b/t					■ Continuous quality control monitoring ■ Inert gases control checks ■ Post-purifier quality certification ■ Leak detection	68
DF-750 NanoTrace ULTRA																				ppm/b/t		■ Continuous quality control of bulk UHP gases for semiconductor fabs	68
DF-760E NanoTrace ULTRA																	ppm/b/t			ppm/b/t		■ Monitoring O_2 and H_2O as contaminants in UHP bulk gases used in semiconductor applications	68
FID																			ppm			■ Cryogenic air separation ■ Process control ■ Food gas manufacture ■ Product validation	69
Chroma		ppm/b	ppm/b	ppm/b	ppm/b		ppm	ppm/b			ppm/b				%ppm/b		ppm/b					■ Medical gas production ■ Air separation unit ■ Cryogenic truck loading station ■ High purity gas production	69
Plasma															ppm							■ Argon production ■ Truck loading ■ Pure gas bottling ■ Specialty gas laboratories	69
NOx												ppm	ppm	ppm								■ Scrubber efficiency ■ Turbine/generator feedback control ■ SCR/SNCR feedback control	70
HFID							ppm				ppm								ppm			■ Compliance monitoring and testing ■ VOC abatement ■ Scrubber efficiency	70
MultiExact 4100			%ppm	%ppm							ppm					ppm	%ppm			ppm		■ Product purity on air separation unit ■ Validation of medical O_2, N_2 and air ■ Process control on air separation unit	70
MultiExact 4200			%ppm	%ppm							ppm					ppm	%ppm			ppm		■ Hydrogen production ■ HyCO plants ■ Syngas production	71

GAS DETECTION	NH_3	Ar	CO	CO_2	He	C1-C6	NMHC	H_2	HCl	H_2S	CH_4	NO	NOx	NO_2	N_2	N_2O	O_2	C_3H_6	THC	H_2O	SO_2	KEY APPLICATIONS | GAS DETECTION	PAGE
OxyDetect																	%					■ Pharmaceutical plants ■ Helium production and storage ■ Semiconductor facilities ■ Laboratories and universities	71

SERVOFLEX	NH_3	Ar	CO	CO_2	He	C1-C6	NMHC	H_2	HCl	H_2S	CH_4	NO	NOx	NO_2	N_2	N_2O	O_2	C_3H_6	THC	H_2O	SO_2	KEY APPLICATIONS | PORTABLES	PAGE
Micro i.s. 5100																	%					■ Process monitoring ■ Inerting applications ■ Controlled atmosphere ■ Hazardous area combustion optimization	72
MiniMP 5200				%													%					■ Laboratories and research ■ Air separation and gas bottling plants ■ Transfilling ■ Combustion analysis	72
MiniHD 5200			%	%													%					■ Physiology studies ■ Universities ■ Combustion optimization ■ Medical gas verification	73
MiniFoodPack 5200				%													%					■ Equilibrium Modified Atmosphere Packaging (EMAP) fresh consumable produce testing ■ Laboratory and research	73

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

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

YOUR PRODUCT GUIDE

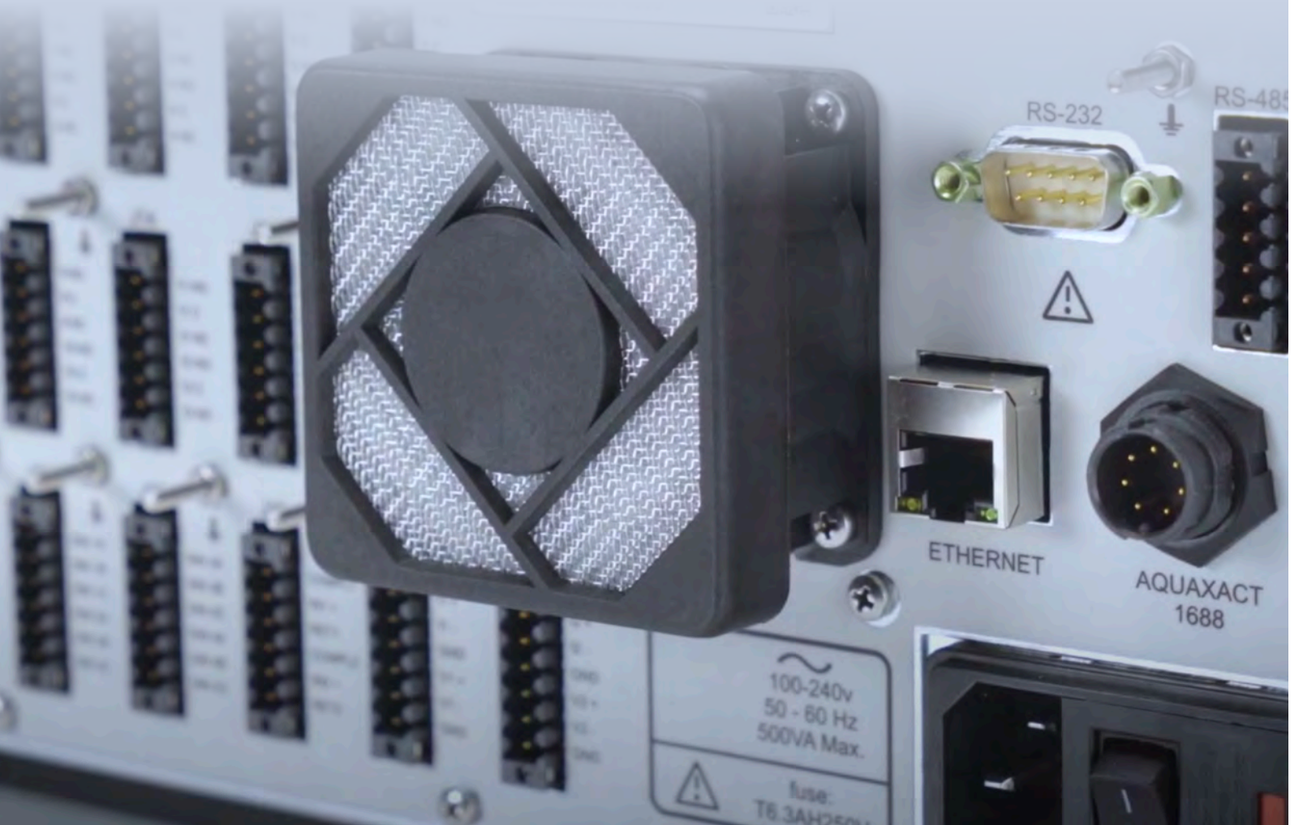
Developed and manufactured in our state-of-the-art technical centers in the UK and US, Servomex gas analyzers are hand-built to meet precise requirements. Every product we make is optimized to the need of each customer process.

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

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

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

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



H2scan — HAZARDOUS AREA

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

The H2scan hydrogen process analyzer features thin film technology that provides a direct hydrogen measurement that is not cross-sensitive to other gases.

FEATURES AND BENEFITS

- UL Class 1, Division 1, Groups B, C, D. ATEX & CSA certifications
- Simple system integration

APPLICATIONS

- Refinery
- Petrochemical
- Manufacturing
- Industrial gas supply

GAS	MEASURES	APPLICATION
HYDROGEN	PERCENT	PROCESS CONTROL
		QUALITY

SENSING TECHNOLOGY

H2scan thin film

SERVOTOUGH Oxy 1800 — SAFE AREA

ACCURATE AND STABLE SAFE AREA O_2 ANALYZER

Designed to reliably measure non-flammable samples up to 100% O_2 in many 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
- mA range and alarm outputs aids integration into control systems
- Easy to set-up, install and operate

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
		SAFETY

SENSING TECHNOLOGY

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, measurement stability and reliability from a single, cost-effective unit.

FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
		SAFETY

SENSING TECHNOLOGY

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 2200 can be configured with a Zone 1 or Zone 2 hazardous area control unit, with up to six transmitters per control unit.

FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
		SAFETY

SENSING TECHNOLOGY

PARAMAGNETIC

SERVOTOUGH SpectraExact 2500 — HAZARDOUS AREA

RUGGED PHOTOMETRIC GAS ANALYZER FOR DEMANDING PROCESS APPLICATIONS

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

FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
TOXIC	PERCENT	PROCESS CONTROL
FLAMMABLE	TRACE PPM	
CORROSIVE		

SENSING TECHNOLOGY

GAS FILTER CORRELATION

INFRARED

SERVOTOUGH FluegasExact 2700 — HAZARDOUS AREA

ADVANCED FLUE GAS ANALYZER FOR HIGH-TEMPERATURE MEASUREMENT OF O_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 1, Division 2
- Unique Flowcube flow sensor technology enables positive flow conditions to be validated with optional flow alarm
- Sulfur-resistant combustibles sensor enables sensor to operate at elevated sulfur levels
- Close-coupled extractive measurement principle
- Flame traps incorporated as standard within sample compartment
- Wide selection of probe lengths and materials available

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
COMBUSTIBLES	TRACE PPM	COMBUSTION

SENSING TECHNOLOGY

CALORIMETRY

ZIRCONIA

THE FUTURE OF PHOTOMETRIC GAS ANALYSIS

THE NEW

SpectraExact II 2500 SERIES

COMING IN 2021

In 2021, we release the next generation of SpectraExact 2500s, combining proven measurement technology with state-of-the-art processing capability, a modern interface, and smart diagnostics – delivering exceptional accuracy you can trust.

Sign up and get the launch news first **servomex.com/signup**

SERVOTOUGH Laser 3 Plus Environmental HAZARDOUS AREA

COMPACT NH_3 MEASUREMENT, OPTIMIZED FOR AMMONIA SLIP DeNOx APPLICATIONS

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

FEATURES AND BENEFITS

- High measurement reliability utilizing Servomex's own line lock cuvette technology
- ATEX, IECEx and North American hazardous area approvals
- A compact analyzer specifically optimized for the fast, accurate and responsive measurement of NH_3
- Auto-validation feature provides complete assurance of ongoing measurement accuracy

APPLICATIONS

- Process heaters
- Incinerators
- Power stations
- Furnaces

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

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SERVOTOUGH Laser 3 Plus Combustion HAZARDOUS AREA

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

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

FEATURES AND BENEFITS

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

APPLICATIONS

- Process heaters
- Incinerators
- Power stations
- Furnaces

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

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SERVOTOUGH Laser 3 Plus Process HAZARDOUS AREA

COMPACT TDL GAS ANALYZER, OPTIMIZED FOR PROCESS O_2 MEASUREMENTS

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

FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
		COMBUSTION

SENSING TECHNOLOGY

TUNABLE DIODE LASER

SERVOPRO AquaXact 1688 SAFE AREA

A FAST, ACCURATE AND RESILIENT MOISTURE MEASUREMENT SOLUTION

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

FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
WATER	DEW POINT	PROCESS CONTROL
	PPMV	

SENSING TECHNOLOGY

ALUMINUM OXIDE

SERVOPRO AquaXact 1688 Controller SAFE AREA

DIGITAL CONTROLLER PLATFORM FOR THE AquaXact 1688

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

FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
WATER	DEW POINT	PROCESS CONTROL
	PPMV	

SENSING TECHNOLOGY

ALUMINUM OXIDE

SERVOPRO MonoExact DF150E SAFE AREA

TOUCHSCREEN OPERATED PPM O_2 ANALYZER FOR GENERAL INDUSTRIAL APPLICATIONS

With a new and improved digital touchscreen and icon-driven guided user interface (GUI) for easier operation, the MonoExact DF150E combines the reliability of Servomex's tried and tested Coulometric O_2 sensor with a more user-friendly package.

FEATURES AND BENEFITS

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

APPLICATIONS

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

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

SENSING TECHNOLOGY

COULOMETRIC

SERVOPRO MonoExact DF310E

SAFE AREA

NEXT-GENERATION DIGITAL O_2 ANALYZER DESIGNED FOR INDUSTRIAL GAS APPLICATIONS

Designed specifically for accurately measurements of oxygen in industrial gas applications, the MonoExact DF310E is a next-generation digital O_2 analyzer that combines precision trace-level measurement with a new icon-driven guided user interface (GUI) and advanced digital communications.

FEATURES AND BENEFITS

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

APPLICATIONS

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

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

SENSING TECHNOLOGY

COULOMETRIC

PARAMAGNETIC

SERVOPRO 4900 Multigas

SAFE AREA

AN ADVANCED DIGITAL MULTI-GAS CEMS ANALYZER

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

FEATURES AND BENEFITS

- A comprehensive solution for CEMS analysis of multiple flue gas components
- Low maintenance and cost of ownership
- Advanced digital communications including Ethernet (Modbus TCP/IP), Modbus RS485 and PROFIBUS
- Automated calibration/validation routines triggered by internal timer or external triggers
- Completely updated icon-driven software interface for easy set-up and operation

APPLICATIONS

- Utility boilers
- Chemical incinerators
- Crematoria
- Mobile labs

GAS	MEASURES	APPLICATION
MULTIPLE	PERCENT	EMISSIONS
	TRACE PPM	

SENSING TECHNOLOGY

GAS FILTER CORRELATION

INFRARED

PARAMAGNETIC

SERVOPRO NanoChrome

SAFE AREA

SUB-PPB TRACE MEASUREMENT OF H_2, CH_4, CO, CO_2, N_2, Ar AND NMHC FOR THE SEMICONDUCTOR INDUSTRY

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

FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
MULTIPLE	ULTRA TRACE PPB	QUALITY
	ULTRA TRACE PPT	

SENSING TECHNOLOGY

GAS CHROMATOGRAPHY

PLASMA

SERVOPRO DF-500 Range

SAFE AREA

LEADING ULTRA-TRACE PPT O_2 ANALYZER RANGE

Verified by independent experts as measuring O_2 to the lowest ppt levels available, the DF-500 analyzer range delivers the premium performance in ultra-trace O_2 measurement. Consisting of the DF-550E NanoTrace and DF-560E NanoTrace II, the NanoTrace series delivers exceptional O_2 measurements at trace and ultra-trace ppt levels.

FEATURES AND BENEFITS

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

APPLICATIONS

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

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

SENSING TECHNOLOGY

COULOMETRIC

SERVOPRO DF-700 Range

SAFE AREA

TUNABLE DIODE LASER (TDL) TRACE MOISTURE ANALYZER RANGE

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

FEATURES AND BENEFITS

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

APPLICATIONS

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

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

SENSING TECHNOLOGY

LASER MOISTURE

SERVOPRO NanoChrome ULTRA

SAFE AREA

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

Delivering superior ultra-trace measurements of UHP gases in a wide range of background gases, the revolutionary NanoChrome ULTRA incorporates the latest advances in sensing and signal processing methodology, for exceptional performance.

FEATURES AND BENEFITS

- Innovative high-sensitivity Plasma Emission Detector (PED) enables ultra-trace measurements of Ar, N_2, H_2, CH_2, CO, CO_2 and NMHC
- ProPeak peak detection technique enables unprecedented measurement sensitivity
- A complete stand-alone UHP gas analysis solution when combined with DF-500 and DF-700 analyzers

APPLICATIONS

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

GAS	MEASURES	APPLICATION
MULTIPLE	ULTRA TRACE PPB	QUALITY
	ULTRA TRACE PPT	

SENSING TECHNOLOGY

GAS CHROMATOGRAPHY

PLASMA

SERVOPRO DF-560E NanoTrace ULTRA

SAFE AREA

MEASURES ULTRA-TRACE O_2 TO THE LOWEST LEVELS

Designed to measure ultra-trace O_2 to the ultra-low ppt levels demanded by the semiconductor sector, the DF-560E ULTRA delivers an industry-leading 45ppt LDL. Once the analyzer is measuring below 1 ppb, the units automatically convert to ppt for better resolution of the smallest of concentration movements.

FEATURES AND BENEFITS

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

APPLICATIONS

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

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

SENSING TECHNOLOGY

COULOMETRIC

SERVOPRO DF-750 NanoTrace ULTRA

SAFE AREA

THE FIRST CHOICE IN MOISTURE ANALYSIS FOR THE SEMICONDUCTOR INDUSTRY

A TDL-based trace/ultra-trace analyzer, the DF-750 ULTRA delivers industry-best measurements of moisture as a contaminant in the ultra-high-purity (UHP) gases used in 300mm semiconductor fabs, with a Lower Detection Limit of 55 ppt.

FEATURES AND BENEFITS

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

APPLICATIONS

- Continuous quality control of bulk UHP gases for semiconductor fabs

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

SENSING TECHNOLOGY

LASER MOISTURE

SERVOPRO DF-760E NanoTrace ULTRA

SAFE AREA

MARKET-LEADING DUAL ANALYSIS OF O_2 AND MOISTURE

Delivering industry-leading quality control measurements for UHP bulk gases, the compact DF-760E NanoChrome ULTRA analyzer is a superior solution for the dual measurement of trace and ultra-trace moisture and oxygen (O_2).

FEATURES AND BENEFITS

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

APPLICATIONS

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

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

SENSING TECHNOLOGY

LASER MOISTURE

COULOMETRIC

SERVOPRO FID

SAFE AREA

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

A Flame Ionization Detector analyzer designed to assure safe operation for cryogenic ASU, the FID ensures the level of Total Hydrocarbons (THC) is maintained below flammable limits, as well as providing quality control in pure O_2, N_2, Ar, air, He and CO_2.

FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
TOTAL HYDROCARBONS	TRACE PPM	SAFETY
		QUALITY

SENSING TECHNOLOGY

FLAME IONIZATION DETECTOR

SERVOPRO Chroma

SAFE AREA

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

Offering a non-depleting Plasma Emission Detector (PED), Flame Ionization Detector (FID) and Thermal Conductivity Detector (TCD), the Chroma analyzer is one of the most versatile gas analyzers for trace gas measurement available. Most applications will be satisfied by a single 4U rack analyzer configuration, making the Chroma a compact, cost-effective solution for continuous process control or quality monitoring.

FEATURES AND BENEFITS

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

APPLICATIONS

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

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

SENSING TECHNOLOGY

GAS CHROMATOGRAPHY

PLASMA

FLAME IONIZATION DETECTOR

THERMAL CONDUCTIVITY

SERVOPRO Plasma

SAFE AREA

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

Specifically designed for the continuous monitoring of N_2 in Ar or He or both, the Plasma's non-depleting Plasma Emission Detector provides an accurate, highly stable and reliable measurement ideal for the requirements of ASU plant operators.

FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
NITROGEN	TRACE PPM	QUALITY

SENSING TECHNOLOGY

PLASMA

SERVOPRO NOx

SAFE AREA

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

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

FEATURES AND BENEFITS

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

APPLICATIONS

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

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

SENSING TECHNOLOGY

CHEMILUMINESCENCE

SERVOPRO HFID

SAFE AREA

HIGH-PERFORMANCE FAST ANALYSIS USING HEATED FID

Using a highly sensitive heated Flame Ionization Detector (HFID) for measuring volatile hydrocarbon concentrations in industrial or vehicle emission applications, the HFID utilizes an internally heated oven set to 190°C, 374°F to maintain the sample gas above its dew point, for optimum performance in 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

APPLICATIONS

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

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

SENSING TECHNOLOGY

FLAME IONIZATION DETECTOR

SERVOPRO MultiExact 4100

SAFE AREA

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

The MultiExact 4100 is a high-performance multi-gas analyzer designed to provide up to four simultaneous gas stream measurements including: O_2 (trace, control, and purity), CO_2, CO, N_2O, CH_4 (trace) and H_2O.

FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
MULTIPLE	PERCENT	PROCESS CONTROL
	TRACE PPM	QUALITY

SENSING TECHNOLOGY

GAS FILTER CORRELATION

ZIRCONIA

PARAMAGNETIC

ALUMINUM OXIDE

INFRARED

SERVOPRO MultiExact 4200

SAFE AREA

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

The MultiExact 4200 is a high-performance multi-gas analyzer designed to provide up to four simultaneous gas stream measurements including: O_2 control, CO_2, CO, N_2O, CH_4 (trace) and H_2O.

FEATURES AND BENEFITS

- Comprehensive solution for flammable gas contaminant monitoring
- Integrated support for the AquaXact 1688 Aluminum Oxide moisture transmitter
- Uses ultra-stable, non-depleting digital sensing technologies that help extend maintenance intervals

APPLICATIONS

- Hydrogen production
- HyCO plants
- Syngas production

GAS	MEASURES	APPLICATION
MULTIPLE	PERCENT	PROCESS CONTROL
	TRACE PPM	QUALITY

SENSING TECHNOLOGY

GAS FILTER CORRELATION

ZIRCONIA

PARAMAGNETIC

ALUMINUM OXIDE

INFRARED

GAS DETECTION OxyDetect

SERVOMEX

NON-DEPLETING PARAMAGNETIC O_2 MONITOR DESIGNED FOR LIFE SAFETY APPLICATIONS

Oxygen depletion monitor designed for safe area or hazardous area environments, utilizing superior performance of non-depleting Hummingbird Paramagnetic O_2 sensing technology.

FEATURES AND BENEFITS

- IP54 (indoor use only)
- The most reliable O_2 detector on the market
- No more false readings or false alarms caused by depleting cell technologies
- Configurable alarm relays and mA output available as standard
- Modbus digital communications option available
- SIL 2 hardware compliant

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	SAFETY

SENSING TECHNOLOGY

PARAMAGNETIC

GET THE INFORMATION YOU NEED WITH OUR EXPERT VIDEOS

- **Products** – features and benefits of our analyzers
- **Applications** – how our analyzers fit into your process
- **Unboxing** – our experts unpack key gas analysis solutions

Watch now: **servomex.com/videos**

SERVOFLEX Micro i.s. 5100

PORTABLES

INTRINSICALLY SAFE ANALYZER MEASURES O_2

Designed for the measurement of oxygen in potentially flammable gas samples, the intrinsically safe Micro i.s. 5100 is a unique analyzer certified to Zone 0 and Division 1 and suitable for measuring percent levels of O_2.

FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
		SAFETY

SENSING TECHNOLOGY

PARAMAGNETIC

SERVOFLEX MiniMP 5200

PORTABLES

BENCHTOP ANALYZER OFFERING SINGLE OR DUAL MEASUREMENTS OF O_2 AND CO_2

The only truly portable battery-powered gas analyzer with MCERTS and TUV certification, the MiniMP 5200 is designed to offer single or dual measurement of O_2 and CO_2 by utilizing Servomex's advanced Paramagnetic and Infrared sensing technologies.

FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	PROCESS CONTROL
CARBON DIOXIDE		QUALITY
		EMISSIONS

SENSING TECHNOLOGY

PARAMAGNETIC INFRARED

SERVOFLEX MiniFoodPack 5200

PORTABLES

BENCHTOP ANALYZER FOR QUALITY CONTROL/CHECKS IN MODIFIED ATMOSPHERE PACKAGING

A small sample volume portable benchtop analyzer designed specifically for the checking and quality control of gas mixtures in Modified Atmosphere Packaging (MAP) used in the food and pharmaceutical industries, the MiniFoodPack 5200 enables single or dual measurements for percent levels of O_2 and CO_2.

FEATURES AND BENEFITS

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

APPLICATIONS

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

GAS	MEASURES	APPLICATION
OXYGEN	PERCENT	QUALITY
CARBON DIOXIDE		

SENSING TECHNOLOGY

PARAMAGNETIC INFRARED

SERVOFLEX 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

APPLICATIONS

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

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

SENSING TECHNOLOGY

PARAMAGNETIC INFRARED

WE'RE RIGHT BY YOUR SIDE

THE SERVOFLEX PORTABLE OXYGEN ANALYZER RANGE

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

Contact us today: **servomex.com/contact**

FROM CONSULTATION TO COMMISSIONING:

THE SERVOMEX SYSTEMS JOURNEY

SHELLEY MOORE, HEAD OF GLOBAL SYSTEMS, WALKS US THROUGH THE SYSTEM BUILD PROCESS

When it comes to systems, Servomex implicitly understands our customers are looking for solutions that solve problems. These could be productivity issues, cost challenges, or compliance requirements. That's why we approach the creation of a new system from a problem-solving perspective at the outset. That way we deliver the reliable, cost-effective system that ensures you meet your operational goals.

SHELLEY MOORE
HEAD OF GLOBAL SYSTEMS

CONSULTATION

BUILDING THE RIGHT RELATIONSHIP

Development of a Servomex system requires genuine partnership between our systems team and our customers. To ensure we build a close relationship, we assign a dedicated team to each project. Our experts stay in place throughout that project, ensuring customers maintain consistent, accessible points of contact.

Project timescales vary significantly depending on the scope and size of the project, plant, unit, applications specifications and other requirements. For a typical small analyzers and cal/val panels, two to three months to deliver; for analyzers in enclosures, three to four months to deliver; for analyzers in a three-sided shelter, five to six months to deliver and complete analyzer shelters, seven to ten months. We often think a systems scope clarification begins with the consultation process, but increasingly we find it starts earlier, with our team members involved during the analyzer system bidding process.

This earlier level of customer contact means that not only do clients get a clearer idea of our systems capabilities from the outset, but our experts get a greater understanding of specific customer requirements surrounding their project.

A key outcome of the consultation stage is determining parameters that need to be met by the system. The required gas measurements are our starting point, but we have many other variables to consider: hazardous or safe area classifications, the process pressure and temperature variables, stream composition and measured components, and ambient conditions that can influence the measurements.

Other factors to consider include the number of sample points, the locations of the sample taps and the distance of the sample lines to the analyzer system. Also single or multi-phase processes and where the sampling point is located in the unit(s).

Serviceability and maintainability are critical considerations to a well thought out design and build for each analyzer system that meets the most rigorous customer expectations.

Servomex has a detailed technical questionnaire that helps the customer and our team together to focus on all the key plant, unit and application information needed to design an analyzer system. This will ensure the system meets customers specifications, environmental and safety requirements, and perform successfully.

SAFETY FIRST, EVERY TIME

OUR SYSTEMS ARE EXPERT, RESILIENT & COMPLIANT

Hazardous areas are defined as any place where an explosive atmosphere may occur in quantities sufficient to require special precautions to protect the safety of workers. Area classification – such as an ATEX or IECEx rating – indicates the minimum design requirements for personnel safety, process operation safety, and environmental impacts.

Servomex expertise and applications knowledge ensures that the system we build meets the correct specifications for components and performance, delivering safe operation.

ATEX
IEC
SIL

SYSTEMS INTEGRATION

DESIGN AND BUILD

COMBINING ENGINEERING AND EXPERTISE

Once the Systems team is briefed, we confirm the most compatible gas analysis technology for the customer's application, and consider the optimum design to the optimal best solution for the customer.

For example, for analyzer systems designed for operation in the Gulf Coast region of Texas and Louisiana, our risk assessment accounts for high temperatures during the summer – and cool temperatures in the winter. Ambient temperature controls within our analyzer system would be part of the design. Process temperatures are also a consideration to prevent unwanted condensation in the sample lines and/or a dual phase system. There are various methods used to control temperature within the analyzer systems depending on the size and scope of the project, i.e. HVAC, vortec coolers, to mention a few. These methods are typically used in enclosures and shelters.

Accessibility is critical and Servomex has different technologies and system configurations to help plant engineers and technicians. Analyzers can be mounted in different configurations depending on the sample tap location, such as the analyzer is at the sample point, transmitter is at the sample point but the controller is at grade in a convenient location, transmitter and controller is at grade on a panel, inside an enclosure or a shelter.

The application requirements and specifications are fully reviewed, then a design and bill of material are produced, typically within two to three weeks of the purchase.

All drawings and documents are reviewed by the customer until the design is agreed. A detailed bill of materials, specifying the key components of the system, is finalized following the review.

The Systems team then purchases all the required materials and components, including analyzers. Around the third or fourth month of the project, this equipment should be ready for engineering to shift focus to the workshop.

Both engineering and shop integration work of the systems take place at one of Servomex's regional centers. This ensures customers are paired with a team that's easy to reach and takes into account any regional issues or challenges.

This can include meeting regional environmental legislation requirements, as well the safety and regulatory requirements.

The collaboration and communication between Servomex and the customer doesn't stop once the consultation phase is over. We continue to provide progress reports throughout the process, even while we're building it.

Typically, the build process begins with sub-assemblies such as pressure reducing stations and associated panels. For larger systems, further assembly work on enclosures and sampling systems can be carried out ahead of the arrival of the shelter.

For larger projects such as shelters, the sub-assemblies, panels and enclosures are mounted and installed on the walls of the shelter as well as installation of the electrical system(s), gas analysis equipment and HVAC.

DELIVERY, INSTALLATION AND SUPPORT

FINAL STEPS FROM CHECKING TO COMMISSIONING

Following the assembly of the system, an internal system test is always performed. This is closely followed by a scheduled Factory Acceptance Test (FAT) for the complete system: a focused, collaborative process between our Systems team and the customer, often taking several days and encompasses a 100% vetting of the complete solution. After the FAT, the minor punch list items, usually tags, are cleared and an as built package is put together by document control and the project team over the next two weeks.

The finished system is then shipped to site. This is where Servomex's global Service Network gets involved, providing commissioning, personnel training and other installation support. This ensures the system is delivered to specification, on time.

Servomex's experienced, highly trained field service engineers ensure that the system is correctly installed, calibrated and performing to specifications.

"Creating a system is a big job, but that's what we do. The most satisfaction is to see the total solution system in the plant, with everything interconnected and working. We've taken something from initial concept, brought it into the plant, and now it's up and running, the customer is satisfied and is coming back to our team for future applications – that is the best part for us."

Jianfu Qiao, Servomex System Engineering Manager, China.
jqiao@servomex.com

SYSTEMS INTEGRATION

SERVOMEX SYSTEMS
CONSULT. DESIGN. DELIVER.

Whatever the size of your project, Servomex Systems has the capability to build and deliver the required customized solution. We assess application requirements, site conditions and many other factors to ensure we provide the system that works best, whether it be a single analyzer or a systems house containing multiple sampling and analysis devices.

Contact us today: **servomex.com/systems**

CONSULT

YOUR NEEDS ARE AT THE CENTER OF THE PROJECT

Our dedicated team will determine your process parameters at the outset, working with you at every stage to ensure the best results from your system.

BENEFITS

- Project scope
- Management procedures
- Consultation meetings
- Solution proposals
- Agreed timescales

DESIGN

WORLD-LEADING ENGINEERS FOR WORLD-LEADING PERFORMANCE

We'll select the most compatible analysis technology for your application, designed for your unique process conditions, and assembled by expert engineers.

BENEFITS

- System design
- Expert project management
- Optimum solutions
- Safety regulation

DELIVER

YOUR SYSTEM BUILT ON TIME AND BUILT TO LAST

After extensive testing, we'll deliver and install your system, providing expert support and training to ensure it operates just the way you expected, providing the results you need.

BENEFITS

- Installation
- Commissioning
- Process optimization
- Full support
- Extended service options

Analyzers and panels

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

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

FEATURES AND BENEFITS

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

Racks

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

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

FEATURES AND BENEFITS

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

Enclosures

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

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

FEATURES AND BENEFITS

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

Houses

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

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

FEATURES AND BENEFITS

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

Continuous Quality Control

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

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

FEATURES AND BENEFITS

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

GLOBAL SERVICE NETWORK

Our expertise in gas analysis doesn't stop with the products we manufacture – all our systems and analyzers are backed by deep applications knowledge and a global team that delivers the support you need, wherever you're based.

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

Our experts can be present from day one, commissioning, setting up and calibrating your new analyzer for optimum performance.

We also deliver training for your staff, make regular site visits to check and maintain your devices, and ensure you have access to the spares you need.

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

MEET THE TEAM

MARK CALVERT
GLOBAL HEAD OF SERVICE

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

NEIL TILEY
EMEAI SERVICE MANAGER

Neil is an experienced leader who has worked in a variety of service and technical support disciplines. He has managed field and office-based staff across within many gas analysis, medical device and semiconductor markets.

CHRIS GALLEY
AMERICAS SERVICE MANAGER

As Service Manager for the Americas, Chris is responsible for the successful operation of our repair depots and field service groups throughout the region.

NICK TAN
ASPAC SERVICE MANAGER

Nick is our Service Manager for the Asia Pacific region, responsible for the operations of the service team within South East Asia. His key tasks are to drive service growth, build the team and maximize customer satisfaction.

GUANGYONG WANG
CHINA SERVICE MANAGER

Leading our dedicated service team in China, GuangYong drives our expert support to customers in this key industrial market, ensuring high-quality service provision.

SERVICE PLANS

ALL THE SUPPORT YOUR ANALYZER NEEDS

For maximum peace of mind, Servomex's Service Plans keep your analyzer operating at optimum performance.

These plans have the full expertise and resources of Servomex behind them, with on-site and remote support from our highly trained service engineers, application specialists and scientists.

They are designed to deliver the highest possible measurement availability for your analyzer, ensuring our trusted gas analysis is available when you need it.

Each service plan is customized to suit your individual needs. Our expert team can recommend a plan to suit your requirements, and will put together a package that will benefit your process.

For example, choose commissioning to get fast, seamless installation and set-up by our experienced, knowledgeable engineers, delivering optimum analyzer operation from day one.

Then add spares support to ensure you're prepared for any unexpected breakdowns, with rapid access to factory-authorized replacement parts whenever you need them.

And complete the plan with one of our service agreements that provides engineer site visits, analyzer health checks and expert analysis in a standard or configurable, cost-effective package.

"Maintaining the highest level of measurement availability is critical for process safety and cost control. Servomex offers you lifetime support for our products, guaranteeing the highest levels of performance, availability and reliability."

Mark Calvert, Global Head of Service, Servomex

YOU RECEIVE

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

Find out how our customized service packages can support your analyzer performance:
servomex.com/service

IN THE FIELD

THE WORK OF A SERVOMEX SERVICE ENGINEER

SERVOMEX FIELD SERVICE ENGINEER ROY DINIS PINA PROVIDES SOME INSIGHT INTO OUR GLOBAL SERVICE NETWORK'S PROVISION FOR CUSTOMERS.

rfdpina@servomex.com

What's a typical day like for a Servomex service engineer?

I start by checking my emails, giving specific attention to customer communications that need a prompt response.

Next, I drive to meet our customer. On arrival at the site, I sign in at reception and watch a site safety video, followed by some questions that help me understand the safety and site rules.

While this is going on, the customer has been informed of my arrival, so they meet me at reception and we go to their office. There we're likely to enjoy a welcome cup of coffee while we discuss how to approach the service, repair or preventative maintenance work.

Before starting work, I will gear up with safety clothing, pick up the work permit and perform a Last-Minute Risk Assessment (LMRA).

We deal with a lot of different analyzers and service tasks, so there's no typical repair issue that we have to deal with. If there is a process failure, for instance from moisture entering the analyzer, we might not be able to save the sensor and may have to replace it, but that's just one example.

If we're visiting for a maintenance task, then commonly the customer asks us to inspect, validate and calibrate the analyzer. Most analyzers also need a sample handling system that has to be serviced, inspected and cleaned.

Once the service is finished, there's a debrief to inform the customer of the work I have carried out. I also fill in a service report, leaving a copy with the customer.

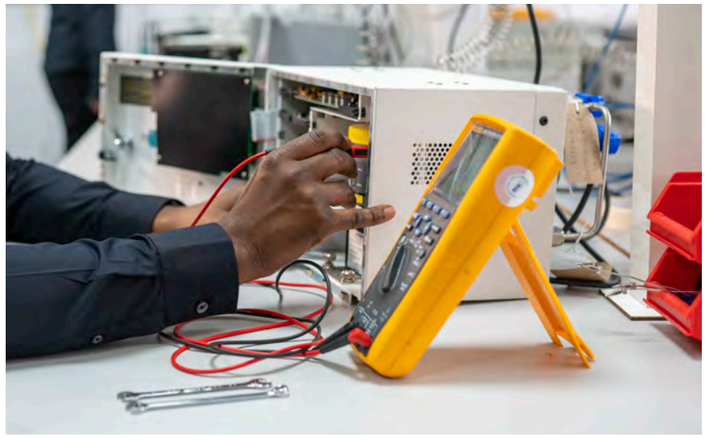
5 AVERAGE HOURS ON SITE

Typically, we spend around five hours on site per analyzer or preventative maintenance check.

Before heading home, I check my emails again to see if any customers need an urgent reply. Once back at base, I finalize the paperwork and send via email to the customer. Then, preparations begin for the next site visit!

What sort of background does a typical Servomex service engineer need?

It's important to have a knowledge of electronics and instrumentation, to understand flow and pressure, and to be aware how to work with pressurized gases. You need an accurate mindset and an attention to detail. It's also essential that you're not afraid to talk with people!



What training does Servomex provide for its engineers?

Whenever a new analyzer is launched, all the service engineers receive specific product and service training. We also get refresher service training on existing products.

How do customers react when you attend their site?

The customer is always glad that we can support them, especially as we come prepared with any necessary service parts, and we know our way around on-site.

Servomex provides global service coverage – is there much travel involved?

In the Netherlands and Flanders region where I work, we have a large number of customers, and our average travel time each day is about three hours. Our customers expect us to reply at short notice – this doesn't mean we have to be on-site the same day, but we need to be able to contact the customer and provide support quickly, for instance by telephone in their native language (Dutch), which is a big advantage for our customers. We do not need to make a lot of travel arrangements, as all our traveling is done by car.

People might think that service engineers are only called in to put right faults and breakdowns. Are there services you can provide to stop these things happening in the first place?

We support our customers not only with any faults or breakdowns they might experience, but with any service-related questions they may have about Servomex analyzers. With every new analyzer we sell, we offer a start-up and commissioning package, and can provide tailored service training for customers. We also offer a preventative maintenance service, with or without the benefit of a service agreement.

What's it like working with Servomex's products and systems? How easy are they to install and maintain?

Servomex products are easy to operate, and are always supplied with installation, operator, and startup/shutdown manuals. These cover most questions that customers have, but we can always provide further operator training if required. The products also come with service manuals, but we advise customers to attend one of our service training courses if they wish to perform servicing themselves. In general, Servomex's design philosophy makes installation and maintenance simple, but like any equipment, it's more effective when supported by expertise and training.

What, in your opinion, makes Servomex's service support so important for customers?

Firstly, we offer a steady, consistent service team, which means the customer isn't confronted with a new face every time. It also means we get to know the customer site very well. Our regional service coverage means we speak the same local language as our customers, and can provide a prompt reply to service requests. Finally, we come prepared, and have the right spare parts available locally for a rapid service response.

Contact your nearest service engineer:
servomex.com/service

GLOBAL SERVICE NETWORK

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

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

Service plan

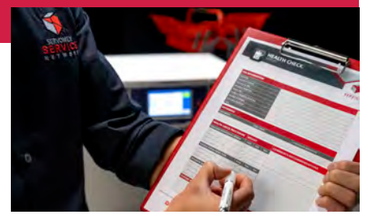
ALL THE SUPPORT YOUR ANALYZER NEEDS

A Servomex service plan ensures our trusted gas analysis is available whenever you need it, providing maximum peace of mind.

BENEFITS

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

Health check



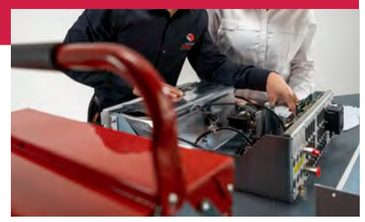
KEEPING ON TOP OF THE OPERATIONAL EFFICIENCY OF YOUR ANALYZER CAN BE DIFFICULT AND TIME CONSUMING

Our engineer ensures your system is performing as expected, while anomalies are detected before they become costly problems.

BENEFITS

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

Training



ENSURE YOUR ON-SITE USER AND MAINTENANCE TEAM ARE FULLY TRAINED ON THE RELEVANT ANALYZER

Our customized training programs can help you get the best performance from your Servomex system. Get hands-on, practical analyzer instruction.

FEATURES AND BENEFITS

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

On-site service support

SERVOMEX SERVICE ENGINEERS ARE THE HEART OF THE SERVOMEX SERVICE NETWORK

Ranging from emergency assistance to routine maintenance, we ensure your gas analysis systems remain efficient and safe.

FEATURES AND BENEFITS

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

Service center support

WHEREVER YOU ARE, THERE'S A SERVOMEX SERVICE NETWORK TEAM NEAR YOU

For a rapid response located close to customers, our state-of-the art service centers provide comprehensive support.

FEATURES AND BENEFITS

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

Service agreements

YOU GET MUCH MORE THAN SERVICE WITH A SERVOMEX SERVICE AGREEMENT – YOU GET PEACE OF MIND, TOO

Regular servicing of your gas analysis systems adds real value to your operations, with service packages to meet your individual process needs.

FEATURES AND BENEFITS

- Proactive maintenance
- Ongoing partnership
- Pre-structured
- Options range from off-site telephone support to complete management and maintenance of your gas analysis system

Commissioning

WHEN INSTALLING YOUR NEW ANALYZER, A SERVICE NETWORK COMMISSIONING PACKAGE WILL ENSURE OPTIMUM PERFORMANCE

Get the performance you expect from the outset, with systems installation and configuration by our highly trained commissioning engineers.

FEATURES AND BENEFITS

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

Rentals

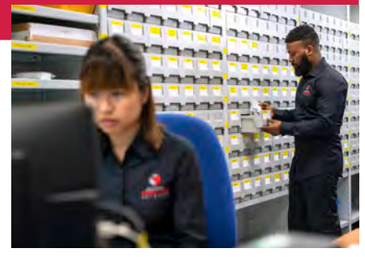
SERVOMEX ANALYZERS ARE AVAILABLE FOR HIRE, WHENEVER YOU NEED THEM

Source a temporary replacement analyzer for your system quickly, with complete confidence that it will operate correctly and integrate easily.

FEATURES AND BENEFITS

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

Spares



MAINTAIN PROCESS UPTIME WITH RAPID ACCESS TO HIGH-QUALITY SPARE PARTS

Access to the right spare parts and consumables at the right time is critical to maintaining plant operations and safeguarding productivity. We deliver high-quality, authorized parts wherever and whenever you need them.

FEATURES AND BENEFITS

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

Factory Acceptance Testing

GET PEACE OF MIND THAT YOUR GAS ANALYSIS SYSTEM WILL OPERATE EXACTLY AS EXPECTED

Conducted in partnership with our expert personnel at a Servomex regional service center, a Factory Acceptance Test (FAT) ensures your system meets specifications prior to dispatch.

FEATURES AND BENEFITS

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

GET THE RESOURCES YOU NEED TO SUPPORT YOUR PROCESS SOLUTION

EXPERT PAPERS

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

PRODUCT BROCHURES

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

MANUALS

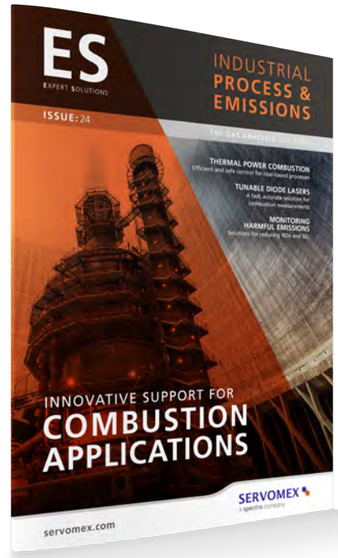
Whether you need to replace a lost product manual, need a quick online reference, or just want to see how the product works before you order, we've got you covered. All our existing product instruction manuals are available to download, for quickstart, installation, operation and certification.

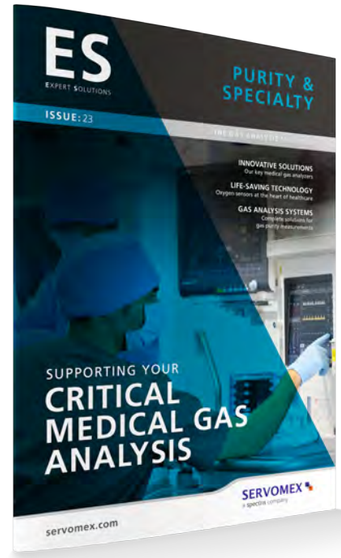
VIDEOS

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

STAY INFORMED WITH OUR EXPERT SOLUTIONS MAGAZINES

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





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

SIGN UP TO SERVOMEX NEWS

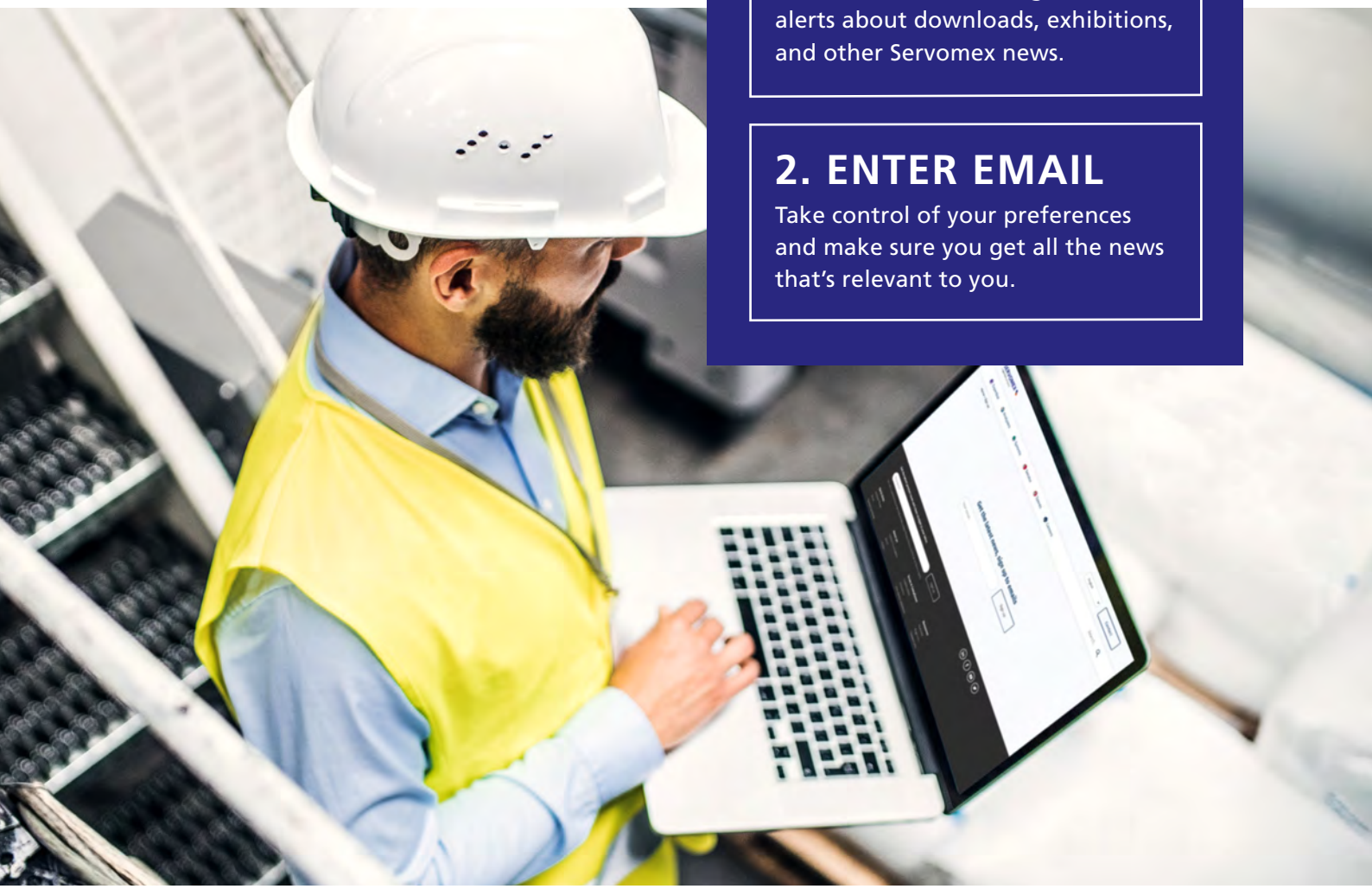
GET THE LATEST ALERTS ABOUT
SERVOMEX SYSTEMS AND PRODUCTS

1. VISIT:
servomex.com/signup

When you sign up to receive Servomex emails, you'll be the first to know about our new products. You can also choose to get the latest alerts about downloads, exhibitions, and other Servomex news.

2. ENTER EMAIL

Take control of your preferences and make sure you get all the news that's relevant to you.



TECHNICAL CENTERS

AMERICAS

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

UNITED KINGDOM

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

FOR ALL ENQUIRIES PLEASE CONTACT YOUR LOCAL BUSINESS CENTER

ASIA PACIFIC

Tel: +86 (0)21 6489 7570
Fax: +86 (0)21 6442 6498
Email: asia_sales@servomex.com

EUROPE

Tel: +44 (0)1892 603 330
Fax: +44 (0)1892 662 253
Email: europe_sales@servomex.com

INDIA

Tel: +91 22 6606 2700
Fax: +91 22 6606 2701
Email: MEI_sales@servomex.com

MIDDLE EAST

Tel: +971 6552 8073
Fax: +971 6552 8074
Email: MEI_sales@servomex.com

AMERICAS

Tel: +1 281 295 5800
USA Toll Free +1 800 862 0200
Fax: +1 281 295 5899
Email: americas_sales@servomex.com

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a spectris company

servomex.com