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EXPERT SOLUTIONS

GAS ANALYSIS GUIDE

ISSUE: 27

THE GAS ANALYSIS MAGAZINE

HOW TO FIND THE RIGHT ANALYZER

We explain the key criteria

IDEAL SOLUTIONS FOR YOUR GAS MEASUREMENT

Just follow our handy flowcharts

WHAT TO LOOK FOR FROM YOUR SUPPLIER

We assess the important qualities
for reliable analysis

SPECIFIER'S GUIDE TO GAS ANALYSIS

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a spectris company

LET'S FIND THE RIGHT SOLUTION TOGETHER

Welcome to the latest issue of Expert Solutions magazine, which is a Specifier's Guide to gas analysis solutions.

We know that selecting the right gas analyzer for your essential process measurement can be challenging, so our experts set out to help by identifying the key criteria you need to address.

In this magazine, you'll learn how gas measurement range, the process environment, and sensing technology chosen, all affect the results you get from your analyzer.

We also look at the variety of hazardous area, safety and environmental certifications offered, and what you should look for from your gas analysis supplier.

If you need a reliable, accurate measurement of oxygen, carbon dioxide, methane, or carbon monoxide, our easy-to-use flowcharts will help you narrow down which solution to pick.

In addition, our expert team has a vast pool of applications knowledge, and are ready to steer you in the right direction for optimum results.

If you want to know more about the best sensor solution for your process, get in touch at servomex.com/contact-us



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Find the oxygen analyzer that best suits your process



SPOTLIGHT ON FAT TESTING

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

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

A successful FAT means that when the system arrives on your site, it can be installed and ready to operate quickly – especially if supported by our commissioning service product.

Visit: servomex.com/service/fat

THE NEW SERVOMEX.COM HAS ARRIVED

EVEN MORE INFORMATION TO HELP IMPROVE YOUR PROCESS

Our new website will help you to find what you need, fast! There's more information than ever before about products and services, and how they benefit your applications. We've also added a new section to speed up your spares and order process.

The site is now live – see for yourself: servomex.com

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 (O₂) analyzers measure up to 100% O₂ 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

SAFE AREA
SERVOPRO

Analysts 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.

HAZARDOUS AREA
SERVOTOUGH

Analysts 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.

PORTABLE
SERVOFLEX

Analysts 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 at: servomex.com/systems

SELECTING THE RIGHT SENSING TECHNOLOGY IS ESSENTIAL

Analysts rely on sensing technology to accurately detect and measure a gas. The sensing technology used can determine not only the gases that are monitored, but also affect the measurement ranges possible, and the extent to which outside influences affect analyzer performance.

TECHNOLOGY	GAS SENSED	TYPICAL APPLICATIONS
 Aluminum Oxide	H ₂ O	Air separation units (ASUs), medical gases, semiconductors
 Chemiluminescence	NO, NO ₂ , NO _x	Vehicle emissions testing, continuous emissions monitoring, combustion efficiency
 Calorimetry	CO, CO _e	Process heaters, thermal crackers, incinerators
 Coulometric	O ₂	Semiconductors, solder reflow ovens, reactor process control
 FID	Total hydrocarbons	ASUs, product pipelines, cylinder filling stations
 Gas Chromatography	Multiple	Semiconductors, ASUs, 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 ₂ O	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
 Spectroscopic	Light hydrocarbons	Natural gas quality and composition, BTU/Wobbe content measurements, LNG production and custody transfer
 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 DeNO _x measurements, safety monitoring
 Zirconia	O ₂	Process heaters, thermal crackers, incinerators

CONTROL YOUR PROCESS AND EMISSIONS



CO₂ CARBON DIOXIDE

A colorless gas, carbon dioxide (CO₂) 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 CO₂ is important in many industrial processes for process control and efficiency. In addition, CO₂ emissions are frequently measured by industrial plants to prove compliance with environmental regulations.

Since it is present in air at trace levels, CO₂ is often encountered as a contaminant in high-purity gases, so measurements of very low-level CO₂ must be achieved for this application.

Use pages **8-9** to identify the best CO₂ 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 CO₂, 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.

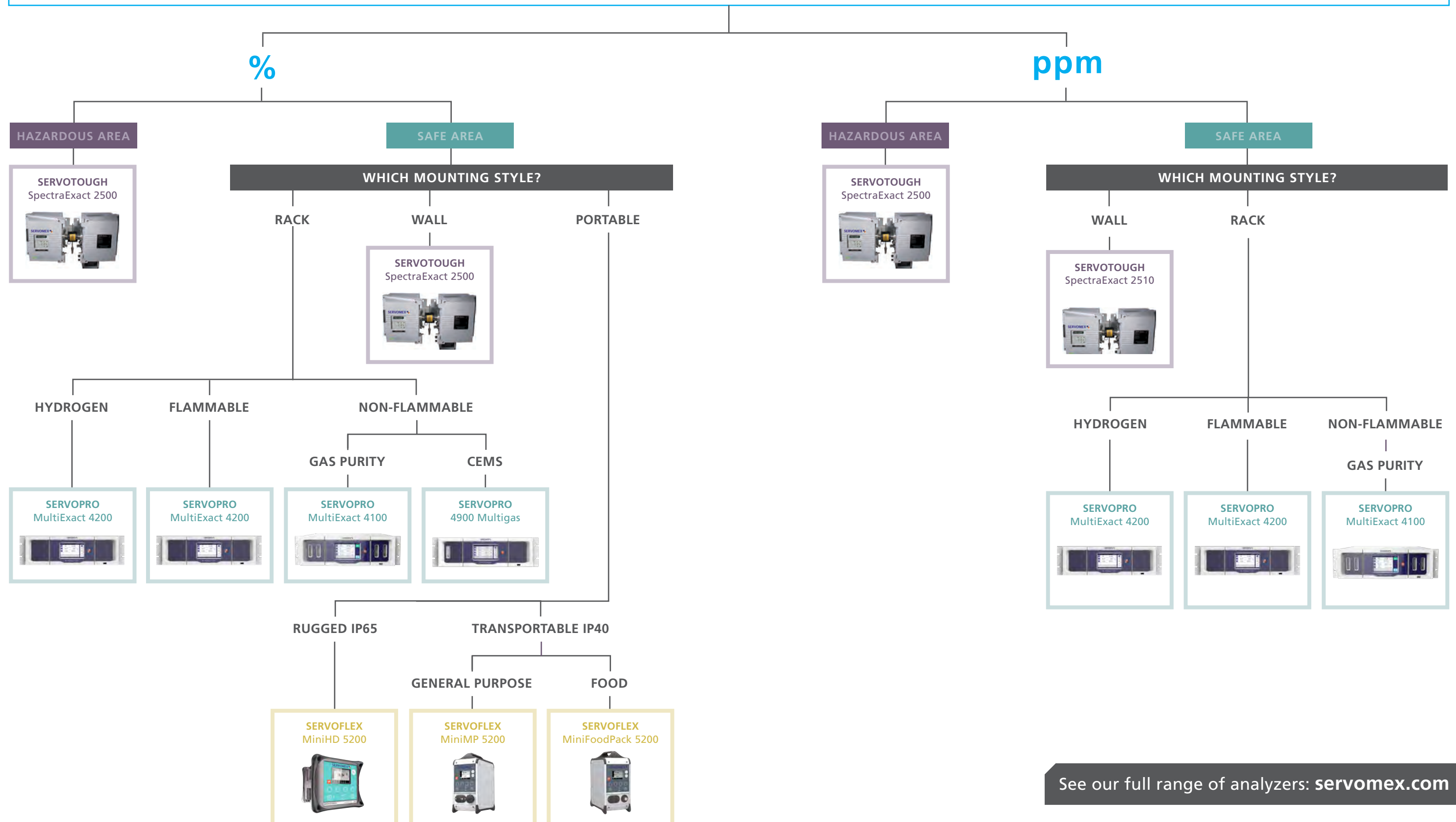
CO is regarded as a criterion pollutant under many environmental standards, so any industrial emissions must be monitored to ensure regulatory compliance.

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

CARBON DIOXIDE GAS ANALYZER FINDER

CO₂

WHAT LEVEL/RANGE OF CARBON DIOXIDE DO YOU REQUIRE?

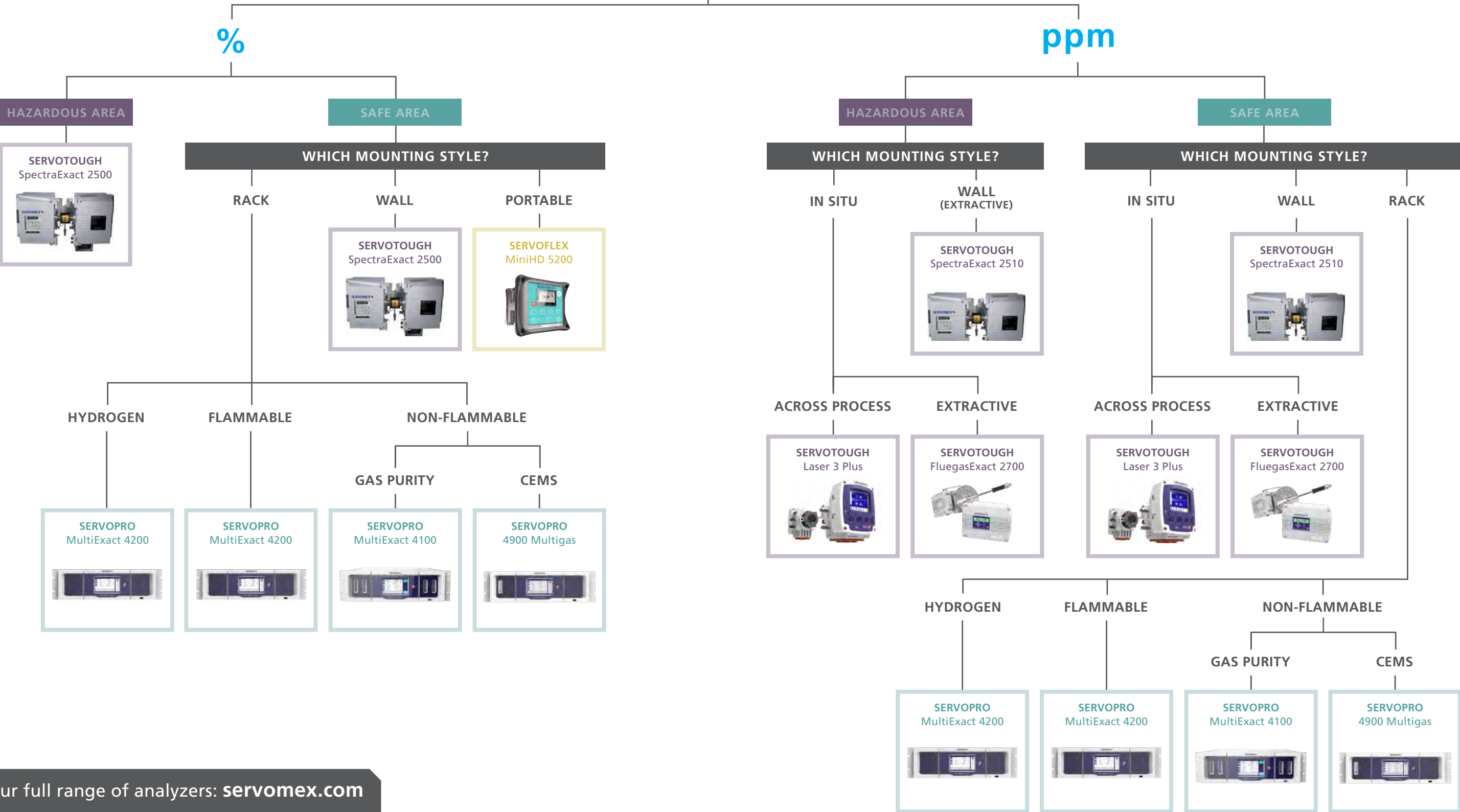


See our full range of analyzers: servomex.com

CARBON MONOXIDE GAS ANALYZER FINDER

CO

WHAT LEVEL/RANGE OF CARBON MONOXIDE DO YOU REQUIRE?



See our full range of analyzers: [servomex.com](https://www.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 CH₄. 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 CH₄ 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 CH₄ is key to reaction efficiency and safety. In general, CH₄ 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 CH₄ emissions do not exceed environmental regulatory limits.



COMBUSTION



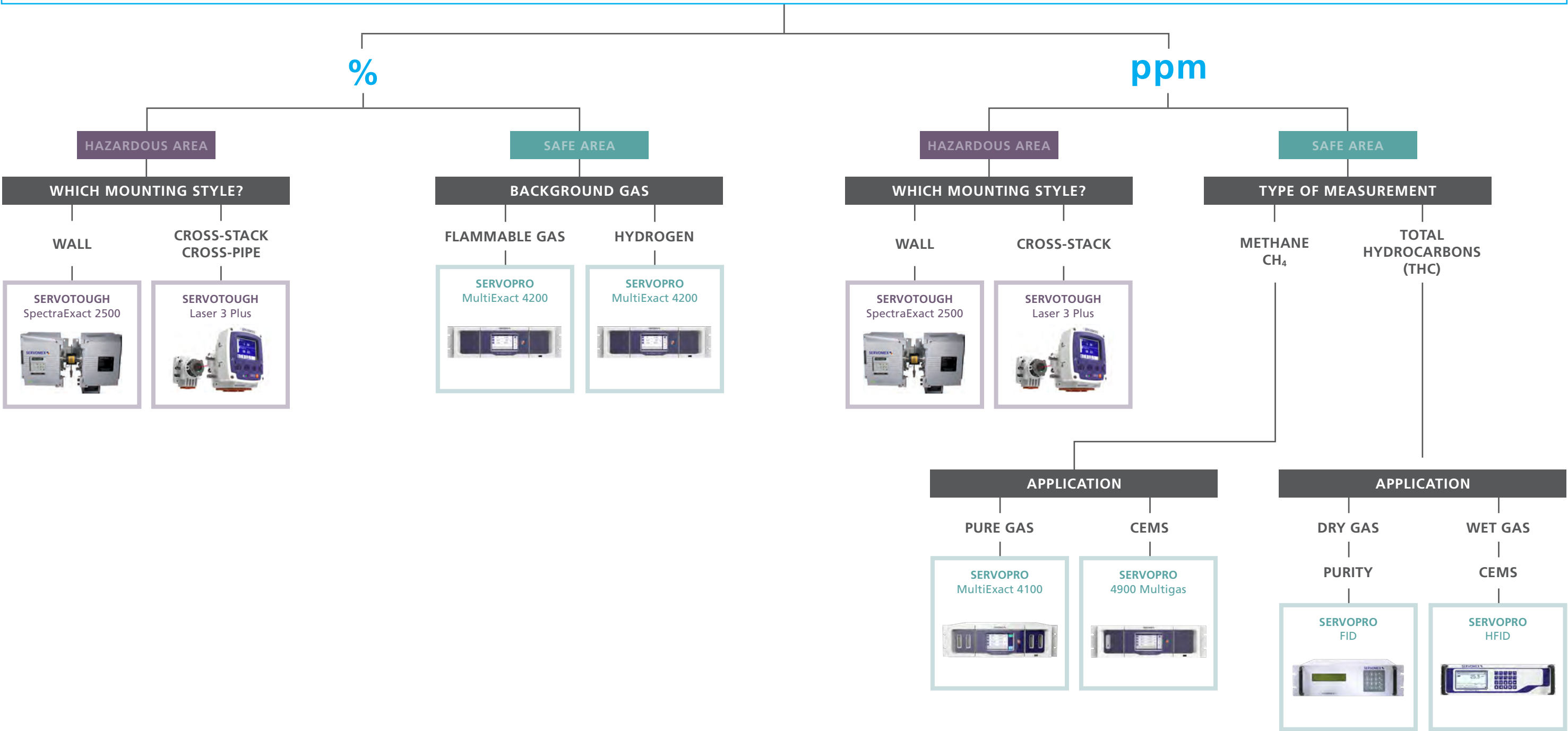
MEDICAL/ SEMICONDUCTOR



EMISSIONS

Use pages 14-15 to identify the best CH₄ solution for your process

WHAT MEASUREMENT/RANGE DO YOU REQUIRE?



See our full range of analyzers: [servomex.com](https://www.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.

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?

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.

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 mean 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.

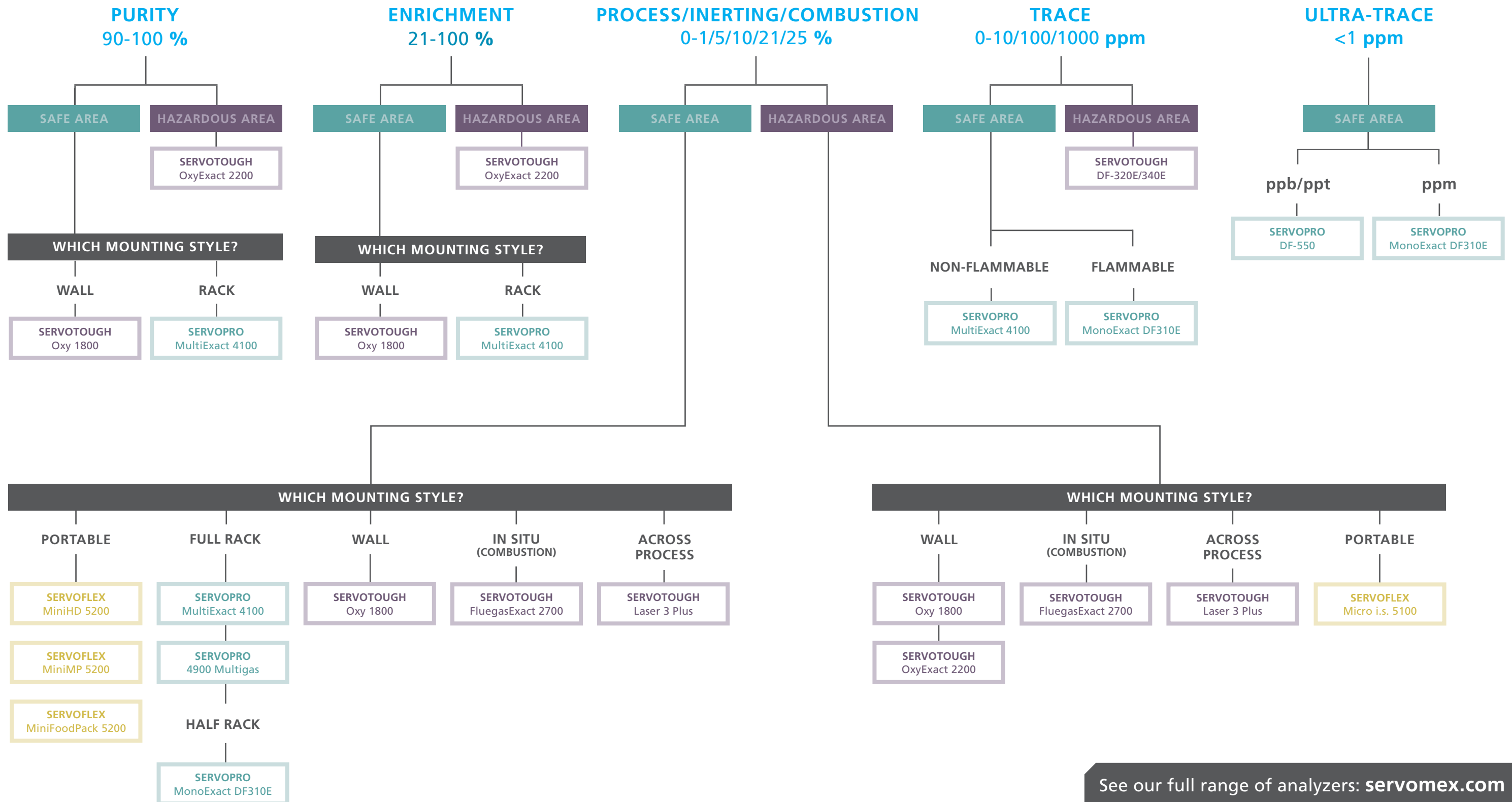
As a major component of atmospheric air, O_2 is often found as a contaminant in high-purity gases such as nitrogen and argon. A Coulometric sensor offers excellent ultra-trace detection of O_2 down to ppt concentrations.

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

OXYGEN GAS ANALYZER FINDER

O₂

WHAT LEVEL/RANGE OF OXYGEN DO YOU REQUIRE?



See our full range of analyzers: servomex.com

A RANGE OF GAS ANALYZERS TO

SUPPORT YOUR PROCESS NEEDS

SERVOTOUGH HAZARDOUS AREA

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

Optimized for hazardous area use, and utilizing both extractive and in-situ analysis techniques, common gas measurements receive higher level analysis for light hydrocarbons and combustibles;

this makes SERVOTOUGH analyzers ideal for extensive use within most hydrocarbon processing applications.

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

SUPPORTING

- 

PROCESS CONTROL
- 

PROCESS SAFETY
- 

EMISSIONS MONITORING
- 

COMBUSTION CONTROL
- 

PRODUCT QUALITY



SERVOPRO SAFE AREA

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

An extensive range of non-depleting Servomex gas sensing technologies – including Paramagnetic, Zirconia, Flame Ionization Detection, Plasma and Gas Chromatography – are integrated into flexible analyzers. These either meet specific measurement requirements, such as for syngas, hydrocarbons or trace gas mixtures, or provide multi-gas

monitoring capabilities for applications including ASU production and Continuous Emissions Monitoring Systems (CEMS).

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

SUPPORTING

- 

PROCESS CONTROL
- 

PROCESS SAFETY
- 

EMISSIONS MONITORING
- 

PRODUCT QUALITY



SERVOFLEX PORTABLES

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

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

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

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

SUPPORTING

- 

PROCESS CONTROL
- 

PROCESS SAFETY
- 

COMBUSTION CONTROL



Discover our full analyzer range at servomex.com

A COMBINED SOLUTION FOR YOUR GAS PROCESS

SERVOMEX PROVIDES A COMPREHENSIVE, SINGLE-SUPPLIER SOLUTION FROM PRECISION GAS ANALYSIS TO ENTIRE SYSTEMS AND EXPERT GLOBAL SUPPORT.



Discover our analyzer range:
servomex.com/gas-analyzers

Servomex's analyzer range is the most comprehensive available from a single manufacturer, setting the standard for the industrial gas (IG) market for decades with a unique 'all of market' solution.

Powered by reliable, ground-breaking sensor technologies, our range delivers accurate, stable measurements for every point

in your process, with a full range of percent to ultra-trace measurements.

Servomex analyzers support quality control, maintaining gas purity during the production process and detecting impurities during processes such as medical gas supply or semiconductor production.

We also provide solutions for process control and ensure safety and emissions monitoring for potentially hazardous processes.

Our commitment to ongoing development ensures that even the most trusted measurements are continuously improved, with added features that increase ease of use and reduce the cost of ownership.



Discover our systems solutions:
servomex.com/systems

In addition to individual analyzers, Servomex also supplies complete system solutions designed to order for your project. State-of-the-art systems engineering centers in

the US, China, India and Europe provide a global service, offering solutions ranging from simple utilities panels to fully-contained air-conditioned shelters.

Proven experience ensures the optimum level of efficiency, safety and cost-effective operation for your application.



Discover our service solutions:
servomex.com/service

Servomex support doesn't end with the supply of your analyzer or system. Our expert team delivers gas analysis expertise directly to your plant. With global coverage provided by service centers and

mobile engineers worldwide, the Servomex Service Network ensures your processes run efficiently, safely and profitably. Support offered includes service agreements, spares,

commissioning, health checks, training, and equipment rental. We also provide expert support from our extensive network of service centers, or on-site at your facility.

SERVOMEX SPARES

SUPPORTING CRITICAL INDUSTRY SECTORS

A RELIABLE, RAPID-RESPONSE SERVICE

Delivered by our network of regional support teams.

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