

ES

EXPERT SOLUTIONS

SERVOMEX SEMICONDUCTOR SOLUTIONS

ISSUE: 25

THE GAS ANALYSIS MAGAZINE

THE BATTLE FOR UHP GAS ANALYSIS

Which wins when GC-PED takes on
APIMS in a clash of the technologies?

THE NEW ULTRA — SERIES — PURITY MADE SIMPLE



SERVOMEX.COM

SERVOMEX 
a spectris company

IMPROVE YOUR GAS ANALYSIS

CATCH UP WITH OUR
EXPERT WEBINARS

ALL OUR RECENT EXPERT SOLUTIONS WEBINARS ARE NOW ONLINE

OUR PRODUCT SPECIALISTS EXAMINE KEY APPLICATIONS:
SAFETY, PROCESS CONTROL, AND MEDICAL GASES.

Listen today: gotostage.com/channel/servomex-webinars

THE NEXT LEVEL FOR YOUR UHP GAS ANALYSIS

Our Purity & Specialty (P&S) Division is vastly experienced at providing gas analysis solutions that meet the demanding challenges of the semiconductor market.

We continue to look for new ways to improve our products and serve the ever-evolving needs of our customers.

That's why we're excited to introduce the new ULTRA Series of ultra-high-purity (UHP) gas analyzers, designed to take impurity detection to the next level.

You can read about all our new ULTRA products in this edition of ES, discover the performance improvements they offer, and learn how they will revolutionize gas analysis in the semiconductor market.

If you want to find out more about the ULTRA Series and our gas analysis solutions for your process, the P&S team and I are here to help – get in touch at our new, improved website: servomex.com/contact



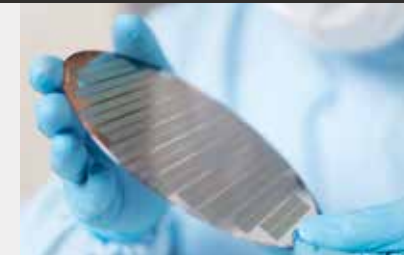
MIKE PROCTOR
P&S BUSINESS UNIT DIRECTOR
mproctor@servomex.com

This magazine is published August 2020 by Servomex Group Limited, Crowborough, East Sussex, TN6 3FB. Editorial enquiries and feedback should be sent to Colin Jones, Marketing Communications Director. Email: cjones@servomex.com

[@servomex](#) [linkedin.com/company/servomex](#) [www.facebook.com/servomexgroup](#)

IN THIS ISSUE

P04-05.
A total solution
for UHP gases



P06-07.
Taking detection to
a new level – the
SERVOPRO
NanoChrome ULTRA

P08-09. Technology comparison – GC-PED vs APIMS



P10-11.
Ultimate moisture
detection – the
SERVOPRO DF-750
NanoTrace ULTRA

P14-15.
Industry-best oxygen
detection – the SERVOPRO
DF-560E NanoTrace ULTRA



SPOTLIGHT ON SERVOPRO DF-700 HOT SWAP

Use our hot swap service and we'll replace your old or faulty moisture analyzer or cell with a refurbished unit, complete with new warranty.

It means DF-700 range customers get a factory-approved replacement fast, minimizing downtime. We give you a definite cost at the outset, so there's no uncertainty over repair costs.

Not only is hot swap quicker than conventional repair, it's cheaper too, as the working analyzer is already built and ready to send.

Visit: servomex.com/service

ULTRA

SERIES

THE DEVELOPMENT OF A TOTAL SOLUTION FOR SEMICONDUCTOR GAS ANALYSIS



NanoChrome
ULTRA



DF-560E NanoTrace
ULTRA



DF-750 NanoTrace
ULTRA

Semiconductor wafer manufacturing processes require ultra-pure gases – even the smallest impurities can cause major defects in a wafer, creating costly scrap and waste.

To avoid contamination and ensure the purest gases are used, semiconductor manufacturers use many different resources, including:

- Strict gas supplier specifications
- Multiple gas purification techniques
- Real-time continuous gas purity monitoring
- Post-process inspection

Gas analysis is used to ensure the purity of all critical process gases prior to them entering the manufacturing process. This requires the monitoring of the major process impurities at parts-per-trillion (ppt) levels.

THE MAIN CRITICAL PROCESS GASES	
Oxygen (O ₂)	Helium (He)
Nitrogen (N ₂)	Argon (Ar)
Hydrogen (H ₂)	Carbon dioxide (CO ₂)

THE MAJOR IMPURITIES MONITORED	
Oxygen	Nitrogen
Moisture (H ₂ O)	Argon
Methane (CH ₄)	Carbon monoxide
Non-methane hydrocarbons (NMHC)	Carbon dioxide

There are established and highly effective solutions for accurate trace-level O₂ and H₂O measurements. For example, Servomex offers the SERVOPRO DF-560E ULTRA for industry-leading Coulometric analysis of O₂, the SERVOPRO DF-750 ULTRA for the lowest detection limits of H₂O, and the SERVOPRO DF-760E ULTRA to combine these measurements into one device.

However, the remaining impurities required several different analyzers to monitor them all, taking up a lot of space

and adding to costs – both for initial system set-up and for ongoing operational expenses.

To solve these issues, Servomex experts developed the SERVOPRO NanoChrome, designed to use safe, stable Plasma Emission Detector technology to provide ultra-trace measurements for a range of impurities.

This performance has now been further enhanced to create the NanoChrome ULTRA, which offers detection limits far exceeding the demands of the semiconductor industry.



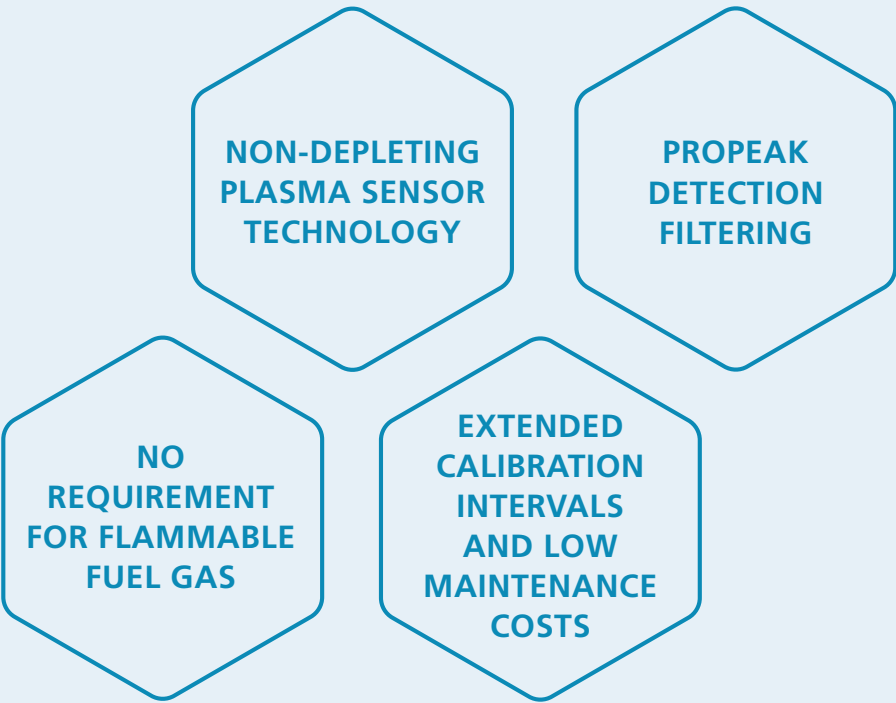
Complete systems support from design to delivery – download our integrated Systems brochure: servomex.com/systems

GAME-CHANGING GAS ANALYSIS – THE SERVOPRO NanoChrome ULTRA

Using proven Plasma Emission Detector sensing, updated to significantly reduce noise, the SERVOPRO NanoChrome ULTRA meets the most stringent demands of the semiconductor sector.

Its Lower Detection Limit (LDL) has been reduced even further for many impurities - down to 100 parts per trillion (ppt), compared to 500ppt on the standard model.

To reflect the improved detection performance, the NanoChrome ULTRA display shows measurements in ppt instead of the parts-per-billion (ppb) readings shown by the standard analyzer.



ULTRA PERFORMANCE

- ENHANCED PLASMA EMISSION DETECTOR**
Better signal to noise performance
- BASELINE OPTIMIZATION**
Signal enhancement in low ppt
- SOFTWARE AND FIRMWARE UPDATE**
Improved stability and speed
- PARTS-PER-TRILLION DISPLAY**
Goes beyond 1ppb readings



MEASURES: Hydrogen (H₂), Methane (CH₄), Carbon monoxide (CO and Carbon dioxide (CO₂)

IN: Electronics-grade Nitrogen (N₂), Hydrogen (H₂), Helium (He), Argon (Ar) and Oxygen (O₂)

THE ULTRA GIVES YOU IMPROVED LOWER DETECTION LIMITS COMPARED TO THE STANDARD NANOCHROME

Find out the full specs on our website:
servomex.com/nanochromeultra

Gas	IMPURITY													
	CH ₄		CO		CO ₄		NMHC		N ₂		H ₂		Ar	
	Std	Ult	Std	Ult	Std	Ult	Std	Ult	Std	Ult	Std	Ult	Std	Ult
Ar	500	100	500	100	500	100	500	100	300	100	500	500	N/A	N/A
H ₂	500	100	500	100	500	100	500	100	300	100	N/A	N/A	500	500
He	500	100	500	100	500	100	500	100	300	100	500	500	500	500
N ₂	500	100	500	100	500	100	500	100	N/A	N/A	500	500	500	500
O ₂	500	100	500	100	500	100	500	100	100	300	500	500	500	500

WHICH TECHNOLOGY IS BEST FOR UHP GAS
ANALYSIS IN THE SEMICONDUCTOR INDUSTRY?

THE CONTENDERS

GC-PED

An established, reliable gas analysis technique that combines the Gas Chromatography (GC) advantage of isolating impurities from the background gas with the selectivity and sensitivity of a Plasma Emission Detector (PED).

VS

APIMS

Specifically developed for trace-level analysis of impurities in bulk gases, Atmospheric Pressure Ionization Mass Spectrometry (APIMS) identifies the type and amount of chemical present in the sample by measuring the mass-to-charge ratio in a gas phase ion.

ROUND 1 DETECTION LIMITS

GC-PED

Lower detection limit (LDL) ranges from 50-100 parts-per-trillion (ppt), depending on the analyte of interest. This performance is tested and corroborated for every analyzer produced.

VS

APIMS

LDL ranges from 10-150ppt. However, no scientific data is available on how the LDL is calculated. Different ions produce varying intensities, so different LDLs would be expected.

WINNER

For evidence-backed performance, the GC-PED has science on its side, delivering proven detection that still matches the most challenging requirements of semiconductor production.

ROUND 3 LONG-TERM PERFORMANCE

GC-PED

Doesn't need supporting utilities, or regular maintenance to maintain accurate performance. Has long-term stability against aging, temperature and humidity. Uses parallel detectors to cover various impurities, so a single detector failure will only affect one measurement.

VS

APIMS

Affected by inherent errors introduced by the calibration process and vacuum pump degradation. Requires frequent servicing to maintain its theoretical performance. Uses one detector for all impurities, so a single failure will bring down the whole system.

WINNER

Unless you're willing to give your analyzer constant attention, the GC-PED provides the most reliable long-term operation.

ROUND 2 COMPLEXITY

GC-PED

Easy to operate. Any corrective maintenance is relatively easy to perform, using simpler parts.

VS

APIMS

A complex technique that requires significant effort to repair in the event of power outage, component failure or chamber contamination.

WINNER

For a simple-to-operate solution that's also easier to repair when required, the GC-PED wins hands-down.

ROUND 4 LIFETIME COSTS

GC-PED

Has a comparatively less expensive 'up front' cost, a built-in span gas calibration dilution system, and no regular maintenance requirements.

VS

APIMS

Has a significant initial cost and is both difficult and expensive to maintain. No built-in span gas calibration dilution system, so this must be provided separately at extra cost.

WINNER

The GC-PED is clearly the most cost-effective option.

AND THE WINNER IS...

While the headline specifications of APIMS make it appear superior for the UHP gas market, we believe the many benefits of GC-PED demonstrate it is the better choice overall.

Download our GC-PED vs APIMS expert paper: servomex.com/resources



SUPERIOR MOISTURE MEASUREMENTS FOR QUALITY CONTROL

Delivering an industry-leading 55 parts-per-trillion (ppt) Lower Detection Limit (LDL), the SERVOPRO DF-750 NanoTrace ULTRA is the best choice for trace and ultra-trace moisture measurements in a range of UHP gases.

Ideal for the demanding requirements of 300mm semiconductor fabs, it measures moisture as a contaminant in the electronics grade gases nitrogen, hydrogen, helium, argon and oxygen – significantly improving on the 100ppt LDL of the standard model.

Tunable Diode Laser (TDL) sensing technology delivers stable, highly accurate measurements with low lifetime maintenance requirements and zero-drift stability.

ULTRA PERFORMANCE

BEST AVAILABLE MOISTURE MEASUREMENT

Industry-leading 55ppt LDL for moisture

LOW SIGNAL-TO-NOISE RATIO

Ensures greater accuracy

ROBUST HERRIOTT GAS CELL

Virtually immune to mechanical disturbances

LINE-LOCK REFERENCE CELL SYSTEM

Focuses on exact moisture line of interest

REAL-TIME ABSORPTION LINE DISPLAY

Quickly confirms system performance

NON-DEPLETING
LASER MOISTURE
SENSOR

DIGITAL
COMMUNICATIONS
OPTIONS

PARTS-
PER-TRILLION
MEASUREMENT
DISPLAY

RESISTANT
TO GAS CELL
CONTAMINATION



MEASURES: Moisture (H₂O)

IN: Electronics-grade Nitrogen (N₂), Hydrogen (H₂), Helium (He), Argon (Ar) and Oxygen (O₂)

Learn more: servomex.com/df-750ultra

SETTING THE STANDARD FOR ULTRA-TRACE O₂ ANALYSIS

The new SERVOPRO DF-560E ULTRA delivers industry-best detection of ultra-trace oxygen (O₂), down to 45 parts-per-trillion (ppt), making it ideal for semiconductor fabs and analytical carts.

It combines reliable, highly stable Coulometric sensing technology with an improved analyzer chassis and advanced software for quieter processing. Background noise is virtually eliminated, ensuring ultimate accuracy.

Like the standard DF-560E range, the DF-560E ULTRA is optimized for ease of use and portability, and can be operated via the front panel or digital communication options.

ULTRA PERFORMANCE

- MEASURES O₂ TO INDUSTRY-LEADING 45PPT
- HANDLES FLAMMABLE AND NON-FLAMMABLE SAMPLES
- ELECTROLYTE CAN BE TOPPED UP FOR EXTENDED SENSOR LIFE
- LASTS 5-10 TIMES LONGER THAN REGULAR ELECTROCHEMICAL SENSORS
- FAST RESPONSE AND QUICK RECOVERY FROM PROCESS UPSETS

MEASURES:
Oxygen (O₂)

IN: Multiple background gases



LONG-LIFE COULOMETRIC SENSOR

DIGITAL COMMUNICATIONS OPTIONS

PARTS-PER-TRILLION MEASUREMENT DISPLAY

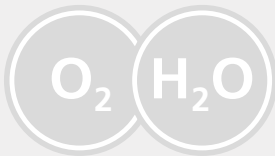
HAND-CARRY PORTABLE OPTION AVAILABLE

A COMBINED SOLUTION

The SERVOPRO DF-760E ULTRA provides a simultaneous dual measurement for moisture and O₂ in a single, compact analyzer, saving on space and costs.

It combines the Coulometric technology of the DF-560E ULTRA and the Laser Moisture sensing of the DF-750 ULTRA to deliver industry-leading Lower Detection Limits (LDL) of 55ppt (H₂O) and 45ppt (O₂).

Its unmatched measurement performance is supported by a low-maintenance design and resilient zero-drift sensing technologies which require no ongoing calibration.



Find out more: servomex.com/df-560eultra

Get the full details: servomex.com/df-760eultra

SYSTEMS SOLUTIONS FOR MULTI-GAS MONITORING

As global experts in gas analysis systems integration, Servomex's Systems team designs and delivers the most accurate, reliable solutions available to the semiconductor market.

Each system is designed from the customer perspective, establishing all the necessary requirements, then working with the customer to find the best way to resolve their unique process challenges.

This collaborative approach, combined with our extensive systems expertise, transforms the way we create and deliver systems for ultra-high-purity gas analysis.

THE ULTRA CART

The ULTRA Cart is an integrated, compact mobile system combining all your solutions in one place. It can be configured with any combination of our ULTRA Series analyzers, creating a complete, tailor-made UHP gas analysis system for your semiconductor fab.

Incorporating our secure, Windows 10-based control software, it also manages data collection, data storage and alarm notifications, delivering effective quality control for any bulk gas distribution system.



//
Wherever you are in the world, our global approach ensures you get consistent, high-quality systems expertise that's accessible from your time zone. This means you can easily communicate with our teams inside working hours, building a partnership that supports your project from start to finish.

Thanks to our regional coverage, your system doesn't have to travel halfway around the world to reach you, and our global network of service staff is close to your site to provide rapid support and maintenance for a lifetime of systems performance.

Richard Bobeck, System Engineering Manager.
rbobek@servomex.com



Optimize your process: servomex.com/systems

A COMBINED SOLUTION FOR YOUR INDUSTRIAL 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 contracts, spares, calibration kits,

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.



VISIT OUR WEBSITE

EVEN MORE INFORMATION TO HELP IMPROVE YOUR PROCESS

Our 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.

See for yourself: servomex.com

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.

