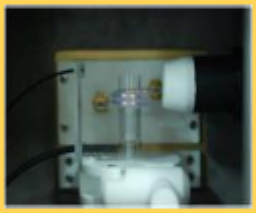
pg instruments

# ICP5000

Inductively Coupled Plasma

## *Detailed Specification for ICP5000 DV*



Analytical
Instruments
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Certificate – Сертификат – 證明書 – Certificat – 증명서 – شهادة

# Certificate of Compliance

No. 3B190719.PGITW49

| | |
|---|---|
| Certificate's Holder: | PG Instruments Limited<br>Alma Park, Woodway lane, Claybrooke Parva, Lutterworth, LE17 5FB |
| Certification ECM Mark: | ENTE CERTIFICAZIONE MACCHINE – European Conformity – SAFETY COMPLIANCE MARK – Type Approved |
| Product: | Inductively Coupled Plasma |
| Model(s): | ICP5000DV |
| Verification to: | Standard:<br>EN 61010-1:2010, EN 61326-1:2013<br><br>related to CE Directive(s):<br>2014/35/EU (Low Voltage)<br>2014/30/EU (Electromagnetic Compatibility) |

**Remark:** The product(s) has been verified on a voluntary basis. The product(s) satisfies the requirements of the Certification Mark of ECM, in reference to the above listed Standard(s). The above Compliance Mark can be affixed on the product(s) accordingly to the ECM regulation about its release and its use. The regulation can be found at www.entecerma.it. This Certificate of Compliance can be checked for validity at www.entecerma.it
This verification doesn't imply assessment of the production of the product(s).

Additional information, clarification about the CE Marking:

We attest that a TCF for the CE Marking process is in place. Whereas the Manufacturer is Responsible to start the CE *Marking Certification Procedure* and to perform all the necessary activities, as required by the Directive before placing the CE Mark on the product(s).

Date of issue 19 July 2019

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Expiry date 18 July 2024

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# ICP5000DV Dual View Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES) – Technical Presentation.

## Introduction to PG Instruments Limited Scientific Instruments - Development Leader

PG Instruments Limited is a British company that has for many years manufactured a comprehensive range of UV-Visible Spectrophotometers and Atomic Absorption Spectrometers. Based near Leicester in the heart of the UK we export to almost every country in the world. Over the last few years PG Instruments has diversified and considerably added to our portfolio of instrumentation. In addition to the UV-Vis Spectrophotometers and Atomic Absorption Spectrometer instruments we also produce Water Purifiers, Micro-Wave Digestion Systems, Atomic Fluorescence, Flame Photometers, pH and Conductivity Meters, Automatic Titration, Karl Fischer Analysis Systems, etc. In early 2016 we introduced an Inductively Coupled Plasma Spectrometer system (ICP-OES), with just a Radial View and added the Dual View system to our comprehensive range of analytical instruments at the end of 2016. The ICP5000DV is already installed in a number of laboratories. In the UK we have sold to Rolls Royce Limited, The Waste Water Care Group, Churchill Group, Heineken Brewery, Wear Check Oil Analysis, We have also units installed at Nestle in France, Belgium, Mexico, India, Peru, South Africa, Spain, and Italy to name but a few

Due to its versatility and high performance, the instrument can be used in almost any laboratory for a wide range of applications such as:

- Agricultural
- Food
- Geological
- Clinical
- Metal
- Petrochemical
- Environmental
- Mining
- Pharmaceutical
- Education

The system and all its parts meet all the International and CE European safety and security directives (for Low Voltage, Electromagnetic Radiation, UV and RF). The CE Certificate for the ICP5000DV can be supplied and PG Instruments is also ISO Registered.

## Introduction & Basic Specifications - ICP5000DV Dual View Inductively Coupled Plasma Spectrometer – Fast & Precise Analysis

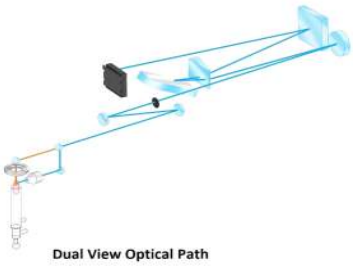
The ICP5000DV Dual View ICP is a Fully Automated, Fast Simultaneous Analysis ICP Spectrometer designed to give you FAST analyse of YOUR samples with cost effective low use of gas that does not compromise performance even for the most difficult samples. The 5000DV is designed to offer Ultra-Low level analysis by allowing analysis to be carried out with axial, radial and a simultaneous axial and radial view of the vertical plasma, thus allowing fast, precise analysis of the most complex matrices. The ICP5000DV can analyse samples such as drinking waters, high concentrated brines, organics solvents, to name but a few, easily and produces fast accurate data with excellent precision. The low standby power of the plasma minimizes start up times and reduces gas consumption. The wide spectral range of the spectrometer, purged with either nitrogen or argon, allows the analysis of elements far into the UV when switching between samples of high or varying matrix.

### The RF Generator.

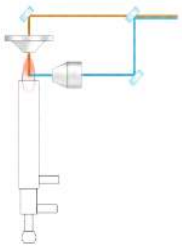
The system has a 27.12 MHz Solid State, maintenance free, water cooled RF generator with a power output of 500-1600 Watts, reacts rapidly to changes in the load and provides a stable and consistent power supply into the plasma. The coupling efficiency of the ICP5000DV is better than 75%. The 'Free Running Design' of the RF Generator allows for extremely fast matching when the load changes thus allowing the customer to analyse the most complex and challenging matrices. The ICP5000DV has a computer controlled forward power range of 500 - 1600 Watts with real time automatic tuning and stability better than 0.1%. The plasma ignition and generator output is fully monitored and controlled via the ICP-Win Software.

All of the configurations of the ICP5000DV feature a vertical torch allowing the chemist to measure the most challenging samples, from high matrix to volatile organic solvents. The vertical torch and solid state RF Generator allow uncompromised, robust measurements on tough samples with less cleaning, less downtime and less replacement torches.

### Collection Optics for the THREE Optical Views Axial, Radial and Dual View.



Dual View Optical Path



Axial and Radial Viewing Positions

### Optical System.

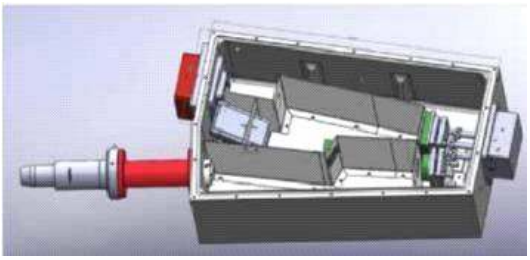
The purged Optical System with a 0.4m Focal Length offers a wavelength range of 165-870nm, using an Echelle Grating providing the FULL Spectrum in a compact area on a single CCD Detector (Charged Coupled Device) from a single entrance slit. The detector is mounted on a triple stage Peltier cooling system which is cooled and maintained at approximately -40°C to ensure the lowest possible dark current and noise. For the fastest analysis and lowest possible gas consumption the instrument combines the spectrum of both the axial and radial views simultaneously.

A wide range of torches, sample intake and other accessories covers the analytical requirements of any Laboratory

## Pre-Optical Path

The pre-optics feature computer controlled high precision axial and radial plasma views which are purged to allow low wavelength analysis down to 160nm. The sealed pre-optical design offers reduced interference and maximized linear range.

## Optical System

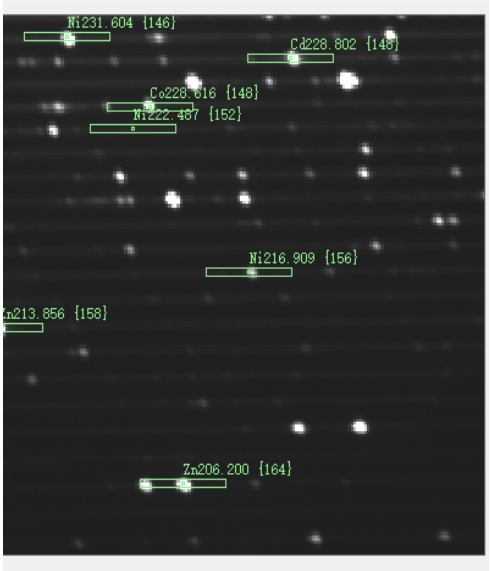


Optical System of ICP5000

The Purged Spectrometer in the ICP5000DV has a focal length of 0.4m and a spectral wavelength range of 165 - 870nm. Because the Spectrometer is purged with either argon or nitrogen there is NO requirement for either vacuum or air pumps. This means that the system will also work very reliably at high altitudes of over 3500 metres above sea level. The Spectrometer has an Echelle Polychromator, WITHOUT any moving parts to ensure the lowest detection limits and maximum stability. The primary optics consist of one grating and one Prism, which acts as a Cross Dispersion Device allowing the simultaneous display of all spectral lines in a single exposure and the analysis of the complete spectrum in a compact area . The Echelle Grating, a coarsely ruled grating with approximately 50 grooves/mm, measures the wavelengths and a prism stacks the wavelengths in orders. Thus producing the complete spectrum in a very small area. This is shone directly on to a CCD where the intensity of the pixels are measured.

## An example of the Echelle Spectrum via the ICP5000DV Software

This Picture shows the Echelle Spectrum that would be focused on to the CCD. The wavelengths are shown in nm e.g. Ni216.909. The distance between the orders is the dispersion and these lines can very clearly be seen in the




This Picture shows the Echelle Spectrum that would be focused on to the CCD. The wavelengths are shown in nm e.g. Ni216.909. The distance between the orders is the dispersion and these lines can very clearly be seen in the picture.

In the software it is possible to chose whether the customer wants to view the Radial or Axial View. Indeed the options available are:

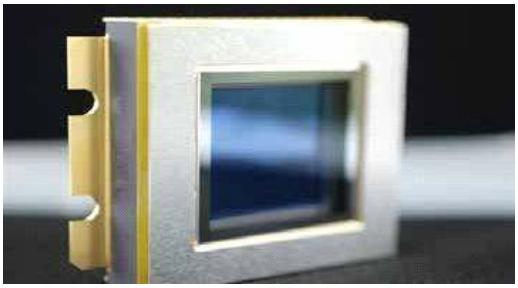
- Radial Only
- Axial Only
- Both Radial and Axial simultaneously.

These parameters can be set in the methods directly from the software

The Optical System is thermally stabilized at 38°C and purged with either Nitrogen or Argon to allow for the analysis of elements in the far UV.

The polychromator in combination with the detector continuously & simultaneously fully covers the entire wavelength range from 160nm to 870 nm
The optical system has a stability less than 1% RSD for more than 8 hours of operation, without the use of an internal standard or any type of drift correction.
The system has resolution ability <0.0070 nm for As at 188.980nm.

## CCD Detection System



CCD Detector

The CCD (Charged Coupled Device) with 1024x1024 Pixels, (Pixel Size 24µm x 24µm) is a high speed detector with anti-blooming protection on every pixel has a zero gas consumption design and has a low warm up time. It is designed for true simultaneous coverage of the full wavelength range from the far UV to the Visible region of the spectrum (160nm to 870nm). The high speed acquisition system provides for simultaneous Full-Spectrum reading and real-time single pixel sub-array monitoring, allowing very fast analysis

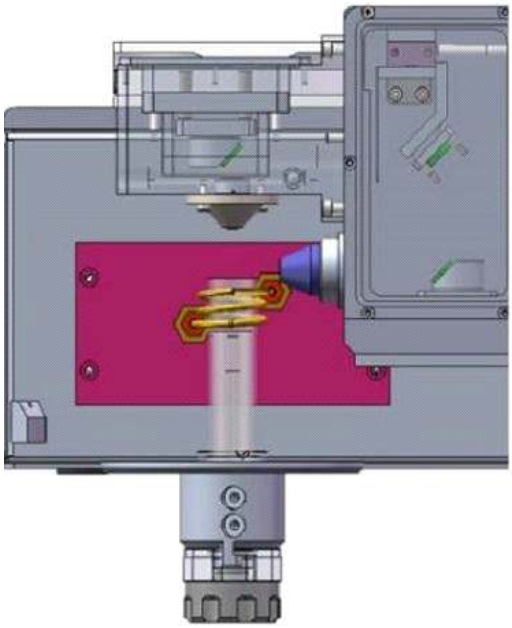
The detector is electrically cooled down to -40°C region with a Triple Stage Peltier system, for superior and fast cooling providing lower dark current and noise. All pixels of the CCD feature Anti-Blooming Protection (ABP) for improved resolution and separation of simultaneous analytical peaks.

## Gas Controls

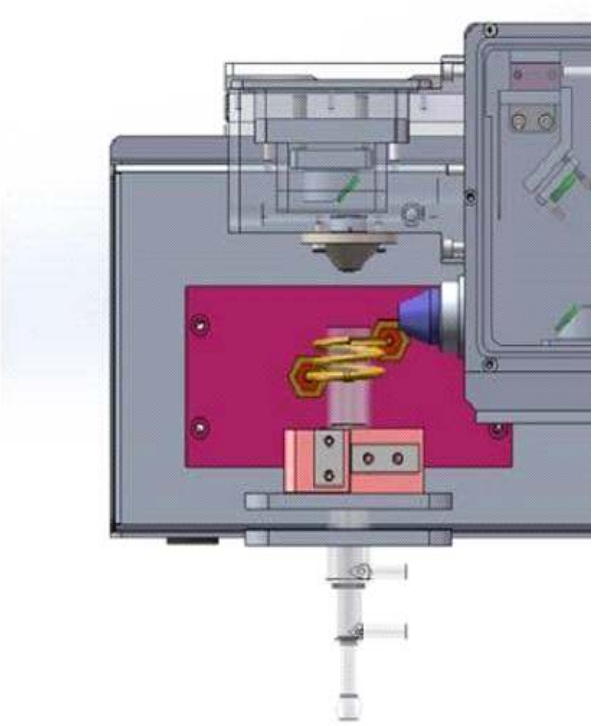
- All plasma related gas flows are computer controlled, using high precision Mass Flow Controllers:
- Plasma gas 8-20 L/min in 0.1 L/min increments, default setting 12 L/min
- Auxiliary gas 0-2.0 L/min in 0.01 L/min increments, default setting 1.0 L/min
- Nebulizer gas 0-1.5 L/min in 0.01 L/min increments, default setting 0.7 L/min
- Make up gas 0-2.0 L/min in 0.01 L/min increments (used for optional accessories)
- Option gas (argon/oxygen blend), added as percent of auxiliary gas (0-2.0 L/min) via software (used for some organic solvent applications)
- An Argon Purifier is built in to the instrument as standard.

## Sample Introduction System

A Demountable Torch OR a Standard Torch, cyclonic spray chamber and a concentric glass nebulizer are supplied as standard with the Instrument.



ICP5000DV with Demountable Torch



ICP5000DV with Standard Torch

## The Components of the Demountable Torch for the 5000DV


**STANDARD CONFIGERATION FOR DEMOUNTABLE TORCH FOR MOST APPLICATIONS**


**STANDARD CONFIGERATION FOR DEMOUNTABLE TORCH FOR MOST APPLICATIONS**

Additional sample intake systems are available for :
a. Samples containing hydrogen fluoride
b. Organic samples (lubricants, etc.)
c. Samples with high concentration of salts (such as sea-water)

The Argon Humidifier is available.
The Wind Tunnel for the Auto-sampler is available.

## Maximizing Up-Time – Elegra Argon Humidifier

- Compact, cost-effective design.
- No heating or electric power required.
- Non-pressurized water reservoir.
- An easy-to-use bypass switch allows you to take the Elegra off-line without disconnecting argon lines. (Not available with Elegra Dual)
- Highly efficient membrane humidification technology.
- Improved signal stability for samples with high TDS.
- Simple to use and maintain.
- Facilitates long, uninterrupted run times.
- Inert metal-free construction eliminates possibility of contamination.
- Rugged and durable polymer casing.
- Maximum and minimum fill marks ensure that you are always operating under optimum conditions.
- Compatible with all ICP-OES and ICP-MS models. Direct connection to argon outlet provided for most models.
- Two-channel configuration available for ICP-MS instruments using auxiliary argon.


## DC Nebulizer

The DC (Direct Connection) nebulizer has a UniFit sample connector which slides easily over the sample arm and an argon connector configured to connect directly to your ICP.

DC Nebulizer Benefits:

- Inert metal-free argon connector.
- Instrument-specific Direct Connect flexible argon line.
- Reliable ratchet fitting ensures leak-free gas connection.

In addition to these unique benefits, the DC nebulizer shares the following benefits with the U-Series nebulizer:

- Resists blockage: The sample channel is uniform from the entry point to the tip, so there is nowhere for particulates to be trapped.
- Fast washout: Since there is nowhere for sample to be trapped, the fastest possible washout and highest sample throughput is achieved.
- Simple to use: Our proprietary UniFit connector slides easily over the sample arm and creates an excellent seal.
- Full length VitriCone construction

## SeaSpray Nebulizer High Performance and Tolerance

- Material: Borosilicate glass
- High physical reproducibility ~ 1%
- TDS tolerance, typically up to 20%
- Tolerance to particulates, typically up to 75µm
- Low RSD's due to highly accurate construction
- Standard available uptake: 2.0 and 0.4mL/min (1mL/min uptake available on request)

## Conikal Nebulizer The Industry Standard for ICP-OES

- Material: Borosilicate glass
- High physical reproducibility ~ 1%
- TDS tolerance, typically up to 5%
- Tolerance to particulates, typically up to 75µm
- Low RSD's due to highly accurate construction
- Standard available uptake: 1 & 2mL/min

The nebulizers, spray chambers and torches are manufactured by Glass Expansion. These products are used by ALMOST every manufacturer including Perkin Elmer, Thermo, Agilent, Shimadzu etc.

The system does use a plasma cold area (tail) removal technique from the optical monitoring area.

The system includes a nebulizer chamber and a nebulizer suitable for analyses of samples with high concentration of total dissolved solids (e.g. seawater). (see above we use the SeaSpray).

Other types of sample input systems are available to be selected and used by the operator.

## DuraMist Nebulizer Routine High Precision for HF Samples and High Salt Samples

- Material: HF Resistant PEEK
- High physical reproducibility ~ 2%
- Tolerance to particulates, up to 75µm depending on uptake
- TDS tolerance, typically up to 30%
- Low RSD's due to concentric geometry
- Uses only standard ICP argon supply pressures
- Standard 6mm size fits standard cyclonic spray chambers. Adaptors are available for Scott type spray chambers
- Standard available uptakes: 0.4 and 1.0 mL/min

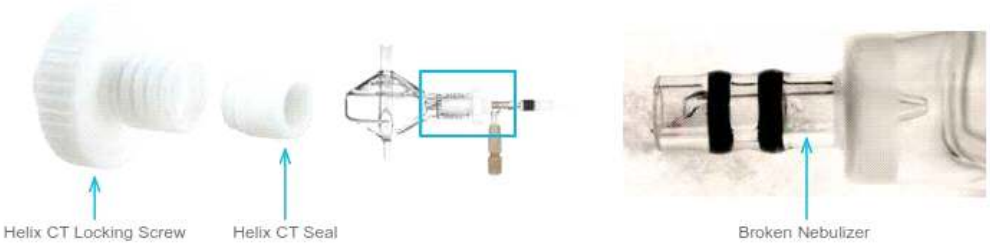
## Ceramic VeeSpray Nebulizer Ideal for dirty samples

- Material: 99.8% Alumina Ceramic
- High physical reproducibility ~ 1%
- TDS tolerance, typically up to 30%
- High tolerance to particulates, typically up to 300µm
- Must be pumped – does not self aspirate
- Design uptake range: 0.6 – 3mL/min. Operates best between 1.5 and 2.5mL/min

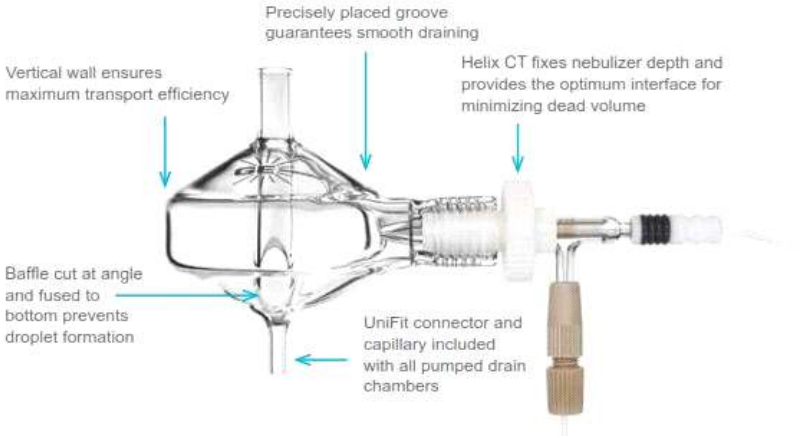
The construction of the spray system ensures fast and simple disconnection and reconnection for cleaning and maintenance, as well as for the installation of other intake systems.

## Exclusive Helix CT interface between nebulizer and spray chamber

- New Helix CT locking screw with ConstanTorque technology
- PTFE ferrule seals spray chamber
- Solution contacts only PTFE and glass
- Standard for all spray chambers
- Prevents pooling at nebulizer port reducing carryover




## Glass Spray Chamber Detail




The ignition and the extinction of the plasma is done by the computer, fully automatically.
The sample introduction system is via a multi-channel (5 Channel) 12 roller peristaltic pump, with adjustable speed fully controlled by the PC.

Two additional Gas input lines are available on the ICP5000DV. These could be used for example as an oxygen feed for the plasma to remove surplus carbon in the analysis of some organics.

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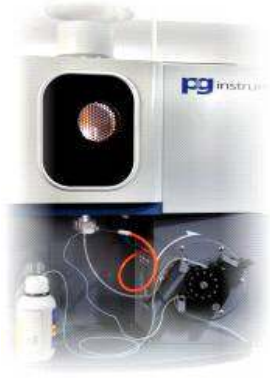
|  |  |
| Sample introduction system & observation window | 5 Channel - 12 roller peristaltic pump |

An Automatic Sampler is available.

**Automatic sampler** with up to 360 sample positions.

Sample covers can be provided if required to prevent sample contamination. We can provide the following configuration for samples Random Access X-Y-Z Auto-sampler that is designed to be sturdy and reliable. The system provides the automated analysis for up to 360 samples and 10 standards, with analysis volumes of 8ml (360 samples), 15ml (240 samples), 20ml (160 samples), 30ml (96 samples MOST COMMON CONFIGURATION) and 50ml (84 samples).

A Rinse station is also provided. Interface and software is included for ICP5000. The ICP-Win software fully controls all features of the auto-sampler and also contains a diagnostic program to fully test the complete operation of the auto-sampler.

## Options

High Performance Liquid Dilution System
Rapid Sample Introduction System
Integrated Clean Enclosure

## Autosampler Enclosures

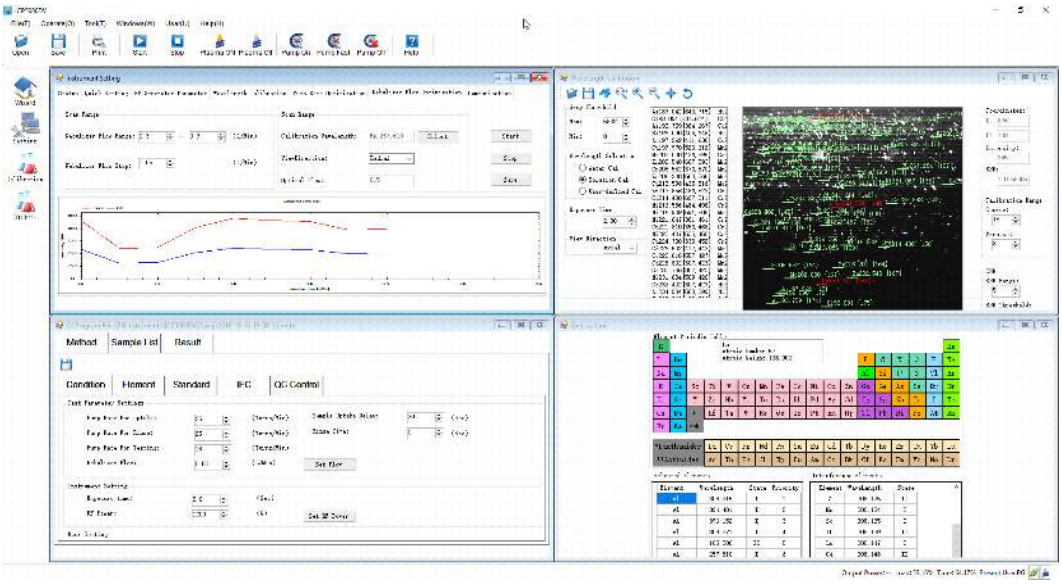
- Protects Samples against airborne contaminants
- Protects the user against acid fumes and odours
- Made of translucent shatter proof Polycarbonate
- Easy access through front and rear “roll up doors”
- Optional fan maintains positive pressure
- Optional HEPA Filter
- Optional exhaust port fan
- Optional solid polyethylene base.
- Multiple ports for tubing and power cables.

The above parts are available for use with the ICP5000DV

## Flow Control System

All gas flows (plasma, nebulizer, auxiliary) used in the system are accurately controlled by the computer via installed Mass Flow Controllers

The ICP5000DV can use ALL of the nebulisers which have a very wide range of argon control features these are operated directly from the software. (see picture below, top left, shows the optimisation of the gas flows for the nebuliser). The correct flow rates and pressures for each nebulisers can be set directly by the software.



The flow range of the nebulizer is 0-1.5 l/min per 0.01 l/ min or better.
The plasma flow regulation range is 8-17.0 l/min per 0.1 l/min or better.
The range of auxiliary flow setting is 0-2.0 l/min per 0.01 L/minor better.
The system is designed to accept up to two extra gas intakes, one is Oxygen, the other can be used for an optional Nitrogen purge of the spectrometer.

### Computer

The system is delivered with a Branded PC with the following or better characteristics:

- Processor of the latest type available in the market at the time of the delivery to the laboratory – I3
- RAM 16GB
- 120Gb SATA-3 2.5in SSD
- External HD ≥1TB
- DVD RW
- 23.6" LED Widescreen Multimedia
- Keyboard & mouse
- Four (4) USB outputs
- Microsoft Windows 10 Professional Operating System and pre=loaded with ICP-Win Software
- 1 x Brother HL3140 Colour Laser Printer
- 1 x 8 Port Gigabit Switch
- CAT5E 3M Booted Patch

The computer has two-way communication with the entire system and connection to the accessories (keyboard, Mouse, printers)

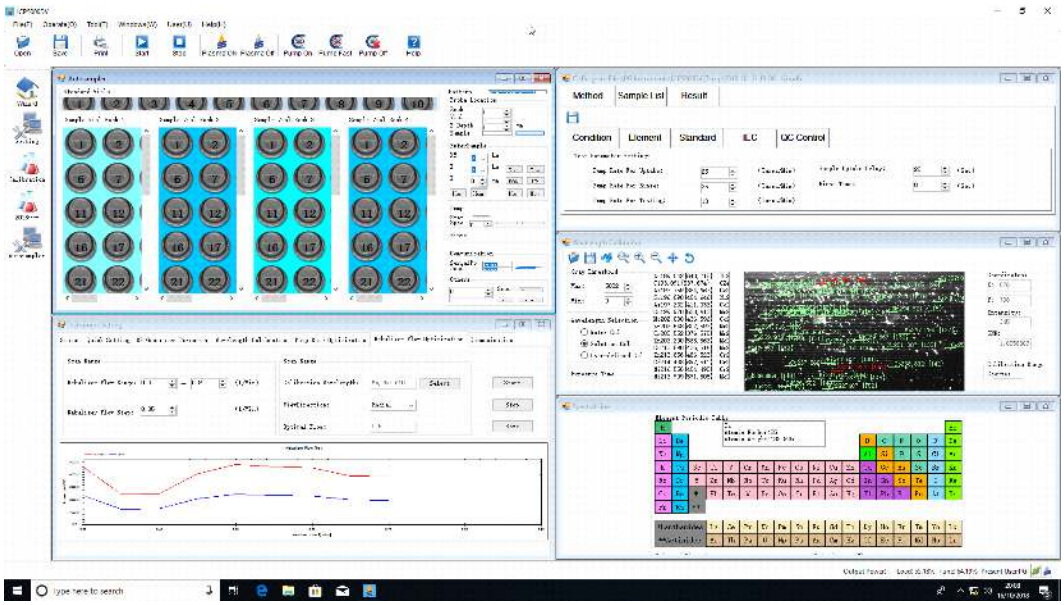
### Analysis Software

The ICP5000DV is fully computer controlled via user friendly ICP-Win Software. The multi– window and multi-method analysis program enables fast simultaneous measurements. The software has a built-in library of over 70,000 spectral lines showing inter-element corrections (IEC's) and interferences.

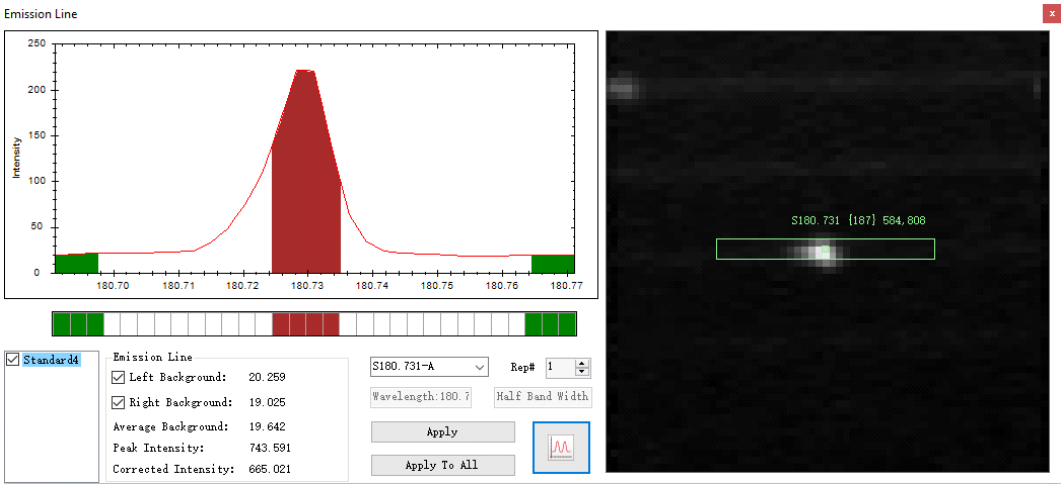
Visual Background correction points are shown. The software allows the display of complete "Spectrograms" showing automatically and manually calibrated spectral lines

## Software Capabilities

- Multi–window and multi-method analysis program for fast simultaneous measurements.
- Built-in library of over 70,000 spectral lines showing inter-element corrections (IEC's) and interferences.
- Display of Visual Background correction points
- Display of complete "Spectrograms" showing automatically and manually calibrated spectral lines
- Pre-stored methods.
- Full control of the whole system (gas flows, axial or radial plasma view, plasma ignition and shut-down, plasma stability, water flow, safety system, full function monitoring) and automatic sampling. The picture below directly from the software shows the following:
- Top Left is the Auto-Sampler Set up.
- Bottom Left is the optimisation of gas flows for the nebuliser which also shows the selection of the view whether it be Radial or Axial.



Background correction positions can be selected by the user ORr removed automatically via the software, to achieve correction with optimal accuracy and repeatability (see picture below)




- Calibration procedures, with external polynomial standards and with standard additions.
- Quality control program in accordance with the user's choices and current international requirements.
- Presentation of the calibration curves and the peaks of all the analyzed items at the same time.
- HELP and SERVICE DIAGNOSTICS systems.

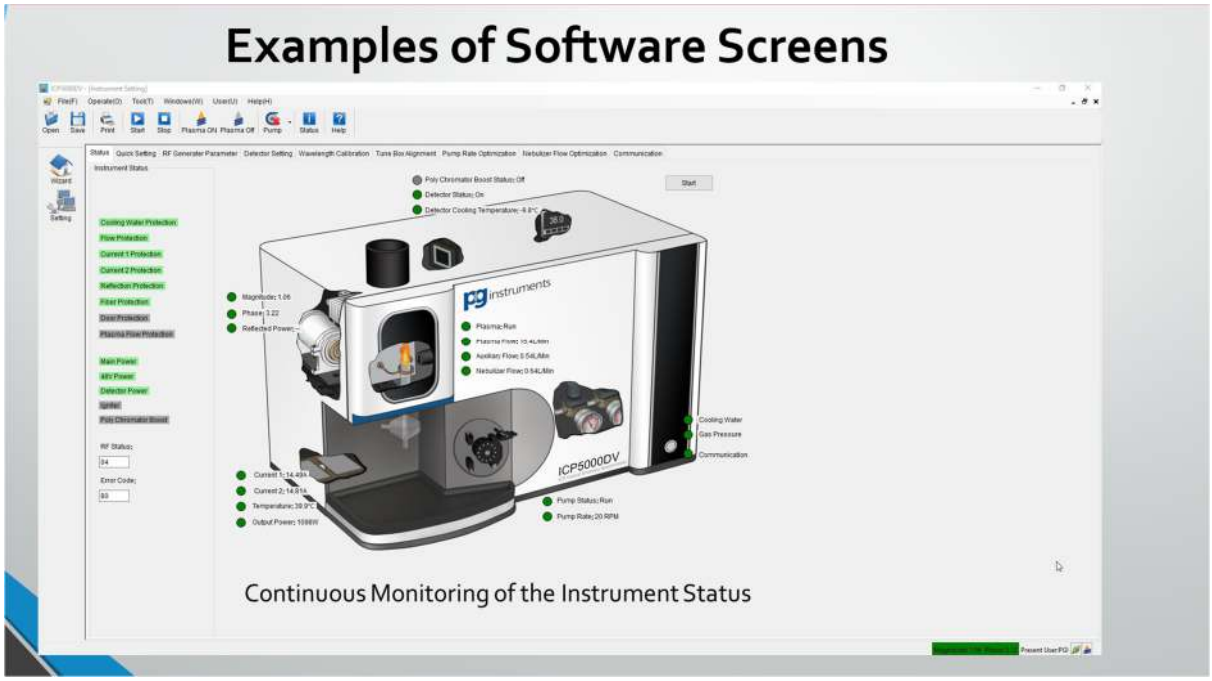
- Simultaneous reading of Background and Emission data.
- Semi-quantitative analysis capability of unknown samples.
- Full control of all peripheral units and components (such as Hydride Generator, Autosampler, etc.)
- Upgrades of Software are available periodically and supplied to users **FREE OF CHARGE**..

## Specifications

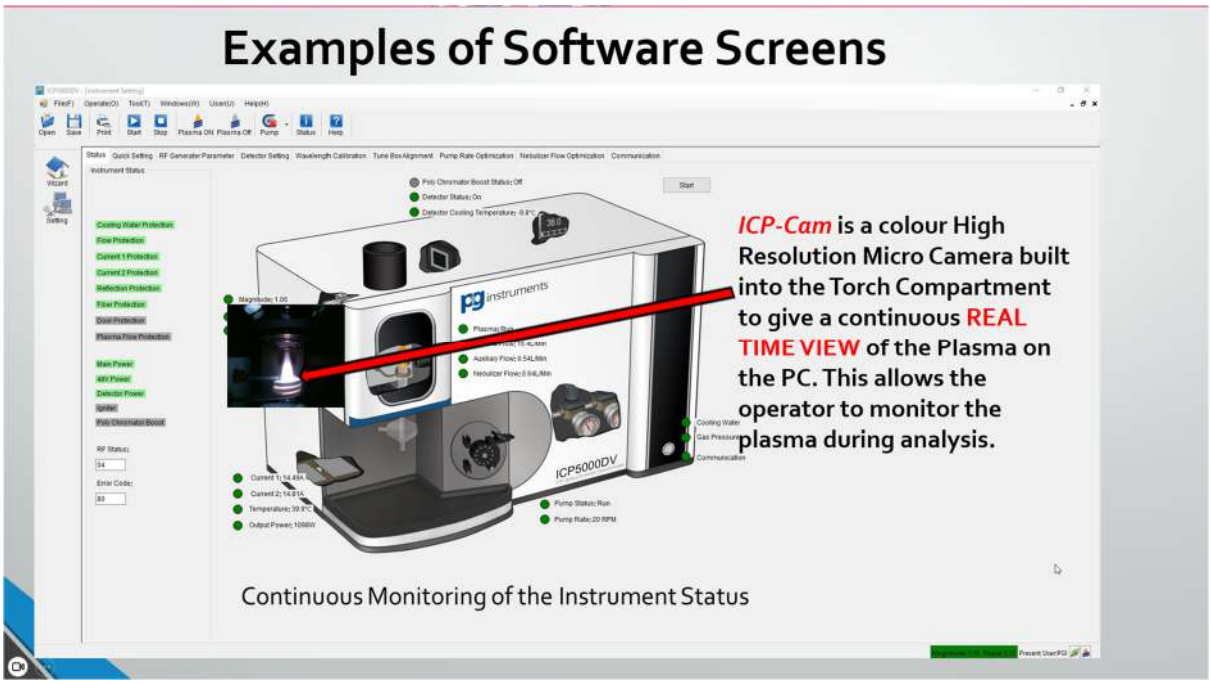
| | |
|---|---|
| ***RF Generator*** | |
| ***Generator*** | *Solid State (low voltage), low maintenance.* |
| ***RF Frequency*** | *27.12MHz* |
| ***Output Power Range*** | *500 – 1600 Watts* |
| ***Output Power Control*** | *Automatic* |
| ***Output power steps.*** | *10W max, PC adjustable* |
| ***Output Power (RF) Stability*** | *<0.1%* |
| *Power Adjustment Time* | *Time to adjust power to sample impedance change is dependent on the sample. Matrix. For example it will take longer for the matching network to adjust for sea waters to 30% Brine solutions. Typically the impedance change is controlled in under 1 second.* |
| ***Plasma Power Efficiency*** | better than 75% |
| ***RF Coil Cooling*** | *Water recirculation chiller* |
| ***Plasma Coil cooling*** | *Water recirculation chiller* |
| ***Optical System*** | |
| ***Grating*** | *Echelle Grating approx. 50 grooves/mm* |
| ***Prism*** | *Cross Dispersion Device* |
| ***Focal Length*** | *400mm* |
| ***Temperature Control*** | *Stabilised at 38˚C – **Fast Warm Up Time** typically ready for analysis from cold in10-15 minutes.* |
| ***Detector*** | *CCD (Charged Coupled Device)* |
| ***Pixel Size*** | *24µm x 24µm* |
| ***Detector Pixels*** | *1024 x 1024 pixels* |
| ***Protection*** | *Anti-Blooming* |
| ***Detector Cooling*** | *Triple Peltier Device* |
| ***Wavelength Range*** | *160nm - 870nm* |
| ***Resolution*** | *0.006nm @200nm* |
| ***Purge*** | *Spectrometer and optical path with Argon (Nitrogen can also be used)* |
| ***Optical View*** | *Radial and Axial* simultaneously |
| ***Optical Height*** | *Adjustable via Software* |
| ***Sample Introduction*** | |
| ***Torches*** | *Demountable Self Aligning Totch is supplies as Standard* |
| ***Spray Chambers*** | *Cyclonic Glass (standard)* |
| | *Programmable Temperature Controlled (Optional)* |
| ***Nebulizers*** | *Glass Concentric (standard)* |
| | *Quartz Concentric (optional)* |
| | *V-Groove (optional)* |
| | *HF resistant (optional)* |
| | *Sea Spray (optional) and for high dissolved solids content.* |
| ***Sample Intake*** | *5 Channel system 12 Roller Peristaltic Pump (optional)* |
| ***Sample Intake*** | *Hydride generation system, Continuous Flow (optional)* |
| ***HF resistant*** | *Optional* |
| ***Auto-Sampler Samples Standards*** | *Random Access XYZ type. Software PC control. Interface included-*<br>*Up to 360 x 8 mL, 240 x 15 mL, 160 x 20 mL, 96 x 30 mL, 84 x 50 mL 10* |
| • ***Rinse station*** | *Standard* |
| • ***Dilution System*** | *Optional* |

| | |
|---|---|
| **Computer** | |
| **Operating System** | Windows 10 Professional |
| **Operation Control** | |
| The system has full control, of the while system, keeping track of and constantly monitoring:<br><br>The system is constantly monitoring the RF Power, forward and reflected, Gas Flows and Pressures, Safety System (see Picture below) | Flow of cooling water<br>Closing of the door and sample chamber<br>Plasma stability<br>Gas pressures<br>Gas flows<br>Axial or radial plasma view<br>Plasma ignition and shut-down<br>Safety system<br>Full function monitoring<br>Automatic sampling |
| **Software** | |
| Operating Software | ICP-Win Software |
| Element Library | >50000 Spectral Lines showing inter-element corrections (IEC's) and interferences. |
| Element Corrections | IEC (inter-element corrections) and Background Corrections |
| Software Capabilities | • Multi–window and multi-method analysis program for fast simultaneous measurements.<br>• Built-in library of over 50,000 spectral lines<br>• Display of Visual Background correction points<br>• Display of complete "Spectrograms" showing automatically and manually calibrated spectral lines<br>• Permission of Management<br>• Password Change<br>• Check of instrument status<br>It includes RF power, cooling water pressure, Ar storage pressure, cooling gas, auxiliary gas, carrier gas and the peristaltic pump operation condition<br>• Instrument Parameter Settings<br>• Settings of Detector<br>• Automatic Wavelength Calibration<br>• Manual wavelength calibration<br>• Torch Collimation<br>• Pump Speed Optimization<br>• Carrier gas optimization<br>• Creating a test<br>• Creating a new test<br>• Copy of a Stored Analysis Method<br>• Analysis and Data Processing<br>• Sample Analysis<br>• Background Matting & Peak Position Setting<br>• Recalculation of Results<br>• Editing of Calibration Curve<br>• Results Print and Data Export<br>• Pre-stored methods.<br>• Full control of the whole system (gas flows, axial or radial plasma view, plasma ignition and shut-down, plasma stability, water flow, safety system, full function monitoring) and automatic sampling.<br>• Background correction either by the user or automatically, to achieve correction with optimal accuracy and repeatability<br>• Calibration procedures, with external polynomial standards and with standard additions.<br>• Quality control program in accordance with the user's choices and current international requirements.<br>• Presentation of the calibration curves and the peaks of all the analyzed items at the same time.<br>• HELP and SERVICE DIAGNOSTICS systems.<br>• Simultaneous reading of Background and Emission data.<br>• Semi-quantitative analysis capability of unknown samples.<br>• Fully control of all peripheral units and components (such as Hydride Generator, Autosampler, etc.)<br>• Upgradability free of charge. |
| **Size and weight** | |
| **Dimensions** | 106(W) x 67(L) x 75(H)cm (ICP5000DV only) |
| **Weight** | 180Kg |

| ***Installation Requirements*** | |
|---|---|
| *Room Dimensions (LxDxH)* | *3m x 3m x 2.7m (recommended)* |
| *Room Temperature* | *20$^{o}$C (recommended)* |
| *Water supply from chiller* | *2.0L/min, 2bar* |
| *Mains Voltage* | *120-240V, 50-60Hz, Single Phase, 25A* |
| *Voltage Stabilizer* | *Included at NO charge with a NEW Instrument* |
| *UPS* | *Optional **A UPS unit** that will ensure uninterrupted operation of the system for at least 15 minutes in the event of power failure.* |
| *Fume extractor capacity* | *>400m3/h System is optional can be supplied by PG Instruments Limited* |
| | |
| ***Other Accessories*** | |
| *Qualification Kit.* | *Supplied as Standard with **NEW** Instrument. **FREE OF CHARGE*** |
| *Water Purifier System* | *Optional* |
| *Water Chiller-(Circulator)* | *Supplied as Standard with **NEW** Instrument. **FREE OF CHARGE*** |
| *Voltage Stabiliser* | *Supplied as Standard with **NEW** Instrument. **FREE OF CHARGE*** |
| *Plasma Video Cam* | *a colour High Resolution micro camera built into the torch compartment to give a continuous **SAFE** view of the Plasma on the PC Screen. This allows the operator to monitor the plasma during analysis. Supplied as Standard with **NEW** Instrument. **FREE OF CHARGE.*** |
| *Additional Oxygen Line* | ***Gas control module for oxygen** addition with Two Ports, one for Argon and one for Argon/Oxygen is included. The use of oxygen for organic samples eliminates the build up of carbon in the torch and decreases the RSD for the analysis of **Oils, Bio-Diesels, Hydro-Carbons, Organics etc.** Supplied as Standard with **NEW** Instrument. **FREE OF CHARGE.*** |




**THE ABOVE PICTURE SHOWS THE MONITORING SYSTEM WITHIN THE SOFTWARE** for gas flows, CCD Temperature, Cooling System, RF Power, forward and reflected, humidity, temperature of the system etc.




**THE ABOVE PICTURE SHOWS THE MONITORING SYSTEM WITHIN THE SOFTWARE** with the ICP-Cam continuing monitoring the Plasma

## Accessories

*Random Access Auto-sampler*

- *Rinse station*
- *Dilution System*

*Continuous Flow Hydride system*

*Nebulizers*

- *Quartz Concentric*
- *V-Groove*
- *HF resistant*

*Programmable Temperature Controlled Spray Chamber*

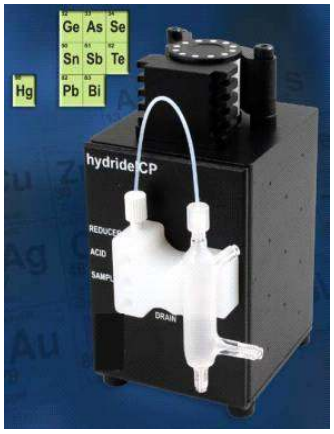
*Sample Introduction – HF Acid resistant available on request.*

*Voltage Stabilizer*

*Qualification Kit.*

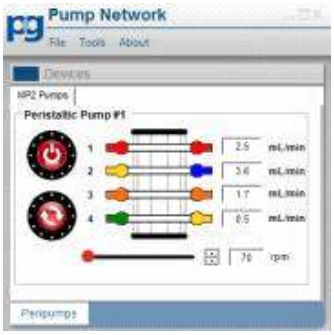
*Water Purifier System*

# Hydride Generator for ICP5000DV




**A Compact Hydride Generation System for ICP**

**with Improved Stability and Performance**




## Product Description

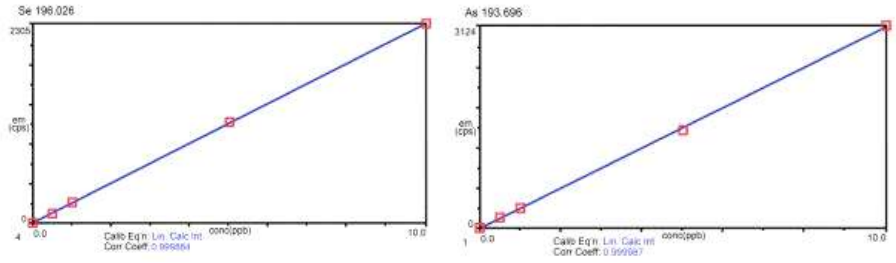
PG Instruments new hydride generation system with integrated precision micro peristaltic pump, improves ICP detection limits for hydride-forming elements such as As, Se, and Sb.

Sub-ppb levels of such elements are often difficult to detect with ICP, but the PG Instruments Hydride Generator converts hydride-forming elements to gas, increasing signal intensity.

In a low-volume quartz gas-liquid separator the elemental hydrides are separated from liquid waste then carried to the ICP injector.

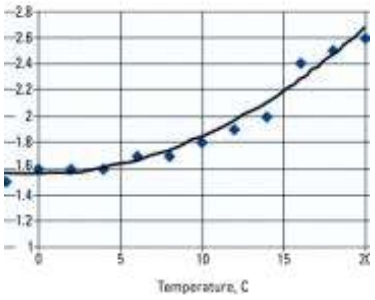
The system can increase ICP sensitivity by an order of magnitude or more over a nebulizer-only system.

The hydride generator is available with 4 or 6 channels. The 4-channel version is for basic hydride formation, and the 6-channel version allows the user to add an internal standard, such as Bi.




The above shows calibration data obtained with the ICP5000 for Selenium and Arsenic (0 – 10ppb) using the PG Instruments Hydride generator system. Software controlled peristaltic pump speed, to be able to repeat flow conditions exactly and precisely, obtaining precise and accurate results.

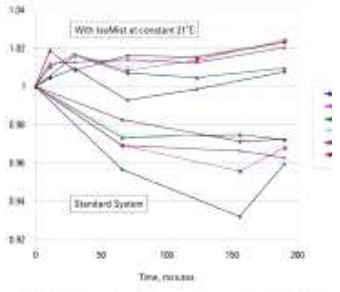
# IsoMist Temperature Controlled Spray Chamber



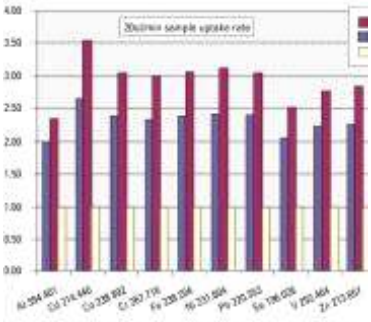

ffect of IsoMist Temperature on ICP-MS Oxide

| | Conc, ug/L | Conc, ug/L |
|---|---|---|
| | 57 | 55 |
| | 31 | 32 |
| | 35 | 33 |
| | 24 | 23 |
| n | 11 | 12 |
| | 589 | 517 |
| | 451 | 424 |
| | 216 | 213 |
| | 22 | 22 |
| | 107 | 104 |

2. Reproducibility results for undiluted naphtha a
rements at 90 minute interval).




re 3. Effect of constant temperature on signal stability.



gure 4. Effect of spray chamber temperature on sensitivi

The Programmable Temperature Spray Chamber, provides the benefits of a temperature-controlled ICP sample introduction system in a compact convenient package.

**Product Description**

The temperature is electronically controlled using a powerful inbuilt Peltier device. the user can select any temperature between -10°C in 1°C increments to provide the optimum conditions for any application. The rapid response of the Peltier device allows a spray chamber temperature of -5°C to be reached within 15 minutes. Once set the temperature is maintained to within 0.1°C.

**Versatile Computer Interface**

For maximum convenience the IsoMist can be controlled from an ICP software Window via a Bluetooth wireless interface or a standard USB network connection. The spray chamber temperature can be monitored through a temperature versus time plot on your ICP software screen. For regulatory compliance, the temperature versus time data file can be saved with analytical data.

**Reduced Oxide Interferences in ICP-OES.**
By introducing the sample at a lower temperature, the IsoMist reduces oxides resulting in fewer interferences and improved detection limits.

**Designed specifically for Volatile Organics**
The temperature can be set as low as -10°C to reduce the solvent load on the plasma and allow the straightforward ICP-OES Analysis of even the most volatile organic solvents such as undiluted naphtha.

**Constant Temperature Improves Stability**
By holding the spray chamber at a constant temperature, the IsoMist significantly improves long-term signal stability, increasing the likelihood of calibration checks passing the QC criteria.

**Heating Mode Enhances Performance**
The sensitivity for many analyses is enhanced by running the spray chamber at an elevated temperature, a feature that is very important for samples with limited volume. The heating mode also facilitates the analysis of viscous samples such as engine oils and edible oils

## Universal Fume Extraction

## Designed for Atomic Absorption, ICP, ICP-MS

Complete Fume Extraction system for ANY Make of Atomic Absorption Spectrometer, ICP or ICP-MS Instruments.

PG Instruments Limited manufacture a stainless steel fume extraction system which is suitable for ALL makes of Atomic Absorption Spectrometers, ICP, ICP-MS systems etc. and is currently being offered at a VERY special Price. The extraction system is also FULLY compatible with our AA500 and ICP5000DV system.
PG Instruments Exhaust Venting System is manufactured in the UK from High Quality BRITISH Stainless Steel and Comprises of:

- ONE Extraction fan with polymer coated anti-corrosion protection blades 150mm Diameter, 240 volts, 50/60Hz.
- ONE Stainless steel hood 300mm
- ONE Piece of Duct with an adjustable length
- FOUR Pieces of Ducting length 500mm
- ONE Duct with a length 500mm with damper
- FOUR bends 30 degrees (extra bends available)
- ONE Duct horizontal discharge 500mm
- ONE Pair of fan mounting brackets
- ONE Rivet tool
- FOUR Adjustable support brackets
- FULL fitting instructions

**A venting system for ICP-OES is required to remove the heat and the vapours**

Exhaust venting is important for a number of reasons:

- Will protect laboratory personnel from toxic vapours which may be produced by some samples.
- Will help to remove the effects of room drafts and the laboratory atmosphere on plasma stability.
- Will help to protect the instrument from corrosive vapours which may originate from the samples.
- Will remove dissipated heat which is produced by the plasma .

The venting system provides a flow rate of approximately 7000-8500 L/min.

The Fume Extraction System comes in an easy to assemble kit with detailed instructions.

## Water Purifier (WP750 Series)

The 750 Water Purifier System will supply High Purity Water suitable for use with Atomic Absorption, ICP, ICP-MS, HPLC as well as Cell Cultures.

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