

## Analytical solutions for environmental science



**Scientific Instrumentation**  
Australia & New Zealand

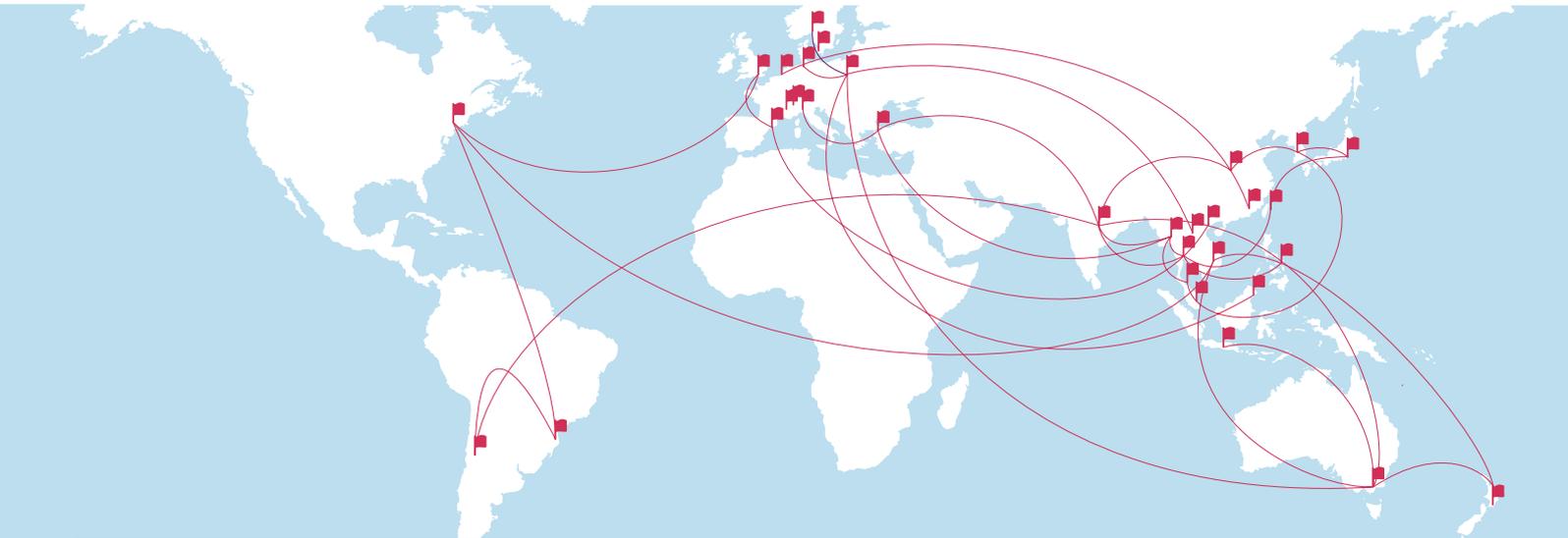
# Our profile

DKSH is the leading Market Expansion Services provider worldwide, with a focus on Asia. As the term “Market Expansion Services” suggests, DKSH helps other companies and brands to grow their business in new or existing markets. DKSH has been doing business in Asia for almost 150 years and has built a unique distribution network which is part of regional and local infrastructure communities. We bring together Eastern

and Western approaches to business for the benefit of clients and customers. In short, we combine the Swiss reliability with the Asian can-do attitude.

With head offices in Zurich, Switzerland, we conduct sourcing, marketing, distribution, sales, support and service with over 30,320 specialised staff in 36 countries through a comprehensive network of 735 business locations around the world.

In Australia and New Zealand, the Research Business Line supplies a wide range of laboratory instruments, scientific equipment, life science products and consumables, to laboratories in the government, research, university, contract analysis and industrial sectors. We also provide applications support and service across all sectors.



- Net Sales: CHF 10.5 billion 
- 30,320 specialised staff of 65 nationalities 
- Operations in 36 countries 
- 735 business locations around the World 
- 5 business locations in Australia and 2 in New Zealand 
- Network of more than 4,000 suppliers and over 500,000 customers 
- Over 150 state-of-the-art distribution centers 
- Largest SAP application in Asia 

**“DKSH Australia and New Zealand - providing technical solutions for environmental laboratories”**

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## Elemental analysis overview

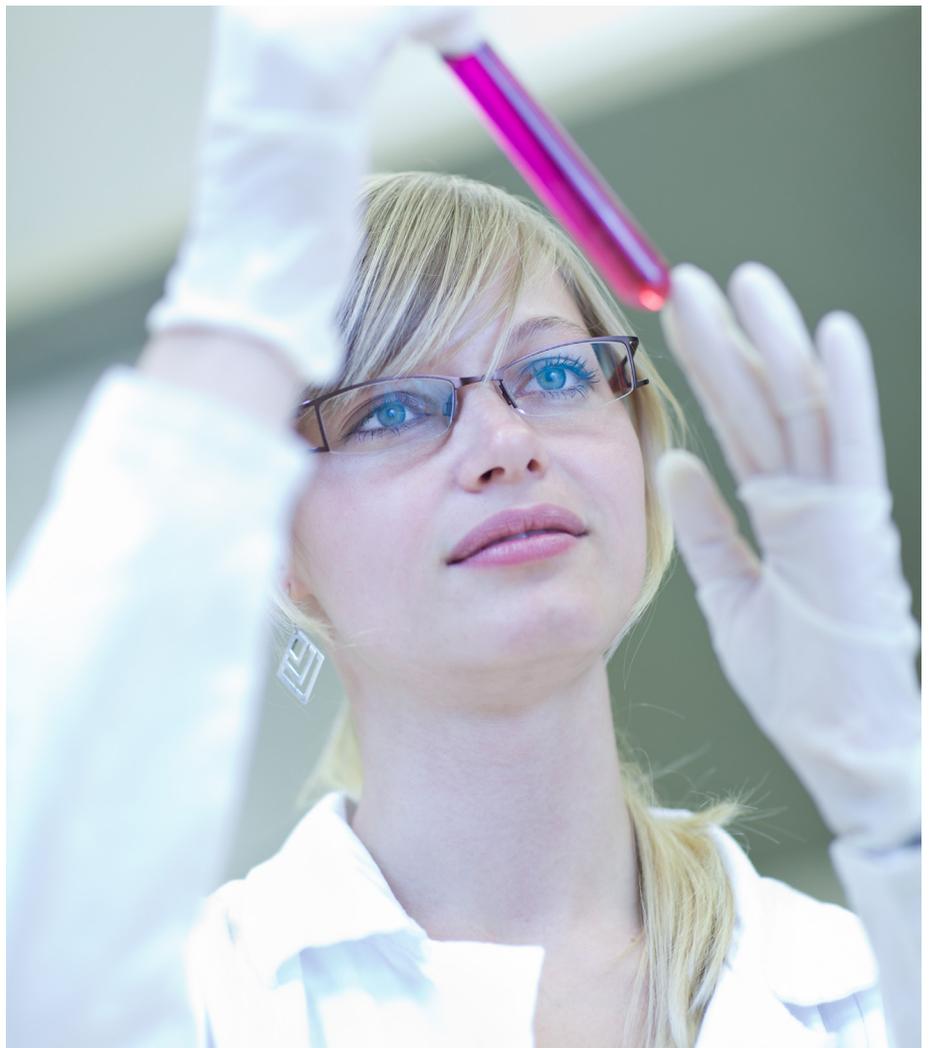
The impact of environmental issues on our surroundings and health still remains as one of the key topics in society. Organisations are constantly faced with new Government policies and regulations that result in monitoring and reducing emissions as well as requirements to change processes that will result in a safer and cleaner future.

There are several focus areas where environmental analysis is applied and managed.

- Environmental contaminants
- Water quality parameters
- Major anions and cations
- Heavy and trace metals
- Trace organics
- Nutrients

Analysis data and information can be used to make informative decisions on environmental issues and corrective actions such as:

- Environmental monitoring
- Site assessment and remediation
- Sediment assessment for dredging
- Drinking, catchment, recycled and desalination water monitoring
- Occupational hygiene
- Waste characterisation
- Emission monitoring



# Analytical solutions for field, laboratory and on-line use



## Water

pH	Color	Hardness	Cyanide
Alkalinity	COD	TOC/TN/TIC	Phenol
Acidity	BOD	Oil & Grease	Mercury
Conductivity (EC)	Dissolved Oxygen	Anions	VOCs
Fluoride	TSS	Metals	Pesticide residues
Turbidity	TDS	Nutrients	TKN



## Soil

pH	Cations	Pesticide residues	Moisture analysis
Alkalinity	C, H, N, S, O	Soil carbon	Stability
Acidity	Metals	(organic /inorganic)	Separation
Conductivity (EC)	Nutrients	Acid Sulphate Soils	Degradation
Fluoride	Cyanide	Salinity	Isotope Ratio Mass
TOC/TNb/TIC	Mercury	Particulates	Spectrometry
Anions	VOCs	CO <sub>2</sub> Analysis	



## Air monitoring

Alkanes (C1-C6)	PAH	Compounds	Ammonia
Anions	Particle size	Compositional	Aldehydes
BTEX & S	PCB	Analysis (C1-C8)	Sulphur
Dust fall Light Gases (O <sub>2</sub> , N <sub>2</sub> , CO, CO <sub>2</sub> )	Dioxins/Furans Silica	CO <sub>2</sub> , O <sub>2</sub> , Benzene, H <sub>2</sub> S, N <sub>2</sub>	Mercury
Metals	TVOC	Amines	Carboxylic Acids



## Waste management

COD	Ph Adjustment	Filtration	Waste cost analysis
BOD	Polymer	Water Recovery	Trace/Heavy Metals
TDS	Flocculation	Reduce Operating Cost	

# Our business partners



Multi-parameter, titration, BOD and COD analysis for laboratory and process testing  
[www.mantech-inc.com](http://www.mantech-inc.com)



ICP-OES, ICP- MS, Arc/Spark and XRF analysers. Hand held, mobile and laboratory-based metal analysers.  
[www.spectro.com](http://www.spectro.com)



Purge and Trap, Headspace and Sample Concentration for GC analysis of VOCs in air, water and soils.  
[www.cdsanalytical.com](http://www.cdsanalytical.com)



Flow Injection Analysis for low level nutrient determinations with IC options. Rapid distillation of cyanide, phenols and ammonia using fully disposable technology.  
[www.lachatinstruments.com](http://www.lachatinstruments.com)



Syringe pumps (liquefied gases to tar, flow rates from sub-microliter to 400 ml per minute, and pressures to 20,000 psi (1380 bar) and flash chromatography systems for organic purification, drug discovery, medicinal chemistry and natural product separations.  
[www.isco.com](http://www.isco.com)



Digestion apparatus, Nitrogen determination (Dumas method), rapid distillation systems, rapid extraction systems and CN- determination  
[www.gerhardt.de](http://www.gerhardt.de)



**Dedicated fuel analysers**, including combustion, IC prep and Chlorine/ Sulfur systems. Karl Fischer moisture analysers and automatic titrators.  
[www.dins.jp](http://www.dins.jp)



Consumables and equipment for wet chemistry techniques, including acid digestion, cyanide and phenol distillation, BOD, TSS, oil and grease testing.  
[www.envexp.com](http://www.envexp.com)



Precise measuring systems for the accurate measurement of air and material humidity as well as air temperature and differential pressure  
[www.novasina.com](http://www.novasina.com)



Laboratory stirrers, rockers, shakers, sample concentrators, gelation timers, heating blocks and incubators.  
[www.bibby-scientific.com](http://www.bibby-scientific.com)



Certified reference material for ICP, ICP-MS, IC, atomic absorption, wet chemistry, QC applications and custom standards  
[www.inorganicventures.com](http://www.inorganicventures.com)



**Pipet-Aids**, microdispensers, oocyte injectors and capillary tubing.  
[www.drummondsci.com](http://www.drummondsci.com)



Range of laboratory refrigerators at -20°C freezers 130L to 1325L  
[www.telstar-lifesciences.com](http://www.telstar-lifesciences.com)



Plasticware and general laboratory products.  
[www.jetbiofil.com](http://www.jetbiofil.com)

# Elemental analysis by ICP



## Optical Emission Spectroscopy (OES)

Optical Emission Spectroscopy (OES) is a method of chemical analysis that uses the intensity of light emitted from a flame, plasma, arc or spark at a particular wavelength to determine the quantity of an element in a sample. The wavelength of the atomic spectral line

gives the identity of the element (qualitative analysis) while the intensity of the emitted light is proportional to the number of atoms of the element (quantitative analysis).

For a simplistic approach, there are three stages to analysis by Optical Emission Spectrometry:

- Excitation of the atoms in the sample using a flame, plasma, arc or spark
- Splitting of the light emitted into different wavelengths using a monochromator.
- Measurement of the light intensity and wavelength using a detector.

## Inductively Coupled Plasma (ICP)

Inductively coupled plasma optical emission spectroscopy (ICP-OES) uses inductively coupled plasma (at temperatures of about 7000 K) to produce excited atoms and ions that emit electromagnetic radiation at wavelengths characteristic of particular elements. Advantages of ICP-OES are excellent limit of detection and linear dynamic range, multi-element capability, low chemical interference and a stable

and reproducible signal. Samples are typically solution in order to spray into the instrument.

Key features of all SPECTRO ICP-OES instruments:

- A chiller is NOT required: cooling is facilitated through the patented 'OPI-AIR' Interface that uses the normal plasma exhaust for all cooling needs

- Purged Argon is NOT required for the optics on the BLUE and ARCOS: they both utilise the patented 'UV-PLUS' gas purification system
- All SPECTRO ICP-OES's have the proprietary ICAL system logic which automatically monitors operation of the instrument guaranteeing continuous optimum operating conditions



SPECTRO GENESIS

The SPECTRO GENESIS is the first and only ICP-OES available with a complete set of factory methods - truly "plug & analyse" without needing to first develop a method. These factory methods cover all common environmental and industrial applications, like water, waste water, industrial waste water, soil, sewage sludge, filter dust, wear metals in oil and additives in oil.

Compliant to national and international norms, they are delivered ready for use straight out of the box with an application package that includes the sample introduction system,

sample preparation instructions and method documentation. An extensive package of accessories is available for the SPECTRO GENESIS to further expand its application range.

The SPECTRO GENESIS offers a real economic alternative to sequential ICP and atomic absorption spectrometers, enabling those who are unfamiliar with ICP to profit from the advantages of leading CCD ICP technology and to use a powerful, low cost and user friendly analytical system.

The SPECTROBLUE is an ICP-OES that sets new benchmarks among compact, mid-range spectrometers for simplified operation, low maintenance and affordability.

With a 750 mm focal length Paschen-Runge optical system and 15 linear CCD array detectors, it provides unmatched optical resolution and sensitivity. The unique full-transparency UV-PLUS approach eliminates consumable purge gases and ensures excellent long-term stability.

A field-proven, robust generator design was ample power reserves that can handle the most extreme plasma loads. The heat from the generator's high-power ceramic tube is eliminated through the use of innovative air-cooled technology that alleviates the need for an expensive external water-based cooling system.



SPECTROBLUE

# Elemental analysis by ICP



ARCOS ICP-OES is a Simultaneous ICP-OES Spectrometer with dedicated radial or axial and MultiView Plasma observation - the only multi-view ICP where the entire torch can be moved into either axial viewing or radial viewing positions.

This is a 'world first' and what it means is that the one instrument can now perform at 100% in either axial or radial modes. The ARCOS(Multi-view) also has an 'air cooled' interface, so no longer is a chiller required for cooling in either axial or radial viewing modes.



### New LDMOS generator

- Strongest generator on the market
- Suitable for highest plasma loads
- Highest efficiency
- Contains no consumable items
- Short circuit proof

### True axial and true radial plasma observation in a single instrument

- Highest sensitivity
- Highest stability and precision
- Highest dynamic range
- Highest matrix compatibility
- Freedom from matrix interferences

### SPECTRO ICP-OES instrument configuration options

	Radial	Axial	Twin interface	Multiview
GENESIS	Y	N	N	N
BLUE	Y	Y	Y	N
ARCOS	Y	Y	N	Y



SPECTRO MS

The SPECTRO MS is a double-focusing sector field mass spectrometer based on a Mattauch-Herzog design with a newly developed ion optic and pioneering detector technology. It is the only instrument available on the market today that is capable of simultaneously measuring the complete mass range used for inorganic mass spectrometry from  ${}^6\text{Li}$  to  ${}^{238}\text{U}$  with a permanent ion beam going to the detector.

The time-consuming scanning of masses one after the other is no longer required.

Instead, each mass in the relevant spectrum is covered by approximately 20 out of the 4800 channels that the completely new semiconductor detector provides for simultaneous readout at a very high rate. In doing so, with each measurement the complete mass spectrum is determined and stored for immediate or later evaluation and re-processing.

Every single component of the SPECTRO MS has been optimised in view of analytical performance and simple operation.

# Elemental analysis by XRF



X-ray fluorescence (XRF) is the emission of characteristic "secondary" (or fluorescent) X-rays from a material that has been excited by bombarding with high-energy X-rays. The technique is widely used for elemental analysis, particularly in the investigation of petrochemicals, metals, building materials and in the study of environmental, forensic and geological samples. The X-rays expel tightly held electrons from the inner orbitals of the atom. The removal of an electron in this way renders the electronic structure of

the atom unstable and electrons in higher orbitals "fall" into the lower orbital to fill the hole left behind.

In falling, energy is released in the form of a photon, the energy of which is equal to the energy difference of the two orbitals involved as shown. There are a limited number of ways in which this electron transition can take place.

By measuring the wavelength and intensity of the fluorescence, both

qualitative and quantitative information on the elements within a sample can be gained.

XRF is suitable for analysis of solid, liquid and powdered samples; however it is important the sample is uniform for more accurate work. Sample preparation may involve fusing or pressing powder samples.

The sensitivity, precision and speed of an analytical instrument are of particular importance for industrial process control applications. The SPECTRO iQ already set standards in this respect. The new SPECTRO iQ II maintains this course with further improved technologies and a consequent alignment towards simplicity and dependability of operation.

For many applications the measurement precision of major components and the sensitivity for important trace elements place the SPECTRO iQ II into the same performance

class as the much more expensive wavelength dispersive X-ray fluorescence spectrometers. Applications that were previously the domain of these types of instruments can now be handled using SPECTRO's unique energy-dispersive technology.

Clarity, simplicity and focus: All hallmarks of the SPECTRO iQ II software. The new graphical user interface displays all important functions for routine operation at a glance. A touch screen can make operation even less complicated and more intuitive.



SPECTRO iQ II



SPECTRO XEPOS

The SPECTRO XEPOS is a versatile XRF spectrometer for demanding applications.

Optimum excitation using polarisation and secondary targets, an autosampler for up to 12 items and intelligent software modules, deliver higher sensitivity and accuracy for the entire element range from Na - U and make the SPECTRO XEPOS one of the most versatile element analyser available.

The range of applications includes, among others: The analysis of waste,

soils, sewage sludge, additives in oil, cement, slag, refractories and electronic components and parts in compliance with RoHS; making the SPECTRO XEPOS a true multi-talent.

The higher powered SPECTRO XEPOS HE also allows enhanced analysis trace elements in pressed powder pellets, used / waste oil and processed fuel oil.

# Elemental analysis by XRF



SPECTRO MIDEX

Many elemental analysis tasks in industry, research and the sciences require a non-destructive measuring system that is extremely sensitive and offers a small measuring spot.

The SPECTRO MIDEX X-ray fluorescence spectrometer was developed for these requirements down to the finest details. With input from our customers, it has been extended and optimised. The result

is a SPECTRO MIDEX, that sets new standards for analytical performance and ease of use.

Now in its third generation, the SPECTRO MIDEX X-ray fluorescence spectrometer has developed into an all-round talent for the fast, non-destructive analysis of small spots and the rapid mapping of large surfaces (up to double EC format, 233x160 mm, 9.2x6.3").

The new SPECTRO xSORT is designed for high-throughput elemental testing and spectrochemical analysis of a wide range of metals and other materials in the field. Its speed, accuracy and ease of use set new benchmarks for handheld spectrometric performance. SPECTRO xSORT is ideal for applications, including positive material identification (PMI) and environmental screening, recycling of alloys, precious metals, and aluminum, plus mining and compliance screening.

For many jobs, such as material verification,

SPECTRO xSORT delivers highly reliable analyses in two seconds. And, for more complex matrices such as in environmental screening, SPECTRO xSORT achieves very low detection limits without the need for complex sample preparation.

The new SPECTRO xSORT also is available with time and cost-saving features, such as an integrated video camera for precise spot testing and visual memory storage. Also available is an integrated global positioning system (GPS).



SPECTRO xSORT



SPECTRO SCOUT

The new SPECTROSCOUT analyzer incorporates much of the analytical power of top-grade laboratory benchtop analyzers like the SPECTRO XEPOS, while approaching the easy portability of a SPECTRO xSORT handheld instrument. Thus SPECTROSCOUT is to deliver fast, dependable, truly lab-quality results in the field - all at surprisingly low cost.

For environmental applications, SPECTROSCOUT brings lab-class

advantages such as SPECTRO's advanced TURBOQUANT unknown - sample analysis and optional customer-specific calibrations.

Most importantly, it provides good spectral resolution and low limits of detection across a range of relevant elements - from heavy elements such as uranium to light elements such as sodium.

## Summary of XRF instruments from SPECTRO

	Energy/Wavelength Dispersive	Sample Type	Elements	Range	Portable or Lab based
iQ II	ED	Various	Na - U	typical sub - ppm - 100%	Lab
XEPOS	ED		Na - U		
Midex	ED		Na - U		
xSORT	ED		Na - U		
SCOUT	ED		Na - U		Portable

# Elemental analysis of Nitrogen, Sulphur and Halogens

## Total sulphur / nitrogen / halogen Analyser

MITSUBISHI CHEMICAL ANALYTECH CO., LTD.

The NSX-2100V Elemental Analyser from MITSUBISHI is a total sulphur / nitrogen / halogen (chlorine) analyser with vertical furnace. It can simultaneously measure nitrogen (CMD) and sulphur (UVF) from 20 ppb to 10,000 ppm. Add the TRU-100 (Trap and Release) and lower your sulphur detection limit to 5 ppb.

The NSX-2100V has the option of adding a Microcoulometric Detector (MCD) allowing the user to measure both sulphur and chlorine by Oxidative Combustion Microcoulometry. Alternatively you could add any of the five Gas Injector Systems to

measure nitrogen, sulphur and halogens (chlorine) in gases and LPG.

### Modes:

S (UVFL, Coulometry) (DR 0.05 - 10000 ug/g)  
 N (Chemiluminescence) (DR 0.5 - 5000 ug/g)  
 Cl (Coulometry) (DR 0.01 - 500 ug/g)

The NSX-2100V can analyse sample volumes between 50– 100 uL and weight between 30– 150 mg. It can react digestion temperature of up to 1100 OC. It can be used for a wide range of petrochemical applications and specifically follows ASTM, EN, ISO and JIS Methods protocols.



Mitsubishi NSX-2100H

Element	Sulphur	Nitrogen	Chlorine	Sulphur
Method of Detection	Ultraviolet Fluorescence	Chemiluminescence	Coulometric titration	
ASTM(Vertical Furnace)	D5453, D6667, D7183, D7551	D4629, D5176, D6069, D7184	D4929, D5808, D6721, D7457	D3120, D3246
ASTM(Horizontal Furnace)	D5453, D6667, D7183, D7551	D4629, D5176, D6069, D7184, D5762	D4929, D5808, D6721, D7457	D3120, D3246
UOP	987, 988	936, 971, 981	779, 910	
ISO/EN	ISO20846, EN15486	ISO11905-2 EN12260		ISO16591.2

## Nitrogen determination via the Dumas Method

Gerhardt Analytical Systems



The Gerhardt DUMATHERM works observing the current international standards and analytical requirements - thus meeting the required qualities. For the majority of sample matrices, the Dumas method is a fast and reliable alternative to the classical digestion method like e.g. Kjeldahl. There are 2 models available: DUMATHERM with manual sampler and DUMATHERM with automatic sampler for 40, 80, or 120 samples.

Some of the applications and standards followed include:

- Soil (Fertilizer) e.g. DIN 11512-20, DIN 19684-Teil 4 or AOAC 973.48
- Soil improvement and culture media
- Fertilizer, e.g. AOAC 993.13, DIN EN 13654-2
- Water e.g. DEV, H11, H28

# Elemental analysis of total organic and absorbable organic halogens



MITSUBISHI CHEMICAL ANALYTECH CO., LTD.

The TOX-300 Organic Halogen Analyser is a modulated system and can be used in both environmental and industrial applications for routine and QA analysis. Environmental measurement modes include AOX/EOX and POX whereas industrial also includes TSX (solids and liquids).

The TOX-300 has only ONE combustion program – universal method for all samples even unknown.

The AOX-200 Absorbable Organic Halogen Analyser is ideally suited to analyses the quality of water for contamination by organic halides by measuring the organic chlorine, bromine and iodine compounds absorbed to activated carbon. The open top combustion pyrolysis system is extremely easy to use and has incredibly low running costs as air is used as the combustion gas!

Official Methods include:

- ISO 9562 (DIN EN 1485)
- EPA 9090
- DIN 38414 part18
- EN 15171
- Batch and column method

The unique features of Mitsubishi's AOX-200 include:

- Gas leakage almost impossible as mass flow forced by suction not by overpressure
- No sealing's connected to combustion tube
- No flush back of sulphuric acid
- No heated transfer tubes
- No sealing's of sample inlet port
- Acetic acid destruction (Thus no exposure to toxic acetic acid vapour and no inconvenience due to smell of acetic acid)
- Small foot print (< 100cm width)
- Universal automation for batch and column method
- Autosampler for columns
- Direct injection of carbon columns



AOX-200

# Sample preparation for elemental analysis

## Ion-chromatography pre-treatment unit for fluorine, chlorine, bromine, iodine and sulphur



The AQP-2100H Automatic Quick Furnace (Horizontal) Combustion Analyser simultaneously prepares gas, liquid and solid samples, for analysis by Ion Chromatography for sulphur, fluorine, bromine, chlorine and iodine analysis. The AQP offers significantly improved measurement quality (concentration ranges from ppb to low % levels), replaces Wickbold, oxygen bombs and other dangerous combustion methods currently used. It does all this while reducing total analysis time (simultaneously measures sulphur, fluorine, bromine, chlorine and iodine in under 12 minutes) and costs for sample handling.

The AQP-2100H can interface with ANY manufacturers Ion Chromatography System and solid and liquid autosamplers, automatic boat controllers, gas injectors and LPG injectors are all available. The system also has the following benefits:

- The combination of the boat control system and duplex tube combustion guarantees safe and reliable combustion performance without the need for advanced operator training. The combustion process can be completed in as little as five minutes.
- All units come with a low-blank gas control unit allowing an exceptionally low gas blank value to be achieved. Combine this with the high-purity quartz pipe the user is able to obtain precision analysis of trace volumes.
- The Hydro pyrolysis system in the AQP-2100 regulates the humidity thus the combustion system maintains constant humidity at high volumes improving fluorine, concentrated chlorine and bromine analysis accuracy.
- The high-precision level sensor maintains constant volume for improved analysis accuracy and the constant volume regulator is compatible with a wide range of sample types.

▲ MITSUBISHI CHEMICAL ANALYTECH CO., LTD.

- Using the optional external fluid selector together with the sample changer enables fully automated measurement of calibration curves and combustion conditions.
- With connecting to suitable IC, AQP sample prep-station can be integrated automated combustion IC analyser (C-IC) system.

For the AQP-2100 Automatic Quick Furnace (+ IC) complies with the following standards:

- ASTM D 5987 (Fluorine)
- ASTM D 7359 (Fluorine, Chlorine and Sulphur)
- JIS K7392 (Bromine)
- JIS R9301 (ISO 2828) (Fluorine)
- JIS R1616 (Fluorine and Chlorine)
- JIS R1603 (Fluorine and Chlorine)
- JIS Z7302 (Chlorine and Sulphur)
- JEITA ET-7304A (Fluorine, Chlorine, Bromine, Iodine and Sulphur)
- KS M0180 (Fluorine, Chlorine, Bromine and Sulphur)

# Sample preparation for elemental analysis

## Certified Standards

Inorganic Ventures manufactures a higher class of inorganic standards for a variety of industries. Reference materials are produced for ICP, ICP-MS, AA, IC, and QC/environmental applications. Custom manufacturing is the company's claim to fame, producing more than 5,000 unique custom blends. These blends are carefully engineered to be stable, compatible, and easy to use. All standards include an extensive Certificate of Analysis, which details NIST traceability, certified values, and trace impurities.

Furthermore, Inorganic Ventures is registered to ISO 9001, ISO Guide 17025 and ISO Guide 34, meaning every standard they produce is fully compliant with nearly every quality system worldwide.



## Elemental analysis instrument summary

### Summary of XRF instruments from SPECTRO

Techniques	Instrument	Supplier
XRF	iQII XEPOS Midex xSORT SCOUT	SPECTRO
ICP MS	MS	SPECTRO
ICP OES	Genesis Blue Arcos	SPECTRO
AAS	Flame & graphite Flame only Graphite only	Hitachi
Organic Halogen Analyser	TOX-300	Mitsubishi
Absorbable Halogen Analyser	AOX-200	Mitsubishi
Nitrogen, Sulphur and Halogens	NXS-2100V	Mitsubishi
Nitrogen	DUMATHERM	Gerhardt

# Water analysis

## MANTECH: Multi-parameter systems for environmental analysis laboratories



MANTECH offers multi-parameter analysis instruments that automate 1 to 197 samples in a single batch! Simply:

- Place samples in load position
- Select parameters
- Click on Start

Environmental Laboratories are routinely required to analyse for many different parameters!

In most laboratories, you will find different stations devoted to each test. However MANTECH can perform all these tests

unattended from a simple sample:

- pH and EC
- CaCl<sub>2</sub>
- Nitrates
- Phosphates
- Other such as FI, Na, Cl etc
- BOD and COD (PeCOD)

MANTECH offers more automation, better precision and trusted accuracy and extremely high throughput (large sample racks and simultaneous testing of multiple samples available). In terms of multi-

parameter analysis, you will find there is no equal to MANTECH systems. Nothing could be more convenient. Choose the parameters your lab requires and a system is configured specifically for you... It's truly the perfect fit!

The TitraSip SA, is MANTECH's stand alone instrument. Once the TitraSip SA has completed all the selected analyses, the results are collated into a single report, and the TitraSip SA notifies the chemist that it is ready for the next sample. It truly is that simple!



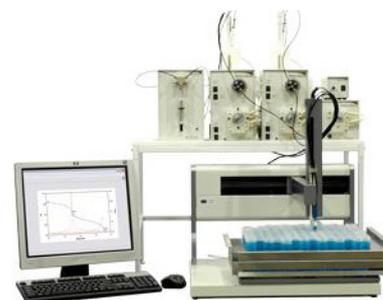
PC-Titrate  
– Fully automated multi-parameter analysis with a sample changer

Government agencies, viticulture Institutes and wineries have all invested in MANTECH solutions. Be assured, once you invest in MANTECH, results will be quicker, accurate, and more precise and the lab will run more efficiently.



TitraSipSA  
– Multi-parameter analysis from a single sample

As needs arise, additional parameters and automation may be added. For large wineries, the MANTECH TitraSip SA may be upgraded to add an autosampler for true multi-parameter analysis over many samples. It has the capability to run unattended, overnight for up to 197 samples, 5 parameters each. For even greater automation and speed you could choose a RapidDUO system which will complete two titrations on the same sample in <4minutes!



RapidDuo  
– Super fast high throughput fully automated multi-parameter analysis

# Water analysis

## MITSUBISHI: automated/manual titration

MITSUBISHI CHEMICAL ANALYTECH CO., LTD.



Mitsubishi GT-200

The versatile GT-200 supports multiple titration configurations in a compact, user-friendly unit, featuring Quick Mode for instant start-up along with a range of automation and solvent extraction options. It has an advanced interface and the new algorithm have enhanced the ease of use in versatile potentiometric titration measurement.

GT-200 Automatic Titrator complies with the following standards:

- ASTM D 2896
- ASTM D 664

- ISO 6619
- ISO 3371

The Mitsubishi GT-200 has several features making it incredibly versatile and functional for general lab use:

- Separate Buret & Stirrer (just the titration part can be placed in a fume cupboard)
- Maximum 12 Burets
- 24 position sample changer
- Electrodes with BNC connector can be attached/detached from FRONT SIDE
- Numerous Titration Modes (High performance)

Titration method	Chemistry	Application
Potentiometry	Acid-Base	Acidity (Food), Isocyanate(Uretane), HF, HNO <sub>3</sub> , CH <sub>3</sub> COOH (Mixed Acid), Purity (Acid), H <sub>2</sub> SO <sub>4</sub> (Waste acid)
	Acid-Base (petro)	TAN/TBN (petroleum)
	Redox	Vitamin C, Iodine value (edible oil, biodiesel oil, fat), Fe (Plating), Peroxide value (Palm oil)
	Precipitation	Halogen (Water), Salt (Food), Cl (Oil, Plating), NaCN (Plating), Cl <sup>-</sup> (Concrete)
	Cheletometric	Impurity metal in various plating bath (Ni, Cu, Pb, Zn), hardness (water), CaO, MgO (cement)
	Surfactant	Anion&Cation (Surfactant)
Amperometry	Polarisation (Constant current)	Bromine Index, Bromine Number (Oil), *Amperometry or Potentiometry depends on the testing method
	Polarisation (Constant Voltage)	
Conductivity	Acid-Base	Basicity of Chemicals (Resin Solution etc.)
	Precipitation	Methacrylic acid (Dye, potentiometry also applicable)
Photometry	Acid-Base	TAN/TBN (Oil), Acidity (Food), Isocyanate(Uretane), Purity (Acid).
	Cheletometric	Metal(Ni, Cu, Pb, Zn etc. Plating), Hardness (Water), CaO, MgO (Cement)

## Moisture Meters, Water Vaporisers and Karl Fischer Reagents

Mitsubishi offer two compact AND portable Karl-Fischer moisture meters. The CA-31 and KF-21 are compact and light weight trace moisture analysers which can be used for a wide range of applications capable of measuring from 1 ppm – 100% water in a wide verity of matrices. Carry cases are available.



Mitsubishi CA-31 with carry case



# Water analysis



▲ MITSUBISHI CHEMICAL ANALYTECH CO., LTD.

CA-31 coulometric moisture meter is both compact and portable. Vapouriser connection is available and it comes in two colours!

Mitsubishi CA-31 available in "Samurai Black" or "Hot Pink"



KF-21 volumetric moisture meter is both compact and portable ideal for routine moisture analysis in the field or laboratory and a reagent dispenser comes as standard. CA-21 Coulometric/KF-21 Volumetric Karl Fischer Moisture Meter complies with the following standards:

- ASTM D 1533
- ASTM D 1744

- ASTM D 4377
- ASTM D 4928
- ASTM D 6304
- ASTM E 203
- ISO 10337
- ISO 12937
- IP 356
- IP 386

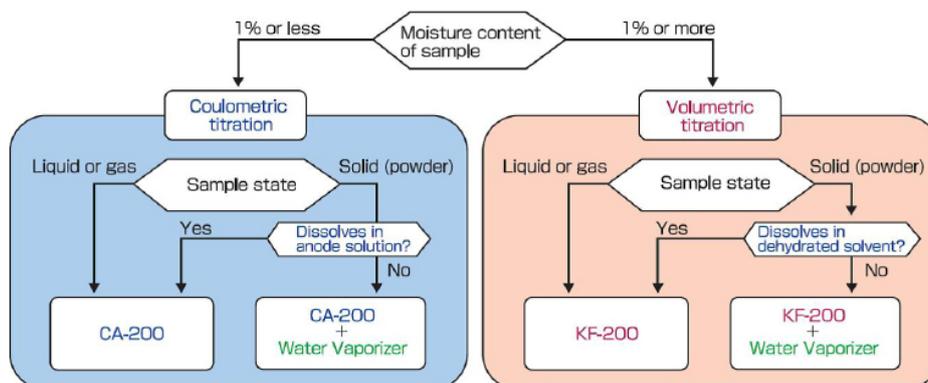


The dual channel Karl Fischer laboratory moisture measurement can be used in either coulometric (CA-200: 1 ppm – 100% Water in any matrix) or volumetric (KF-200: 5 ppm – 100% Water in any matrix) mode. The dual channel option means that the user can choose to measure 2 samples simultaneously by either coulometric or volumetric, or a combination of the two. Both models can perform general potentiometric titrations and KF analysis simultaneously with the GT-Option and measure the bromine index and bromine number. There are even numerous reagents for a wide range

of applications available.

CA-200 Coulometric/KF-200 Volumetric Karl Fischer Moisture Meter complies with the following standards:

- ASTM D 1533
- ASTM D 1744
- ASTM D 4377
- ASTM D 4928
- ASTM D 6304
- ASTM E 203
- ISO 10337
- ISO 12937
- IP 356
- IP 386



# Water analysis

Model	Type	Application
VA-200	Sample Boat	Various types of plastics, rubber, foods, pharmaceuticals, inorganic salts, powders and solid samples
VA-230	Disposable Vial Type	Measurement using disposable vials
VA-210	Lubricants	Lubricants, grease, tar, oils, clay, metal oxides, iron ores and inorganic salt products
VA-121	High Temperature	Iron ore, clay, metal oxides and inorganic salts
VA-122	High/Low Temperature	Ancillary moisture, iron ore, clay, welding rods, metal oxides and inorganic salts
VA-24VS	Disposable vial type Automatic Vaporiser	Continuous measurement of 24 general solid samples

## Elemental analysis of total organic carbon and nitrogen

Mitsubishi TOC-300V has a clear edge for dirty samples! The new TOC analyser uses a DIRECT INJECTION METHOD making it predominantly tough against samples with particulates and allowing them to be measured without any pre-treatment. The TOC-300V easily complies with the cellulose (suspended matter) test the European EN1484 (ISO 8245). Having no filtration system means no extraneous organic matter and greater accuracy.

TOC measurement takes less than 4 minutes and the NPOC measurement is the fastest in the industry! Conventional NPOC measurements average 57 minutes for 3 samples, the TOC-300V takes only 37 mins.

Combustion TOC (total organic carbon) analysis is a popular technique for monitoring environmental water and discharge fluids; however detection performance for suspended matter in can be poor. The TOC-300V boasts a reliable, high-sensitivity detection system together with direct injection for enhanced detection of suspended matter in samples.

Official Methods employed by the TOC-300V:

- ISO 8245 (EN1484)
- ASTM D 7573
- EPA Method 415.1
- EPA Method 9060A
- Standard Method 5310
- JIS K0101, JIS K0102, JIS K0557

▲ MITSUBISHI CHEMICAL ANALYTECH CO. LTD.

A wide range of vaporisers are available to accommodate various types of samples including plastics, food, pharmaceuticals, inorganic salts, lubricants, grease, oils, minerals, clay, metal oxides, iron ores and various types of chemicals.

▲ MITSUBISHI CHEMICAL ANALYTECH CO. LTD.

The TOC-300V can be combined with TNb analysis to allow SIMULTANEOUS measurement of nitrogen and TOC. It comes with a 60 place autosampler as standard and auto dilution is available.



Mitsubishi TOC-300V

## Lachat: nutrient analysis for water laboratories



For 20 years, Lachat Instruments has led the world in productivity for automated ion analysis based on flow injection analysis (FIA) technology. The simplicity and ruggedness of FIA, the outstanding accuracy, precision, low detection limits and dynamic ranges of our guaranteed QuickChem methods and our unique Data Quality Management closed-loop

software system combine to give the best analytical results in the shortest time compared to any other ion analyser.

Over 400 QuickChem methods testify to the ability of flow injection analysis and ion chromatography which address a huge diversity of analytical challenges.

**LACHAT**  
INSTRUMENTS

# Water analysis

## Mantech: PeCOD® 15 minute COD analysis

The water quality monitoring system that is fast, accurate and does not use dichromate



COD results in just 15 minutes, with no use of dichromate. PeCOD® is breaking the barriers to traditional COD analysis methods.

PeCOD® offers a unique nanotechnology-based approach to COD analysis that overcomes many of the problems encountered by existing COD analysis methods, making it the new global standard for COD analysis.

PeCOD can be configured to meet the specific needs of your laboratory or process operation. There are 4 models available (laboratory, field, automated and on-line models) each with the capacity to add additional parameters such as pH, EC, alkalinity, BOD and turbidity.

With PeCOD operators no longer have to undertake potentially hazardous operations such as digesting samples with boiling sulphuric acid containing dichromate, mercury and silver salts (the "dichromate method" of COD analysis).

Additionally there are major benefits of performing real-time COD measurements in the food and beverage sector:

- Real-time data on wastewater discharge
- Quick notification when limits are exceeded
- Wastewater strength can be linked to operations
- Processes can be optimized to reduce wastewater composition

The relationship between BOD and COD is fairly consistent; however the ratio of BOD to COD is dependent on the product and is

usually site specific. Once this relationship has been established for each site, the "Real Time COD" (PeCOD) test can be used for monitoring and process control.

Gathering real time measurements will enable operators to better optimize their process and manage their wastewater composition Reducing surcharges as a result of quick notification when limits are exceeded and eliminating the need for toxic and harmful chemicals generated by the dichromate COD method.



# Air and volatile analysis

## Thermal sample preparation equipment



CDS Thermal desorption systems are used to collect trace organic chemicals from air, water, soil, food (coffee, grains, juices, chocolate, flavourings etc) and their packaging materials. CDS also has some unique selling points:

- Can connect direct to MS interface
- Can connect to ANY GC (or FTIR/FID)
- Only High Pressure product on the market place (500psi)
- Automation that complies with water EPA methods
- Can adjust temperature (15000C), heating rate, and perform multiple step manipulations
- Can have a reactive atmosphere i.e. perform pyrolysis, catalytic reactions or trapping in a gas different to the carrier gas

### CDS offers equipment for the following applications

	Applications	Instrument
Purge & Trap	Generally water and/or Soil for volatile organics. Based on EPA Methods 524 (drinking water), 624 (waste water) and 8260 (solid waste) Soils prep (EPA 5035)	7000E Concentrator (single sample), 7300A Water only Autosampler, 7400 Soil/Water Autosampler
CDS Thermal Desorption	Generally air collected on sorbent tubes and/or Solid looking at off gassing for volatile organics. Based on EPA Methods TO-17, ASTM method D6196, NIOSH method 2459 and MDHS method 72	9300 (Single tube desorber), 9305 (single tube desorber, with near real time sampling capabilities), 9350 (two tube desorber with continuous sampling capabilities) 7500 - thermal Desorption Autosampler can connect to 9300, 7000E or Any standard Purge & Trap concentrator. CDS 5200 with Thermal desorption Probe.
Thermal Extraction	Generally looking at residuals, contaminants and additives in a solid matrix	Large heated headspace vessels (40 ml Test tube desorber, 140 ml and 800 ml vessels), 5000 series pyrolysis systems, (Thermal desorption probe, test tube desorber or straight pyrolysis tube)
Pyrolysis	Generally looking at a fingerprint of a solid (Polymer), and/or Thermal degradation of solids (or extracts) at high temperatures. Pyrolysis in "Reactant" gases will result in the analytes being trapped on a solid sorbent and thermally desorbed to the GC.	CDS- 4000, and 5000 series Pyroprobes

## Rapid distillations



VAPODEST watersteam rapid distillation systems by Gerhardt are used worldwide, e.g. for the determination of nitrate, nitrite, ammonium, Kjeldahl digestion solutions, volatile acids, sulphur dioxide,

ethanol, formaldehyde, phenols as well as other compounds.

There are several different models available.

### Model information

Model	Description
VAPODEST 200	VAPODEST 200 is the ideal instrument for distillation of volatiles, SO <sub>2</sub> , Alcohol und Phenol. Laboratory glassware with volumes up to 1200 ml is available for direct distillation.
VAPODEST 300	VAPODEST 300 is the ideal rapid water steam distillation instrument for Kjeldahl distillation
VAP 400	Model with extended functions designed for comfortable Kjeldahl analysis.
VAPODEST 450	VAPODEST 300 is the ideal rapid water steam distillation instrument for Kjeldahl distillation. Available with or without pH/titration capabilities

# Air and volatile analysis

## Soxtherm pollution monitoring

The Gerhardt SOX THERM rapid extraction systems can be used in nearly every analytical area and is a very precise instrument when it comes to the determination of the pollution of e.g. soil or water.

The data obtained can then be used to make fast environmental decisions. Depending on your laboratory's needs and sample throughput, there are 3 options available: 2, 4, or 6 place system. To further increase throughput all systems

can be operated either by a MULTISTAT controller or by our modern controlling software SOX THERM Manager. Both these systems can individually control and monitor up to four SOX THERM extraction units (up to 24 samples) simultaneously. The savings in costs and space are significant.



Soxtherm rapid extraction system

## Cyanide determination systems

The Gerhardt SOX THERM rapid extraction systems can be used in nearly every analytical area and is a very precise instrument when it comes to the determination of the pollution of e.g. soil or water.

The data obtained can then be used to make fast environmental decisions. Depending on your laboratory's needs and sample throughput, there are 3 options available: 2, 4, or 6 place system.

To further increase throughput all systems can be operated either by a MULTISTAT controller or by our modern controlling software SOX THERM Manager.

Both these systems can individually

control and monitor up to four SOX THERM extraction units (up to 24 samples) simultaneously. The savings in costs and space are significant.



Soxtherm rapid extraction system

# Sample preparation

## Kjeldahl digestions



### Traditional kjeldahl analysis

The Gerhardt Traditional Kjeldahl digestion apparatus are designed for digestions according to Kjeldahl and are available with 50, 100, 250, 500 and 750 ml Kjeldahl flasks. All units have a very efficient glass exhaust manifold with funnel shaped adapters which fit into the necks of the flasks.

### Block kjeldahl analysis

#### Block digestion systems

#### -KJELDATHERM

The compact Gerhardt KJELDATHERM block digestion systems allow for simultaneous multiple digestions. Precise temperature control allows the conditions for the digestions (75ml, 100 ml, 250 ml, and 400 ml tubes ) to be optimised thus providing reproducible results. The temperature control is provided by an external controller which is included in the standard configuration.

### Infrared digestion systems

#### - TURBOTHERM

TURBOTHERM is a versatile infrared rapid Kjeldahl digestion system capable of handling a wide range of samples in today's modern laboratory. The digestion time is dramatically reduced due to the extremely short heating up and cooling down periods. TURBOTHERM is available in five different configurations; each of the five can be ordered either with electronic or manual control.

- 12 places, complete with digestion tubes 100 ml
- 12 places, complete with digestion tubes 250 ml
- 6 places, complete with digestion tubes 250 ml
- 4 places, complete with digestion tubes 400 ml
- 4 places, complete with digestion tubes 800 ml

### TURBOSOG exhaust equipment

Fumes from the Kjeldahl digestion process can be safely removed, condensed and neutralised using the TURBOSOG. The TURBOSOG works in two steps, separating and washing out acid fumes. The removal of the fumes is very efficient with extremely low running costs. Little service is required as no activated carbon filters are used in the system.

# Sample preparation



Block digestion systems - KJELDATHERM



Infrared digestion systems – TURBOTHERM



TURBOSOG exhaust equipment



## Lachat's BD40 block digester

BD40 block digester will improve accuracy, precision and productivity of your high temperature digestions. Developed to digest total Kjeldahl nitrogen and total phosphorus samples, the BD40 brings key features to this well-accepted block digestion technique.

**LACHAT**  
INSTRUMENTS



## Automatic Kjeldahl and titration analysis with autosampler

Vapour distillation and titration software controlled, monitored Kjeldahl analysis instrument - VAPODEST 50s offers state-of-the-art technology with modern microprocessor control. The VAPODEST 50s can also be combined with an autosampler to allow fully automatic analysis. This model was developed for continuous operation with high sample through-put. The operator time is reduced to loading the tubes and filling the storage tanks with chemicals. Data transfer supports the input of all data relevant for the samples.

Different Carousel inserts available for:

- 20 digestions tubes 250 ml
- 16 digestion tubes 400 ml
- 12 digestion tubes 800 ml

**Gerhardt**  
Analytical Systems

# Sample preparation

## Sample concentrators, heaters and stirrers



Stuart provides a range of block heaters as well as sample concentrators.

A block heater provides a source of precise heating for many sensitive analytical procedures. Through choice of block, a wide variety of tubes and vessels can be accommodated in a standard unit.

A sample concentrator is a fast and convenient way of concentrating multiple samples simultaneously in a block heater a simple gas delivery system for fast, efficient evaporation.



You can rely on Electrothermal Mantles to be the heating workhorse within your laboratory. They are economical to run, robust and easy to use, and cater for the most popular flask sizes, making them flexible enough to meet almost all of your laboratory's heating requirements.



The Techne Sample Concentrator accelerates the concentration of large numbers of samples in a matter of minutes, where traditional methods can take hours. It is ideal for the life science researcher and chemist alike designed for applications such as sample preparation, drug screening, hormone assays, chromatographic analysis and scintillation counting.



# Sample preparation

## HotBlocks



HotBlocks in the Environmental Express range include:

- 25-Position, 100 mL
- 54-Position, 50 mL
- 25-Position, 100 mL
- 35-Position 100 mL
- 36-Position 50 mL
- 96-Position 15 mL
- 12-Position 50 mL

AutoBlocks adds concentrated acids and heats and cools samples in self-contained HEPA filtered environment.



Environmental Express HotBlock



Environmental Express AutoBlock

## Digestion systems COD and trace metal



The SMA (trace metal digestion system) and CSB (COD digestion system) consist of a Kjeldatherm digestion block for 8 or 20 samples, insert rack and tubes.

The SMA compact trace metal digestion systems from Gerhardt allow for simultaneous multiple digestions of up to 20 samples. The precise temperature control permits the conditions for the digestions to be optimised thus providing reproducible results. The SMA complies with DIN 38414 for the digestion with aqua regia to determine the acid-soluble parts of metals in sludge, sediments and soils.

In the CSB the temperature control is provided by an external controller which is included in the standard configuration. The required heating up phase of the samples to around 148 °C is reached in less than 10 minutes. The CSB complies with DIN 38409 for the determination of the Chemical Oxygen Demand of water.



The SMA compact trace metal digestion system



The CSB COD digestion system

# General laboratory and consumables

## ENVIRONMENTAL EXPRESS: Providing innovative solutions for wine laboratories for over 20 years



Environmental Express is the first choice for applications based solutions for all types of laboratories, being known for reliability, quality, and most of all, a commitment to customer focus.

They continue to be a leading laboratory supplier, finding solutions and creating new applications such as disposable BOD bottles, the AutoBlock for hands-free digestions, solvent extraction equipment,

soxhlet thimbles and accessories, pump tubing, graphite tubes, sample cups, nebulisers, electron multiplier, torches and sample/skimmer cones.



## JET-BIO: All your consumable needs



JET-BIO brings you a wide range of consumables to meet all your research and analytical needs. Innovatively designed to work perfectly with any laboratory instrumentation and manufactured in 100,000 grade clean-room environment under the control of ISO 9001:2008 and ISO 13485 quality management system.

They are made exclusively from high-grade polystyrene (GPPS) or polyethylene (PE) to eliminate all extraneous materials and are excellent for clear observation. In addition, all Jet-Bio products are gamma irradiation sterilised in order to meet the different research needs and enhance the practicability.



# Our capabilities in Life Science

Products	Range	Brands
Cell counters	Automated cell density / viability analyser	NOVA
Cell culture analysers	Up to 15 vital cell culture tests - glucose, glutamine, ammonium, PO <sub>2</sub> , sodium, Ionised calcium, lactate, glutamate, pH, PCO <sub>2</sub> , potassium, cell density/ viability/diameter, osmolality, IgG or P04	NOVA
Colony counters		Stuart
Conductivity meters	Bench meters, micro-volume meters, conductivity cells, consumables	Jenway
ELISA automation	4 plate fully automated ELISA analyser	Virion Serion
Endotoxin testing	Reagents and instrumentation for endotoxin testing	ACC
Flash chromatography	Hardware and columns	Teledyne Isco
Freezers & refrigerators	Freezers 175L – 1000L, -20 Deg C - -80 Deg C. Refrigerators 130L – 1400L stainless steel or glass door	Telstar
Heating blocks		Techne, Stuart
Heating equipment	Mantles, Bunsens, Kjeldahl equipment, water & ration heaters	Electrothermal
Histology equipment	Flotation baths, wax dispensers, slide drying benches	Electrothermal
Homogenisers	Handheld, laboratory, ultrasonic, industrial	Stuart
Incubators	General purpose, refrigerated, microtitre plate incubator, hybridisation incubator and shaker, hybridisation bottles, incubator with orbital shaker	Stuart
Infectious disease testing reagents	CFT, ELISA, antigens and controls	Virion\Serion
Liquid handling	Pipet-Aids, pipettes	Drummond
Melting point	Automatic, digital, analogue	Stuart
Microscopy	Slides, heating, incubation and live cell imaging equipment	ibidi
Mixers, Rollers & Shakers	Rollers, rotators, vortex mixers	Stuart
Ovens	Universal ovens, hybridisation ovens	Techne
Plasticware consumables	Flasks, bottles, cell scrapers, tissue culture plates, centrifuge tubes, tissue culture dishes, serological pipettes	Jet-Bio
Platelet aggregometers	Whole blood, PRP, ATP, digital and analogue models	Chrono-Log
Rotary evaporators		Stuart
Spectroscopy	UV/Visible spectrophotometers, nano spectrophotometers	Jenway
Stirrers, hotplate stirrers and hotplates	Digital and analogue, variety of sizes	Stuart
Thermal cyclers	Personal, full Size and Real-Time PCR system	Techne
Water baths	General purpose, heating, cooling, circulating	Stuart
Water purification		Stuart

# Our services in the environmental market

## Service maximising your analytical system uptime

DKSH Australia and New Zealand offer a total care solution for the instruments that we supply. This total care approach encompasses pre-sale, installation, application, warranty, training and after sales support.

As our customers have a range of support requirements, so our service contracts are customised to meet individual needs. DKSH offer Preventative Maintenance, Shared Support, Fully Comprehensive and Labour Only contracts.

Service support is provided by a dedicated team of trained engineers. They carry, and have access to, an extensive parts stock,

which allows us to provide fast, on-site diagnosis and repair. Advice on the latest and most cost effective consumables is also given with the support from our strong supplier network. The end result is to add value to your operation and clients you serve.



## Competence and support training/ seminars

DKSH offer in-depth product or application seminars and training courses. Acquire the specific knowledge in one of our application-tailored programs to become even more efficient and productive when working with your analytical system.

Training is an important factor in helping to maintain your analytical system. Expert training during installation and refreshment courses will keep you up to date with the latest techniques, regulations and practices. This ensures that the most accurate and precise results are always obtained.

### Training courses include:

- Tailored on-site programs at installation followed by standard and advanced levels
- Local seminars
- User meetings
- International training courses

### Training programs cover:

- Theory and practice
- Calibration Applications
- Sample preparation
- Method development
- Evaluations
- Interpretation
- Reporting
- Database management
- Standard methods
- Basic maintenance
- Trouble shooting

- \* Training activities are fully traceable with the supply of certificates and documentation.
- \* Information regarding organised training programs can be obtained from DKSH.

# We also offer solutions and services in these areas:



**Academic / Government Research**



**Life Sciences**



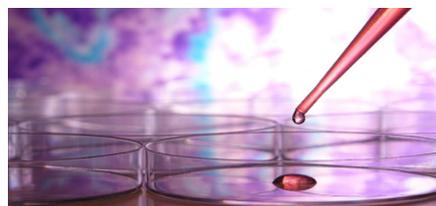
**Material Science**



**Food, Dairy and Beverage**



**Energy Resources**



**General Laboratory Supplies**

## Reference links

### Environmental Protection Agencies

[www.epa.gov](http://www.epa.gov)

[www.epa.govt.nz](http://www.epa.govt.nz)

[www.epa.sa.gov.au](http://www.epa.sa.gov.au)

[www.epa.nt.gov.au](http://www.epa.nt.gov.au)

[www.epa.vic.gov.au](http://www.epa.vic.gov.au)

### Other authorities

[www.environment.gov.au](http://www.environment.gov.au)

[www.derm.qld.gov.au/](http://www.derm.qld.gov.au/)

<http://australia.gov.au/topics/environment-and-natural-resources>

[www.clw.csiro.au/](http://www.clw.csiro.au/)

[www.asris.csiro.au/index\\_ie.html](http://www.asris.csiro.au/index_ie.html)

[www.epa.wa.gov.au](http://www.epa.wa.gov.au)

[www.epa.nsw.gov.au](http://www.epa.nsw.gov.au)

[www.epa.qld.gov.au](http://www.epa.qld.gov.au)

[www.epa.tas.gov.au](http://www.epa.tas.gov.au)

## Locations

### VICTORIA (Head Office)

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Fax: +61 3 9554 6677

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Lane Cove NSW 2066

Freecall: 1800 010 114

Fax: +61 2 9425 5099

### QUEENSLAND

11 Macadam Street

Seventeen Mile Rocks

QLD 4073

Freecall: 1800 010 114

Fax: +61 7 3725 7555

### SOUTH AUSTRALIA

2 Burdon Street

Dudley Park SA 5008

Freecall: 1800 010 114

Fax: +61 8 8241 5134

### WESTERN AUSTRALIA

1146 Abernethy Road

High Wycombe WA 6057

Freecall: 1800 010 114

Fax: +61 8 9453 3446

### NEW ZEALAND (Head Office)

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# Notes

A large grid of dashed lines for taking notes, consisting of 20 columns and 30 rows.



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