KORE TECHNOLOGY

Products Brochure 2024

Kore Technology: At the heart of innovative analysis

About Kore

Kore Technology Ltd. has been in business designing and manufacturing high performance scientific instruments based on time-of-flight mass spectrometers since 1991. We specialise in customised mass spectrometers, related components, and other vacuum-based equipment. We can offer bespoke instruments at affordable prices because we are able to re-use existing design modules from our large, well documented back catalogue. This pre-existing mechanical information, combined with any one-off engineering that is required, allows us to create reasonably priced instruments tailored to our customers' specific requirements.

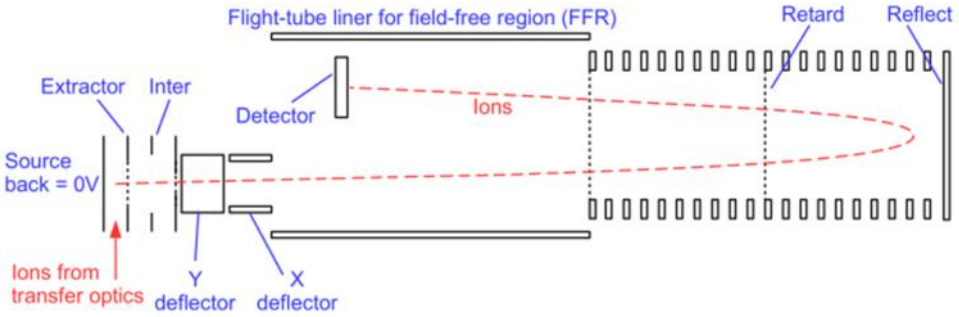
Our team has now delivered over 350 analytical instruments to researchers and companies around the world. To reduce our carbon footprint, our components are sourced 80% from UK/Europe. Every instrument is assembled with precision and care in our premises in Ely, Cambridgeshire UK.

Our friendly customer support is second to none. We provide installation, application support, remote/in-person training, maintenance and servicing contracts by our UK team and our global representatives.

TOF-MS Principles and Applications

Time-of-flight mass spectrometry (TOF-MS) offers the clear advantage of **parallel ion detection**. All ions present in the source can be analysed at once (rather than filtering and scanning a narrow range of masses), giving TOF analyser systems a **very high overall sensitivity and mass resolution**.

The advent of high speed electronics and high stability voltage supplies in the late 1980s allowed physicists to harness the potential of TOF-MS. Kore personnel have been involved in most aspects of this development.



Simplified schematic of ion trajectories in a reflectron TOF-MS

The suitability of TOF-MS for analysing fast, transient signals makes it ideal not only for laboratory experiments but also for **real-time** analysis in the field, such as:

Environment — water, soil, atmosphere and air quality

Real-time measurements of pollutants, hazardous and nuisance emissions

Industry and Process — quality control, health and safety, production line, food/drinks flavour analysis

Volatile Organic Compounds (VOCs) analysis in biological processes, breath analysis

Forensics — arson, explosives, chemical warfare agents, drugs of abuse

Our Products

This brochure will introduce you to our standard product range, and also our custom systems and components. Our products are focused around TOF-MS and ultra-high vacuum (UHV) systems. We manufacture standard instruments for:

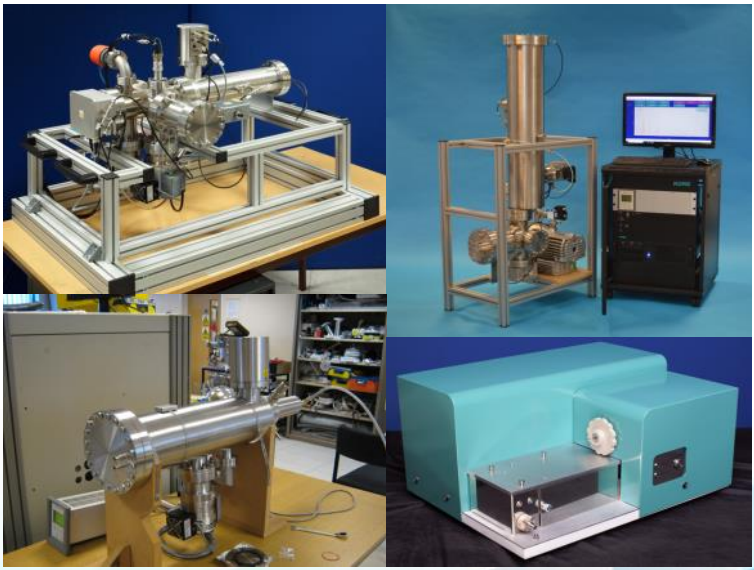
- **Gas, liquid and solid chemical analysis**, using proton-transfer reaction (PTR) and electron impact (EI) TOF-MS
- **Surface chemistry analysis**, using TOF secondary ion mass spectrometry (TOF-SIMS)

To optimise the user interface, we provide **easy-to-use, functional software** to suit the experimental design. Kore's experienced scientists and engineers enjoy working with customers to provide a complete solution to their analytical or instrumental challenges. Each product comes with a detailed **user manual** tailored to the customer's needs.

Kore Custom TOF-MS Systems

Our longstanding expertise in custom TOF-MS allows us to design and manufacture your instrument according to your requirements. We have built instruments for a range of experiments including photolysis, plasma, cluster and high mass ion analysis, and temperature-programmed desorption. Using our large repository of components and our extensive back catalogue of existing designs, we can design the perfect instrument for your experiments at an affordable price.

All options can be purchased separately and customised to your analytical performance requirements or to interface with existing equipment or UHV chambers. Every custom system designed at Kore is rigorously tested, so you will get a fully working instrument ready for your research and measurements.



Example Custom Systems/Components

To explore the custom systems and components we have designed and manufactured for previous clients, please visit www.kore.co.uk/custom-tof-ms.

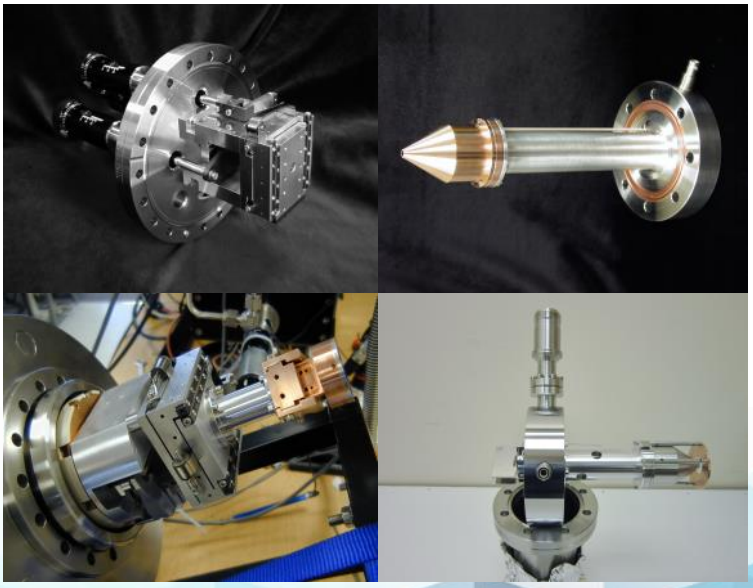
If you don't see what you need in the following list, please ask us!

- Client ion source integration (MeV SIMS, VUV, laser, beamline/synchrotron)
- Electron impact ionisers (variable energy 10–100eV available)
- Soft chemical ionisation modules and reactors
- High/low temperature sample stages
- Ion optics and differential pumping apertures
- TOF source with ion deflectors
- Dual-slope reflectrons
- Dual microchannel plate, discrete dynode and 20kV high mass detector systems
- Fast analogue and digital preamplifiers
- 4GHz Time-to-Digital Converter
- Analogue pulse counting systems
- Ion counting electronics
- High voltage power supplies
- Data systems
- Pumping, gauging and failsafe systems

Kore TOF-MS Components

For our customers who are building their own analytical systems, Kore has a large catalogue of components for integration into existing apparatus. Our staff, many of whom have a research background in addition to their instrument development experience, can provide the technical bridge between your experimental aims and our extensive range of components and configurations. Kore's engineering team works very closely with our end users and has detailed knowledge of existing design elements, making it possible to re-use not only whole configurations, but also design fragments, which contributes to reducing costs.

Because of the nature of our novel instrument design, it is often the case that incoming projects will require some new design work, and this in turn contributes to our component pool. Therefore, the number of components available at Kore is always increasing.



Kore PTR 3c

Mass accuracy	±0.002amu
Concentration range	50ppm to ppt levels
Sensitivity	>200cps/ppbv VOCs (measured with benzene)
Detection limit	~10ppt
Response time to concentration changes	~100ms
Mass resolution at max sensitivity	≥3500m/δm (FWHM) at m/z 79
Mass resolution	~4,000m/δm achievable
Mass range	Unlimited; in practice 1000m/z (limited by gas phase thermochemistry)
Glow discharge ion source	Reagent ions H_3O^+, O_2^+, NO^+
Dimensions	920 x 730 x 530mm
Weight	~150kg
Power requirement (normal operation)	<750W
Reactor oven heating	30–130°C (150°C transfer line available)
Fully computer-controlled operation, automatic analysis software function	
Option for computer-controlled reagent ion switching	
Option for mass calibration unit (injecting low levels of high mass compound)	

The compact **Kore PTR 3c** is a 'soft' chemical ionisation tool for sensitive analysis of volatile organic compounds (VOCs) in ambient air. Using soft chemical ionisation, the PTR-TOF-MS can monitor all masses in parallel, allowing the maximum amount of information to be collected in minimal sampling time. The PTR 3c has been developed to be transportable in a small van for on-site real-time applications (mains or portable battery/electronic vehicle power required), with full computer control of instrument parameters.

PTR-TOF-MS is a soft ionisation method utilising H_3O^+ (hydronium) ions to transfer protons to all compounds with a higher proton affinity than water. General components in air are not ionised by the hydronium beam, but most VOCs are ionised by H_3O^+ with little or no fragmentation. Alternative reagent ions, such as O_2^+ and NO^+, can be used to ionise compounds that do not protonate with H_3O^+.

Kore PTR 2e

Mass accuracy	0.002amu
Concentration range	50ppm to ppt levels
Sensitivity	>200cps/ppbv VOCs (measured with benzene)
Detection limit	~10ppt
Response time to concentration	~100ms
Mass resolution at max sensitivity	>6000m/δm (FWHM) at m/z 79
Mass resolution	~8000m/δm achievable
Mass range	Unlimited; in practice 1000m/z (limited by gas phase thermochemistry)
Glow discharge ion source	Reagent ions H_3O^+, O_2^+, NO^+
Dimensions	1030 x 1630 x 650mm
Weight	~230kg
Power requirement (normal	<750W
Reactor oven heating	30–130°C
Fully computer-controlled operation, automatic analysis software function	
Option for computer-controlled reagent ion switching	
Option for mass calibration unit (injecting low levels of high mass compound)	

Kore Technology designed the TOF-MS system for the first PTR-TOF-MS instrument (Series 1) back in 2002, and we have continued our innovation since. We are pleased to present our higher performance PTR-TOF-MS instrument, the **Kore PTR 2e**.

Kore's original Series 1 PTR instrument has been redesigned to deliver:

- High sensitivity resulting in low detection limits for analyte species
- High mass resolution for unambiguous identification of chemical species
- A rugged instrument cushioned in a frame, portable in a transit van for field work

Kore TOF-SIMS 'SurfaceSeer S'

High surface sensitivity	$1x10^9$ atoms/cm^2 (ppm)
Mass resolution	>2500m/δm (FWHM)
Mass range	>1000amu
	Mass range 1–10,000amu with high mass detector (option)
Mass accuracy	±0.005 amu
Analysis area	100µm to 1000µm
Dimensions (height x width x depth)	Instrument frame 1800 x 1860 x 950mm
SIMS	Positive and negative ion modes
Primary ion beam	5keV Cs^+
Low-energy electron gun for charge compensation of insulators	
Isotopic analysis	
Conducting and insulating sample analysis	
Elemental and molecular information from surfaces	
Sputter cleaning capability	
<1 minute analysis	
5 minute sample pump down from atmosphere	
SIMS data libraries available	
Optional optical microscope / camera / monitor	

The **Kore SurfaceSeer S** is an affordable and compact system for fast surface chemical characterisation. This instrument is ideal for investigating the chemical composition of sample surfaces and is equally at home in R&D or industrial quality control applications.

Understanding surface chemistry is critical both in university research labs and in industrial settings. Surface science instruments have typically been very expensive and have required qualified staff to operate them and interpret the data. This has meant that acquisition of surface science instruments in industry has been mainly confined to the large central research labs of major companies. The SurfaceSeer S allows researchers and companies of all sizes to gain access to important surface chemistry information at an affordable cost.

Kore TOF-SIMS 'SurfaceSeer I'

High surface sensitivity	1x10^{9} atoms/cm^{2} (ppm)
Mass resolution	>3000m/δm (FWHM)
Mass range	>1000m/z
	Mass range 1–10,000amu with high mass detector (option)
Mass accuracy	±0.002m/z
Analytical spatial resolution	≤0.5µm
Dimensions (height x width x depth)	Desk frame 977 x 1704 x 800mm Instrument frame 1860 x 920 x 920mm
25keV LMIG with Au or Ga liquid metal ion sources	
Sputter cleaning capability with O_2 ion gun (option)	
Positive and negative SIMS	
Conducting and insulating surfaces	
Elemental and molecular information from surfaces	
<1 minute analysis	
5 minute sample pump down from atmosphere	
Separates common organics from elements	
Isotopic analysis	
SIMS data libraries available	

The **Kore SurfaceSeer I** is a high sensitivity TOF-SIMS for imaging and chemical mapping of insulating and conducting surfaces. This instrument is ideal for investigating the chemistry of surfaces and is equally at home in R&D or industrial quality control applications.

The SurfaceSeer I uses the same TOF-MS technology as the SurfaceSeer S, but is fitted with a high brightness, high spatial resolution 25kV liquid metal ion gun (LMIG) as the primary ion source. The probe size, ≤0.5µm, of the LMIG allows for high analytical spatial resolution. Full instrument computer control allows the gun to be scanned during the mass spectral acquisition so that chemical images, or maps, may be collected. A secondary electron detector (SED) is also provided for tuning of the primary beam and SED image capture.

Kore Compact EI-TOF-MS

Concentration range	From ppb levels to 100% (four sensitivity settings in software)
Maximum sensitivity	Krypton in air (1.1ppm) in 10 seconds (capillary inlet)
	Xenon in air (90ppb) in 1 minute (capillary inlet)
	Benzene detection limit <50ppb in 10 seconds (with membrane inlet)
Mass accuracy	±0.005amu
Mass resolution	>1000m/δm (FWHM)
Mass range	Unlimited; in practice 1–1000m/z (limited by gas phase thermochemistry)
Electron impact ion source	70eV; compatible with NIST database
Dimensions	440 x 280 x 520mm
Weight	23kg
Pumping	85l/s turbomolecular pump, backed by a diaphragm pump
Ion source baking	Up to 100°C (hot source available on request)
Supplied with two sample inlet systems	Capillary inlet
	Membrane inlet (enhanced sensitivity for VOC detection)
Response times	<1 second (capillary inlet)
	~10 seconds for benzene (membrane inlet)
Time to operation after transportation	~ 30 minutes

The **Kore Compact EI-TOF-MS** is a modular, computer-controlled, time-of-flight mass spectrometer that can be operated as a benchtop instrument or transported for on-site operation. It provides rapid and sensitive gas analysis for production and research applications.

The instrument is designed with ease of use in mind and is ideally suited to monitoring the constituents of gases at pressures from millibars to 10 bar in process monitoring and other industrial applications.

Electron impact (EI) ionisation is one of the first and most widely used ionisation techniques in mass spectrometry and has been in use for over 100 years. The ionisation of the analyte molecule relies on a beam of (usually) 70eV electrons removing an electron from the molecule during the collision. EI is described as 'hard ionisation'; the excess energy in the collision produces many fragment ions. The 'fingerprints' or patterns of molecular and fragment ions can be related to extensive databases such as NIST and allow for mass spectral deconvolution. EI ionisation can be used for ionisation of both inorganic and organic compounds.

Kore MS-200

Concentration range	From ppb levels to 100% (% using minor isotopes)
Maximum sensitivity	Benzene detection limit <5ppb in 10 seconds (membrane inlet)
Mass resolution	>200m/δm (FWHM)
Mass range	1–1000m/z
Electron impact ion source	70eV; compatible with NIST database
Dimensions	531 x 328 x 213mm
Weight	21kg
Pumping	Built-in ion pump
Battery run time	Analysis: 6 hours (1 spectrum every 5 mins)
	Pumping only: 4 days
Supplied with dual membrane inlet	Enhanced sensitivity for VOC detection
Response time after new gas sample introduction	Variable, depending upon compound permeation rate (typically, tens of seconds)

Kore continues to offer our best-selling portable mass spectrometer, the **Kore MS-200:** a battery-powered electron ionisation mass spectrometer for gas analysis, entirely contained in a suitcase.

The Kore MS-200 transports the advantages of mass spectrometry — good specificity for the identification of unknowns, versatility, accuracy and sensitivity — from the laboratory into the field. The MS-200's membrane inlet concentrator allows a wide range of VOC compounds to be identified and measured from the low ppb range up to percent levels.

Kore HR EI-TOF-MS

Mass range	Unlimited; in practice 1–1000m/z (limited by gas phase thermochemistry)
Mass resolution	≥8000m/δm (FWHM)
Response time	~100ms
Sensitivity	Xenon in ambient air: 90ppb in 1 minute
Mass accuracy	1 milli amu (interpolated), 2 milli amu (extrapolated)
Inlet system	Capillary and membrane up to 10 bar pressure gas inlet
Inlet heater	Up to 150°C
Power supply	220–240 volts, 1kW
Dimensions	610 x 1650 x 800mm
Weight	250kg
Data acquisition	Rack-mounted PC or laptop

The **Kore High Resolution (HR) EI-TOF-MS** is designed for analysis of process gases for production and research applications. The longer flight tube allows for higher mass resolution analysis of gas samples. This instrument offers real-time, high time resolution, high sensitivity detection of all gas species in parallel. All masses are collected, preserving the maximum amount of information. The dual inlet system comprises a heated capillary inlet for inorganic gases and a permeable membrane concentrator inlet assembly for VOCs.

The HR EI-TOF-MS has the ability to analyse inorganic gases as well as identify and analyse VOCs at pressures from millibar to 10 bar, which makes the equipment well suited to process monitoring as well as catalysis studies and combustion or pyrolysis reaction research. The rack-mounted instrument has anti-vibration suspension for easy and safe transportation between different sites.

Kore's global support

As well as conducting sales, servicing and support, both in person and remotely, from our headquarters in Ely, Cambridgeshire UK, Kore offers support across the globe via selected representatives who facilitate local instrument sales and local servicing. To find a representative in your region, please check our website or email us at sales@kore.co.uk.

Kore's consultancy services

For those involved in R&D in TOF-MS and vacuum physics, we are pleased to offer excellent rates for consultancy services ranging from experimental design, samples and/or pilot testing and results analysis, to instrumentation integration and software development. With our team's long history at the heart of innovative analysis, we love to help customers solve their analytical challenges using TOF-MS. Just email us at info@kore.co.uk.

NIST and Kore

Kore is a licensed re-seller of the widely used and highly respected NIST mass spectral library of electron impact ionisation spectra. This database is the product of a multiyear, comprehensive evaluation and expansion of the world's most widely used mass spectral reference library. The package includes a powerful software program that provides a variety of search modes for interrogating the library of compounds. Kore can offer the full NIST24 package or upgrades from previous versions.

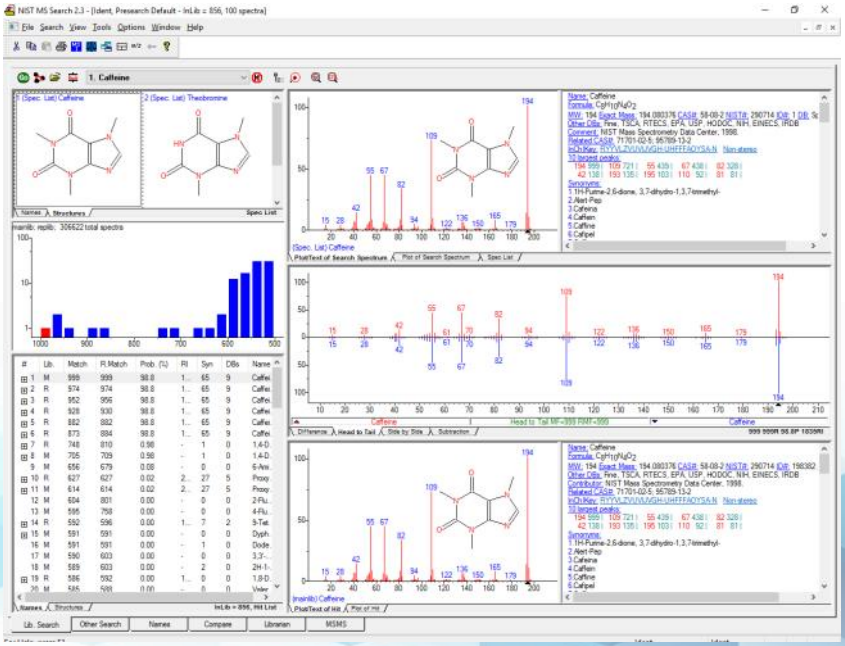
PHOTONIS

Photonis Scientific Inc. is at the forefront of ion detection technology, offering the highest temporal resolution detectors for ADC and TDC based systems. This pioneering company is recognized as the global leader in electron multiplication technology for its Channeltron® Mass Spectrometer Detectors, Long-Life™ Microchannel Plates and Advanced Performance Detectors. Kore is proud to be the UK distributor for Photonis and can provide technical information and quotations for their range of products.

AP TECH

APPLIED PHYSICS TECHNOLOGIES

Applied Physics Technologies Inc. specializes in thermionic and field emission cathodes, producing CeBix® (cerium hexaboride), LaB6 (lanthanum hexaboride), HfC (hafnium carbide) cathodes, CFE and ESE sources. AP Tech is a leader in custom design and fabrication, electron emission research and publication, bringing innovation from the laboratory to the marketplace. As their agent since 2004, Kore can help you find the cathodes you need for replacement, OEM, and custom applications.



Screenshot of NIST spectral library

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