

# Classical and special AMD Magnetic Sector mass spectrometers (extracted from power point presentations)



## High Resolution Mass Spectrometer

AMD 402/403 S

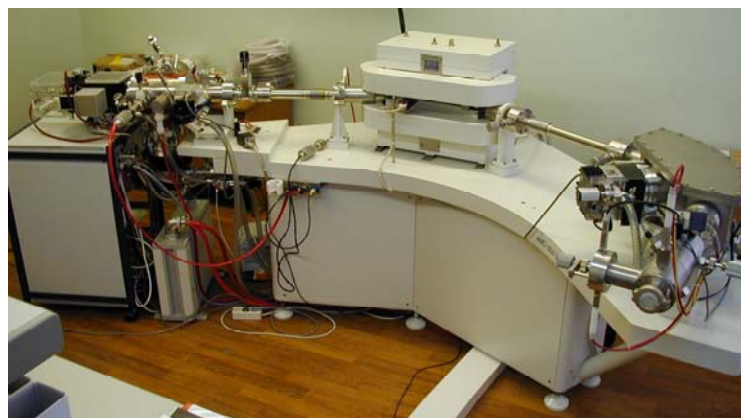


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## High Resolution Mass Spectrometer

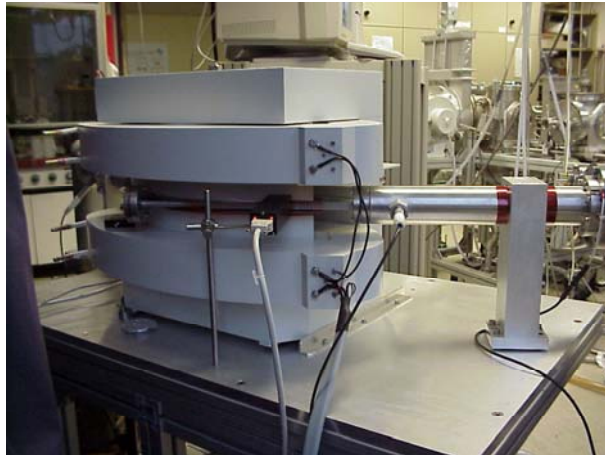
AMD 604 S



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## System for Cluster Ion Deposition



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## Compact High Performance Mass Spectrometer for demanding Process Analysis



- Detection of Heavy Water in cooling circulations system of nuclear power stations
- Measurement of Isotopic Ratio of  $H_2$  und HD under high resolution conditions
- General Process Analysis applications

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# Astronomic Dimensions in Mass Spectrometry

## AMD QuAS<sup>3</sup>AR



### Innovation in Analytical Instrumentation

The AMD QuAS<sup>3</sup>AR is designed to meet the demanding challenges and applications for mass spectrometry in Life Sciences, Environmental Analyses, Chemical Research and other Areas

The future orientated AMD QuAS<sup>3</sup>AR mass spectrometer combines all advantages of magnetic sector, time of flight and quadrupole technologies resulting in an unmatched summation of success parameters: Quality of Analyses, Sensitivity, Speed, Specificity, Accuracy, Resolving power = QuAS<sup>3</sup>AR

A unique combination of ionization techniques results in outstanding features including GC/MS, LC/MS and CE/MS methodologies

### Configurations:

- Dedicated GC/MS with unique in-axis EI and CI sources for simultaneous recording of fragment ions and quasi-molecular ions or rapid switching between the ionization techniques
- Dedicated LC/MS with unique in-axis API (ESI/APCI) and EI sources
- Dual Chromatography GC/LC/MS for alternating analyses in both chromatography modes
- Multi Purpose Systems according to customer demands incorporating additional modules as DEI, DIP, DCI, Liquid SIMS (FAB), FI/FD techniques

### Features:

- Electric recording of mass spectra covering 1.2 mass decades by simultaneous multi channel scanning
- Fast scan speed achieving up to 30 spectra per sec for full scan
- Accurate mass measurements better than 5 ppm at dynamic working resolution (6000 FWHM)
- Outstanding long term stability of external calibration and use of one lock mass for full mass range
- Large dynamic range and drastically improved specificity for quantitative SIM analyses

### Technology:

- A compact double focusing magnetic sector analyzer applying Mattauch-Herzog ion optical geometry
- Focal plane for the detection of highly resolved ions in a wide mass range at constant magnetic field
- Unique AMD QuAS<sup>3</sup>AR technology using parallel multi channel detection system
- Latest digital hardware technology for data acquisition and processing and sophisticated software

## The Innovators in Magnetic Sector Mass Spectrometry

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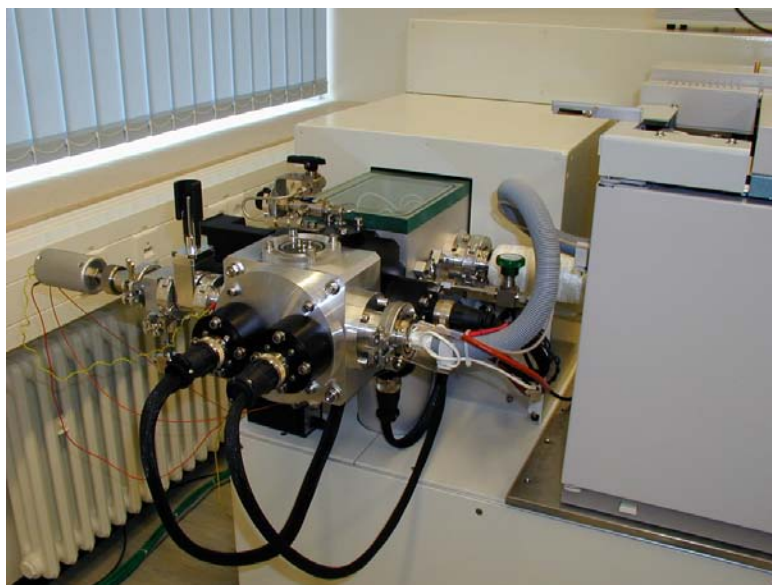
## AMD QuAS<sup>3</sup>AR

### Modular Multi Application High Resolution Mass Spectrometer

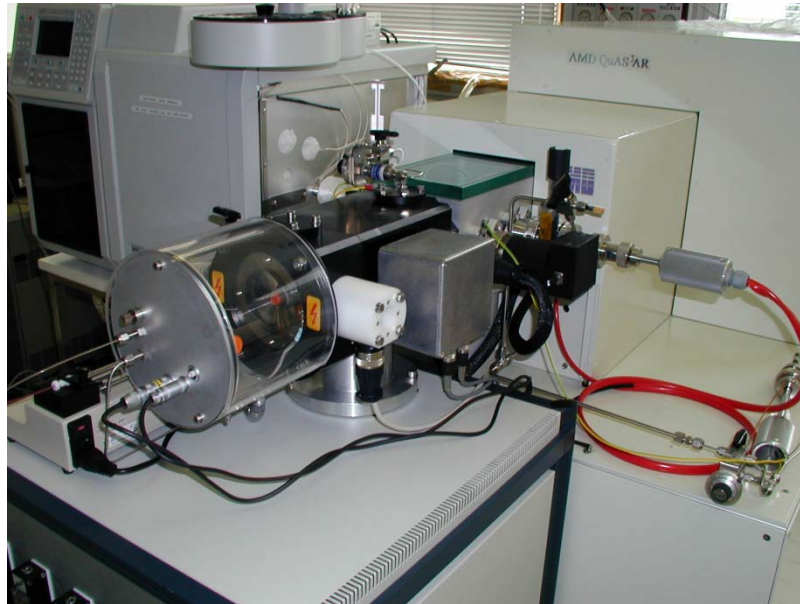
#### Description of a unique System



**GC/MS Configuration with EI ion source and DIP/DEI sample introduction**



**GC/MS Configuration with Dual EI/CI Ionization module**



**GC/LC/MS Configuration with EI/CI/ESI Ionization module**

<b>Module</b>	<b>Description</b>
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**Basic System**

<b>QuAS<sup>3</sup>AR</b>	<p><b>Double focusing magnetic sector mass spectrometer</b> of the new <b>AMD compact class</b> in special EB configuration</p> <p><b>Integrated system electronics</b> for bipolar mode</p> <p><b>Universal ion source housing</b> for different ionization techniques, sample inlet systems and coupling with a choice of peripheral chromatographic systems</p> <p><b>Turbo molecular pumping system</b>, vacuum control unit with safety circuitry</p>
<b>Detector</b>	<p><b>Single channel detector</b> for largest deflection radius with post-acceleration and SEM</p>
<b>Multichannel</b>	<p><b>AMD QuAS<sup>3</sup>AR Detector Technology</b> with Multi-Exit slit arrangement, post-acceleration, simultaneous multi-channel ion detection system</p>
<b>EI</b>	<p><b>High Intensity EI-ion source</b></p>
<b>Reference</b>	<p><b>Reference inlet system</b>, 250 °C, regulation valve, injection volume</p>

**Module Description**

**Control** **Multi-Tasking Instrument-Control-System (AMD MICS)** for processor control of system functions incl. all parameters for ion sources, analyzer, detector and sample introduction systems.

**Data System** **AMD Data system** (version 2012) for simultaneous data acquisition and data processing

**Dual-Processor PC, state of the art technology, Windows™** operating system, large TFT-flat screen monitor, LaserJet Printer

**Acquisition and real time display system** with digital IO, digital multi satellite communication interface and A/D-D/A satellites for simultaneous V/E scans in multi spectral ranges, resulting in a full mass range spectrum based on unique **AMD QuAS<sup>3</sup>AR Technology**

**Raw data** and peak **centroid data** acquisition in all LR and HR scan modes

**Exact mass determinations** in single channel, multi channel V/E- and B-scan modes

**Raw data accumulation, spectra averaging and ion chromatography** for LR,HR and Selected Ion Monitoring (SIM)

**Options Data System and Scan Techniques**

**Evaluation** **AMD NetCDF Writer**, conversion of files in CDF Format for evaluation of data by off-line programs according to customers choice

Determination of elemental compositions and isotopic distributions

Quantification from ion chromatography data in SIM and scan series modes

**NIST** **NIST** data base and library search interface

**Batch** **Control of automatic injection** (batch analyses) in scan and SIM modes (GC or LC with auto sampler required)

**Decon** **Deconvolution program** for determination of molecular weights from multiple charged ions in **ESI** mode

**Module**      **Description****Options Sample Introduction and Ionization Techniques**

<b>DIP</b>	<b>Direct Inlet System</b> Software controlled direct inlet system (DIP) with high vacuum lock and insertion probe, gas cooled crucible mounting, temperature range from 18°C - 350°C (low temperature cooling possible)
<b>CI-Standard</b>	<b>CI device</b> CI-Ionization box movable into EI ion source via DIP inlet port for <b>GC/MS and CI/DCI operation</b> , shut-off and regulation valve for reagent gas
<b>DEI/DCI</b>	<b>DEI/DCI sample introduction</b> Software controlled DCI/DEI inlet probe for the direct analysis of thermo labile/polar substances, temperature range from 20°C -1000 °C
<b>GC-MS</b>	<b>GC-MS Interface</b> , Temperature up to 280 °C
<b>GC</b>	<b>Gas Chromatograph</b> (customer choice) with split/split-less injector
<b>API-UDIC</b>	<b>API interface</b> in AMD UDIC (Unique Dual Ionization Configuration) „in-axis“ configuration for alternating or simultaneous recording of ions from EI and API ion sources, API housing with counter-electrode, corona needle for calibration and testing, nozzle, lens, skimmer stage with fore pump, ion guide quadrupole with turbo pump
<b>ESI</b>	<b>Electrospray-Ionization (ESI) Module</b> for LC/MS Coupling and Direct Infusion, flow rates 5 - 100 µl/min, split for higher flow rates

**Optional configurations**

<b>GC/LC/MS</b>	<b>Dual Chromatography GC/LC/MS Configuration structure</b> which allows <b>alternating analyses</b> (injections) in <b>GC/MS or LC/MS</b> modes <b>without system modifications</b>
<b>Transfer</b>	<b>AMD UDIC ion optics</b> (Unique Dual Ionization Configuration) with <b>AMD MICS extension</b> in special „in-axis“ configuration for two ionization modes. Alternatively: API, LSIMS, extended CI/DCI or FD/FI form with the standard EI source a system <b>for simultaneous or alternating recording of ions from two independent ion sources.</b>
<b>CI-UDIC</b>	<b>CI-UDIC Ion source</b> (Module “Transfer” required). Flange with EI ion source structure, AMD MICS extension, movable CI ionization volume, shut-off and regulation valve for reagent gas, high vacuum lock, special “in axis” configuration (with transfer ion optics) for <b>simultaneous or alternating recording</b> of ions from <b>CI/DCI</b> and standard <b>EI</b> ion source

## AMD QuAS<sup>3</sup>AR Performance Specifications:

- 1 Analyzer:** **Magnetic sector analyzer** system in double focusing **EB** configuration for **multichannel parallel ion recording**
- 2 Resolution:** **Point detector** at largest magnetic deflection radius:  
300 - 10000 (10 % valley) or 600 - 20000 (FWHM)  
  
**Multi channel mode**  
300 - 3000 (10 % valley) or 600 - 6000 (FWHM)
- 3 Mass range:** 1 - 2,000 Dalton at 6 kV accelerating voltage  
2 - 4,000 Dalton at 3 kV accelerating voltage
- 4 Scan range:** **B-scan:** full mass range  
**V/E-scan in multi channel mode:** 1.2 mass decade selectable (e.g. 50 – 800 or 100 – 1600 u)
- 5 Scan speed:** **B-scan:** 0.5 sec/mass decade (cycle time 0.8 sec)  
  
**V/E-scan in multi channel mode:** 30 msec/1.2 mass decade (cycle time 40 msec)
- 6 Sensitivity:** **5 - 10 picogram** injected on a capillary column result in substance specific mass spectra for standard samples in **GC/MS** EI-mode (identifiable by library search) and in CI mode (quasi molecular ion)  
  
**SIM Techniques:**  
  
Substance quantitation for standard sample concentrations in the range of **2–5 picogram/µl** in **GC/MS-EICI** mode, (**femto-gram range** at low chemical noise level possible)  
  
**100 picogram Reserpine** in flow injection **ESI-mode** yield a signal to noise ratio S/N > 100:1 for the protonated molecular ion
- 7 Accuracy of mass determination:** **Computer aided accurate mass determination** (short range V/E-Scan):  
**2 - 5 ppm at R=3000** (10% valley)  
  
**B-Scan mode:** precision and accuracy of masses in the range of **0.5 – 2.0 mmu**, averaging of at least 5 spectra (scan speed: 1,0 sec/dec, R = 3000 (10% valley), mass range 70-600 u (100 ions per peak required))

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