Technical Data

PlasmaQuant 9200 Series
High-Resolution ARRAY ICP-OES

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General

- High-resolution ARRAY optical emission spectrometer with an inductively coupled plasma for multi-element analyses of highest accuracy and precision
- Compact bench-top instrument with smallest width on market designed for high performance analytical tasks and ease of use
- Wide range of accessories maximize productivity, safety, ease of use and reduce wear

Torch and Sample Introduction

V Shuttle Torch

Plasma geometry	Vertical
Torch mounting	Shuttle design with compact sliding torch base made from thermally and chemically inert material
Gas connections	Incorporated in torch base without separate gas tube connections
Torch models	▪ Fully demountable torch with separable inner, outer and injector tubes ▪ One-piece torch
Torch alignment	▪ Precision auto-alignment without necessity for routine re-alignment ▪ Automatic optimization of radial observation position ▪ Possibility for manual torch height optimization for special applications

Sample Introduction

Standard kit	▪ Borosilicate glass cyclonic spray chamber ▪ Demountable V Shuttle Torch with 2 mm injector and bonnet (quartz) ▪ Concentric borosilicate nebulizer 1 mL/min ▪ PVC pump tubing
Salt kit	▪ Borosilicate glass cyclonic spray chamber with dip tube ▪ Demountable V Shuttle Torch with 2 mm injector (Alumina) ▪ Concentric borosilicate nebulizer 2 mL/min ▪ Argon humidifier ▪ PVC pump tubing
HF kit	▪ PTFE cyclonic spray chamber ▪ Demountable V Shuttle Torch with alumina inner tube, Syalon outer tube, 2 mm alumina injector and bonnet ▪ Concentric nebulizer PFA 1 mL/min ▪ PVC pump tubing
Organic kit	Borosilicate glass cyclonic spray chamber with dip tube

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	▪ Demountable V Shuttle Torch with 1 mm injector (quartz) ▪ Concentric borosilicate nebulizer 1 mL/min ▪ Viton pump tubing
Precision kit	▪ Borosilicate glass cyclonic spray chamber with dip tube ▪ Demountable V Shuttle Torch with 2 mm injector and bonnet (quartz) ▪ Precision nebulizer, 2 mL/min ▪ PVC pump tubing
Additional sample introduction	Wide range of concentric nebulizers (EasyFit®), parallel path nebulizers, ultrasonic nebulizer, pump tubing and torch components available
Sample transportation	12-roller peristaltic pump with four channels

Accessories for sample introduction

Autosamplers	▪ ASPQ 3300 (capacity up to 180 samples) ▪ Cetac ASX 280 (capacity up to 180 samples) ▪ Cetac ASX 560 (capacity up to 360 samples) ▪ Cetac XLR 860 (capacity up 720 samples) ▪ Cetac Oils 7400 (capacity up to 384 samples)
Dilution autosamplers	▪ Cetac SimPrep offline dilution system ▪ Cetac SDX_{HPLD} online dilution system
Discrete sample introduction	▪ Cetac ASX_{PRESS} P_{LUS} 6 port rapid sample introduction system for aqueous samples ▪ Cetac ASX_{PRESS} P_{LUS} 6 port rapid sample introduction system for oil samples
Temperature controlled spray chamber	Isomist XR with temperature range from -25 °C to 80 °C
Hydride systems	▪ Continuous flow hydride system HS PQ Pro with online reactant addition, micro spray chamber as gas/liquid separator and hydride pro injector for superior detection limits of hydride elements ▪ Continuous flow hydride system HS PQ with online reactant addition and dual inlet spray chamber for the simultaneous analysis of hydride and non-hydride elements
Argon humidifier	Elegra Argon Humidifier

RF Generator

Solid State RF Generator

Type	Solid-state generator, virtually center grounded
Specification	27 MHz, 300 V RMS
Power range	700 to 1700 W (in 50 W increments), no plasma shield

Coil	3-winding

Plasma Observation

Dual View Plus

Plasma observation	Radial, axial
Attenuated plasma observation	Radial plus, axial plus
Control	Method parameter in software
Working range	Sub µg/L to high percentage range
Viewing position	Fully automated optimization of the plasma viewing position in all plasma observation modes

Plasma Check

Plasma Check	Camera for remote observation of the plasma

Optical Bench

High-resolution optics

	PlasmaQuant 9200 Elite	PlasmaQuant 9200
Type	▪ Echelle Double Monochromator	
Pre-monochromator	▪ Quartz prism	
Entrance slit	▪ 5 variable settings and fixed intermediate slit (dimensions entrance slit: 35 x 1800 µm)	
Optical bench	▪ Encapsulated and argon purged	
Grating	▪ Echelle grating with large blaze angle of 74.6° to 75°	
Focal length	▪ 400 mm	
Spectral resolution	▪ 0.002 nm at 200 nm	▪ 0.006 nm at 200 nm
FWHM values	▪ ≤ 3.5 pm for As 193.696, Tl 190.796	▪ ≤ 5.0 pm for As 193.696, Tl 190.796
Wavelength range	▪ 160 – 900 nm	
Number of accessible emission lines	▪ > 43,000	
Wavelength accuracy	▪ < 0.4 pm via internal Ne-correction	

Detector

Type	Charge Coupled Device (CCD)
Cooling	Peltier cooled to -10 °C
Integration times	1 ms to 10 s
Linear dynamic range	6 orders of magnitude
Integration modes	Peak, spectrum

Limits of Detection*

Element/Line [nm]	*LOD axial [µg/L]*		*LOD axial [µg/kg]*
	0.5 % HNO3	15% NaCl*	100% Kerosene*
P 177.436	< 2.0	< 5.0	< 3.0
As 193.698	< 2.0	< 5.0	< 4.0
Zn 213.856	< 0.1	< 0.4	< 0.6
Pb 220.353	< 1.0	< 3.0	< 10
Mn 257.610	< 0.05	< 0.3	< 0.1
V 292.401	< 0.1	< 0.3	< 1.0
Cu 324.754	< 0.2	< 0.7	< 0.6
Na 589.592	< 0.5	n.a.	< 4.0
K 766.491	< 1.0	n.a.	< 2.0

* LOD specification as preliminary results for PlasmaQuant 9200 Elite only

Gas Control

Automated gasbox for all gas flows	Yes
Plasma gas	7.5 to 20 L/min with 0.1 L/min increments
Auxiliary gas	0.2 to 2.0 L/min with 0.05 L/min increments
Nebulizer gas	0.1 to 1.5 L/min with 0.01 L/min increments
Oxygen gas	0.0 to 0.05 L/min with 0.01 L/min increments
Gas purity	> 4.6
Argon inlet pressure	5 to 7 bar

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Self-Check System

Sensors and interlocks	▪ Gas pressures ▪ Gas flow rates ▪ Extraction rate of exhaust system ▪ Positioning of torch ▪ Pressure of spectrometer gas ▪ Nebulizer blockage ▪ Generator power ▪ Temperature of cooling agent ▪ Flow rate of cooling agent ▪ Plasma intensity and stability ▪ Status of door for torch compartment

Physical Data

Weight	ca. 115 kg
Dimensions (W x H x L)	600 mm x 932 mm x 809 mm
Dimensions without tray (W x H x L)	600 mm x 932 mm x 570 mm
Interface	PC connection: USB
Operating voltage	200-240 V (± 10%)
Power supply	2500 VA
Power consumption	2500 VA
Operation conditions	+ 15 to 35 °C, 20 to 80% relative humidity, non-condensing atmosphere, free from corrosive fumes
Exhaust requirements	3.5 to 5.5 m^3 / min
Technical standards	Complies with standards for safety and electromagnetic compatibility for CE Marking (LVD 2014/35/EU; EMC 2014/30/EU; RoHS 2011/65/EU) and UL, CSA marking, ISO 9001 compliant
Gas consumption in standby	None
Warm-up from powered-down	< 10 min

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Control and Data Evaluation

Requirements	▪ Operating system: Windows 11 (32-Bit or 64-Bit) ▪ RAM: min. 8 GB ▪ Memory: min. 256 GB, SSD recommended ▪ Graphic resolution: min. 1280 x 1024 px. ▪ 2x USB 2.0
Control unit requirement	ASpect PQ with: ▪ Method development tool (line library, pre-defined methods, free selection of instrument parameters, various calibration strategies) ▪ Spectral evaluation tools (Inter element correction (IEC), patented automatic baseline correction (ABC), static baseline fitting, correction of spectral interferences (CSI), identification of emission lines, free selection of number and position of evaluation pixels ▪ Quality control module with pre-defined QC tests and QC charts ▪ FDA 21 CFR Part11 compliance ▪ QC charts with pre-defined QC tests ▪ Advanced statistics module

Chiller Requirements

Cooling capacity	<2500 VA
Water temperature (at cooling water inlet ICP-OES)	18 °C – 20 °C
Set temperature cooler	20 °C
Temperature stability	plus/minus 0.1 °C
Water flow in cooling water circuit	min.1.5 ... 2,0 l/min
Cooling water pressure	max. 6 bar
Water purity Conductivity	50 ... 200 uS/cm
Hose diameter cooler outlet	13 mm = ½ inch.

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