

Optima 7x00 DV Series ICP-OES

System configurations	SCD detector(s)	Cross-disperser(s)	Wavelength range
Optima 7100	single	single	163-403 nm ¹
Optima 7200	single	single, dual dispersion with shutter selection	163-403 nm and 421, 610, 670, 766 nm
Optima 7300	dual	dual	163-782 nm

¹ Can be upgraded to include full dual detector wavelength range (163-782 nm).

Spectrometer specifications

Polychromator	<p>The high-energy (f/6.7) echelle-based Optima™ polychromator utilizes one or two SCD detectors depending on the Optima model. The measured resolution of the system is 0.006 nm at 200 nm. The 80 by 160 mm echelle grating has 79 lines per mm and a blaze angle of 63.4 degrees. In the Optima 7100, the cross-disperser for the UV region (163-403 nm) is a 374 lines/mm grating. In the Optima 7300, a 60-degree fused-quartz prism is added as the cross-disperser for the visible region (403-782 nm). The Optima 7200 includes a single cross-disperser with dual dispersion (374 and 187 lines/mm, computer-controlled shutter selectable) to cover the full UV region (163-403 nm) and selected parts of the visible region (421 nm, 610 nm, 670 nm and 766 nm). The UV disperser on all Optima 7x00 DV series spectrometers incorporates Schmidt correction to eliminate aberration for the 400-mm radius camera sphere.</p> <p>The entire optical system is enclosed in a purged and thermostatted optical enclosure. The optical enclosure is mounted on the same large optical bench as the sample-introduction system. The optical bench is shock-mounted to the frame of the instrument so that normal floor vibrations do not affect system performance.</p>
Plasma viewing	<p>With the patented dual-view capabilities of the Optima 7x00 DV series (U.S. Patent No. 5,483,337), viewing of the plasma is accomplished by computer control of a mirror located in the optical path and allows selection of axial, radial or mixed viewing modes and adjustment of the plasma viewing in both the vertical and horizontal planes. The viewing position can be optimized by the software.</p>
Shutter and Hg recalibration system	<p>The computer-controlled, pneumatically operated shutter automatically opens and closes for each sample, protecting the first transfer mirror from long exposures to the intense UV radiation of the plasma, extending the useful lifetime of the mirror. A mercury lamp is built into the shutter mechanism and can be viewed at a user-selected frequency to automatically update the system wavelength calibration at the 253 nm mercury emission line.</p>
Detectors	<p>Custom-designed, application-specific, patented PerkinElmer Segmented-array Charge-coupled Device detectors or SCDs (U.S. Patent No. 4,820,048) consist of 235 addressable subarrays covering approximately 6000 wavelengths on a 13 by 19 mm silicon substrate. Typical readout noise is about 13 electrons RMS; dark current is less than 100 electrons/pixel/second; and readout speed is 50 µsec/pixel. Correlated double-sampling data-acquisition electronics further reduce electronic noise.</p>

ICP system specifications

RF generator	<p>The Optima 7x00 DV series of ICP-OES systems features a second-generation 40 MHz, free-running solid-state RF generator, adjustable from 750 to 1500 watts, in 1 watt increments. The power efficiency is greater than 81% with < 0.1% variation in output power stability. True Power Control maintains the plasma power at the set point, even when changing sample matrices. The compact RF supply meets all FCC certification requirements for RF emission (Part 18 of FCC rules and regulations) and complies with EC and VDE 0871 Class B requirements.</p>
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Ignition and power control	Plasma ignition is computer-controlled and totally automated. The software allows the plasma to be ignited automatically at a user-determined time and turned off automatically after an analysis.
Safety interlocks	For user safety and system protection, the system constantly monitors water flow, shear gas pressure, argon pressures, sample-compartment door closure and plasma stability, and displays the interlock status on the computer screen as graphic symbols. If an interlock is interrupted, the plasma will immediately and safely shut down.
Cooling water	A water-recirculating cooling system is required, with approximately 4 L/min flow capacity at 310 to 550 kPa and a temperature between 15 °C and 25 °C.

Gas flow controls

Argon flow	Computer-controlled solenoid valves are used to regulate the flow automatically within the range of 0-20 L/min in 1 L/min increments for plasma argon and 0 to 2.0 L/min in 0.1 L/min increments for auxiliary argon. A mass-flow controller is supplied with all systems for the nebulizer argon flow and is variable between 0 and 2.0 L/min in 0.01 L/min increments.
Shear gas	A compressed-air shear gas (18-25 L/min) is used to remove the plasma tail from the optical path, minimizing interferences and extending the dynamic range. The shear gas design offers a maintenance-free and lower-cost approach to removing the cooler plasma zone.

Sample introduction system

Torch/torch mount	A unique demountable torch design using one-piece quartz tubing for plasma and auxiliary gas flow is supplied. The standard torch includes a 2.0-mm i.d. alumina injector for full corrosion resistance to all acids, including hydrofluoric and aqua regia. A variety of other injectors is available. The externally mounted spray chamber is integrated into an easily removed sample-introduction cassette in an enclosed compartment. The sample-introduction cassette can be adjusted (with the plasma on) for maximum performance in different matrices. No tools are required for torch or sample-introduction cassette removal.
Spray chambers	Instruments can be ordered with a Ryton® HF-resistant Scott-type or a glass cyclonic spray chamber. An optional spray-chamber compartment thermostat is available for laboratories with minimal air conditioning.
Nebulizers	The Optima 7x00 DV systems can be ordered with a cross-flow or glass concentric nebulizer. The cross-flow design with GemTips™ is corrosion-resistant (sapphire/ruby tips in a PEEK body). The system can routinely handle 50% (v/v) solutions of HCl, HNO ₃ , H ₂ SO ₄ , H ₃ PO ₄ , 20% (v/v) HF and 30% (w/v) NaOH. Additional nebulizers are available.
Peristaltic pump	The integrated three-channel, computer-controlled pump has speeds variable from 0.2 to 5 mL/min in 0.1 mL/min increments using 0.76 mm (0.030 in.) i.d. tubing. Software features, including FastPump™ and SmartRinse™, dramatically improve sample rinse-out and analysis time.
Spares kit	A spares kit of common replacement items is included.

System specifications

Power	One 200-240 V, 20A line, single-phase, 50/60 Hz
Dimensions	150 x 76 x 89 cm (W x H x D), 200 kg
Environmental	The instrument will operate with a laboratory temperature between 15 and 35 °C (59-95 °F). For optimum instrument performance, the room temperature should be controlled at 20 ±2 °C.

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