

# Thermo Scientific iCAP PRO ICP-OES and Thermo Scientific iCAP PRO X ICP-OES

## Cost-effective multi-element analysis

### Benefits

- Cost-effective alternative to AAS
- Easy to use with pre-optimized settings
- Comprehensive Qtegra ISDS Software

### Keywords

Ease of use, elemental analysis, ICP-OES, simplified work flow

Deliver robust, uncomplicated trace elemental analysis in your laboratory with the Thermo Scientific™ iCAP™ PRO ICP-OES and Thermo Scientific iCAP PRO X ICP-OES systems. These systems incorporate easy-to-use software and multi-element detection technology far superior to that of the single-element AAS and multi-element microwave plasma techniques. These instruments are ideal for laboratories with low sample through put requirements. For ease of use, a number of optimized settings are

defined as standard, making them ideal for users new to the technique or those who require a simple solution for multi-elemental analysis. The new vertical torch design for all instrument models ensures high matrix robustness for a range of sample types. The iFR (intelligent Full Range) analysis mode measures the entire wavelength range in one measurement, simplifying method development and analysis without comprising sensitivity or accuracy.



# iCAP PRO ICP-OES and iCAP PRO X ICP-OES hardware summary

## Sample introduction

The bench height sample introduction system is positioned to facilitate user accessibility to all parts.

## Spraychamber

- Single-pass cyclonic spraychamber to efficiently filter out larger aerosol droplets for improved plasma stability
- Compatible with all 6 mm OD nebulizers
- Optional spraychambers for total dissolved solids tolerance and resistance to organics or aggressive mineral acids

## Nebulizer

- Glass concentric nebulizer for optimal sample consumption
- Optional nebulizers in a range of flow rates, total dissolved solids tolerance and resistance to organics or aggressive mineral acids

## Torch

- Demountable Enhanced Matrix Tolerance (EMT)
- All connectivity (argon gas supplies and plasma ignition) designed into the torch holder, reducing complexity and improving usability
- Proprietary, screw-in, self-aligning injector for simplicity and reproducibility

## Peristaltic pump

- High precision 12 roller, 3 channel pump
- Pump tubing options are available for aqueous and samples containing organic solvents
- The iCAP PRO ICP-OES pump speed is optimized at 45 rpm
- The iCAP PRO X ICP-OES pump speed optimized and selectable at 30 or 45 rpm

## Inductively coupled plasma

The iCAP PRO Series ICP-OES plasma system is designed to rapidly adapt to changing matrices and provide unparalleled robustness even for challenging samples such as brine samples.

## RF generator

- Argon ICP source with digital, solid state RF generator
- Dynamic frequency impedance matching the plasma at 27 MHz
- Highly stable and robust plasma
- The iCAP PRO ICP-OES power is optimized at 1150 W
- The iCAP PRO X ICP-OES power is optimized and selectable at 750, 1150 or 1350 W

## Load coil

- Water-cooled load coil with PTFE coating for improved lifetime and reliable plasma ignition

## Plasma viewing

### Dedicated radial plasma

- The vertical plasma is viewed directly in a radial mode using high efficiency mirrors
- The foreoptics are fully purged to provide enhanced performance in the UV region of the spectrum
- Optimized radial viewing height of:
  - 10 mm for Duo instruments
  - 11 mm for Radial only instruments

### Dual view plasma

- The vertical dual view plasma may be viewed axially for applications requiring the lowest detection limits or radially to minimize matrix effects and extend the working range
- The dual purged optical path interface ensures excellent sensitivity in the UV region of the spectrum

## Optical system

### Type

- High energy Echelle cross dispersion optical system with “side-by-side” optical arrangement of prism and grating
- Unique mirror design for very high image quality, improved optical resolution and very low stray light performance

## Spectrometer optical path

- The entire spectrometer and foreoptics are purged with either argon or nitrogen to ensure high light transmission in the UV region

## Spectral bandpass

- <7 pm at 200 nm

## Wavelength coverage

- Capture the entire wavelength range in one measurement with the unique iFR analysis mode
- Lower wavelength limit of 167.021 nm allowing the determination of aluminium at the most sensitive wavelength of 167.079 nm
- Wavelength coverage extends to 852.145 nm for the option of determining potassium at 766.490 nm and sodium at 818.326 nm

## Detector

### Type

- New CID821 high performance solid state Charge Injection Device (CID). The new Thermo Scientific™ CID821 is an enhanced camera device delivering high contrast/low noise imaging and quantification of all wavelengths in the analytical range without blooming. The new device offers possibility of measuring high intensity WL next to low intensity WL (overlapping sub) without impact of measurement results

### Array size

- Four mega pixel individually addressable detector pixels of 12 µm x 12 µm in a 2048 x 2048 array for continuous coverage of the available wavelengths

## iCAP PRO ICP-OES and iCAP PRO X ICP-OES configuration

Table 1.

Configuration	iCAP PRO ICP-OES	iCAP PRO X ICP-OES
Peristaltic pump	3 channel optimized at 45 rpm	3 channel selectable at 30 or 45 rpm
Nebulizer	Glass concentric	
Spraychamber	Single pass glass cyclonic	
Torch orientation	Vertical (both radial and dual view)	
Injector	Quartz 1.5 mm standard for radial 2 mm standard for duo	
RF generator	27 MHz, optimized at 1150 W	27 MHz, selectable at 750, 1150 or 1350 W
Load coil	Water cooled with PTFE coating	
Ar gas flow controllers	<b>Nebulizer</b> <ul style="list-style-type: none"> <li>• MFC tunable via software</li> <li>• Adjustable between 0.3-0.5 L/min</li> </ul> <b>Auxiliary</b> <ul style="list-style-type: none"> <li>• MFC stabilized</li> <li>• Fixed at 1.5 L/min</li> </ul> <b>Plasma</b> <ul style="list-style-type: none"> <li>• MFC stabilized</li> <li>• Fixed at 12 L/min</li> </ul>	<b>Nebulizer</b> <ul style="list-style-type: none"> <li>• MFC tunable via software</li> <li>• Adjustable between 0.0-1.5 L/min</li> </ul> <b>Auxiliary</b> <ul style="list-style-type: none"> <li>• MFC stabilized</li> <li>• Selectable 0.5 or 1.5 L/min</li> </ul> <b>Plasma</b> <ul style="list-style-type: none"> <li>• MFC stabilized</li> <li>• Fixed at 12 or 14 L/min (RF power related)</li> </ul>
Plasma viewing	Radial and duo (axial view and radial view)	
Optical system	Echelle cross dispersion optical system with "side-by-side" optical arrangement	
Optical path purge	Argon or nitrogen purged	
Spectral resolution	<7 pm at 200 nm	
Wavelength range	167.021 to 852.145 nm	
Detector type	Charge injection device CID821	
Array size	2048 x 2048 pixel array	
Full frame imaging	Yes	
Startup time	1 hour	From power off, gas off 1 hour From Standby 15 minutes
Standby gas flow	Standby not available	0.4 L/min
Minimum integration time	30 seconds	15 seconds
Detector cooling temperature	-45 °C controlled within 0.1 °C	

## Site requirements and dimensions

Table 2.

Environmental		
Temperature	Range	15-35 °C
	Rate of change	< 2.5 °C·h <sup>-1</sup>
Humidity	Range	20-80% (non-condensing)
Utilities		
Electrical	Supply	200-240 V AC, 50/60 Hz single phase
	Power	Apparent power: 2694 VA Effective power: 2605 W
Cooling water	Supply temperature	25 °C
	Supply rate	> 2 L·min <sup>-1</sup>
	Pressure	0.2 MPa (2bar)
Argon gas supply	Purity	> 99.995%
	Typical flow rate	16 L·min <sup>-1</sup>
	Pressure	0.55-0.6 MPa (5.5-6.0 bar; 82.5-90 psi)
Plasma exhaust	Port dimensions	135 mm (recommended 120 mm ID ducting)
	Flow rate (120 mm ID ducting)	180-220 m <sup>3</sup> ·h <sup>-1</sup> for radial and duo systems

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