PRODUCT NOTE

ICP-Mass Spectrometry

KEY BENEFITS

- Super energy-efficient cooling
- Lightweight, compact, quiet and flexible
- Stable instrument performance
- Eco-friendly and cost-effective

GreenCT Cooling System – Keeping the Instrument and Planet Cool

Introduction

PerkinElmer's GreenCT™ cooling system is designed to provide a reliable, energy-efficient, cost-effective, and eco-friendly solution for cooling PerkinElmer's NexION® 2200 ICP-MS system, making it an ideal choice for laboratories looking to optimize their operations and lower operating costs, while reducing their environmental footprint. With its sophisticated sensors, efficient cooling path, and modern design, this future of ICP-MS cooling technology is optimized for the NexION 2200 ICP-MS.

Figure 1. PerkinElmer GreenCT™ cooling system.

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For the Better

Super Energy-Efficient Cooling

GreenCT is precisely matched to the cooling requirement of the NexION 2200 ICP-MS. Thanks to the NexION ICP-MS's patented LumiCoil™ technology that eliminates the need for liquid cooling of the RF plasma load coil, GreenCT is able to utilize liquid-to-air heat-change technology, which operates at much higher energy efficiency than traditional refrigeration-compressor-type ICP-MS chillers. The high efficiency of GreenCT is achieved through a unique and synergistic combination of:

- Revised ICP-MS instrument coolant flow path and components with reduced flow restriction.
- All-aluminum, micro-channel-type liquid-to-air heat exchanger with a very large surface area.
- Variable speed, advanced-technology fluid pump and ball-bearing air fan enable powerful yet peaceful heat radiation and long operational life.
- Exclusive new water-based coolant formula with industry-proven anti-corrosion, anti-wear and surface-active additives that offers higher heat transfer efficiency than traditional glycol-based coolants, combined with an extended change interval.
- Use of ambient laboratory air as a heat transfer medium eliminates the need for the refrigeration compressor found in chiller systems.
- On-board system controller and sensors continuously monitor all critical environmental and cooling-system parameters and optimize air and coolant flow rates to minimize power consumption and noise while actively stabilizing the ICP-MS interface temperature.

Lightweight, Compact, Quiet and Flexible

The GreenCT system is approximately **1/3 the size** and **1/5 the weight** of a comparable chiller, with the ability to cool the NexION 2200 ICP-MS operating continuously with 1600 watts of plasma RF power.

It provides quiet and vibration-free operation, thanks to its advanced fluid pump and air-cooling fan. Under typical operating conditions the GreenCT is practically inaudible, contributing to a healthier and more productive lab environment.

Flexible location: with its compact size and light weight, the GreenCT can be located beside, behind, or under the ICP-MS instrument, or even remotely up to 3 meters away.

Stable Instrument Performance

Unlike simple chillers and recirculators, the GreenCT system features a comprehensive set of sensors that monitor coolant pressure, level, temperature and flow, air temperatures, and other key parameters. This allows GreenCT to adjust its cooling capability according to operating conditions, ensuring optimal performance at all times, and reduce temperature fluctuations that could compromise your lab results.

The GreenCT system is usable in laboratory environments with air temperatures ranging between 15 and 30 °C and automatically compensates for variations in lab air temperature and instrument heat load.

Figure 2. GreenCT ensuring stable coolant temperature to the NexION 2200 ICP-MS.

Figure 3. GreenCT adjusting to ambient air temperature changes, ensuring stable coolant temperature to the NexION 2200.

The combined GreenCT/NexION 2200 cooling path contains only aluminum and plastic polymer components, which – when combined with the proprietary coolant formulation – minimizes internal corrosion of ICP-MS instrument components that can lead to long-term degradation of instrument performance.

Eco-Friendly and Cost-Effective

Designed from the outset for unmatched energy efficiency, the GreenCT system consumes **up to 90% less*** electrical power than a chiller. The water-based coolant is optimized for ICP-MS applications and doesn't pose any risk to the environment or laboratory personnel. Integrated air and coolant filters are easily cleaned and are designed for indefinite re-use.

GreenCT is designed to provide a reliable, energy-efficient, and eco-friendly solution for cooling ICP-MS systems, making it an ideal choice for laboratories looking to optimize their operations while reducing their environmental footprint and utility costs. With its sophisticated technology** and compact modern design, the GreenCT is the future of ICP-MS cooling technology.

** Electrical power savings depend on lab air temperature*
*** U.S Patent Application 2023/0028640 A1*

NOTE: In a typical ICP-MS instrument, the maximum heat load (due to plasma source operation) which must be removed by the liquid cooling system is approximately 2000 watts in total, distributed as follows:

- From RF generator: 500 watts
- From atmosphere to vacuum interface: 1000 watts
- From RF load coil: 500 watts

However, in the NexION ICP-MS systems, since the RF load coil is NOT part of the liquid cooling circuit, the overall heat load which must be removed by the liquid cooling system is reduced by approximately 25% (500 watts at maximum plasma power). This reduced cooling requirement enables the use of a smaller and more energy-efficient cooling system, which is sufficient for our NexION design but marginal for other ICP-MS instrument designs of comparable plasma power.

Table 1: Comparison of GreenCT Cooling System to Typical ICP-MS Chiller

	GreenCT	Typical Chiller
Size WxHxD (cm)	24x44x54	38x56x66
Weight (Kg)	15.0	70.0
Power Consumption (W)	300	3000
Coolant Type	Green Coolant	Green Coolant Glycol Coolant
Intelligence	Built-in	Not included
Noise	Less than 55dBA[#]	Less than 70dBA
Operational Cost[##]	1X	9X

[#] At optimal laboratory temperature 20 ± 2 °C.

[##] Calculated on the max power consumption of the devices.

PerkinElmer U.S. LLC
710 Bridgeport Ave.
Shelton, CT 06484-4794 USA
(+1) 855-726-9377
www.perkinelmer.com

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