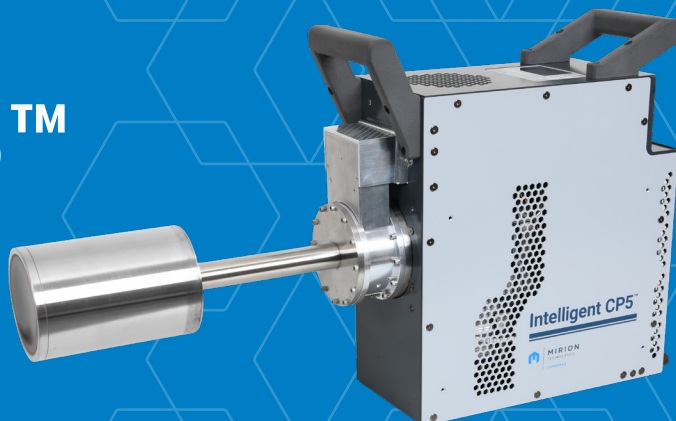




# Intelligent CP5™

## Smart Cryo-Pulse® Cryostat



**Intelligent CP5 (iCP5) is an electrical, LN<sub>2</sub>-free cooling cryostat enabling automated, and simplified operations for germanium detectors. It provides long-term reliability, uncompromised detector performance, and full system visibility, supporting efficient operation across fixed HPGe detector applications.**

The system integrates both hardware and digital components that communicate seamlessly, delivering a more improved workflow efficiency in a single platform.

As a smart Cryo-Pulse Cryostat, iCP5 builds on two decades of proven performance and reliability in LN<sub>2</sub>-free High Purity Germanium (HPGe) detector operation, enabling efficient, low maintenance workflows. **The iCP5 supports all standard Mirion HPGe detector configurations across cryostat, preamplifier, and detector model platforms.**

By integrating the cryocooler controller and iPA™ II Intelligent Preamplifier electronics into a single system, iCP5 offers a digitally integrated detector system with centralized monitoring and control via a Web UI or local LCD panel. A unified SoH dashboard provides clear system visibility, for faster troubleshooting and more efficient operation.

Automated cooler operation and intuitive control further reduce manual intervention, simplifying day-to-day use while maintaining the performance and reliability of Cryo-Pulse technology.

## FEATURES

### High-resolution detector performance:

- ✓ Maintains detector resolution without compromise

### Long-term reliability and uptime:

- ✓ Proven Cryo-Pulse pulse-tube technology delivers stable operation and extends system life

### Lower total cost of ownership:

- ✓ LN<sub>2</sub>-free cooling eliminates LN<sub>2</sub> supply, storage, and infrastructure costs

### Safer operation:

- ✓ Eliminates LN<sub>2</sub> handling and associated hazards

### Simplified operation and integrated system management:

- ✓ LN<sub>2</sub>-free operation eliminates refilling
- ✓ Automated operation with intuitive local and remote control
- ✓ State-of-Health (SoH) monitoring via centralized dashboard
- ✓ Integrated cooling, monitoring, and control in a single system

### Efficient serviceability and maintenance:

- ✓ Built-in diagnostics and centralized SoH monitoring enable data-driven troubleshooting
- ✓ Simplified system management through a single integrated platform

### Future-ready platform:

- ✓ Built on next-generation CP5 architecture
- ✓ Supports long-term upgrades and system lifecycle

## PROVEN CRYO-PULSE PULSE-TUBE COOLING TECHNOLOGY

A pulse-tube cooler operates using a pressure wave instead of a piston, minimizing wear and vibration. With more than 20 years of field-proven deployment, Cryo-Pulse technology **has been shown to deliver** exceptional reliability and long operational lifetime, with a mean time to failure (MTTF) of more than 3 million hours and a lifetime aligned with the HPGe detector.

This reliability is backed by a 5-year warranty on the iCP5 cooler, with a 2-year warranty covering all remaining components, including the preamplifier. Detectors purchased new alongside the iCP5 are also included under the 2-year warranty.

## CENTRALIZED CONNECTIONS AND REDUCED CABLING

The iCP5 simplifies system setup by reducing cable count and centralizing all connections on a single rear panel. In addition to standard detector connections, only a single data connection (Ethernet or USB) and a power supply are required.

This integrated approach enables direct Web UI access from any PC on the same network, with no additional software installation required.

Through the Web UI, users have centralized access to:

- SoH dashboard with status indicators and historical data
- Cooler control
- Intelligent preamplifier data and files
- Network configuration
- User account management
- Backup and restore functionality

## COMPATIBILITY WITH MODERN IT ENVIRONMENTS

The iCP5 integrates into modern IT environments, supporting secure connectivity and compliance with current cybersecurity requirements.

The system leverages Mirion's proven Lynx® II cybersecurity architecture to ensure secure communication and system integrity.

Key security features include:

- **Transport Layer Security (TLS)** – Authenticates and encrypts all communication interfaces
- **Trusted Execution Environment (TEE)** – Ensures the integrity and authenticity of firmware and system components

These capabilities enable secure remote access, protect system data, and support deployment within IT-managed environments where cybersecurity and data integrity are critical.

## CENTRALIZED SOH MONITORING

iCP5 introduces an expanded set of sensors across the detector, cooler, and system components, providing a comprehensive view of system health. These include temperature sensors, fan speed monitoring, and detector orientation sensing, with all data continuously logged in on-board memory.



Figure 1: iCP5 top panel: picture of the keypad and LCD display

System status can be monitored locally via LED indicators and the LCD display on the top panel (See Figure 1), or remotely through the Web UI (See Figure 2). The Web UI dashboard provides a clear overview of system status, enabling rapid assessment, while detailed parameter readings support deeper analysis. Logged data can be downloaded directly and shared with Mirion service teams to support remote diagnostics.

Through integration with the iPA II Intelligent Preamplifier, detector-specific information is also available within the Web UI, ensuring all relevant system information is accessible in one place. The HPGe detector specification sheet—containing the most critical detector-specific parameters—is displayed directly below the dashboard for quick reference.

This centralized monitoring approach enables improved system visibility, supports data-driven troubleshooting, and helps minimize overall system downtime.

## INTUITIVE COOLER CONTROL WITH MANUAL OVERRIDE

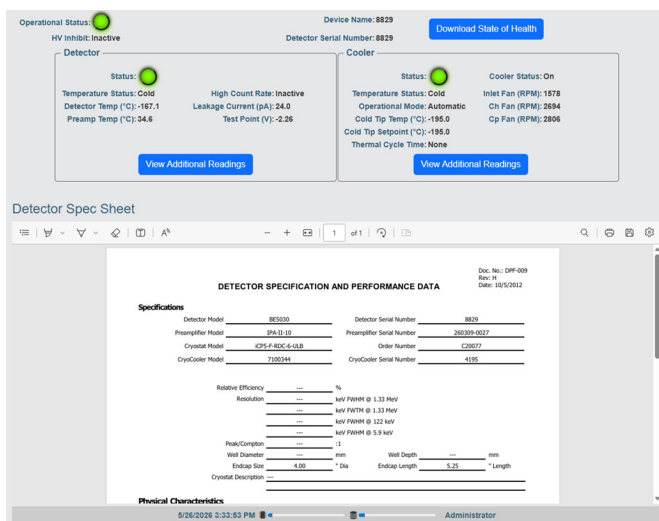


Figure 2: iCP5 Web UI: screenshot of the State-of-Health dashboard

iCP5 simplifies cooler operation through automated system control and intuitive user interfaces, reducing manual intervention while maintaining full user control. Upon power-up, the system performs a status check and automatically initiates the cool-down process when conditions are met. Once the detector reaches operational temperature, the system enables normal operation.

Cooler operation can also be controlled locally via the top panel or remotely through the Web UI. Remote access allows users to monitor and control the system without physical access, supporting more flexible operation.

## SPECIFICATIONS

### MECHANICAL

- Dimensions (excluding detector chamber): 312 x 330 x 144 mm (12.3 x 13.0 x 5.7 in.) (D x H x W)
- Weight: 19 kg (41.8 lb) approx.

### POWER REQUIREMENTS

- Universal AC/DC adapter with 85-264 VAC ; 47 Hz – 63 Hz input;
- DC input: 48 V ; 6 A (288 W) max.
- Nominal: 100 W approx

## CONNECTORS

- DB9: Preamplifier power input;
- 3x BNC: Energy, Test, AUX detector signals. AUX corresponds to:
  - Timing signal in case of Intelligent RC feedback preamplifier;
  - Inhibit signal in case of Intelligent transistor reset preamplifier.
- SHV: High Voltage signal
- MCX: High Voltage Inhibit signal (iCP5 accessory kit contains MCX-to-BNC adapter cable)
- RJ45: ethernet port
- USB-C: USB port

## LOCAL USER INTERFACE

- LED status indicators:
  - Fault indicator
  - High Count Rate indicator
- Display: Small character LCD on top of iCP5 unit with different screens for system health status
- Operating controls:
  - On/Off switch
  - Keypad:
    - Start/Stop Thermal cycle;
    - Start/Stop Cooler;
    - Page navigation for LCD

## ENVIRONMENT

- Operating temperature range: +5 to +40 °C (41 to 104 °F) on standard models and configurations
- Audible noise: < 55 dB(A) at 1 m

## AVAILABLE DETECTOR MODELS AND OPTIONS

- iCP5 unit can be ordered with all standard GC-, GX-, GR-, BE-, GL-, GUL-, GSW-detector models (see applicable detector specification sheets for details)
- Intelligent preamplifiers:
  - Preamplifier integration in iCP5
  - Standard detector cryostat model for iCP5 is flanged, also for non-RDC models
  - Exception: ACT-LC model is provided with Slimline configuration
- Non-intelligent preamplifiers:
  - Preamplifier is not integrated in iCP5
  - The RDC option is only available on flanged cryostat models (see Cryostat specification sheets)

## STANDARD ACCESSORY KIT

- Quick Start Guide
- MCX-to-BNC adapter cable
- Ethernet cable
- USB A-to-C cable
- Vertical stand-off kit
- ICP5-AC-SUPPLY power adapter

## PERFORMANCE

Mirion guarantees detector performance as warranted by detector model with cooler in operation.



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