MIRION TECHNOLOGIES

Radiation Safety. **Amplified.**

Cryo-Pulse® 5 Plus

Electrically Refrigerated Cryostat

Nuclear | Healthcare | Homeland Security & Defense | Labs and Education | Industrial and Manufacturing

FEATURES

- Completely LN_2 free
- Non-CFC/non-flammable refrigerant
- MTTF >3,000,000 hours
- No maintenance required
- Low power demand
- Low vibration/low noise
- Compact and lightweight
- No compromise on detector specifications
- Remote read-out
- Pulse-tube technology
- 2-year full warranty + pro-rated warranty on the coldhead
- Optional water-cooling for use up to +50 °C

BENEFITS

- Safety
- Low operating cost
- High availability
- Expanded field of applications
- Quiet: <55 dB(A) at 1 m

DESCRIPTION

The Cryo-Pulse 5 Plus is an electrically powered cryostat for use with HPGe radiation detectors. It utilizes a pulse tube cooler, a highly reliable technology originally used in military and space applications and which has proven its value for germanium detectors in the original Cryo-Pulse 5.

Like its predecessor, the Cryo-Pulse 5 Plus still consists of a cold head assembly, to which the detector is attached, and an external power controller. The basic external design and interface of the coldhead have been preserved to maximize interchangeability between the previous and the new version. However the coldhead internals and the controller have been completely redesigned and new features have been added to further improve the performance and reliability and to answer our customers' requirements even better.

KEY IMPROVEMENTS

Active and passive vibration reduction:

- Expanded range of HPGe detector models now available with electric cooling.
- Reduced audible noise.
- Improved heat sinking, allowing operation up to 40 °C ambient temperature (up to +50 °C with water cooled heat sinks).
- Graphical User Interface for remote control and status monitoring.
- Integrated HV-inhibit circuit.

A pulse-tube cooler contains CFC free, non-flammable gas and is hermetically sealed, so no gas-refill is required. The compressor contains no oil or lubricant, so no contamination of the refrigerant occurs and no periodic filter exchange is required. This makes the Cryo-Pulse 5 Plus completely **maintenance free**.

The cooler is integrated in a compact coldhead-assembly which is directly attached to the detector housing. The unit can operate in all orientations. The coldhead-assembly is connected to a bench-top power controller that produces the necessary output voltage to drive the compressor. The controller contains an auto ranging power supply at 100-240 V and 50 or 60 Hz. In addition to the relay output, the new controller is also equipped with a **RS-232 serial interface** to connect to a PC. A dedicated GUI allows remote control and status monitoring. Two BNC-connectors are located on the rear panel to combine the inhibit signal of the preamplifier and the controller for enhanced detector protection. The Cryo-Pulse 5 Plus **controllers are backwards compatible** with the previous Cryo-Pulse 5 model coldheads.

A pulse tube cooler operates with a pressure wave instead of a piston, virtually eliminating wear and vibrations. This means pulse tube coolers are extremely reliable (MTTF of about 3,000,000 hours) and have a demonstrated life time of **over 100000 hours** or 11 years of operation. This life time estimation is documented in a paper that can be found under 'Detectors' in the Technical Literature section of the CANBERRA web site.

Although the compressor already produces very low vibration levels, all efforts are done to reduce these even more. Apart from shock mounts to isolate the compressor from the rest of the cooler and the detector housing, the Cryo-Pulse 5 Plus is equipped with an active vibration reduction system. An accelerometer inside the coldhead measures the vibrations generated by the compressor and feeds this signal back to the controller. The controller then adjusts the drive signal to the cooler so that vibrations are minimized. The system is even self-tuning such that it adapts to possible changes of the system's vibration characteristics over time. It is currently the best available technology in the field and allows CANBERRA to offer the broadest range of detector models available with **electric cooling** and continue to provide high-quality detector solutions with **no compromise on performance**.

Our confidence in the Cryo-Pulse 5 Plus is demonstrated by the **two year full warranty** on the complete system (detector included) and **additional pro-rated warranty on the coldhead**. If the coldhead fails after the second year, it will be repaired or replaced at 40, 60 or 80% of the list price in year three to five respectively.

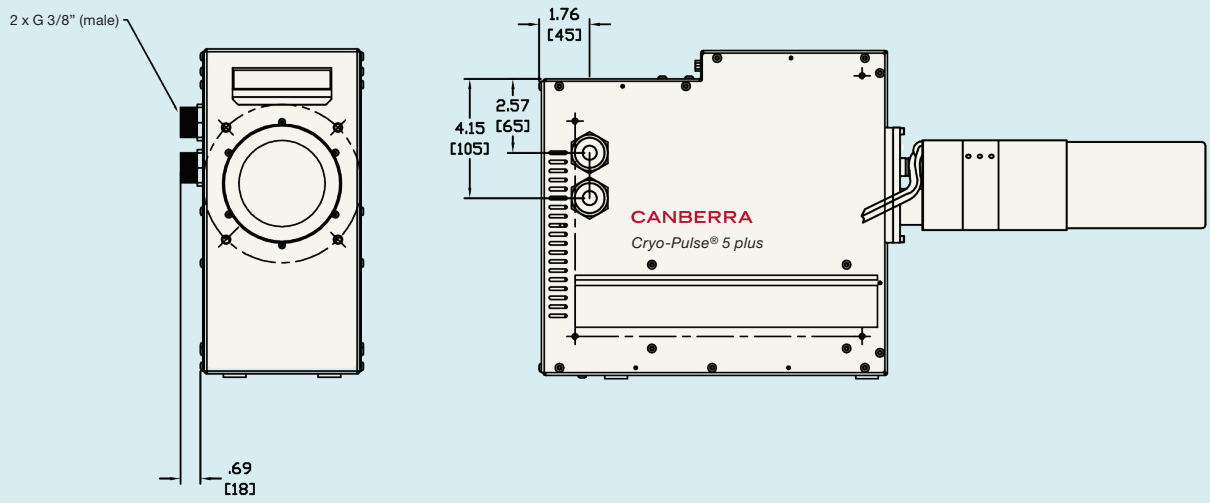
WATER COOLED OPTION

The Cryo-Pulse 5 plus coldhead can be equipped with water cooled heat sinks instead of the standard internal cooling fans. The water cooled option has two major advantages. The coldhead can now be used in ambient temperatures up to +50 °C and the heat (±100 W in nominal operation) can be dissipated away from the detector system.

For the power controller the maximum operating temperature still is limited to +40 °C. With the 3 m or optional 7.5 m cable, the controller can be located away from the detector and cryostat and outside of the hotter area.

The water cooled coldhead is fitted with 2x male 3/8 in. BSP threaded fittings for the inlet and outlet of the coolant. A closed loop chiller and external coolant flow lines need to be provided separately. The type of chiller and external flow lines depend on each specific installation: expected ambient temperature for the chiller, distance between coldhead and chiller, number of coldheads to be cooled on a single chiller, etc. Desired adaptor pieces to the desired inlet and outlet fitting, such as a compression fitting or quick-disconnect, can be added to the male 3/8 in. BSP threads.

Water Cooled Option



SPECIFICATIONS

PHYSICAL

Cold Head:

(Excluding detector chamber)

- Dimensions – 145 x 287 x 313 mm (5.7 x 11.3 x 12.3 in.) (W x H x D).
- Weight – 17 kg (37.5 lb) approx.

Power Controller:

- Dimensions – 280 x 88 x 315 mm (11 x 3.5 x 12.4 in.)
- Weight – 5.3 kg (11.6 lb).
- Power Controller Cable Length – 3 m (10 ft).

Option:

- Model CP5PLUS-C-25 – Controller Cable 7.5 m (24.5 ft).

POWER

Power Requirements:

- 100–240 V ac, 50–60 Hz, 250 watts max. (auto ranging power supply).
- Fuse – 2x T3.15 A 250 V.

Connectors:

- 2X BNC-F – HV-inhibit.
- RS-232 – Remote control and status read-out (USB/RS-232 adapter provided).
- DB15-F – Relay output – cooler status and warm/cold indication.

ENVIRONMENTAL

Cooling:

- Standard version: forced air (internal fans).
- **Optional:** water-cooled heat sinks
  - Coolant inlet and outlet fittings: 3/8 in. male BSP
  - Max. coolant pressure: 10 bar (145 psi) – or as limited by the selected chiller unit
  - Max. coolant inlet temperature: +30 °C (86 °F)
  - Min. coolant inlet temperature: above dew point temperature to avoid condensation inside the unit
  - Min. coolant flow rate: 1 l/min (0.26 gpm)
  - Coolant: water with corrosion inhibitor or de-ionized water

Operating Temperature:

- +5 to +40 °C (41 to 104 °F) on standard models and configurations.
- With water-cooled option: +5 to +50 °C (41 to 122 °F).

Available Detector Models and Options:

- Cryo-Pulse 5 Plus can be ordered with all standard GC-, GX-, GR-, BE-, GL-, GUL-, GSW- detector models (see applicable detector specification sheets for details).
- The RDC-option is only available on flanged cryostat models (see Cryostat specification sheets).

Performance:

- CANBERRA guarantees detector performance as, warranted by detector model with cooler in operation.

Ordering Information:

Model	Description
CP5-PLUS	Cryo-Pulse 5 plus
CP5-PLUS/W	Water Cooled Cryo-Pulse 5 plus (*)

(*) Chiller and external coolant flow lines to be provided separately.

LEGe/BEGe, Nom. Area (mm^2)	End Cap Diameter, mm [in.]
=<2000	76 [3.0]
2800	83 [3.25]
3800	89 [3.50]
5000	102 [4.0]
6500	114 [4.50]

Coax Rel. Efficiency (%)	End Cap Diameter, mm [in.]
=<40	76 [3.0]
40-50	83 [3.25]
50-70	89 [3.50]
70-100	95 [3.75]
100-120	102 [4.0]
120-150	108 [4.25]
150	114 [4.50]

End cap dimensions depend on detector size. The tables above show the typical surface area or efficiency range vs. end cap diameter. End cap lengths are also greater for larger detectors. Consult the factory if end cap size is critical in your application.

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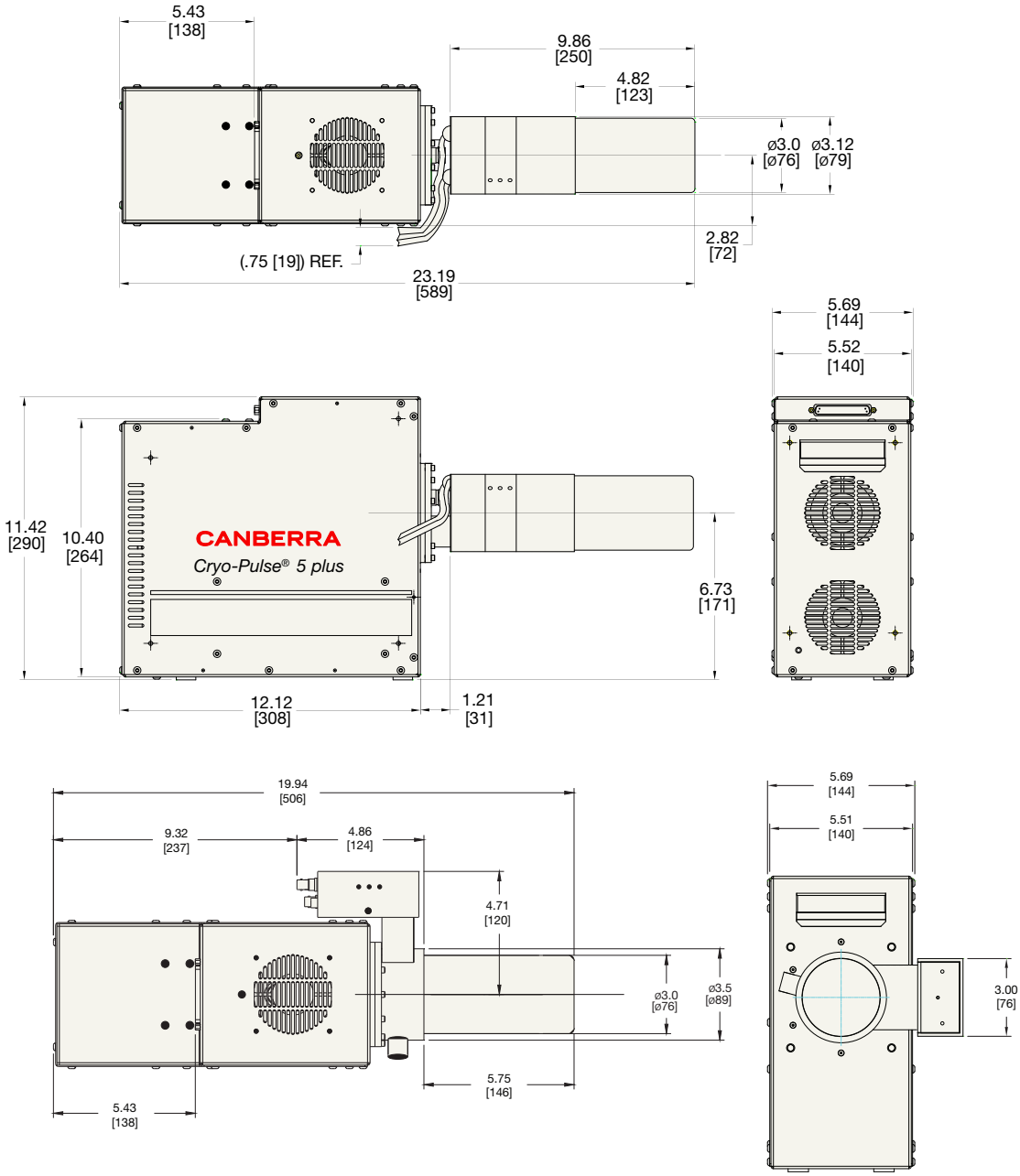

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