

# ORTEC®

## ICS® Integrated Cryocooling System



Premium detector resolution and LN<sub>2</sub>-free operation,  
for excellence in performance, safety, reliability and value.

**AMETEK®**  
ADVANCED MEASUREMENT TECHNOLOGY

# ICS<sup>®</sup> Integrated Cryocooling System

## Introduction

ICS<sup>®</sup> — ORTEC's newest integrated, mechanically cooled system for HPGe radiation detectors exploits the latest generation in cryogenic technology to provide LN<sub>2</sub> free operation with premium detector performance. ICS is now available in two versions to support an even wider selection of detector models.

**ICS and ICS-E models incorporate a unique, hardened cryostat**, for superior integrity, reliability, and operational performance. This feature allows instant recovery after a loss of power, eliminating the need to fully thermal cycle the detector in the event of a partial warm-up.

**ICS-P4 (PopTop<sup>®</sup> model), uses a conventional cryostat**, which provides full compatibility with ORTEC PopTop detector capsules, and can be used with either new detectors or in-field upgrades.

All ICS versions are highly reliable, maintenance free, mechanically cooled cryostats that deliver superior performance for HPGe radiation detectors. Using Sunpower's industry proven Stirling cooler, ICS is more efficient and reliable than Pulse Tube designs. Increased efficiency means improved cooling with proportionally less heat generation and lower power consumption. With a cooler Mean-Time-To-Failure (MTTF) of **over 200,000 hours**, ICS operational reliability is unmatched.

All ICS models incorporate AVC<sup>™</sup> (Active Vibration Cancellation) technology, and are designed to **virtually eliminate vibrational and audible noise** levels. This provides resolution performance comparable to LN<sub>2</sub> cooled systems in all operational orientations, making it **the choice** for customers seeking premium resolution and versatility in a vast array of HPGe applications.



ICS and ICS-E



ICS-P4

Sunpower is a product line of AMETEK Advanced Measurement Technology (AMT), a part of AMETEK's Materials Analysis Division (MAD).

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| Benefit                                                                                                                                          | Feature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Performance</b> <ul style="list-style-type: none"> <li>• Resolution</li> <li>• Versatility</li> <li>• Environmental Friendly</li> </ul>       | <ul style="list-style-type: none"> <li>• Supports a wide range of ORTEC detectors – GEM, GMX, PROFILE</li> <li>• LN<sub>2</sub> free operation</li> <li>• AVC™ technology</li> <li>• Vibration dampeners</li> <li>• Multi-orientation operation</li> <li>• Wide operating temperature range (up to 40°C)</li> <li>• Quiet, less than 55 dBA at 1 meter below 30°C ambient</li> </ul>                                                                                                                                                                   |
| <b>Safety</b>                                                                                                                                    | <ul style="list-style-type: none"> <li>• LN<sub>2</sub> free operation</li> <li>• High Voltage Shutdown (ICS model only)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Reliability</b>                                                                                                                               | <ul style="list-style-type: none"> <li>• Full 2-year warranty on the cryocooler</li> <li>• Long service life, MTTF &gt; 200,000 hours cooler</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Cost Effective</b> <ul style="list-style-type: none"> <li>• Low Cost of Ownership</li> <li>• Availability</li> <li>• Compatibility</li> </ul> | <ul style="list-style-type: none"> <li>• LN<sub>2</sub> free operation</li> <li>• Low power consumption (Sunpower cooler)</li> <li>• Long service life, MTTF &gt; 200,000 hours cooler</li> <li>• No maintenance (no gas lines or filters)</li> <li>• Vacuum hardened cryostat (no molecular sieve, no need for thermal cycling on ICS and ICS-E models)</li> <li>• Small footprint and light weight (integrated controller, no external box)</li> <li>• Selectable cooling rod length at the time of the order (ICS and ICS-E models only)</li> </ul> |

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## Spectroscopic Performance

|                                                                                                                 | ICS and ICS-E                                                                                                                                                                                                                      | ICS-P4                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| New ORTEC detectors                                                                                             | <p>@ <math>\geq 100</math> keV energy equivalent to LN<sub>2</sub> with cooler running</p> <p>@ <math>&lt; 100</math> keV energy up to 10% resolution degradation</p> <p>(see detector configuration guide for specifications)</p> | <p>@ <math>\geq 100</math> keV energy equivalent to LN<sub>2</sub> with cooler running</p> <p>@ <math>&lt; 100</math> keV energy up to 10% resolution degradation</p> <p>(see detector configuration guide for specifications)</p>                                                                                                                                                                               |
| Existing ORTEC detectors (resolution specifications are relative to existing detector performance in the field) | Return to Factory Service Upgrade.*                                                                                                                                                                                                | <p><b>PopTop Detector with LN<sub>2</sub> Cryostat</b><br/>           @ <math>\geq 100</math> keV energy no change<br/>           @ <math>&lt; 100</math> keV energy up to 10% resolution degradation</p> <p><b>PopTop Detector with X-COOLER</b><br/>           No change or lower resolution</p> <p><b>Non-PopTop Detector</b><br/>           Return to Factory Service Upgrade* for conversion to PopTop.</p> |

Note: Resolution is warranted at room temperature.

\*Performance of an upgraded detector is warranted to be within 10% of the combined resolution and efficiency of the HPGe detector at the time of the upgrade. This will be determined at the factory before reconfiguration.

An example of combined relative efficiency and resolution is a 5% increase in resolution and a 5% decrease in relative efficiency, or a 10% increase in resolution and 0% decrease in relative efficiency.

Consult the factory for upgrade of a non-ORTEC detector into hardened vacuum or PopTop configurations.

# ICS<sup>®</sup> Integrated Cryocooling System

## Typical Applications

- **Commercial, Government and Environmental Labs** – The ICS is a superb choice due to no compromise of resolution performance and low audible noise. There is no requirement for refilling the LN<sub>2</sub> on a regular basis, providing increased cost savings, detector availability, and minimizing work hazard.
- **Nuclear Power and Industrial Plants** – The ICS provides an advantage in deployments where power failures are frequent. The hardened cryostat increases detector availability by eliminating the need for thermal cycling and reduces equipment down time. With no need for regular maintenance and LN<sub>2</sub> filling, personnel spend less time in radiation “hot” zones. The compact size of the ICS allows easy installation into new or existing counting setups.
- **Research and Education** – Similar to Lab applications, the ICS is an excellent choice due to no compromise of resolution performance and low audible noise. No need for LN<sub>2</sub> gives the ICS a low cost of ownership.
- **Waste Management and Field Remediation** – Hardened cryostat version makes the ICS an excellent choice for applications requiring maximum “up time”. PopTop cryostat version allows field upgrades/replacements of existing detectors.
- **Health Physics** – Low heat generation, low audible noise and no compromise on resolution performance give the ICS an edge for HPGe systems in the field of health physics, whether as an upgrade or as a new HPGe system.
- **Homeland Security and Safeguards** – The ICS is an unmatched solution in these applications due to a combination of unique features: the hardened cryostat which eliminates the need to fully thermal cycle the detector in the event of a partial warm-up or PopTop cryostat which allows field replacements/upgrades, low power consumption and the use of a universal power supply.

| Key Attribute                      | Major Market Benefits                         |                                     |                                |                                        |                      |                                  |
|------------------------------------|-----------------------------------------------|-------------------------------------|--------------------------------|----------------------------------------|----------------------|----------------------------------|
|                                    | Commercial, Government and Environmental Labs | Nuclear Power and Industrial Plants | Research and Education         | Waste Management and Field Remediation | Health Physics       | Homeland Security and Safeguards |
| Typical HPGe Type                  | GEM, GMX, PROFILE C and S                     | GEM, GMX, PROFILE C and S           | GEM, GMX, PROFILE C, S, and SP | GEM, GMX, PROFILE S                    | GEM, PROFILE S and C | GEM, PROFILE S and SP            |
| LN <sub>2</sub> Free               | ✓                                             | ✓                                   | ✓                              | ✓                                      | ✓                    | ✓                                |
| LN <sub>2</sub> -Like Resolution   | ✓                                             |                                     | ✓                              |                                        | ✓                    | ✓                                |
| High Reliability/No Maintenance    | ✓                                             | ✓                                   | ✓                              | ✓                                      | ✓                    | ✓                                |
| Quiet Operation                    | ✓                                             |                                     | ✓                              |                                        | ✓                    |                                  |
| Compact Size                       |                                               | ✓                                   |                                | ✓                                      | ✓                    | ✓                                |
| Hardened Cryostat (ICS/ICS-E only) |                                               | ✓                                   |                                | ✓                                      |                      | ✓                                |
| PopTop Cryostat (ICS-P4 only)      |                                               | ✓                                   |                                | ✓                                      |                      |                                  |
| Low Power Consumption              |                                               |                                     |                                |                                        | ✓                    | ✓                                |
| Wide Operating Temperature         |                                               | ✓                                   |                                | ✓                                      |                      | ✓                                |
| All Attitude Operation             |                                               | ✓                                   |                                | ✓                                      | ✓                    | ✓                                |

# ICS<sup>®</sup> Integrated Cryocooling System

## Specifications – Common for ICS, ICS-E and ICS-P4

|                                            |                                                                                                                                    |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| HPGe Compatibility                         | All ORTEC GEM, GMX and PROFILE detectors.                                                                                          |
| Resolution (warranted at room temperature) | See Spectroscopic Performance (page 4).                                                                                            |
| Cooler                                     | AMETEK Sunpower with AVC™ (active vibration cancellation) technology.                                                              |
| All-Attitude Operation                     | Yes                                                                                                                                |
| Compatible Endcap Windows                  | Aluminum, Carbon Fiber, Beryllium.                                                                                                 |
| Electrical Supply                          | 100–240 V AC (50/60 Hz) auto ranging.                                                                                              |
| Low/Reduced Background Option              | Yes                                                                                                                                |
| Audible Noise                              | Less than 55 dBA at 1 meter fully operational, below 30°C ambient.                                                                 |
| Environmental                              | Temperature range: –10°C to 40°C.<br>Humidity: non-condensing.                                                                     |
| Auxiliary Cooling                          | Internal fan (vented).                                                                                                             |
| Backup Battery                             | No built-in battery. ICS is compatible with commercial batteries and universal power supplies (UPS). ORTEC offers an optional UPS. |
| Cooler Life                                | >200,000 hours.                                                                                                                    |
| Warranty                                   | 2 years on cryocooler, internal controller and active noise cancellation.<br>1 year on new detector and preamplifier.              |
| Maintenance                                | No maintenance is required.                                                                                                        |
| Stand Compatibility                        | Stand not included. Optional stand (ICS-STAND2) is available.                                                                      |

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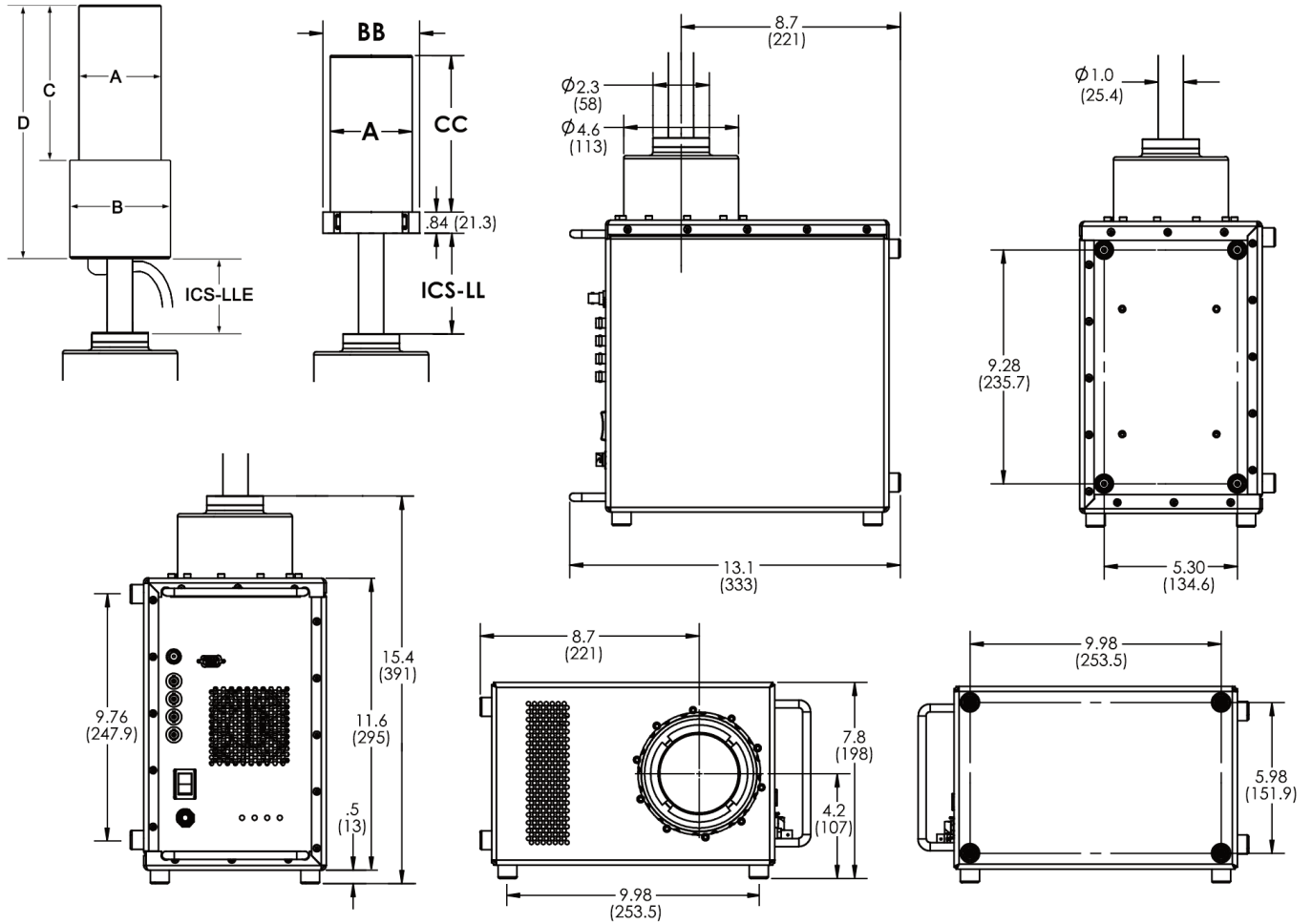
## Specifications – Unique for ICS, ICS-E and ICS-P4

|                                                 | ICS and ICS-E                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ICS-P4                                              |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Hardened Cryostat                               | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | No                                                  |
| PopTop Compatible                               | No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Yes                                                 |
| Molecular Sieve                                 | No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Yes                                                 |
| Weight                                          | 40 lbs. (18 kg) excluding the detector.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 28.5 lbs. (12.7 kg) excluding the detector capsule. |
| Typical Power Consumption (at room temperature) | 70 W typical, 130 W maximum.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 80 W typical, 200 W maximum.                        |
| Typical Cooldown Time                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                     |
| • Small Detector (<40% rel. eff.)               | 5 hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6–8 hours                                           |
| • Medium Detector (40–70% rel. eff.)            | 6 hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12–14 hours                                         |
| • Large Detector (up to 100% rel. eff.)         | 8 hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 14–18 hours                                         |
| Status Display                                  | <p><b>ICS only</b><br/>4 LED lights indicate status: power ON/OFF, COLD, cooler On/OFF, preamp count rate.</p> <p><b>ICS-E only</b><br/>2 LED lights indicate status: power ON/OFF, COLD</p>                                                                                                                                                                                                                                                                                                                                                                             | 1 LED light indicate status: power ON/OFF           |
| Preamp Configuration                            | Internal (ICS) or External (ICS-E). See note for ICS below.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | External                                            |
| Connectors                                      | <p><b>ICS only (connectors on front panel) (includes detector cable set)</b><br/>4 each BNC (energy out, energy or timing out, HV Shutdown, test).<br/>1 each SHV cable (high voltage in).<br/>1 each 9 pin (preamp power)<br/>Notes:<br/>1) Additional BNC is added for TRP preamp (-PL) option.<br/>2) No BNC connectors on housing with SMART option. HV Shutdown out is converted to Temperature Readout in the SMART option.</p> <p><b>ICS-E only (includes detector cable set)</b><br/>Standard 1 ft (0.3 m) detector cable bundle comes from detector endcap.</p> | None (does not include detector cable set)          |

Note: Internal and External preamp configurations are with reference to the cooler enclosure. “Internal” means the preamp is inside cooler enclosure which makes the detector capsule smaller. “External” means the preamp is outside of the cooler enclosure and typically inside the detector capsule. Most standard streamline and PopTop detectors have the preamp inside the detector capsule as described for the “External” configuration.

# ICS<sup>®</sup> Integrated Cryocooling System

## ICS and ICS-E Dimensions





# ICS<sup>®</sup> Integrated Cryocooling System

## ICS and ICS-E Detector Endcap Dimensions

- Dimensions listed in mm (inches) are for reference only and subject to change.
- If dimensional constraints are critical, contact the factory.

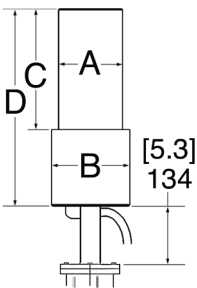
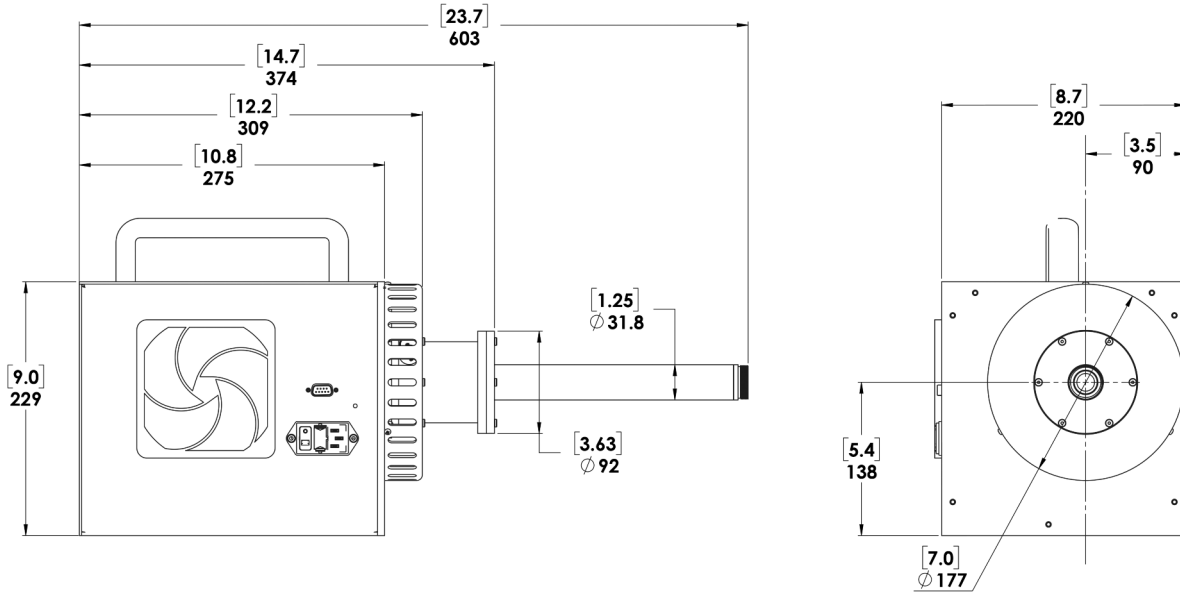
| GEM and GMX Detectors                        |            |               |                                                                                                                                        |               |               |               |               |
|----------------------------------------------|------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|---------------|
| Endcap Model (dia. mm)                       |            |               | -70                                                                                                                                    | -76           | -83           | -95           | -108          |
| % Efficiencies available in this endcap size |            |               | 0-35                                                                                                                                   | 25-45         | 25-65         | 60-110        | 120-150       |
| Dim.                                         | Unit       | Tol.          |                                                                                                                                        |               |               |               |               |
| A                                            | mm<br>(in) | 0.3<br>(0.01) | 70<br>(2.75)                                                                                                                           | 76<br>(3.0)   | 83<br>(3.25)  | 95<br>(3.75)  | 108<br>(4.25) |
| B                                            | mm<br>(in) | 0.3<br>(0.01) | 101<br>(4.0)                                                                                                                           | 101<br>(4.0)  | 101<br>(4.0)  | 114<br>(4.5)  | 127<br>(5.0)  |
| BB                                           | mm<br>(in) | 0.3<br>(0.01) | 85<br>(3.4)                                                                                                                            | 92<br>(3.6)   | 98<br>(3.9)   | 111<br>(4.4)  | 124<br>(4.9)  |
| C                                            | mm<br>(in) | 5<br>(0.2)    | 144<br>(5.7)                                                                                                                           | 157<br>(6.2)  | 157<br>(6.2)  | 182<br>(7.2)  | 182<br>(7.2)  |
| CC                                           | mm<br>(in) | 5<br>(0.2)    | 145<br>(5.7)                                                                                                                           | 158<br>(6.2)  | 158<br>(6.2)  | 183<br>(7.2)  | 183<br>(7.2)  |
| D                                            | mm<br>(in) | 5<br>(0.2)    | 243<br>(9.6)                                                                                                                           | 256<br>(10.1) | 256<br>(10.1) | 281<br>(11.1) | 281<br>(11.1) |
| ICS-LL                                       | mm         | 3             | Specify length. Choose from 051, 064, 076, 089, 102, 114, 127, 140, 152, 165, 178, 191, 203, 216, 229, 241, 254, 267, 279, 292, or 305 |               |               |               |               |
| ICS-LLE                                      | mm         | 3             | Specify length. Choose from 025, 031, 037, 050, 063, 075, 088, 101, 114, 126, 139, 152, 164, 177, 190, 202, 215, or 228                |               |               |               |               |

| PROFILE S Detectors                          |            |               |                                                                                                                         |              |               |
|----------------------------------------------|------------|---------------|-------------------------------------------------------------------------------------------------------------------------|--------------|---------------|
| Endcap Model (dia. mm)                       |            |               | -70                                                                                                                     | -83          | -108          |
| % Efficiencies available in this endcap size |            |               | 0-35                                                                                                                    | 25-65        | 120-150       |
| Dim.                                         | Unit       | Tol.          |                                                                                                                         |              |               |
| A                                            | mm<br>(in) | 0.3<br>(0.01) | 70<br>(2.75)                                                                                                            | 83<br>(3.25) | 108<br>(4.25) |
| B                                            | mm<br>(in) | 0.3<br>(0.01) | 101<br>(4.0)                                                                                                            | 101<br>(4.0) | 127<br>(5.0)  |
| C                                            | mm<br>(in) | 5<br>(0.2)    | 127<br>(5.0)                                                                                                            | 127<br>(5.0) | 127<br>(5.0)  |
| D                                            | mm<br>(in) | 5<br>(0.2)    | 226<br>(8.9)                                                                                                            | 226<br>(8.9) | 226<br>(8.9)  |
| ICS-LLE                                      | mm         | 3             | Specify length. Choose from 025, 031, 037, 050, 063, 075, 088, 101, 114, 126, 139, 152, 164, 177, 190, 202, 215, or 228 |              |               |

| PROFILE M, C, and F Detectors                |            |               |                                                                                                                         |               |               |               |
|----------------------------------------------|------------|---------------|-------------------------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|
| Endcap Model (dia. mm)                       |            |               | -70                                                                                                                     | -83           | -95           | -108          |
| % Efficiencies available in this endcap size |            |               | 0-35                                                                                                                    | 25-65         | 60-110        | 120-150       |
| Dim.                                         | Unit       | Tol.          |                                                                                                                         |               |               |               |
| A                                            | mm<br>(in) | 0.3<br>(0.01) | 70<br>(2.75)                                                                                                            | 83<br>(3.25)  | 95<br>(3.75)  | 108<br>(4.25) |
| B                                            | mm<br>(in) | 0.3<br>(0.01) | 101<br>(4.0)                                                                                                            | 101<br>(4.0)  | 114<br>(4.5)  | 127<br>(5.0)  |
| C                                            | mm<br>(in) | 5<br>(0.2)    | 144<br>(5.7)                                                                                                            | 157<br>(6.2)  | 182<br>(7.2)  | 182<br>(7.2)  |
| D                                            | mm<br>(in) | 5<br>(0.2)    | 243<br>(9.6)                                                                                                            | 256<br>(10.1) | 281<br>(11.1) | 281<br>(11.1) |
| ICS-LLE                                      | mm         | 3             | Specify length. Choose from 025, 031, 037, 050, 063, 075, 088, 101, 114, 126, 139, 152, 164, 177, 190, 202, 215, or 228 |               |               |               |

# ICS<sup>®</sup> Integrated Cryocooling System

## ICS-P4 Dimensions



## ICS-P4 GEM, GMX, and PROFILE PopTop Detector Dimensions

- Dimensions are for reference only and subject to change.
- If dimensional constraints are critical, contact the factory.

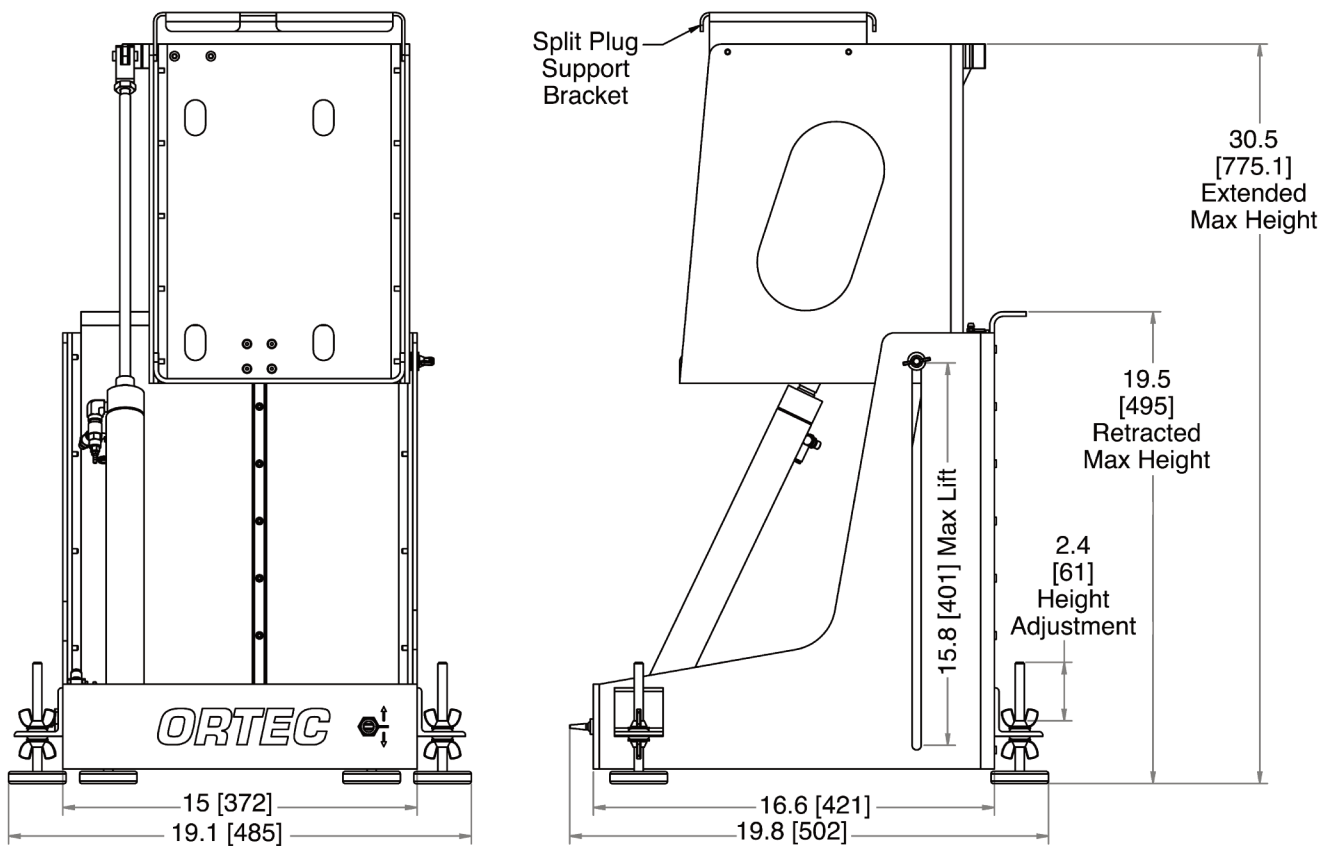
| Endcap Model (dia. mm)                       |      |        | -70    | -76    | -83    | -95    | -108    |
|----------------------------------------------|------|--------|--------|--------|--------|--------|---------|
| % Efficiencies available in this endcap size |      |        | 0-35   | 25-45  | 25-65  | 60-110 | 120-150 |
| Dim.                                         | Unit | Tol.   |        |        |        |        |         |
| A                                            | mm   | 0.3    | 70     | 76     | 83     | 95     | 108     |
|                                              | (in) | (0.01) | (2.75) | (3.0)  | (3.25) | (3.75) | (4.25)  |
| B                                            | mm   | 0.3    | 75     | 88     | 88     | 100    | 113     |
|                                              | (in) | (0.01) | (2.95) | (3.45) | (3.45) | (3.95) | (4.45)  |
| C                                            | mm   | 5      | 134    | 165    | 168    | 193    | 207     |
|                                              | (in) | (0.2)  | (5.3)  | (6.4)  | (6.6)  | (7.6)  | (8.2)   |
| D                                            | mm   | 8      | 250    | 282    | 282    | 309    | 323     |
|                                              | (in) | (0.3)  | (9.8)  | (11.2) | (11.2) | (12.2) | (12.7)  |

# ICS<sup>®</sup> Integrated Cryocooling System

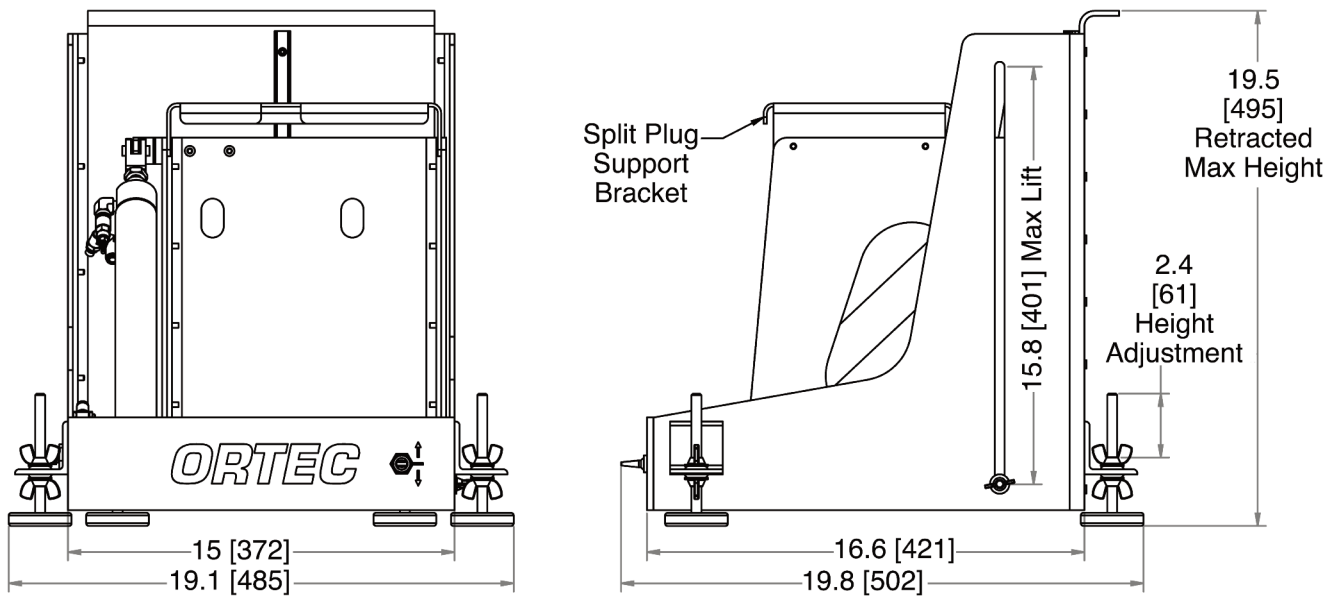
## Accessories

The ICS-STAND2 is intended for single user installation of any ICS model. It incorporates a multi-positional height selector to set overall operating height, and uses a pneumatic arm to raise and lower the ICS. This variable height selection accommodates most commercial shield tables. Rollers on the stand provide easy positioning of the ICS underneath the shields. Note, the ICS-STAND2 is for vertical orientation only.

Caution: Since the ICS must be installed into a shield from below, the user must ensure the shield opening is greater than the detector seal-clamp diameter on the ICS/ICS-E. (Dimension BB.)



# ICS<sup>®</sup> Integrated Cryocooling System



## Ordering Information

- For ICS and ICS-E, see the detector configuration guide of the detector of choice – GEM, GMX, or PROFILE.

| Model             | Description                                         |
|-------------------|-----------------------------------------------------|
| <b>CFG-ICS-P4</b> | Integrated Cryocooling System for PopTop Detectors. |
| <b>ICS-STAND2</b> | Vertical Positioning Stand for any model ICS        |

Specifications subject to change  
111616

**ORTEC<sup>®</sup>**

[www.ortec-online.com](http://www.ortec-online.com)

Tel. (865) 482-4411 • Fax (865) 483-0396 • [ortec.info@ametek.com](mailto:ortec.info@ametek.com)  
801 South Illinois Ave., Oak Ridge, TN 37830 U.S.A.  
For International Office Locations, Visit Our Website

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