

- 135 eV resolution for 5.9 keV x rays
- Ultra-thin detector window for spectroscopy to <0.5 keV in windowless cryostats
- Excellent resolution at ultra-high count rates
- Wide acceptance angle: active area up to 200 mm²
- Peak-to-tail ratio >1000 — ideal for PIXE
- Far superior to Si(Li) detectors
- Ideal choice for PIXE, XAFS, XRF, and Fusion
- Custom designed XAFS arrays
- Complete analog or digital electronics available

IGLET and IGLET-X detectors provide state-of-the-art energy resolution at energies up to 30 keV. For the lowest energies the IGLET-X is the detector of choice, with a front contact so thin that spectroscopy may be performed even below 0.5 keV. In many applications the low energy limit of the IGLET-X is established by the cryostat window. The IGLET's lower energy limit is 3 keV.

Due to the superior intrinsic energy resolution of germanium vs. silicon, the IGLET-X and IGLET are better than Si(Li) detectors for most applications. Another advantage of IGLET and IGLET-X detectors over Si(Li) detectors is the result of a special low-capacitance geometry that yields minimal electronic noise despite the relatively large active area.

Because many applications present conflicting demands for high-count-rate operation and excellent energy resolution, an advanced Pulsed Optical Feedback (POF) preamplifier is incorporated. Resolution specifications are given at 5.9 keV at 100,000 cps with a 0.5 μs amplifier time constant. Throughput curves at various time constants are shown in Figure 1. Energy resolution vs. shaping time is shown in Figure 2.

IGLET-X™ HPGe Detector for Very-Low-Energy X Rays

The IGLET-X is a unique germanium detector especially designed for x-ray spectrometry in PIXE, XAFS, and XRF applications. The large active area combined with the high density of germanium (vs. silicon) yields a high efficiency detector for x-ray energies from <500 eV (in a windowless cryostat) to >60 keV.

IGLET-X delivers high peak-to-tail ratios and Gaussian peak shapes, even at energies below 500 eV (in a windowless cryostat). Excellent energy resolution may be achieved even at count rates of 100,000 cps and above.

With a resolution of **135 eV** for a 6-mm-diameter, 6-mm-deep detector and **145 eV** for a 11-mm-diameter, 10-mm-deep detector, the IGLET-X detector provides substantially better resolution than is possible with conventional planar or modified planar detector geometries. With an IGLET-X detector in a windowless system, resolution of less than 110 eV, with perfectly Gaussian peak shape, has been reported for the oxygen K_{α1} line (at 525 eV). (Fig. 3)⁶

Another feature of the IGLET-X is a well-collimated, sharply defined entrance contact, which provides a high acceptance angle without peak distortion, a key issue for PIXE.

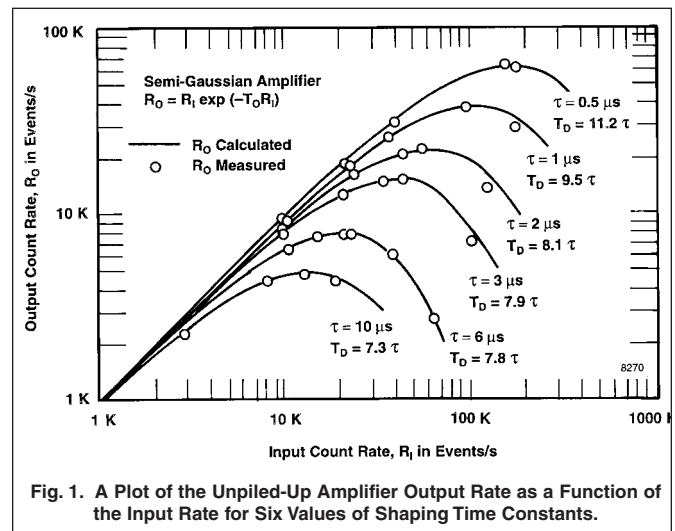
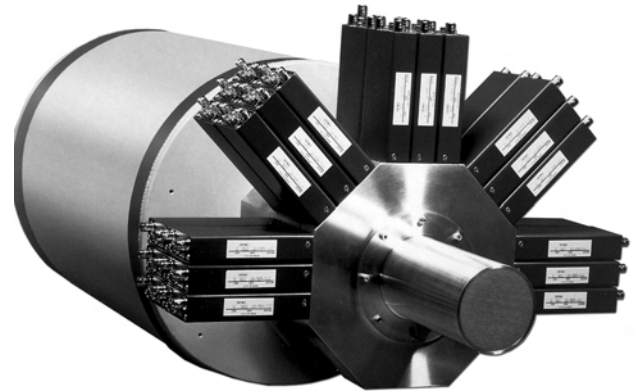


Fig. 1. A Plot of the Unpiled-Up Amplifier Output Rate as a Function of the Input Rate for Six Values of Shaping Time Constants.

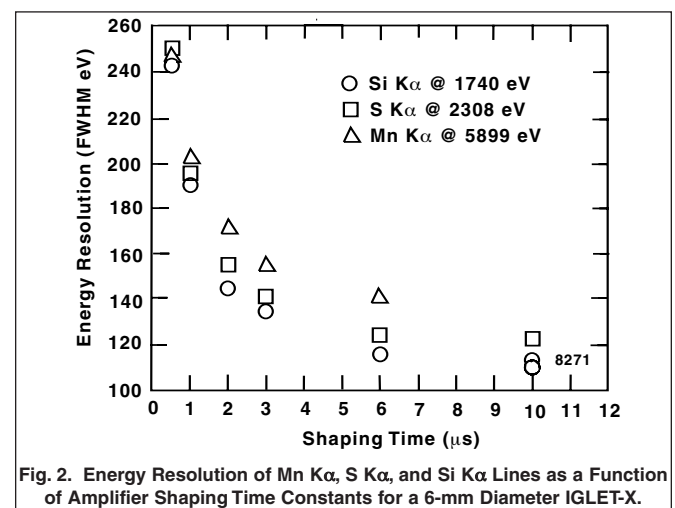


Fig. 2. Energy Resolution of Mn K_α, S K_α, and Si K_α Lines as a Function of Amplifier Shaping Time Constants for a 6-mm Diameter IGLET-X.

IGLET and IGLET-X HPGe Detectors for Low and Very-Low Energy X Rays Product Configuration Guide

IGLET™ HPGe Detector for Low-Energy X Rays

The IGLET detector geometry results in substantially better resolution than is achievable with Ge planar detectors. By virtue of a proprietary detector-element geometry and an advanced reset-feedback preamplifier, the IGLET offers unmatched performance from 3 keV to 30 keV, the energy range for XAFS measurements at synchrotron light sources. Furthermore, the IGLET has unmatched warranted performance at 100,000 cps, thus ensuring full exploitation of the extreme brightness of x-ray beams at the newest facilities.

Cryostat Windows

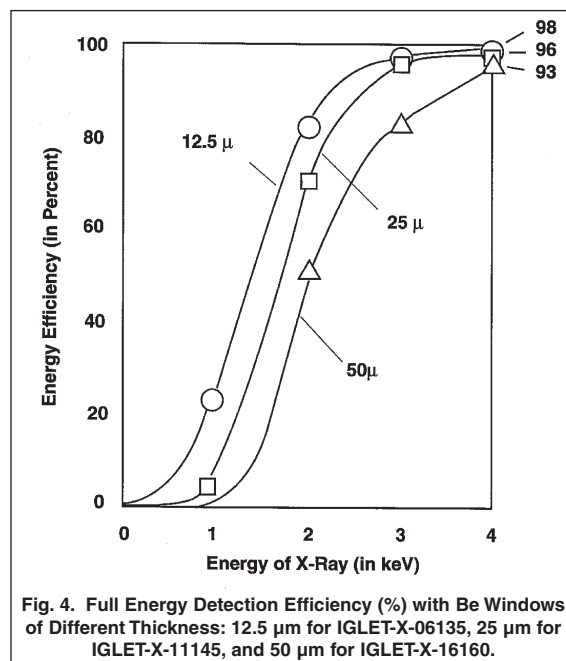
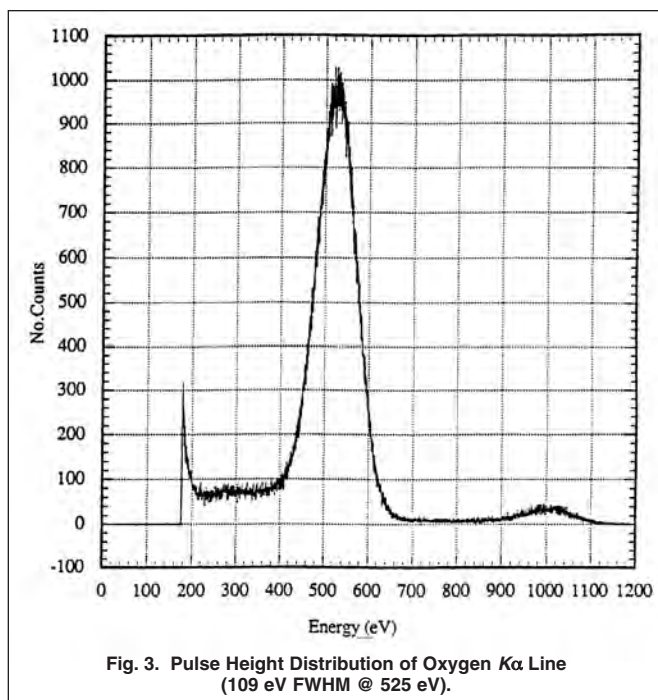
While the IGLET detector element entrance window establishes 3 keV as a lower limit for the useful energy range, the IGLET-X low energy capability is limited only by the cryostat window. ORTEC offers thin Be windows with the performance shown in Fig. 4.

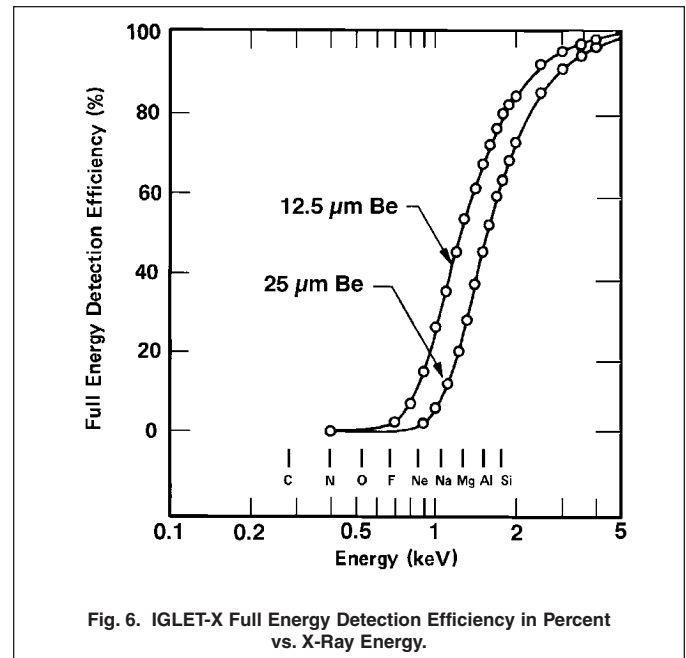
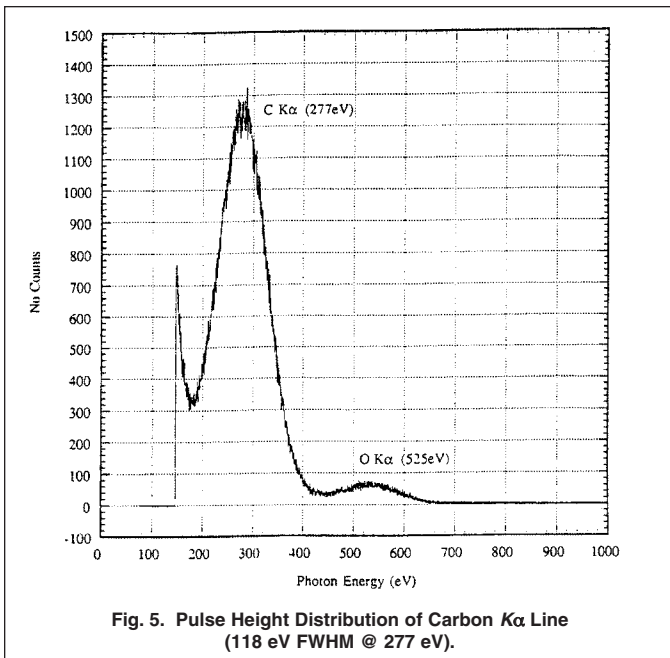
Through even ultra-thin beryllium windows, there is little transmission of <1-keV photons. There is a practical, reliable method of achieving excellent resolution at energies as low as the carbon K_{α} line at 277 eV (Fig. 5)⁵. The answer is a windowless system, for which the experimenter must control the cleanliness of the vacuum, such as a CFG-JIMG cryostat outfitted with a gate valve. It should be noted that a good vacuum, free of impurities, is then needed in the x-ray source. Although ORTEC does not warrant any detector which has been opened, reliable operation can be obtained with a clean vacuum.

At energies below 3 keV the Full Energy Detection Efficiency of IGLET-X detectors is dominated by x-ray absorption in the endcap window. Figure 6 shows the results obtained with Be windows of different thickness.

Individual Detector or Multiple-Detector Arrays

The IGLET and IGLET-X detectors are available either as individual detectors or in an individual cryostat or in multiple-detector arrays.





Configuration Guidelines

Streamline (non-PopTop) Configuration

In so called Streamline systems, the detector capsule is NOT demountable. Detector capsule and cryostat share the same vacuum. In configuration terms, this requires a cryostat or cryostat/dewar selection with the cryostat having a matching diameter to the capsule endcap. A cryostat must always be ordered with a Streamline capsule, because they are integral.

Steps to Configure Your ORTEC HPGe Detector

1) Configure the Detector Model

- Ge Crystal dimensions and specifications
- Endcap and window

2) Configure the Cryostat/Dewar Model

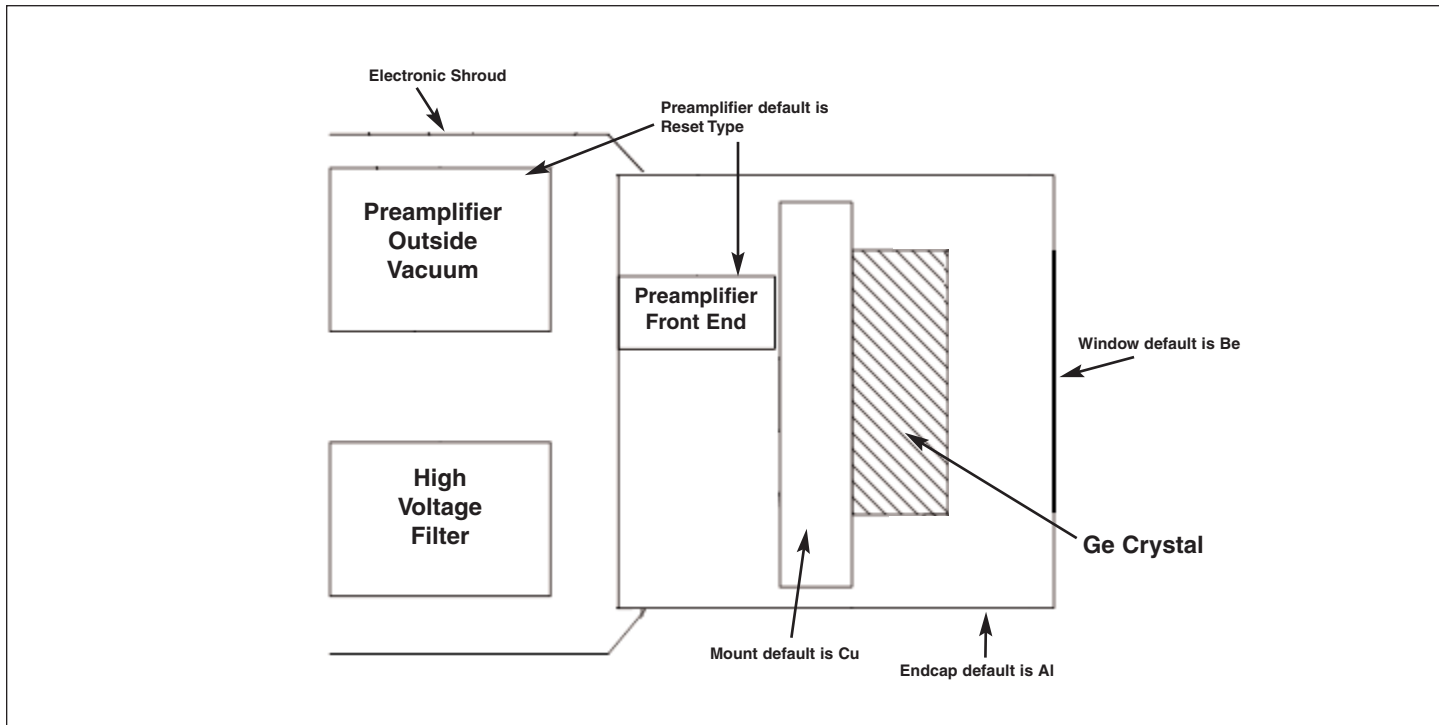
- Vertical Dipstick style (separate Dewar)
- Horizontal Dipstick style (separate Dewar)
- Portable with all-position or multi-position cryostat/dewar models
- Downlooking designed to be oriented with the detector pointing down
- Sideloooking designed to be oriented with the detector horizontal at the bottom of the dewar
- "J" configuration designed with the detector attached near the bottom of the dewar and a right angle bend in the cryostat orienting the detector to look up.

A cryostat and dewar or other cooling device are required for operation.

You must choose a cryostat or cryostat/dewar model for the detector to be mounted on and vacuum sealed. The cryostat or cryostat/dewar combination diameter must match the endcap diameter of the selected detector.

IGLET and IGLET-X HPGe Detectors for Low and Very-Low Energy X Rays Product Configuration Guide

Streamline Detector



JIM Cryostat/Dewar Assemblies

Both IGLET and IGLET-X detectors are available in all standard ORTEC cryostats. IGLET detectors are also available in the cryostat-dewar assemblies shown in Fig. 7. For spectroscopy on extremely small targets, these JIM series cryostats with their small diameter, are the best choice. (Not available for IGLET-X.)

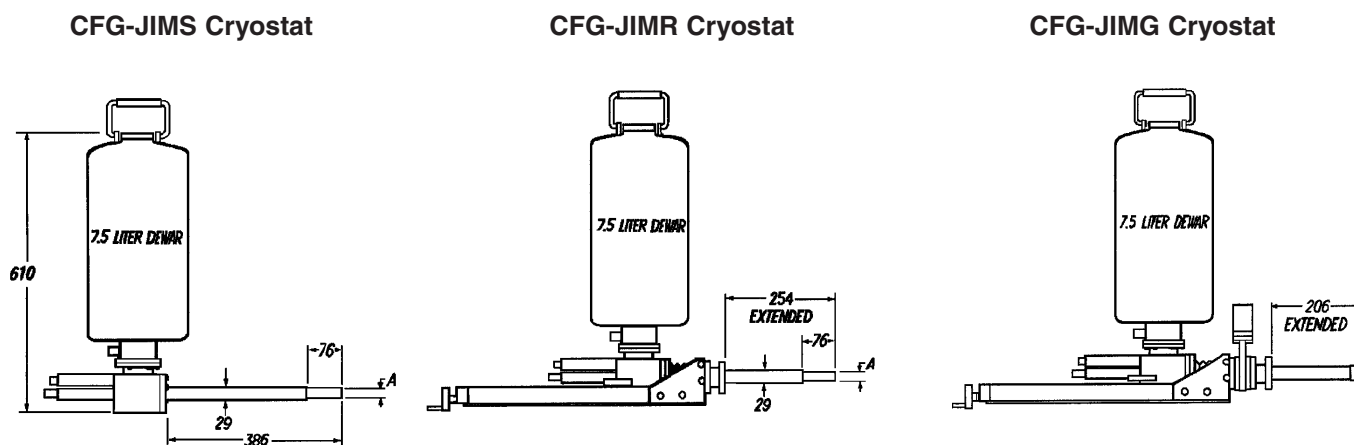


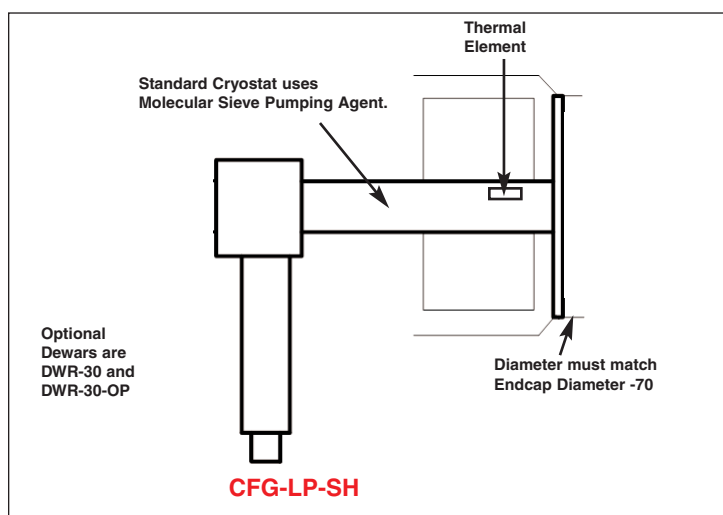
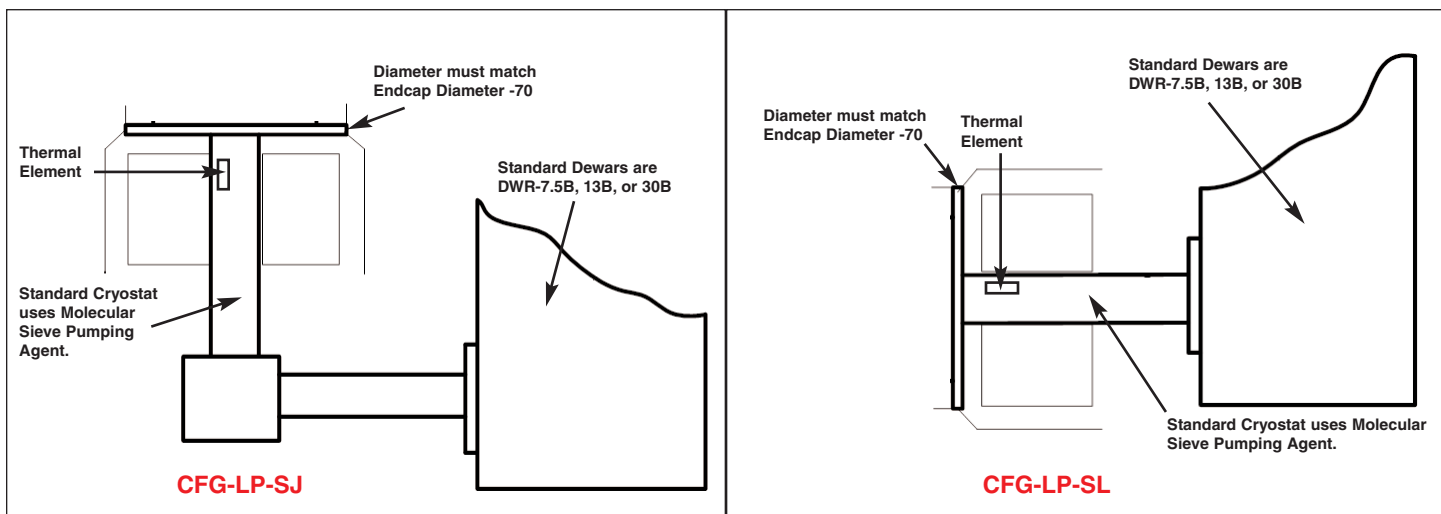
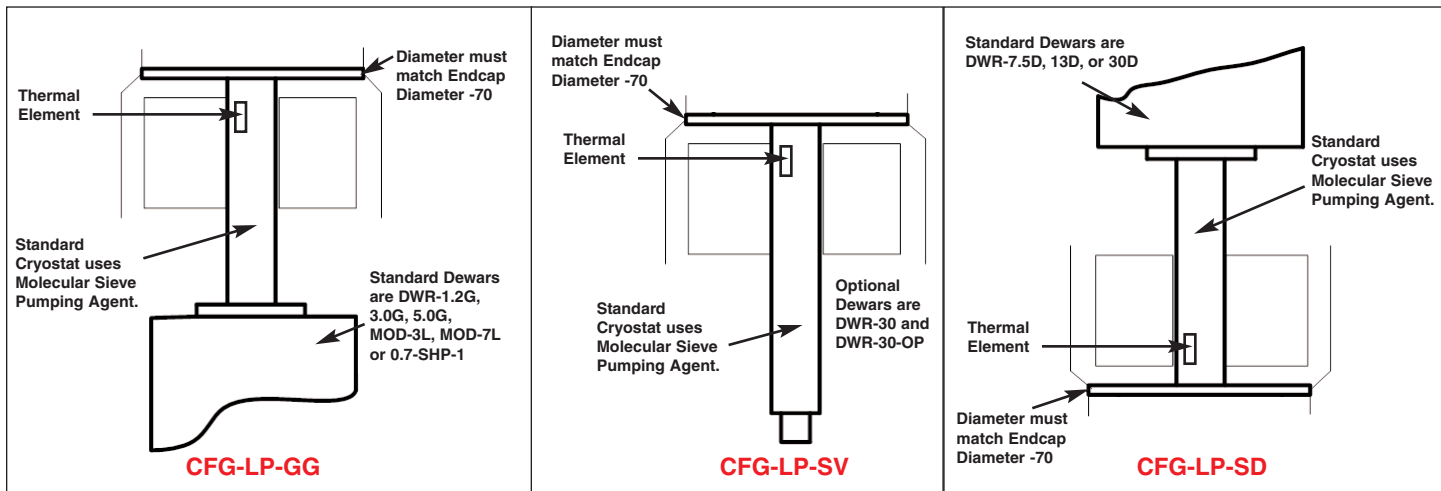
Fig. 7. CFG-JIMS, CFG-JIMR, and CFG-JIMG Cryostat Types for IGLET Detectors.

Active Diameter (mm)	06	11	16
"A" Dimension (mm)	19	22	29

IGLET and IGLET-X HPGe Detectors for Low and Very-Low Energy X Rays Product Configuration Guide

Streamline Cryostat and Cryostat/Dewar Assemblies

Streamline systems (detector capsule and cryostat) share the same vacuum, requiring a cryostat or cryostat/dewar selection with the cryostat having a matching diameter to the capsule endcap.



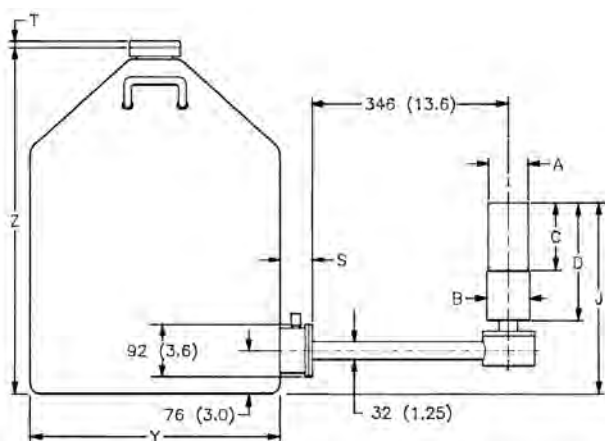
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Streamline Dimensional Data

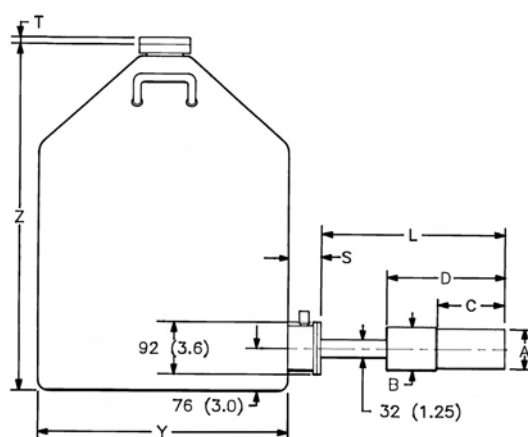
Streamline systems (detector capsule and cryostat) share the same vacuum, requiring a cryostat or cryostat/dewar selection with the cryostat having a matching diameter to the capsule endcap. A cryostat must be ordered with a Streamline capsule.

The cryostat and dewar drawings that follow are to be used in conjunction with the accompanying tables of dimensions.

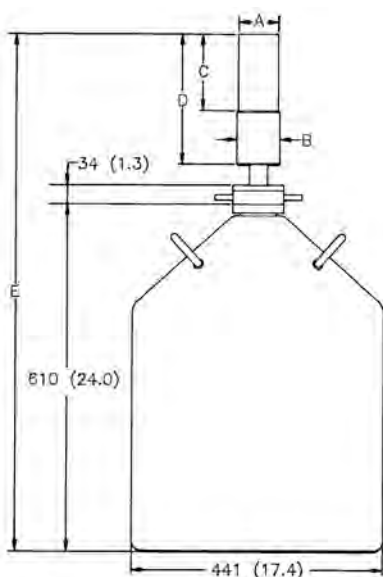
Note: Cryostat/Dewar drawings are NOT to scale, see tables that follow for complete dimensions.



CFG-LP-SJ, DWR-30B (or -13B or -7.5B)



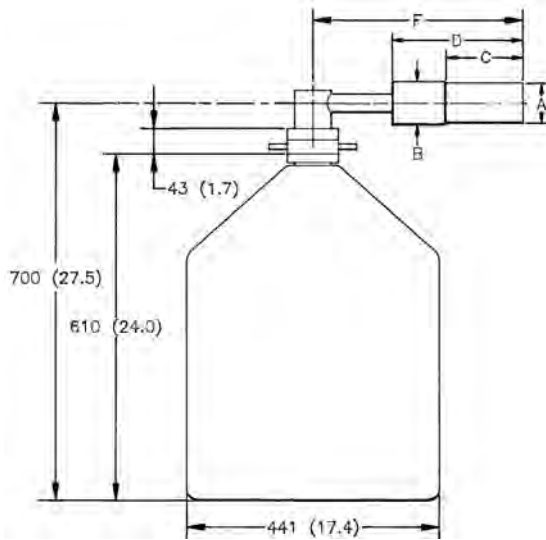
CFG-LP-SL, DWR-30B (or -13B or -7.5B)



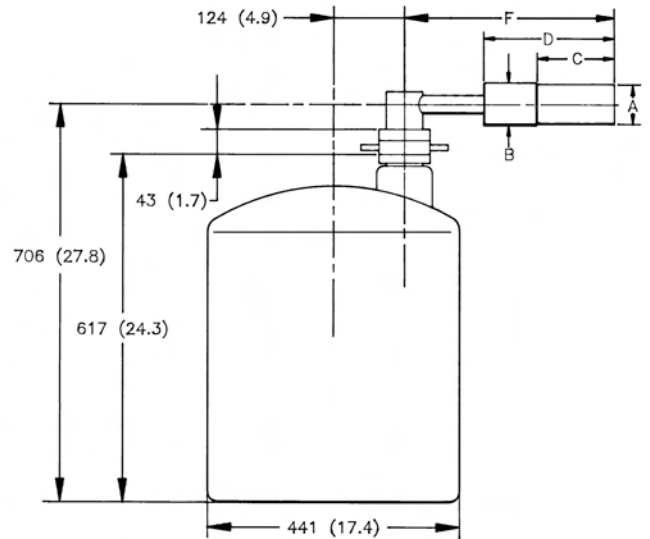
CFG-LP-SV, DWR-30

IGLET and IGLET-X HPGe Detectors for Low and Very-Low Energy X Rays Product Configuration Guide

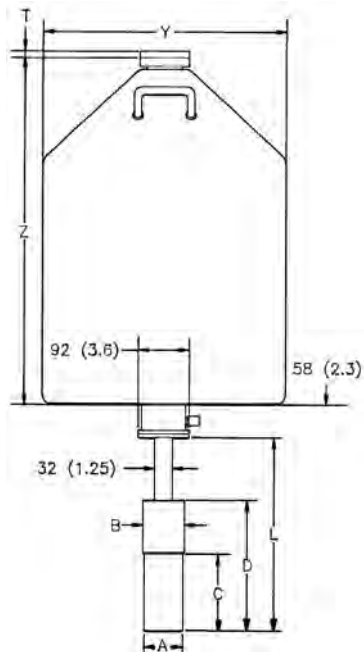
Note: Cryostat/Dewar drawings are NOT to scale, see tables that follow for complete dimensions.



CFG-LP-SH, DWR-30



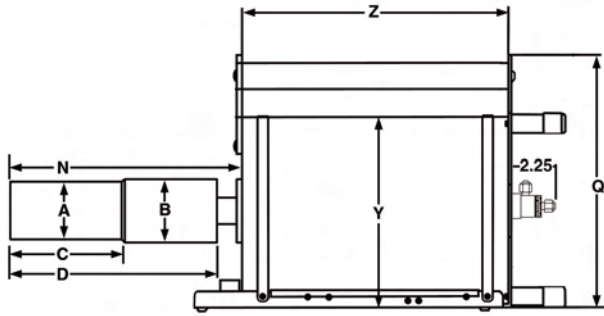
CFG-LP-SH, DWR-30-OP



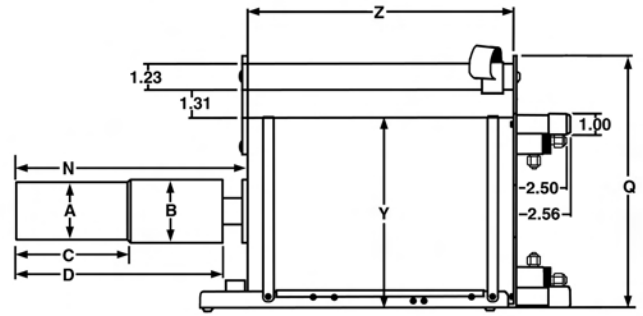
CCFG-LP-SD, DWR-30D (or -13D or -7.5D)

IGLET and IGLET-X HPGe Detectors for Low and Very-Low Energy X Rays Product Configuration Guide

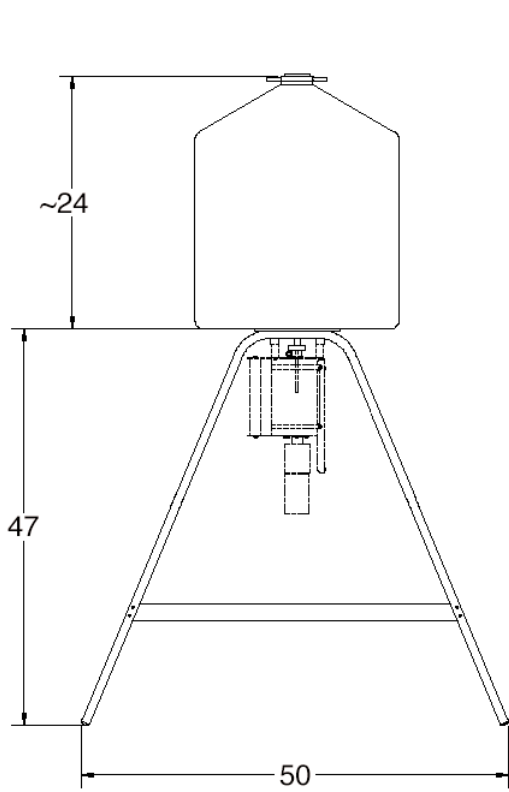
Note: Cryostat/Dewar drawings are NOT to scale, see tables that follow for complete dimensions.



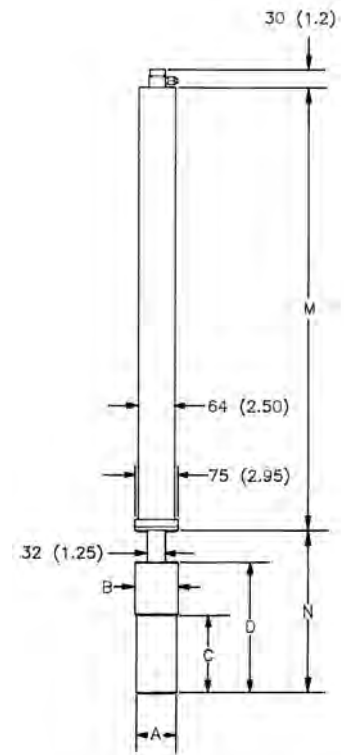
CFG-LP-GG, DWR-1.2G (or -3.0G, -5.0G)



CFG-LP-GG, DWR-MOD3L (or -MOD7L)



DWR-S/F



CFG-LP-GG, DWR-0.7-SHP-1

IGLET and IGLET-X HPGe Detectors for Low and Very-Low Energy X Rays Product Configuration Guide

IGLET and IGLET-X Detector Dimensions

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

Dim.	Unit	Tol.	Streamline
A	mm (in)	0.3 (0.01)	70 (2.75)
B	mm (in)	0.3 (0.01)	75 (2.95)
C	mm (in)	5 (0.2)	71 (2.8)
D	mm (in)	8 (0.3)	163 (6.4)
E	mm (in)	8 (0.3)	CF
F	mm (in)	18 (0.7)	305 (12.0)
G	mm (in)	10 (0.4)	305 (12.0)
H	mm (in)	10 (0.4)	X X
HB	mm (in)	18 (0.7)	X X
HC	mm (in)	0.3 (0.1)	X X
HD	mm (in)	5 (0.2)	X X
J	mm (in)	10 (0.4)	X X
L	mm (in)	18 (0.7)	274 (10.8)
M	mm (in)	10 (0.4)	X X
N	mm (in)	8 (0.3)	X X
P	mm (in)	10 (0.4)	186 (7.3)

Gamma Gage and Side-Looking Dewar Dimensions

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

			Cryostat/Dewar or Dewar Type							
			DWR-x.xG			DWR-MOD-xL		DWR-xxB and DWR-xxD		
			VOLUME			VOLUME		VOLUME		
Dim.	UNIT	TOL. ±	1.2L	3L	5L	3L	7L	7.5L	13L	30L
Q	mm (in)	13 (0.5)	229 (9.0)	302 (11.9)	302 (11.9)	229 (9.0)	302 (11.9)	X X	X X	X X
R	mm (in)	10 (0.4)	X X	X X	X X	X X	X X	174 (6.9)	174 (6.9)	155 (16.1)
S	mm (in)	7.6 (0.3)	X X	X X	X X	X X	X X	77 (3.0)	77 (3.0)	60 (2.3)
T	mm (in)	5 (0.2)	X X	X X	X X	X X	X X	10 (0.4)	10 (0.4)	13 (0.5)
Y	mm (in)	5 (0.2)	157 (6.2)	229 (9.0)	229 (9.0)	157 (6.2)	229 (9.0)	224 (8.8)	307 (12.1)	442 (17.4)
Z	mm (in)	5 (0.2)	229 (9.0)	267 (10.5)	419 (16.5)	292 (11.5)	320 (12.6)	452 (17.8)	429 (16.9)	610 (24.0)

IGLET and IGLET-X HPGe Detectors for Low and Very-Low Energy X Rays Product Configuration Guide

Example Model Numbers

Streamline Configuration

IGLET-06135 CFG-LP-GG-70 DWR-1.2G	6-mm diameter, 6-mm thick IGLET detector with 70-mm diameter endcap. Portable Gamma Gage cryostat with matching 70-mm diameter flange. 1.2 liter all-position dewar for Gamma Gage Cryostat.
IGLET-X-11145 CFG-LP-SD-70 DWR-7.5D	11-mm diameter, 10-mm deep IGLET-X detector with 70-mm diameter endcap. Downlooking cryostat with matching 70-mm diameter flange. 7.5 Liter downlooking dewar for downlooking cryostat.
IGLET-16160 CFG-JIMS-7.5	16-mm diameter, 10-mm deep IGLET detector with 70-mm diameter endcap. Sidelooping, 7.5-liter bucket dewar, small diameter cryostat and endcap.

Ordering Information

- If dimensional considerations are critical, contact factory.
- Cryostat and dewar or other cooling device are not included with detector.
- Cryostat and dewar or other cooling device are required for operation.
- A cryostat must be ordered with a Streamline detector.

Model No.	Be Window Thickness (μm)	Active Diameter (mm)	Active Depth (mm)	Warranted Resolution	
				@5.9 keV, 10 μs 1000 cps	@5.9 keV, 0.5 μs 100,000 cps
IGLET-06135	13	6	6	135 eV	250 eV
IGLET-11145	25	11	10	145 eV	270 eV
IGLET-16160	50	16	10	160 eV	280 eV
IGLET-X-06135	13	6	6	135 eV	250 eV
IGLET-X-11145	25	11	10	145 eV	270 eV
IGLET-X-16160	50	16	10	160 eV	280 eV

IGLET and IGLET-X HPGe Detectors for Low and Very-Low Energy X Rays Product Configuration Guide

IGLET and IGLET-X Streamline Cryostats

• Select dewar from IGLET and IGLET-X Streamline Dewars. Dewar included except where marked*.

Model No.	Description
CFG-LP-GG-70	Gamma Gage Cryostat Dewar
CFG-LP-SD-70	Down-Looking Cryostat with Dewar
CFG-LP-SH-70	Horizontal Cryostat (Dipstick type). Includes LNTC1.25WH. Dewar not included.*
CFG-LP-SJ-70	J-type Cryostat with Dewar
CFG-LP-SL-70	Side-Looking Cryostat with Dewar
CFG-LP-SV-70	Vertical Cryostat with (Dipstick type). Includes LNTC1.25WH. Dewar not included.*

IGLET and IGLET-X Streamline Dewars

For Cryostat	Choose	Description	
CFG-LP-GG	DWR-1.2G	1.2-liter All-Orientation Dewar	Included with Cryostat
	DWR-3.0G	3.0-liter All-Orientation Dewar	Included with Cryostat
	DWR-5.0G	5.0-liter All-Orientation Dewar	Included with Cryostat
	DWR-MOD-3L	3-liter Multi-Orientation Dewar	Included with Cryostat
	DWR-MOD-7L	7-liter Multi-Orientation Dewar	Included with Cryostat
	DWR-0.7-SHP-1	0.7-liter Shallow-Hole Probe Dewar	Included with Cryostat
	DWR-S/F	Storage/Fill Dewar for DWR-XG	
CFG-LP-SJ, SL	DWR-7.5B	7.5-liter Side-Looking Dewar	Included with Cryostat
	DWR-13B	13-liter Side-Looking Dewar	Included with Cryostat
	DWR-30B	30-liter Side-Looking Dewar	Included with Cryostat
CFG-LP-SD	DWR-7.5D	7.5-liter Down-Looking Dewar	Included with Cryostat
	DWR-13D	13-liter Down-Looking Dewar	Included with Cryostat
	DWR-30D	30-liter Down-Looking Dewar	Included with Cryostat
CFG-LP-SV, SH	DWR-30-OP	30-liter Offset-Port Dewar	
	DWR-30	30-liter Dewar	

IGLET Streamline Cryostats with Small Diameter Endcap and Dewar

• Not available for IGLET-X.

• Dewar included.

Model No.	Description
CFG-JIMS-7.5	Sidelooking, 7.5 liter bucket dewar, small diameter cryostat and endcap.
CFG-JIMR-7.5	Sidelooking, 7.5 liter bucket dewar, small diameter cryostat and endcap with retractable slide and bellows.
CFG-JIMG-7.5	Sidelooking, 7.5 liter bucket dewar, small diameter cryostat and endcap with retractable slide and bellows, and high vacuum gate valve.

IGLET and IGLET-X HPGe Detectors for Low and Very-Low Energy X Rays Product Configuration Guide

Literature

Visit the ORTEC website for the following papers:

1. "On the Use of a High-Purity-Ge Detector for PIXE Spectrometry on Geological Material" by R.D. Vis, Free University of Amsterdam, Faculty of Physics and Astronomy. (This paper conclusively shows that, for most PIXE applications, Ge detectors [such as ORTEC IGLET-X] advantageously replace Si(Li) detectors.)
2. "A Soft X-Ray Solid-State Detector for Beamline 3.4. Part 2: Detector Characterization for Photon Energies Below 1 keV" by A.D. Smith and R.C. Farrow. (This paper shows how to obtain spectra down to energies down to the C K alpha line <300 keV.)
3. "A Solid-State Detector for Soft Energy Extended X-Ray Absorption Fine Structure Measurements" by A.D. Smith, G.E. Derbyshire, R.C. Farrow, A. Sery (DRAL U.K.) and T. W. Raudorf and M. Martini (ORTEC), Rev. Sci. Instruments 66 (2) February 1995. (This paper expands on the subject covered in reference #2.)

Specifications subject to change
120409

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www.ortec-online.com

Tel. (865) 482-4411 • Fax (865) 483-0396 • ortec.info@ametek.com
801 South Illinois Ave., Oak Ridge, TN 37831-0895 U.S.A.
For International Office Locations, Visit Our Website

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