

- Specifically designed to meet the demanding requirements of isotopic ratio software codes used in Safeguards and NDA.
- Excellent resolution is maintained over a wide range of count rates, enhancing measurement flexibility.
- Available in a full range of crystal diameters.
- Extensive range of cryostats with multi-orientation dewar options for applications requiring portability.
- Compatible with all existing Safeguards multichannel analyzers.

The precise measurement of isotopic ratios required in Safeguards and non-destructive assay (NDA) applications places a severe demand on the techniques of gamma-ray and x-ray spectroscopy. Figure 1 demonstrates the complexity of the 90–130 keV region of a typical Pu spectrum. The choice of energy region(s) for analysis depends specifically on the sample type and origin and the material matrix.

National laboratory software codes¹ written to obtain highly accurate isotopic ratios, must deal with these spectra to analyze low-energy and/or high-energy regions in which groups of peaks are located close together. Each code requires exceptional system resolution and stability in order to achieve accurate unfolding of these regions.

Recent safeguards development trends have led to a growing requirement of isotopic ratio determinations involving higher energy gamma-rays. Such needs spring from the need to measure attenuated samples, such as those found in waste assay and in certain homeland security applications. Software codes such as FRAM and MGAHI² can now determine Pu isotopic ratios from the higher energy regions of the spectrum. As a consequence, it is desirable to produce HPGe detectors that offer improved higher energy performance, while maintaining the excellent resolution characteristics required in such applications.

The ORTEC Safeguards series include both coaxial and planar geometry detectors, specifically designed to meet the demands of the applications software used for isotopic ratio determination, have been developed to strike an optimum balance between low-energy resolution and high-energy efficiency.

SGD planar detectors are compatible with ALL conventional MCA types, although optimum performance will be obtained when used with the ORTEC Digital Signal Processing Spectrometers.

All SGD planar detectors feature the following:

- Choice of fixed, portable, and custom cryostats, including the latest MOD multi-orientation dewar option.
- Robust aluminum endcap
- Streamline preamplifier assembly
- LN₂-Free option

The latest low-power resistive feedback preamplifier with "no ring" output, suitable for use with all existing types of MCA systems. Power consumption less than 25 mA at ± 12 and ± 24 V.

Application Considerations

For safeguards accountancy measurements involving the verification of declared materials values, the sample is usually presented in a pure form in a purpose-designed thin-walled container. This occurs with routine safeguards inspection programs, when a portable system is employed.

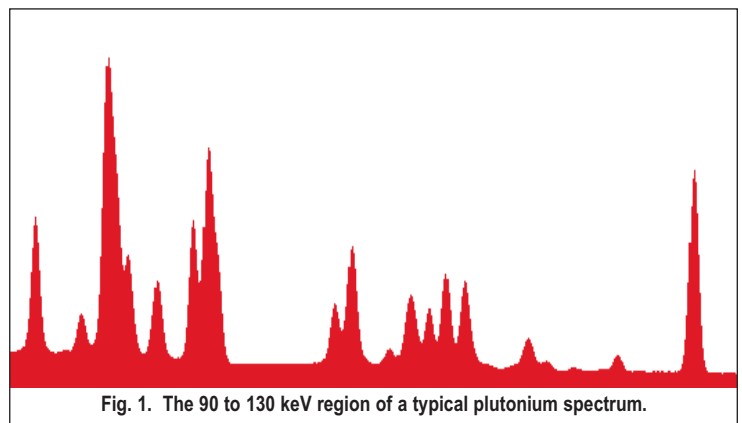


Fig. 1. The 90 to 130 keV region of a typical plutonium spectrum.

High-Performance Germanium Planar Detectors for Safeguards and Non-Destructive Assay

Product Configuration Guide

The Following Specifications are Provided for SGD Planar Detectors

- Active crystal diameter and depth.
- Energy resolution at 122 keV photons from ^{57}Co at 1 kcps and optimum shaping time.
- Shape specifications for Full Width Tenth Maximum (FWTM) to Full Width Half Maximum (FWHM) and Full Width Fiftieth Maximum (FWFM) to FWHM at <50 kcps for 122 keV photons from ^{57}Co .
- SGD-16550P4 only: High rate specification of energy resolution at 122 keV photons from ^{57}Co at 50 kcps with 1 μs shaping time.

Configuration Guidelines

PopTop or Streamline (non-PopTop) Configuration

The essence of a PopTop detector system is that the HPGe detector element, preamplifier, and high voltage filter are housed in a detector “capsule” which is then attached to an appropriate cryostat (Figure 2.)

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.

The actual PopTop capsule has its own vacuum. It can be mounted on any of the available cryostats or cryostat/dewar combinations.

Steps to Configure Your ORTEC HPGe Detector

1) Configure the Detector Model

- Capsule type (PopTop or Streamline)
- Crystal dimensions and specifications
- Endcap and window
- Mount
- Preamplifier
- Cable Package

Preamplifier options are available.

2) Configure the Cryostat/Dewar Model

- Vertical Dipstick style (separate Dewar or Mobius Recycler)
- Horizontal Dipstick style (separate Dewar or Mobius Recycler)
- Portable with all-position or multi-position cryostat/dewar models
- Downlooking designed to be oriented with the detector pointing down
- Sidelooking 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.

If a PopTop detector has been selected, you can choose a PopTop style cryostat or cryostat/dewar combination.

If a Streamline detector has been selected, 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.

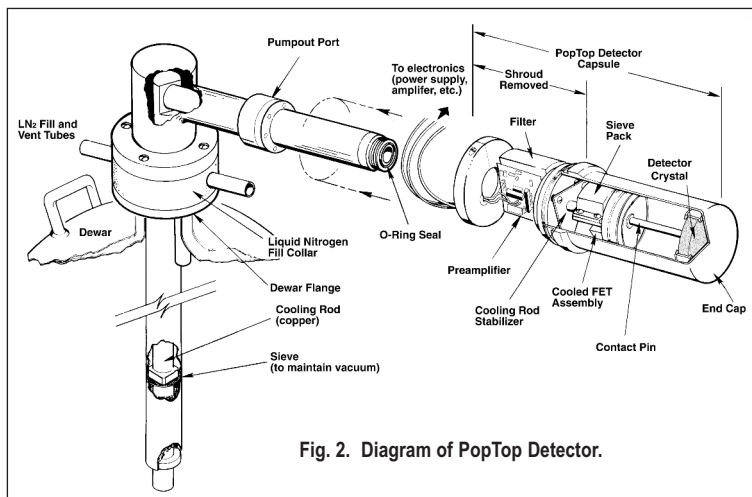


Fig. 2. Diagram of PopTop Detector.

¹Specifically these codes are: FRAM from Los Alamos National Laboratory; MGA from Lawrence Livermore National Laboratory and TRIFID from Rocky Flats Plant.

²MGAHI is now included in the MGA-B32 suite of software available from ORTEC.

Detector Options

SMART-1 Option (-SMN)

The SMART-1 option monitors and reports on vital system functions, and can save authentication codes and report the code at a later time. It has the high voltage included, so none of the instruments require an external high-voltage power supply.

The SMART-1 is housed in a rugged ABS molded plastic enclosure and is permanently attached to the detector endcap via a molded-strain-relieved sealed cable. This eliminates the possibility that the detector will suffer severe damage from moisture leaking into high-voltage connectors. The SMART-1 can be positioned in any convenient place and does not interfere with shielding or other mounting hardware.



SMART-1 Detector Interface Module.

Defining the Detector Model

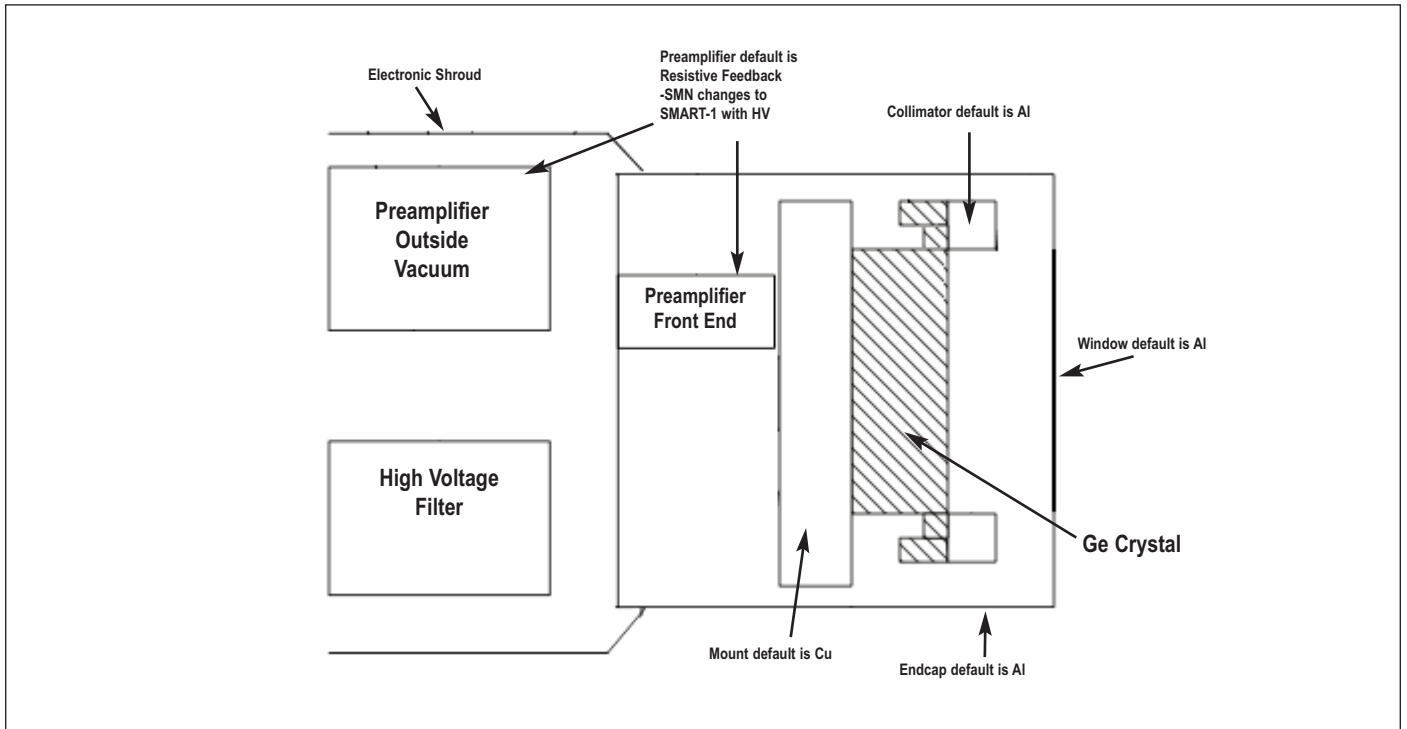
- See ordering information for option compatibility.

Base Model (example)	PopTop or Streamline	High Voltage Option (if required)
SGD-16550	P4 (PopTop) (Streamline)	-SMN

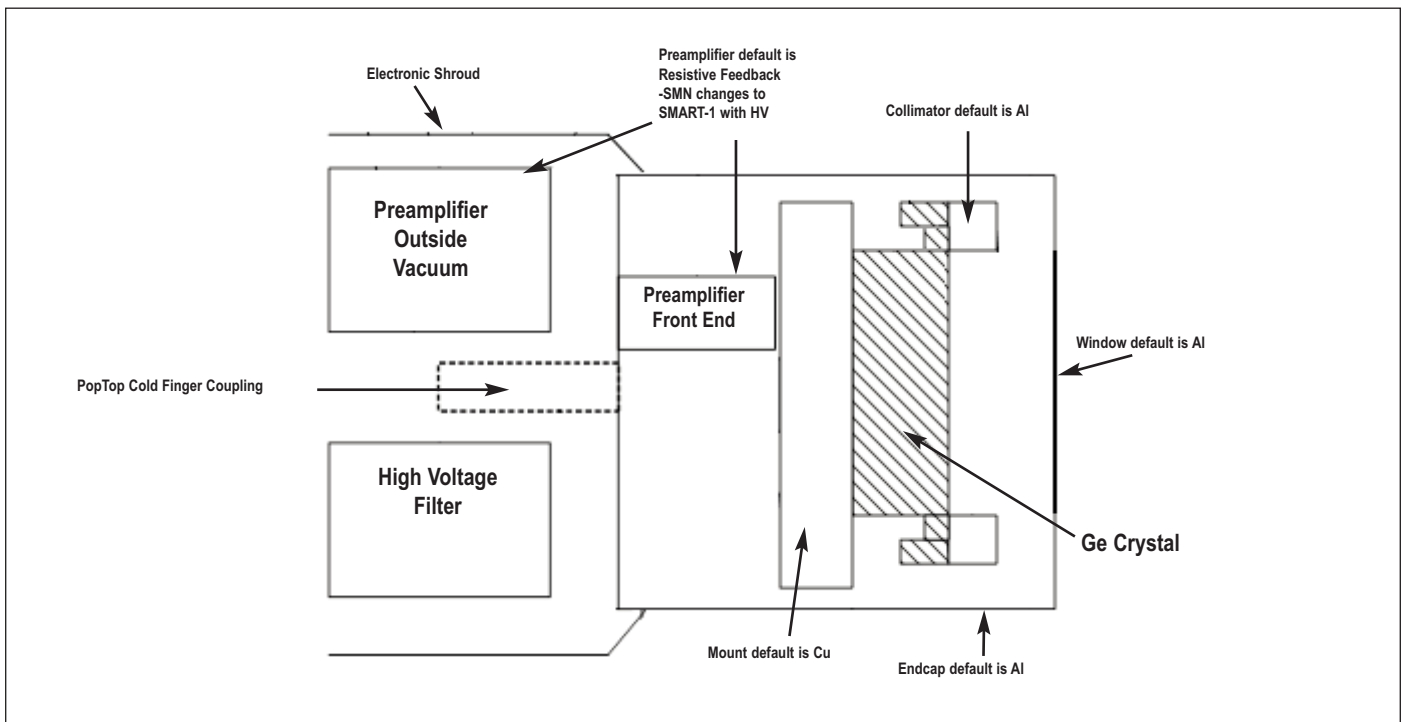
High-Performance Germanium Planar Detectors for Safeguards and Non-Destructive Assay

Product Configuration Guide

Streamline Detector Capsule



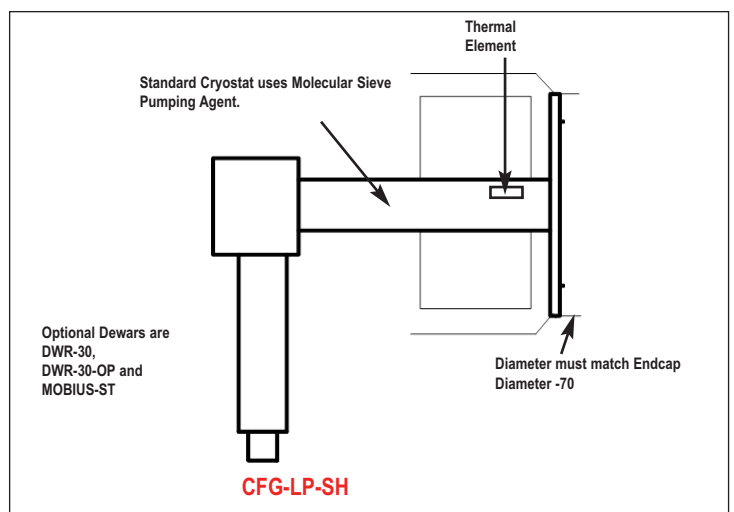
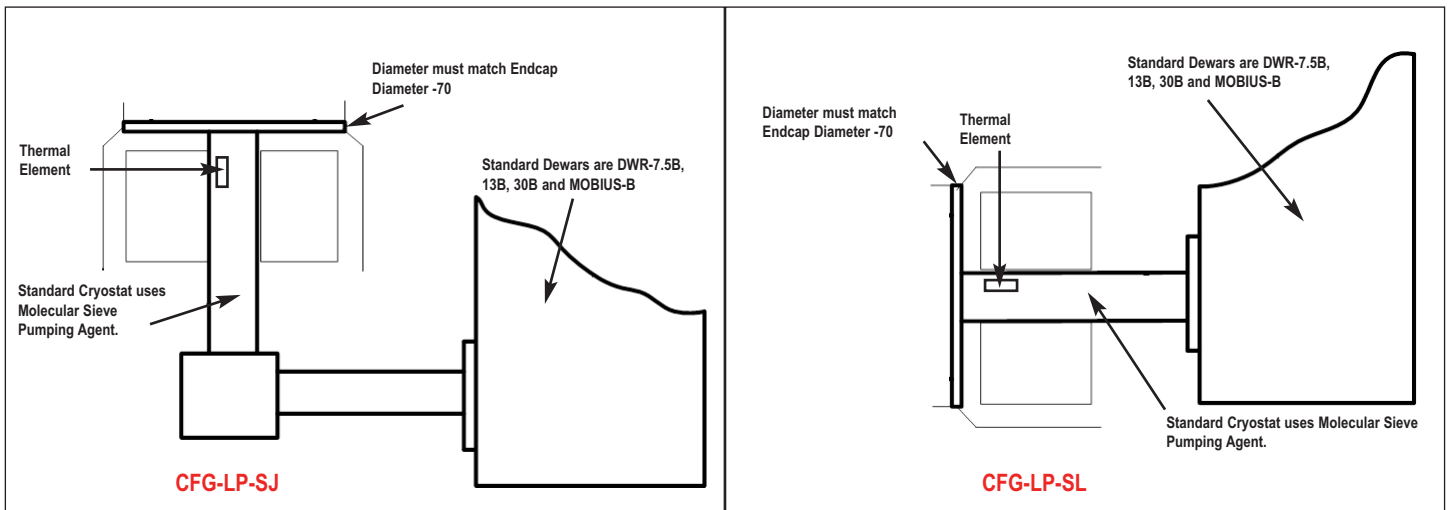
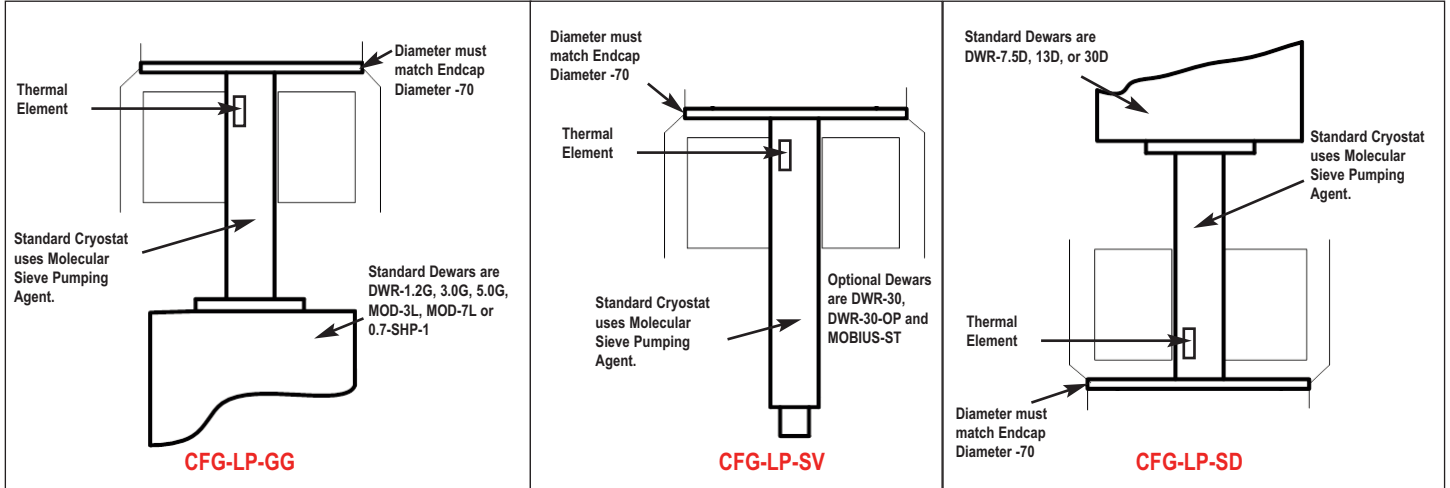
PopTop Detector Capsule



High-Performance Germanium Planar Detectors for Safeguards and Non-Destructive Assay 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.



High-Performance Germanium Planar Detectors for Safeguards and Non-Destructive Assay

Product Configuration Guide

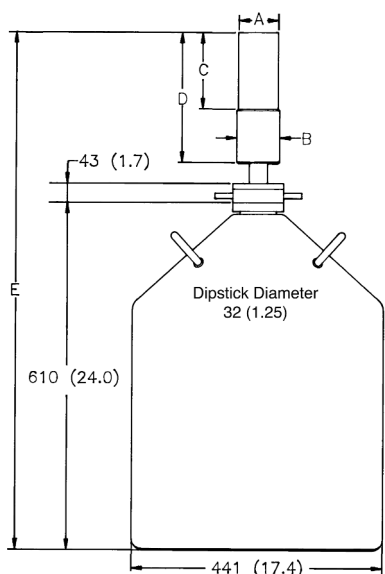
PopTop and Streamline Dimensional Data

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.

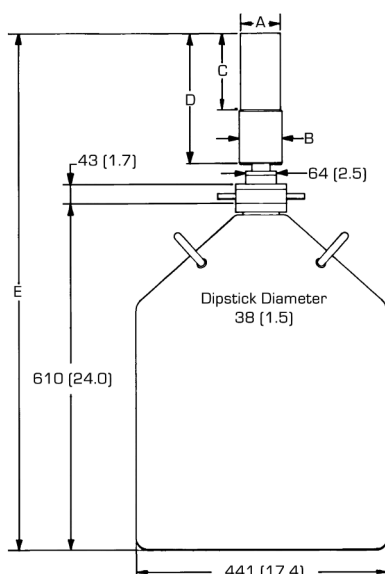
The PopTop capsule features an internal vacuum arrangement. It can be mounted on any of the available PopTop cryostats or cryostat/dewar combinations.

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

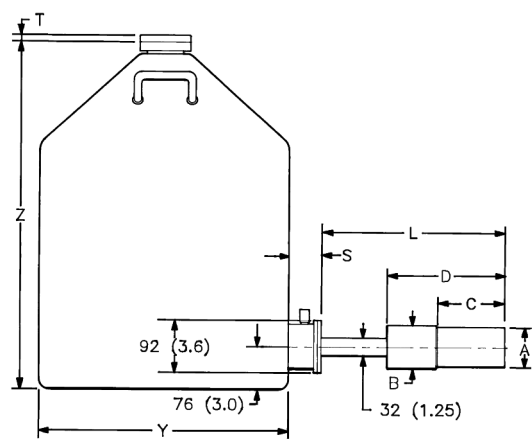
Note: Cryostat/Dewar drawings are NOT to scale, see tables that follow for complete dimensions. Dimensions are for reference only and subject to change, if dimensional constraints are critical, contact the factory.



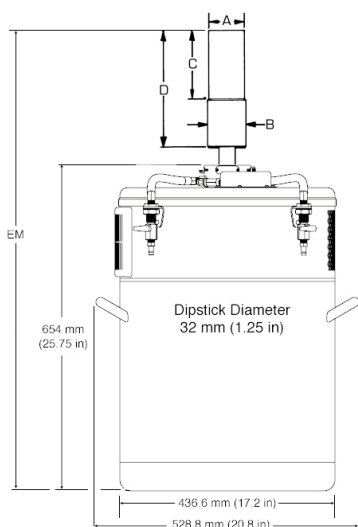
CFGLP-SV, DWR-30



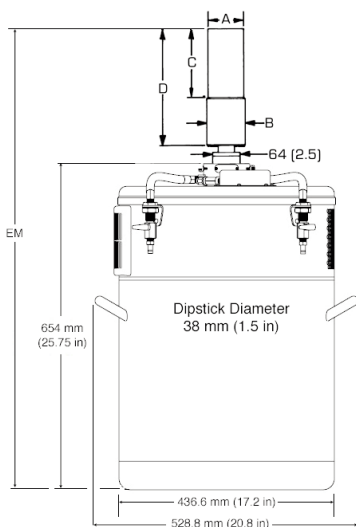
CFGPV4, DWR-30



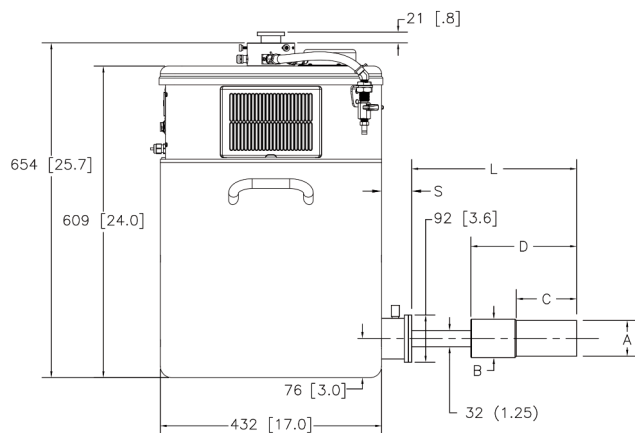
CFGPS4-30 (or -13 or -7.5) or CFGLP-SL, DWR-30B (or -13B or -7.5B)



CFG-SV, MOBIUS-ST



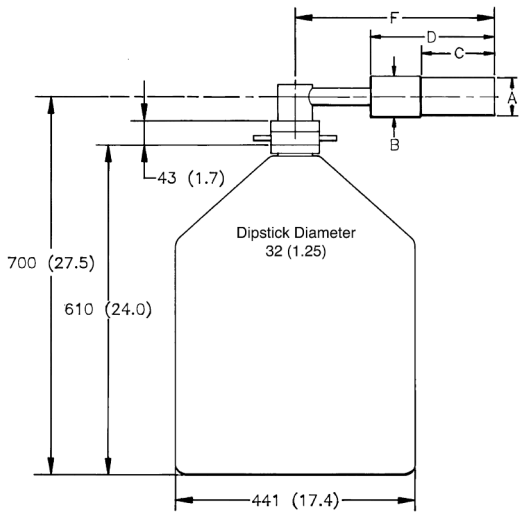
CFGPV4, MOBIUS-PT



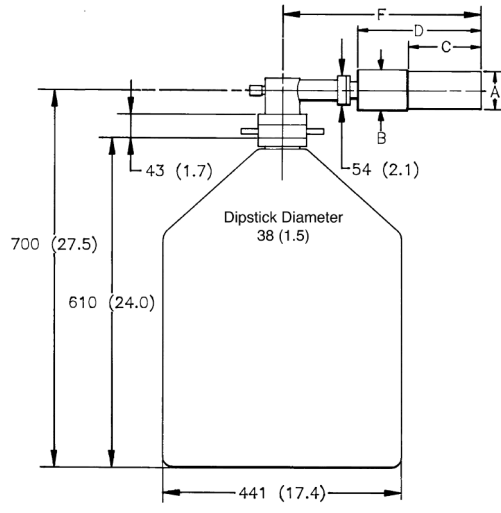
CFGPS4-MOBIUS-B or CFGLP-SL, MOBIUS-B

High-Performance Germanium Planar Detectors for Safeguards and Non-Destructive Assay Product Configuration Guide

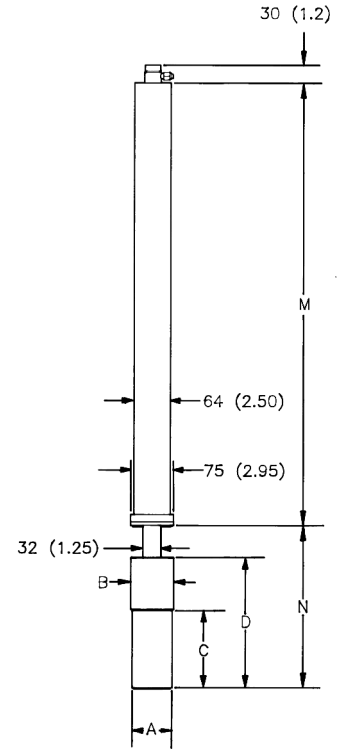
**Note: Cryostat/Dewar drawings are NOT to scale, see tables that follow for complete dimensions.
Dimensions are for reference only and subject to change, if dimensional constraints are critical, contact the factory.**



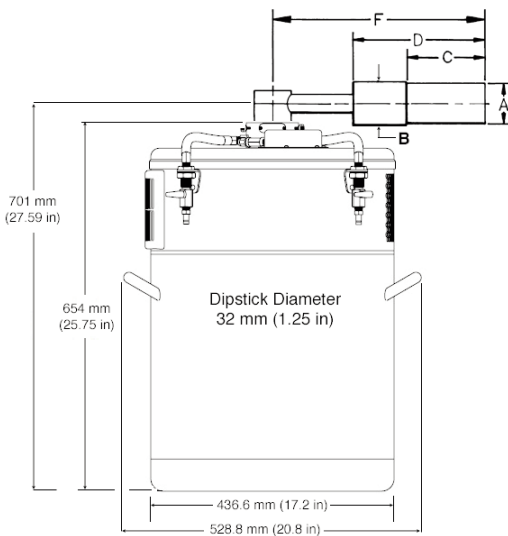
CFG-LP-SH, DWR-30



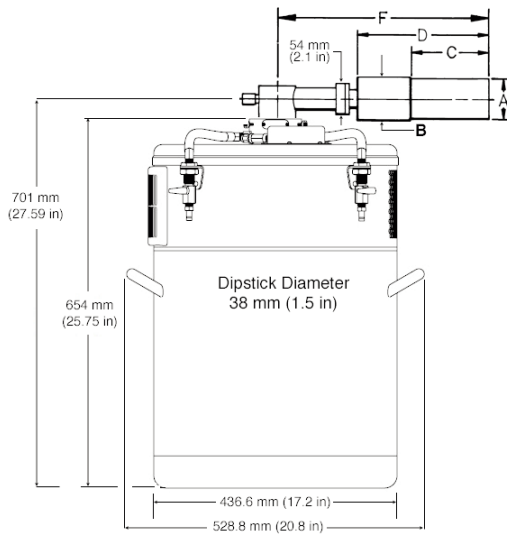
CFG-PH4, DWR-30



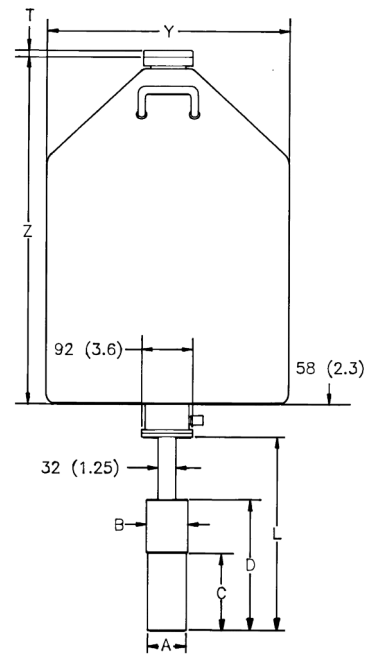
**CFG-PSHP4 or
CFG-LP-GG, DWR-0.7-SHP-1**



CFG-SH, MOBIUS-ST



CFG-PH4, MOBIUS-PT

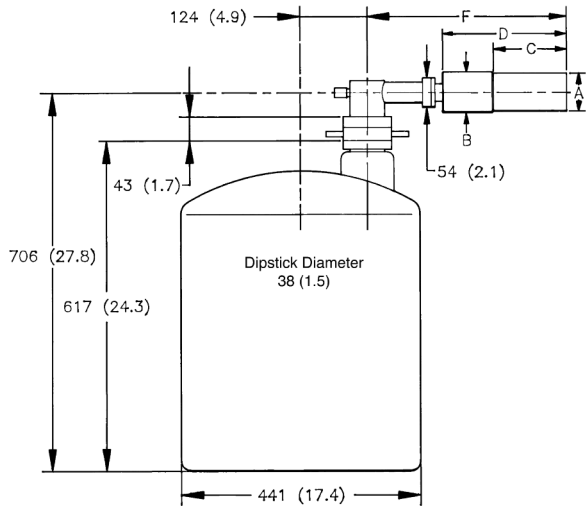


**CFG-PD4-30 (or -13 or -7.5) or
CFG-LP-SD, DWR-30D (or -13D or -7.5D)**

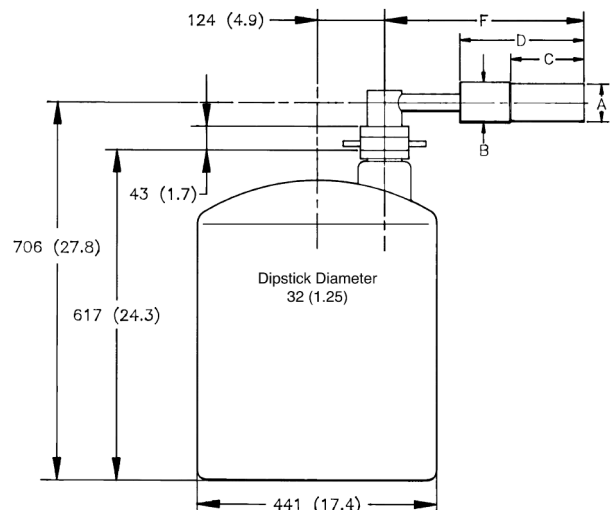
High-Performance Germanium Planar Detectors for Safeguards and Non-Destructive Assay

Product Configuration Guide

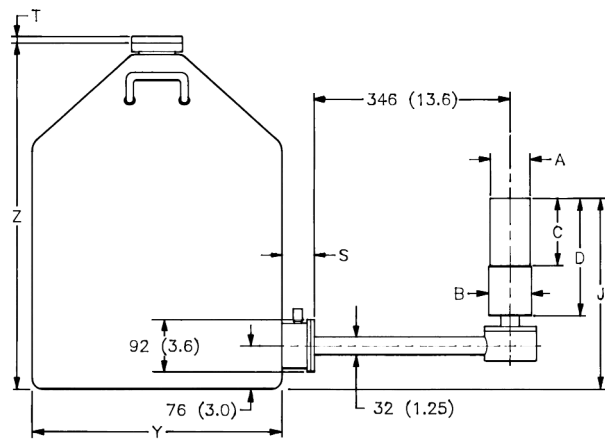
Note: Cryostat/Dewar drawings are NOT to scale, see tables that follow for complete dimensions. Dimensions are for reference only and subject to change, if dimensional constraints are critical, contact the factory.



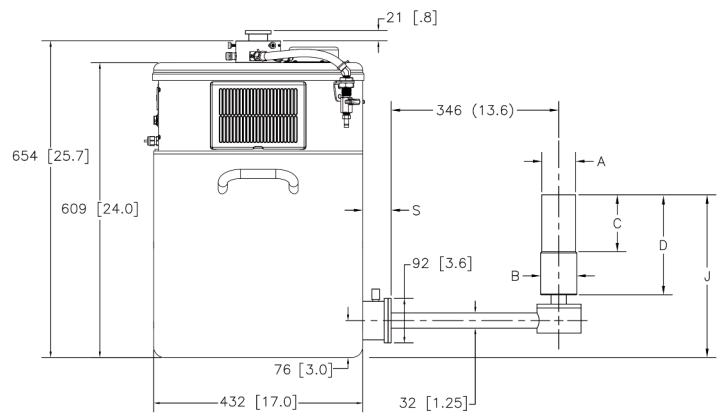
CFG-PH4, DWR-30-OP



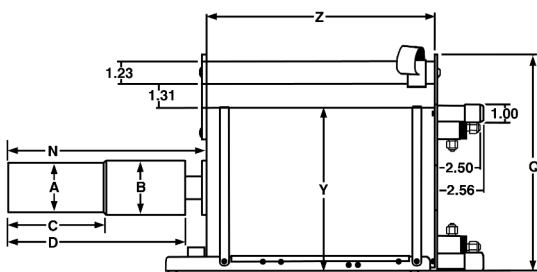
CFG-LP-SH, DWR-30-OP



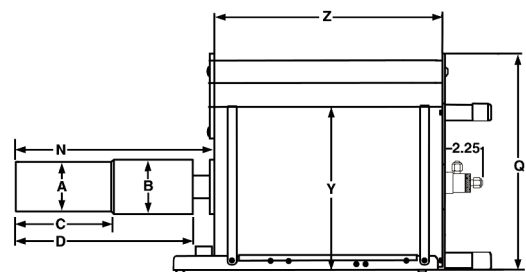
CFG-LP-SJ, DWR-30B (or -13B or -7.5B)



CFG-LP-SJ, MOBIUS-B



**CFG-PMOD4-3 (or -7) or
CFG-LP-GG, DWR-MOD3L (or -MOD7L)**

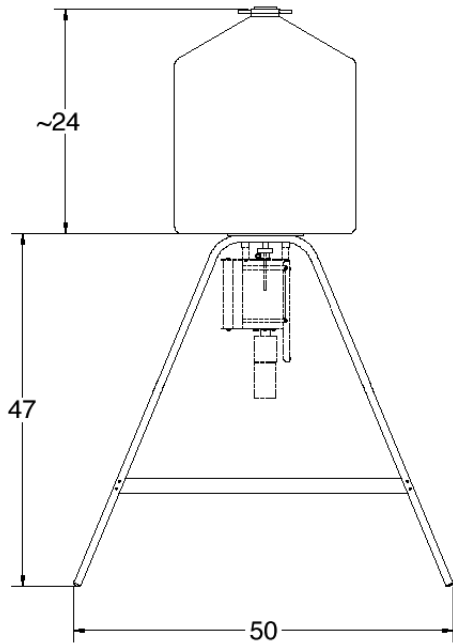


**CFG-PG4-1.2 (or -3 or -5) or
CFG-LP-GG, DWR-1.2G (or -3.0G, -5.0G)**

High-Performance Germanium Planar Detectors for Safeguards and Non-Destructive Assay

Product Configuration Guide

Note: Cryostat/Dewar drawings are NOT to scale, see tables that follow for complete dimensions.
 Dimensions are for reference only and subject to change, if dimensional constraints are critical, contact the factory.



DWR-S/F

SGD Planar Detector Dimensions

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

Dim.	Unit	Tol.	PopTop	Streamline
A	mm (in)	0.3 (0.01)	70 (2.75)	70 (2.75)
B	mm (in)	0.3 (0.01)	75 (2.95)	75 (2.95)
C	mm (in)	5 (0.2)	135 (5.3)	71 (2.8)
D	mm (in)	8 (0.3)	250 (9.8)	182 (7.2)
E	mm (in)	8 (0.3)	947 (37.3)	854 (33.6)
EM	mm (in)	9 (.35)	948 (37.3)	855 (33.7)
F	mm (in)	18 (0.7)	396 (15.6)	305 (12.0)
J	mm (in)	10 (0.4)	X X	318 (12.5)
L	mm (in)	18 (0.7)	338 (13.3)	274 (10.8)
M	mm (in)	10 (0.4)	790 (31.1)	X X
N	mm (in)	8 (0.3)	278 (10.9)	215 (8.5)

High-Performance Germanium Planar Detectors for Safeguards and Non-Destructive Assay

Product Configuration Guide

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							
			CFG-PG4 and DWR-x.xG			CFG-PMOD4 and DWR-MOD-xL		CFG-PS4, CFG-PD4, 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 (6.1)
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)	13 (0.5)	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)

Example Model Numbers

Streamline Configuration

SGD-16550 16-mm diameter, 15-mm deep SGD planar detector with 70-mm diameter endcap.
 CFG-LP-GG-70 Portable Gamma Gage cryostat with matching 70-mm diameter flange.
 DWR-1.2G 1.2 liter all-position dewar for Gamma Gage cryostat.

SGDGLP-16525-SMN 16-mm diameter, 10-mm deep SGD GLP planar detector with 70-mm diameter endcap and SMART-1 preamplifier and high voltage supply.
 CFG-LP-SV-70 Vertical “dipstick” style cryostat with matching 70-mm diameter flange.
 DWR-30 30 liter top port dewar that accepts “dipstick” style cryostats.

PopTop Configuration

SGD-16550P4-SMN 16-mm diameter, 15-mm deep SGD planar detector with 70-mm diameter endcap and SMART-1 preamplifier and high voltage supply.
 CFG-PG-3 Portable Gamma Gage cryostat with 3 liter all-position dewar.
 SGDGLP-36585P4 36-mm diameter, 13-mm deep SGD GLP planar detector with 70-mm diameter endcap.
 CFG-PD4-7.5 Downlooking cryostat with 7.5 liter dewar.

High-Performance Germanium Planar Detectors for Safeguards and Non-Destructive Assay Product Configuration Guide

Ordering Information

- For Streamline, remove the "P4" from the model number.
- Available with internal shielding, contact the factory for details.
- 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.	Active Diameter (mm)	Thickness (mm)	Warranted Resolution @122 keV	Warranted FW.1M/FWHM	Warranted FW.02M/FWHM
SGD-16550P4	16	15	550 @ 1 kcps 6 μ s 615 @ 50 kcps 1 μ s	1.87 @ <50 kcps	2.5 @ <50 kcps
SGDGLP-06480P4	6	5	480 @ 1 kcps 6 μ s	N/A	N/A
SGDGLP-10485P4	10	7	485 @ 1 kcps 6 μ s	N/A	N/A
SGDGLP-16525P4	16	10	525 @ 1 kcps 6 μ s	N/A	N/A
SGDGLP-25545P4	25	13	545 @ 1 kcps 6 μ s	N/A	N/A
SGDGLP-32570P4	32	13	570 @ 1 kcps 6 μ s	N/A	N/A
SGDGLP-36585P4	36	13	585 @ 1 kcps 6 μ s	N/A	N/A

SGD Planar Detector Options

-SMN SMART-1 detector option for negative bias detector, add "-SMN" to the model number.

SGD Planar PopTop Cryostats and Dewars

Model No.	Description
CFG-PD4-7.5	Down-looking Cryostat with 7.5-liter Dewar
CFG-PD4-13	Down-looking Cryostat with 13-liter Dewar
CFG-PD4-30	Down-looking Cryostat with 30-liter Dewar
CFG-PG4-1.2	Gamma Gage Cryostat with 1.2-liter Dewar
CFG-PG4-3	Gamma Gage Cryostat with 3-liter Dewar
CFG-PG4-5	Gamma Gage Cryostat with 5-liter Dewar
CFG-PH4	Horizontal Cryostat (Dipstick type). Choose DWR-30, DWR-30-OP, MOBIUS-PT or MOBIUS-PT-DET.
CFG-PMOD4-3	Gamma Gage Cryostat with 3-liter Multi-Orientation Dewar
CFG-PMOD4-7	Gamma Gage Cryostat with 7-liter Multi-Orientation Dewar
CFG-PS4-7.5	Side-Looking Cryostat with 7.5-liter Dewar
CFG-PS4-13	Side-Looking Cryostat with 13-liter Dewar
CFG-PS4-30	Side-Looking Cryostat with 30-liter Dewar
CFG-PS4-MOBIUS-B	Side-Looking Cryostat with Möbius Recycler 28-liter Dewar
CFG-PS4-MOBIUS-B-DET	Side-Looking Cryostat with Möbius Recycler 28-liter Dewar for purchase in combination with PopTop detector.
CFG-PSHP4	Down-Looking Shallow-Hole Probe with 0.7-liter Dewar
CFG-PV4	Vertical Cryostat (Dipstick type). Choose DWR-30, DWR-30-OP, MOBIUS-PT or MOBIUS-PT-DET.
MOBIUS-PT	Möbius Recycler.
MOBIUS-PT-DET	Möbius Recycler 28-liter Dewar for purchase in combination with PopTop detector and vertical or horizontal dipstick cryostat.
DWR-30	30-liter Dewar. Includes collar for 1.5" diameter cryostat.
DWR-30-OP	30-liter Offset-Port Dewar. Includes collar for 1.5" diameter cryostat.
DWR-S/F	Storage Fill Dewar for CFG-PG4-X

High-Performance Germanium Planar Detectors for Safeguards and Non-Destructive Assay Product Configuration Guide

SGD Planar Streamline Cryostats

- May only be purchased with a detector.
- Dewar required. Select dewar from SGD Planar Streamline Dewars.
- Horizontal and Vertical Cryostats include CFG-ADAPTOR to increase cryostat diameter from 1.25 inch to 1.5 inch for use with DWR-30 and DWR-30-OP.

Model No.	Description
CFG-LP-GG-70	Gamma Gage Cryostat
CFG-LP-SD-70	Down-Looking Cryostat
CFG-LP-SH-70	Horizontal Cryostat (Dipstick type)
CFG-LP-SJ-70	J-type Cryostat
CFG-LP-SL-70	Side-Looking Cryostat
CFG-LP-SV-70	Vertical Cryostat (Dipstick type)

SGD Planar Streamline Dewars

For Cryostat	Choose	Description
CFG-LP-GG	DWR-1.2G	1.2-liter All-Orientation Dewar
	DWR-3.0G	3.0-liter All-Orientation Dewar
	DWR-5.0G	5.0-liter All-Orientation Dewar
	DWR-MOD-3L	3-liter Multi-Orientation Dewar
	DWR-MOD-7L	7-liter Multi-Orientation Dewar
	DWR-0.7-SHP-G	0.7-liter Shallow-Hole Probe Dewar
	DWR-S/F	Storage/Fill Dewar for DWR-XG
CFG-LP-SJ, SL	DWR-7.5B	7.5-liter Side-Looking Dewar
	DWR-13B	13-liter Side-Looking Dewar
	DWR-30B	30-liter Side-Looking Dewar
	MOBIUS-B	Möbius Recycler 28-liter Side-Looking Dewar
CFG-LP-SD	DWR-7.5D	7.5-liter Down-Looking Dewar
	DWR-13D	13-liter Down-Looking Dewar
	DWR-30D	30-liter Down-Looking Dewar
CFG-LP-SV, SH	DWR-30	30-liter Dewar. Includes collar for 1.5" diameter cryostat.
	DWR-30-OP	30-liter Offset-Port Dewar. Includes collar for 1.5" diameter cryostat.
	MOBIUS-ST	Möbius Recycler 28-liter Dewar for purchase stand alone
	MOBIUS-ST-DET	Möbius Recycler 28-liter Dewar for purchase in combination with Detector

Specifications subject to change
082322

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