HELIUM-3

26 YEARS OF MAKING CRYOGENICS FOR RESEARCHERS

www.cryoindustries.com

CIA
CRYO Industries of America, Inc.

He-3 Cryostats - Sample in vacuum or top loading into vapor/liquid

- Lowest base temperature due to advanced synthetic charcoal technology
- Versatile 3-way charcoal sorb cooling system for lowest vibration and sub cooling
- Flex circuits for quick & easy wire installation/removal and automatic thermal anchoring
- Can be integrated into our high efficiency optical & non-optical cryostats, superconducting magnet systems, storage (transport) dewars or into your existing system.

Helium-3

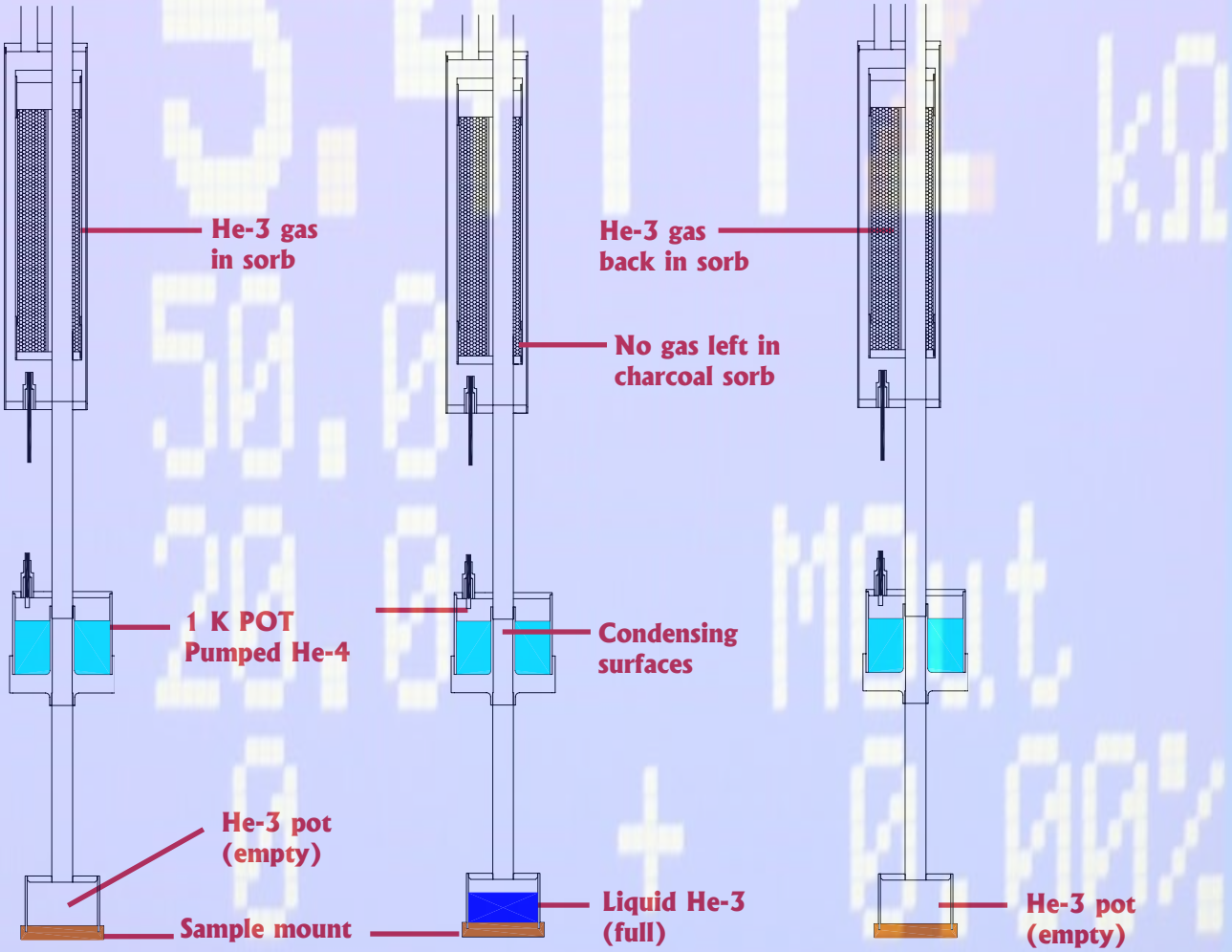
Introduction

The basic principles of He^3 inserts are indicated by the following three steps, 1,2,3.

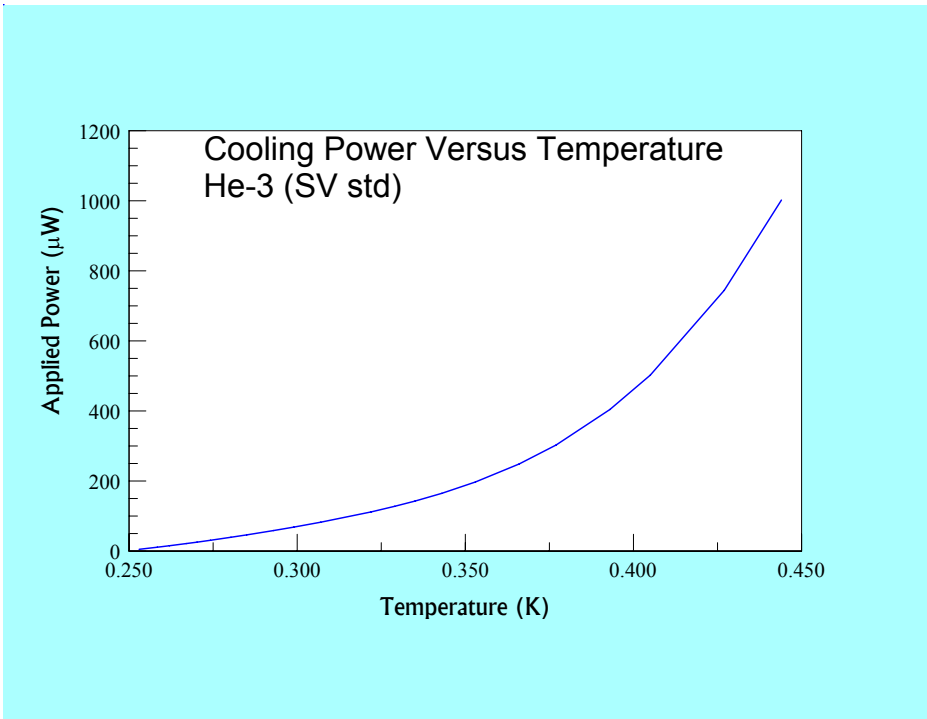
1 **Warm the charcoal to release the adsorbed He^3 gas which is then condensed by the 1 K POT. The liquid helium-3 collects in the He-3 pot, cooling the sample.**

2 **Lowering the charcoal temperature to 4 K cryopumps the liquid He^3 lowering its temperature . The isotope He^3 is used instead of He^4 because it does not exhibit film creep and a lower pressure can be reached (lower pressure means lower temperature).**

3 **Collect the He^3 gas back into the sorb and reuse - over and over and over again.**



Advanced Sorb Technology
New charcoal technology provides for the higher pumping speeds
- needed to cool the sample to less than 260 mK.



Screenshot taken during actual test of cryostat no. 3895

Temperature (K)	Power (μW)
0.253	5.0
0.258	10.9
0.262	15.1
0.267	21.3
0.270	25.5
0.274	30.9
0.280	39.4
0.285	46.2
0.293	58.6
0.299	68.4
0.307	82.3
0.322	112
0.329	128
0.335	143
0.343	165
0.353	197
0.366	249
0.377	303
0.393	404
0.405	502
0.427	744
0.444	1002

Advanced sorption pump technology

The advanced sorption pump technology combined with CIA 'performance by design' components allow samples to be cooled down to below 260 mK! Cooling power available is more than 60 μW at 300 mK. No other system meets this level of performance.

HE3-SV5
[sample in vacuum]

CIA Helium-3 systems have all the features, the performance and more!

Quick sample access -
Sample access is quick and easy through our tapered grease seal. The vacuum shroud seal is prepared by coating it with a thin layer of silicone vacuum grease; after which the precision machined pieces are mated. Attach to a vacuum pump and an instant seal is made. Upon cooling, the seal freezes making an extremely strong and reliable seal. Removing the insert from the dewar will cause the seal to warm and the grease to return to normal; hence, the parts can easily be separated for fast and easy sample access. Seal parts are made on high precision CNC equipment producing perfect reliable mating parts.

Precooling of warm desorbed gas -
The warm gas from the degassed sorb is sent through a built-in 4K heat exchanger and cooled to 4.2 K before reaching the 1 K POT. This means higher condensing efficiency with minimum temperature increases during recondensing. Fast sample evaluation with long hold times on the first cycle.

'Line-of-sight' port -
If future needs require top loading samples into liquid He-3, the port is there (built-in).

Magnetic field compatibility -
Manufactured from non magnetic stainless steel, copper and other magnetic field compatible materials. Low magneto-error temperature sensors are used throughout. If not now, be ready to add a magnetic field when needed.

Flex circuits for quick & easy wire installation/ removal
Automatic thermal anchoring -
Wiring and thermal anchoring is now "Oh, so easy". Flexible printed circuit sheets are bonded to the 1 K POT and the He-3 pot. Wires soldered to the printed circuits are automatically thermally anchored. Just touch the end of the wire with a low watt soldering iron to the thermally anchored circuit; attach the wire at one end of the circuit and continue the wire by soldering to the circuit outlet. Changing, modifying or removing wires is now a simple task and heat sinking wires is quick, easy, automatic and neat.

Advanced sorption pump technology -
The advanced sorption pump technology combined with CIA 'performance by design' components offer the best technology available. **Advance design synthetic charcoal** gives increased pumping speed, resulting in lower base temperature and enhanced cooling power.

Versatile Independent Charcoal Cooling - Cool It Your Way!
The charcoal can be cooled by dynamic flow, static exchange gas or submerged in LHe. Select the cooling technique that best suits your geometry and needs. Dynamic flow for lowest sorb temperatures, highest pumping speed and use with low helium levels or temperature stratified dewars - flow is controlled using the 'charcoal needle valve'. Static exchange gas for high temperature stability (*change sample temperature efficiently by adjusting the pumping speed through the temperature of the charcoal - instead of adding heat to the sample*), lowest vibration and easy to do operation. Or, just submerge the charcoal container in LHe - versatility and performance is yours.

Permanently Stored Helium-3 gas
No handling of expensive He-3 gas since the storage reservoir is built onto the top of the insert.

Easy to use -
A system easy to use even by less experienced students. The standard system fits into a standard transport dewar (50 mm diameter neck). No gas to handle and the sliding seal allows the system to be slowly inserted in and out of the main or transport storage dewar at any time with minimum liquid helium loss. Not only a system suitable for fast sample characterisation but also the insert can be configured with a superconducting magnet.

Level Probe for 1K POT [optional]!
To cool the Helium-3 gas below its condensing temperature, a small reservoir containing helium-4, called a 'POT', is pumped on using an external rotary pump. The temperature of the liquid helium-4 in the POT is typically 1.4 K. The main function of the POT, commonly called a '1K POT', is to condense He3 gas. Afterwards, the pot can reduce potential thermal heat conduction to the sample.

A needle valve controls the flow of LHe-4 from the main bath into the pot. The flow rate can be set to replenish the consumption rate - keeping the POT continuously 'COLD"

Now, always know the level of liquid in the POT! Students (and Professors) no longer need to guess or wonder the amount of liquid in the 1 K POT . The level of the liquid helium is digitally displayed on demand - a CIA exclusive feature!

Highest efficiency and lowest base temperature are obtained with the POT flow off; then, it seems to empty at the wrong time. Not anymore - both POT temperature and LHe-4 level are displayed!

An advanced LHe level monitor specifically designed for use in superfluid pumped liquid helium at temperatures below 2K.

In order to minimize liquid helium loss and heat input to the POT, the monitor automatically energizes the liquid helium level sensor at user programmable time intervals and monitors the normal (resistive) zone as it progresses from the top of the sensor toward the liquid surface. As soon as the normal zone reaches the liquid surface, the level reading is saved and the current in the sensor is turned off until the next sample interval occurs.

Sample intervals are user programmable from the front panel. A manual update switch provided on the front panel can also be set to obtain continuous readings during the POT fill period or to manually force an immediate measurement. The monitor provides automatic helium level sensor vacuum burnout protection.

A 4 digit LED digital display provides liquid helium level indication in inches, centimeters, or percent as selected by a front panel switch. The monitor is equipped with 'High' and 'Low' alarm setpoints which activate front panel LED warning indicators and rear panel relay outputs. The alarms also energize an audible warning which can be silenced from the front panel. "High" and "Low" setpoints are programmable from 0 to 100 percent of sensor active length.

Screenshot taken during actual test of cryostat no. 3782

BUILT-ON HELIUM-3 GAS STORAGE RESERVOIR

Helium-3 gas is stored in the integral built-on gas storage reservoir when the insert is not in use. No pumps and no He-3 gas losses.

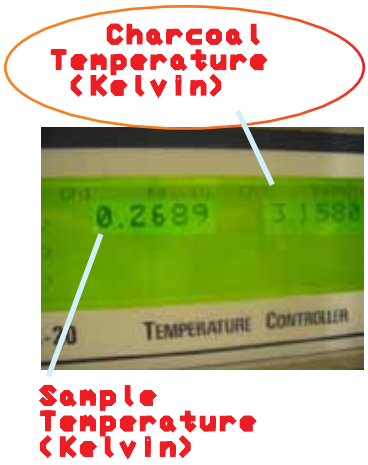
This Helium-3 gas is liquefied and cools the sample.

The built-in charcoal sorb pumps on the liquid helium-3 lowering the temperature. High pumping speed is achieved by locating the charcoal cryopump near the liquid helium-3 and by using new charcoal technology.

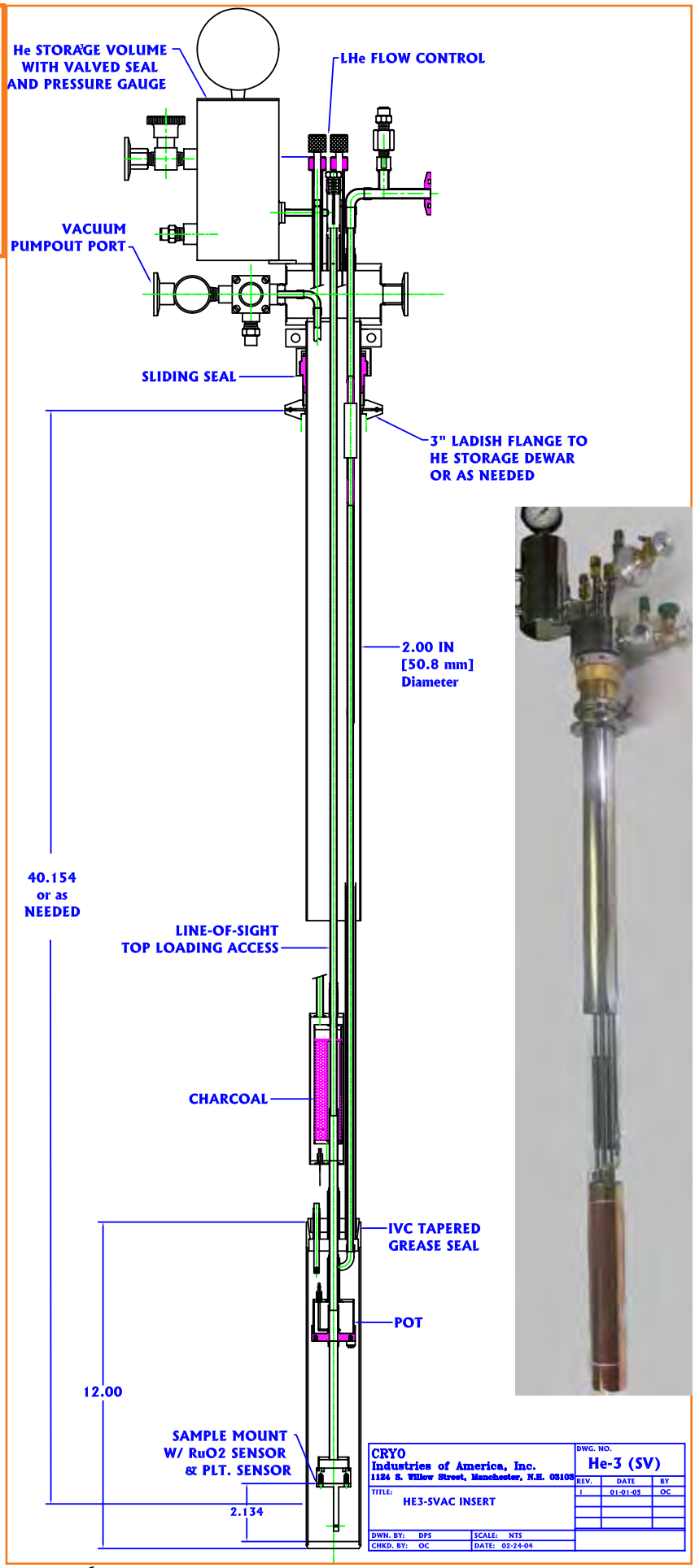
HELIUM-3 (SV) 'Sample in Vacuum'

He3-SV insert is the standard for sample in vacuum and easily top loads into storage or research dewars and superconducting magnet systems.

Screenshot taken during actual test of cryostat no. 3913



Helium-3	Sample in Vacuum
Base Temperature	260 mK
Cooling Power at 300 mK	60 μW See graph p. 3
Hold Time at Base Temperature	60 Hours
Temperature Range	0.26 K to 80 K (300 K optional)
Thermometers	Cernox - Charcoal & POT RuO2 - Sample Si diode or platinum RTD -to monitor sample cooldown
Helium-3 Regeneration Time	30 min typ.
Sample Mount Diameter	1.37 inch 34.9 mm
Sample Environment	Vacuum (std) with Liquid/vapor Top Load Port 0.21 in dia. clear [5.3 mm] (Port epoxy sealed with NPT fitting)
Experimental Access Vacuum Seal	Quick connect IVC with tapered grease seal
POT digital level monitor	Yes, optional
Wire Anchors	Kapton flex circuits + 4K extendable copper post
Charcoal Cooling Method	Both dynamic and static exchange gas (direct thermal contact)
Experimental Wiring	5 twisted pairs (10) wires for Customer use
Materials of Construction	Non magnetic [Insert and all main temperature sensors compatible with use in high magnetic fields]



Helium-3 'The Pro'	Sample in Vacuum
Base Temperature	300 mK
Hold Time at Base Temperature	24 Hours
Temperature Range	Base Temperature to 80 K
Thermometers	Cernox - Charcoal & Condenser RuO2 (1K) - Sample Si diode or Platinum RTD - to monitor sample cooldown
Helium-3 Regeneration Time	30 min typ.
Sample Mount Diameter	1.37 inch 34.9 mm
Sample Environment	Vacuum (std) with Liquid/vapor Top Load Port 0.21 in dia. clear [5.3 mm] (Port epoxy sealed with NPT fitting)
Experimental Access Vacuum Seal	Quick connect IVC with tapered grease seal
POT digital level monitor	No
Wire Anchors	Kapton flex circuits + 4K extendable copper post
Charcoal Cooling Method	Both dynamic and static exchange gas
Experimental Wiring	5 twisted pairs (10) wires for Customer use
Materials of Construction	Non magnetic [Insert and all main temperature sensors compatible with use in high magnetic fields]

HELIUM-3 PRO

Sample in vacuum 3He refrigerator

Nanotechnology has created the demand. So, we set up our most popular Helium-3 insert on the CNC, to provide you with the lowest priced helium-3 system available anywhere.

The reason cryostat systems can be expensive is due to the fact that many are made in single (1) quantities. Volume saves manufacturing costs (money)!

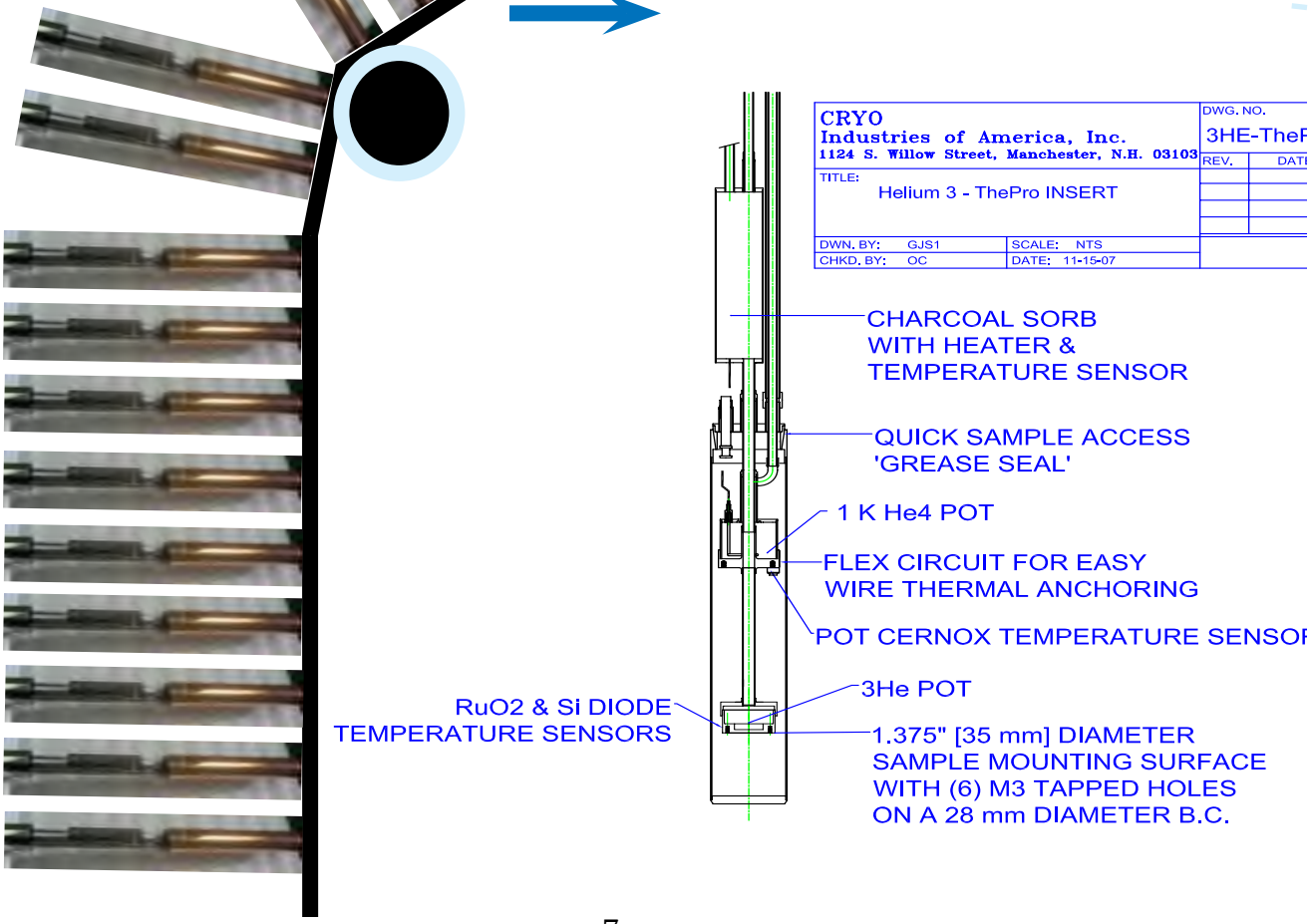
The **'Pro'** is a Production (volume) manufactured He-3 insert. This saves up to 40% or more when compared with similar systems and we pass the savings on to you! Why delay your experiments two months or more waiting to get more money?

Q & A 'The Pro'

Q. What is the difference between the Pro and the standard He-3 insert?
A. Nothing, they are the same cryostat except the std has extra accessories, can be fully customized. and is tweaked after testing.

Q. Can I customize The Pro?
A. No, except for the length.

Q. What is the base temperature?
A. The Pro system is individually tested to make sure that it reaches a base temperature less than 300 mK.



HELIUM-3 FOR Variable Temperature Inserts (VTI)

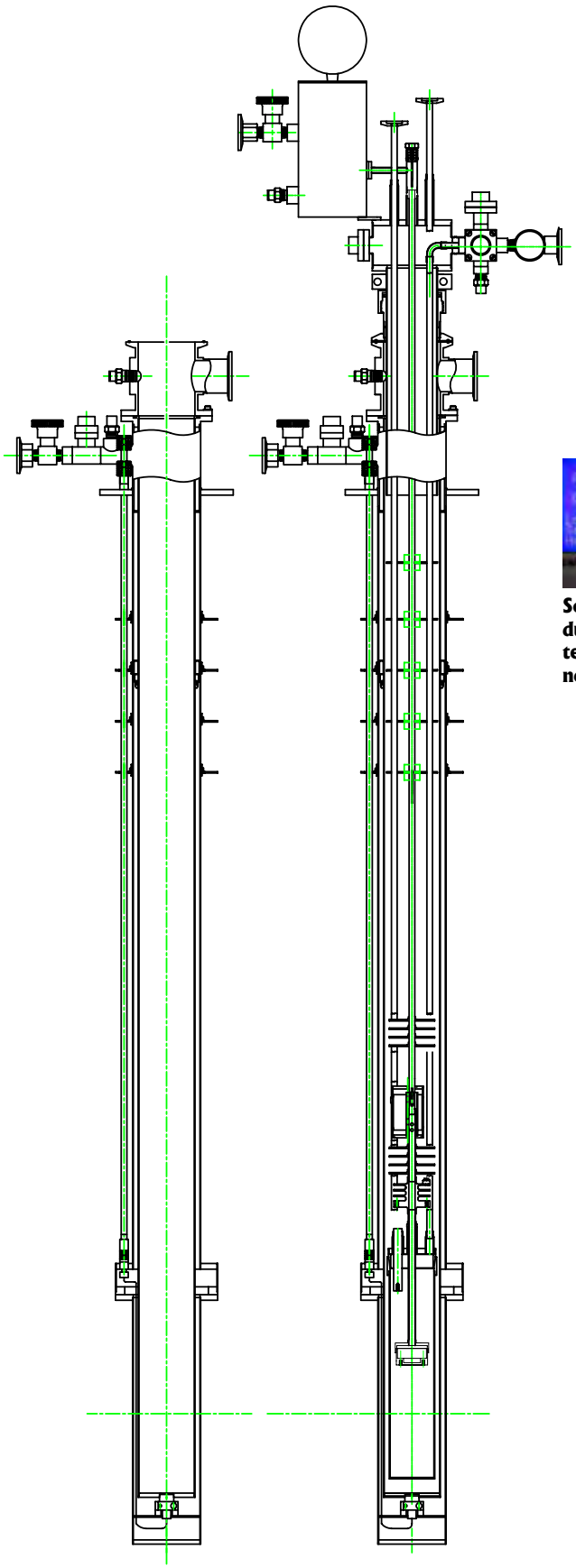
The model 'He3-VTI' fits into standard dynamic flow Variable Temperature Inserts (VTI). The 3He refrigerator Top Loads into the sample tube of the VTI. Top Loads just like the standard sample stick.

The 3He insert is cooled by the LHe4 flow in the sample tube. Pumping on the sample tube provides the low temperature needed to condense the helium 3.

After doing its 'job' condensing the 3He, the VTI flow cools the charcoal cryopump providing high pumping speeds and temperatures below 300 mK.

The standard 'grease seal' provides fast sample access. He-3 gas storage is built-in - no gas handling needed.

Helium-3 'For VTI'	Sample in Vacuum
Base Temperature	280 mK
Hold Time at Base Temperature	24 Hours
Temperature Range	Base Temperature to 80 K
Thermometers	Cernox - charcoal & condenser RuO2 (1K) - sample Si diode or platinum RTD - to monitor sample cooldown
Helium-3 Regeneration Time	30 min typ.
Sample Mount Diameter	1.25 inch 31.7 mm
Sample Environment	Vacuum (std) with Liquid/vapor Top Load Port 0.21 in dia. clear [5.3 mm] (Port epoxy sealed with NPT fitting)
Experimental Access Vacuum Seal	Quick connect IVC with tapered grease seal
POT digital level monitor	No
Wire Anchors	Kapton flex circuits + 4K extendable copper post
Charcoal Cooling Method	Both dynamic and static exchange gas
Experimental Wiring	5 twisted pairs (10) wires for Customer use (manganin)
Materials of Construction	Non magnetic [Insert and all main temperature sensors compatible with use in high magnetic fields]



Screenshot taken during actual test of cryostat no. 4308

HELIUM-3 WITH INTEGRAL LHe-4 RESERVOIR

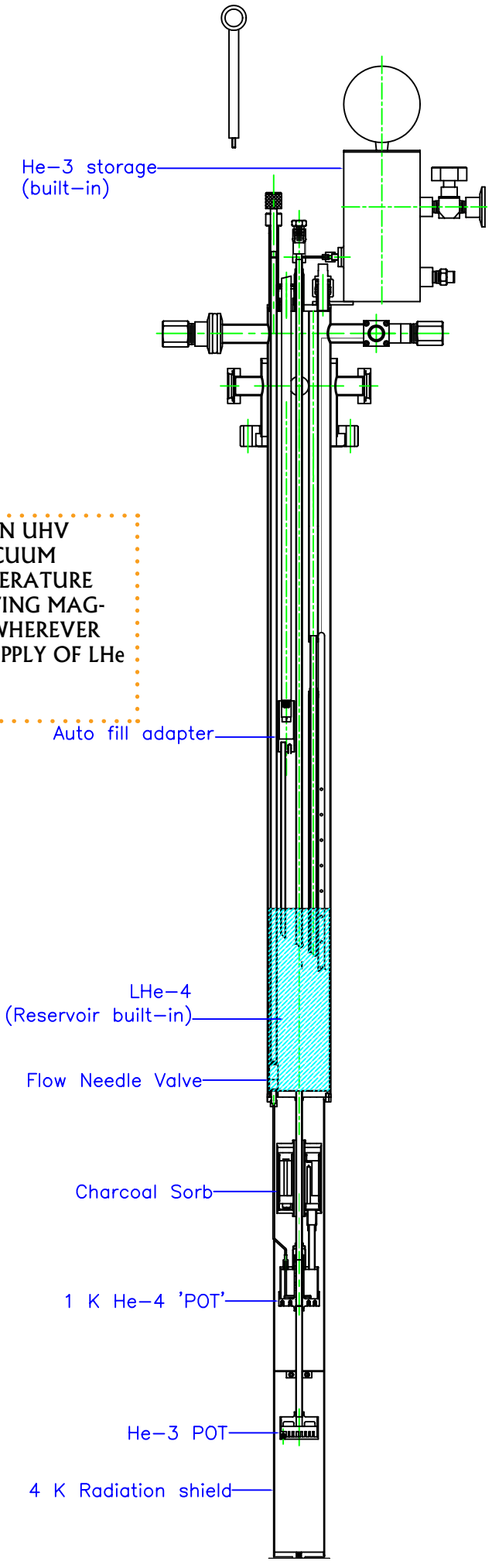
The model 'He3-SV4' has a liquid helium reservoir built-in. This reservoir supplies the LHe-4 for the POT and for condensing He-3 gas. Ideal for applications where there is no access to the main LHe bath.

A liquid helium-4 reservoir is built-in! This insert has the standard He-3 pot, 1 K POT, and charcoal sorb and a He-4 reservoir that is filled externally using a vacuum insulated liquid helium transfer line.

A fill adapter automatically separates warm He-4 gas to allow refilling at any time without moving the transfer line position. This allows the transfer line to conveniently remain in place switched on or off as needed. (*Note: If a transfer line is needed, ask about our LHe transfer lines with in-line flow valve.*) The He-3 gas storage is also built-in - no gas handling needed.

IDEAL FOR USE IN UHV CHAMBERS, VACUUM OR ROOM TEMPERATURE SUPERCONDUCTING MAGNET BORES OR WHEREVER THE BUILT-IN SUPPLY OF LHe IS NEEDED.

Helium-3	Sample in Vacuum
Base Temperature	300 mK
Hold Time at Base Temperature	24 Hours
Temperature Range	0.30 K to 80 K (300 K optional)
Thermometers	Cernox - Charcoal & POT RuO2 (1K) - sample Si diode or platinum RTD - to monitor sample cooldown
Helium-3 Regeneration Time	30 min typ.
Sample Mount Diameter	1.25 inch 31.7 mm
Sample Environment	Vacuum (std) with Liquid/vapor Top Load Port 0.21 in dia. clear [5.3 mm] (Port epoxy sealed with NPT fitting)
Experimental Access Vacuum Seal	Quick connect IVC with tapered grease seal
POT digital level monitor	Yes, optional
Res, digital level monitor	Yes, included
Wire Anchors	Kapton flex circuits + 4K extendable copper post
Charcoal Cooling Method	Dynamic flow
Experimental Wiring	5 twisted pairs (10) wires for Customer use (manganin)
Materials of Construction	Non magnetic [All main temperature sensors compatible with use in high magnetic fields]



HELIUM-3 (TL) 'Top Loader'

The 'TL' is designed for fast sample exchange; the sample can be removed and inserted directly into the He-3 while operating 'cold'.

CIA 'TL' Helium-3 systems feature top loading sample and 'performance by design'!

Easy to use - The sample holder is easy to load and unload, it can be handled by one person. The sample holder is rigid and resistant to bending. The lowest part (He3 end) is designed to be highly thermally isolated and rigid. It doesn't bend!

The thermal anchors slide easily while maintaining excellent thermal contact. And, they do not get stuck when loading and unloading the probe.

Easy to use and resistant to ('*student*') damage!

Easy and fast sample exchange - Sample access is quick and easy:
1. Attach the sample assembly to the top of the cryostat using the quick connect clamp.
2. Pump out the air around the sample.
3. Cool the charcoal to adsorb the He-3 gas.
4. Open the gate valve and slide the sample in.

That's all there is to it!
The sample can be removed and inserted directly into the He-3 while the sample is cold.

Fast cooldown (when needed)- After inserting the sample, the gas is released from the charcoal. The pot cools and the sample temperature drops to less than to 1.5 K in less than an hour from room temperature. Then, closing the full pot and pumping hard on the charcoal brings down the sample to base temperature within less than 30 min.

Advanced sorption pump technology - Advances in synthetic sorption pump technology have been incorporated into the 'He3-TL' to reduce the base temperature and increase the cooling power. The advanced sorption pump technology combined with 'performance by design' CIA technology offer unrivaled performance. The advanced design sorb provides increased pumping speed, lower base temperature and enhanced cooling power.

Independent control of charcoal and He-3
The charcoal has no connection with sample or pot, so regardless of sample temperature the gas can be kept in the charcoal or the gas pressure changed by adjusting the charcoal temperature. At higher temperatures, a very good high vacuum can be maintained, which is important for some applications.

Independent charcoal cooling, controlled through a separate needle valve, provides for easy sub cooling of the charcoal to 2 K - resulting in the highest level of performance available.

Subcooling the charcoal makes quite a difference for 'top loading systems, more so than for sample in vacuum type. To reach the lowest temperatures, charcoal at 1.7-1.8 K is best.

Fine efficient temperature control is another benefit of isolated and independent cooling. Fine adjust the charcoal temperature to vary the temperature at the low end without adding heat.

Independent cooling means cold charcoal independent of the height of the liquid helium in the research or transport (storage dewar).

Cooling of the charcoal is by direct contact with flowing LHe-4. Thermal contact is highly efficient because no thermal interfaces such as cooling coils are used. Thermal contact area between the flowing LHe-4 is large and near absolute, not small as is with a circular coil on a container wall.
Dynamic flow for lowest sub cooled sorb temperatures, highest charcoal pumping speed and use with low helium levels or temperature stratified dewars.

Precooling of warm desorbed gas -
The warm gas from the degassed sorb is sent through a built-in 4K heat exchanger and cooled to 4.2 K before reaching the 1 K POT. The results are higher condensing efficiency with minimum temperature increases during recondensing. Fast sample evaluation with long hold times on the first cycle.

Magnetic field compatibility - Manufactured from non magnetic stainless steel and other magnetic field compatible materials. Low magneto-error temperature sensors are used throughout. If not now, be ready to add a magnetic field when needed.

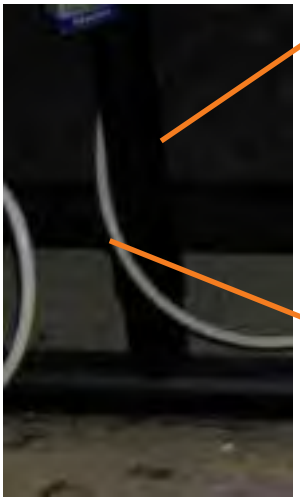
Flex circuits for quick & easy wire installation/removal
Automatic thermal anchoring
Printed Circuit (PC) breakout - Wiring and thermal anchoring is now "oh, so easy". Flexible printed circuit sheets are bonded to the sample probe. Wires soldered to the printed circuits are automatically thermally anchored. Changing, modifying or removing wires is now a simple task and heat sinking wires is quick, easy, automatic and neat.

A break out rectangle section allows bringing better larger experimental wires down from room temperature. Change over to small diameter low thermal conduction wires at the break out rectangle. Large diameter sample tubes (select 1" (25 mm) or 1.5 inch (40 mm) with large quantity wire handling capability provides for experimental versatility without the limitations imposed by other systems.

External Gas Handling system with cryopump (std) or active sealed rotary pump
- easy moving of He-3 gas between storage and insert.
In the 'top loader' inserts the sample is located directly in the Helium-3. A gas handling system is supplied with the TL He-3 cryostat. Our sealed rotary pump or external cryopump easily move the gas from the insert to the supplied storage reservoir.

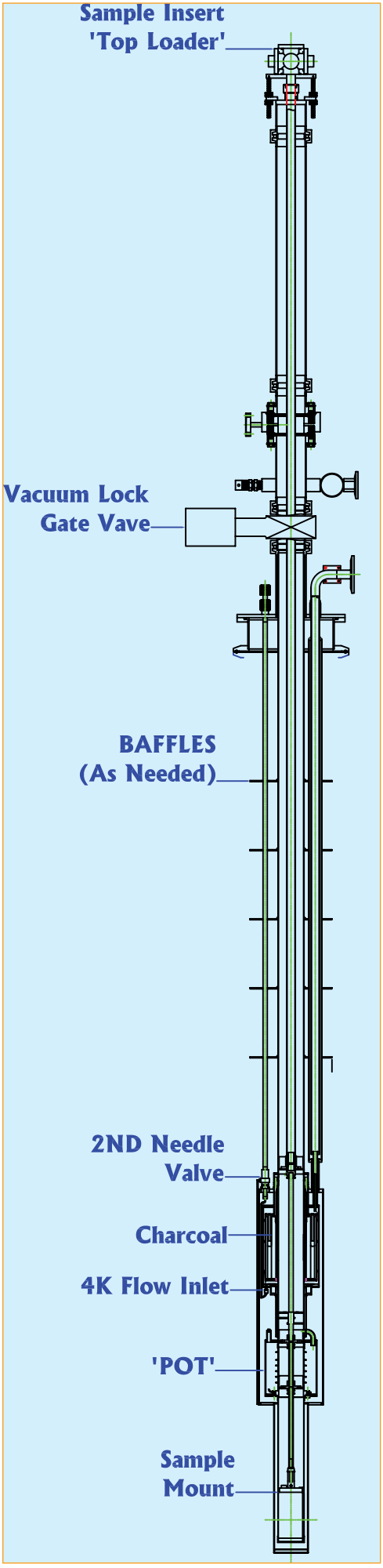
Level Probe for 1K POT [optional]!
To cool the Helium-3 gas below its condensing temperature, a small reservoir containing helium-4, called a 'POT', is pumped on using an external rotary pump. The temperature of the liquid helium-4 in the POT is typically between 1 and 1.5 K. The main function of the POT, commonly called a '1K POT', is to condense the He3 gas. Afterwards, the pot will reduce the heat conducted to the sample space. A needle valve controls the flow from the main liquid helium bath into the pot. The flow can be set to keep the pot continuously 'COLD'.

The CIA top loading helium-3 system works nicely having improved handling capability with separate sub lambda control over charcoal and pot temperatures, long hold times, rigid sample holder, high efficiency thermal anchors on sample stick and efficient radiation baffles - truly 'performance by design and performance and features not available anywhere else!



Comments:

1. The sample holder is easy to load and unload; it can be handled by one person, has more rigidity, doesn't get stuck when loading and the lowest part doesn't bend.
2. *Independent control He-3:* The charcoal has no connection with sample or pot, so regardless of sample temperature the gas can be kept in the charcoal or the gas pressure adjusted by adjusting the charcoal temperature. When working at higher temperatures, I can have very good vacuum, which is important for some of my applications.
3. Releasing the gas from the charcoal and then cooling with the pot brings down the sample in less than an hour to 1.5 K from room temperature, if I wish to. Then, closing the full pot and pumping hard on the charcoal brings down the sample to base temperature within less than 30 min.
4. The closed pot lasts for around 24 hours. The He-3 liquid lasts longer than that, and the pot can be refilled with only a short, temporary increase in sample temperature. I can for instance warm up the sample to 0.6 K for a couple of minutes without boiling off all LHe-3, and then cool down the sample again just by not heating the sample any more.
5. The system behavior is predictable, it cools, warms, etc. just as expected. When heating the charcoal, I can close the charcoal needle valve and don't need to use any LHe etc.
6. I installed many copper wires down to the PC break out. Transitioned to manganin and phosphor bronze down to the He-3 sample mount. All works well!
7. Subcooling the charcoal makes quite a difference, more so than I would have thought. If I want to go to 0.4 K, then it doesn't matter. But to reach the lowest temperatures, I need to cool the charcoal to 1.7-1.8 K.
8. All the sample wires and the large sample space enables measurements without such limitations.
9. I have the large 38 mm sample tube and have installed 34 wires. The sample, which is located 63 mm above the bottom of the sample tube, goes down to 0.30 K on the Ru02 sample mount sensor just by cooling the charcoal without any special tricks.



HELIUM-3 (TL) 'Top Loader'

Helium-3	Sample in Liquid/Gas
Base Temperature	300 mK - 25 mm dia. sample
	300 mK - 340 mK - 38 mm dia. sample
Hold Time at Base Temperature	> 24 hours
Operating Range	0.3 K to 300 K
Closed POT hold time (no inlet flow)	24 hours (approx)
POT refill time	"POT can be refilled in a few minutes with only a short, temporary increase in sample temperature."
Open POT hold time (inlet flow on)	Continuous (Inlet flow replenishes consumption)
Fast Cooldown mode (note: fast cooling can shorten cycle hold time)	1.5 hours from room temperature to base temperature (typical)
Thermometers [All temperature sensors compatible with use in high magnetic fields]	Cernox - Charcoal & POT RuO2 - Sample Si diode or platinum RTD -to monitor sample cooldown
Sample Environment	Liquid/Vapor 'Easy-to-Load' top loading sample holder Size (diameter): - 25 mm or 38 mm Rigidized sample holder CIA 'performance by design' sliding thermal contact
Experimental Access Vacuum Seal	ISO-KF 40 (NW25) Gate Valve Vac Lock
POT digital level monitor	Yes, optional
Wire Anchors	Kapton flex circuits Breakout box
Charcoal Cooling Method	Dynamic flow with direct thermal contact
	Subcooling
	Independent Control - high temperature operation with sample in Xgas or 'very good' vacuum
Experimental Wiring	10 twisted pairs (20 wires) for User

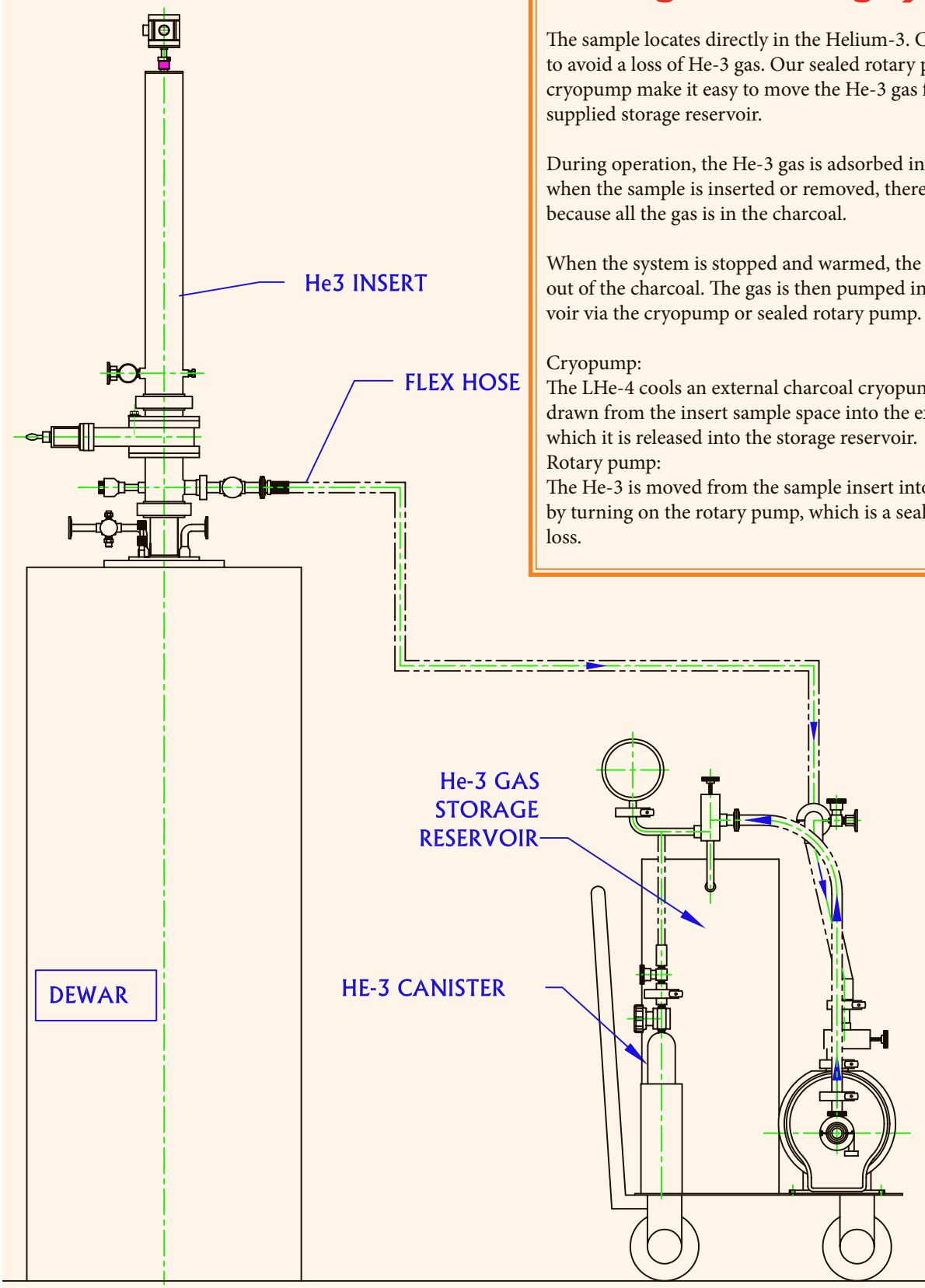
HELIUM-3 (TL) 'Top Loader' gas handling system

The sample locates directly in the Helium-3. Care must be taken to avoid a loss of He-3 gas. Our sealed rotary pump or external cryopump make it easy to move the He-3 gas from the insert to the supplied storage reservoir.

During operation, the He-3 gas is adsorbed into charcoal. Hence, when the sample is inserted or removed, there is no escape of gas because all the gas is in the charcoal.

When the system is stopped and warmed, the He-3 gas will desorb out of the charcoal. The gas is then pumped into the storage reservoir via the cryopump or sealed rotary pump.

Cryopump:
The LHe-4 cools an external charcoal cryopump. The He-3 gas is drawn from the insert sample space into the external charcoal, after which it is released into the storage reservoir.
Rotary pump:
The He-3 is moved from the sample insert into the storage reservoir by turning on the rotary pump, which is a sealed to avoid He-3 gas loss.



HELIUM 3 'TL' INSERT CRYOSTAT
AND GAS HANDLING SYSTEM
CRYO INDUSTRIES OF AMERICA, INC.

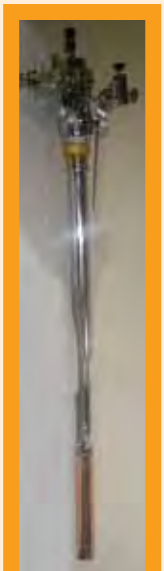
HELIUM-3 (TL) 'Top Loader'
Helium-3 (SV) 'Sample in Vacuum
And More!

Standard models for
Optical
UHV
Storage Dewar Mount
Superconducting Magnets
- top loading inserts & sample
- fits to our popular SM6
horizontal field optical magnet system
NMR
AFM (Atomic Force Microscope)
& Scanning Microscope probe systems
X-ray

Top Load or vacuum mount and configure an insert for your experiment.
CIA has manufactured thousands of proven 'performance by design' cryostats.

ATM - atomic force microscope with cantilever style scanning head

SM6 horizontal field split magnet with TL He-3 and He-4 VTI Inserts (interchangeable)



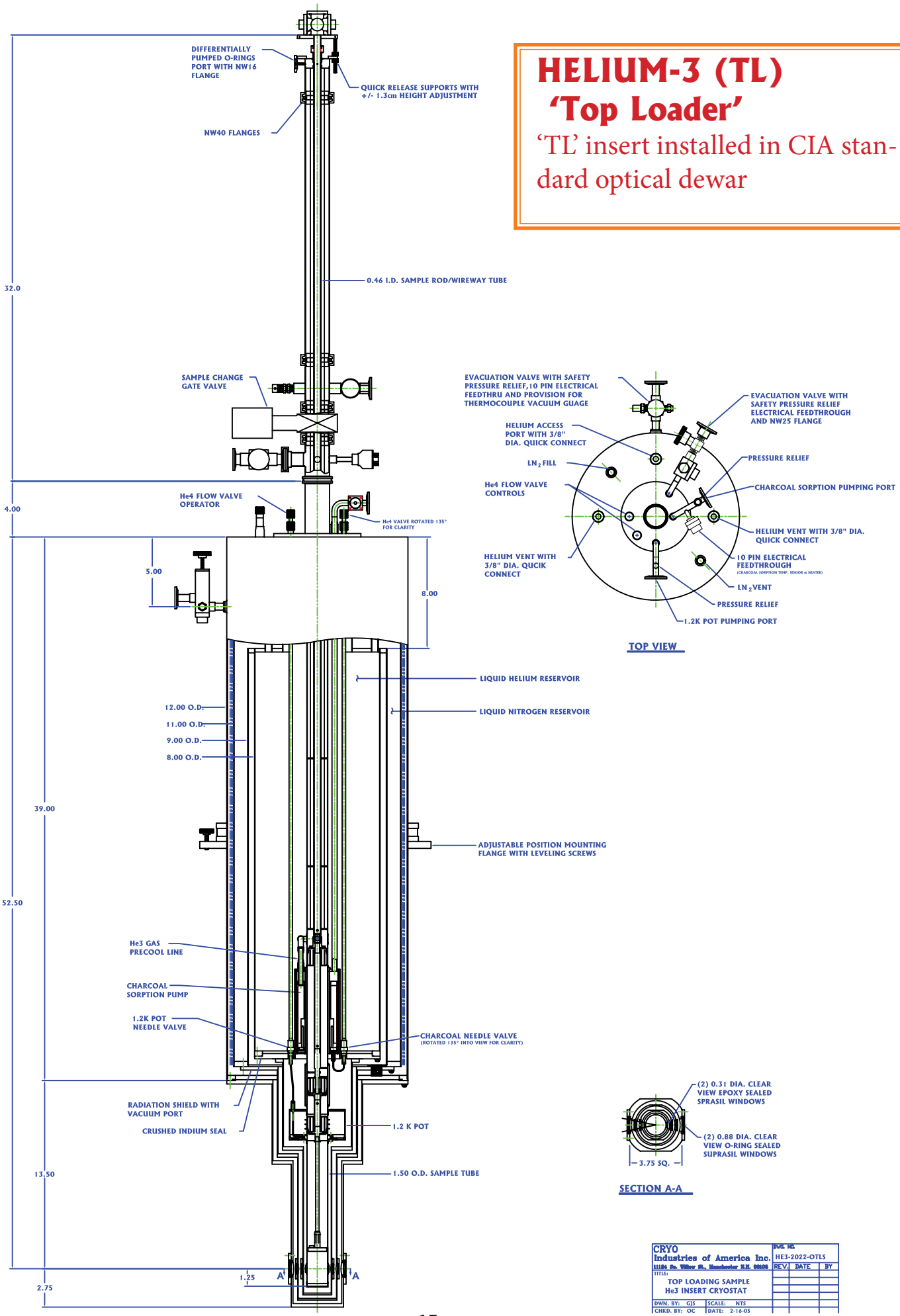
Storage (transport) dewar mount

Optical

He-3 Cryogen Free No liquid helium needed!

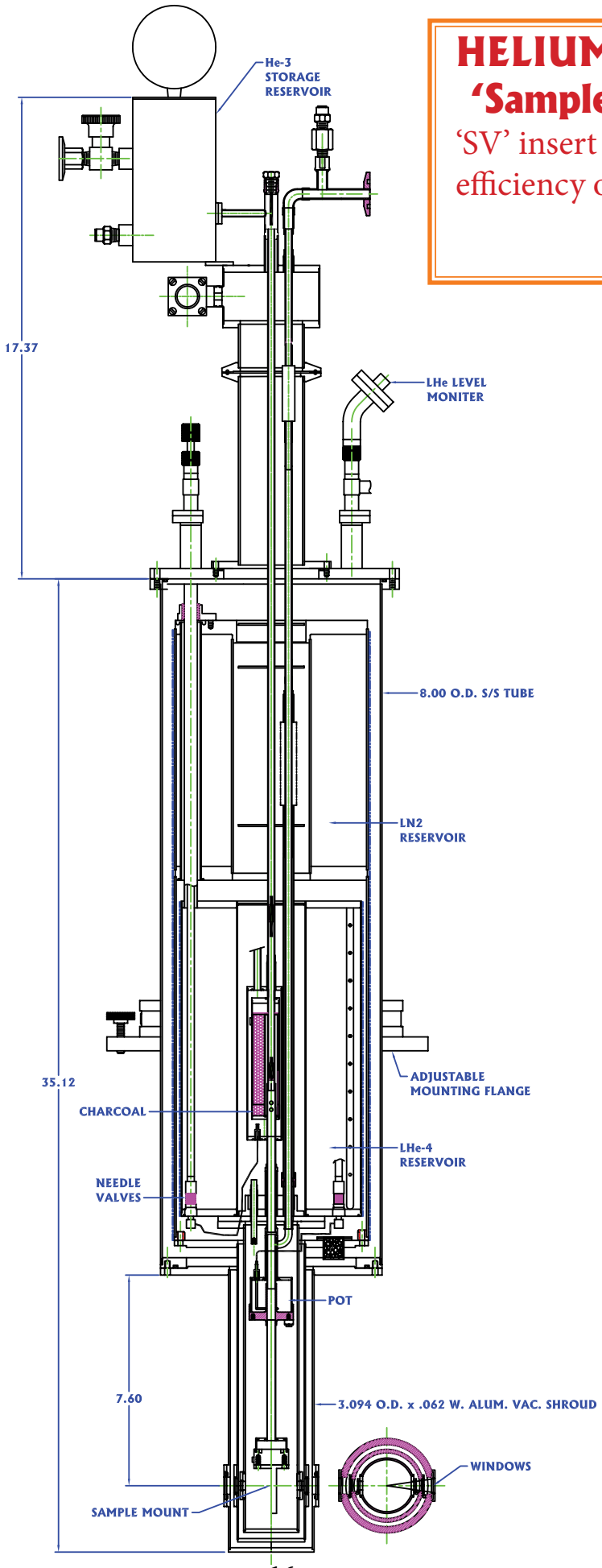
HELIUM-3 (TL)
'Top Loader'

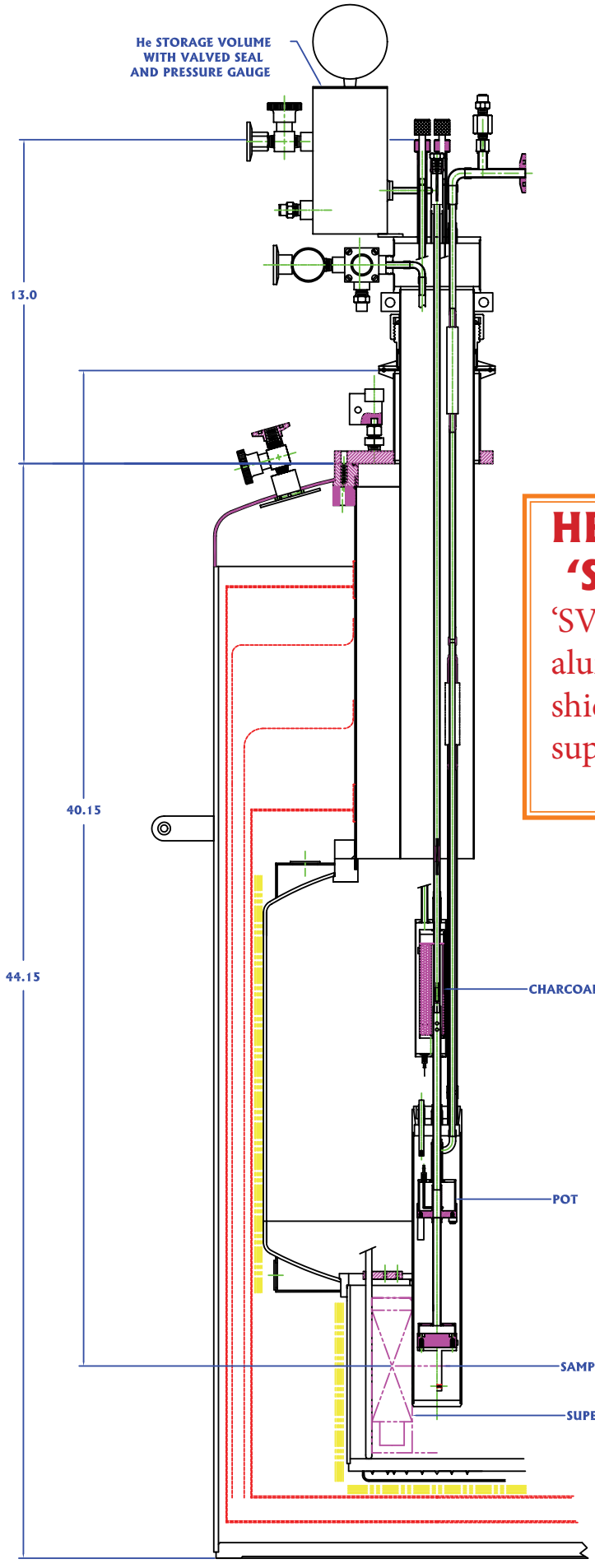
'TL' insert installed in CIA standard optical dewar



HELIUM-3 (SV)
'Sample in Vacuum'

'SV' insert installed in CIA high efficiency optical dewar

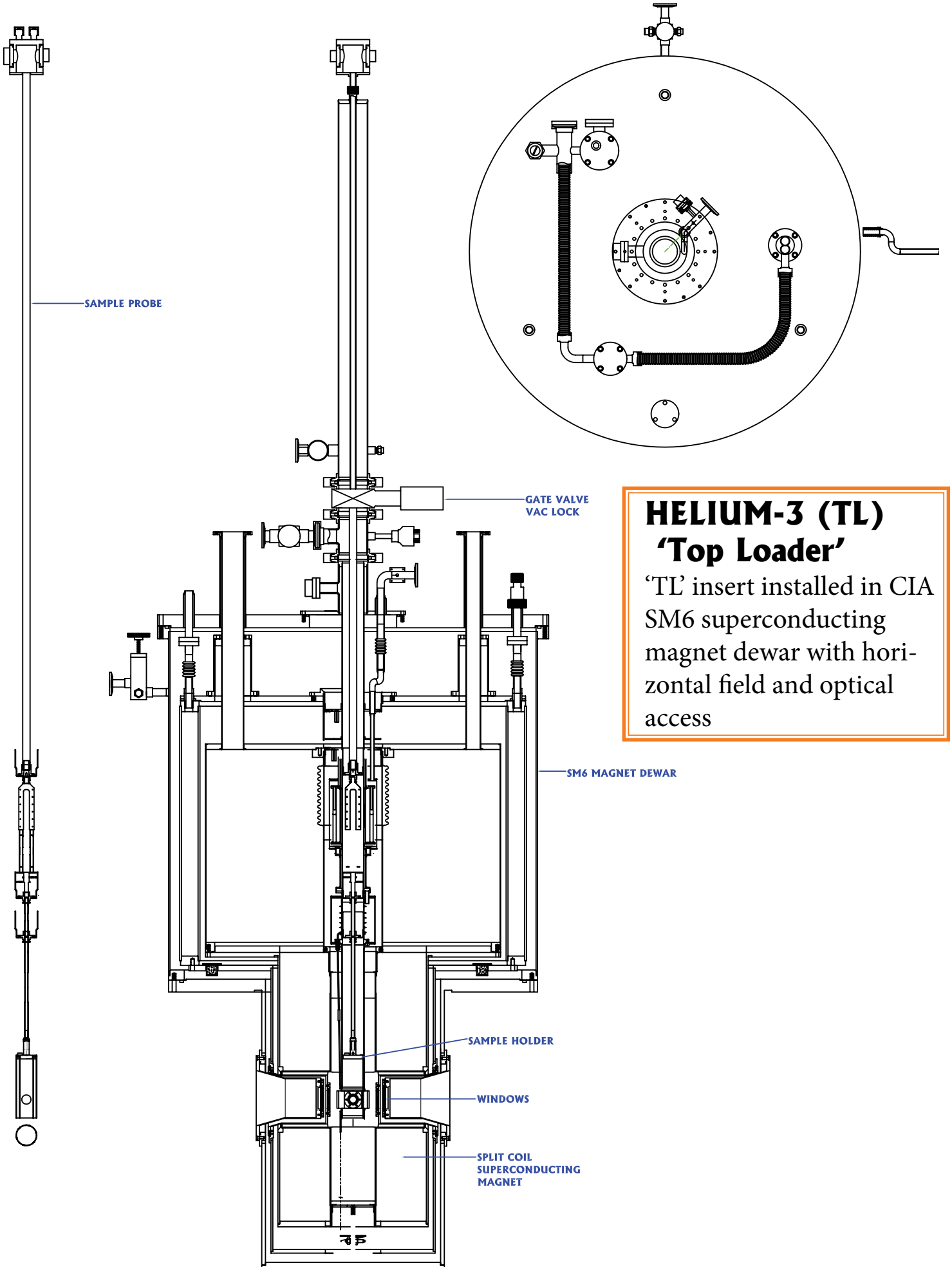




HELIUM-3 (SV)
'Sample in Vacuum'

'SV' insert installed in CIA aluminum/fiberglass vapor shielded 'belly' dewar with superconducting magnet

CRYO Industries of America, Inc. 1124 S. Willow Street, Manchester, N.H. 03103		DWG. NO. He-3 'SV' INSERT
TITLE: HE3-SV INSERT WITH SUPERCONDUCTING MAGNET & 'BELLY' DEWAR		REV. / DATE / BY
DWN. BY: DPS		
CHKD. BY: OC		



HELIUM-3 (TL) 'Top Loader'

'TL' insert installed in CIA SM6 superconducting magnet dewar with horizontal field and optical access

Cryo Industries of America, Inc.
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Manchester, NH 03103
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