크라이오 에이치앤아이(주)

Cryo H&I

CRYO EQUIPMENT

The Future of Cryogenic Technology

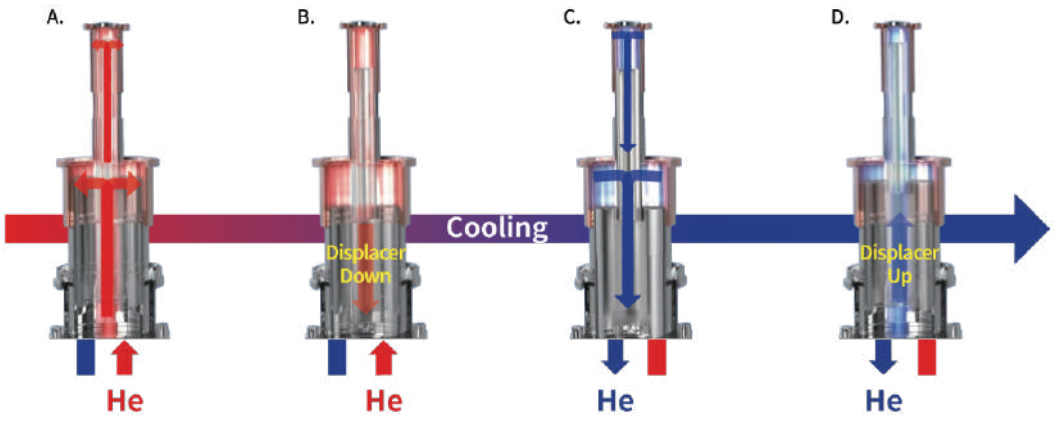
www.cryohi.com

The Future of Cryogenics!

Long History - Independent technology from 1976
One & Only manufacturer with cryogenic technology in Korea

Cryo H&I is a cryogenic technology company specializing in the development and production of cryocooler. It is the only and first company in Korea to produce GM Cryocoolers and cryogenic equipment using them.

Cryogenic technology is currently being applied to high-tech industries such as Environment · Energy · Defense · Bio · Quantum computers and basic science technology, including the semiconductor display industry and is an essential core technology for advanced technology R&D.



< GM Cryocooler Cooling Cycle >

크라이오 에이치앤아이(주)
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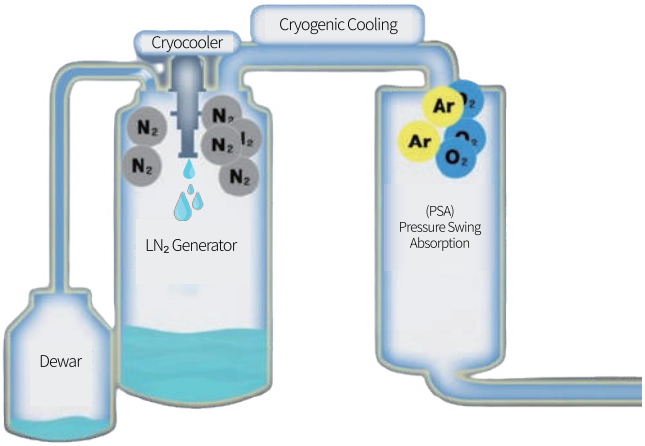
The Global Leader of Cryogenic Technology

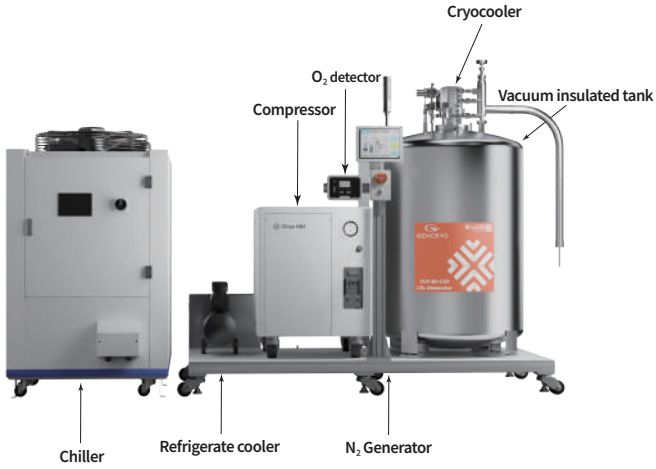
LN_2 Generator	Charpy specimen cooling system	Cryogenic CTOD Tester	Cryogenic Tensile Tester
			

Cryo H&I is the only GM Cryocooler manufacturer in Korea, and based on its 20+ years of know-how and technology,
it **provides various applications in the cryogenic fields** such as bio · environment · aerospace · energy · hydrogen · logistics and others, representing a new era of cryogenic technology.

LN_2 Generator & Storage

Systems that can be conveniently and stably produced and supplied directly by simply operation by liquefying gaseous nitrogen in the atmosphere with cryocooler and automatically supplying the liquid nitrogen.





< CLN40 >

Contents	Purchasing Liquid Nitrogen	Liquid Nitrogen Production
Efficiency	LN2 is consumed in the middle → Bio-specimens can be contaminated	Real-time LN2 production and supply → No specimen contamination
Convenience	LN2 needs to be purchased and transported every time → Management is very cumbersome	No need to purchase or transport LN2
Safety	Container pressure 14 atm → Major disaster occurs in case of explosion	Container pressure 2 atm or less → No explosion risk
BOG Generation (Consumption)	BOG (Boil Off Gas) occurs → continuous consumption	BOG (Boil Off Gas) "Zero" → continuous storage
Maintenance Cost	No maintenance cost, but management cost is high	Maintenance (2-year cycle) required after purchasing the system

Applications


Rapid freezing of tissue/blood vessels


Cell/Sample preservation


Special texture food cooking


Microbial preservation

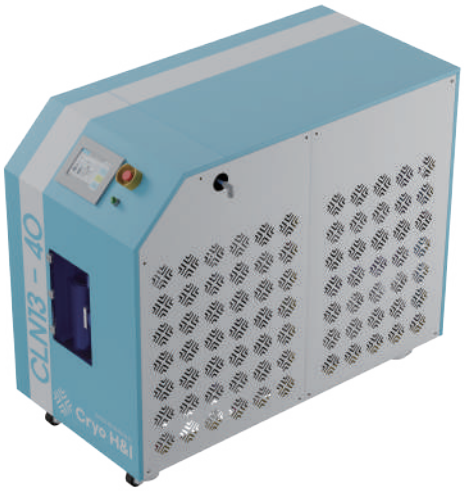

Food processing/manufacturing


Refrigerated container storage/transporation


Electronics manufacturing/testing


Cooling data center

CLN13 (13ℓ/day)



※ Specifications subject to change without notice

Specifications			
Productions rate (ℓ / day)	≥ 13	Cooling water method	Air cooled
LN_2 Purity (%)	> 99	Compressed air requirement	Built-in Oil-free Compressor
Dewar volume (liter)	40	Operating pressure (bar)	< 1.0
Electrical requirement	220V. 1 PH. 30A. 50/60Hz	Noise level	< 65 db @ 1 meter
NET weight (kg)	500	Dimension (WxDxH/mm)	940 X 1,640 X 1,350

CLN20 (20ℓ/day)

※ Specifications subject to change without notice

Specifications			
Productions rate (ℓ / day)	≥ 20	Cooling water method	Air cooled
LN_2 Purity (%)	> 99	Compressed air requirement	Built-in Oil-free Compressor
Dewar volume (liter)	40	Operating pressure (bar)	< 1.0
Electrical requirement	220V. 1 PH. 30A. 50/60Hz	Noise level	< 65 db @ 1 meter
NET weight (kg)	500	Dimension (WxDxH/mm)	940 X 1,640 X 1,350

CLN40 (40ℓ/day)

※ Specifications subject to change without notice

Specifications			
Productions rate (ℓ / day)	≥ 40	Cooling water method	Water cooled [＞7LMP @ 5bar]
LN_2 Purity (%)	＞ 99	Compressed air requirement	Built-in Oil-free Compressor
Dewar volume (liter)	120	Operating pressure (bar)	＜ 1.0
Electrical requirement	380V. 3 PH. 30A. 50/60Hz	Noise level	< 65 db @ 1 meter
NET weight (kg)	excluding chiller: 450 including chiller: 620	Dimension (WxDxH/mm)	excluding chiller: 1,500x860x1,530 including chiller: 2,200x1,050x1,530

CLN60 (60ℓ/day)

※ Specifications subject to change without notice

Specifications			
Productions rate (ℓ / day)	≥ 60	Cooling water method	Water cooled [＞18LMP @ 5bar]
LN_2 Purity (%)	＞ 99	Compressed air requirement	Built-in Oil-free Compressor
Dewar volume (liter)	120	Operating pressure (bar)	＜ 1.0
Electrical requirement	380V. 3 PH. 30A. 50/60Hz	Noise level	< 65 db @ 1 meter
NET weight (kg)	excluding chiller: 550 including chiller: 820	Dimension (WxDxH/mm)	excluding chiller: 1,600x950x1,600 including chiller: 2,400x1,550x1,600

CLN120 (120ℓ/day)

※ Specifications subject to change without notice

Specifications			
Productions rate (ℓ / day)	≥ 120	Cooling water method	Water cooled [>18LMP @ 5bar]
LN_2 Purity (%)	> 99	Compressed air requirement	Built-in Oil-free Compressor
Dewar volume (liter)	250	Operating pressure (bar)	< 1.0
Electrical requirement	380V. 3 PH. 30A. 50/60Hz	Noise level	< 65 db @ 1 meter
NET weight (kg)	excluding chiller: 600 including chiller: 870	Dimension (WxDxH/mm)	excluding chiller: 1,800x1,000x1,600 including chiller: 2,600x1,550x1,600

Cryo H&I provides customized systems that meet customer needs based on liquefaction and re-liquefaction technology based on GM Cryocooler

Thermonics LN_2 Chiller

Cryogenic chiller device that using liquid nitrogen (-196°C) and chiller coolant heat exchange.

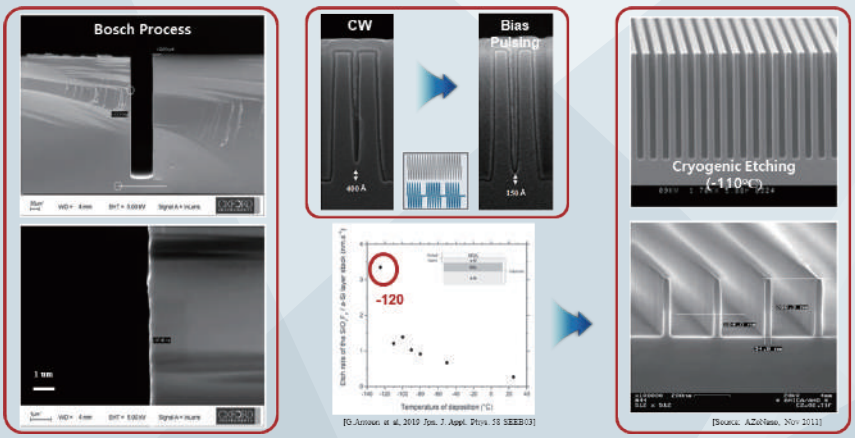
- ✓ Cooling capacity Max. 10kW @ -80°C
- ✓ 8 GPM @ 30psi SS Mag Drive Turbine Pump
- ✓ Compant footprint and price
- ✓ Powerful controller with color touch screen, graphing, datalogging, diagnostic and Ethernet/RS-232 communications

※ Specifications subject to change without notice

Specifications (10kW of cooling @ -80°C @ 8GPM @ 30 psi)			
Heat Rejection	LN_2 Cooled	Wetted Materials	Hard plumbed copper / stainless
LN_2 Consumption	LN_2 Consumption automatically adjusts to meet cooling demands	Flow Rate	8 GPM @ 30 PSI
GN_2 Exhaust Port	6" ID Duct	System Dimensions (WXDXH)	64" X 22" X 28"
Power	220V, 3 Phase, 50Hz, 15A Service	Reservoir Size/Type	Sealed Stainless Steel
Process Fluid	3M Novec 7100	Ambient Temperature Range	18°C ~ 27°C (23°C Nominal)

Cryogenic Etching Solution

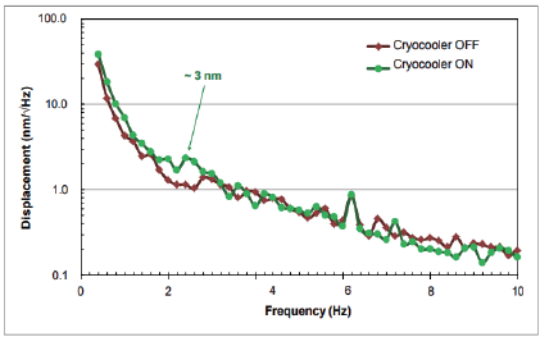
- ✓ -100°C Plasma Etching process available
- ✓ High Stability (Temperature & Safety)
- ✓ Low Power Consumption



Cryostat

We provide cryogenic solutions capable of experiments from 1.5K to 80K, and supply various types of products such as 4K Cold Head.

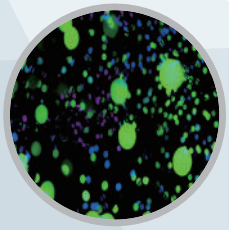
- ✓ Ultra low vibrations (3-5 nm)
- ✓ Supports working distnaces as small as 1.5 mm
- ✓ Continuously adjustable sample holder (1.5 ~7 mm)
- ✓ Low profile windows
- ✓ Cold tip down orientation
- ✓ Fully customizable



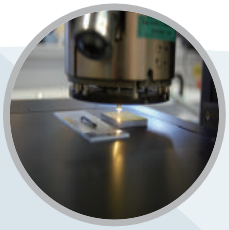
< Vibration Spectra >

Applications

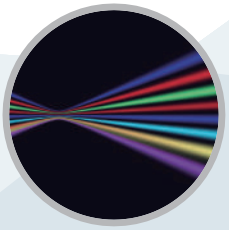
Micro Raman



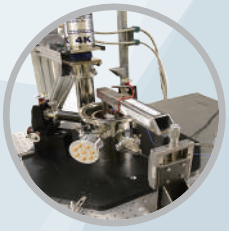
Micro-PL
(Micro Photoluminescence)



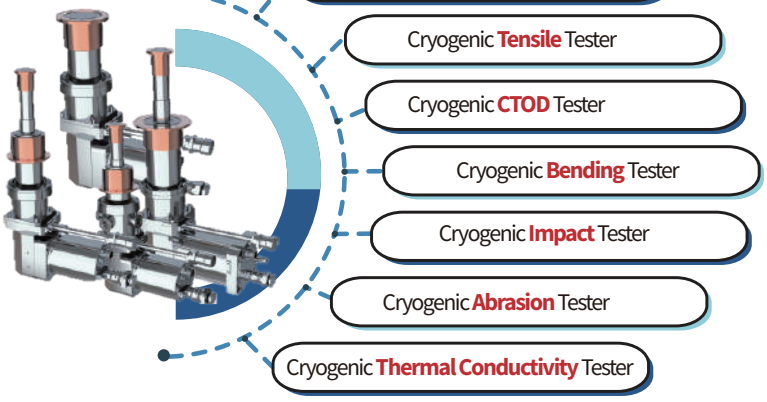
Micro FTIR

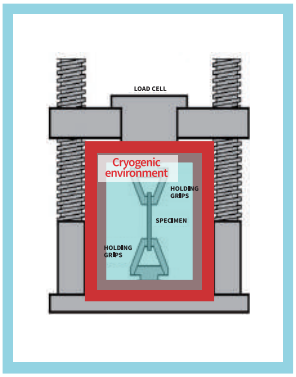


Micro Spectroscopy



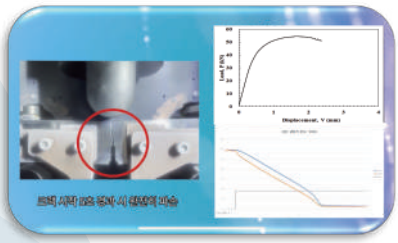
Low Vibration
Optical Experiments





Cryogenic CTOD Tester

Evaluates the fracture toughness of materials at cryogenic temperature below 20K(-253°C) using GM Cryocooler. It provides the same cryogenic environment as liquid hydrogen.



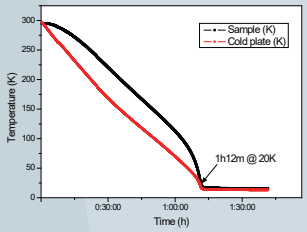
20K CTOD Test

No need for liquefied substances (liquid nitrogen, hydrogen, helium) for cryogenic testing

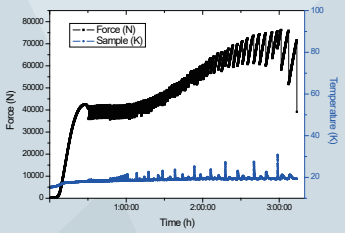
Cryogenic Tensile Tester

Device tests tensile strength at cryogenic temperatures below 20K(-253°C) using GM Cryocooler.

- ✓ Cooling from room temperature to 20K (-253°C) within 120 mins.
- ✓ Chamber has ample space inside, making it easy to install gauges for measurement and maintenance
- ✓ View Port can be used to minitor internal situations during and before the test
- ✓ Cryogenic Radiation Shield (70K or less) is used to clock radiant heat
- ✓ Compatible with any UTM equipment



< Sample cool down time >



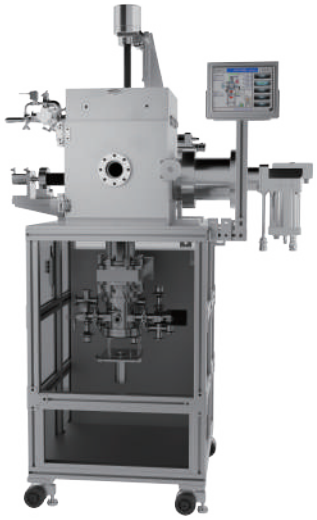
< Stainless Steel (SUS 304) tensile test >

20K Tensile test

Charpy specimen cooling system

System that cools the standard specimen before performing the Charpy impact test under cryogenic temperatures. Possible to cool speciments to temperatures below 20K in the absence of liquefied gas.

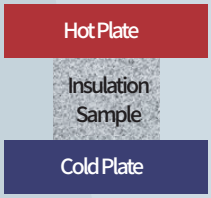
- ✓ Compact size with one-touch method (Touch Panel installed)
- ✓ High-speed cooling implementation (within 120 mins. based on 20K)
- ✓ High-speed atmospheric discharge of cooled specimen (within 3.5 sec.)
- ✓ Wide range of cooling range settings (17K~273K)
- ✓ Convenient specimen loading (front door installed)
- ✓ Monitoring inside the chamber possible (View Port installed)



Thermal Conductivity Tester

Measuring the heat transfer coefficient (λ) of metal specimens, can derive λ value at temperatures ranging from 20K to 300K, and has the characteristic of being able to control pressure (vacuum).

- ✓ Compact size with one-touch method (Touch Panel installed)
- ✓ No need liquefied gas
- ✓ High-speed cooling implementation (within 120 mins. based on 20K)
- ✓ Wide range of cooling section settings (17K~273K)
- ✓ Vacuum degree controllable ($1.0E^{-6}$ ~ $1.0E^{-3}$)
- ✓ Radiation heat source shielding
- ✓ Data collection and storage



λ=Thermal conductivity
λ=(Qu+QL)/2 *t/ΔT
Qu=Upper heater flux transduce
QL=Lower heater flux transduce

< Insulator >

< Metal >

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