CNP120

Compact On-Site Liquid Nitrogen Generators by Imtek Cryogenics

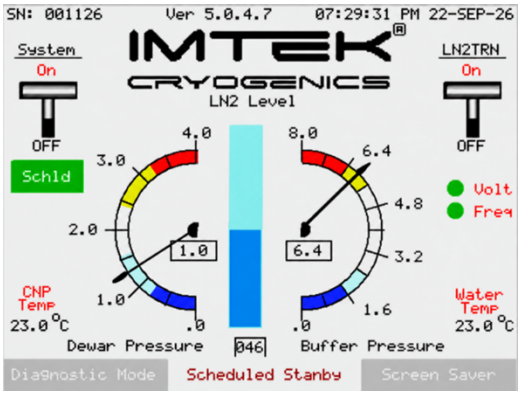


CNP120 is a compact and fully integrated liquid nitrogen generation system designed for laboratories, research facilities, biological storage applications, universities, medical institutions and industrial users requiring reliable on-site liquid nitrogen production. Combining IMTEK Cryogenics' proven PSA nitrogen generation technology with GM cryocooler-based liquefaction, CNP120 provides 120 liters of liquid nitrogen production per day while maintaining stable purity, low operating costs and high operational reliability.

The system integrates nitrogen generation, cryogenic liquefaction, liquid nitrogen storage, automation, monitoring and safety functions into a compact two-module platform, minimizing installation requirements and reducing dependence on bulk liquid nitrogen deliveries. Unlike conventional LN_2 supply chains that require regular deliveries and storage logistics, CNP120 enables continuous on-site liquid nitrogen production directly from atmospheric air.

Intelligent Air Management Algorithm (IAMA)

Despite its compact size, CNP120 incorporates IMTEK's Intelligent Air Management Algorithm (IAMA), originally developed for larger cryogenic plants. The IAMA continuously compensates for pressure fluctuations caused by PSA cycling, condensate discharge and varying air consumption conditions.



By stabilizing the air supply to the PSA system, IAMA contributes to:

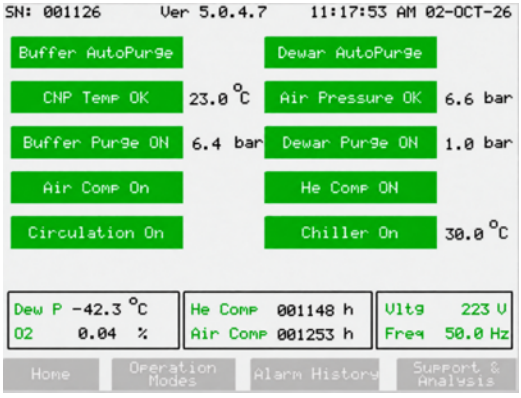
- Improved nitrogen purity stability
- Reduced compressed air consumption
- Extended adsorbent lifetime

IMTEK CRYOGENICS

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• Stable liquefaction performance
• Improved long-term operational reliability

Integrated condensate management, multi-stage filtration and advanced dew-point control ensure that only clean and dry air enters the PSA system.

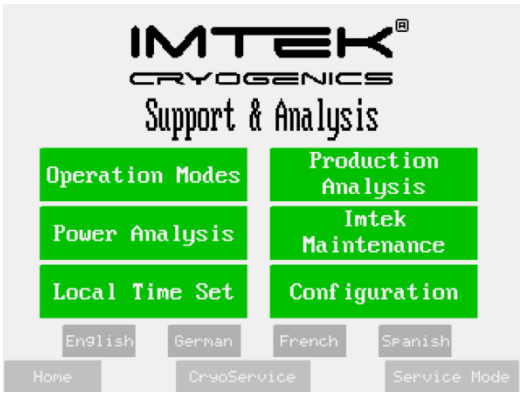


Nitrogen Generation System

Atmospheric air is compressed and processed through a multi-stage air treatment system consisting of filtration, condensate removal and drying stages.

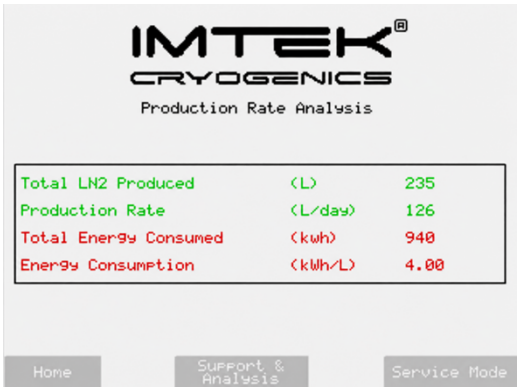
The integrated dryer reduces the dew point to as low as –40 °C or optionally –70 °C depending on configuration.

The purified air is then processed by IMTEK's dual-column Pressure Swing Adsorption (PSA) system utilizing carbon molecular sieve technology. The PSA system is optimized to provide:



• High nitrogen production efficiency
• Long adsorbent service life
• Low compressed air consumption
• Low operating cost
• Stable nitrogen purity

The generated nitrogen is accumulated in a dry nitrogen buffer tank before entering the cryogenic liquefaction stage.



Cryogenic Liquefaction System

At the heart of CNP120 is a GM-type cryocooler refrigeration system consisting of:

• Two water-cooled Sumitomo F70 helium compressors
• Two Sumitomo CH110 cryogenic cold heads
• Two 120 L vacuum-insulated liquid nitrogen storage vessels (240 L total)

Each module combines one F70 helium compressor, one CH110 cold head and one 120 L storage vessel. The water-cooled refrigeration system continuously liquefies nitrogen and requires an external chiller.

The cold head is designed for industrial operation and offers maintenance intervals of up to 15,000 operating hours.

The helium compressors operate in closed-cycle helium circuits, with helium adsorber replacement intervals of up to 30,000 operating hours.

Intelligent Reliability Architecture

CNP120 combines reliable hardware with intelligent monitoring and diagnostic functions. The PLC continuously monitors:

• Air pressure
• Dewar pressure
• Cryocooler performance
• Process temperatures
• System alarms and warnings
• Nitrogen pressure
• LN_2 level
• Helium compressor status
• PSA operating conditions

Historical operating data, alarms and maintenance events are recorded for troubleshooting and service planning.

This proactive monitoring approach improves system reliability while reducing maintenance-related downtime.

User Experience and Maintenance

CNP120 is designed for simple daily operation and minimal operator intervention. Features include:

- One-button start-up
- Automatic production control
- Remote monitoring capability
- Operating hour tracking
- Fully automatic operation
- Intelligent alarm management
- Operator-friendly PLC/HMI interface
- Maintenance tracking and service reminders

Routine maintenance primarily consists of filter replacement and periodic inspections.

The cold head is designed for on-site serviceability, reducing maintenance costs and minimizing operational interruptions.

Compact Platform Design

CNP120 combines nitrogen generation, liquefaction, storage and control systems within a compact footprint. The modular design simplifies installation, improves service accessibility and allows operation in laboratories, universities, research facilities and industrial environments where space is limited. The result is a reliable and cost-effective source of on-site liquid nitrogen production with low operating costs and long-term operational stability.

Section CNP120 Technical Specification

Plant Performance & Capacity	The system provides a nominal liquid nitrogen production capacity of 120 liters/day at 23 °C ambient temperature, equivalent to approximately 5.0 liters/hour. The produced liquid nitrogen purity is typically between 99.0% and 99.5% N_2. Actual performance depends on the selected configuration, cooling-water conditions and site conditions.
Air Compressor & Air Treatment	Three separate air-compressor options are available, with 2.2, 3.0 or 4.0 kW motors. Select according to site altitude, ambient temperature and required air delivery for the installation site. Each package includes refrigerated drying; downstream filtration, condensate removal and process drying protect the PSA. Compressor hot air must be ducted outside the equipment room.
PSA Nitrogen Generator	The nitrogen generation system is based on IMTEK's dual-column Carbon Molecular Sieve (CMS) Pressure Swing Adsorption technology. The PSA system is optimized for high nitrogen recovery, low compressed air consumption and stable purity performance. A dry nitrogen buffer vessel is incorporated to stabilize pressure and flow before liquefaction. Optional oxygen analysis and purity monitoring functions are available.
Cryogenic Liquefaction System	The liquefaction system comprises two Sumitomo CH110 GM cold heads, each connected to an F70 helium compressor and a 120 L vacuum-insulated storage vessel. The two-module arrangement provides 120 liters/day nominal production. Cold head maintenance intervals are up to 15,000 operating hours. Cooling is water-based; an external chiller is required.
Helium Compressor System	Two water-cooled Sumitomo F70 helium compressors operate in closed helium circuits. Helium is recirculated and is not consumed during normal operation. Helium adsorber replacement intervals are up to 30,000 operating hours. The preliminary combined electrical input basis is 14 kW; final ratings follow the supplied equipment nameplates.

LN_2 Storage Dewar	Liquid nitrogen is stored in two 120 L vacuum-insulated cryogenic vessels, providing 240 L total nominal storage. Each vessel forms part of one liquefaction module. Automatic level monitoring controls production and supports transfer protection. Operating and transfer pressures follow the approved CNP120 configuration.
PLC & HMI	The system is controlled through an industrial PLC platform with a color touchscreen HMI interface. Automatic start-up, shutdown, restart, alarm handling and process protection functions are fully integrated. Real-time operating parameters, alarm history, service information and operating hours are continuously monitored and recorded. Optional Ethernet-based remote monitoring capability is available.
Service & Maintenance	CNP120 is designed around a service-friendly architecture that minimizes downtime and simplifies maintenance procedures. Cold head maintenance can be performed on-site without major system modifications. Long service intervals, simplified access to components and predictive maintenance tracking contribute to low operating costs and high system availability.
Certificates & Documentation	CNP120 is manufactured under an ISO 9001 certified quality management system and complies with applicable CE requirements. Comprehensive documentation includes operation manuals, maintenance manuals, electrical drawings, P&ID diagrams, recommended spare parts lists and operator training materials. Technical support and after-sales service are available throughout the system lifecycle.

Specifications	**CNP120**
LN_2 Production Capacity	>120 liters/day nominal at 23 °C
LN_2 Production Rate	Approx. 5.0 liters/hour
LN_2 Storage Capacity	2 × 120 L; 240 L total
Nitrogen Gas Requirement	Approx. 3.4 Nm^3/h net; 4.0 Nm^3/h design supply including margin
Nitrogen Purity	≥ 99.0%
Cryogenic Cold Heads	2 × Sumitomo CH110
Helium Compressor	2 × Sumitomo F70; water-cooled
PSA Technology	Dual Column PSA
Control System	PLC + HMI
Operation Mode	Fully Automatic
Remote Monitoring	Optional
Dew Point	–40 °C (–70 °C optional)
Maximum Altitude	Site-specific; subject to compressor selection and approval**
Noise Level	< 65 dB
Electrical Rating	3 Ph; 380-415 V @ 50/60 Hz 460-480 V @ 60 Hz
Power Consumption*	He compressors: 14 kW combined preliminary basis; auxiliaries additional
Required Cooling Water	At least 20 Lpm @ 2 bar
Air Compressor Power Consumption*	2.2 / 3.0 / 4.0 kW motor options (50 Hz)
Total Installed Power*	Approx. 22–26 kW (helium compressors + air compressor + chiller); auxiliaries additional. TBD depending on configuration
Maintenance Interval	Cold heads: up to 15,000 h; helium adsorbers: up to 30,000 h

Nitrogen basis: 1 L LN_2 ≈ 0.645 Nm^3 gas (0 °C, 1.013 bar). Net demand is 3.22 Nm^3/h at 120 L/day or 3.39 Nm^3/h at 126 L/day. A 4.0 Nm^3/h design supply provides approximately 18% margin at 126 L/day; initial purge demand is additional.

* Values may vary depending on final configuration and site conditions.

** Maximum installation altitude is subject to site-specific compressor selection and manufacturer approval.