

CNLab/CNP 65

Compact On-Site Liquid Nitrogen Generators by Imtek Cryogenics



CNP65 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, CNP65 provides approximately 65 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 single compact platform, minimizing installation requirements and reducing dependence on bulk liquid nitrogen deliveries.

Unlike conventional LN₂ supply chains that require regular deliveries and storage logistics, CNP65 enables continuous on-site liquid nitrogen production directly from atmospheric air.

Intelligent Air Management Algorithm (IAMA)

Despite its compact size, CNP65 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
- 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
- Low compressed air consumption
- Stable nitrogen purity
- Long adsorbent service life
- Low operating cost

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

Cryogenic Liquefaction System

At the heart of CNP65 is a GM-type cryocooler refrigeration system consisting of:

- One Sumitomo F70 helium compressor
- One Sumitomo cryogenic cold head
- One vacuum-insulated liquid nitrogen storage vessel

The refrigeration system continuously liquefies nitrogen at temperatures between 77 K and 80 K while maintaining stable production and storage conditions.

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

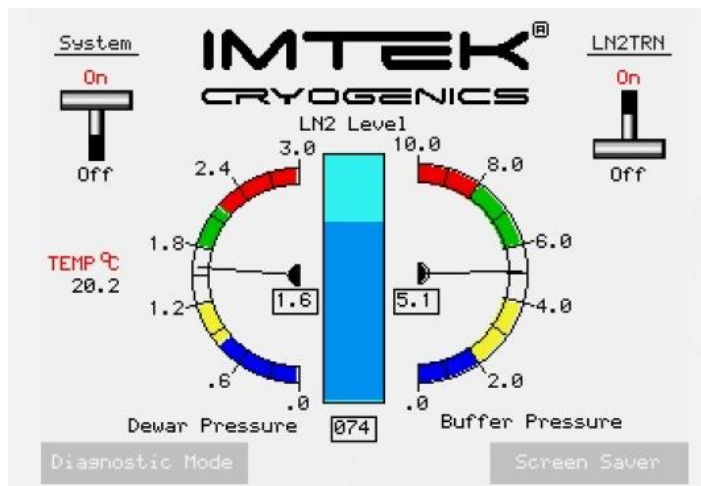
The helium compressor operates in a closed-cycle helium circuit and requires maintenance only at intervals of up to 30,000 operating hours.

Intelligent Reliability Architecture

CNP65 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

CNP65 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

CNP65 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 CNP65 Technical Specification

Plant Performance & Capacity	The system shall provide a minimum liquid nitrogen production capacity of 65 liters/day under nominal operating conditions at 23 °C ambient temperature. Typical production rate is approximately 2.7 liters/hour. The produced liquid nitrogen purity is typically between 99.0% and 99.5% N ₂ . The system is optimized for energy-efficient operation and low specific power consumption while maintaining stable long-term production performance.
Air Compressor & Air Treatment	CNP65 utilizes an industrial oil-free air compressor providing approximately 7–10 m ³ /h free air delivery at 6–7 bar(g). The integrated air treatment package includes multi-stage filtration, automatic condensate removal, coalescing filters and refrigerated drying technology. The system delivers clean, dry and stable compressed air to the PSA module, ensuring long adsorbent lifetime and reliable nitrogen production.
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 stage is based on proven GM cryocooler technology specifically optimized for continuous liquid nitrogen production. Nitrogen is liquefied and transferred directly into the storage vessel. The refrigeration system is designed for industrial reliability, long operating life and stable production performance. Typical cold head maintenance intervals are up to 15,000 operating hours.
Helium Compressor System	The GM cryocooler is driven by a closed-cycle helium compressor system utilizing high-purity helium gas. Helium is continuously recirculated within the refrigeration circuit and is not consumed during normal operation. The compressor package is designed for long-term industrial use with maintenance intervals of up to 30,000 operating hours.

LN₂ Storage Dewar	Liquid nitrogen is stored in a high-performance vacuum-insulated cryogenic vessel designed to minimize heat ingress and evaporation losses. Storage capacities of 120 L, 160 L and 210 L are available depending on customer requirements. The control system automatically starts and stops LN ₂ production according to liquid level. Typical storage pressure is 1–3 bar(g).
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	CNP65 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	CNP65 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	CNP65/CNLab65
LN ₂ Production Capacity	≥ 65 liters/day
LN ₂ Production Rate	≥ 2.7 liters/hour
LN ₂ Storage Capacity	160–210 liters
Nitrogen Generation Capacity	Approx. 2 Nm ³ /h
Nitrogen Purity	≥ 99.0%
Cryogenic Cold Heads	1
Helium Compressor	1
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	4500 meters**
Noise Level	< 62 dB @ 1 meter
Electrical Rating	380/400/415 VAC, 3Ph, 50 Hz or 480 VAC, 3Ph, 60 Hz
Power Consumption*	6.5 kW @50 Hz, 7.4 kW@60 Hz
Chiller Power Consumption*	2.1 kW @ 50 hz or 3.1 kW @ 60 Hz
Air Compressor Power Consumption*	1.3 kW @ 50 Hz or 1.5 kW@ 60 Hz
Total Installed Power*	10 kW @ 50 Hz or 12.0 kW @ 60 Hz
Maintenance Interval	Up to 15,000 operating hours

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

** For higher altitudes use external compressor