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INNOVATION

HCP CryoNoster

The Future of Cryo Storage

HCP CryoNoster is a fully automatic cryogenic mass storage system for bio-banks, hospitals, biopharmaceutical companies and research organisations. Its innovative cooling technology ensures ice-free and temperature-consistent storage at down to **–150° C**.

HCP Life Science has been developing cryogenic technology and cryogenic systems for over 20 years. The **paternoster system** it has developed offers maximum storage density, maximum security, and rapid fully automated access to the refrigerated goods.

The HCP CryoNoster is the first ultra-cooling system that works with **compressors** or with **nitrogen** cooling. As a tandem system, both cooling methods can even run in parallel operation. Latest generation compressors ensure maximum **energy efficiency**, redundant security systems and low-maintenance and matured mechanics for trouble-free operation over decades.

This PDF contains

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AT A GLANCE

1. The advanteges of the HCP CryoNoster

- HCP CryoNoster is compatible with **all types of storage system**, including cryovials, SBS-formatted tubes, SBS plates and blood bags. Each machine is individually tailored to customers' needs.

- With its novel paternoster system, HCP CryoNoster achieves **unparalleled storage density** with regard to space volume. The HCP CryoNoster can also be used in confined or low-ceilinged spaces that have no lateral access.

- The customized containers can store all types of samples. By using HD racks, the storage capacity can be improved significantly compared to SBS-formatted storage systems. Depending on the configuration, it is possible, e.g,. to store **20,000 bags** or **15 million vials** in a tandem system. The samples are dispensed through a large drawer, either as a single sample, in an SBS box or in an HD rack with up to 1,500 vials per rack.

Options without limits

HCP CryoNoster is compatible with all types of storage system, including cryovials, SBS-formatted tubes, SBS plates and blood bags.

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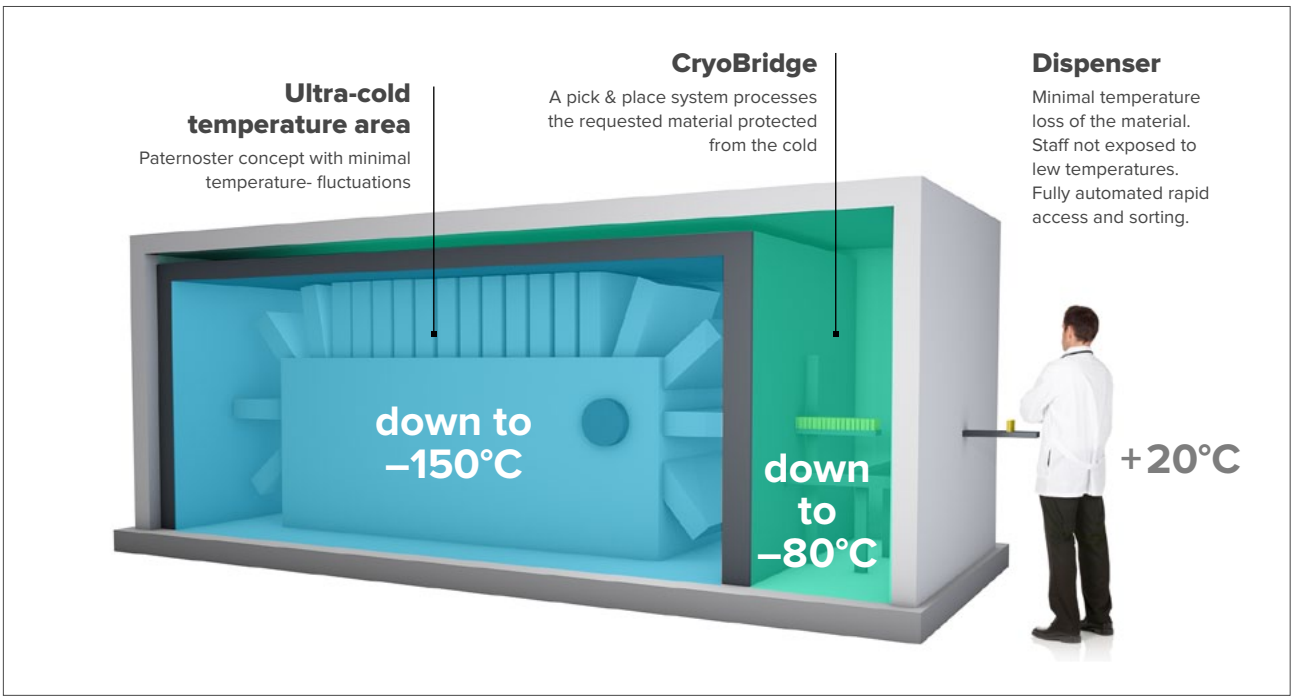
- The **CryoBridge output system** enables quick access to the stored material at a sample handling temperature of down to –80 ° C. The samples are dispensed at room temperature to prevent exposure to the ultra-cold area, thus preserving the quality of the sample and ensuring the safety of employees.
- Thanks to the **modular structure**, HCP CryoNoster can be extended at any time, whilst maintaining the output unit with its pick-and-place robots.
- Different cooling technologies (compressor/LN_2) can be combined in **parallel operation**.
- GLP/GMP-compatible inventory management is possible through an API connection to **all standard IT and database systems**. This ensures fast in- and output and real-time logging of the stored material.
- The technology of the HCP CryoNoster is **low-maintenance** and **durable**. Trained users can access the system at any time and carry out first level service work.
- HCP CryoNoster is easy to use and **no special know-how is required** to operate the system.

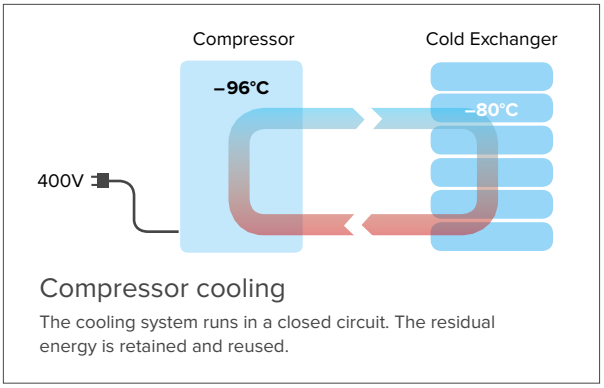


HCP CryoNoster

1. Advantages of the cooling system

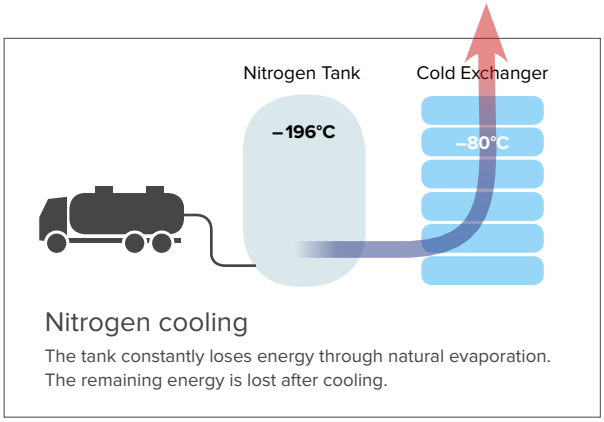
Safety and reliability are crucial for cryogenic storage systems: every sample requires maximum protection for years and decades. The HCP CryoNoster system works ice-free and has modern, redundant security features.

For a long time, liquid nitrogen (LN_2) was the only option to guarantee permanent ultra-cold temperatures of down to -150° C. This is typically done in half-open barrels. Even when used correctly, unused gas is lost continuously. Nitrogen has to be delivered regularly by tank trucks. Furthermore, it is toxic and contact with it can cause serious injuries.



Compressor cooling

The cooling system runs in a closed circuit. The residual energy is retained and reused.



Nitrogen cooling

The tank constantly loses energy through natural evaporation. The remaining energy is lost after cooling.

Compressor cooling
HCP Life Science has succeeded in creating an energy- efficient cooling system based on a compressor technology that reaches constant storage temperatures of up to –150° C. The latest generation of compressors does not require external logistics and is more energy efficient than nitrogen due to the use of natural coolants. The temperature fluctuations in the system are less than +/- 2° C. Lower energy consumption levels and a novel vacuum insulation noticeably reduce operating costs.

Nitrogen cooling
Do you prefer cooling with liquid nitrogen? The CryoNoster system works both with compressors and with nitrogen cooling. In the tandem version with two paternosters it is even possible to operation both cooling systems in parallel.

All areas of the HCP CryoNoster are monitored 24/7 by a remote-controllable HD camera system.

HCP CryoNoster

Safety through redundant systems.

HCP CryoNoster has a redundant and crisis-proof cooling concept. Vital system functions are not interrupted even if the power supply fails. The construction of the system with its double vacuum insulation of each single paternoster makes sure that any losses will be minor over long periods of time. Operation of the computer and access to the material can be performed via UPS batteries and gensets.

All areas of the HCP CryoNoster are monitored 24/7 by a remote-controllable HD camera system. All important function data are documented and monitored via the GLT system. The system automatically detects malfunctions.

The software and system are protected against misuse or manipulation by high security measures. All vital parameters of the refrigerated goods (work performed, time and duration of retrieval) are documented individually for each sample.

Double vacuum insulation
The insulation of the HCP CryoNoster contains special vacuum elements that have a 10 times higher insulation value. Sensors provide status information that can be read from the outside.

Protection from ice and frost
Ice and ice-crystal growth are a common problem in freezers and cryo-refrigerators. A specially designed cooling and drying system in the HCP CryoNoster ensures ice-free operation. In addition, the patented double door system protects against the ingress of humidity.

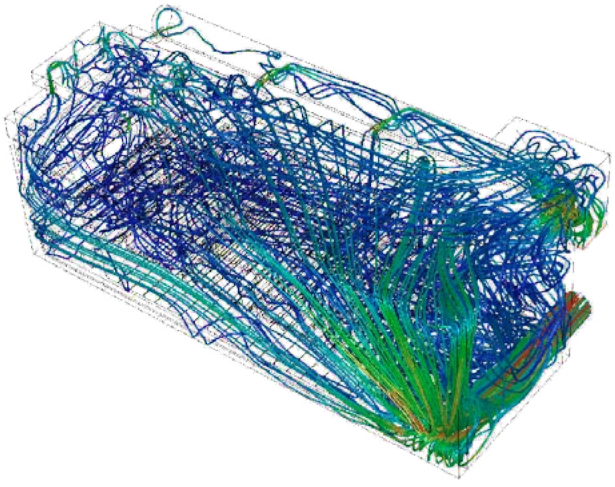
3. Constant temperature is important

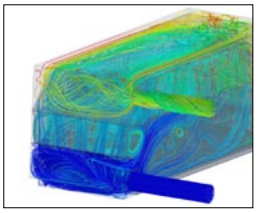
Consistency of storage temperatures is vital for the storage of organic materials.

In conventional systems, cold temperature distribution is based on free convection. This can only function when there are clear differences in temperature within the same space. In static storage systems it is therefore not physically possible to maintain the same temperature throughout the system.

The HCP CryoNoster paternoster system is moved regularly so that the air in the cooling unit is periodically circulated as the material moves through the system. This concept achieves unparalleled temperature consistency, with tolerances ranging below +/- 2° C.

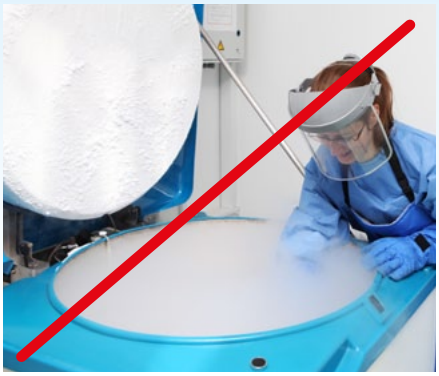
Active air circulation
The active air circulation system developed by HCP Life Science ensures ideal temperature distribution, even when the paternoster is not motion, and consistent temperature distribution throughout the system, with tolerances ranging around +/- 1 ° C.

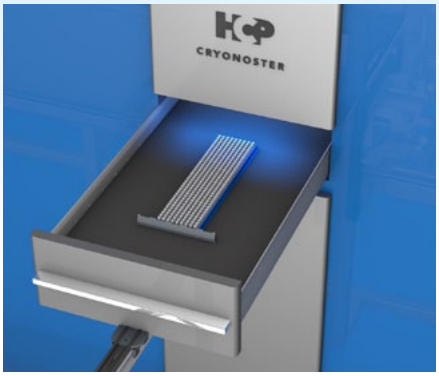




Even with passive air circulation temperatures only vary by +/- 2°C

Passive or active air circulation
The paternoster system developed by HCP Life Science enables previously unattained temperature constancy – with active air circulation even at standing paternoster. The temperature distribution in the system is then constant up to +/- 1°C in every area of the system.





No ice scraping, no searching:
The user works in normal ambient temperature and has no contact with the cold or ultra cold area.

4. Advantages for the staff

Ordering and taking samples from the HCP CryoNoster can be done easily by mouse or by pressing a button. The samples are transferred to the bridge using the latest generation of delta robots. With up to 1,000 storage and retrieval operations per day, the system is one of the fastest on the market. The robots work at low and ultra-low temperatures.

The HCP CryoNoster can dispense the material in any way desired – singly or in large quantities, in open or closed transport containers, SBS boxes or HD racks with up to 1,500 vials per plate. The samples are conveniently dispensed via a drawer.

No exposure to ultra-cold area
The user works in normal ambient temperature and does not come into contact with the cold or ultra-cold area. Compared to conventional cryo-cooling methods, the HCP CryoNoster requires no manual searching, no stacking of samples and no ice scraping. Instead, use of the system and quick access to the material is possible without any special know-how.

5. Software and sample management

The HCP CryoNoster system is controlled digitally. The samples can be retrieved from the LIMBS system from the workplace or directly from the device.

The system technology is based on standard industrial software. Database and sample management are carried out by an individually tailored API. It is compatible with all standard systems such as Mosaic or LabWare. Depending on the system, the samples are coded using either RFID or ISBT codes.

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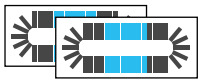
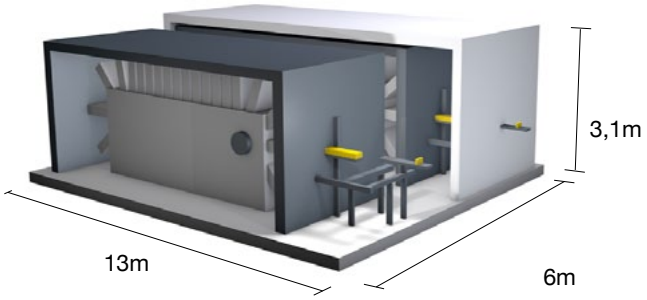
Example of sizes A

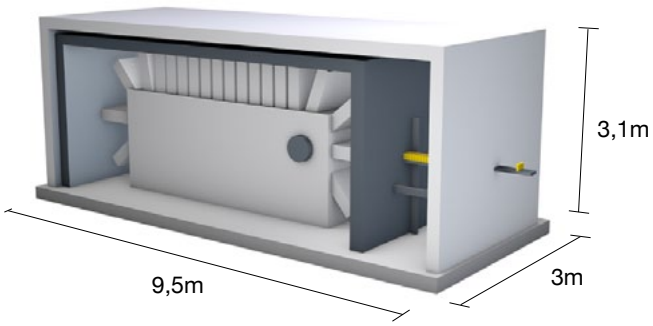
7,25 million vials 0,5 & mixed sizes (tandem)





Example of sizes B

1,7 million vials 0,5 & mixed sizes

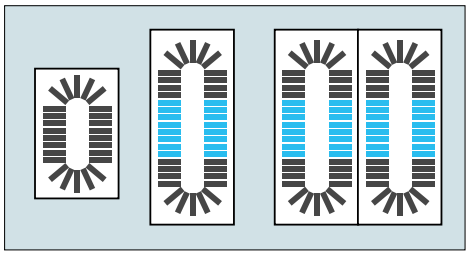


Fully automated system (mixed content)

Model	A	B	C	D
Number of vials	7,25 Mio (0,5ml + mixed)	1,7 Mio (0,5ml + mixed)	4 Mio (0,3ml)	1,5 Mio (0,6ml)
Number of CryoNoster	Tandem	Single	Tandem	Tandem
Length	13m	9,5m	11m	12m
Width	6m	3m	5,6m	5,5m
Height	3,1 m	3,1m	3m	3m

Fully automated system (0,5 l bloodbags)

Model	E	F
Number of vials	4.332 (500ml bags)	15.120 (300ml bags)
Number of CryoNoster	Single	Single
Length	7,6m	14,5m
Width	5,5m	3m
Height	3 m	3m



The system can be extended, either in length or by several paternosters.

6. Structure and dimensions

What will your requirements for refrigerated goods look like in five or ten years? The HCP CryoNoster paternoster system can be extended, either in length or by several parallel paternosters. The pick-and-place system and the dispensing area can be maintained.

It is possible to extend its size, add other cooling methods (compressor/nitrogen) or make a system more cost-efficient by using different cooling temperatures.

7. Service and maintenance

Longevity and reliability were the most important criteria when developing the HCP CryoNoster. It is designed for a lifespan of 25 or more years. The technology is therefore based on mature standard industrial components that will be available worldwide for decades.

Easy access to the technical area and the robust industrial design provide for uncomplicated maintenance work and servicing. This also applies to the sophisticated additional components made by leading manufacturers. Our 24/7 support is permanently available.

Many machine parts can be serviced with conventional tools thanks to comprehensive technical documentation.

Trained staff can take over level 1 service work.

8. Background and development


Hans-Christoph Paul


Dr. Georg Thiessen

HCP Life Science from Denmark and their distributor MABAG from Germany have acquired more than 20 years of experience together in the development of innovative cryo-bank solutions.

Chief engineer Hans-Christoph Paul focuses on the reliability and maximum energy efficiency of his cryo-systems. His research in the field of cryo-technology has resulted in numerous innovative solutions in the fields of process technology, materials, and technical functions.

MABAG was founded in 1998 and, together with its Austrian sister company CLST, sells modern cryo-systems worldwide.

In 2011, the to-date largest installation of the Cryo Mass Storage System with a capacity of almost 15,000 blood bags was set up in a partnership between MABAG and HCP Life Science in Kuwait.

9. Workshops

Our systems are tailor-made. In individual conceptual workshops that we conduct with you on site we analyze which is the ideal turnkey solution for you based on the existing infrastructure. You then receive one non-binding CAD sketch with a workflow adjusted to your needs.

10. Contact and information

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