



Pharma Concept Freeze Drying Systems for Vials



Modular production
systems with expandable
features for maximum
flexibility



We create values

Experience, expertise and innovation for your pharmaceutical production

Martin Christ – Specialists for pharmaceutical freeze drying and more

Cutting-edge technologies and innovative ideas are prerequisites for achieving excellent results. Reliability in the process means high-quality execution to guarantee secure and aseptic production. High-quality active pharmaceutical substances pose complex requirements for freeze dryers. We successfully meet this challenge.

As a leading international innovator, we at Martin Christ are continuously advancing our components and processes. Intuitive process control in detail is a given with our freeze drying systems, as is the use of new process optimization techniques.

Intralogistics with premier loading systems

Our subsidiary Motus Engineering GmbH & Co. KG is one of the leading solution provider of advanced loading systems for freeze dryers – we are able to offer optimal complete solutions consisting of freeze dryers with suitable loading systems for almost all tasks.

Our diverse array of products and services are designed to optimize your operations and ensure utmost efficiency.

Are you currently using one of our pilot or lab devices? Then you are already familiar with our professional operations and individualized support. Martin Christ provides comprehensive, solution-oriented service.

Take advantage of our innovative spirit and years of experience with freeze drying systems.



Vision for efficiency and success

The powerful concept is the starting point and foundation of your project



- Experienced partner for the whole life cycle of the freeze dryer
- Integration of system technology in the process flow
- Flexible equipment variants
- Simple and reliable automated
- Best partner concept

Optimally combined to meet your requirements

Your defined requirements (URS) are the basis for planning your freeze drying system. We support you from the first idea all the way to its implementation as it's essential that your freeze dryer and the loading and unloading system match your requirement profile perfectly.

The comprehensive process of producing the active substance solution, filling in vials, transporting to and from the freeze dryer with automatic loading/unloading and capping requires optimal selection of individual machines.

We have developed a best partner concept for all of the other process steps required. In cooperation with filling and finishing specialists, together we develop the process system that you need.

Pre-engineering for optimal production

Customized expert consultation and design



Play it safe and take no risks

With our pre-engineering services, we offer you expert technical support and guidance throughout the planning and design phases of your freeze drying systems and associated loading/unloading systems.

Our goal is to assist you in comprehending your specific requirements, pinpointing the most suitable solutions, and establishing the fundamental framework for constructing and implementing these systems with mechanical and electrical interface clarification into your filling line.

- Requirements analysis
- Technical evaluation
- Concept development
- Engineering consultation
- Detailed specifications

- Tailored solutions
- Efficiency and performance optimization
- Risk mitigation
- Expertise and support

Zeta – compact freeze drying systems

The pharmaceutical series for production facilities



Pharma concept by Martin Christ

The Zeta product series includes steam sterilizable freeze dryers with loading and unloading systems that have been specially designed for cGMP production of pharmaceutical products. They cover production sizes from 1 to 13 m² and vials from 2R up to 50H. Also completely to be integrated in an isolator system. The standardised freeze dryer system Zeta makes project implementation fast, inexpensive and uncomplicated. The modular standard makes individualised solutions possible.

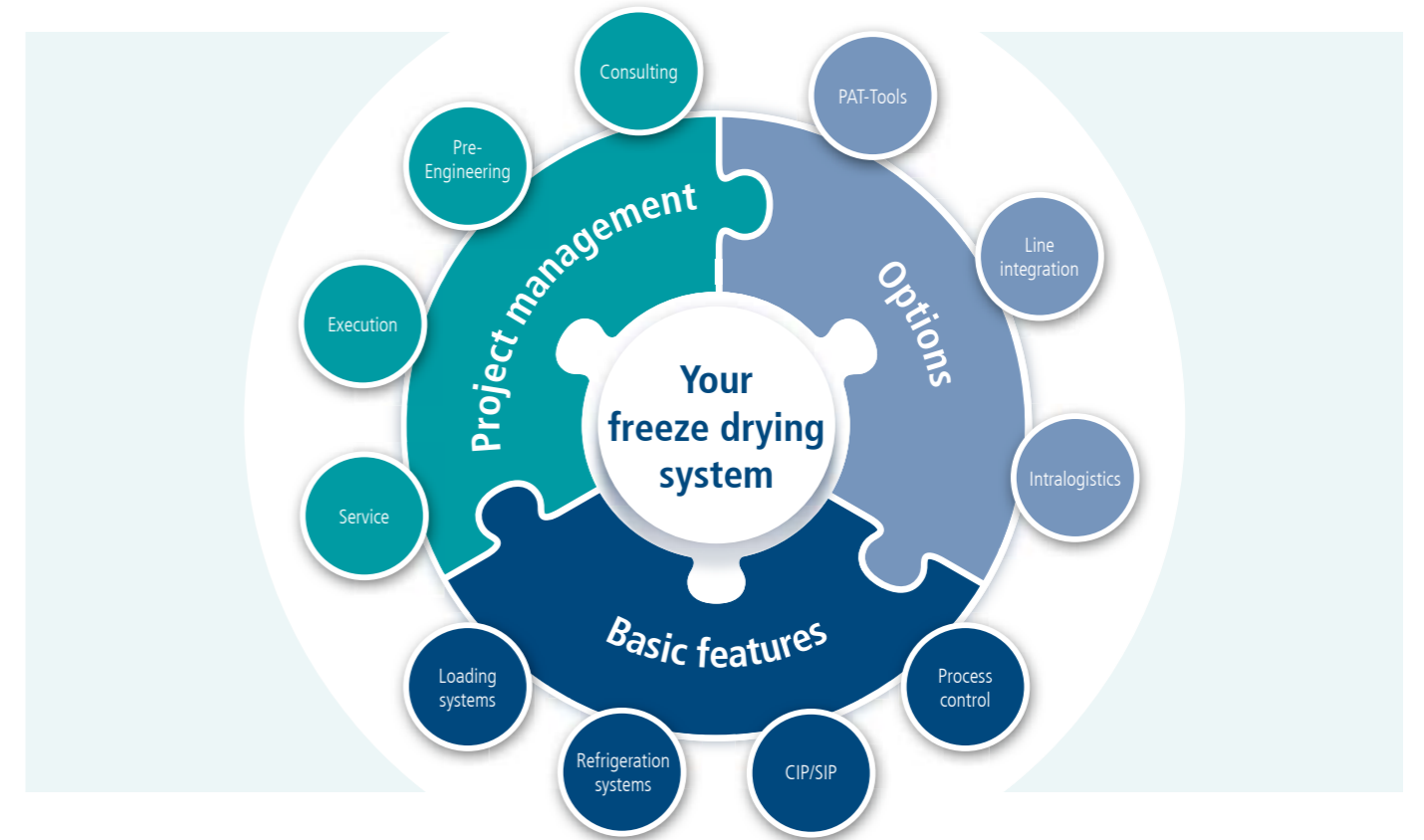
Our pre-configured freeze dryers available in six different sizes:

Zeta		Zeta-1	Zeta-2	Zeta-4	Zeta-6	Zeta-10	Zeta-13
Max. shelf area	m ²	1.1	2.2	4.1	5.8	10	13
Number of shelves		2 – 5	4 – 6	5 – 8	6 – 8	6 – 10	7 – 9
Shelf dimension (W x D)	mm	500 x 450	600 x 600	600 x 850	850 x 850	850 x 1,200	1,200 x 1,200
Ice capacity	kg	12	24	45	63	110	140
Batch Volume (ca.)*	l	8	15	29.0	41	73	95
Number of vials	2R	4,880	9,546	18,056	25,624	45,150	57,663
	10R	2,110	4,116	7,840	11,040	19,670	25,398

Remarks: Technical changes reserved / *Batch volume: for 10R-vials and 1 cm filling volume

Special features customized for your project

Boost your production line with our powerful add-ons



Our Zeta freeze dryers operate on a modular concept, functioning as a versatile building block for your freeze drying endeavors.

Basic equipment (selection):

- CIP/SIP
- Filter Integrity Test (FIT) or Water Intrusion Test (WIT)
- Stainless steel slot door
- Hydraulic/pneumatic door locking system
- and many others

Customized options:

- Alternative refrigeration systems
- Loading and unloading system
- PAT-Tools
- Process control
- and many others

Alternative refrigeration systems – Always up to date

To make sure your freeze dryer is ready for the future, we stay at the forefront of refrigeration technology. These are the current, future-proof technical solutions:

- Conventional refrigeration CFC-free
- CO₂ / air combination
- CO₂ / liquid nitrogen combination
- Liquid nitrogen

Intralogistics, filling and more – Perfect integration

Through our subsidiary Motus Engineering we can solve the challenges of transporting between filling machines, clean rooms, capping machines and freeze dryers. Our extended product portfolio:

- Monitoring equipment
- Containments and sterile containers
- Magazine robots
- Belt connections, buffer
- Tray filling and powder handling

Reliable and process-oriented

Impressive concept for your freeze dryer

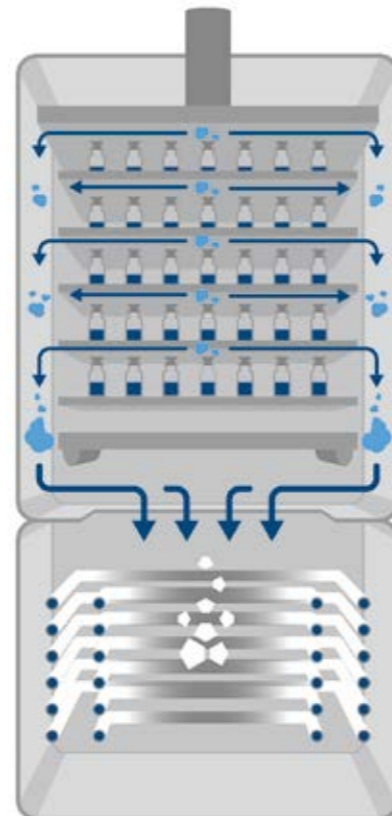
Optimized system design

For cGMP process in pharmaceutical applications, we offer the Zeta freeze dryer series concept featuring the dual-chamber principle, developed by us. The big integrated intermediate valve separates the two parts: product chamber and ice condenser. The large opening provides ideal flow conditions for water vapour. The dual-chamber system is especially beneficial for automated and validated CIP.

For our customers, using the Zeta freeze dryer means increased performance, reduced process times and greater cost-effectiveness. Temperature-sensitive materials can be dried gently and reliably.

The impressive system concept combines all of the benefits essential for an automated and validated process:

- Optimal water vapour transport to the ice condenser
- SCADA system for data capture and upper-level controls
- Wide range of fully integrated PAT tools
- Utilizes production space efficiently with vertical arrangements of the freeze dryer
- Easy loading and unloading with the innovative LyoShuttle
- Easy access to the ice condenser

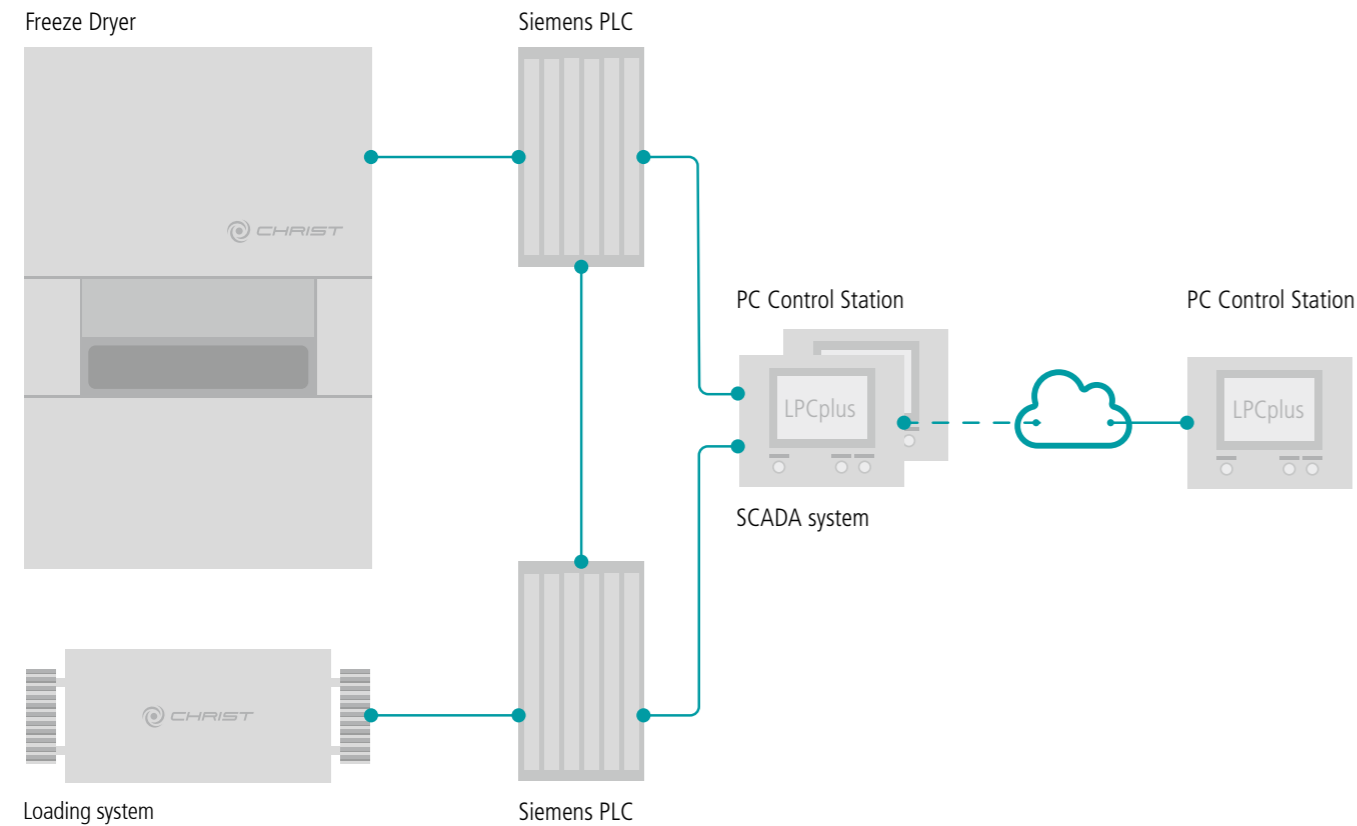


- Optimal vapour flow
- Optimized automation concept
- Integrated PAT-Tools
- Easy scale up and tech transfer
- Space saving design



Application-optimized automation concept

Combined process visualisation and data management



Optimal combination of standards and our experience

The Martin Christ automation concept combines industry standards in process automation with a focus on freeze drying systems for the pharmaceutical industry and the decades long experience of our specialists. The result is optimal control of freeze drying systems, including manufacturer independent communication with integrated unit operations.

A coordinated system:

- Siemens PLC process control
- Martin Christ in-house LPCplus or WinCC (TIA Portal)
- Profibus for sensor connectivity
- Ethernet for visualization and remote access

Safe, flexible, expandable, and cGMP compliant:

- System control from several operator stations
- Scalability for controlling multiple freeze drying systems
- Integration of the LyoShuttle system and interfacing with other external systems
- Intrinsically safe control elements for the safety-related functions
- GMP compliant integration of PAT-Tools
- Application of all standards in the pharmaceutical industry such as Gamp5 and cGMP

Optimized process visualization

LPCplus – user-friendly SCADA system



Process visualization with LPCplus

The SCADA software LPCplus has been programmed in house and is continuously developed for all freeze drying applications. Our user-friendly software for process and system control provides an uniform user interface for all freeze dryer functions, as well as loading systems and associated administration tasks.

- LPCplus software developed in compliance with all regulations relevant to the pharmaceutical industry
- Process control system can run on a Windows PC
- LPCplus functionality can also be implemented in WIN CC
- Remote access available
- CIP, SIP and FIT processes configurable in SCADA system

- Process visualization
- Process documentation
- Data backup and recovery
- Recipe administration
- User administration
- Full integration of all PAT tools

Optimal process monitoring

Well-designed, fully integrated PAT-Tools



LyoCoN – controlled nucleation

Precision freezing of all vials – that is the controlled nucleation solution LyoCoN from Martin Christ. At the press of a button, crystallization of all the vials in the freeze dryer is initiated.

- Ice vapour is generated from the product, so no additional external substances (such as WFI) are required
- GMP compliant process
- No media (exhaust air or gas) that could contain active substances or product to be treated
- Usable also in pilot systems that are not pressure-resistant

LyoCam – camera system

Video recordings of the product at variable intervals, depending on the process steps or as event-controlled recording – LyoCam brings greater transparency to the freeze drying process. Monitoring and analysis of freeze drying is easy and uncomplicated with this technology from Martin Christ.

- High-end full HD industrial camera
- Cold light LED lamps to avoid energy input
- Completely integrated with LPCplus process visualization
- Intelligent image storage, with image frequency linked to special process events
- Identical timestamp to other logged process parameters
- Up to four cameras can be used in LPCplus
- Observation of loading, unloading and vial closure processes

MTMplus – manometric temperature measurement

The product temperature is one of the most critical parameters in freeze drying. It influences the shape of the ice structure, the speed of the freeze drying process and can initiate the thawing process. The Manometric Temperature Measurement system MTMplus, optimized by Martin Christ, can optimally monitor the temperature.

- The product temperature is online calculated during the measurement
- Non-invasive method
- Reduced risk of product damage
- Easily retrofittable in many Christ freeze dryers

WTMplus – wireless product temperature

The wireless product temperature measurement system WTMplus from Martin Christ makes wireless sensor-based product temperature measurement possible for freeze drying. Wireless sensors are placed directly in the vials during loading and report product temperatures to the system controller during the entire drying process.

- Low influence of product temperature due to passive construction without batteries and very low power levels
- Any probe location can be set in LPCplus
- Automatic sensor recognition via RFID
- Up to 16 sensors for monitoring at various probe positions
- Guaranteed service life of 100 cycles for the entire sensor
- GMP design of the antenna and sensor
- Fully integrated in loading and unloading systems
- Fully integrated in the SCADA system



Maximize Productivity

Loading and unloading systems for optimal process performance



Our loading and unloading systems complement our product range perfectly. They are individually adapted to the needs of our customers, taking into account the capacity of the freeze dryers as well as all relevant requirements, including GMP regulations. Our offer ranges from manual solutions to semi- and fully automatic frame loading systems to fully automatic loading and unloading systems based on different principles.

Martin Christ's loading and unloading systems are specifically designed to transport pharmaceutical products safely and efficiently. These capabilities were further enhanced by adding the loading and unloading manufacturer Motus Engineering to our family of companies. Our wide range of systems includes pilot to production sizes and allows for customized adaptation to any layout and project-related requirements. High performance and reliability are fundamental features of our solutions that ensure maximum process reliability.

Our frame loading systems boast excellent efficiency and flexibility. We offer different solutions from semi-automatic to fully automated systems that meet a diverse range of requirements. These solutions are ideal for medium-sized batches and retrofit projects as they can be seamlessly integrated into existing infrastructures.

Fully automatic vial handling is possible thanks to our push-pull systems, especially at high filling speeds and without the need for operator intervention. We can adapt the various system configurations, from the classic push-pull system to our innovative LyoShuttle system, to suit best your individual requirements.

In addition, we use containment technologies to ensure the highest safety standards when handling hazardous products and sterility in demanding environments. These technologies play a crucial role in ensuring the safety of operators and products, especially in sensitive production environments.

Choose from a variety of solutions of loading and unloading. You can have them set up to work systematically with your upstream and downstream equipment.



MOTUS
Life Science Technology

Together we can do more
Motus is part of Christ group

www.martinchrist.de/motus

Frame loading systems

Efficient and customizable solutions for the pharmaceutical industry

The pharmaceutical industry is currently experiencing a growing need for frame loading systems, which help to raise the transport process to a significantly higher level of performance. These systems stand out thanks to their ability to harmoniously combine efficiency and flexibility in various applications. This versatility makes it a crucial option for optimizing vial handling. These solutions are particularly suitable for medium-sized batches and retrofit projects, as they can be seamlessly integrated into existing infrastructures.

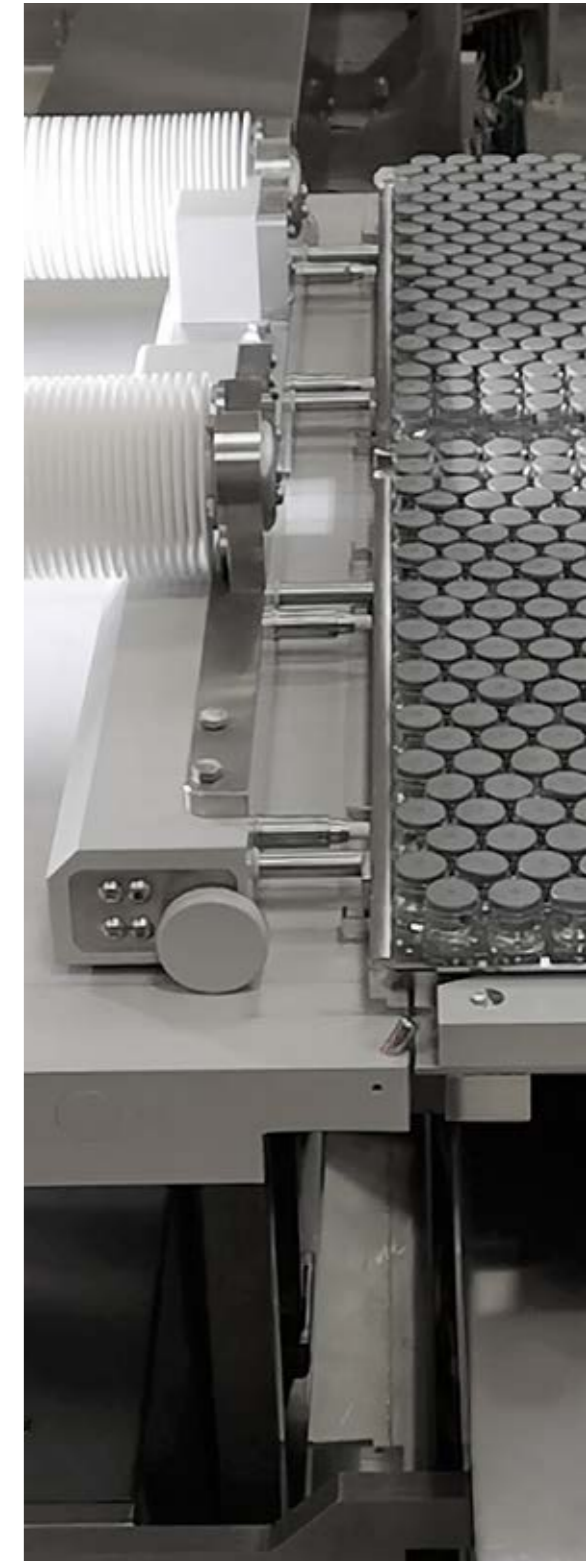
Our frame loading systems are versatile and can be used for both smaller freeze dryers and production lines with multiple freeze dryers. Rail systems for transport vehicles do not require integration into the building floor. Our systems enable optimum loading for both swing doors and slot doors. The working height can be adjusted as required, and it is easy to seamlessly integrate maganizers (frame-loaders) downstream of the filling machine.

The frames can be picked up by an autoclave to ensure the highest hygiene standards. Versions with cRABS and washdown comply with the most stringent safety and hygiene standards during the loading and unloading process.

Semi-automatic frame loading systems provide excellent balance between automation and manual interaction. They are ideal for applications where flexibility and adaptability is required without impacting efficiency or precision. These systems are a valuable addition to production plants that require a combination of automated and manual processes.

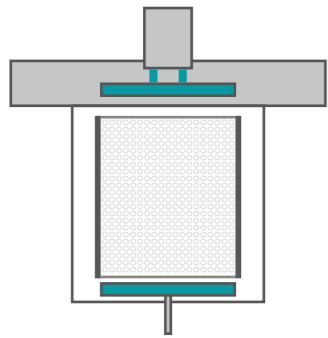
Fully automatic frame loading systems allow the various process steps to be carried out without manual intervention by the operator to ensure maximum production safety.

- Flexible and customizable designs
- High production safety and product quality
- Fulfilment of CMP requirements
- Cost-effective solutions
- Seamless integration into existing infrastructures

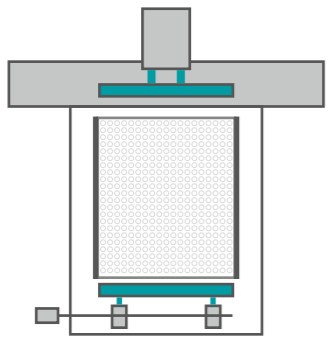


Push-pull systems for production freeze dryers

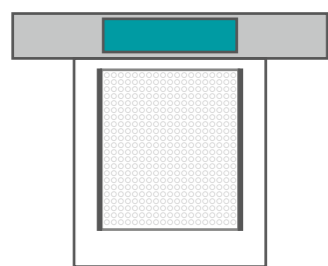
Highest efficiency and quality



Push-BackPusher (PBP) System



Push-BackChain (PBC) System



Push-InsidePush (PIP) System

Our advanced push-pull systems for production freeze dryers come with a range of innovative features to significantly increase the efficiency and quality of your production processes. The batch loading allows for precise arrangements of vials in the freeze dryer, which not only optimizes the available space, but also greatly increases the overall efficiency of your processes.

Our loading and unloading systems move vials at impressive speeds, both when loading (up to 450 vials per minute) and when unloading (up to 600 vials per minute).

The systems ensure accurate vial counting and placement, reducing errors to an absolute minimum. We offer various designs such as unload pushers (PBP), chain push systems (PBC) and LyoShuttle (PIP), which are carefully selected and customized to suit production requirements. Overall concepts are based on a variety of standard assemblies to be perfectly customized to your specific requirements.

Proper integration of loading and unloading ensures reliable buffering of vials and enables a smooth production process. Our systems allow multiple series of vials to be unloaded simultaneously and at high speed, which is crucial to increasing your production performance. We offer flexible solutions for connection to a filling line, both after filling and to the capping machine. When multiple freeze dryers need to be supplied, our distribution systems can be used efficiently to precisely direct the vials to the appropriate freeze dryers.

Integration with containment solutions such as RABS or isolators ensures that hazardous and sensitive products are handled safely in controlled environments. Format parts with anti-static properties minimize the risk of electrostatic discharge and ensure your sensitive products are perfectly transported.

- Maximum performance up to 600 vials/min
- Precise counting and exact batch formation
- Flexible single and multi-row unloading
- Seamless integration into overall filling lines
- Efficient distribution systems for multiple freeze dryer

LyoShuttle

A cutting-edge loading and unloading system (Push-InsidePush)

The LyoShuttle system represents the pinnacle of innovation when it comes to row-by-row loading and unloading of freeze dryers. It is the optimal choice for this task.

Our LyoShuttle system employs cutting-edge technology to streamline the loading and unloading process of freeze dryers. A battery-powered wireless robot is responsible for efficiently handling this task. This robot utilizes a toothed belt drive to move horizontally along a set of rails positioned at a consistent loading level, adjacent to both the left and right sides of the shelf package. Communication between the loading robot and the controller occurs through secure wireless communication channels. This innovative technology ensures that no moving components are located inside the freeze dryer system.

During the loading process, the robot pushes the vial package onto the shelf. After the freeze drying cycle, the shelf package is raised slightly. The LyoShuttle robot then moves beneath the loaded shelves to a designated parking position behind the shelf package. The shelf to be unloaded is subsequently moved to the unloading height (maintaining a constant loading level), and the robot pushes the vial package back to the conveyor belt.

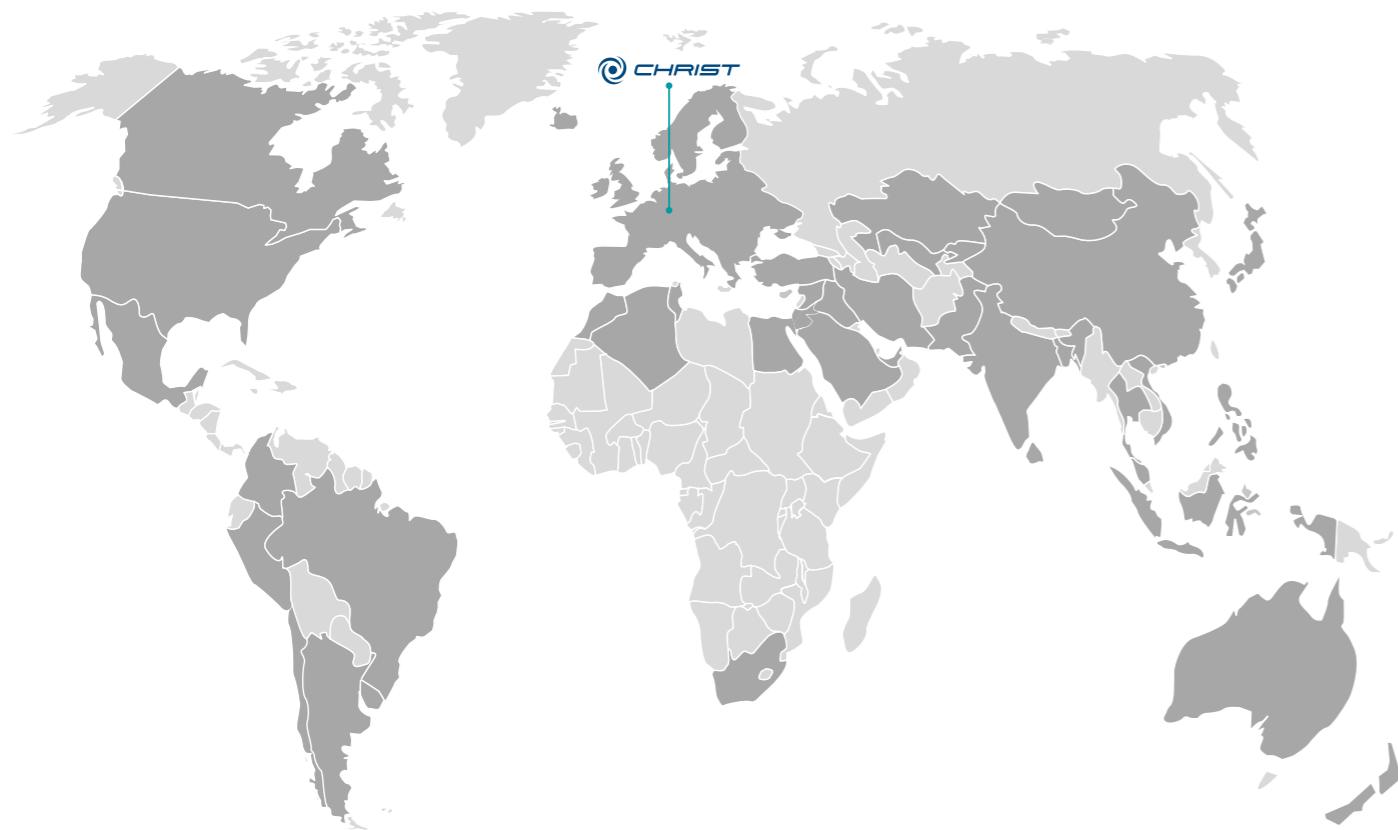
In essence, our system operates exclusively in front of, behind, and beneath the vials, eliminating any moving parts above the vials containing the product. The innovative LyoShuttle technology ensures that no moving components are situated within the freeze drying system. Its compact design allows for easy access to all components, simplifying the cleaning process. We have taken all GMP considerations into account in the design of the LyoShuttle system, with a particular focus on compact construction for use in isolators, excellent accessibility, and outstanding cleaning and decontamination capabilities.

- No moving components above the vials
- Robust operation with minimal moving parts
- Compact footprint
- Easy to clean and decontaminate
- Designed for operation within isolators



Global service

Service network in over 70 countries worldwide



Lifetime support by Martin Christ

At Martin Christ, we attach importance to high service quality, and offer comprehensive services for all aspects of our products. Our goal is to ensure optimal functionality and long service life of your system by consulting, supporting, or implementing. Decades of experience enable us to act quickly and competently. Check it out for yourself...

- Specialised and certified service technicians on site
- Online support for problems
- 24/7 hotline for technical solutions to problems
- Short response times in case of malfunction or fault
- Calibration of all sensors, incorporating local standards
- Wear parts and critical spare parts available for at least 10 years
- Planning and coordination of maintenance activities
- Comprehensive retrofits and upgrades to ensure system reliability

Our product spectrum

Comprehensive program of freeze dryer systems



We also manufacture laboratory-scale freeze dryers and RVCs (Rotational vacuum concentrators) for routine applications and R&D.

- 1 Pilot freeze drying systems for process development and optimization, with ice condenser capacities from 4 to 16 kg.
- 2 Freeze drying systems for industrial production, with ice condenser capacities from 20 to 500 kg, individualized systems planning including loading and unloading.
- 3 Manual, semi-automatic and fully automatic loading systems to fully automatic push-pull loading and unloading systems from pilot to production size.



Martin Christ
Gefriertrocknungsanlagen GmbH

An der Unteren Söse 50
37520 Osterode am Harz

Tel. +49 (0) 55 22 50 07-0

info@martinchrist.de
www.martinchrist.de