



## Loading and unloading system LyoShuttle

The product range of the Martin Christ Company has been expanded to include the new, patent-pending LyoShuttle automated loading and unloading system. The freeze-dryer is loaded by a loading robot that uses timing belts to move horizontally.

The loading robot moves on a set of rails mounted at the constant loading level alongside the shelf set. Motive force is provided by battery-powered stepper motors. The batteries are charged wirelessly when the robot is in the parked position in front of the freeze-dryer. The loading robot communicates wirelessly with the controller.

Thanks to its flexible and space-saving construction, the LyoShuttle option is particularly suitable for production freeze dryers in the pharmaceutical field, including under insulated conditions, and requires significantly less space.

**The LyoShuttle system from Martin Christ has outstanding advantages to ensure product quality and production reliability:**

- **No moving parts above the vials**  
Many common systems have an unloading bar that moves above the vials filled with the product. With the LyoShuttle system from Martin Christ, the shelf package is raised a few centimeters to allow unloading of the vials. The integrated unloading beam of the LyoShuttle moves beneath the loaded shelves to a parked position behind the shelf package. The shelf to be unloaded can then be moved to the unloading height (constant loading level). With LyoShuttle, there is never any moving part above the vials filled with the product, even after capping. Conclusion: In summary, with the LyoShuttle, we only move in front, behind and beneath the vials.
- **No additional space needed above the vials**  
With most of the usual push-pull systems, up to 50 mm of additional space above the capped vials – for each shelf – is necessary for unloading freeze dryers with an unloading bar. This makes the freeze dryer 50 to 100 cm higher than usual, significantly increasing production costs. The unloading bar of the LyoShuttle system moves below the shelves loaded with vials. No additional space is necessary above the vials, so the freeze dryer can be made lower.
- **Compact, easy-to-clean construction with proper insulation**  
All GMP aspects have been consistently taken into account in the design of the LyoShuttle system. Particular attention has been given to compact construction for use in isolators or LAF units, along with good accessibility and excellent cleaning capability. Service-friendliness was also given special attention as the design was developed.

- **Integrated automation LPCplus**

With LPCplus, we offer a comprehensive automation solution for process visualization and documentation, which we have further adapted for LyoShuttle. All processes can be visualized, operated, and documented continuously from loading and unloading to freeze drying. Of course, integrated solutions for insulation technology and filling lines are no trouble at all with our open and flexible solution approaches, and have already been proven in practice many times over.

- **Optional redundant technology**

For the first time in a fully automated loading and unloading system, we offer redundant system components in order to ensure system availability with cGMP compliance, even in critical situations. For example, electrical, rechargeable batteries, and charging stations are designed to be redundant. All systems are sized to be able to support full cycles. The redundancy thus significantly improves the availability of the system.



LyoShuttle loading



LyoShuttle unloading



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