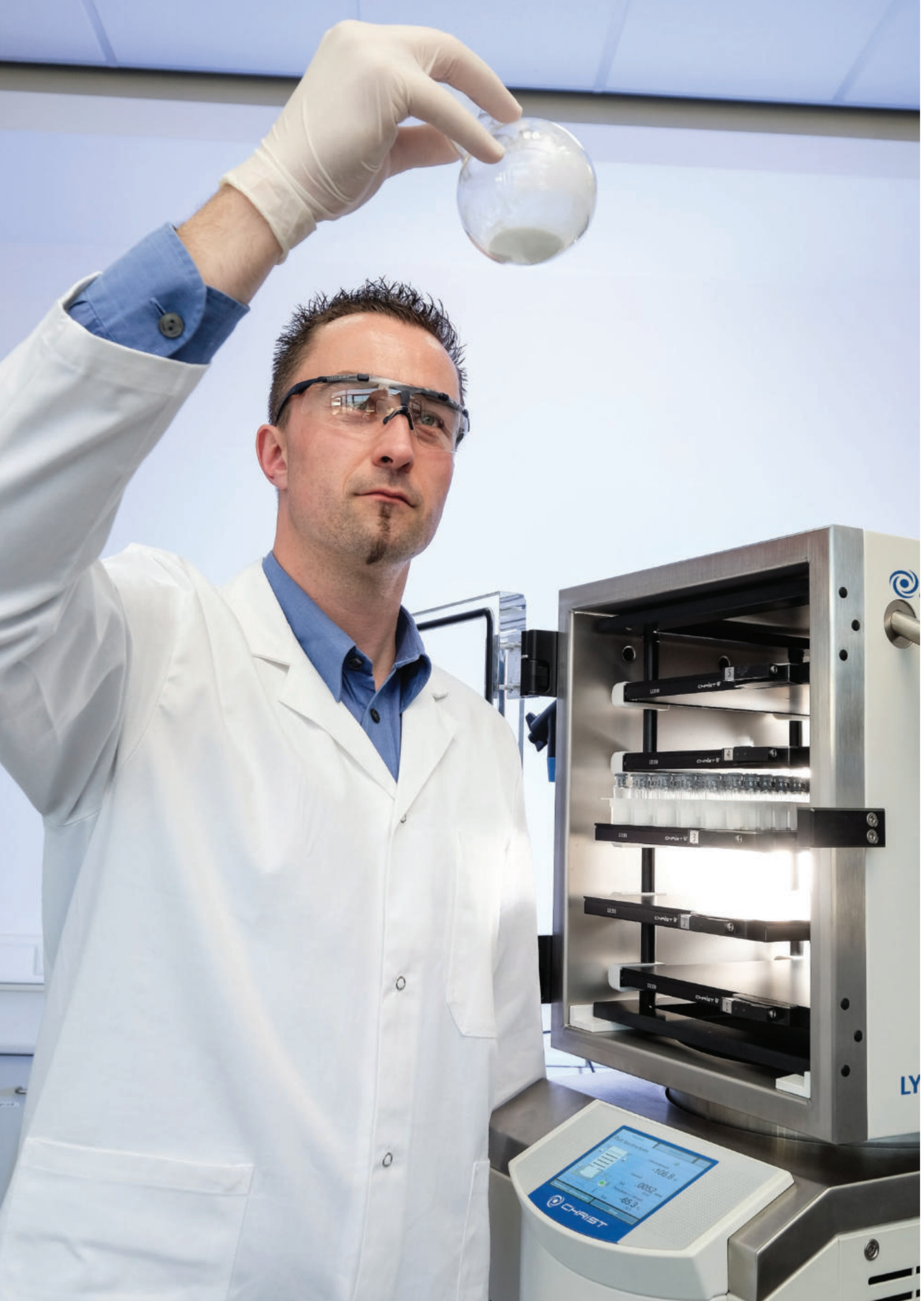
Laboratory freeze drying systems
Advanced applications

Process management and control with LSCplus

www.martinchrist.de



Perfect process operation

for first-class products

Optimal process control and reproducibility for quick and reliable freeze drying

We are the leading manufacturer of freeze drying systems, with over 75 years of experience in all aspects of freeze drying, including devices for special applications. We offer you a closely graduated series of systems for product-specific freeze drying with a wide range of optimization options. The highly diverse, modularly structured range of accessories allows the laboratory freeze drying systems to be used for a wide variety of tasks.

Outstanding products thanks to superior technology and comprehensive service

We developed the LSCplus control unit, featuring intuitive operation, for better process management and process control of freeze drying systems. It is used in all laboratory and pilot freeze drying systems and enables perfect control matched to the process concerned. A variety of PAT tools are integrated and offer excellent opportunities for product development and automatic control of the process sequence.

The best possible overall system for advanced applications

- Innovative LSCplus-controller with color touchscreen
- Manual or automatic processes
- Easy operation with Wireless Shelf Technology (WST)
- Precise regulation of shelf temperature for uniform temperature distribution
- Drying chamber above the ice condenser chamber for high sublimation performance and short process times
- Ice condenser chamber with internal condenser coils, all made of high-grade stainless steel
- Integrated hot gas function for quick defrosting
- Modular structure for an extremely wide range of applications
- Extensible with numerous accessories

Detailed application examples:
martinchrist.de/application

Make the right choice

Graduated ice condenser temperatures and drying capacities

The laboratory freeze dryers in the LSCplus series are available in several sizes with a wide range of accessories to match individual applications.

Product designation format

Alpha 1-4 LSCplus

- Alpha: System type
- 1: Ice capacity
- 4: Temperature
- LSCplus: Controller type

Laboratory freeze dryer systems are also available with two different ice condenser temperatures:

Temperature	Temperature	Typical application area
1	–55 °C	Aqueous products
2	–85 °C	Products with low freezing points

The various models have different maximum ice capacities:

Maximum ice capacity	System type
4 kg	Alpha 1-4 LSCplus Alpha 2-4 LSCplus
8 kg	Beta 1-8 LSCplus Beta 2-8 LSCplus
16 kg	Gamma 2-16 LSCplus
24 kg	Delta 2-24 LSCplus

Tell us your task requirements – we will be pleased to advise you.

4 kg

–55 °C
–85 °C

Alpha 1-4 LSCplus
Alpha 2-4 LSCplus

8 kg

–55 °C
–85 °C

Beta 1-8 LSCplus
Beta 2-8 LSCplus

16 kg

–85 °C

Gamma 2-16 LSCplus

24 kg

–85 °C

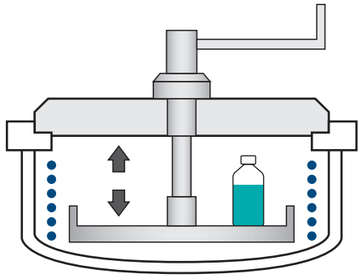
Delta 2-24 LSCplus

Drying methods for laboratory systems

Single-chamber and double-chamber methods

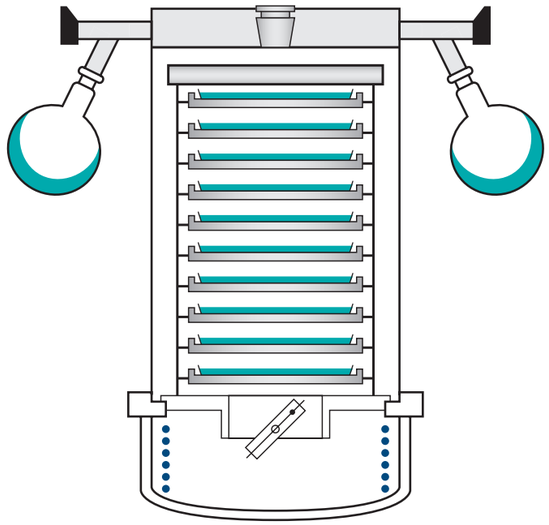
The freeze drying systems with the LSC-plus controller set standards for application diversity and process control. The modular range of accessories enables application-specific system configurations that fulfil all requirements. Two different drying methods are available to handle virtually every task.

Single-chamber method
With this unique configuration, the product is frozen inside the ice condenser chamber and then dried. This method is particularly suitable for substances with a low freezing point or thermally unstable substances. In this method, the shelves are located directly in the ice condenser chamber. Freezing can also be assisted by a fan. A sealing device for vials can optionally be used.



Single-chamber method

Double-chamber method
With this configuration the product is separately pre-frozen and then dried above the ice condenser chamber.
This method allows a large variety of accessories to be used. An intermediate valve can be used to separate the product chamber from the ice condenser chamber for the pressure rise test.



Double-chamber method

Intuitive touchscreen user interface

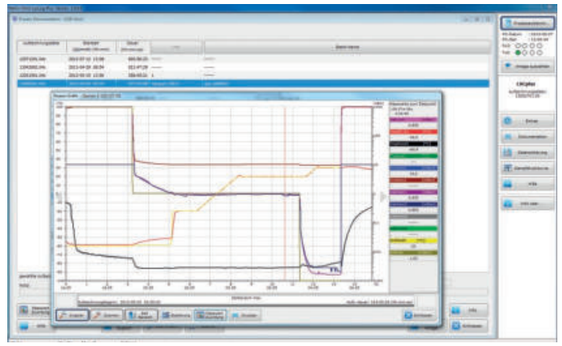
LSCplus with add-ons for seamless documentation and analysis

The LSCplus system controller incorporates pioneering technologies to provide a simple, intuitive user interface. All of the accessories are also integrated.
Reproducible results are assured by automatic process sequences.

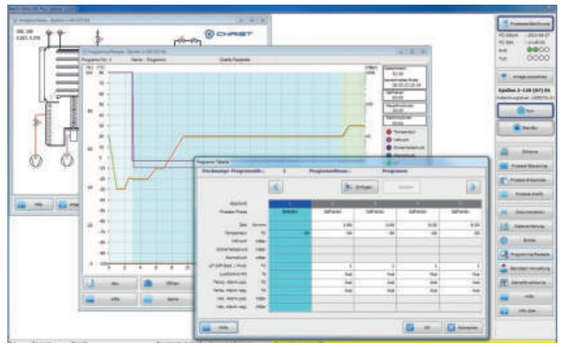
- Color touchscreen with clear presentation
- Automated or manual sequencing of freeze drying processes
- Intuitive program entry using various freeze drying sequences or recipes
- Memory for 32 user-defined programs with the optional program selector
- Graphical display of freeze drying sequence
- Choice of several continuation conditions, depending on the system configuration
- Detailed messages
- Large selection of languages
- Selectable units for temperature (°C, °F) and pressure (mbar, hPa, Torr)
- Optional password protection
- Process data acquisition and optional data exchange over USB or Ethernet

LyoLogplus Documentation Software
The demands on process monitoring and validation in the laboratory are increasing. The documentation and archiving of all process data can be carried out efficiently and reliably with the LyoLogplus software. The data can be transferred from the freeze dryer via USB or directly to the PC via Ethernet. LyoLogplus allows complete documentation and subsequent analysis of the processes with an intuitive user interface.

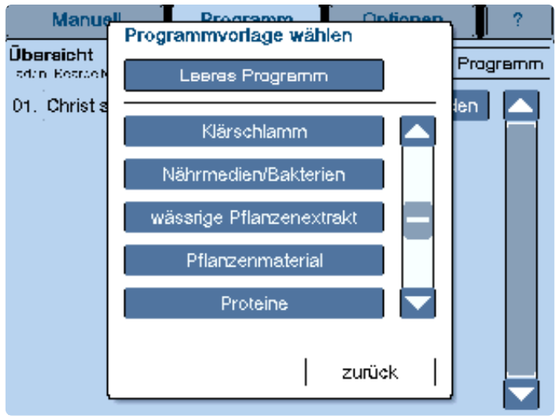
LPCplus SCADA Software
With LPCplus, freeze drying applications can be developed and process data can be viewed in real time on a graphical display. LPCplus offers the same options as LyoLogplus. Consistent and uniform operation across all system sizes is guaranteed as LPCplus is also used for pilot and production lyophilization systems and complies with the latest GAMP guidelines.



LyoLogplus documentation software



LCPplus control and documentation software



Program templates for typical applications

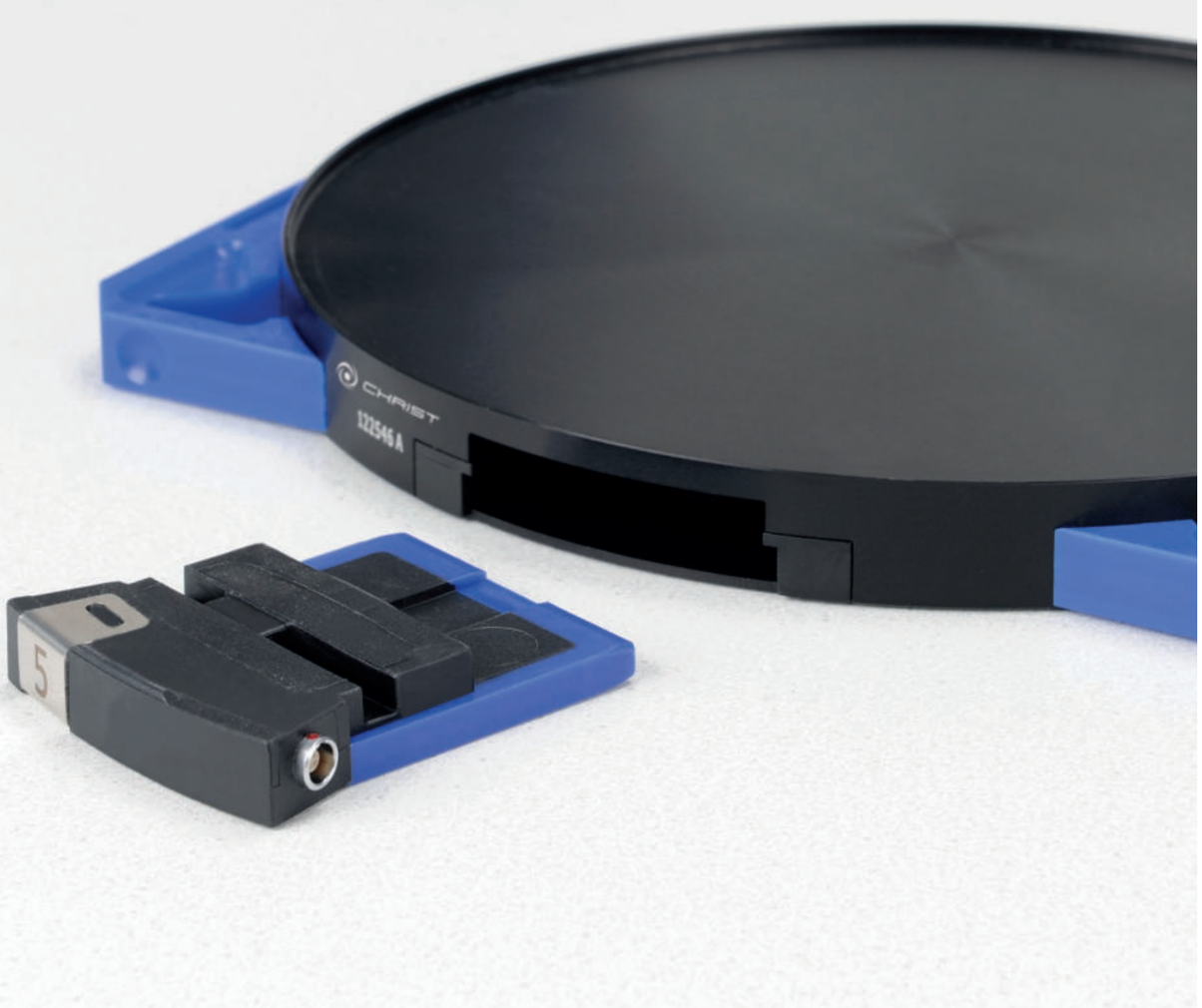
Wireless Shelf Technology
Convenience and time savings
thanks to wireless technology.

Wireless technology for individual handling

Wireless Shelf Technology (WST)

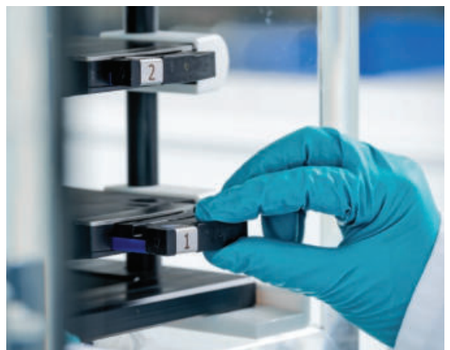
Unique wireless technology with individual handling of each shelf
Unique and innovative Wireless Shelf Technology (WST) eliminates the need for cables between the freeze drying system and the heated shelves. Each shelf is equipped with an easily removable LyoBus module (see picture page 20). This system also gives you significantly better process control and process monitoring options.

- Heated shelves without a separate controller, for a fast and regulated drying process
- Uniform drying thanks to a temperature distribution of ±1 K over each shelf
- Easy shelf handling. The shelves with the grips on the sides are easy to insert and remove from the rack
- A temperature sensor or a LyoRx sensor (for freezing point determination and process control) can be connected to each LyoBus module



Wireless Shelf Technology (WST)
Rack with five WST shelves and one temperature sensor

Frontlader for extremely simple operation



Easy front loading

LyoCube stainless steel and LyoCube acrylic glass

View LyoCube acrylic glass product video

Front loader for extremely simple operation with large capacity

LyoCube is the ideal solution when fast and convenient loading is a primary consideration or bulky products have to be freeze dried.

- It is compatible with every Martin Christ laboratory freeze drying system with an LSCplus controller
- Rectangular shelves with a hinged door for convenient operation
- With WST Wireless Shelf Technology (WST), which means no cables between the shelves and the base unit
- One temperature sensor or LyoRx sensor per shelf for optimal process management
- Easy removal of shelves and rack, e.g. for tall containers
- Standard configuration with five shelves (0.38 m^2)
- Maximum eight shelves for optimal utilization with MTP or deep-well plates
- Also available with six connectors for flask drying (only LyoCube stainless steel)
- Extensive accessories including thermoblocks, product trays and product screens

Possible number of shelves
Dimensions (W x D): 256 x 300 mm

Usable shelf area	Total shelf area A_{tot}	Shelf spacing
1 shelf	0.08 m^2	348.0 mm
2 shelves	0.15 m^2	165.0 mm
3 shelves	0.23 m^2	105.4 mm
4 shelves	0.31 m^2	73.5 mm
5 shelves	0.38 m^2	55.2 mm
6 shelves	0.46 m^2	43.0 mm
7 shelves	0.54 m^2	34.2 mm
8 shelves	0.61 m^2	27.7 mm

LyoCube acrylic glass

LyoCube stainless steel with six connectors for flask drying (option)

Example configurations

Alternative configurations possible – ask us!

Alpha 1-4 LSCplus
Alpha 2-4 LSCplus

4 kg | –55 °C / –85 °C

	Manifold [1]	Shelves				Application
No.	Number of vessels	Number	Ø	A_{tot}	Spacing	Special features
1	–	1	200 mm	0.031 m²	70 mm	Freezing and drying inside the ice condenser (single-chamber method) on a heatable shelf, optionally with a fan.
2	–	1	200 mm	0.031 m²	70 mm [2]	Freezing and drying inside the ice condenser (single-chamber method) on a heatable shelf with a sealing device for vials, optionally with a fan.
3	2 x 12	–	–	–	–	For round-bottom flasks, wide-neck filter bottles or ampoule distributors.
4	8	–	–	–	–	For round-bottom flasks, wide-neck filter bottles or ampoule distributors.
5	12	5	200 mm	0.155 m²	25 mm	Heatable shelves, variable spacing by removing individual shelves, additional optional connectors for round-bottom flasks, wide-neck filter bottles or ampoule distributors.
6	–	10	200 mm	0.31 m²	25 mm	Heatable shelves, variable spacing by removing individual shelves.
7	12	2	250 mm	0.09 m²	45 mm [2]	Heatable shelves with sealing device, shelf spacing can be increased to 110 mm by removing a shelf, additional connectors for round-bottom flasks, wide-neck filter bottles or ampoule distributors.
8	–	4	250 mm	0.18 m²	50 mm [2]	Heatable shelves with sealing device, variable spacing up to 290 mm by removing individual shelves.
9	–	5	256 x 300 mm	0.38 m²	55 mm	LyoCube stainless steel with heatable shelves, spacing variable by removing individual shelves.
10	20	–	–	–	–	F for round-bottom flasks, wide-neck filter bottles or ampoule distributors.
11	–	5	256 x 300 mm	0.38 m²	55 mm	LyoCube acrylic glass with heated shelves.

1) For round-bottom flasks, wide-neck filter bottles or ampoule distributors
2) Spacing for sealing device


1


2


3


4


5


6


7


8


9


10


11

Example configurations

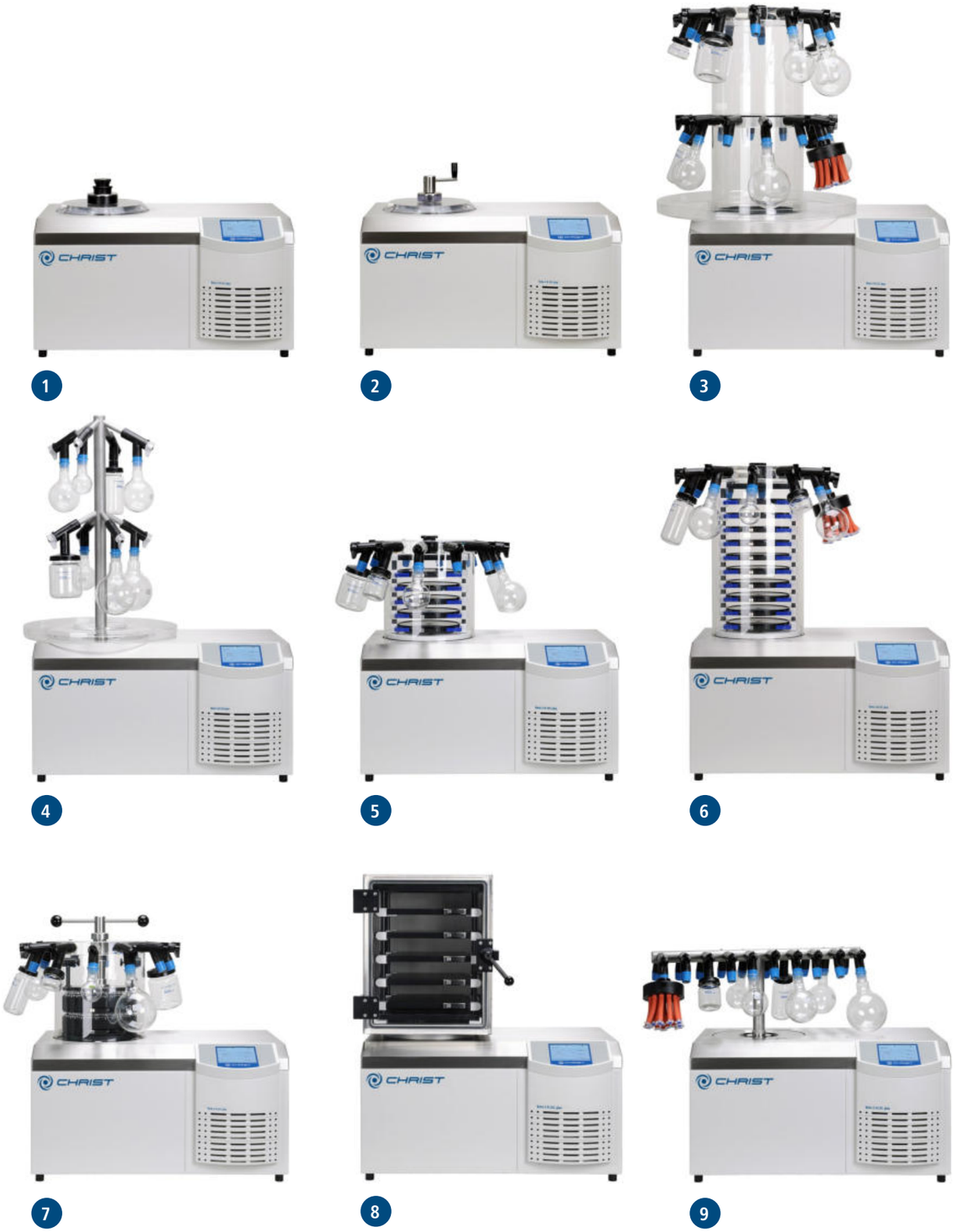
Beta 1-8 LSCplus
Beta 2-8 LSCplus

8 kg · –55 °C / –85 °C

	Manifold [1]	Shelves				Application
No.	Number of vessels	Number	Ø	A_{tot}	Spacing	Special features
1	–	1	200 mm	0.031 m²	70 mm	Freezing and drying inside the ice condenser (single-chamber method) on a heatable shelf, optionally with a fan.
2	–	1	200 mm	0.031 m²	70 mm [2]	Freezing and drying inside the ice condenser (single-chamber method) on a heatable shelf with a sealing device, optionally with a fan.
3	2 x 12	–	–	–	–	For round-bottom flasks, wide-neck filter bottles or ampoule distributors.
4	8	–	–	–	–	For round-bottom flasks, wide-neck filter bottles or ampoule distributors.
5	12	5	200 mm	0.155 m²	25 mm	Heatable shelves, variable spacing by removing individual shelves, additional optional connectors for round-bottom flasks, wide-neck filter bottles or ampoule distributors.
6	12	10	200 mm	0.31 m²	25 mm	Heatable shelves, variable spacing by removing individual shelves, additional optional connectors for round-bottom flasks, wide-neck filter bottles or ampoule distributors.
7	12	2	250 mm	0.09 m²	45 mm [2]	Heatable shelves with sealing device, shelf spacing can be increased to 110 mm by removing a shelf, additional connectors for round-bottom flasks, wide-neck filter bottles or ampoule distributors.
8	–	5	256 x 300 mm	0.38 m²	55 mm	LyoCube stainless steel with heatable shelves, spacing variable by removing individual shelves.
9	20	–	–	–	–	Manifold for round-bottom flasks, wide-neck filter bottles or ampoule distributors.

1) For round-bottom flasks, wide-neck filter bottles or ampoule distributors
2) Spacing for sealing device

Alternative configurations possible – ask us!



Example configurations

Gamma 2-16 LSCplus

16 kg –85 °C

	Manifold [1]	Shelves				Application
No.	Number of vessels	Number	Ø	A_{tot}	Spacing	Special features
1	–	5	200 mm	0.155 m²	25 mm	Freezing and drying inside the ice condenser (single-chamber method) on heatable shelves, spacing variable by removing individual shelves, optionally with a fan.
2	–	2	250 mm	0.09 m²	45 mm [2]	Freezing and drying inside the ice condenser (single-chamber method) on heatable shelves with sealing device, spacing can be increased to 110 mm by removing a shelf, optionally with a fan.
3	2 x 12	–	–	–	–	For round-bottom flasks, wide-neck filter bottles or ampoule distributors.
4	8	–	–	–	–	For round-bottom flasks, wide-neck filter bottles or ampoule distributors.
5	12	5	200 mm	0.155 m²	25 mm	Heatable shelves, variable spacing by removing individual shelves, additional connectors for round-bottom flasks, wide-neck filter bottles or ampoule distributors.
6	–	10	200 mm	0.31 m²	25 mm	Heatable shelves, variable spacing by removing individual shelves.
7	12	2	250 mm	0.09 m²	45 mm [2]	Heatable shelves with sealing device, shelf spacing can be increased to 110 mm by removing a shelf, additional connectors for round-bottom flasks, wide-neck filter bottles or ampoule distributors.
8	–	4	250 mm	0.18 m²	50 mm [2]	Heatable shelves with sealing device, variable spacing up to 290 mm by removing individual shelves.

1) For round-bottom flasks, wide-neck filter bottles or ampoule distributors
2) Spacing for sealing device

Alternative configurations possible – ask us!

1

2

3

4

5

6

7

8

Example configurations

Delta 2-24 LSCplus

24 kg –85 °C

	Manifold [1]	Shelves				Application
No.	Number of vessels	Number	Ø	A_{tot}	Spacing	Special features
1	–	10	200 mm	0.31 m²	25 mm	Freezing and drying inside the ice condenser (single-chamber method) on heatable shelves, spacing variable by removing individual shelves, optionally with a fan.
2	–	4	250 mm	0.18 m²	45 mm [2]	Freezing and drying inside the ice condenser (single-chamber method) on heatable shelves with sealing device, spacing can be increased to 110 mm by removing a shelf, optionally with a fan.
3	2 x 12	–	–	–	–	For round-bottom flasks, wide-neck filter bottles or ampoule distributors.
4	12	10	200 mm	0.31 m²	25 mm	Heatable shelves, variable spacing by removing individual shelves, additional optional connectors for round-bottom flasks, wide-neck filter bottles or ampoule distributors.
5	–	4	250 mm	0.18 m²	50 mm [2]	Heatable shelves with sealing device, variable spacing up to 290 mm by removing individual shelves.
6	–	8	375 mm	0.88 m²	48 mm	Heated shelves, larger spacing available upon request, optional hoist for drying chamber available.

1) For round-bottom flasks, wide-neck filter bottles or ampoule distributors
2) Spacing for sealing device

Alternative configurations possible – ask us!

1

2

3

4

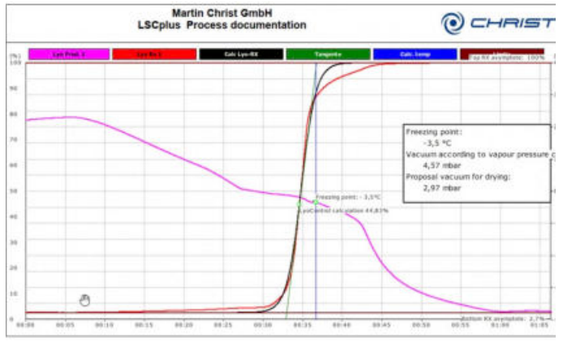
5

6

Perfect tools

for optimizing your freeze drying processes

The freeze drying systems in the LSCplus series offer various options for the optimization of freeze drying processes. Along with the documentation and analysis of many types of essential data, critical product data can be acquired and used for monitoring and process control in fully automatic programs. In this way, theses laboratory freeze drying systems offer many features to support process development and optimization, which can provide important information for
scale-up analyses.



Freezing point determination using LyoLogplus software

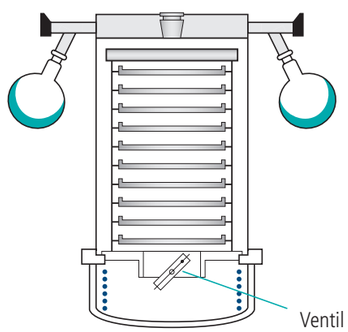
Freezing point
The LyoRx sensor can be used to measure the electrical resistance and temperature of the product. From the curves of these two variables, the LyoControl tool can automatically determine the freezing point. This enables estimation of this critical product temperature, which should not be exceeded during the main drying process in order to avoid thawing of the product.

Product resistance
The LyoRx sensor allows the energy supply to the individual shelves to be controlled automatically during the main drying phase, which reduces the risks of product thawing and other problems. The LyoBus module provides the connection.

LyoBus module with LyoRx sensor

Product temperature
The product temperature can be measured with a Pt100 sensor for each shelf. The product temperatures on the individual shelves can be displayed on the LSCplus system controller. The LyoBus module provides the connection.

Pressure rise test
The transition between main drying and final drying can be determined using the pressure rise test. For this a valve is placed between the product chamber and the ice condenser (see the image on the right). It is briefly closed during the main drying phase. If the pressure rise in the product chamber with the valve closed remains below a defined limit value, moisture is no longer sublimating from the product and final drying can be started automatically.



Double-chamber method

Technical data

Technical data	Alpha 1-4 LSCplus	Alpha 2-4 LSCplus	Beta 1-8 LSCplus	Beta 2-8 LSCplus
Ice condenser				
• Maximum capacity	4 kg	4 kg	8 kg	8 kg
• Temperature	approx. –55 °C	approx. –85 °C	approx. –55 °C	approx. –85 °C
• Chamber volume	approx. 6.5 l	approx. 6.5 l	approx. 11 l	approx. 11 l
Shelf temperature or product temperature during freezing inside the ice condenser with a fan (single-chamber method)	approx. –25 °C	approx. –35 °C	approx. –25 °C	approx. –35 °C
Dimensions of base unit (W x H x D)	390 x 415 x 555 mm	390 x 415 x 555 mm	780 x 415 x 540 mm	780 x 415 x 540 mm
Weight	approx. 48 kg	approx. 60 kg	approx. 63 kg	approx. 78 kg
Electrical connection (other variants available upon request)	220 V / 50 Hz 230 V / 60 Hz 208 V / 60 Hz	220 V / 50 Hz 230 V / 60 Hz 208 V / 60 Hz	220 V / 50 Hz 230 V / 60 Hz 208 V / 60 Hz	220 V / 50 Hz 230 V / 60 Hz 208 V / 60 Hz
Nominal power of the base unit	0.4 kW	1.1 kW	0.75 kW	1.1 kW
Noise level as per DIN 45635	54 dB(A)	54 dB(A)	54 dB(A)	54 dB(A)
Defrost function	Hot gas	Hot gas	Hot gas	Hot gas
Vacuum sensor				
• Pirani	●	●	●	●
• Capacitive	○	○	○	○
Vacuum control	●	●	●	●
Temperature				
• Ice condenser (display)	●	●	●	●
• Shelf (display and control)	●	●	●	●
• Product (display of max. 10 sensors)	●	●	●	●
End point determination				
• Product temperature measurement	●	●	●	●
• Pressure rise test	○	○	○	○
Communication				
• Ethernet (LAN)	●	●	●	●
• Program selector	○	○	○	○
• USB	○	○	○	○
• LyoControl	○	○	○	○
• LyoLogplus	○	○	○	○
• LPCplus	○	○	○	○

The data provided refers to the base unit with ambient conditions of +10 °C to +25 °C.

● Basic Equipment ○ Optional

Subject to change without prior notice.

Technical data

Technical data	Gamma 2-16 LSCplus	Delta 2-24 LSCplus
Ice condenser • Maximum capacity • Temperature • Chamber volume	16 kg approx. –85 °C approx. 30 l	24 kg approx. –85 °C approx. 45 l
Shelf temperature or product temperature during freezing inside the ice condenser with a fan (single-chamber method)	approx. –35 °C	approx. –35 °C
Dimensions of base unit (W x H x D)	860 x 485 x 650 mm	860 x 1050 x 650 mm
Weight	approx. 160 kg	approx. 250 kg
Electrical connection (other variants available upon request)	220 V / 50 Hz 230 V / 60 Hz 208 V / 60 Hz	3x 400 V / 50 Hz
Nominal power of the base unit	1 kW	1.3 kW
Noise level as per DIN 45635	54 dB(A)	54 dB(A)
Defrost function	Hot gas	Hot gas
Vacuum sensor • Pirani • Capacitive	 ● ○	 ● ○
Vacuum control	●	●
Temperature • Ice condenser (display) • Shelf (display and control) • Product (display of max. 10 sensors)	 ● ● ●	 ● ● ●
End point determination • Product temperature measurement • Pressure rise test	 ● ○	 ● ○
Communication • Ethernet (LAN) • Program selector • USB • LyoControl • LyoLogplus • LPCplus	 ● ○ ○ ○ ○ ○	 ● ○ ○ ○ ○ ○

The data provided refers to the base unit with ambient conditions of +10 °C to +25 °C.
Subject to change without prior notice.

● Basic Equipment ○ Optional

Our product range

With a unique and broad graduated range of devices and accessories, we can supply freeze drying systems and vacuum concentrators for every application. Let us show what we can do!

1. Freeze drying systems for industrial production with ice condenser capacity from 20 to 500 kg; custom system design including loading and unloading systems.
2. Pilot freeze drying systems for process development and/or optimization with ice condenser capacity from 4 to 16 kg.
3. Freeze drying systems for routine applications or research and development with ice condenser capacity from 2 to 24 kg.
4. Rotational vacuum concentrators for applications ranging from routine to evaporation concentration in the high-end range of pharmaceutical research.

Martin Christ
Gefriertrocknungsanlagen GmbH

An der Unteren Söse 50
37520 Osterode am Harz

Phone +49 (0)552-250-070

info@martinchrist.de
www.martinchrist.de

03 / 2024