VERTRIEB DURCH:

RIEGER
Industrievertretungen GmbH

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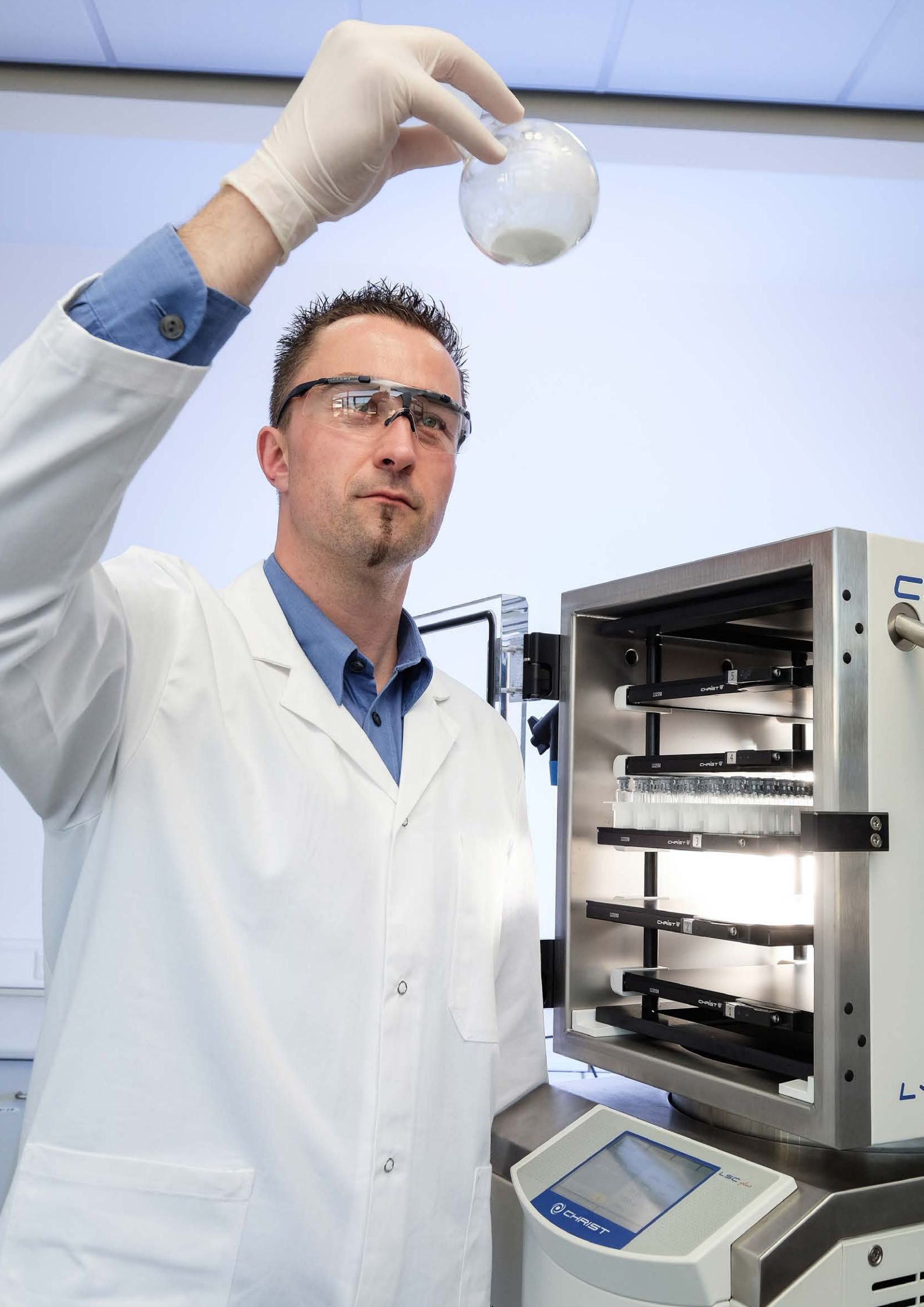
Laboratory Freeze Dryers
Advanced Applications

LSCplus: intuitive
and wireless

www.martinchrist.de


CHRIST
L-SC plus

Perfect process operation

for first-class products

Optimal process control and reproducibility for fastest possible and reliable freeze drying

We are the leading manufacturer of freeze drying systems, with over 65 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 optimisation 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 designed processes can be reliably documented and fulfil the stringent GMP/GAMP requirements, for example for pharmaceutical processes.

The best possible overall system for advanced applications

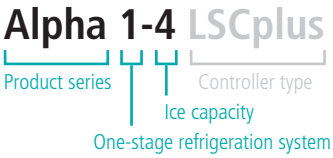
- Innovative LSCplus control system with colour touchscreen
- Manual or automatic processes
- Easy operation with Wireless Shelf Technology (WST)
- Precise regulation of shelf temperature for uniform temperature distribution
- Drying chamber above the ice condenser chamber for high sublimation performance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

Selection criteria

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



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

Temperature	Typical application area
–55 °C (one-stage refrigeration system)	Aqueous products
–85 °C (two-stage refrigeration system)	Products containing solvents or with low freezing points

The various models have different maximum ice capacities:

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

Alpha 1-4 LSCplus
Alpha 2-4 LSCplus

4 kg –55 °C –85 °C

Gamma 1-16 LSCplus
Gamma 2-16 LSCplus

16 kg –55 °C –85 °C

Tell us your task requirements – we will be pleased to advise you at no obligation.

Beta 1-8 LSCplus
Beta 2-8 LSCplus

8 kg

–55 °C
–85 °C

Delta 1-24 LSCplus
Delta 2-24 LSCplus

24 kg

–55 °C
–85 °C

Convenience and time savings thanks to wireless technology.

Wireless Shelf Technology (WST)

Unique wireless technology with easy shelf handling

Unique and innovative (patent pending) 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. 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 the shelves with individual energy input for each shelf
- Easy shelf management. Eliminates the need to connect shelf cables. 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

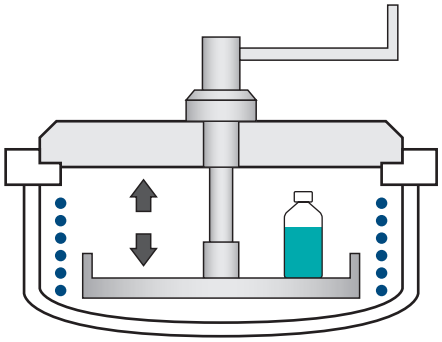
Wireless Shelf Technology (WST)
Rack with five WST shelves and one temperature sensor

Drying Methods

for Laboratory Systems

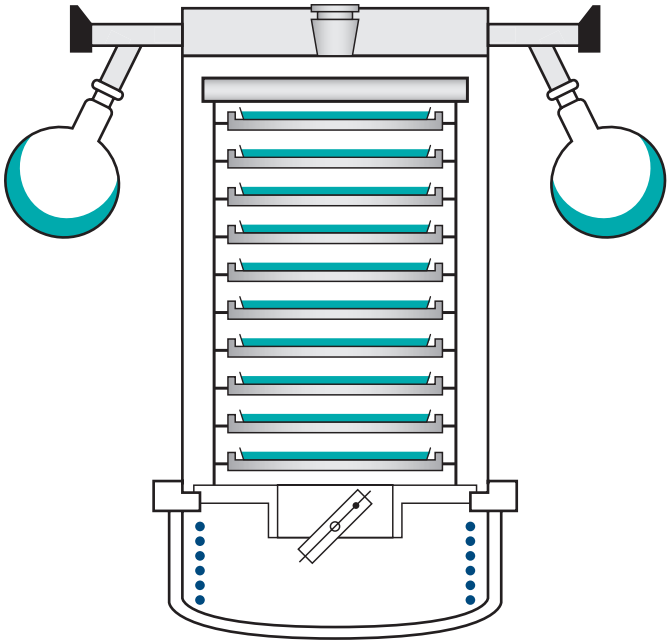
The new freeze drying systems with the LSCplus controller set standards for application diversity and process control. The modular range of accessories enables application-specific configurations that fulfil all requirements. Two different drying methods are available to handle virtually every task.

Single-chamber method (inside)
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. Freezing can also be assisted by a fan. A stoppering device for vials may optionally be used.



Single-chamber method

Double-chamber method (outside)
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 installed to separate the product chamber from the ice condenser for the pressure increase test.



Double-chamber method

Please also see our comprehensive accessories catalogue at

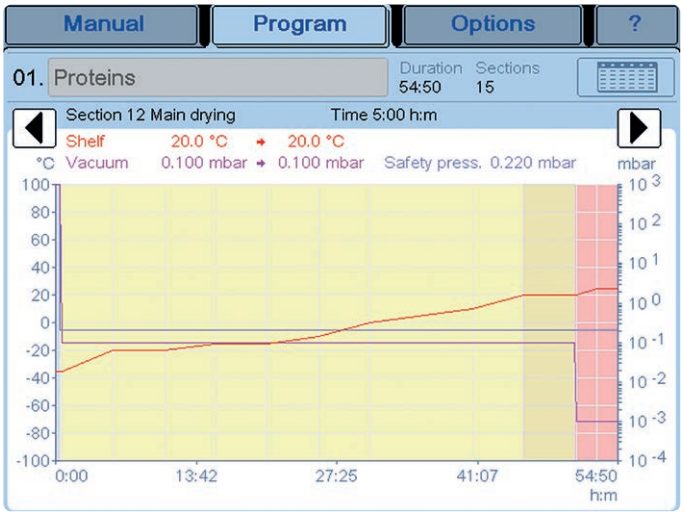
www.martinchrist.de

LSCplus System Controller

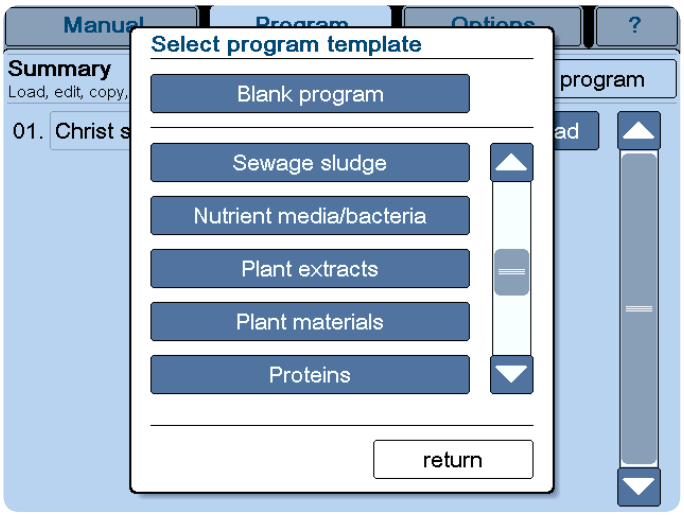
Colour touchscreen and intuitive operation

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.

- Colour touchscreen with clear presentation
- Automatic or manual sequencing of freeze drying processes
- Intuitive program entry using various freeze drying sequences or recipes
- Memory for 32 user-defined programs
- Graphical display of freeze drying sequence
- Choice of several continuation conditions depending on 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



Graphical display of freeze drying sequence (set values)



Program templates for typical applications

Process Monitoring and Documentation

Laboratories in particular are increasingly subject to stringent requirements such as validation or process monitoring.

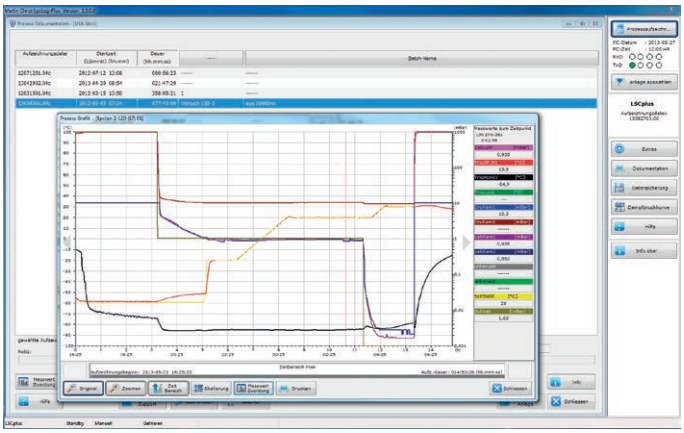
Documentation and archiving of all process data is possible with the LyoLogplus software, which can be installed on a separate PC. The data can be transferred from the freeze drying system to the PC on a USB stick or directly over Ethernet. LyoLogplus enables seamless documentation and post-process analysis with an intuitive user interface.

LPCplus can also be used. With LPCplus you can develop programs for freeze drying and view process data in real time on a graphical display. LPCplus additionally offers the same capabilities as LyoLogplus. Consistent and uniform operation over all system sizes is ensured by the fact that LPCplus is also used in pilot and production freeze drying systems.

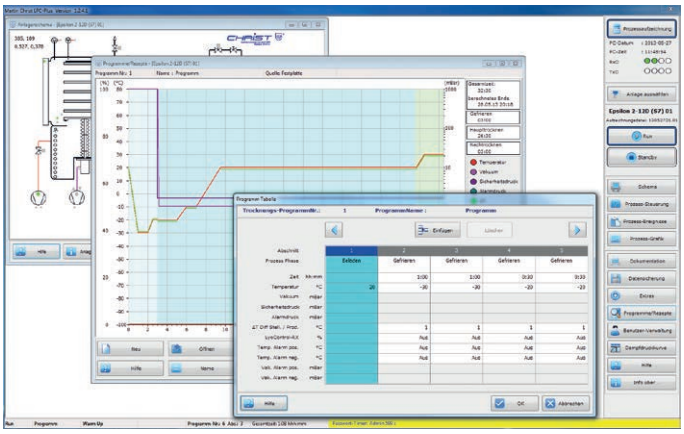
- Data recording on USB data storage media
- Easy process documentation with LyoLogplus
- LPCplus for process control and documentation
- Process monitoring with the LyoRx sensor to avoid undesired thawing
- Automatic freezing point determination with LyoControl for reliable process control
- LyoLogplus and LPCplus with multilingual user interface

The system design of our freeze drying systems is based on the cGMP and GLP guidelines. The optional LPCplus software conforms to the current GAMP guidelines.

System qualification (IQ/QQ) is available upon request.



LyoLogplus documentation software



LPCplus control and documentation software

Process Optimisation

The freeze drying systems in the LSCplus series provide various options for the optimisation 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 optimisation, which can provide important information for scale-up analyses.

Freezing point

The LyoRx sensor can be used to measure the electrical resistance and temperature of the product. From the trends of these two data, the LyoControl can automatically determine the freezing point. This enables the estimation of this critical product temperature, which should not be exceeded during the main drying process in order to avoid melting 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 risk of product thawing and other problems.
The LyoBus module provides the connection.

Product temperature

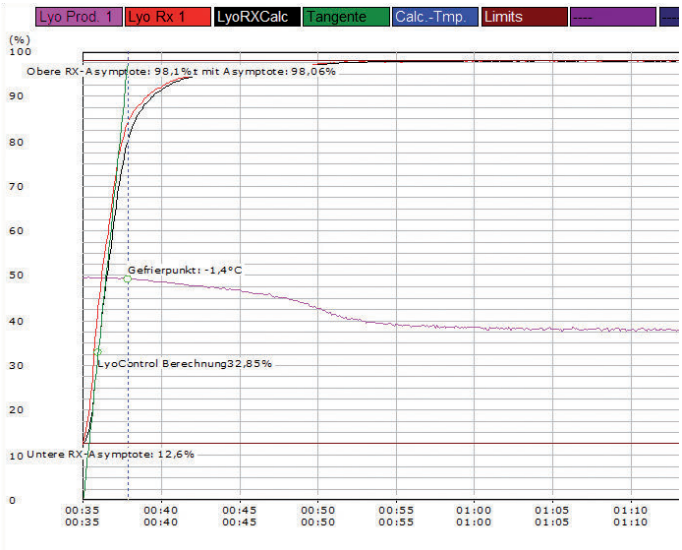
The product temperature can be measured with a Pt100 sensor for each shelf. The product temperatures on the individual shelves can be displayed on the LSCplus system controller.
The LyoBus module provides the connection.

Pressure increase test

The transition from the main drying phase to the final-drying phase can be determined with the aid of the pressure increase test. For this a valve is placed between the product chamber and the ice condenser. 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.

Comparative pressure measurement

The end of the main drying phase can also be deduced by using two different vacuum probes (Pirani and capacitative). When the difference between the pressure measurements exceeds a preselected limit value, final-drying is started automatically.



Freezing point determination
using LyoLogplus documentation software

LyoBus module with LyoRx sensor

Example Configurations

Alpha 1-4 LSCplus
Alpha 2-4 LSCplus

4 kg –55 °C –85 °C

	Drying manifold [a]	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 (one-chamber method) on a heated shelf, optionally with a fan.
2	-	1	200 mm	0.031 m²	70 mm [b]	Freezing and drying inside the ice condenser (one-chamber method) on a heated shelf with a stoppering device for vials, optionally with a fan.
3	2 x 12	-	-	-	-	For round-bottom flasks, wide-neck filter bottles or ampoule distributors; specifically suitable for aqueous products.
4	8	-	-	-	-	For round-bottom flasks, wide-neck filter bottles or ampoule distributors; specifically suitable for solvent drying.
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	5	200 mm	0.155 m²	66 mm	Heatable shelves, variable spacing by removing individual shelves, additional optional connectors for round-bottom flasks, wide-neck filter bottles or ampoule distributors.
8	12	2	250 mm	0.09 m²	45 mm[b]	Heatable shelves with stoppering device, shelf spacing can be increased to 110 mm by removing a shelf, additional connections for round-bottom flasks, wide-neck filter bottles or ampoule distributors.
9	-	4	250 mm	0.18 m²	50 mm[b]	Heatable shelves with stoppering device, variable spacing up to 290 mm by removing individual shelves.
10	-	5	256 x 300 mm	0.38 m²	55 mm	LyoCube with heatable shelves, variable spacing by removing individual shelves.
11	20	-	-	-	-	Drying manifold for round-bottom flasks, wide-neck filter bottles or ampoule distributors; specifically suitable for drying with solvents.

a) For round-bottom flasks, wide-neck filter bottles or ampoule distributors
b) Distance for stoppering device

Alternative configurations available upon request.

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Example configurations

Beta 1-8 LSCplus
Beta 2-8 LSCplus

8 kg –55 °C –85 °C

	Drying manifold [a]	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 (one-chamber method) on a heated shelf, optionally with a fan.
2	-	1	200 mm	0.031 m²	70 mm [b]	Freezing and drying inside the ice condenser (one-chamber method) on a heated shelf with stoppering device, optionally with a fan.
3	2 x 12	-	-	-	-	For round-bottom flasks, wide-neck filter bottles or ampoule distributors; specifically suitable for aqueous products.
4	8	-	-	-	-	For round-bottom flasks, wide-neck filter bottles or ampoule distributors; specifically suitable for solvent drying.
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[b]	Heatable shelves with stoppering device, shelf spacing can be increased to 110 mm by removing a shelf, additional connections for round-bottom flasks, wide-neck filter bottles or ampoule distributors.
8	-	5	256 x 300 mm	0.38 m²	55 mm	LyoCube with heatable shelves, variable spacing by removing individual shelves.
9	20	-	-	-	-	Drying manifold for round-bottom flasks, wide-neck filter bottles or ampoule distributors; specifically suitable for drying with solvents.

a) For round-bottom flasks, wide-neck filter bottles or ampoule distributors
b) Distance for stoppering device

Alternative configurations available upon request.

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Example configurations

Gamma 1-16 LSCplus
Gamma 2-16 LSCplus

16 kg –55 °C –85 °C

	Drying manifold [a]	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 (one-chamber method) on heated shelves, spacing variable by removing individual shelves, optionally with a fan.
2	-	2	250 mm	0.09 m²	45 mm [b]	Freezing and drying inside the ice condenser (one-chamber method) on heated shelves with stoppering 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; specifically suitable for aqueous products.
4	8	-	-	-	-	For round-bottom flasks, wide-neck filter bottles or ampoule distributors; specifically suitable for solvent drying.
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[b]	Heatable shelves with stoppering device, shelf spacing can be increased to 110 mm by removing a shelf, additional connections for round-bottom flasks, wide-neck filter bottles or ampoule distributors.
8	-	4	250 mm	0.18 m²	50 mm[b]	Heatable shelves with stoppering device, variable spacing up to 290 mm by removing individual shelves.
9	-	8	375 mm	0.88 m²	48 mm	Heated shelves, larger spacing available upon request, optional hoist for drying chamber available.

a) For round-bottom flasks, wide-neck filter bottles or ampoule distributors
b) Distance for stoppering device

Alternative configurations available upon request.

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Example configurations

Delta 1-24 LSCplus
Delta 2-24 LSCplus

	Drying manifold [a]	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 (one-chamber method) on heated shelves, spacing variable by removing individual shelves, optionally with a fan.
2	-	4	250 mm	0.18 m²	45 mm [b]	Freezing and drying inside the ice condenser (one-chamber method) on heated shelves with stoppering 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; specifically suitable for aqueous products.
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 [b]	Heatable shelves with stoppering 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.

a) For round-bottom flasks, wide-neck filter bottles or ampoule distributors
b) Distance for stoppering device

Alternative configurations available upon request.

CHRIST
DELTA 2-24 LSC plus

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DELTA 2-24 LSC plus

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DELTA 2-24 LSC plus

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DELTA 2-24 LSC plus

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DELTA 2-24 LSC plus

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CHRIST
DELTA 2-24 LSC plus

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LyoCube

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 freeze drying system with LSCplus control
- Front-loader with rectangular shelves and transparent chamber door for easy handling
- With WST Wireless Shelf Technology – no cables between shelves and the base unit
- One temperature sensor or LyoRx sensor per shelf for optimal process management
- Shelves easily removed for tall containers
- Standard configuration with five shelves (0.38 m^2)
- Maximum eight shelves for optimal utilisation with MTP or deep-well plates
- Solvent-resistant version with stainless steel door (option)
- Also available with six connections for flask drying
- 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

Technical specifications

	Alpha 1-4	Alpha 2-4	Beta 1-8	Beta 2-8
Ice condenser – Max. capacity – Max. performance – Temperature – Chamber volume	 4 kg 4 kg/24 h approx. –55 °C approx. 6.5 l	 4 kg 4 kg/24 h approx. –85 °C approx. 6.5 l	 8 kg 6 kg/24 h approx. –55 °C approx. 11 l	 8 kg 6 kg/24 h approx. –85 °C approx. 11 l
Shelf temperature or product temperature during freezing in the ice condenser with a fan	approx. –25 °C	approx. –35 °C	approx. –25 °C	approx. –35 °C
Refrigeration system	0.51 kW	2 x 0.51 kW	0.51 kW	2 x 0.51 kW
Dimensions of basic 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
Power supply (other voltages 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
Communication interface	Ethernet	Ethernet	Ethernet	Ethernet
Refrigerant	CFC-free	CFC-free	CFC-free	CFC-free
Noise level as per DIN 45635	54 dB(A)	54 dB(A)	54 dB(A)	54 dB(A)
Defrosting function	Hot gas	Hot gas	Hot gas	Hot gas
Vacuum measurement	●	●	●	●
Vacuum control	●	●	●	●
Temperature – Ice condenser (measurement) – Shelf (measurement and control) – Product (measurement for max. 10 sensors)	 ● ● ●	 ● ● ●	 ● ● ●	 ● ● ●
End point determination – Product temperature measurement – Pressure increase test – Capacitive pressure measurement	 ● ○ ○	 ● ○ ○	 ● ○ ○	 ● ○ ○
Programmer module	○	○	○	○
USB	○	○	○	○
LyoControl (freezing point determination, measurement of product resistance)	○	○	○	○
LyoLogplus process documentation software	○	○	○	○
LPCplus process control and documentation software	○	○	○	○

● = standard ○ = optional

The specifications apply to the basic unit and ambient temperature range of +10 °C to +25 °C.
Subject to change without prior notice.

Technical specifications

	Gamma 1-16	Gamma 2-16	Delta 1-24	Delta 2-24
Ice condenser – Max. capacity – Max. performance – Temperature – Chamber volume	 16 kg 12 kg/24 h approx. –55 °C approx. 30 l	 16 kg 12 kg/24 h approx. –85 °C approx. 30 l	 24 kg 18 kg/24 h approx. –55 °C approx. 45 l	 24 kg 18 kg/24 h approx. –85 °C approx. 45 l
Shelf temperature or product temperature during freezing in the ice condenser with a fan	approx. –40 °C	approx. –50 °C	approx. –40 °C	approx. –50 °C
Refrigeration system	0.6 kW	2 x 0.6 kW	0.88 kW	2 x 0.88 kW
Dimensions of basic unit (W x H x D)	860 x 485 x 650 mm	860 x 485 x 650 mm	860 x 1050 x 650 mm	860 x 1050 x 650 mm
Weight	approx. 135 kg	approx. 160 kg	approx. 215 kg	approx. 250 kg
Power supply (other voltages 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
Communication interface	Ethernet	Ethernet	Ethernet	Ethernet
Refrigerant	CFC-free	CFC-free	CFC-free	CFC-free
Noise level as per DIN 45635	54 dB(A)	54 dB(A)	54 dB(A)	54 dB(A)
Defrosting function	Hot gas	Hot gas	Hot gas	Hot gas
Vacuum measurement	●	●	●	●
Vacuum control	●	●	●	●
Temperature – Ice condenser (measurement) – Shelf (measurement and control) – Product (measurement for max. 10 sensors)	 ● ● ●	 ● ● ●	 ● ● ●	 ● ● ●
End point determination – Product temperature measurement – Pressure increase test – Capacitive pressure measurement	 ● ○ ○	 ● ○ ○	 ● ○ ○	 ● ○ ○
Programmer module	○	○	○	○
USB	○	○	○	○
LyoControl (freezing point determination, measurement of product resistance)	○	○	○	○
LyoLogplus process documentation software	○	○	○	○
LPCplus process control and documentation software	○	○	○	○

● = standard ○ = optional

The specifications apply to the basic unit and ambient temperature range of +10 °C to +25 °C.
Subject to change without prior notice.

Our Product Spectrum

With a unique and broad graduated range of equipment and accessories, we can supply freeze drying systems and vacuum concentrators for every application. Let us show you 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 system.
2. Pilot freeze drying systems for process development or process optimisation with ice condenser capacity from 4 to 16 kg.
3. Freeze drying systems for routine applications or R&D with ice condenser capacity from 2 to 24 kg.
4. Rotational vacuum concentrators for applications extending from routine to evaporation concentration in the high-end range of pharmaceutical research.

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