CHRIST

RIEGER
Industrievertretungen GmbH
www.rieger-iv.at
Wir sind für Sie da:
E-Mail: office@rieger-iv.at
Telefon: +43(1) 728 00 52
Fax: +43(1) 728 69 16
Rustenschacher Allee 10
1020 Wien, Austria

Accessories Catalogue

For Perfect
Freeze Drying

www.martinchrist.de

CHRIST

Accessories

for Perfect Freeze Drying

Martin Christ
Gefriertrocknungsanlagen GmbH

An der Unteren Söse 50
37520 Osterode am Harz

Phone +49 (0) 55 22 50 07-0
Fax +49 (0) 55 22 50 07-12

www.martinchrist.de
info@martinchrist.de

1 Freeze Drying / Lyophilisation 5

2 Example Applications 9

3 Drying Chambers and shelves 19
3.1 Drying chambers **20**
3.2 Unheated shelves **27**
3.3 Heated shelves **30**
3.3.1 LSC sealing device (wired) **30**
3.3.2 LSCplus sealing device (wireless) **32**
3.3.3 LSCplus shelves (wireless) **35**
3.3.4 LSC shelves (wired) **39**
3.4 Drying manifolds **46**

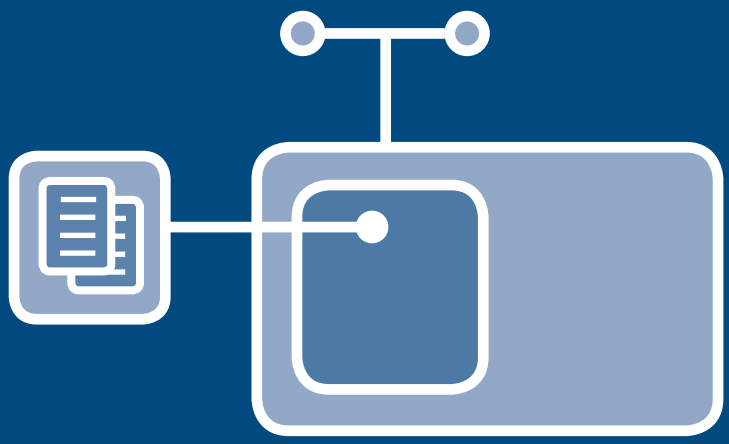
4 Drying Accessories 53
4.1 Product dishes **54**
4.2 Product sieves **55**
4.3 Thermoblocks, split **56**
4.4 Thermoblocks, not split **60**
4.5 Rubber valves **68**
4.6 Round-bottom flasks **69**
4.7 Filter inserts **69**
4.8 Wide-neck bottles **70**
4.9 Protective nets **71**
4.10 Ampoules **72**
4.11 Single vial sealing device **72**
4.12 Injection vials **73**

5 Epsilon Accessories 77

6 Vacuum 91
6.1 Vacuum pumps **92**
6.2 Vacuum pump oil **94**
6.3 Vacuum hoses **94**
6.4 Vacuum accessories **95**

7 Process Data Acquisition 99
7.1 Software and hardware **100**
7.2 Sensors **101**
7.3 Miscellaneous **102**

8 Cooling Baths and Freezing Equipment 107



Freeze Drying / Lyophilisation

*Freeze drying or lyophilisation takes place in the solid (frozen) state and is the preferred means for the long-term preservation of a wide variety of substances and for specimen preparation for modern analytic methods.
It is also used in animal preparations and in museums to preserve the original material forms.
Relatively new applications involve the drying of nanoparticles, where it is important to avoid the effects of capillary forces and surface tension.
Freeze drying is used for more than 30 different substance categories or materials, with the pharmaceutical and biotechnology industries and food preservation being the most significant application areas.

1 Freeze Drying / Lyophilisation

1 Freeze Drying / Lyophilisation

Freeze drying or lyophilisation is by far the gentlest way to remove moisture from materials. The physical phenomenon of sublimation means a direct transition from the solid state to the vapour state without passing through the liquid state. The frozen material is dried under vacuum without thawing. This method can be used for a wide variety of applications:

- Preserving the characteristics of original substances in products (e.g. pharmaceutical products or milk)
- Preserving the original form (e.g. animal preparations, archaeological objects or flowers)
- Conditioning the material (e.g. freeze-dried fruit in yoghurt)
- Chemical analyses (e.g. trace element analyses of foods, sludge or soil)

Freeze dryers are generally divided into two categories: batch freeze dryers and continuous freeze dryers. Batch freeze dryers are available with capacities from 2 kg to approximately 1 tonne per batch. Christ specialises in this product category and is the only manufacturer worldwide offering products that cover the full spectrum from standard laboratory units to pilot freeze dryers and large production units.

Laboratory freeze dryer systems

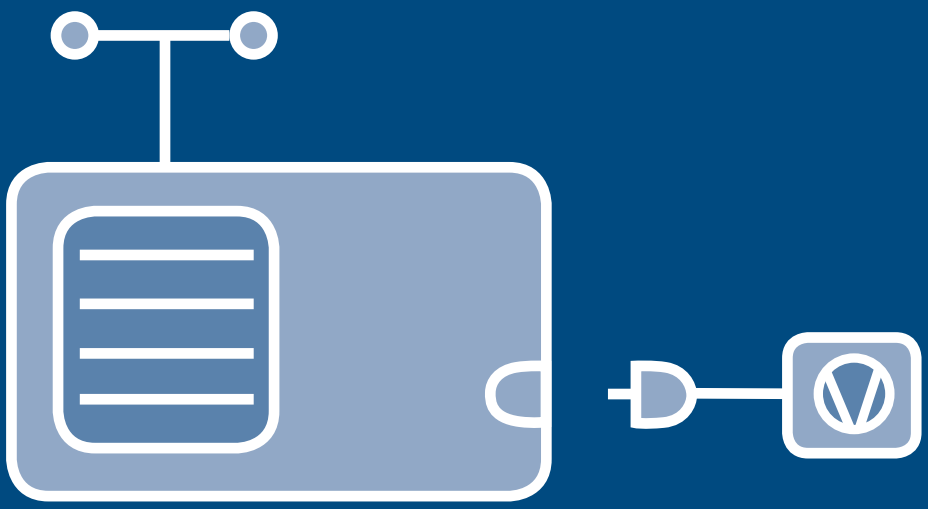
- Ice condenser capacity 2 to 24 kg
- Mainly air-cooled chilling systems
- Broad range of accessories for a wide variety of applications

Pilot freeze dryer systems

- Ice condenser capacity 6 to 16 kg
- Air-cooled or water-cooled chilling systems
- Freezing and drying in the drying chamber
- on shelves with liquid temperature control

Production freeze drying systems

- Ice condenser capacity 20 to more than 1000 kg
- Water-cooled chilling systems
- Freezing and drying in the drying chamber
- on shelves with liquid temperature control
- One-chamber and two-chamber systems
- Special custom systems, SIP/H_2O_2 disinfection, CIP, IQ/OQ, etc.
- Process integration (loading systems, auxiliary units)



Example Applications

*Accessories from Christ enable tailored solutions for individual applications. The modular system architecture makes adaptation to altered requirements easy, even a long time after the basic unit was acquired.
The units in the Advanced series can be operated as one-chamber or two-chamber systems as desired with the appropriate accessories.
Many accessories, such as acrylic chambers, can be used on basic units with capacities from 4 kg to 24 kg (ice capacity). A number of example systems are described below.

2 Example Applications

Starter package

Accessories for our smallest unit, Alpha 1–2 LDplus, for drying in round-bottom flasks, wide-neck bottles or ampoules or on unheated shelves.

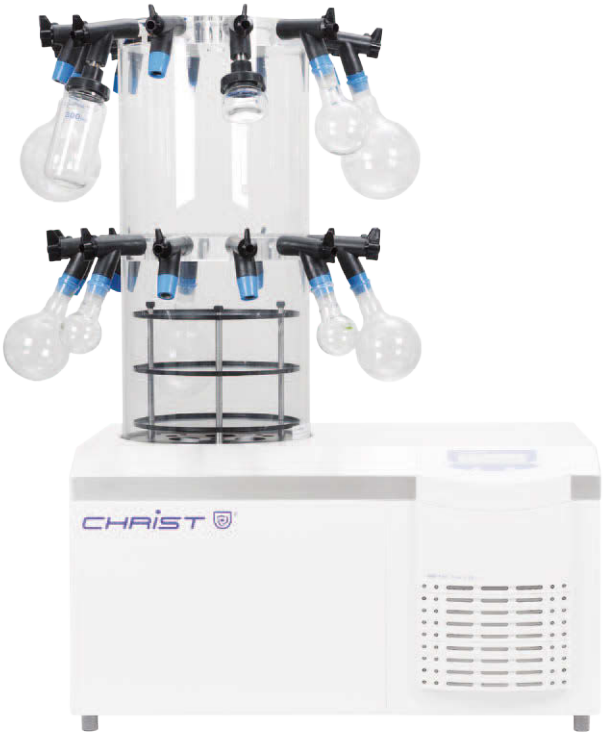
Starter product package with Alpha 1–2 LDplus

Starter

3 shelves dia. 200 mm = 920 cm², distance between shelves 85 mm, additional ports for 8 flasks, round-bottom flasks and wide-neck bottles or distributor (Figure 3 in the Routine Processes folder)			
System	Alpha 1-2 LDplus (item no. 101521)		
Description	Item number	Quantity	Page
1 Vacuum sensor	125478	1	97
2 Vacuum hose	125702	1	96
3 Base plate	120890	1	44
4 Three unheated shelves	120893	1	27
5 Acrylic drying chamber with 8 ports	121455	1	20
6 Rubber valves	121860	8	68
7 Vacuum pump RZ-2,5 (2.25 m³/h)	125302	1	94
8 Exhaust filter	125501	1	97

Routine package

Accessories for the Beta series for drying in round-bottom flasks, wide-neck bottles or vials or on unheated shelves with relatively high specimen volume.



Routine product package with Beta 2–8 LDplus

Routine

Drying chamber with 24 ports for bottles, round-bottom flasks and wide-neck bottles or distributor for ampoules (Figure 12 in the Routine Processes folder)			
System	Beta 2–8 LDplus (item no. 101582)		
Description	Item number	Quantity	Page
1 Vacuum sensor	125478	1	97
2 Vacuum pump RZ-6	125307	1	95
3 Exhaust filter	125501	1	97
4 Vacuum hose	125702	1	96
5 Base plate	120900	1	44
6 3 shelves with rim	120903	1	27
7 Acrylic drying chamber	121550	1	22
8 Extra acrylic drying chamber	121850	1	22
9 Rubber valve for connecting vessels	121860	24	68
10 Drip tray for acrylic drying chamber	121360	1	45

Pharmacy product package

Accessories for the Alpha LSCplus series for carrying out the complete freeze drying process, including connection of crimp-seal vials under vacuum or inert gas.

Pharmacy 1 product package with Alpha 2-4 LSCplus

Pharmacy 1

Freezing and drying ice condenser chamber (method A) cooled shelves with sealing device (dia. 200 mm, total area 0.031 m²) (Figure 2 in Advanced Processes folder)			
System	Alpha 2-4 LSCplus (item no. 102142)		
Description	Item number	Quantity	Page
1 Extension unit HED-16 LSCplus	125041	1	
2 Vacuum pump RZ-2,5 (2.25 m³/h)	125302	1	94
3 Exhaust filter	125501	1	97
4 Vacuum hose with standard flange couplings	125702	1	96
5 Electromagnetic pressure control and stop valve	125910	1	96
6 Sealing device integrated in acrylic lid	120860	1	32

Dish Drying 1 product package

Accessories for laboratory systems with LSCplus controller for drying relatively large specimen volumes in dishes or vessels (or in aluminium blocks if necessary).

Dish Drying 1 product package with Alpha 1-4 LSCplus

Dish Drying 1

10 heated shelves (dia. 200 mm; total area 0.31 m², distance between shelves 25 mm – can be adjusted by removing shelves)			
System	Alpha 1-4 LSCplus (item no. 102141)		
Description	Item number	Quantity	Page
1 Extension unit HED-16 LSCplus	125041	1	
2 Vacuum pump RZ-6	125307	1	95
3 Exhaust filter	125501	1	97
4 Vacuum hose with standard flange couplings	125702	1	96
5 Electromagnetic pressure control and stop valve	125910	1	96
6 Base plate	120880	1	36
7 Frame for 10 shelves	121160	1	37
8 Shelves with rim, dia. 200 mm, with LyoBus-Modul	122576	10	37
9 Acrylic drying chamber	121556	1	22

Pharmacy 2 product package

Accessories for laboratory systems with LSCplus controller for drying relatively large product volumes in crimp-seal vials, including connection under vacuum or inert gas.

Pharmacy 2 product package with Alpha 2-4 LSCplus

Pharmacy 2

4 heated shelves with sealing device (dia. 250 mm, total area 0.18 m², distance between shelves 50 mm – can be adjusted by removing shelves)			
System	Alpha 2–4 LSCplus (item no. 102142)		
Description	Item number	Quantity	Page
1 Extension unit HED-16 LSCplus	125041	1	
2 Vacuum pump RZ-6	125307	1	95
3 Exhaust filter	125501	1	97
4 Vacuum hose with standard flange couplings	125702	1	96
5 Electromagnetic pressure control and stop valve	125910	1	96
6 Base plate	120880	1	36
7 Sealing device with 1 shelf	120841	1	33
8 Shelf with rim	120830	3	33
9 Acrylic drying chamber	121505	1	27

Flask Drying / Solvent product package

Accessories for the Gamma (and Delta) LSCplus series for drying in round-bottom flasks, wide-neck bottles or ampoules. Optionally also for aggressive solvents.

Flask Drying / Solvent product package with Gamma 2–16 LSCplus

Flask Drying / Solvent

Drying manifold for 24 round-bottom flasks / wide-neck bottles or distributor for ampoules			
System	Gamma 2–16 LSCplus (item no. 102211)		
Description	Item number	Quantity	Page
1 Vacuum pump RC-6	125295	1	94
2 Vacuum hose with standard flange couplings	125702	1	76
3 Electromagnetic pressure control and stop valve	125911	1	
4 Solvent-resistant manifold with 24 rubber valves	112237	1	47
5 Drip tray	121360	1	45

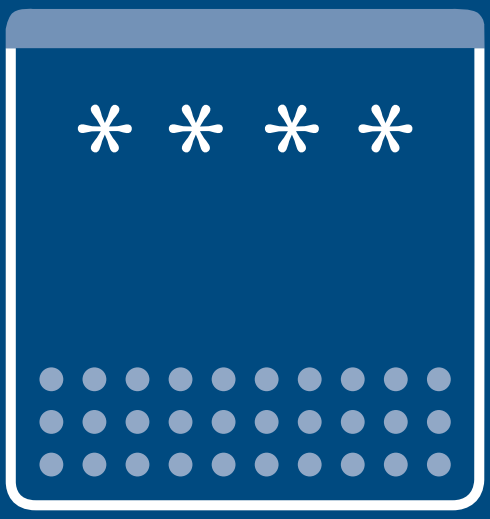
Dish Drying 2 product package

Accessories for the Delta (and Gamma) LSCplus series for drying very large specimen volumes (up to 16 litres) in dishes.

Dish Drying 2 product package with Delta 1-24 LSCplus

Dish Drying 2

8 heatable shelves (dia. 375 mm, total area 0.88 m², distance between shelves 48 mm)			
System	Delta 1–24 LSCplus (item no. 102300)		
Description	Item number	Quantity	Page
1 Vacuum pump DUO 20 (20 m³/h)	125322	1	
2 Exhaust filter	125502	1	97
3 Electromagnetic pressure control and stop valve	125911	1	
4 Plate frame with 8 electrically heatable shelves	122826	1	38
5 Acrylic drying chamber	121529	1	25
6 Lifting hoist for acrylic drying chamber, electronic control	121914	1	



Drying Chambers

* Drying chambers and manifolds are often desirable extensions to the basic unit for high specimen throughput. The chambers are recipients in which both heated and unheated shelves can be placed. Sealing devices can be used when long-term storage of the freeze-dried specimens under vacuum or under an inert gas atmosphere is desired.
Stainless steel manifolds are the ideal solution for users who work exclusively with flasks or wide-neck bottles.

3 Drying chambers and shelves – Alpha to Delta

3.1 Drying chambers **20**
3.2 Unheated shelves **27**
3.3 Heated shelves 30
3.3.1 LSC sealing device **30**
3.3.2 LSCplus sealing device **32**
3.3.3 LSCplus shelves **35**
3.3.4 LSC shelves **39**
3.4 Drying manifolds **46**

3.1 Drying Chambers

Drying chambers Ø 240 mm (for Alpha 1–2 LDplus)

The drying chamber can be placed directly on top of any laboratory system. A base plate is additionally necessary when shelves and racks are used.

Acrylic drying chamber — Order number 121450

Diameter	240 mm
Clear height	285 mm
Weight approx.	3.6 kg
Features	With NS 45/40 ground joint stoppers
Remark	Alpha 1-2 LDplus

Acrylic drying chamber — Order number 121454

Diameter	240 mm
Clear height	285 mm
Weight approx.	3.6 kg
Features	With 6 ports for individually closable rubber valves, including NS 45/40 ground joint stoppers
Remark	Alpha 1-2 LDplus

Acrylic drying chamber — Order number 121455

Diameter	240 mm
Clear height	285 mm
Weight approx.	3.6 kg
Features	With 8 ports for individually closable rubber valves, including NS 45/40 ground joint stoppers
Remark	Alpha 1-2 LDplus

Overview

Ø 240 mm only for Alpha 1–2 LDplus

Item number	Height [mm]	Connections	Weight [kg]
121450	285		3.6
121454	285	6	3.6
121455	285	8	3.6

Stainless steel drying chamber — Order number 121536

Diameter	240 mm
Clear height	295 mm
Weight	8 kg
Features	With adapter ring, only usable in combination with glass lid 121398
Remark	Alpha 1-2 LDplus

Connection ring, stainless steel — Order number 121534

Diameter	240 mm
Clear height	55 mm
Weight	2.7 kg
Features	With 8 ports for rubber valves including adapter ring; can only be used in combination with glass lid 121398 and stainless steel drying chamber 121536
Connection	For connecting vessels with DIN female ground joint NS29/32: 8x 100 ml, 8x 250 ml, 8x 500 ml, 8x 1000 ml, 8x 2000 ml round-bottom flasks 8x 75 ml, 8x 150 ml, 8x 300 ml, 8x 600 ml, 8x 1200 ml wide-neck filter bottles
Remark	Alpha 1-2 LDplus

Drying chambers Ø 300 mm (not for Alpha 1–2 LDplus)

Acrylic drying chamber — Order number 121500

Diameter	300 mm
Clear height	295 mm
Weight approx.	4.5 kg
Features	With stoppers
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber — Order number 121505

Diameter	300 mm
Clear height	460 mm
Weight approx.	6 kg
Features	With stoppers
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber — Order number 121509

Diameter	300 mm
Clear height	600 mm
Weight approx.	6.8 kg
Features	With stoppers
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber — Order number 121558

Diameter	300 mm
Clear height	515 mm
Weight approx.	6.4 kg
Features	Suitable for hoist
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber	Order number 121550
Diameter	300 mm
Clear height	295 mm
Weight approx.	5.1 kg
Connection	With 12 ports for individually closable rubber valves
Features	With stoppers
Remark	For all laboratory units except of Alpha 1-2 LDplus

Additional acrylic chamber	Order number 121850
Diameter	300 mm
Clear height	295 mm
Weight approx.	4.8 kg
Connection	With 12 ports for individually closable rubber valves
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber	Order number 121555
Diameter	300 mm
Clear height	460 mm
Weight approx.	6 kg
Connection	With 12 ports for individually closable rubber valves
Features	With stoppers
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber	Order number 121556
Diameter	300 mm
Clear height	515 mm
Weight approx.	6.6 kg
Connection	With 12 ports for individually closable rubber valves
Features	With NS 45/40 standard ground joint
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber	Order number 121557
Diameter	300 mm
Clear height	515 mm
Weight approx.	6.6 kg
Connection	With 12 ports for individually closable rubber valves
Features	Suitable for hoist
Remark	For all laboratory units except of Alpha 1-2 LDplus

Overview

Ø 300 mm for Alpha to Delta

Item number	Height [mm]	Connections	Weight [kg]
121500	295		4.5
121550	295	12	5.1
121850	295	12	4.8
121505	470		6
121555	460	12	5.1
121558	515		6.4
121557	515	12	6.6
121556	515	12	6.6

Stainless steel drying chamber — Order number 121537

Diameter	300 mm
Clear height	295 mm
Weight approx.	5.4 kg
Related items	Only suitable for use with glass lid 121411
Features	With adapter ring
Remark	For all laboratory units except of Alpha 1-2 LDplus

Stainless steel drying chamber — Order number 121538

Diameter	300 mm
Clear height	460 mm
Weight approx.	8.6 kg
Related items	Only suitable for use with glass lid 121411
Features	With adapter ring
Remark	For all laboratory units except of Alpha 1-2 LDplus

Conection ring, stainless steel — Order number 121535

Diameter	300 mm
Height	55 mm
Weight	2 kg
Connection	For connecting vessels with DIN female ground joint NS29/32: 12x 100 ml, 12x 250 ml, 12x 500 ml, 12x 1000 ml, 12x 2000 ml round-bottom flasks · 12x 75 ml, 12x 150 ml, 12x 300 ml, 12x 600 ml, 12x 1200 ml wide-neck filter bottles
Related items	Only usable for use with glass lid 121411 and stainless steel drying chamber 121537 or 121538
Features	With adapter ring
Remark	For all laboratory units except of Alpha 1-2 LDplus

Drying chambers Ø 457 mm (not suitable for use with Alpha 1–2 LDplus)

- Adapter flange item no. 120901 required for Alpha 1/2–4 LDplus and Beta 1/2–8 LDplus
- Adapter flange item no. 120881 required for Alpha 1/2–4 LSCplus and Beta 1/2–8 LSCplus

Acrylic drying chamber — Order number 121511

Diameter	457 mm
Clear height	340 mm
Weight approx.	12.7 kg
Features	With hoisting eye including connection for lifting device
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber — Order number 121515

Diameter	457 mm
Clear height	340 mm
Weight approx.	12.7 kg
Features	With 18 individually closable rubber valves, hoisting eye including connection for lifting device
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber — Order number 121517

Diameter	457 mm
Clear height	460 mm
Weight approx.	14.3 kg
Features	With hoisting eye including connection for lifting device
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber — Order number 121521

Diameter	457 mm
Clear height	460 mm
Weight approx.	14.3 kg
Features	With18 ports for rubber valves, hoisting eye including connection for lifting device
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber — Order number 121523

Diameter	457 mm
Clear height	565 mm
Weight approx.	15.8 kg
Features	With hoisting eye including connection for lifting device
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber — Order number 121527

Diameter	457 mm
Clear height	565 mm
Weight approx.	15.8 kg
Features	With 18 ports for rubber valves, with hoisting eye including connection for lifting device
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber — Order number 121529

Diameter	457 mm
Clear height	693 mm
Weight approx.	17.6 kg
Features	With hoisting eye including connection for lifting device
Remark	For all laboratory units except of Alpha 1-2 LDplus

Acrylic drying chamber — Order number 121531

Diameter	457 mm
Clear height	693 mm
Weight approx.	17.6 kg
Features	With 18 ports for rubber valves, hoisting eye including connection for lifting device
Remark	For all laboratory units except of Alpha 1-2 LDplus

Overview

Ø 457 mm for Alpha to Delta

Item number	Height [mm]	Connections	Weight [kg]
121511	340		12.7
121515	340	18	12.7
121517	460		14.3
121521	460	18	14.3
121523	565		15.8
121527	565	18	15.8
121529	693		17.6
121531	693	18	17.6

Stoppers for acrylic chambers — Order number 121410

NS	45/40
Colour	Black
Remark	Also usable with acrylic lid (121401) and glass lid (121411)

Rubber stoppers — Order number 492299

Function	For closing ports in acrylic chambers
Colour	Grey

Silicone cap — Order number 492300

Function	For ports of acrylic chambers

3.2 Unheated shelves

Shelves for LDplus controller

3 aluminium shelves with rim — Order number 120893

Diameter	200 mm
Heating/cooling	Unheated
Features	Spacing between shelves 80 mm
Remark	Only for Alpha 1–2 LDplus

3 aluminium shelves with rim — Order number 120903

Diameter	265 mm
Height approx.	270 mm
Heating/cooling	Unheated
Features	Spacing between shelves 79 mm

5 aluminium shelves with rim — Order number 120902

Diameter	265 mm
Heating/cooling	Unheated
Features	Spacing between shelves 79 mm

5 aluminium shelves — Order number 112229

Diameter	360 mm
Heating/cooling	Unheated
Features	Spacing between shelves 70 mm
Remark	Not for Alpha 1–2 LDplus

1 aluminium shelf with rim and feet — Order number 112279

Spacing	33 mm
Diameter	265 mm
Heating/cooling	Unheated
Features	Stackable up to 10 high
Remark	Not for Alpha 1–2 LDplus

1 aluminium shelf with rim and feet — Order number 112318

Diameter	200 mm
Heating/cooling	Unheated
Remark	For use with Alpha 1–2 LDplus and other laboratory freeze dryers

Number of drying vessels per shelf, order number 120902 and 120903

Order number of drying vessels	ID code Nominal capacity (ml)	Dimensions Ø (mm)	Dimensions height (mm)	Content with 1 cm layer		Number	Min. necessary spacing
				Static (ml)	Dynamic (ml) *		
127502	2 ml	12	121	0.6	1.2 (sh. f.)	345	125
127505	5 ml	12	156	0.6	2.5 (sh. f.)	345	160
127510	10 ml	16	156	1.2	3.5 (sh. f.)	185	160
127572	2 R	16	35	1.2		185	50
127576	6 R	22	40	3.0		100	55
127580	10 R	24	45	4.5		88	60
127582	20 R	30	55	6.0		54	70
127585	50 H	42.5	73	12.0	35–40 (sp. f.)	25	88
127590	100 H	51.6	94.5	18.0	65–70 (sp. f.)	16	110
127603	300	78	140	38.0	125–135 (sp. f.)	7	162
127605	500	78	207	38.0	250–300 (sp. f.)	7	229
127000		65	20	28.0		11	25
127010		75	20	45.0		8	25
127073		200	18	300.0		1	25

* sh.f. = shell freezing; sp.f. = spin freezing (see introduction)

Rack — Order number 127202

Function	To hold 10 (11) microtiter plates (no deep-well plates)
Clearance	20 mm
Material	Anodised aluminium plate holders and stainless steel spacers
Features	If the microtiter plates are placed in this rack for freezing (externally), the specially formed anodised aluminium plate holders act as cold buffers, which prevents partial or full thawing of the specimens at the start of the process
Remark	Use base plate 120906 for Alpha to Delta
Dimensions	Height 283.5 mm, depth 97.5 mm, width 133.5 mm

Rack — Order number 127203

Function	To hold 1 deep-well plate or 1 microtiter plate
Clearance	50 mm
Material	Anodised aluminium plate holders and stainless steel spacers
Features	If the microtiter plates are placed in this rack for freezing (externally), the specially formed anodised aluminium plate holders act as cold buffers, which prevents partial or full thawing of the specimens at the start of the process. Shelves can be stacked up to 5 high
Remark	For Alpha to Delta

Rack	Order number 110394
Function	To hold 6 microtiter plates or 6 deep-well plates
Clearance	85 mm
Material	Anodised aluminium with stainless steel spacers in three levels
Features	Not stackable
Remark	Also for Alpha 1–2 LDplus

Rack	Order number 110527
Function	To hold 5 microtiter plates
Clearance	25 mm
Material	Stainless steel with PDVF feet
Features	Racks can be stacked up to 3 high
Remark	Also for Alpha 1–2 LDplus
Dimensions	Height 137 mm, depth 130.6 mm, width 89.5 mm

Sealing devices for LDplus controller

Sealing device with 2 shelf with rim	Order number 121015
Diameter	200 mm
Temperature control system	None
Extension	Shelves, separation 70 mm; with just one shelf 152 mm
Features	Only in combination with base plate 120890
Remark	For Alpha 1–2 LDplus
Hood	121450 or 121455 can be used

Sealing device with 1 shelf with rim	Order number 121020
Diameter	250 mm
Temperature control system	None
Extension	Can be extended to 2 shelves (max.) with shelf 120959
Remark	For Alpha 1/2–4 LDplus and Beta 1/2-8 LDplus
Hood	121500 or 121550 can be used

Sealing device with 1 shelf with rim	Order number 121021
Diameter	250 mm
Temperature control system	None
Extension	Can be extended to max. 4 shelves (120959)
Remark	For Alpha 1/2–4 LD plus and Beta 1/2-8 LD plus
Hood	121505 or 121555 can be used

3.3 Heated shelves

Sealing devices for LSC system controller (wired)

Sealing device integrated into acrylic lid Ø 300 mm — Order number 121009

Function	For sealing injection vials, sealing distance adjustable, under vacuum or inert gas with 1 shelf with rim Ø 200 mm
Temperature control system	Heatable with integrated PT 100 sensor
Weight approx.	6 kg
Remark	For Alpha with LSC system controller

Number of drying vessels per shelf, order number 120860 and 121009

Order number of drying vessels	ID code Nominal capacity (ml)	Dimensions Ø (mm)	Dimensions height (mm)	Content with 1 cm layer		Number
				Static (ml)	Dynamic (ml) *	
127572	2 R	16	35	1.2		116
127576	6 R	22	40	3.0		60
127580	10 R	24	45	4.5		48
127582	20 R	30	55	6.0		29
127585	50 H	42.5	73	12.0	35–40 (sp. f.)	15
127000		65	20	28.0		5
127010		75	20	45.0		4

* sh. f. = shell freezing; sp. f. = spin freezing (see introduction)

Sealing device with 1 shelf with rim — Order number 121010

Diameter	250 mm
Function	For sealing injection vials with serrated rubber stoppers under vacuum or inert gas
Temperature control system	Electrical heating with built-in sensor PT 100
Extension	Can be extended to max. 2 shelves (120960)
Features	Height of pressure plate is adjustable
Weight approx.	9 kg
Remark	For Alpha to Delta with LSC controller

Options for order number 121010 and 121020

Shelf arrangement	Clearance between shelves (mm)	Usable shelf area (cm^2)
1	110 to 35	450
2	2x 45 to 35	900

Sealing device with 1 shelf — Order number 121011

Diameter	250 mm
Function	For sealing injection vials with serrated rubber stoppers under vacuum or inert gas
Temperature control system	Electrical heating with built-in sensor PT 100
Extension	Can be extended to max. 4 shelves (120960)
Features	Height of pressure plate is adjustable
Weight approx.	10 kg
Remark	For Alpha to Delta with LSC controller

Options for order number 121011 and 121021

Shelf arrangement	Clearance between shelves (mm)	Usable shelf area (cm^2)
1	290 to 35	450
1 & 3	2x 135 to 35	900
1, 2 & 3	3x 83 to 35	1350
1 to 4	4x 50 to 35	1800

Aluminium shelf with rim — Order number 120959

Diameter	250 mm
Surface	Black anodised
Temperature control system	None
Use	For 121020 and 121021

Aluminium shelf with rim — Order number 120960

Diameter	250 mm
Surface	Black anodised
Temperature control system	Electrical heating
Use	For 121010 and 121011

Aluminium shelf with rim — Order number 120961

Diameter	250 mm
Surface	Black anodised
Temperature control system	Electrical heating with built-in sensor PT 100
Use	For 121010 and 121011

Sealing devices for LSCplus controller (wireless)

Sealing device with 1 shelf — Order number 120860

Diameter	200 mm
Function	For sealing injection vials with serrated rubber stoppers under vacuum or inert gas
Temperature control system	Electrical heating with built-in sensor PT 100 and LyoBus-Modul
Weight approx.	6.5 kg
Remark	Max. vessel height 70 mm; for LSCplus controller

Fan — Order number 120862

Diameter	200 mm
Function	For circulation of cold air
Weight approx.	
Remark	For LSCplus controller; integrated into 120860, 120861 and 120761

Number of drying vessels per shelf, order number 120860 and 121009

Order number of drying vessels	ID code Nominal capacity (ml)	Dimensions Ø (mm)	Dimensions height (mm)	Content with 1 cm layer		Number
				Static (ml)	Dynamic (ml) *	
127572	2 R	16	35	1.2		116
127576	6 R	22	40	3.0		60
127580	10 R	24	45	4.5		48
127582	20 R	30	55	6.0		29
127585	50 H	42.5	73	12.0	35–40 (sp. f.)	15
127000		65	20	28.0		5
127010		75	20	45.0		4

* sh. f. = shell freezing; sp. f. = spin freezing (see introduction)

Sealing device with max. 2 shelves — Order number 120821

Diameter	250 mm
Function	For sealing injection vials with serrated rubber stoppers under vacuum or inert gas
Temperature control system	Electrical heating with built-in sensor PT 100 and LyoBus-Modul
Extension	Can be extended to max. 2 shelves (120830)
Weight approx.	8 kg
Remark	For LSCplus controller

Options

Shelf arrangement	Clearance between shelves (mm)	Usable shelf area (cm^2)
1	110 to 35	450
2	2x 45 to 35	900

Sealing devices for LSCplus controller (wireless)

Sealing device with max. 4 shelves — Order number 120841

Diameter	250 mm
Function	For sealing injection vials with serrated rubber stoppers under vacuum or inert gas
Temperature control system	Electrical heating with built-in sensor PT 100 and LyoBus-Modul
Extension	Can be extended to max. 4 shelves (120830)
Features	Height of pressure plate is adjustable
Weight approx.	8.4 kg
Remark	For LSCplus controller

Options

Shelf arrangement	Clearance between shelves (mm)	Usable shelf area (cm^2)
1	290 to 35	450
2	2x 135 to 35	900
3	3x 83 to 35	1350
4	4x 50 to 35	1800

Shelf — Order number 120830

Diameter	250 mm
Surface	Black anodised
Temperature control system	Electrical heating with built-in sensor PT 100 and LyoBus-Modul
Use	For item 120821 and 120841

Fan — Order number 120801

Diameter	250 mm
Function	For circulation of cold air
Weight approx.	1.1 kg
Remark	For LSCplus controller; integrated into 120821 and 120841

Number of drying vessels per shelf order number 120821, 120841 and 120830

Order number of drying vessels	ID code Nominal capacity (ml)	Dimensions Ø (mm)	Dimensions height (mm)	Content with 1 cm layer		Number	Min. necessary shelf area and spacing
				Static (ml)	Dynamic (ml) *		
127502	2 ml	12	121	0.6	1.2 (sh. f.)	280	125
127505	5 ml	12	156	0.6	2.5 (sh. f.)	280	160
127510	10 ml	16	156	1.2	3.5 (sh. f.)	154	160
127572	2 R	16	35	1.2		154	50
127576	6 R	22	40	3.0		80	55
127580	10 R	24	45	4.5		67	60
127582	20 R	30	55	6.0		45	70
127585	50 H	42.5	73	12.0	35–40 (sp. f.)	19	88
127590	100 H	51.6	94.5	18.0	65–70 (sp. f.)	14	110
127603	300	78	140	38.0	125–135 (sp. f.)	6	162
127605	500	78	207	38.0	250–300 (sp. f.)	6	229
127000		65	20	28.0		8	25
127010		75	20	45.0		6	25

* sh. f. = shell freezing; sp. f. = spin freezing (see introduction)

Shelves for single-chamber method (“inside”) for LSCplus controller

Shelves with integrated acrylic lid — Order number 120861

Diameter	200 mm
Material	Aluminium, black anodised
Temperature control system	Electrical heating with built-in sensor PT 100 and LyoBus-Modul
Weight	
Remark	Max. vessel height 70 mm; for LSCplus controller

Shelves with integrated acrylic lid — Order number 120761

Diameter	200 mm
Material	Aluminium, black anodised
Temperature control system	Electrical heating with built-in sensor PT 100 and LyoBus-Modul
Weight	
Remark	Max. vessel height 140 mm; only usable with 120755, for LSCplus controller

Adapter / distance ring — Order number 120755

Diameter	300 mm
Material	PET

Fan — Order number 120862

Diameter	200 mm
Function	For circulation of cold air
Weight	
Remark	For LSCplus controller; integrated into 120860, 120861 and 120761

Support frame — Order number 121945

Function	To hold max. 5 shelves Ø 200 mm
Use	Inside the ice condenser chamber
Height approx.	295 mm
Weight	2 kg
Remark	Suitable for Gamma and Delta with LSCplus controller

Variations

Shelf arrangement	Clearance between shelves (mm)	Usable shelf area (cm²)
1	208	314
1+5	138+32	628
1+4	130+76	628
1, 3 + 5	2x 69 + 32	942
1 to 5	4x 25 + 32	1570

Shelves for single-chamber method (“inside”) for LSCplus controller

Support frame — Order number 121960

Function	To hold max. 10 shelves Ø 200 mm
Use	Inside the ice condenser chamber
Height approx.	514 mm
Weight	3.3 kg
Remark	Suitable for Delta with LSCplus controller

Variations

Shelf arrangement	Clearance between shelves (mm)	Usable shelf area (cm²)
1	428	314
1 + 10	377 + 32	628
1 + 9	330 + 76	628
1 + 8	289 + 120	628
1 + 7	245 + 164	628
1 + 6	201 + 208	628
1, 5 + 9	2x 157 + 76	942
1 + 4 + 7 + 10	3x 113 + 32	1256
1 + 3 + 5 + 7 + 9	4x 69 + 76	1570
1 to 10	9x 25 + 32	3140

Shelf — Order number 122576

Diameter	200 mm
Material	Aluminium, black anodised
Temperature control system	Electrical heating with built-in sensor PT 100 and LyoBus-Modul
Weight approx.	2.3 kg
Control	For LSCplus controller

Shelves for double-chamber method (“outside”) for LSCplus controller

Base plate — Order number 120880

Diameter	300 mm
Function	The base plate is necessary when shelves are used
Control	For LSCplus controller

Adapter flange — Order number 120881

Diameter	457 mm
Function	For mounting drying chamber Ø 457 mm
Remark	Only for Alpha and Beta with LSCplus controller

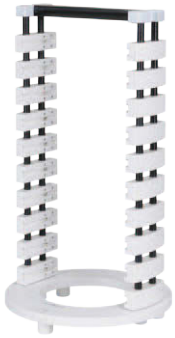
Shelves for double-chamber method ("outside") for LSCplus controller

Support frame — Order number 121145

Function	To hold max. 5 shelves Ø 200 mm
Use	Outside of ice condenser chamber
Height approx.	295 mm
Weight	2 kg
Control	For LSCplus controller

Variations

Shelf arrangement	Clearance between shelves (mm)	Usable shelf area (cm²)
1	208	314
1+5	138 +32	628
1+4	130 +76	628
1 + 3 + 5	4x 69 + 32	942
1 to 5	4x 25 + 32	1570



Support frame — Order number 121160

Function	To hold max. 10 shelves Ø 200 mm
Use	Outside of ice condenser chamber
Height approx.	514 mm
Weight	3.3 kg
Control	For LSCplus controller

Variations

Shelf arrangement	Clearance between shelves (mm)	Usable shelf area (cm²)
1	428	314
1+10	377+32	628
1+9	330+76	628
1+8	289+120	628
1+7	245+164	628
1+6	201+208	628
1 + 5 + 9	2x 157 + 76	942
1 + 4 + 7 + 10	3x 113 + 32	1256
1 + 3 + 5 + 7 9	4x 69 + 76	1570
1 to 10	9x 25 + 32	3140

Shelf — Order number 122576

Diameter	200 mm
Material	Aluminium, black anodised
Temperature control system	Electrical heating with built-in sensor PT 100 and LyoBus-Modul
Weight approx.	2.3 kg
Control	For LSCplus controller

Shelves for double-chamber method (“outside”) for LSCplus controller

Intermediate valve — Order number 122032

Diameter	300 mm
Control	For LSCplus controller
Remark	Base plate 120880 is necessary

LyoCube Base frame — Order number 122557

Dimensions	424 x 334 x 360 mm (H x W x D)
Material	Stainless steel
Weight	Approx. 3 kg
Control	For LSCplus controller

Shelf — Order number 122561

Dimensions	256 x 300 mm
Material	Aluminium, black anodised
Temperature control system	Electrical heating with built-in sensor PT 100 and LyoBus-Modul
Weight approx.	Approx. 2.5 kg
Control	For LSCplus controller

Plate frame with 3 shelves, 86 mm between shelves — Order number 122872

Plate frame with 5 shelves, 67 mm between shelves — Order number 122857

Plate frame with 8 shelves, 48 mm between shelves — Order number 122826

Diameter	375 mm
Material	Aluminium, black anodised
Temperature control system	Electrical heating with built-in sensor PT 100 and LyoBus-Modul
Control	For LSCplus controller

Spacer — Order number 122051

Spacing	Shelf spacing:48 mm

Spacer — Order number 122053

Spacing	Shelf spacing:58 mm

3.3.4 Heated shelves

Heated shelves for LSC controller

Plate frame with 5 electrically heatable shelves — Order number 120930

Diameter	375 mm
Spacing	Shelf spacing 67 mm
Material	Aluminium
Surface	Black anodised
Features	Each shelf is equipped with a base heater, precision connector, connecting cable and LED display for checking operation
Extension	Can be extended to max. 8 shelves
Remark	Suitable for Alpha, Gama and Delta with LSC controller
Weight	~ 30 kg

Plate frame consisting of 3 electrically heatable shelves — Order number 120920

Diameter	375 mm
Material	Aluminium, black anodised
Heating/cooling	Each shelf equipped with base heater and PT 100 sensor
Features	Precision connector, connecting cable, LED display for checking operation, distance adjustable with spacers (see page 32)
Extension	Can be extended to max. 8 shelves with LSC controller
Remark	Suitable for Gamma and Delta
Weight	~ 5 kg

Shelves — Order number 120975

Diameter	375 mm
Material	Aluminium, black anodised
Heating/cooling	Equipped with base heater
Features	LED display for checking operation
Extension	For extension of plate frame 120920
Weight	~ 5 kg

Select a drying chamber order no. to 121511 to 121529 and select spacers according to number of shelves and shelf spacing

Order no. 121511/515 Clear height: 340			Order no. 121517/521 Clear heigh: 460			Order no. 121523/527 Clear heigh: 565			Order no. 121529/531 Clear heigh: 693			Usable shelf area Ø 375 (cm²)
Order number	Spacing	Number of shelves	Order number	Spacing	Number of shelves	Order number	Spacing	Number of shelves	Order number	Spacing	Number of shelves	
121000	138	2	121003	196	2	121005	251	2	121006	314	2	2208
120988	86*	3	120999	124	3	121002	161	3	121004	202	3	3313
120987	60*	4	120995	89	4	120998	116	4	121001	148	4	4417
			120992	67	5	120995	89	5	120997	114	5	5522
			120986	53*	6	120993	71	6	120996	92	6	6626
						120990	58	7	120994	76	7	7731
						120985	48*	8	120991	64	8	8835

* Standard

Heated shelves for LSC controller

Stainless steel spacers (1 set)	Order number 120985
Spacing	Shelf spacing: 48 mm
Weight approx.	0.3 kg

Stainless steel spacers (1 set)	Order number 120986
Spacing	Shelf spacing: 53 mm
Weight approx.	0.3 kg

Stainless steel spacers (1 set)	Order number 120987
Spacing	Shelf spacing: 60 mm
Weight approx.	0.4 kg

Stainless steel spacers (1 set)	Order number 120988
Spacing	Shelf spacing: 86 mm
Weight approx.	0.5 kg

Stainless steel spacers (1 set)	Order number 120996
Spacing	Shelf spacing: 92 mm

Stainless steel spacers (1 set)	Order number 120997
Spacing	Shelf spacing: 114 mm

Stainless steel spacers (1 set)	Order number 120999
Spacing	Shelf spacing: 124 mm

Heated shelves for LSC controller

Number of drying vessels per shelf Ø 375 mm in combination with drying chamber order numbers 121511 to 121531

Order number of drying vessels	ID code / nominal capacity	Dimensions		Content with 1 cm layer Freezing		Number		Minimum necessary shelf spacing (mm)
		Diameter (mm)	Height (mm)	Static (ml)	Dynamic* (ml)	a	b	
127502	2 ml	12	121	0.6	1.2 (sh. f.)	700	330	125
127505	5 ml	12	156	0.6	2.5 (sh. f.)	700	330	160
127510	10 ml	16	156	1.2	3.5 (sh. f.)	395	215	160
127572	2 R	16	35	1.2		395		50
127576	6 R	22	40	3.0		205		55
127580	10 R	24	45	4.5		170		60
127582	20 R	30	55	6.0		110		70
127585	50 H	42.5	73	12.0	35–40 (sp. f.)	50	40	88
127590	100 H	51.6	94.5	18.0	65–70 (sp. f.)	32	27	110
127000		65	20	28.0		21		25
127010		75	20	45.0		16		25
127073		200	18	300.0		1		25
127128		200	18	300.0		1		25
127112		360	32	1000.0		1		48

* sh. f. = shell freezing; sp. f. = spin freezing (see introduction) a = without thermoblock; b = with thermoblock

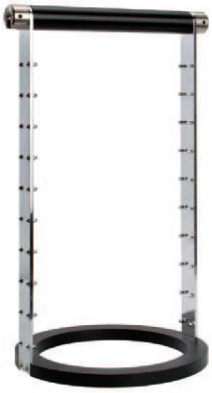
Shelf rack — Order number 120905

Shelf holder	To hold max. 5 shelves Ø 200 mm
Temperature control system	Heated (including two connecting cables)
Height approx.	295 mm
Control	For LSC controller

120905: Variations

Shelf arrangement	Clearance between shelves (mm)	Usable shelf area (cm²)
1	200	314
1 + 5	145 + 35	628
1 + 4	105 + 75	628
1 + 3 + 5	65 + 65 + 35	942
1 to 5	4x 25 + 35	1570

Heated shelves for LSC controller



Shelf rack — Order number 120910

Shelf holder	To hold max. 10 shelves Ø 200 mm
Temperature control system	Heated (including two connecting cables)
Height approx.	435 mm
Control	For LSC controller

120910: Variations

Shelf arrangement	Clearance between shelves (mm)	Usable shelf area (cm²)
1	360	314
1 + 10	320 + 35	628
1 + 9	280 + 70	628
1 + 8	245 + 110	628
1 + 7	210 + 145	628
1 + 6	170 + 180	628
1 + 5 + 9	2x 135 + 70	942
1 + 4 + 7 + 10	3x 99 + 35	1256
1 + 3 + 5 + 7 + 9	4x 62 + 70	1570
1 to 10	9x 25 + 35	3140

Connecting cable for rack — Order number 141328

Length	700 mm

Connecting cable for rack — Order number 141327

Length	500 mm

Connecting cable for rack — Order number 141322

Length	700 mm
Surface	Teflon encapsulated

Extension cable with precision connector — Order number 122020

Length	500 mm
Function	For feeding the plug-and-socked connection through the base plate of the intermediate valve
Features	For connection of an electrically heated shelf

Extension cable with precision connector — Order number 122021

Length	500 mm
Function	For feeding the connector through the base plate of the intermediate valve for connection of a process sensor (124802)

Extension cable with precision connector — Order number 122022

Length	500 mm
Function	For power supply to shelves with electric heaters
Connection	For connection of rack no. 120905 or 120910 of sealing device 121010 or 121011 and plate frame 120920

Extension cable with precision connector — Order number 141315

Length	500 mm
Surface	Teflon encapsulated
Function	For feeding the plug-and-socked connection through the base plate of the intermediate valve
Connection	For connection of an electrically heated shelf

Aluminium shelf with rim — Order number 120950

Diameter	200 mm
Temperature control system	Electrical heating with built-in sensor PT 100 and connecting cable
Connection	In the absence of a rack, the shelf can be placed directly on the floor of the ice condenser chamber
Control	For LSC controller

Aluminium shelf with rim — Order number 120951

Diameter	200 mm
Temperature control system	Electrical heating with base heater
Remark	Usable with rack 120905 and 120910

Number of drying vessels per shelf order number 120951 and 120950

Order number of drying vessels	ID code / nominal capacity	Dimensions		Content with 1 cm layer Freezing		Number		Minimum necessary shelf spacing (mm)
		Diameter (mm)	Height (mm)	Static (ml)	Dynamic* (ml)	a	b	
127502	2 ml	12	121	0.6	1.2 (sh. f.)	240	104	125
127505	5 ml	12	156	0.6	2.5 (sh. f.)	240	104	160
127510	10 ml	16	156	1.2	3.5 (sh. f.)	115	80	160
127572	2 R	16	35	1.2		115		50
127576	6 R	22	40	3.0		57		55
127580	10 R	24	45	4.5		50		60
127582	20 R	30	55	6.0		30		70
127585	50 H	42.5	73	12.0	35–40 (sp. f.)	16	13	88
127590	100 H	51.6	94.5	18.0	65–70 (sp. f.)	8	8	110
127000		65	20	28.0		7		25
127010		75	20	45.0		5		25
127073		200	18	300.0		1		25

* sh. f. = shell freezing; sp.f. = spin freezing (see introduction) a = without thermoblock; b = with thermoblock

Base plate	Order number 120890
Diameter	240 mm
Features	The accessory base plate is necessary when shelves are used
Remark	Only for Alpha 1–2 LDplus

Base plate	Order number 120900
Diameter	280 mm
Features	The accessory base plate is necessary when shelves are used
Remark	Alpha to Delta

Base plate for 10 microtiter plate rack	Order number 120906
Diameter	280 mm
Features	To hold 6 racks no. 127202 in combination with transition flange no. 120908
Remark	Only for Alpha and Beta

Base plate	Order number 127204
Diameter	423 mm
Features	With large hood; Gamma and Delta

Adapter flange	Order number 120901
Function	For mounting drying chamber Ø 457
Features	For Alpha 1/2–4 LDplus and Beta 1–8/2–8 LDplus

Drip tray for manifold — Order number 121350

Diameter	500 mm
Function	For protection of the freeze dryer; collects the condensation water dripping from the drying vessels
Remark	Alpha to Gamma, for manifolds 121208, 110538 and 121280

Drip tray for drying chamber — Order number 121355

Diameter	575 mm
Inside diameter	260 mm
Function	For protection of the freeze dryer; collects the condensation water dripping from the drying vessels
Remark	For Alpha 1–2 LDplus

Drip tray — Order number 121360

Diameter	650 mm
Function	For protection of the freeze dryer; collects the condensation water dripping from the drying vessels
Weight approx.	2 kg
Remark	Suitable for drying chamber Ø 300 mm

Drip tray — Order number 121365

Function	For protection of the freeze dryer; collects the condensation water dripping from the drying vessels
Remark	Suitable for drying chamber Ø 457 mm, outside 800 mm

Glass lid — Order number 121398

Diameter	240 mm
Features	With central DIN female ground joint NS 45/40 and stopper NS 45/40
Remark	Only for Alpha 1–2 LDplus

Acrylic lid — Order number 121401

Diameter	300 mm
Weight approx.	3.1 kg
Features	With central DIN female ground joint NS 45/40 and stopper NS 45/40
Thickness	40 mm

Safety glass lid — Order number 121411

Diameter	300 mm
Features	Solvent resistant, with central stainless steel DIN female ground joint NS 45/40 and stopper
Thickness	19 mm

3.4 Drying manifolds

Drying manifolds

Vertical manifold	Order number 110538
Material	Stainless steel with DIN male ground joint NS 45/40
Width	372 mm
Height	1030 mm
Function	For connection to acrylic or glass lid with female ground joint and 12 rubber valves, **for substances containing solvents**
Connections	For connecting vessels with DIN female ground joint NS 29/32: 12x 100 ml, 12x 250 ml, 12x 1000 ml, 12x 2000 ml round-bottom flasks, 12x 75 ml, 12x 150 ml, 12x 300 ml, 12x 600 ml, 12x 1200 ml, 8x 2000 ml wide-neck filter bottles
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Three levels with four connections each; Alpha 1-2 LDplus, Alpha 1/2–4, Beta 1/2–8, Gamma 1/2–16 and Delta 1/2–24

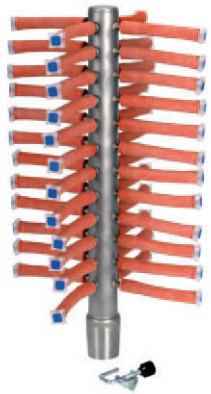
Vertical manifold	Order number 121224
Material	Stainless steel with DIN male ground joint NS 45/40
Width	650 mm
Height	1170 mm
Weight approx.	18 kg
Function	With flange-mounted glass lid Ø 300 mm and 24 rubber valves, for aqueous solutions
Connections	For connecting vessels with DIN female ground joint NS29/32: 24x 100 ml, 24x 250 ml, 24x 500 ml, 24x 1000 ml, 16x 2000 ml round-bottom flasks, 24x 75 ml, 24x 150 ml, 24x 300 ml, 24x 600 ml, 24x 1200 ml, 8x 2000 ml wide-neck filter bottles
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Three levels with eight connections each; Alpha 1/2–4, Beta 1/2–8, Gamma 1/2–16 and Delta 1/2–24

Vertical manifold	Order number 121226
Material	Stainless steel with DIN male ground joint NS 45/40
Width	380 mm
Height	755 mm
Function	For connection to acrylic or glass lid with female ground joint and 8 rubber valves, **for substances containing solvents**
Connections	For connecting vessels with DIN female ground joint NS29/32: 8x 100 ml, 8x 250 ml, 8x 500 ml, 8x 1000 ml, 4x 2000 ml round-bottom flasks, 8x 75 ml, 8x 150 ml, 8x 300 ml, 8x 600 ml, 8x 1200 ml, 4x 2000 ml wide-neck filter bottles
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Two levels with four connections each; Alpha 1–2 LDplus, Alpha 1/2-4, Beta 1/2–8, Gamma 1/2–16, Delta 1/2–24 and Epsilon 2–6 D LSC/LSCplus

Vertical manifold	Order number 112237
Material	Stainless steel with DIN male ground joint NS 45/40
Width	650 mm
Height	946 mm
Function	With flange-mounted glass lid Ø 300 mm and 24 rubber valves, **for substances containing solvents**
Features	**With DIN10KF connector for hot water defrosting**
Connections	For connecting vessels with DIN female ground joint NS 29/32: 24x 100 ml, 24x 250 ml, 24x 500 ml, 24x 1000 ml, 8x 2000 ml round-bottom flasks, 24x 75 ml, 24x 150 ml, 24x 300 ml, 24x 600 ml, 16x 1200 ml, 8x 2000 ml wide-neck filter bottles
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Three levels with eight connections each; Alpha 1/2–4, Beta 1/2–8, Gamma 1/2–16 and Delta 1/2–24

Vertical manifold	Order number 112306
Material	Stainless steel
Width	650 mm
Height	903 mm
Function	With flange-mounted glass lid Ø 300 mm and 16 rubber valves, **for substances containing solvents**
Features	**With DN 10 KF connector for hot water defrosting**
Connections	For connecting vessels with DIN female ground joint NS 29/32: 16x 100 ml, 16x 250 ml, 16x 500 ml, 16x 1000 ml, 16x 2000 ml round-bottom flasks, 16x 75 ml, 16x 150 ml, 16x 300 ml, 16x 600 ml, 16x 1200 ml, 8x 2000 ml wide-neck filter bottles
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Three levels with eight connections each; Alpha 1/2–4, Beta 1/2–8, Gamma 1/2–16 and Delta 1/2–24

Vertical manifold	Order number 112393
Material	Stainless steel
Width	650 mm
Height	1129 mm
Function	With flange-mounted glass lid Ø 300 mm and 16 rubber valves, **for substances containing solvents**
Features	**With DN 10 KF connector for hot water defrosting**
Connections	For connecting vessels with DIN female ground joint NS 29/32: 16x 100 ml, 16x 250 ml, 16x 500 ml, 16x 1000 ml, 16x 2000 ml round-bottom flasks, 16x 75 ml, 16x 150 ml, 16x 300 ml, 16x 600 ml, 16x 1200 ml, 16x 2000 ml wide-neck filter bottles
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Three levels with eight connections each; Alpha 1/2–4, Beta 1/2–8, Gamma 1/2–16 and Delta 1/2–24



Vertical manifold — Order number 121280

Material	Stainless steel with DIN male ground joint NS 45/40
Width	108 mm
Height	450 mm
Weight	3 kg
Function	For connection to acrylic or glass lid with female ground joint and 48 rubber valves, for aqueous solutions, for connecting vials
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Alpha 1–2 and 1/2–4, Beta 1/2–8, Gamma 1/2–16 and Delta 1/2–24

Vertical manifold — Order number 110280

Material	Stainless steel with DIN male ground joint NS 45/40
Width	108 mm
Height	440 mm
Function	For connection to acrylic or glass lid with female ground joint and 60 rubber valves, **for substances containing solvents,** for connection of ampoules
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Alpha 1/2–4, Beta 1/2–8, Gamma 1/2–16 and Delta 1/2–24

Vertical manifold — Order number 112322

Material	Stainless steel with DIN KF 40 connection
Width	520 mm
Height	770 mm
Weight	Approx. 10 kg
Function	For connection to acrylic or glass lid and 96 rubber hoses, for aqueous solutions, for connection of ampoules
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Alpha 1/2–4, Beta 1/2–8, Gamma 1/2–16 and Delta 1/2–24

Overview

Vertical manifolds

Item number	Connec-tions	Solvent	Water	Mounting	Width (mm)	Height (mm)	Weight (kg)	Connections[1]	Systems
121226	8	Yes	Yes	Ground joint stubs	380	755	4	4x 2000 ml round-bottom flasks and wide-neck bottles	Alpha–Epsilon
110538	12	Yes	Yes	Ground joint stubs	372	1030		8x 2000 ml wide-neck bottles	Beta–Delta
112306	16	Yes	Yes	Glass lid Ø 300 mm	650	876		8x 2000 ml wide-neck bottles	Alpha–Delta
121224	24		Yes	Acrylic lid Ø 300 mm	650	1170	18	16x 2000 ml round-bottom flasks and 8x wide-neck bottles	Alpha–Delta
112237	24	Yes	Yes	Glass lid Ø 300 mm	650	946		8x 2000 ml round-bottom flasks and wide-neck bottles	Alpha–Delta
112393	16	Yes	Yes	Glass lid Ø 300 mm	650	1129		16x 2000 ml round-bottom flasks and wide-neck bottles	Alpha–Delta
121280	48		Yes	Ground joint stubs	108	450	3	Ampoules	Alpha–Delta
110280	60	Yes	Yes	Ground joint stubs	108	440		Ampoules	Alpha–Delta
112322	96		Yes	Connection over KF40	520	770	10	Ampoules	Alpha–Delta

with individually closable rubber valves for connection of round-bottom flasks and wide-neck bottles with DIN female ground joint NS 29/32

[1] The maximum number of large-volume vessels

Horizontal manifold (T shape) — Order number 110005

Material	Stainless steel
Width	1070 mm
Height	550 mm
Weight approx.	6 kg
Function	With flange-mounted glass lid Ø 300 mm and 16 rubber valves, for aqueous solutions
Connections	For connecting vessels with DIN female ground joint NS29/32: 16x 100 ml, 16x 250 ml, 16x 500 ml, 8x 1000 ml, 8x 2000 ml round-bottom flasks 16x 75 ml, 16x 150 ml, 16x 300 ml, 16x 600 ml, 16x 1200 ml, 16x 2000 ml wide-neck filter bottles
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Alpha 1/2–4, Beta 1/2–8, Gamma 1/2–16 and Delta 1/2–24

Horizontal manifold (T shape) — Order number 121290

Material	Stainless steel with DIN male ground joint NS 45/40
Width	687 mm
Height	320 mm
Weight approx.	5.7 kg
Function	For connection to acrylic or glass lid with female ground joint and 20 rubber valves, for aqueous solutions
Connections	Injection vials
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Alpha 1–2 LDplus, Alpha 1/2–4, Beta 1/2–8, Gamma 1/2–16 and Delta 1/2–24

Horizontal manifold (T shape) — Order number 110367

Material	Stainless steel with DIN male ground joint NS 45/40
Width	301 mm
Height	611 mm
Function	For connection to acrylic or glass lid with female ground joint and 40 rubber valves, **for substances containing solvents,** for connection of ampoules
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Alpha 1–2 LD plus, Alpha 1/2–4, Beta 1/2–8, Gamma 1/2–16 and Delta 1/2–24

Horizontal manifold (T shape), multi-row — Order number 110528

Note	Wall fastening necessary
Material	Stainless steel with DIN male ground joint NS 45/40
Width	1076 mm
Height	1327 mm
Function	Connection over clamp joint stubs DN65 ISO, S and 20 rubber valves, **for substances containing solvents**
Connections	For connecting vessels with DIN female ground joint NS29/32: 20x 100 ml, 20x 250 ml, 20x 500 ml, 20x 1000 ml, 11x 2000 ml round-bottom flasks 20x 75 ml, 20x 150 ml, 20x 300 ml, 20x 600 ml, 20x 1200 ml, 14x 2000 ml wide-neck filter bottles
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Delta 2–24 LSC

Horizontal manifold (T shape) — Order number 121227

Material	Stainless steel with DIN male ground joint NS 45/40
Width	860 mm
Height	1054 mm
Function	For connection to glass lid and 21 rubber valves, for aqueous solutions
Connections	For connecting vessels with DIN female ground joint NS29/32: 21x 100 ml, 21x 250 ml, 21x 500 ml, 21x 1000 ml, 21x 2000 ml round-bottom flasks 21x 75 ml, 21x 150 ml, 21x 300 ml, 21x 600 ml, 21x 1200 ml wide-neck filter bottles
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Gamma 1/2–16 LSC and Delta 1/2–24 LSC

Horizontal manifold (T shape), multi-row — Order number 112209

Material	Stainless steel
Width	865 mm
Height	918 mm
Function	Connection over clamp joint stubs DN 50 ISO, S and 24 rubber valves, for substances containing solvents
Connections	For connecting vessels with DIN female ground joint NS29/32: 24x 100 ml, 24x 250 ml, 24x 500 ml, 24x 1000 ml round-bottom flasks 24x 75 ml, 24x 150 ml, 24x 300 ml, 24x 600 ml, 24x 1200, 12 x 2000 ml wide-neck filter bottles
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Gamma 1/2–16 LSC and Delta 1/2–24 LSC; requires connection kit 112429

Overview

Horizontal manifolds

Item number	Connec-tions	Solvent	Water	Mounting	Width (mm)	Height (mm)	Weight (kg)	Connections	Systems
110005	16		Yes	Acrylic lid Ø 300 mm	1070	550	6	8x 1000 ml round-bottom flasks, 8x 2000 ml round-bottom flasks	Alpha–Delta
121290	20		Yes	Ground joint stubs	687	320	5.7	Injection vials	Alpha–Delta
110367	40	Yes	Yes	Ground joint stubs	301	611		Ampoules	Alpha–Delta
110528	20	Yes	Yes	Wall attach-ment, clamp joint stubs	1076	1327		Multi-row	Delta
121227	21		Yes	Ground joint stubs	860	1054		Multi-row	Gamma–Delta
112209	24	Yes	Yes	Clamp nipples	865	918		Multi-row 12x 2000 ml wide-neck bottles	Gamma–Delta

With individually closable rubber valves for connection of round-bottom flasks and wide-neck bottles with DIN female ground joint NS 29/32

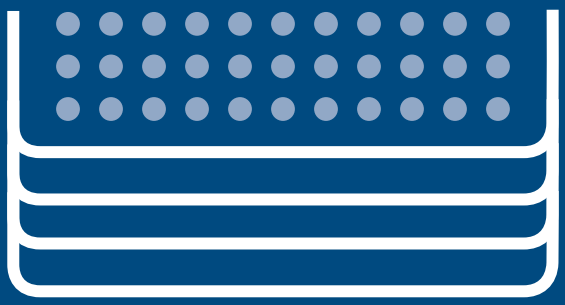
1 The maximum number of large-volume vessels

Distributor for ampoules — Order number 121870

Connections	15

Ball tap with small flange DN 10KF and accessories — Order number 112271

Function	For hot water defrosting



Drying Accessories

* Here you can find the commonly used small items that can be essential for good results in your daily work with freeze dryers. For example, product sieves can prevent the loss of very light or fine-grain material.
Wide-neck filter bottles allow the equipment to be used almost continuously by connection to rubber valves, which act as three-way taps. Ampoules and injection vials are containers for long-term storage without contact with oxygen.

4 Drying Accessories

4.1 Product dishes 54
4.2 Product sieves 55
4.3 Thermoblocks, split 56
4.4 Thermoblocks, not split 60
4.5 Rubber valves 68
4.6 Round-bottom flasks 69
4.7 Filter inserts 69
4.8 Wide-neck filter bottles 70
4.9 Protective nets 71
4.10 Ampoules 72
4.11 Individual sealing device 72
4.12 Injection vials 73

4.1 Product dishes

Product dishes

Product dish	Order number 127000
Material	Stainless steel
Diameter	65 mm
Rim height	20 mm

Product dish	Order number 127010
Material	Stainless steel
Diameter	75 mm
Rim height	20 mm

Product dish	Order number 127073
Material	Stainless steel
Diameter	200 mm
Rim height	18 mm

Product dish	Order number 127112
Material	Stainless steel
Diameter	360 mm
Rim height	32 mm

Product dish	Order number 127170
Material	Stainless steel, acrylic rim
Diameter	340 mm
Rim height	35 mm
Features	With removable bottom

Product dish, Teflon coated	Order number 127001
Material	Teflon-coated stainless steel
Diameter	65 mm
Rim height	20 mm

Product dish, Teflon coated	Order number 127011
Material	Teflon-coated stainless steel
Diameter	75 mm
Rim height	20 mm

Product dish, Teflon coated — Order number 127071

Material	Teflon-coated stainless steel
Diameter	200 mm
Rim height	18 mm

Product dish, Teflon coated — Order number 127111

Material	Teflon-coated stainless steel
Diameter	360 mm
Rim height	32 mm

4.2 Product sieves

Product sieves

Product sieve — Order number 127075

Diameter	200 mm
Mesh size	0.2 mm

Product sieve — Order number 127076

Diameter	200 mm
Mesh size	0.25 mm

Product sieve — Order number 127115

Diameter	360 mm
Mesh size	0.2 mm

Product sieve — Order number 127117

Diameter	360 mm
Mesh size	0.25 mm

Aluminium product dishes

Product dish — Order number 127126

Material	Aluminium
Diameter	63 mm
Rim height	20 mm

Product dish — Order number 127127

Material	Aluminium
Diameter	140 mm
Rim height	18 mm

Product dish	Order number 127128
Material	Aluminium
Diameter	200 mm
Rim height	18 mm

Product dish	Order number 127130
Material	Aluminium
Diameter	360 mm
Rim height	32 mm

4.3 Thermoblocks, split

Aluminium thermoblocks for sealing device, Ø 195 mm

Thermoblock	Order number 110069
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	37 mm
Form	Two-piece
Function	For holding a total of 100 vessels Ø 10.2–10.8 x 42–49 mm with round bottom

Thermoblock	Order number 112288
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	33 mm
Form	Two-piece
Function	For holding a total of 72 vessels Ø 14–14.8 x 34–40 mm with flat bottom

Thermoblock	Order number 112302
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	30 mm
Form	Two-piece
Function	For holding a total of 92 vessels Ø 12–12.8 x 33–38 mm with flat bottom

Aluminium thermoblocks for sealing device, Ø 195 mm

Thermoblock	Order number 112339
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	30 mm
Form	Two-piece
Function	For holding a total of 70 vessels Ø 16 x 35 mm (2R vials)

Thermoblock	Order number 112487
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	41 mm
Form	Two-piece
Function	For holding a total of 34 vessels Ø 21.5–22.6 x 44–51 mm (6R/8R vials)

Thermoblock	Order number 112243
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	45 mm
Form	Two-piece
Function	For holding a total of 14 vessels Ø 27.5 x 57 mm with flat bottom

Thermoblock	Order number 110308
Material	Aluminium
Surface	Black anodised
Diameter	192 mm
Height	30 mm
Form	Two-piece
Function	For holding a total of 64 vessels Ø 16 x 35 mm (2R vials)
Remark	For sealing device 121009 (units with LSC controller)

Thermoblock	Order number 112200
Material	Aluminium
Surface	Black anodised
Diameter	192 mm
Height	41 mm
Form	Two-piece
Function	For holding a total of 32 vessels Ø 22.5 x 45 mm (6R/8R vials)
Remark	For sealing device 121009 (units with LSC controller)

Thermoblock	Order number 112288
Material	Aluminium
Surface	Black anodised
Diameter	192 mm
Height	33 mm
Form	Two-piece
Function	For holding a total of 72 vessels Ø 14.8 x 35.5 mm
Remark	For sealing device 121009 (units with LSC controller)

Thermoblock for shelves inside ice condenser chamber (120761)

Thermoblock	Order number 113318
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	70 mm
Form	Two-piece
Function	For a total of 24 vessels Ø 27.8–29.2 x 77–90 mm (50 ml flask) Only in combination with distance ring 120755

Thermoblock for sealing device Ø 240 mm

Thermoblock	Order number 110200
Material	Aluminium
Surface	Black anodised
Diameter	240 mm
Height	20 mm
Form	Two-piece
Function	For holding a total of 136 vessels Ø 12 x 30 mm

Thermoblock	Order number 110159
Material	Aluminium
Surface	Black anodised
Diameter	240 mm
Height	30 mm
Form	Two-piece
Function	For holding a total of 94 vessels Ø 15.4–16.3 x 31–36 mm (2R vials)

Thermoblock	Order number 110064
Material	Aluminium
Surface	Black anodised
Diameter	240 mm
Height	30 mm
Form	Two-piece
Function	For holding a total of 48 vessels Ø 23–24.2 x 35–41 mm with flat bottom

Thermoblock	Order number 112240
Material	Aluminium
Surface	Black anodised
Diameter	240 mm
Height	36 mm
Form	Two-piece
Function	For holding a total of 48 vessels Ø 23–24.2 x 41–48 mm (10R vials)

Thermoblock for sealing device Ø 240 mm

Thermoblock	Order number 112370
Material	Aluminium
Surface	Black anodised
Diameter	240 mm
Height	36 mm
Form	Two-piece
Function	For holding a total of 198 vessels Ø 10.5–11.1 x 41–48 mm with flat bottom

Thermoblock	Order number 112402
Material	Aluminium
Surface	Black anodised
Diameter	240 mm
Height	41 mm
Form	Two-piece
Function	For holding a total of 112 vessels Ø 21.4–22.5 x 44–51 mm (6R/8R vials)

Thermoblock	Order number 112449
Material	Aluminium
Surface	Black anodised
Diameter	240 mm
Height	43 mm
Form	Two-piece
Function	For holding a total of 32 vessels Ø 28.6–30.1 x 50–59 mm (20R vials)

Overview

Aluminium thermoblocks

Item number	Block diameter (mm)	Number of vials	Vial diameter (mm)	Comments
110069	195	100	10.2–10.8 x 42–48	with round bottom
112288	195	72	14–14.8 x 34–40	with flat bottom
112302	195	92	12–12.8 x 33–38	with flat bottom
112339	195	70	16 x 35	2R vials
112487	195	34	21.5–22.6 x 44–51	6R/8R vials
112243	195	14	27.5 x 57	with flat bottom
113318	195	24	27.8–29.2 x 77–90	50 ml flask
110200	240	136	12 x 30	
110159	240	94	15.4–16.3 x 31–36	2R vials
110064	240	48	23–24.2 x 35–41	with flat bottom
112240	240	48	23–24.2 x 41–48	10R vials
112370	240	198	10.5–11.1 x 41–48	with flat bottom
112402	240	112	21.4–22.5 x 44–51	6R/8R vials
112449	240	32	28.6–30.1 x 50–59	20R vials

4.4 Thermoblocks, not split

Aluminium thermoblocks Ø 195 mm

Thermoblock	Order number 110319
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	30 mm
Function	For holding a total of 70 vessels Ø 11.1–11.8 x 30–35 mm or 27 vessels Ø 19.7–20.7 x 37–43

Thermoblock	Order number 110007
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	30 mm
Function	For holding a total of 79 vessels Ø 15.4–16.3 x 31–36 mm with flat bottom

Thermoblock	Order number 110053
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	30 mm
Function	For holding a total of 118 vessels Ø 7.9–8.3 x 33–38 mm with round bottom

Thermoblock	Order number 110183
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	33 mm
Function	For holding a total of 50 vessels Ø 12.1–12.8 x 33–38 mm with round or flat bottom or 50 vessels Ø 10.2–10.8 x 36–42 mm with flat or round bottom

Thermoblock	Order number 127213
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	30 mm
Function	For holding a total of 104 vessels Ø 12.1–12.8 x 33–38 mm with flat or round bottom

Aluminium thermoblocks Ø 195 mm

Thermoblock	Order number 127215
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	30 mm
Function	For holding a total of 86 vessels Ø 14–-14.8 x 33–38 mm

Thermoblock	Order number 112218
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	30 mm
Function	For holding a total of 44 vessels Ø 19.7–20.7 x 35–41 mm with flat bottom

Thermoblock	Order number 112455
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	70 mm
Function	For holding a total of 22 vessels Ø 27.8–29.2 x 36.5–43 mm (designed for flasks or Eppendorf) or 21 vessels Ø 9.9–10.5 x 48–56 mm or 22 vessels Ø 14.9–15.8 x 50.5–59 mm

Thermoblock	Order number 112448
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	31 mm
Function	For holding a total of 69 vessels Ø 16.5–17.5 x 36–42 mm

Thermoblock	Order number 112225
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	32 mm
Function	For holding a total of 50 vessels Ø 18.1–19.2 x 36–42 mm with flat bottom

Thermoblock	Order number 112461
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	40 mm
Function	For holding a total of 16 strips with 8 tubes per strip

Aluminium thermoblocks Ø 195 mm

Thermoblock	Order number 112367
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	35 mm
Function	For holding a total of 85 vessels Ø 15.1–16 x 40–47 mm with flat bottom

Thermoblock	Order number 110006
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	50 mm
Function	For holding a total of 43 vessels Ø 21.1–22.2 x 43–50 mm

Thermoblock	Order number 110011
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	50 mm
Function	For holding a total of 44 vessels Ø 14–14.8 x 41–48 mm (injection vials with crimp seal Ø 23 mm)

Thermoblock	Order number 112354
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	38 mm
Function	For holding a total of 140 vessels Ø 9.8–10.4 x 43–50 mm

Thermoblock	Order number 110282
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	40 mm
Function	For holding a total of 93 vessels Ø 13.5–14.3 x 43–50 mm with flat bottom

Thermoblock	Order number 112223
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	45 mm
Function	For holding a total of 37 vessels Ø 23.5–24.7 x 48–56 mm with flat bottom

Aluminium thermoblocks Ø 195 mm

Thermoblock	Order number 112363
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	41.5 mm
Function	For holding a total of 36 vessels Ø 24.2–25.4 x 48.5–57 mm (10H vials)

Thermoblock	Order number 113307
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	45 mm
Function	For holding a total of 58 vessels Ø 10.2–10.8 x 48–56 mm (Eppendorf caps)
Remark	two pieces not for sealing device

Thermoblock	Order number 113345
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	44 mm
Function	For holding a total of 36 vessels Ø 22.8–24 x 51–60 mm (10R / 15R vials)

Thermoblock	Order number 112364
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	46 mm
Function	For holding a total of 23 vessels Ø 30.4–32 x 53–62 mm (20H vials)

Thermoblock	Order number 113344
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	55 mm
Function	For holding a total of 36 vessels Ø 28.5–30 x 63–74 mm (30R vials)

Thermoblock	Order number 110161
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	58 mm
Function	For holding a total of 86 vessels Ø 14.4–15.3 x 62–73 mm with round bottom (ampoules)

Aluminium thermoblocks Ø 195 mm

Thermoblock	Order number 110010
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	60 mm
Function	For holding a total of 79 vessels Ø 15.4–16.3 x 63–74 mm with round bottom

Thermoblock	Order number 110050
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	70 mm
Function	For holding a total of 20 vessels Ø 32.1–33.7 x 65–75 mm with round bottom

Thermoblock	Order number 110530
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	60 mm
Function	For holding a total of 100 vessels Ø 11.1–11.8 x 63–74 mm with round bottom

Thermoblock	Order number 112246
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	60 mm
Function	For holding a total of 91 vessels Ø 16.8–17.8 x 63–74 mm with flat bottom

Thermoblock	Order number 110182
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	70 mm
Function	For holding a total of 22 vessels Ø 27.8–29.2 x 68–80 mm or 22 vessels Ø 15.8–16.8 x 70–82 mm

Thermoblock	Order number 112365
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	61 mm
Function	For holding a total of 13 vessels Ø 40.4–42.5 x 68–80 mm (50H vials)

Aluminium thermoblocks Ø 195 mm

Thermoblock	Order number 112366
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	43 mm
Function	For holding a total of 7 vessels Ø 49.6–51.6 x 77.5–91 mm (100H vials)

Thermoblock	Order number 112317
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	85 mm
Function	For holding a total of 124 vessels Ø 6.9–7.3 x 80–94 mm or 124 vessels Ø 6.9–7.3 x 88–103 mm

Thermoblock	Order number 110193
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	85 mm
Function	For holding a total of 37 vessels Ø 23–25.1 x 84–99 mm with round bottom

Thermoblock	Order number 110023
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	80 mm
Function	For holding a total of 190 vessels Ø 7.9–8.3 x 83–97 mm with round bottom

Thermoblock	Order number 112224
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	85 mm
Function	For holding a total of 37 vessels Ø 23.9–25.1 x 90–106 mm with flat bottom

Thermoblock	Order number 110311
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	100 mm
Function	For holding a total of 37 vessels Ø 23.5–24.7 x 99–116 mm with flat bottom

Thermoblock. not split Ø 195 mm, stackable

Thermoblock	Order number 127227
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	30 mm
Function	For holding a total of 354 vessels Ø 10.2–10.8 x 33–38 mm (Eppendorf caps)
Remark	Total height of three stacked blocks = 200 mm Space between thermoblocks 55 mm

Thermoblock	Order number 112316
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	45 mm
Function	For holding a total of 58 vessels Ø 10.2–10.8 x 33–38 mm (Eppendorf caps)
Remark	Max. stacking height 4 blocks; spacers required (item no. 112315) Space between thermoblocks 30 mm

Thermoblock	Order number 112346
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	70 mm
Function	For holding a total of 72 vessels Ø 15.8–16.8 x 70–82 mm (15 ml flask); spacers required (item no. 113316)

Thermoblock	Order number 110281
Material	Aluminium
Surface	Black anodised
Diameter	195 mm
Height	70 mm
Function	For holding a total of 27 vessels Ø 27.8–29.2 x 77–90 mm (50 ml flask); spacers required (item no. 113316)

Thermoblock. not split Ø 360 mm

Thermoblock	Order number 110057
Material	Aluminium
Surface	Black anodised
Diameter	356 mm
Height	150 mm
Function	For holding a total of 12 vessels Ø 76.8–80 x 155–182 mm

Thermoblock	Order number 110055
Material	Aluminium
Surface	Black anodised
Diameter	366 mm
Height	220 mm
Function	For holding a total of 6 vessels Ø 104.2–108.5 x 227–267 mm

Overview

Aluminium thermoblocks

Item number	Block diameter (mm)	Number of vials	Vial diameter (mm)	Comments
110319	195	70 / 27	11.1–11.8 x 30–35 19.7–20.7 x 37–43	
110007	195	79	15.4–16.3 x 31–36	with flat bottom
110053	195	118	7.9–8.3 x 33–38 12.1–12.8 x 33–38	with round bottom
110183	195	50	10.2–10.8 x 36–42	Eppendorf caps
127213	195	104	12.1–12.8 x 33–38	Round or flat bottom
127215	195	86	14–14.8 x 33–38	with flat bottom
112218	195	44	19.7–20.7 x 35–41	with flat bottom
112455	195	22/21	27.8–29.2 x 36.5–43 9.9–10.5 x 48–56	
112448	195	69	16.5–17.5 x 36–42	
112225	195	50	18.1–19.2 x 36–42	with flat bottom
112461	195	16	Tube strips	
112367	195	85	15.1–16 x 40–47	with flat bottom
110006	195	43	21.1–22.2 x 43–50	
110011	195	44	14–14.8 x 41–48	Injection vials
112354	195	140	9.8–10.4 x 43–50	with flat bottom
110282	195	93	13.5–4.3 x 43–50	with flat bottom
112223	195	37	23.5–24.7 x 48–56	with flat bottom
112363	195	36	24.2–25.4 x 48.5–57	10H vials
113307	195	52	10.2–10.8 x 48–56	Eppendorf caps/two pieces
113345	195	36	22.8–24 x 51–60	10R/15R vials
112364	195	23	30.4–32 x 53–62	20H vials
113344	195	36	28.5–30 x 63–74	30R vials
110161	195	86	14.4–15.3 x 62–73	Ampoules
110010	195	79	15.4–16.3 x 63–74	with round bottom
110050	195	20	32.1–33.7 x 65–75	with round bottom
110530	195	100	11.1–11.8 x 63–74	with round bottom
112246	195	91	16.8–17.8 x 63–74	with flat bottom
110182	195	22	27.8–29.2 x 68–80	
112365	195	13	40.4–42.5 x 68–80	50H vials
112366	195	7	49.6–51.6 x 77.5–91	100H vials
112317	195	124	6.9–7.3 x 80–94	
110193	195	37	23–25 x 84–99	with round bottom
110023	195	190	7.9–8.3 x 83–97	with round bottom
112224	195	37	23.9–25.1 x 90–106	with flat bottom
110311	195	37	23.5–24.7 x 99–116	with flat bottom

4.5 Rubber valves

Rubber valves

Rubber valve — Order number 121860

Function	For connection to drying chamber or as spare rubber valve for drying manifold
Features	The rubber valve is equipped with a DIN male ground joint NS29/32 for connection of round-bottom flasks, etc.; 5–100 ml injection vials or wide-neck filter bottles can be connected after removing the rubber ground joint from the valve
Sterilisation	Fully sterilisable at +121°C

Rubber valve — Order number 121861

Features	Rubber valve with stainless steel shut-off knob, solvent resistant version
Function	For connecting vessels with DIN female ground joint 29/32

Replacement rubber and piece — Order number 121865

Features	For rubber valve, NS 29/32
Sterilisation	Sterilisable at +121°C

Screw stopper — Order number 121862

Material	Plastic
Connection	For rubber valve
Sterilisation	Sterilisable at +121°C

Shut-off knob — Order number 121863

Material	Stainless steel
Connection	For rubber valve
Sterilisation	Sterilisable at +121°C

Adapter — Order number 121880

Connection	For rubber valve, NS 14.5

Adapter and filter — Order number 121890

Connection	For rubber valve NS 29132

4.6 Round-bottom flasks

Round-bottom flasks

Round-bottom flask	Order number	127350
Size	100 ml	

Round-bottom flask	Order number	127355
Size	250 ml	

Round-bottom flask	Order number	127360
Size	500 ml	

Round-bottom flask	Order number	127361
Size	500 ml	
Features	With glass shard protection	

Round-bottom flask	Order number	127365
Size	1000 ml	

Round-bottom flask	Order number	127370
Size	2000 ml	

4.7 Filter inserts

Filter inserts and spare parts for filter inserts

Filter insert	Order number	121891
Features	With fine filter for rubber valves	

Filter insert	Order number	121892
Material	Stainless steel	
Features	With fine filter for rubber valves (solvent resistant)	

Filter paper	Order number	127444
Diameter	18 mm	
Quantity	100	
Function	For retention filter	

4.8 Wide-neck filter bottles

Wide-neck filter bottles

Wide-neck filter bottle — Order number 127400
Size: 75 ml

Wide-neck filter bottle — Order number 127405
Size: 150 ml

Wide-neck filter bottle — Order number 127410
Size: 300 ml

Wide-neck filter bottle — Order number 127415
Size: 600 ml

Wide-neck filter bottle — Order number 127420
Size: 1200 ml

Wide-neck filter bottle — Order number 127425
Size: 2000 ml

Order number of drying vessels	Nominal capacity (ml)	Dimensions Ø outside (mm)	Dimensions height (mm)	Bottle opening Ø	Content with 1 cm layer	
					Static (ml)	Dynamic (ml) *
127400	75	60	87	49	25	45
127405	150	70	87	49	35	115
127410	300	70	151	49	35	226
127415	600	105	130	77	78	302
127420	1200	105	222	77	78	560
127425	2000	105	352	77	78	945

Spare rubber cap — Order number 127430
Size: For Ø 75 ml to Ø 300 ml

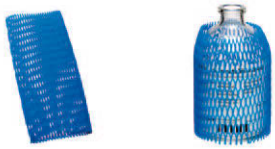
Spare rubber cap — Order number 127431
Size: For Ø 600 ml to Ø 2000 ml

Filter paper	Order number 127440
Size	Ø 30 mm
Quantity	100
Pore size	70 µm
Use	For wide-neck filter bottles 75 ml to 300 ml

Filter paper	Order number 127442
Size	Ø 47 mm
Quantity	100
Pore size	70 µm
Use	For wide-neck filter bottles 600 ml to 2000 ml

4.9 Protective nets

Protective nets



Protective net	Order number 127380
Vessel Ø	80–120 mm
Function	For round-bottom flasks and wide-neck filter bottles
Length	250 mm

Protective net	Order number 127381
Vessel Ø	100–200 mm
Function	For round-bottom flasks and wide-neck filter bottles
Length	250 mm

Protective net	Order number 127382
Vessel Ø	150–230 mm
Function	For round-bottom flasks and wide-neck filter bottles
Length	250 mm

4.10 Ampoules

Ampoules

Long-neck ampoules	Order number 127502
Capacity	2 ml
Diameter	12 mm
Overall length	121 mm
Neck diameter	8 mm
Neck length	90 mm
Quantity	100

Long-neck ampoules	Order number 127505
Capacity	5 ml
Diameter	12 mm
Overall length	156 mm
Neck diameter	8 mm
Quantity	100

Long-neck ampoules	Order number 127510
Capacity	10 ml
Diameter	16 mm
Overall length	156 mm
Neck diameter	8 mm
Quantity	100

Ampoule sealing torch	Order number 127695
Remark	For connection to gas and oxygen or to gas, air and oxygen The torch has a special flame stabilisation system, which allows it to be operated with a high air ratio to cool the flame.

4.11 Single vial sealing device

Screw bottles

Screw bottles	Order number 112488
Remark	For screw bottles compliant with ISO 11418, with round fitting 18 x 3.0
Function	For connection to rubber valve

4.12 Injection vials

Injection vials (crimp seal vials), DIN/ISO compliant

Injection vials	Order number	127572
Type	2 R	
Quantity	352	

Injection vials	Order number	127576
Type	6 R	
Quantity	192	

Injection vials	Order number	127580
Type	10 R	
Quantity	160	

Injection vials	Order number	127582
Type	20 R	
Quantity	99	

Injection vials	Order number	127585
Type	50 H	
Quantity	130	

Injection vials	Order number	127590
Type	100 H	
Quantity	88	

Vial type	Maximum capacity (ml)	Diameter (mm)	Height (mm)	Capacity with 1 cm fill level (ml)
2 R	4	16	35	1.4
4 R	6	16	45	1.4
6 R	10	22	40	3.0
8 R	11.5	22	45	3.0
10 R	13.5	24	45	3.7
15 R	19	24	60	3.7
20 R	25	30	55	5.8
25 R	30.5	30	65	5.8
30 R	36	30	75	5.8
5 H	7	20.8	41.3	2.7
7 H	9	22.1	40.8	3.1
8 H	10	23	46.8	3.4
10 H	15	25.4	53.5	4.2
15 H	17	26.5	58.8	4.7
20 H	26	32	58	6.6
25 H	32	36	58	8.5
30 H	38	36	62.8	8.5
50 H	60	42.5	73	11.6
100 H	119	51.6	94.5	17.7

Serrated rubber stopper	Order number 127650
Diameter	13 mm
Function	For injection vials 2 R
Quantity	100

Serrated rubber stopper	Order number 127651
Diameter	20 mm
Function	For injection vials 6 R–100 H
Quantity	100

Crimp caps	Order number 127660
Dimensions	Ø 13 x 6.8 mm
Function	For injection vials 2 R
Quantity	100

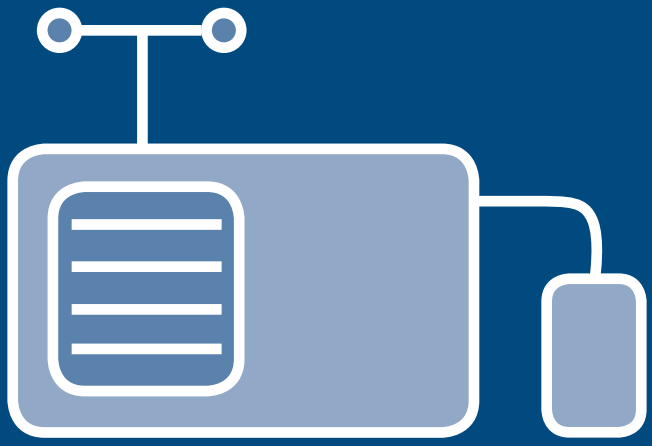
Crimp caps	Order number 127661
Dimensions	Ø 20 x 7.5 mm
Function	For injection vials 6 R–100 H
Quantity	100

Hand crimper	Order number 127670
Remark	For 2 R

Hand crimper	Order number 127671
Remark	For 6 R–100 H

Decrimper	Order number 127680
Remark	For 2 R

Decrimper	Order number 127681
Remark	For 6 R–100 H



Epsilon Accessories

* Systems with rectangular drying chambers are traditionally designated Epsilon at Christ. The shelves are usually heated or cooled, depending on the process step. Here as well it is important to choose the right accessories. The available options include product dishes for bulk goods, frames for direct contact between shelf surfaces and crimp vials, and drying manifolds for drying in flasks or wide-neck bottles on Epsilon systems.

5 Epsilon Accessories

5 Epsilon Accessories

Product dishes

Product dish — Order number 127280

Material	Stainless steel
Size (mm)	225 x 300 x 30 (W x D x HD)
Remark	For Epsilon 2-6 D

Product frame — Order number 127286

Material	Stainless steel
Size (mm)	225 x 300 x 30 (W x D x HD)
Remark	For Epsilon 2-6 D

Product base sheet — Order number 127285

Material	Stainless steel
Size (mm)	225 x 300
Function	For product frame 127286
Remark	For Epsilon 2-6 D

Product sieve — Order number 127282

Size (mm)	225 x 300
Mesh size	0.2 mm

Product dish — Order number 127230

Material	Stainless steel
Size (mm)	227 x 400 x 20 (W x D x HD)
Rim height	20 mm
Remark	For Epsilon 1–4 / 2–4 D

Product frame — Order number 127231

Material	Stainless steel
Size (mm)	227 x 400 x 20 (W x D x HD)
Remark	For Epsilon 1–4 / 2–4 D

Product base sheet — Order number 127229

Material	Stainless steel
Size (mm)	227 x 400
Function	For product frame 127231
Remark	For Epsilon 1–4 / 2–4 D

Product dish — Order number 127230

Material	Stainless steel
Size (mm)	227 x 400 x 20 (W x D x HD)
Remark	For Epsilon 1–4 / 2–4 D

Product dish — Order number 127290

Material	Stainless steel
Size (mm)	350 x 450 x 30 (W x D x HD)
Weight approx.	2.3 kg
Remark	For Epsilon 2-12 D

Product dish — Order number 127190

Material	Stainless steel
Size (mm)	350 x 400 x 30 (W x D x HD)
Weight approx.	2.3 kg
Remark	For Epsilon 2-12 D

Product frame — Order number 127293

Material	Stainless steel
Size (mm)	350 x 450 x 30 (W x D x HD)
Weight approx.	1.5 kg
Remark	For Epsilon 2-12 D

Product base sheet — Order number 127295

Material	Stainless steel
Function	For product frame 127293
Weight approx.	1.8 kg
Remark	For Epsilon 2-12 D

Overview

Product dishes

Item number	Size in mm	Nominal volume Layer thickness 1 cm	Device
127230	270 x 400	1080 ml	Epsilon 1-4/2-4 and Epsilon 2-20
127280	225 x 300	675 ml	Epsilon 2-6
127260	300 x 400	1200 ml	Epsilon 2-16
127190	350 x 400	1400 ml	Epsilon 2-10 D
127290	350 x 450	1575 ml	Epsilon 2-12 D
127300	300 x 300	900 ml	Production systems
127310	300 x 450	1350 ml	Production systems
127320	300 x 600	1800 ml	Production systems

Product sensor	Order number 124799
Model	PT 100
Cable length approx.	0.8 m

Product sensor	Order number 124801
Model	PT 100
Cable length approx.	2 m

Product sensor	Order number 124806
Model	2x PT 100

Product sensor	Order number 124804
Model	PT 100 Mini-Epsilon

Horizontal drying manifold	Order number 121202
Width	575 mm
Height	753 mm
Material	Stainless steel
Function	With connection to rear wall of system via 2x DN 40 KF-37 and 12 rubber valves, **for substances containing solvents**
Connection	For connecting vessels with DIN female ground joint NS29/32: 12x 100 ml, 12x 250 ml, 12x 500 ml, 12x 1000 ml, 8x 2000 ml round-bottom flasks· 12x 75 ml, 12x 150 ml, 12x 300 ml, 12x 600 ml, 12x 1200 ml, 6x 2000 ml wide-mouth filter bottles
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	Epsilon 1/2–6 D

Vertical manifold	Order number 121204
Width	400 mm
Height	524 mm
Material	Stainless steel
Function	Flange mounted directly on drying chamber, with 4 rubber valves, **for substances containing solvents**
Connection	For connecting vessels with DIN female ground joint NS29/32: 4x 100 ml, 4x 250 ml, 4x 500 ml, 4x 1000 ml, 4x 2000 ml round-bottom flasks 4x 75 ml, 4x 150 ml, 4x 300 ml, 4x 600 ml, 4x 1200 ml wide-mouth filter bottles
Features	The connections can be shut off individually and the drying vessels can be vented individually
Remark	1 level; only for Epsilon 1/2–4 LSC

Drip tray	Order number 121345
Size	30 x 138 x 525 mm
Function	For drying manifolds
Remark	For Epsilon 1–6 and 2–6

Thermblocks for Epsilon

Thermoblock	Order number 112428
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 30 (L x W x H)
Function	For holding a total of 30 vessels Ø 7.6–8 x 35–41 mm with flat bottom or holding a total of 20 vessels Ø 14.2–15.1 x 35–41 mm with flat bottom

Thermoblock	Order number 110382
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 48 (L x W x H)
Function	For holding a total of 40 vessels Ø 9.6–10.2 x 48.5–57 mm with flat bottom and crimp rim Ø 12.2

Thermoblock	Order number 112290
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.7 x 31.5 (L x W x H)
Function	For holding a total of 40 vessels Ø 10–10.6 x 36.5–43 mm with bail crimp

Thermoblock	Order number 110534
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 43 (L x W x H)
Function	For holding a total of 30 vessels Ø 10.4–11 x 51–60 mm (Eppendorf caps)

Thermoblock	Order number 110535
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 23 (L x W x H)
Function	For holding a total of 48 vessels Ø 11–11.6 x 28–33 mm

Thermoblock	Order number 110356
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 72 (L x W x H)
Function	For holding a total of 48 vessels Ø 11.3–12 x 79.5–93 mm with round bottom

Thermblocks for Epsilon

Thermoblock	Order number 113309
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 50 (L x W x H)
Function	For holding a total of 35 vessels Ø 12.1–12.8 x 55–64 mm with flat bottom

Thermoblock	Order number 110216
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.7 x 21 (L x W x H)
Function	For holding a total of 35 vessels Ø 12.6–13.3 x 27–31 mm with flat bottom

Thermoblock	Order number 110220
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 38 (L x W x H)
Function	For holding a total of 35 vessels Ø 13.8–14.6 x 44–51 mm with flat bottom

Thermoblock	Order number 110054
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 86 x 28 (L x W x H)
Function	For holding a total of 35 vessels Ø 14–14.8 x 33–38 mm with flat bottom

Thermoblock	Order number 110275
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 45 (L x W x H)
Function	For holding a total of 12 vessels Ø 14.1–15 x 43–50 mm with flat bottom

Thermoblock	Order number 110385
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	198 x 99 x 35 (L x W x H)
Function	For holding a total of 50 vessels Ø 15 x 45 mm with round or flat bottom

Thermblocks for Epsilon

Thermoblock	Order number 110355
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 72 (L x W x H)
Function	For holding a total of 24 vessels Ø 15.1–16 x 72–84 mm with round bottom

Thermoblock	Order number 110191
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 44 (L x W x H)
Function	For holding a total of 24 vessels Ø 15.8–16.8 x 44–51 mm with round bottom

Thermoblock	Order number 110374
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 35 (L x W x H)
Function	For holding a total of 24 vessels Ø 16.1–17.1 x 41.5–48 mm

Thermoblock	Order number 110300
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 72 (L x W x H)
Function	For holding a total of 24 vessels Ø 16.3–17.3 x 72–84 mm with round bottom

Thermoblock	Order number 112344
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 30 (L x W x H)
Function	For holding a total of 24 vessels Ø 17.3–18.3 x 36–42 mm with flat bottom

Thermoblock	Order number 110364
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 38 (L x W x H)
Function	For holding a total of 18 vessels Ø 19.2–20.2 x 46–54 mm with flat bottom

Thermblocks for Epsilon

Thermoblock	Order number 110370
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.7 x 25 (L x W x H)
Function	For holding a total of 18 vessels Ø 20.2–21.2 x 33–38 mm with flat bottom

Thermoblock	Order number 110305
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 61 (L x W x H)
Function	For holding a total of 12 vessels Ø 21.9–23 x 68–80 mm with flat bottom

Thermoblock	Order number 110219
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 38 (L x W x H)
Function	For holding a total of 12 vessels Ø 23.2–24.4 x 45–53 mm with flat bottom

Thermoblock	Order number 110322
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.7 x 31.5 (L x W x H)
Function	For holding a total of 12 vessels Ø 24–25.2 x 33.5–39 mm with flat bottom

Thermoblock	Order number 110321
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.7 x 31 (L x W x H)
Function	For holding a total of 10 vessels Ø 24–25.2 x 38–44 mm with flat bottom

Thermoblock	Order number 110511
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	187.5 x 134.5 x 20 (L x W x H)
Function	For holding a total of 35 vessels Ø 24 x 45 mm with flat bottom (10R vials)

Thermblocks for Epsilon

Thermoblock	Order number 110368
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 38 (L x W x H)
Function	For holding a total of 10 vessels Ø 26.4–27.7 x 45–53 mm with flat bottom

Thermoblock	Order number 110304
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 61 (L x W x H)
Function	For holding a total of 10 vessels Ø 26.6–28 x 68–80 mm with flat bottom

Thermoblock	Order number 110301
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 93 x 65 (L x W x H)
Function	For holding a total of 12 vessels Ø 26.2–27.5 x 70–82 mm with flat bottom

Thermoblock	Order number 110533
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 63 (L x W x H)
Function	For holding a total of 11 vessels Ø 27.5–28.9 x 70–82 mm with flat bottom

Thermoblock	Order number 110376
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 38 (L x W x H)
Function	For holding a total of 8 vessels Ø 28.7–30.2 x 45–53 mm with flat bottom

Thermoblock	Order number 110190
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 44 (L x W x H)
Function	For holding a total of 6 vessels Ø 30.6–32.2 x 48–56 mm with flat bottom

Thermblocks for Epsilon

Thermoblock	Order number 110197
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 61 (L x W x H)
Function	For holding a total of 6 vessels Ø 32.5–34.2 x 69–81 mm with round bottom

Thermoblock	Order number 110192
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 66.5 (L x W x H)
Function	For holding a total of 4 vessels Ø 42.3–44.5 x 51–60 mm with flat bottom

Thermoblock	Order number 110324
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	127.8 x 85.8 x 42 (L x W x H)
Function	For holding a total of 2 vessels Ø 57.2–59.5 x 42–49 mm with flat bottom

Overview

				Number of thermoblocks per shelf			
Item number	Block dimensions (mm)	Number of vials	Vial diameter (mm) Height (mm)	Epsilon 1-4 LSCplus Epsilon 2-4 LSCplus 270 x 400 mm (W x L)	Epsilon 2-6D LSCplus 225 x 300 mm (W x L)	Epsilon 2-10D LSCplus 350 x 400 mm (W x L)	Epsilon 2-12D 350 x 400 mm (W x L)
112428	127.8 x 85.8 x 30	30	7.6–8 x 35–41	9	5	12	12
110382	127.8 x 85.8 x 48	40	9.6-10.2 x 48.5-57	9	5	12	12
112290	127.8 x 85.7 x 31.5	40	10-10.6 x 36.5-43	9	5	12	12
110534	127.8 x 85.8 x 43	30	10.4-11 x 51-60	9	5	12	12
110535	127.8 x 85.8 x 23	48	11-11.6 x 28-33	9	5	12	12
110356	127.8 x 85.8 x 72	48	11.3-12 x 79-93	9	5	12	12
113309	127.8 x 85.8 x 50	35	12.1-12.8 x 55-64	9	5	12	12
110216	127.8 x 85.7 x 21	35	12.6-13.3 x 27-31	9	5	12	12
110220	127.8 x 85.8 x 38	35	13.8-14.6 x 44-51	9	5	12	12
110054	127.8 x 86 x 28	35	14-14.8 x 33-38	9	5	12	12
110275	127.8 x 85.8 x 45	12	14.1-15 x 43-50	9	5	12	12
110385	198 x 99 x 35	50	15 x 45	4	3	6	6
110355	127.8 x 85.8 x 72	24	15.1-16 x 72-84	9	5	12	12
110191	127.8 x 85.8 x 44	24	15.8-16.8 x 44-51	9	5	12	12
110374	127.8 x 85.8 x 35	24	16.1-17.1 x 41.5–48	9	5	12	12
110300	127.8 x 85.8 x 72	24	16.3-17.3 x 72-84	9	5	12	12
112344	127.8 x 85.8 x 30	24	17.3-18.3 x 36-42	9	5	12	12
110364	127.8 x 85.8 x 38	18	19.2-20.2 x 46-54	9	5	12	12
110370	127.8 x 85.7 x 25	18	20.2-21.2 x 33-38	9	5	12	12
110305	127.8 x 85.8 x 61	12	21.9-23 x 68-80	9	5	12	12
110219	127.8 x 85.8 x 38	12	23.2-24.4 x 45-53	9	5	12	12
110322	127.8 x 85.7 x 31.5	12	24-25.2 x 33.5-39	9	5	12	12
110321	127.8 x 85.7 x 31	10	24-25.2 x 38-44	9	5	12	12
110511	187.5 x 134.5 x 20	35	24 x 45	4	2	4	4
110368	127.8 x 85.8 x 38	10	26.4-27.7 x 45-53	9	5	12	12
110304	127.8 x 85.8 x 61	10	26.6-28 x 68-80	9	5	12	12
110301	127.8 x 93 x 65	12	26.2-27.5 x 70-82	8	4	8	8
110533	127.8 x 85.8 x 63	11	27.5-28.9 x 70-82	9	5	12	12
110376	127.8 x 85.8 x 38	8	28.7-30.2 x 45-53	9	5	12	12
110190	127.8 x 85.4 x 44	6	30.6-32.2 x 48-56	9	5	12	12
110197	127.8 x 85.8 x 61	6	32.5-34.2 x 69-81	9	5	12	12
110192	127.8 x 85.8 x 66.5	4	42.3-44.5 x 51-60	9	5	12	12

Thermoblocks for Epsilon 2-4 / 2-10

Thermoblock	Order number 110245
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	400 x 99 x 25 (L x W x H)
Function	For holding a total of 150 vessels Ø 9.7–10.3 x 28–33 mm with round or flat bottom
Remark	6-row block

Thermoblock	Order number 112414
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	400 x 115.5 x 32 (L x W x H)
Function	For holding a total of 100 vessels Ø 10.2–10.8 x 34–40 mm or a total of 190 vessels Ø 9.1–9.6 x 36–42 mm
Remark	Two-sided, designed for two vessel sizes

Thermoblock	Order number 112411
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	400 x 63 x 45 (L x W x H)
Function	For holding a total of 50 vessels Ø 10.2–10.8 x 48–56 mm (Eppendorf caps)

Thermoblock	Order number 112413
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	400 x 113.8 x 45 (L x W x H)
Function	For holding a total of 100 vessels Ø 10.2–10.8 x 48–56 mm (Eppendorf caps)
Remark	Vials placed stepwise at an angle of 60° in four rows

Thermoblock	Order number 112220
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	296 x 219 x 5 (L x W x H)
Function	For holding a total of 88 vessels Ø 14.5–15.4 x 13–15 mm

Thermoblock	Order number 112434
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	200 x 270 x 30 (L x W x H)
Function	For holding a total of 108 vessels Ø 16 x 35 mm with flat bottom (2R vials)

Thermoblock	Order number 112435
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	225 x 300 x 30 (L x W x H)
Function	For holding a total of 130 vessels Ø 16 x 35 mm with flat bottom (2R vials)

Thermoblock	Order number 112483
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	400 x 80 x 62 (L x W x H)
Function	For holding a total of 11 vessels Ø 27.8–29.2 x 65–76 mm (50 ml flask)
Remark	1-row block

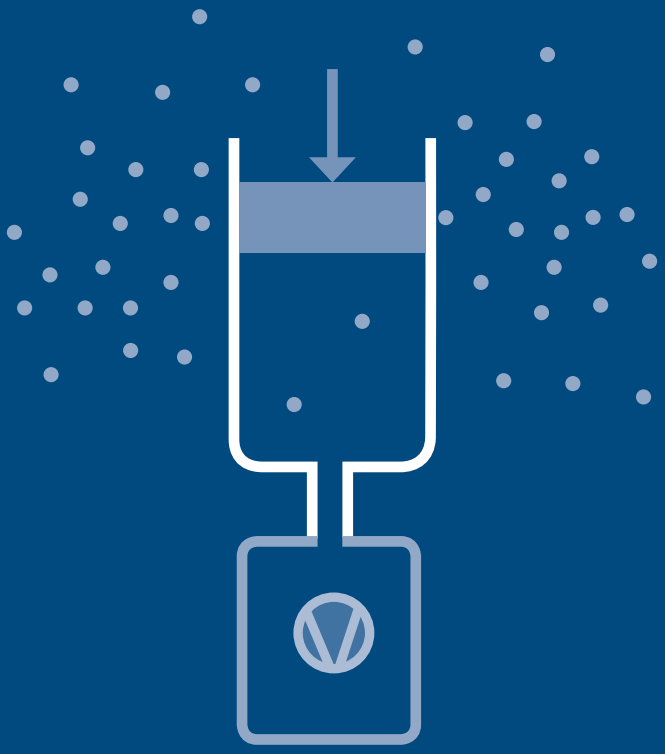
Overview

				Number of thermoblocks per shelf			
Item number	Block dimensions (mm)	Number of vials	Vial diameter (mm) Height (mm)	Epsilon 1-4 LSCplus Epsilon 2-4 LSCplus 270 x 400 mm (W x L)	Epsilon 2-6D LSCplus 225 x 300 mm (W x L)	Epsilon 2-10D LSCplus 350 x 400 mm (W x L)	Epsilon 2-12D 350 x 400 mm (W x L)
110245	400 x 99 x 25	150	9.7-10.3 x 28-33	2	0	3	3
112414	400 x 115.5 x 32	100	10.2–10.8 x 34-40	2	0	3	3
112411	400 x 63 x 45	50	10.2–10.8 x 48-56	4	0	6	5
112413	400 x 113.8 x 45	100	10.2–10.8 x 48-56	2	0	3	4
112220	296 x 219 x 5	88	14.5-15.4 x 13-15	1	1	1	2
112434	200 x 270 x 30	108	16 x 35	2	1	2	2
112435	225 x 300 x 30	130	16 x 35	1	1	1	2
112483	400 x 80 x 62	11	27.8-29.2 x 65-76	3	0	4	5

Thermoblocks for Epsilon 2-12D

Thermoblock	Order number 110296
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	290.5 x 89.2 x 90 (L x W x H)
Function	For holding a total of 75 vessels Ø 14.5–15,2 x 100–115 mm

Thermoblock	Order number 110303
Material	Aluminium
Surface	Black anodised
Dimensions (mm)	231.3 x 80 x 85 (L x W x H)
Function	For holding a total of 44 vessels Ø 16 x 100 mm with round bottom



Vacuum

*The best drying results are obtained with the right vacuum. For aqueous media or media with low solvent content, oil-sealed rotary vane pumps are typically used, although oil-free dry-running pumps are increasingly being used. Their advantage is that there is no need for oil changes or disposal of used oil. Where specimens containing solvents or specimens fully dissolved in organic substances such as DMSO, acetonitryl or tertiary butanol are used, pumps that can withstand these chemicals must be used.
The state of the art here is chemistry hybrid pumps, which consist of a rotary vane pump with an auxiliary diaphragm pump that evacuates the oil space. This reduces the condensation of aggressive solvents in the vacuum pump oil. The vacuum range that pump systems for freeze drying must be able to achieve in practice is 0.005 to 0.01 millibar (hPa).
Most vacuum sensors used for process control are hot-wire types (Pirani sensors; see the general information section) and are also available in chemical-resistant versions.

6 Vacuum

6.1 Vacuum pumps 92
6.2 Vacuum pump oil 94
6.3 Vacuum hoses 94
6.4 Vacuum accessories 95

6.1 Vacuum pumps

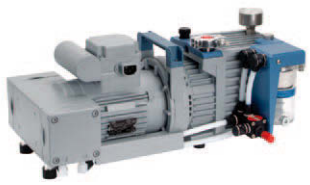
Vacuum pumps

Chemical hybrid vacuum pump — Order number 125291

Model	CV 12 D
Suction capacity	11 m^3/h
Power	115/230 V, 50/60 Hz
Features	With small flange coupling DN 25/25
Remark	Final vacuum 2×10^{-3} mbar

Chemical hybrid vacuum pump — Order number 125292

Model	CV 23 D
Suction capacity	16 m^3/h
Power	230 V; 50/60 Hz
Features	With small flange coupling DN 25/25
Remark	Final vacuum 2×10^{-3} mbar



Chemical hybrid vacuum pump — Order number 125295

Model	RC 6
Suction capacity	5.9 m^3/h
Power	230 V, 50/60 Hz
Features	With small flange coupling DN 16
Remark	Final vacuum 2×10^{-3} mbar

Chemical hybrid vacuum pump — Order number 125296

Model	RC 6
Features	Emissions condenser and trap, for substances containing solvents
Suction capacity	5.9 m^3/h
Power	230 V, 50/60 Hz
Features	With small flange coupling DN 16
Remark	Final vacuum 2×10^{-3} mbar

Vacuum pump (chemical-resistant rotary-vane pump) — Order number 125261

Model	Pascal 2010 C1
Suction capacity	10 m^3/h
Power	230 V, 50/60 Hz
Features	With small flange coupling DN 16
Remark	Final vacuum 2×10^{-3} mbar

Vacuum pump (chemical-resistant rotary-vane pump) — Order number 125263

Model	Pascal 2021 C1
Suction capacity	21 m^3/h
Power	230 V, 50/60 Hz
Features	With small flange coupling DN 25
Remark	Final vacuum 2×10^{-3} mbar

Vacuum pump (rotary-vane pump) — Order number 125302

Model	RZ 2,5
Suction capacity	2.3 m^3/h
Power	230 V, 50/60 Hz
Features	With small flange coupling DN 16
Remark	Final vacuum 2×10^{-3} mbar

Vacuum pump (rotary-vane pump) — Order number 125307

Model	RZ 6
Suction capacity	5.7 m^3/h
Power	230 V, 50/60 Hz
Features	With small flange coupling DN 16
Remark	Final vacuum 2×10^{-3} mbar

Vacuum pump: — Order number 125317

Model	DUO 10
Suction capacity	11.1 m^3/h
Power	230 V, 50/60 Hz
Features	With small flange coupling DN 25/25
Remark	Final vacuum 2×10^{-3} mbar

Vacuum pump: — Order number 125318

Model	DUO 20
Suction capacity	20 m^3/h
Power	230 V, 50/60 Hz
Features	With small flange coupling DN 25/25
Remark	Final vacuum 2×10^{-3} mbar

Vacuum pump: — Order number 610882

Model	nXDS 10i
Suction capacity	11.4 m^3/h
Power	200–240 V, 50/60 Hz
Remark	Final vacuum <0,01 mbar
Features	With small flange coupling DN 25/25

6.2 Vacuum pump oil

Vacuum pump oil

Pump oil	Order number 126181
Contents	1 l bottle
Pumps	RZ / RC / DUO

Pump oil	Order number 126185
Contents	5 l cannister
Pumps	RZ / RC / DUO

Pump oil	Order number 126200
Contents	20 l cannister
Pumps	RZ / RC / DUO

6.3 Vacuum hoses

Vacuum hoses

Vacuum hose	Order number 125702
Length	1 m
Features	With standard flange couplings DN 16 / DN 25

Vacuum hose	Order number 125706
Length	1.5 m
Features	With standard flange couplings DN 16 / DN 25

Vacuum hose	Order number 125704
Length	1 m
Features	With standard flange couplings DN 25 / DN 25

Vacuum hose	Order number 125705
Length	1.5 m
Features	With standard flange couplings DN 25 / DN 25

6.4 Vacuum accessories

Vacuum accessories

Micro aeration valve — Order number 125931

Features	With hose fitting

Micro vent valve — Order number 125932

Features	With hose fitting and pipe bend, DN25 / DN25

Electromagnetic pressure control valve — Order number 125910

Function	For installation in the suction line of the vacuum pump
Features	With DN 25 / DN25
Remark	Alpha and Beta LDplus, as well as Alpha to Gamma systems with LSC and Epsilon 1–4/2–4

Manual stop valve — Order number 125920

Function	For the vacuum hose between LDplus series freeze dryer systems and the vacuum pump (in place of the solenoid pressure control valve 125910)
Features	With standard flange DN 25 / DN25

Exhaust filter — Order number 125501

Remark	For vacuum pumps 125302 / 125307

Replacement filter cartridge — Order number 125509

Remark	For 125501

Exhaust filter	Order number 125502
Model	ONF 25 L
Features	With automatic oil return

Exhaust filter	Order number 125503
Model	ONF 25 L
Features	Without automatic oil return

Replacement filter cartridge	Order number 125510
Remark	For 125502 and 125503

Vacuum sensor	Order number 125478
Model	A VSP 63 MV SW
Connection	With integrated signal processing for direct connection to the freeze drying system
Measuring range	1000 – 0.001 mbar
Measuring principle	Pirani
Features	With connecting cable, clamping/centring and T fitting
Warranty	6 months
Note	These sensors are wear parts whose service life is largely dependent on the proper use and handling of the freeze dryer

Replacement sensor	Order number 125468
Model	A VSP 62 MV SW
Warranty	6 months

Vacuum sensor	Order number 125463
Model	Type 722 A
Connection	Preferably for pilot systems
Measuring range	1000 – 0.1 mbar (or lower with reduced accuracy)
Measuring principle	Capacitive and piezoelectric
Features	With Jumo pressure sensor d trans p30
Warranty	6 months
Note	These sensors are wear parts whose service life is largely dependent on the proper use and handling of the freeze dryer

Vacuum sensor — Order number 125471

Model	Type VSP 3000
Connection	with integrated signal processing for direct connection to the freeze drying system
Measuring range	1000 – 0.1 mbar
Measuring principle	Pirani
Features	With connecting cable, clamping/centring and T fitting
Warranty	6 months
Note	These sensors are wear parts whose service life is largely dependent on the proper use and handling of the freeze dryer

Chemical-resistant vacuum sensor — Order number 125476

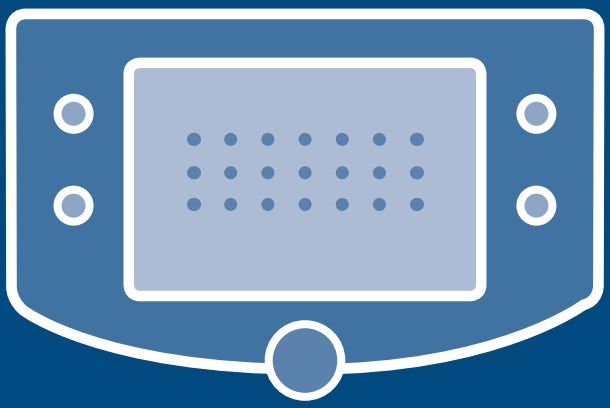
Model	TPR 281
Connection	With integrated signal processing for direct connection to the freeze drying system
Measuring range	1000 – 0.001 mbar
Measuring principle	Pirani
Features	Complete with connecting cable, two centring and clamping rings and T fitting DN 25/25 ISO-KF
Warranty	6 months
Note	These sensors are wear parts whose service life is largely dependent on the proper use and handling of the freeze dryer

Replacement sensor — Order number 125466

Model	TPR 281
Connection	For connection to system controller; chemical resistant
Warranty	6 months
Note	These sensors are wear parts whose service life is largely dependent on the proper use and handling of the freeze dryer

High-vacuum grease — Order number 126210

Remark	



Process Data Acquisition

* Our unique software for process documentation is described in this section. It is available in two versions: a basic version for data logging and a full version with extensive additional control functions. A software module for recipe generation and an extension unit for the utilisation of heated shelves are also available.
The related hardware accessories include product probes for temperature and electrical resistance, data cables, etc.

7 Process Data Acquisition

7.1 Software and hardware 100
7.2 Sensors 101
7.3 Miscellaneous 102

7.1 Software and hardware

Software and hardware

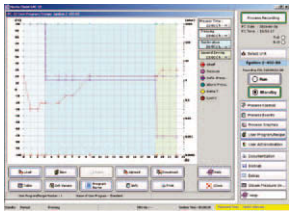
Program selection module	Order number 125099
Model	PGM-30
Function	LSCplus system controller extension module for 30 user-defined individual programs
Control	Control of temperature and pressure profiles and individual process steps (freezing, primary drying, secondary drying)
Features	Very easy to use thanks to integration into system controller and guided data entry; supports entry and deletion of individual steps

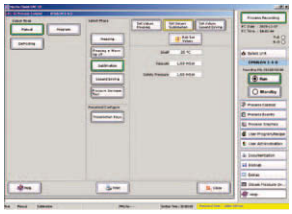
LyoControlplus	Order number 125050
Function	Determination of eutectic point
Features	Includes sensors for temperature and resistance
Note	For use in combination with LSCplus system controller and LyoLogplus documentation software

Documentation software LyoLogplus	Order number 125025
Function	Windows-based software for logging relevant process parameters: ice condenser temperature, product temperature, shelf temperature, vacuum, and/or Lyo-Rx (depending on freeze dryer configuration)
Features	Supports export in PDF and Excel file formats

Extension kit	Order number 125036
Function	Serial interface for LD plus

USB	Order number 125037
Model	Process data logging for equipment with LSCplus system controller
Function	For graphical process display
Includes	USB stick, LyoLogplus installation CD





LPCplus process visualisation — Order number 125042

Model	LPCplus
Function	Software for standard PCs for data transfer and freeze drying system monitoring in combination with LSCplus system controller
Includes	LPC software on diskettes, 1 connecting cable, installation and operation manual, PC with operating system, colour monitor and colour graphic printer
Note	PC hardware included

7.2 Sensors

Sensors

Product sensor — Order number 124802

Model	PT 100
Cable length approx.	0.8 m
Features	With precision connector for use with LSC controller
Remark	Alpha–Delta

Product sensor — Order number 124812

Model	PT 100
Cable length approx.	0.26 m
Features	With precision connector for use with LSCplus controller

Product sensor	Order number 124799
Model	PT 100
Cable length approx.	0.8 m
Features	With precision connector
Remark	Epsilon

Product sensor	Order number 124800
Model	PT 100
Cable length approx.	1.3 m
Features	With precision connector
Remark	Epsilon

Product sensor	Order number 124801
Model	PT 100
Cable length approx.	2 m
Features	With precision connector
Remark	Epsilon

Sensor for temperature and resistance	Order number 124809
Function	For LyoControlplus
Remark	With precision connector for use with LSCplus system controller
Cable lenght	0,26 m

Sensor for temperature and resistance	Order number 124811
Function	For LyoControlplus
Remark	With precision connector for use with LSCplus system controller
Cable lenght	0,8 m

Sensor for temperature and resistance	Order number 125130
Function	For LyoControl and LyoControlplus
Remark	Epsilon
Cable lenght	0,8 m

7.3 Miscellaneous

Interface cable	Order number 125173
Model	USB-RS 232

Cooling Baths and Freezing Equipment

* The accessories in this section can be used for routine external freezing of specimens in round-bottom flasks or wide-mouth bottles prior to drying. Freezing under rotation to form relatively thin frozen layers dramatically reduces drying time
(see separate booklet "Principles and Applications of Freeze Drying"). Suitable media for cooling baths are also available.

8 Cooling Baths and Freezing Equipment

8 Cooling Baths and Freezing Equipment

Cooling Baths and Freezing Equipment

Cooling bath — Order number 101840

Model	CB 18-40
Dimensions (mm)	410 x 450 x 460
Bath depth	200 mm
Bath opening (mm)	300 x 327 (W x L)
Characteristics	Air cooled
Features	Stainless steel tank with integrated condensate drain, digital display and actual ice condenser temperature indication
Capacity	18 litres
Bath temp.	Approx. -40 °C
Power	230 V, 50/60 Hz
Note	For connection of 1 or 2 rotators
Features	Non-halogenated chilling media

Rotator with support rod — Order number 120720

Function	For freezing liquids in round-bottom flasks
Weight approx.	3.8 kg
Power	230 V, 50 Hz
Features	Speed continuously variable from 60 to 2000 rpm

Horizontal roller rotator — Order number 120726

Material	Stainless steel
Weight approx.	11.5 kg
Application	For 1 or 2 1200-ml wide-neck filter bottles
Power	220 V, 50 Hz
Features	Speed continuously variable from 60 to 2000 rpm

Therminol D12 — Order number 130345

Quantity	5 l cannister

Therminol D12 — Order number 130350

Quantity	10 l cannister

Therminol D12 — Order number 130360

Quantity	20 l cannister

Service and Representatives

Christ systems are marketed in more than 70 countries worldwide.
To enable support for our customers at all times, we have an international network of representatives for advice and service.
At the national level, support and advice are provided by our representatives and by our trained system specialists directly from our head office.

We are there for you all the time.

Selected international Christ representatives

For information about our international representatives and contact data, visit www.martinchrist.de

Questionnaire for requesting advice or a quotation

Your name and address

1 What is the maximum quantity (kilograms or litres) to be dried each day?

2 Are there any particular requirements regarding batch size? If so, please specify.

3 What has to be dried?

4 What is the ratio (weight percentage) of the dry substance to the initial overall mass?

5 What is the consistency of the substance to be dried (low viscosity, high viscosity, pasty, solid)? If solid, how big are the pieces?

6 Does the substance to be dried contain solvents other than water? If so, which ones and in what percentages?

7 What residual moisture level in the dried substance is considered acceptable?

8 If you already have experience with freeze drying, of the substance concerned, what is your opinion of:

a) the quality of the dried substance?

b) the equipment used?

9 What vessels are to be used for drying? What are the shapes and sizes of the vessels? Can you provide samples? How much undried substance should be present in each vessel? How many vessels per batch are necessary? (Note: These details are particularly important to help us determine the proper choice of freeze drying equipment for your application.)

10 Will the substance be stored in the drying vessels, or is transfer necessary?

11 Is sealing under vacuum necessary?

.....

12 Is preservation under nitrogen necessary?

.....

13 Available power:

AC ..... V ..... Hz

3-phase AC ..... V ..... Hz

.....

14 Do you have any other specific wishes or requirements?

.....

A laboratory is available for carrying out tests of drying methods.

....

Date Signature

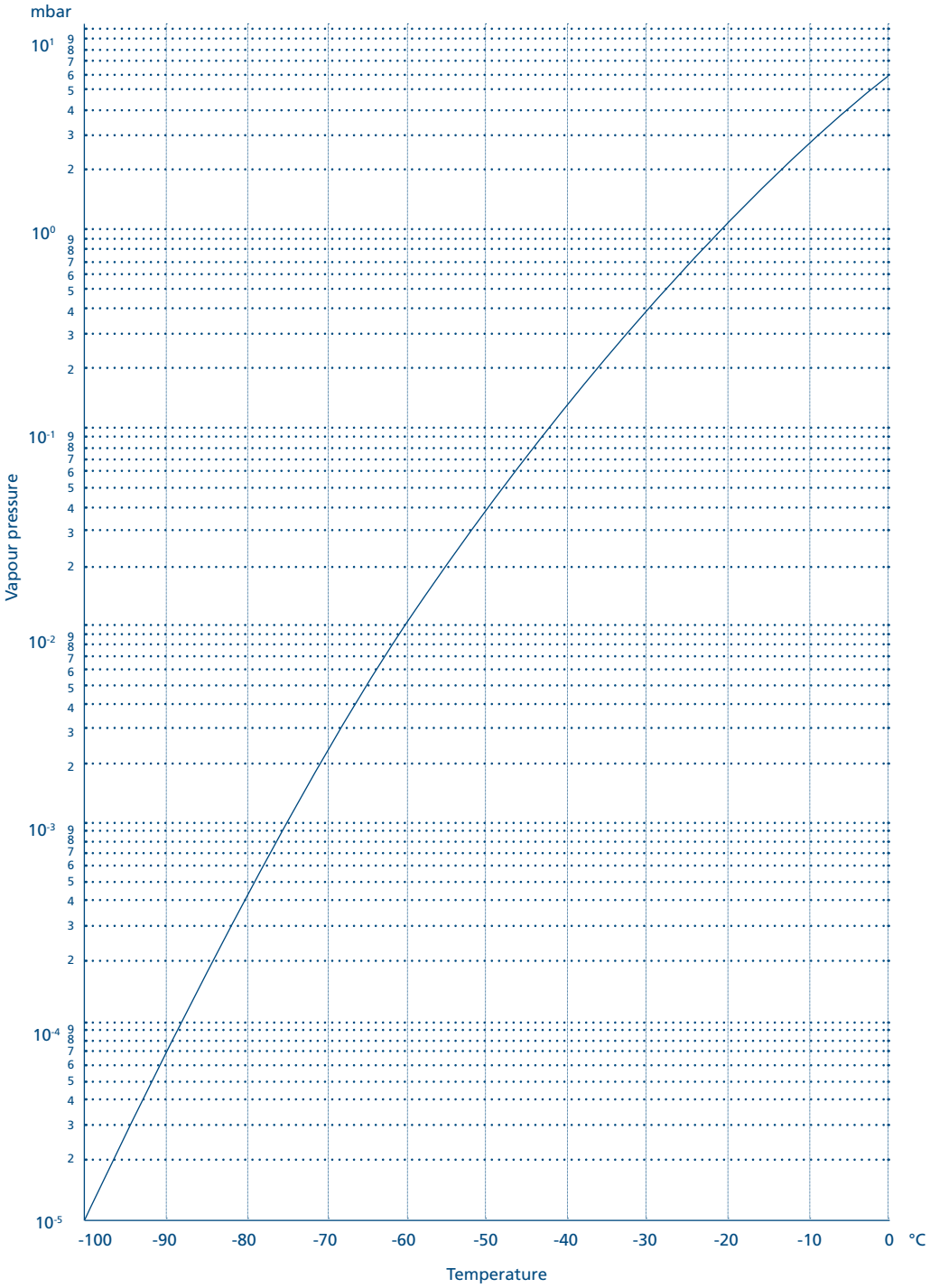
Martin Christ
Gefriertrocknungsanlagen GmbH

A der Unteren Söse 50
37507 Osterode am Harz

Phone +49 (0) 55 22 50 07-0
Fax +49 (0) 55 22 50 07-12

www.martinchrist.de
info@martinchrist.de

Vapour pressure above ice



1 mbar ≙ 1 hPa = 10^{2} Pa 1 mbar ≙ 10^{5} Pa = 0.1 N/mm²

1 Pa = 1 N/m²

1 Torr = 1.3332 mbar

Conversion table

Conversion table for vapour pressure above ice (ice temperature in °C and corresponding pressure in mbar)

°C	≙ mbar	°C	≙ mbar	°C	≙ mbar	°C	≙ mbar
0	6.110	-20	1.030	-40	0.120	-60	0.011
-1	5.620	-21	0.940	-41	0.110	-61	0.009
-2	5.170	-22	0.850	-42	0.100	-62	0.008
-3	4.760	-23	0.770	-43	0.090	-63	0.007
-4	4.370	-24	0.700	-44	0.080	-64	0.006
-5	4.020	-25	0.630	-45	0.070	-65	0.0054
-6	3.690	-26	0.570	-46	0.060	-66	0.0047
-7	3.380	-27	0.520	-47	0.055	-67	0.0047
-8	3.010	-28	0.470	-48	0.050	-68	0.0035
-9	2.840	-29	0.420	-49	0.045	-69	0.0030
-10	2.560	-30	0.370	-50	0.040	-70	0.0026
-11	2.380	-31	0.340	-51	0.035	-71	0.0023
-12	2.170	-32	0.310	-52	0.030	-72	0.0019
-13	1.980	-33	0.280	-53	0.025	-73	0.0017
-14	1.810	-34	0.250	-54	0.024	-74	0.0014
-15	1.650	-35	0.220	-55	0.021	-75	0.0012
-16	1.510	-36	0.200	-56	0.018	-76	0.0010
-17	1.370	-37	0.180	-57	0.016	-77	
-18	1.250	-38	0.160	-58	0.014	-78	
-19	1.140	-39	0.140	-59	0.012	-79	

Our Product Spectrum

With our unique and broad spectrum of equipment and accessories, we 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 capacities from 20 to 500 kg; custom system engineering including loading and unloading systems.
2. Pilot freeze drying systems for process development or optimisation with ice condenser capacities from 4 to 12 kg.
3. Freeze drying systems for routine applications or R&D with ice condenser capacities from 2 to 24 kg.
4. Rotation vacuum concentrators for applications ranging from routine operations to evaporation concentration in advanced pharmaceutical research

Martin Christ
Gefriertrocknungsanlagen GmbH

An der Unteren Söse 50
37520 Osterode am Harz

Phone +49 (0) 55 22 50 07 0
Fax +49 (0) 55 22 50 07 12

info@martinchrist.de
www.martinchrist.de