INCREASE YOUR
LAB EFFICIENCY

CoolSafe
How to configure
your freeze dryer

Scandinavian by Design



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THE PROCESS

PRE-FREEZING, PRIMARY DRYING & SECONDARY DRYING

THE BASIC PRINCIPLE:

Freeze drying is a process whereby a product is dried by removing the water under low temperature and pressure.

THE TECHNICAL EXPLANATION:

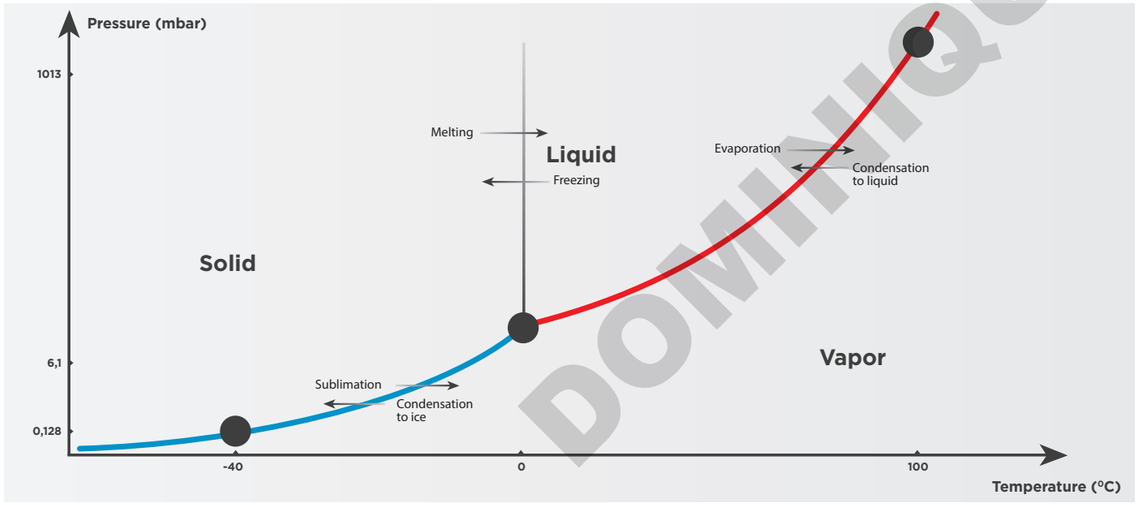
Freeze drying involves the removal of water or other solvents from a given product by a process called sublimation. This occurs when the ice of a frozen product converts directly to the gaseous state without passing through the liquid phase. This enables the preparation of a stable product that is easy to use and store at ambient temperatures.

A low pressure environment is a pre-requisite to allow this process to take place. In order to start the removal of the water, the pressure inside the freeze dryer must be below the “triple point value” for the product, whilst also maintaining the temperature of the sample below its freezing point.

FIRST STAGE – PRE-FREEZING:

The sample is frozen, which means the water in the product is converted to ice, thereby the phase has changed from liquid to solid.

Slow pre-freezing will produce larger ice crystals, which are easier to freeze dry, whilst fast pre-freezing results in smaller crystals.



SECOND STAGE – PRIMARY DRYING:

In the second stage the sublimation process starts. The ice formed in the pre-freeze step is removed from the sample by the direct transition of the “solid” ice to a vapour without passing through a liquid phase. The resultant vapour is collected in the condenser, which has a lower temperature and pressure than the product. The vapour is thus converted back to ice on the condenser surface.

The “energy” required for this process to occur is provided by a gentle heating of the sample, which will start the sublimation process and eventually the sample will dry.

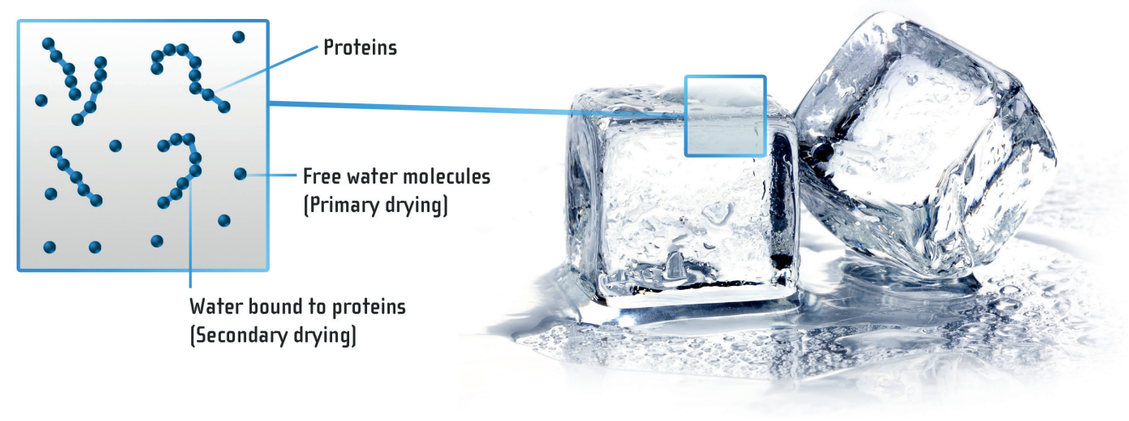
If too much energy (heat) is applied to the sample during this stage the condenser may not be able to condense the volume of vapours fast enough, the ice condenser temperature will subsequently rise along with its vapor pressure, thus increasing the risk of the sample melting.

THIRD STAGE – SECONDARY DRYING:

Finally, any residual water present, which is strongly bound to the molecules of the sample, is converted to vapour and removed from the sample.

This water has invariably a vapour pressure lower than that of water in its “free” form.

Removal of the water in this final stage will be performed at higher product temperatures, consequently, any biological activity of the sample will not be impaired or affected. This usually involves increasing the temperature and lowering the pressure to provide enough energy to break down the molecular bonding. A process called desorption.



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CHOOSING

YOUR FREEZE DRYER

HOW TO CALCULATE THE SIZE OF THE FREEZE DRYER

When the size of the freeze dryer is to be determined several questions have to be addressed, for example:

- What condenser size (volume) is required?
- What condenser temperature is required?
- What is the maximum number of samples to be freeze dried at one time?
- What is the total volume of the samples?
- What is the size of the container/tray you want to use for the samples?
- What is the sample volume in each tube/vial?

If “bulk drying” on trays or shallow containers, the sample depth should ideally be less than 1,5 cm. When all these questions have been answered the size and configuration of the freeze dryer can then be determined.



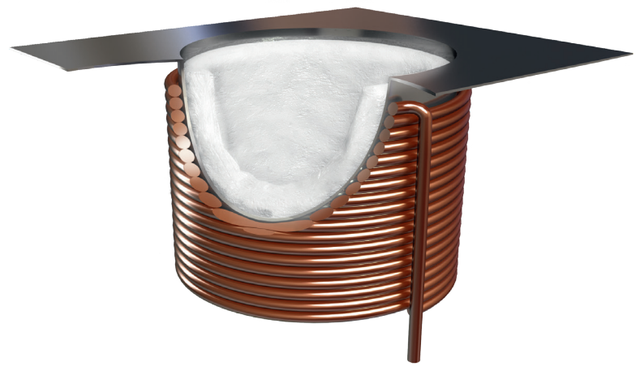


WHAT SIZE OF CONDENSER IS REQUIRED?

The size of a freeze dryer is rated in size by the capacity of the condenser to hold ice that is produced in a 24 hour drying cycle (i.e. water from the sample)

As a minimum, the condenser capacity must be adequate to handle the total amount of vapor from the sample volumes in a single batch before de-icing is required.

The larger the condenser’s surface area, the more efficiently vapor is condensed to ice and, consequently, the thinner the ice-layer formed.



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WHAT CONDENSER TEMPERATURE IS NEEDED?

The choice of condenser temperature is important! If the temperature is too high, then a correct freeze drying process cannot take place.

In the table to the right are the freezing points/ collapsing temperatures of some commonly used solvents and known products. These are given for guidance purposes and to assist in deciding the condenser temperature for your application.



If the condenser temperature is near to the freezing point of the sample, then the freeze drying cycle times are extended.
The product could possibly start to melt, thus giving very poor recovery rates and enhancing the possibility of damaging the vacuum pump, eventually polluting the laboratory environment. This phenomenon is known as a “collapse” of the sample.

The driving force in freeze drying is expressed as the temperature/pressure differential between the product and the condenser.

In conclusion, the lower the condenser temperature, the better! For example, for aqueous samples a -55C condenser temperature is the preferred choice.

However, a lower temperature condenser will provide faster freeze drying, avoiding melting and give better results, with the additional benefit of protecting the vacuum pump and the environment.

Collapsing temperatures of different products

Products	Temperatures
Apple Juice	-42°C
Citrate Buffer	-40°C
Coffee Extract	-20°C
Dextran	-9°C
Fruktose	-48°C
Gelatin	-8°C
Glucose	-40°C
Inisitol	-27°C
Lactose	-32°C
Lemon Juice	-36°C
Methocel	-9°C
MSG	-50°C
Orange Juice	-24°C
Ovalbumim	-10°C
Phosphate Buffer	-8°C
PVP	-23°C
Sorbitol	-45°C
Sucrose	-32°C
Solutions containing ethanol etc.	-60°C – -110°C
Trichlorethylene	-86,4°C



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CONFIGURE

THE FREEZE DRYER FOR YOUR APPLICATION

The process of selecting the correct freeze dryer for your application is divided into 8 steps:

- Step 1: Temperature, volume, voltage, surface of the condenser and the preferred freeze dryer version – Basic, Pro, Touch or Touch Superior.
- Step 2: This will guide you to the particular model based on your requirements.
- Step 3-8: Select the type and size of the chamber, type and size of a manifold and any accessories you need for your freeze drying application.



STEP 1

Temperature:
You can choose between -55°C, -95°C, -100°C and -110°C condenser temperatures. Please refer to the information on the previous pages with regards to which temperature is optimal for your freeze drying requirements.

Volume:
Based on the chosen temperature you have different condenser volumes to select from.

	-55°C	-95°C	-100°C	-110°C
4 litre	X			X
9 litre	X		X	
15 litre	X	X		
80 litre	X	X		

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Check it at
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BASED ON YOUR CHOICE OF TEMPERATURE AND VOLUME SELECT THE MODEL MOST SUITED FOR YOUR REQUIREMENTS:

	Basic	Pro	Touch	Superior Touch XS/XL	Superior Touch
-55°C and 4L	X	X	X		
-55°C and 9L	X	X	X		
-55°C and 15L		X	X		
-55°C and 80L					X
-95°C and 15L		X	X	X	
-95°C and 80L					X
-100°C and 9L		X	X	X	
-110°C and 4L	X	X	X		

BASIC

Digital read-out of temperature. Included are hose and flange for connections to the vacuum pump and the vacuum solenoid valve, which is controlled from the front of the freeze dryer.

PRO

Digital read-out of temperature and pressure. Included are hose and flange for connections to the vacuum pump and the vacuum solenoid valve, which is controlled from the front of the freeze dryer.

TOUCH

For Manual and Automatic operation, with optimum control and regulation of temperature, pressure and time. Included are vacuum hose and flange connection to the pump.

All operations are controlled from the touchscreen display, including:

- Vacuum solenoid valve.
- Pressure regulation valve for primary drying.
- Vacuum release valve.
- Electrical de-icing.
- Software back-up.

SUPERIOR TOUCH

For manual and automatic operation, with optimum control and regulation of temperature, pressure and time, with the additional facility of pre-freezing. Included are vacuum hose and flange connection to the pump.

All operations are controlled from the touchscreen display, including:

- Vacuum solenoid valve.
- Pressure regulation valve for primary drying.
- Vacuum release valve.
- Electrical de-icing.
- Software back-up.

The XS models are inclusive of an electrical heated three-shelf rack for pre-freezing. For the XL models, you can choose between a version inclusive of an electrical heated three-shelf rack and a version inclusive of an electrical heated five-shelf rack. See page 18 for the distances between the shelves.



CoolSafe Basic and Pro



CoolSafe Touch



CoolSafe Superior Touch XL/XS



CoolSafe Superior Touch

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VOLTAGE:

You have the possibility of choosing between 115V/60Hz and 230V/50-60Hz.
For an 80 litre condenser the only option is 3x400V/50-60Hz.

Surface of the condenser
Some of our freeze dryers can be supplied with teflon coated condensers for use when for freeze drying materials that may contain aggressive acids. Please contact us for further information and advice.

STEP 2

The freeze dryer version
Based on your selection of temperature, volume, model, voltage and surface of the condenser you will have specified the exact model, which best suits your exact requirements and needs.







STEP 3

TOP LIDS -Select the lid required for your application

For CoolSafe Basic, Pro and Touch



Acrylic lid (ACpl)
Acrylic plate on the top of the CoolSafe including vacuum release.

This facilitates all non-heated chambers (CCS200 and 300) and manifold M4 basic.

Art no.: 7001100061



CCS 300 lid with hole for M4 basic manifold
Extra top plate for CCS 300 with drilled hole for adaption of M4 Basic.

Art no.: 7111000615

STEP 4

MANIFOLDS -Select the manifold required for your application

For CoolSafe Basic, Pro and Touch



Manifold 4 Basic
Manifold Basic with 4 rubber valves 3/4 inch for freeze drying in flasks. (Can be extended with the addition of Manifold 4 Extension).

Art no.: 7001000062



Manifold 4 Extension
Manifold extension including 4 rubber valves 3/4 inch for freeze drying in flasks.

Art no.: 7001000063



Complete M4 Manifold
+Manifold 4 Extension
+ Acpl



Drum manifold
Drum manifold made of stainless steel.

Included are 12 3/4 inch rubber valves.

The ACpl lid is not necessary to use this manifold.

Art no.: 7001000163



Ampoule manifold 16
Ampoule manifold made of stainless steel for 3/4 inch rubber valves with 16 x 6 mm pipes. Included is 1,5 meter hose.

Art no.: 7001000076



Additional information

Please contact the LaboGene distributor in your specific country or visit our webpage www.labogene.com

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For CoolSafe Superior Touch 80 L



Manifold 5
Side manifold for CoolSafe Superior Touch 55°C/95°C with an 80 litre capacity with 5 quick seal valves 3/4 inch.

Art no.: 7001000862



Manifold 14
Manifold for CoolSafe Superior Touch 55°C/95°C with an 80 litre capacity with 14 quick seal valves 3/4 inch for freeze drying in flasks.

Art no.: 7001000869

STEP 5

CHAMBERS

Non-heated chambers
– to be used with the Basic, Pro or Touch models.

Various sizes and formats are available which offer complete flexibility of use.
These include options for stoppering, attachment of flasks, and racks with removable shelves.

Chamber CCS 200



Chamber CCS 200, ø200 mm
Polycarbonate chamber ø200 mm including 2 x ø180 mm adjustable stainless steel shelves and trays.

Distance between shelves:
Min. 20 mm with 6 shelves.
Max. 105 mm with 2 shelves.
(Possibility to have up to 6 shelves and trays).

Art no.: 7001000064



Rack 200
Extra rack for CCS 200 including 2 shelves and trays for pre-freezing.

Art no.: 7001000287



Tray 200
Extra stainless steel tray ø180 mm x 18 mm for CCS 200 chamber.

Art no.: 7001000264



Shelf ø180 mm
Extra stainless steel shelf for CCS 200 chamber.

Note it only works as support for the tray.

Art no.: 7001000164

Chamber CCS 300



Chamber CCS 300, ø300 mm
Acrylic chamber ø300 mm with 3 stainless steel shelves ø250 mm and 3 trays with adjustable height.

Distance between shelves:
Min. 28 mm with 12 shelves.
Max. 328 mm with 2 shelves.
(Possibility to have up to12 shelves and trays).

Art no.: 7001000085



Chamber, CCS 300 4V, ø300 mm
Acrylic chamber ø300 mm with 3 stainless steel shelves ø250 mm, 3 trays with adjustable height and 4 x 3/4 inch rubber valves.

Distance between shelves:
Min. 28 mm with 12 shelves.
Max. 328 mm with 2 shelves.
(Possibility to have up to 12 shelves and trays).

Art no.: 7001000086



Chamber, CCS 300 8V, ø300 mm
Acrylic chamber ø300 mm with 3 stainless steel shelves ø250 mm, 3 trays with adjustable height and 8 x 3/4 inch rubber valves.

Distance between shelves:
Min. 28 mm with 12 shelves.
Max. 328 mm with 2 shelves.
(Possibility to have up to 12 shelves and trays).

Art no.: 7001000087



Chamber, CCS 300 with stoppering arrangement
Acrylic chamber ø300 mm with 3 shelves ø250 mm with mechanical stoppering arrangement.

Distance between shelves:
Min. 20 mm
Max. 78 mm
Total 0,15 m2 shelf area.

Art no.: 7001000187



Shelf ø250 mm
Extra stainless steel shelf for CCS 300 chamber.

Please note that the shelf only acts as support for the tray.

Art no.: 7001000185



Tray 300
Extra stainless steel tray ø250 mm x 21 mm for CCS 300 chamber.

Art no.: 7001000285

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Rack 300
Extra rack for CCS 300 including 3 shelves and trays for pre-freezing.

Art no.: 7001000387



Rack micro-titre plate
Rack for 3 x 14 micro-titre or 3 x 7 micro-titre plates for CCS 300 chamber.

Art no.: 7001000479

Chamber CCS 500



Chamber, CCS 500, ø500 mm
Acrylic chamber ø500 mm. The internal height is 480 mm.

Included are 3 stainless steel shelves and trays with adjustable height.

Distance between shelves:
Min. 39 mm with 9 shelves.
Max. 318 mm with 2 shelves.
(Possibility to have up to 9 shelves and trays.)

Lid with 40 NV flange and NV 40 flex hose for connection to the CoolSafe are also included.

Art no.: 7001500085



Tray 500
Extra stainless steel tray ø435 x 23 mm for CCS 500 chamber.

Art no.: 7001500285



Shelf ø440 mm
Extra stainless steel shelf for CCS 500 chamber.

Art no.: 7001500185

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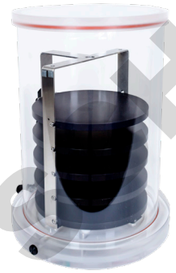
Heated chambers

– to be used with the CoolSafe Touch and Superior Touch XL & XS

We offer a wide selection of chambers with electrical heated shelves that ensure uniform and faster drying, especially in the secondary drying stage. Giving increased recovery rates with controlled programmable energy input.

Versatility with Adaptability!

Chamber CCS 300 E



Chamber, CCS 300 E, ø300 mm, heated
Acrylic chamber ø300 mm with 5 heated shelves ø250 mm.

Distance between shelves:
Min. 38 mm with 5 shelves.
Max. 89 mm with 3 shelves.
(no. 2 and no. 4 shelves have been removed).

Included are the connection kit and product sensor.

Art no.: 7001300082



Chamber, CCS 300 4VE, ø300 mm, heated
Acrylic chamber ø300 mm with 5 heated shelves ø250 mm and 4 3/4 inch rubber valves.

Distance between shelves:
Min. 38 mm with 5 shelves.
Max. 89 mm with 3 shelves.
(no. 2 and no. 4 shelves have been removed).

Included are the connection kit and product sensor.

Art no.: 7001300083



Chamber, CCS 300 8VE, ø300 mm, heated
Acrylic chamber ø300 mm with 5 heated shelves ø250 mm and 8 3/4 inch rubber valves.

Distance between shelves:
Min. 38 mm with 5 shelves.
Max. 89 mm with 3 shelves.
(no. 2 and no. 4 shelves have been removed).

Included are the connection kit and product sensor.

Art no.: 7001300184



Chamber, CCS 300 E Stop, heated
Acrylic chamber ø300 mm with 3 heated shelves ø250 mm and stoppering arrangement.

Distance between shelves:
Min. 20 mm
Max. 78 mm.

Included are the connection kit and product sensor.

Art no.: 7001300197



Tray 300
Extra stainless steel tray ø250 mm x 21 mm for CCS 300 E chamber.

Art no.: 7001000285

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Chamber CCS 500 E



Chamber, CCS 500 E, ø500 mm, heated
Acrylic chamber ø500 mm. The internal height is 480 mm. Included are 2 electrical heated shelves ø435 mm with adjustable height.
The minimum distance is 65 mm with 5 electrical heated shelves.

Please note that the distance(s) increase when the shelf or shelves are removed.

Included are the connection kit and product sensor. Lid with 40 NV flange and NV 40 flex hose for connection to the CoolSafe are also included.

Art no.: 7001300194



Tray 500
Extra stainless steel tray ø435 x 23 mm for CCS 500 E chamber.

Art no.: 7001500285

Racks for CoolSafe Superior Touch XS and XL

XS (9 L volume/1,5 kg. ice capacity) and XL (15 L volume/3 kg. ice capacity)
The standard model XS is supplied with an electrical heated three-shelf rack for pre-freezing. For model XL, you can either choose a version supplied with an electrical heated three-shelf rack or a version supplied with an electrical heated five-shelf rack.
This provides a fully automatic research freeze drying system that incorporates the highest performance characteristics and technical features to meet the demands of today's research, analytical and development laboratories.



Superior Touch XS
Freeze dryer including rack with 3 heated shelves ø180 mm.

Distance between shelves is 34 mm.

Contact us for further information if teflon coating is needed.

Art no. for XS 230V: 700059
Art no. for XS 115V: 700060



Superior Touch XL 3 Shelves
Freeze dryer including rack with 3 heated shelves ø180 mm.

Distance between shelves is 79 mm.

Contact us for further information if teflon coating is needed.

Art no. for XL 3S. 230V: 700061
Art no. for XL 3S. 115V: 700062



Superior Touch XL 5 Shelves
Freeze dryer including rack with 5 heated shelves ø180 mm.

Distance between shelves is 34 mm.

Contact us for further information if teflon coating is needed.

Art no. for XL 5S. 230V: 703178
Art no. for XL 5S. 115V: 703179

Chambers for CoolSafe Superior Touch (80 L volume / 10 kg. ice capacity)

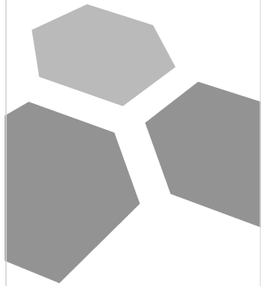
CoolSafe Superior Touch which has a condenser capacity of 80L can be configured with bulk rack or vial rack with heated shelves for pre-freezing. This provides a fully automatic research freeze drying system that incorporates the highest performance characteristics and technical features to meet the demands of today's research, analytical and development laboratories.



Vial rack Superior Touch
Vial rack including the stoppering arrangement pneumatic and 2 electrical heated shelves (250 x 400 mm) for stoppering of vials. It takes up to 5 shelves.

Distance between shelves: (without/with radiation shelf)
2 shelves mounted: 106/101 mm
3 shelves mounted: 67/63 mm
4 shelves mounted: 47/45 mm
5 shelves mounted: 36 mm

Art no.: 7001001881



Compressor up to 6 Bar, 230V/50-60 Hz
Compressor up to 6 Bar for the stoppering arrangement.

Can be purchased locally.

Art no.: 7001300885



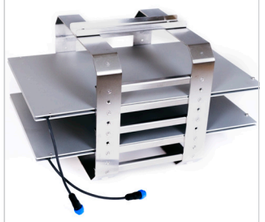
Shelf 2540 for Superior Touch Vial
Extra electrical heated shelf 2540 (250 x 400 mm). Each shelf is 0,10 m2, and a maximum of 3 extra shelves can be added.

Art no.: 7001001883



Tray 2540 for Superior Touch Vial
Tray 2540 in stainless steel for operation in vials rack.
(30 x 250 x400 mm).

Art no.: 7001001884



Bulk Rack Superior Touch no. 1
Bulk rack including 2 electrical heated shelves (300 x 500 mm). It accommodates up to 5 shelves.

Distance between shelves:
Min. 35 mm with 5 shelves.
.

Art no.: 7001001882



Tray 3050 for Superior Touch Bulk no. 1
Tray 3050 in stainless steel for bulk drying (30 x 300 x 500 mm).

Art no.: 7001001806

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Bulk rack Superior Touch no. 2
Bulk rack including 2 electrical heated shelves (300 x 500 mm), with a maximum of up to 8 shelves.
Distance between shelves:
Min. 18 mm with 8 shelves.
Max. 200 mm with 2 shelves.

Art no.: 7001001897



Tray 3050 for Superior Touch for Bulk no. 2
Tray 3050 in stainless steel for bulk drying (15 x 300 x 500 mm).

Art no.: 7001001802



Shelf 3050 for Superior Touch Bulk
Extra electrical heated shelf 3050 (300 x 500 mm).
Each shelf is 0,15 m2. A maximum of 3 extra shelves can be added for Bulk no. 1 and 6 extra shelves for bulk no. 2.

Art no.: 7001001801

STEP 6

PUMPS

Select the vacuum pump most suited for your freeze dryer/chamber combination.



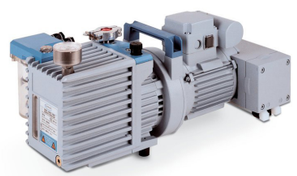
Vacuum pump, RZ 2.5
30 L/min and 2,5 m3/hour. The ultimate vacuum is 0,001 mBar with anti-blow back valve.
Included is the oil mist filter – art no.: 7001500071.

Art no. for 230V/50Hz version: 7001500069
Art no. for 110V/60Hz version: 7001506069



Vacuum pump, RZ 6
105 L/min and 6,0 m3/hour. The ultimate vacuum is 0,001 mBar with anti-blow back valve.
Included is the oil mist filter – art no.: 7001500071.

Art no. for 230V/50Hz version: 7001510070
Art no. for 110V/60Hz version: 7001516070



Vacuum pump, RC 6 Chemistry hybrid pump
Chemistry hybrid vacuum pump. 5.9/6.9 m3/hour.
The ultimate vacuum is 0,002 mBar.
Included is the oil mist filter – art no.: 7001500071.

Art no. for 230V/50Hz version: 7001510071



Vacuum pump, RZ 9
140 L/min and 8,6 m3/hour. The ultimate vacuum is 0,0002 mBar. Included is the oil mist filter – art no.: 7001201070.

Art no. for 230V/50Hz version: 7001201169

STEP 7

ACCESSORIES

Practical accessories for your consideration.



SVM 85
ScanVac Vacuum Meter, absolute pressure is 1200-0.001 mBar, with data-logging facility, NV 10 and flange.
Including connection kit for SVM 85.

For CoolSafe Basic.

Art no.: 7001000269



Connection kit for 2 chambers
T-kit with 2 x ¾ inch rubber valves for connection of 2 chambers to 1 vacuum pump.

Art no.: 7001000077



Trolley, freeze drying
Compact trolley for one CoolSafe and Vacuum pump.

Art no.: 7001100950



Gate valve
Valve enabling closure between CoolSafe and a ø500 chamber.

Art no.: 7001500879



Castors
Set of 4 pieces, with 2 which are lockable. For mounting on a freeze dryer. It can be mounted on the following versions: CoolSafe 55-4, CoolSafe 55-9 and CoolSafe 110-4.

Art no.: 7001000066

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STEP 8

FLASKS

Choose between round bottom and normal freeze drying flasks.

Freeze drying flasks

Round bottom freeze drying flasks



Flasks 150 mL
Freeze drying flasks/chamber 150 mL with rubber lid for connection to 3/4 inch rubber valves, ø52 x 60 mm.

Art no.: 7001200100

Flasks 300 mL
Freeze drying flasks/chamber 300 mL with rubber lid for connection to 3/4 inch rubber valves, ø52 x 120 mm.

Art no.: 7001200101

Flasks 600 mL
Freeze drying flasks/chamber 600 mL with rubber lid for connection to 3/4 inch rubber valves, ø75 x 100 mm.

Art no.: 7001200102

Flasks 1200 mL
Freeze drying flasks/chamber 1200 mL with rubber lid for connection to 3/4 inch rubber valves, ø75 x 200 mm.

Art no.: 7001200103

Round bottom flasks 250 mL
Round bottom 250 mL freeze drying flasks for cone 29/32

Art no.: 7001200105

Round bottom flasks 500 mL
Round bottom 500 mL freeze drying flasks for cone 29/32.

Art no.: 7001200106

Round bottom flasks 1000 mL
Round bottom 1000 mL freeze drying flasks for cone 29/32.

Art no.: 7001200107

Round bottom flasks 2000 mL
Round bottom 2000 mL freeze drying flasks for cone 29/32.

Art no.: 7001200108

Cone connectors, that enables freeze drying flasks to connect directly to manifold valves.

Round bottom freeze drying flasks



Cone 24/29
3/4 inch aluminium cone 24/29.

Art no.: 7001000074

Cone 29/32
3/4 inch aluminium cone 29/32.

Art no.: 7001000072

Cone 34/36
3/4 inch aluminium cone 34/36.

Art no.: 7001000073



Spin freeze drive
Spin freeze drive for spin freezing of flasks for freeze drying.

Art no.: 7001000372



Having completed the configuration procedure, you will have the freeze dryer tailored to your specific requirements.

Why not try our online configurator on our webpage!

This will guide you through the complete process, and will also enable you to connect with our distributor in your particular country.

For additional information, please contact the LaboGene distributor in your specific country or visit our webpage www.labogene.com

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