



LaboGene™ is a Danish Company that specialises in the design, development, manufacture and sales of laboratory and industrial equipments in the fields of Clean Air & Laminar Flow, Vacuum & Cooling and Centrifugation.

Clean Air & Laminar Flow

ScanLaf represents the best in Class II and laminar flow cabinets with the advantage of low energy consumption, digital control and ergonomic design. The Industrial **ScanLaf** program offers a range of Down Flow modules and enclosures for powder and animal handling as well Air showers and Glove boxes, all of which can be produced to Customers specifications. A truly unique bespoke portfolio!

Vacuum & Cooling

ScanVac epitomizes the best in Freeze Drying and Vacuum Concentration equipments and offers a wide range of bench or floor standing units with temperatures down to -110 °C.

Together with accessories and components compatible with previous Heto models, **ScanVac** offers continuity of service with expert advice and assistance.

ScanCool the brand that describes a range of Ultra Freezers for sample storage offering a choice of Chest or Upright models from 100 to 600 litres capacity. Environmentally friendly and energy saving design concepts are standard features of all units in the ScanCool range.

The **ChillSafe** range of cooling & cryogenic baths and circulators with capacities of 8 to 18 litres and temperatures from -30 °C to -90 °C completes the ScanCool offering.

Centrifugation

ScanSpeed, the name that defines quality centrifuges from **LaboGene**. Offering bench-top high and low speed models with or without refrigeration for today's discerning laboratory technician. Quality engineering with modern designs and features that exemplifies Danish craftsmanship.



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Laboratory Freeze Dryers

A complete range of basic bench top and large capacity research and laboratory freeze dryers offering Sophistication with Simplicity of operation with condenser temperatures to -110°C and a wide range of high quality chambers and accessories.

"ScanVac - Innovation from Experience"



The Freeze Drying & Vacuum Concentration Process

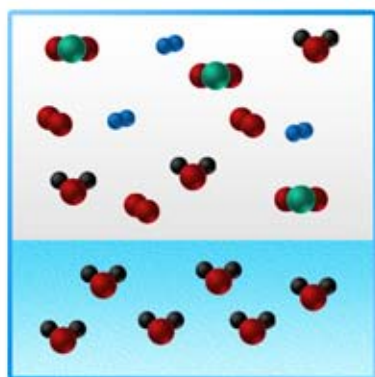
Freeze Drying is basically a 3 stage process. In the first stage, the sample is frozen so that the “free” water present is converted to ice, thereby the phase change from liquid to solid is achieved. This stage is known as the **PRE-FREEZING** step. In the second stage of the freeze drying process, the ice formed in the pre-freezing step is removed from the sample by the direct conversion of the ice (solid phase) to a vapour (vapour phase), without passing through a liquid phase, by a process called **sublimation**. This stage is known as the **PRIMARY DRYING** step.

Typically most aqueous samples/solutions show an increase in concentration as the product temperature is reduced and the water is converted to ice, during the Pre Freeze step.

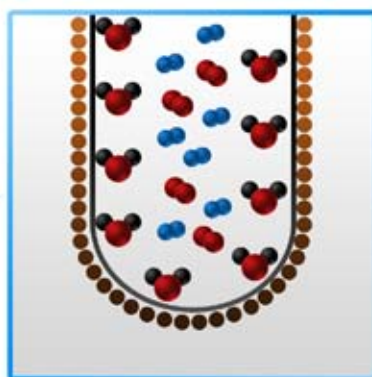
These are known as **EUTECTIC FORMING** solutions.

Some solutions however do not exhibit this quick transformation from a liquid phase to a solid phase, when the temperature is reduced, they just become more viscous. These are known as **GLASS FORMING** solutions. Most sugars solutions or samples containing sugars exhibit this phenomena.

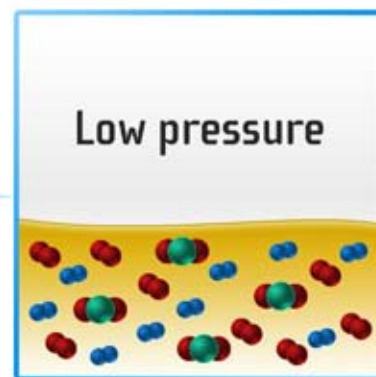
Evacuation sequence



Chamber

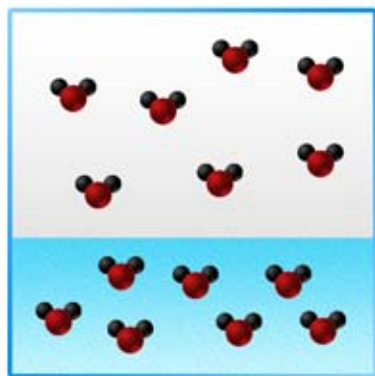


Condenser

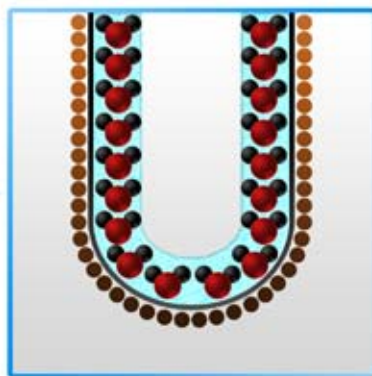


Vacuum pump

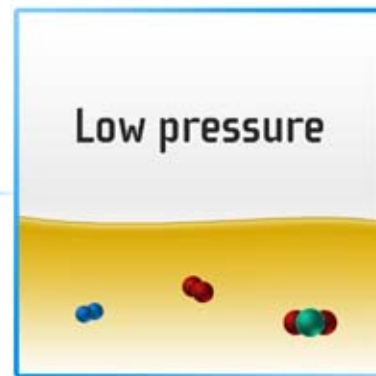
Freeze drying process



Chamber



Condenser



Vacuum pump



Finally in the third stage, any water that is “molecular bound” to the solids of the sample, is converted to vapour and removed from the sample. This stage is known as **SECONDARY DRYING** and usually involves increasing the temperature and pressure environment i.e. the shelf temperature / vacuum inside the chamber, to provide the energy to “break the molecular bonding”. This process is called **desorption**.

Both in Freeze Drying & Vacuum Concentration, a low pressure environment is required to allow these processes to take place, therefore a high quality vacuum pump is necessary.

In Freeze Drying, in order to start the removal of the water, the pressure inside the sample chamber has to be below the “triple point” value, whilst maintaining the temperature of the sample below its freezing point.

Whilst in Vacuum Concentration, where we want to keep the sample in a “liquid phase” during the process, vacuum is required to reduce its “boiling point” to a level whereby the liquid sample can be evaporated at low temperatures without denaturing the sample. The centrifugal force exerted on the sample inhibits any bubbling/boiling action whilst concentrating any solutes at the bottom of the tube.

Primary Drying

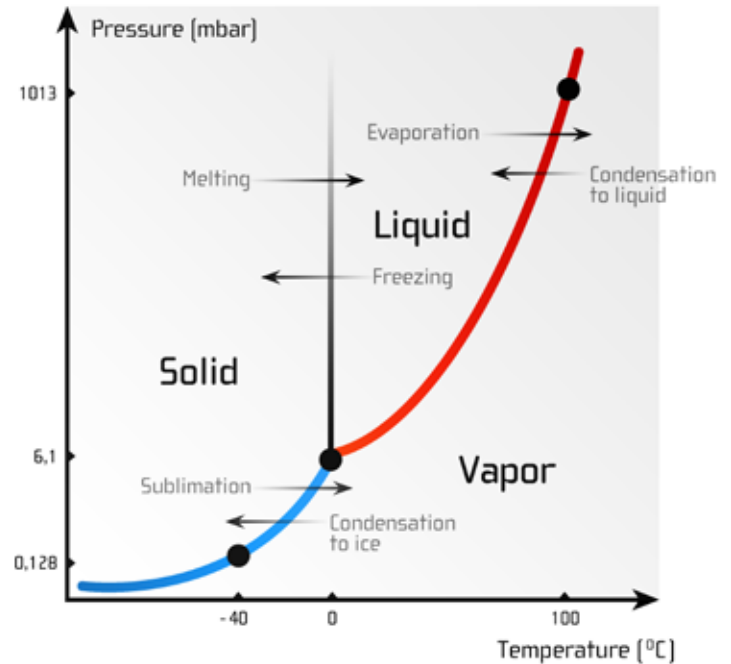
During the primary drying stage, the ice in the sample is converted directly to a vapour, at low temperature and pressure, by the process of sublimation and is converted back to ice in the condenser, which is at a lower temperature and pressure than that of the sample chamber.

The “energy” required for this process to occur is provided by a gentle increase in sample temperature (heat). In vacuum concentration the sample is not normally in a frozen state, therefore this stage of the cycle is evaporation rather than sublimation.

The amount of “energy” required to initiate this step in the freeze drying / vacuum concentration cycle, is equivalent to that needed to melt the ice and/or evaporate the liquid. The resulting vapour is collected by the condenser/cold trap, which has a lower temperature and pressure than the product and hence is converted back to ice on the condenser surfaces.

If too much energy (heat) is applied to the sample during this Primary Drying step, such that sublimation takes place too rapidly, the condenser may not be able to convert the vapours to ice fast enough, the temperature inside the condenser will increase along with its vapour pressure and this results in the sample melting.

Optimising the heat applied to the sample in the Primary Drying step can only be achieved by experimentation and is essential so that the capacity of the condenser is not exceeded or overloaded, and that the product temperature does not rise above its “melting” point thereby destroying it.

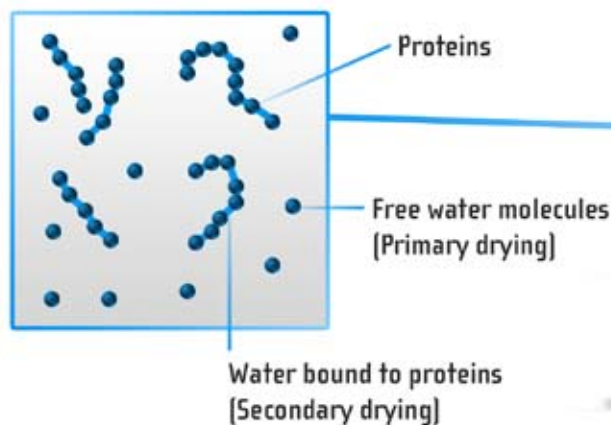


Secondary Drying

After the removal of the “free” water/ice in the Primary Drying stage by sublimation or evaporation in the case of vacuum concentration, there is usually residual water present which is strongly bound to the molecules of the sample.

This water bound to the molecular structure invariably has a vapour pressure lower than that in water in its “free” form.

Removal of this bound water is performed in the Secondary Drying stage at higher product temperature because now any biological activity of the sample/product will not be impaired or effected.



How to calculate the size of the freeze dryer

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

- 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 container/tray you want to use for the samples?
- What is the sample volume in each tube/vial?
 - remembering that the depth of sample should not exceed its diameter, the greater the surface area the quicker it will dry.
- If “bulk drying” on trays or shallow containers, the sample depth should ideally be less than 1.5 cm.
- What size of condenser is required ?
- When all of these questions have been answered the size of the freeze dryer can 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).

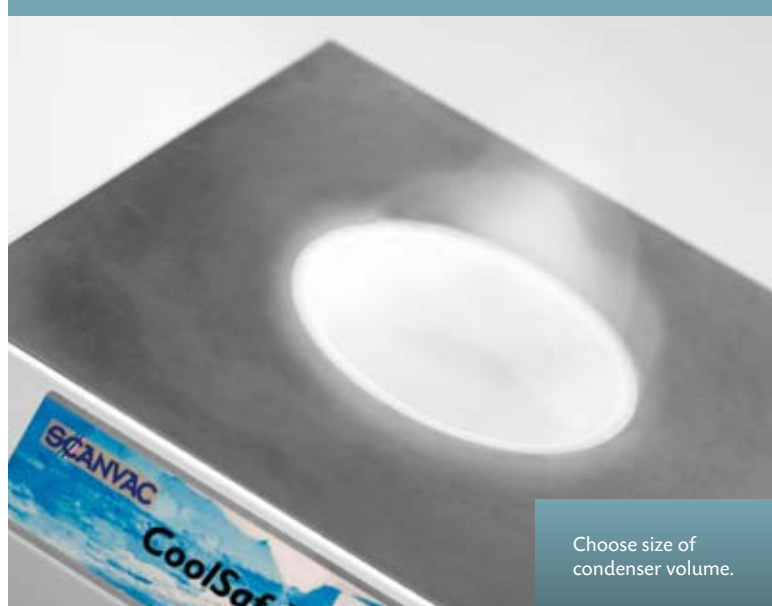
As a minimum, the condenser capacity must be adequate to handle the total amount of sample volumes in a single batch before de-icing is required. The larger the condensers surface area, the more efficiently vapour is converted to ice and consequently the thinner the ice-layer formed. This means processing time is faster, de-icing frequency is minimised and a stable low temperature maintained.

What condenser temperature is needed?

The choice of condenser temperature is important, if the temperature is not low enough a correct freeze drying process cannot take place.

If the sample contains even a small amount of acids or organic solvents and the effective condenser temperature is above -90°C , the vapours will not be trapped in the condenser and will exit into the vacuum pump. This will deplete the pressure level and possibly damage the vacuum pump, eventually polluting the laboratory environment.

In the table we provide 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 best condenser temperature for your application. If the condenser temperature is close to the freezing point of



Choose size of condenser volume.

the sample – freeze drying cycle times are extended and the product could even start to melt, giving very poor recovery rates. This phenomenon is known as a “collapse” of the sample. The driving force in freeze drying is expressed as ΔP or ΔT corresponding to the temperature/pressure differential between the product and the condenser – the larger this difference the faster the freeze drying process.

In conclusion, the lower the condenser temperature the better! – for aqueous samples a -55°C condenser temperature is the preferred choice – but a lower temperature condenser will provide faster freeze drying, avoid melting and give better results with the added benefit of protecting the vacuum pump and the environment.

Collapsing temperatures of different products:

Product	Temperature
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 to -110°C

Seamless condenser with external Cooling Coil

The drawing shows a CoolSafe Condenser illustrating that the condenser cylinder is welded to top plate and the cooling coil fixed to its outer surface. This design gives an unrestricted large surface area for ice formation without gaskets or seals to cause breakdowns or leaks, it also allows for easy cleaning and quick, efficient de-icing.

The compact bench-top design saves valuable space but if required can be mounted on castors or trolleys for ease of re-location anywhere in the laboratory. The high cooling capacities on all models are measured over a 24 hour period and give fast, efficient and reproducible freeze drying performance.



Seamless condenser and cooling coil outside of condenser for best trapping performance at -110°C .

The CoolSafe range of Freeze Dryers

The CoolSafe family of freeze dryers comprises of a large range of different size condensers and with a choice of either -55°C , -95°C , -100°C or -110°C temperatures.

The sizes offered are from 4 litres up to 15 litres for bench-top models and 80 litres on Superior floor standing models.

All the condensers are heavily insulated to save energy and give increased performance characteristics.

The seamless, gasket-free construction ensures long life and maintenance-free usage, together with easy cleaning and fast de-icing.

A vacuum valve between the condenser and the vacuum pump allows for separate cool down of the condenser and warm up of the vacuum pump giving an efficient start-up sequence.

The vacuum valve will only open if the condenser temperature is low enough to capture vapours – otherwise it remains closed, thereby protecting the pump and the sample and not allowing premature operation.



The CoolSafe control options

Basic with temperature display and AWO indicator (Alarm-Wait-OK) Temperature display indicates condenser temperature and AWO shows Alarm|Wait/OK status.
When "green" OK is indicated the unit is ready for freeze drying.

PRO microprocessor control via display and key-pad.
Temperature and pressure display and measurement to 0.001 mbar.
Offers full programming capability in Automatic mode or basic operation in Manual mode.

drying cycles for different sample types and to control and monitor the complete process automatically.
Data Logging – data can be presented in Excel spreadsheet format or as graphical curves with data point display and tabulation.

Vacuum regulation

Vacuum regulation and control available only on PRO versions.



CoolSafe PRO with display of pressure with optional regulation control.

Controls temperature of chambers with electrically heated shelves, auto-start and stop, pressure regulation, de-ice and time. Including alarms for overload, malfunctions of compressors and sensors.

PC Option is the ideal choice when documentation is required – allows the monitoring of the parameters for pressure, condenser temperature and heated shelves and product sensors (if included). Full programming facility – to programme complete freeze

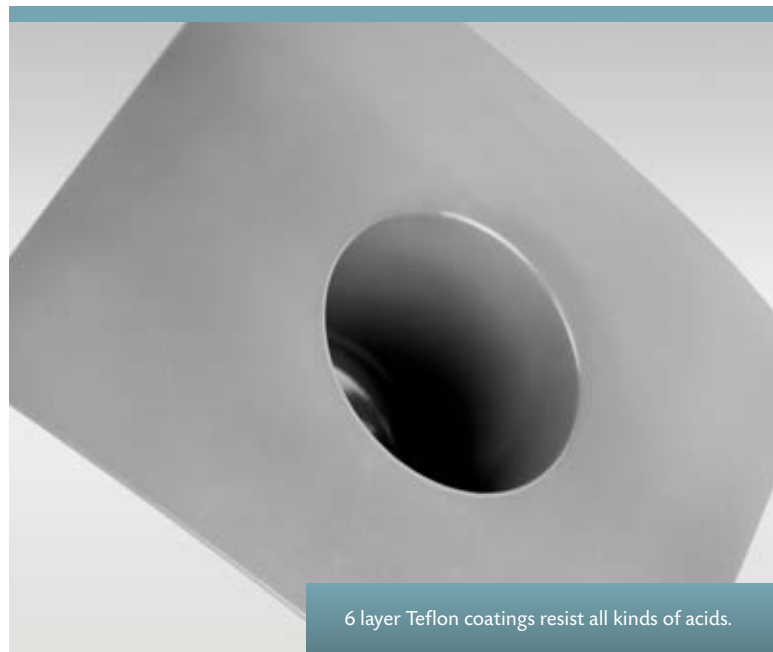
The choice of Teflon coating

When working with aggressive solvents and acids such as HCl, TFA, DMSO, etc. the option of a "heavy-hard" 6 layer Teflon coating of the condenser chamber is available, ensuring longevity and easy cleaning and decontamination.

This is often a wise option to select, especially when requiring a low temperature condenser with versatility, multi-purpose applicability and resistant to heavy use with the most aggressive liquids and solvents.



PC option for easy operation and documentation.



6 layer Teflon coatings resist all kinds of acids.

De-ice

Usually an electric de-ice facility is not always necessary, especially on small volume condensers, a small amount of hot water in the condenser will allow easy removal of "ice core" with thawing and consequent drainage. After wiping dry the freeze dryer will be ready for operation again in a few minutes.

If electric de-icing is a requirement – at the press of a button, the condenser wall warms up and releases the "ice plug" which can then be removed, the condenser wiped dry and the freeze dryer is ready for operation.



Fast, efficient and easy deicing.

Bench top or Floor standing

The CoolSafe series are delivered as standard for direct placement on the laboratory table – but can also be supplied with lockable castors for easy transport and saving laboratory bench space.

Alternatively a trolley (with lockable castors) is available, with location for the vacuum pump, making the complete system a mobile freeze drying unit that can be positioned anywhere in the lab.



Bench top models with ease of portability.



Floor models.

Choosing your CoolSafe

Select your CoolSafe from the wide range of high capacity, compact, low temperature freeze dryers and cooling traps that offer:

- Faster drying/trapping with easy maintenance free operation
- Seamless stainless steel condensers with external cooling coils
- Built-in drain valve and vacuum valve
- Digital display of temperature
- Basic or PRO models with Temp display and/or measurement, display of Temp & Vacuum.
- Wide range of sizes, 4; 9; or 15 litre capacities.
- Lowest temperatures of -55°C or -95°C or -100°C or -110°C

The CoolSafe "family" can offer high performance freeze drying and ease of operation from models that suit your exact requirements and specifications.

CoolSafe 55 is the economical choice for water based samples and the CoolSafe 110 for those samples that may be aqueous but also contain organic solvents, strong acids or other volatiles.

For freeze drying with full control and measurement of temperature and pressure, then the CoolSafe PRO models are the preferred choice, with features that include freeze drying in chambers with electrically heated shelves with up to 15 programmable steps, storage of 5 distinct protocols, temperature/vacuum regulation and optional computer connection and data collection in Excel format.



Large condensers can facilitate large chambers.



Flexibility of options to suit sample size.



Versatility of drying applications.

Specifications CoolSafe

Type	55-4	110-4	55-9	55-4 PRO
Cat. No., 220 V, 50 Hz	7.001.000.060	7.001.000.115	7.001.000.055	7.001.000.560
Cat. No., 115 V, 60 Hz	7.001.100.060	7.001.100.115	7.001.100.055	7.001.100.560
Cat. No., 220 V, 60 Hz	7.001.200.060	7.001.200.115	7.001.200.055	7.001.200.560
Ultimate temperature	-55 °C at 20 °C room temperature	-110 °C at 20 °C room temperature	-55 °C at 20 °C room temperature	-55 °C at 20 °C room temperature
Condenser dimension, mm	162 × 180	162 × 180	200 × 235	162 × 180
Total volume, L	4	4	9	4
Cabinet dimensions H×W×D, mm	500 × 400 × 500	500 × 400 × 500	500 × 400 × 500	500 × 400 × 500
Insulation, cm:	9	9	5	9
Vacuum read-out				Atm. to 0,001 mbar
Condenser capacity per 24 hours, kg	2,5	2,5	4	2,5
Condenser capacity/total, kg	3	3	7	3
Cooling media	R507	R507/R1150	R507	R507
Power consumption, W	300	600	500	500
Materials	Cabinet polyester coated steel, Condenser stainless steel AISI 316	Cabinet polyester coated steel, Condenser stainless steel AISI 316	Cabinet polyester coated steel, Condenser stainless steel AISI 316	Cabinet polyester coated steel, Condenser stainless steel AISI 316
Weight, kg	40	55	45	40
Drain tap:	Yes	Yes	Yes	Yes
Pressure read-out to 0,001 mbar	No	No	No	Yes
Digital read-out of temperature	Yes	Yes	Yes	Yes
USB Port	No	No	No	Yes
Teflon coating	No	7.001.300.002	No	No
Pressure regulation:	No	No	No	7.001.300.092
De-Ice, Electrical	No	No	No	7.001.300.001
Castors	7.001.000.066	7.001.000.066	7.001.000.066	7.001.000.066
AcPI – Freeze Drying	7.001.100.061	7.001.100.061	7.001.100.061	7.001.100.061
CtPI Cooling Trap	7.001.000.061	7.001.000.061	No	7.001.000.061
PC Control: Software incl. PC for full PC Control and documentation	No	No	No	7.001.300.096
Release Function	No	No	No	7.001.300.098
Vacuum valve	Man.	Man.	Man.	El valve

Type	110-4 PRO	55-9 PRO	100-9 PRO	55-15 PRO	95-15 PRO
Cat. No., 220 V, 50 Hz	7.001.000.515	7.001.000.555	7.001.000.615	7.001.300.550	7.001.300.950
Cat. No., 115 V, 60 Hz	7.001.100.515	7.001.100.555	7.001.100.615	7.001.400.550	7.001.400.950
Cat. No., 220 V, 60 Hz	7.001.200.515	7.001.200.555	7.001.200.615	7.001.500.550	7.001.500.950
Ultimate temperature	-110 °C at 20 °C room temperature	-55 °C at 20 °C room temperature	-100 °C	-55 °C	-95 °C
Condenser dimension, mm	162 × 180	236 × 200	236 × 200	236 × 300	236 × 300
Total volume, L:	4	9	9	15	15
Cabinet dimensions H×W×D, mm	500 × 400 × 500	500 × 400 × 500	490 × 620 × 750	490 × 620 × 750	490 × 620 × 750
Insulation, cm	9	5	9	9	9
Vacuum read-out	Atm. to 0,001 mbar	Atm. to 0,001 mbar	Atm. to 0,001 mbar	Atm. to 0,001 mbar	Atm. to 0,001 mbar
Condenser capacity per 24h, kg	2,5	4	4	6	6
Condenser capacity/total, kg	3	7	7	10	10
Cooling media	R507/R1150	R507	R507/R170	R507	R507/R170
Power consumption, W	1000	600	1300	800	1400
Materials	Cabinet polyester coated steel, Condenser stainless steel AISI 316	Cabinet polyester coated steel, Condenser stainless steel AISI 316	Cabinet polyester coated steel, Condenser stainless steel AISI 316	Cabinet polyester coated steel, Condenser stainless steel AISI 316	Cabinet polyester coated steel, Condenser stainless steel AISI 316
Weight, kg	55	55	75	70	85
Drain tap:	Yes	Yes	Yes	Yes	Yes
Pressure read-out to 0,001 mbar	Yes	Yes	Yes	Yes	Yes
Digital read-out of temperature	Yes	Yes	Yes	Yes	Yes
USB Port	Yes	Yes	Yes	Yes	Yes
Teflon coating	7.001.300.002	No	7.001.300.002	No	7.001.300.002
Pressure regulation	7.001.300.092	7.001.300.092	7.001.300.092	7.001.300.092	7.001.300.092
De-Ice, Electrical	7.001.300.001	7.001.300.001	7.001.300.001	7.001.300.001	7.001.300.001
Castors	7.001.000.066	Yes	7.001.800.096	7.001.800.096	7.001.800.096
AcPI – Freeze Drying	7.001.300.061	7.001.300.061	7.001.300.061	7.001.300.061	7.001.300.061
CtPI Cooling Trap	7.001.000.061	No	No	No	No
PC Control: Software incl. PC for full PC Control and documentation	7.001.300.96	7.001.300.96	7.001.300.96	7.001.300.96	7.001.300.96
Release Function	7.001.300.098	7.001.300.098	7.001.300.098	7.001.300.098	7.001.300.098
Vacuum valve	El valve	El valve	El valve	El valve	El valve

Choose the freeze drying accessories for your application

The ScanVac Freeze dryer accessory program has been developed from our 50 years experience in this discipline and offers quality and innovative components that enables the customer to assemble a Freeze Drying system to meet their exact requirements. Complete versatility and adaptability of your ScanVac Freeze dryer is assured by this range of supplementary attachments.

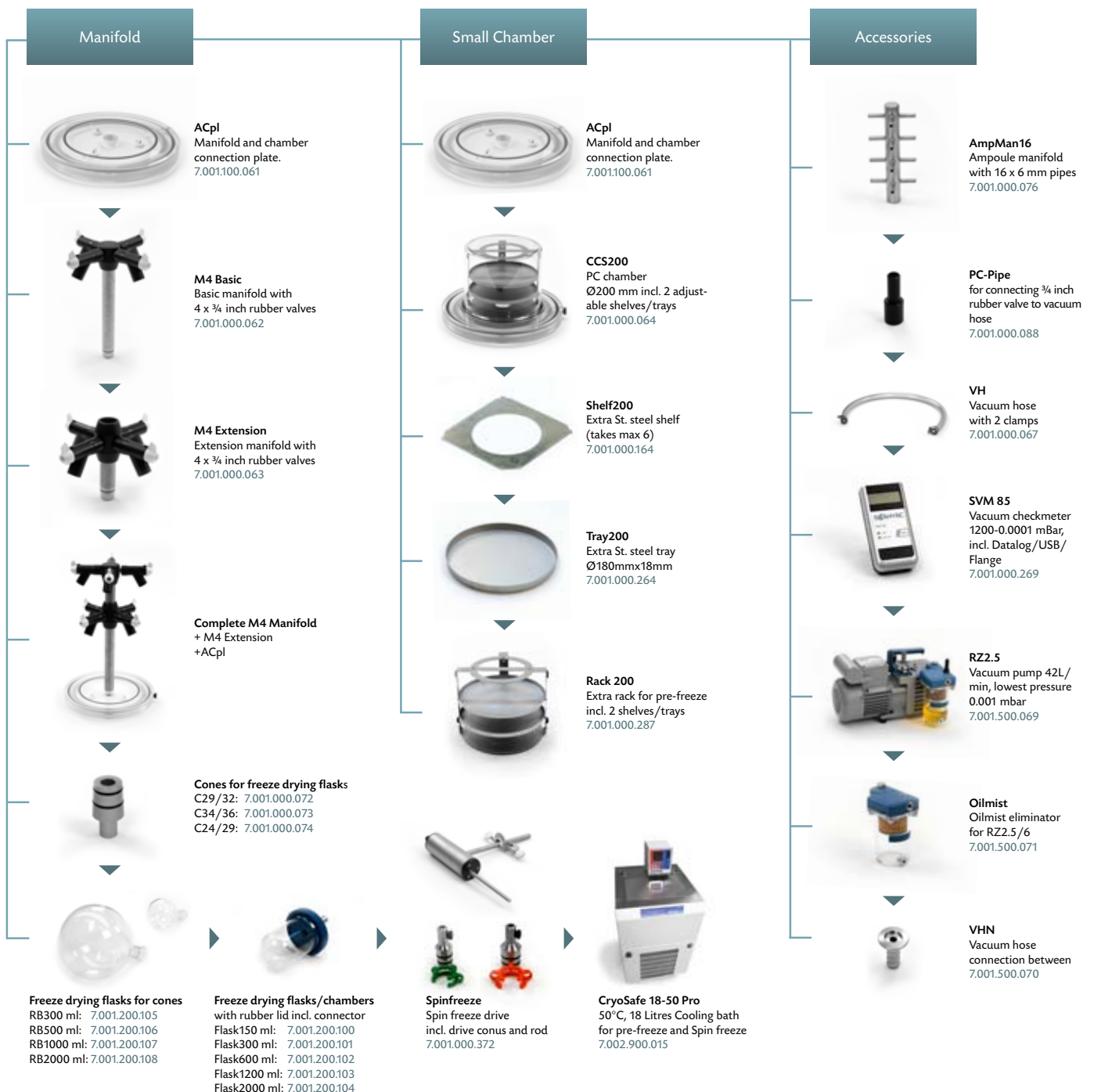
The choose of freeze dryer accessories is divided into:

- Manifold, small chamber drying and other accessories
- Drying in versatile large chambers
- EI – heated shelves chambers



Save bench space with floor standing models.

Manifold, small chamber drying and other accessories





Independent, mobile Freeze Drying work stations.



Ampoule and/or flask manifolds.



Freeze Drying flasks and mini-chambers.

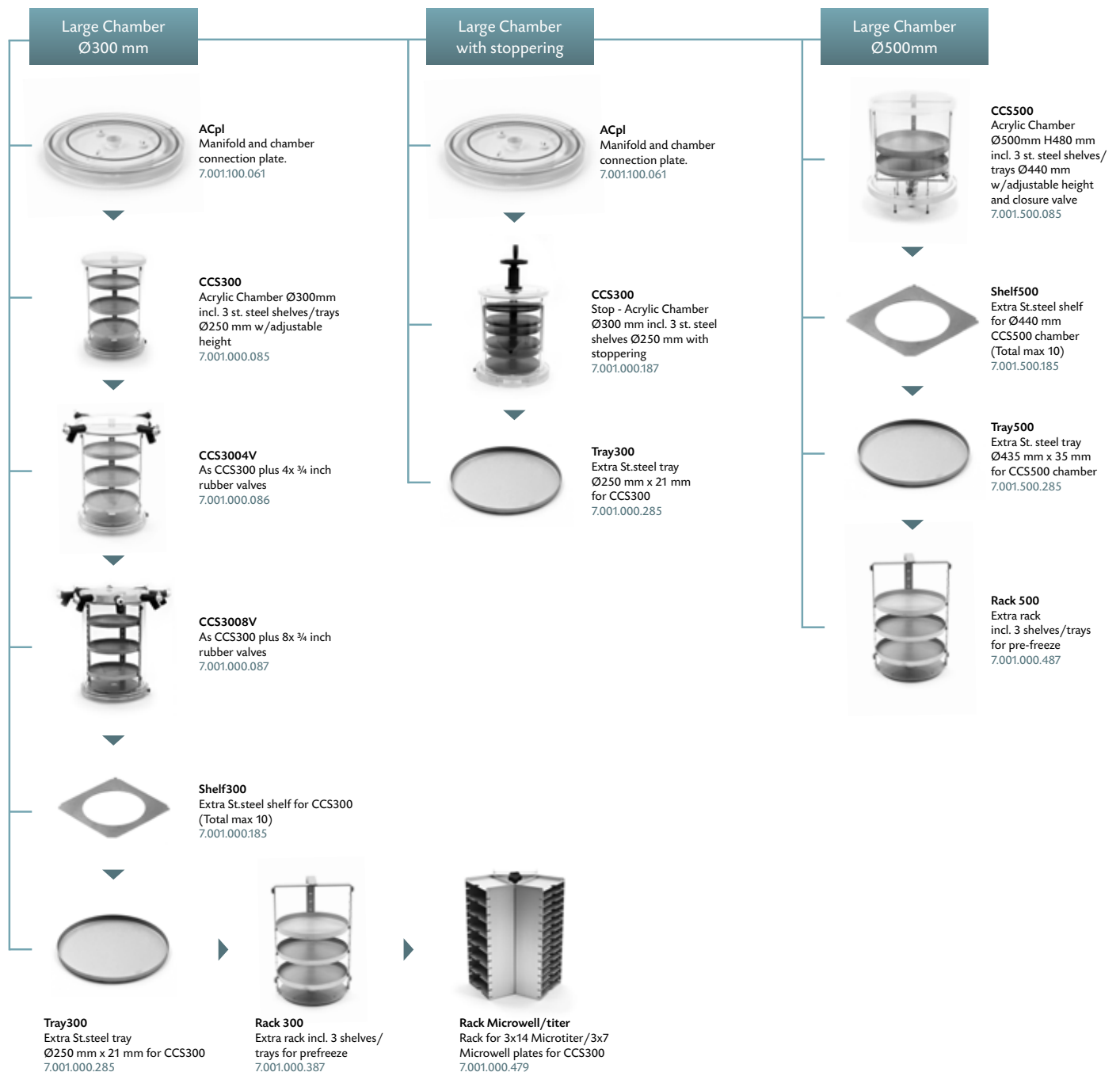
Drying in versatile large Acrylic Freeze Drying Chambers - Unheated Shelves

A versatile range of chambers and accessories for vial and bulk drying on trays is offered as part of the CoolSafe program that can cater for all sample requirements.

Various sizes and formats are available to offer complete flexibility of usage, these include options for stoppering, attachment of flasks, and racks with removable shelves.



Save space with floor standing models.





Large chamber CCS 500 with closing valve between Chamber and condenser.



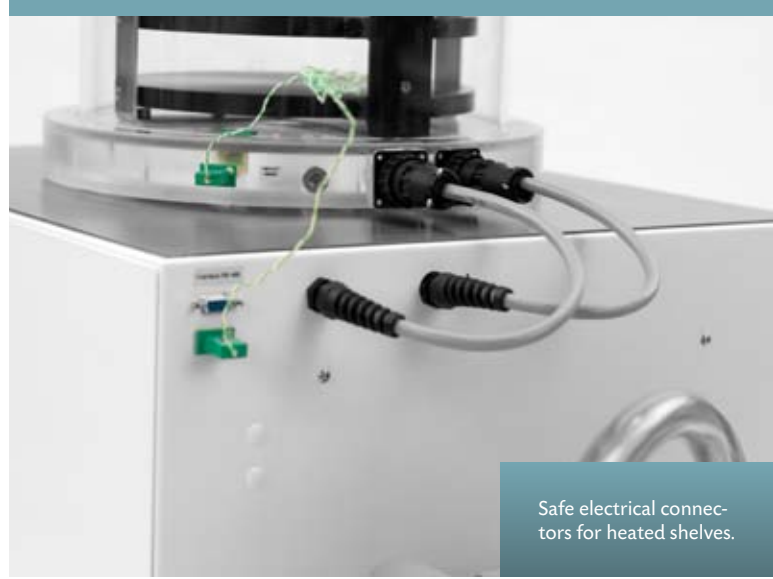
Chamber CC300-8V with shelves and manifold combined.



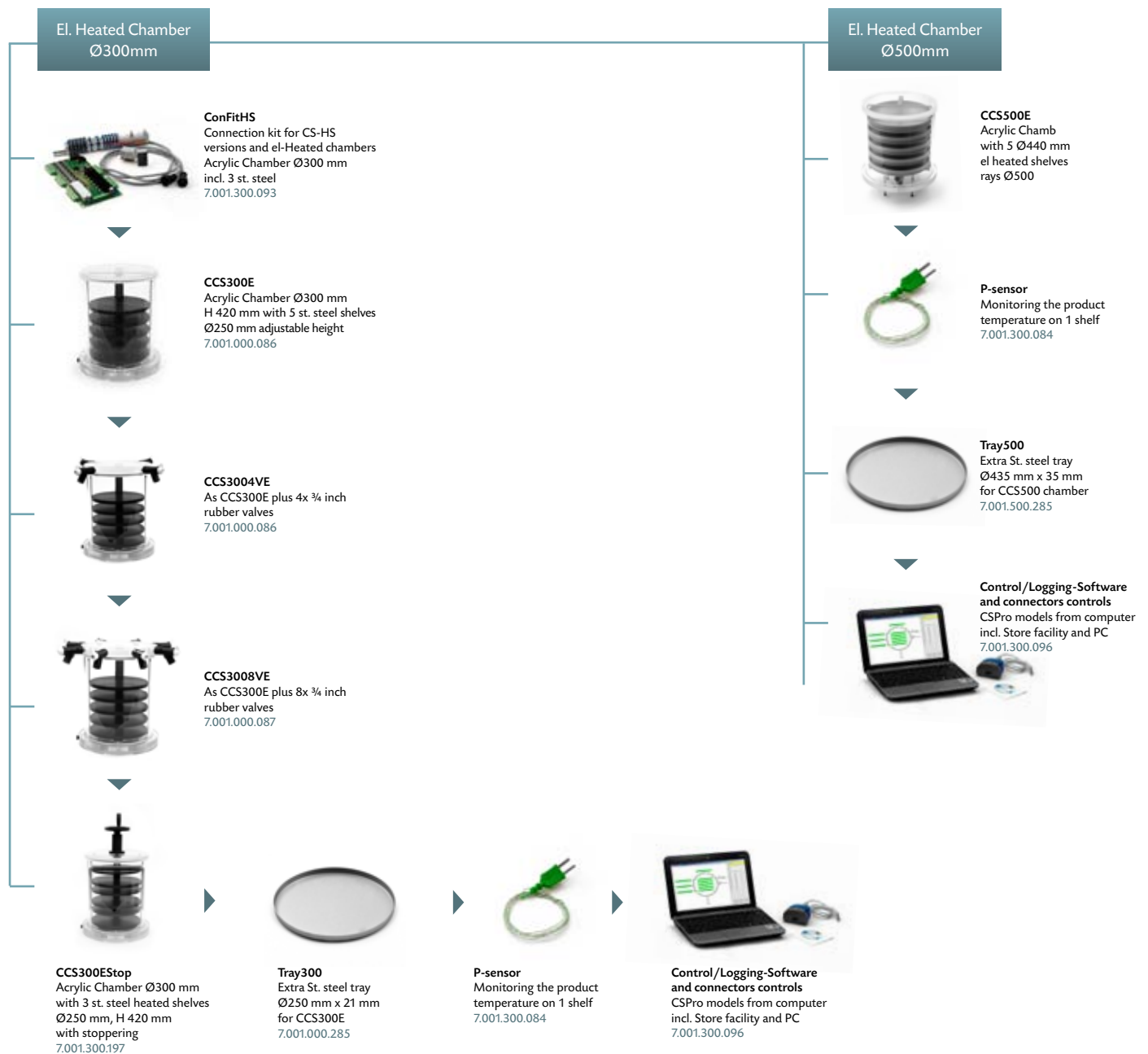
Acrylic Freeze Drying Chambers with electrically heated shelves

A range of chambers with electrically heated shelves for vial or bulk drying protocols that ensure uniform and faster drying, especially in the Secondary Drying stage, giving increased recovery rates with controlled programmable energy input.

A wide selection of options and combinations are available ensuring complete versatility and adaptability.



Safe electrical connectors for heated shelves.





CoolSafe 95-15 with CCS3008VE chamber.



CoolSafe 95-15 with CCS500 chamber.

SUPERIOR XS

9 litres condenser

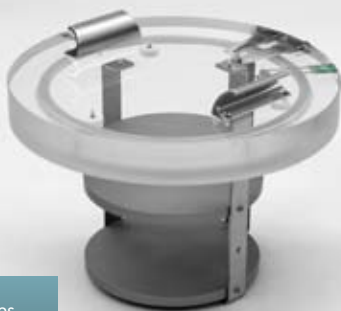
Lowest temperature $-100\text{ }^{\circ}\text{C}$

3 el heated shelves $\text{Ø}180\text{ mm}$



Options available

- PC and Software package for operation, control and data storage. Visual Graphics and real time display of drying process. Logging of data and storage in Excel™ format.
- Electric De-Ice of condenser, for fast easy deicing.
- Teflon Coating of condenser, resistant to organic solvents and aggressive acids.
- Tray200, Extra St. steel tray $\text{Ø}180\text{ mm} \times 18\text{ mm}$
- Castors lockable with shelf for vacuum pump.



Rack incl. 3 el heat shelves
- adjustable to 2 or 1.

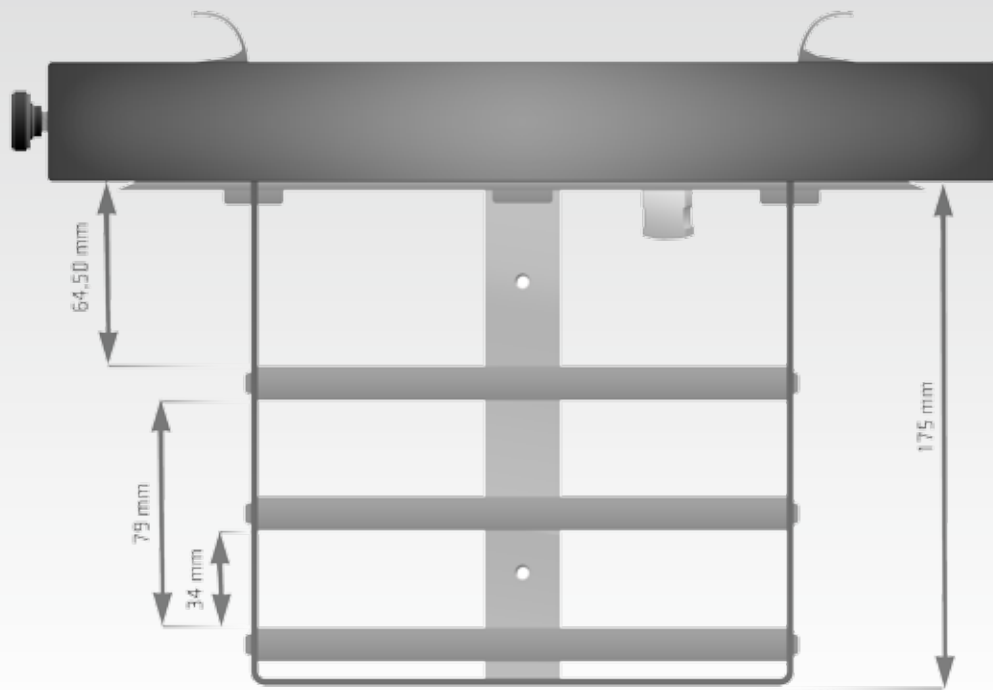
CoolSafe 100-9 PRO Superior XS Freeze Dryer

A complete 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.

Exceptional features include:

- Unique Chamber design that locates inside the condenser that is easily loaded and removed, which gives a short vapour "pathway" with no restrictions, reproducible pre-freeze performance offering incremental pre-freeze steps, 3 electrically heated shelves 18 cm dia. with trays. Chamber design configuration allows for low pre-freeze temperatures down to $-80\text{ }^{\circ}\text{C}$, avoiding product collapse and automatic trouble-free transition to the primary drying stage.
- PRO microprocessor controller with digital display of temperature and pressure, programming for shelf temperature in up to 15 steps, including incremental pre-freezing, temperature and pressure programming for complete drying cycle, optional remote control and data capture/storage/documentation via USB and PC.
- Seamless stainless steel 9 litre condenser with external cooling coil, no seals or gaskets, lowest temperature $-100\text{ }^{\circ}\text{C}$. Total ice capacity 7 kg.
- Vacuum valve between vacuum pump and condenser for auto run and auto closure.
- Pt Sensors, one per each shelf, 3 in total for precise regulation of each shelf better than $1\text{ }^{\circ}\text{C}$ and shelf for vacuum pump.
- Compact transportable design, either free standing or with castors.

Type	Superior XS
Cat. No., 220 V, 50 Hz	7.001.810.090
Cat. No., 115 V, 60 Hz	7.001.810.091
Cat. No., 220 V, 60 Hz	7.001.810.092
Ultimate temperature	$-95\text{ }^{\circ}\text{C}$
Condenser dimension, mm	236 × 200
Total volume, L:	9
Cabinet dimensions H×W×D, mm	490 × 620 × 750
Insulation, cm	9
Vacuum read-out	Atm. to 0,001 mbar
Condenser capacity per 24h, kg	4
Condenser capacity/total, kg	7
Cooling media	R507 /R170
Power consumption, W	1300
Materials	Cabinet polyester coated steel, Condenser stainless steel AISI 316
Weight, kg	75
Drain tap	Yes
Pressure read-out to 0,001 mbar	Yes
Digital read-out of temperature	Yes
USB Port	Yes
Teflon coating	7.001.300.002
Pressure regulation	7.001.300.092
De-Ice, Electrical	7.001.300.001
Castors	7.001.800.096
PC Control: Software incl. PC for full PC Control and documentation	7.001.300.096
Release Function	7.001.300.098
Vacuum valve	Included



Chamber configuration for Superior XS, illustrating inter-shelf dimensions with 3 electrically heated shelves.



Control/Logging- Software and connectors controls
 CPro models from computer incl. Store facility and PC.
 7.001.300.096

P-sensor
 Monitoring the product temperature on 1 shelf
 7.001.300.084

SUPERIOR XL

15 litres condenser

Lowest temperature -95°C

5 el heated shelves \varnothing 180 mm



Options available

- PC and Software package for operation, control and data storage. Visual Graphics and real time display of drying process. Logging of data and storage in Excel™ format.
- Electric De-Ice of condenser, for fast easy deicing.
- Teflon Coating of condenser, resistant to organic solvents and aggressive acids.
- Tray200, Extra St. steel tray \varnothing 180 mm x 18 mm
- Castors lockable with shelf for vacuum pump,



Rack incl. 5 el heat shelves - adjustable to 1.

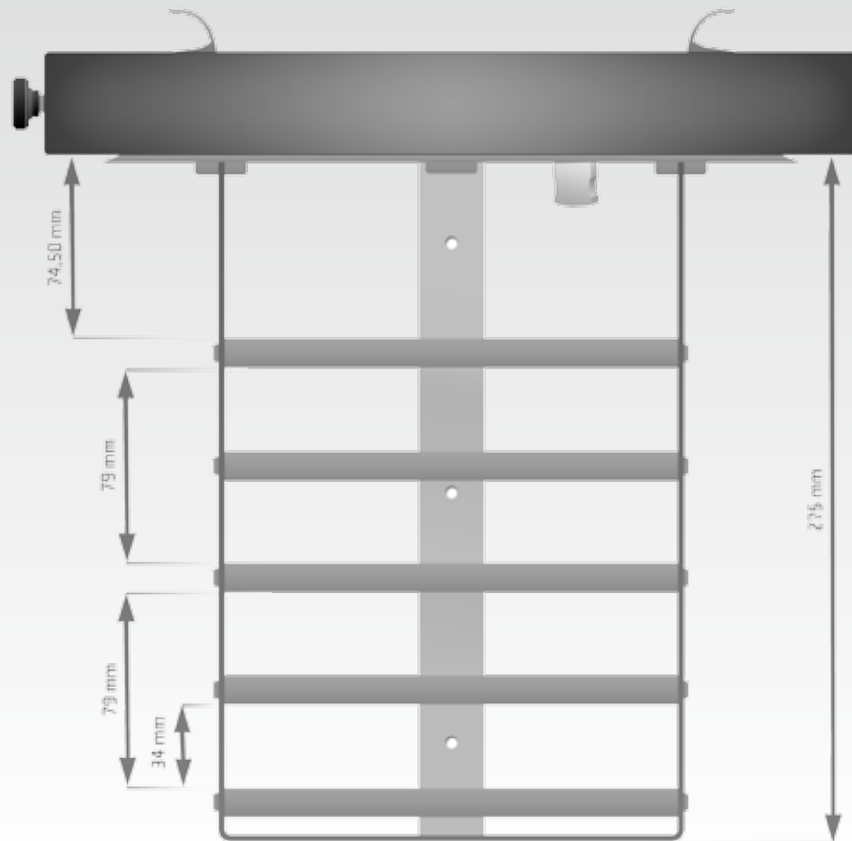
CoolSafe 95-15 PRO Superior XL Freeze Dryer

A complete Fully Automatic Research freeze drying system that incorporates the highest performance characteristics and technical features to meet the demands of today's research, development and pilot plant laboratories.

Exceptional features include:

- Unique Chamber design that locates inside the condenser that is easily loaded and removed, which gives a short vapour "pathway" with no restrictions, reproducible pre-freeze performance offering incremental pre-freeze steps, 5 electrically heated shelves 18 cm dia. with trays. Chamber design configuration allows for low pre-freeze temperatures down to -80°C , avoiding product collapse and automatic trouble-free transition to the primary drying stage.
- PRO microprocessor controller with digital display of temperature and pressure, programming for shelf temperature in up to 15 steps, including incremental pre-freezing, temperature and pressure programming for complete drying cycle, optional remote control and data capture/storage/documentation via USB and PC.
- Seamless stainless steel 15 litre condenser with external cooling coil, no seals or gaskets, lowest temperature -95°C . Total ice capacity 10 kg.
- Vacuum valve between vacuum pump and condenser for auto run and auto closure.
- Pt Sensors, one per shelf, 5 in total for precise regulation of each shelf better than 1°C and shelf for vacuum pump.
- Compact transportable design, either free standing or with castors.

Type	Superior XL
Cat. No., 220 V, 50 Hz	7.001.810.115
Cat. No., 115 V, 60 Hz	7.001.810.116
Cat. No., 220 V, 60 Hz	7.001.810.117
Ultimate temperature	-100°C
Condenser dimension, mm	236 x 200
Total volume, L:	15
Cabinet dimensions HxWxD, mm	490 x 620 x 750
Insulation, cm	15
Vacuum read-out	Atm. to 0,001 mbar
Condenser capacity per 24h, kg	6
Condenser capacity/total, kg	10
Cooling media	R507 /R170
Power consumption, W	1400
Materials	Cabinet polyester coated steel, Condenser stainless steel AISI 316
Weight, kg	85
Drain tap	Yes
Pressure read-out to 0,001 mbar	Yes
Digital read-out of temperature	Yes
USB Port	Yes
Teflon coating	7.001.300.002
Pressure regulation	7.001.300.092
De-Ice, Electrical	7.001.300.001
Castors	7.001.800.096
PC Control: Software incl. PC for full PC Control and documentation	7.001.300.096
Release Function	7.001.300.098
Vacuum valve	Included



Chamber configuration for Superior XL, illustrating inter-shelf dimensions with 5 electrically heated shelves.



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