LyoPilot D Series

Pilot Freeze Dryer, 2-chamber system

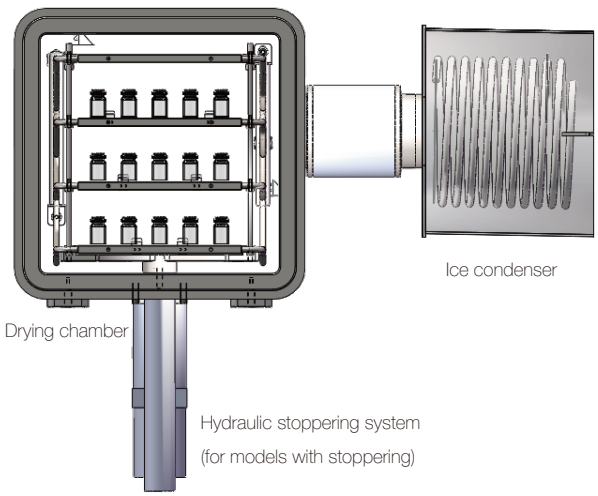
Equipped with stainless steel shelf areas with synthetic silicone heat transfer fluid, the larger 8/12kg pilot systems meet the highest standards of the pharma and biotech industries. The 2-chamber system is integrated with advanced PAT functions for optimized process.

LyoPilot D series includes temperature control system, vacuum level control system, identical operation and freeze-drying process controls, are ideally suited for freeze-drying solids or liquids in a wide variety of containers, such as vials, flasks, trays, microtiter plates, and ampoules. LyoPilot D series is extremely valuable to optimize (shorten) the length of the freeze-drying cycle, especially if there is potential for process repetition or scale-up for production.

Advanced system technology

2-chamber systems

- Optimal vapor transport.
- Standard side-opening ice condenser for easier observation and cleaning.
- Ultra-low pressure drop between the two chambers.
- Excellent drying rates for sensitive materials and products with low eutectic points or low collapse temperatures.
- Intermediate valve for determining the transition from primary to secondary drying phase.



Choose the system fits your application best!

Product designation format:

LyoPilot	D	8/12	S/-
Product series	Dual (2) chamber	Ice capacity (kg)	With/without stoppering

Silicone heat transfer fluid shelves

- Equipped with stainless steel shelf areas with silicone heat transfer fluid, providing excellent thermal conductivity.
- The accuracy of different layers and a same layer is within 1°C.
- Hydraulic stopper system, rising from bottom to top and easy for cleaning （available for LyoPilot D8S/LyoPilot D12S）

Design features

Minimal space requirements

Compact design with highly efficient and economical operation.

Precise temperature and vacuum control

- Precise Temperature and Vacuum Control Thanks to independently developed adaptive PID algorithms, the equipment achieves higher precision in temperature and vacuum control.
- The 10mm thick stainless steel silicone oil shelf ensures a temperature difference of 1°C.
- The ASV adaptive gas injection system, achieving a vacuum control accuracy of up to 0.002 mbar.

Comprehensive online analysis tools

Equipped with advanced tools, providing clearer and more intuitive control over the freeze-drying process:

- Eutectic point testing
- Resistivity monitoring
- Pressure rise test
- Pressure comparison method (optional)
- Flash nucleation technology (optional)

Outstanding refrigeration system

- Ice condenser: 2-compressor cascade system, ice condenser temperature reaches -90°C.
- Shelf: pulse-type electronic expansion valve, featuring a wide regulation range, quick and precise control on shelf temperature, and low energy consumption.
- PT100 sensor makes the temperature accuracy 1°C.

Efficient & convenient ice condenser:

- Internal ice condenser, condenser coil contacts vapor directly, for easier vapor capturing and lower energy consumption.
- Standard hot gas defrosting, enables customers to quickly proceed to the next freeze-drying process.
- Mechanism door lock of ice condenser, for convenient cleaning.

Stoppering function (available for LyoPilot D8S/LyoPilot D12S)

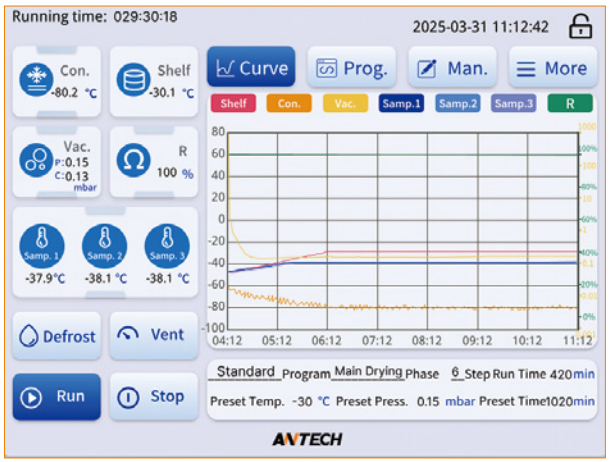
The fully hydraulic automatic stoppering system operates from bottom to top, saving time and facilitating cleaning.

Unique system controller LyoSMART+

LyoSMART+ system controller make an easy-to-use and intuitive user interface.
All of the extensive accessories are also integrated. Reproducible results are assured by automatic process sequences.

Convenient and intuitive

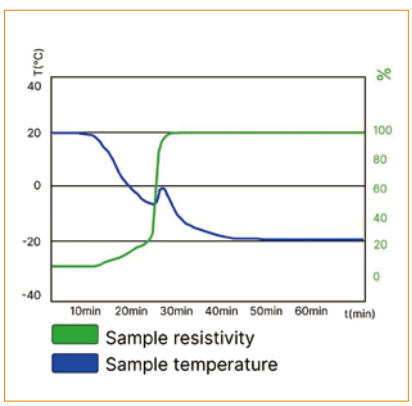
- Color touchscreen with clear display.
- Automatic or manual mode optional.
- Intuitive program entry, using various freeze-drying sequences and recipes.
- Memory space for 30 user-defined programs with 36 steps.
- Real-time freezing drying diagram display, selective parameter display, data query & export.
- The main interface is clear and concise, facilitating program editing and operation.
- The control system can set safety values such as vacuum level and resistivity for process feedback control.
- Password protection for startup and lock screen protection when operator is away during processing.
- Equipped with USB port & RS232 port.



Smart solutions for optimal process observation

Freezing point determination

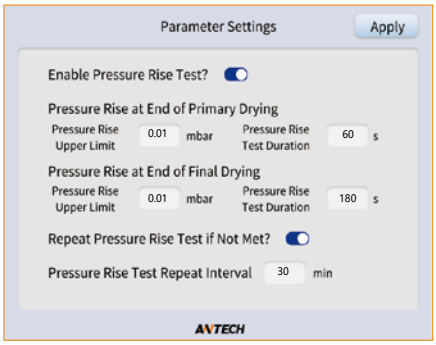
- The LyoTR sensor temperature & resitance combined monitors both electrical resistance and product temperature. From the curves of both of these variables, you can determine the eutectic point and freezing point of your product.
- Our LyoSOFT software and LyoSMART+ makes this possible. The LyoTR sensor allows automated control of the energy supply to the shelves during the main drying phase, so you can avoid critical temperatures during the main drying phase. This reduces the risk of defrosting effects on the product.



- The ultra-fine probes with flexible PTFE wire harness is compact, highly resistant to interference, corrosion-resistant, and easy to calibrate.

Pressure rise test

- The pressure rise test is achieved through the design of the intermediate valve between the drying chamber and the ice condenser. During the drying process, this valve is closed to measure the pressure increase in the drying chamber over a defined time period, which serves as a key indicator for determining the freezing point.
- Typically, the pressure rise rate at the end of main drying should within 0.01 mbar/min. The accurate vacuum control is critical for this function. Thanks to Antech's ultra-high accurate ASV (Advanced Smart Valve) vacuum control, our pressure rise test delivers superior reliability.

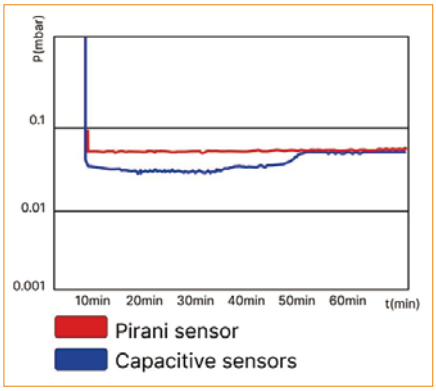


Pre-vacuum and micro-negative pressure stoppering

- The range accuracy of the traditional Pirani vacuum gauge is limited.Pirani data is not available at higher ranges (10-1000mbar). We can add a silicon crystal vacuum gauge to supplement the measurement and control of this part of the range.
- After putting the sample into the machine, you can first set a rough vacuum degree of 600-950mbar for the airtightness check of the equipment to ensure that the machine is in a good airtight condition and to prevent airtightness problems caused by too low temperature, which leads to vacuum abnormalities.
- After the freeze-drying is completed, a higher vacuum degree of 500-800mbar can also be set. The equipment can backfill the inert gas according to the set value, so that the vial can be plugged under a slightly negative pressure, thereby ensuring that the dried sample can be stored for a longer time.

Comparative pressure measurement（Optional）

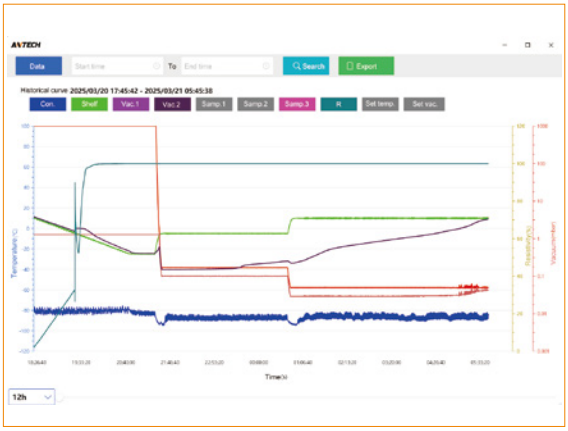
- The end of the main drying phase can be detected by using two different vacuum measurement sensors (Pirani gauge and capacitive sensor).
- When the difference between the pressure measurements falls below a preselected threshold, final drying is started automatically.

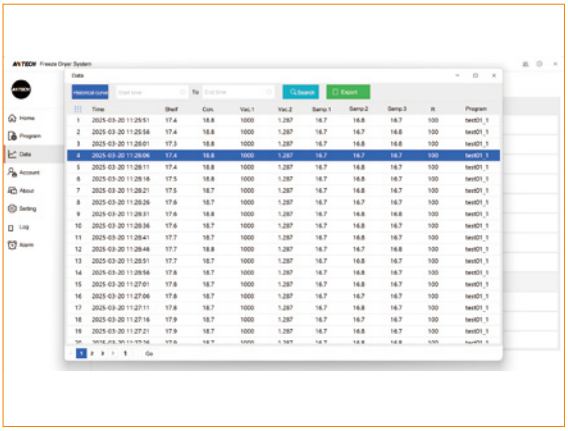


Instantaneous Co-Crystallization system

- Due to thermodynamic factors, the crystallization process of samples within the same batch is not synchronized but random. Variations in supercooling time lead to differences in crystal structure, resulting in inconsistent freeze-drying outcomes (e.g., moisture residue, appearance, etc.).
- The instantaneous crystallization technology can integrate vacuum changes in the cold trap chamber and sample chamber, enabling sudden condensation of samples through controlled vacuum adjustments. Unlike other ice fog-induced nucleation methods, our instantaneous crystallization technology does not require additional auxiliary devices or exogenous substances, even when handling small-scale sample tests.

Process monitoring LyoSOFT (for PC)





For precise documentation and evaluation

- Our experience shows that freeze-drying processes must be precisely monitored and documented. Regardless of the drying parameters or batch size, this is the only way to ensure accurate analysis.
- The optional LyoSOFT software (PC based) enables comprehensive recording and archiving of all process data. Installed on a separate computer, the software receives data directly from the freeze dryer via an RS232 interface.
- With LyoSOFT, programs for freeze drying can be developed and process data can be viewed in real time in graphical format. Operation is consistent and uniform across all unit sizes, as LyoSOFT is also used with larger production freeze drying systems.

Are you planning to scale up?

- Data recording on USB drive.
- Simple process documentation with LyoSOFT.
- LyoSOFT for process control and documentation.
- Process monitoring with the LyoTR sensor to avoid undesired defrosting effects.
- Automatic determination of the freezing point for reliable process control.
- High-precision temperature and vacuum control ensures the accuracy of the freeze-drying process.
- Scientific structural layout not only meets the convenience of operation, but also ensures the repeatability of the process.
- LyoSOFT software complies with current GAMP standards.

With stoppering

Specification

	Model	LyoPilot D8S	LyoPilot D12S
Basic	Type	2-chamber	2-chamber
	Stopper	●	●
Ice condenser	Type	Internal placed	Internal placed
	Temperature *	-90°C	-90°C
	Max. ice capacity	8 kg	12 kg
	Chamber volume	18L	30L
	Performance	6kg/24h	10kg/24h
	Hot gas Defrosting	●	●
Shelf	Type	Silicone heat transfer fluid	Silicone heat transfer fluid
	Dimensions(W*D)	240*410mm	280*500mm
	Number of shelves	3+1	4+1
	Area	0.3m²	0.56m²
	Spacing	80mm	73mm
	Hydraulic stoppering system	Bottom to top	Bottom to top
	Temperature range	-55°C ~ +60°C	-60°C ~ +60°C
	Temperature accuracy	±1°C	±1°C
	Temperature uniformity	±1°C	±1°C
	Cooling rate (+20°C to –40°C)	1.3°C/min	1.3°C/min
Controller	Display	8" touch screen	8" touch screen
	Operating system	LyoSmart+	LyoSmart+
	Password protection	●	●
Data	Data record	●	●
	USB port	●	●
	RS232 port	●	●
Vacuum	Vacuum gauge type	Pirani	Pirani
	Vacuum level	0.01mbar	0.01mbar
	Vacuum control accuracy	0.002mbar	0.002mbar
	Vacuum leakage rate	0.005mbar L / s	0.005mbar L / s
Process control	Pressure rise test	●	●
	Safety pressure	●	●
	T&R monitoring to prevent defrosting	●	●
	Target/actual comparison Tproduct and Tshelf area	●	●
PAT tools	T&R(determining freezing point, product resistance)	●	●
	Product temperature measurement	●	●
	Capacitive pressure measurement	○	○
	Comparative pressure measurement	○	○
Backfill Aeration	Automatic backfill (N2, clean air, etc)	●	●
	Automatic areation	●	●
Cooling	Cooling system	2 Compressor cascade	2 Compressor cascade
	Refrigerant	Hydrocarbon	Hydrocarbon
Power	Voltage	220V/50Hz;220V/60Hz;120V/60Hz	380V/50Hz
	Rated power	3400W	4500W
Noise level	Freeze dryer	56 (dB)	60 (dB)
Dimensions	Freeze dryer (W x H x D)	960*765*1320mm	1065*860*1380mm
Weight	Freeze dryer	330Kg	450Kg
Vacuum pump	Vacuum pump and hose	●	●
Software for PC	LyoSOFT	○	○

*: Tested at ambient temperature 24°C, with good ventilation

● Basic configuration ○ Optional

Without stoppering

Specification

	Model	LyoPilot D8	LyoPilot D12
Basic	Type	2-chamber	2-chamber
	Stopper	/	/
Ice condenser	Type	Internal placed	Internal placed
	Temperature *	-90°C	-90°C
	Max. ice capacity	8 kg	12 kg
	Chamber volume	18L	30L
	Performance	6kg/24h	10kg/24h
	Hot gas Defrosting	●	●
Shelf	Type	Silicone heat transfer fluid	Silicone heat transfer fluid
	Dimensions(W*D)	315*410mm	350*500mm
	Number of shelves	3+1	4+1
	Area	0.39m²	0.7m²
	Spacing	80mm	73mm
	Temperature range	-55°C ~ +60°C	-60°C ~ +60°C
	Temperature accuracy	±1°C	±1°C
	Temperature uniformity	±1°C	±1°C
	Cooling rate (+20°C to –40°C)	1.3°C/min	1.3°C/min
Controller	Display	8" touch screen	8" touch screen
	Operating system	LyoSmart+	LyoSmart+
	Password protection	●	●
Data	Data record	●	●
	USB port	●	●
	RS232 port	●	●
Vacuum	Vacuum gauge type	Pirani	Pirani
	Vacuum level	0.01mbar	0.01mbar
	Vacuum control accuracy	0.002mbar	0.002mbar
	Vacuum leakage rate	0.005mbar L / s	0.005mbar L / s
Process control	Pressure rise test	●	●
	Safety pressure	●	●
	T&R monitoring to prevent defrosting	●	●
	Target/actual comparison Tproduct and Tshelf area	●	●
PAT tools	T&R(determining freezing point, product resistance)	●	●
	Product temperature measurement	●	●
	Capacitive pressure measurement	○	○
	Comparative pressure measurement	○	○
Backfill Aeration	Automatic backfill (N2, clean air, etc)	●	●
	Automatic areation	●	●
Cooling	Cooling system	2 Compressor cascade	2 Compressor cascade
	Refrigerant	Hydrocarbon	Hydrocarbon
Power	Voltage	220V/50Hz;220V/60Hz;120V/60Hz	380V/50Hz
	Rated power	3400W	4500W
Noise level	Freeze dryer	56 (dB)	60 (dB)
Dimensions	Freeze dryer (W x H x D)	960*765*1320mm	1065*860*1380mm
Weight	Freeze dryer	300Kg	420Kg
Vacuum pump	Vacuum pump and hose	●	●
Software for PC	LyoSOFT	○	○

*: Tested at ambient temperature 24°C, with good ventilation

● Basic configuration ○ Optional

Specification

LyoPilot D8S (with stopering)

Shelf dimensions (W x D): 240x 410 mm								
Vial volume (total)			2ml	6ml	10ml	20ml	50ml	100ml
Number of shelves	Area (m^2)	Spacing (mm)	Max. number of vials *					
3(Standard)	0.30	80	1263	630	540	360	N/A	N/A
2(Customized)*	0.20	120	842	420	360	240	100	64

LyoPilot D12S (with stopering)

Shelf dimensions (W x D): 280x 500 mm								
Vial volume (total)			2ml	6ml	10ml	20ml	50ml	100ml
Number of shelves	Area (m^2)	Spacing (mm)	Max. number of vials *					
4(Standard)	0.56	73	2380	1200	1008	648	N/A	N/A
2(Adjustable)*	0.28	146	1190	600	504	324	160	100

LyoPilot D8 (without stopering)

Shelf dimensions (W x D): 315x 410 mm								
Vial volume (total)			2ml	6ml	10ml	20ml	50ml	100ml
Number of shelves	Area (m^2)	Spacing (mm)	Max. number of vials *					
3(Standard)	0.39	80	1611	852	714	429	N/A	N/A
2(Customized)*	0.26	120	1074	568	476	286	144	100

LyoPilot D12 (without stopering)

Shelf dimensions (W x D): 350x 500 mm								
Vial volume (total)			2ml	6ml	10ml	20ml	50ml	100ml
Number of shelves	Area (m^2)	Spacing (mm)	Max. number of vials *					
4(Standard)	0.70	73	2952	1508	1296	800	N/A	N/A
2(Adjustable)*	0.35	146	1476	754	648	400	196	122

*Adjustable: equipment is adjustable at user's site based on standard configuration.
*Customized: non-standard configuration to be manufactured at factory.
*Note: Data for maximum load, qty will be less when using loading frames.

Vial size overview

Total vial volume	2 ml	6 ml	10 ml	20 ml	50 ml	100 ml
Vial type	2R	6R	10R	20R	50H	100H
↕ mm vial only	35	40	45	55	73	95
↕ mm with Lyo plug	45	50	55	65	83	105
ϕ mm	16	22	24	30	43	52
Net fill volume at 1 cm fill height (ml)	1.2	2.2	4.0	4.6	6.0	7.0