PiNK®

Systems for drying and processing technology

Drying technology

Contents

PINK technology for industry and research

Customized quality

PINK GmbH Thermosysteme – founded by Friedrich Pink – is located in Wertheim and employs a workforce of over 100 employees. Its versatile and all-embracing product range includes equipment for drying and processing, vacuum soldering and sintering systems as well as low-pressure plasma systems.

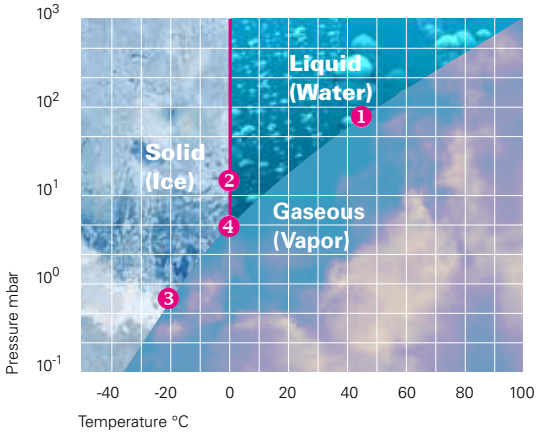
PINK operates in all major markets and supplies individual plants and systems all over the world. These enjoy an excellent reputation in terms of design, reliability, performance, user comfort and quality. Well-known technology companies rely on the company's innovative and high-quality products.

Due to continuous product improvements and a consequent customer orientation in the past years, the PINK family business has grown steadily and successfully and has become a byword for vacuum, drying and processing equipment. Its extensive product range in the drying sector extends from static dryers in various designs, sizes and equipment versions through to dynamic drying systems working on different drying principles according to the customer's needs.

Areas of application

- Pharmaceutical industry
- Chemical industry
- Automotive industry
- Process and electrical engineering industry
- Food industry
- Cosmetics industry
- Biotechnology
- Battery cell industry

Phase diagram of water



1. Condensation
2. Melting
3. Sublimation
4. Triple point (0.01 °C/6.09 mbar)

Gentle drying under vacuum

Among the thermal processes, vacuum drying has proven particularly effective in many sectors. The purpose of this process is to gently dry a high-grade product containing water or solvents without modifying the product characteristics.

During drying under vacuum, the total pressure in the drying oven is lowered so that the water or solvent vaporizes even at low temperatures.

The drying process is optimized by selectively controlling the heat supply and pressure.

A vacuum drying system consists basically of a drying oven with a heating system and a vacuum pump assembly designed for a specific drying process with the associated control.

Perfect clean and contamination-free drying processes

GMP-/FDA-compliant design: The vacuum drying ovens of the VSD series are equipped as standard with automatically locking turning latches that are particularly easy to clean (no thread).

GMP/FDA-compliant

The manufacture of sensitive and, under certain circumstances, highly potent, hazardous products calls for plants and systems capable of gently drying such products under extremely clean and contamination-free conditions. The VSD vacuum drying ovens create precisely these conditions.

These vacuum drying ovens are an indispensable feature of pilot plants, kilo labs and production installations. The VSD is ideal for GMP/FDA-compliant processes.

Intelligent design for high customer benefit

Together with its elaborate production process, the design principle of the VSD system is responsible for the vacuum drying ovens' outstanding features: no corners, no sharp edges – an interior as from a single mold. The heated shelves, ceiling and floor are double-walled and merge seamlessly into the chamber walls. Due to the system's efficient heat circulation, the walls are also uniformly heated and cannot serve as condensation surfaces therefore.

On the front, the vacuum drying ovens are fitted with a continuous mounting frame for wall installation, the frame being tightly welded to the vacuum chamber. With its pharmaceutical design the door is eccentrically hinged so that the door seal can be perfectly fitted to avoid abrasion and bruising.

System features

- GMP-/FDA-compliant design
- Simple cleaning
- Rounded corners, no sharp edges, no concealed surfaces
- No penetrations for the heating medium and no supports in the product chamber
- Outstanding surface quality (ground and polished)
- Excellent temperature distribution

N_2 distribution manifold: Vertical distribution tube with gas guide lances in each charging chamber – for the controlled introduction of gases and for chamber ventilation.

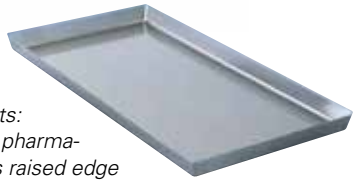
Options

- Double-chamber design
- Pass-through version
- Isolator connection as a containment solution
- Door heating
- Design suitable for installation and operation in explosion-hazardous environments (ATEX)

Reproducible cleaning results with CIP device

For cleaning cycle validation, an automatic and reproducible cleaning process is essential. The CIP (Cleaning In Place) device perfectly adapted to the VSD supports the user in this.

The device consists essentially of a cleaning lance with spray heads, which are driven either electrically or pneumatically. The drive moves the cleaning lance about its vertical axis while the spray heads rotate additionally about their horizontal axis.



GMP-compliant components: Charging carts and trays in pharmaceutical design (continuous raised edge at a 15° angle and ground and polished surfaces).

VSD with integrated CIP device.

Containment systems for contamination-free and safe drying of HAPI products

The drying of highly active and toxic substances in test centres, laboratories or production calls for protective measures for both the operator and the product. PINK has therefore combined its VSD drying oven with an isolator to ensure the safe handling of HAPIs. The VSDI is ideal for drying these substances.

System features

- cGMP-/FDA-compliant design
- Simple cleaning and control
- Protection of the operator
- Ergonomic handling
- Protection of the product
- No cross-contamination
- No product loss

Design and function

- Wide variety of options for product insertion/removal such as RTPs, main and lock chambers, endless hose systems etc.
- Filter systems for incoming/outgoing air and including pressure control (filter removal from the interior of the isolator).
- CIP device consisting of spray nozzles and spray gun.
- VSD with special door design for ergonomic working within the isolator.
- VSD doors turn through 180°: easy to clean, with visual inspection of front and back.
- HEPA filter upstream of the vacuum connectors to protect the vacuum system from contamination (here, too, filter removal from the interior of the isolator).

Containment solution consisting of isolator, vacuum drying oven, lock chamber and RTP in each unit.

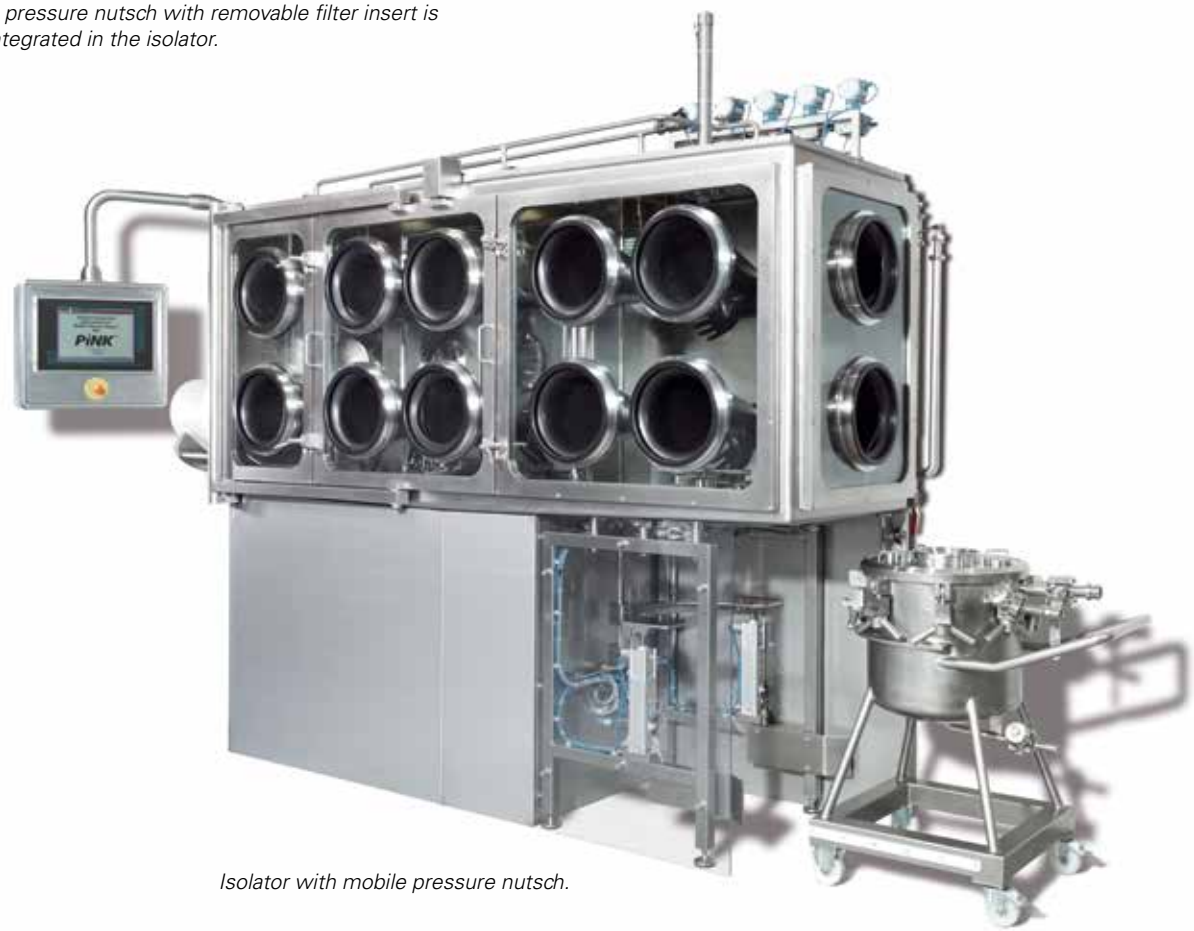
System for the prefiltration and drying of liquid, toxic products

A pressure nutsch with removable filter insert is integrated in the isolator.

As another example of an intelligent combination, PINK combines VSD vacuum drying ovens, isolators and pressure nutsches in integrated systems.

This combination enables the prefiltration of liquid products before the drying process proper, thus optimizing work processes.

For applications in which the filling and filtration of the product is to take place outside the isolator, PINK has designed a mobile pressure nutsch for contamination-free docking.



Isolator with mobile pressure nutsch.

Compact and flexible for laboratory applications

PINK's VSD-e is a compact, high-grade vacuum drying oven designed to provide users in industry, science, and research with a high-performance, safe and clean system for the laboratory.

PINK is thus now making the advantages of the VSD vacuum drying oven with its GMP/FDA-compliant design available for smaller laboratory applications as well.

The VSD-e has electric contact heating with an integrated control. Its operation only requires a plug socket and a vacuum device.

System features

- GMP-/FDA-compliant design
- Extra-compact design
- For mobile and flexible use
- No concealed surfaces
- Rounded corners and edges (20 mm radius)
- Simple cleaning
- No penetrations for heating
- Outstanding surface quality (ground and polished)
- Double-jointed door hinge

Dynamic drying system for high-purity and sterile processes

For many applications, it is useful to combine drying with motion. Powders and granulates are mixed during the drying process, thus ensuring uniform heat transfer to the product. In addition, the rotary dryer can be loaded and unloaded contamination-free and with reduced effort. The drum has a dual-cone design.

The efficient system was designed for efficient rotary vacuum drying. Its main advantage over conventional rotary ovens is that the drum of the RTSD has a single rotary joint. This means that the supply of heating medium, measurements, vacuum generation and the drive are all effected via the single rotary penetration. This enables an optimum installation in clean rooms for sterile processes.

GMP-compliant drum interior with filter and product temperature sensor.

System features

- GMP-/FDA-compliant design
- Simple cleaning of drum interior
- Dust-free powder handling

Options

- Suitable for wall installation separating gray and clean rooms or for integration in a sterile wall
- Drum optionally available as a tumbler
- Design suitable for installation and operation in explosion-hazardous environments (ATEX)

For standard drying processes

VT vacuum drying ovens have been in successful use in the field for many years. The heating medium is supplied and returned vacuum-tight through the chamber's rear wall.

Options

- Heating of the side walls, rear wall, floor and ceiling
- The interior can be designed without shelves – for unrestricted use
- Pass-through version with lock function between gray and clean rooms
- Different door types, e.g. sliding or lifting door
- Design suitable for installation and operation in explosion-hazardous environments (ATEX)

VT vacuum drying ovens, pass-through version with a lock function between gray and clean rooms. Loading with charging frame.

Vacuum drying oven VT with heated shelves, prepared for the integration into a clean room wall.

Drying, heating, tempering and sterilizing

Circulating air oven in an explosion-protected version, GMP-compliant interior, charging and support cart loading.

Circulating air tempering oven in a gas-tight version (for inert gas), pneumatically driven lifting door.

Certain products are not suitable for drying under vacuum or do not require this technology. For these PINK offers a comprehensive range of circulating air ovens in a huge variety of versions. These ovens can be used for drying under atmospheric conditions and for heating, tempering and sterilizing.

For drying products containing solvents under normal pressure PINK again has a highly reliable solution. The UT-ex circulating air oven with external solvent recovery offers such features as the ability to safely condense and collect potentially explosive solvents for proper disposal at any time.

Options

- Interior in GMP-compliant design
- Charging and support cart loading
- Charging trays in standard and pharmaceutical design
- With recessed floor rails for ground-level access
- Reinforced chamber floor for heavier loads
- Fresh air circulation control by vapor solvent concentration
- Humidity measurement and control
- Oxygen concentration monitoring
- Gas-tight version
- Vertical air flow
- Design suitable for installation and operation in explosion-hazardous environments (ATEX)

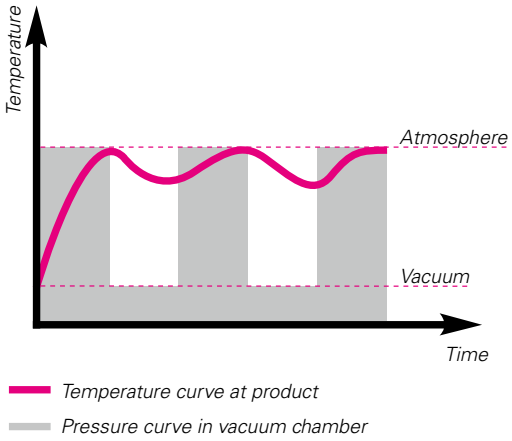
Reliable drying with a combination of vacuum and circulating air

To vacuum-dry a product that is embedded in a product carrier or, due to its inherent structure, exhibits poor heat transfer by conduction, it makes good sense to combine two different forms of drying: vacuum and circulating air.

For such applications, PINK has its VUT vacuum circulating air oven. The product is heated to a defined temperature by circulating air, and then a vacuum is generated. This process can be repeated a number of times, the number of cycles depending on the product's drying behaviour.

Inline system with circulating air heating zones and a vacuum drying zone.

Diagram for combined vacuum circulating air operation



The vacuum circulating air cycle can be repeated several times as required.

Vacuum circulating air system with specially positioned air baffles for a defined air flow.

Single-source services for every customer requirement

PINK regards the requirements of its customers as a challenge and analyzes them carefully in order to develop optimum products that are superior to standard solutions.

In doing so, PINK delivers the entire package from one single source:

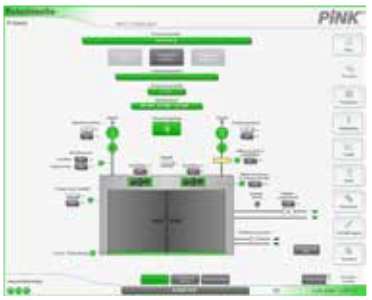
- Consultation, planning and project design
- Design & development
- Mock-up studies for ergonomic product handling
- Production
- Software development, system control and visualization
- Documentation, qualification and validation
- Delivery, assembly, commissioning and training
- Service and spare parts supply

PINK attaches utmost importance to the reliability and performance of its plants and the components used. All vacuum systems are helium leak-tested and checked with pressure increase measurements. The tests are documented with a certificate.

PINK – the supplier for complete solutions

As a systems supplier, PINK not only builds individual customized drying ovens in a wide range of versions, but also supplies complete systems with the entire plant periphery. PINK optionally supplies the desired drying oven, depending on customer requirement, (in combination) with:

- Vacuum pump systems
- Heating/cooling combinations
- CIP systems
- Control and visualization
- Remote maintenance (VPN)
- 21 CFR Part 11
- DQ (Design Qualification)
- IQ (Installation Qualification)
- OQ (Operational Qualification)
- GAMP 5
- Automated charging and integration in existing production lines



The plant is operated from a user-friendly touch panel with clearly structured and easy menu guidance, developed by PINK.

VSD vacuum drying oven in a double-chamber version with the complete periphery – all from one single source.

System overview

VSD

VSDI /VSDIN

VSD-e

Type of system	Vacuum drying oven	Vacuum drying oven with isolator/with isolator and pressure nutsch	Vacuum drying oven
Drying principle	Vacuum, heat	Vacuum, heat	Vacuum, heat
Temperature	max. 200 °C	max. 200 °C	max. 200 °C
Shelf area, interior volume[1]	1 to 20 m²	0.2 to 2 m²	0,18 m²
Heating	Hot water, thermal oil	Hot water, thermal oil	Electric
Materials	High-grade stainless steels, special materials such as Hastelloy, Inconel and titanium	High-grade stainless steels, special materials such as Hastelloy, Inconel and titanium	High-grade stainless steels, special materials such as Hastelloy, Inconel and titanium
Surfaces	Ground and polished [2]	Ground and polished [2]	Ground and polished [2]

Options:

Charging trays (standard and pharmaceutical design)	✓	✓	✓
Charging and support cart loading	✓	—	—
Wall installation	✓	✓	—
Pass-through design with lock function	✓	—	—
ATEX design	✓	✓	—
Automated loading and charging	✓	—	—
Validable CIP	✓	✓	—

[1] Other sizes available on request *[2] Electropolished on request*

VT

UT

VUT

RTSD

VT	UT	VUT	RTSD
Vacuum drying oven	Circulating air oven	Vacuum circulating air oven	Rotary vacuum dryer
Vacuum, heat	Circulating air, heat	Vacuum, circulating air, heat	Vacuum, heat, rotation
max. 200 °C	max. 250 °C	max. 200 °C	max. 200 °C
1 to 20 m²	0.8 to 12 m³	On request	125, 250, 500, 1,000 l
Hot water, thermal oil, electric	Hot water, thermal oil, electric, steam	Hot water, thermal oil, electric	Hot water, thermal oil
High-grade stainless steels	High-grade stainless steels	High-grade stainless steels	High-grade stainless steels, special materials such as Hastelloy, Inconel and titanium
Ground and polished [2]	Ground and polished, mill finish	Ground and polished, mill finish	Ground and polished [2]
✓	✓	✓	—
✓	✓	✓	—
✓	✓	✓	✓
✓	✓	✓	—
✓	✓	✓	✓
✓	✓	✓	✓
—	—	—	—

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