

Overview of possible applications

There is certainly a huge number of other application possibilities. We would be very pleased if you could tell us about your applications. Whatever the material, whatever the appliance and wherever you may be!

We would love to discuss with you your individual task at hand in order to find a suitable solution in the context of our standard programme or our customised designs.

Application	Appliance	Parameters
Photostability test acc. to ICH Q 1B	Climate chamber ICH L	+10 °C to +60 °C, 10 to 80 % rh Fluorescent lights (cold white, daylight: light colour 865) and UV lights (320 - 400 nm) comply with standard illuminant D65
Stability test acc. to ICH Q 1A accelerated und intermediate tests, long-term storage	Climate chamber ICH Constant climate chamber HPP Cooled incubator ICP Humidity chamber HCP	+10 °C to +60 °C, 10 to 80 % rh -10 °C to +60 °C 0 °C to +70 °C, 10 to 90 % rh (HPP110 to HPP1060) +15 °C to +60 °C, 10 to 80 % rh (HPP1400) -12 °C to +60 °C +20 °C to +90 °C, 20 to 95 % rh +20 °C to +160 °C
Freeze-Thaw stability test	Climatic test chamber CTC	-42 °C to +190 °C, 10 to 98 % rh
Stress tests	Temperature test chamber TTC Cooled incubator IPP Cooled incubator ICP	-42 °C to +190 °C 0 °C to +70 °C -12 °C to +60 °C
Short-term stability testing of emulsifier mixtures Testing of migration and permeation	Universal oven U Incubator I	+30 °C to +300 °C +30 °C to +80 °C
Microbiological tests, determination of bacterial counts, virology, toxicology, cultivation above and below room temperature	Incubator I Cooled incubator ICP Cooled incubator IPP Universal oven U	+30 °C to +80 °C -12 °C to +60 °C 0 °C to +70 °C +30 °C to +300 °C
Cultivation of cells and tissue In vitro fertilisation and biosynthesis	CO ₂ incubator ICOMed (medical device class IIa)	+18 °C to +50 °C, CO ₂ 0 to 20 % O ₂ 1 - 20 % (optional) 40 - 97 % rh (optional)
Determination of dry content/humidity content acc. to the oven drying method	Universal oven U Vacuum oven VO	+30 °C to +300 °C +20 °C to +200 °C
Drying and heating of pastes, powder, pellets, plant extracts, wax, gel, talc, or granulate for formulation and production	Universal oven U Cleanroom drying oven UF750plus Vacuum oven VO	+30 °C to +300 °C +30 °C to +300 °C +20 °C to +200 °C
Warming of paraffin, ointments or emulsions	Paraffin oven UNpa	+30 °C to +80 °C
Drying of cleaned machine components	Vacuum oven VO	+20 °C to +200 °C
Sterilisation of laboratory glass	Steriliser S	+30 °C to +250 °C
Heat sterilisation of moisture-sensitive materials like ointments, talc or powder	Universal oven U Steriliser S	+30 °C to +300 °C +30 °C to +250 °C
Growing of plants, insects, fishes and mammals	Constant climate chamber HPP	+15 °C to +40 °C, 10 to 85 % rh white light (standard illuminant D5) or warm-white light (not available for HPP1060/HPP1400)
Process simulation vacuum drying	Vacuum oven VO	+20 °C to +200 °C
Cleaning validation in the laboratory	Universal oven U	+30 °C to +300 °C
Temperature control of samples, plates, breeding media and emulsions in the laboratory	Universal oven U Waterbath WNB/WNE/WPE	+30 °C to +300 °C +30 °C to +95 °C + boiling stage (with cooling unit CDP115 from +10 °C)
Degassing of solutions	Vacuum oven VO	+20 °C to +200 °C
Incubating in non-air-conditioned rooms and at constant temperatures	Cooled storage incubator IPS	+14 °C to +45 °C
Simulation of storage and transport conditions during intercontinental flights	Cooled vacuum oven VOcool	+5 °C to +90 °C
Stability testing of hemp flowers	Climate chamber ICH	+10 °C to +60 °C, 10 to 80 % rh



memmert
Experts in Thermostatics

Small things matter most

Temperature control appliances for the pharmaceutical industry and life sciences




100% ATMOSAFE. MADE IN GERMANY.

www.memmert.com | www.atmosafe.net



Partner of industry and research



Some like it quiet. Protein crystals, for example. In a Memmert Peltier-cooled incubator, they can grow at absolutely constant temperatures at almost no vibrations.

Everybody asks for reliability. So does the staff of the stability department, who can rely on the fact that no alarm signal will interrupt their well-earned leisure time. Stability samples can be stored in a Memmert climate chamber at unparalleled homogenous temperature and humidity for many years.

Safety at all times. A biochemist who cultivates especially sensitive cells needs a CO₂ incubator that keeps vaporisation and condensation at a minimum and can easily bypass a temporary power failure.

This unconditional focus on the requirements of our customers has made us a reliable partner of the pharmaceutical industry and life sciences for many decades now. It is our passion for details that determines the outstanding quality of our temperature control appliances. And the fact that all our products are developed and manufactured exclusively in-house has made us technology leaders in temperature control chambers.

100% AtmoSAFE is our promise to you to ensure a perfect atmosphere in all our appliances. What can we do for you?

Incubator
Microbiology

Steriliser
Microbiology

Cooled incubator
Microbiology, structural biology and stability

Temperature test chamber
Stability

Drying oven
Sample preparation and production

Waterbath
Microbiology

Paraffin oven
Warming

Cooled storage incubator
Incubating in non-air-conditioned rooms and at constant temperatures

Temperature

CO₂ incubator
Cell biology

CO₂ incubator
Cultivation in vitro fertilisation and biosynthesis

Climate chamber
Microbiology

Temperature Humidity CO₂ and/or O₂

Constant climate chamber
Stability

Climatic test chamber
Stability

Humidity chamber
Stability

Climate chamber
Stability acc. to ICH

Temperature Humidity



Temperature Humidity Light

Constant climate chamber
Photostability

Constant climate chamber
Plant cultivation

Climate chamber
Stability acc. to ICH and material tests, photostability

Temperature Vacuum

Vacuum oven
Sample preparation and production

Cooled vacuum drying oven
Microbiology, cell biology and sample preparation



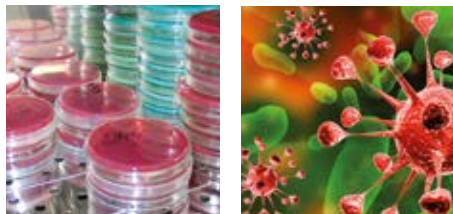
CO₂ INCUBATOR IComed

56 | 107 | 156 | 241 litres
+18 °C to +50 °C
Humidity 40 - 97 % rh (optional)
O₂: 1 – 20 % (optional)

Safety at all times. The operating display, logging and CO₂ control of the CO₂ incubator ICOMed stay functional when there is a power failure thanks to the battery-buffered ControlCOCKPIT. The fine-tuned control guarantees that the set-point temperature is reached without temperature overshoots. Rounded corners allow for easy cleaning of the interior, which can also be sterilised together with all installations and sensors within 60 minutes at 180 °C.

All parameters are logged in accordance with the FDA and, a particularly important feature regarding safety, when the individually adjustable ranges for CO₂, O₂, temperature and humidity are surpassed, the ICOMed can send notification to a mobile phone.

The Memmert active humidity control offers the best protection for cell and tissue cultures. It minimises vaporisation in the interior and ensures short recovery times after the door has been opened. All-round heating of the interior and the heated inner glass door additionally prevent the dangerous formation of condensation.



The CO₂ incubator from a scientific point of view

The ideal conditions are clearly defined: Constant temperatures in the entire interior of the incubator, humidity as high as possible to avoid osmotic fluctuations, but no condensation whatsoever. The gas atmosphere needs to be individually adjustable and highly constant in daily operation, the device needs to be clearly arranged and decontamination and cleaning must be easy. Incubators for in-vitro cultivation should be designed in such a way to meet the GCCP (Good Cell Culture Practice) requirements. This may sound easy, but for the technical realisation, high expertise, technical skills, intelligent control and comprehensive knowledge of the various requirements in the laboratory are required.

Source and more information: „Warum wir endlich eine Good Cell Culture Practice brauchen!“ (Why we need Good Cell Culture Practice now!), Professor Dr. rer. nat. Gerhard Unteregger, diploma in biology, in vitro – Institute for Molecular Biology, published in BIOSpektrum 12/08



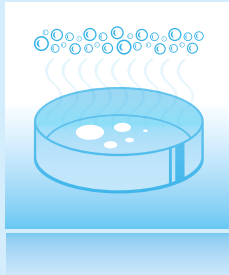
CO₂ Incubator ICOMed is a medical device:

Memmert subjected its CO₂ incubator ICOMed to a comprehensive medical device evaluation. Every Memmert CO₂ incubator ICOMed is classified as a Class IIa medical device. The ICOMed is intended for the creation and maintenance of constant environmental conditions for application in the field of in vitro fertilisation (IVF), especially for the incubation of oocytes, spermatozoa and zygotes in special culture dishes for IVF application as well as for gene expression and the biosynthesis of RNA and proteins. The CE label on the appliances includes the mark 0197, denoting TRLP – TÜV Rheinland as the notified body.

We know how: As little air circulation as possible in the incubator

The less forced air circulation the better. Why? Thanks to a protective layer of humid air that forms over the humidity-containing samples, the bacteria cultures cannot dry out. If air circulation is applied, this air layer is destroyed and the warm air replacing it further withdraws humidity.

Homogeneity measurements at 27 points in Memmert incubators demonstrate that thanks to a perfect interaction of all-round heating with temperature control, air circulation is in most cases unnecessary. Even in an appliance with 749 litres chamber volume, the maximum deviation at natural convection and 37 °C never exceeds ± 0.7 K. Provided the chamber is fully loaded and forced air circulation is required, it can be precisely adjusted (0 - 100 % in 10 % steps). By the way, all Memmert incubators comply with the strict requirements of DIN 12880:2007-05!



COMPRESSOR-COOLED INCUBATOR ICP

53 | 108 | 256 | 449 | 749 litres
-5 °C to +60 °C (ICP55)
-12 °C to +60 °C
(ICP110 to ICP750)

If a large number of samples needs to be permanently incubated, you can rely on the maximum utilisation of the chamber in the cooled incubator ICP. After all, of what use is a large chamber if some levels cannot be used after validation.

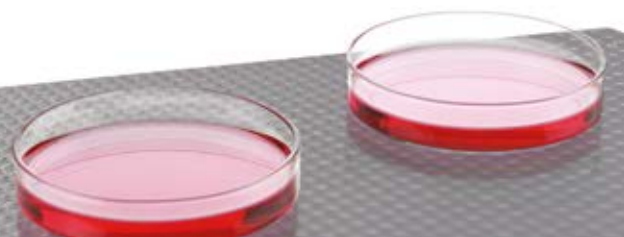
And if rapid and precise alternation between heating up and cooling down phases in ramp operation is called for, Memmert cooled incubators with compressor cooling prove to be in peak form – yet working extraordinarily quiet. Thanks to the finely adjusted control technology, temperatures reach the set point precisely, without any energy-intensive surge heating and without any temperature fluctuations.

If you need a particularly precise temperature control in combination with a low-noise and vibration-free operation, the Memmert Peltier-cooled incubator with its temperature range between 0 and +70 °C is just the right choice for you.

POSSIBLE APPLICATIONS

- Microbiological tests
- Germ count determination
- Incubation of cell and tissue cultures
- Cultivation below and above room temperature
- BSB5 and BSB7 determination

If you want to find out more about the advantages of the appliances from Memmert, we recommend our technology overview "10 good reasons for a Memmert". Just send an e-mail to sales@memmert.com, and specify which Memmert appliance you are interested in and we will also send you the corresponding brochure.





PELTIER-COOLED INCUBATOR IPP

32 | 53 | 108 | 256 | 749 litres
0 °C to +70 °C

Excellent controllability, extremely small control fluctuations, low-vibration operation and impressive energy savings provide the added value from the Peltier technology in the Memmert cooled incubators of the IPP series. In modern food analytics, cosmetics research, cell biology, immunology, pharmacology, bio-analytics or biotechnology, tests and processes must be repeatable and documentable under precisely defined conditions. The Memmert IPP Peltier-cooled incubators operate at high precision, without vibration and in addition provide unparalleled energy efficiency, as, in contrast to compressor technology, energy is only used during the heating or cooling process. The advantages: The risk of the sample drying out is minimal, since condensation formation during the cooling down process takes place outside the working chamber on the Peltier element. As the IPP cooled incubator does not need a compressor, it saves valuable space in the laboratory.

If, for your application, you need fast and precise switching between heating and cooling phases in ramp operation, then the compressor-cooled incubator ICP with a temperature range between -12 °C and +60 °C is the right choice from the Memmert portfolio.

We will be glad to send you our detailed brochures! Just give us a call or send an e-mail to sales@memmert.com

Application IPP: Protein crystallography

The sensitive protein crystals often grow for weeks or even months in the incubator, as slowly and with as little vibration as possible, at constant temperatures between +4 °C and +20 °C.

Above all thanks to its low-vibration properties, the Memmert cooled incubator IPP lends itself perfectly to store crystallisation preparations due to its precise temperature control by means of Peltier technology without compressor.

In addition to the low noise and minimal vibration, the exact controllability of the incubator plays a crucial role in crystallisation, since temperature fluctuations can impact the reproducibility of the crystals, particularly during the nucleation phase. 10 years ago, Memmert for the first time managed to adapt Peltier technology for powerful laboratory equipment – in order to enable heating and cooling with just a single system. A Peltier element in a Peltier-cooled incubator or a Peltier constant climate chamber is switched up to 18,000 times a second, thus enabling extremely sensitive temperature control.



POSSIBLE APPLICATIONS

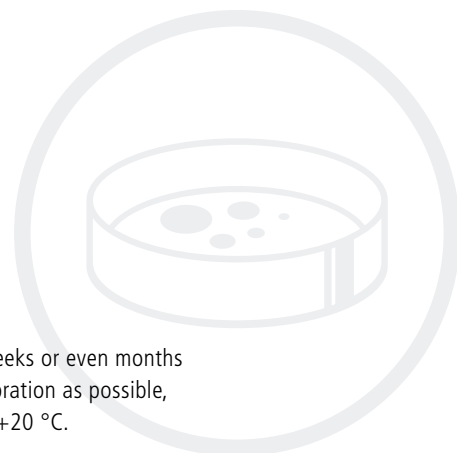
Microbiological tests

Germ count determination

Incubation of cell and tissue cultures

Cultivation below and above room temperature

BSB5 and BSB7 determination





Application ICH: Stability testing of hemp flowers

Swiss Ai Fame GmbH has succeeded to, for the first time in the world, make the active substances of the cannabis plant water-soluble, and thus more readily processable. Leaves, buds, pollen and seeds of the indoor-cultivated cannabis plants are sold for the production of liqueur or as a stock for pest control in the agricultural sector. GMP was already introduced in the company in 2010, paving the way for the pharmaceutical approval of active substances. The aim for the future is to extract various pharmaceutical ingredients from the flower and pollen of the cannabis plant by means of high pressure extraction.

For stability testing of the cannabis flowers in accordance with the ICH guideline, the test laboratory Ai Lab Swiss uses a Memmert climate chamber ICH. Samples are exposed to a climate of +25 °C and 60 % rh for up to one year. Due to the long test duration, the consistently good and thus standard-compliant temperature and humidity distribution in the chamber and the uninterrupted logging and documentation of all test parameters in the chamber was of particular importance to the company.

Application IPS: Incubating caries bacteria

At required temperatures of +37 °C for incubation and similarly high room temperatures, most incubators come up short. But not the IPS cooled incubator, which, due to its Peltier elements, cools down in a reliable and energy-saving way.

60 – 90 % of schoolchildren and the majority of adults in industrial countries suffer from caries, according to the WHO (World Health Organization). The paediatric dentistry department at the Gießen site of the University Clinic of Gießen and Marburg has declared war on this worldwide plague and is doing intensive research to extend tooth life. One important resource is a fully automated artificial oral cavity, which can simulate how caries develops in a simple and above all accelerated manner. During the experiments, the caries model is stored in a Memmert cooled storage incubator IPS. The temperature for incubating the caries bacteria in the incubator is a constant +37 °C, but since temperatures of over +35 °C can occur in summer in the relatively moderate climate zone around Gießen and Marburg, an incubator that would reliably cool down was needed.



INCUBATING IN NON-AIR-CONDITIONED ROOMS

The Peltier-cooled storage incubator IPS is ideal for incubation in non-air-conditioned rooms and at constant temperatures.



CLIMATE CHAMBER ICH

108 | 256 | 749 litres

-10 °C to +60 °C

Humidity 10 to 80 % rh

Its excellent temperature and humidity homogeneity positions the climate chamber ICH in the international top league of stability test chambers. Thermal transfer to the interior – whether heat or cold – is guaranteed through a large-area air jacket on four sides. Thanks to its hermetically sealed interior, the ICH does not consume any water once the setpoints have been reached, provided that the door is not opened.

Thanks to an illumination unit in the climate chamber ICH L, tests in accordance with ICH Q1B, option 2, can be performed. Fluorescent lights with cold white light (daylight: light colour 865, 6,500 K) and UV radiation in the spectral range of 320 - 400 nm (comply with standard illuminant D65).

Model ICH C offers a digital electronic CO₂ control with autozero and NDIR system.

Stability tests

ICH Q1A (R2) and Q1B, option 2
WHO, GMP, GLP
EMA, ASEAN



CONSTANT CLIMATE CHAMBER HPP



108 | 256 | 384 | 749 |

1060 | 1360 litres

0 °C to +70 °C (HPP110 to HPP1060)

+15 °C to +60 °C (HPP1400)

Humidity 10 to 90 % rh
(HPP110 to HPP1060)

10 to 80 % rh (HPP1400)

Climate chambers must work reliably for years without interruption. After all, nobody concerned with stability testing wants to receive an emergency call in their well-earned leisure time because there has been an alarm. The Peltier technology applied in the Memmert constant climate chamber HPP not only makes it possible to precisely control the temperature during stability tests but also – even after many years of use – runs without any maintenance like changing the coolant, as it is required for compressor appliances. As the effectiveness of Peltier appliances is considerably higher after reaching the setpoint temperature than in conventional climatic test chambers and as manufacturing them has less impact on the environment, the constant climate chamber HPP makes a considerable contribution to improving the carbon footprint.

Light module for HPP110, HPP260, HPP400 and HPP750 available as option.

POSSIBLE APPLICATIONS

Stability tests according to ICH Q1A, WHO, GMP, GLP, EMA, ASEAN

Breeding of insects and zebra fish, keeping mice

Plant cultivation

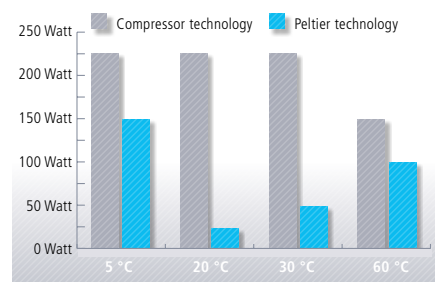
We know how:

Saving energy in the laboratory

The topic of energy efficiency has been under discussion in the pharmaceutical industry for some time now. Energy-saving laboratory equipment cuts operating costs and is an integral aspect of environmental certification and management. As a matter of fact, all Memmert appliances featuring conventional heating elements or compressor cooling are designed to reduce energy consumption to a minimum, thanks to insulating materials, finely-adjusted electronic temperature control systems and large-area all-round heating. However, in order to actually make temperature control chambers exemplary energy savers, innovative ideas like using Peltier technology are required. Memmert's wide range of Peltier appliances for heating and cooling includes the cooled incubator, the constant climate chamber for stability tests, the storage chamber, the cooled vacuum oven and waterbath cooling – unparalleled by any other manufacturer worldwide.

In contrast to compressor technology, Peltier technology works in a particularly economical and energy-saving manner at temperatures close to the ambient temperature, since energy is only required if heating or cooling is needed. In addition, very fine adjustments can be made to the heating or cooling functions.

Compressor technology vs Peltier technology



Up to 90 % less energy consumption at 22 °C ambient temperature





Application HPP: Breeding zebra fish

With the help of zebra fish, the University of Gent does research on genetic causes of diseases of the cardiovascular system such as the arterial tortuosity syndrome, a genetic disease of the connective tissue characterised by torsion and elongation of the arteries. It can lead to severe constrictions of the blood vessels, aneurysms or hyperextensible skin and joints. Apart from that, their research focuses on genetic dysfunctions in connection with the formation of bones and tissue.



To develop perfectly, zebra fish need as much peace and quiet as possible during growth. The University of Gent therefore uses the constant climate chamber HPP108 with light module, which runs without a loud and vibrating compressor. Peltier technology precisely heats and cools the interior without any disturbing vibrations and noises. Additionally, the Memmert technical service further reduced the performance of the air turbine to eliminate this source of noise as far as possible. Thanks to the fish breeding chamber's LED lighting between 8 am and 10 pm, zebra fish can grow in a nature-like environment at a constant temperature of +28 °C.



Application HPP: Keeping mice



Based on research on the model organism of the mouse, the question as to why the energy balance in some mammals gets into difficulties, subsequently leading to being overweight or underweight, or diabetes type II is being examined at the department for Molecular Nutritional Medicine of the Else Kröner-Fresenius Centre at the Technical University of Munich.

In a clean room, various types of mice are kept at +30 °C and at +5 °C, as well as 55 - 60 % relative humidity in two Memmert constant climate chambers HPP750 in a "specific pathogen free" (SPF) state. To be able to guarantee humidity between 45 and 65 % rh even at low temperatures, the Memmert customisation department integrated a compressed air drying unit. In addition, LED lighting with a timer enables a day and night rhythm to be simulated.

In conventional ovens, mice and rats can only be kept at room temperature or warmer, since problems are generally associated with air exchange in combination with cooling and dehumidification. Walk-in climate chambers with temperature and humidity control have the disadvantage that above all working at +30 °C puts a strain on the animal keeper staff.

BREEDING MODEL ORGANISMS

Since there is no loud and vibrating compressor, the constant climate chambers HPP are ideal for breeding model organisms such as arabis, zebra fish and drosophila.



VACUUM OVEN VO

29 | 49 | 101 litres

+20 °C to +200 °C

Pressure range:

5 mbar to 1100 mbar

A gentle force! The vacuum oven VO offers outstanding properties for applications in pharmaceutical formulation and production. Substances sensitive to heat and oxygen are treated gently and carefully, complex machine components are dried residue-free – and all that is achieved very rapidly, since the Memmert vacuum oven VO activates its turbo with its digital pressure control. Thanks to ramp programming of temperature and vacuum cycles in combination with direct heating of the thermoshelves, unparalleled heating up and process times can be achieved.

POSSIBLE APPLICATIONS

Determination of dry content/humidity content acc. to the oven drying method

Drying and heating of pastes, powder, pellets, plant extracts, wax or granulate for formulation and production

Drying of cleaned machine components

Process simulation vacuum drying

Degassing of solutions



Application VO:

Drying of powder and granulate

If vacuum ovens are applied to dry large amounts of powder and granulate, the occurring volume expansion of the heated atmosphere in the interior sets a physically defined end to the capability of the vacuum pump to transfer humidity. The result: Heat transfer and steam removal come out of balance and the samples dry extremely slow or even simmer in their own juice.

Just opening the door of the vacuum oven to ventilate the interior would be the worst possible solution of this problem. For this reason, Memmert as the first manufacturer worldwide has developed a turbo-drying system with vacuum cycles for its vacuum oven VO. Thanks to this ramp programming, two vacuum values can be set between which the pressure in the interior is adjusted in a digital, well-controlled way. The advantages are obvious: Large amounts of dry air, which absorbs humidity, can be admitted within a short time and is then immediately extracted by the vacuum pump.





Customisation department: Mettmert myAtmoSAFE meets any specific customer demand

The customisation department adapts standard appliances to special needs. Their solutions are economic as well as technologically advanced and customers profit from the full guarantee period. Some customer-specific development projects, like the cooled vacuum oven VOcool or the climate chamber for keeping mice HPPLife even made their way into the standard product range.

If users want to make sure they chose the right appliance offering the right suit of parameters and functions, they can have their application tested in advance in the Mettmert MPTC Test Centre.

Customer-specific adjustment of standard models:

- Feed-throughs and ducts
- Special fittings for special applications (e.g. weighing equipment)
- Limiting temperatures in the heating and cooling range
- Air exchange rates
- Relative humidity
- Light intensity and spectrum
- (Wall) Frames
- Telescopic trays
- Heavy duty appliances, heavy duty bottom grids
- Special bases, stacking frames
- Central or integrated water supply
- Special model sizes
- Appliances for integration in the production lines



COOLED VACUUM OVEN VOcool

29 and 49 litres
+5 °C to +90 °C
Pressure range:
5 to 1100 mbar

As the first manufacturer worldwide, Mettmert has developed a cooled vacuum oven. For cooling purposes, a compact, energy-saving and extremely precise Peltier cooling unit was integrated. This way, the Mettmert cooled vacuum oven achieves a surface temperature distribution with a maximum deviation of ± 1 K.

Gentle low temperature vacuum drying and storage of microorganisms or active pharmaceutical components are particularly applied in the food and pharmaceutical industry. Thanks to this process, unstable substances can be dried at moderate temperatures, but above zero, without causing too much damage to the cell structure. Additionally, the cooled vacuum oven VOcool from Mettmert can be deployed to easily and cost-effectively simulate storage and transport of pharmaceutical products during intercontinental flights.

POSSIBLE APPLICATIONS

Drying and storage of starter cultures and bacteria

Simulation of storage and transport conditions during intercontinental flights

Drying and conservation of bacterial strains below room temperature