



**memmert**  
Experts in Thermostatics

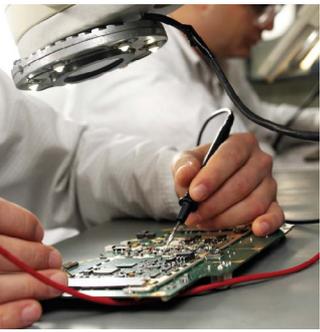
# Nothing but the best

Temperature control appliances for the industry  
Automotive - Electronics - Plastics - Metal



100% ATMOSAFE. MADE IN GERMANY.

[www.memmert.com](http://www.memmert.com) | [www.atmosafe.net](http://www.atmosafe.net)



# Quality. Reliability. Precision. Down to the tiniest detail.

Just imagine that your highly sensitive sensors are stored in a climate chamber with a maximum temperature deviation of 0.2 K and this across the entire chamber interior.

Just imagine that your process times during vacuum drying are reduced to an optimum, thanks to programme-controlled cycles for ventilation and temperature.

Just imagine that your oven runs for many decades, precisely and reliably.

With a Memmert your vision becomes reality. Our passion for detail determines the outstanding quality of our temperature control appliances and has made us the leader in technology. 100% AtmoSAFE is our promise to you to guarantee a perfect atmosphere in all our appliances. What can we do for you?

Universal oven  
**Ageing, drying, conditioning**

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Cleanroom drying oven  
**Ageing, drying, conditioning**

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Temperature test chamber  
**Ageing, drying, conditioning**

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Cooled incubator  
**Storing, conditioning**

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Waterbath  
**Sample temperature control**

Temperature

Constant climate chamber  
**Stability and material tests, conditioning**

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Climatic test chamber  
**Stability and material tests, conditioning**

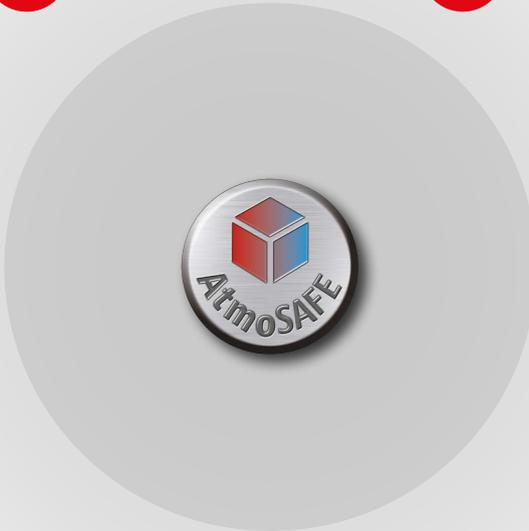
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Climate chamber  
**Stability tests acc. to ICH and material tests, conditioning**

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Humidity chamber  
**Stability and material tests, conditioning**

Temperature Humidity



Temperature Humidity Light

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

Temperature Vacuum

Vacuum oven  
**Drying, degassing, storing**

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Cooled vacuum oven  
**Drying, atmosphere simulation**



## UNIVERSAL OVEN U

32 to 1060 litres  
 +30 °C to +300 °C  
 Natural convection or  
 forced air circulation

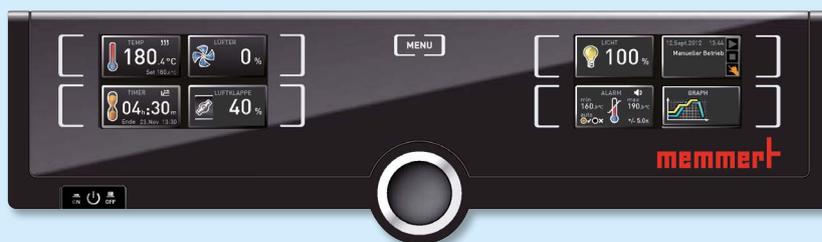
The success story of Memmert began in the year 1947, with the development of a hot air steriliser for the Red Cross. Today, Memmert heating and drying ovens are an essential part of quality assurance and manufacturing. Since the company's establishment, an uncompromising philosophy of quality has gone into every new development. Aesthetics and design coupled with unparalleled precision and reliability: corrosion-resistant, easy-to-clean stainless steel in the interior and outside, large-area all-round heating, device-specific interaction of heating and control.

### POSSIBLE APPLICATIONS

- Tempering/burning-in of electronic and mechanical components
- Drying of components
- Heated storage of plastics, metal parts and electronic components
- Hardening of adhesive compounds
- Ageing and conditioning of cables and wiring at defined air exchange rates
- Migration tests, heat resistance tests of paints and varnish

### We know how: Controlled air exchange

Certain standard applications require controlled fan function and fixed air exchange rates. For the appliances with a TwinDISPLAY, fan speed and flap position can be set in the ControlCOCKPIT with the touch screen or can be programmed as parameters of the test routine with the control and logging software AtmoCONTROL.



### Application U: Sample conditioning for cable ageing



As a manufacturer of cable measurement equipment, we work together very closely with the industry in the conception of modules for cable testing. Conditioning of test specimens that conforms to standards is essential for a valid measurement result.

In this respect, the greatest challenge represents the various different regulations for ventilation in the interior of the heating oven. With a standard oven without modifications such as specially adapted ventilation flaps, it is hardly possible to perform even one test conforming to standards, let alone conforming to the wide range of national, international and company specific standards for cable testing.

Whereas one standard demands the renewal of air in the interior 8 times per hour, other standards require 20 – 100 air changes per hour. Cyclical programming of automatic air change is a must as is, of course, the outstanding spatial temperature homogeneity. Since the heating oven needs to be opened to load it with test objects, the recovery times after the door has been opened should be as short as possible.

Heiko Freund, director | iiM measurement + engineering AG



## Application UFP: Tempering of optical lenses



The future of cameras, sensors, measuring equipment and other opto-electronic systems belongs to plastic optical lenses. The Nuremberg-based company UPT Optik Wodak GmbH has specialised in the development and manufacturing of these innovative optical components.

In order to defuse tensions in plastics, to increase form stability, to minimise the danger of crack formation and to degas undesired volatile substances, the plastic components are tempered for 24 hours in a Memmert drying oven after injection moulding and other processing steps such as coating. The average glass transition temperature of materials used to manufacture plastic optical lenses lies at 105 °C. If these plastics are exposed to higher temperatures for a prolonged period, they transform into a rubber-like, gooey substance. Tempering is thus done at temperatures between 90 and 95 °C, just below the glass transition temperature.

As a certified manufacturer of medical products, UPT decided to purchase the Memmert drying oven UFP800, which is suitable for use in a cleanroom. Excellent controllability, variable programming and possibility of logging and reading out process parameters were also part of their decision criteria.

### We know how:

#### Precision and perfect temperature distribution

The smaller the heating elements in an oven, the more they must be heated up to reach the required temperature in the interior. A standard ring heater with an overall heating element length of one metre will even start to glow, making a gentle and accurate adjustment considerably more difficult to achieve.

A Memmert heating oven with a volume of 749 litres is surrounded on all sides by 52 metres of heating elements. Six heating circuits are controlled separately from one another so that the required temperature is exactly attained and maintained at every point in the interior – linearly and without fluctuations. In a Memmert drying oven, the heating doesn't simply switch off when the



set temperature has been reached but the temperature is controlled permanently, gently and evenly throughout the entire chamber.

The logical consequence of this unique system: Excellent values for temperature homogeneity and temperature stability.



## PASS-THROUGH OVEN UF TS

161 | 256 | 449 | 749 litres

+30 °C to +250 °C

Forced air circulation

The pass-through oven UF TS is based on a standard heating oven and features all technological highlights like product specific heating and perfectly adjusted control technology. For the curing of lead frames and adhesive bonds or tempering of components the pass-through oven can be equipped, for example, with belt input and output at the side as well as with turn pulleys.

The specialists of the Memmert customisation department will gladly provide customer-specific adjustments as well as develop tailor-made application solutions.



## VACUUM OVEN VO

29 | 49 | 101 litres  
 +20 °C to +200 °C  
 Pressure range:  
 5 to 1100 mbar

Cooled vacuum drying oven  
 29 | 49 litres  
 +5 °C to +90 °C  
 Pressure range: 5 to 1100 mbar

Curing, conditioning, degassing, ageing – the vacuum oven VO can do much more than just drying. Substances sensitive to heat and oxygen are treated gently, components with complex geometries are dried residue-free – with unsurpassed energy efficiency thanks to a speed-controlled vacuum pump and thanks to digital pressure control at turbo speed. Ramp programming of temperature and vacuum cycles in combination with direct heating of the thermoshelves allows unrivalled process times, even when fully loaded.

### POSSIBLE APPLICATIONS

Tempering/burning-in of electronic and mechanical components

Degassing and evaporating volatile substances and solutions from adhesive compounds, synthetic resin or thermoset material

Residue-free drying of components with complex geometries

Drying and heating of powder and granulate

Drying of cleaned (machine) parts in production

Oxygen-free storage of electronic parts

Simulation of atmospheric pressures (special model with cooling unit)



### Application VO:

#### Drying of blood pumps made of PUR



If an acute heart insufficiency should occur in a patient, there is usually no donor heart available. In this case, artificial hearts, so-called VADs (ventricular assist device), step into the breach as lifesavers.

In the production of artificial hearts by Berlin Heart, the highest standards of quality apply for all processes. Clockmakers and precision engineers are responsible for the precise finishing, down to the micrometre, of pumps and cannula, which, of course, takes place under cleanroom conditions, since the slightest unevenness or deviation could lead to life-threatening complications for the patient.

For many years, Memmert vacuum ovens have been used for the drying process. For example, the assembled EXCOR® blood pumps from Berlin Heart are subsequently dried and degassed in the vacuum oven VO. The gentle drying of the components made from heat-sensitive polyurethane is done in a vacuum at 30 °C over a period of 24 hours. In doing this, Berlin Heart makes use of the advantages of the vacuum cycles in the Memmert vacuum oven. The pressure in the interior is briefly reduced by the programme under controlled circumstances, so that humidity and possible residue is removed more quickly.



## Application IPP: Storage tests of decorative cosmetics



As a partner of internationally renowned cosmetics manufacturers, Faber-Castell Cosmetics is one of the leading private label manufacturers of products for decorative cosmetics. Based on in-house developments and using innovative technologies, high-quality cosmetic pencils for face, eyes, lips and nails are produced adapted to individual customer requirements. For storage tests, the Faber-Castell Cosmetics test laboratory relies on a Memmert cooled incubator IPP.

The wood or plastic-cased cosmetic pencils are stored in the cooled incubator between 5 °C and 50 °C for twelve weeks and subsequently tested for changes of the colouring component and case. The cooled incubator is moreover used for temperature tests at changing temperatures. Since storage tests are performed at defined temperatures, temperature stability is an important criterion. The permissible maximum temperature deviation over time and throughout the chamber is  $\pm 1$  K.

Additional decision criteria in choosing the right appliance were the comfortable programming as well as the possibility of logging and reading out the process parameters saved in the cooled incubator even after a longer period of time.



## COMPRESSOR-COOLED INCUBATOR ICP<sup>eco</sup>

256 | 449 | 749 litres  
-12 °C to +60 °C

If a large number of samples have to be permanently incubated, you can rely on the maximum utilisation of the chamber in the cooled incubator ICP<sup>eco</sup>. This environmentally-friendly cooled incubator with compressor technology is cooled with climate-neutral CO<sub>2</sub>. Thanks to the excellent thermodynamic properties of the CO<sub>2</sub> refrigerant (R744) and the finely adjusted control technology, it is both powerful and efficient. It keeps temperatures at the setpoint without energy-intensive re-adjustment and without any temperature fluctuations.

## We know how:

### 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.

## PELTIER- COOLED INCUBATOR IPP

32 | 53 | 108 | 256 | 384 | 749 | 1060 litres  
0 °C to +70 °C

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. As the IPP cooled incubator does not need a compressor, it saves valuable space in the laboratory.



## 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)

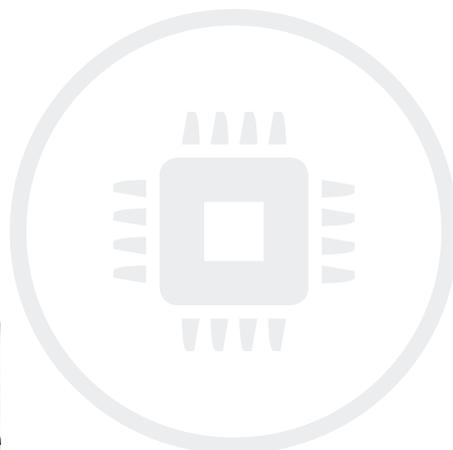
10 to 80 % rh (HPP1400)

100% AtmoSAFE! Climate chambers must work reliably and without interruption because a breakdown not only means that the employees cannot enjoy their leisure time but in some cases could threaten an experiment running over months. The Peltier technology of the Memmert HPP constant climate chamber works reliably over many years, enables absolutely precise temperature regulation and requires, in contrast to compressor equipment, no maintenance work at all, such as the replacement of coolant. Since the efficiency of Peltier appliances is considerably better once the set temperatures have been reached than that of conventional climate chambers and since they are considerably more eco-friendly in their production, the HPP makes a significant contribution to improving the climate balance. LED light module for HPP110/260/400/750 as option.

### POSSIBLE APPLICATIONS

Stability tests

Storage of plastics, metal parts, compound materials and electronic components in constant climate for conditioning, ageing, corrosion tests etc.



### Application HPP: Adjusting sensors

Energy efficiency and comfort in buildings depend to a large degree on the technology with which temperature, air quality, air humidity or brightness can be precisely measured and automatically adjusted. For years, the innovative Nuremberg company S+S Regeltechnik has been one of the German manufacturers who have been setting the pace in the development of sensor technology. For the fine adjustment of temperature and humidity sensors, S+S Regeltechnik uses two Memmert HPP models with a volume of 749 litres.

During the adjustment, the sensitive sensors must be subject to a defined and constant environment for several hours. Here, S+S set the constant climate chamber a challenging hurdle in terms of homogeneity and temperature stability: The temperature deviation over time and throughout the whole chamber may be no more than a maximum of  $\pm 0.2$  K and humidity fluctuation in time may only be a maximum of 1 %. Additionally, the HPP has the advantages that it only takes up little space and works in an energy-saving manner although it has a large interior.

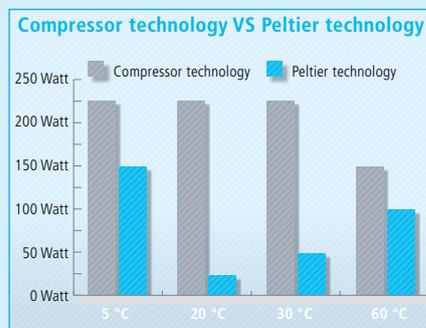


S+S REGELTECHNIK

### We know how: Saving energy

The subject of energy efficiency has long since reached industry. Energy-saving laboratory equipment cuts operating costs and is an integral aspect of environmental certification and management. However, in order to actually create exemplary energy savers, innovative ideas like using Peltier technology are required.

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. Therefore, very fine adjustments can be made to the heating or cooling functions.



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



## Customisation department as a “development assistant”

The Memmert customisation department regards itself as an extension of the customer’s construction or R & D department and 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 Memmert 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

## HUMIDITY CHAMBER HCP

56 | 107 | 156 | 241 litres

+18 °C to +90 °C

Humidity 20 to 95 % rh

Thanks to the excellent homogeneity of its temperature/humidity, the HCP is ideally suited for environmental simulation and lifetime tests. Active humidity control and heating on all six sides including heated inner glass door minimise vaporisation in the interior and thus the risk of condensed water dripping onto the test object. A host of convenience functions make work easier: battery-buffered Control-COCKPIT (option), process runtime starts with SetpointWAIT function only when the setpoint temperature is reached, alarm messages can be sent via e-mail or SMS (option), standard feed-through at the rear panel and much more.

### POSSIBLE APPLICATIONS

Climate-controlled storage of plastics, metal parts, coating, building materials, compound materials and electronic components for service life tests, conditioning, ageing etc.



## CLIMATE CHAMBER ICHeco

256 | 749 litres

-10 to +60 °C

Humidity 10 to 80 % rh

100% AtmoSAFE! The ICHeco is the environmentally-friendly future of compressor-cooled climate chambers foretold. It works with climate-neutral CO<sub>2</sub> (R744) as its refrigerant. Furthermore, it scores with its unique uniformity of temperature and humidity. Thermal transfer to the interior – heat and cold – is guaranteed through a large-area air jacket on four sides. Because this is hermetically sealed, the ICHeco consumes no more water once the setpoints have been reached, as long as the door is kept closed.

The ICHeco L model features an illumination unit with cold white light and UV radiation (standard illuminant D65). For building material and concrete testing, the ICH C model combines temperature, humidity and digital CO<sub>2</sub> control with automatic zero setting.

### POSSIBLE APPLICATIONS

Storage in a constant climate of plastics, metal parts, compound materials and electronic components for conditioning, ageing, corrosion tests

Test for photostability of plastics, metal parts, compound material

Building material testing, determination of the depth of carbonation in concrete

### Application ICH:

#### Testing control appliances in the climate chamber

The precision and reaction time with which sensors react to changes in ambient conditions is what makes the difference in a control appliance for building technology as well as in a temperature control chamber. For this reason, Stuhl Regelsysteme GmbH from Spalt in Bavaria is testing the functionality of its electronic control appliances for the fields heating, climate and ventilation in a Memmert climate chamber ICH.

Since nearly all its products contribute to maximising the energy efficiency of systems in building engineering, the exact and finely tuned interplay between sensors and electronics is the decisive quality feature of the appliances. The quality laboratory checks the characteristics of the sensors, measures the precision of the electronic control and subjects the appliances to regular stress tests, under defined temperature and humidity conditions.

The control appliances are subject to both constant temperature/humidity combinations and climate changes, whereby the test duration lies between a few hours and 14 days. The climate chamber ICH is connected to the company network via Ethernet and can be operated from any computer. The test specimens receive their signals through a cable feed-through. The signals are recorded on external calibrated measuring equipment along with the test parameters. At the same time, the chamber internal log of temperature and humidity is used for the plausibility test of the external measurement results. At Stuhl Regelsysteme, the many convenient functions that simplify and accelerate the test processes are highly appreciated in particular, along with the very good temperature/humidity distribution in the ICH.



## Application CTC: Climate testing of light-alloy wheels



The production of the Fuchsfelge® wheel for the legendary Porsche 911 is how Otto Fuchs KG became famous. Today, the product range includes different light-alloy wheels for several car makers' premium class, which is why Otto Fuchs KG places great importance on quality assurance. In a Memmert climatic test chamber, prototypes and pilot runs are tested for corrosion resistance.

Once a scratch mark is applied to the surface, it stays in a salt fog chamber under defined conditions for 24 hours for example and is afterwards put in a Memmert climatic test chamber CTC for 28 days for corrosion. The temperature-humidity combination varies according to the applied standard or manufacturer. However, usually 40 °C/82 % rh or 60 °C/82 % rh is used. Subsequently, the corrosion creep depth of the filiform corrosion is evaluated subsequently. Temperature may deviate by a maximum of  $\pm 1$  K over the entire test period. This is why Otto Fuchs especially appreciates the long-term stability and associated failure-free weekend operation of the climatic test chamber CTC along with the simple menu navigation.



## Application customisation department CTC: Climate testing of in vitro diagnostics



ikfe GmbH, the renowned institute for clinical research and development in Mainz, in particular tests in vitro diagnostics such as glucometers or insulin pumps in the customised Memmert climatic test chamber CTC in accordance with the applicable ISO standards.

The constant temperature/humidity parameters differ per stage and the test time is up to an hour. Responsibility and reproducibility of the test conditions are vital for the validity of the studies. Therefore, the climate chamber is validated prior to each test. In order not to exceed the maximum deviation in the interior (usually  $\pm 2$  K and  $\pm 5$  % rh) under any circumstances, ikfe performs tests with the help of chamber-independent sensors on the working surface. A viewing window and two entry ports were installed into the door. ikfe can now equip the climate chamber with gloves and operate the medical devices in the interior while the temperature/humidity conditions are constant. In order to reach physical limits such as an interior temperature of +12 °C and a relative humidity of less than 25 % and in order to restore them as quickly as possible after opening the door, the Memmert customisation department integrated one additional adjustable compressed air drying unit.



## CLIMATIC TEST CHAMBER CTC TEMPERATURE TEST CHAMBER TTC

256 litres | -42 °C to +190 °C  
Humidity 10 to 98 % rh

The climatic test chamber CTC and its equally accurate brother, the temperature test chamber TTC, were designed specifically for standards-compliant temperature and climate testing. Due to the high capacity reserves in both the warm and cold ranges, both appliances quickly reach the set temperature even with alternating climates. In heating operation, temperature change rate amounts to 10 K/min. In cooling operation from +180 to -40 °C temperature change rate is 3 K/min in accordance with IEC 60068-3-5. Thanks to the active humidity system, the set humidity levels are reached quickly and precisely with short recovery times.

### POSSIBLE APPLICATIONS

Storage in an alternating or constant climate of electrical appliances and components, varnish, coatings, compound materials, plastics and metal

Climate and temperature testing of electronic components and modules, plastics, textiles and compound materials

# Overview of possible applications

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

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
Burn-in of metal parts, varnish, contacts	Vacuum oven <b>VO</b> Universal oven <b>U</b>	+20 °C to +200 °C +30 °C to +300 °C
Hot air ageing of india rubber, rubber and elastomers	Universal oven <b>U</b>	+30 °C to +300 °C
Vulcanisation of india rubber	Universal oven <b>U</b>	+30 °C to +300 °C
Testing of leather through artificial ageing under dry heat	Universal oven <b>U</b> Temperature test chamber <b>TTC</b>	+30 °C to +300 °C -42 °C to +190 °C
Climate and temperature testing of electronic components and modules, plastics, textiles and compound materials	Climatic test chamber <b>CTC</b> Temperature test chamber <b>TTC</b> Climate chamber <b>ICHeco</b>	-42 °C to +190 °C, 10 to 98 % rh -42 °C to +190 °C -10 °C to +60 °C/ +10 °C to +60 °C, 10 to 80 % rh
Hardening of adhesive compounds, synthetic resin	Universal oven <b>U</b> Vacuum oven <b>VO</b>	+30 °C to +300 °C +20 °C to +200 °C
Burn-in tests/long term stress tests of electronic components, PCBs and devices	Universal oven <b>U</b>	+30 °C to +300 °C
Drying of electronic components	Vacuum oven <b>VO</b> Universal oven <b>U</b>	+20 °C to +200 °C +30 °C to +300 °C
Migration tests, heat resistance tests for paints and printing ink	Universal oven <b>U</b>	+30 °C to +300 °C
Drying of powders and granulates	Vacuum oven <b>VO</b>	+20 °C to +200 °C
Ageing of cables and wires at different air exchange rates	Universal oven <b>U</b>	+30 °C to +300 °C
Conditioning of plastics, metals and compound materials for further tests (e.g. determining water absorption, stability testing)	Universal oven <b>U</b> Climatic test chamber <b>CTC</b> Constant climate chamber <b>HPP</b>  Humidity chamber <b>HCP</b> Climate chamber <b>ICHeco</b>	+30 °C to +300 °C -42 °C to +190 °C, 10 to 98 % rh 0 °C to +70 °C, 10 to 90 % rh (HPP110 to HPP1060) +15 °C to +60 °C, 10 to 80 % rh (HPP1400) +18 °C to +90 °C, 20 to 95 % rh -10 °C to +60 °C/ +10 °C to +60 °C, 10 to 80 % rh
Drying of cleaned machine parts, membrane filters, including in production	Vacuum oven <b>VO</b> Universal oven <b>U</b>	+20 °C to +200 °C +30 °C to +300 °C
Degassing of thermoset plastics, synthetic resins, adhesive compounds	Vacuum oven <b>VO</b>	+20 °C to +200 °C
Long-term exposure to heat of hard metals to determine change in mass under the influence of humidity	Humidity chamber <b>HCP</b> Constant climate chamber <b>HPP</b>  Climatic test chamber <b>CTC</b>	+18 °C to +90 °C, 20 to 95 % rh 0 °C to +70 °C, 10 to 90 % rh (HPP110 to HPP1060) +15 °C to +60 °C, 10 to 80 % rh (HPP1400) -42 °C to +190 °C, 10 to 98 % rh
Storage of cleaned metal components under vacuum, prevention of oxidation	Vacuum oven <b>VO</b>	+20 °C to +200 °C
Long-term exposure to heat of plastics to determine dimensional stability and post-shrinkage, softening temperature testing of plastic	Universal oven <b>U</b>  Waterbath <b>WNB/WNE/WPE</b>	+30 °C to +300 °C  +30 °C to +95 °C + boiling stage (with cooling unit CDP115 from +10 °C)
High-temperature storage/alternating temperature tests of electronic components and modules for testing error mechanisms such as stress migration, the Kirkendall effect	Universal oven <b>U</b> Climatic test chamber <b>CTC</b>	+30 °C to +300 °C -42 °C to +190 °C, 10 to 98 % rh
Temperature/humidity storage of electronic components, varnish, coatings and compound materials for testing corrosion behaviour and stability	Climatic test chamber <b>CTC</b> Constant climate chamber <b>HPP</b>  Humidity chamber <b>HCP</b> Climate chamber <b>ICHeco</b>	-42 °C to +190 °C, 10 to 98 % rh +5 °C to +70 °C, 10 to 90 % rh (HPP110 to HPP1060) +15 °C to +60 °C, 0 to 80 % rh (HPP1400) +18 °C to +90 °C, 20 to 95 % rh -10 °C to +60 °C/ +10 °C to +60 °C, 10 to 80 % rh
Climate-controlled storage of electrical equipment for the calibration and testing of functionality	Climatic test chamber <b>CTC</b> Constant climate chamber <b>HPP</b>  Humidity chamber <b>HCP</b> Climate chamber <b>ICHeco</b>	-42 °C to +190 °C, 10 to 98 % rh +5 °C to +70 °C, 10 to 90 % rh (HPP110 to HPP1060) +15 °C to +60 °C, 10 to 80 % rh (HPP1400) +18 °C to +90 °C, 20 to 95 % rh -10 °C to +60 °C/ +10 °C to +60 °C, 10 to 80 % rh
Testing of plastics for UV resistance	Climate chamber <b>ICHeco L</b>	+10 °C to +60 °C, 10 to 80 % rh daylight: light colour 865, UV-light 320 to 400 nm, comply with standard illuminant D65
Accelerated testing of electronic components	Humidity chamber <b>HCP</b>	+18 °C to +90 °C, 20 to 95 % rh