memmert

Vacuum Oven VO

Gentle Drying for Your Applications

2024

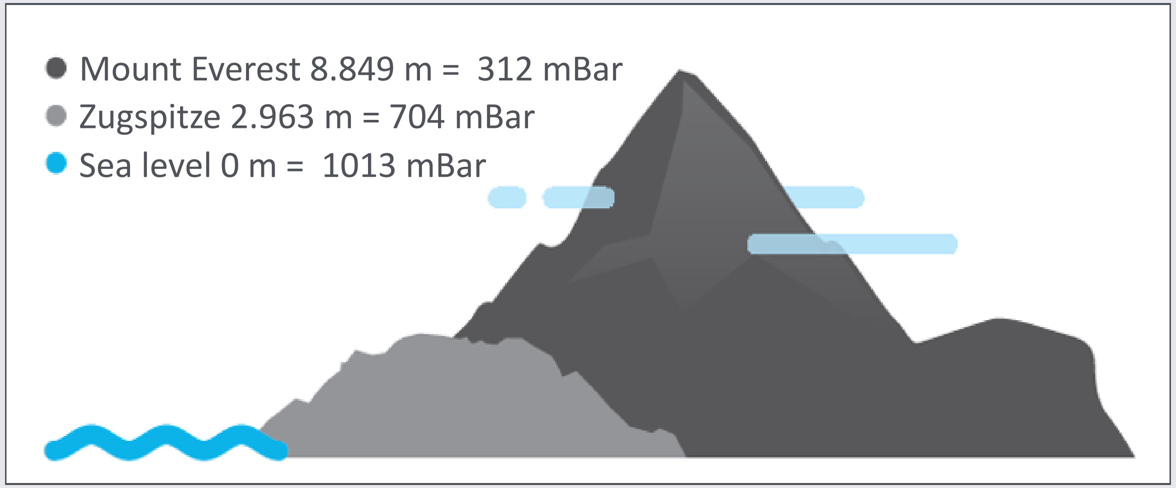
VO | Agenda

VO | Vacuum Concept

Tenzing Norgay (left) and Sir Edmund Hillary (right) after the successful first ascent of Mount Everest in 1953.

VO | Vacuum Concept

- Temperature of protein coagulation 82 ˚C
- Temperature of yolk solidification 77˚C



Dependence of the boiling point on the water pressure:

Pressure (mBar)	**Water boiling point** (˚C)
312	72,8
704	90,4
1013	100

VO | Vacuum Concept

- Reducing the pressure lowers the boiling point of the water
  → Water can already vaporize at temperatures below 100 °C
- Drying processes at low temperatures
- Gentle on the load

vapor pressure table of water

Torr	mbar	°C
3.008	4.009	-5
4.579	6.10	0
6.543	8.72	5
9.209	12.27	10
12.788	17.05	15
17.535	23.37	20
23.756	31.66	25
31.824	42.42	30
42.175	56.21	35
55.324	73.74	40
71.880	95.81	45
92.510	157.3	50

At a pressure of approx. 50 mbar the boiling point of water is approx. 33 °C.

VO | Agenda

01 Vacuum Concept

02 How does a vacuum oven work?

03 Applications

04 Why choose Memmert vacuum ovens?

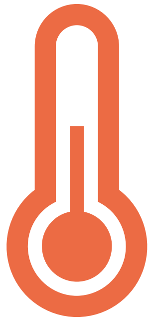
05 USP

VO | How does a vacuum oven work?

Vacuum drying ovens work on the basis of two simple principles: Vacuum and heat.

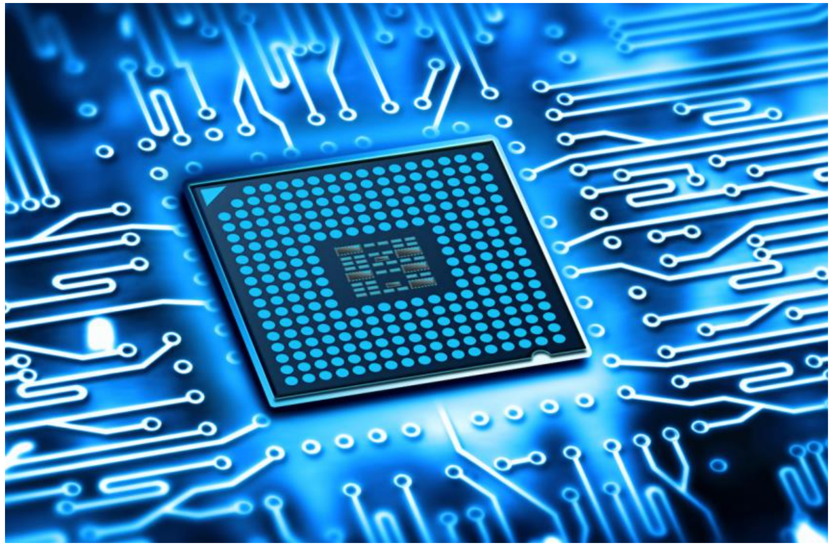
1. 1. Generation of the vacuum:

2. Heating up:



Dehumidification:

Applications in the electronic, food, pharmaceutical and medical industries



VO | Application in the food industry

Drying powders for quality testing

Challenge:

- Proteins and other organic substances are damaged at high temperatures
- Equipment material has a high moisture content

Requirements:

- Gentle and controlled drying at low temperatures
- Efficient drying process

VO | Applications in the electronic industry

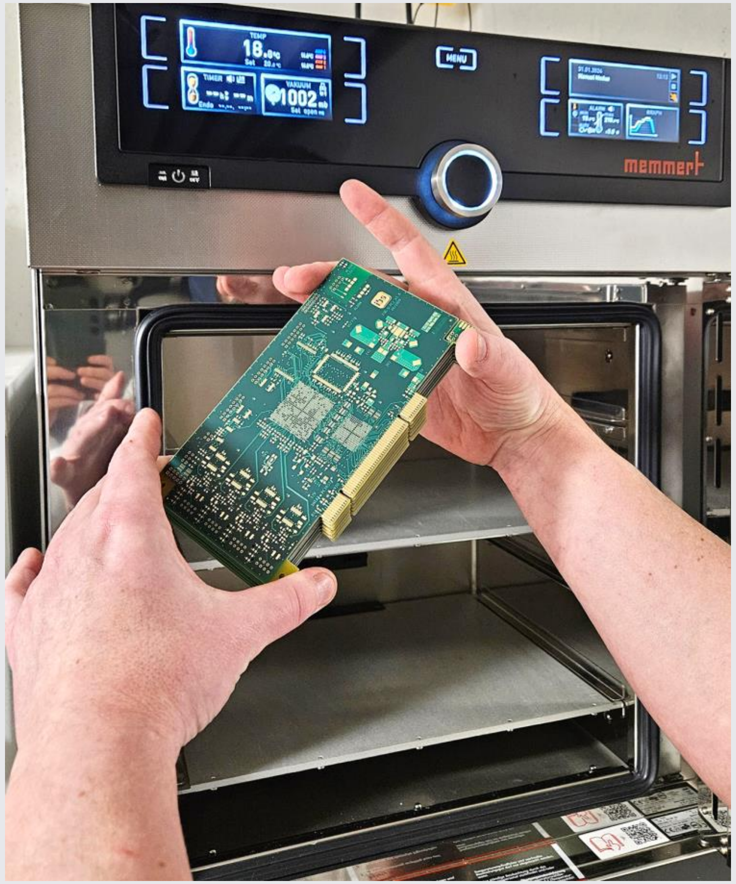
Drying and storage of electronic components

Challenge:

- Some electronic components tend to absorb and store moisture during storage and cleaning, which leads to damage, e.g. delamination during subsequent processes with high temperatures
- High temperatures lead to ageing or destruction of heat-sensitive surfaces

Requirements:

- Gentle and controlled drying at low temperatures
- Efficient drying process
- Prevention of oxidation



VO | Applications in the electronic industry

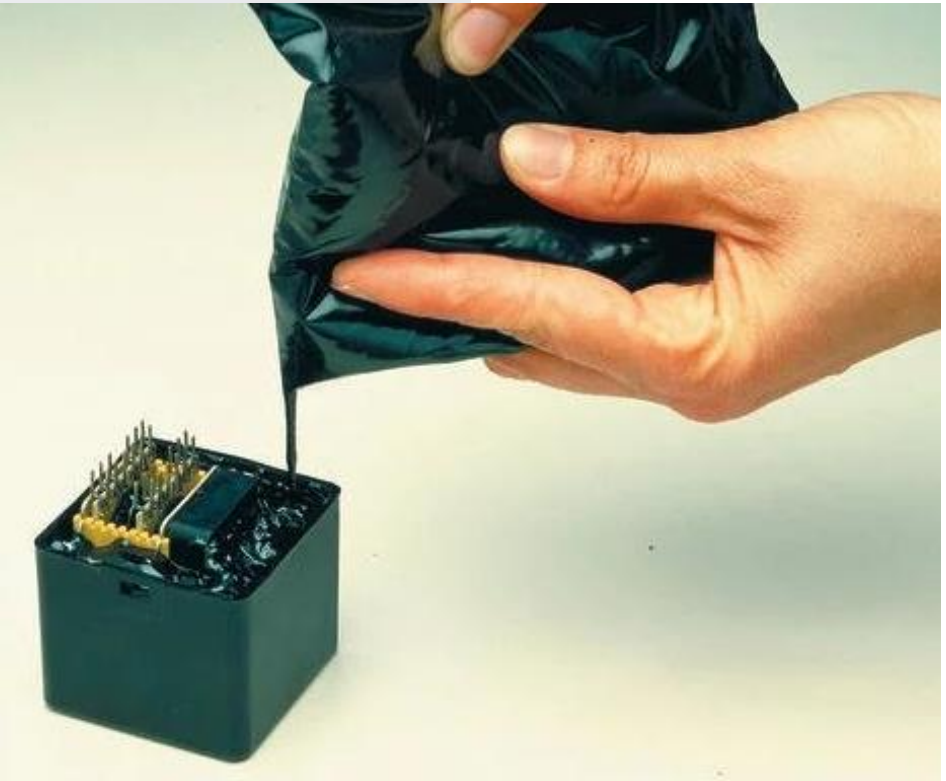
Removal of gas inclusions and drying of the potting compound

Challenge:

- Pore formation due to air pockets during the drying process of potting compounds could lead to stresses and cracks and reduce the required properties

Requirements:

- Gentle and controlled drying at low temperatures
- Efficient drying process
- Degassing at the required vacuum level



VO | Applications in the medical industry

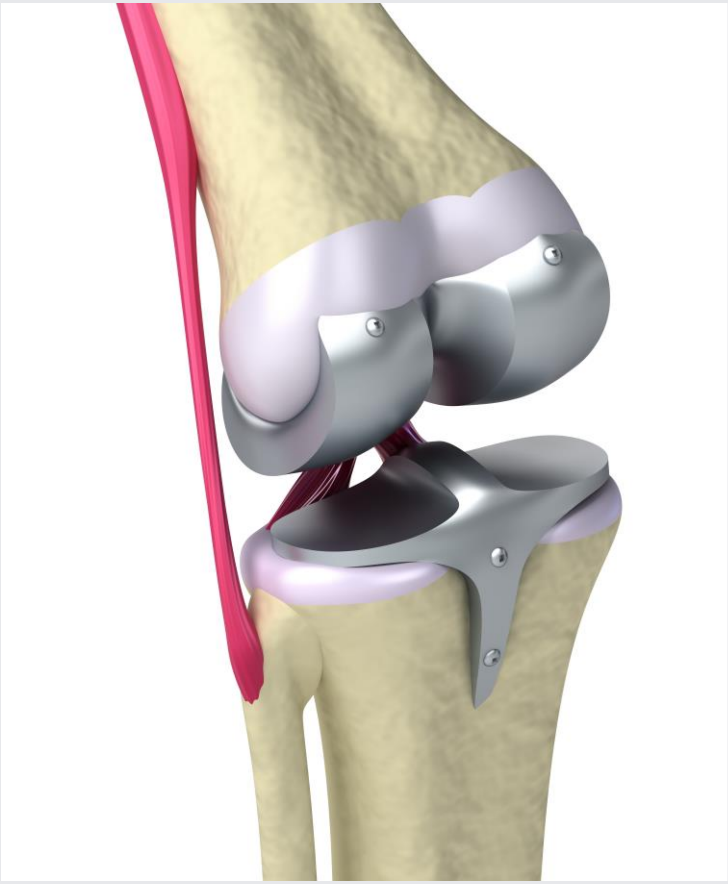
Drying titanium powder

Challenges

- Titanium powder binds enormous amounts of moisture
- High oxidation potential in combination with oxygen
- High demand for dehumidification performance sometimes requires the use of other gases as a drying medium

Requirements

- Efficient drying process
- Possibility of connecting gas cylinders



VO | Applications in the pharmaceutical industry

Drying pharmaceutical powders

The challenge:

- Materials and substances are easily oxidized
- Some powders are damaged at high temperatures
- Process is subject to the strictest FDA safety regulations

Requirements:

- Gentle and controlled drying at low temperatures
- Precise temperature control and calibration
- Data logging according to FDA standards

VO | Applications for VO with cooling

VO49cool

Applications:

- Vacuum drying of bacteria and starter cultures under cooling conditions
- Simulation of storage and transport scenarios

Requirements:

- Creating a vacuum under cooling conditions

VO | Requirements for drying in vacuum ovens:

- Gentle and controlled drying at low temperatures
- Efficient drying process
- Prevention of oxidation
- Degassing at the required vacuum level
- Possibility of connecting gas cylinders
- Precise temperature control and calibration
- Data logging in accordance with FDA standards

Why is Memmert vacuum oven the best solution?

VO | Controller

Display of the thermoshelves used

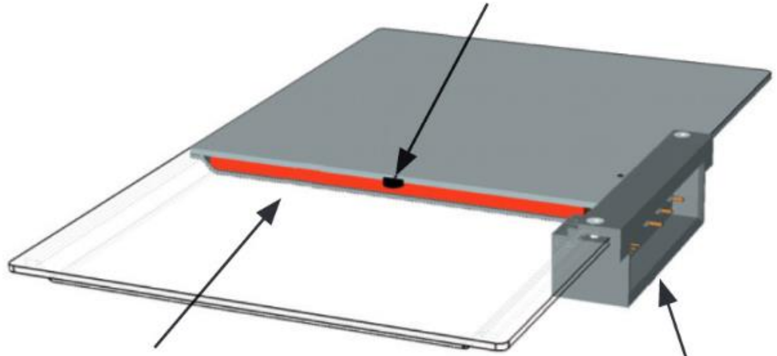
Indicator for available but unused thermoshelf contact

Actual temperature value of the lowest thermoshelf

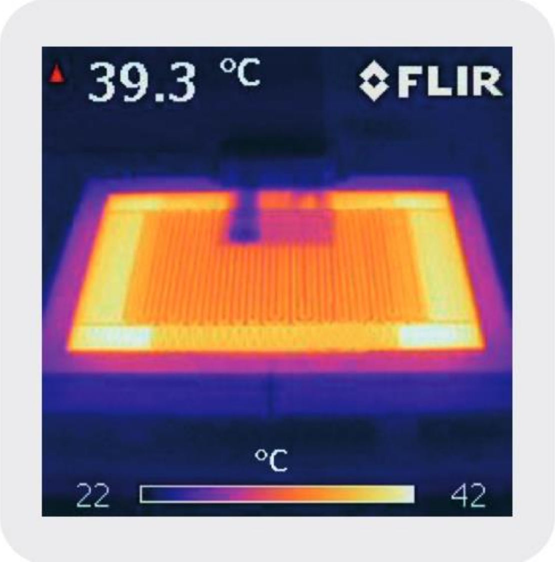
Setting temperature for all thermoshelves

VO | Heating System

- Short heat-up and process times
- Intelligent direct heating
- Precise temperature control and calibratability thanks to a temperature sensor for each thermoshelf
- Automatic, individual heat output adjustment for each thermoshelf



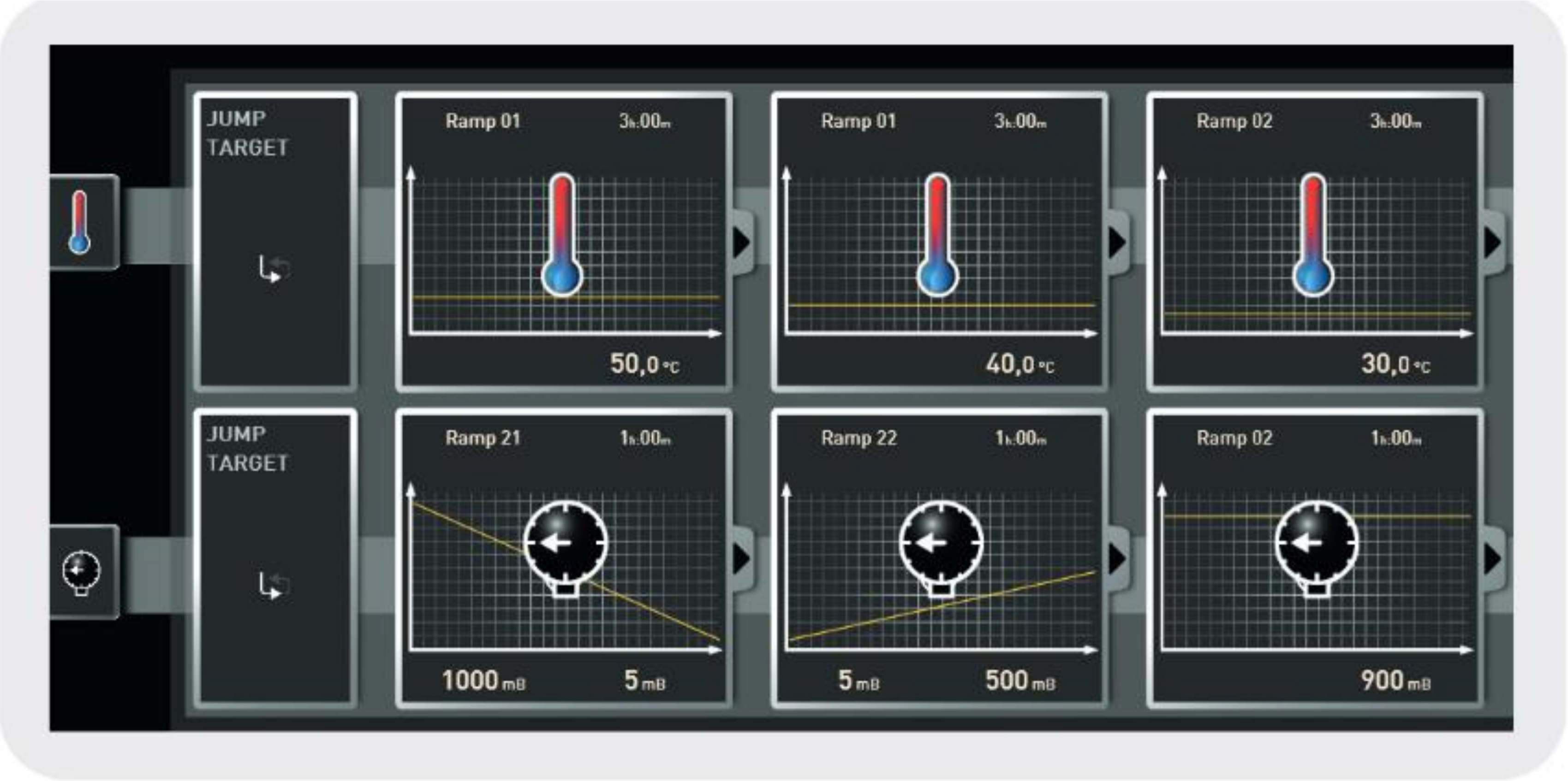
Multi-level sensing & heating



Temperature	Deviation [+/- K]		
	VO29	VO49	VO101
50 °C	+/-0.7	+/-0.7	+/-0.7
100 °C	+/-1.5	+/-1.0	+/-1.3
150 °C	+/-2.0	+/-1.5	+/-2.0
200 °C	+/-2.5	+/-2.0	+/-2.5

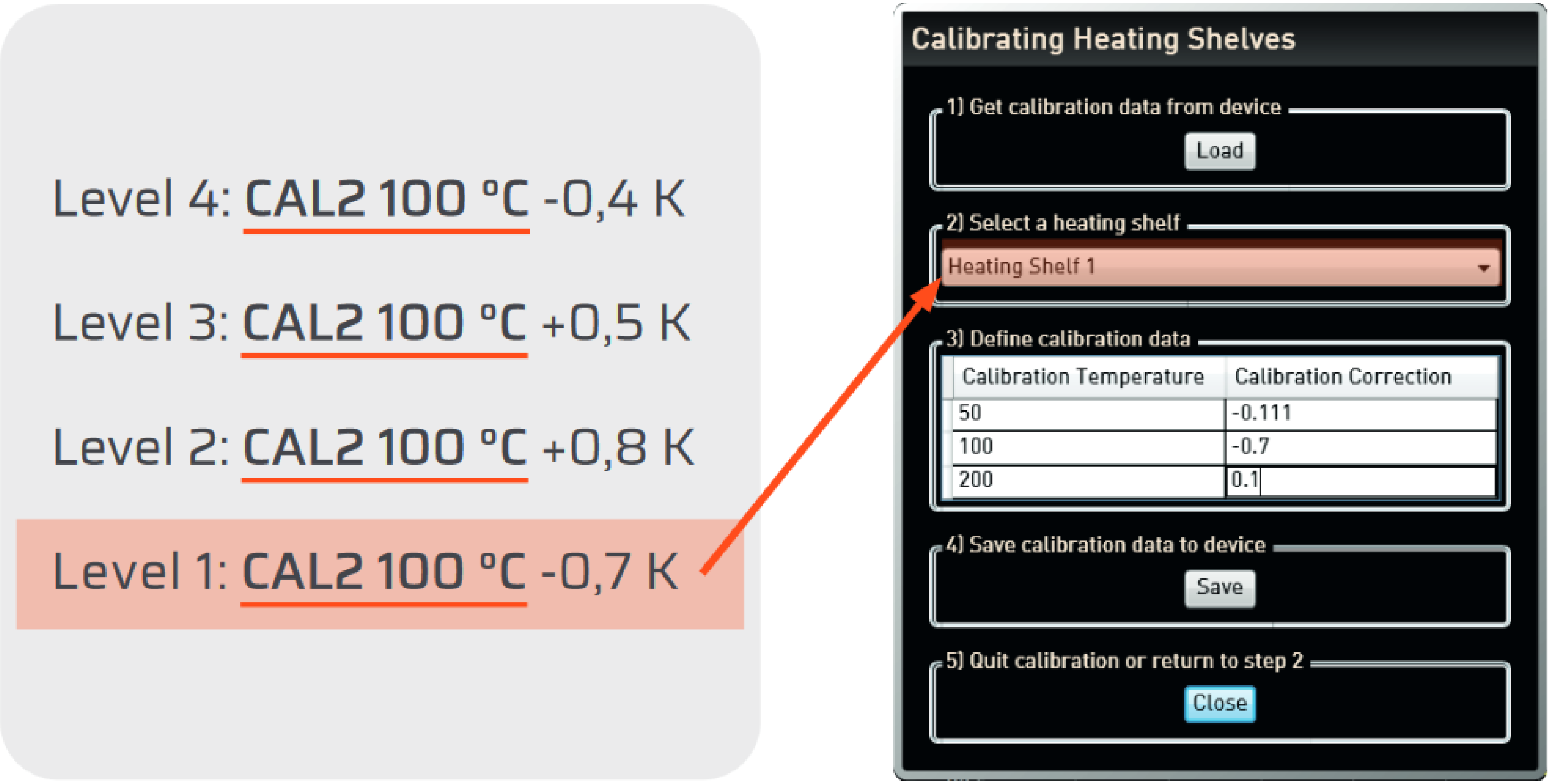
VO |Software AtmoCONTROL

- Intuitive programming of different temperature and vacuum setpoints
- Display of all logged set and actual values
- Archiving of ramps and programsequences
- Log data can be converted to Excel / PDF/A/Test File/CSV as a graphical representation

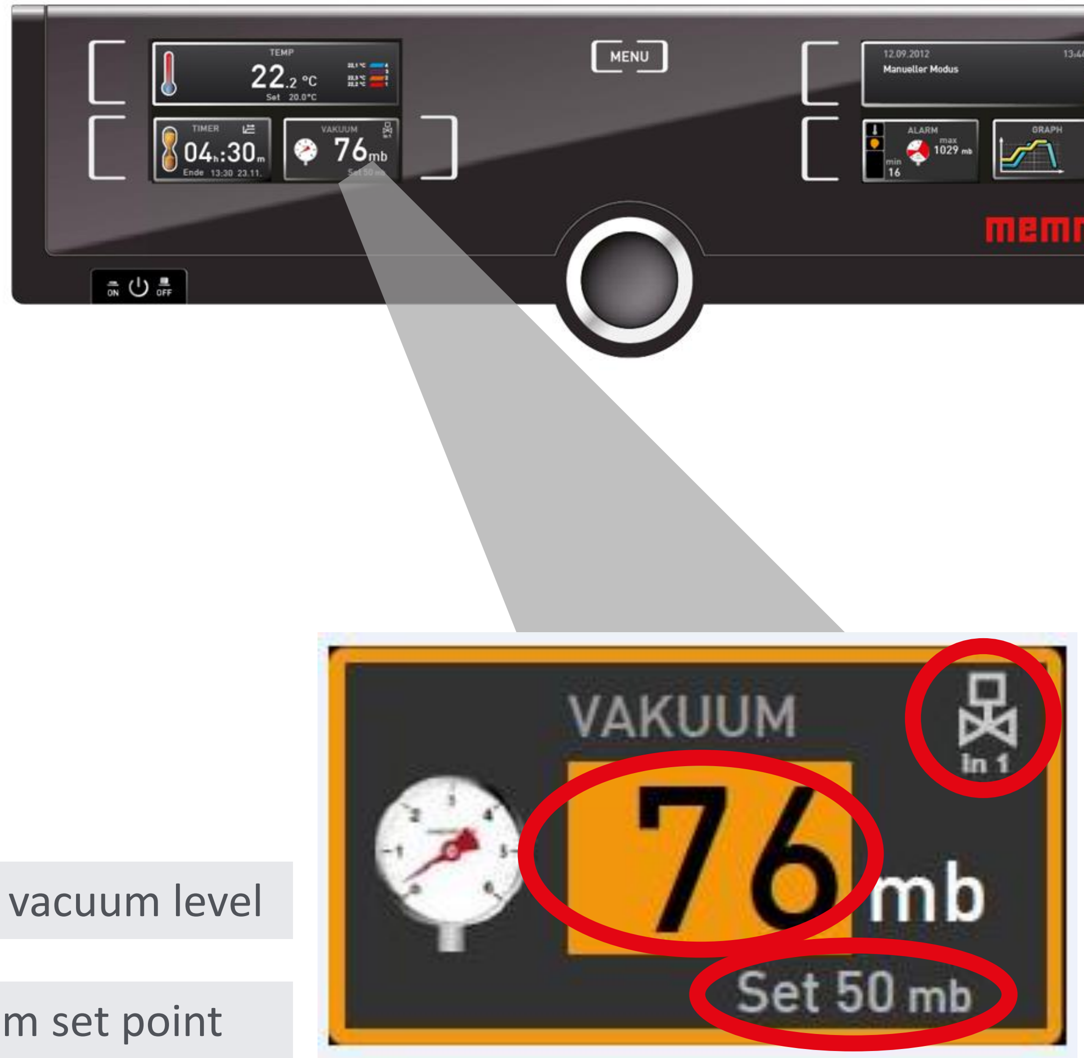


VO | Software AtmoCONTROL. Calibration

- Individual calibration by controller or software



VO | Vacuum - Controller



Actual vacuum level

Vacuum set point

Gas inlet:
IN1 - fresh air (normal)

Optional (T5):
IN2 - inert gas (premium module VO 29/ 49 / 101)

No symbol - contact not open

VO | Vacuum. PM and PMP

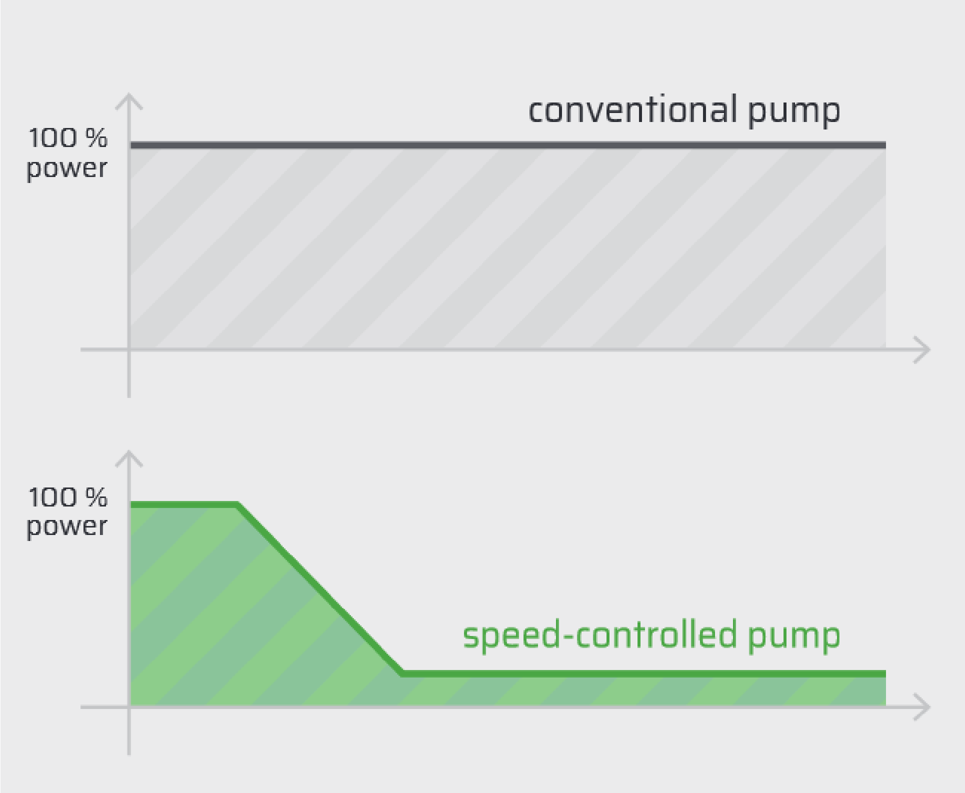
- Noise-insulating pump module
- Signal cable B39410 and vacuum connection hose B04026 included

PMP29 PMP49 PMP101

VO | Vacuum Pump

- Low-noise, speed-controlled vacuum pump is automatically recognized by each VO
- High-precision control to setpoint
- Chemically resistant diaphragms

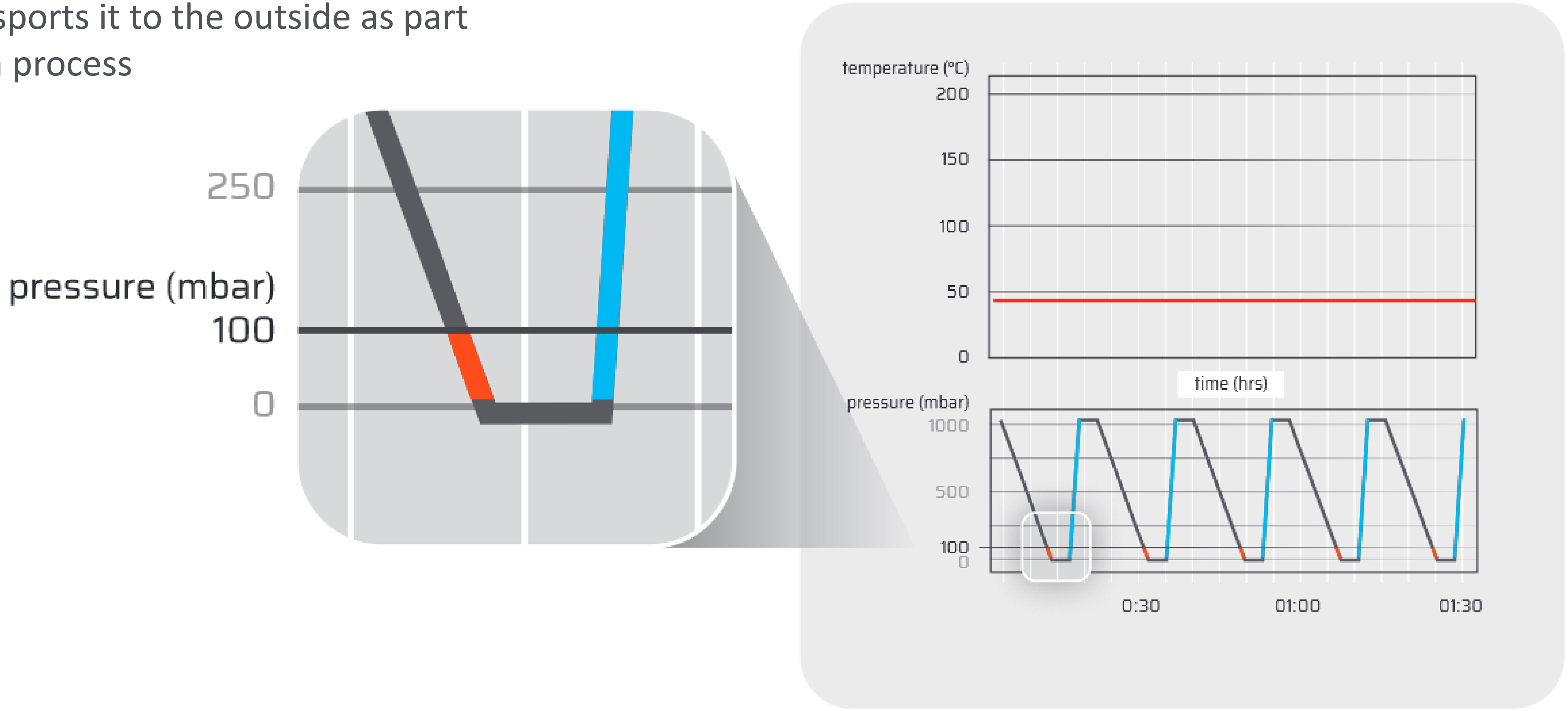
- 70% energy savings compared to conventional vacuum pumps in ramp mode



VO | Vacuum Cycles

Turbo drying:
Digitally controlled vacuum cycles

- The incoming dry air absorbs the moisture and then transports it to the outside as part of the vacuum process



VO | Premium module T5. Inert gas

Premium module T5

- Comprises the inert gas inlet (for all sizes)

Fresh air (IN1)

- Precise vacuum controlling by opening and closing solenoid valves

Inert gas (IN2)

- Protective atmosphere to prevent undesired chemical reactions as oxidation memmert

VO | Premium module T5. Thermoshelves

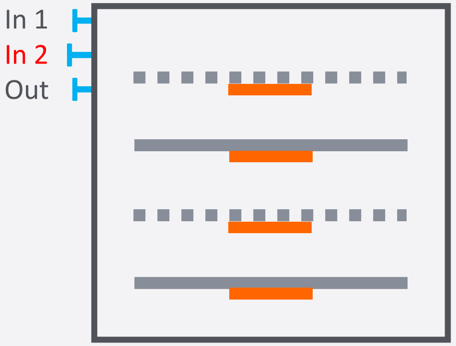
Premium module T5

- Additional connections for thermoshelves

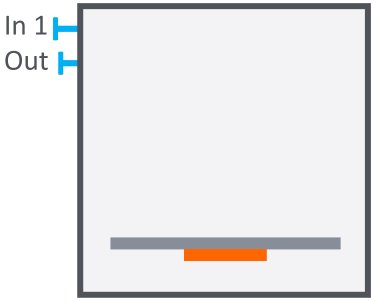
  1 (size 29)
  2 (size 49/101)

- One additional thermoshelf (size 49/101)
- **Subsequent changes are not possible!**

VO49/VO101 Standard



VO49/VO101 Premium



VO29 Standard

VO29 Premium

VO29T5

VO49T5

VO101T5

VO | Product specifications

Volume (l)	29	49	101
Max. Load per appliance (kg)	40	60	60
Max. Load per thermoshelf (kg) (aluminum / stainless steel)		20	
Working temperature range (°C)		at least 5 above ambient temperature up to +200	
Adjustment temperature range (°C)		+20 to +200	
Vacuum setting range (mbar)		5 to 1100 mbar	

VO | Agenda

VO | USP

Powerful. Efficient. Effective.

Intelligent direct heating with calibration function.

Short process times thanks to digitally controlled vacuum cycles.

Enormous energy savings due to infinitely variable vacuum pump

Longer service life of the pump diaphragm