

Gorenje gospodinjski aparati and Kambič

Kambič – Equipment for Precise Environmental Testing

Kambič is a family-owned company with over 40 years of tradition in the development, production, assembly, and testing of sophisticated laboratory and process equipment.

Our products, solutions, and services are present in all industrial sectors that rely on applications with precise control of temperature, relative humidity, pressure, vacuum, or gas concentrations (N₂, O₂).

Our team of specialized development engineers, test engineers, and skilled assemblers enthusiastically tackle new challenges and the evolving demands of the market, primarily in the field of test equipment and demanding process applications.

The team is complemented by over 50 external partners and representatives in more than 40 countries worldwide

PARTNERSHIP FOR ADVANCED VALIDATION AND DEVELOPMENT

Gorenje, headquartered in Velenje, is one of Europe's leading manufacturers of home appliances, with a **long-standing tradition of innovation and high-quality production**. The company employs more than 3,000 people and serves as the central development and production hub of Hisense Europe, further strengthening its role in the global market for **modern, energy-efficient appliances**.

The first **Kambič climate chambers** were delivered to **Gorenje** in **2016**, following earlier collaborations on other projects. Today, they operate seven units that play a key role in **product development, validation, and quality assurance**. With their support, Gorenje verifies **the reliability, robustness, and compliance of its products** with market demands and international standards.

ENVIRONMENTAL TESTING AS SUPPORT FOR ELECTRONICS DEVELOPMENT

Kambič chambers are used for testing and validation in the development of electronics for household appliances in the following areas:

- **Cooking and baking**
- **Refrigerators and freezers**
- **Washing and drying of laundry**
- **Food preparation**

Reliability and long service life of electronics play a key role in market competitiveness. Electronic components in household appliances are exposed to various **environmental influences**—such as humidity, heat, and cyclic loads—therefore, proper testing is essential already in the development phase and before the start of serial production.

For this purpose, Gorenje applies advanced accelerated testing methods for lifetime and reliability, such as **ALT** (Accelerated Life Testing) and **HALT** (Highly Accelerated Life Testing).



ACCELERATED TESTING WITH ALT AND HALT METHODOLOGIES

In component validation, Gorenje applies accelerated testing methods such as **ALT** (Accelerated Life Testing) and **HALT** (Highly Accelerated Life Testing).

ALT enables the simulation of long-term product use in a shorter time by exposing components to increased mechanical, thermal, and environmental stresses. This approach allows early detection of potential weaknesses and shortens the required testing time.

HALT goes beyond classical validation approaches: by gradually increasing the intensity of thermal, mechanical, or vibration stresses, the robustness of components and their operating limits are determined. The purpose of HALT testing is not only to verify whether a component functions, but also to identify where and how it fails.

For these tests, Gorenje uses Kambič climate chambers with capacities ranging from **190 to 1000 litres**, **temperature ranges from -40 °C to +180 °C**, and **relative humidity control from 10% to 98%**. All chambers are equipped with powerful cooling and heating systems that enable temperature change rates of 5 K/min, in accordance with IEC 60068-3-5 (Environmental testing – Supporting documentation and guidance – Confirmation of the performance of temperature chambers).

This configuration makes it possible to perform demanding accelerated tests, including **highly dynamic temperature variations** required by modern robust validation methods.



PARTNERSHIP FOR ELECTRONICS DEVELOPMENT

Kambič provides Gorenje with **reliable testing equipment, fast response, and in-depth technical support**. In the laboratories, the chambers are in **constant use**, often running **intensive test cycles**, which means significant mechanical and thermal stress not only for the tested products but also for the **equipment itself**. Within this collaboration, we jointly identified **several improvement points** that enhanced the robustness of the chambers and **optimized their performance** to meet the needs of **development processes**.

Such cooperation is based on **open communication, flexibility, and trust**, enabling a **long-term partnership**.

TRUST, EXPERTISE, AND RELIABILITY

The collaboration between Gorenje and Kambič demonstrates how a manufacturer of complex household appliances and a developer of specialized testing equipment can jointly achieve a high level of quality and reliability. They are connected by technical excellence, mutual trust, and a shared commitment to development.

The outcome of this partnership is not only customized technical solutions but also a stable and efficient testing environment—an essential factor in the development of modern, energy-efficient, and reliable household appliances.