LAUDA

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APPLICATION NOTE

PROVEN QUALITY MEETS MODERN TECHNOLOGY

Upgrade to LAUDA Universa MAX impresses with outstanding temperature stability and homogeneity

JUMO, the leading provider of industrial sensor and automation solutions, has relied on LAUDA calibration thermostats for over 30 years. Now, an innovative combination of a proven legacy unit and the new Universa MAX control head demonstrates how decades of quality can be combined with state-of-the-art electronics—not only saving costs but also delivering measurable technical improvements.

Customer profile – Precision since 1948
JUMO GmbH & Co. KG is a leading international provider of industrial sensor and automation technology systems and solutions. As a third-generation family-run company headquartered in Fulda, JUMO currently employs over 2,100 people worldwide. Its extensive product range includes components, systems, and solutions for measuring, controlling, recording, analyzing, and monitoring physical and chemical parameters.

At its Fulda location, JUMO operates a state-of-the-art calibration laboratory that has been officially recognized by DAkkS (German Accreditation Body) in accordance with DIN EN ISO/IEC 17025 since 1992. For oil-bath measurement procedures in the temperature range from 90 to 300 °C—accredited with a measurement uncertainty of just 0.015 K—JUMO has relied on LAUDA calibration thermostats for decades. The laboratory houses devices from numerous LAUDA generations dating back to the 1980s.

The starting point –
When proven technology reaches its electronic limits
Among other things, JUMO operates two UB 40 J calibration thermostats from the Ultra series, which were purchased in the 1990s and have been performing reliably ever since. However, the built-in electronics are reaching their age-related limits: electronic components are no longer available, and repairs are becoming difficult or impossible.

After decades of operation, JUMO therefore faced a fundamental decision: purchase new equipment (with time-consuming revalidation of the entire system), continue operating the existing units (with a high risk of failure due to outdated, irreparable electronics), or seek an alternative solution and modernize the existing, proven hardware. Together with LAUDA, the company decided to carry out the modernization jointly.

The previous Ultra bath thermostats were used for calibrating temperature sensors in a temperature range of 80 to 180 °C and 180 to 300 °C, both with a temperature stability of ±0.006 K. To maintain DAkkS accreditation and meet the demands of this challenging application, the modernization must enable identical temperature ranges and ensure a temperature stability of at least 0.015 K.

The LAUDA solution – Universa MAX Retrofit:
New electronics for proven mechanics
In the UB 40 J, the control unit is housed in a separate enclosure, distinct from the thermostatic bath. The heating element consists of a welded bath tank 450 mm deep, a cooling coil, and a cylindrical calibration insert. The bath bridge is bolted to the bath tank and supports both the cooling coil and the cylindrical insert. Inspired by the new, modular Universa line of bath circulation thermostats, the idea arose to retain the mechanically high-quality, wear-free design of the Ultra heating unit and replace only the control

Figure 1:
Cylinder of the bath lower section with new bath bridge and installed cooling coil

head with the electronics. This would allow existing quality to be combined with powerful, future-proof electronics.

The MAX variant of the LAUDA Universa product line was selected as the control head, as it meets all requirements for performance, precision, and temperature range. To connect it to the proven bath base unit, several design adjustments were necessary:

- **New bath cover** adapted to accommodate the Universa MAX control head
- **Cooling coil connections** split and positioned at the rear corners of the bath bridge
- **Connector** for the corrugated hose from the cylindrical calibration insert to the pump outlet of the Universa MAX head
- **Cooling coil** with M16x1 thread
- **Mounting bolts** for mounting the MAX control head

Validation and field testing

The combination of the UB 40 J and the MAX control head was tested at both LAUDA and JUMO.

At LAUDA, temperature stability and homogeneity were determined according to accredited standards at nine measurement points in the cylindrical calibration insert (two measurement levels, each with four measurement points, plus one central measurement point). Water at 50 °C was used as the temperature control fluid, and the pump stage was set to eight (maximum). The result: Both temperature stability and radial and vertical homogeneity achieved values significantly better than 0.01 K.

JUMO conducted extensive comparative measurements using silicone oil at an immersion depth of 220 mm over a period of two hours. In these tests, a temperature deviation of 0.003 K and a radial homogeneity of 0.0034 K were achieved. **Both values represent a significant improvement over the original thermostat.**

Figure 2:
Bath bridge with Universa MAX pump control unit installed

Figure 3:
Universa MAX connected to the UB 40 J base and split cooling coil connections

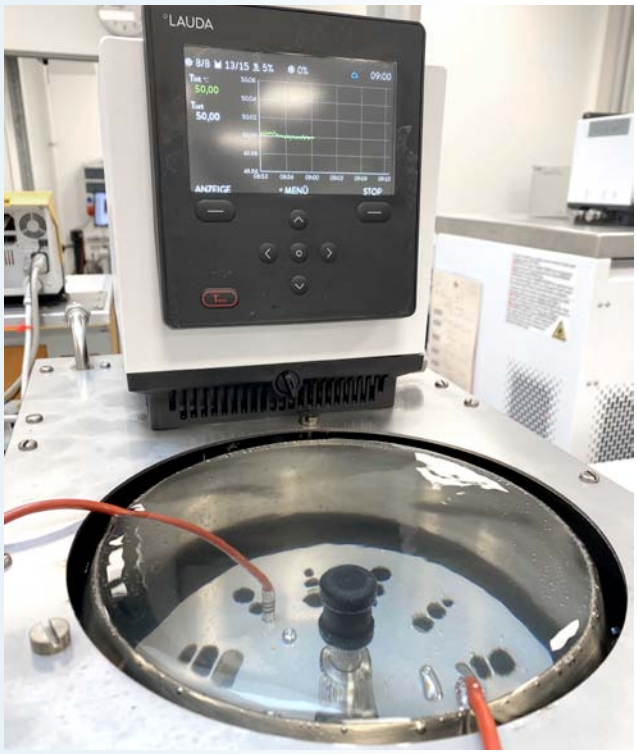

Figure 4:
Test setup in the LAUDA test laboratory

Figure 5:
Test setup at JUMO

Conclusion –
Measurable improvements and conservation of resources
The implementation of the MAX retrofit solution delivers concrete, measurable benefits on multiple levels: technical, economic, and environmental.

The new Universa MAX pump control unit enables a significant improvement in temperature stability and temperature homogeneity and even exceeds DAkkS requirements – precise calibrations with lower measurement uncertainty and reproducible measurement results.

In addition to the economic benefits, reusing the bath base conserves valuable resources. The upgrade extends the product's service life, which has a positive impact on the CO_2 footprint. The modular design serves as a model approach for sustainable laboratory technology.

The long-standing partnership between LAUDA and JUMO – spanning over three decades and several generations of equipment – is an outstanding example of mutual trust and joint innovation, fully in line with LAUDA's corporate philosophy: ›Empowering Excellence. For a better future.‹

Customer testimonial
»The idea of modernizing our 30-year-old calibration thermostat with new electronics was ideal. The new Universa MAX pump control unit is significantly more stable than the previous control head.

All of our requirements were met exactly. The quality corresponds exactly to the LAUDA quality we have known and valued for years. The measurable improvements are particularly impressive:

Stability has improved by a factor of 3, and the radial distribution has been virtually halved. This allows us to perform our calibrations even more precisely.«

Rodrigue Scholz,
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