

Chemical syntheses and crystallisations at temperatures down to -90°C .

Perfect conditions with the new LAUDA Integral XT process thermostats

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Advancements in catalyst technology have revolutionised synthesis processes in the chemical and pharmaceutical industries. Many reactions or crystallisations in fine chemistry now take place at relatively low temperatures. This also applies to the production scale. The decisive advantage here is in the high selectivity of the resulting reaction products. At low temperatures, there is a significantly lower occurrence of by-products – which increases the yield of pure substance. By selecting the appropriate temperature range, it is possible to considerably optimise the quality and quantity of the syntheses relative to conventional processes.

The cost savings and efficiency of the low temperature processes are striking. Modern process technology even allows

complex syntheses of particularly temperature-sensitive products in exo- or endo-thermic reaction stages. The precondition for this is dynamic tempering. Set target temperatures must be observed precisely throughout the entire reaction, in order to protect the product. In the crystallisation of pure substances, for example, precisely specified cooling rates ensure maximum product yield and high quality (Figure 1).

THE PERFECT THERMOSTAT CONCEPT: LAUDA INTEGRAL XT 1590 W

The quality of the thermostat is of decisive importance for sophisticated chemical procedure processes. As a pioneer in temperature control, LAUDA has been developing high performance

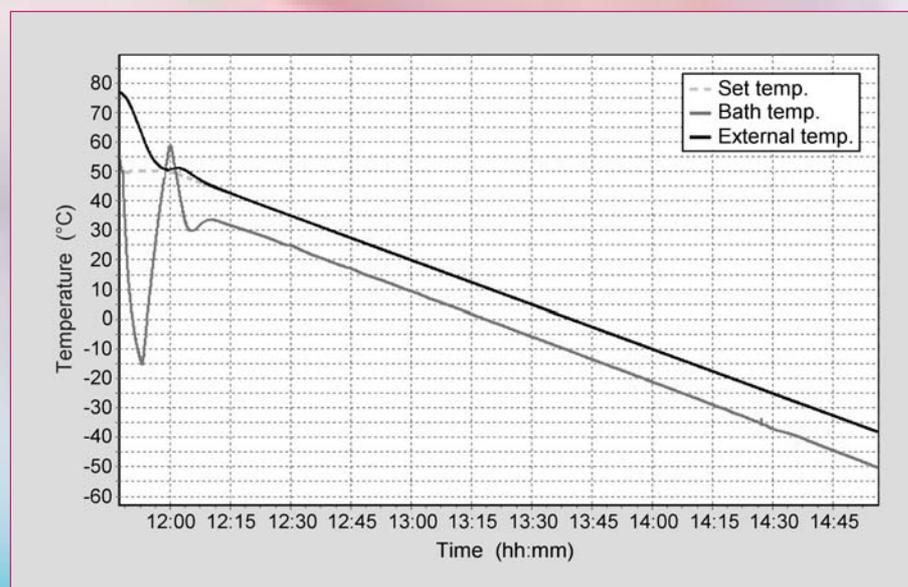


Figure 1 – Constant cooling with the LAUDA Integral XT 1590 W: the prescribed gradient of $0.5\text{ }^{\circ}\text{C}/\text{min}$ is adhered precisely over a period of three hours – Ideal conditions for sensitive crystallisations

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Figure 2 – LAUDA Integral XT 1590 W process thermostat with 20-litre triple clad glass reactor. For demanding applications down to -90°C

equipment for the broadest range of application areas for a number of years. For particularly high requirements in the low temperature range to -90°C, LAUDA offers the new Integral XT 1590 W model type (Figure 2). Even at temperatures of -60°C, the water-cooled thermostat has a cooling capacity of 3.7 kW and correspondingly high reserves. In the upper temperature range, the thermostat extends up to 200°C. For users with lower power requirements, a smaller model will soon be available in the -90°C class: the water-cooled XT 490 W thermostat, with a cooling capacity of approx. 4 kW (at 20°C).

In addition to the powerful cooling and heating capacity, other characteristic features also make the Integral XT process thermostats stand out. These include the excellent thermal control action based on a self-adaptation. The adaptive control independently detects the optimum control parameters for the application during the automatic process of a test programme. Other advantages are easy integration into existing networks and control / data management systems (LIMS), and particularly convenient operation. The safety technology of the Integral XT series is also exemplary, providing optimum protection for the operating personnel and precisely monitoring the temperature control process.

RAPID TEMPERATURE COMPENSATION IN EXO- AND ENDO-THERMIC REACTIONS

In order to produce high quality reaction

products, the process must be reliably controlled by thermostats in an external reactor – this also particularly applies for intense exo- and endo-thermic reactions. However, high reserve capacities are only one important aspect of the process technology. The other, equally relevant factor is long-term reliability – particularly for routine applications in the low temperature range. Only with constant working conditions is it possible to reproduce process simulations and subsequent syntheses and to draw reliable conclusions for scaling-up

Furthermore, this results in the availability of more power at higher temperatures.

The corresponding temperature processes for the adjustment action with defined temperature jumps also illustrate the capacity of the process thermostat (Figures 4 and 5).

ADVANCEMENT IN PERFORMANCE AND SAFETY

LAUDA Integral XT thermostats convince users with their excellent technical performance. This applies particularly with respect to process reliability and monitoring. Numerous additional functions ensure the success of the tempering process. The SelfCheck assistant automatically detects faults and shows them on the display. In addition to important basic functions such as

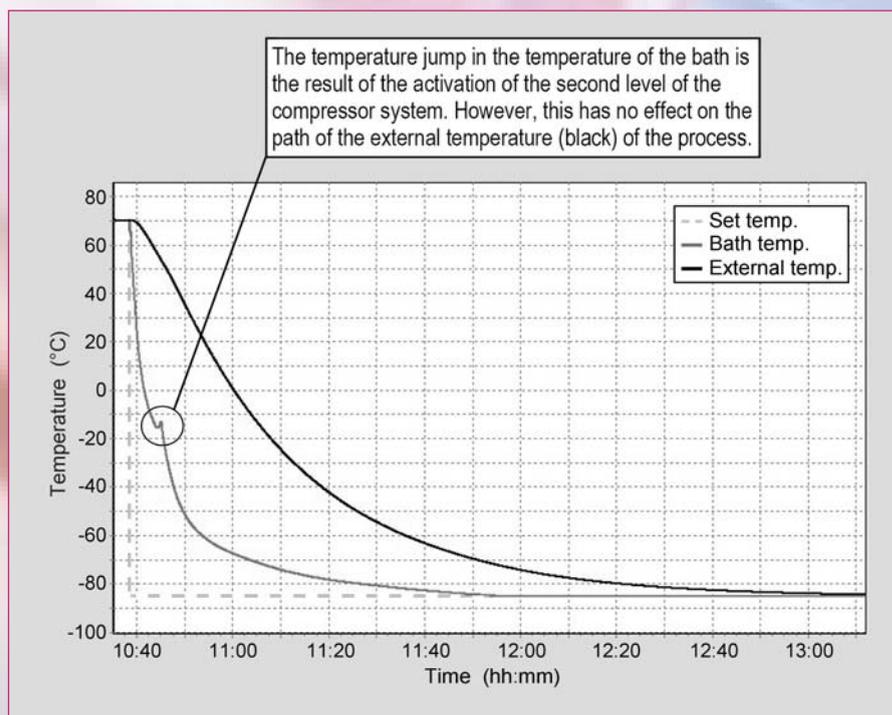


Figure 3 – Cooling curve of the LAUDA Integral XT 1590 W with a nominal value temperature jump from 70 to -85°C

to the production scale.

At LAUDA, efficiency is defined in many ways and it includes a number of aspects: for example, the robust and precise controlled refrigerating machine with a two-stage compressor system – the heart of the XT 1590 W. The technical distinguishing feature of the system is that the first level of the cascade not only serves the purpose of cooling the second, it is also used for process refrigeration. Thus, cooling starts not merely after the activation of the second level but rather immediately, which produces rapid cooling (Figure 3).

protection against overtemperature, pump overload, low levels and excess levels, the process thermostats also have a flow control system. This is important in order to prevent freezing or overheating of the thermostating system. The high-performance Vario pump provides the highest pressure in its class. The power is transmitted magnetically between the motor and the pump. This creates a hermetically locked, permanently sealed hydraulic system. It is then possible to vary the pump level in eight stages and to adapt it to individual requirements. This allows

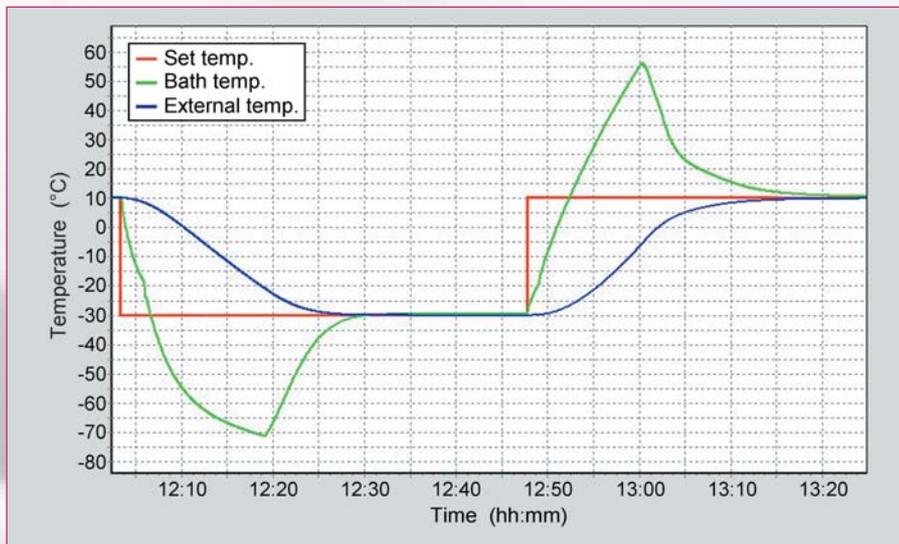


Figure 4 – Control action with moderate temperature jumps: temperature trend in the reactor (blue line) with nominal value reduction / increase by 40°C. The adjustment is rapid and highly precise

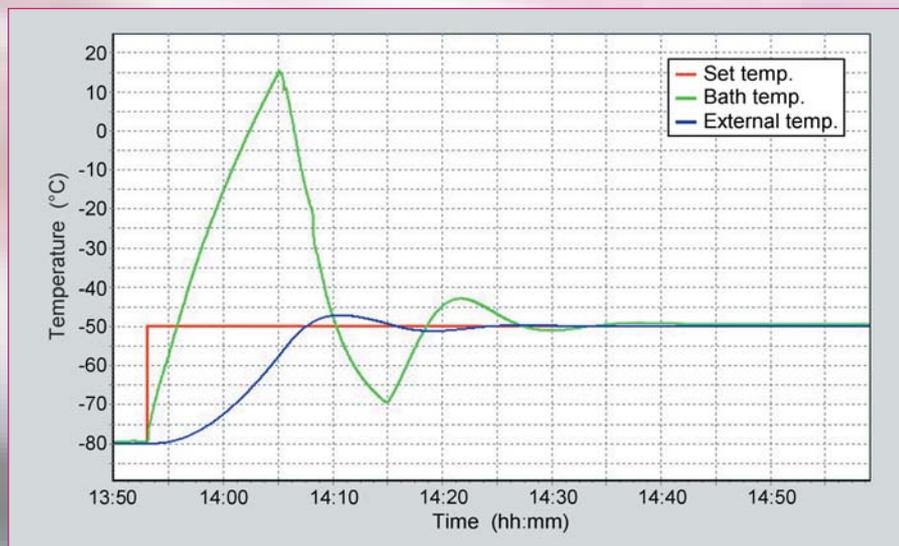


Figure 5 – Simulation of an intensely exothermic reaction using a temperature jump from -80 to -50°C. The adjustment is very quick and the brief, minimal deviations from the target value are within the range of tolerance

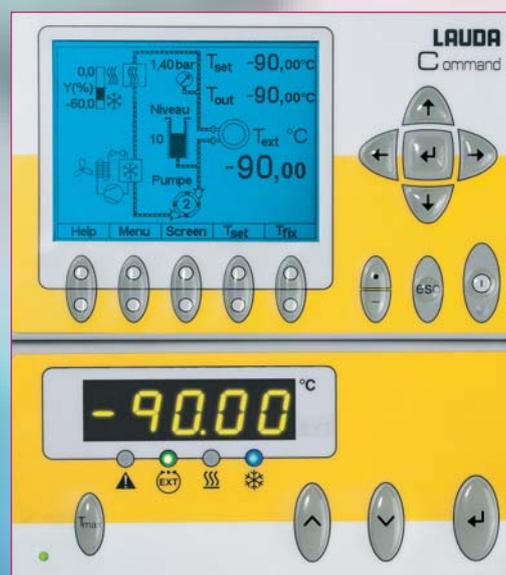


Figure 6 – The command console with graphic LCD offers convenient operation and optimum process control – and can also be removed from the thermostat to function as a remote control

the optimum flow of the broadest range of consumers – even in a spatially separate test set-up with long lines. As an alternative to the eight pump power levels, operation may also be by pressure control. This allows safe work, for example with pressure sensitive glass reactors, by the setting of a maximum pressure. The sensitive control electronics reliably and continuously monitor adherence to the set outflow pressure.

In the Integral XT, the thermally active heat transfer medium does not come into direct contact with the ambient air. A thermally decoupled expansion tank ensures volume compensation in the case of temperature changes. This functioning principle has numerous advantages for the user. The condensation of humidity is

minimised at low temperatures, as is the odour nuisance at high temperatures. With slight evaporation and oxidation, long tempering fluid lifetimes are guaranteed.

FORWARD-THINKING: EASY OPERATION AND DATA MANAGEMENT

Top class in temperature control technology is also defined by other aspects: such as the simplest possible, intuitive menu navigation in process programming. The high-resolution graphics display of the command console allows clear, logically structured data entry and perfect online monitoring of the most important process parameters (Figure 6). If required, the entire operating panel can also be removed and used as a remote control. In order to satisfy the different network circumstances and documentation requirements on site, connection to existing networks is possible through various interface modules. In addition to the RS-232/485 interface built into the operating console as standard, a connection for a Pt 100 temperature probe is also available as standard. Moreover, two further modules may be installed by plug and play. Available as interface modules are: a Profibus module for integration into a Profibus network with up to 126 devices, two contact modules (SUB-D or NAMUR), and an analogue module.

DIVERSITY OF APPLICATIONS

The application range of the Integral XT product line ranges from temperature control in stirring vessels and reactors in chemistry, pharmacy and biotechnology to applications in the cosmetics industry. Other areas include product development in electrical engineering and the semi-conductor industry as well as the automotive and supply industries. In industrial materials testing / thermal stress tests, extreme temperature changes in rapid cyclical succession serve to assure the quality of materials, components or complete systems. In addition to the high quality thermostat range, LAUDA also offers a competent service for these demanding applications. The comprehensive network allows for the fastest possible response times. The overall concept of high-tech thermostats and high quality service provides a maximum level of security and allows developers and engineers time to carry on with their important work.