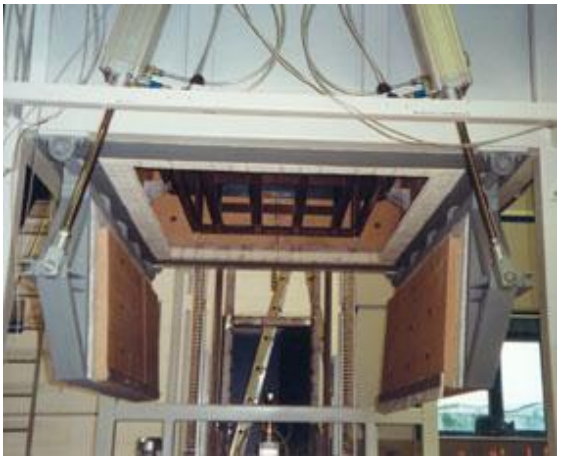
Mid-Temp Circulation Furnace (< 600 °C) – e.g. for batch tempering of Al-sheets

The heat treatment of aluminum and its alloys is getting more and more important for the today needs of the automotive industry. The requirements are lightweight components with optimized material properties especially strength and toughness. The solution annealing of aluminum alloys is a successful example to meet this requirement.

In the low temperature, range (< 600 °C) the main heat transfer mechanism is convection (forced). To reach a good temperature distribution and short heating cycles, the air circulation has been applied in furnaces of different designs. The presented equipment is developed for the application of solution annealing of aluminum sheets at 550 °C. The Al-sheets are located on a flexible transport rack, with automated quenching process and process cycle control.
To increase the capacity of the furnace, an exchangeable charging system with special transport racks, was designed. Boundary conditions were short heating times, a fast homogeneous temperature distribution of +/- 3 K and the control of the cooling water temperature. The optimized design is an overhead-furnace with quenching water bath below and transport/charging device in front of the furnace.
The furnace is a bottom loader system with four heating zones around the chamber. The hot gas circulation fans (2 x 70 m^3/min^{-1}) are located on top of the furnace. The positioning of the fans ensures the most efficient heat transfer.
The airflow in the batch is controlled via the geometry of the circulation gas nozzels (bottom part of the furnace) and the arrangement of the gas guiding channels. The furnace mouth is realized with two-drop doors, which are pneumatically operated and opened downwards.
The quenching bath with integrated lifting device, water-level control, and circulation and heat recovery of the cooling water is installed under floor. The heat recovery from the cooling water is carried out with a tubular heat exchanger system at the inner side of the cooling water tank (cooling coils).
The control is performed with a programmable controller (PLC), especially programmed for this application. The controller is able to meet all user applications and to optimize the processes. To check and record the temperature distribution in the chamber in a range of +/- 3 K the furnace is equipped with four additional thermocouples inside the process chamber.

Solution annealing furnace for aluminium and its alloys.
Volume flow (2 x 70 m³/min) and 4 zone heating for load temperature homogeneity. Capacity: 3,6 m^3 / 1,3 x 1,8 x 1,55 m (wxdxh), 90 kW, 550 °C.



After opening of the drop doors of the furnace, the transport racks with the charge is automatically moved to the quenching bath.

Info: Aluminium 2006, Essen, 20.-22.9.2006, Hall 6, Booth G32 and info@linn.de