

# THERMOPROCESSING PLANTS AND EQUIPMENT



**... FOR ALUMINIUM ROLLING MILLS**

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METALS**

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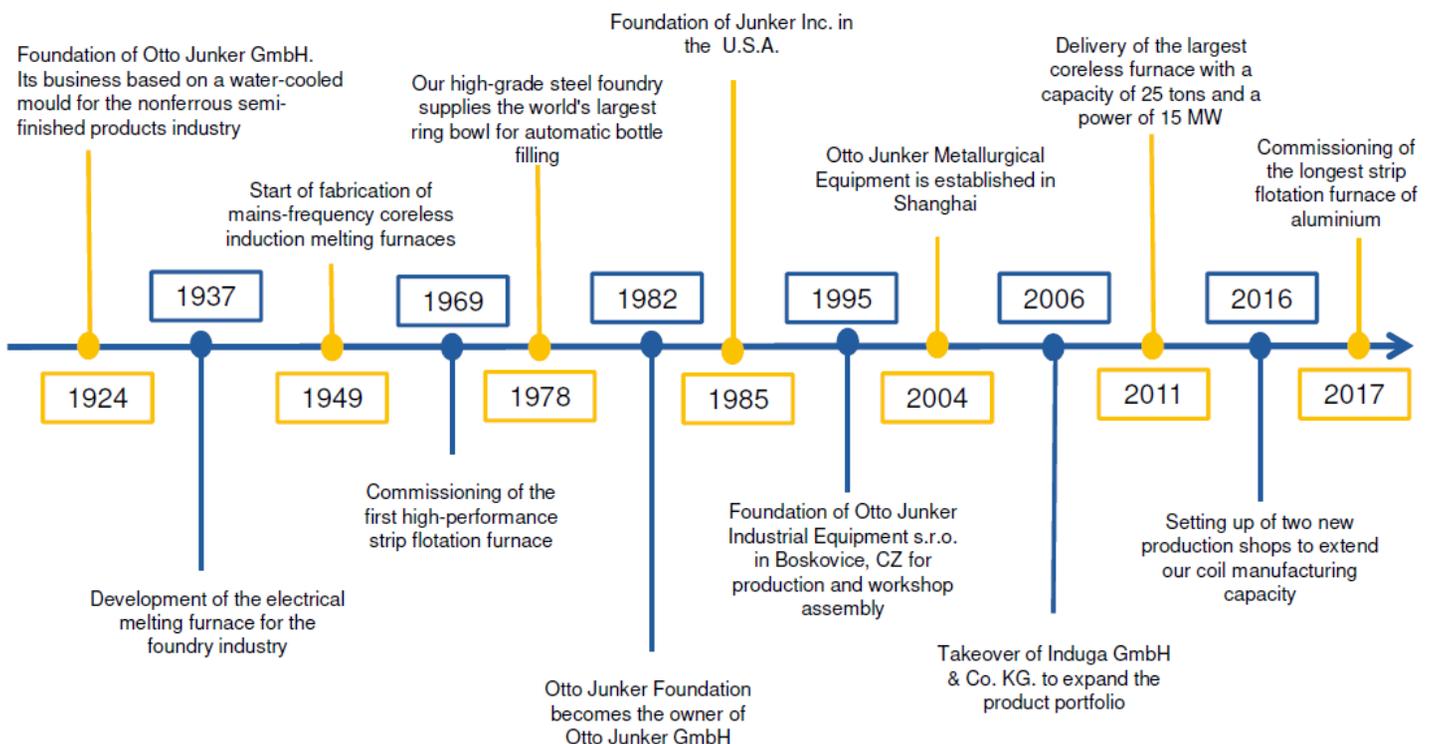
# Otto Junker GmbH

Established in 1924, **OTTO JUNKER GmbH** draws on more than 90 years of experience and continuous product development. The company is represented by subsidiaries, service agencies and sales offices all over the world.

The product range embraces melting, casting, heating and heat treating equipment for the Aluminium and Copper industries as well as melting and casting equipment for iron and steel foundries.

Our foundry in Lammersdorf produces high-grade sand castings from iron, nickel and cobalt-based materials, both as cast and fully finished. In the attached machining section, precision parts are made for demanding applications.

Since 1982, the company has been owned by the OTTO JUNKER FOUNDATION. Consistent with the Foundation's charter, it promotes the training of young engineers at the RWTH Aachen and sponsors research and development in the fields of metallurgy and electrical engineering.



# Preheating and Homogenizing of Rolling Slabs Pusher Type Furnace

Pusher furnace systems are used to preheat and homogenize rolling slabs prior to hot rolling. They deliver outstanding throughput rates at maximum efficiencies (temperature uniformity, energy consumption, automation), especially with large lots.

These furnaces are used as standalone units or in parallel configurations synchronized via a common handling system.

Furnace:

- High-convection technology for rapid heating and cooling
- Gas heating
- Heating and homogenizing in air or nitrogen / protective gas atmosphere
- Model-based control of the furnace energy input systems to minimize cycle times and energy demand



Products:  
Rolling slabs in all aluminium alloys

Reference dimensions:

- Length: 3,000 - 8,500 mm
- Width: 800 - 2,300 mm
- Thickness: 250 - 820 mm
- Weight of slab: 32 t

Charge weight per furnace: 200 t - >1,000 t

Pusher furnace systems consist of the following main assemblies:

- Loading table
- Uprinder
- Pusher system
- Furnace
- Extractor
- Downender
- Skid-shoe handling

Options:

- Slab buffering
- Cooling system
- Multi-furnace charging machines
- Side-loaded pusher furnace design



# Preheating and Homogenizing of Rolling Slabs Cartridge Furnace

Cartridge furnaces are used to preheat and homogenize rolling slabs prior to hot rolling. These furnaces provide very high levels of flexibility and maximum efficiency (temperature uniformity, energy demand, automation), especially with small lots and loads coming in many different sizes and alloys.

The furnaces are set up in parallel configurations, permitting a shared use of handling equipment that serves multiple units.

Furnace:

- High-convection technology for rapid heating and cooling
- Gas or electrical heating
- Heating in air or under nitrogen / protective gas
- Model-based control of the furnace energy input systems to minimize cycle times and energy demand



Furnace:  
Rolling slabs in all aluminium alloys

Reference dimensions:

- Length: 5,000 - 7,000 mm
- Width: 1,000 - 2,800 mm
- Thickness: 400 - 800 mm
- Weight of slab: max. 32 t

Charge weight per Furnace: 100 - 200 t

Cartridge furnace systems consist of the following main assemblies:

- Loading roller conveyor
- Measuring roller conveyor
- Mobile roller conveyor
- Charging machine with upender and feeding boogie
- Furnaces

Options:

- Slab buffering
- Cooling system



# Preheating and Homogenizing of Rolling Slabs

## Pit Furnace and Chain Conveyor Furnace

Pit furnaces and chain conveyor furnaces are used to preheat and homogenize rolling slabs prior to hot rolling.

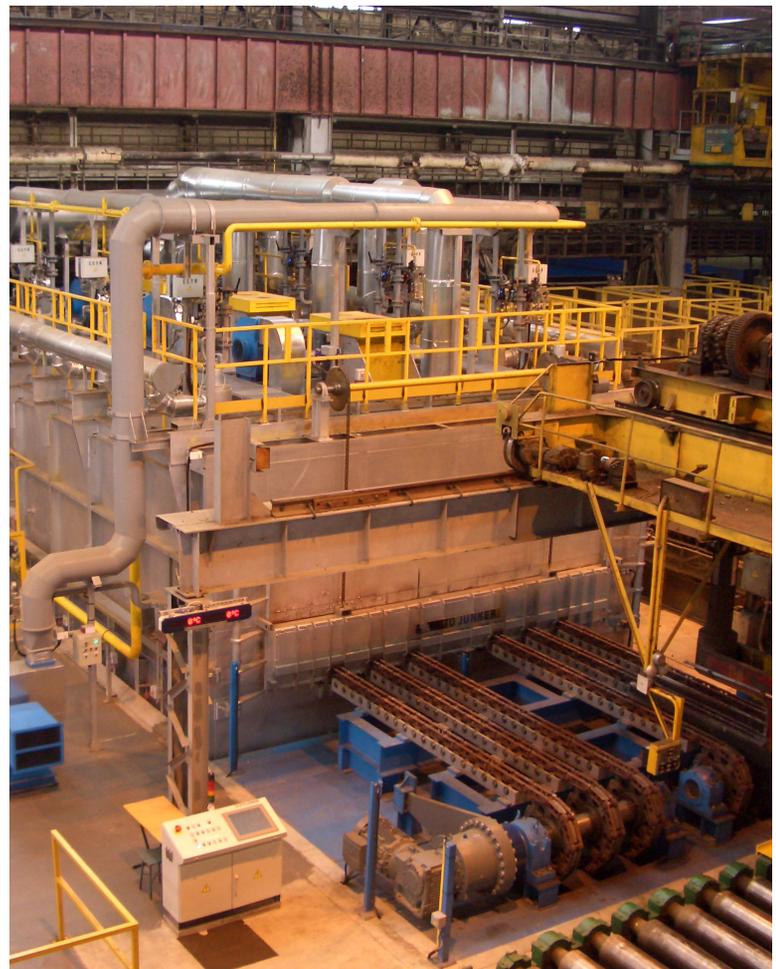
Pit furnaces can provide very high levels of operating flexibility with small product lots and different slab sizes and alloys.

- The furnace chambers are usually loaded by a slab crane.
- Designed for preheating or homogenizing of slabs
- Matching cooling system delivers a defined cooling ramp

Chain conveyor furnaces are noted for their low space requirement for small product lots.

The rolling slabs are moved through the system lying flat on chains, either continuously or in batch mode. This furnace offers very high flexibility in terms of slab sizes.

The slabs are heated by the high-convection principle from above and below. Loading and unloading is performed by overhead crane.



# Rapid Slab Cooling HiPreQ<sup>®</sup> Slab Quench

These systems are used for fastest possible cooling down rolling slabs from their homogenization temperature to the rolling temperature for metallurgical reasons. By reducing dwell times in the pusher furnace or cartridge furnace, they can increase plant capacity.

An slab quench system consists of the following main components:

- Transfer roller conveyor from the pusher / cartridge furnace to the slab quench
- Slab quench
- Transfer roller conveyor to the soak chamber
- Soak chamber

Cycle time: 5 min



# Heat Treatment of Plates and Extruded Products HHT (Horizontal Heat Treatment) Line

Heat treatment lines for aluminium plate are built in accordance with aerospace industry specifications AMS 2750 E and AMS 2772 G for the heat treatment of aluminium alloys.

A horizontal heat treatment of plates and extruded products offers major benefits compared to vertical processes:

- Transfer of plates and sectional products without damaging or scratching the metal
- Homogeneous metallurgical properties over the product's full length and width:
  - Uniform heating on both sides due to high-convection technology
    - Temperature accuracy in the metal:  $\pm 1.5\text{ }^{\circ}\text{C}$
    - Temperature accuracy in the furnace atmosphere:  $\pm 1.5\text{ }^{\circ}\text{C}$
    - Short heat-up rates for maximum throughput and low energy consumption
- Hard and soft quench for uniform cooling from both sides
- Batch-type or continuous furnace operation
- Supports future expansion stages
- Automatic operation



**Products:**

Plates and extruded products in heat-treatable 2xxx, 6xxx, 7xxx series aluminium alloys for aircraft and automotive industry applications.

**Reference dimensions:**

- Width: up to 4350 mm
- Thickness: 3 - 406 mm
- Length: 1.5 - 40 m

**Extruded products:**

- Wall thickness: up to 250 mm

These heat treatment lines consist of the following main assemblies:

- Loading roller conveyor
- Furnace
- Main cooling zone with hard and soft quench
- Cool-down section
- Dryer
- Unloading roller conveyor

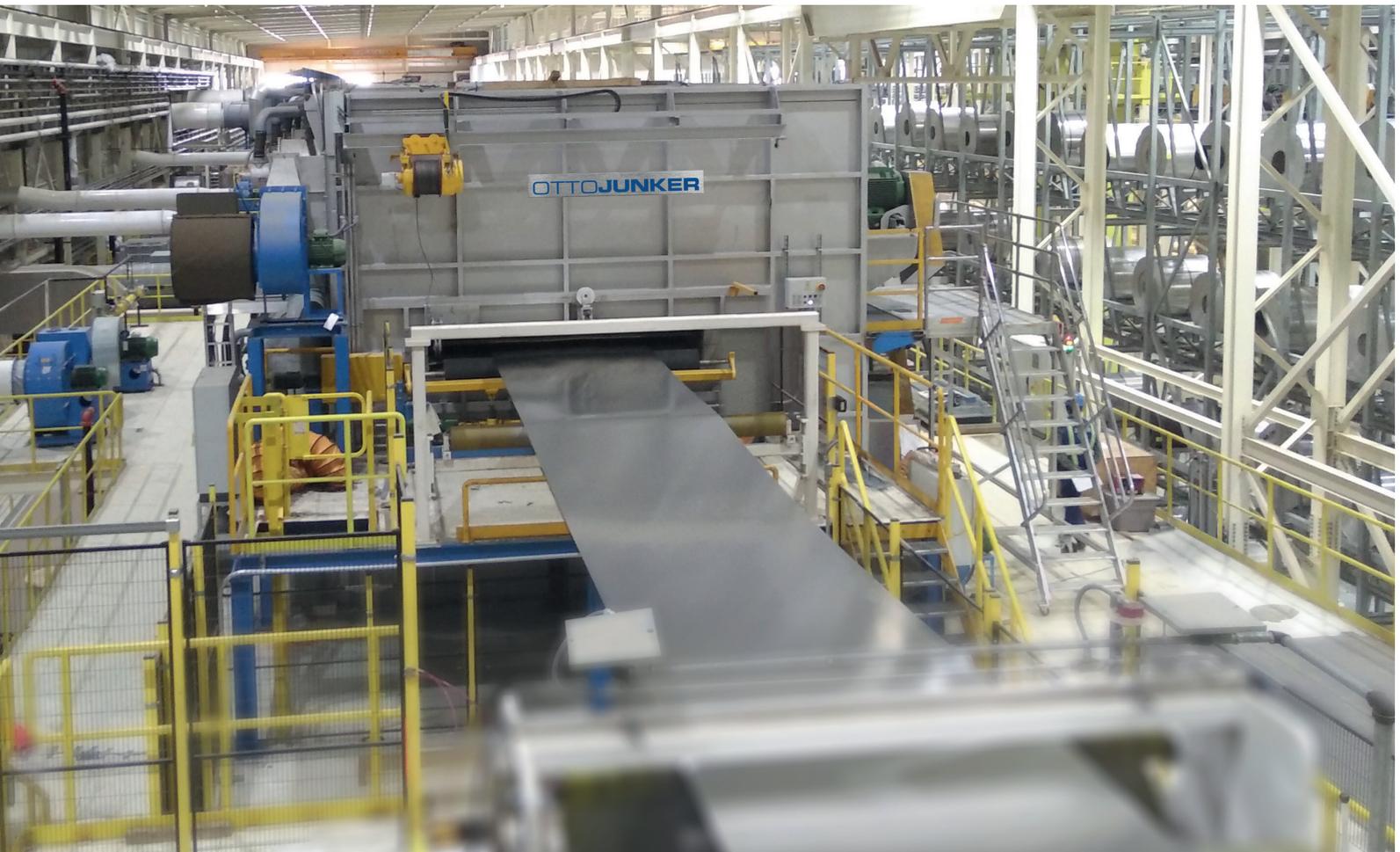


# Continuous Heat Treatment of Strip Strip Flotation Line with Furnace and Quench

Strip flotation lines are used for the continuous horizontal heat treatment of aluminium strip for the aerospace and automotive industry.

The furnace and cooling sections both operate on the strip flotation principle, supporting the running strip on an air cushion as it is heated, air cooled, and dried. The proven OTTO JUNKER nozzle system ensures high heat input and stable non-contacting strip movement that is particularly gentle on the product. The system's high heat transfer and perfect centering action support high throughput rates despite minimum line length.

The strip is cooled at presettable cooling rates and with different media. Water, mist or air can be used for cooling, depending on the alloy and strip thickness.



Products:  
Aluminium strip in 2xxx, 5xxx, 6xxx, 7xxx alloys

Reference dimensions:

- Width: max. 2.350 mm
- Thickness: 0.6 - 7 mm

Strip heat treatment lines consist of the following main assemblies:

- Furnace
- Combined mist and air cooling zones
- Air cooling zones
- Pre-aging furnace



# Annealing and Cooling of Strip Coils Chamber Furnace

Strip coil furnaces are used in intermediate and final annealing as well as tempering of aluminium strip coils in various alloys and dimensions. The coils are heat-treated with and without spool on special annealing trays, using a process that is gentle on the metal.

The heat treatment is commonly performed in a protective gas atmosphere to prevent discolorations, cracking of residual oil, or strip oxidation. However, the process may also be performed under air.

Strip coil furnaces are built as single- or multi-coil units. The loading method varies with the furnace type, i.e., the coils can be charged either horizontally using a charging machine or vertically by means of a scissor lift table in the case of elevator furnaces.

The heat treatment process ensures achievement of the following characteristic benefits:

- Short heating and cooling cycles
- High throughput
- Temperature uniformity conforming to CQI9 and AMS specifications
- Low consumption
- Model-based control of the furnace energy input systems to minimize cycle times and energy demand



Products:

Coils of aluminium strip (all alloys)

Reference dimensions:

- Width: up to 2,500 mm
- Diameter: up to 2,600 mm
- Weight of Coil: up to 30 t

Size of Charge: 1 - 8 strip coils

Strip coil annealers consist of the following main assemblies:

- Furnace
- Heating – gas based or electrical
- Mathematical model

Options:

- Preheating of protective gas and purge gas
- Protective atmosphere recoling system
- Charging machine
- Loading and unloading stations
- Cooling chambers



# Annealing and Cooling of Foil Coils Chamber Furnace

Chamber furnaces for the heat treatment of aluminium foil coils are used to provide thermal degreasing and final annealing of ultra-thin to very thick foils.

The annealing processes are commonly performed in air but may also be carried out under a protective gas atmosphere to prevent oxidation and the problem of foil layers sticking together.

These furnaces are characterized by their high flexibility, given the capability to treat thin and sensitive foils with the appropriate slow heating rates while heating thick foils at maximum rates.

The heating method is either electrical or based on indirect gas firing according to the mass flow principle.

Products:

Coils of aluminium foil (all alloys)

Reference dimensions:

- Width: max. 2,400 mm
- Diameter: max. 2,000 mm
- Weight of Coil: max. 10 t

Options:

- Preheating of protective gas and purge gas
- Protective gas recooling system
- Charging machine or bogie hearth



# Homogenizing and Stress Relieving of Cast Rolling Slabs and Billets

## Chamber Furnace and Cooling Chamber

Chamber furnaces for homogenizing and stress-relieving rolling slabs or extrusion billets are used in making slabs of hard alloys, specifically for the aerospace industry and billets.

The stresses created during casting and cooling must be reduced so that subsequent mechanical processing steps can be performed.

These homogenizing furnaces are directly gas-fired and built to aircraft industry specifications and standards where necessary.

Cooling of the charge may be performed either by fresh-air cooling within the furnace or in separate cooling chambers.

Products:

Slabs / billets in various aluminium alloys

Reference dimensions:

■ Length:	max. 8,000 mm
■ Width:	max. 2,000 mm
■ Thickness:	max. 600 mm
■ Diameter:	max. 600 mm
■ Slab Weight:	max. 32 t

Options:

- Loading and unloading stations
- Cooling chambers
- Charging machines



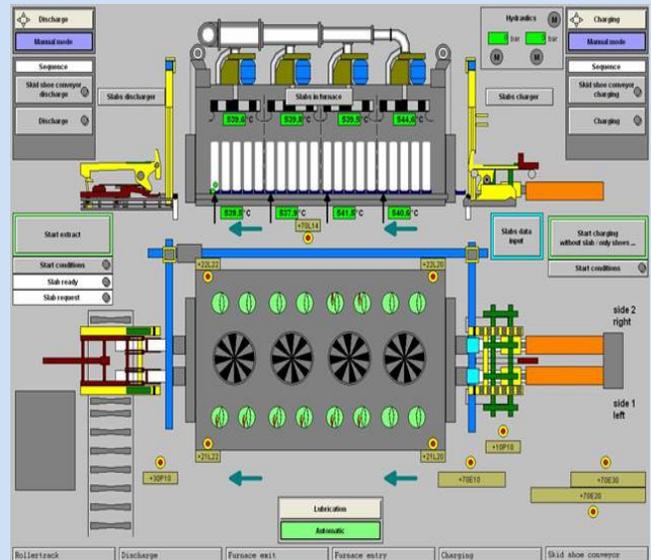
# Automation and Visualization

For high product quality and maximum throughput, it is essential that the equipment should be simple and reliable to operate.

Schematic diagrams in the machine visualization system provide information on the production process and equipment component functions at any time.

Continuous logging of process data for quality monitoring.

Interfacing with higher-level IT systems (level 3).



# Service, Maintenance and Inspection

Otto Junker's customer service delivers fast and competent troubleshooting support to minimize plant downtimes.

To benefit fully from our equipment's high reliability, operating safety and long service life, regular maintenance and inspections are a must.

We offer maintenance contracts affording professional and competent service based on defined maintenance schedules.



# On-site Installation

Detailed planning and the complete on-site installation of the equipment by our expert teams will ensure a professional and timely realization of your project.

Our services include:

- Supervision of installation
- Equipment commissioning
- Deployment of installation personnel with tools, lifting gear, etc.

Advantages:

- Benefits of a single-source solution
- Timely and professional installation
- Professional site management
- Production launch assistance
- Long service life



# Technology Center

At the OTTO JUNKER Technology Centre, pilot systems are available for heating and cooling trials to support basic research investigations. Apart from process studies, it is possible to examine aspects of flow dynamics and thermal engineering in this environment.

If necessary, we can adapt the equipment to suit your particular questions.





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**OTTOJUNKER GMBH**  
Jägerhausstr. 22  
52152 Simmerath  
Germany

Phone: +49 2473 601 0 | Fax: +49 2473 601 600  
E-Mail: [sales@otto-junker.com](mailto:sales@otto-junker.com)

**[WWW.OTTO-JUNKER.COM](http://WWW.OTTO-JUNKER.COM)**

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