THERM CONCEPT

THERMAL PROCESS-TECHNOLOGY

HEAT TREATMENT OF ALUMINIUM AND TITANIUM ALLOYS

Furnaces and heat treatment plants for

TEMPERING | AGING AND POST AGING | PREHEATING
HOMOGENISING | SOLUTION ANNEALING | CURING
ANNEALING | HEATING | AGING | TEMPERING

THERMCONCEPT

High-performance furnaces and systems for heat treatment of aluminium and titanium

Lightweight construction is regarded as one of the key technologies for many industrial sectors, particularly in the automotive and aircraft industries. Aluminium and titanium are therefore gaining in importance as the most important materials for lightweight construction. Wherever weight savings, protection, strength and corrosion resistance are required, aluminium is the material of choice.

The demands placed on components and structures made from light metal alloys are constantly increasing. Heat treatment is the key to achieving the desired material properties. Today, up to 60% of all castings are heat treated.

The use of modern furnace concepts in all relevant stages of the process chain is a prerequisite for the production of innovative components made of light metal alloys. The aim: products with optimum material quality.

The demands on the required furnace systems are high: precise and controlled temperature control, high energy efficiency, long service life, flexible use, sophisticated safety technology, digital monitoring units and documentation systems.

THERMCONCEPT has decades of experience in the development, design and manufacture of high-performance industrial furnaces and systems for the heat treatment of light metal alloys. Our innovative engineering results in powerful products and practical, customised concepts that meet the highest demands in terms of efficiency, temperature control and documentation.

Engineering

Our highly skilled development engineers and designers, hardware and software experts, technicians and mechanics develop cost-effective and reliable furnace solutions. Our close proximity to the user enables us to design furnaces that work in the field. Our aim is to give you the decisive technical and economic advantage.

Flexibility and speed

Many applications can be solved with our standard furnace range. The advantages for you: proven and mature models, excellent value for money, short delivery times. Of course, we can also supply you with a furnace system specifically designed for your application. We will work closely with you to design an furnace system that will solve your demanding tasks reliably and economically.

Automation and Industry 4.0

The need for automation in all areas of production is constantly increasing. THERMCONCEPT complements furnace systems with customised systems for batch movement. We are just as familiar with linear handling as we are with robot-supported systems.

We use sophisticated software and hardware components to monitor, control and regulate heat treatment processes. Machine communication and worldwide technical support are part of our service profile.

Global sales and service network

THERMCONCEPT furnaces and systems are in daily use with satisfied customers in many countries around the world. Our international sales network guarantees our customers personal support, fast response times and qualified service on site.

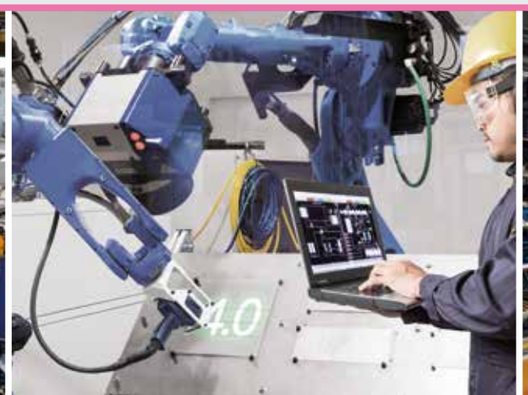
THERMCONCEPT *powered by innovation*

THERMCONCEPT high performance furnaces and Heat Treatment Systems stand for:

- TOP quality and sophisticated technology
- Practical and service-friendly designs
- Tailor-made and application-oriented customised solutions
- Maximum thermal efficiency and economy
- Environmentally friendly materials
- Professional service and system support to ensure reliable operation

THERMCONCEPT is your partner when it comes to high-performance furnaces and systems for a wide range of demanding applications in production and research.



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THERMCONCEPT

High-performance furnaces for industrial use

THERMCONCEPT

High-performance furnaces for industrial use

Furnace systems for heat treatment of aluminium components

THERMCONCEPT manufactures a comprehensive range of furnaces and systems for the heat treatment of aluminium components. The furnace systems are characterised by very high quality and optimum energy efficiency. Depending on the requirements, electric or gas-fired furnaces are used.

The THERMCONCEPT range of furnaces covers the process steps of solution annealing, quenching, ageing, hardening, stress relief annealing and more. If required, downstream cooling zones can be used to cool the parts for the next production step.

Types of furnaces

The following are used

- Fully and semi-automatic quenching and tempering systems with integrated quenching baths
- Batch furnaces such as chamber furnaces, bogie hearth furnaces, pit furnaces
- Continuous furnaces with horizontal or vertical charge transport

System peripherals

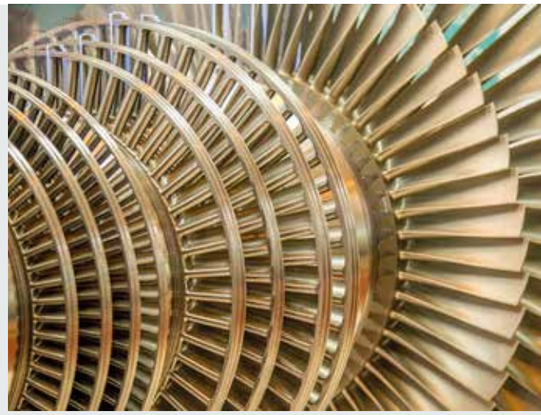
THERMCONCEPT‘s system peripherals are tailored to the user‘s processes. Automated batch transport and batch handling complete the furnace systems.

Industrial applications

for THERCONCEPT furnace systems

AMS2750, NADCAP, CQI-9

THERMCONCEPT process control systems enable precise and controlled temperature control of furnace systems. The systems comply with all relevant process standards, such as the international aerospace standard AMS 2750 and the international automotive standard CQI-9.



Drop-bottom system

Customer applications in the aircraft industry

THERMCONCEPT supplies furnace systems for the heat treatment of structural parts and components made of aluminium alloys according to T4, T5, T6, T7, T8. The processes include preheating, solution annealing with quenching and hardening.

Customer applications in the automotive industry

THERMCONCEPT furnaces are used in a wide range of applications in the automotive industry. Numerous components such as transmission parts, EGR valves, filter holders, electrical housings, control units, thermostats, heating and ventilation systems, controller housings, engine mounts, control arms, etc. are heat treated in THERMCONCEPT furnaces.

Furnaces for preheating, solution annealing and ageing

80 – 850 °C

Electric heating

Indirect and direct gas heating

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Chamber furnaces

Bogie hearth furnaces

Chest furnaces

Continuous furnaces

Paternoster furnaces

Turntable furnaces

Drawer furnaces

Air circulating chamber furnaces

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Customised furnace sizes | Individual loading solutions

Stainless steel interior/exterior | Cooling | Hinged or lift door

Air circulation chamber furnaces KT

T max. 250 °C to 450 °C

Features

- Furnaces for maximum temperatures of 250 °C and 450 °C, e.g. for drying and preheating large batches
- All furnaces with horizontal or vertical airflow are electrically heated.
- Robust, double-walled housing constructions, inner housing to cover the insulation and air baffle made of heat-resistant stainless steel.
- Furnace door designed as a single-leaf or double-leaf swing door
- High-quality insulation with low heat loss and power consumption
- Powerful recirculation fans for high air exchange and optimum temperature distribution of up to +/- 5 K in the usable space according to DIN 17052 in the working chamber

Furnace systems to EN 1539

During the heat treatment of components contaminated with cooling lubricants, pastes and oils, flammable and combustible substances can escape. Furnace systems for this application are equipped with safety technology in accordance with EN 1539 to prevent the formation of explosive mixtures.

THERMCONCEPT offers the following options for many models EN 1539 compliant versions. These include the furnace as a „Type A Dryer“ with

- Controlled air exchange
- Controlled air circulation
- Controlled pre-purge time
- and an additionally sealed working chamber.

The design of the flushing volume is individually adapted to the requirements.

TECHNICAL DATA

Models		T max. [°C]		Internal dimensions [mm] Width x depth x height	Volume [l]	Power [kW]		Voltage [V]
KT 1000/02/A	KT 1000/04/A	250	450	1000 x 850 x 1200	1020	17	20	400 3/N
KT 1500/02/A	KT 1500/04/A	250	450	1000 x 850 x 1850	1570	20	36	400 3/N
KT 2000/02/A	KT 2000/04/A	250	450	1100 x 1500 x 1200	1980	27	41	400 3/N
KT 3000/02/A	KT 3000/04/A	250	450	1000 x 1500 x 2000	3000	30	48	400 3/N
KT 4000/02/A	KT 4000/04/A	250	450	2200 x 1500 x 1200	3960	41	53	400 3/N
KT 4000/02/A1	KT 4000/04/A1	250	450	1100 x 1500 x 2300	3795	41	53	400 3/N
KT 5000/02/A	KT 5000/04/A	250	450	2000 x 2000 x 1250	5000	48	66	400 3/N
KT 6000/02/A	KT 6000/04/A	250	450	2000 x 2000 x 1500	6000	66	90	400 3/N
KT 8000/02/A	KT 8000/04/A	250	450	2200 x 1500 x 2300	7590	78	96	400 3/N

Photo left:
Furnace system consisting of 3 indirect gas heated chambers for heat treatment of components up to 150° C.

Photo right:
125 m³ low-temperature furnace for working temperatures up to 200 °C, ground level access.

Air circulation chamber furnaces KT

T max. 250 °C to 450 °C

Features

- Electric lift door
- Entrance ramp/lanes for ground level entry with charging trolleys
- Customised charging trolleys with and without shelves
- Rail-mounted trolleys with electric drive
- Automatic control of supply and exhaust air dampers for furnace ventilation
- Supply air fan for forced furnace ventilation
- Automatic cooling system for forced cooling
- Inspection window and chamber lighting
- All models available with indirect gas heating
- Visual/acoustic signals
- Connections for thermocouples

Chamber furnace up to 250 °C with a rail-mounted charging cart.

84 m³ chamber furnace up to 250°C with front and rear doors for charging trolleys. Temperature uniformity up to +-3K.

Air circulation chamber furnace

for the aerospace industry

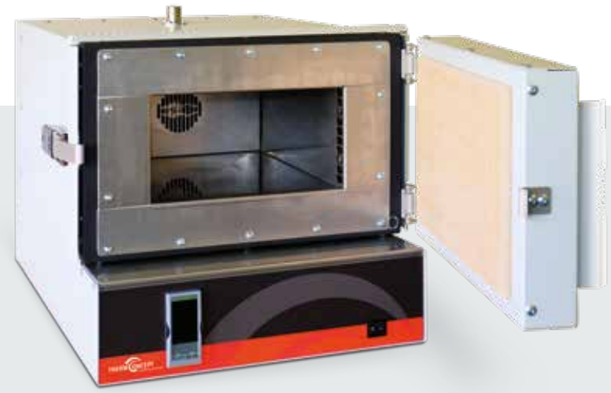
The chamber furnace is used for heat treatment of large size components for the aerospace industry. With internal dimensions of 5 m wide, 10 m deep and 2.5 m high, the furnace has a chamber volume of 125 m³. The temperature uniformity is ± 3°C according to DIN 17052.

The system has 36 vacuum connections with pump stand and 72 thermocouple inputs.

Batches are identified by a barcode reader. A Siemens PLC with Siemens WinCC control software is used for process control and monitoring, with various options for data tracking and archiving.

Air circulation chamber furnaces KU

T max. 450 °C and 650 °C



Features

- Air-circulation chamber furnaces up to 450 °C and 650 °C, particularly suitable for tempering, ageing, preheating, drying, shrinking, curing, testing, ...
- Robust housing constructions made of high-quality steel sheets
- Right hand hinged door
- Internal air baffle made of heat-resistant stainless steel, for long service life, extremely durable and corrosion-resistant
- Standard version with 2 pairs of shelves for optional shelves
- High-quality heating elements with long service life, mounted in the air flow for even and fast heat transfer
- High-performance horizontal air circulation ensures uniform temperature distribution up to +/- 5 K according to DIN 17052
- High-quality insulation for low energy consumption and electricity costs
- Base frame included as standard
- KU 15/06/A as a compact benchtop furnace with air deflector, designed for installation in the HS 1 hardening system, without shelves

Furnace options

- Pneumatic lift door with hand or foot switch
- Automatic control of supply and exhaust air dampers for furnace ventilation
- Automatic cooling system for forced cooling
- Drill holes and feedthroughs for pipe access to the furnace chamber
- Gas purge boxes for inert gas heat treatment with matching charging trolley
- Inspection window
- Eurotherm controller with recorder function, interfaces and software for documentation
- Calibration of thermocouple and controller at different temperatures
- Solid state relay control of heating elements
- Custom designs available

TECHNICAL DATA

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Models		T max. [°C]		Internal dimensions [mm] Width x depth x height	Volume [l]	Power [kW]		Voltage [V]
KU 15/06/A		650		300 x 350 x 150	15	2,5		230 1/N
KU 40/04/A	KU 40/06/A	450	650	300 x 400 x 300	35	3,2	4,2	400 3/N
KU 70/04/A	KU 70/06/A	450	650	350 x 500 x 400	70	4,2	8,2	400 3/N
KU 140/04/A	KU 140/06/A	450	650	450 x 600 x 500	135	5,7	12,2	400 3/N
KU 270/04/A	KU 270/06/A	450	650	600 x 750 x 600	270	9,7	16,7	400 3/N
KU 540/04/A	KU 540/06/A	450	650	750 x 900 x 800	540	13,7	24,7	400 3/N
KU 800/04/A	KU 800/06/A	450	650	800 x 1250 x 800	800	24,2	35,7	400 3/N

Air circulation chamber furnaces KU

T max. 750 °C and 850 °C

Features

- Air-circulation chamber furnaces up to 850 °C, suitable for almost all processes where high temperature accuracy is required, such as tempering, ageing, preheating, shrinking, testing
- Robust housing construction made of high-quality sheet steel with right-hinged swing door
- Inner housing made of heat-resistant stainless steel, extremely durable and corrosion-resistant, with a long service life
- Equipped with 2 pairs of slide-in shelves, slide-in trays for loading on several shelves levels optionally available
- Models up to 750 °C in semi-gas-tight design suitable for operation with non-flammable inert gases such as argon, nitrogen etc.
- Multi-sided heating via powerful horizontal air circulation with uniform temperature distribution up to temperature distribution up to +/- 3 K according to DIN 17052 (750 °C models)
- High-quality heating elements with a long service life, mounted in the air flow of the air circulation system
- High-quality insulation for low energy consumption and low electricity costs
- Base frame included in standard scope of delivery

Air circulating chamber furnaces for T max. 750 °C are also available in a low-dust version with fully covered insulation.

TECHNICAL DATA

Models		T max. [°C]		Internal dimensions [mm] Width x depth x height	Volume [l]	Power [kW]		Voltage [V]
KU 40/07/A	KU 40/08/A	750	850	300 x 400 x 300	35	5,5	6,7	400 3/N
KU 70/07/A	KU 70/08/A	750	850	350 x 500 x 400	70	10,6	9,7	400 3/N
KU 140/07/A	KU 140/08/A	750	850	450 x 600 x 500	135	14,2	15,7	400 3/N
KU 270/07/A	KU 270/08/A	750	850	600 x 750 x 600	270	21,7	21	400 3/N
KU 540/07/A	KU 540/08/A	750	850	750 x 900 x 800	540	28,7	31	400 3/N
KU 800/07/A	KU 800/08/A	750	850	800 x 1250 x 800	800	41	41	400 3/N

Air circulation chamber furnaces KM

T max. 650 °C and 850 °C

Features

- Air-circulation chamber furnaces for heavy industrial use, suitable for charge weights of several tonnes depending on the design
- Robust housing constructions made of high-quality steel sheets
- Inner housing made of heat-resistant stainless steel with long service life, extremely durable and corrosion-resistant
- Furnace door designed as a parallel-guided swing door
- High-quality heating elements with long service life
- Heated from several sides and powerful horizontal air circulation for uniform temperature distribution up to +/- 5 K according to DIN 17052 in the usable space
- Optimum airflow through air guidance system with adapted arrangement of the air outlets
- High-quality insulation for low energy consumption and low electricity costs

Furnace options

- Pneumatic, electric or hydraulic lift door
- Automatic exhaust air flap control
- Powerful fan cooling
- Semi gas-tight furnace with inert gas connection for inert gas operation
- Gassing systems
- Charging racks and accessories
- Visual/acoustic signals
- Customised special designs

KU 840/07/AS

Air-circulation chamber furnace up to 750 °C with internal dimensions of 750 x 3000 x 400 mm (W x D x H) for heat treatment of bar, profile and plate materials.

With shelves inside the furnace, lift door and loading aid in the base frame for easy loading of long parts.

TECHNICAL DATA

Models		T max. [°C]		Internal dimensions [mm] Width x depth x height	Volume [l]	Power [kW]		Voltage [V]
KM 1000/06/A	KM 1000/08/A	650	850	1000 x 1000 x 1000	1000	39	45	400 3/N
KM 1500/06/A	KM 1500/08/A	650	850	1500 x 1000 x 1000	1500	51	65	400 3/N
KM 1500/06/A1	KM 1500/08/A1	650	850	1000 x 1500 x 1000	1500	51	65	400 3/N
KM 2000/06/A	KM 2000/08/A	650	850	2000 x 1000 x 1000	2000	75	83	400 3/N
KM 2000/06/A1	KM 2000/08/A1	650	850	1000 x 2000 x 1000	2000	75	83	400 3/N
KM 4000/06/A	KM 4000/08/A	650	850	2200 x 1500 x 1200	3960	85	97	400 3/N
KM 4000/06/A1	KM 4000/08/A1	650	850	1500 x 2200 x 1200	3960	85	97	400 3/N

Air circulation chamber Furnaces

for Light Metals

Furnace systems for heat treating components at temperatures up to 300°C. Components are used in the aerospace, marine, motorsport and engineering industries.

Air circulation chamber Furnaces

with Lifting Doors

These furnaces are used to heat treat high performance components for the racing and aerospace industries. In order to push the limits of material properties, both precise process control and comprehensive process documentation are required.

The furnace systems have feedthroughs for vacuum, pressure and instrumentation. System control and process documentation comply with international standards such as CQI-9 or AMS 2750.

Motorised lift doors save space in front of the furnace and allow easy loading and unloading without the inconvenience of swinging doors in front of the furnace chamber.

Air circulation chamber furnace

for stress relieving aluminium components

Air-circulation chamber furnace with internal dimensions of 2600 x 6000 x 2300 mm for max. 250°C for stress relieving welded aluminium components at approx. 230°C. The furnace has an electro-hydraulic lifting door at each end and 8 high capacity recirculation fans of 14,000 m³/h each for a temperature uniformity of +-5K.

The furnace is loaded and unloaded using grid boxes on roller frames. These are drawn into the furnace by a hand-guided tractor via an infeed lane.

CQI 9 furnace control

- All thermocouples in the kiln have a calibration hole
- All controllers and thermocouples calibrated at 3 temperatures

Programme control, temperature control and monitoring with a Siemens PLC. Programming via a TP 1200 Comfort touch panel with graphic display of the entire furnace system, including all information required for operation, and a clear programming screen for easy operation via a multilingual user interface, switchable between English, German and Spanish.

Batch tracking with RFID scanner

- Registration of incoming and outgoing batch baskets via scanners at each door
- Automatic selection of heating programmes using an RFID code on the batch baskets
- Automatic batch documentation via Eurotherm 6100A recorder and connected network server

Air circulating chamber furnace

for bulk material

Electrically heated convection double chamber furnace with internal dimensions of 3680 x 1700 x 1200 mm each for max. 650°C.

Both chambers are equipped with electric lift doors. 4 pallet cages of bulk material can be placed side by side in each chamber.

Loading and unloading is done with an electric pallet truck.

The chambers are operated alternately and preheated with the exhaust air from the other furnace via an air-to-air heat exchanger. See also page 114/115 for details.

Air circulating chamber furnace

for roller production

Furnace system for rolls up to 14,500 mm in length.

The furnace is automatically loaded and unloaded via a linear loading system. Loading is via a 16 m wide and 2.1 m high lift door. The furnace is designed for a maximum temperature of 310 °C and is divided into 4 heating zones.

Chamber furnace system

with charging stations

6-chamber furnace

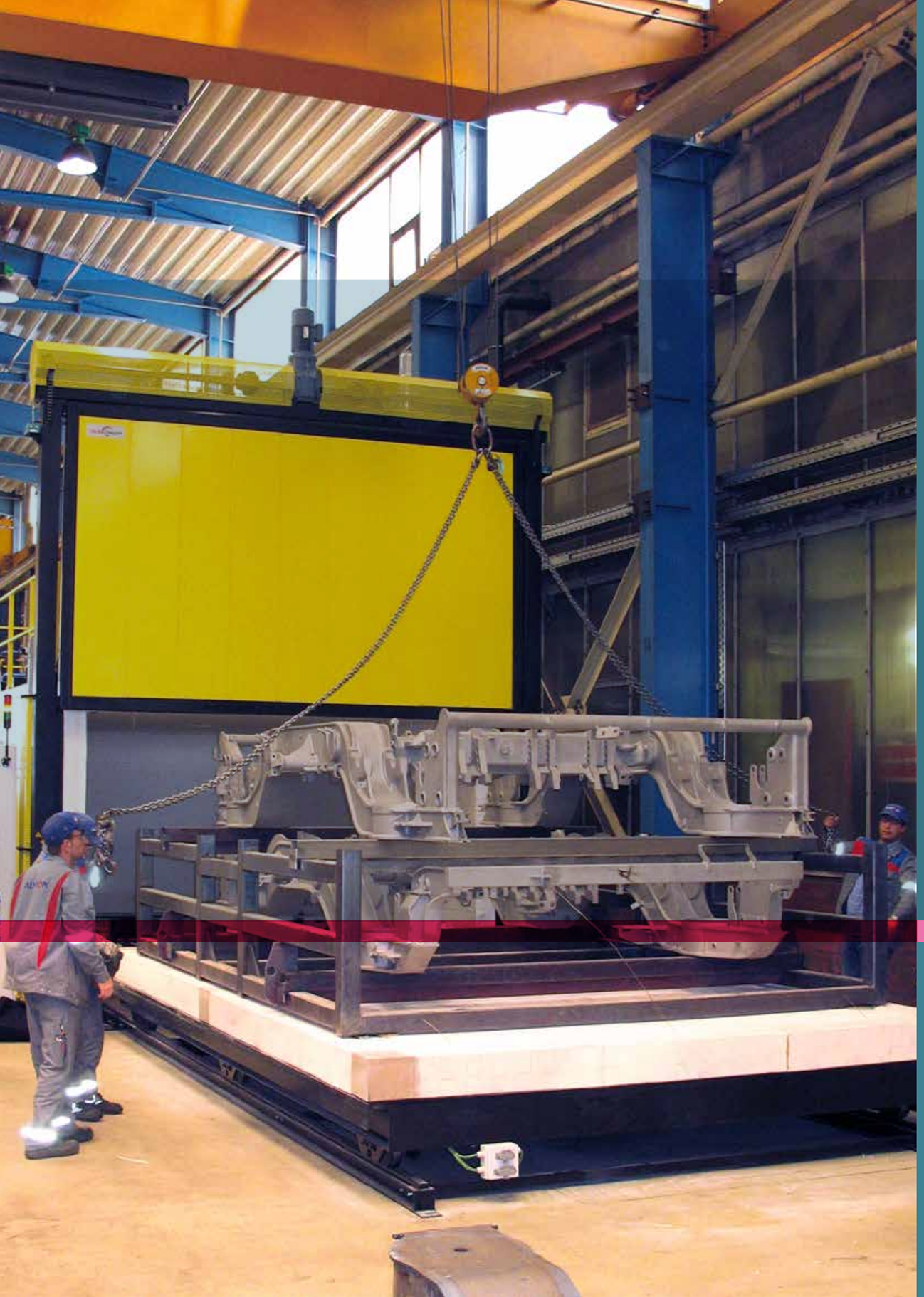
thermconcept.com

Special system consisting of a chamber furnace with a retractable floor at a height of 6.2 m and a floor area of 1.2 m x 1.4 m for temperatures up to 700 °C and 2 charging stations with working platform.

The components are placed in the loading rack at one of the staging areas using a slewing crane. Once loaded, the rack is placed on a rail-mounted trolley and moved into the furnace chamber.

The system is designed to heat treat both light alloys and steel components.

- Furnace system consisting of 6 individual chambers which are heated independently of each other.
- All chambers are equipped with sturdy steel frames to support the components.
- Loading via 6 separately controlled lift doors
- Batch weight per chamber 5 tonnes
- Supplied with air/water heat exchanger
- Usable internal dimensions of a chamber: 1500 x 3000 x 1500 mm (W x D x H)
- Outer dimensions of furnace system: 7700 x 4600 x 4600 mm (W x D x H)
- Process control via Siemens SPS S7 with touch panel and various options for Data tracking and archiving



Air circulation bogie hearth furnaces

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Customised furnace sizes | Individual charging solutions

Stainless steel interior/exterior | Cooling | Hinged or lift door

Air circulation bogie hearth furnaces WM

T max. 250 °C, 450 °C, 650 °C and 850 °C

Features

These bogie hearth furnaces are particularly suitable for heat treatment of large batches with heavy charge weights.

- All furnaces with horizontal or vertical airflow, electrically heated
- Robust, double-walled body construction, inner body to cover insulation and air baffle made of heat-resistant stainless steel
- Furnace door as standard with parallel swinging action
- Sturdy bogie with flanged wheels on rails, including rails in front of the furnace, bogie completely covered with stainless steel plates
- Powerful recirculation fans for high air exchange and optimum temperature distribution of up to +/- 5 K according to DIN 17052 in the chamber
- High quality insulation with low heat loss and low power consumption
- Manual exhaust air dampers
- Applications such as chamber furnaces, e.g. according to EN 1539

Pictures:
Electrically heated air circulation bogie hearth furnaces with vertical air circulation for T max. 450°C (left) or 850°C (top).

Both models with vertical air circulation, bogie hearth on rails and pneumatic lifting door.

TECHNICAL DATA

Models		T max. [°C]		Internal dimensions [mm] Width x depth x height	Volume [l]	Power [kW]		Voltage [V]
WM 1000/02/A	WM 1000/04/A	250	450	1000 x 1000 x 1000	1000	32	41	400 3/N
WM 1500/02/A	WM 1500/02/A	250	450	1000 x 1500 x 1000	1500	47	53	400 3/N
WM 2000/02/A	WM 2000/04/A	250	450	1000 x 2000 x 1000	2000	59	68	400 3/N
WM 3500/02/A	WM 3500/04/A	250	450	1300 x 2500 x 1100	3580	72	81	400 3/N
WM 5000/02/A	WM 5000/04/A	250	450	1300 x 3100 x 1250	5040	78	87	400 3/N
WM 7000/02/A	WM 7000/04/A	250	450	1500 x 3100 x 1500	6980	93	102	400 3/N

Air circulation bogie hearth furnaces WM

T max. 250 °C, 450 °C, 650 °C and 850 °C

Furnace options

- Lifting door with electric or hydraulic drive
- Automatic control of supply and exhaust air dampers for furnace ventilation and faster cooling down
- Automatic cooling system for forced cooling
- Exhaust fan
- Electric bogie hearth drive
- Second door on the rear wall of the furnace, e.g. for operation with two bogies
- Furnace system with transverse shifting device for operation with several bogie hearths and parking or charging stations
- Support grids for bogie hearths made of heat-resistant cast steel for optimum distribution of heavy loads
- Bogie hearth furnaces also available with indirect gas heating
- Customised special designs

TECHNICAL DATA

Models		T max. [°C]		Internal dimensions [mm] Width x depth x height	Volume [l]	Power [kW]		Voltage [V]
WM 1000/06/A	WM 1000/08/A	650	850	1000 x 1000 x 1000	1000	47	50	400 3/N
WM 1500/06/A	WM 1500/08/A	650	850	1000 x 1500 x 1000	1500	59	66	400 3/N
WM 2000/06/A	WM 2000/08/A	650	850	1000 x 2000 x 1000	2000	75	86	400 3/N
WM 3500/06/A	WM 3500/08/A	650	850	1300 x 2500 x 1100	3580	93	101	400 3/N
WM 5000/06/A	WM 5000/08/A	650	850	1300 x 3100 x 1250	5040	10	156	400 3/N
WM 7000/06/A	WM 7000/08/A	650	850	1300 x 3100 x 1250	6980	117	168	400 3/N

Air circulation chest furnaces

thermconcept.com

Customised furnace sizes

Individual charging solutions

Cooling function

Air circulation chest furnaces

Different types

- Furnace with 2-piece manually operated hinged lid for side opening
- Lid with counterweight or dampers for support

Production line consisting of 4 chest furnaces

Indirect gas fired horizontal air flow furnace for tempering paper rolls

Chest furnace with 3 separately controlled chambers for preheating components for shrink fitting

Single chamber shaft furnace for preheating aluminium profiles before bending

Air circulation chest furnace

with sliding support racks

- Shaft furnace with a useful length of 32 m for heating rolls.
- The shaft furnace is loaded by crane
- To accommodate components of different lengths, the furnace floor is equipped with with sliding supports

Chest furnace with powerful rotating device

Extraction system on a chest furnace

Air circulation shaft furnace

with vertical air flow | T max. 450 °C, 650 °C and 750 °C

Features

Convection pit furnaces allow charging from above. The square base allows baskets to be used for charging. Long parts can also be suspended in the furnace.

- Robust body construction made from high quality sheet steel
- Inner housing made of heat resistant stainless steel with long service life, extremely corrosion and corrosion resistant
- Vertical air circulation with optimised air flow due to air guidance system with adapted arrangement of air outlets of the air outlets
- Excellent temperature uniformity up to +/- 3 K according to DIN 17052 (750 °C models)
- Heated by high quality tubular heating elements with long service life
- High quality insulation for low energy consumption and electricity costs
- Hand tool for charging available (option)

Furnace options

- Pneumatic lid drive
- Powerful fan cooling
- 750 °C semi-gas tight furnaces with inert gas connection for inert gas applications
- Charging baskets
- Gas purge boxes for inert gas heat treatment
- Gassing systems

Air circulation shaft furnace

with vertical air circulation cylinder | T max. 750 °C

Features

- Durable, robust production furnaces designed for continuous operation with heavy charge weights
- Furnace equipped with round air guide cylinder for charging multiple round baskets
- Powerful air circulation fan with very high air speed and forced flow through the load
- Excellent temperature uniformity up to +/- 3 K according to DIN 17052
- Heated by high quality, long life heating elements
- High quality insulation for low energy consumption and electricity costs

Furnace options

- Pneumatic lid drive
- Automatically controlled supply and exhaust air flaps
- Powerful fan cooling
- Semi gas-tight design for inert gas applications
- Gas flushing systems
- Custom designs and other temperature ranges available on request

TECHNICAL DATA

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Models	T max. [°C]	Internal dimensions [mm] Ø x height	Volume [l]	Voltage [V]	Weight [kg]
SU 40/04/06/07/VA	450 / 650 / 750	300 x 300 x 400	35	400 V 3/N	130
SU 70/04/06/07/VA	450 / 650 / 750	350 x 400 x 500	70	400 V 3/N	145
SU 140/04/06/07/VA	450 / 650 / 750	450 x 500 x 600	135	400 V 3/N	230
SU 270/04/06/07/VA	450 / 650 / 750	600 x 600 x 750	270	400 V 3/N	495
SU 540/04/06/07/VA	450 / 650 / 750	750 x 800 x 900	540	400 V 3/N	580
SU 800/04/06/07/VA	450 / 650 / 750	800 x 800 x 1250	800	400 V 3/N	830

Models	T max. [°C]	Internal dimensions [mm] Ø x height	Volume [l]	External dimensions [mm] Width x depth x height	Power [kW]	Voltage [V]
SU 220/07/VAZ	750	630 x 700	220	1100 x 1100 x 1580	24	400 V 3/N
SU 310/07/VAZ	750	630 x 1000	310	1100 x 1100 x 1880	32	400 V 3/N
SU 380/07/VAZ	750	630 x 1200	380	1100 x 1100 x 2080	36	400 V 3/N
SU 700/07/VAZ	750	900 x 1100	700	1600 x 2400 x 1800	54	400 V 3/N
SU 1020/07/VAZ	750	900 x 1600	1020	1800 x 2500 x 1800	80	400 V 3/N
SU 1050/07/VAZ	750	1100 x 1100	1050	1800 x 2800 x 2200	8421	400 V 3/N
SU 1810/07/VAZ	750	1100 x 1900	1810	2000 x 3100 x 2200	105	400 V 3/N

Continuous furnaces

Horizontal operation

Customised furnace sizes | Individual loading solutions

Stainless steel interior/exterior | Cooling | Hinged or lift door

Continuous furnaces

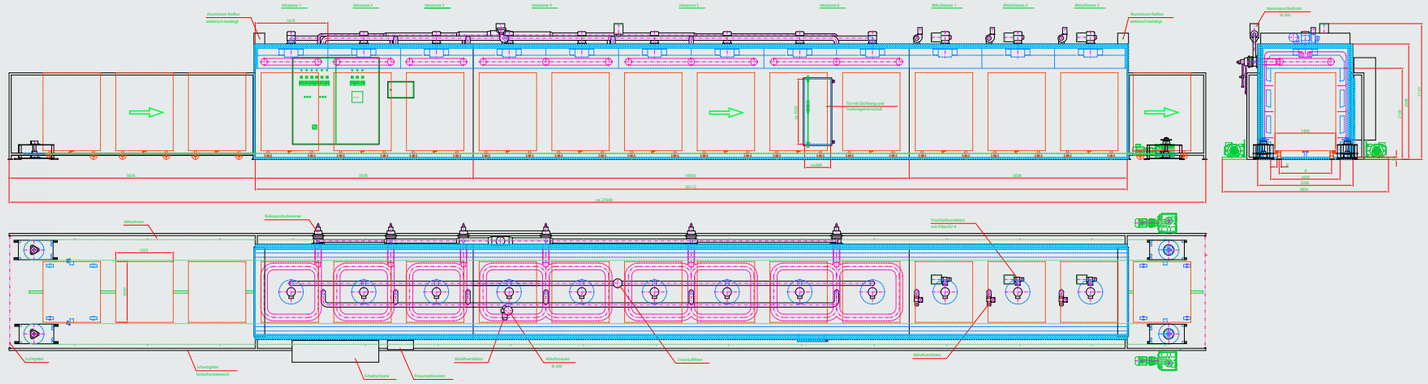
Continuous furnace for loading with standardised transport trolleys. The trolleys are manually loaded into the furnace, while the furnace is automatically loaded and unloaded in cycles. The number of trolleys in the tempering zone depends on the throughput. Different numbers of cycles and cycle times can be achieved.

The system is equipped with a downstream cooling zone, which is automatically loaded during the cycle.

Cooling is possible with active recirculation cooling or only by fresh/exhaust air exchange.

Trolley weights up to 400 kg. Digital batch tracking with temperature data recording, network connection optional.

Furnaces in excess of 30 metres in length are used.



Continuous furnace

with workpiece carrier

Linear continuous furnace for fully automated production with one workpiece per carrier. The furnace system is used for preheating processes prior to joining or for aging. The part weight is 45 kg.

Continuous furnace

with three passage sections

The furnace system has 3 continuous lines for heating, with accumulation conveyor and separator in the heating chamber and 3 return lines for cooling the parts as well as batch separation before feeding into different lines according to product ID and the resulting required process.

The furnace system is used for preheating before joining or for tempering. Fully automatic production with one workpiece on a carrier. Part weight 45 kg.

Continuous furnace

Large-scale plants

This system is used in the automotive industry and consists of 4 sections, „loading zone“, „heating zone“, „cooling zone“ and „unloading zone“. The charge baskets are loaded by forklift truck in the loading zone at the beginning of the passage section, up to 2 baskets on top of each other. The drive unit consists of a total of 16 independently driven sections to allow fully automatic, independent movement of the individual baskets. This ensures full independent utilisation of the system.

Basket weights of up to 500 kg and a total furnace load of 4 tonnes are possible, the total length is approximately 16 m.

After tempering, the batch is automatically transported to the cooling zone. It is then transferred to the unloading zone and removed manually by forklift. The following batches are then prepared automatically in stages.

Continuous furnace

for preheating

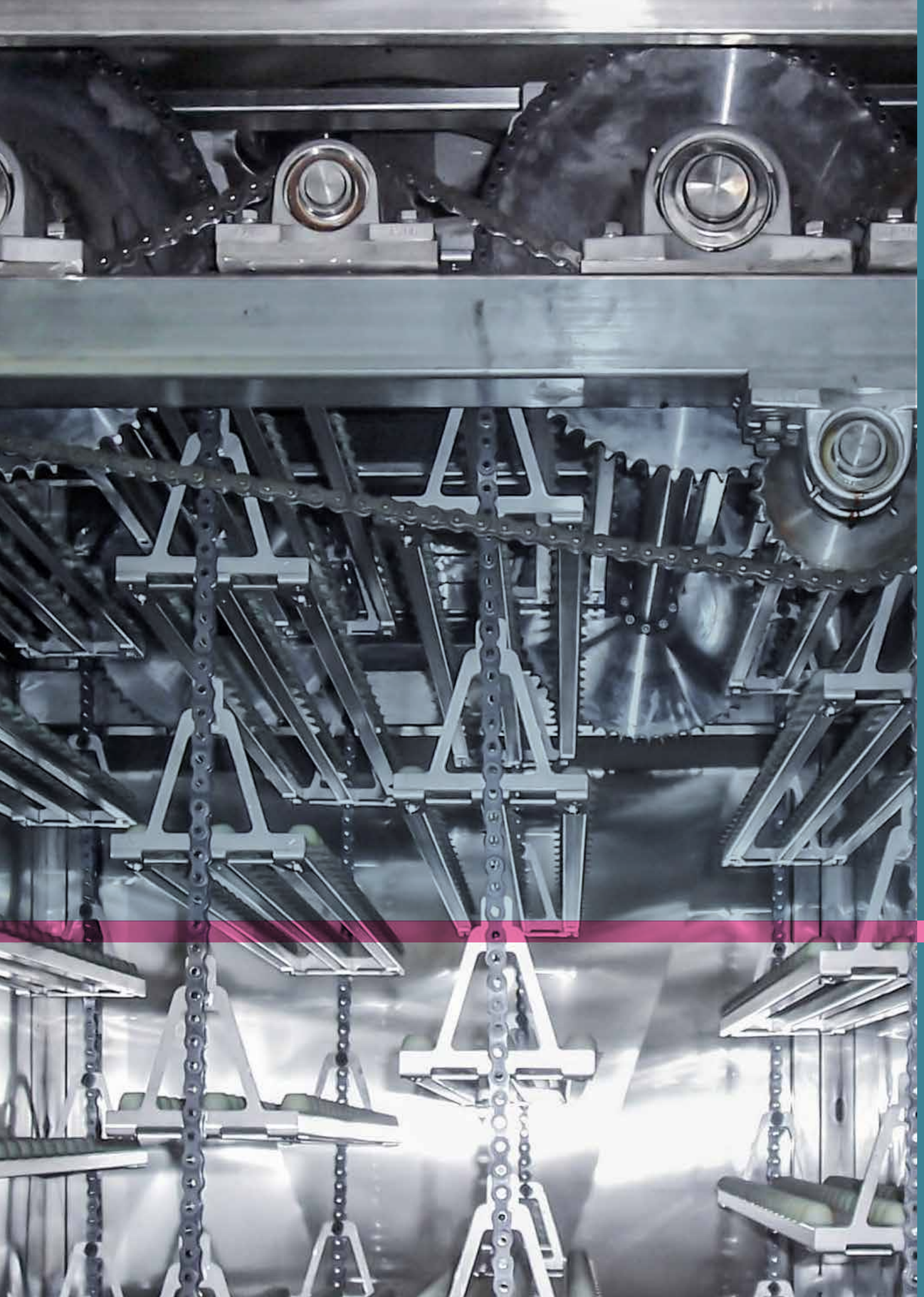
The furnace system is used to preheat the gears before pressing. The wheels are checked for a minimum temperature of 170°C using a pyrometer before leaving the furnace. A robot is used for loading and unloading.

Continuous furnace with a length of 20 metres for unloading. Components are positioned on charging trolleys. The batch trolleys are driven by a chain.

Continuous furnace

with rolling door

The continuous furnace is used to remove aircraft components from storage. The furnace is part of a production line. The assembly trolleys are fed into the furnace via a conveyor at the rear of the furnace. After heat treatment, the assembly trolleys leave the furnace at the front for further processing. The furnace system has space saving roller doors.



Paternoster furnaces

Customised furnace sizes | Individual loading solutions
Integration into the flow of goods through appropriate automation
Stainless steel interior/exterior | Cooling function

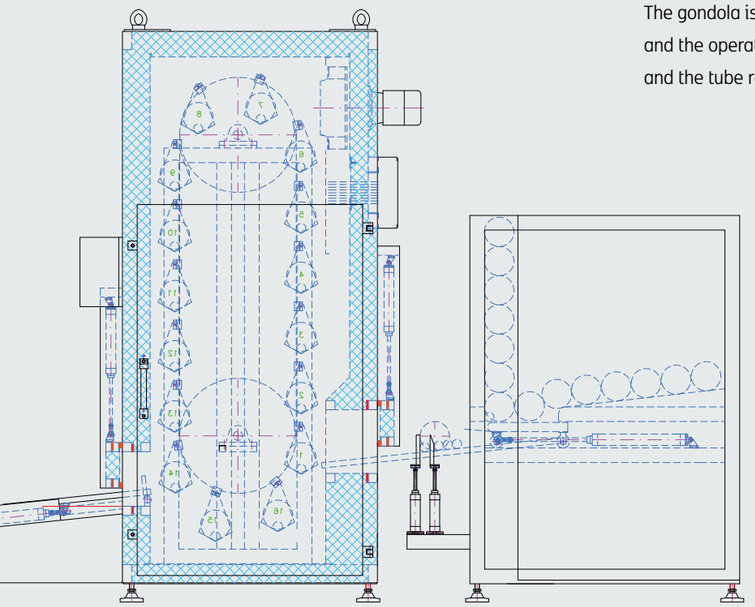
Paternoster furnaces

Paternoster furnaces are used when there is limited space available for an furnace. Paternoster furnaces are built from the top down, providing a space saving alternative, and are available as gondola or tray paternosters. In the gondola design, the carriers remain mounted on a chain within the furnace system. In the tray paternoster design, the workpiece tray can be moved out of the furnace system. Direct connection e.g. to a cooling section is possible.

Gondola paternoster for tube annealing

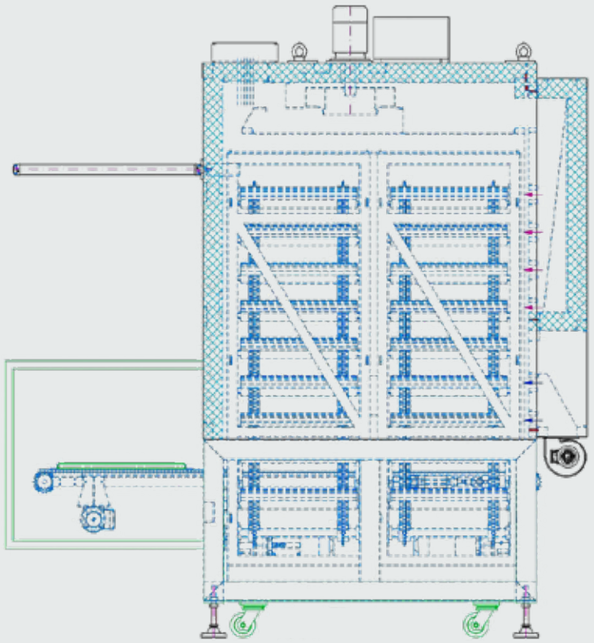
The furnace system is designed to preheat tubes. Tubes are automatically fed into the furnace by a separator, passed through the furnace and offered to an operator at the batch exit for further manual processing.

The gondola is unloaded after the cycle time has elapsed and the operator has given the go-ahead. The door opens and the tube rolls out.



Paternoster furnace for component drying

The pallet or tray paternoster furnace is an integral part of a production process for drying and preheating components for subsequent coating in the injection moulding process. The complete trays are loaded manually.



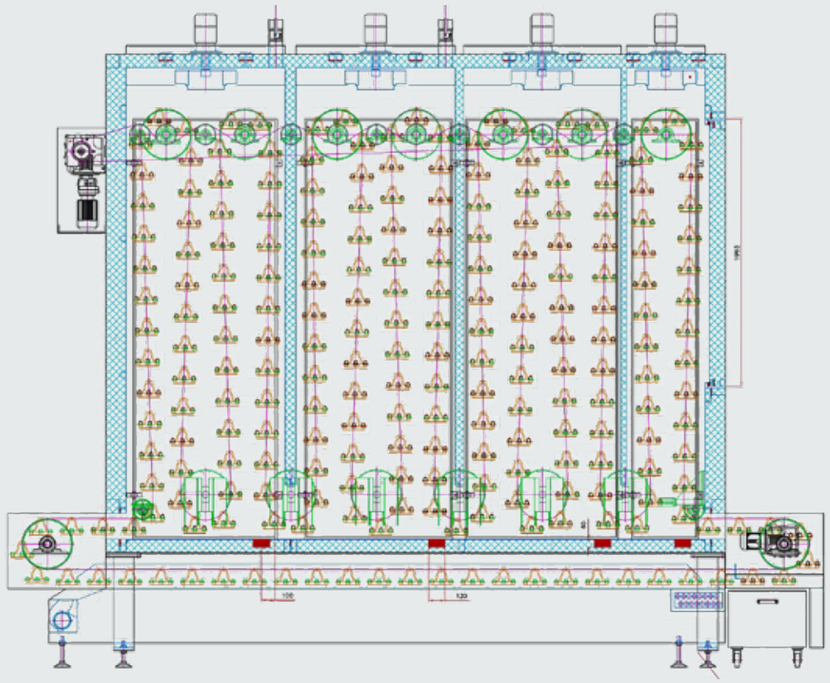
Multi-chamber paternoster

These paternoster systems are fully integrated into an automation system. 18 furnaces run 24/7 with only one week of maintenance per year.

The key design challenge was to create a mechanical system that could withstand continuous operation.

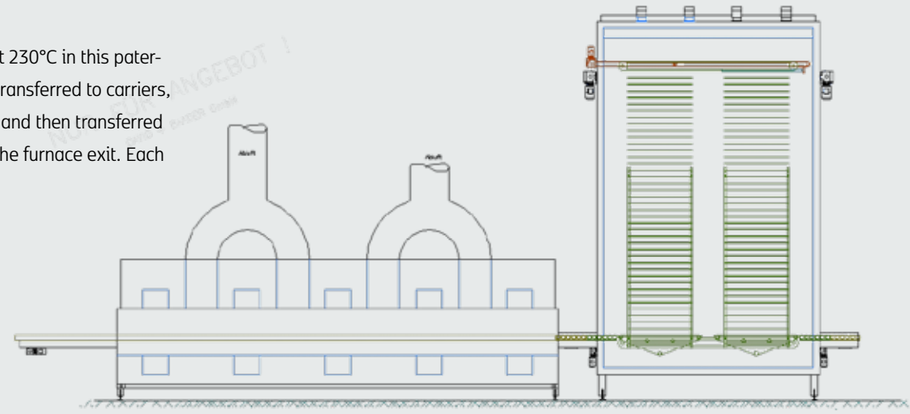
The system is a multiple meander gondola system. This provides a long dwell time in the system and is also used to separate the tempering zones due to the spatial structure.

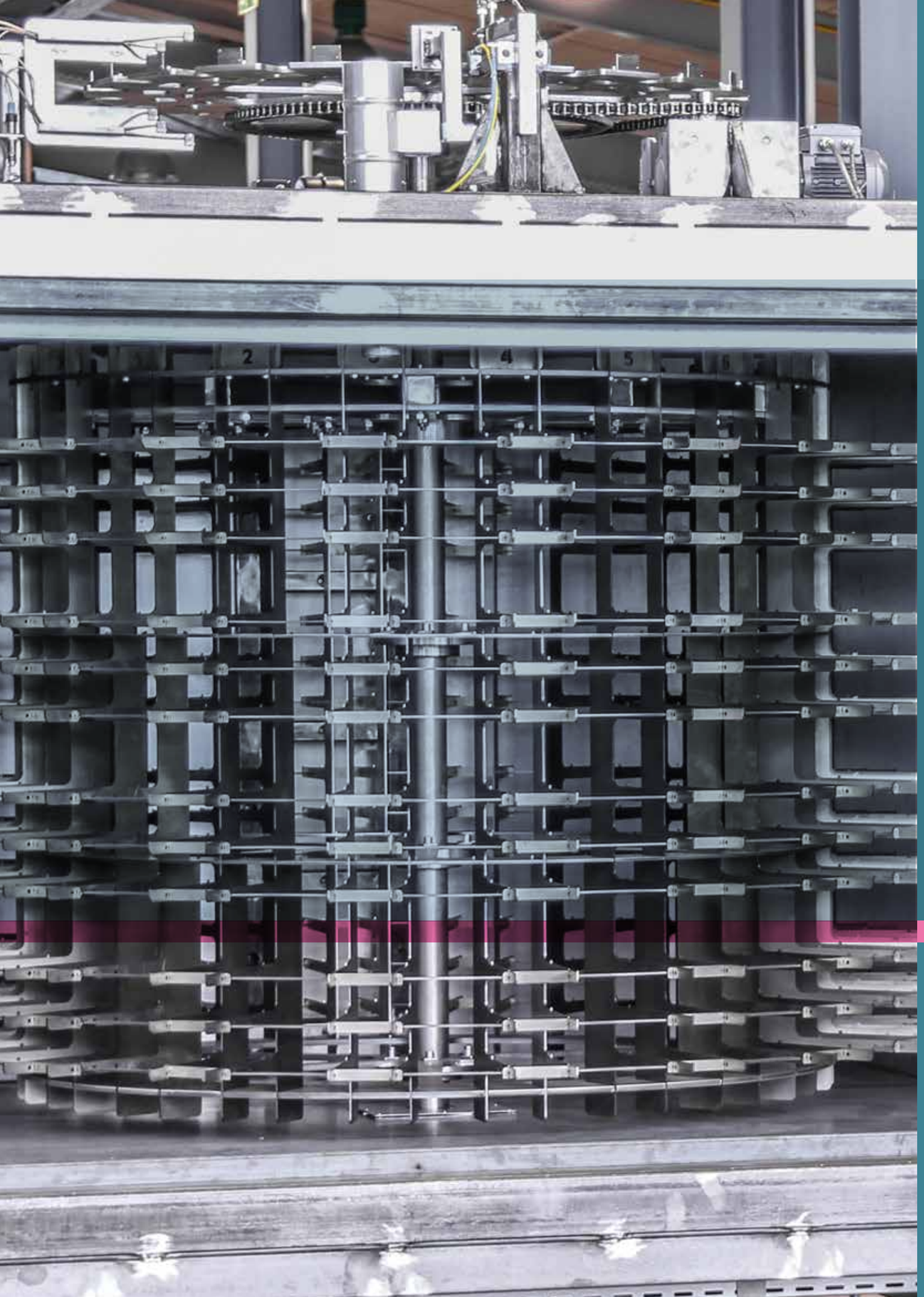
The system is loaded and unloaded by industrial robots.



Paternoster furnace with cooling section

Batches are heat treated at 230°C in this paternoster furnace. Plates are transferred to carriers, cycled through the furnace and then transferred to the cooling conveyor at the furnace exit. Each tower holds 2 tonnes.





Turntable furnaces

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Customised furnace sizes | Individual loading solutions

Integration into the flow of goods through appropriate automation

Stainless steel interior/exterior | Cooling function

Turntable furnace

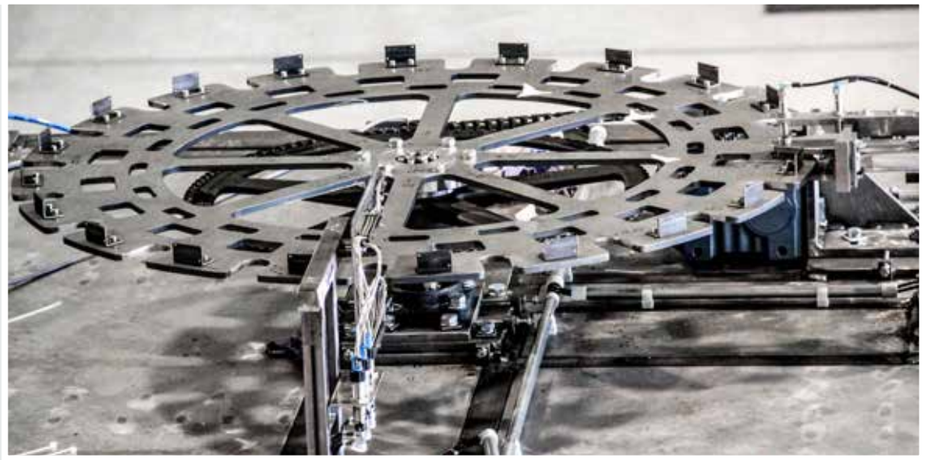
KT 700/02/A-CR

Turntable furnace with a total of 12 chambers on two levels for application temperatures between 150 – 180 °C.

The furnace is equipped with two pneumatically operated lift doors, each opening up and down, to remove preheated parts independently from the upper or lower chamber and to minimise temperature loss.

Turntable furnace

with 12 levels



In this turntable furnace, rings are placed in the furnace in 6 second cycles. The furnace has 12 levels with 20 bays each, i.e. 240 bays. Each space is uniquely identified by the pitch circle and the RFID memory mounted on it.

The positioning accuracy of the rotary axis and the 12 levels corresponds to the accuracy required by the robot used for loading and unloading.

Turntable furnaces

KU series convection chamber furnace with manual turntable for preheating aluminium sheets to be processed individually. The turntable is rotated mechanically by the closing movement of the door.

Turntable furnace with automatic

Turntable furnace for heat treatment of components with automatic loading and unloading by an industrial robot

Turntable furnace for heating components

This turntable furnace is loaded and unloaded manually. Components are heated before moulding. The turntable unit has two levels and a nominal 16 positions on each level. The layout is flexible and can be changed at any time. The system is not mechanically linked, but uses a servo motor so that the step angle (on the control panel) can be changed via software - depending on the part dimensions.

Drawer furnaces

Customised furnace sizes | Individual loading solutions
Stainless steel interior/exterior | Cooling function

Drawer furnaces

Overview

For flat, horizontal materials, drawer furnaces are an ergonomic and space-saving solution.

Drawer furnaces offer space for a large number of components in a small area.

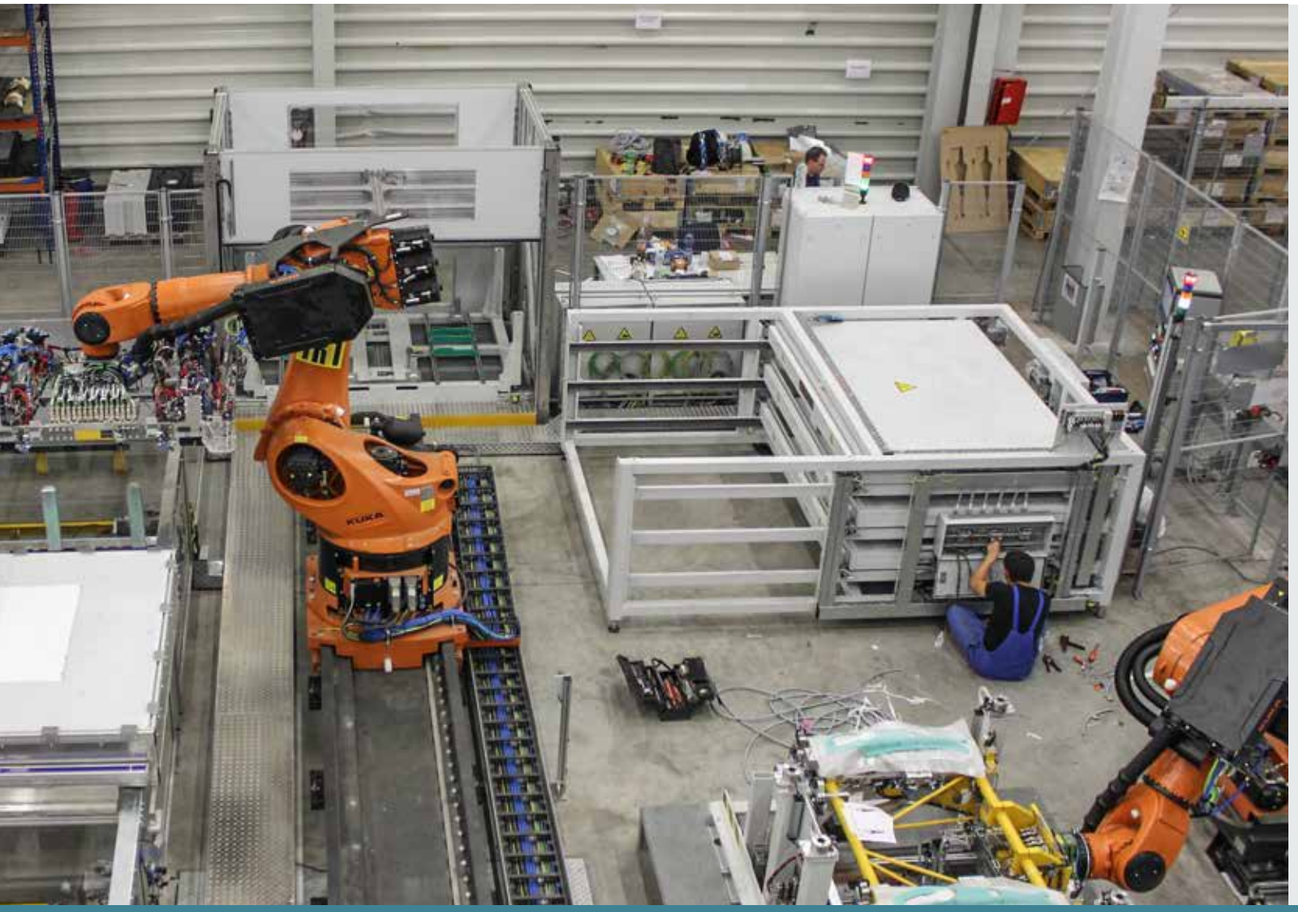
Constant residence times and FIFO principles can be implemented using timers, lights or mechanical locks. This prevents the introduction of untempered parts into the next process step. It is also possible to automate the loading and unloading of the drawers.

Drawer furnaces are available in a variety of designs. In the most common design, each drawer has a front panel. Other versions have an furnace door with drawers behind it.

Furnaces with double-leaf doors for independent time sequences with common heating and circulating air. With pull-out shelf for easy loading

Drawer furnace

with automatic loading



The furnace system has three drawers. Component loading and unloading is automated. The loading robot is equipped with a special vacuum gripper. The drawers open automatically.

Drawer furnace

The furnace systems shown here are used for internal transport between two production stations. The components are first dried and preheated to 90° C in the pre-production stations. After filling, the furnaces are moved to a further processing station. In the second production step, the pre-heated components are removed from the furnaces, coated and returned to the furnaces for reheating. The use of the furnaces for internal transport between the production stations provides optimum flexibility in the customer's layout.

Tempering plants

Solution annealing | Quenching | Artificial ageing

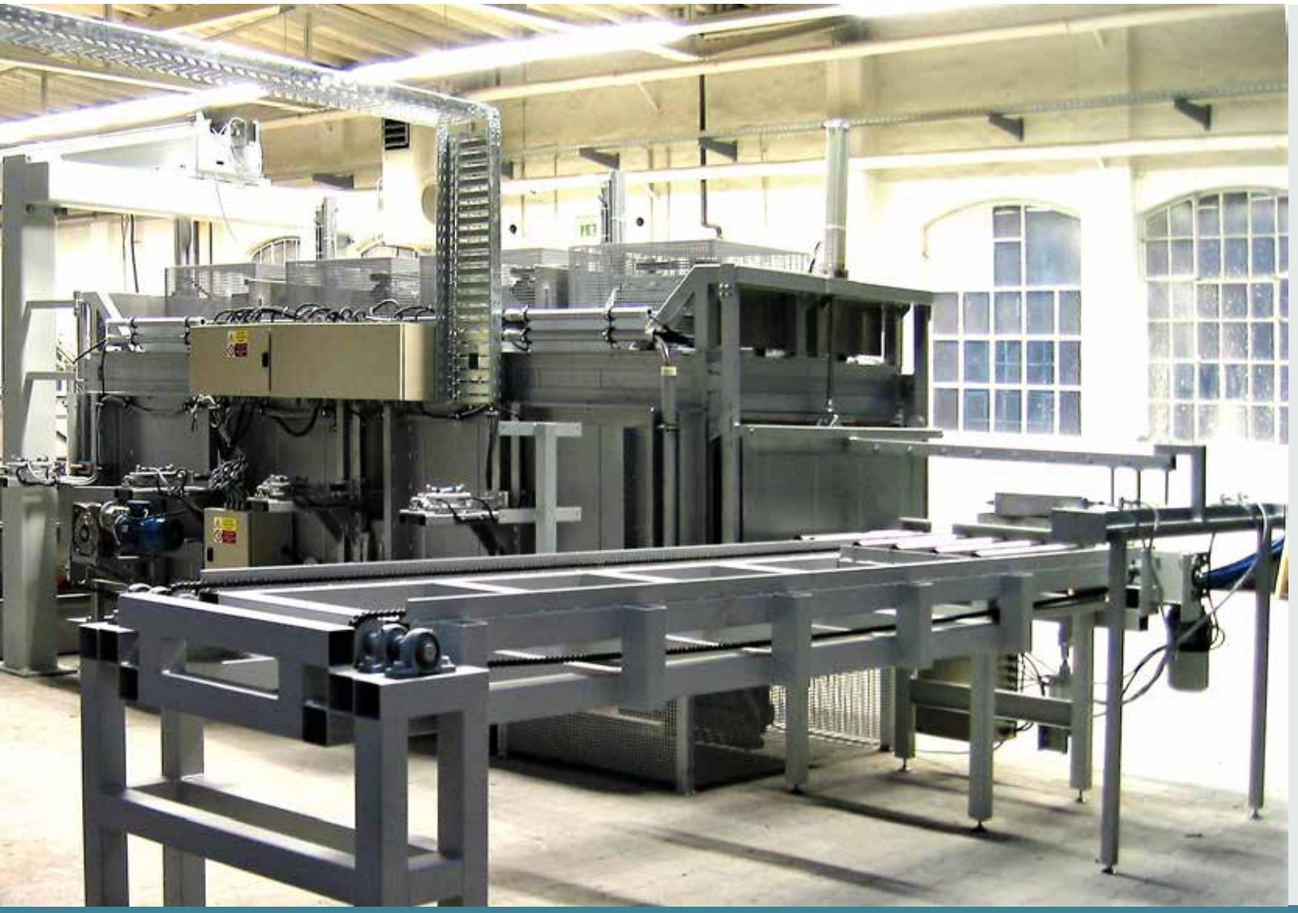
Vertical or horizontal charge transport

Fully automatical heat treatment systems

Process documentation according to NADCAP, AMS, CQI-9

Tempering Systems

Overview



THERMCONCEPT quenching and tempering systems are used for solution annealing, quenching and artificial ageing of aluminium components in processes T1 – T9.

Design of the systems

The design of the systems is tailored to the specific component and process requirements:

- Tempering systems with vertical or horizontal charge transport
- Tempering systems with fixed or mobile furnaces
- Mobile or stationary quenching tank, also with installation in a pit
- Systems with multiple furnaces, different baths and different batch storage locations
- Systems for manual operation up to fully automated heat treatment lines
- Furnace systems usually with electric heating, alternatively also available with direct or indirect gas heating

The furnace systems are characterised by very high temperature accuracy and fast batch transport. Temperature ranges are between 80°C and 600°C, with an optional extension to 850°C.

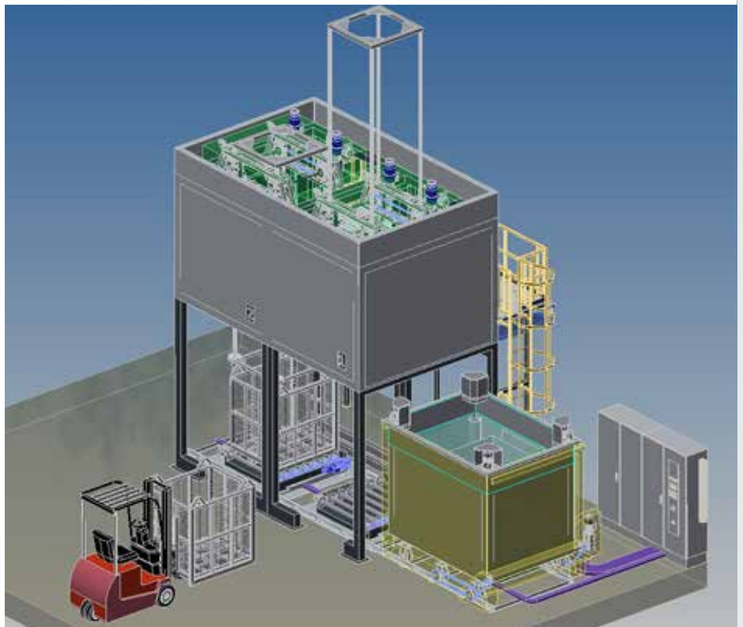
The system is normally controlled by a PLC. All movements can be fully automated.

Process documentation is in accordance with NADCAP, AMS, CQI-9 and optionally with batch identification systems.

THERMCONCEPT heat treatment systems are used in the aerospace, automotive, forging and foundry industries.

Tempering Systems

Overview



Tempering systems are designed on the basis of different furnace systems:

Tempering systems based on chamber furnaces

- Horizontal charge transport
- Manual batch handling by forklift truck
- Automated batch handling by traversing unit or robotic system
- Water quenching bath placed in front of the furnace

Tempering systems based on pit-type furnaces

- Vertical charge transfer
- Manual charge handling by overhead crane
- Automated batch handling by lifting conveyor
- Water quenching bath located next to the furnace

Tempering systems based on bogie hearth furnaces

- Horizontal and, with elevated furnace, vertical charge transfer
- Manual charge handling by overhead crane
- Automated batch handling by means of a lifting conveyor
- Water quenching bath in front of the furnace

Tempering systems based on continuous furnaces

- Horizontal charge transport
- Automated batch handling by conveyor system
- Water quenching bath located at the exit of the solution annealing furnace
- Versions with integrated or separate ageing furnaces

Tempering systems based on drop-bottom furnaces

- Vertical charge transport for very short quenching times
- Automated charge transfer via lift conveyor
- Fixed or mobile drop bottom furnaces
- Versions with fixed or mobile quenching baths under the furnace
- Optionally equipped with loading and unloading bays

Tempering systems

Drop-bottom furnace system

Tempering systems

Drop-bottom furnace system

Heat treatment plant for aluminium parts with a quenching delay time of ≤ 7 seconds.

This heat treatment plant is designed for solution annealing and ageing of aluminium parts and consists of an electrically heated circulating air drop bottom furnace for solution annealing between 500°C – 600 °C with integrated water bath and a circulating air chamber furnace for ageing between 100°C – 200 °C.

Plant control and process documentation is carried out according to CQI-9.

After the basket with components has been placed in the charging frame of the furnace, the operator closes the safety door and starts the heat treatment process by pressing a button. After that, all subsequent process steps up to process step 5 run fully automatically. The furnace system is equipped with all relevant safety features for fully automatic operation.

PROCESS STEP 1:

- Initial position of the furnace: Furnace is open, charging frame is in loading position
- Operator opens the safety door manually

PROCESS STEP 2:

- A forklift truck places the basket on the charging frame
- Operator closes the safety door manually and starts the process

PROCESS STEP 3:

- The charging frame with basket is pulled up into the solution annealing furnace.
- Furnace bottom moves forward and closes the furnace
- After closing the bottom, the furnace starts the programmed heating cycle.

PROCESS STEP 4:

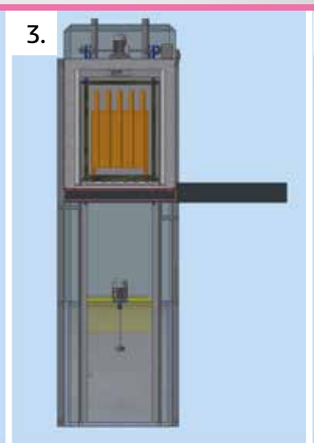
- At the end of the heating cycle, the furnace floor moves back and opens the furnace
- Charging frame with basket sinks into the water bath below

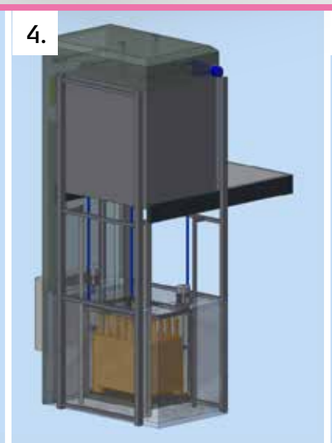
PROCESS STEP 5:

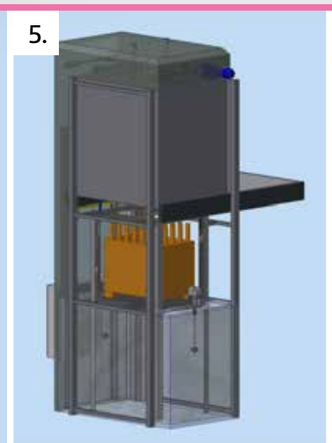
- After quenching, the charging frame with basket is raised to the loading/unloading position
- In this position, the water drips out of the load

PROCESS STEP 6:

- Operator manually opens the safety gate
- A forklift truck removes the basket from the charging frame of the solution annealing furnace.
- The basket is then placed in the ageing furnace.
- The solution annealing furnace is ready to receive the next batch.







Tempering systems

Drop-bottom furnace system

This fully automated system is used to heat treat aluminium components for the automotive industry. The system is based on drop-bottom furnaces, which are used whenever short quenching times are required.
The system consists of two identical drop-bottom furnaces for solution annealing, a stationary water bath and several ageing furnaces.

A charge basket is provided at the charging position. The drop bottom furnace moves over the basket and draws it into the furnace chamber. Solution annealing is started after the furnace bottom is closed. After the selected holding time at working temperature, the drop-bottom furnace moves over the water bath. The quenching process is initiated by opening the furnace bottom.

The basket is lowered into the quenching bath below by means of a lifting unit integrated into the furnace. After quenching, the basket is pulled back into the furnace by the lifting mechanism. The furnace moves to a storage position and deposits the batch basket. From here the basket is transferred to one of the available ageing furnaces.

Tempering systems based on drop-bottom furnaces are designed to meet specific customer requirements and can be supplied in several variants:

- Tempering systems with a fixed drop-bottom furnace and the quenching bath positioned underneath.
- Tempering systems with a fixed drop-bottom furnace and a moving water bath
- Tempering systems with several mobile drop-bottom furnaces and one or more fixed or mobile quenching baths.
- The facilities can be supplemented with staging and parking areas.
- Movement can be semi-automatic or fully automatic
- Documentation is in accordance with relevant aerospace and automotive standards such as AMS 2750 or CQI-9.

The plant consists of the following components:

Drop-bottom furnaces with air circulation for solution annealing

The drop-bottom furnaces have a volume of 1100 litres and can be operated flexibly up to 650 °C. Each furnace has a horizontally movable bottom and an integral drive for vertical lifting and lowering of the charging basket.

For quenching, the entire furnace is motorised over the quenching bath.

After opening the floor, the basket is lowered into the water bath.

Stationary water quench

The water bath is installed between the two drop-bottom furnaces. In order to minimise the height of the drop-bottom furnaces, the quenching basin is embedded in the floor of the hall. The water bath is equipped with a cooling unit and a water circulation system. The water temperature in the quenching basin and the temperature rise during quenching are continuously recorded and documented.

Air circulating chamber furnaces for aging

After quenching, the batch basket is placed in a storage position and manually moved to one of the available aging furnaces.

The aging furnaces are similar in size to the drop-bottom furnaces but are adapted for manual charging from the front. The maximum operating temperature is 450°C.

Due to their independent installation and operation, the furnaces can also be used to temper steel components after hardening from the adjacent steel tempering line.

Tempering systems

Continuous furnaces system

Tempering systems

Continuous furnace system

This fully automatic furnace system is used to heat treat high performance pistons for car racing engines. The system consists of a batch feeder, a 4-chamber continuous furnace, a traversing unit with horizontal and vertical working areas, a double quenching bath, a cleaning basin and a storage area. Tempering takes place in separate chamber convection furnaces. The entire process is fully automated, from the preparation of the batch baskets in front of the furnace to their placement in the storage area.

Batch Feeding

- The batch feeder consists of a batch table, an infeed table and a cross conveyor.
- The baskets are manually placed on the batch table.
- The batch table holds 4 annealing baskets. Automatic transport of the baskets on the infeed table
- The prepared batch basket is moved from the charging table into the furnace, while the next batch basket is pulled from the batch table to the furnace entrance.

Detailed descriptions can be found on the next two pages.

Solution Annealing Furnace

- The continuous furnace is designed for T max. 650° C.
- The furnace system consists of 4 chambers separated by partitions. Each chamber can be controlled separately.
- Heating to 580 °C takes place in the first chamber.
- When the set temperature is reached, the charge basket moves automatically into in chamber 2, one of the two holding chambers.
- After a dwell time, the basket moves to chamber 3, the second holding chamber.
- After the set holding time at working temperature, is reached the basket moves to chamber 4, the removal chamber
- The basket in chamber 4 is waiting to be removed.
- When the furnace door is opened, the basket automatically moves to the transfer position at the furnace exit. Here the manipulator takes over the basket for further transport to the quench tanks.

Tempering systems

Continuous furnace system

1. Double quenching tank

- The solution heat treatment system consists of a double quenching tank for two different emulsions.
- Both quenching tanks are equipped with a heating system, a circulation pump and a swivelling shower. with a spray device
- The quenching unit can be moved on rails and is located in a sump which can absorb the entire contents of the bath in the event of a leak.
- A drain is fitted to both sinks.
- The quenching system is made entirely of stainless steel.

2. Cleaning basin

- The cleaning basin is stationary and is also located in a sump.
- The sink has an air bubble system.
- The entire system is made of stainless steel

3. Manipulator

- After solution annealing in the continuous furnace, the baskets are automatically transferred by a manipulator.
- The manipulator, suspended on a running rail, picks up the basket at the transfer position and carries out the quenching process in one of the two water baths.
- After quenching, the basket and the parts are washed in a cleaning bath.
- The manipulator then places the basket on a storage table. The storage table has Rollers for the further transport of the baskets
- The storage table is equipped with limit switches for occupancy detection.
- From here the baskets are picked up manually and transported to the multi-chamber ageing furnace.

4. Ageing furnace system

- The curing plant is equipped with 2 identical 4 chamber convection furnaces for a maximum temperature of 260°C for curing.
- Each chamber can be controlled separately and is designed to hold 2 charging baskets one above the other.

1.

2.

3.

4.

Tempering systems

Chamber furnaces system

Tempering systems

Chamber furnace system

Electrically heated chamber furnace with 4 m³ volume up to max. 900°C for solution annealing of aluminium and hardening of steel, 200 kW output with underfloor quenching tank and connected recooling tower.

Electric convection chamber furnace with 4 m³ volume up to max. 550°C for ageing aluminium and tempering steel, 110 kW output.

Electrically movable manipulator for horizontal loading and unloading of the furnaces and for vertical quenching in the underfloor water basin.

Tempering systems

Chamber furnace system

The semi-automatic quenching and tempering system is designed for solution annealing followed by quenching and ageing of aircraft aluminium components with a quenching time of 7 seconds.

Process flow

The process flow is semi-automatic. First, the charge basket containing the components is pushed into the solution annealing furnace via a roller conveyor. A pivotable section of the roller conveyor allows for connection to the open furnace.

After the specified dwell time in the furnace, the operator opens the furnace door by pressing a foot switch at the water bath. The furnace door opens, and the operator uses a pull hook to move the charge basket over the roller conveyor onto the quenching rack until it reaches a stop.

The system is equipped with light barriers. Once both light barriers confirm that the basket is correctly positioned on the quenching rack, the rack automatically lowers into the water bath. The pull hook is also automatically released. The quenching time is 7 seconds.

The dwell time of the basket in the quench bath can be set via the furnace control. At the end of the programmed dwell time, the basket returns to its original position above the water bath.

The operator can now manually move the basket into the drying station via the roller conveyor. The drying station fan starts automatically. The drying time can also be programmed.

When the drying process is complete, the operator pulls the basket back onto the loading grid and moves the basket to the opposite ageing furnace. The ageing process takes place at approximately 180°C.

If no removal process is required, the basket with the dried parts can be taken directly to a storage area.

The next basket of untreated aluminium parts is then collected from a staging area.

Tempering systems

Chamber furnace system

The annealing system consists of the following components:

Solution annealing furnace model KU 270/06/A

This tempering system is based on two identical convection chamber furnaces for T max. 650 °C with pneumatic lifting door. The two furnaces are positioned opposite each other. The parts are charged in customised charging baskets.

Water quenching bath with pneumatic lifting device

Quenching takes place in a water quench bath equipped with a pneumatically operated lifting grate. The lifting grate is fitted with stainless steel ball rollers to move the charging basket above the water bath. The water quenching bath is mounted on rails and can be moved between the two furnaces.

The water quenching bath has a chiller, heat exchanger and circulation pump. The water temperature is continuously monitored. The cooling water is pumped through the heat exchanger to keep it constantly cooled. The system components are matched to ensure precise process cooling and energy efficient operation.

Drying station

A drying station with a powerful blower is located between the two furnaces. Parts removed from the water bath are blown dry. The drying station has a stainless steel roller conveyor and is equipped with a water collection tray. It is automatically switched on and off by the system control.

Aging furnace model KU 270/06/A

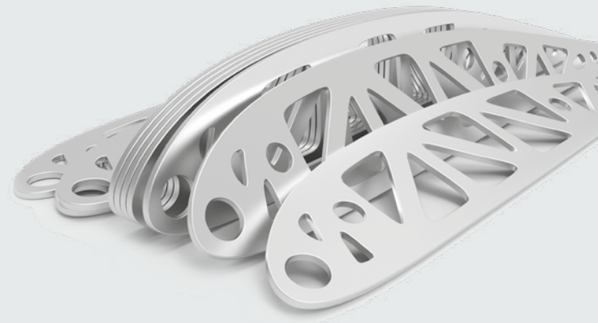
The second circulating air chamber furnace is mounted on the opposite side of the tempering system to save space and is integrated into the tempering process. Depending on the application, this furnace can be used as an ageing furnace or as a solution annealing furnace.

Charging Stations

The system can be supplemented with various storage locations for the batch or baskets. Any number of finished batch storage locations can also be integrated.

System Control

The system is controlled by a Siemens PLC S7 with touch panel and various options for data tracking and archiving with full documentation according to AMS 2750 E.



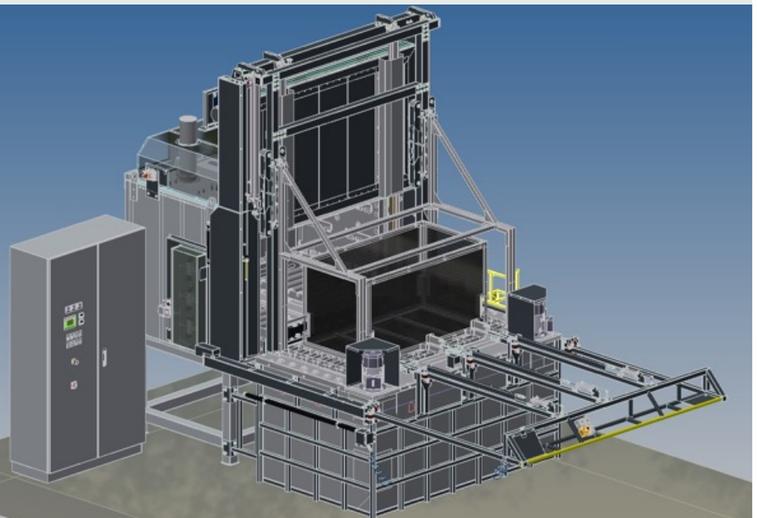
Tempering systems

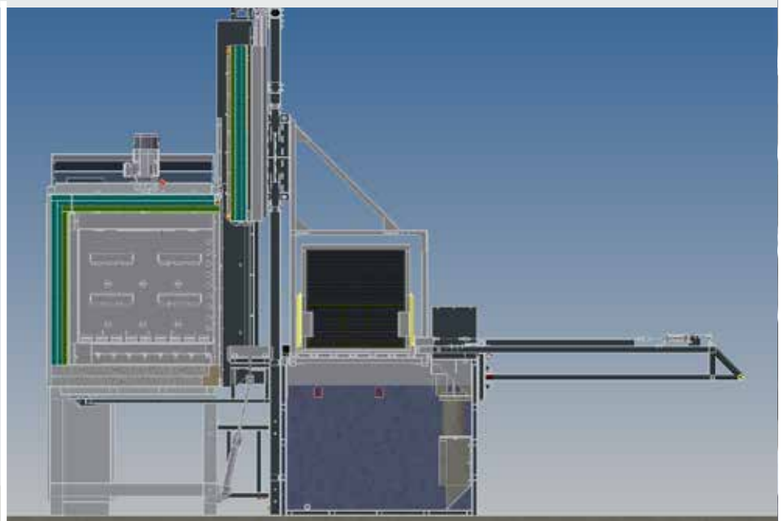
Chamber furnace system

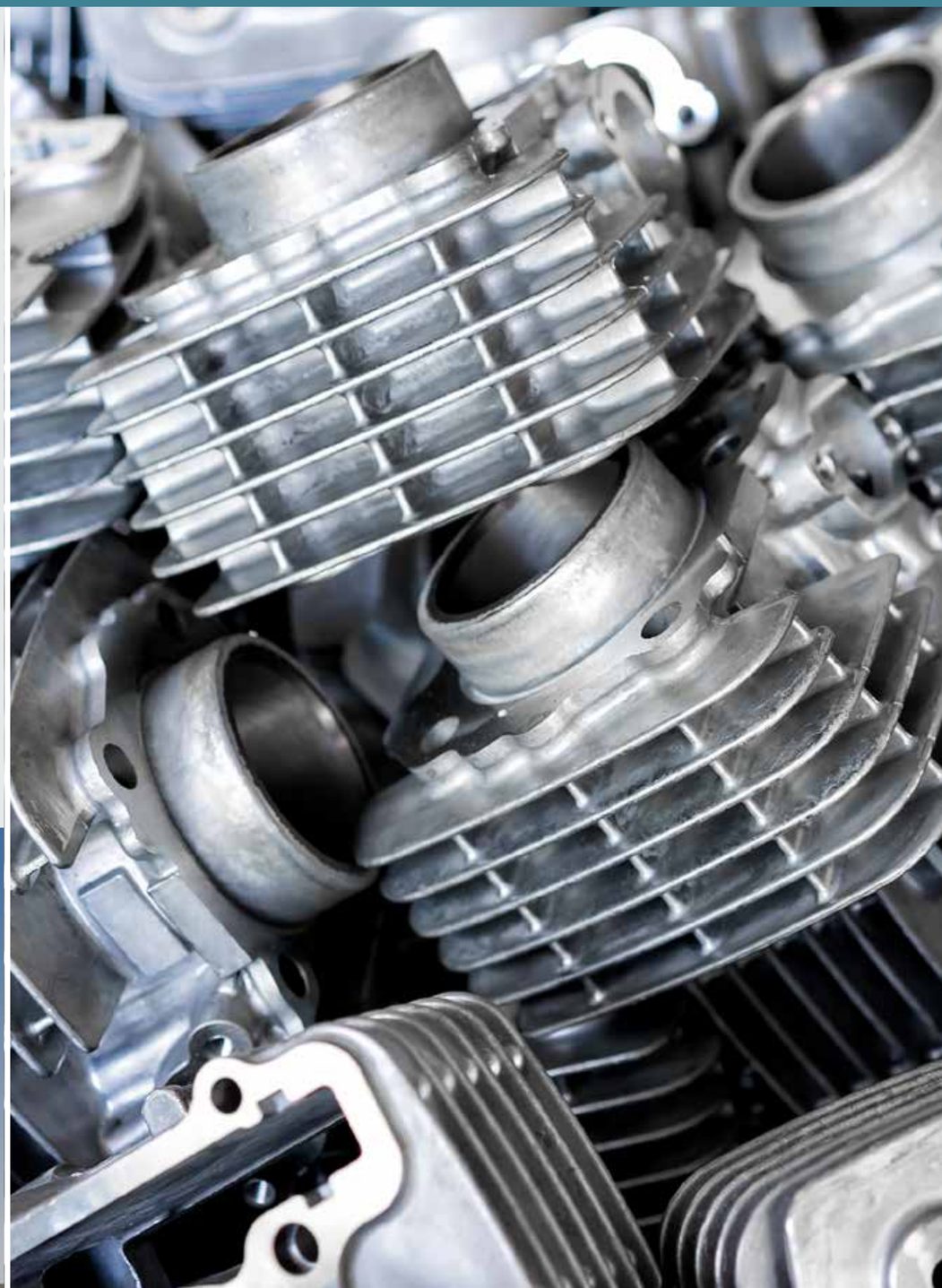
Semi-automatic tempering system KM 1700/06/AS

Furnace system with semi-automatic basket movement and water quenching bath

- Furnace system for heat treatment of structural components in the aerospace industry.
- Furnace designed for batch dimensions of 1500x800x800 (mm). The working temperatures are 430 - 500 °C.
- Batch basket loading and unloading by means of a loading table mounted on the side of the furnace, Automatic centring devices in front of the furnace chamber.
- Manual movement of the charge basket in front of the furnace on a ball roller table using a handrail with lateral guidance. Telescopic slides ensure safe and smooth handling.
- After removal from the furnace, the basket is placed over the water bath and automatically lowered when the stop contact is released. Lifting the basket after the quenching process is is done with a push button. The basket then returns to its original position above the water bath. The charging basket is then removed via the side loading or unloading table.
- Safety fancing around of the entire working area of the system, the operator stands outside the fenced area, access door to the working area with safety switch.







System peripherals

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Plant automation

Quenching and cleaning baths

Energy efficiency concepts

Quenching baths

The need for automation in all areas of industrial production is constantly increasing. THERMCONCEPT complements furnace systems with integrated systems

- for loading and unloading products onto charge carriers, tables and trolleys outside the furnace
- with systems for direct loading and unloading of an furnace chamber
- for the transfer of hot and cold products after the process

These systems can be manually controlled, run as a function of the temperature process or fully integrated into the production process.

The following systems are used:

- Suspended transport systems
- Roller conveyors
- Automatic cross transfer systems for rail-mounted bogies
- Rail mounted linear conveyors
- Fully automatic loading and unloading systems based on 6-axis industrial robots

Automation is carried out in close co-operation with the user and the suppliers of the individual components.

Quenching baths

For various heat treatment processes, THERMCONCEPT supplies quenching baths, ranging from a 50-liter standard bath to custom-designed, freestanding special baths.

Water quenching bath

Quenching bath installed in a pit between two drop-bottom furnaces for solution annealing of aluminum components in the automotive industry.

For larger systems, baths are designed based on the process data and customised to the requirements. Loading racks and baskets combined with charging trolleys for easy loading and unloading are also available as well as water circulation systems for fast and uniform quenching and cleaning.

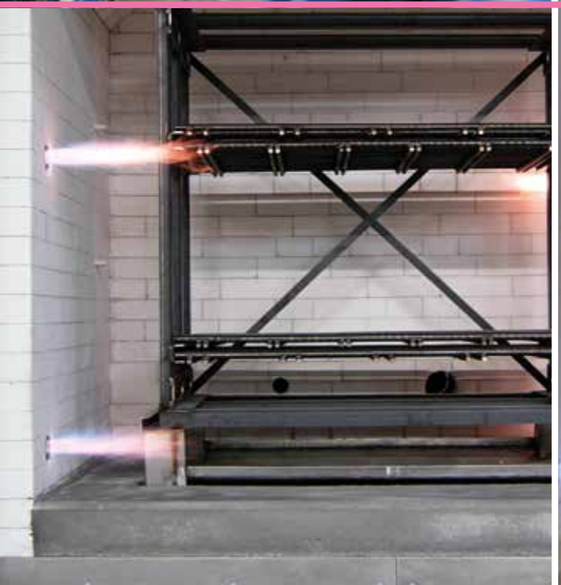
Quench bath

Capacity 2500 litres, including
3 pneumatic charging units, cooler,
2 agitators and extraction unit.

Double water quenching bath

for aluminium components after solution annealing, integrated into an intermittent throughput system.

Energy efficiency concepts



Gas-fired furnaces in particular generate large amounts of waste heat. The heat potential of the burner exhaust gases can be utilised for downstream processes, improving overall energy efficiency. The economic efficiency of the whole process increases.

Heat recovery in THERMCONCEPT industrial furnaces is achieved by means of heat exchangers. Air-to-air or air-to-water heat exchangers are used.

THERMCONCEPT supplies intelligent solutions for heat recovery that lead to significant savings in energy costs and also protect the environment.

The photo shows the heat recovery system for a gas-fired 6-chamber furnace with a heat output of 1800 kW. Heat is recovered via an air-to-air heat exchanger. The waste heat from the furnace is used to heat the production hall.

Energy efficiency concepts

for a two-chamber furnace

The principle

- The system is based on the exchange of hot and cold air between 2 furnace chambers.
- At the end of the heating process in the 1st furnace, the hot air is blown into the still cold 2nd furnace and the cold air is blown into the 1st furnace.
- This air exchange continues until the temperatures in both furnaces are equal.
- At this point, external cold air is injected into the 1st furnace to further reduce it to room temperature.
- At the same time, the 2nd furnace begins to heat up the preheated chamber via furnace heating system to max. process temperature.
- Continuous batch production is a prerequisite for energy savings of up to 50%.

Process description

1. Start of the cycle and first cycle run

- New baskets are moved into the right-hand chamber furnace by forklift truck
- Scanning the barcode to enter the batch data into the PLC
- Start of the 1st heating cycle in the right-hand furnace chamber
- In the meantime, new baskets with untreated batches are loaded into the left-hand chamber by forklift truck, and the barcode is scanned to enter the batch data into the PLC

2. Heat recovery

- As soon as the process in the right-hand chamber is completed, energy recovery starts automatically
- The heat energy is transferred from the right to the left chamber
- In this step, the heating in both furnaces is switched off
- This cycle step runs for a predefined time until thermal equilibrium is reached

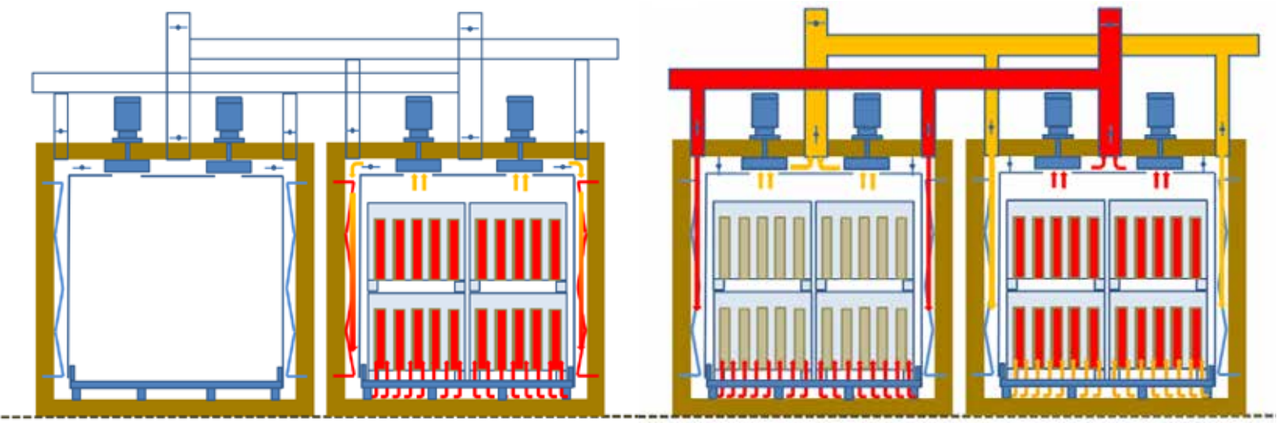
3. Finishing of heat treatment in the right chamber

- The heat treatment in the right-hand chamber is completed. At this stage, the finished products still have a temperature of 250 – 300 °C
- The furnace system now offers the following alternatives:
  a) Unloading of the hot batch and direct loading of the untreated crates for optimum energy efficiency
  b) Further cooling of the finished batch before unloading and transport to the next trans-shipment point (lower energy efficiency)

4. Running the next cycle

- While the heating cycle is running in the left chamber, the right chamber is ready to receive new and untreated crates
- As soon as the heating cycle in the left chamber is complete, energy recycling from the left to the right chamber starts automatically

1.



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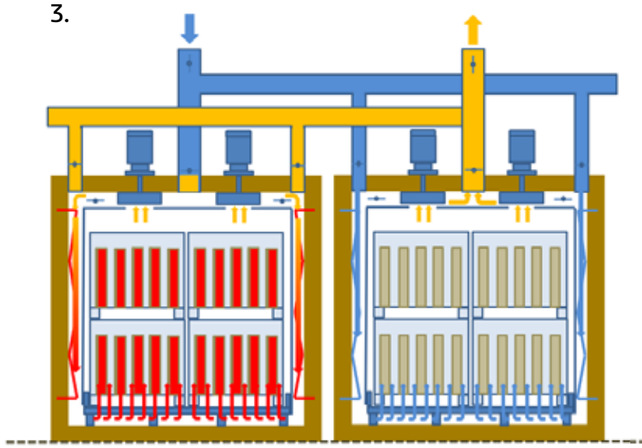

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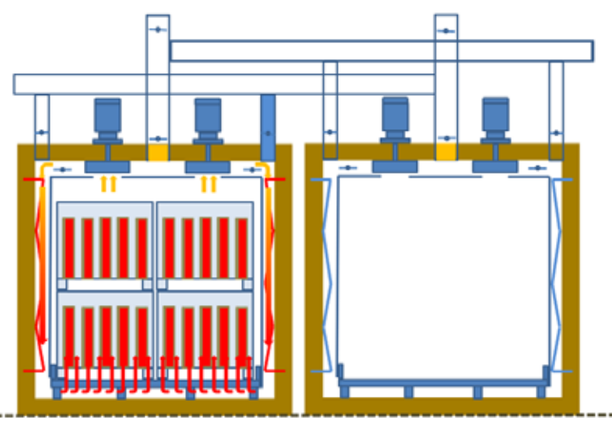


Process control & Process standards

Process control and documentation

Programm-controller

THERMCONCEPT furnaces are equipped as standard with control technology tailored to the application and furnace. Controllers from renowned manufacturers ensure extremely precise control of the processes. If required, the control technology can be expanded to include software for programming, monitoring and evaluation the processes. PLC controls with touch panels are also available as operator interfaces. Our furnace standard systems can also be supplied to factory standards and equipment specifications.

Furnace temperature control

Furnace control

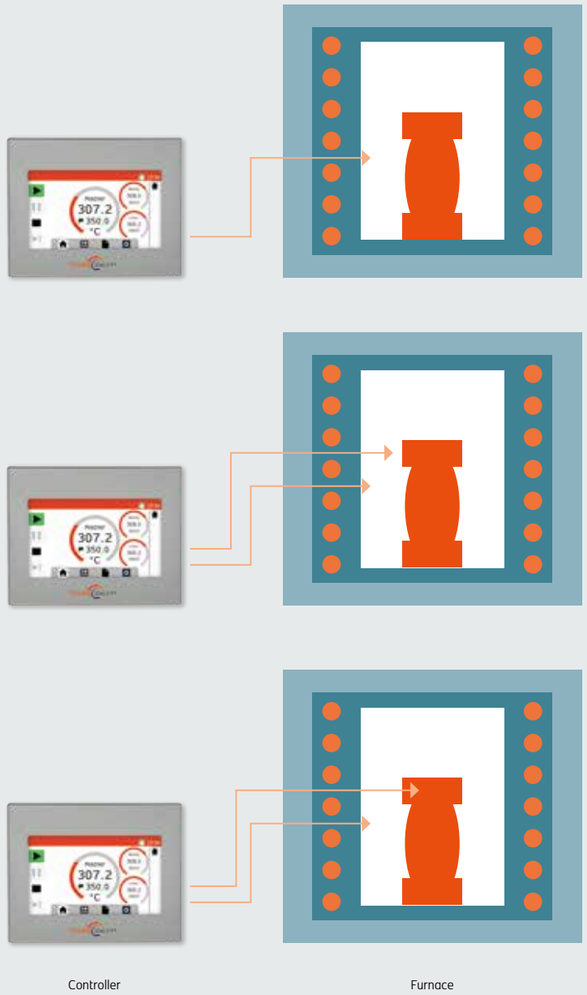
- Measurement at a mechanically protected point in the kiln chamber, which experience has shown to be a good average value for the control

Chamber control with batch measurement

- Independent display of measured temperatures
- For manual control of programmed temperature values
- No influence on the control

Batch control (cascades)

- Temperature measurement and control in the chamber and directly on the load
- Display of both temperatures
- Very accurate temperature control due to continuous balancing of chamber and charge temperature



Controller Furnace

Heating element control

Contactors

- Practice oriented switching frequencies, sufficient for many processes
- Inexpensive and efficient solution

Solid state relays (SSR)

- High switching frequency and therefore fast r esponse time for temperature control
- Wear-free and noiseless
- Cost-effective solution for higher control and temperature accuracy requirements
- Heater circuit monitoring with heater failure indication as an option

Thyristors (phase control)

- Extremely accurate temperature control
- Also wear-free and noiseless
- Smooth, constant power grid load, no power fluctuations, protection of heating elements
- Heater circuit monitoring with heater failure indication as an option

Eurotherm 3208/3216

- 1 programme with 8 segments (4 ramps and 4 dwell times)
- 1 extra function
- RS 485 interface and iTools software optional
- Optional multi-zone control

Eurotherm 3216i/32h8i

- Can be used as temperature setpoint monitor or adjustable temperature setpoint limiter
- Plain text alarm messages
- Can also be used as a fixed temperature indicator, with optional interface for documentation via iTools software

Eurotherm Nanodac

- Can be used as a programme controller/recorder combination for multi-zone or cascade control
- Clear colour display
- Freely programmable programme controller with 100 programmes of 25 segments each
- 4 freely configurable thermocouple inputs
- USB port for removable media, integrated flash memory
- Ethernet interface
- Includes software for programming, control and documentation

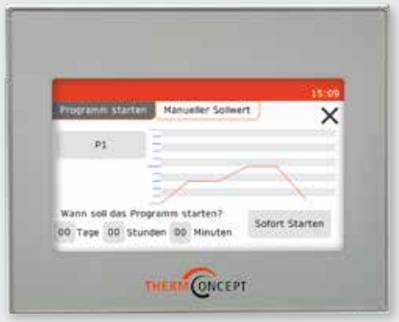
Programm-controller

THERMCONCEPT PID controller TCP 400 with 4.3“ and TCP 1000 with 10“ touch panel

- 200 programmes with 24 segments each
- PID programme controller with touch panel input
- Precise temperature control, self-optimisation
- Clear and intuitive operation largely language-independent via pictograms
- Up to 5 programme-controlled event functions / control contacts possible
- Resistive touch screen, operation also possible with gloves
- Programmes can be individually named with plain text
- Display of up to 3 operating states (depending on the furnace version)
- Graphic display of programme progress
- Language selection (GER, GBR, FRA, CZE, CHN, NED, ES, PT, IT)
- Alarm messages in plain text
- Real-time display with date and timer for up to 20 days lead time
- History display of the last 48 h on the display
- USB interface for reading out data history on USB stick integrated (plug-in socket optional)
- Ethernet interface for connection to a PC with corresponding software integrated (plug-in socket optional)
- Excel script for simple graphical evaluation of the measurement data
- Holdback for guaranteed warm-up time

Options

- Cascade control module:
  Programmable controller with chamber and batch temperature control with 1 thermocouple each, switchable between chamber and batch control for optimum temperature control in each case
- Multi-zone control module: For precise temperature control across multiple heating zones in the chamber
- Web viewer to monitor and control the furnace from a mobile phone, tablet, laptop or PC
- Temperature controller with 7-day preset timer for programmable day/night temperature switching, ideal for shift and continuous operation furnaces



Process control and documentation

Control system

THERMCONCEPT uses Siemens PLC S7 control systems to control complex processes and programme sequences, taking into account any necessary safety devices. These are created and optimised individually and specifically for each application in close cooperation with the user.

Siemens PLC S7 control/operator interfaces

- Customised and programmed for furnace and process
- Customised, individual operator interfaces available as an option
- Optimum solution for systems with a wide range of functions and high process reliability
- Detailed process messages with full text output (multilingual)
- Simple tabular programme input via touch panel
- Clear colour display

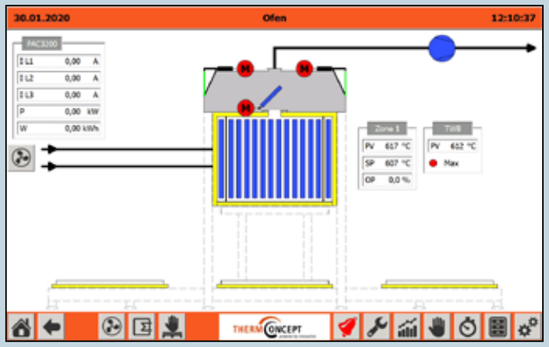
Documentation

Documentation of all process-relevant data plays an important role as proof of compliance with heat treatment regulations and for quality assurance. THERMCONCEPT offers a range of options for this:

- Eurotherm iTools and Eurotherm Controllers for connection to a PC for programming, monitoring and documentation.
- Digital recorders with up to 18 channels, USB interfaces, Ethernet, memory cards
- Process standard compliant recorders such as Eurotherm Aerodac 6100A, 6180A, 6100XIO, Nanodac

Control and Analysis Software

- Eurotherm iTools for professional process control and documentation of temperature/time profiles and batch data
- Multiple furnaces can be managed simultaneously
- Control from a central PC or over a network
- Great operating convenience



Process standards

International aerospace material standard AMS 2750

This standard covers the requirements of the aerospace industry for heat treatment equipment and applies to furnaces and equipment and their thermocouples, temperature controllers and indicators. Documentation of heat treatment processes, as well as periodic system accuracy and temperature uniformity tests, play an important role in quality assurance and are performed to ensure that components have been heat treated in accordance with applicable standards.

The standard classifies heat treatment systems into furnace classes (temperature distribution in the working chamber) and instrumentation versions (pyrometry design).

Furnace class

The furnace class results from the temperature distribution of a furnace in a defined, empty usable space and in a specific temperature range.

The temperature distribution depends on the furnace technology used (air circulation, multi-zone control, etc.).

Appropriate furnaces are selected and, if necessary, customised according to the customer's requirements.

Temperature distribution	
Furnace class 1+/- 3 °C	Furnace class 4+/- 10 °C
Furnace class 2+/- 6 °C	Furnace class 5+/- 14 °C
Furnace class 3+/- 8 °C	Furnace class 6+/- 28 °C

Instrumentation

Depending on the version, the instrumentation includes controllers, data loggers and temperature sensors/thermocouples.

Controllers must be calibratable, AMS 2750 approved and have a high level of control accuracy to meet the high requirements.

Data is usually recorded electronically using the measurement data from the controllers. The recording must be tamper proof.

The temperature sensors / thermocouples used by THERMCONCEPT are designed as thermocouples with a test hole. These are accessible from the outside and therefore do not need to be removed. This makes calibration easier!

The instrumentation versions include the following equipment:

Instrumentation A
- TCP 400 controller
- Eurotherm nanodac or Eurotherm 6100A/6100XIO recorder
- 2 thermocouples for the hottest and coldest points in the furnace, determined by test
- 1 thermocouple for measurement on a component
- 1 overtemperature monitor with independent thermocouple

Instrumentation B
- TCP 400 controller
- Eurotherm nanodac or Eurotherm 6100A/6100XIO recorder
- 1 thermocouple for measurement on a component
- 1 overtemperature monitor with independent thermocouple

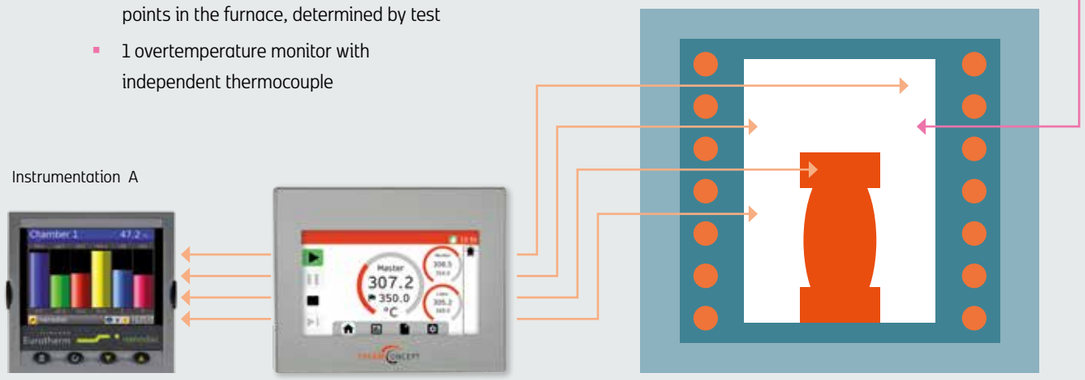
Instrumentation C
- TCP 400 controller
- Eurotherm nanodac or Eurotherm 6100A/6100XIO recorder
- 2 thermocouples for the hottest and coldest points in the furnace, determined by test
- 1 overtemperature monitor with independent thermocouple

Instrumentation D+
- TCP 400 controller
- Eurotherm nanodac or Eurotherm 6100A/6100XIO recorder
- 1 additional thermocouple for independent temperature measurement in the furnace chamber
- 1 overtemperature monitor with independent thermocouple

Instrumentation D
- TCP 400 controller
- Eurotherm nanodac or Eurotherm 6100A/6100XIO recorder
- 1 overtemperature monitor with independent thermocouple

Instrumentation E
- TCP 400 controller

Temperature selection monitor



Equipment / Instrumentation version	Instrumentation version A	B	C	D+	D	E
Controller	X	X	X	X	X	X
Recorder	X	X	X	X	X	
Hot & Coldt	X		X			
Component Measurement	X	X				
Additional Data Acquisition				X		
Overtemperature	X	X	X	X	X	

Process standards

CQI-9 International automotive industry standard

The CQI-9 is a self-assessment for heat treatment of components in the automotive industry and has been introduced in collaboration with leading international automotive manufacturers and suppliers and the International Organisation for Standardisation (ISO) for continuous improvement, error prevention and reduction of process variation.

Relevant content has been taken from AMS 2750 and adapted to automotive heat treatments in terms of application, requirements, available furnace technology and frequency of testing.

It is important to verify process values through tamper-proof data recording and to meet required accuracies.

Proven AMS 2750 instrumentation, as described on page 125, can be selected and customised as required.

THERMCONCEPT Service

Professional service

We make your furnace project ours

Success through counselling

You can rely on the experience we have gained over the years in industrial furnace construction. We will turn your special requirements into optimum solutions.

Your application takes centre stage

We support you in selecting the right furnace system so that you make the right investment decision.

Everything from a single source

As a system provider, we not only advise you on the selection of the right furnace system. You can also contact us when it comes to system automation and the use of additional aids, tools and systems.

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Qualified service staff

With our qualified employees, we offer a wide range of professional services for all aspects of the furnace system, for your safety right from the start. Our service technicians are involved in the production process at our headquarters and are therefore always up to date with their knowledge. They are specialists for

- Insulation
- Control and regulation technology
- Heating technology
- Software
- Electrical engineering/electronics
- Mechanics

The holistic support and maintenance of your furnace system is our focus.

Retrofit and standardisation

Furnace systems from THERMCONCEPT are known for their durability. After many years of hard use, they are far from being a thing of the past. We take care of your systems and make them fit for the future. Significant energy savings can often be achieved with little effort. Adaptations to current standards are also possible so that the furnace system can also be used for additional applications and processes. Modern control systems increase operating convenience and expand the possibilities for process documentation.

Fit for Future

What you can expect from us is a comprehensive package of professional services to keep your furnace fit in the future

Furnace inspections

During a furnace inspection, we thoroughly check the condition and functionality of your furnace system. On request, this also includes measuring the temperature uniformity according to DIN 17052-1, SAT, TUS and checking whether your system still complies with the applicable standards. The results are documented in a test report. In addition, we provide you with profitability analyses for the necessary retrofit measures.

Preventive maintenance – Predictive maintenance – Life-cycle costing

Unexpected system downtimes cause trouble and considerable follow-up costs. That‘s why we offer you flexible maintenance contracts with regular inspections as well as preventive and cost-effective replacement of critical spare parts. The maintenance work is comprehensively documented and analysed. This is the prerequisite for optimising life cycle costs.

Spare and wear parts: Only the original is first choice

Spare and wear parts from THERMCONCEPT offer you:

- always original equipment quality
- 100 % safe to use and a perfect fit
- maximum service life
- a better price-performance ratio than supposedly cheaper replica parts
- constant availability
- the adoption of product improvements also for spare parts
- responsive logistics

Online monitoring / online support

With online support, we offer our customers an extremely cost-effective service for support, e.g. for programme optimisation, troubleshooting, etc. This often avoids costly on-site visits by service technicians.

Product range overview

GFRP | CFRP | Fibre-reinforced composites

THERMCONCEPT supplies a comprehensive range of low-temperature furnaces and industrial drying systems in a variety of designs for a wide range of applications for drying and processing composite materials such as CFRP, GFRP, elastomers and silicone. In addition to the classic chamber furnace, drawer furnaces, chest furnaces and furnace systems with removable trolleys are also used. Continuous furnaces with horizontal or vertical component transport are available for continuous processes.

Technical ceramics | Bio-ceramics High-end ceramics

THERMCONCEPT furnaces and heat treatment systems are used for many industrial applications in the development and production of technical ceramics. Our chamber furnaces, bogie hearth furnaces and hood furnaces are electrically or gas fired. In addition to a wide range of practical standard models, we also supply furnace systems, system automation and appropriate exhaust air cleaning systems to suit your application.

Metal | Industry | Production

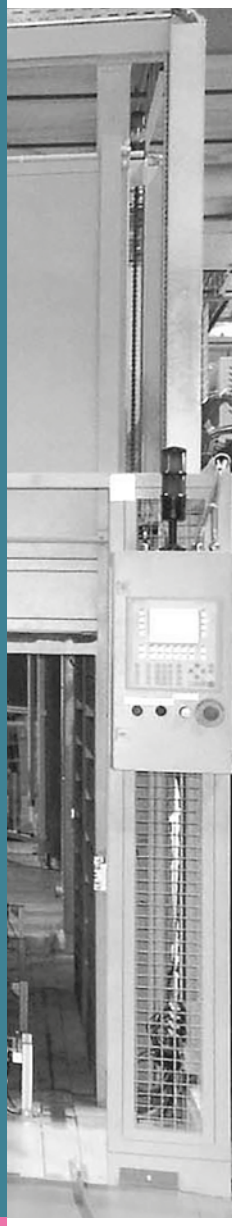
Here you will find furnaces, systems and accessories for a wide range of heat treatment applications in the metalworking industry. Almost all major heat treatments are covered by our furnace range.

Non-ferrous metals | Melting | Holding | Heat treatment

The foundry range includes electric and fuel-heated melting and holding furnaces for light and heavy metals, designed as both bale-out and tilting furnaces. We also supply furnaces for a wide range of in-foundry heat treatments.

Laboratory | Research | Development

Furnaces for research and laboratory applications are available for temperatures from 200 °C to 1800 °C. Our range includes muffle furnaces, tube furnaces, drying furnaces, elevator furnaces and high temperature furnaces.



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